

## Foreword

This Manual is developed to provide service and maintenance technicians and management persons at LIFAN service centers with the information about the structures, working principles and technical parameters of LIFAN 820 series so as to facilitate their vehicle inspections, fault diagnosis, disassembly and installation, and adjustment, service and maintenance.

This Manual contains three volumes: Volume I, Volume II, Volume III and wiring diagrams, so as to meet different needs of readers.

This Manual features combination of texts and illustrations, understandable descriptions and a number of service and maintenance tips, so as to shorten working hours and improve working efficiency.

It is of great importance to keep following points in mind when using this Manual:

1. Read this Manual carefully before performing inspection, fault diagnosis, disassembly and installation, and adjustment, service and maintenance, and conduct such operations in accordance with the requirements specified in the Manual. Also, pay attention to the instruction contained in "Warning", "Note" and "Hint" texts.
2. This Service Manual is applicable for LIFAN 820 series products. As vehicle models are different, some devices, facilities or functions may be not found on some models.
3. To avoid damage to vehicle devices or even safety accidents, it is strictly forbidden to modify the existing devices or add other devices to the vehicles by users without authorization, especially for the electrical system, brake system, steering system and other systems related to driving safety.
4. Purchase genuine parts and accessories tested and approved by LIFAN from LIFAN service centers.
5. LIFAN shall not be held responsible, liable and accountable for accidents or any other direct or indirect losses arising from the violation against the No. 3 and No. 4 instructions mentioned above.
6. The contents contained in this Manual may differ from the actual LIFAN 820 series products improved with the technical progress. LIFAN shall reserve the right to update its vehicle design without prior notice. Therefore, LIFAN will revise the contents contained in this Manual at the time of republication without prior notice. LIFAN shall not be held directly or indirectly responsible, liable and accountable for any loss of users arising therefrom.

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Chongqing Lifan Passenger Vehicle Co., Ltd.

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# 01- Overview

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## How to Use this Manual

### General information

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1. This Manual focuses on the first procedure “Diagnosis” (see fault diagnosis in each chapter), the second procedure “Replacement, maintenance and commissioning”, and the third procedure “Final inspection”.
2. This Manual analyzes and explains the maintenance respectively from system description (in theory), fault diagnosis (finding problems) and maintenance guide (troubleshooting).
  - System Overview: including system description, preparation, maintenance data, precautions, parts diagram, general inspection, etc. This Manual features description and explanation of faults on the basis of theory about system and from the perspective of complete system, provides theoretical guide for maintenance, and analyzes and solves problems from the perspective of complete system.
  - Fault diagnosis includes fault symptom list, fault symptom table, etc. It mainly explains common and possible faults of vehicle, points out possible fault locations, and provides troubleshooting method to help quickly find out the fault causes and locations.
  - Maintenance guide: It classifies components of the system, and provides detailed and proper maintenance guide for inspection, test, removal and installation of each part to improve maintenance quality and efficiency.
3. Though the following basic operations are not specially detailed in this Manual, yet they are absolutely necessary in practical operations.
  - Use of jack
  - If necessary, clean the dismantled components.
  - Visual inspection
4. Each chapter of this Manual contains maintenance cautions. Read these contents carefully before maintenance to avoid part damages and personal injuries due to misoperation.

### General check

"General Check" mainly performs inspection and adjustment of important positions related to structure, repair and service as well as other related inspection (such as looseness, clearance, crack and damage).

### Inspection

Using recommended tools and measuring gauges, perform related inspection and check procedures through sensor. But in practical steps of repair and service, visual inspection is also required for related inspection.

## Preparation

Service tools and service data required for repair are listed at the beginning of each chapter in this Manual. Well preparation before repair will improve your repair quality and efficiency.

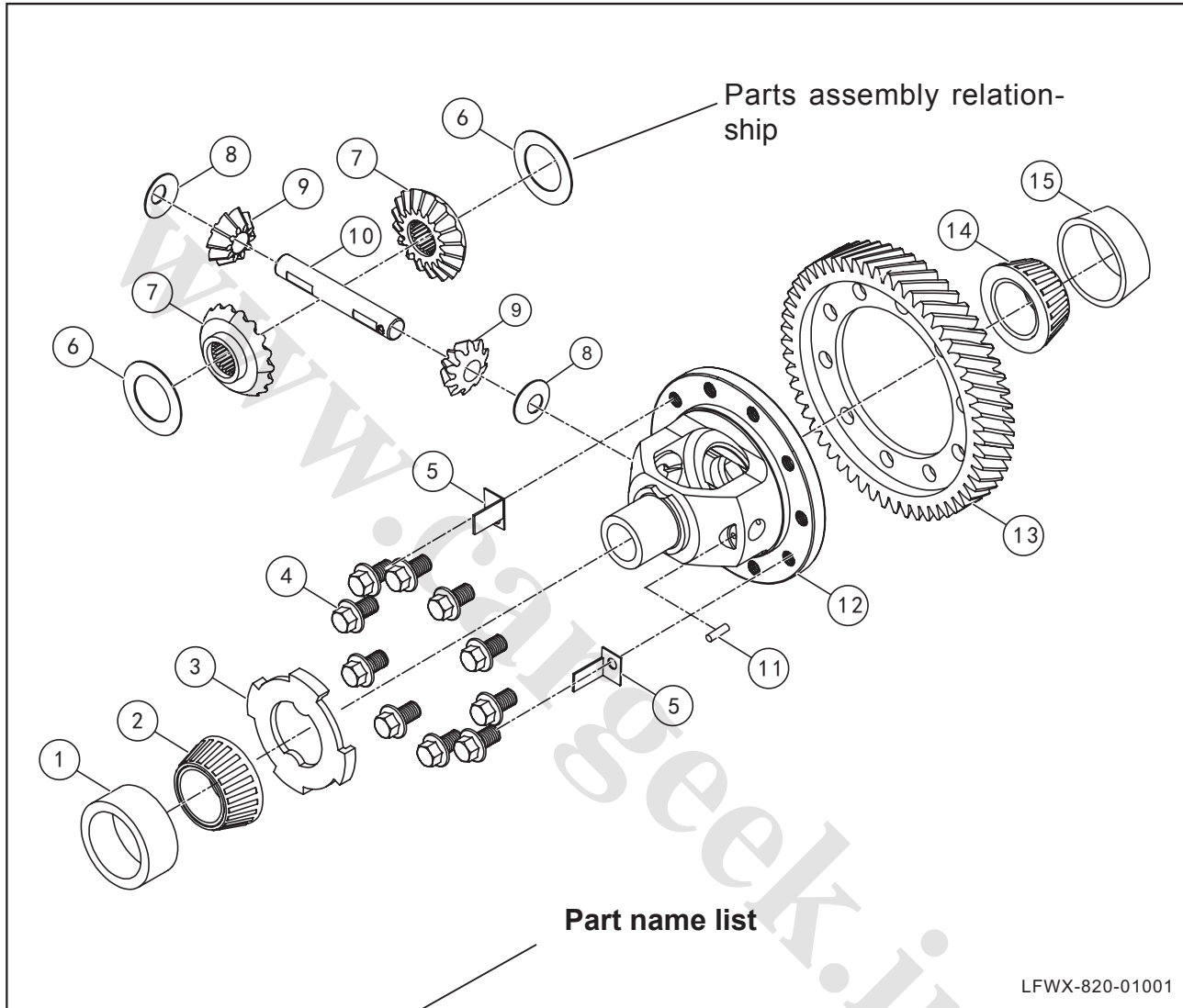
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## Maintenance procedures

1. Component drawings are inserted where necessary, and introductions to the system where components or components are serviced are made in details.
2. Component drawings clearly describe the assembly relationship of components in the form of explosive view.

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1	Differential front bearing cover
2	Differential front bearing
3	Odometer Gear Ring
4	Housing fasteners
5	Gear shaft retainer
6	Axle shaft gear washer
7	Axle shaft gear washer

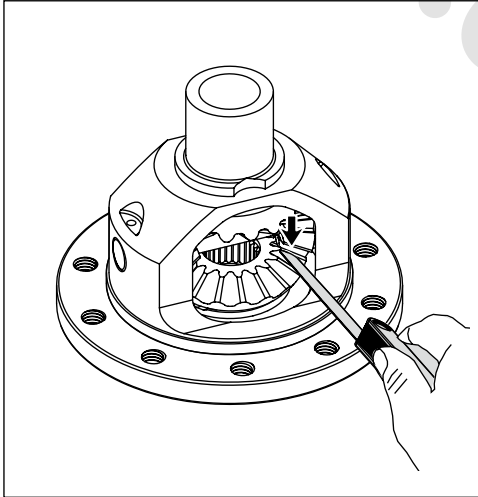
9	Planetary gear
10	Planetary-gear shaft
11	Planetary-gear shaft elastic cylindrical pin
12	Differential housing
13	Differential ring gear
14	Differential ring gear
15	Differential rear bearing

8	Planetary gear gasket		
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3. If an installation procedure is reverse to the removal one, only the important procedure is described.
4. This Manual uses illustrations for the important part and the operation part in the working procedures, provides detailed descriptions of such components, and lists operation method, reference data and cautions.
5. The working procedures are described in the following forms:
  - Illustrations: “What to Do” and “Where to Do” .
  - Titles of operation procedures: “What to Do” .
  - Operation procedures indicate “How to Finish Tasks” , and provide "WARNIN", "NOTICE", "HINT" and other useful information to facilitate the maintenance.

Example:

**Illustration**  
What to do and where to do



**What to do**

**1. Check the gear clearance between planetary gear and axle shaft gear**  
(a). Check the gear clearance between planetary gear and axle shaft gear, if the backlash exceeded standard value, the appropriated space ring shall be selected, and the backlash measured.  
**Guarantee value: 0.025mm - 0.150mm**

**Note**  
Gear clearance on both sides shall be adjusted into equal.

**Task finished**

**Help info**

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## Terms definition

### Standard value

Indicating standard for part quality judgment or assembly inspection, or related correction and adjustment value of related parts and assemblies. Indicating with range type.

### Limit value

Indicating part quality judgment and assembly inspection standard as well as maximum value or minimum value of parts or assemblies conforming to function performance and strength demand.

## Torque

Torque (Nm) mainly presents the standard tightening torque value range. When relative torque of bolts and nuts are not provided, refer to tightening torque table for detail.

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## "Warning", "Note" and "Hint"

### ▲ WARNING

It is highlighted in bold type to require necessary measures applied to avoid personal injury or death.

### 📌 Note:

It is highlighted in bold type to stress the necessity of a certain diagnosis or maintenance procedure. Otherwise, it may result in personal injury or parts and components damage.

### △ HINT

It provides additional instruction helpful for improving work efficiency of the maintenance.

## International System of Units (SI)

The "Unit" in this Manual adopts the international system of units (SI).

For example:

**Torque: 30N•m**

## Index

At the end of this Manual, index of content table is provided to facilitate the maintenance process.

## Abbreviations

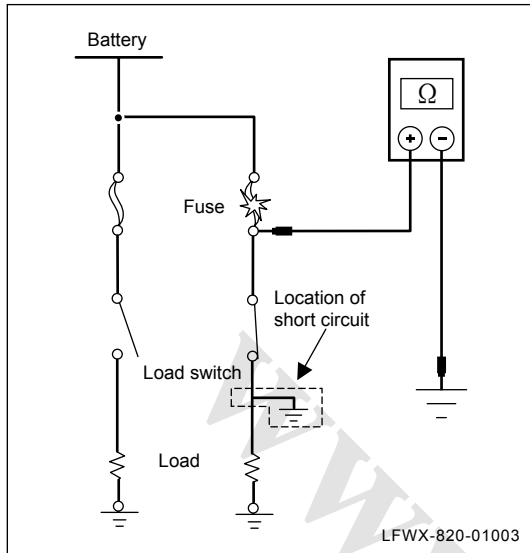
At the end of this Manual, abbreviation table is provided to facilitate the maintenance process.

## DTC list

At the end of this Manual, DTC list is provided to facilitate the maintenance process.

## How to Eliminate the Fault

### Inspection and repair of fuse

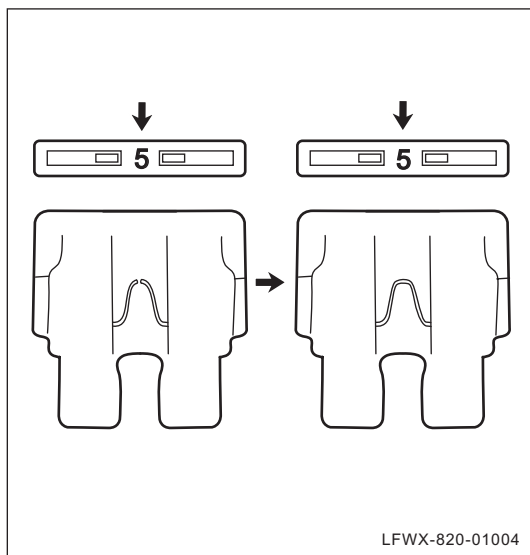


#### 1. Check the blown fuse circuit

- (a) Remove the blown fuse and measure the resistance between blown fuse loading end and grounding. Switch off all circuit switches connected with this fuse. Under this condition, the resistance is about  $0\ \Omega$  and short circuit point may exist at certain part between switch and loading. When the resistance is not  $0\ \Omega$ , it indicates there is no short circuit symptom. But over high loading transient voltage may also result in blown fuse.

Main causes for short circuit include the following.

- Outer surface of wire harness is damaged due to wear or overheating.
- There is water in connectors.
- Artificial fault, etc.

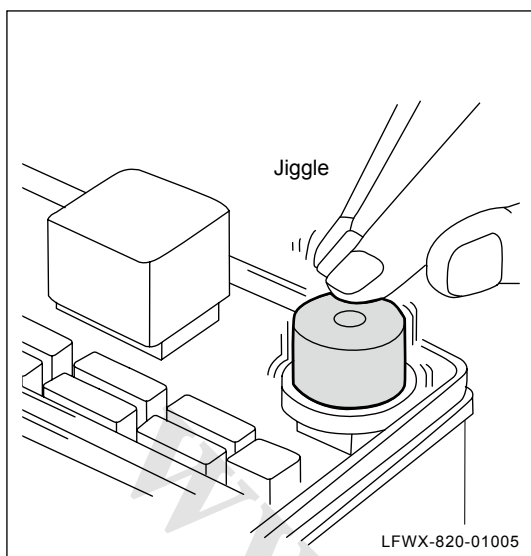


- (b). When replacing a fuse, make sure that the rated current intensity of a new one is correct. It is forbidden to use a fuse with current being more than or less than rated value.

### How to handle intermittent fault

To confirm condition of intermittent fault, ask the customer about vehicle driving condition, weather condition, fault frequency and fault symptom and then try to simulate fault symptom. Judge whether the inspected circuit is damaged or normal and confirm and eliminate

the fault. For narrowing the range of the possible faults, refer to the fault symptom table of each system.



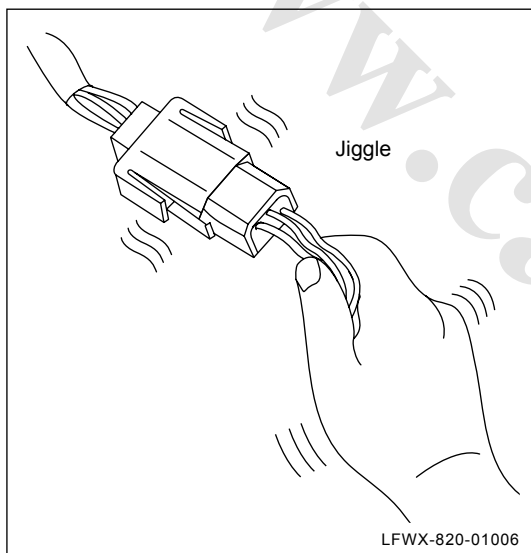
## 1. Shaking method

### (a) Components and sensors.

Lightly shake the possible faulty sensor with your fingers, and check whether fault appears again.

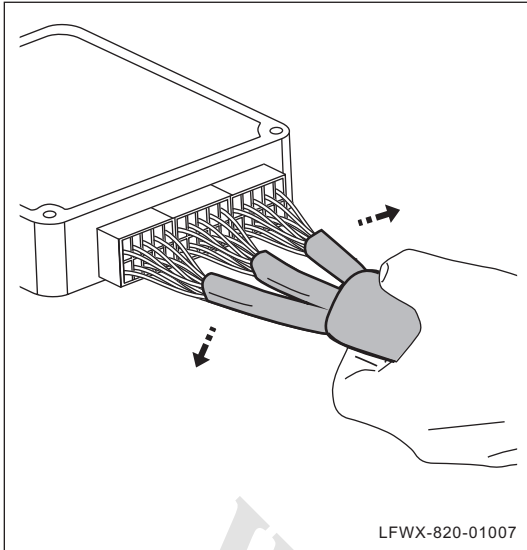
#### **Note:**

Excessive force may cause the relay open-circuited.



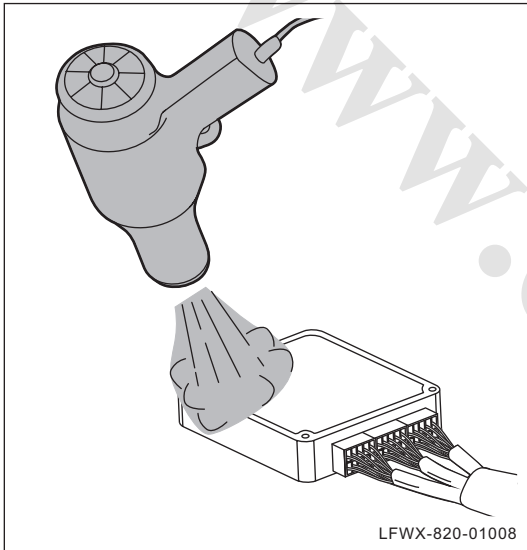
### (b) Connector.

Lightly shake the connector vertically and horizontally and judge whether fault appears again.



(c) Wire harness.

Lightly shake the wire harness and connector vertically and horizontally and judge whether fault appears again.

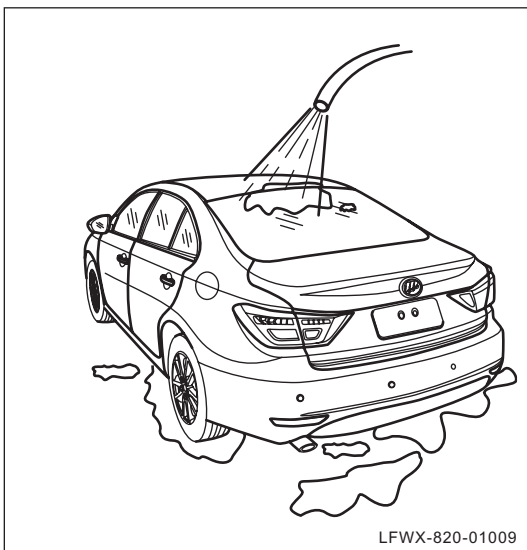


## 2. Heating method

(a) Heat the potential parts with an electric dryer or the similar to determine whether the fault reappears.

### ⓘ Note:

- Do not damage parts and components structure during heating.
- Do not heat any ECU component directly.



## 3. Water-spraying method

(a). Spray water onto the vehicle, and judge whether fault appears again.

### ⓘ Note:

- Avoid spraying water onto the engine directly.
- It is forbidden to spray water to the electrical components directly.

### △ HINT:

Water leakage may damage some electrical components. Take great care during the water-spraying test.

#### 4. Others

- (a) Connect all loadings and judge whether fault appears again.

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### How to handle previous fault

Although fault does not appear under current condition, but the fault occurred before. In case of such condition, related faults may exist all the time.

When previous fault exists, perform the following inspection procedures.

- (a) Confirm whether user has replaced the fuse or disconnected the connectors.
- (b) If related fuse was replaced or connector was disconnected, clear the DTC and check whether its DTC is reset. If the DTC is not reset, complete the diagnosis.
- (c) In case of DTC reset, perform related DTC process. Then check wire harness and connectors and refer to "How to Handle Intermittent Fault" for detail.

## Precautions before Repair

### Safety protection system

#### 1. Precautions for SRS maintenance

- (a) After disconnecting negative cable of battery, wait for 60s at least before any operation. Disconnect the battery, and SRS system will provide sufficient voltage to airbag for deployment. Do not repair SRS system components within 60s after disconnecting battery cable. Otherwise SRS system may be started and airbag may be deployed, resulting in serious accident.
- (b) When repairing or handling SRS components, read related warnings/notices carefully. Warning tag is located at right sunvisor.
- (c) Always make sure that specified special tool and measuring devices are used.
- (d) Removed SRS components should be placed at clean and dry area. Place airbag module at flat surface with its inflation direction facing upward. Do not place any object on its top.
- (e) Do not remove or repair SRS components (SRS control unit, airbag module and clock spring)
- (f) After completing SRS repair, check warning lamp for normal operation to ensure normal system function.
- (g) Before handling airbag module or when handling vehicle equipped with airbag module, make sure airbag is deployed.

#### 2. When perform SRS component operation (including indirect operation related to SRS), follow the following steps

- (a) When removing or installing parts, do not collide with or shake SRS components.
- (b) During praying, remove the SRS control unit, airbag module, clock spring, front impact sensor and seat belt with pre-tightening function to avoid heating damage.

### Engine oil

#### 1. Health warning

- (a) Contact with engine oil for a long time repeatedly will lead to skin natural oil reducing, resulting in dry, irritated and inflammed skin.
- (b) Engine oil may contain potential dangerous objects that may result in skin cancer. Apply proper skin protection method and related cleaning equipment.

#### 2. Recommended preventive actions

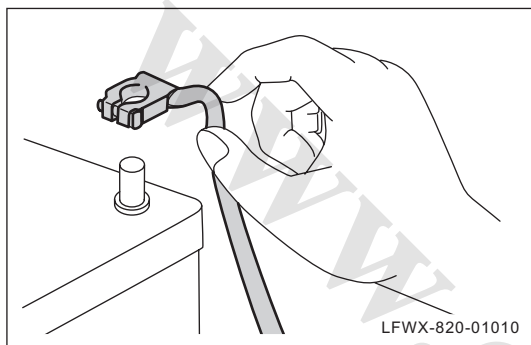
- (a) Avoid to contact with engine oil (especially the used engine oil) for a long time repeatedly.



- (b) Wear protective clothes, including practical leak-proof gloves.
- (c) Do not put rag attached with oil stain into pocket. To avoid such case, wear uniform without pocket.
- (d) The uniform should be clean and stored alone.
- (e) Wear goggles and mask during operation and take along related eye washing device.
- (f) Do not clean the skin with petroleum, kerosene, diesel, gasoline or solvent.
- (g) In case of related skin disease, go to a doctor immediately without any delay.

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## Electrical system maintenance



Before replacing related components in electrical system or repairing electrical system, disconnect negative cable of battery to avoid short circuit.

Before disconnecting or connecting negative cable of battery, make sure that ignition switch and light switch are switched off (if above devices are not switched off, it may result in damage to semiconductor parts).

## Vehicle cleaning

When clean the vehicle with high-pressure cleaning devices or steam cleaning devices, pay attention to the following information to avoid damage to related plastic components.

**Nozzle distance:**  $\geq 40\text{cm}$

**Pressure:**  $\leq 3900\text{kPa}$

**Temperature:**  $\leq 82^{\circ}\text{C}$

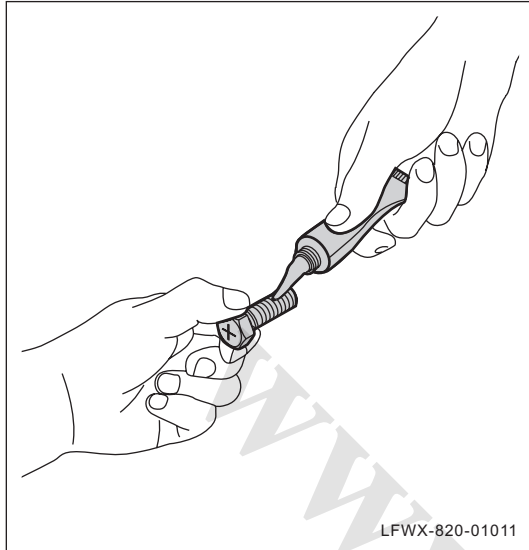
**Centralized injection time of single point:**  $\leq 30\text{s}$

## Application of preservative and primer

Preservative or primer falling on sensor or actuator will influence the performance of sensor or actuator. When spraying preservative and primer, cover the sensor and actuator with protective cover.

## Maintenance Guide

### Maintenance tips



#### 1. Pre-coated parts

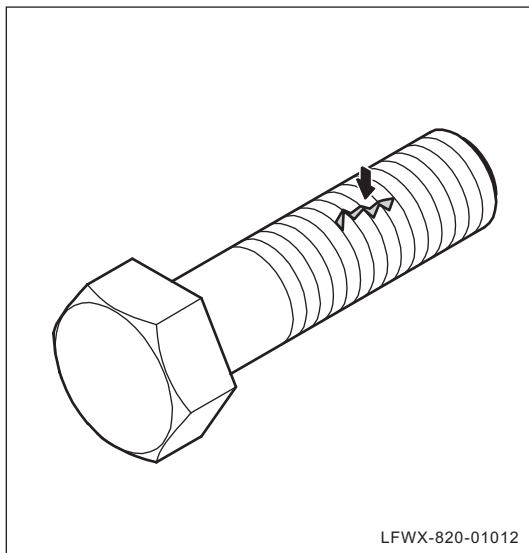
- (a). Pre-coated parts are bolts, nuts, etc. that are coated with a sealant at the factory.
- (b). If a pre-coated part is retightened, loosened or caused to move in any way, it must be recoated with the specified sealant.
- (c). When reusing pre-coated parts, clean off the old sealant and dry the part with compressed air. Then apply the specified sealant to the thread of bolts and nuts.
- (d). After applying the sealant, wait for a period of time until the sealant hardens.

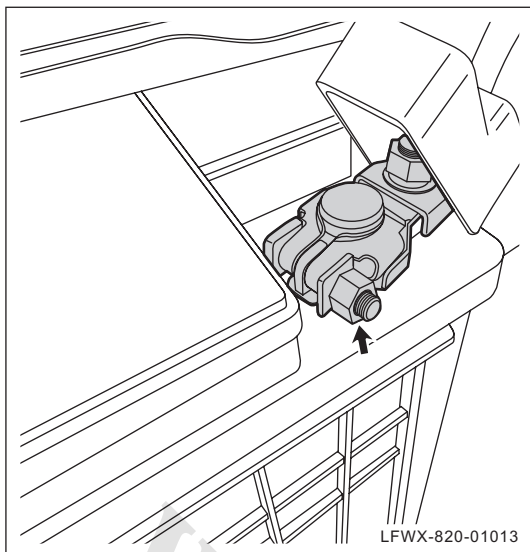
#### 2. Washers

- (a). When necessary, use a sealer on gaskets to prevent leaks.

#### 3. Bolt, nut, screw

- (a). Before use, check whether there are more than three damaged threads in the bolt, nut and screw. If so, replace it.
- (b). Follow all specifications for the tightening torques of bolts.

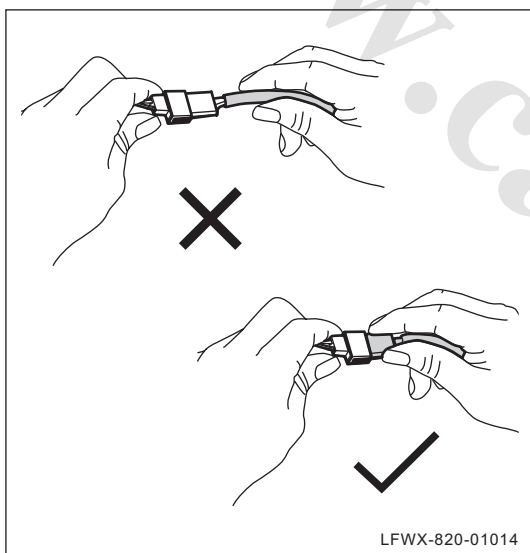




#### 4. Battery

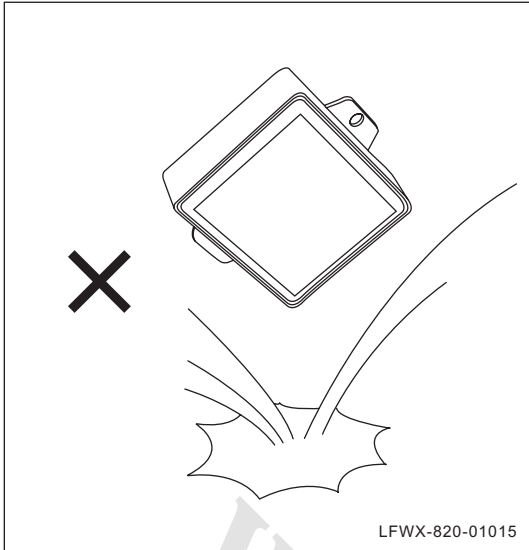
- (a) Before checking or repairing on-board electric equipments and circuits, disconnect the negative cable of battery.
- (b). To avoid damage to the battery terminal post, unscrew the terminal post nut, and remove the cable by lifting it upwards. Do not twist or pry it.
- (c). Wipe the battery terminal post with a cloth. Do not ream or grind it with a file or other grinding tools.
- (d). Unscrew the nut and re-install the cable terminal back to the battery terminal post, and screw the nut. Do not knock the cable terminal to the battery terminal post with a hammer.

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#### 5. Electrical components

- (a). When unplugging any electrical connector, make sure to pull the connector body other than the wire harness.



- (b). Take care not to drop any electrical component (such as sensor and relay). If any component drops to hard ground, replace it.
- (c). When checking the conduction of wire connectors, make sure to carefully insert the tester probe to avoid bending of the terminal.
- (d). After replacing electrical components, make sure to test their functions to ensure normal operation.

## 6. Snap-fits

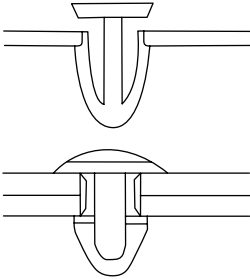
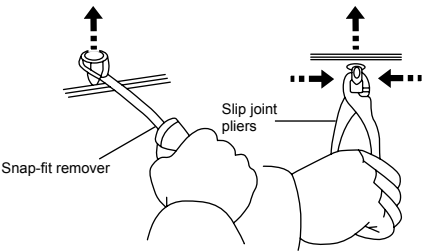
- (a). Special clamp tongs are required to remove snap-fits. The removal and installation methods for the snap-fits used in the common body parts are shown in the following table.


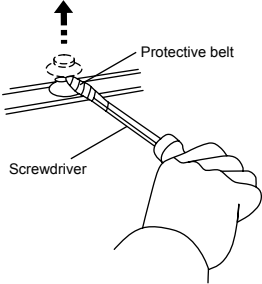
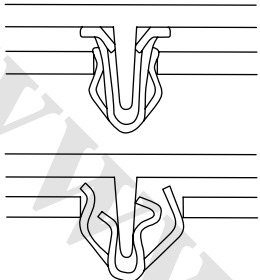
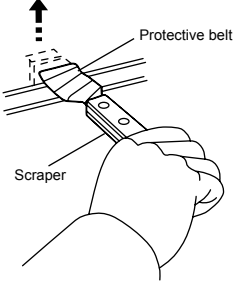
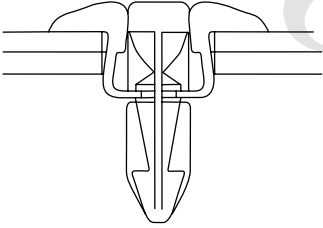
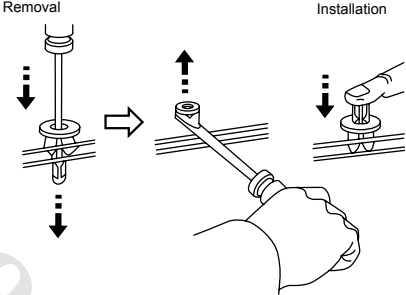
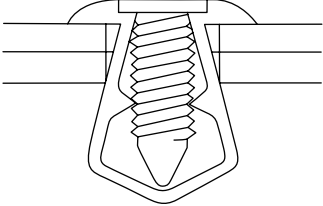
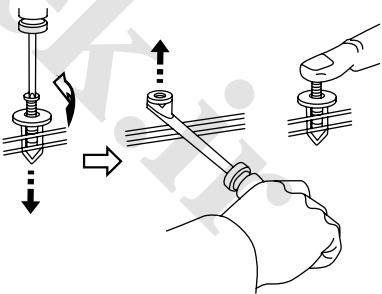
### △ HINT:

If the clamp tongs are damaged during maintenance, make sure to replace it.

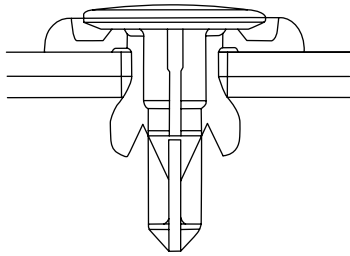
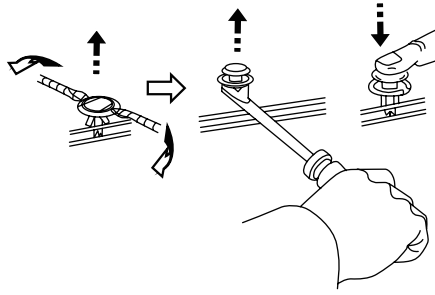
### 🔧 Note:

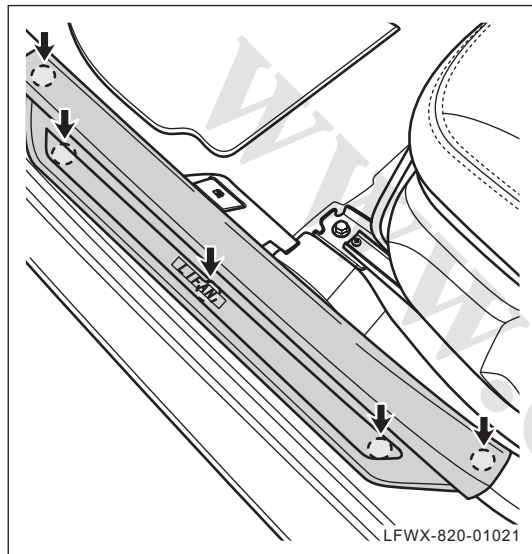
- If a snap-fit is damaged during maintenance, make sure to replace it with a new one.
- Make sure to replace non-reusable snap-fits, and do not reuse them.

Shape (example)	Removal / installation
	

Shape (example)	Removal / installation
	
	
	
	

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Shape (example)	Removal / installation
	



(b) In the chapters, the representation of snap mounting position is shown in the figure on the left.

## Vehicle lifting

### ▲ WARNING:

- To avoid personal injury, make sure to use jack stands when performing any work on or beneath the vehicle that is only supported by a jack.
- To avoid vehicle damage, serious personal injury or fatal accident, when removing the major components from the vehicle and supporting the vehicle with a lift, use the jack stands to support the vehicle at the points designated for proper lifting opposite to the components to be removed.

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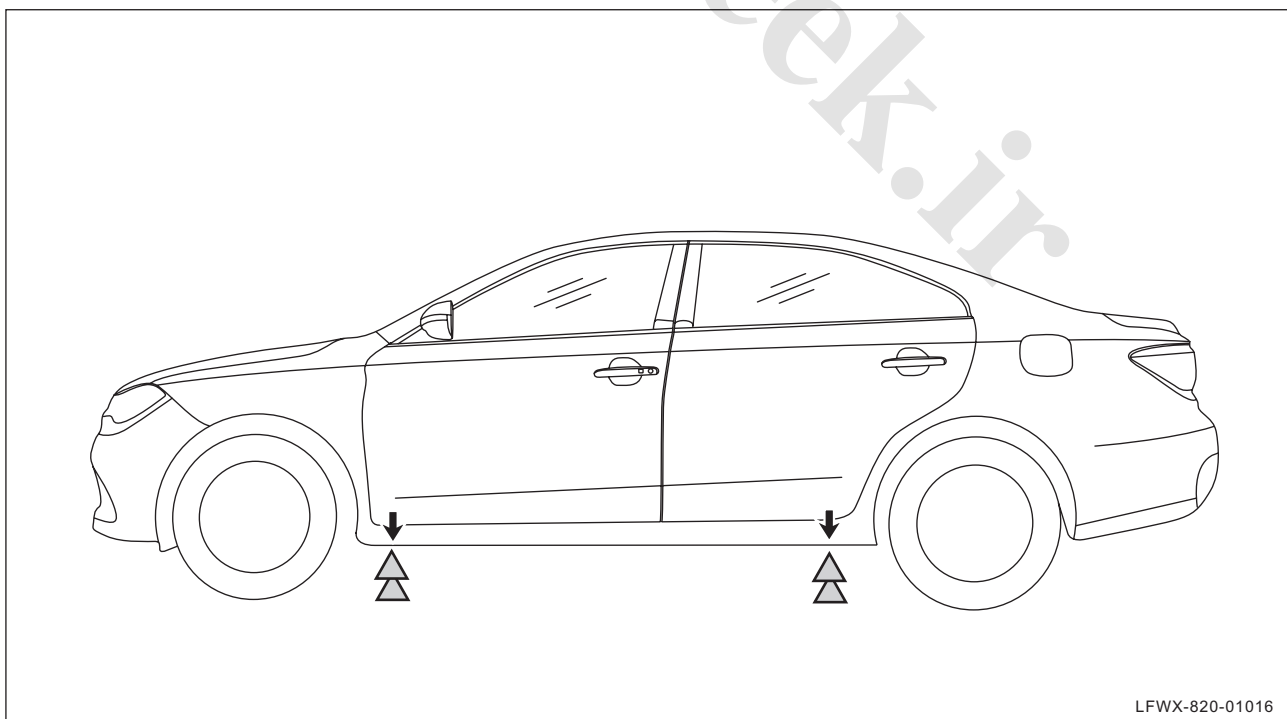
### 📌 Note:

- Make sure the vehicle is located on a clean, hard and flat ground before any lifting procedure.
- Make sure that all lifting devices meet the standards and are in good working conditions.
- Make sure that all loads on the vehicle are distributed evenly and securely.
- When lifting the vehicle at the front-end position, make sure that the jack or its block will not touch the body outer panel, choke plate or fender. Touching these components may damage the vehicle.

### △ HINT:

When lifting, correct support points shall be selected to lift the vehicle safely. Lifan 820 model' s lifting points are as follows:

1. **Side lifting: the lifting point for lifting frame in the workshop is shown in the figure below.**

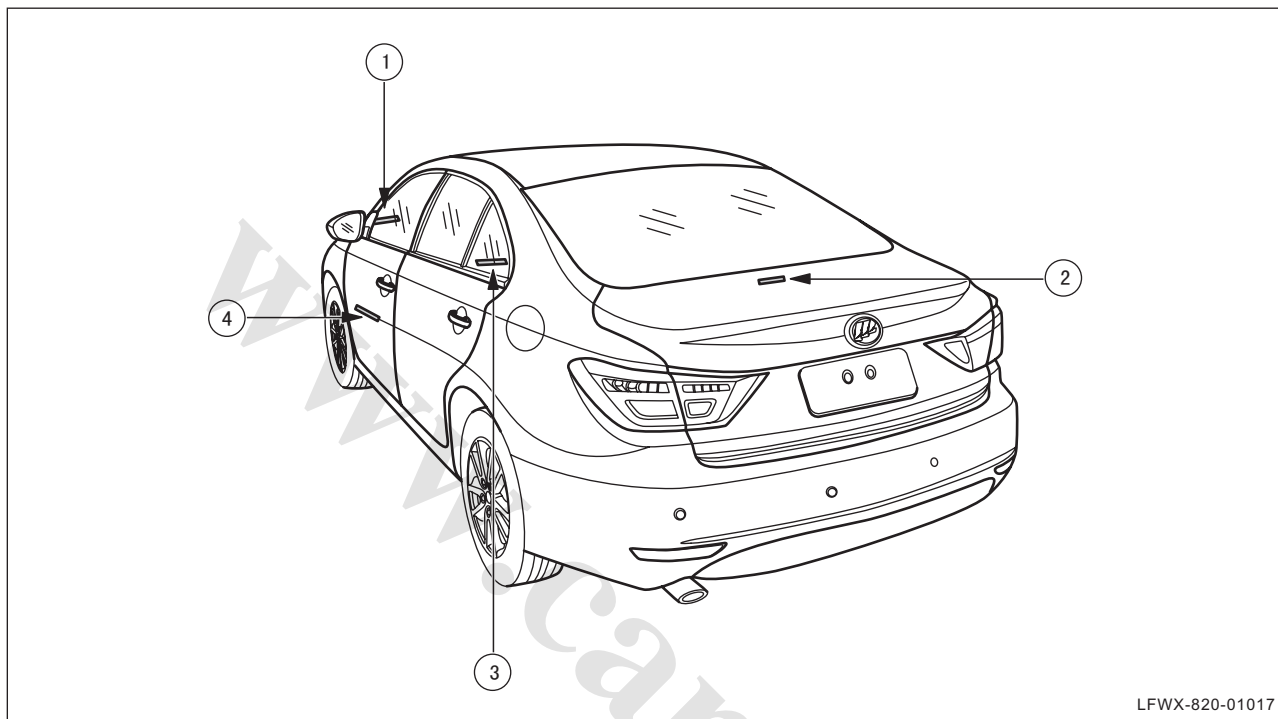


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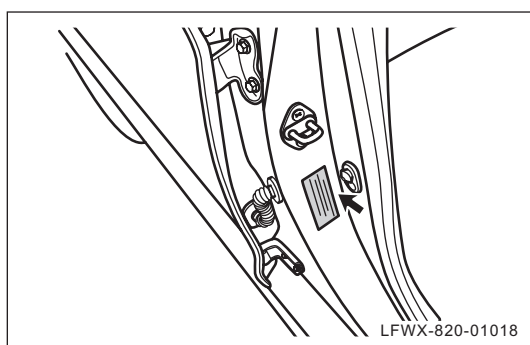
## Vehicle Identification

### Vehicle identification number

1. The vehicle identification number (VIN) is the legal identifier for your car. It is used for registering the ownership of your car



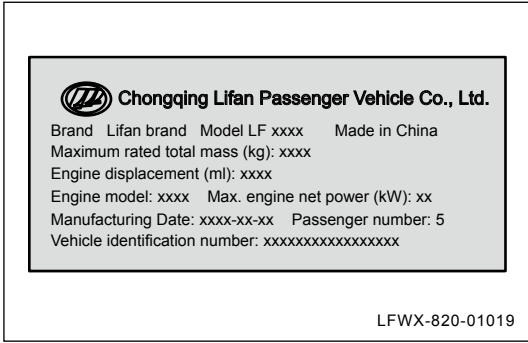
- ①: Vehicle Identification code is imprinted on the upper left of instrument desk.
- ②: Vehicle Identification code is pasted onto the metal plate of the trunk.
- ③: Vehicle Identification code is stamped on the downside of the front passenger' s seat.
- ④: Vehicle Identification code is also stamped on the inner panel of front left door.



### 2. Vehicle nameplate

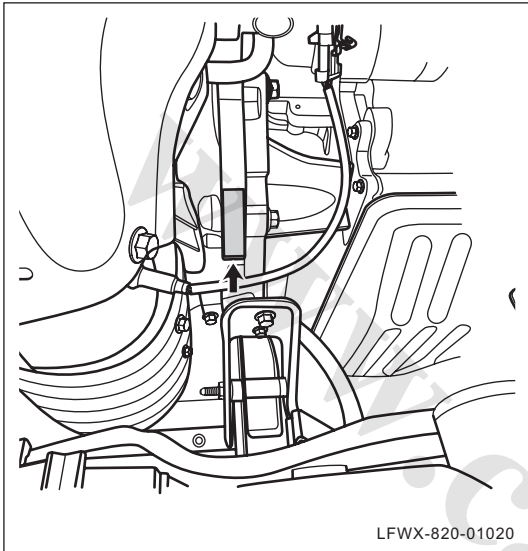
- (a) Manufacturer's name plate is in the lower part of the lock body on the side of the right C pillar.





- (b) The car model, number of occupants, engine model and VIN and others are marked on the manufacturer nameplate.

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### 3. Engine number

- (a) The engine number is stamped on the engine block.

## Specifications for Complete Vehicle

### 1. Basic parameters

Product model and name	LF7186	LF7240/LF7240B
Body structure type	Fully-integrated body, fully-metal-closed structure, 3-box, 4-door, 2-cover, 5-seat	
Drive type	Front transversely mounting of engine, front wheel drive	
Overall dimensions	L×W×H: 4865mm×1835mm×1480mm	
Wheelbase	2775mm	
Front wheel track	1575mm	
Rear wheel track	1560mm	
Front overhang	987mm	
Rear overhang	1103mm	
Number of passengers	5 Person(s)	
Passability parameters		
Approach angle	13° (no load)	
Departure angle	17° (no load)	
Min. turning diameter	11m	
Mass parameters		
Curb weight	1433kg	1545kg
Axle load mass (no load) (front/rear)	825kg/608kg	935/610kg
Full load mass	1808kg	1920kg
Axle load mass (full load) (front/rear)	933kg/875kg	1060/870kg

### 2. Basic performance parameters of complete vehicle

Product model and name	LF7186	LF7240/LF7240B
Maximum speed	179km/h	
Acceleration time (0~100km)	13.7s	
Maximum gradeability	≥ 30°	

### 3. Technical parameters of engine

Engine Model Name	LFB479Q	LF489Q
Type	Four-cylinder four-stroke in-line	
Cylinder bore × stroke (mm)	79×91.5	88.7×96
Displacement (ml)	1794	2373
Compression ratio	10	10
Maximum net torque/revolving speed ( N•m/( r/min))	162/4200~4400	220/4000~4500
Rated torque/revolving speed ( N•m/( r/min))	168/4200~4400	225/4000~4500
Maximum net power /revolving speed (kw/( r/min))	94/6000	118/5700
Rated power /speed [kW/(r/min)]	98/6000	120/5700
Idle speed (r/min)	750 ± 50	700 ± 50
Emission standard	Guo V	Guo IV /V
Ignition sequence	1-3-4-2	
Valve clearance (mm)	IN: 0.20~0.25 EX: 0.30~0.35	IN: 0.20~0.25 EX: 0.30~0.35

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#### 4. Types and parameters of main assemblies of engine accessories and chassis

Product model and name	LF7186	LF7240/LF7240B
Fuel supply system	Plastic fuel tank, built-in electronic fuel pump, electronic pedal-type fuel injection control	
Fuel evaporation	Solenoid control type	
Exhaust system	2-stage muffler, with 2-stage 3-way catalytic converter	
Air intake system	Dry air filter	
Cooling System	Water cooling, 2-stage electronic speed-setting fan	
Clutch	Single plate, dry, diaphragm spring(with torsional absorbers)	
Transmission		
Type	Manual transmission	Automated manual transmission
Gear ratio (1st)	3.182	4.155
Gear ratio (2nd)	2.158	2.375
Gear ratio (3rd)	1.346	1.522
Gear ratio (4th)	0.909	1.144
Gear ratio (5th)	0.703	0.859

Product model and name	LF7186	LF7240/LF7240B
Gear ratio (six positions)	-	0.676
Gear ratio (Reverse)	3.133	3.178
Final drive	4.467	3.81
Drive shaft		
Type	One-piece drive shaft, double constant velocity type universal joint, one end is Rzeppa type, another end is telescopic spherical roller type.	
Suspension		
Front Suspension	Macpherson independent suspension, stabilizer bar	
Rear suspension	Trailing arm torsion bar suspension	
Wheels and tyres		
Tire type	Tubeless radial tyre	
Tyre specification	215/60 R16	215/60 R16
Tire pressures (front / rear)	200kPa/200kPa	200kPa/200kPa
Steering		
Steering gear type	Electric hydraulic power steering	
Steering gear	Telescopic steering column	
Four-wheel alignment		
Kingpin caster	2° 45' ±30'	
King pin inclination	11° 54' ±30'	
Camber of front wheel	-0° 30' ±30'	
Toe-in of front wheel	0° ±30'	
Steering angle	Outer wheel: 36° 54' ~40° 54' Inner wheel: 31° 54' ~35° 54'	
Camber of rear wheel	-1° 24' ±30'	
Toe-in of rear wheel	0° 21' ±30'	
Brake system		

Product model and name	LF7186	LF7240/LF7240B
Type	Hydraulic dual pipeline X arrangement, with vacuum booster, equipped with ABS + EBD	
Service brake	Disc brakes for four wheels (ventilated discs (front)/solid discs (rear))	
Parking brake	Manually- operated mechanical cable, rear wheel braking (for manual transmission) Pedal-type parking brake + electronic parking (for automatic transmission)	
A/C system		
Type	Evaporation compression refrigeration, water heating type	
Operation	The whole series equipped with electrical A/C and self-controlled A/C, location-door and temperature-door driven by microstepping motor, new air-door driven by microstepping motor, and you can select and adjust vent position mode, heating/cooling mode, air inside/outside circulation pattern, and wind speed, temperature, etc. Its control components are arranged on the dashboard central control panel and HVAC.	
Refrigerant	R134a	

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## 5. Types and parameters of body structure

Product model and name	LF7186	LF7240/LF7240B
Vehicle body		
Type	Fully-integrated body, 3-box, 4-door, 2-cover, 5-seat	
Body in white (BIW)	All-metal closed structure	
Door assembly	Frame-type door, anti-collision beams for four doors, clockwise-rotated and hinged doors; power window regulators for front/rear doors	
Engine hood	Open backwards, single-arm-type hinge, pneumatic rod	
Front and rear bumper	Injection-modeled body	
Interiors and exteriors		
Sill trim panels	Injection-modeled body	
Dashboard	Injection-modeled body, support reinforced, left-set instrument cluster	
A, B, and C-pillar and door inner panel	Injection-modeled, front/rear door guard panel equipped with glove boxes	
Windshield, door glass	Windshield glass: laminated glass Front door: hardened glass (white); rear door: hardened glass (white) Rear windshield: Heated toughened glass (white), built-in antenna.	

Product model and name	LF7186	LF7240/LF7240B
Rearview mirror	Exterior rearview mirror: convex mirrors for both right and left sides, with electric controller Interior rearview mirrors: anti-glare type	
Seat	Front seat: independent seat, front and rear positions, back angle and head restraint are all adjustable, equipped with seat belt Rear seat: non-adjustable, non-individual seats, equipped with seat belts	

## 6. Structure and parameters of electrical system

Product model and name	LF7186	LF7240/LF7240B
Power supply, starting and charging systems		
Circuits	Single-wire system, negative ground, voltage DC 12V	
Alternator	Integrated, AC, built-in voltage regulator, 12V/90A	
Starter	12V, 1.4kW	12V, 1.7kW
Electronic fan	Two-stage speed-setting, dual-fan	
Battery	Maintenance-free lead-acid battery, with a capacity of 80Ah (1.8L/2.4L)	
Lighting & signal system		
Front combination light (high-beam)	White 55W 2 pcs	
Front combination light (low-beam)	White 55W 2 pcs	
Front combination light (position lamp)	White LED1 2 pcs	
Front combination light (front turn signal lamp)	Amber 20W 2 pcs	
Rear combination light (rear turn signal lamp)	Amber LED6 2 units	
Rear combination light (rear position lamp)	Red LED4 2 pcs	
Rear combination light (reverse light)	White 21W 2 pcs	
Rear combination light (rear fog lamp)	Red 21W 2 units	
Rear combination light (brake lamp)	Red 21W 2 units	
High-mounted brake lamp	Red LED1.49 2 pcs	

Product model and name	LF7186	LF7240/LF7240B
Licence plate light	White LED 0.5 2 pcs	
Side turn signal lamp	Amber 0.72W 2 pcs	
DRL	White 6W 2 pcs	
Trunk light	White 5W 1 pcs	
Front ceiling light	White 6W 1 pcs	
Rear ceiling light	White 10W 1 pcs	
Courtesy lamp	White 5W 4 pcs	
Makeup mirror	White 5W 2 pcs	
Glove box light	White LED 0.06 1 pcs	
Instrument system		
Instrument cluster	Speedometer, tachometer, fuel gauge, temperature gauge, multi-function display, adjustable instrument cluster lighting	
Indicator	Fuel warning light, Water temperature warning light, Brake system fault warning light, Engine electronic control system fault warning light /automatic transmission fault warning light, Low oil pressure warning light, TCU (Automatic Transmission Control Unit) oil temperature warning light, Lock-trunk warning light, Overspeed warning light, PEPS(Passive Entry Passive Start) fault warning light, ESCL (Electronic Steering Column Lock) fault warning light, Low beam indicator light, High beam indicator light, Clearance lamp indicator light, Turn-signal indicator lights (illuminated alone), Hazard warning lamp indicator lights (illuminated at the same time), Rear fog lamp indicator light, ESP (Electronic Stabilization Programme) indicator light, ESP OFF indicator light, Cruise indicator light, Rear defrosting indicator light, Snow-mode indicator light, OBD engine fault warning light, Parking brake indicator light, Immobilizer indicator light, Airbag fault warning light, ABS (Anti-lock Brake system) fault warning light, Battery charging indicator light, TPMS (Tire Pressure Monitoring System) MIL, Lock-engine-hood warning light, etc.	
Auxiliary electrical system	Including wiper system, windshield washer, audio equipment, antenna, cigarette lighter, rear window defroster, electronic anti-theft system, door locks, window lifters, horns, electric sunroof, electric mirrors, reversing radar, ABS +EBD system, lighting hint, voice hint, airbags	

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## 7. Specifications and amount of filling liquids

Product model and name	LF7186	LF7240/LF7240B
Coolant capacity and specifications	6L-7L; Lucent 100	6-7L; Lucent 100

Brake fluid capacity and specifications	0.6L~0.75L;D0T4	0.6L~0.75L;D0T4
Washer fluid capacity and specifications	3L~4L;NFC-60	3L~4L;NFC-60
Fuel capacity and specifications	60L; 93# (RON) and above, unleaded gasoline	60L; 93# (RON) and above, unleaded gasoline
Engine oil capacity and specifications	3.5L;API: Not less than SL	3.5L;API: Not less than SL
	4L;API: Not less than SL	API: Not less than SL
Air conditioning re- frigerant capacity and specifications	580g~660g;R134a	580g~660g;R134a
MT oil capacity and specifications	2.2L;SAE 80W-90(API GL-4)	2.2L;SAE 80W-90(API GL-4)
AT capacity and specifications	7.5L;ATF3292	7.5L;ATF3292
Steering fluid capacity and specifications	Filling according to the steering reservoir mark; ATF220	Filling according to the steering reservoir mark; ATF220



## Standard bolt torque

### Tightening torques of common thread specifications (for reference only)

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Thread type	Thread specification	Tightening torque (Nm)		
		Grade 8.8	Grade 10.9	Grade 12.9
Coarse thread	M4	3.0	4.4	5.1
	M5	5.9	8.7	10
	M6	10	16	18
	M8	25	36	43
	M10	49	72	84
	M12	86	126	145
	M14	135	200	236
	M16	210	310	365
	M18	300	430	600
	M20	425	610	710
Fine thread	M8×1	27	39	46
	M10×1.25	52	76	90
	M12×1.25	93	135	160
	M12×1.5	89	130	155
	M14×1.5	145	215	255
	M16×1.5	226	330	390
	M18×1.5	340	485	570
	M20×1.5	475	680	790



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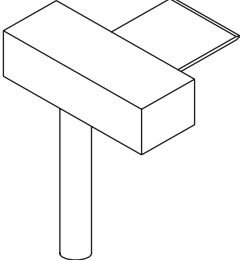
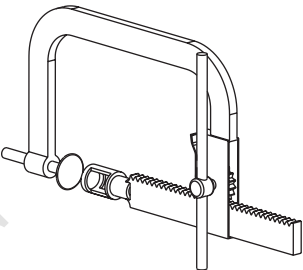
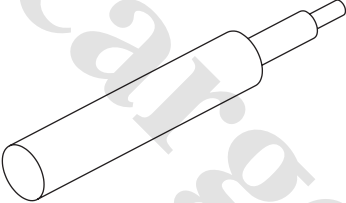
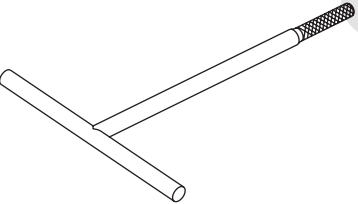
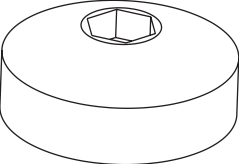
# 11A- Engine Mechanical System

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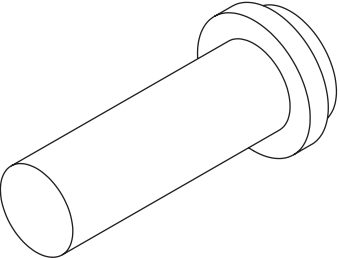
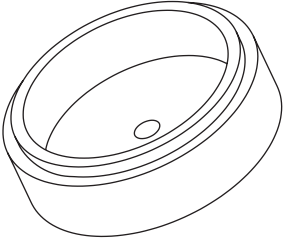
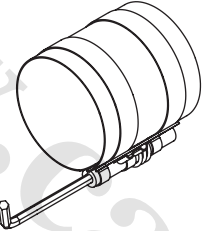
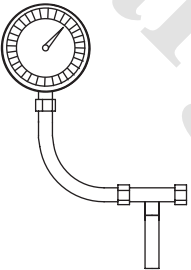
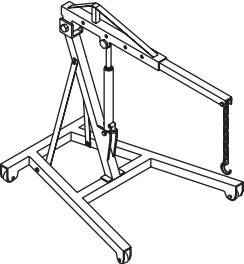
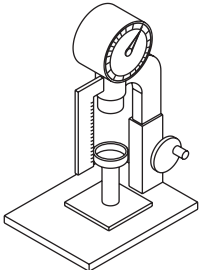
## Mechanical System of Engine

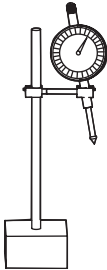
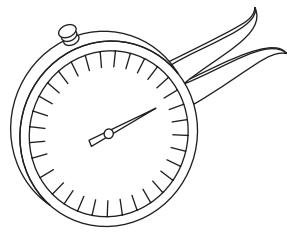
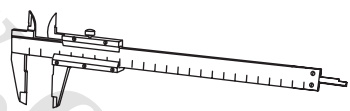
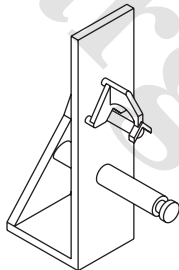
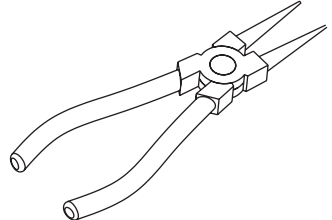
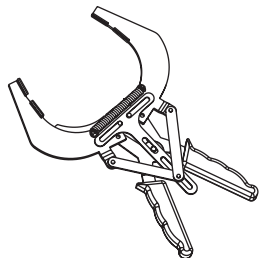
### Preparation

S/N	Tools	Outline diagram	Description
1	Oil pan remover		Removing the oil pan
2	Remover and installer for valve cotter		For removing/installing valve cotter
3	Remover for valve guide		For removing valve guide
4	Reamer		Reaming valve guide
5	Remover and installer for oil filter		Removing and installing oil filter

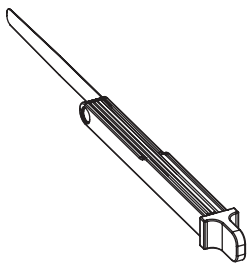
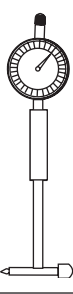
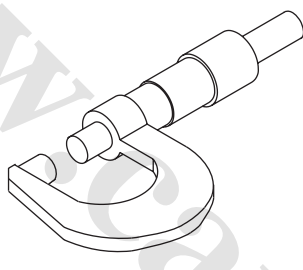
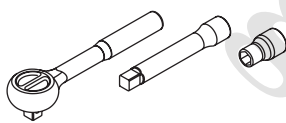
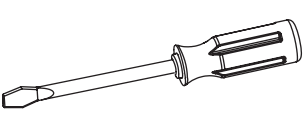
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S/N	Tools	Outline diagram	Description
6	Installation tool for front oil seal of crankshaft		For installing the front oil seal of crankshaft
7	Mounting tool for rear oil seal of crankshaft		For installing the rear oil seal of crankshaft
8	Piston ring compressor		For installing the pistons.
9	Cylinder-pressure gauge		For measuring cylinder pressure
10	Hanger		For hoisting the engine
11	Spring dynamometer		For detecting the elasticity of valve spring

S/N	Tools	Outline diagram	Description
12	Dial gauge		For measuring radial runout of parts
13	Internal micrometer		For measuring inner diameter of parts
14	Vernier caliper		For measuring the length of parts
15	Connecting-rod collimator		For measuring the degree of distortion of piston-connecting-rod
16	Snap ring pliers		Used for removal and installation of snap rings
17	Piston ring expander		For disassembly and assembling piston ring

11A

S/N	Tools	Outline diagram	Description
18	Feeler gauge		Measuring parts' clearance
19	Cylinder bore gauge		For measuring cylinder bore
20	Spiral micrometer		For measuring diameter of parts
21	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts
22	Screwdriver		Remove the fixing screws



## Service data

### 1. Technical specifications table

Cylinder pressure	Maximum cylinder pressure	1.3MPa	
	Standard cylinder pressure	1.2MPa	
	Minimum cylinder pressure	1.0MPa	
	Maximum cylinder pressure difference	0.1MPa	
Max. elongation of timing chain		122.6mm	
Min. diameter of exhaust camshaft timing sprocket (with timing chain)		97.3mm	
Min. diameter of crankshaft timing sprocket (with timing chain)		51.6mm	
Max. thickness of moving rail of timing chain		1.0mm	
Cylinder head flatness	Cylinder block joint surface	0.05mm	
	Intake side	0.10mm	
	Exhaust side	0.10mm	
Max. value of camshaft radial runout		0.03mm	
Maximum lift of intake/exhaust camshaft	Intake camshaft	44.168mm~44.268mm	
	Exhaust camshaft	43.705mm~43.805mm	
Camshaft journals	No.1 exhaust	24.949mm~24.965mm	
	Others	22.949mm~22.965mm	
Camshaft axial clearance	Standard axial clearance	0.040mm~0.095mm	
	Maximum axial clearance	0.10mm	
Valve spring	Free length	43.40mm	
	Elastic force of the installation	153N~169N(33.88mm)	
	Maximum working elasticity	335.3N~370.7N(24.1mm)	
Valve spring verticality	Maximum deviation	1.6mm	
	Maximum deviation angle	2°	
Valve edge thickness	Standard thickness	1.0mm	
	Minimum thickness	0.7mm	
Valve length	Intake valve	Standard length	88.65mm
		Minimum length	88.35mm
	Exhaust valve	Standard length	88.69mm
		Minimum length	88.39mm

11A

Valve stem diameter	Intake valve	5.470mm~5.485mm	
	Exhaust valve	5.465mm~5.480mm	
Width of valve-seat contact surface	Width of intake valve-seat	1.0mm~1.4mm	
	Width of exhaust valve-seat	1.0mm~1.4mm	
Valve guide inner diameter		5.510mm~5.530mm	
Thickness of mechanical tappet head		5.055mm~6.005mm	
Valve play	Intake valve	Standard oil clearance	0.025mm~0.060mm
		Maximum oil clearance	0.08mm
	Exhaust valve	Standard oil clearance	0.030mm~0.065mm
		Maximum oil clearance	0.10mm
Valve-guide mounting-hole inner diameter		10.285mm~10.306mm	
Valve-guide specified pressing-in capacity		8.7mm~9.1mm	
Valve clearance	Standard intake valve clearance (cold)	0.20mm~0.25mm	
	Standard exhaust valve clearance (cold)	0.30mm~0.35mm	
Standard piston diameter		78.925mm~78.935mm	
Piston oil-film clearance	Standard oil-film clearance	0.065mm~0.085mm	
	Maximum oil-film clearance	0.085mm	
Piston pin mounting hole diameter		20.006mm~20.015mm	
Piston pin outer diameter		20.004mm~20.013mm	
Piston-connecting-rod axial clearance	Standard axial clearance	0.16mm~0.34mm	
	Maximum axial clearance	0.34mm	
Piston-connecting-rod oil-film clearance	Standard oil-film clearance	0.030mm~0.054mm	
	Maximum oil-film clearance	0.08mm	
Piston pin oil film clearance (piston pin mounting holes)	Standard oil-film clearance	0.002mm~0.011mm	
	Maximum oil-film clearance	0.011mm	
Connecting-rod small end hole inner diameter		20.012mm~20.021mm	
Oil film clearance of piston pin (wrist pin hole)	Standard oil-film clearance	0.001mm~0.017mm	
	Maximum oil-film clearance	0.017mm	
Piston ring groove clearance	Top ring groove	0.03mm~0.08mm	
	Second ring groove	0.03mm~0.07mm	

Piston ring gap	Standard end play	Top ring	0.20mm~0.35mm
		Second ring	0.40mm~0.55mm
		Film loop	0.20mm~0.70mm
	Maximum piston ring gap	Top ring	1.05mm
		Second ring	1.20mm
		Film loop	1.10mm
Maximum deviation angle of the connecting-rod			0.05mm/100mm
Maximum connecting-rod distortion			0.05mm/100mm
Connecting-rod bolt diameter	Standard diameter	7.30mm~7.40mm	
	Minimum diameter	7.20mm	
Maximum crankshaft radial run-out			0.03mm
Crankshaft main journal diameter			47.982mm~48.000mm
Max. ellipticity of crankshaft main journal			0.02mm
Crankshaft connecting-rod journal diameter			43.992mm~44.000mm
Max. ellipticity of crankshaft connecting rod journal			0.02mm
Crankshaft oil-film clearance	Standard oil-film clearance	0.014mm~0.032mm	
	Maximum oil-film clearance	0.10mm	
Cylinder block main bearing cap fixing bolt diameter	Standard diameter	8.80mm~9.00mm	
	Minimum diameter	8.70mm	
Top surface warping of upper cylinder block (maximum warping)			0.05mm
Cylinder block bore diameter			79.00mm~79.13mm

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## 2. Table of tightening torque

Item	N•m
Engine left mounting fixing bolt	85~90
Fixing bolt of engine right mounting	85~90
Engine front mounting fixing bolt	85~90
Engine rear mounting fixing bolt	85~90
Bolt and nut for throttle body	10~12
Bolt and nut for intake manifold	30
Bolt for exhaust timing sprocket	54
Phaser bolt	60
Bolt for moving rail module of timing chain	19

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Item	N•m	
Bolt for fixed rail module of timing chain	13	
Timing cover bolt	23	
Timing-chain tensioner nut	11	
Crankshaft pulley bolt module	138	
Water pump mounting bolts	11	
Fixed bolt for right mounting bracket of engine	52	
Bolt and nut for tensioner assembly	69 (bolt); 29(nut)	
Alternator fixing bolt	25 (short bolts); 54 (long bolts)	
Cylinder head cover mounting bolts	11	
Camshaft cover bolt	No. 1 camshaft cover bolt	23
	Other bolt	13
Cylinder head bolt (tightened by two stages)	49 (first time ), 90 (second time)	
Connecting rod bolt	50	
Cylinder block water drain bolt	23	
Oil filter	25~30	
Oil strainer mounting bolts	25	
Oil pan bolt	10	
Crankshaft main bearing cap fixing bolt (fastening them twice)	40 (first time ), 60 (second time)	
Fixed bolt for upper/lower part of cylinder block	18	
Flywheel bolt	88	
Torque for oil pressure alarm	14~16	
Connecting nut for oil filter	20	
Oil pump bolt		

## Precautions

### 1. Precautions before repair

- (a) Do not drain the engine coolant and oil until the engine cools down.

### 2. Precautions for maintenance

- (a) When disconnecting fuel pipe, keep the working environment away from fire source and children as far as possible.
- (b) After removing fuel pipe, each oil pipe joint shall be sealed to prevent fuel pipe from blocking or fuel leakage.

- (c) Be sure to remove the engine with care. Always avoid damage to any mating surface and sliding surface.
- (d) During dismantling the engine, use tapes or equivalents to seal opening of the engine to prevent foreign matters from going into the engine.
- (e) During dismantling, it is necessary to identify and arrange disassembled parts in order so as to make troubleshooting and reinstall them.
- (f) Before repairing or replacing, clean and check parts thoroughly.
- (g) When assembling the engine, the principle of tightening bolt and nut is to tightening bolt or nut in the middle by the same torque, and then tightening bolt or nut on internal and external diagonal lines. Follow specified order if there is any.
- (h) When assembling the engine, replace gaskets, oil seals and O-rings with new ones.
- (i) When applying sealant, it shall be applied uniformly. After applying, install the component within specified period.
- (j) When assembling the engine, carefully check if the engine pipe and vacuum pipe are blocked.
- (k) When connecting each sensor connector, a clear "click" is heard, it means the connector is in the right position.

### 3. Other precautions

- (a) After repairing and assembling the engine, start the engine and increase the engine speed, and check engine coolants, fuel, engine oil and exhaust gas for leakage.

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## General Check

### Check the system

#### 1. Check system components

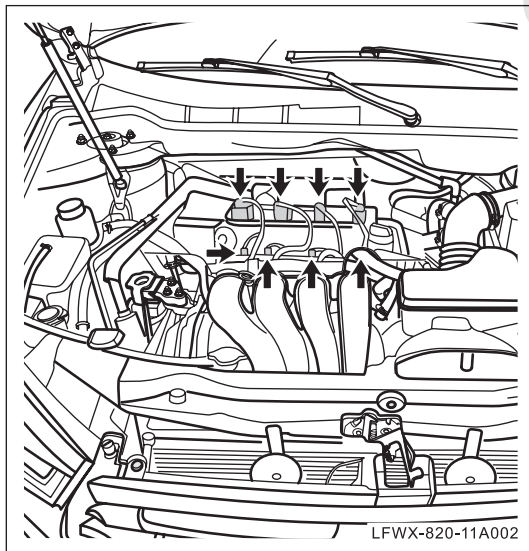
- (a) Check system for obvious mechanical damage. If any, repair it.
- (b) Check system for obvious collision and deformation. If any, repair it.
- (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.
- (d) Check the accessories and belts for cracks, breakage and looseness. If any, replace it timely.

#### 2. Check the coolant system .(See 13- Cooling System-) General Inspection

#### 3. Check the lubrication system. (See 17- Lubrication System- General Inspection)

#### 4. Check the intake/exhaust system. (See 15- Intake/Exhaust System- General Inspection)

### Check cylinder pressure



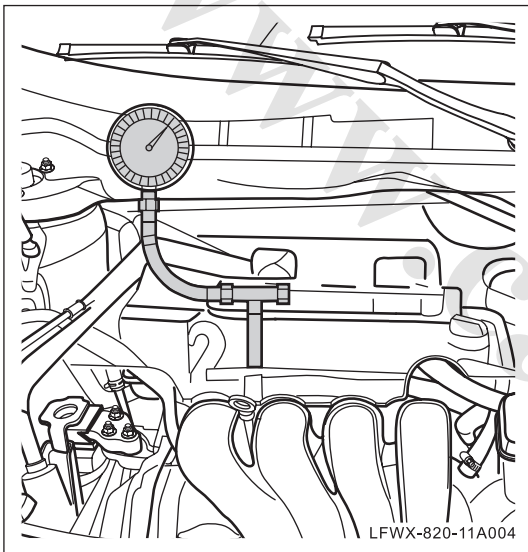
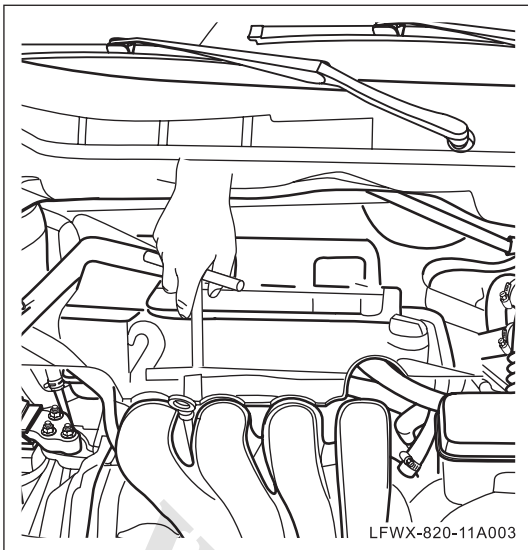
#### 1. Check cylinder pressure

- (a) Preheat the engine and then stop it.

#### ⓘ Note:

After warming up the engine, shift the shift lever to the "Neutral" position and apply the parking brake.

- (b) Disconnect each ignition coil connector and each injector connector.



- (c) Remove the fixing bolt of each ignition coil, and remove the 4 ignition coils in turn.
- (d) Remove the spark plug with spark plug remover.

**Note:**

- Do not damage insulation section of ignition coil.
- Mark the ignition coils during removal to facilitate reinstallation.

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- (e) Install the pressure gage into the mounting hole of the spark plug.
- (f) Start the engine and read the value shown in pressure gauge.

**Standard cylinder pressure: 1.2MPa**

**Minimum cylinder pressure: 1.0MPa**

**Maximum cylinder pressure: 1.3MPa**

**HINT:**

Before starting, it is necessary to inspect whether the battery is fully charged. If not, recharge the battery or replace the battery.

- (g) Test the pressure of other cylinders in the same way, and calculate the maximum pressure difference between cylinders.

**Maximum cylinder pressure difference:  
0.1MPa**

**Note:**

**All tests should be finished in very short time (about 15s) to avoid damaging starter.**

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Hard to start the engine	1. Ambient temperature or body temperature (too low)	See 11-Mechanical system Diagnosis, Fault diagnosis (1. Hard to start the engine)
	2. Battery voltage (too low)	
	3. Starter (faulty)	
	4. Fuel tank (no fuel)	
	5. Fuel quality (poor)	
	6. Engine oil grade (incorrect selection)	
	7. Air inlet system (clogged)	
	8. Water temperature sensor fault)	
	9. Throttle position sensor (faulty)	
	10. Throttle body (faulty)	
	11. Crankshaft position sensor failure	
	12. Camshaft position sensor failure	
	13. Fuel pressure (too low)	
	14. Individual or multiple fuel injectors (poor operation)	
	15. Ignition coil (faulty)	
	16. Spark plug (faulty)	
	17. Valve clearance (incorrect)	
	18. Cylinder pressure (low)	
	19. Engine ECU (fault)	



Symptom	Suspected area	Recommended action
Poor engine idling	1. Intake air system leakage	See 11-Mechanical system, Diagnosis, Fault diagnosis 2. Poor engine idling
	(2. Water temperature sensor fault)	
	3. Air intake pressure temperature sensor failure	
	4. Throttle position sensor (faulty)	
	5. Throttle body (faulty)	
	6. Fuel pressure (too low)	
	7. Individual or multiple fuel injectors (poor operation)	
	8. Ignition coil (faulty)	
	9. Spark plug (faulty)	
	10. Cylinder pressure (low)	
	11. Engine ECU (fault)	
Poor engine acceleration	1. Fuel quality (poor)	See 11-Mechanical system, Diagnosis, Fault diagnosis (3. Poor engine acceleration)
	2. Air inlet system (clogged)	
	(3. Water temperature sensor fault)	
	4. Air intake pressure temperature sensor failure	
	5. Throttle position sensor (faulty)	
	6. Knock sensor (failed)	
	7. Fuel pressure (too low)	
	8. Individual or multiple fuel injectors (poor operation)	
	9. Ignition coil (faulty)	
	10. Spark plug (faulty)	
	11. Canister solenoid valve (faulty)	
	12. Cylinder pressure (low)	
	13. Catalytic converter is clogged	
	14. Engine ECU (fault)	

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Symptom	Suspected area	Recommended action
Underpowered engine	1. Fuel quality (poor)	See 11-Mechanical system, Diagnosis, Fault diagnosis 4. Underpowered engine
	2. Air inlet system (clogged)	
	3. Exhaust system (clogged)	
	4. Inlet and exhaust pipes (too long)	
	5. Water temperature sensor (faulty)	
	6. Throttle position sensor (faulty)	
	7. Throttle body (faulty)	
	8. Air intake pressure temperature sensor failure	
	9. Fuel pressure (too low)	
	10. Individual or multiple fuel injectors (poor operation)	
	11. Ignition coil (faulty)	
	12. Spark plug (faulty)	
	13. Canister solenoid valve (faulty)	
	14. Cylinder pressure (low)	
	15. Engine ECU (fault)	
Abnormal exhaust smoke color (black smoke)	1. Air inlet system (clogged)	See 11-Mechanical system, Diagnosis, Fault diagnosis (5. Abnormal exhaust smoke color (black smoke))
	2. Exhaust system (clogged)	
	3. Water temperature sensor (faulty)	
	4. Throttle position sensor (faulty)	
	5. Air intake pressure temperature sensor failure	
	6. Oxygen sensor fault	
	7. Valve clearance (too large)	
	8. Individual or multiple fuel injectors (poor operation)	
	9. Cylinder pressure (low)	
	10. Engine ECU (fault)	
Abnormal exhaust smoke color (white smoke)	1. Ambient temperature or body temperature (too low)	See 11-Mechanical system, Diagnosis, Fault diagnosis (6. Abnormal exhaust smoke color (white smoke))
	2. Fuel quality (poor)	
	3. Cylinder sleeve (damaged)	
Abnormal exhaust smoke color (blue smoke)	1. Engine oil grade (incorrect selection)	See 11-Mechanical system, Diagnosis, Fault diagnosis (7. Abnormal exhaust smoke color (blue smoke))
	2. Valve, valve guide or valve seal (faulty)	
	3. Piston and piston ring (faulty)	

Symptom	Suspected area	Recommended action
The engine oil pressure is too low (natural and gradual slow-down)	1. Oil pressure alarm (fault)	See 11-Mechanical system, Diagnosis, Fault diagnosis (8. Engine oil pressure is too low (natural and gradual slow-down))
	2. Engine oil remaining amount (insufficient)	
	3. Engine oil (deteriorated)	
	4. Oil filter (clogged)	
	5. Oil strainer (clogged)	
	6. Oil pump or oil relief valve (faulty)	
	7. Main bearing bush, connecting rod bearing bush, etc. (badly worn)	
	8. Engine parts (too large clearance)	
The engine oil pressure is too low (sudden slow-down)	1. Oil pressure alarm (fault)	See 11-Mechanical system, Diagnosis, Fault diagnosis (9. The engine oil pressure is too low (sudden slow-down))
	2. Oil pump (failed)	
High engine temperature	1. Water temperature sensor (faulty)	See 11-Mechanical system, Diagnosis, Fault diagnosis (10. High engine temperature)
	2. Coolant (insufficient)	
	3. Radiator (faulty)	
	4. Cooling fan (fault)	
	5. Thermostat (faulty)	
	6. Water pump (faulty)	
	7. Excessive carbon deposition on the top of the piston	
	8. Engine ECU (fault)	
Engine strange noises (natural increasing strange noises)	1. Exhaust system (faulty)	See 11-Mechanical system, Diagnosis, Fault diagnosis (11. Engine strange noises (natural increasing strange noises))
	2. Valve module (fault)	
	3. Camshaft (too large axial clearance)	
	4. Main bearing bush, connecting rod bearing bush (faulty)	
	5. Piston (faulty)	
	6. Crankshaft (too large axial clearance)	
	7. Flywheel (bolt loose or broken)	
Engine strange noises (sudden strange noises)	1. Injector (failed)	See 11-Mechanical system, Diagnosis, Fault diagnosis (12. Engine abnormal sound (sudden strange noises))
	2. Piston (cylinder scoring)	

## Fault diagnosis

### 1. Hard to start the engine

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine and check the engine operation conditions	Diagnosis end.	Engine starting difficulty (engine has no starting phenomenon; engine has starting phenomenon, but cannot be started)	Go to Step 1
1	Diagnose with a diagnostic scanner	Normal	Faulty	Instruction
	Read DTC with a diagnostic scanner	If there is no DTC, go to Step 2	With fault code	According to the fault code, perform troubleshooting (See 12- Engine Control System-Fault Diagnosis)
2	Confirming the ambient temperature	Normal	Faulty	Instruction
	Confirm the ambient temperature conditions	If the ambient temperature is normal, go to Step 3	The ambient temperature is too low	Preheat the engine
3	Check the battery	Normal	Faulty	Instruction
	Check the battery operating conditions. (See 19- Battery- General Inspection, Checking the Battery)	Go to Step 4	Battery voltage is too low	Charge or replace the battery. (See 19- Battery- Battery, Replacement)
4	Check the starter	Normal	Faulty	Instruction
	Check the starter operating conditions. (See 19- Starter/Alternator-General Inspection, Checking the Starter)	Go to Step 5	<ul style="list-style-type: none"> <li>The current of starter is insufficient</li> <li>Starter does not run</li> </ul>	Replace it. (See 19- Starter / Alternator -Starter, Replacement)
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel service conditions. (See 13- Fuel System- General Inspection, Checking the System)	Go to Step 6	<ul style="list-style-type: none"> <li>There is no fuel in the fuel tank</li> <li>Apply poor fuel</li> </ul>	<ul style="list-style-type: none"> <li>Filling</li> <li>Replacement</li> </ul>
6	Check the engine oil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the oil condition. (See 17- Lubrication System-General Inspection, Checking the Engine Oil)	Go to Step 7	The engine oil grade is incorrect	Replacement (see 17 - Oil Lubrication System, Engine Oil, Replacement)
7	Check the intake system	Normal	Faulty	Instruction
	Check the intake system operating conditions. (See 15- Intake/Exhaust System- General Inspection, Checking the System)	Go to Step 8	<ul style="list-style-type: none"> <li>Air filter blocked</li> <li>Intake pipe clogged</li> </ul>	<ul style="list-style-type: none"> <li>Clean or replace the air filter element (see 15 - Intake and exhaust system air filter, replacement)</li> <li>Clean and dredge intake pipe.</li> </ul>
8	Check the water temperature sensor.	Normal	Faulty	Instruction
	Check the water temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 9	Water temperature sensor damaged	Replace it. (See 16- Cooling System-Water Temperature Sensor, Replacement)
9	Check throttle position sensor	Normal	Faulty	Instruction
	Check the throttle position sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 10	The throttle position sensor is damaged	Replace the throttle body. (See 15- Intake /Exhaust System- Throttle, Replacement)
10	Check the throttle valve body	Normal	Faulty	Instruction
	Check the throttle body operating conditions. (See 15-Intake/Exhaust System- General Inspection, Checking the System)	Go to Step 11	The throttle body is clogged or damaged	Clean or replace the throttle. (See 15- Intake/Exhaust System- Throttle, Replacement)
11	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	Check the crankshaft position sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 12	Crankshaft position sensor is damaged	Replace it. (See 11A- Engine Mechanical System-Engine Wire Harness and Sensor, Replacement)

Steps	Inspection item	Inspection result		
12	Check the camshaft position sensor	Normal	Faulty	Instruction
	Check the camshaft position sensor operating conditions. (See 12A-Engine Control System-Engine Control System, General Inspection)	Go to Step 13	The camshaft position sensor is damaged	Replace it. (See 11A-Engine Mechanical System-Engine Wire Harness and Sensor, Replacement)
13	Check fuel system pressure	Normal	Faulty	Instruction
	Check the fuel pressure of the fuel system. (See 13-Fuel System- General Inspection, Checking the Fuel System Pressure)	Go to Step 14	The fuel system pressure is too low	See 13- Diagnosis of Fuel System, Fault Diagnosis (3. Low fuel system pressure)
14	Check injector	Normal	Faulty	Instruction
	Check the injector operating conditions.(See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 15	Individual or multiple fuel injectors (poor operation)	Replace it. (See 13-Fuel System- Injectors, Replacement)
15	Check the ignition coil	Normal	Faulty	Instruction
	Check the ignition coil operating conditions. (See 18- Ignition System- General Inspection, Checking the Ignition Coil)	Go to Step 16	Ignition coil is damaged	Replace (See 18- Ignition System- Ignition Coil, Replacement)
16	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug operating conditions. (See 18- Ignition System- General Inspection, Checking the Spark Plugs)	Go to Step 17	<ul style="list-style-type: none"> <li>Spark plug has oil stain and carbon deposit.</li> </ul> Spark plug is damaged	Clean or replace the spark plug (see 18 - Ignition system spark plug, replacement)
17	Check the valve clearance.	Normal	Faulty	Instruction
	Check the valve clearance status. (See 11A-Engine Mechanical System- Valves, Repair)	Go to Step 18	The valve clearance is incorrect	Adjust the valve clearance. (See 11A- Engine Mechanical System- Valves, Repair)
18	Check cylinder pressure	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the cylinder pressure conditions. (See 11A- Engine Mechanical System- General Inspection, Checking the Cylinder Pressure)	Go to Step 19	Low cylinder pressure	<ul style="list-style-type: none"> <li>Check and adjust the valve clearance. (See 11A- Engine Mechanical System- Valves, Check and Repair)</li> <li>Check the piston, piston ring and cylinder. (See 11A- Engine Mechanical System- Piston and Connecting Rod, Check and Repair)</li> <li>Replace the cylinder head gasket. (See 11A- Engine Mechanical System- Cylinder Head, Check and Repair)</li> </ul>
19	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## 2. Poor engine idling

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine and check the engine idling conditions	Diagnosis end.	The engine idling is unsteady ( too high or too low)	Go to Step 1
1	Diagnose with a diagnostic scanner	Normal	Faulty	Instruction
	Read DTC with a diagnostic scanner	If there is no DTC, go to Step 2	With fault code	According to the fault code, perform troubleshooting.
2	Check the intake system	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the intake system operating conditions. (See 15- Intake/ Exhaust System- General Inspection, Checking the System)	Go to Step 3	<ul style="list-style-type: none"> <li>Air filter blocked</li> <li>Upper or lower cover of the air filter is damaged</li> <li>Air filter blocked</li> <li>Intake pipe connection is not tightened</li> <li>Intake pipe damaged</li> </ul>	<ul style="list-style-type: none"> <li>Re-install the upper cover and lower cover for the air filter. (See 15- Intake /Exhaust System-Air Filter, Replacement)</li> <li>Re-install the intake pipe. (See 15- Intake /Exhaust System-Engine Intake Manifold, Replacement)</li> <li>Re-install the intake pipe. (See 15- Intake /Exhaust System-Engine Intake Manifold, Replacement)</li> <li>Re-install the intake pipe. (See 15- Intake /Exhaust System-Engine Intake Manifold, Replacement)</li> <li>Replace the damaged pipe. (See 15- Intake / Exhaust System-Engine Intake Manifold, Replacement)</li> </ul>
3	Check the water temperature sensor.	Normal	Faulty	Instruction
	Check the water temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 4	Water temperature sensor damaged	Replacement (See 16- Cooling System-Water Temperature Sensor, Replacement)
4	Check intake pressure and temperature sensor	Normal	Faulty	Instruction





Steps	Inspection item	Inspection result		
	Check the intake pressure and temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System , General Inspection)	Go to Step 5	The intake air temperature and pressure sensor is damaged	Replacement (See 15- Intake/Exhaust System-Intake Pressure and Temperature Sensor, Replacement)
5	Check throttle position sensor	Normal	Faulty	Instruction
	Check the throttle position sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 6	The throttle position sensor is damaged	Replace the throttle body. (See 15- Intake/Exhaust System- Throttle, Replacement)
6	Check the throttle valve body	Normal	Faulty	Instruction
	Check the throttle body operating conditions. (See 15-Intake/Exhaust System- General Inspection, Checking the System)	Go to Step 7	The throttle body is clogged or damaged	Clean or replace the throttle. (See 15- Intake/Exhaust System- Throttle, Replacement)
7	Check fuel pressure	Normal	Faulty	Instruction
	Check the fuel pressure of the fuel system. (See 13-Fuel System- General Inspection, Checking the Fuel System Pressure)	Go to Step 8	The fuel system pressure is too low	See 13- Diagnosis of Fuel System, Fault Diagnosis (3. Low fuel system pressure)
8	Check injector	Normal	Faulty	Instruction
	Check the injector operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 9	Individual or multiple fuel injectors (poor operation)	Replacement (See 13- Fuel System- Injectors, Replacement)
9	Check the ignition coil	Normal	Faulty	Instruction
	Check the ignition coil operating conditions. (See 18- Ignition System- General Inspection, Checking the Ignition Coil)	Go to Step 10	Ignition coil is broken	Replacement (See 18- Ignition System- Ignition Coil, Replacement)
10	Check the spark plug	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the spark plug operating conditions. (See 18- Ignition System- General Inspection, Checking the Spark Plugs)	Go to Step 11	<ul style="list-style-type: none"> <li>Spark plug has oil stain and carbon deposit.</li> <li>Spark plug is damaged</li> </ul>	<ul style="list-style-type: none"> <li>Clean or replace the spark plug (see 18 - Ignition System, Spark Plug, Replacement)</li> </ul>
11	Check cylinder pressure	Normal	Faulty	Instruction
	Check the cylinder pressure conditions. (See 11A- Engine Mechanical System-General Inspection, Checking the Cylinder Pressure)	Go to Step 12	Low cylinder pressure	<ul style="list-style-type: none"> <li>Check and adjust the valve clearance. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Check the piston, piston ring and cylinder. (See 11A- Engine Mechanical System-Piston and Connecting Rod, Check and Repair)</li> <li>Replace the cylinder head gasket. (See 11A- Engine Mechanical System- Cylinder Head, Check and Repair)</li> </ul>
12	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Poor engine acceleration

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine and check the engine acceleration conditions	Diagnosis end.	Poor engine acceleration (black smoke, flashback, jitter or deflagration, etc. occurs during deceleration)	Go to Step 1

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Diagnose with a diagnostic scanner	Normal	Faulty	Instruction
	Read DTC with a diagnostic scanner	If there is no DTC, go to Step 2	If there is a DTC, perform troubleshooting according to the DTC	According to the fault code, perform troubleshooting.
2	Check the fuel quality	Normal	Faulty	Instruction
	Check the fuel quality status	Go to Step 3	Apply poor fuel	Replace fuel
3	Check the intake system	Normal	Faulty	Instruction
	Check the intake system operating conditions. (See 15- Intake/ Exhaust System-General Inspection, Checking the System)	Go to Step 3	<ul style="list-style-type: none"> <li>• Upper and lower covers of the air filter is not fastened closely</li> <li>• Upper or lower cover of the air filter is damaged</li> <li>• Air filter blocked</li> <li>• Intake pipe connection is not tightened</li> <li>• Intake pipe damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Re-install the upper cover and lower cover for the air filter.(See 15- Intake /Exhaust System-Air Filter, Replacement)</li> <li>• Replace the upper or lower cover of the air filter (See 15- Intake/ Exhaust System-Air Filter, Replacement)</li> <li>• Clean or replace the air filter (see 15 - Intake/Exhaust System, Air Filter, Replacement)</li> <li>• Re-install the intake pipe. (See 15- Intake /Exhaust System-Engine Intake Manifold, Replacement)</li> <li>• Replace the damaged pipe. (See 15- Intake / Exhaust System-Engine Intake Manifold, Replacement)</li> </ul>
4	Check the water temperature sensor.	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Check the water temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 5	Water temperature sensor damaged	Replacement (See 16- Cooling System-Water Temperature Sensor, Replacement)
5	Check intake pressure and temperature sensor	Normal	Faulty	Instruction
	Check the intake pressure and temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 6	The intake air temperature and pressure sensor is damaged	Replacement (See 15- Intake/Exhaust System-Intake Pressure and Temperature Sensor, Replacement)
6	Check throttle position sensor	Normal	Faulty	Instruction
	Check the throttle position sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 7	The throttle position sensor is damaged	Replace the throttle body. (See 15- Intake/Exhaust System-Throttle, Replacement)
7	Check the knock sensor	Normal	Faulty	Instruction
	Check the knock sensor working conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 8	The knock sensor is damaged	Replace it. (See 11A- Engine Mechanical System-Engine Wire Harness and Sensor, Replacement)
8	Check fuel pressure	Normal	Faulty	Instruction
	Check the fuel pressure of the fuel system. (See 13-Fuel System- General Inspection, Checking the Fuel System Pressure)	Go to Step 9	The fuel system pressure is too low	See 13- Diagnosis of Fuel System, Fault Diagnosis (3. Low fuel system pressure)
9	Check injector	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the injector operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 10	Individual or multiple fuel injectors (poor operation)	Replacement (See 13- Fuel System- Injectors, Replacement)
10	Check the ignition coil	Normal	Faulty	Instruction
	Check the ignition coil operating conditions (See 18- Ignition System- General Inspection, Checking the Ignition Coil)	Go to Step 11	Ignition coil is broken	Replacement (See 18- Ignition System- Ignition Coil, Replacement)
11	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug operating conditions. (See 18- Ignition System- General Inspection, Checking the Spark Plugs)	Go to Step 12	<ul style="list-style-type: none"> <li>Spark plug has oil stain and carbon deposit.</li> <li>Spark plug is damaged</li> </ul>	Clean or replace the spark plug (see 18 - Ignition system spark plug, replacement)
12	Check the exhaust gas recirculation (EGR)	Normal	Faulty	Instruction
	Check the canister solenoid valve working conditions. (See 14- Emission Control System- General Inspection, Checking the Canister Solenoid Valve)	Go to Step 13	Canister solenoid valve is damaged	Replacement (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
13	Check cylinder pressure	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Check the cylinder pressure conditions. (See 11A- Engine Mechanical System-General Inspection, Checking the Cylinder Pressure)	Go to Step 14	Low cylinder pressure	<ul style="list-style-type: none"> <li>Check and adjust the valve clearance. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Check the piston, piston ring and cylinder. (See 11A- Engine Mechanical System-Piston and Connecting Rod, Check and Repair)</li> <li>Replace the cylinder head gasket. (See 11A- Engine Mechanical System- Cylinder Head, Check and Repair)</li> </ul>
14	Check the catalytic converter.	Normal	Faulty	Instruction
	Check the catalytic converter operating conditions. (See 14- Emission Control System-General Inspection, Checking the Catalytic Converter)	Go to Step 15	Catalytic converter is clogged	Replacement (See 15- Intake/Exhaust System-Catalytic Converter, Replacement)
15	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. Underpowered engine

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, and test the engine power on the bench	Diagnosis end.	Underpowered engine	Go to Step 1
1	Diagnose with a diagnostic scanner	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Read DTC with a diagnostic scanner	If there is no DTC, go to Step 2	If there is a DTC, perform troubleshooting according to the DTC	See 12 - Engine Control System, Fault Diagnosis
2	Check the fuel	Normal	Faulty	Instruction
	Check the fuel quality status	Go to Step 3	Apply poor fuel	Replace fuel
3	Check the intake system	Normal	Faulty	Instruction
	Check the intake system operating conditions. (See 15- Intake/Exhaust System-General Inspection, Checking the System)	Go to Step 4	<ul style="list-style-type: none"> <li>• Air filter blocked</li> <li>• Intake pipe clogged</li> <li>• Unreasonable re-fit causes too long intake pipe</li> </ul>	<ul style="list-style-type: none"> <li>• Clean or replace the air filter element (see 15 - Intake and exhaust system air filter, replacement)</li> <li>• Clean and dredge intake pipe.</li> <li>• Restore the intake piping layout before leaving factory</li> </ul>
4	Inspect the exhaust system.	Normal	Faulty	Instruction
	Check the exhaust system for clogging. (See 15- Intake/Exhaust System-General Inspection, Checking the System)	Go to Step 5	<ul style="list-style-type: none"> <li>• Catalytic converter is clogged</li> <li>• The connecting pipe with corrugated pipe is clogged</li> <li>• Front muffler clogged</li> <li>• Rear muffler clogged</li> <li>• Unreasonable re-fit causes too long exhaust pipe</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the catalytic converter (see section 15 - intake and exhaust systems catalytic converter, replacement)</li> <li>• Clean the connecting pipe with corrugated pipe</li> <li>• Clean and unclog the front muffler</li> <li>• Clean and unclog the rear muffler</li> <li>• Restore the exhaust piping layout before leaving factory</li> </ul>
5	Check the water temperature sensor.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the water temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 6	Water temperature sensor damaged	Replace it. (See 16- Cooling System-Water Temperature Sensor, Replacement)
6	Check throttle position sensor	Normal	Faulty	Instruction
	Check the throttle position sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 7	The throttle position sensor is damaged	Replace the throttle body. (See 15- Intake /Exhaust System- Throttle, Replacement)
7	Check the throttle valve body	Normal	Faulty	Instruction
	Check the throttle body operating conditions. (See 15-Intake/ Exhaust System- General Inspection, Checking the System)	Go to Step 8	The throttle body is clogged or damaged	Clean or replace the throttle. (See 15- Intake/Exhaust System- Throttle, Replacement)
8	Check intake pressure and temperature sensor	Normal	Faulty	Instruction
	Check the intake pressure and temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System , General Inspection)	Go to Step 9	The intake air temperature and pressure sensor is damaged	Replace (See 15- Intake/Exhaust System- Intake Pressure and Temperature Sensor, Replacement)
9	Check fuel pressure	Normal	Faulty	Instruction
	Check the fuel pressure of the fuel system. (See 13-Fuel System- General Inspection, Checking the Fuel System Pressure)	Go to Step 10	The fuel system pressure is too low	See 13- Diagnosis of Fuel System, Fault Diagnosis (3. Low fuel system pressure)
10	Check injector	Normal	Faulty	Instruction





Steps	Inspection item	Inspection result		
	Check the injector operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 11	Individual or multiple fuel injectors (poor operation)	Replace it. (See 13- Fuel System- Injectors, Replacement)
11	Check the ignition coil	Normal	Faulty	Instruction
	Check the ignition coil operating conditions. (See 18- Ignition System- General Inspection, Checking the Ignition Coil)	Go to Step 12	Ignition coil is broken	Replace (See 18- Ignition System- Ignition Coil, Replacement)
12	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug operating conditions. (See 18- Ignition System- General Inspection, Checking the Spark Plugs)	Go to Step 13	<ul style="list-style-type: none"> <li>Spark plug has oil stain and carbon deposit.</li> <li>Spark plug is damaged</li> </ul>	Clean or replace the spark plug (see 18 - Ignition system spark plug, replacement)
13	Check the exhaust gas recirculation (EGR)	Normal	Faulty	Instruction
	Check the canister solenoid valve working conditions. (See 14- Emission Control System- General Inspection, Checking the Canister Solenoid Valve)	Go to Step 14	Canister solenoid valve is damaged	Replace (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
14	Check cylinder pressure	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Check the cylinder pressure conditions. (See 11A- Engine Mechanical System-General Inspection, Checking the Cylinder Pressure)	Go to Step 15	Low cylinder pressure	<ul style="list-style-type: none"> <li>Check and adjust the valve clearance. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Check the piston, piston ring and cylinder. (See 11A- Engine Mechanical System-Piston and Connecting Rod, Check and Repair)</li> <li>Replace the cylinder head gasket. (See 11A- Engine Mechanical System- Cylinder Head, Check and Repair)</li> </ul>
15	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 5. Abnormal exhaust smoke color (black smoke)

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, keep idling, and check the exhaust smoke color	Diagnosis end.	The exhaust smoke is black	Go to Step 1
1	Check the intake system	Normal	Faulty	Instruction
	Check the intake system operating conditions. (See 15- Intake/ Exhaust System-General Inspection, Checking the System)	Go to Step 2	<ul style="list-style-type: none"> <li>Air filter blocked</li> <li>Intake pipe clogged</li> </ul>	<ul style="list-style-type: none"> <li>Clean or replace the air filter element (see 15 - Intake and exhaust system air filter, replacement)</li> <li>Clean and dredge intake pipe.</li> </ul>



Steps	Inspection item	Inspection result		
2	Inspect the exhaust system.	Normal	Faulty	Instruction
	Check the exhaust system for clogging. (See 15- Intake/Exhaust System-General Inspection, Checking the System)	Go to Step 3	Catalytic converter is clogged <ul style="list-style-type: none"> <li>The connecting pipe with corrugated pipe is clogged</li> <li>Front muffler clogged</li> <li>Rear muffler clogged</li> </ul>	<ul style="list-style-type: none"> <li>Replace the catalytic converter (see section 15 - intake and exhaust systems catalytic converter, replacement)</li> <li>Clean the connecting pipe with corrugated pipe</li> <li>Clean and unclog the front muffler</li> <li>Clean and unclog the rear muffler</li> </ul>
3	Check the water temperature sensor.	Normal	Faulty	Instruction
	Check the water temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 4	Water temperature sensor damaged	Replacement (See 16- Cooling System-Water Temperature Sensor, Replacement)
4	Check throttle position sensor	Normal	Faulty	Instruction
	Check the throttle position sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 5	The throttle position sensor is damaged	Replace the throttle body. (See 15- Intake /Exhaust System-Throttle, Replacement)
5	Check intake pressure and temperature sensor	Normal	Faulty	Instruction
	Check the intake pressure and temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System , General Inspection)	Go to Step 6	The intake air temperature and pressure sensor is damaged	Replacement (See 15- Intake/Exhaust System-Intake Pressure and Temperature Sensor, Replacement)
6	Check oxygen sensor	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Check the oxygen sensor working conditions. (See 14- Emission Control System-General Inspection, Checking the Oxygen Sensor)	Go to Step 7	Oxygen sensor is damaged	Replacement (See 14- Emission Control System-Front/Rear Oxygen Sensor, Replacement)
7	Check the valve clearance.	Normal	Faulty	Instruction
	Check the valve clearance status. (See 11A- Engine Mechanical System- Valves, Repair)	Go to Step 8	Valve clearance is too large	Adjust (See 11A- Engine Mechanical System-Valves, Check and Repair)
8	Check injector	Normal	Faulty	Instruction
	Check the injector operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 9	Individual or multiple fuel injectors (poor operation)	Replacement (See 13- Fuel System- Injectors, Replacement)
9	Check cylinder pressure	Normal	Faulty	Instruction
	Check the cylinder pressure conditions. (See 11A- Engine Mechanical System-General Inspection, Checking the Cylinder Pressure)	Go to Step 10	Low cylinder pressure	Check and adjust the valve clearance. (See 11A- Engine Mechanical System- Valves, Check and Repair) Check the piston, piston ring and cylinder. (See 11A- Engine Mechanical System-Piston and Connecting Rod, Check and Repair) Replace the cylinder head gasket. (See 11A- Engine Mechanical System- Cylinder Head, Check and Repair)
10	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 6. Abnormal exhaust smoke color (white smoke)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, keep idling, and check the exhaust smoke color	Diagnosis end.	The exhaust smoke is white	Go to Step 1
1	Confirming the ambient temperature	Normal	Faulty	Instruction
	Confirm the ambient temperature conditions	The ambient temperature is too low	The ambient temperature is normal	Go to Step 2
2	Check the fuel quality	Normal	Faulty	Instruction
	Check the fuel quality status	Go to Step 3	Apply poor fuel	Replace fuel
3	Check the cylinder sleeve	Normal	Faulty	Instruction
	Check the cylinder liner conditions. (See 11A- Engine Mechanical System- Cylinder Block, Check and Repair)	Go to Step 4	Cylinder sleeve has cracks	Replace the cylinder sleeve
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## 7. Abnormal exhaust smoke color (blue smoke)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, keep idling, and check the exhaust smoke color	Diagnosis end.	The exhaust smoke is blue	Go to Step 1
1	Confirm the engine oil grade	Normal	Faulty	Instruction
	Check the oil grade is correct. (See 17- Lubrication System- General Inspection, Checking the Engine Oil)	Go to Step 2	Selection of the engine oil grade is incorrect	Replace the oil with the recommended one. (See 17- Lubrication System- Engine Oil, Replacement)

Steps	Inspection item	Inspection result		
2	Check the valve module.	Normal	Faulty	Instruction
	Check the valve, valve guide or valve seal installation conditions. (See 11A- Engine Mechanical System-Valves, Check and Repair)	Go to Step 3	<ul style="list-style-type: none"> <li>The valve seal is aging and failure</li> <li>Clearance between the valve and valve guide is too large</li> </ul>	<ul style="list-style-type: none"> <li>Replace the valve seal (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Replace the valve or valve guide (See 11A- Engine Mechanical System- Valves, Check and Repair)</li> </ul>
3	Check the piston or piston ring	Normal	Faulty	Instruction
	Check the piston or piston ring installation conditions. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)	Go to Step 4	<ul style="list-style-type: none"> <li>Clearance between the piston ring and the piston ring groove is incorrect</li> <li>The piston or piston ring wears badly</li> <li>Elastic force of the piston ring does not meet the requirements</li> </ul>	<ul style="list-style-type: none"> <li>Replace the piston rings. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)</li> <li>Replace the piston and piston rings. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)</li> <li>Replace the piston rings. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)</li> </ul>
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 8. The engine oil pressure is too low (natural slow-down)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, keep idling, and check the engine oil pressure warning light	Diagnosis end.	The engine oil pressure warning light turns on	Go to Step 1
1	Check the oil pressure alarm.	Normal	Faulty	Instruction
	Check the oil pressure alarm operating conditions. (See 17- Lubrication System-General Inspection, Checking the Oil Pressure Alarm)	Go to Step 2	Oil pressure alarm (damaged)	Replace (see 17- Lubrication System-Oil Pressure Alarm, Replacement)
2	Test the engine oil pressure	Normal	Faulty	Instruction
	Measure the engine oil pressure using the gauge. (See 17-Lubrication System- General Inspection, Checking the Oil Pressure)	Diagnosis end.	The engine oil pressure is too low	Go to Step 3
3	Check the engine oil	Normal	Faulty	Instruction
	Check the oil condition. (See 17- Lubrication System-General Inspection, Checking the Engine Oil)	Go to Step 4	<ul style="list-style-type: none"> <li>• Insufficient oil</li> <li>• Oil deterioration</li> </ul>	<ul style="list-style-type: none"> <li>• Add oil</li> <li>• Replace the engine oil (see 17 - Oil lubrication system engine oil, replacement)</li> </ul>
4	Check oil filter	Normal	Faulty	Instruction
	Check the oil filter working conditions. (See 17- Lubrication System-General Inspection, Checking the System)	Go to Step 5	Oil filter clogged	Replace (See 17- Lubrication System-Oil filter, Replacement)
5	Check the oil strainer	Normal	Faulty	Instruction
	Check the oil filter working conditions. (See 17- Lubrication System- General Inspection, Checking the System)	Go to Step 6	The oil strainer is clogged	Clean the oil strainer

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
6	Check oil pump	Normal	Faulty	Instruction
	Check the oil pump operating conditions. (See 17- Lubrication System-Oil Pump, Check and Repair)	Go to Step 7	The oil pump relief valve is faulty The oil pump has mechanical fault	Replace the oil pump (see 17 - Lubrication System, Oil Pump, Replacement)
7	Check the main bearing bush and connecting rod bearing bush	Normal	Faulty	Instruction
	Check the main bearing bush and connecting rod bearing bush for wear. (See 11A - Engine Mechanical System-Piston and Connecting-rod / Crankshaft and Flywheel, Check and Repair)	Go to Step 8	The main bearing bush or connecting rod bearing bush wears badly	Replace the main bearing bush or connecting-rod bearing bush (See 11A - Engine Mechanical System-Piston and Connecting-rod / Crankshaft and Flywheel, Check and Repair)
8	Check the engine service-cycle records	Normal	Faulty	Instruction
	Check the engine service-cycle records, and confirm whether the engine needs overhaul according to the maintenance provisions	Go to Step 9	The engine needs overhaul	Overhaul the engine
9	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 9. The engine oil pressure is too low (sudden slow-down)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, keep idling, and check the engine oil pressure warning light	Diagnosis end.	The engine oil pressure warning light turns on	Go to Step 1
1	Replacement and check	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Replace the oil pressure alarm with the same type, and check whether the fault is removed.	Diagnosis end.	Fault still exists	Go to Step 2
2	Check oil pump	Normal	Faulty	Instruction
	Check the oil pump operating conditions. (See 17- Lubrication System-Oil Pump, Check and Repair)	Go to Step 3	<ul style="list-style-type: none"> <li>The oil pump relief valve is faulty</li> <li>The oil pump has mechanical fault</li> </ul>	Replace the oil pump (see 17 - Lubrication System, Oil Pump, Replacement)
3	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## 10. High engine temperature

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine, keep idling, and check the water temperature warning light	Diagnosis end.	The water temperature warning light turns on	Go to Step 1
1	Check the water temperature sensor.	Normal	Faulty	Instruction
	Check the water temperature sensor operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 2	Water temperature sensor damaged	Replacement (See 16-Cooling System-Water Temperature Sensor, Replacement)
2	Check the coolant	Normal	Faulty	Instruction
	Check the remaining coolant. (See 16 - Cooling System-General Inspection, Checking the Coolant)	Go to Step 3	The coolant is insufficient	Fill the coolant. (See 16 - Cooling System-Coolant, Filling)
3	Check the radiator	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the radiator working conditions. (See 16- Cooling System- Radiator, Check and Repair)	Go to Step 4	The radiator is clogged or the radiator core is deformed and damaged	Clean or replace the radiator. (See 16 - Cooling System- Radiator, Check and Repair)
4	Check the cooling fan.	Normal	Faulty	Instruction
	Check the cooling fan working condition (See 61 – General Check of Cooling System, Check of Cooling Fan)	Go to Step 5	The cooling fan does not operate	See 16- Diagnosis of Cooling System, Fault Diagnosis
5	Check the thermostat	Normal	Faulty	Instruction
	Check the thermostat operating conditions. (See 16- Cooling System-General Inspection, Checking the Thermostat)	Go to Step 5	The thermostat is faulty, and cannot fully open	Replace (See 16- Cooling System-Thermostat, Replacement)
6	Check the water pump	Normal	Faulty	Instruction
	Check the water pump operating conditions. (See 16- Cooling System- Pump, Check and Repair)	Go to Step 7	Water pump damaged	Replacement (See 16- Cooling System- Water Pump, Check and Repair)
7	Check the piston	Normal	Faulty	Instruction
	Check the piston for carbon deposition. (See 11A- Engine Mechanical System-Piston and Connecting-rod)	Go to Step 8	Excessive carbon deposition on the piston top.	Clean the piston
8	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 11. Engine strange noises (natural increasing strange noises)

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction method
	Start the engine and listen to the engine running sound	Diagnosis end.	Engine strange noises	Go to Step 1
1	Inspect the exhaust system.	Normal	Faulty	Instruction method
	Check the exhaust system operating conditions. (See 15-Intake/Exhaust System- General Inspection, Checking the System)	Go to Step 2	<ul style="list-style-type: none"> <li>The exhaust pipe fixing bolts are loose</li> <li>The mounting block or hold hoop of the exhaust pipe is loose or damaged</li> </ul>	<ul style="list-style-type: none"> <li>Re-fasten the fixing bolt</li> <li>Replace the damaged parts.</li> </ul>
2	Check the valve module.	Normal	Faulty	Instruction method
	Check the valve module working conditions. (See 11A-Engine Mechanical System-Valves, Check and Repair)	Go to Step 3	<ul style="list-style-type: none"> <li>Small valve clearance</li> <li>The valve tappet is too dirty, stuck or wears</li> <li>The valve spring is broken or lack of flexibility</li> <li>Valve gets stuck.</li> <li>Clearance between the valve and valve guide is too large</li> </ul>	<ul style="list-style-type: none"> <li>Adjust the valve clearance. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Clean or replace the valve tappet. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Replace the valve spring. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Replace the valve. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Grind the valve. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> </ul>

Steps	Inspection item	Inspection result		
	Check the valve module working conditions. (See 11A- Engine Mechanical System-Valves, Check and Repair)	Go to Step 3	<ul style="list-style-type: none"> <li>The valve sealing tape is not sealed closely</li> <li>The camshaft flange is damaged</li> </ul>	<ul style="list-style-type: none"> <li>Grind the valve. (See 11A- Engine Mechanical System-Valves, Check and Repair)</li> <li>Replace the camshaft. (See 11A- Engine Mechanical System-Camshaft, Check and Repair)</li> </ul>
3	Check the camshaft	Normal	Faulty	Instruction method
	Check the camshaft operating conditions. (See 11A- Engine Mechanical System-Camshaft, Check and Repair)	Go to Step 4	Too large camshaft axial clearance	Adjust the camshaft axial clearance. (See 11A- Engine Mechanical System-Camshaft, Check and Repair)
4	Check the main bearing bush and connecting rod bearing bush	Normal	Faulty	Instruction method
	Check the main bearing bush and connecting-rod bearing bush operating conditions. (See 11A - Engine Mechanical System-Piston and Connecting-rod / Crankshaft and Flywheel, Check and Repair)	Go to Step 5	The main bearing bush or connecting rod bearing bush wears or is misplaced	Replace the main bearing bush or connecting-rod bearing bush (See 11A - Engine Mechanical System-Piston and Connecting-rod / Crankshaft and Flywheel, Check and Repair)
5	Check the piston	Normal	Faulty	Instruction method

Steps	Inspection item	Inspection result		
	Check the piston working conditions. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)	Go to Step 6	<ul style="list-style-type: none"> <li>Excessive carbon deposition on the piston top.</li> <li>Piston pin wear</li> <li>The clearance between the piston and cylinder sleeve is too large</li> <li>Piston ring wears or is damaged</li> </ul>	<ul style="list-style-type: none"> <li>Clean the carbon deposit on the top of the piston</li> <li>Replace the piston pin. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)</li> <li>Replace the piston or cylinder liner. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)</li> <li>Replace the piston rings. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)</li> </ul>
6	Check the crankshaft	Normal	Faulty	Instruction method
	Check the crankshaft working conditions. (See 11A- Engine Mechanical System-Crankshaft and Flywheel, Check and Repair)	Go to Step 7	Crankshaft axial clearance too large	Adjust the crankshaft axial clearance. (See 11A- Engine Mechanical System-Crankshaft and Flywheel, Check and Repair)
7	Check flywheel	Normal	Faulty	Instruction method
	Check the flywheel working conditions. (See 11A- Engine Mechanical System-Crankshaft and Flywheel for, Check and Repair)	Go to Step 8	The flywheel bolt is loose or broken	Replace the flywheel bolts. (See 11A- Engine Mechanical System- Crankshaft and Flywheel, Check and Repair)
8	Verification and check	Normal	Faulty	Instruction method
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## 12. Engine abnormal sound (sudden strange noises)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction method
0	Preliminary inspection	Normal	Faulty	Instruction method
	Start the engine and listen to the engine running sound	Diagnosis end.	Engine strange noises	Go to Step 1
1	Check injector	Normal	Faulty	Instruction method
	Check the injector operating conditions. (See 12A- Engine Control System- Engine Control System, General Inspection)	Go to Step 2	Individual or multiple fuel injectors (poor operation)	Replace it. (See 13- Fuel System- Injectors, Replacement)
2	Check the piston	Normal	Faulty	Instruction method
	Check the piston working conditions. (See 11A-Engine Mechanical System-Piston and Connecting-rod, Check and Repair)	Go to Step 3	Piston cylinder scoring	Replace the piston and cylinder liner. (See 11A-Engine Mechanical System-Piston and Connecting-rod, Check and Repair)
3	Verification and check	Normal	Faulty	Instruction method
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

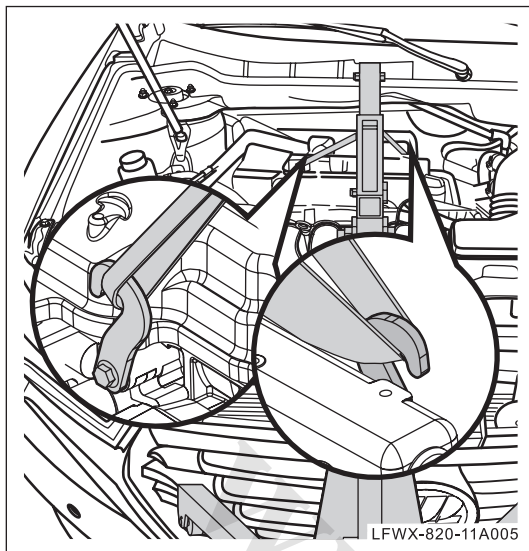
## Engine Assembly

### Removal

1. Drain the engine oil. (See 17- Lubrication System-Oil, Replacement)
2. Remove the oil inlet pipe from the engine. (See 13- Fuel System-Fuel Lines, Replacement)
3. Remove the battery. (See 19- Battery-Battery, Replacement)
4. Remove the air filter assembly. (See 15- Intake /Exhaust System-Air Filter, Replacement)
5. Disconnect the canister solenoid valve's hose connector. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
6. Disconnect the radiator inlet and outlet connections. (See 16- Cooling System-Cooling Circuit, Replacement)
7. Disconnect the heater hose. (See 71- Heating and Air Conditioning-Heater Hose, Replacement)
8. Remove the gearshift flexible shaft assembly from the transmission. (See 21- Manual Transmission-Control Mechanism, Replacement)
9. Remove the clutch slave cylinder. (See 22- Clutch- Clutch Slave Cylinder, Replacement)
10. Remove the front wheel assembly. (See 33- Wheels and tyres-Wheel Assembly, Replacement)
11. Remove the right and left drive shafts. (See 41- Drive Shaft- Drive Shaft Assembly, Check and Repair)
12. Remove the air conditioning compressor. (See 71- Heating and Air Conditioning-Air Conditioning Compressor, Replacement)
13. Disconnect the connection between the rear purifier with bellows assembly and the catalytic converter. (See 15- Intake and Exhaust System-Rear Purifier with Bellows Assembly, Replacement)
14. Remove the power steering pump. (See 61- Hydraulic Steering System-Power Steering Pump, Replacement)
15. Disconnect the engine ECM connector. (See 12A- Engine Control System-Control Module ECM, Replacement)
16. Disconnect the connection between the engine wire harness and the electrical

11A

box.

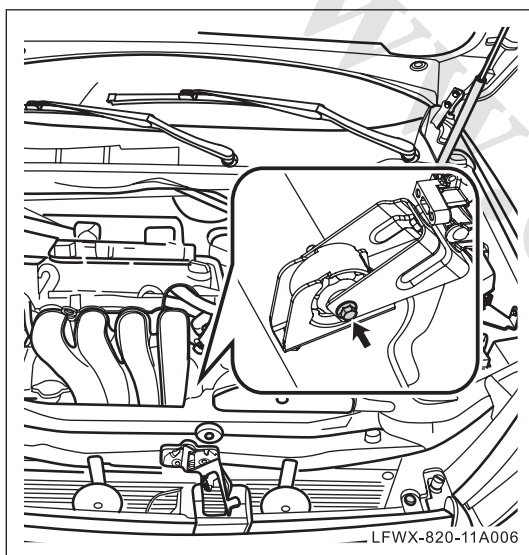


### 17. Hoist the engine by lifting tool

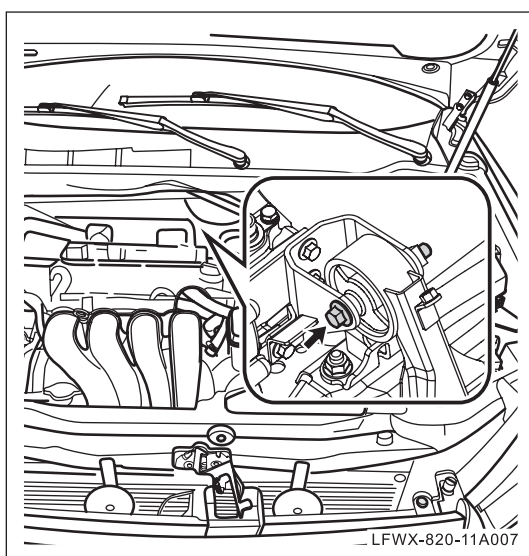
△ HINT:

Remove the trim cover from the engine before lifting the engine.

When lifting the engine, let the sling rope of the hoisting equipment straighten freely.

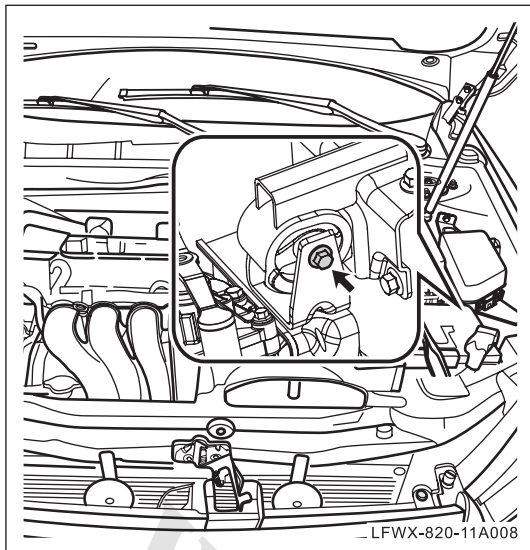


### 18. Remove the fixed bolts of the left mounting of the engine, and remove the rear suspension.



### 19. Remove the fixed bolts of the right mounting of the engine, and remove the rear suspension.





**20. Remove the fixed bolts from rear engine mounting, and remove it.**

△ HINT:

To facilitate taking out engine smoothly, it is better to dismantle engine rear suspension mounting bracket.

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**21. Remove the fixed nuts from the front engine mounting.**

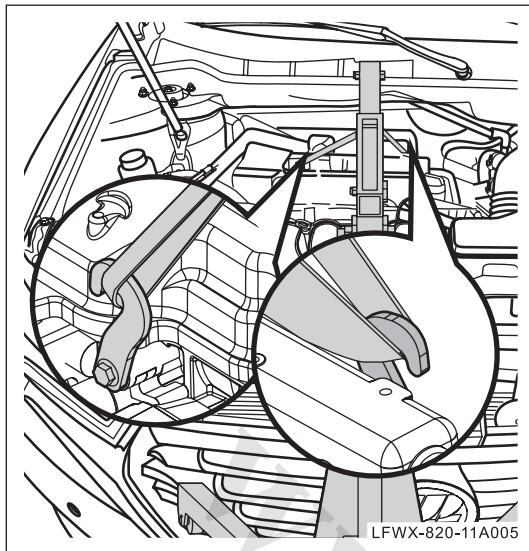
**22. Slowly lift engine lifting bracket and lift engine with transmission assembly out.**

ⓘ Note:

- Before lifting engine, recheck if all connectors, grounding cables, oil pipes, vacuum pipes and water pipes are completely disconnected.
- During lifting, take care to observe parts around engine to avoid damage caused by extruding.

**23. Remove fixing bolts of transmission assembly, and remove transmission assembly.**

## Installation



1. Use engine lifting bracket to lift engine with transmission assembly, and place it above the engine compartment.

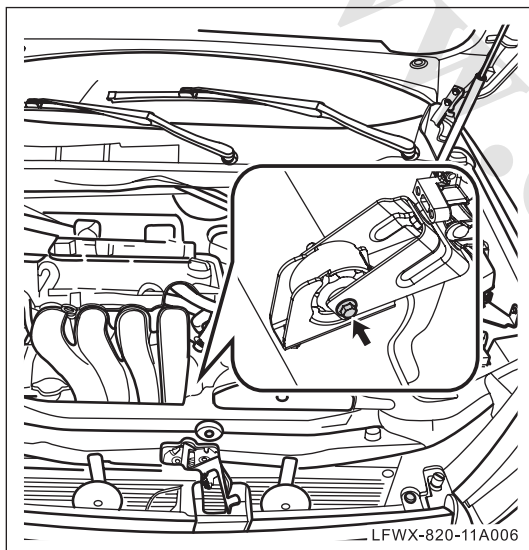
**Note:**

Do not strike engine hood.

2. Slowly lower the engine, and stop lowering after complete engine assembly locates at support position.

**Note:**

Prevent oil pipe, vacuum pipe, air conditioner pipe and water pipe in engine compartment from being damaged by extruding

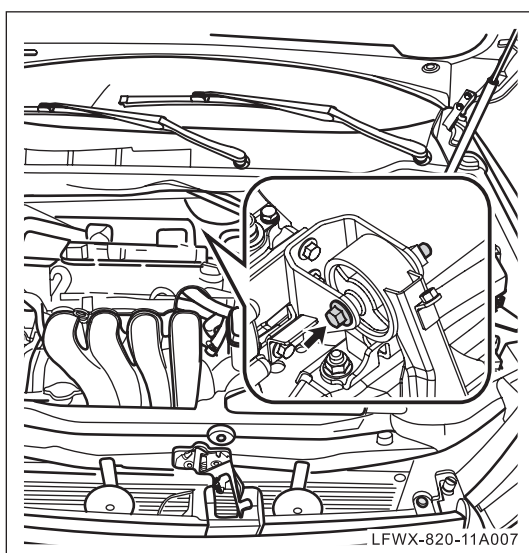


3. Install fixing bolts of engine left mounting.

Torque: 85N•m - 90N•m

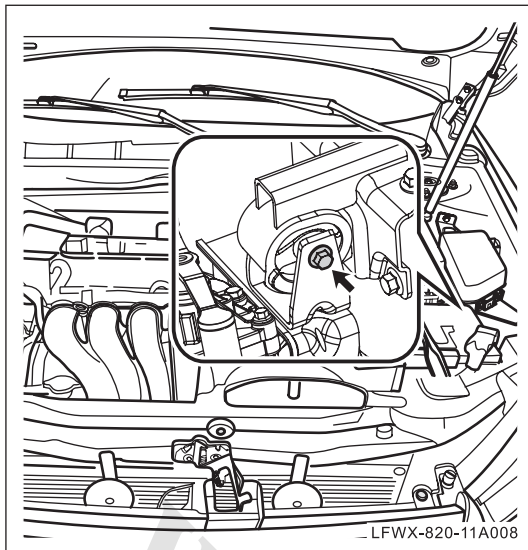
**Note:**

Do not tighten the fixing nut. Tighten them after front, rear, left, right mounting of the engine are completely installed on proper places.



4. Install fixing bolts of engine right mounting.

Torque: 85N•m - 90N•m



5. Install fixing bolts of engine rear mounting.

Torque: 85N•m - 90N•m

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6. Install fixing bolts of engine front mounting.

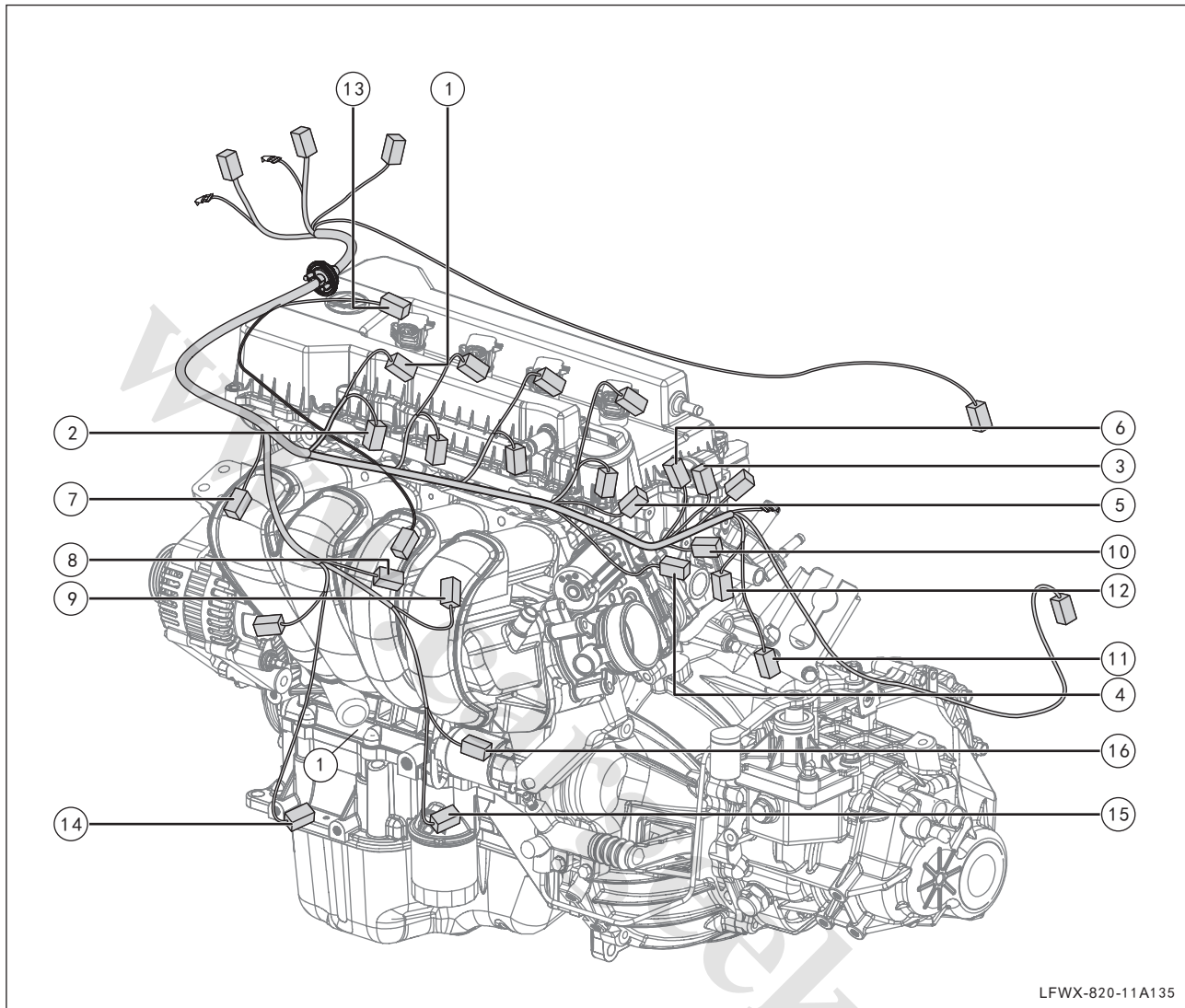
Torque: 85N•m - 90N•m

7. Install the power steering pump. (See 61- Hydraulic Steering System- Power Steering Pump, Replacement)
8. Fix the rear purifier with bellows assembly to the catalytic converter. (See 15- Intake and Exhaust System-Rear Purifier with Bellows Assembly, Replacement)
9. Install the air conditioning compressor. (See 71- Heating and Air Conditioning- Air Conditioning Compressor , Replacement)
10. Install the left and right drive shafts. (See 41- Drive Shaft-Drive Shaft Assembly, Check and Repair)
11. Install the front wheels assembly(see 33 Wheels and tyres, Wheels Assembly, Replacement) .
12. Install the clutch slave cylinder. (See 22- Clutch - Clutch Slave Cylinder, Replacement)

13. Install the gearshift flexible shaft assembly for the transmission. (See 21- Manual Transmission-Control Mechanism, Replacement)
14. Install the heater hose. (see 71- Heater and Air Conditioning-Heater Hose, Replacement)
15. Install the radiator inlet and outlet pipe. (See 16- Cooling System-Cooling Circuit, Replacement)
16. Install the canister solenoid valve hose. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
17. Install the air filter assembly. (See 15- Intake /Exhaust System-Air Filter, Replacement)
18. Install the battery (See 19- Battery-Battery, Replacement)
19. Install the engine oil inlet pipe. (See 13- Fuel System-Fuel Lines, Replacement)
20. Install the engine ECM connector. (See 12A- Engine Control System- Control Module ECM, Replacement)
21. Connect the engine wire harness to the electrical box.
22. Fill the engine oil. (See 17- Oil for Lubrication System, Replacement)

# Engine Wire Harness and Sensor

## Replacement



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### 1. Remove the engine wire harnesses and sensors.

- (a) Disconnect the connectors from the ignition coil ① and injector ② .
- (b) Disconnect the connector from the canister solenoid valve ③ .
- (c) Disconnect the throttle position sensor ④ connector.
- (d) Disconnect the connector from the camshaft position sensor ⑤ , and remove the external sensor from the camshaft.
- (e) Disconnect the connector from the water temperature sensor ⑥ , and remove the temperature sensor.
- (f) Disconnect the connector from the VVT control valve ⑦ , and remove the VVT control valve.
- (g) Disconnect the connector from the intake pressure and temperature sensor ⑧ , and

remove the intake pressure and temperature sensor.

△ HINT:

Air intake pressure and temperature sensor connector is located at the back of intake manifold.

(h) Disconnect the connector from the knock sensor ⑨ , and remove the knock sensor.

△ HINT:

Knock sensor is located at the cylinder block under the intake manifold.

(i) Disconnect the connector from the crankshaft position sensor ⑩ , and remove the crankshaft position sensor.

△ HINT:

Crankshaft position sensor is located on transmission housing.

(j) Disconnect the connector from the speedometer sensor 11.

△ HINT:

Odometer sensor is located on transmission housing

(k). Disconnect the connector of the reverse switch 12.

△ HINT:

Reverse switch is located on the transmission housing.

(l) Disconnect front oxygen sensor 13 connector.

△ HINT:

Oxygen sensor connector is located on exhaust manifold.

(m) Disconnect the connector from the air conditioning compressor' s electronic clutch 14.

(n) Remove the alternator output line, and disconnect the alternator connector.

(o) Disconnect the connector from the oil pressure alarm 15, and remove the oil pressure alarm.

△ HINT:

Oil pressure alarm is located on the oil filter.

(p) Disconnect the connector from the Neutral switch 16.

(q) Remove the starter power leads, and disconnect the starter connector.

(r) Remove the earth wire from the transmission housing.

(s) Remove the fixed bolt of negative ground on the transmission, and disconnect the harness from the negative ground.



## 2. Install the engine wire harnesses and sensors.

△ HINT:

Installation is the reverse of removal.

If you hear a ringing "click" sound when connecting the connector, this indicates the connector is connected in place.

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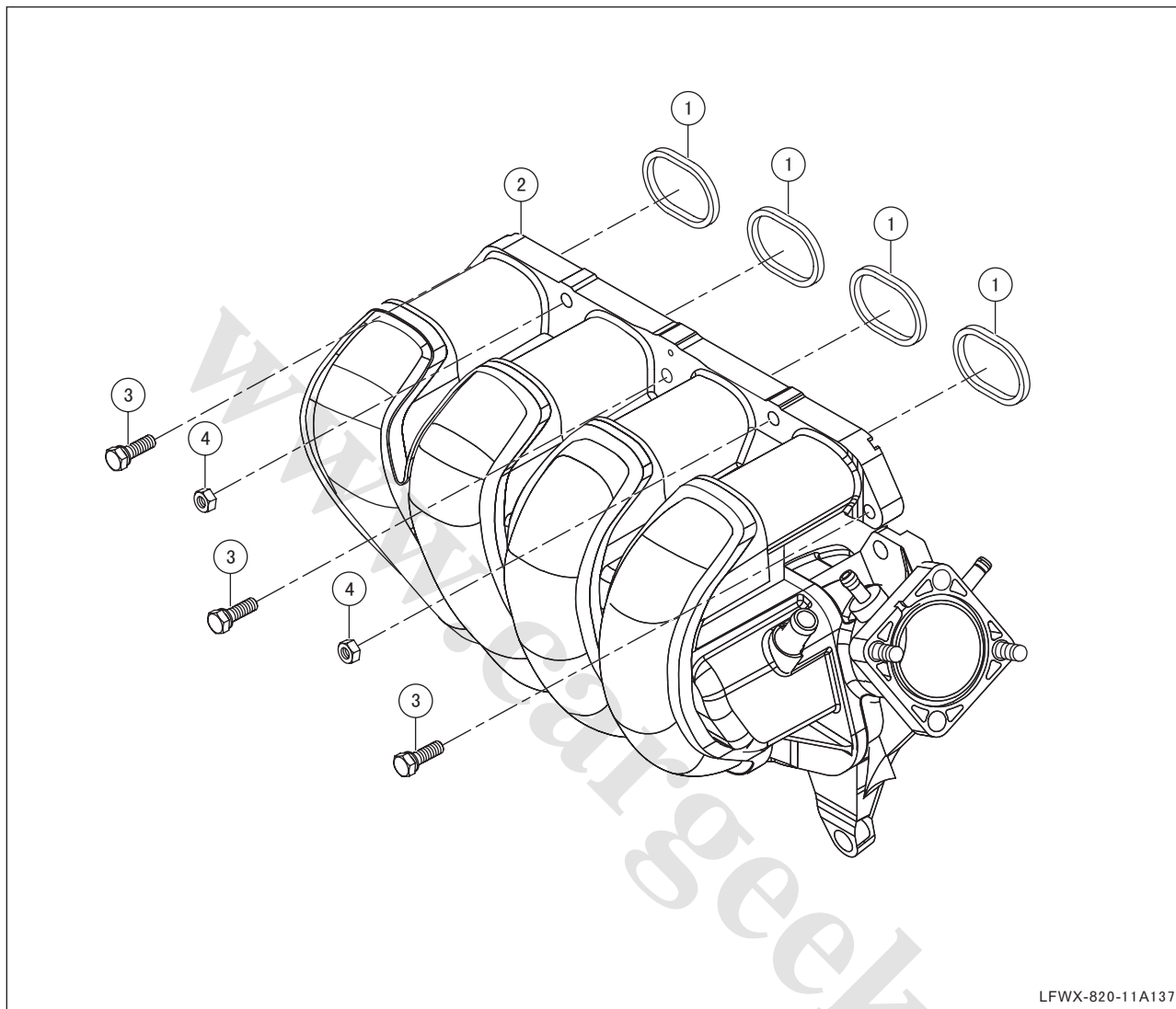
📌 **Note:**

**Ensure that each wire harness connector is connected securely. No looseness is permitted.**

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# Intake Manifold

## Components



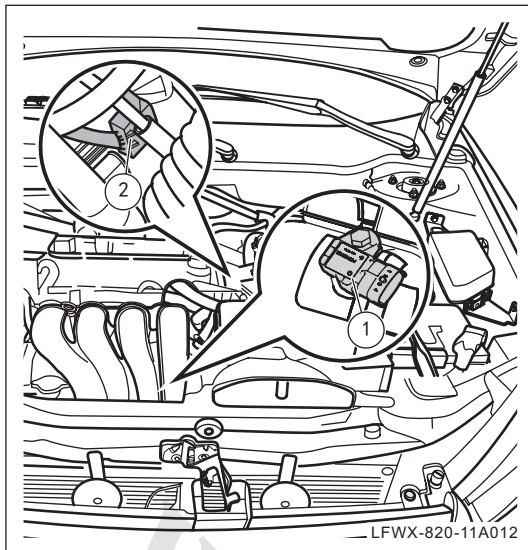
LFWX-820-11A137

1	Rubber O-ring
2	Intake manifold assembly

3	Hexagon head bolt and plain washer assembly
4	Hexagon nut with flange

## Overhaul

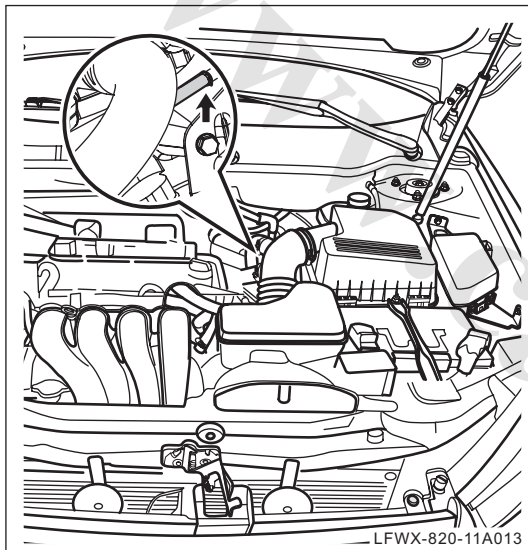




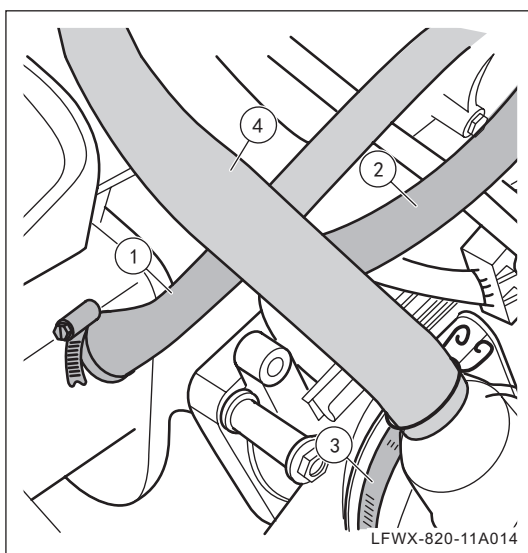
### 1. Removal of intake manifold

- (a) Remove upper cross beam trim panel of water tank. (See 81- Interior and Exterior-Water Tank' s Upper cross member Trim Panel, Replacement)
- (b) Disconnect intake pressure and temperature sensor connector ① .
- (c) Disconnect the throttle position sensor connector ② .

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- (d) Remove vacuum boosting hose.

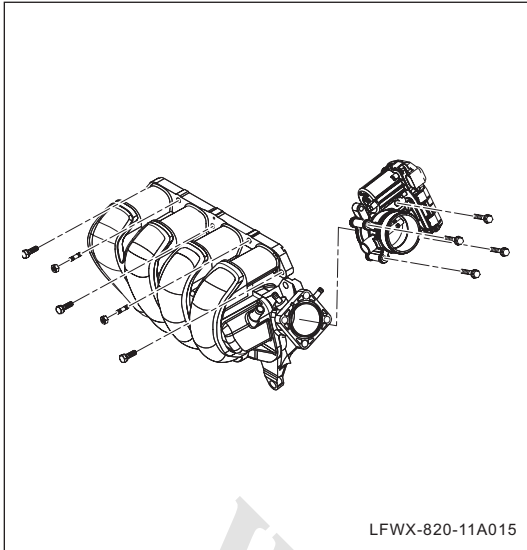


- (e) Remove the air filter hose clamp ③ , disconnect the hose connection.

#### ⓘ Note:

Use clean plastic bag or equivalent to plug the inlet of throttle, to prevent foreign matter from entering into it.

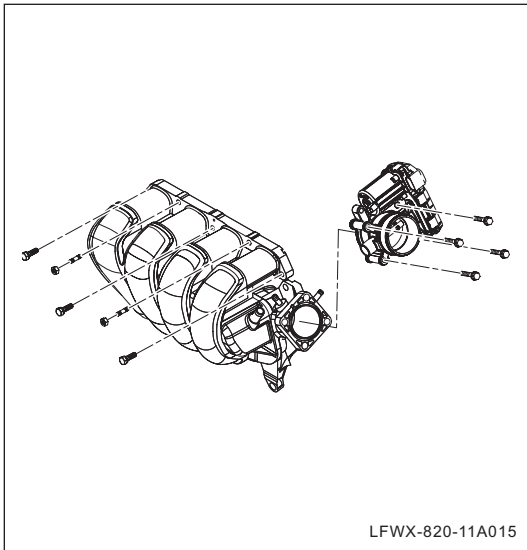
- (f) Remove fixing clamp of PCV valve hose ① , and disconnect hose connection.
- (g) Remove the canister control valve hose ② .
- (h) Remove the engine ventilation hose ④ .



- (i) Remove the intake manifold bolts and nuts, and remove the intake manifold with the throttle body assembly.
- (j) Remove the throttle body bolts, and remove the throttle body assembly.

## 2. Check the intake manifold and throttle.

- (a). Check intake manifold for crack or other damage. If any, replace it.
- (b). Check if the matching surface of the intake manifold has been deformed. If so, replace it.
- (c) Check if the rubber O-ring of the intake manifold has been damaged. If so, replace it.
- (d). Check the throttle body for dirt. If so, clean it.



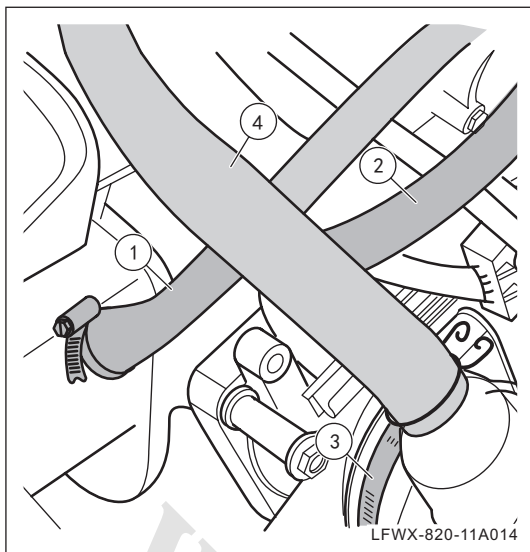
## 3. Installation of intake manifold

- (a) Fix the throttle body to the intake manifold, and install and tighten the mounting bolts.

**Torque: 10N•m-12N•m**

- (b) Fix the intake manifold with throttle body assembly to the cylinder head, and install the bolts and nuts and tighten them.

**Torque: 30N•m**

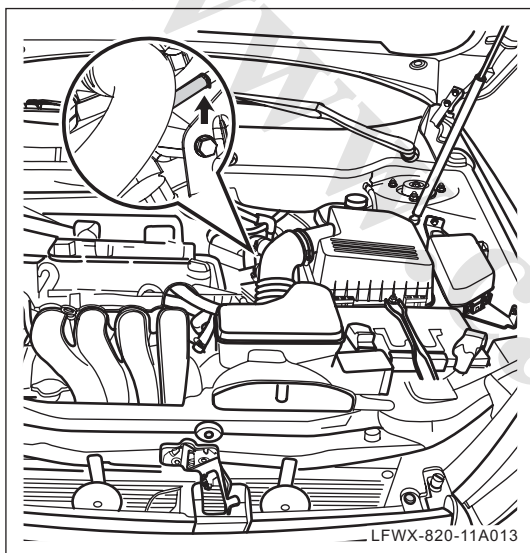


- (c) Fix the air filter hose and clamp to the throttle body and tighten the clamp ③ .
- (d) Fix the PCV valve hose ① and clamp to the mounting position, and tighten the clamp.
- (e) Install the canister control valve hose ② .
- (f) Fix the engine breather hose ④ to the mounting position.

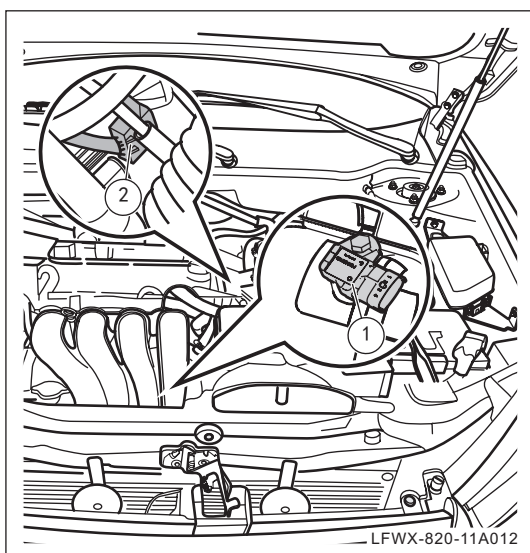
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**Note:**

**Make sure all pipelines are connect firmly and reliably.**



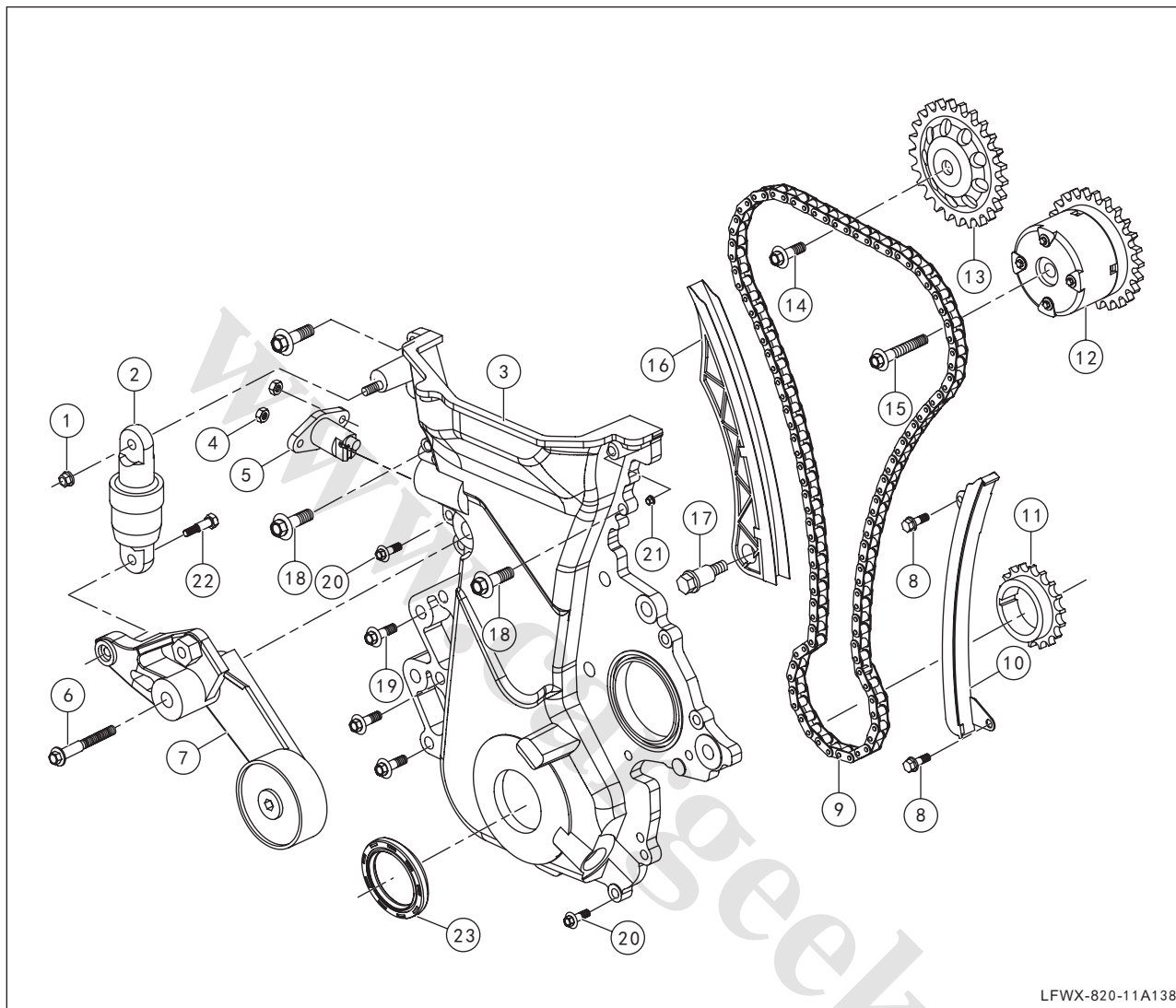
- (g) Install vacuum booster hose.



- (h) Install the intake pressure and temperature sensor' s connector ① .
- (i) Install the throttle position sensor' s connector ② .

# Timing Sprocket

## Components



LFWX-820-11A138

1	Hexagon nut with flange
2	Shock absorber
3	Timing cover
4	Hexagon nut with flange
5	Timing chain tensioner
6	Tensioner bolt
7	Tensioner assembly
8	Hexagon head bolt and plain washer assembly

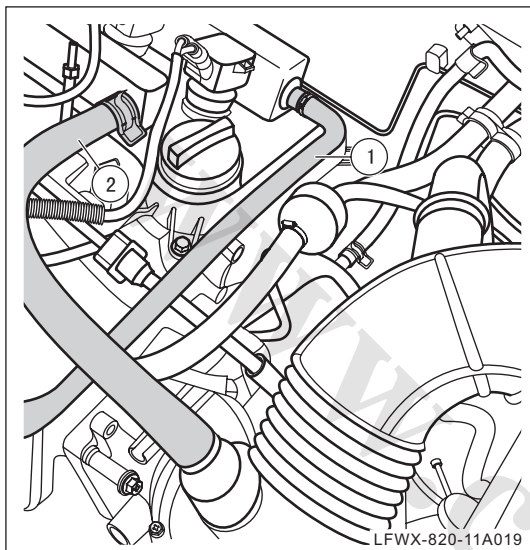
13	Exhaust timing sprocket
14	Exhaust timing sprocket bolt
15	Phaser bolt
16	Chain slipper unit
17	Slipper locating bolt
18	Hexagon bolt with flange
19	Hexagon bolt with flange
20	Hexagon bolt with flange

9	Timing chain
10	Chain guide unit
11	Crankshaft timing sprocket
12	Intake phaser assembly

21	Hexagon nut with flange
22	Hexagon bolt with flange
23	Crankshaft front oil seal

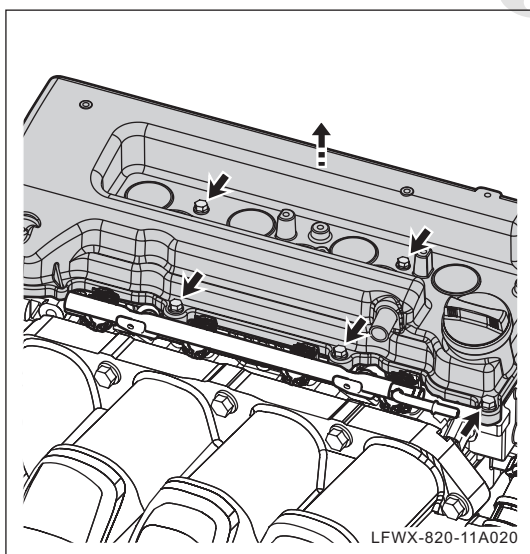
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## Overhaul

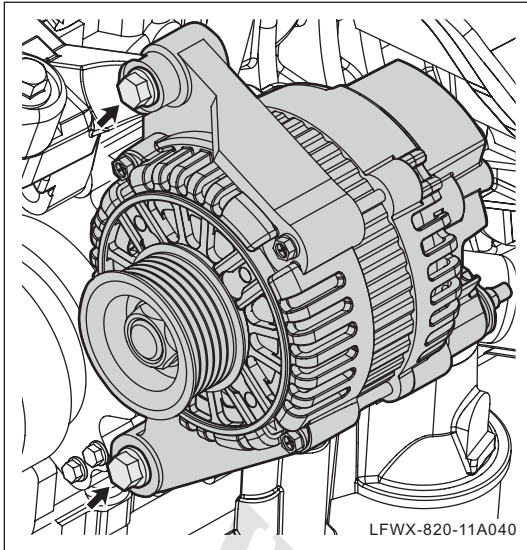


### 1. Remove sprocket mechanism components

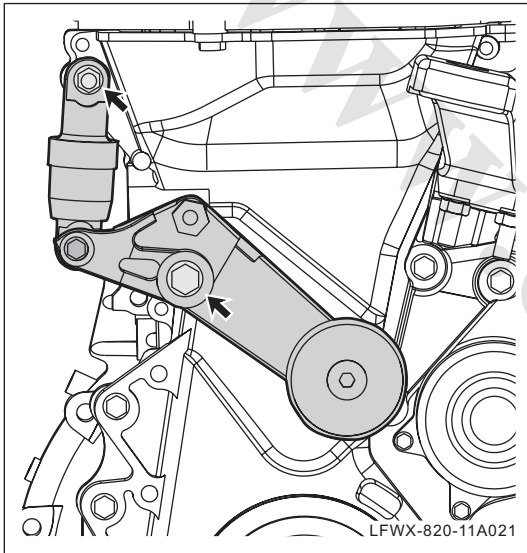
- (a) Remove the spark plugs. (See 18 - Ignition System Spark Plug, Replacement)
- (b) Remove fixing clamp of PCV valve hose ① , and disconnect hose connection.
- (c) Remove the breather hose ② .



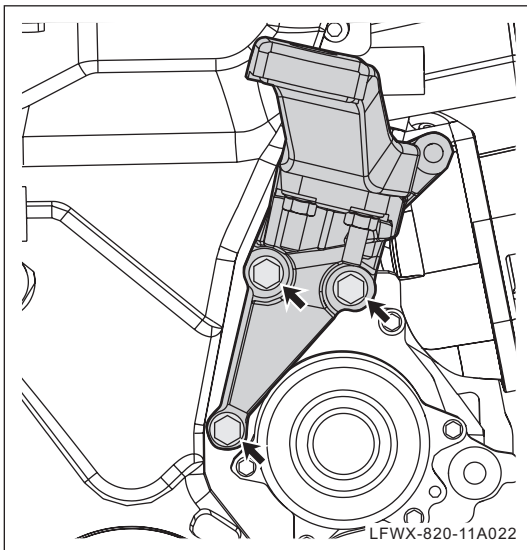
- (d) Remove the bolts from the cylinder head cover, and remove the cylinder head cover.



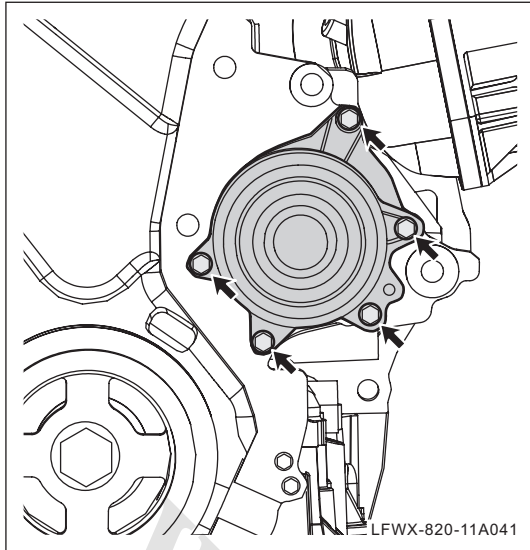
- (e) Remove the fixing bolts of the alternator assembly, and then remove the alternator assembly.



- (f) Remove the tensioner assembly.



- (g) Remove the right mounting bracket of the engine.

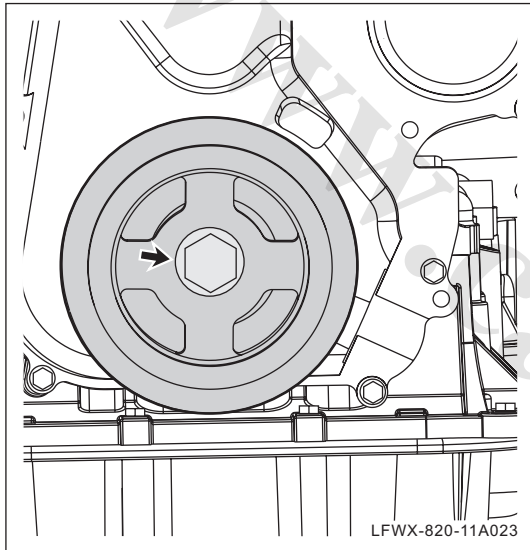


- (h) Remove fixing bolts of water pump, remove water pump and O-rings.

**Note:**

Water pump O-rings cannot be reused after being removed. New O-rings shall be used to avoid water pump from leaking the coolant.

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- (i) Remove fixing bolts of crankshaft pulley.

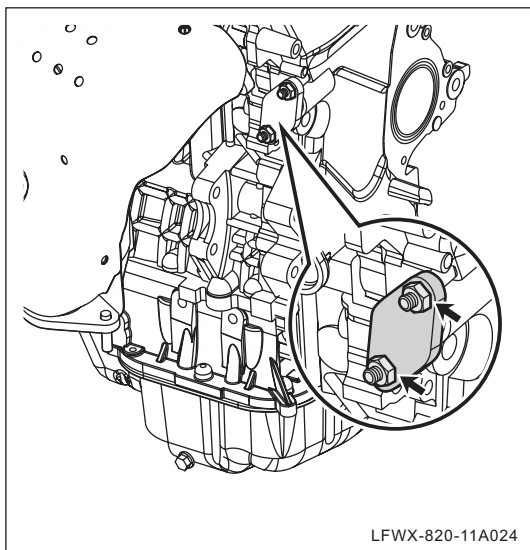
△ HINT:

When removing fixing bolts of crankshaft pulley, it is necessary to fasten the flywheel to avoid rotation of crankshaft

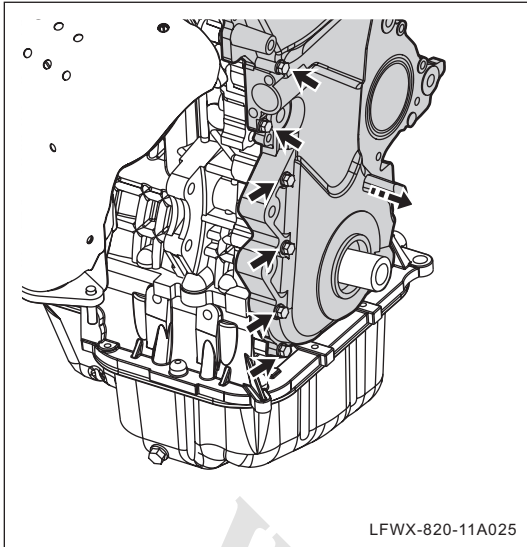
- (j) Use a puller to remove crankshaft pulley remove.

**Note:**

When using a puller, do not damage crankshaft pulley.



- (k) Remove the mounting nut from the timing chain tensioner, and remove the timing chain tensioner.



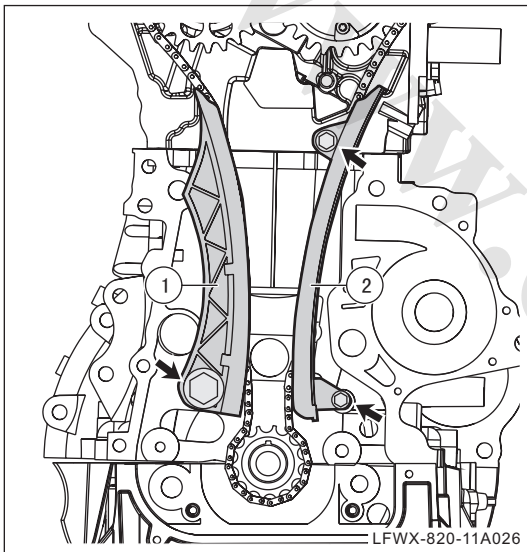
- (l) Remove the bolts from the timing cover and remove the timing cover.

△ HINT:

When removing the timing belt cover, due to the sealant, it may be uneasy to remove it. For the convenience for removal, tap the timing belt cover with a rubber hammer.

ⓘ Note:

**Do not tap it with an iron hammer or a hard tool.**

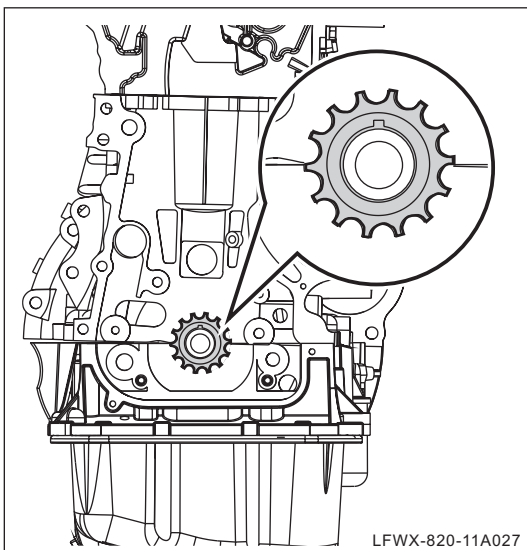


- (m) Remove the timing chain's moving rail module ① and fixed rail module ②.

ⓘ Note:

**To prevent any valve tappet or other part from striking piston due to rotation of crankshaft or camshaft when removing the timing part, be sure to crank the crankshaft before removal, so that all pistons do not stay at TDC or BDC positions.**

- (n) Remove the timing chain.



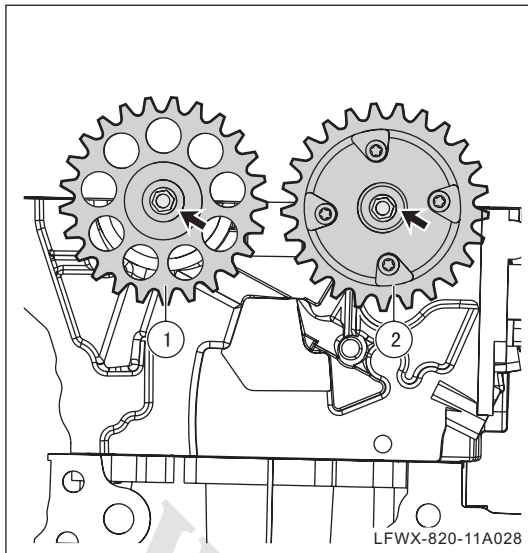
- (o) Remove the crankshaft timing sprocket retainer ring.

- (p) Remove the crankshaft timing sprocket and woodruff key.

△ HINT:

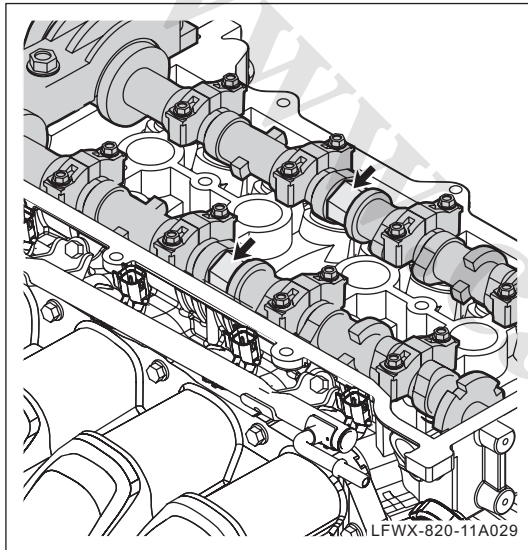
It is difficult to remove the woodruff key embedded in the keyway. In this case, it is unnecessary to remove the woodruff key. If removed at this step, do not miss it when installing.





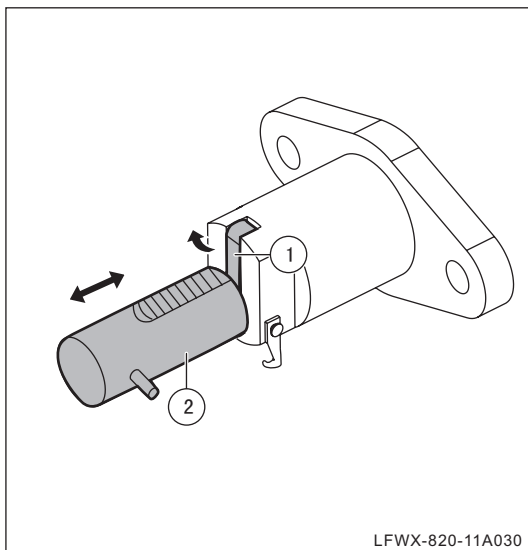
- (q) Remove the mounting bolts from the exhaust timing sprocket ①, and remove the exhaust timing sprocket ①.
- (r) Remove the phaser bolts, and remove the intake phase assembly ②.

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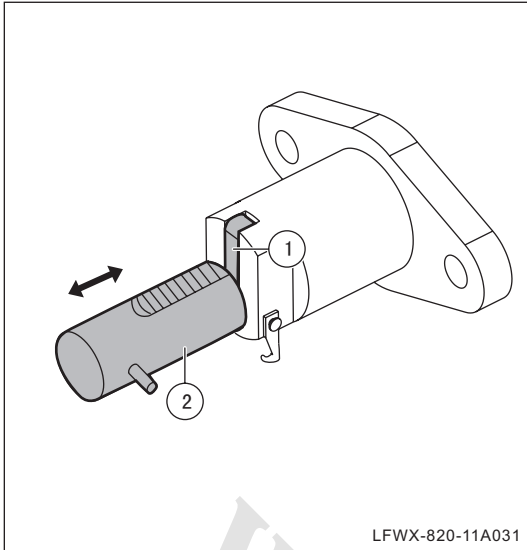
**Note:**

To avoid rotation of camshaft, it is necessary to use wrench to exert reversing force to camshaft (exert force to the position in left figure).



**2. Check the timing chain tensioner.**

- (a) Lift the tensioning shaft locking plate ①, and check whether the tensioning shaft ② can do telescopic movement. If not, replace the tensioner.



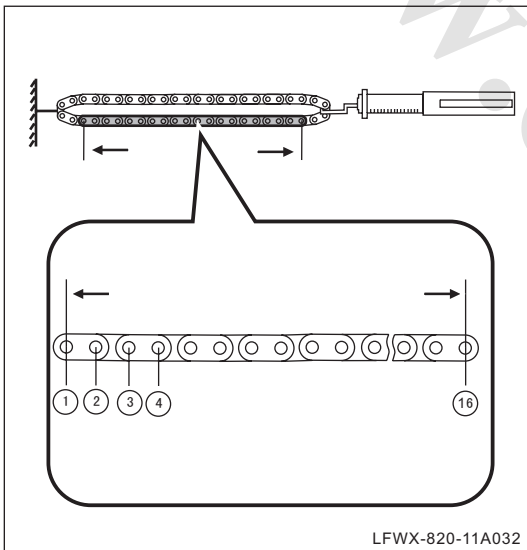
- (b) Let the locking plate ① lock the tensioning shaft ②, and check whether the tensioning shaft ② can do telescopic movement. If so, replace the tensioner.

**Note:**

**This tensioning shaft can only move inwards but cannot extend outwards.**

### 3. Check timing chain

- (a) Check the chain for damage. If any, replace it.



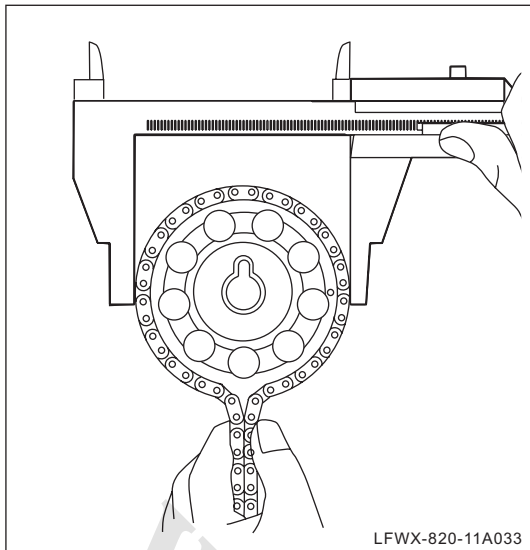
- (b). As shown in the figure, use spring pressure gauge to exert 140N force to the sprocket, and then use vernier caliper to check its length. If the length exceeds maximum extension length, replace the chain.

**Maximum extension of the chain:**

**122.6mm**

**△ HINT:**

According to the method shown in left figure, select 3 or more points as samples to measure chain length.



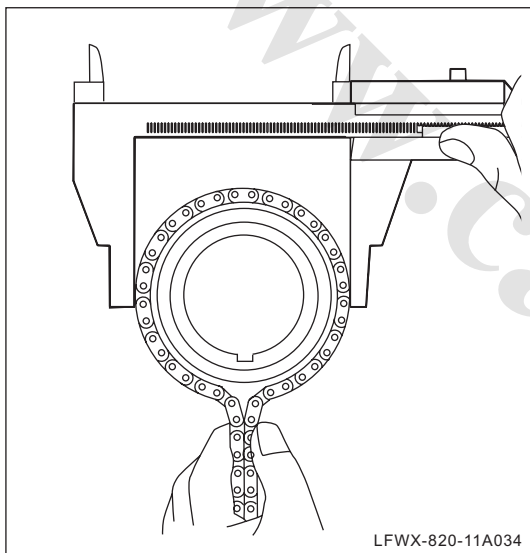
#### 4. Check the exhaust timing sprocket

- (a) Install the chain onto the exhaust timing sprocket.
- (b) Measure the diameter of the exhaust timing sprocket with timing chain using the vernier caliper. If less than the predetermined value, replace the exhaust timing sprocket.

**Minimum diameter: 97.3mm**

**Note:**

When measuring, 2 measuring legs of vernier caliper must tightly contact with chain roller.



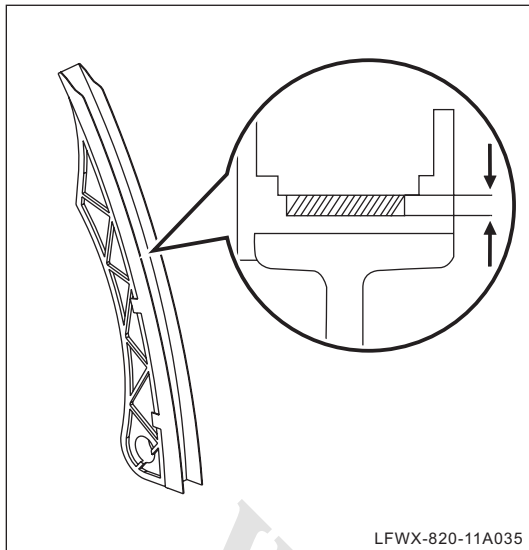
#### 5. Check crankshaft sprocket

- (a). As shown in the figure, make the chain wind around the exhaust camshaft sprocket.
- (b). Use vernier caliper to check the diameter of camshaft sprocket when a sprocket is equipped. If this value is lower than the specified value, replace the camshaft sprocket.

**Minimum diameter: 51.6mm**

**Note:**

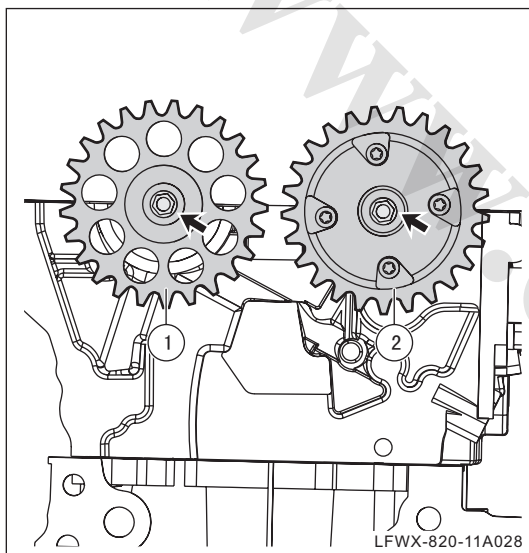
When measuring, 2 measuring legs of vernier caliper must tightly contact with chain roller.



## 6. Check the moving rail module of the timing chain.

- (a). Use vernier caliper to check the thickness of the guide. If the thickness of the rail is greater than the maximum thickness, replace the moving rail module of the timing chain.

**Maximum thickness: 1.0mm**



## 7. Install sprocket mechanism components

- (a) Install the exhaust timing sprocket ① in place, and install and tighten the mounting bolts.

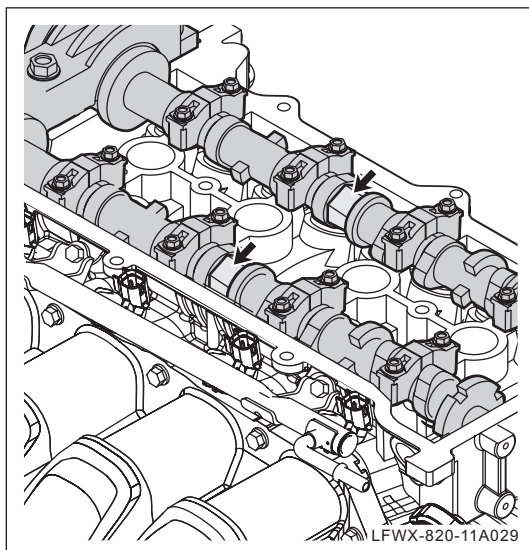
**Torque: 54 N.m**

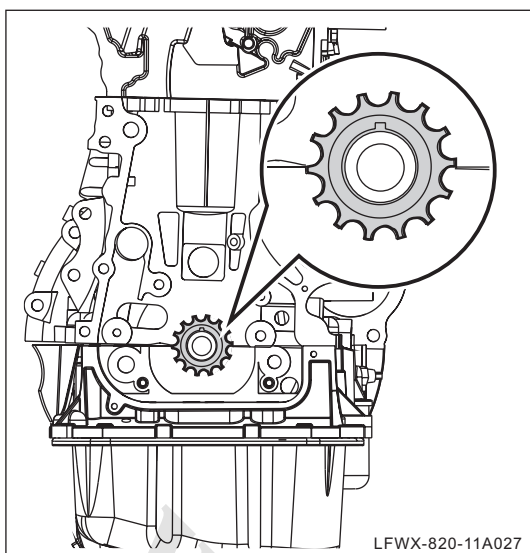
- (b) Install the intake phaser assembly ② in place, and install and tighten the phaser bolts.

**Torque: 60 N.m**

### ⓘ Note:

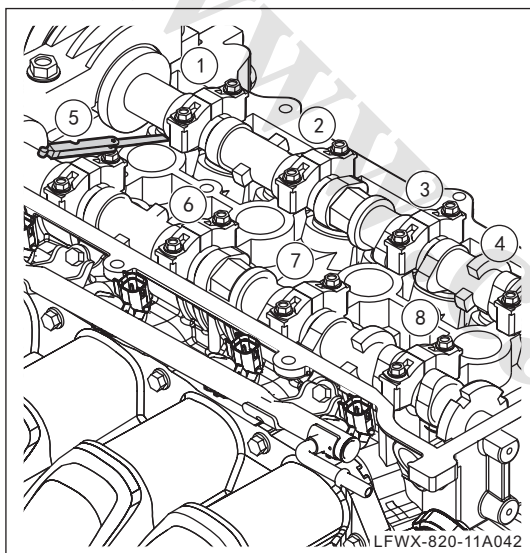
To avoid rotation of camshaft, it is necessary to use wrench to exert reversing force to camshaft (exert force to the position in left figure).





- (c) Install the crankshaft timing sprocket.
- (d) Install crankshaft sprocket retainer.

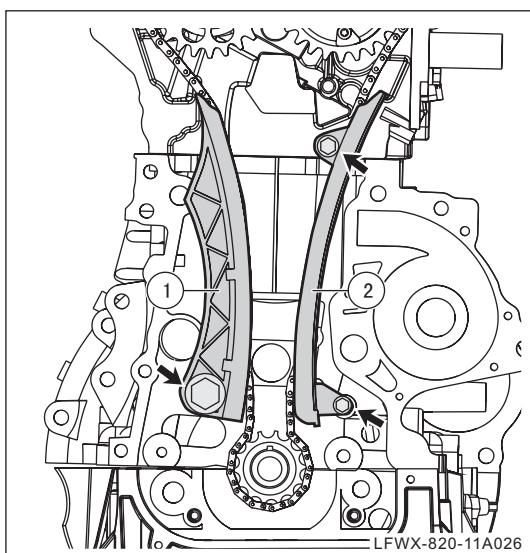
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- (e) Install timing chain.

**Note:**

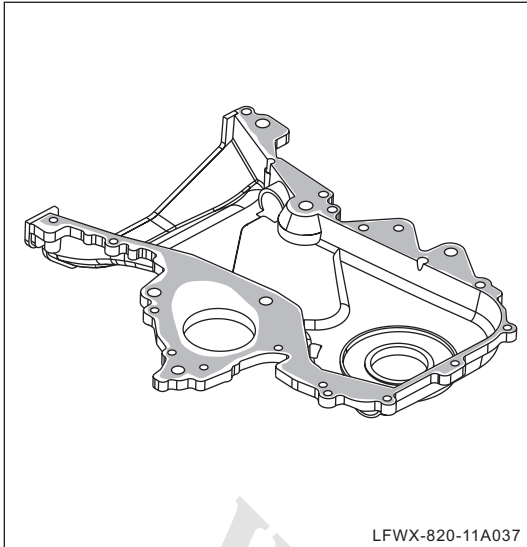
As shown in the figure, align the timing marks when installing the sprocket.



- (f) Install the moving rail module ① and fixed rail module ② of the timing chain.

**Torque: 19N • m (for moving rail bolts)**

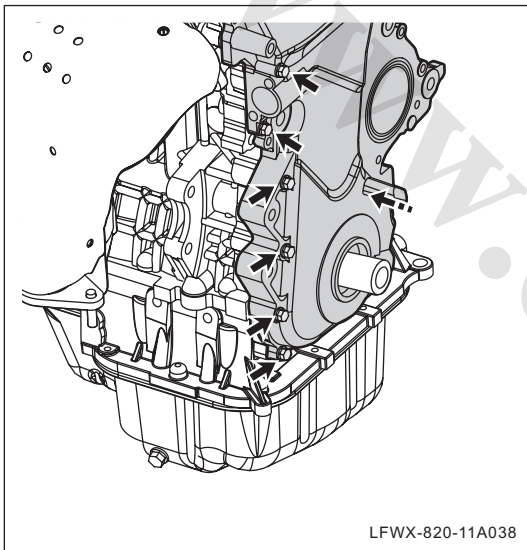
**13N • m (for fixed rail bolts)**



- (g) Apply sealant on the bonding surface of timing cover uniformly.

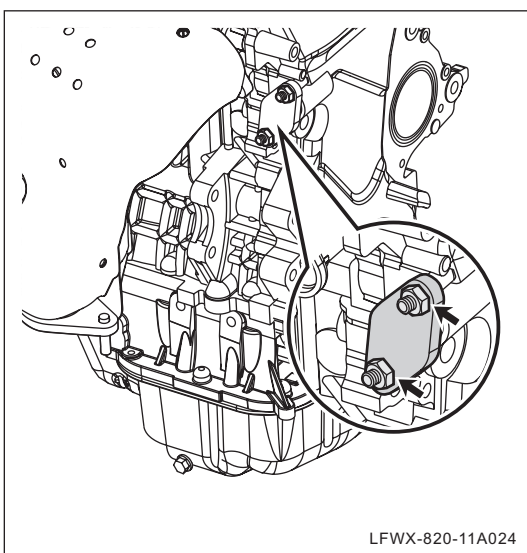
**Note:**

**Before applying new sealant, it is necessary to remove old sealant.**



- (h) Fix the timing cover to the engine, and install and tighten the bolts.

**Torque: 23N.m**



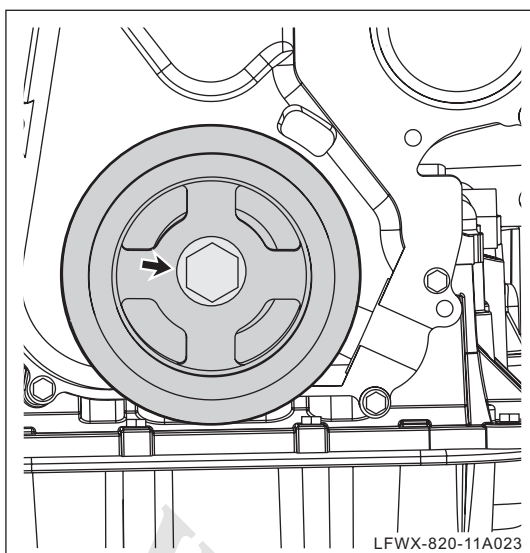
- (i) Install the timing chain tensioner in place, and install and tighten the nuts.

**Torque: 11N.m**

**HINT:**

When installing timing chain tensioner, lock the tensioner plunger piston by using locking plate at first. After tightening bolts of the tensioner is installed, rotate crankshaft counter clockwise to release locking plate.

- (j) Rotate crankshaft clockwise to check if the timing chain tensioner is installed correctly.



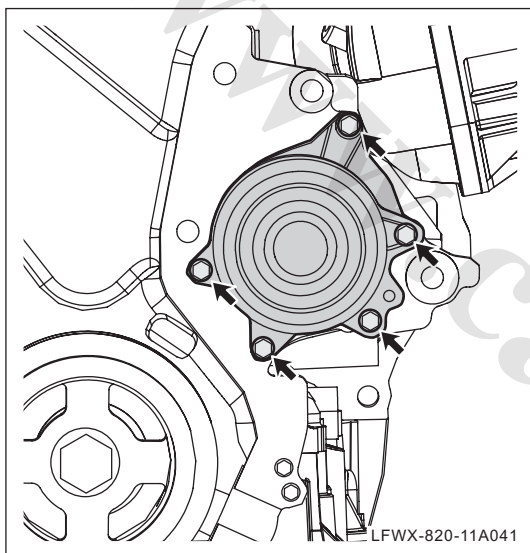
- (k) Install the crankshaft pulley in place, and install and tighten the bolt module.

**Torque: 138N.m**

△ HINT:

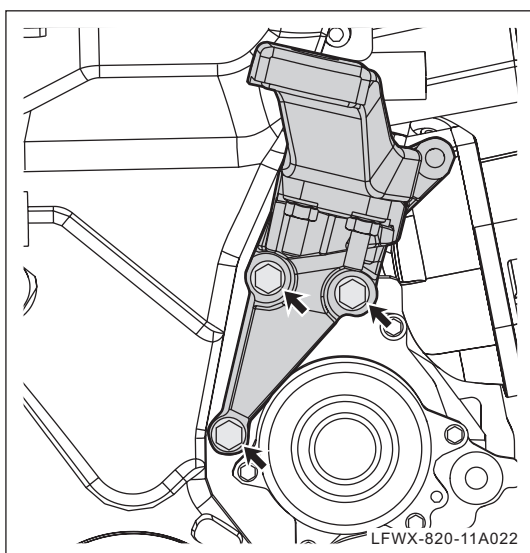
When installing the bolt module of the crankshaft pulley, to prevent rotation of the crankshaft, fix the flywheel in advance.

11A



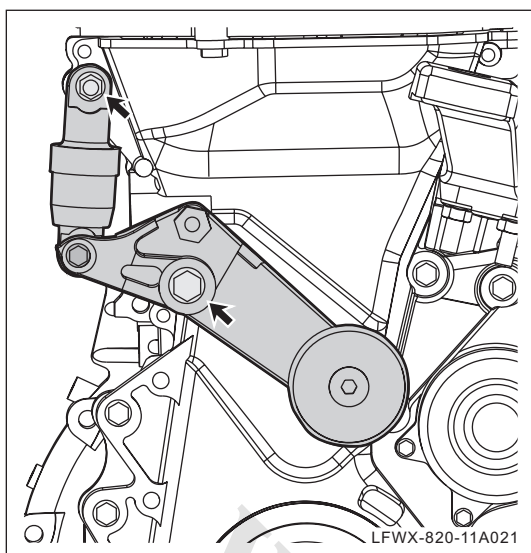
- (l) Install the water pump and seal in place, and install and tighten its bolts.

**Torque: 11N.m**



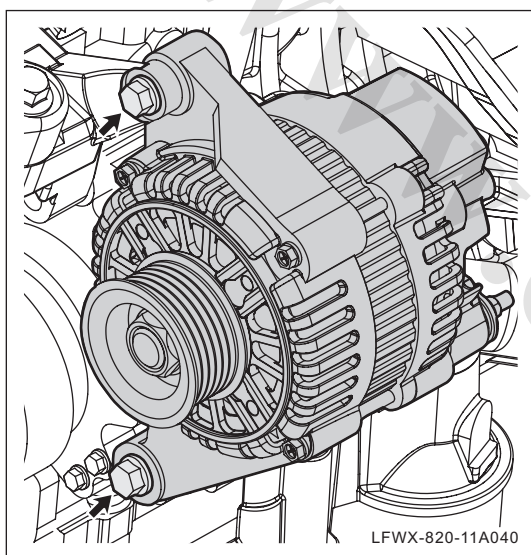
- (m) Install the right mounting bracket of the engine in place, and install and tighten the bolts.

**Torque: 52N.m**



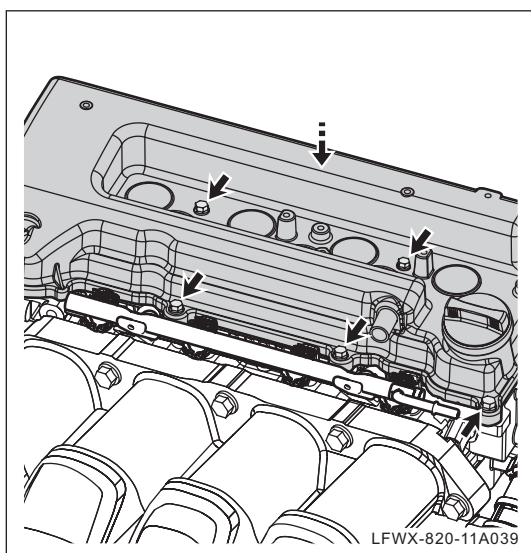
- (n) Install the tensioner assembly in place, and install and tighten its bolts.

**Torque: 69N•m (bolt); 29N•m (nut)**



- (o) Install the alternator assembly in place, and mount & tighten the fixing bolts.

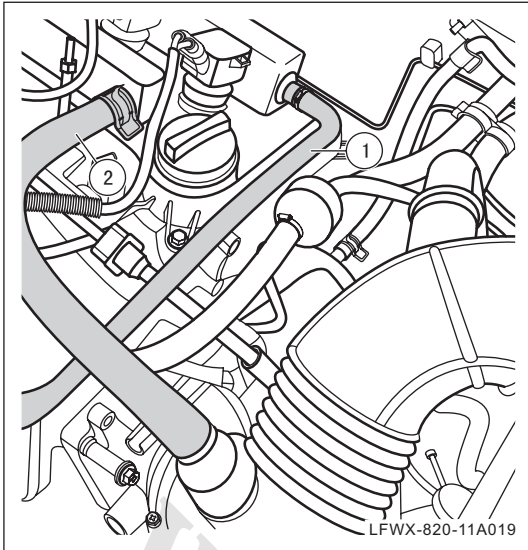
**Torque: 25N • m (for short bolts); 54N • m (for long bolts)**



- (p) Install the cylinder head cover in place, and install and tighten its bolts.

**Torque: 11N.m**





- (q) Install the PCV valve hose ① and clamp in place, and tighten the clamp.
- (r) Install the breather hose ② .

11A

- (s) Install the spark plug. (See 18 - Ignition System Spark Plug, Replacement)

## Camshaft

### Components



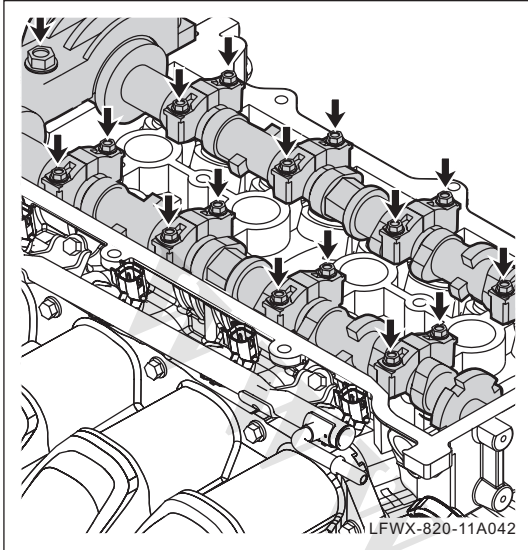
1	Intake camshaft
---	-----------------

2	Exhaust camshaft
---	------------------

## Overhaul

### 1. Remove camshaft assembly

- (a) Remove the timing sprocket mechanism module. (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair)

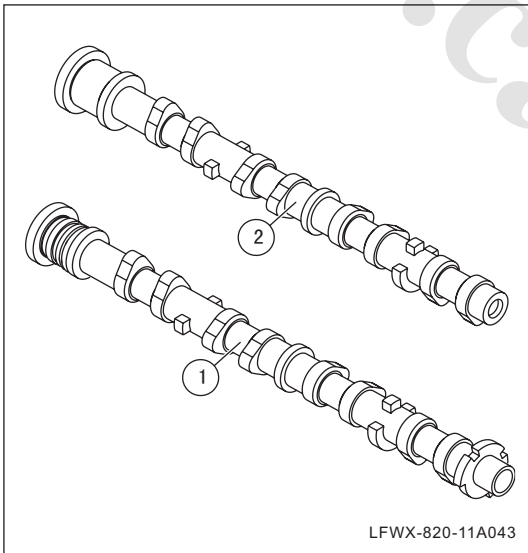


- (b) Remove the camshaft cap bolts, and remove all the camshaft caps.

**Note:**

- Remove the camshaft cap bolts in pairs.
- Put the removed camshaft bearing caps in order. Be careful to distinguish the intake/exhaust camshaft bearing caps, exhaust camshaft bearing cap.

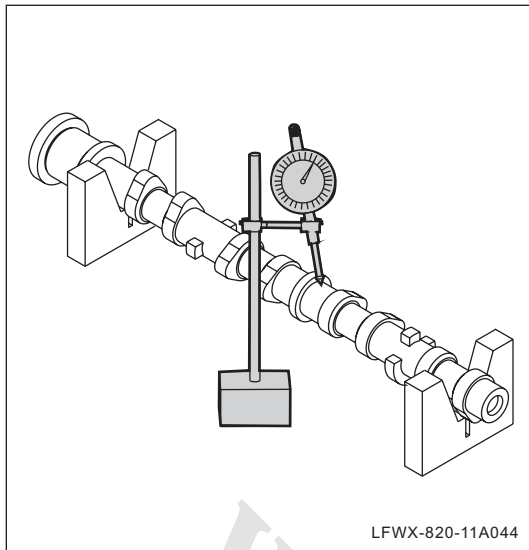
- (c). Remove intake and exhaust camshafts.



**Note:**

Be careful to distinguish intake and exhaust camshafts.

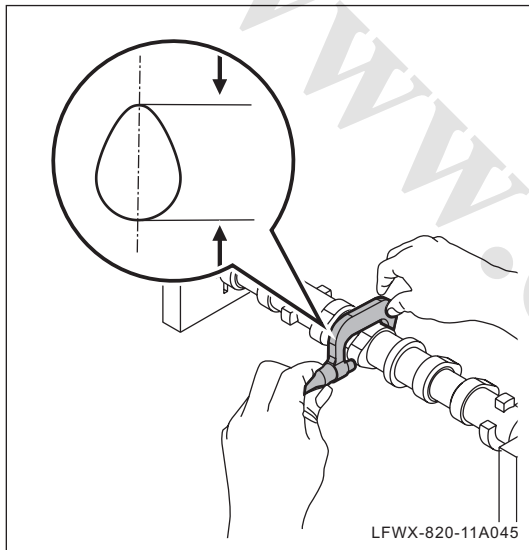
- 1: Intake camshaft,  
2: Exhaust camshaft.



## 2. Check camshaft radial run-out

- (a) Place the camshaft on a V block, measure its circumference radial run-out at intermediate journal with a dial gauge. If radial run-out is larger than the maximum value, replace the camshaft.

**Maximum value: 0.03mm**

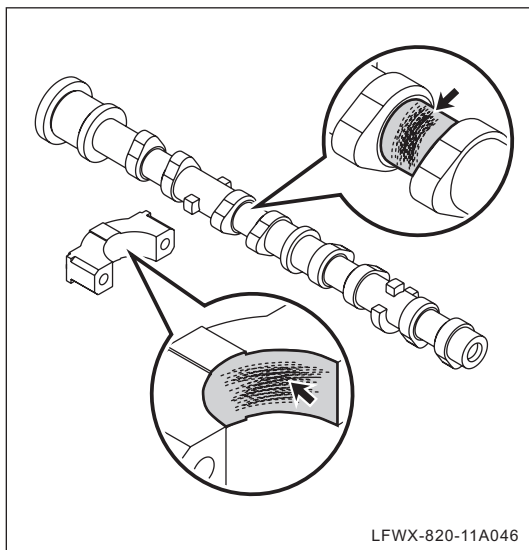


## 3. Check maximum lift of intake/exhaust camshaft

- (a). As shown in the figure , measure maximum lift of intake/exhaust camshaft with a screw micrometer. If it does not conform to the specification, replace it.

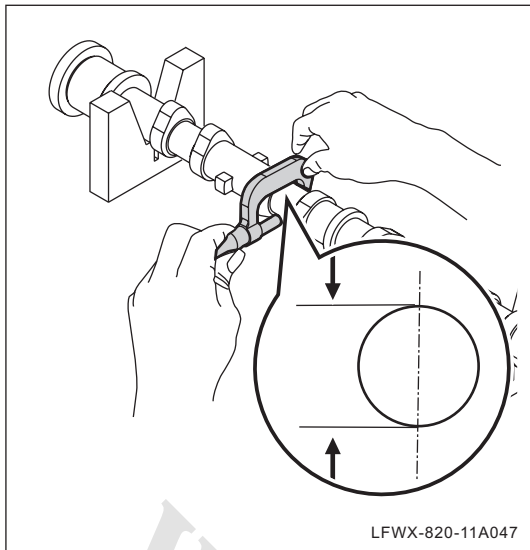
**Intake: 44.168mm - 44.268mm**

**Exhaust: 43.705mm - 43.805mm**



## 4. Check camshaft journal

- (a). Check the camshaft journal and bearing cap for rust, wear or other damages. If any, replace it. If necessary, replace the cylinder head.

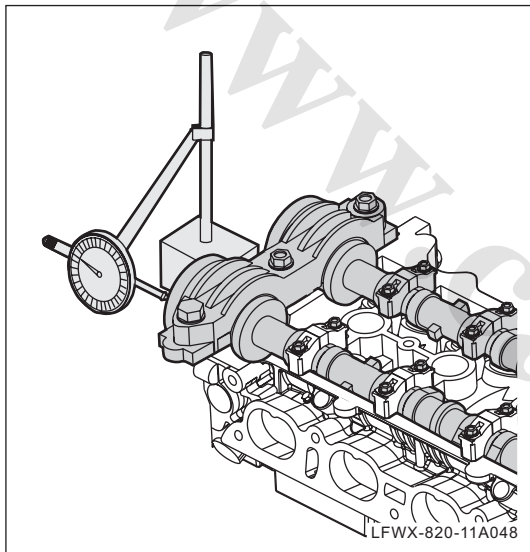


- (b). Measure the camshaft journal with the screw micrometer. If it is inconsistent with the specified value, check the clearance of oil film.

**No.1 Exhaust: 24.949mm - 24.965mm**

**Other: 22.949mm - 22.965mm**

**11A**

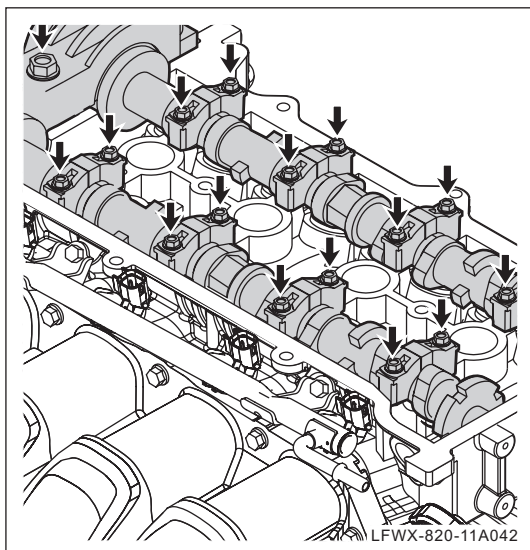


### 5. Check camshaft axial clearance

- (a). Install intake/exhaust camshaft on cylinder head.
- (b). Make the camshaft in alternate motion, and measure the axial clearance of camshaft. If it is inconsistent with the specified value, replace the camshaft. If necessary, replace the cylinder head.

**Standard axial clearance: 0.040mm - 0.095mm**

**Maximum axial clearance: 0.10mm**



### 6. Install camshaft assembly

- (a). Install intake and exhaust camshafts on the cylinder head.

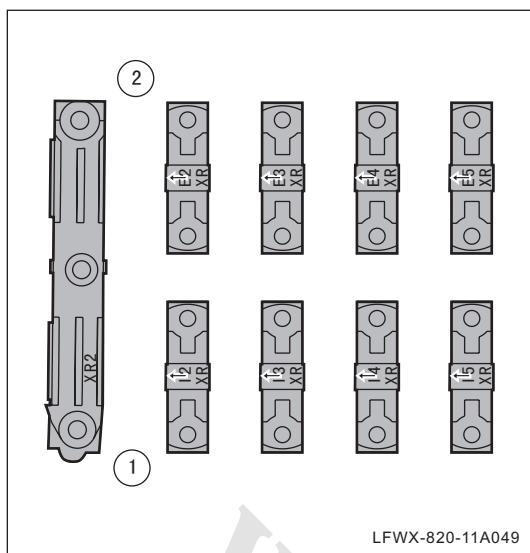
#### ⓘ Note:

- Apply clean oil onto each contact surface of the camshaft evenly.
- Be careful to distinguish intake and exhaust camshafts.

- (b) Install the camshaft cap in place, and install and tighten its bolts.

**No.1 camshaft cap bolt torque: 23N • m**

**Other Torque: 13N • m**

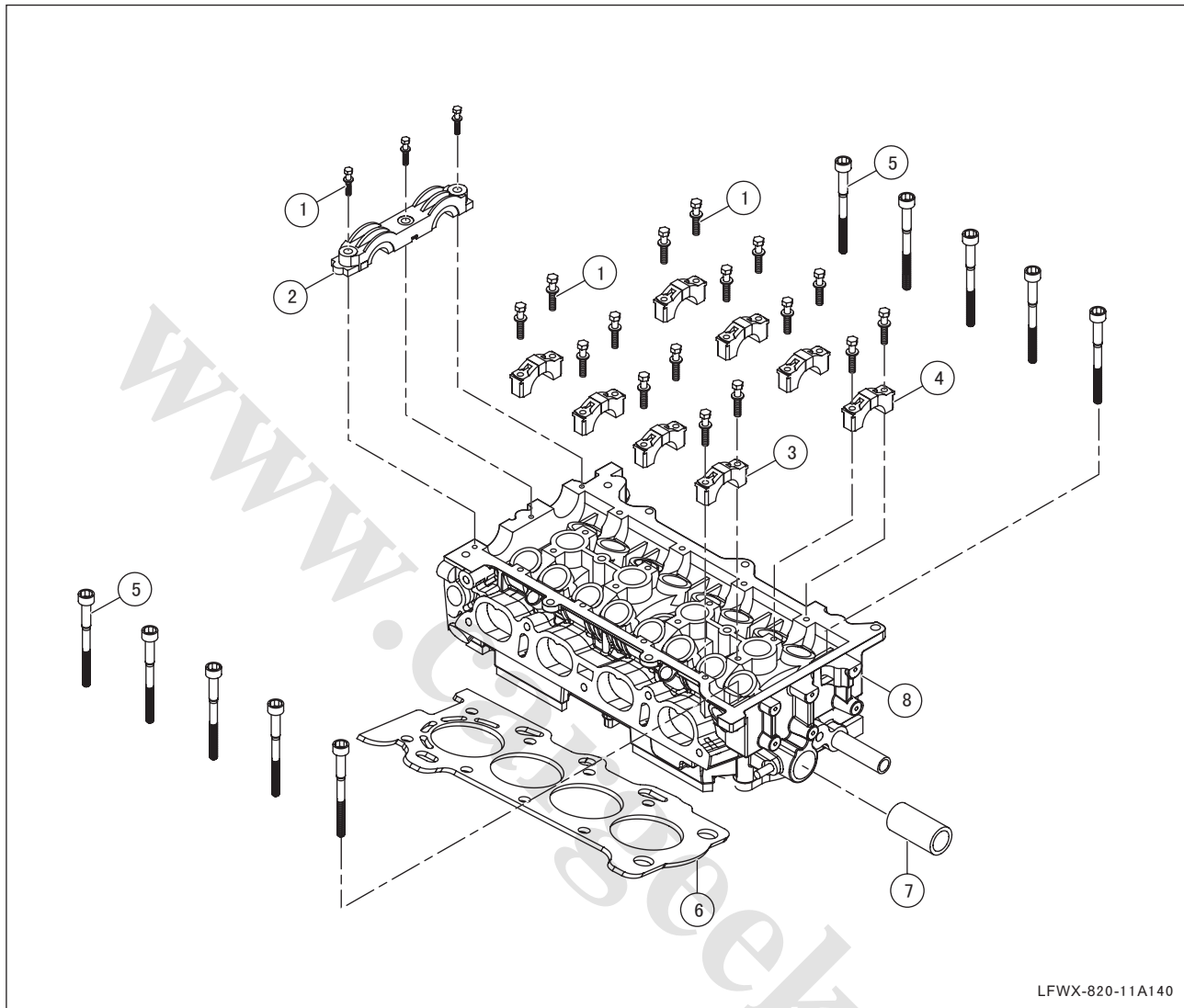

**Note:**

- As shown in figure, pay attention to the sequence of intake and exhaust camshaft bearing caps. Do not mixedly install them. 1 is intake side (mark letter is I); 2 is exhaust side (mark letter is E).
  - Tighten fixing bolts of camshaft bearing cap in pair.
  - After tightening the bolt of the camshaft bearing caps, make sure that the camshafts will rotate smoothly without seizure.
- (c) Install the timing sprocket mechanism module. (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair)

# Cylinder Head

## Components

11A



LFWX-820-11A140

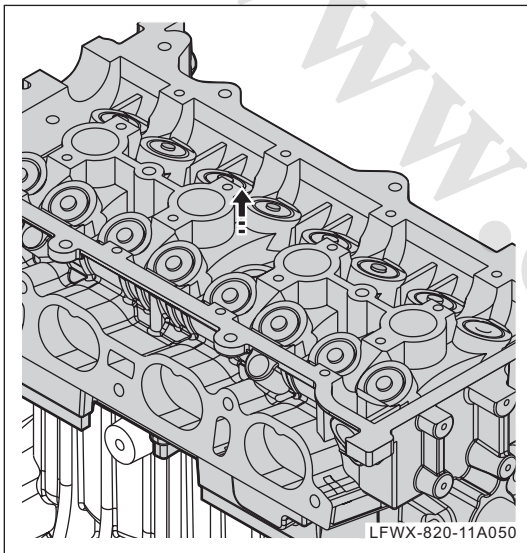
1	Bolts for camshaft cover
2	No.1 camshaft bearing cap
3	Intake camshaft cap
4	Exhaust camshaft cap

5	Cylinder head bolt
6	Cylinder head gasket
7	Water outlet pipe
8	Cylinder head assembly

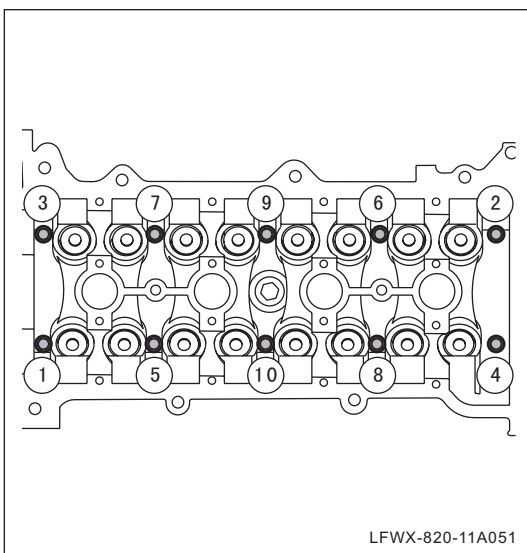
## Overhaul

### 1. Removal of cylinder head

- (a) Remove the canister solenoid valve. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
- (b) Remove the injector. (See 13- Fuel System-Injectors, Replacement)
- (c) Remove intake manifold. (See 11A- Engine Mechanical System-Intake Manifold, Check and Repair)
- (d) Remove the catalytic converter. (See 14- Emission Control System-Catalytic Converter, Replacement)
- (e) Remove the camshaft. (See 11A- Engine Mechanical System-Camshaft, Check and Repair)



- (f) Remove the cylinder head bolts and remove the cylinder head and gasket.



**Note:**

When removing cylinder head bolt, unscrew and remove cylinder head bolt in order shown in the figure.

- (g) Remove the valve module. (See 11A- Engine Mechanical System-Valves, Check and



Repair)

## 2. Check cylinder head components

- (a) Clean the sealant and engine oil on the cylinder head.
- (b) Clean the carbon deposits inside the cylinder head combustion chamber.

11A

### ⓘ Note:

**Do not use any sharp tool to scrape the carbon deposits. When removing the carbon, be careful not to scrape or damage the metal surface.**

- (c) Use high-pressure water gun to clean the cylinder head.

### △ HINT:

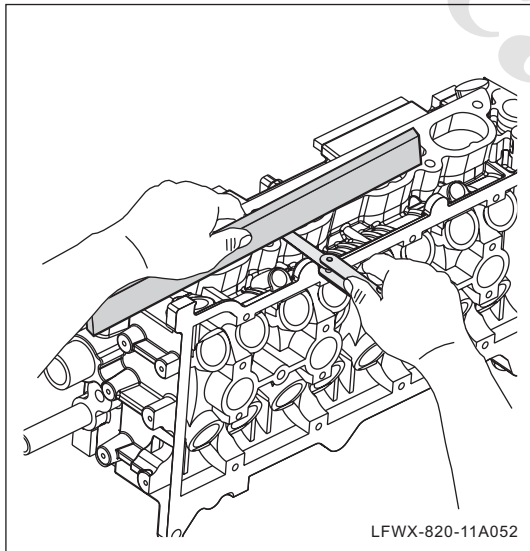
Mainly means the water pipe and the fuel pipe

- (d) Dry the cylinder head with compressed air.

### ⓘ Note:

**When using compressed air, we recommend you wear goggles and protective masks to avoid personal injury due to flying debris or dirt.**

- (e) Check the cylinder head fixing bolts for damage. If any, replace them.



- (f) Check the cylinder cover interface and the intake and exhaust sides for flatness with the ruler and feeler gauge. If the flatness exceeds the maximum value, replace the cylinder head.

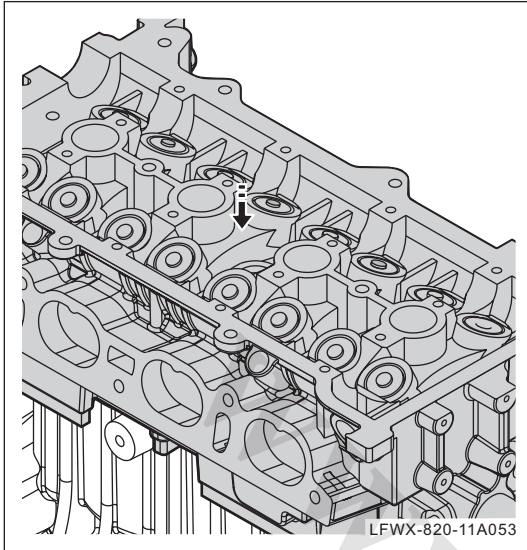
**Block interface: 0.05mm**

**Intake side: 0.10mm**

**Exhaust side: 0.10mm**

### 3. Installation of cylinder head

- (a) Install valve components. (See 11A- Engine Mechanical System-Valves, Check and Repair)



- (b) Install cylinder head pad onto the cylinder block.

**Note:**

Pay attention to replace with new cylinder head pad; meanwhile pay attention to the face and back sides to ensure correct installation.

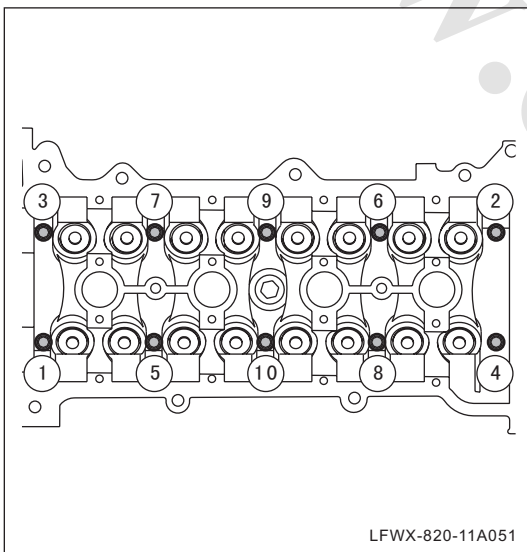
- (c) Fix the cylinder head to the cylinder block, and install and tighten the cylinder head bolts.

**Torque: 49N • m (for the first time)**

**Torque: 90 N.m (for the second time)**

**Note:**

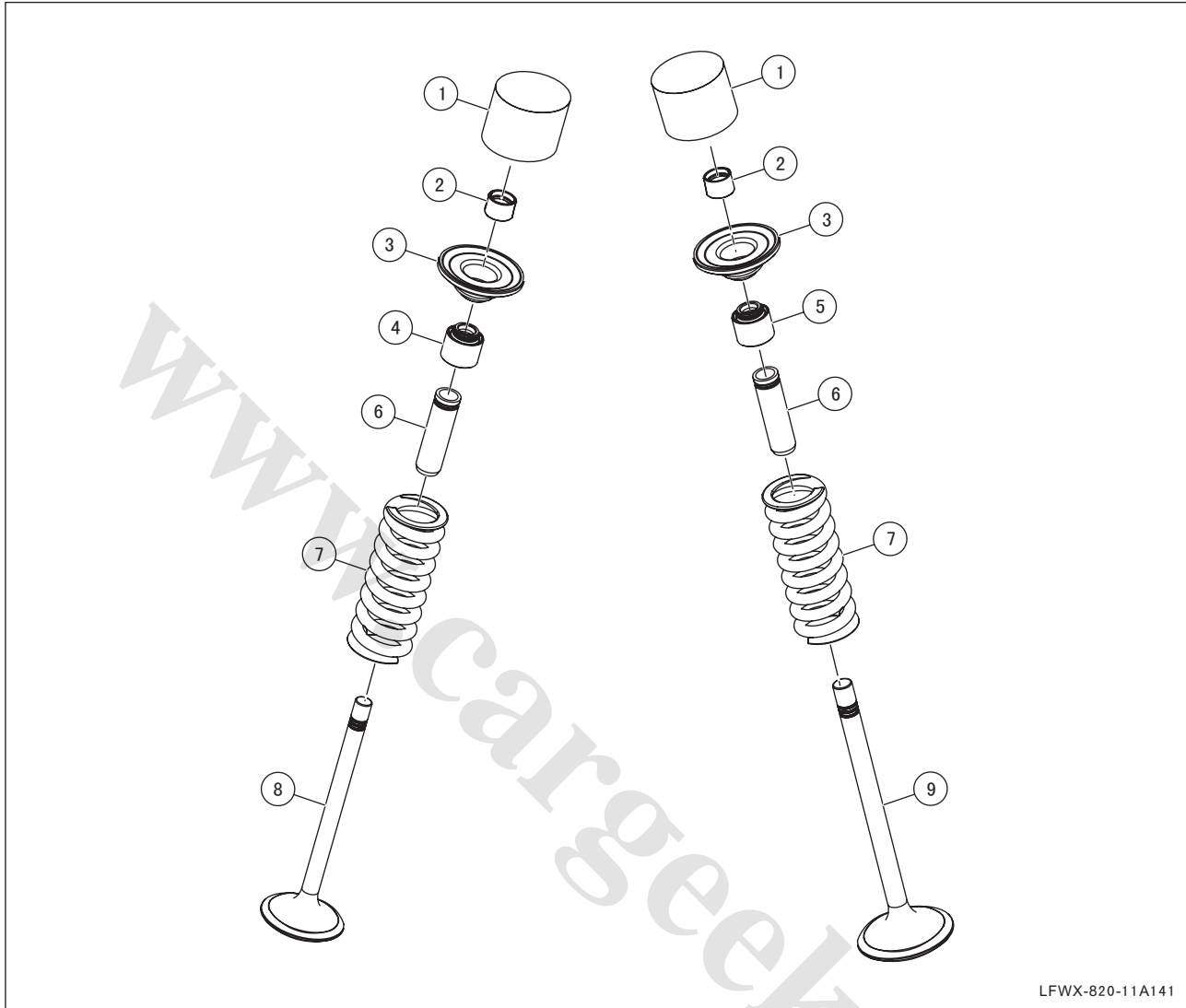
- Apply appropriate amount of clean oil onto the threaded portion of the cylinder head bolts.
- When tightening cylinder head bolt, tighten twice according to the order shown in the figure.



- (d) Install the camshaft. (See 11A- Engine Mechanical System-Camshaft, Check and Repair)
- (e) Install the catalytic converters. (See 14- Emission Control System-Catalytic Converter, Replacement)
- (f) Install the intake manifold. (See 11A- Engine Mechanical System-Intake Manifold, Check and Repair)
- (g) Install the injector. (See 13- Fuel System-Injectors, Replacement)
- (h) Install the canister solenoid valve. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)

# Valve

## Components



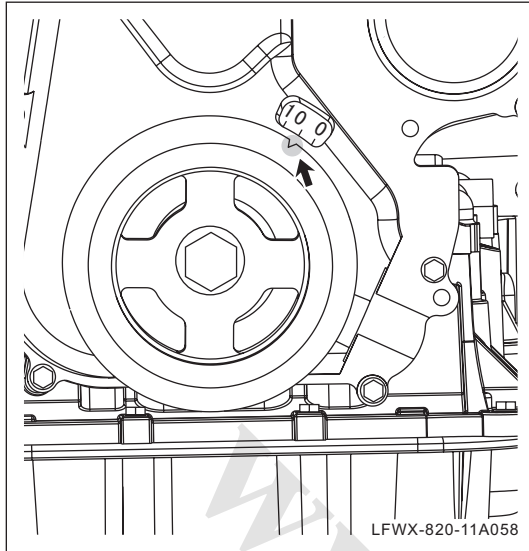
11A

LFWX-820-11A141

1	Tappet
2	Valve cotter
3	Valve spring seat
4	Exhaust valve oil seal
5	Intake valve oil seal

6	Valve guide
7	Valve spring
8	Exhaust valve
9	Intake valve

## Adjustment



### 1. Check and adjust valve clearance

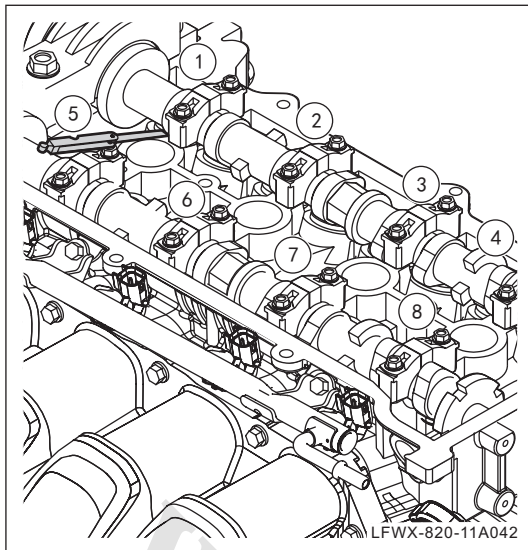
- (a) Adjust the piston (of No.1 cylinder) to the TDC position.

△ HINT:

Rotate the crankshaft pulley, and align its timing mark to the "5" mark on the pulley cover.

- (b) Determine whether the piston of No.1 cylinder or No.4-cylinder is at the TDC of the compression stroke.

- Remove the cylinder head cover. (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair)
- Observe the cam position of the exhaust camshaft of No.1 cylinder or No.4-cylinder. If the cam position of the exhaust camshaft of No.1 cylinder faces downwards (i.e., the exhaust valve is about to open), then the piston of No.4 cylinder is at the TDC of compression stroke. If the cam position of the exhaust camshaft of No.4 cylinder faces downwards (i.e., the exhaust valve is about to open), then the piston of No.1 cylinder is at the TDC of compression stroke.



## (c) Check valve clearance.

- When the piston of No.1 cylinder is at the TDC of compression stroke, use a feeler gauge to measure the valve clearance of valve 1, 3, 5 and 6, and record the results.
- Rotate the crankshaft by  $360^\circ$ , measure valve clearance of the other eight valves with a feeler gauge and record them.

11A

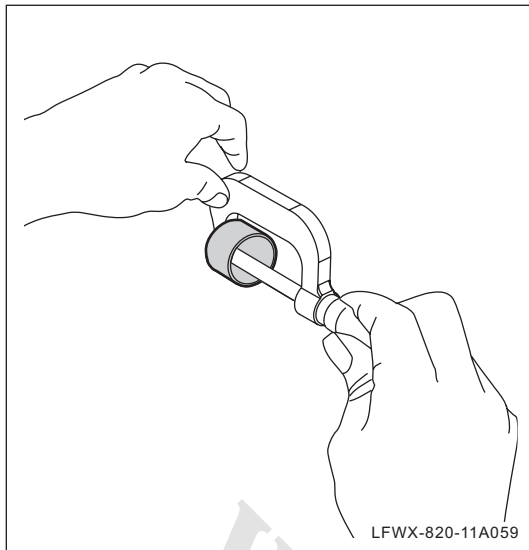
**Standard intake valve clearance (cold):  
0.20mm - 0.25mm**

**Standard exhaust valve clearance  
(cold): 0.30mm - 0.35mm**

## △ HINT:

If the valve clearance is inconsistent with the standard value, you can replace the tappet of the valve head to make its valve clearance reach the standard value.

- When the piston of No.4 cylinder is at the TDC of compression stroke, use a feeler gauge to measure the valve clearance of valve 2, 4, 7 and 8, and record the results.
- Rotate the crankshaft by  $360^\circ$ , measure valve clearance of the other eight valves with a feeler gauge and record them.



(d) Adjust valve clearance.

- Remove the camshaft. (See 11A- Engine Mechanical System-Camshaft, Check and Repair)
- Remove the mechanical tappet to be replaced.
- Measure tappet top end thickness with a screw micrometer.
- Calculate new tappet top end thickness.

Calculation method:

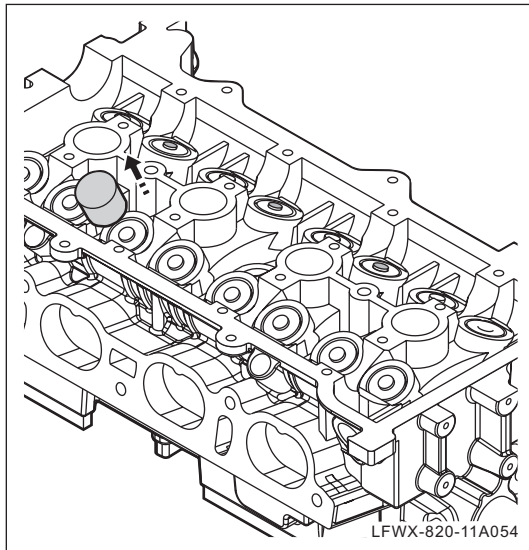
New mechanical tappet top end thickness = measured clearance value - standard clearance value + replaced tappet top end thickness

(e) Re-install the engine.

## Overhaul

### 1. Remove valve components

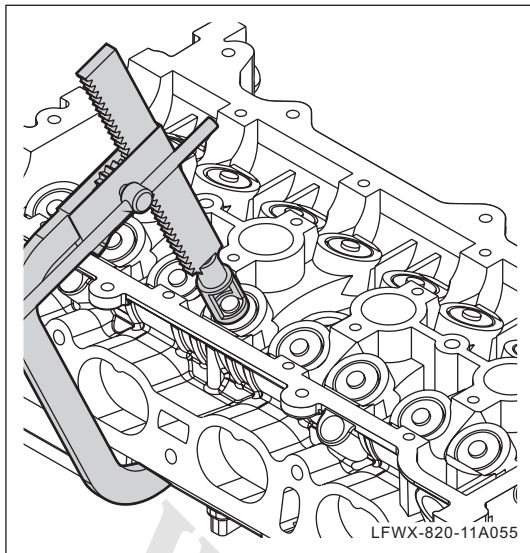
(a) Remove the cylinder head. (See 11A- Engine Mechanical System-Cylinder Head, Check and Repair)



(b) Remove all mechanical tappets in turn.

#### ⓘ Note:

Place the removed mechanical tappets in turn in accordance with their installation locations for subsequent installation.

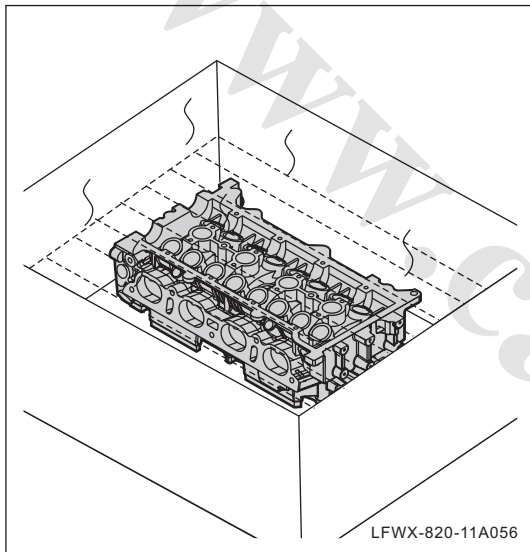


- (c) Remove valve keeper with special tool.
- (d) Remove valve, valve retainer, valve spring and valve oil seal in turn.

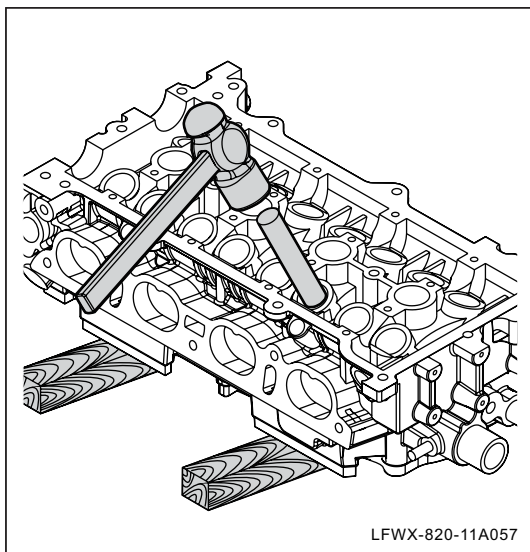
**Note:**

- The intake valve oil seal is gray and the exhaust valve oil seal is black.
- Once the oil seal is removed, it cannot be used any longer. A new oil seal must be used for installation.

11A



- (e) Heat the cylinder head to 80°C - 100°C .



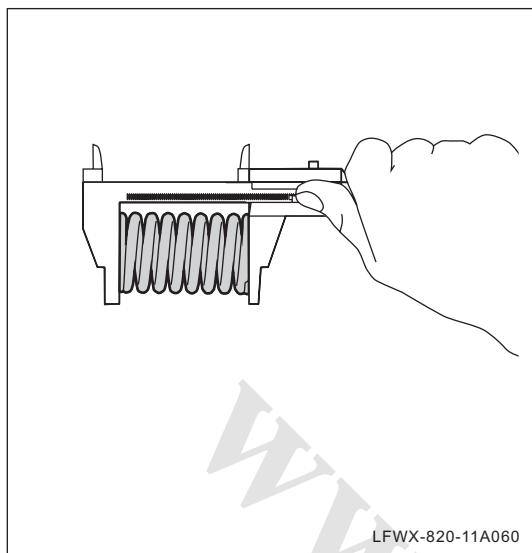
- (f) Put cylinder head onto a wooden plate, and use special tool to take out valve guide.

**Note:**

- The valve guide cannot be used again once it's removed.
- The interference fit between the valve guide and the cylinder head is applied, so a valve guide with a enlarged size will be required when installing the new valve guide.

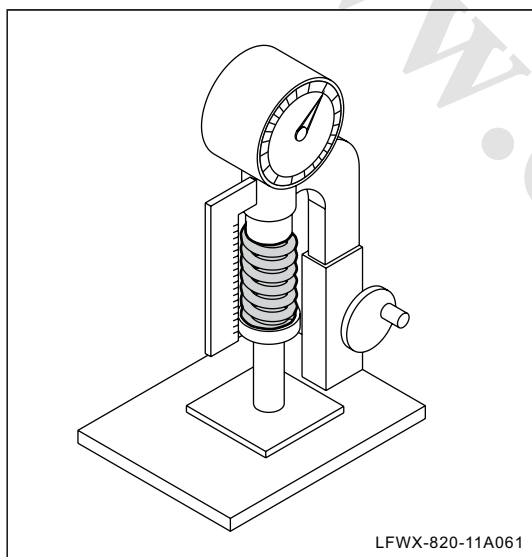
## 2. Check valve components

(a) Check the valve cotter for cracks or damage. If any, replace it.



(b) Measure the free length of valve spring with a dial caliper. If it does not conform to the specification, replace it.

**Free length: 43.40mm**

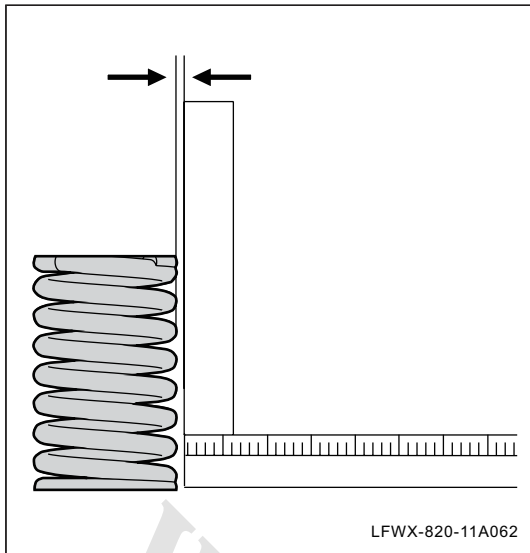


(c) Measure spring force at standard compression length with a spring-loaded thrust meter. If it does not conform to the specification, replace it.

**Elastic force for installation: 153N - 169N (33.88mm)**

**Maximum operating force: 335.3N - 370.7N (24.1mm)**





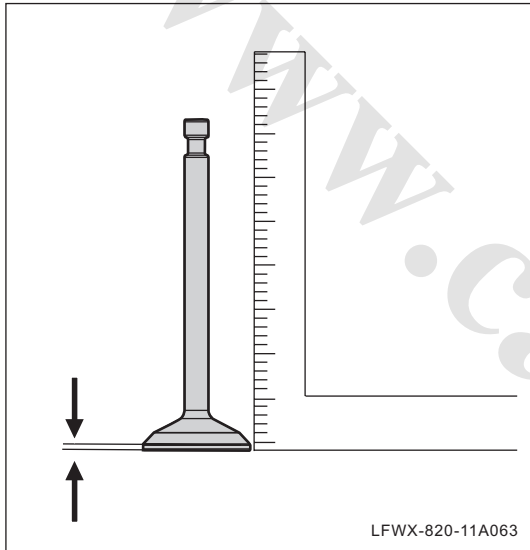
- (d). With a ruler and flat plate, according to the clearance between valve spring end and the ruler, check perpendicularity of each spring. If it does not conform to the specification, replace it.

**Maximum deviation: 1.6mm**

**Maximum deviation angle: 2°**

11A

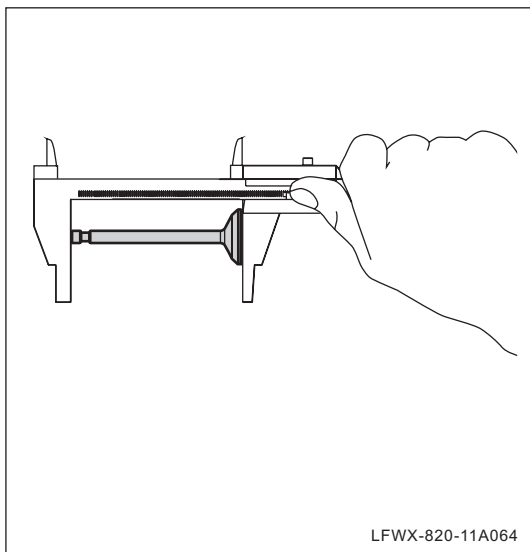
- (e). Clean all carbon deposits on the valve. Check if the working surface and valve stem of each valve are worn, burnt or deformed. If so, repair them. If necessary, replace them.



- (f) Measure valve edge thickness with a try square. If the measured value is less than the minimum value, replace the valve.

**Standard thickness: 1.0mm**

**Minimum thickness: 0.7mm**



- (g) Measure valve length with a dial caliper. If it does not conform to the specification, replace it.

**Standard length:**

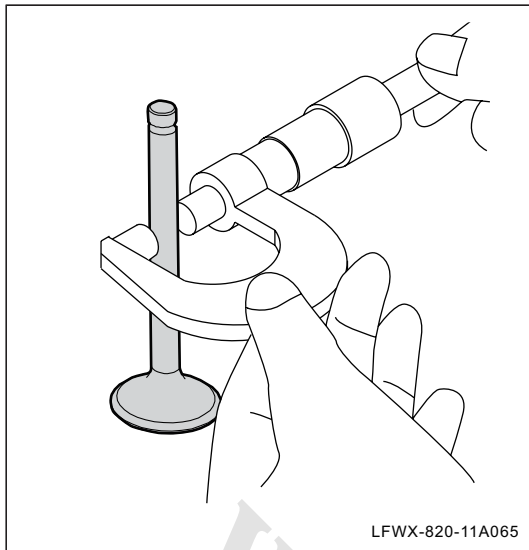
**Intake valve: 88.65mm**

**Exhaust valve: 88.69mm**

**Minimum length:**

**Intake valve: 88.35mm**

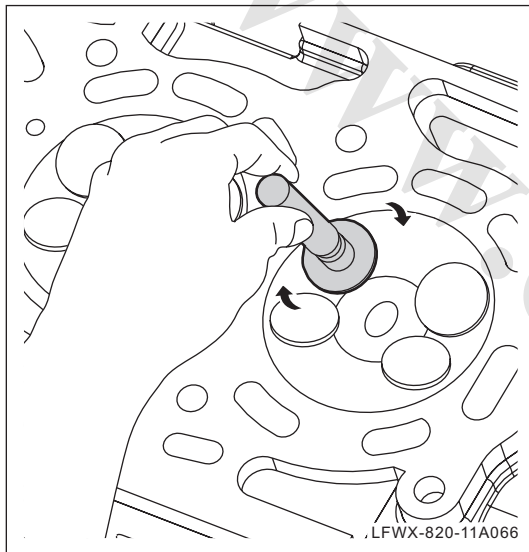
**Exhaust valve: 88.39mm**



- (h) Measure valve stem diameter with a micrometer. If it does not conform to the specification, replace it.

**Intake valve: 5.470mm - 5.485mm**

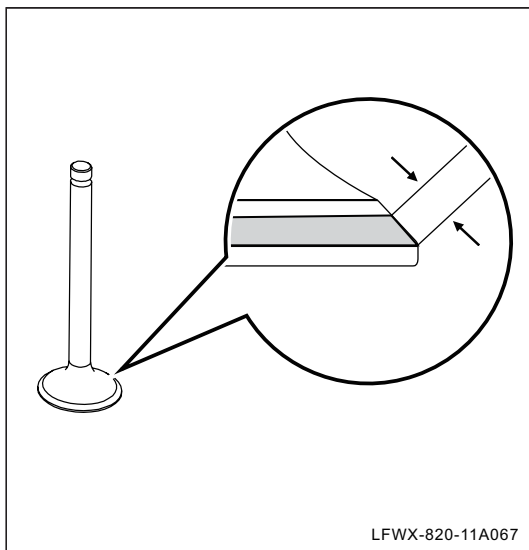
**Exhaust valve: 5.465mm - 5.480mm**



- (i) Check the width of valve-seat contact.

△ HINT:

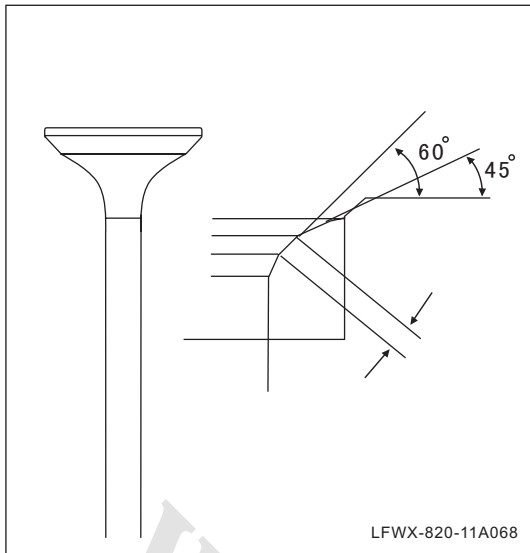
- Apply a layer of blotting membrane to valve seat and then install the valve on cylinder head.
- Rotate the valve in 1/4 turns for several times with the valve grinding tool, and then remove the valve.



ⓘ Note:

- The imprint on valve fitting surface must be continuously annular, and the annular imprint width must be within specified range. If the imprint between valve seat and valve is not uniform or the imprint width is not within the specified range, it is necessary to regrind or cut, grind or polish the valve seat.

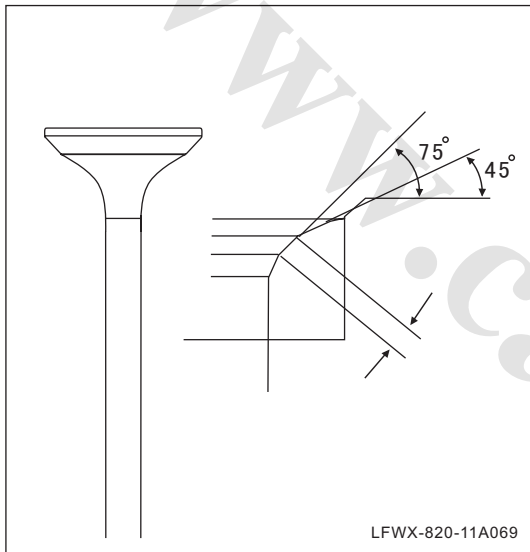
**Intake valve seat width: 1.0mm - 1.4mm**



- **Intake valve seat: repair it twice with a valve seat reamer. Two reamers must be used for repairing: one for 15° and one for 45° . At the second time, it is a must to get the required width.**

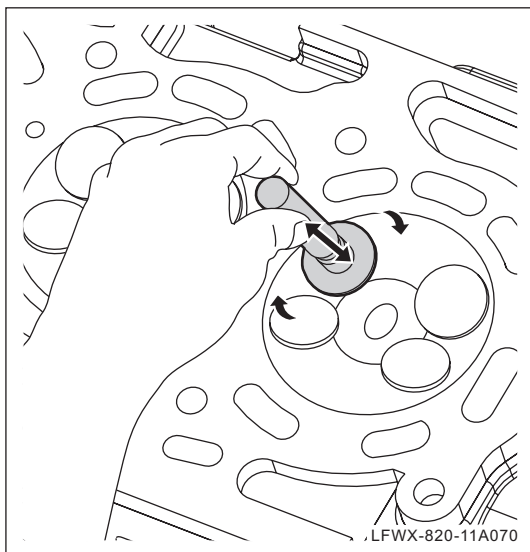
**Intake valve seat width: 1.0mm - 1.4mm**

**11A**



- **Exhaust valve seat: repairing procedure is the same as that of intake valve.**

**Exhaust valve seat width: 1.0mm -1.4mm**

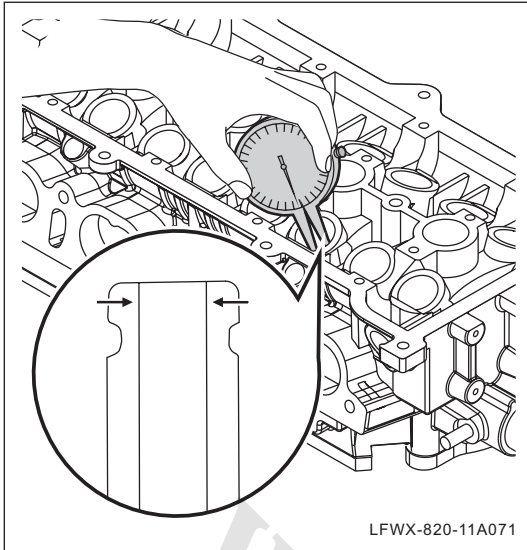


- (j) Grind valve.

△ HINT:

△ Hint: first apply rough abrasive paste on valve seat surface, grind the valve with a grinding tool, then apply fine abrasive paste and go on grinding until the valve and valve seat are perfectly matched.

- (k) After grinding, completely clean valve and valve seat.



- (l) Measure the valve guide inner diameter with the internal micrometer.

**Valve guide inner diameter: 5.510mm - 5.530mm**

- (m) Inner diameter of valve guide pipe minus diameter of valve rod gets the oil clearance of valve guide pipe. If the oil clearance is more than the maximum value, replace the valve and the guide.

**Standard oil clearance:**

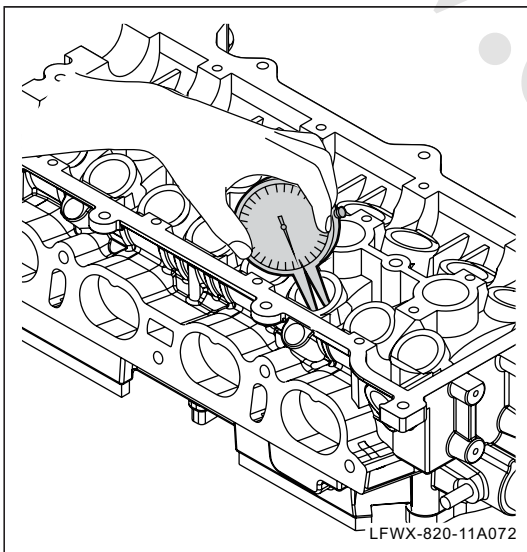
**Intake valve: 0.025mm - 0.060mm**

**Exhaust valve: 0.030mm - 0.065mm**

**Maximum oil clearance:**

**Intake valve: 0.08mm**

**Exhaust valve: 0.10mm**



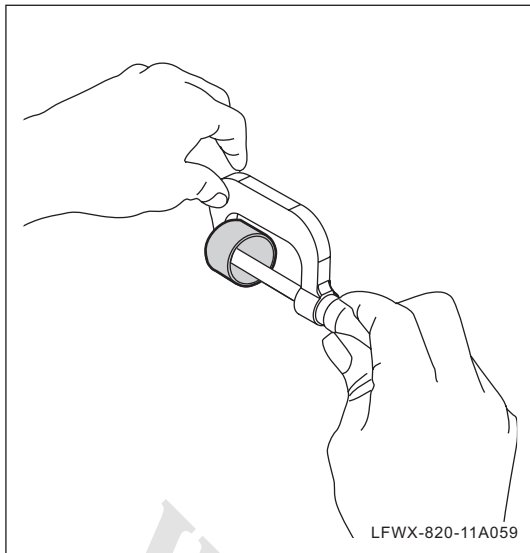
- (n) Measure the valve-guide mounting-hole inner diameter with the internal micrometer.

**Inner diameter: 10.285mm - 10.306mm**

△ HINT:

If inner diameter of mounting-hole of guide pipe is more than maximum value, the guide pipe of cylinder head should be processed to be 10.335~10.350mm, to facilitate installation of larger valve guide (as shown below).

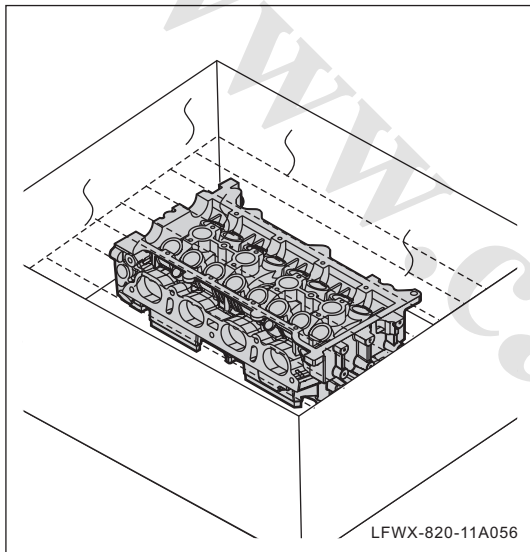
Diameter of valve guide	Valve guide hole inner diameter (mm)
STD1	0.285~10.306
O/S0.05	10.335 ± -10.356



- (o) Check the thickness of top section of mechanical tappet. If it does not conform to the specification, replace it.

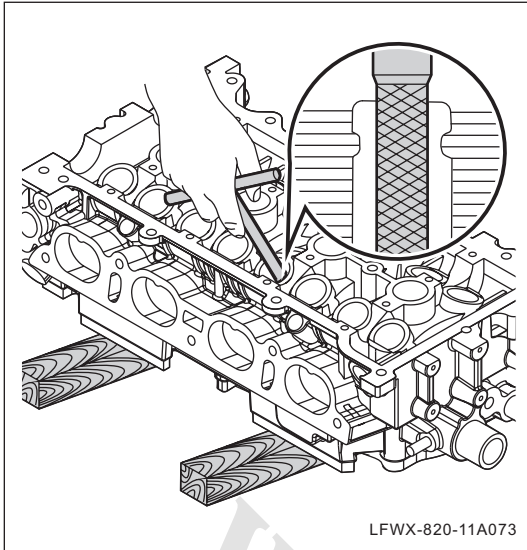
**Standard value: 5.055mm - 6.005mm**

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### 3. Install valve components

- (a) Heat the cylinder head to 80°C - 100°C .
- (b) Remove cylinder head and put it on a wood plate.



(c) Ream valve guide hole with special tool (11mm reamer) to remove burrs before installing valve guide in the cylinder head.

(d) Use special tool, and press the new valve guide in the valve guide hole with the specified pressing-in depth until the special tool contacts the cylinder head.

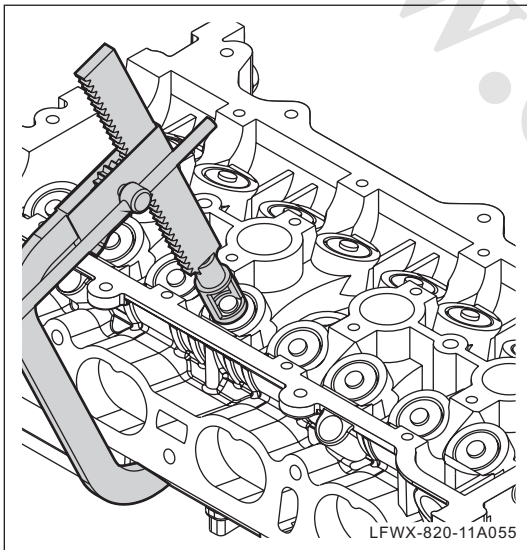
**Specified press-in: 8.7mm - 9.1mm**

(e) Use special tool (5.5mm reamer) to cut valve guide hole to the specified clearance.

**Standard oil clearance:**

**Intake valve: 0.025mm - 0.060mm**

**Exhaust valve: 0.030mm - 0.065mm**

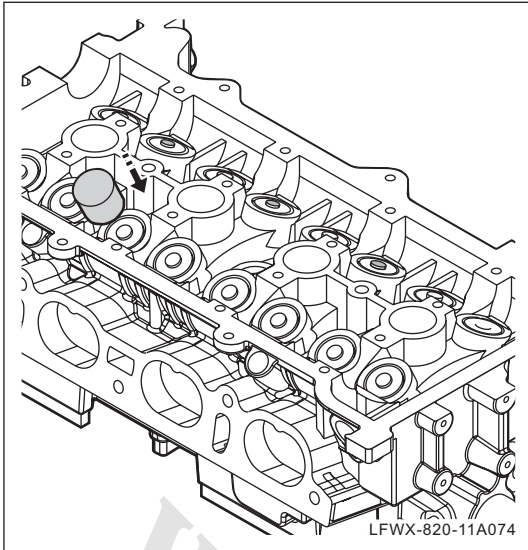


(f) Install valve, valve spring, valve oil seal and valve spring seat in turn.

(g). Install valve cotter with special tool.

**Note:**

- **The intake valve oil seal is gray and the exhaust valve oil seal is black.**
- **Once the oil seal is removed, it cannot be used any longer. A new oil seal must be used for installation.**
- **It is forbidden to tap or strike the special tool with the hammer or other object when installing. Install the oil seal to the valve guide just by pressing the special tool by hand gently. Tapping or striking the special tool may cause damage to the oil seal.**

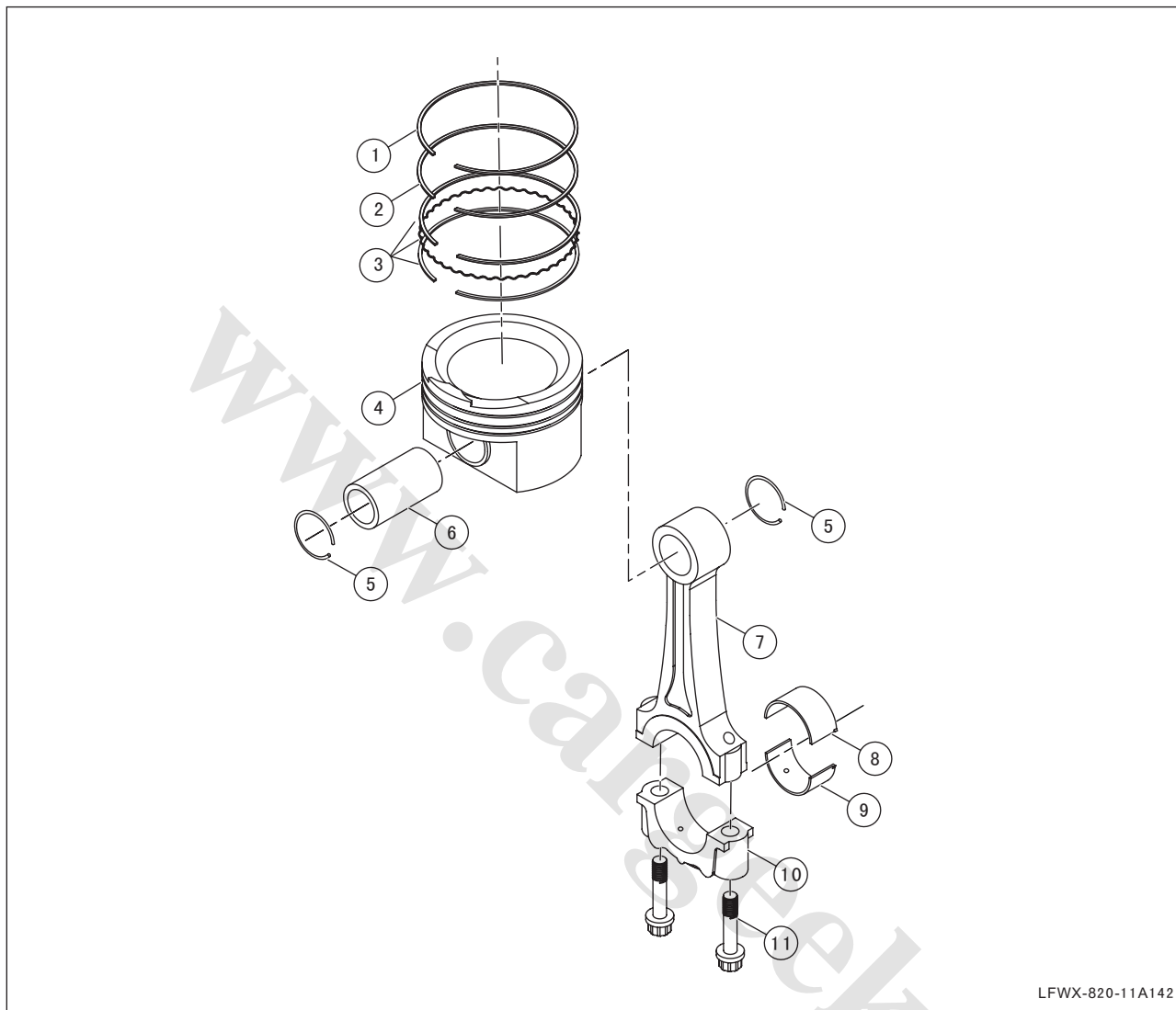


- (h) Fix the mechanical tappet to the cylinder head.
- (i) Install the cylinder head cover. (See 11A-Engine Mechanical System-Cylinder Head, Check and Repair)

11A

# Piston and Connecting Rod

## Components



LFWX-820-11A142

1	The first piston ring
2	The second piston ring
3	Combined oil ring
4	Piston
5	Retainer of piston pin
6	Piston pin

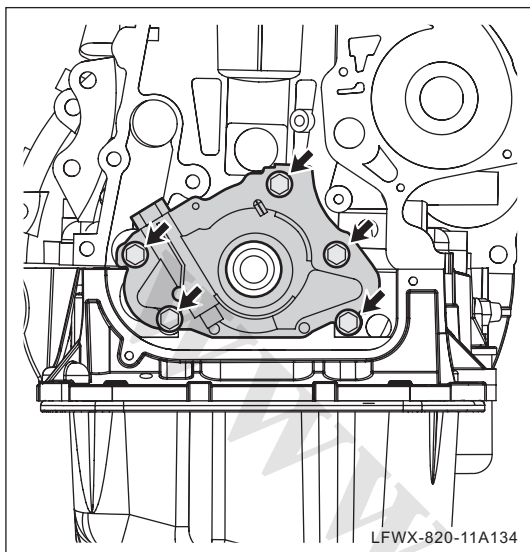
7	Connecting rod body
8	Connecting-rod bush (upper)
9	Lower bush of connecting-rod bearing bush
10	Connecting rod cap
11	Connecting rod bolt



## Overhaul

### 1. Remove piston and connecting rod assembly.

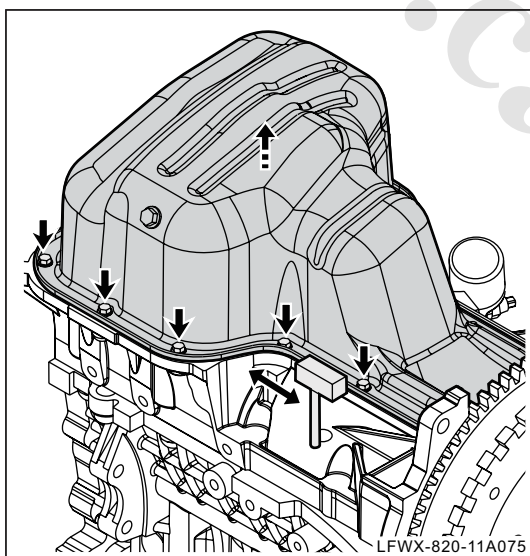
- (a) Remove the cylinder head. (See 11A- Engine Mechanical System-Cylinder Head, Check and Repair)



- (b) Remove the oil pump bolts, and remove the oil pump and gasket.

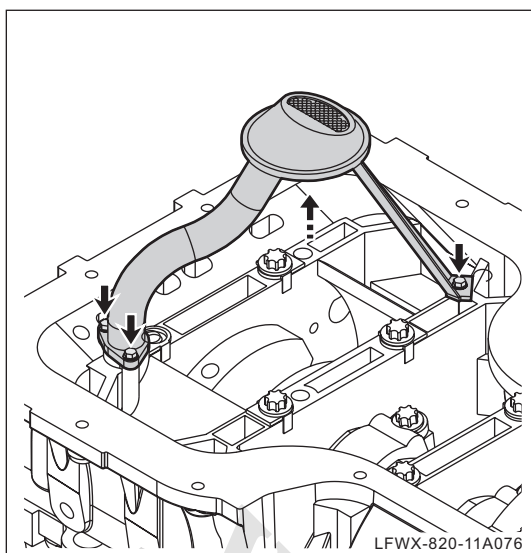
**Note:**

Once the washer is removed, don't reuse it any more. Be sure to use a new one to replace it.

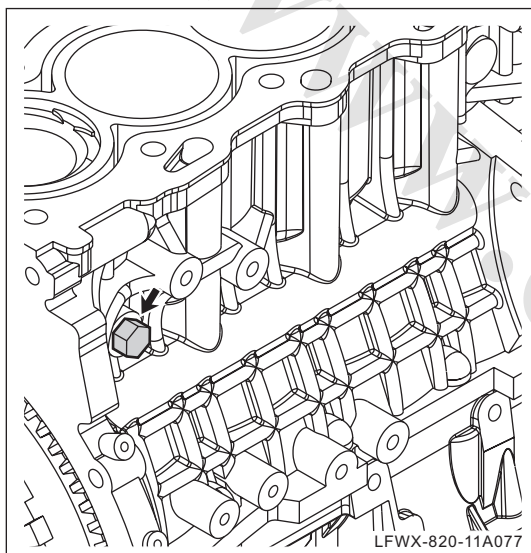


- (c) Remove the oil pan bolts, and remove the oil pan using the remover.

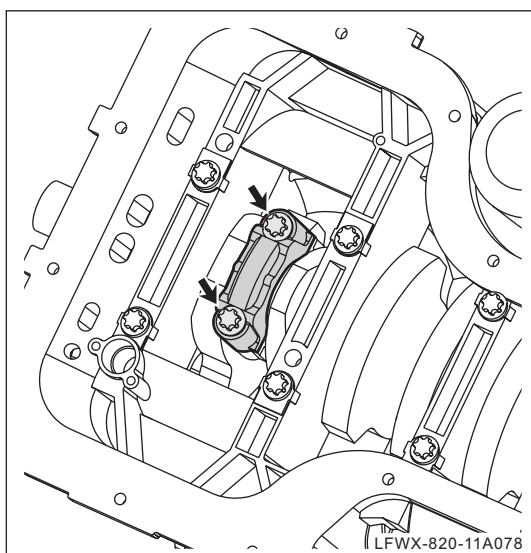
**11A**



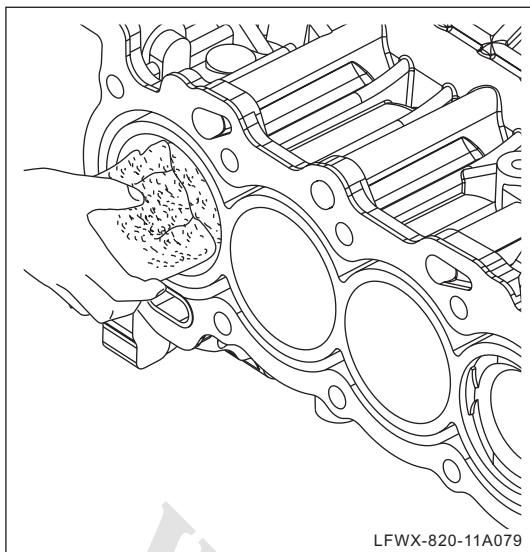
- (d) Remove the oil filter bolts, and remove the oil filter.



- (e) Remove water drain bolt, and tilt cylinder block to completely drain coolant.

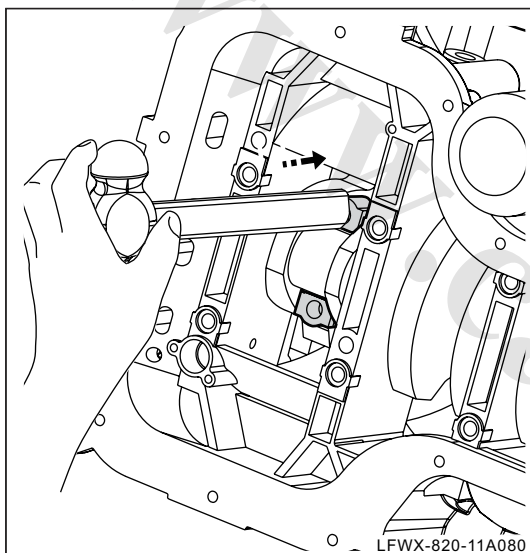


- (f) Rotate crankshaft, make pistons of No. 1 and No. 4 cylinders in lowest point (it means No. 1 and No. 4 connecting rod cap are exposed vertically).
- (g) Remove the connecting-rod bolts, and remove the connecting-rod cap and bearing bush.
- (h) Use the same method to dismantle other connecting rod caps and bearing bushes.



- (i) Clear all carbon deposits on the top of cylinder.

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- (j) Push out piston assembly.

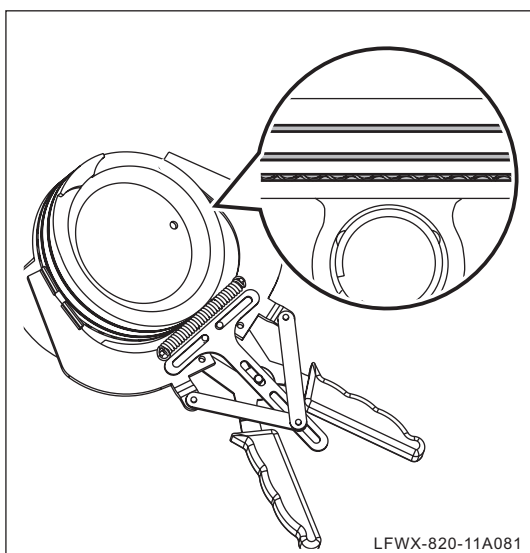
**Note:**

To avoid damage to connecting rod end face, make sure to use wooden or rubber object instead of metallic object to push out the piston assembly.

- (k) Take out the piston assembly from the other side.

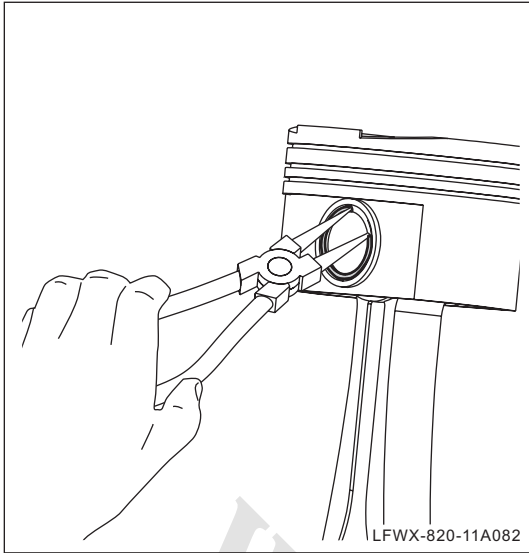
**Note:**

Place the piston and connecting rod components in correct sequence. Do not mix them.

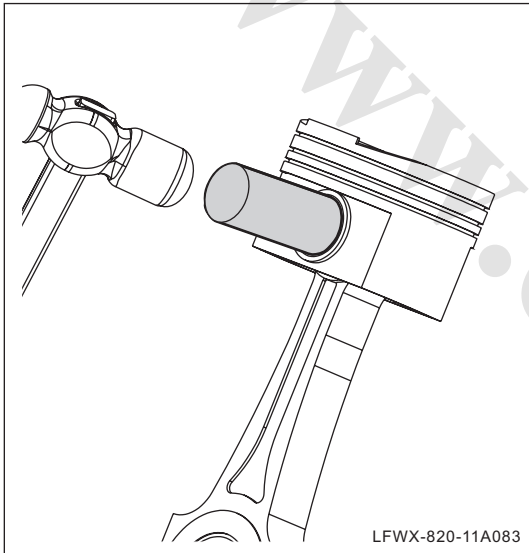


**2. Dismantling of piston and connecting rod assembly**

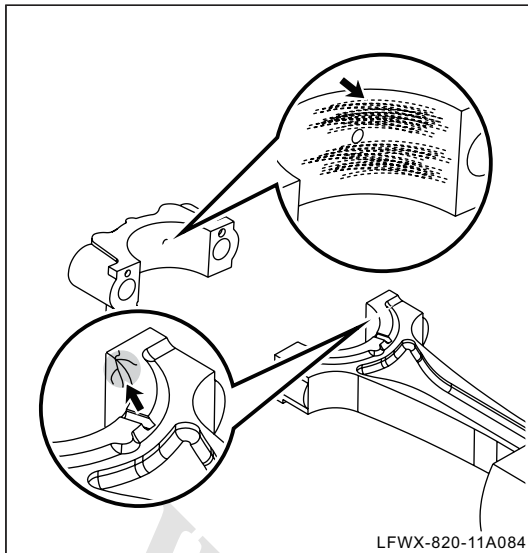
- (a) Use piston ring expander to remove top ring, second ring and combined oil ring.



(b). Remove two piston pin retainer with circlip pliers.



(c) Drive out piston pin with a punch bar.



### 3. Visual check of connecting rod assembly

- (a) Check if connecting rod and connecting rod cap are scored, cracked, burred, scratched or worn.

**Note:**

If there is any obvious abrasion on any position of connecting rod or connecting rod cap, they must be replaced as a complete assembly.

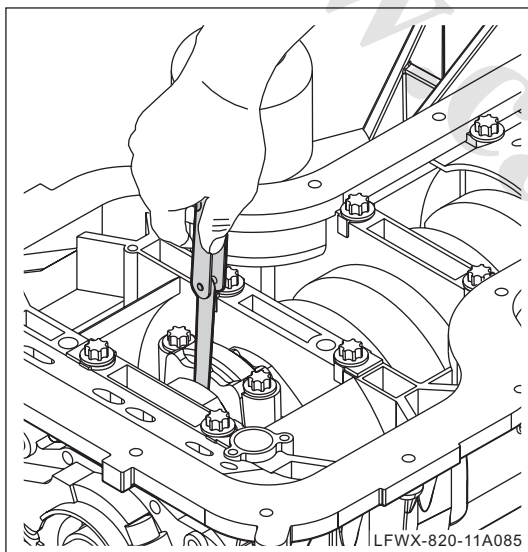
- (b) Check visually if connecting rod bearing and piston pin are cracked, scored or damaged. If any, replace it.
- (c) Check piston skirt, hole, piston head and piston groove for wear or damage. If any, replace the piston.

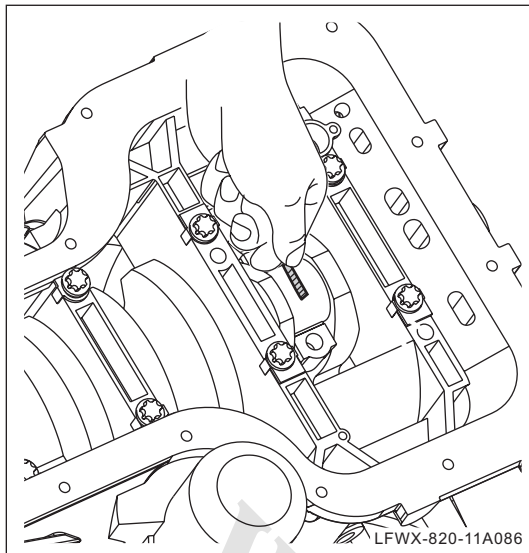
### 4. Check axial clearance of piston connecting rod

- (a) Measure the axial clearance of piston and connecting-rod using a feeler gauge. If the axial clearance is greater than the maximum, replace the connecting-rod module.

**Standard axial clearance: 0.16mm - 0.34mm**

**Maximum axial clearance: 0.34mm**

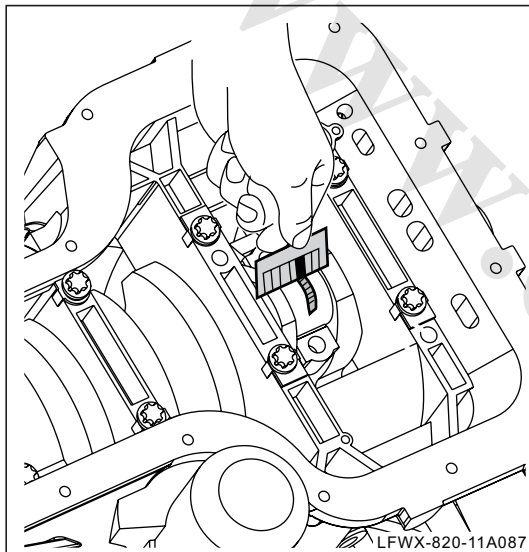




### 5. Check connecting rod oil-film clearance

- (a) Remove bolt of connecting-rod, and then remove the connecting rod cap with bearing bush assembly.
- (b) A section of plastic oil clearance gauge goes through crankshaft connecting rod journal.
- (c) Install the connecting-rod cap and tighten the connecting-rod bolts.

**Torque: 50 N.m**

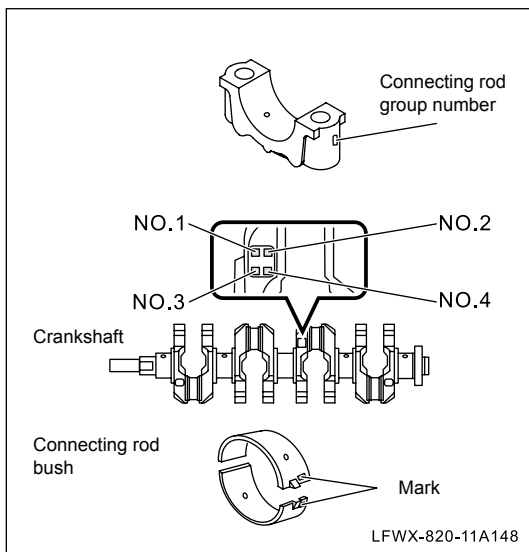


- (d) Remove bolt of connecting-rod, and then remove the connecting rod cap with bearing bush assembly.
- (e) Measure the plastic oil clearance at the widest position. If the oil clearance is more than the maximum value, replace the bearing. If necessary, polish or replace the crankshaft.

**Standard oil-film clearance:  
0.030mm~0.054mm**

**Maximum oil film clearance: 0.08mm**

- (f) Remove all plastic oil gauges.



#### ⓘ Note:

If the number of bearing bush is unclear or the bearing bush needs to be re-matched after the crankshaft/connecting-rod is replaced, let the number on the connecting-rod plus that on the crankshaft minus 1 (Calculation: Number of connecting-rod bearing bush= Number of connecting-rod journal+ Number of connecting-rod hole -1). This will guarantee to choose the correct bearing bushing.

Connecting rod bush optional table

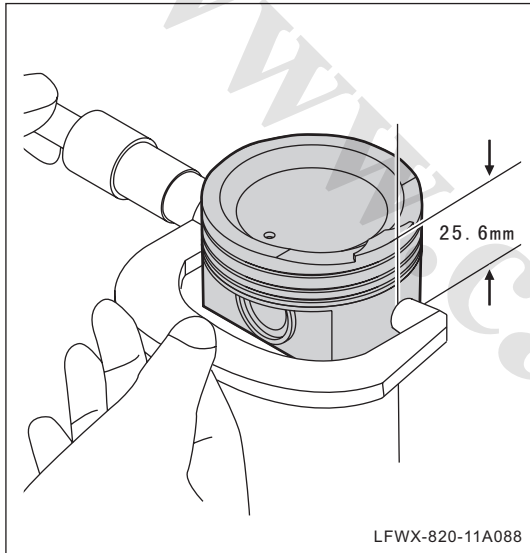
Connecting rod bush number \ Connecting rod hole number	1#	2#	3#
Connecting rod journal number			
1#	1#	2#	3#
2#	2#	3#	4#
3#	3#	4#	5#

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Example:

Connecting-rod matching No. 3 "3" (Number of connecting-rod journal) + Number of crankshaft "1" (Number of connecting-rod hole) - "1" = Total Number "3" (i.e., No. "3" bearing bush used)

11A

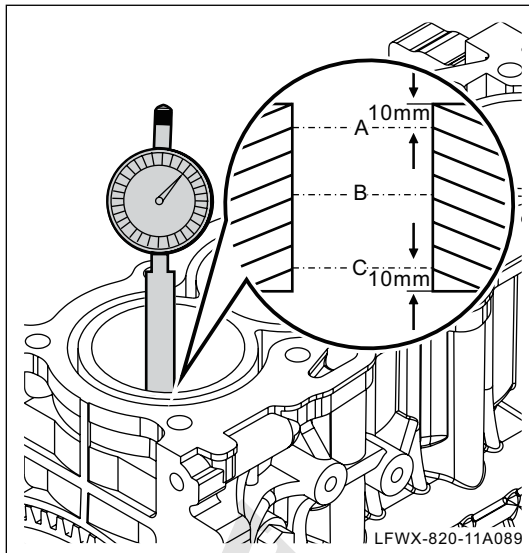


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## 6. Check piston diameter

- (a) At the 25.6mm position from the top of piston, use a screw micrometer to check piston diameter which is vertical to center line of piston pin.

**Standard piston diameter: 78.925mm - 78.935mm**



## 7. Check piston oil film clearance

- (a) Measure the diameter of the cylinder bore at the positions of A, B and C by using cylinder bore gauge.

**Standard diameter: 79.00~79.13mm**

△ HINT:

Measure once along the axial direction and the thrust direction at each position respectively.

- (b). Calculate the difference between the maximum and the minimum of the 6 measured values.

**Maximum difference: 0.10mm**

ⓘ Note:

**If it exceeds maximum value, replace upper block of the cylinder or block.**

- (c) Cylinder hole diameter value minus piston diameter measurement is the piston oil film clearance. If it is greater than the maximum oil film clearance, replace all 4 pistons, and take cylinder reboring. If necessary, replace cylinder block.

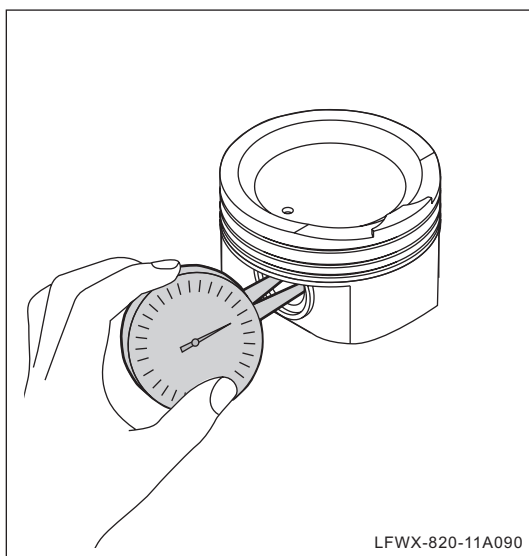
**Standard oil-film clearance:  
0.065mm~0.085mm**

**Maximum oil film clearance: 0.085mm**

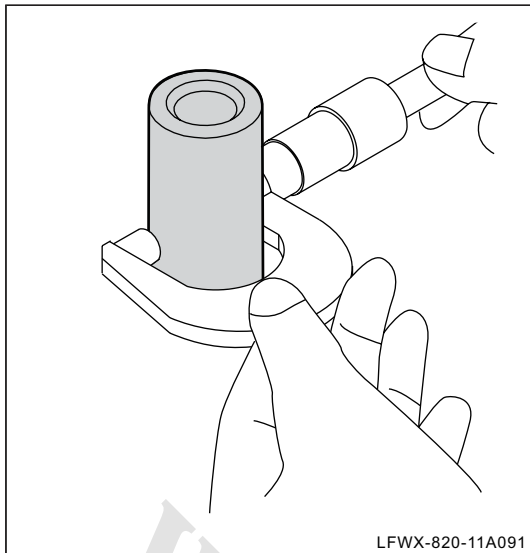
## 8. Check piston pin oil film clearance

- (a) Measure piston pin mounting hole diameter with an inner diameter micrometer.

**Piston pin hole diameter: 20.006mm -  
20.015mm**







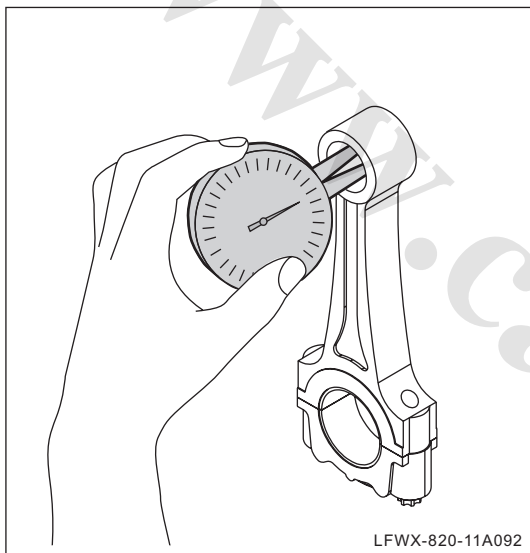
- (b) Measure piston pin outer diameter with a screw micrometer.

**Piston pin outer diameter:**  
**20.004mm~20.013mm**

- (c) Piston pin mounting hole minus piston pin excircle diameter is piston pin oil film clearance. If it is larger than the maximum value, replace the piston pin. If necessary, replace the piston.

**Standard oil-film clearance:**  
**0.002mm~0.011mm**

**Maximum oil film clearance: 0.011mm**



- (d) Measure inner diameter of connecting rod small end hole with an internal micrometer.

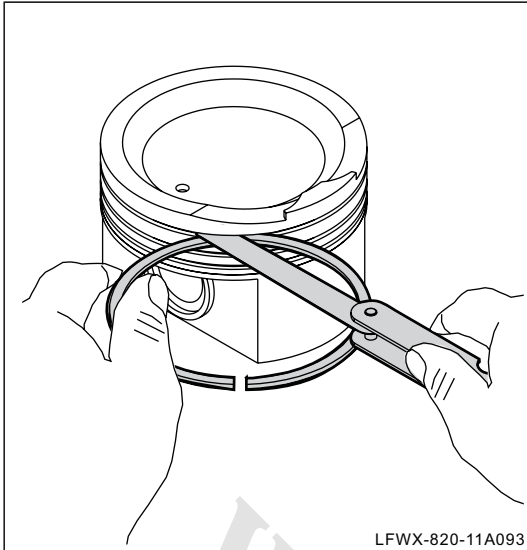
**Inner diameter of the connecting-rod small end hole: 20.012mm~20.021mm**

- (e) Subtract the outer diameter of the piston pin from the inner diameter of the connecting rod small end to the piston pin oil film clearance. If it is larger than the maximum value, replace the connecting rod. If necessary, replace the piston and connecting rod.

**Standard oil-film clearance:**  
**0.001mm~0.017mm**

**Maximum oil film clearance: 0.017mm**

11A



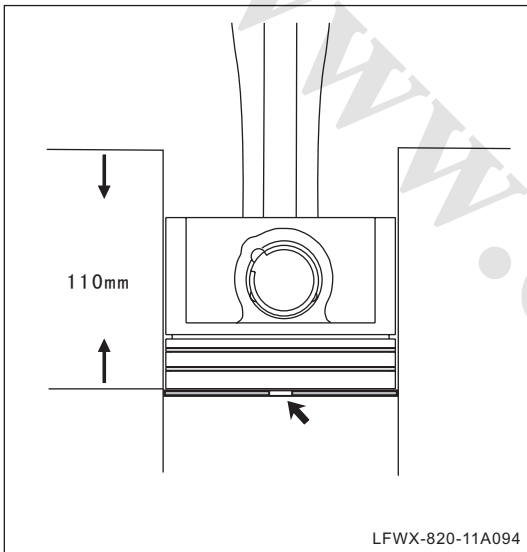
### 9. Check piston ring groove gap

- (a) Measure the gap between piston ring and wall with a feeler gauge. If it exceeds the maximum value, replace the piston.

#### Clearance of ring groove:

**Top ring groove: 0.03mm - 0.08mm**

**2nd ring groove: 0.03mm-0.07mm**



### 10. Check piston ring gap

- (a) Insert piston ring into cylinder hole.
- (b) As shown in the figure, push the ring into the cylinder bore with the piston to make it exceed the bottom of ring stroke slightly.
- (c) Measure piston ring gap with a feeler gauge. If it is larger than the maximum value, replace piston ring.

#### Standard end play:

**Top ring: 0.20mm - 0.35mm**

**2nd ring groove: 0.40mm~0.55mm**

**Wafer ring: 0.20mm-0.70mm**

#### Maximum piston ring gap:

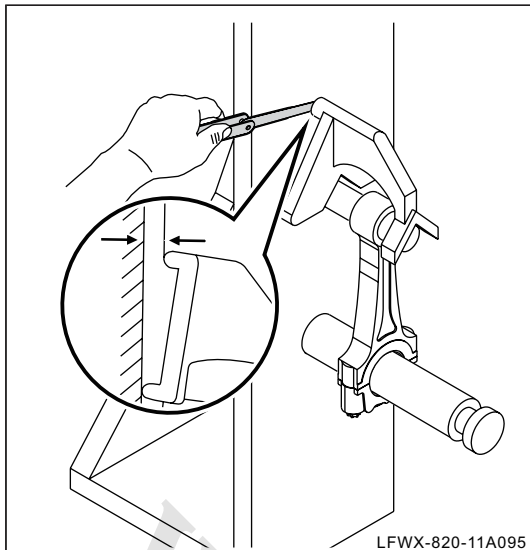
**Top ring: 1.05mm**

**Second compression ring: 1.20mm**

**Film loop:1.10mm**

#### ⓘ Note:

If new piston ring is used, but the ring gap still exceeds the maximum value, rebore 4 cylinders or replace cylinder block.

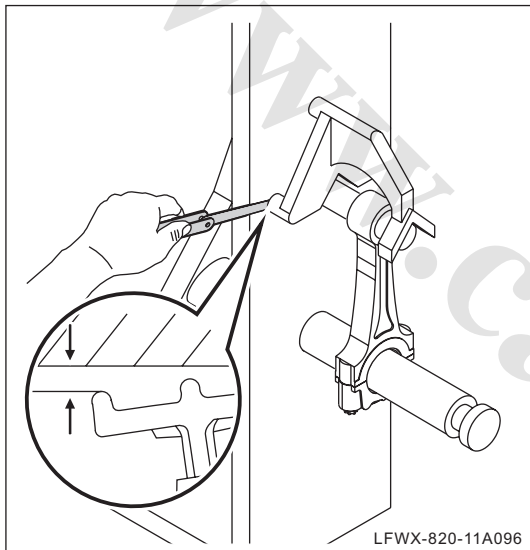


## 11. Check connecting rod

- (a) As shown in the figure, use connecting rod collimator and feeler gauge to check the curvature of connecting rod. If it exceeds the maximum value, replace connecting rod components.

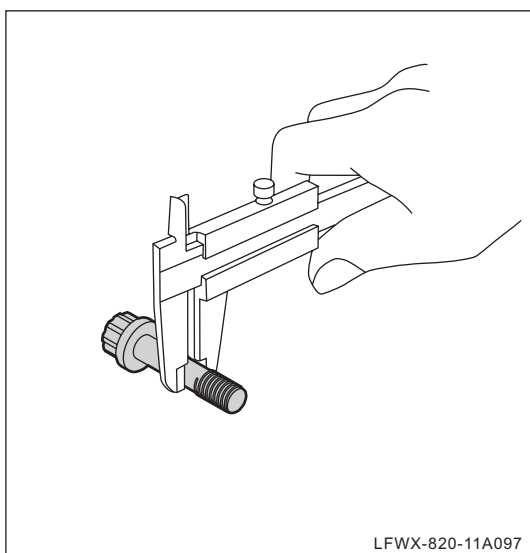
**Maximum bending: 0.05mm (length per 100mm)**

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- (b) Use connecting rod collimator and feeler gauge to check the curvature of connecting rod. If it exceeds the maximum value, replace connecting rod components.

**Maximum torsion resistance: 0.05mm (length per 100mm)**

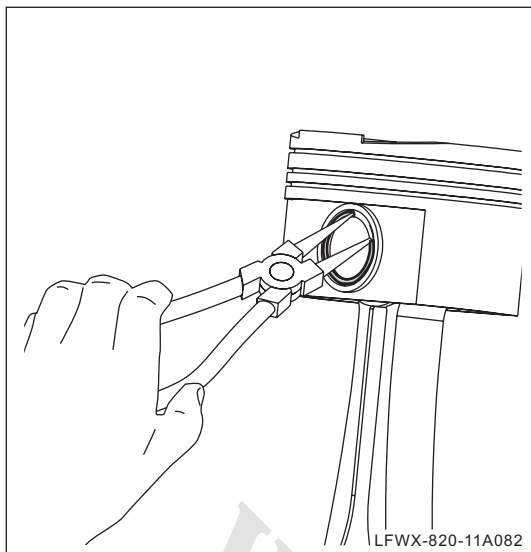


## 12. Check connecting rod bolt diameter

- (a) Measure outer diameter of the connecting rod bolt with the vernier caliper. If it is less than the minimum value, replace the whole set of connecting rod bolt and nut.

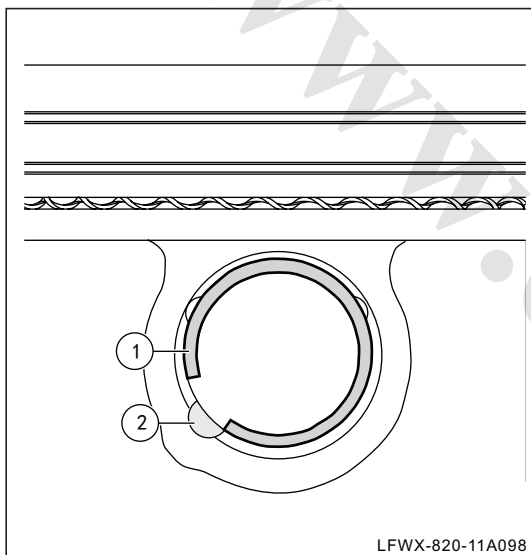
**Standard diameter: 7.30mm - 7.40mm**

**Minimum diameter: 7.20mm**



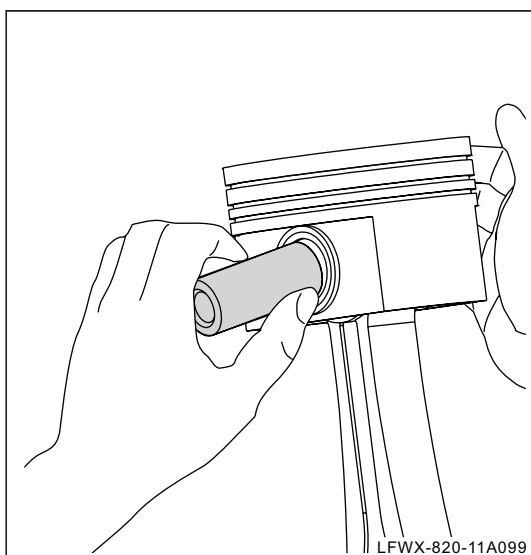
### 13. Assembling of piston and connecting rod assembly

- (a) Use circlip pliers to install retainer of piston pin onto one end of piston pin hole.



**Note:**

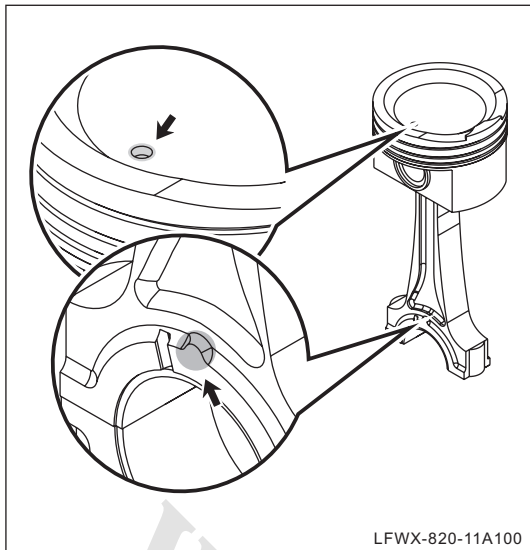
As shown in the figure, make sure that the retaining ring end ① of the piston pin stays at the piston pin hole opening ② .



- (b). Coat a layer of clean oil onto the piston pin evenly.
- (c) Align the small end of connecting rod to piston pin hole, and insert piston pin into pin hole.

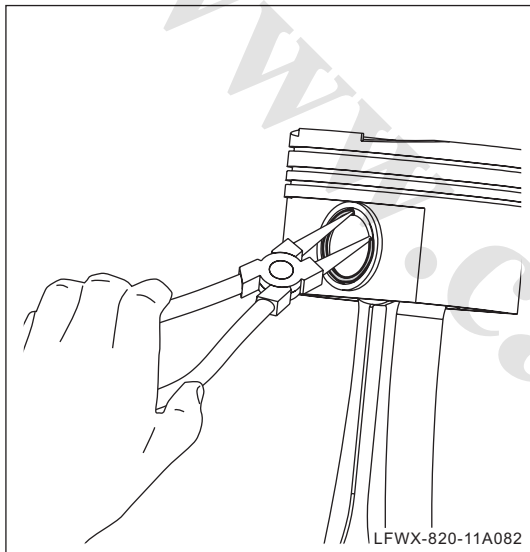
**Note:**

- After installation, rotate the piston pin to make sure that the piston pin is free to rotate.



- Take care to align the forward marks of piston and connecting rod during installation.

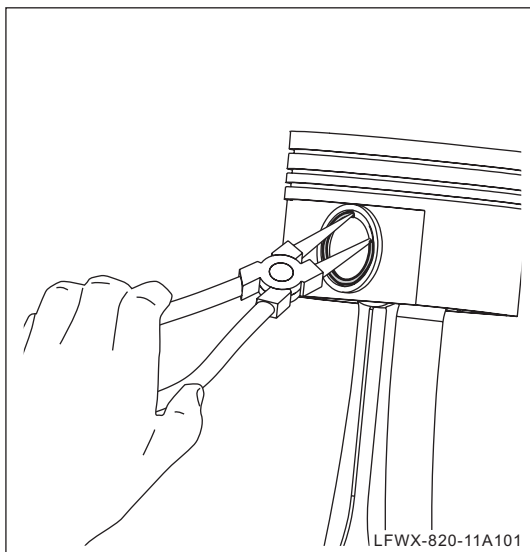
11A



- (d) Use circlip pliers to install the other end of retainer of piston pin hole.

**Note:**

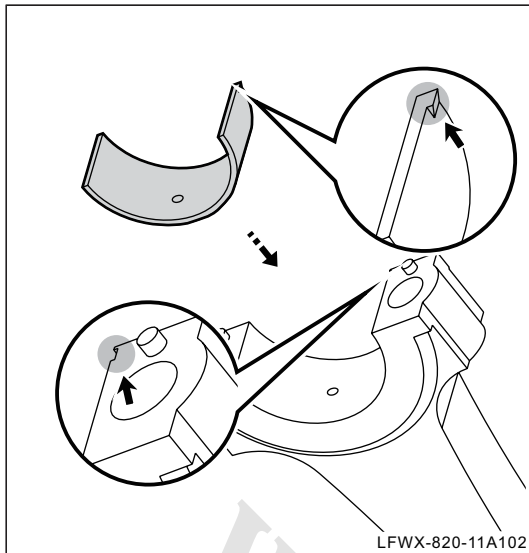
Make sure that the end of retainer of piston pin is located at the opening of piston pin hole.



- (e) Using clean oil to lubricate piston ring and piston skirt.
- (f) Using the piston ring expander, install the top ring, second ring and the combined oil ring.

**Note:**

Install the piston rings and the combined ring properly according to the marks made at the time of removal.



#### 14. Installation of piston and connecting rod assembly

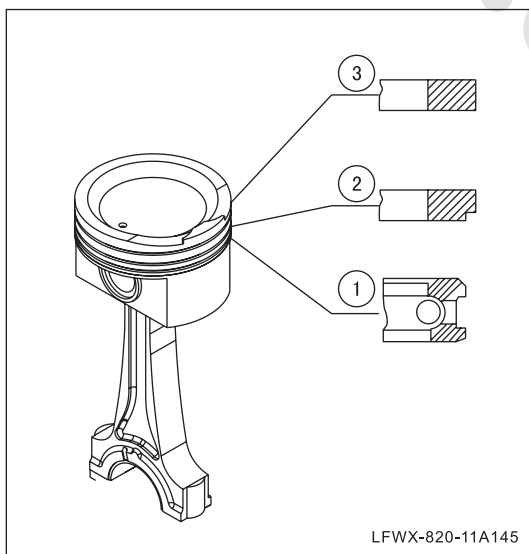
- (a) Install the upper bush of the connecting rod bearing.

**Note:**

- Make sure that the connecting rod and the connecting rod bearing back are clean without any debris.
- It is forbidden to lubricate the bearing back.
- During installation, make sure that the positioning tongue of the bearing is in alignment with the positioning groove on the connecting rod.

△ HINT:

Drop clean oil onto the inside of the connecting rod bearing bush.

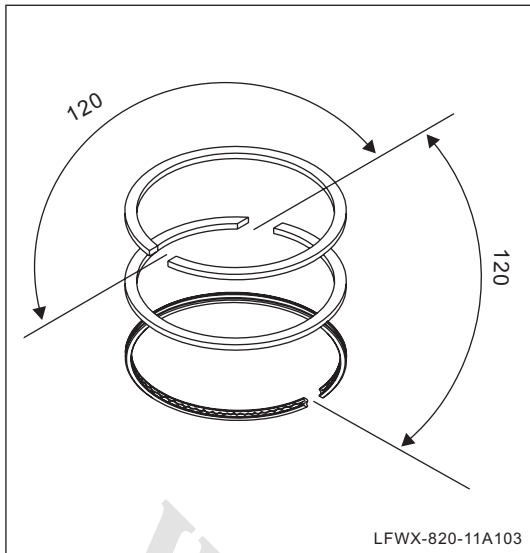


- (b) Using the piston ring expander, install the three piston rings according to the numerical sequence in the figure.

- ① Combined oil ring, ② Second ring  
③ Top ring

**Note:**

- When installing the top/second ring, let the marked side face up.
- Apply oil onto the piston ring surface. Check whether the piston ring can move smoothly in its groove.

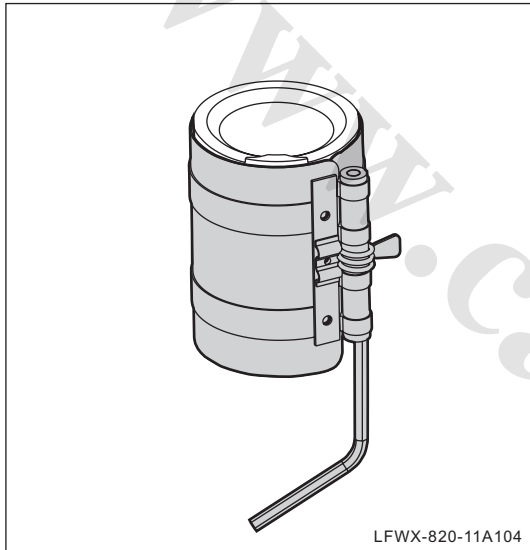


- (c) As shown in the left figure, rotate and adjust the position of the piston ring joint.

**Note:**

Each piston ring joint is not permitted to align to the piston pin or other piston ring joint. Otherwise, the sealing efficiency of the piston ring cannot be achieved.

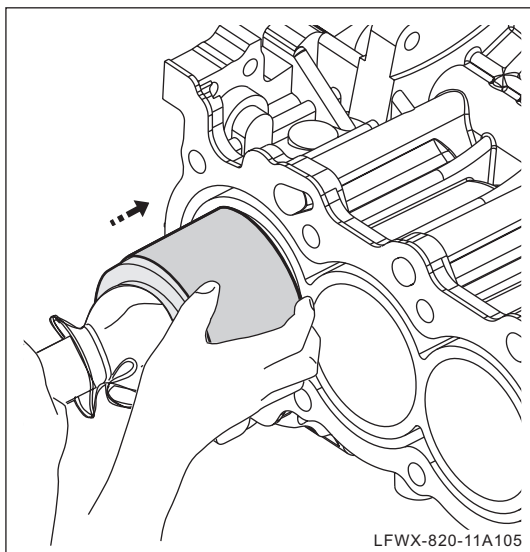
11A



- (d) Compress the piston ring to its working position with the piston ring compressor.

**HINT:**

If there is no special tool, make a ring barrel with sheet iron.



- (e) Rotate crankshaft to make connecting rod journal to be installed locate at the bottom dead center.

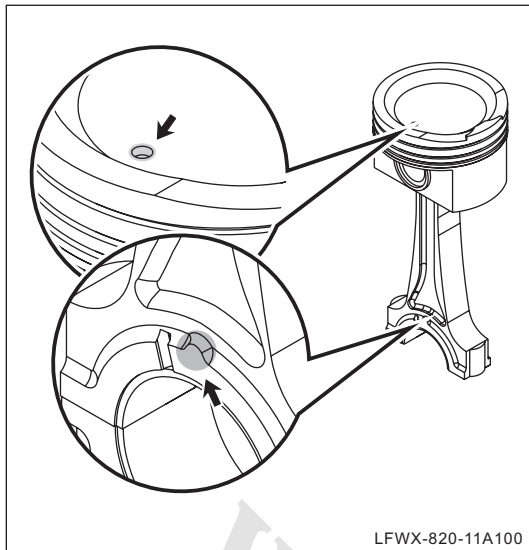
- (f) Push the piston assembly into the cylinder with the mounting tool for piston and the wooden bar.

**HINT:**

- Before installation, apply one thin layer of engine oil to cylinder wall.

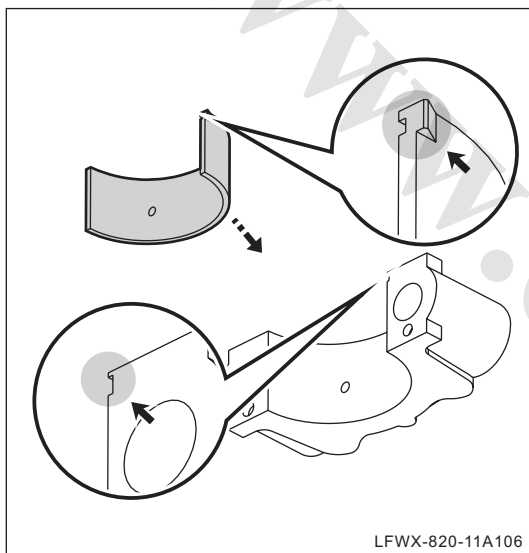
**Note:**

Be sure to push the piston assembly with wooden or rubber material instead of metallic material.


**Note:**

As shown in the figure, let the forward mark of the piston face forward (the crankshaft pulley side).

Follow the marks made at the time of removal to install piston, and do not make sequence mistakes.



- (g) Install the lower shell of the connecting rod bearing to the connecting rod cap.

**Note:**

- Make sure that the connecting rod end cap and the connecting rod bearing back are clean without any debris.
- It is forbidden to lubricate the bearing back.
- During installation, make sure that the positioning tongue of the bearing is in alignment with the positioning groove on the connecting rod end cap.

- (h) Use clean oil to lubricate the inside of lower bush of connecting rod bearing.

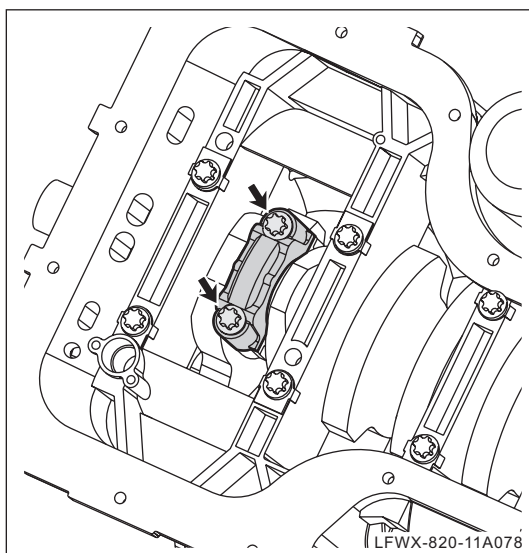
- (i) Install the connecting-rod cap in place, and install and tighten its bolts.

**Torque: 50 N.m**

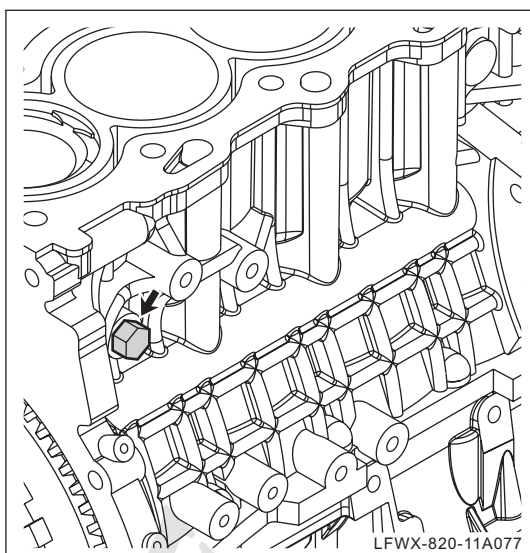
**Note:**

**Make sure to install the connecting rod cap in place to make its positioning groove align the connecting-rod positioning pin for installation.**

- (j). Install the other connecting rod caps in the same manner.



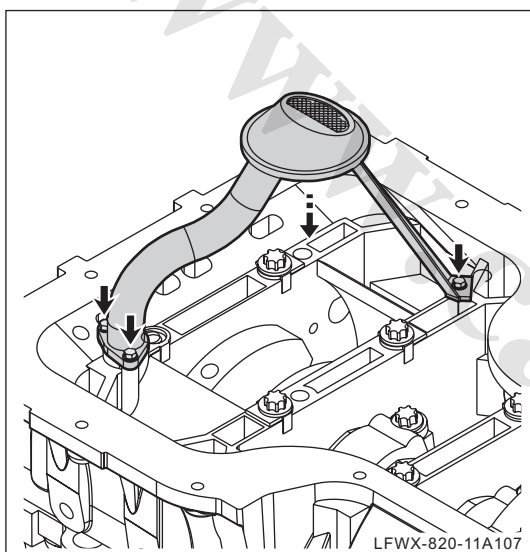




(k) Install water drain bolt and tighten it.

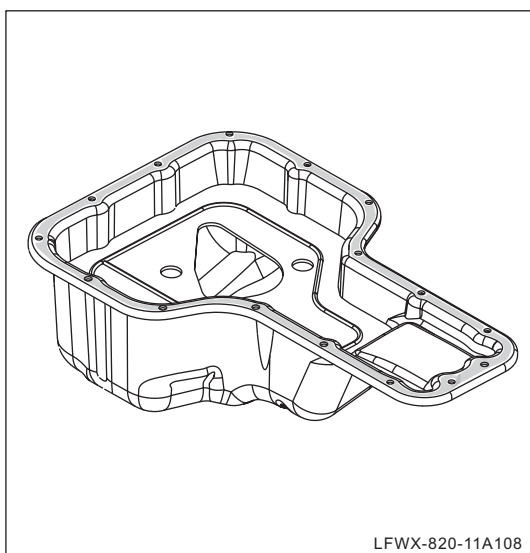
**Torque: 23N.m**

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(l) Fix the oil filter to the cylinder block, and install and tighten its bolts.

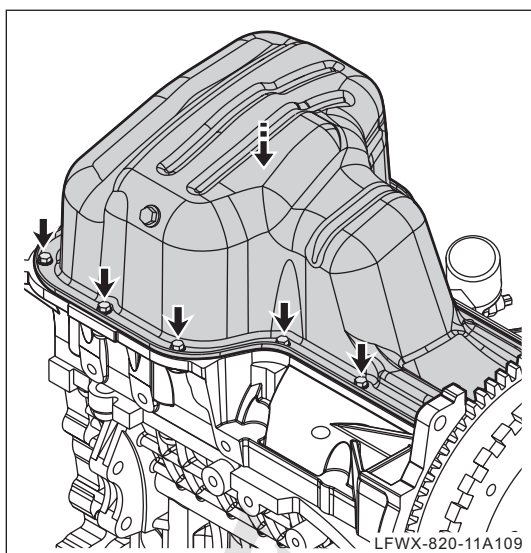
**Torque: 25 N.m**



(m) Apply sealant to the installation surface of oil pan uniformly.

**Note:**

To coat new sealant, be sure to remove the residual old sealant on the cylinder body and the oil sump in advance.



- (n) Fix the oil pan to the cylinder block, and install and tighten its bolts.

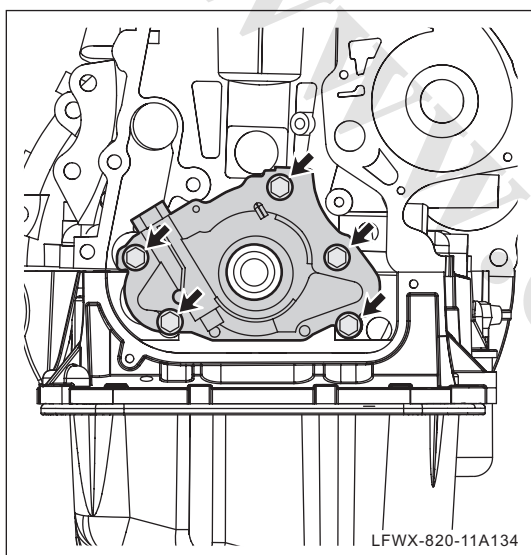
**Torque: 10 N.m**

△ HINT:

When installing the fixing bolts of the oil pan, coat the bolt thread with clean oil.

ⓘ Note:

**When tightening the bolt, start the tightening in the middle and then to both sides.**



- (o) Install the oil pump and gasket in place, and install and tighten the bolts.

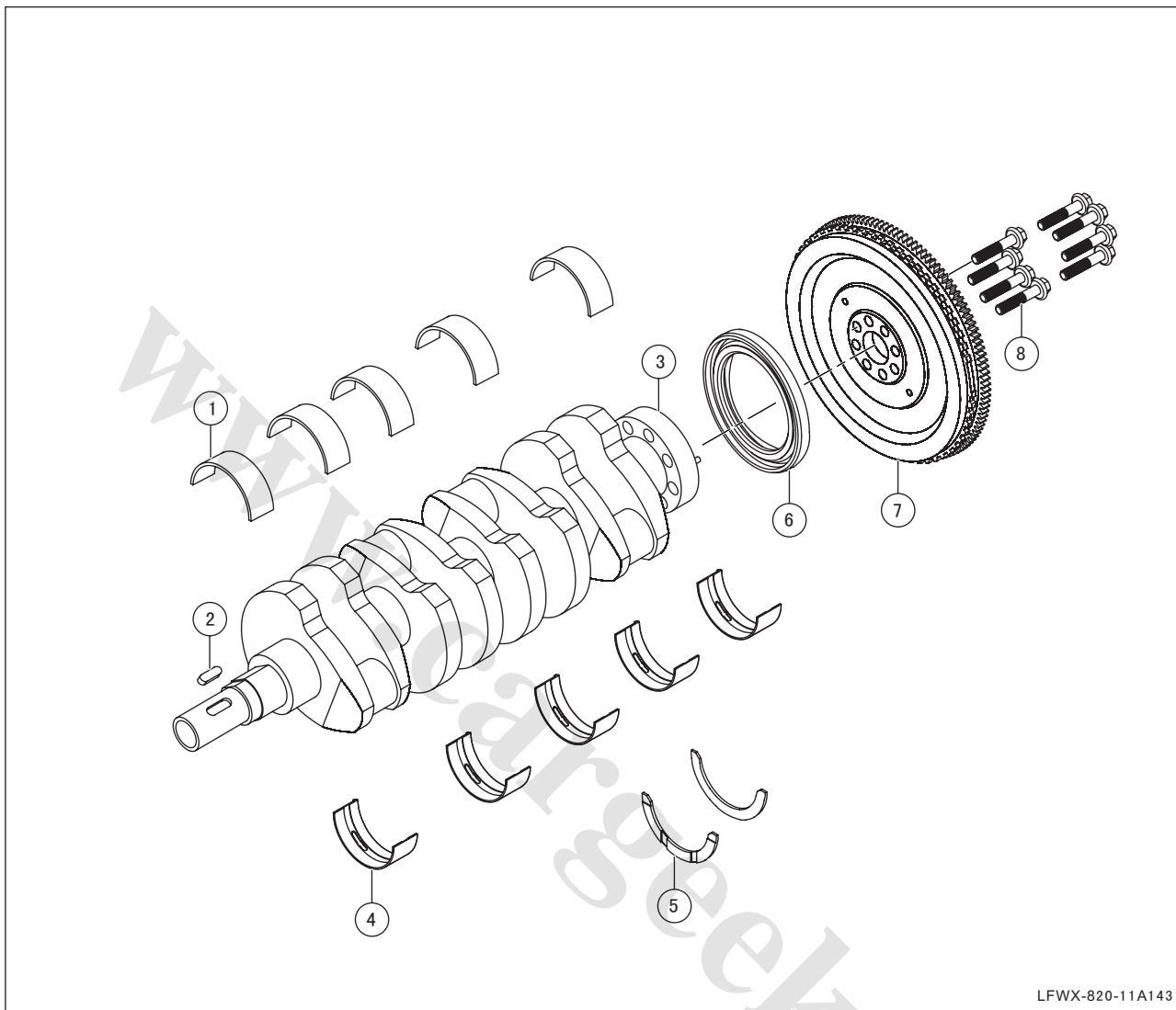
**Torque:**

- (p) Install the cylinder head. (See 11A- Engine Mechanical System-Cylinder Head, Check and Repair)

# Crankshaft and Flywheel

## Components

11A



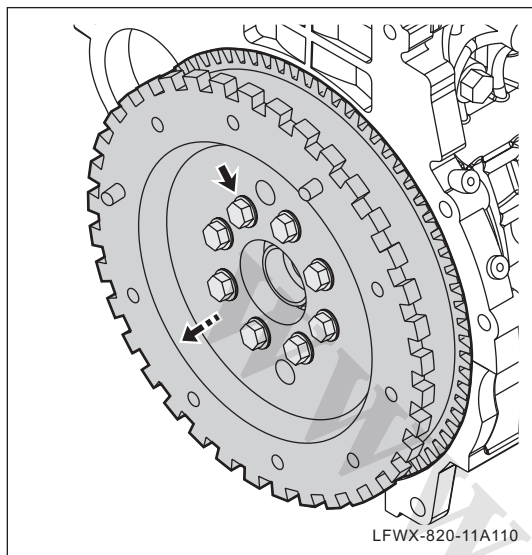
1	Upper main bearing bush
2	Woodruff key
3	Crankshaft
4	Lower main bearing bush

5	Lower thrust plate
6	Crankshaft rear oil seal
7	Flywheel assembly
8	Flywheel bolt

## Overhaul

### 1. Remove the crankshaft and flywheel

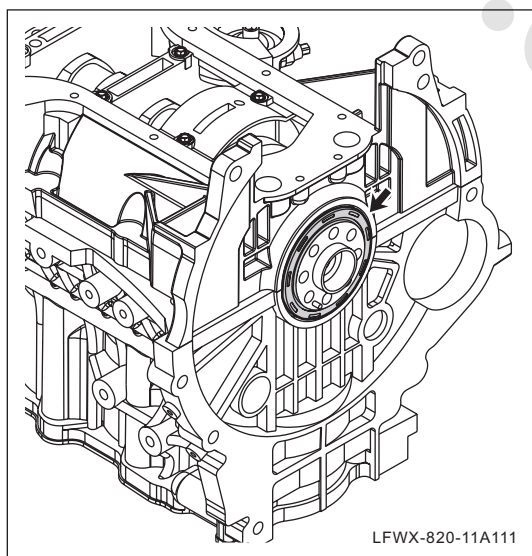
- (a) Remove the piston and connecting-rod assembly. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)



- (b) Remove the flywheel fixing bolts, and then remove the flywheel assembly.

△ HINT:

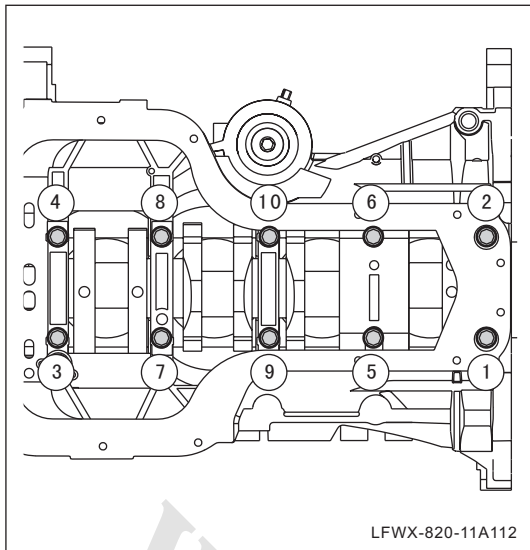
While removing flywheel assembly, to avoid rotation of flywheel, it is necessary to firstly fix the flywheel, or use rubber material or wooden tool to fix crankshaft.



- (c) Use a "flat-blade" screwdriver to pry rear oil seal of crankshaft.

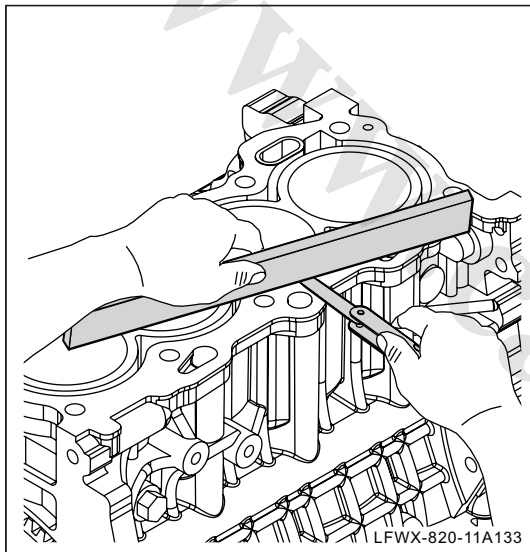
ⓘ Note:

**Do not reuse the removed oil seal. Replace it with a new one during installation.**



- (d) Remove fixing bolt of main bearing cap of cylinder block according to the order shown in the figure.

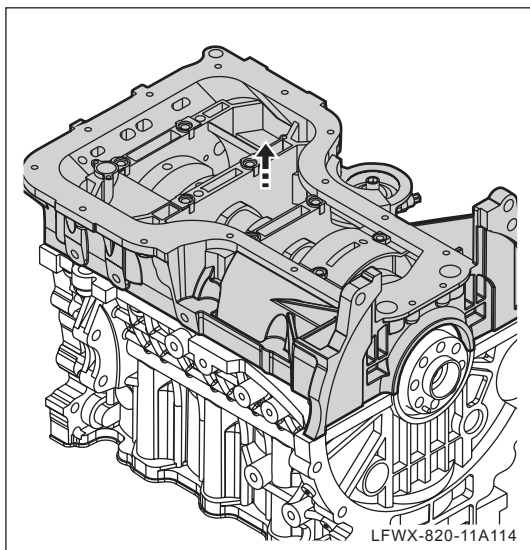
11A



- (e) Remove fixing bolt of upper and lower blocks of cylinder according to the order shown in the figure.

**Note:**

**Do not forget to remove connecting nut of engine oil filter (as shown in figure 11).**



- (f) Remove lower block of cylinder block.

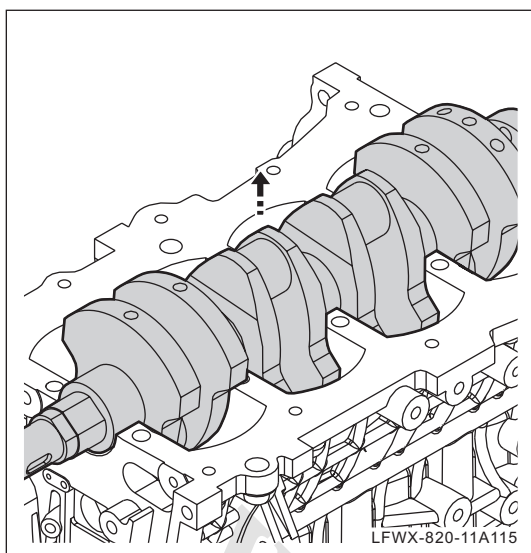
△ HINT:

Use rubber hammer to slightly strike the lower block of cylinder block to facilitate removal.

- (g) Remove the lower main bearing bush and thrust plate.

**Note:**

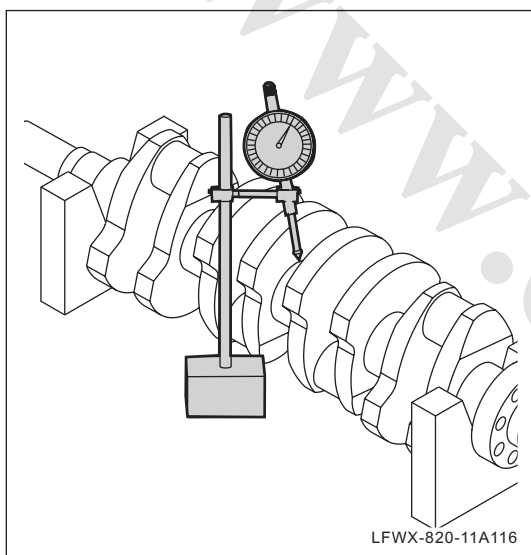
**Place the lower main bearing bush according to the specified order for ease of subsequent installation.**



- (h) Remove crankshaft assembly.
- (i) Remove the upper main bearing bush.

**Note:**

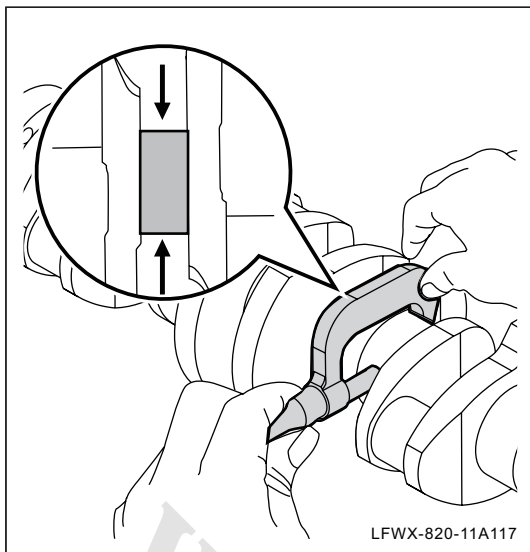
Place the upper main bearing bush according to the mounting positions in turn for ease of subsequent installation.



**2. Check crankshaft radial run-out**

- (a) Place crankshaft on V block.
- (b) Measure radial run-out of intermediate journal with a micrometer gauge. If radial run-out is larger than the maximum value, replace the crankshaft.

**Maximum radial run-out: 0.03mm**



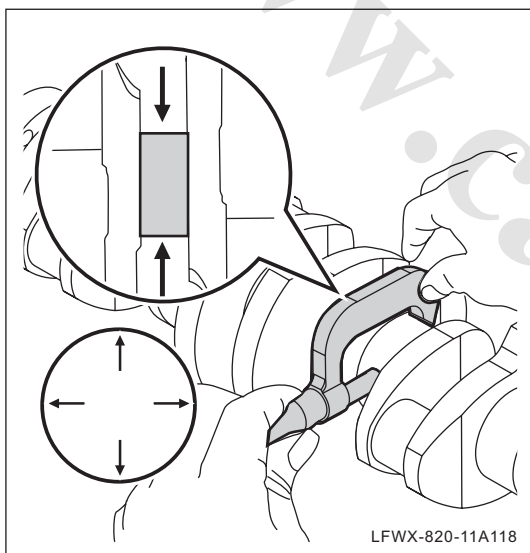
### 3. Check the main journal diameter of crankshaft

- (a) Use a screw micrometer to check the diameter of each main journal. If it does not meet requirement, check oil film clearance. If necessary, grind or replace the crankshaft.

**Standard diameter: 47.982mm - 48.000mm**

△ HINT:

If the main journal or the connecting rod journal is inconsistent with the specified standard, be sure to grind the crankshaft and connecting rod journal. According to the grinding situations, select the thickened bearing of different levels.

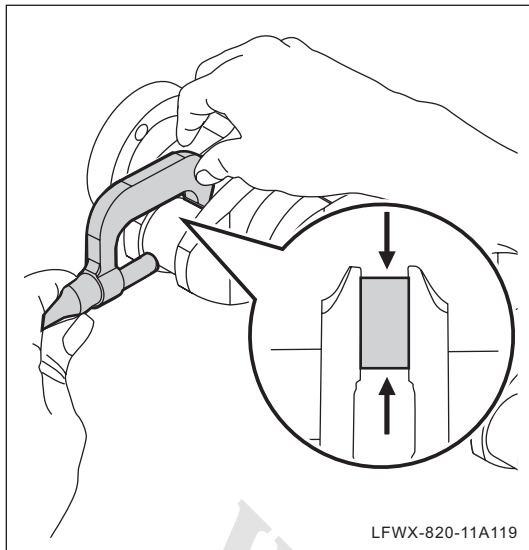


### 4. Inspect ovality of main journal of crankshaft.

- (a) As shown in the figure, check each main journal ovality. If it is greater than the maximum value, replace the crankshaft.

**Maximum ovality: 0.02mm**

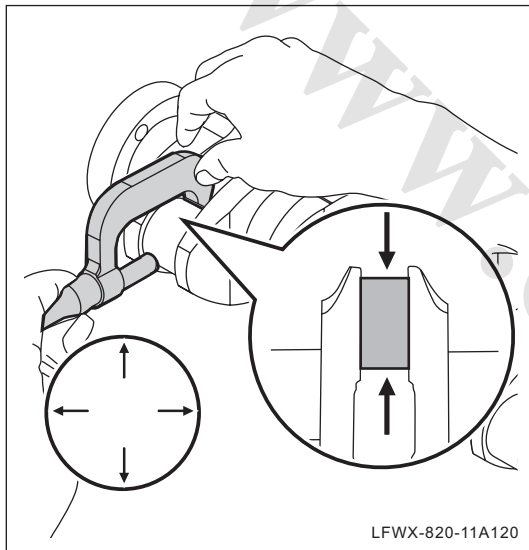
11A



### 5. Check connecting rod journal diameter of crankshaft

- (a) Use a screw micrometer to check the diameter of each connecting rod journal, if it doesn't meet requirement, check oil film clearance. If necessary, grind or replace crankshaft.

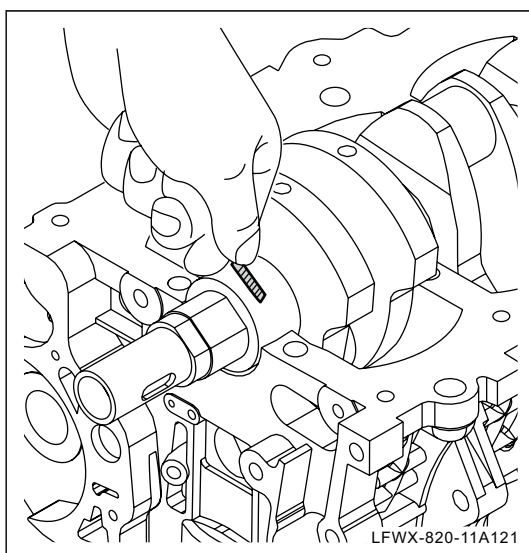
**Connecting-rod neck diameter:  
43.992mm - 44.000mm**



### 6. Check ovality of connecting rod journal of crankshaft.

- (a) As shown in the figure, check each connecting-rod journal ovality. If it is greater than the maximum, replace the crankshaft.

**Maximum ovality:0.02mm**



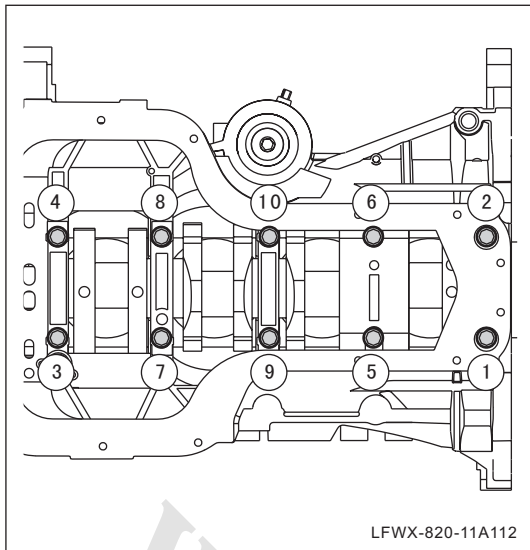
### 7. Check crankshaft oil film clearance

- (a). Clean the crankshaft journal and all crankshaft bearing bushes thoroughly.
- (b) Fix the main bearing bush to the upper part of the cylinder block, and fix the crankshaft onto the upper part of the cylinder block.
- (c) A section of plastic oil clearance gauge goes through main journal of the crankshaft.

#### ⓘ Note:

**Do not rotate the crankshaft.**





- (d) Fix the lower main bearing bush to the lower part of the cylinder block.
- (e) Install the lower block of cylinder block onto the upper block of cylinder block, and tighten 10 fixing nut of the main bearing cap according to the order shown in the figure.

**11A****Torque:****First 40 N.m****Second 60 N.m**

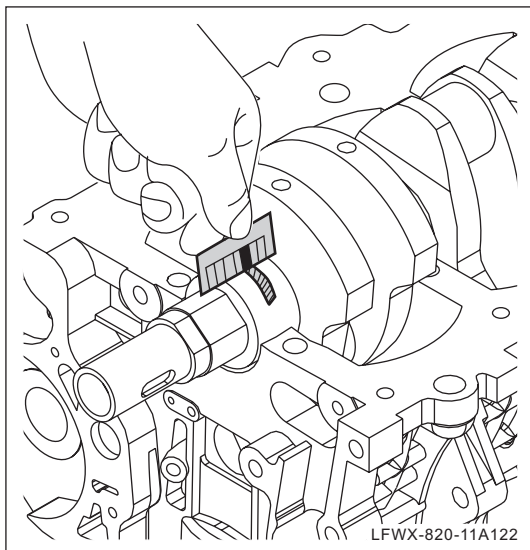
## △ HINT:

Tightening the tightening bolt of the main bearing cap twice.

- (f) Remove the 10 tightening bolts of the main bearing cap in the order shown in the figure, and then remove the lower block of cylinder block.

## △ HINT:

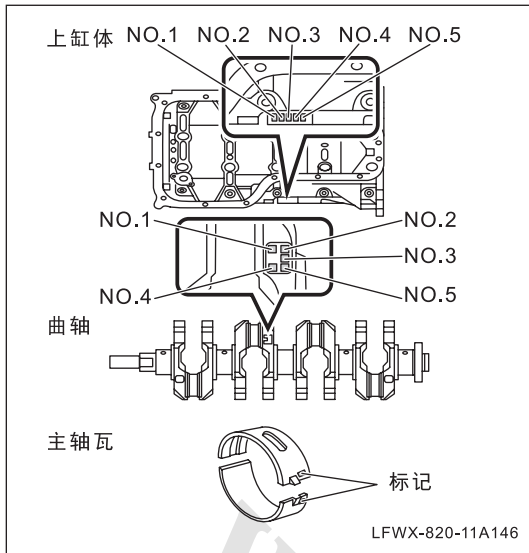
Tighten and loosen the bolts for several times.



- (g) Measure the plastic oil film clearance at the widest position. If it is greater than the maximum value, replace the bearing bush. If necessary, grind or replace the crankshaft.

**Standard oil-film clearance:**  
**0.014mm~0.032mm**

**Maximum oil film clearance: 0.10mm**



**Note:**

- **⊙** If a standard bearing bushing is used, replace it with the bearing bushing with the same number.
- If you are not sure of the number of bearing bush, you can let the number on the cylinder block plus that on the crankshaft minus 1 for matching (Calculation method: Number of main bearing bush = Number of main journal+ Number of main shaft hole -1), and then select the bearing bush whose number is the same as the calculated result to ensure correct choice of the bearing bush. There are five kinds of standard bearing bush sizes.

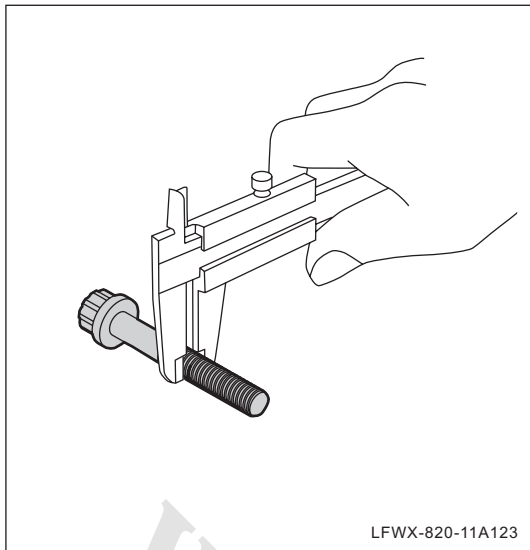
主轴瓦选配表

轴瓦 \ 主轴颈	1#	2#	3#
1#	1#	2#	3#
2#	2#	3#	4#
3#	3#	4#	5#

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Example:

No. 3 cylinder block "3" (Number of main journal) + Number of crankshaft "1" (Number of main shaft hole) - "1" = Total number "3" (i.e., No."3" bearing bush used)



## 8. Check the bolts of main bearing cap of cylinder block.

- (a) Measure the diameter of the bolt of the main bearing cap of the cylinder block using calipers. If the measured value is less than the minimum, replace all the bolts of the main bearing cap.

**Standard diameter: 8.80mm - 9.00mm**

**Minimum diameter: 8.70mm**

**11A**

## 9. Install crankshaft and flywheel

- (a) Use compressed air to blow foreign matter, coolant and oil inside upper and lower blocks of cylinder.

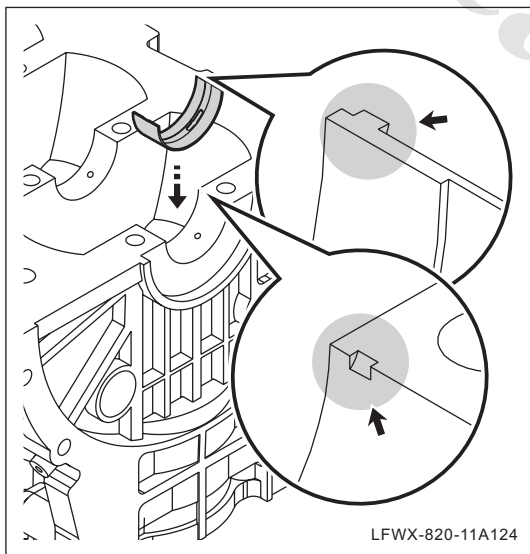
### ⓘ Note:

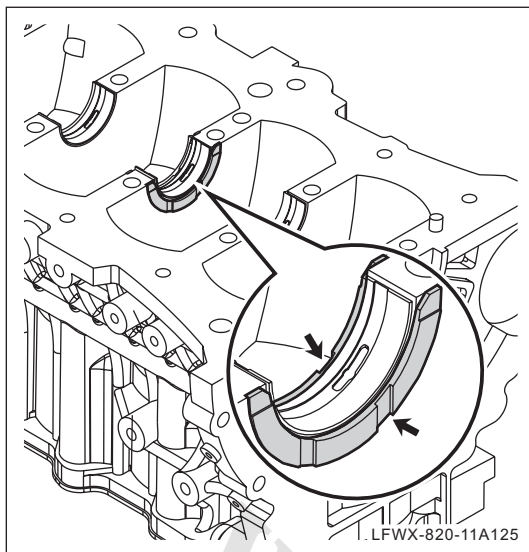
When using compressed air, we recommend you wear goggles and protective masks to avoid personal injury due to flying debris or dirt.

- (b) Fix the upper main bearing bush to the upper part of cylinder block.

### ⓘ Note:

- Install the parts in the placement sequence achieved during removal.
- Make sure that the back side of bearings is clean and without any scrap. Do not use oil to lubricate the back side of bearing.
- During installation, make sure that the position tongue of bearing is in alignment with positioning tongue groove of cylinder block.

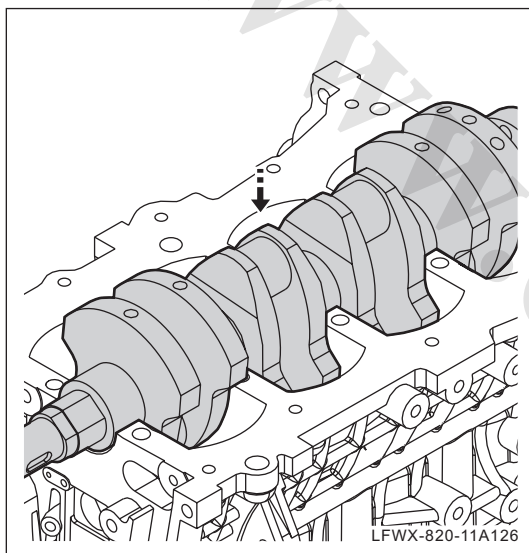




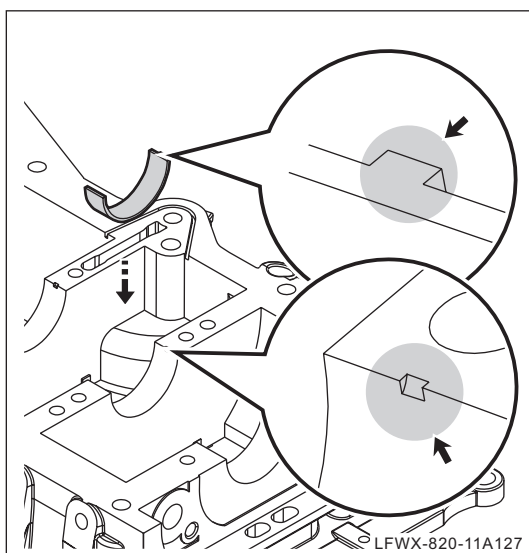
(c) Install the lower thrust plate.

**Note:**

As shown in the figure, make sure that the thrust plates' oil groove faces outwards and thrust plates are correctly installed.



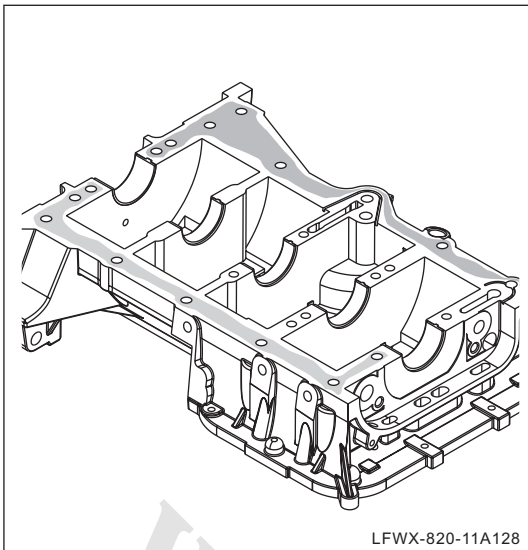
(d) Install the crankshaft assembly.



(e) Fix the lower main bearing bush to the lower part of the cylinder block.

**Note:**

- Install the parts in the placement sequence achieved during removal.
- Make sure that the back side of bearings is clean and without any scrap. Do not use oil to lubricate the back side of bearing.
- During installation, make sure that the position tongue of bearing is in alignment with positioning tongue groove of cylinder block.

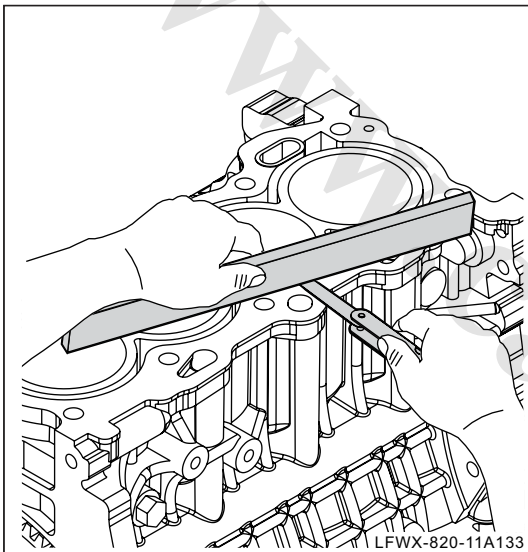


- (f) Apply a layer of sealant to the mounting surface of lower block of cylinder block.

**Note:**

- Before applying new sealant, make sure that residual sealant is cleaned out completely.
- Install lower block assembly of cylinder within 3min after applying the sealant.

11A



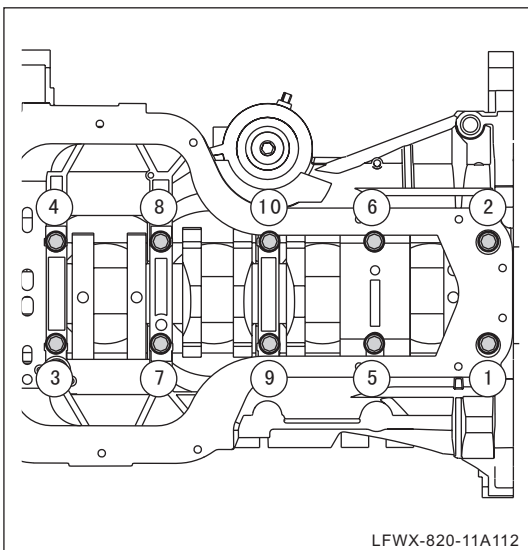
- (g) Tighten fixing bolt of upper and lower blocks of cylinder and connecting nut of oil filter according to the order shown in figure (as shown in figure 11).

**Torque : 18 N.m**

**Torque of connecting nut of oil filter:  
20N•m**

△ HINT:

When mounting the bolts, apply a layer of clean oil evenly to the thread of the bolts. Tighten fixing bolt of cylinder block twice.



- (h) Install lower block of cylinder, and tighten 10 tightening bolts of main bearing cap according to the order shown in figure.

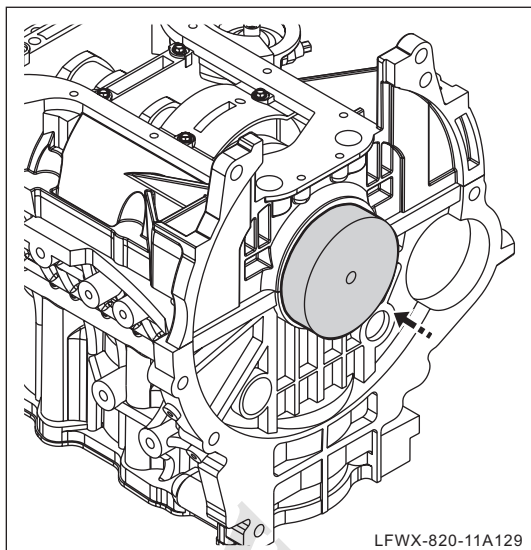
**Torque:**

**First 40 N.m**

**Second 60 N.m**

△ HINT:

Tightening the tightening bolt of the main bearing cap twice.



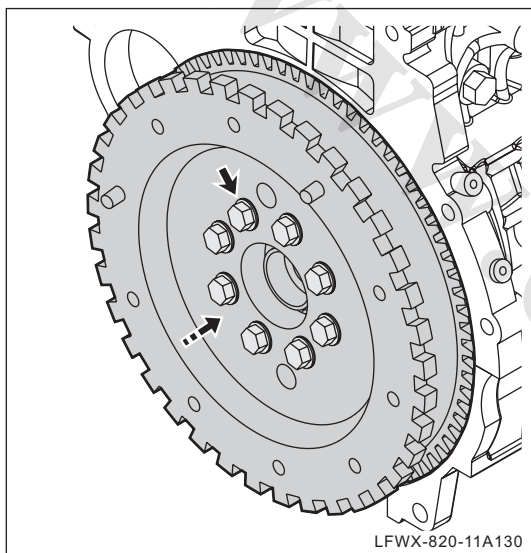
- (i) Install the rear oil seal of crankshaft with the mounting tool for oil seal.

**Note:**

**Be sure to install the seal vertically. Do not install it obliquely.**

**HINT:**

Before installation, apply a layer of clean oil to the seal lip.



- (j) Install the flywheel assembly in place, and install and tighten the flywheel bolts.

**Torque: 88N.m**

**Note:**

**When installing flywheel, make the flywheel in alignment with the locating pin of the crankshaft.**

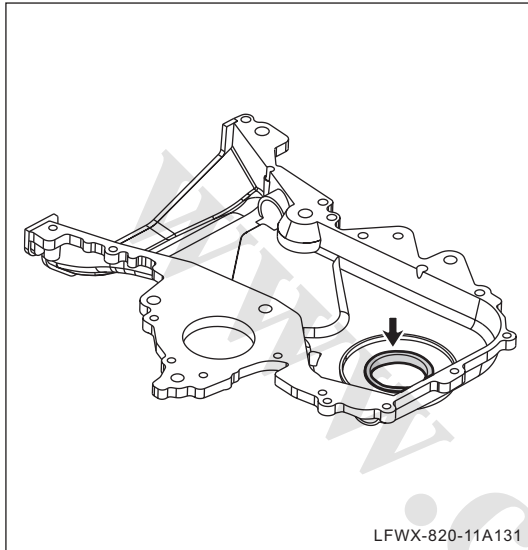
- (k) Install the piston and connecting-rod assembly. (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)

# Crankshaft Oil Seal

## Replacement

### 1. Remove crankshaft front oil seal

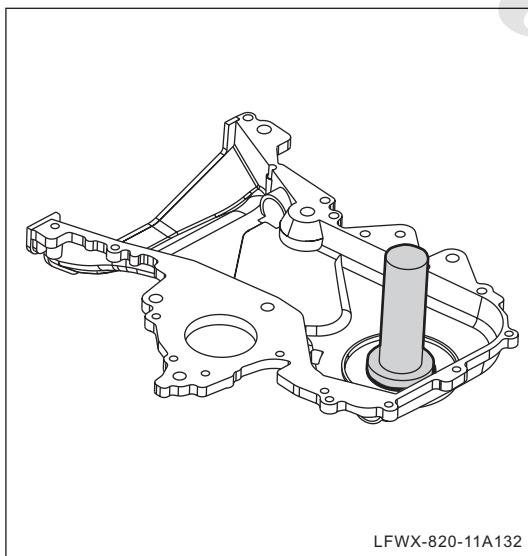
- (a) Remove front cover assembly. (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair)



- (b) Use a "flat-blade" screwdriver to pry front oil seal of crankshaft.

**Note:**

Do not reuse the removed oil seal. Replace it with a new one during installation.



### 2. Install crankshaft front oil seal

- (a). Install the crankshaft front oil seal with the mounting tool for oil seal.

**HINT:**

Before installation, apply a layer of clean oil to the seal lip.

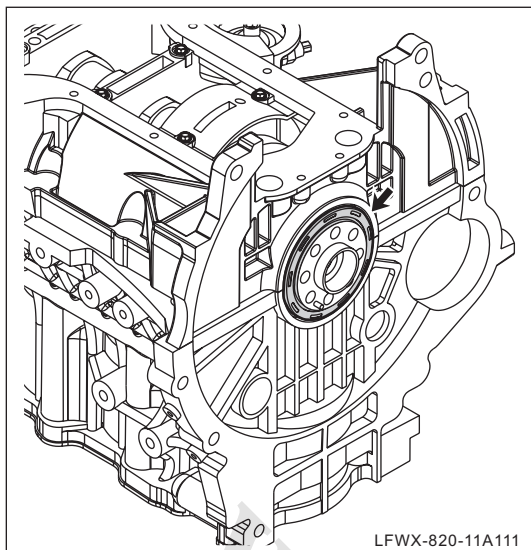
**Note:**

Be sure to install the seal vertically. Do not install it obliquely.

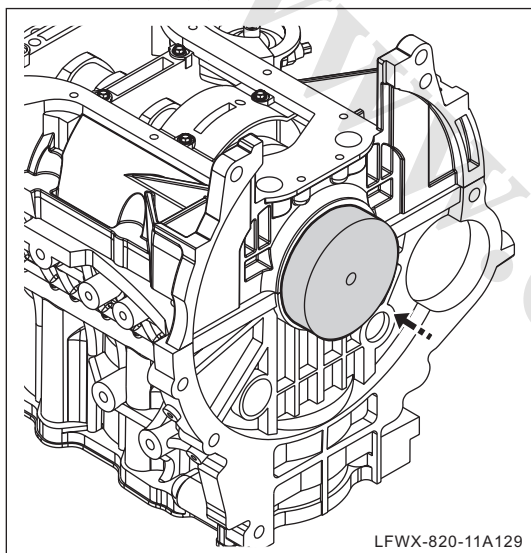
- (b) Install the front cover assembly. (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair)

### 3. Remove rear oil seal of crankshaft

- (a). Remove the flywheel assembly. (See 11A- Engine Mechanical System-Crankshaft and Flywheel, Check and Repair)



- (b) Use a "flat-blade" screwdriver to pry rear oil seal of crankshaft.



#### 4. Install rear oil seal of crankshaft

- (a) Install the rear oil seal of crankshaft with the mounting tool for oil seal.

△ HINT:

Before installation, apply a layer of clean oil to the seal lip.

ⓘ Note:

**Be sure to install the seal vertically. Do not install it obliquely.**

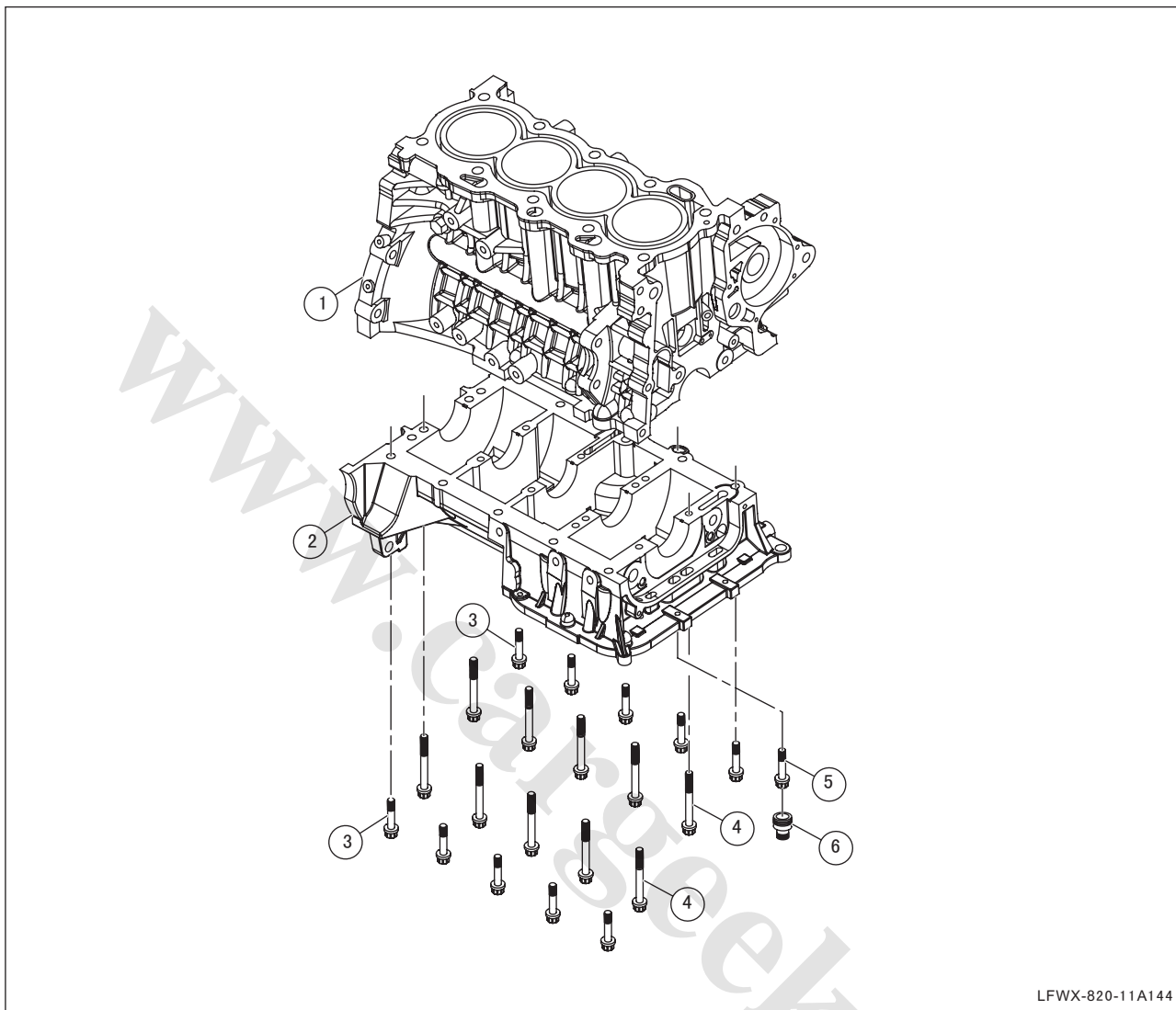
- (b) Install the flywheel assembly. (See 11A-Engine Mechanical System-Crankshaft and Flywheel, Check and Repair)



# Cylinder Block

## Components

11A



LFWX-820-11A144

1	Upper cylinder block
2	Lower cylinder block
3	Cylinder block bolts

4	Fixing bolt of main bearing cap
5	Cylinder block bolts
6	Connecting nut for oil filter

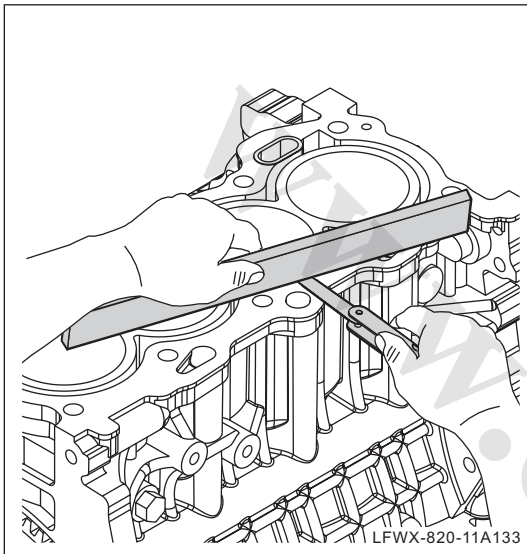
## Overhaul

### 1. Check surface warping of upper block of cylinder block.

- (a) Clean all pad materials on the cylinder block head, and clean the cylinder block thoroughly with soft brush and solvent.

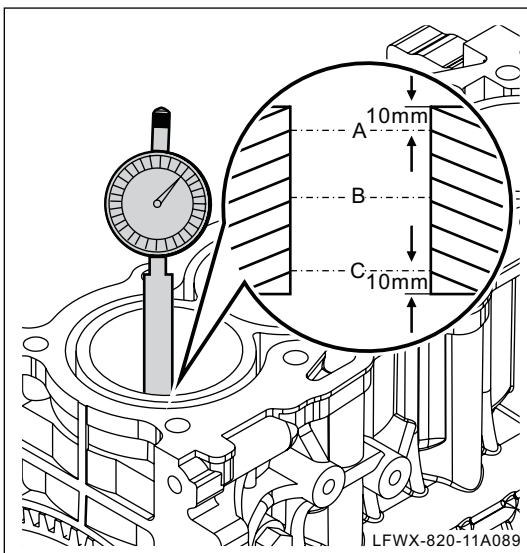
#### ⓘ Note:

When cleaning it with solvent, acid or alkaline materials, follow the manufacturer's recommendations.



- (b) Use a ruler or feeler gauge to check the top plane warping of cylinder block. If the warping value is greater than the maximum value, replace cylinder block.

**Maximum warping value: 0.05mm**



### 2. Check cylinder bore diameter of upper part of cylinder block

- (a) Measure the diameter of the cylinder bore at the positions of A, B and C by using cylinder bore gauge.

**Standard diameter: 79.00~79.13mm**

#### △ HINT:

Measure once along the axial direction and the thrust direction at each position respectively.

- (b). Calculate the difference between the maximum and the minimum of the 6 measured values.

**Maximum difference: 0.10mm**

#### ⓘ Note:

**If it exceeds maximum value, replace upper block of cylinder block.**

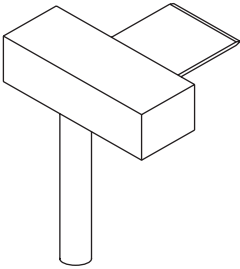
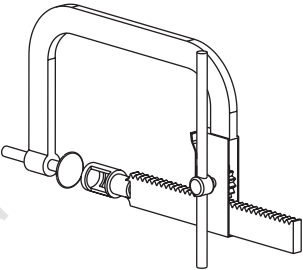
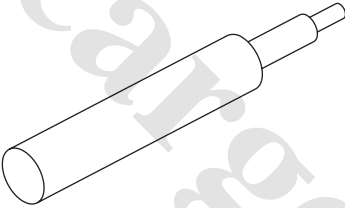
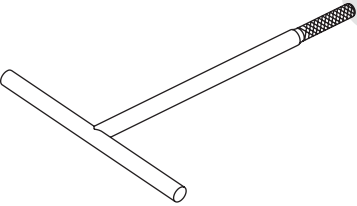
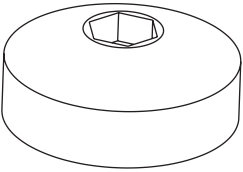
# 11B- Engine Mechanical System

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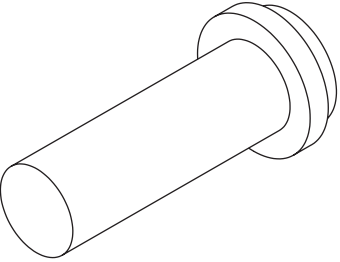
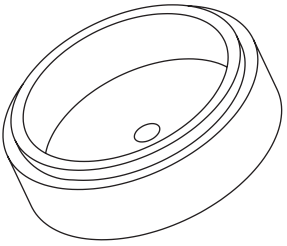
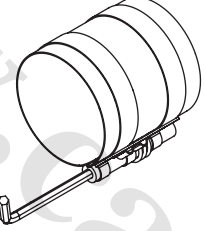
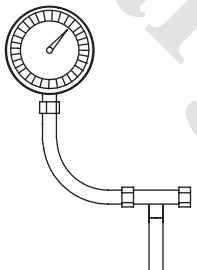
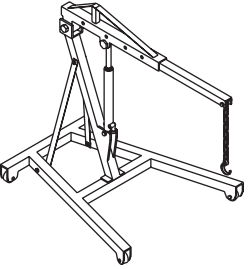
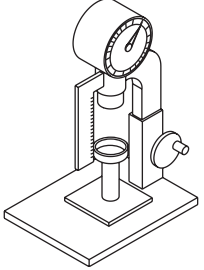
## Mechanical System of Engine

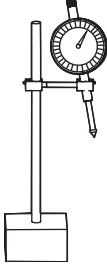
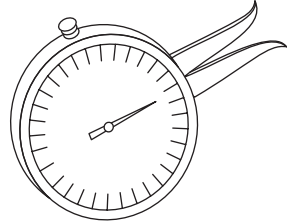
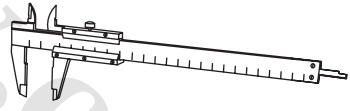
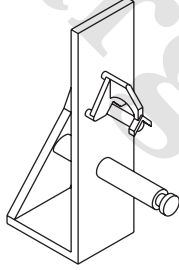
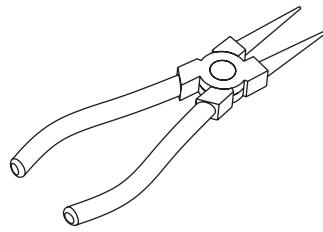
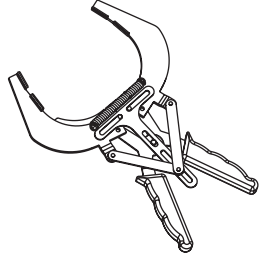
### Preparation

S/N	Tools	Outline diagram	Description
1	Oil pan remover		Removing the oil pan
2	Remover and installer for valve cotter		For removing/installing valve cotter
3	Remover for valve guide		For removing valve guide
4	Reamer		Reaming valve guide
5	Remover and installer for oil filter		Removing and installing oil filter

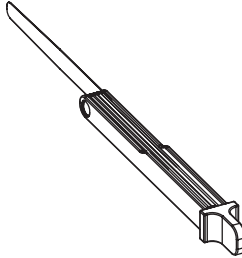
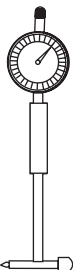
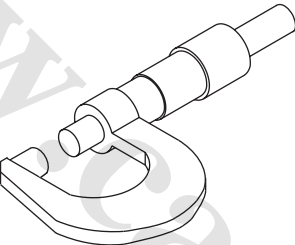
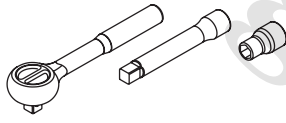
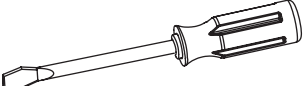
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S/N	Tools	Outline diagram	Description
6	Installation tool for front oil seal of crankshaft		For installing the front oil seal of crankshaft
7	Mounting tool for rear oil seal of crankshaft		For installing the rear oil seal of crankshaft
8	Piston ring compressor		For installing the pistons.
9	Cylinder-pressure gauge		For measuring cylinder pressure
10	Hanger		For hoisting the engine
11	Spring dynamometer		For detecting the elasticity of valve spring

S/N	Tools	Outline diagram	Description
12	Dial gauge		For measuring radial runout of parts
13	Internal micrometer		For measuring inner diameter of parts
14	Vernier caliper		For measuring the length of parts
15	Connecting-rod collimator		For measuring the degree of distortion of piston-connecting-rod
16	Snap ring pliers		Used for removal and installation of snap rings
17	Piston ring expander		For disassembly and assembling piston ring

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S/N	Tools	Outline diagram	Description
18	Feeler gauge		Measuring parts' clearance
19	Cylinder bore gauge		For measuring cylinder bore
20	Spiral micrometer		For measuring diameter of parts
21	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts
22	Screwdriver		Remove the fixing screws



## Service data

### 1. Technical specifications table

Cylinder pressure	Maximum cylinder pressure	1.36MPa	
	Standard cylinder pressure	1.2MPa	
	Minimum cylinder pressure	1.0MPa	
	Maximum cylinder pressure difference	100kPa	
Maximum elongation of timing chain		114.5mm	
Minimum diameter of exhaust timing sprocket		97.2mm	
Minimum diameter of crankshaft sprocket		51.5mm	
Minimum diameter of crankshaft pump sprocket		48.3mm	
Minimum diameter of oil pump sprocket		48.3mm	
Cylinder head flatness	Cylinder block joint surface	0.03mm	
	Intake side	0.06mm	
	Exhaust side	0.06mm	
Camshaft radial run-out		0.03mm	
Maximum lift of intake/ exhaust camshaft	Intake camshaft	10.1037mm	
	Exhaust camshaft	9.0231mm	
Camshaft journals	No.1 exhaust	35.971mm~35.985mm	
	Others	22.959mm~22.975mm	
Camshaft axial clearance	Standard axial clearance	0.08mm~0.135mm	
	Maximum axial clearance	0.15mm	
Valve spring	Free length	45mm	
	Elastic force of the installation	136Nm~148Nm	
	Maximum working elasticity	316Nm~348Nm	
Valve spring verticality	Maximum deviation	1.5mm	
Valve edge thickness	Standard thickness	1.05mm~1.45mm	
	Minimum thickness	0.60mm	
Valve length	Intake valve	Standard length	101.7mm
		Minimum length	101.4mm
	Exhaust valve	Standard length	101.4mm
		Minimum length	101.1mm

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Valve stem diameter	Intake valve	5.465mm~5.480mm	
	Exhaust valve	5.470mm~5.485mm	
Width of valve-seat contact surface	Width of intake valve-seat	1.1mm~1.3mm	
	Width of exhaust valve-seat	1.1mm~1.3mm	
Valve guide inner diameter		5.510mm~5.530mm	
Thickness of tappet top		506mm~574mm	
Valve oil-film clearance	Intake valve	Standard clearance:	0.030mm~0.065mm
		Maximum clearance	0.090mm
	Exhaust valve	Standard clearance:	0.030mm~0.065mm
		Maximum clearance	0.090mm
Valve-guide mounting-hole inner diameter		10.285mm~10.306mm	
Valve-guide specified pressing-in capacity		10.1mm~10.5mm	
Valve clearance	Standard intake valve clearance (cold)	0.20mm~0.25mm	
	Standard exhaust valve clearance (cold)	0.30mm~0.35mm	
Standard piston diameter		88.656mm~88.670mm	
Piston oil-film clearance	Standard oil-film clearance	0.030mm~0.057mm	
	Maximum oil-film clearance	0.090mm	
Piston pin mounting hole diameter		A:22.008mm~22.011mm B:22.011mm~22.014mm	
Piston pin outer diameter		A:22.004mm~22.007mm B:22.007mm~22.010mm	
Piston-connecting-rod axial clearance	Standard axial clearance	0.16mm~0.34mm	
	Maximum axial clearance	0.36mm	
Piston-connecting-rod oil-film clearance	Standard oil-film clearance	0.030mm~0.056mm	
	Maximum oil-film clearance	0.56mm	
Piston pin oil film clearance (piston pin mounting holes)	Standard oil-film clearance	0.001mm~0.007mm	
	Maximum oil-film clearance	0.010mm	
Connecting-rod small end hole inner diameter		A:22.012mm~22.016mm B:22.016mm~22.020mm	
Oil film clearance of piston pin (wrist pin hole)	Standard oil-film clearance	0.005mm~0.012mm	
	Maximum oil-film clearance	0.012mm	

Piston ring groove clearance	Top ring groove		0.035mm~0.085mm
	Second ring groove		0.03mm~0.07mm
	Oil ring		0.02mm~0.06mm
Piston ring gap	Standard end play	Top ring	0.20mm~0.35mm
		Second ring	0.30mm~0.45mm
		Oil ring	0.20mm~0.40mm
	Maximum piston ring gap	Top ring	0.75mm
		Second ring	0.85mm
		Oil ring	0.72mm
Maximum deviation angle of the connecting-rod			0.05mm
Maximum connecting-rod distortion			0.15mm
Maximum crankshaft radial run-out			0.03mm
Crankshaft main journal diameter			1:54.794mm~54.800mm 2:54.788mm~54.794mm 3:54.782mm~54.788mm
Max. ellipticity of crankshaft main journal			0.006mm
Crankshaft connecting-rod journal diameter			1:47.994mm~48.00mm 2:47.988mm~47.994mm 3:47.982mm~47.988mm
Max. ellipticity of crankshaft connecting rod journal			0.006mm
Crankshaft oil-film clearance	Standard oil-film clearance		0.020mm-0.038mm
	Maximum oil-film clearance		0.050mm
Top surface warping of upper cylinder block (maximum warping)			0.05mm
Cylinder block bore diameter			88.7mm~88.713mm

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## 2. Table of tightening torque

Item	N·m
Engine left mounting fixing bolt	85~90
Fixing bolt of engine right mounting	85~90
Engine front mounting fixing bolt	85~90
Engine rear mounting fixing bolt	85~90
Bolts for throttle	10~12
Bolts and nuts for intake manifold	30
Exhaust timing sprocket bolt	54

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Item	N•m
Phaser bolt	60
Bolts for timing chain moving rail module	23
Bolts for timing chain fixed rail module	11
Timing cover bolt	M6:23; M8:25; M10:55; M6X30:11
Timing-chain tensioner nut	11
Crankshaft pulley bolt module	150
Bolts for right mounting bracket of engine	52
Bolts for belt tensioner	M10:53; M8:30
Cylinder head cover mounting bolts	11
Bolt combination for camshaft bearing cap	M8:25; M6:13
Cylinder head bolts (tightened by three stages)	30 (first time ), 70 (second time), 100 (third time)
Fixing bolt of water pump	45
Fastening bolts for connecting-rod cap	25 (first time ), 53 (second time)
Connecting bolts for cylinder block	25
Balance shaft cover bolts	40
Oil pump fixing bolts	25
Oil pan bolt	11
Oil filter	25
Fastening bolts for crankshaft main bearing cap (tightened by two stages)	40 (first time ), 70 (second time)
Drive plate bolts (tightened by three stages)	30 (first time ), 70 (second time), 90 (third time)

## Precautions

### 1. Precautions before repair

- (a) Do not drain the engine coolant and oil until the engine cools down.

### 2. Precautions for maintenance

- (a) When disconnecting fuel pipe, keep the working environment away from fire source and children as far as possible.
- (b) After removing fuel pipe, each oil pipe joint shall be sealed to prevent fuel pipe from blocking or fuel leakage.
- (c) Be sure to remove the engine with care. Always avoid damage to any mating surface and sliding surface.

- (d) During dismantling the engine, use tapes or equivalents to seal opening of the engine to prevent foreign matters from going into the engine.
- (e) During dismantling, it is necessary to identify and arrange disassembled parts in order so as to make troubleshooting and reinstall them.
- (f) Before repairing or replacing, clean and check parts thoroughly.
- (g) When assembling the engine, the principle of tightening bolt and nut is to tightening bolt or nut in the middle by the same torque, and then tightening bolt or nut on internal and external diagonal lines. Follow specified order if there is any.
- (h) When assembling the engine, replace gaskets, oil seals and O-rings with new ones.
- (i) When applying sealant, it shall be applied uniformly. After applying, install the component within specified period.
- (j) When assembling the engine, check carefully its oil pipes and vacuum lines for clogging and aging. If any pipe/line damaged, replace it immediately.
- (k) When connecting each sensor connector, a clear "click" is heard, it means the connector is in the right position.

### 3. Other precautions

- (a) If you finish repairing the engine, check whether the engine wire harness connector is connected in place. Check the oil level in the oil pan and check the degree of oxidation of the oil (which becomes black if seriously oxidated) If the oil needs to be added or replaced, be sure to use new oil. Check the coolant level. If necessary, add coolant.
- (b) After the engine is started, let it idle and observe whether the engine is running properly. If normal, increase the engine speed and check the engine coolant, fuel and engine oil and exhaust for leaks.

## General Check

### Check the system

#### 1. Check system components

- (a) Check system for obvious mechanical damage. If any, repair it.
- (b) Check system for obvious collision and deformation. If any, repair it.
- (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.
- (d) Check the accessories and belts for cracks, breakage and looseness. If any, replace it timely.

#### 2. Check the coolant system .(See 13- Cooling System-) General Inspection

#### 3. Check the lubrication system. (See 17- Lubrication System- General Inspection)

#### 4. Check the intake/exhaust system. (See 15- Intake/Exhaust System- General Inspection)

### Check cylinder pressure

△ HINT:

For inspection methods, see 11A- Engine Mechanical System- General Inspection, Testing Cylinder Pressure.

**Standard cylinder pressure: 1.2MPa**

**Minimum cylinder pressure: 1.0MPa**

**Maximum cylinder pressure: 1.36MPa**

**Maximum pressure difference between cylinders: 100kPa**

## Diagnosis

### Fault symptom table

△ HINT:

See 11A- Engine Mechanical System- Diagnosis, Table of Symptoms.

### Fault diagnosis

△ HINT:

See 11A- Engine Mechanical System- Diagnosis, Fault Diagnosis.

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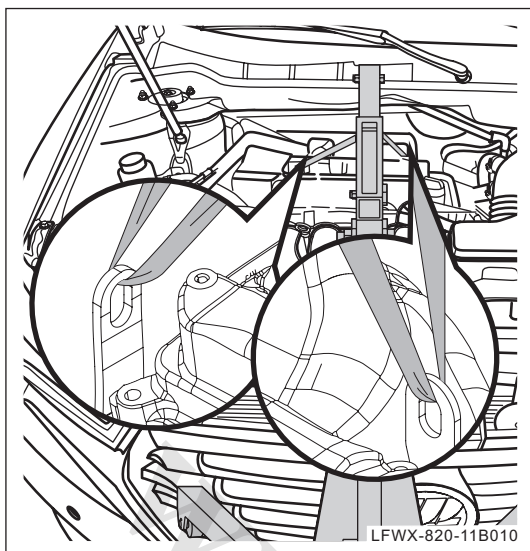
## Engine Assembly

### Removal

1. Drain the engine oil. (See 17- Lubrication System-Oil, Replacement)
2. Remove the oil inlet pipe from the engine (See 13- Fuel System-Fuel Lines, Replacement)
3. Remove the battery. (See 19- Battery-Battery, Replacement)
4. Remove the air filter assembly. (See 15- Intake /Exhaust System-Air Filter, Replacement)
5. Disconnect the canister solenoid valve' s hose connector. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
6. Disconnect the radiator inlet and outlet connections. (See 16- Cooling System-Cooling Circuit, Replacement)
7. Disconnect the heater hose. (See 71- Heating and Air Conditioning-Heater Hose, Replacement)
8. Disconnect the connection between the gearshift flexible shaft and the gear switch. (See 22- Automatic Transmission-Shifter, Replacement)
9. Remove the front wheel assembly. (see 33- Wheels and tyres-Wheel Assembly, Replacement)
10. Remove the right and left drive shafts. (See 41- Drive Shaft- Drive Shaft Assembly, Check and Repair)
11. Remove the air conditioning compressor. (See 71- Heating and Air Conditioning-Air Conditioning Compressor, Replacement)
12. Disconnect the connection between the rear purifier with bellows assembly and the catalytic converter. (See 15- Intake and Exhaust System-Rear Purifier with Bellows Assembly, Replacement)
13. Remove the power steering pump. (See 61- Hydraulic Steering System-Power Steering Pump, Replacement)
14. Disconnect the inlet and outlet pipe connections from the transmission. (See 22- Automatic Transmission-Oil Cooler, Replacement)
15. Disconnect the engine ECM connector. (See 12A- Engine Control System-Control Module ECM, Replacement)
16. Disconnect the connection between the engine wire harness and the electrical



**box.**

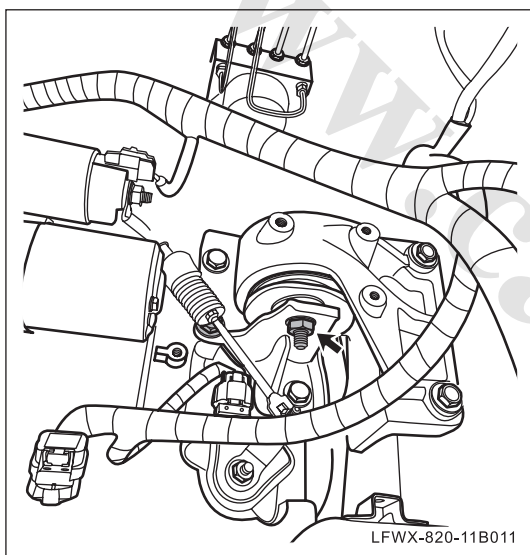


### 17. Hoist the engine by lifting tool

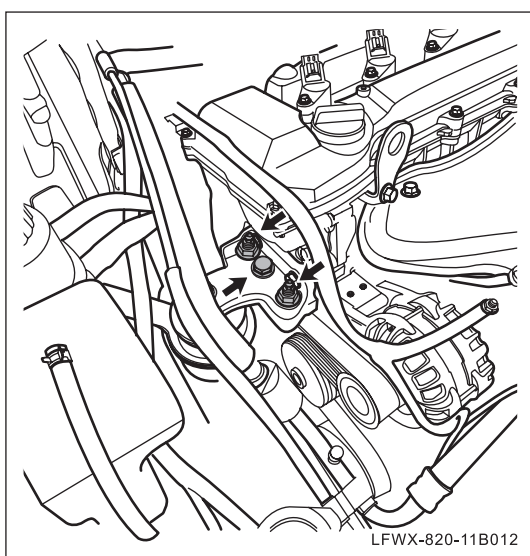
△ HINT:

- Remove the trim cover from the engine before lifting the engine.
- When lifting the engine, let the sling rope of the hoisting equipment straighten freely.

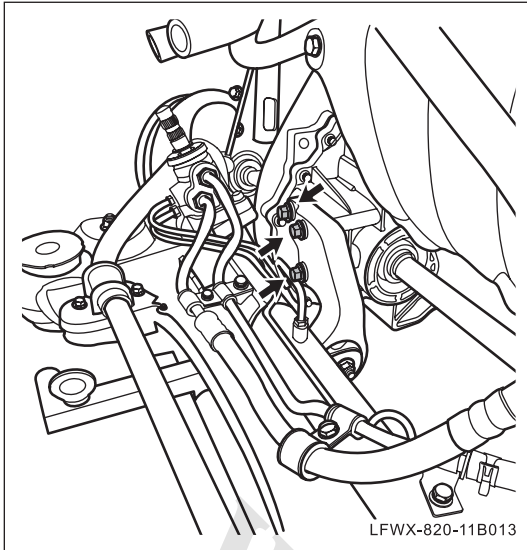
**11B**



### 18. Remove the fixed bolts of the rear suspension of the engine, and remove the rear suspension.



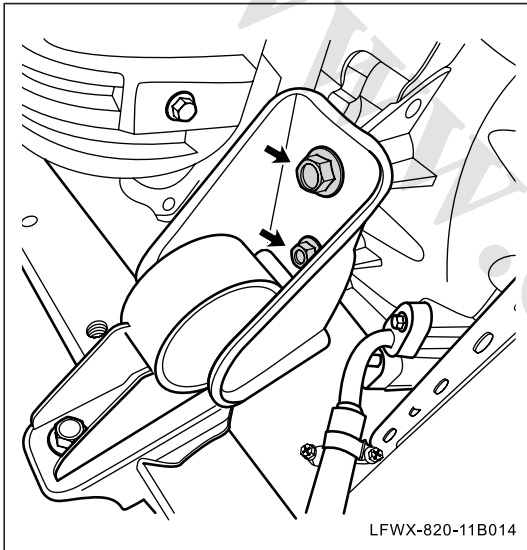
### 19. Remove the fixed bolts of the front mounting of the engine, and remove the rear suspension.



**20. Remove the fixed bolts of the right mounting of the engine, and remove the rear suspension.**

△ HINT:

To facilitate taking out engine smoothly, it is better to dismantle engine right mounting bracket.



**21. Remove the fixed bolts of the left mounting of the engine, and remove the rear suspension.**

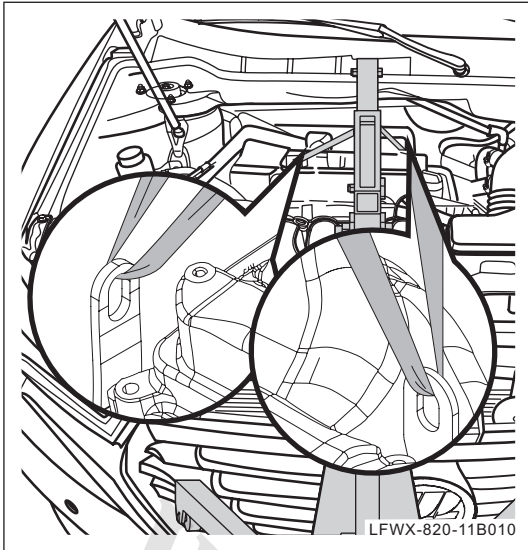
**22. Slowly lift engine lifting bracket and lift engine with transmission assembly out.**

ⓘ Note:

- Before lifting engine, recheck if all connectors, grounding cables, oil pipes, vacuum pipes and water pipes are completely disconnected.
- During lifting, take care to observe parts around engine to avoid damage caused by extruding.

**23. Remove fixing bolts of transmission assembly, and remove transmission assembly.**

## Installation



1. Use engine lifting bracket to lift engine with transmission assembly, and place it above the engine compartment.

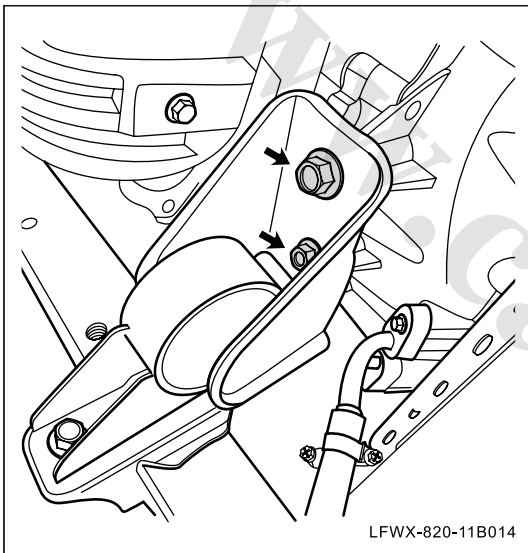
**Note:**

Do not strike engine hood.

2. Slowly lower the engine, and stop lowering after complete engine assembly locates at support position.

**Note:**

Prevent oil pipe, vacuum pipe, air conditioner pipe and water pipe in engine compartment from being damaged by extruding

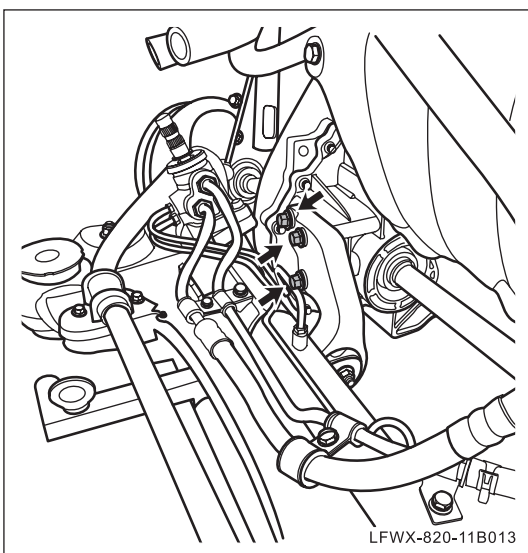


3. Install fixing bolts of engine left mounting.

Torque: 85N•m - 90N•m

**Note:**

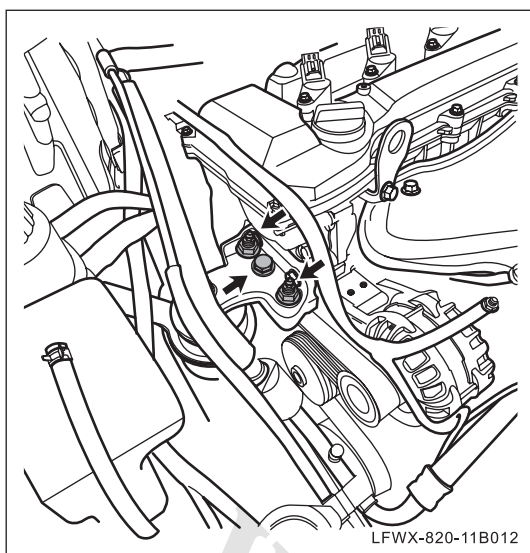
Do not tighten the fixing nut. Tighten them after front, rear, left, right mounting of the engine are completely installed on proper places.



4. Install fixing bolts of engine right mounting.

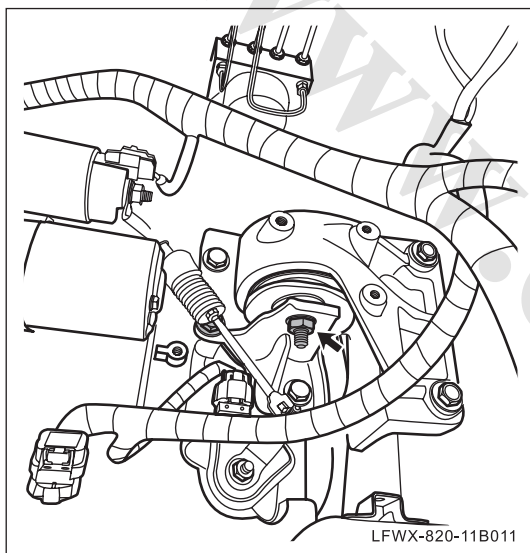
Torque: 85N•m - 90N•m

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5. Install fixing bolts of engine front mounting.

Torque: 85N•m - 90N•m



6. Install the fixed bolts of the rear suspension of the engine.

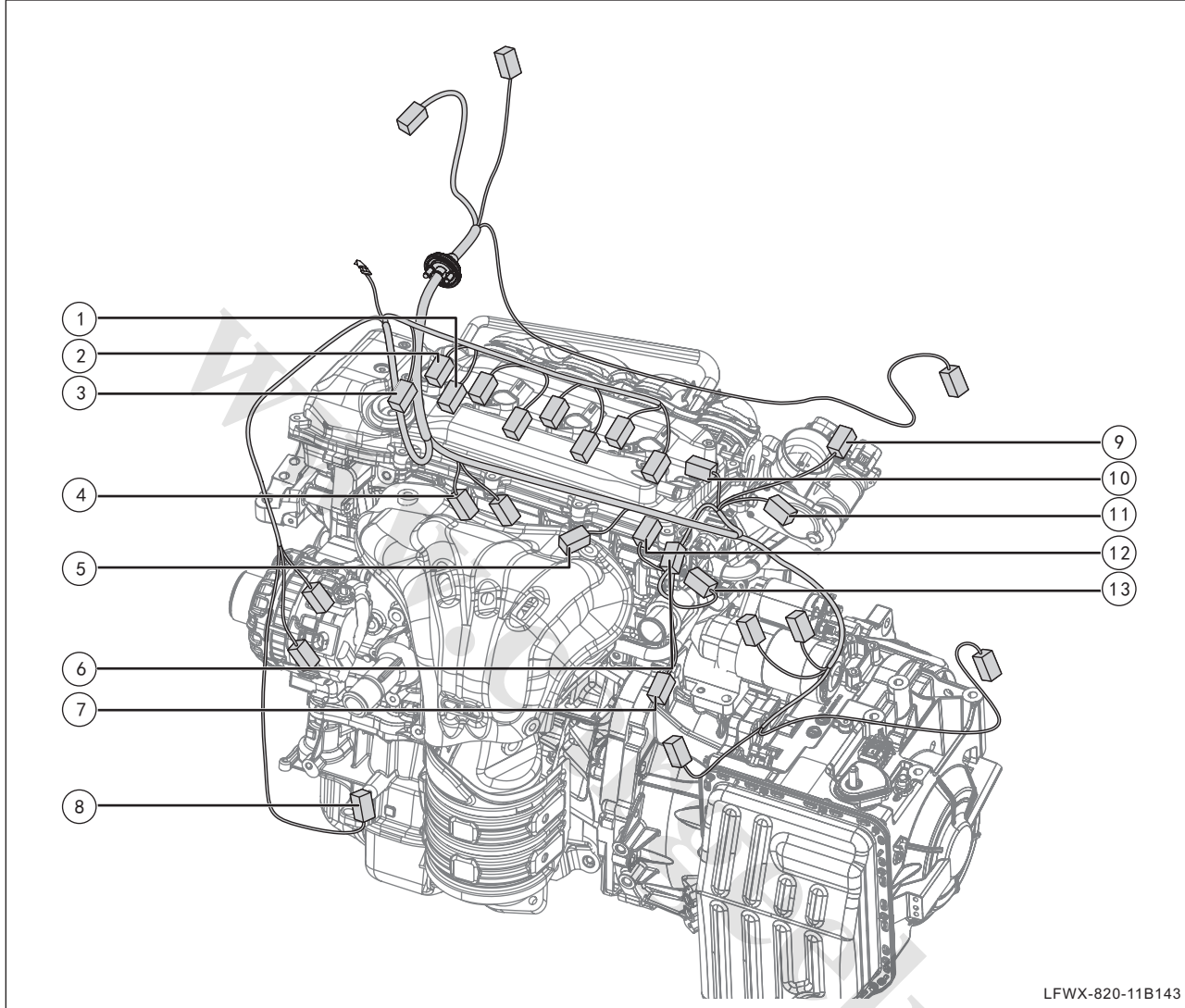
Torque: 85N•m - 90N•m

7. Install the inlet and outlet pipes of the transmission. (See 22- Automatic Transmission-Oil Cooler, Replacement)
8. Install the power steering pump. (See 61- Hydraulic Steering System- Power Steering Pump, Replacement)
9. Fix the rear purifier with bellows assembly to the catalytic converter. (See 15- Intake and Exhaust System-Rear Purifier with Bellows Assembly, Replacement)
10. Install the air conditioning compressor. (See 71- Heating and Air Conditioning- Air Conditioning Compressor , Replacement)
11. Install the left and right drive shafts. (See 41- Drive Shaft-Drive Shaft Assembly, Check and Repair)
12. Install the front wheels assembly(see 33 Wheels and tyres, Wheels Assembly, Replacement) .

13. Install the gearshift flexible shaft to the gear switch.(See 22- Automatic Transmission-Shifter, Replacement)
14. Install the heater hose. (see 71- Heater and Air Conditioning-Heater Hose, Replacement)
15. Install the radiator inlet and outlet pipe. (See 16- Cooling System-Cooling Circuit, Replacement)
16. Install the canister solenoid valve hose. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
17. Install the air filter assembly. (See 15- Intake /Exhaust System-Air Filter, Replacement)
18. Install the battery (See 19- Battery-Battery, Replacement)
19. Install the engine oil inlet pipe. (See 13- Fuel System-Fuel Lines, Replacement)
20. Install the engine ECM connector. (see 12B- Engine Control System- Control Module ECM, Replacement)
21. Connect the engine wire harness to the electrical box.
22. Fill the engine oil. (See 17- Oil for Lubrication System, Replacement)

# Engine Wire Harness and Sensor

## Replacement



LFWX-820-11B143

1	Ignition coil harness connector
2	Injector harness connector
3	OCV valve harness connector
4	Intake pressure and temperature sensor harness connector
5	Knock sensor harness connector
6	Oil pressure sensor harness connector
7	Coolant temperature sensor harness connector

8	Electronic clutch harness connector
9	Throttle position sensor harness connector
10	Crankshaft position sensor harness connector
11	Front oxygen sensor harness connector
12	Camshaft position sensor harness connector
13	Canister solenoid valve harness connector

## 1. Remove the engine wire harnesses and sensors.

△ HINT:

When the harness needs to be replaced, cut off the power first.

- (a) Disconnect the connectors from the ignition coil ① and injector ② .
- (b) Disconnect the OCV valve ③ connector, and remove the OCV valve.
- (c) Disconnect the intake air pressure and temperature sensor ④ connector, and remove the intake air pressure and temperature sensor.

△ HINT:

Air intake pressure and temperature sensor connector is located at the back of intake manifold.

- (d) Disconnect the knock sensor ⑤ connector, and remove the knock sensor.
- (e) Disconnect the oil pressure sensor ⑥ connector, and remove the oil pressure sensor.
- (f) Disconnect the coolant temperature sensor ⑦ connector, and remove the coolant temperature sensor.
- (g) Disconnect the air conditioning compressor' s electronic clutch ⑧ connector.
- (h) Disconnect the throttle position sensor ⑨ connector.
- (i) Disconnect the connector from the crankshaft position sensor ⑩ , and remove the crankshaft position sensor.

△ HINT:

Crankshaft position sensor is located on transmission housing.

- (j) Disconnect front oxygen sensor 11 connector.

△ HINT:

Oxygen sensor connector is located on exhaust manifold.

- (k) Disconnect the camshaft position sensor 12 connector, and remove the camshaft external sensor.
- (l) Disconnect the canister solenoid valve 13 connector.
- (m) Remove the output power cord from the alternator, and disconnect the alternator connector.
- (b) Remove the starter power leads, and disconnect the starter connector.
- (o) Remove the earth wire from the transmission housing.
- (p) Disconnect the connectors from the solenoid valve and gear switch harnesses.
- (q) Remove the fixed bolt for the negative ground on the transmission, and disconnect the negative ground harness.

## 2. Install the engine wire harnesses and sensors.

△ HINT:

- Installation is the reverse of removal.
- If you hear a ringing "click" sound when connecting the connector, this indicates the connector is connected in place.

📌 Note:

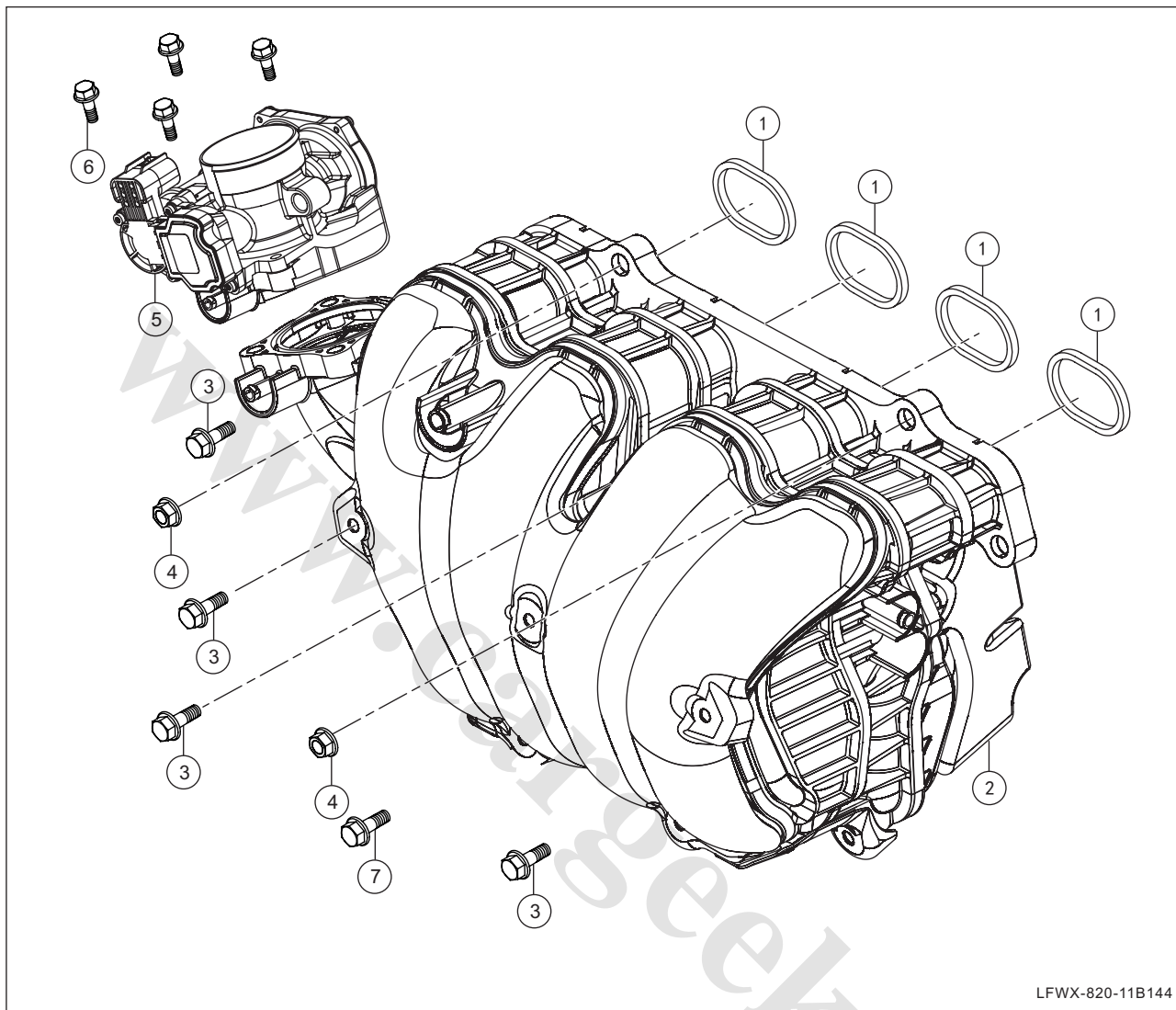
Ensure that each wire harness connector is connected securely. No looseness is permitted.

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# Intake Manifold

## Components



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1	Intake manifold sealing ring
2	Intake manifold assembly
3	Hexagon bolt with flange
4	Hexagon nut with flange

5	Throttle Body Assembly
6	Hexagon bolt with flange
7	Hexagon bolt with flange

## Overhaul

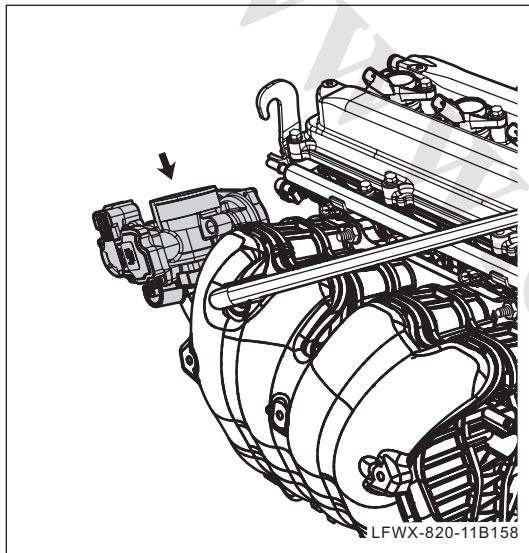
### 1. Removal of intake manifold

- (a) Remove upper cross beam trim panel of water tank. (See 81- Interior and Exterior- Water Tank' s Upper cross member Trim Panel, Replacement)

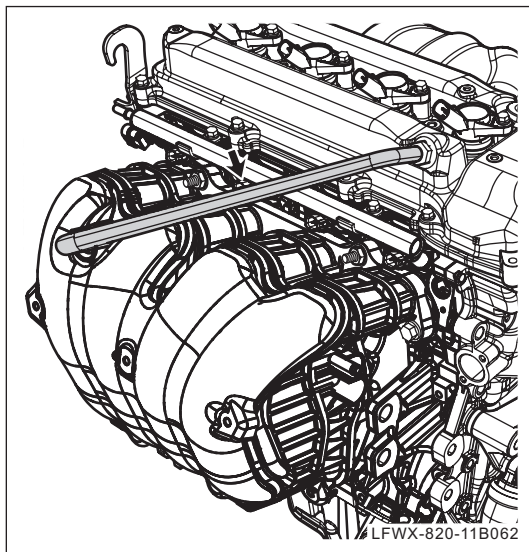
△ HINT:

We recommend you remove the harness connector to the intake manifold first. If necessary, also remove the harness connector of the fuel rail.

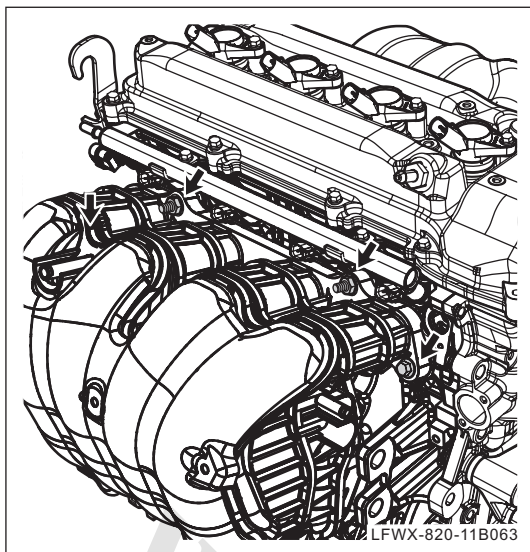
- (b) Disconnect intake pressure and temperature sensor connector.  
 (c) Disconnect the throttle position sensor connector.  
 (d) Remove vacuum boosting hose.



- (e) Remove the throttle body bolts, and remove the throttle body assembly.

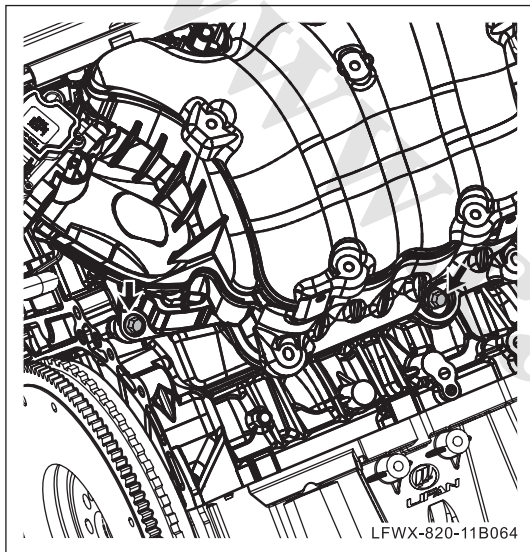


- (f) Remove the PCV hose clamp, and disconnect the PCV hose.



- (g) Remove the nuts and bolts on the upper end of intake manifold.

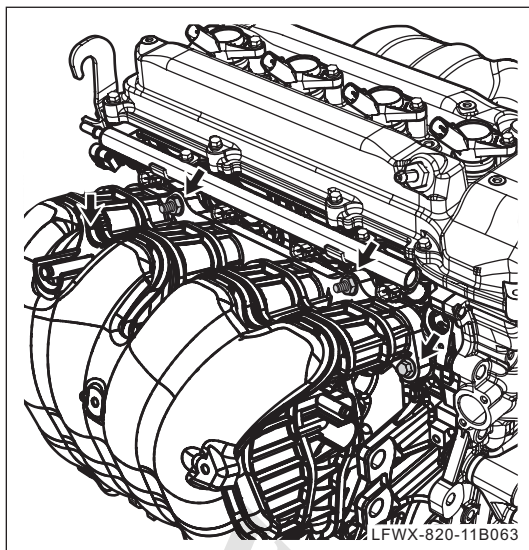
11B



- (h) Remove the bolts on the lower end of the intake manifold, and remove the intake manifold.

## 2. Check the intake manifold and throttle.

- (a). Check intake manifold for crack or other damage. If any, replace it.
- (b). Check if the matching surface of the intake manifold has been deformed. If so, replace it.
- (c). Check the intake manifold seal rubber ring for damage. If damaged, replace the rubber seal ring.
- (d). Check the throttle body for dirt. If so, clean it.



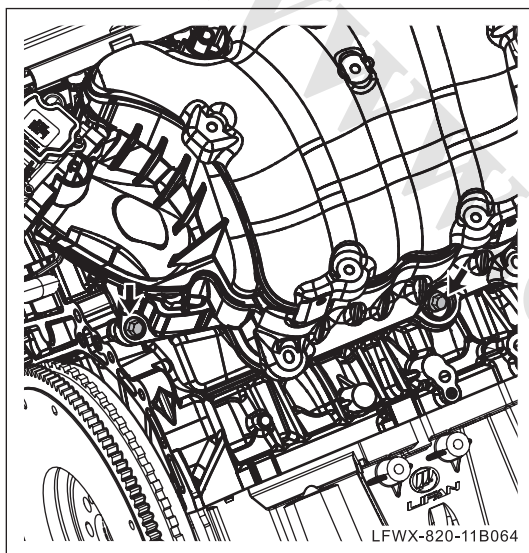
### 3. Installation of intake manifold

- (a) Install and tighten the bolts and nuts on the upper end of the intake manifold.

**Torque: 30N•m**

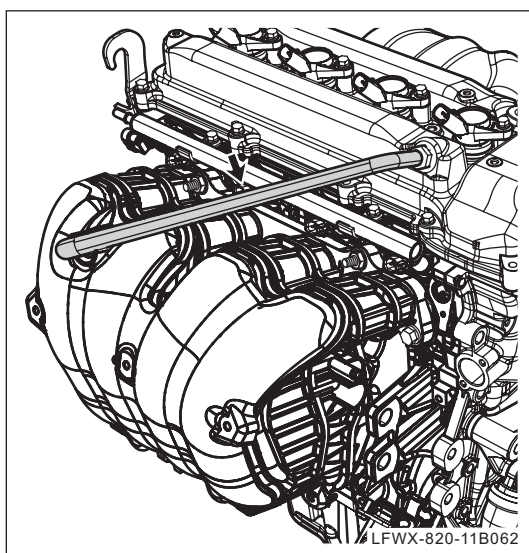
**Note:**

Here, install the two nuts on the upper end first. Do not tighten the nuts until all the bolts have been screwed into the screw holes by 2 to 3 threads. Tightening order: first two nuts, and then the long bolts (70). Finally, four long bolts (35).

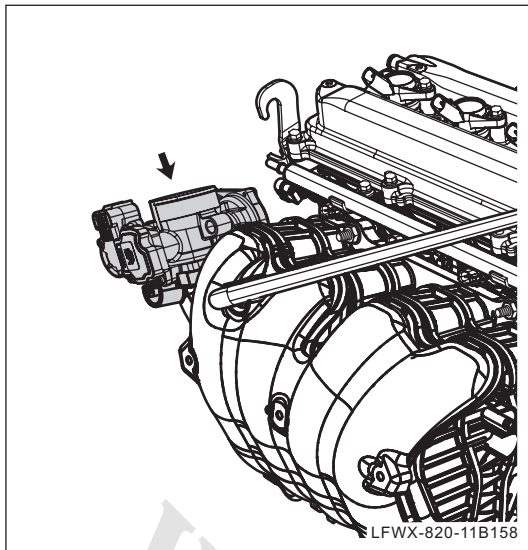


- (b) Fix the intake manifold to the cylinder head, and install and tighten the bolts on the lower end.

**Torque: 30N•m**



- (c) Fix the PCV hose and clamp to the mounting position.



- (d) Fix the throttle body to the intake manifold, and install and tighten the mounting bolts.

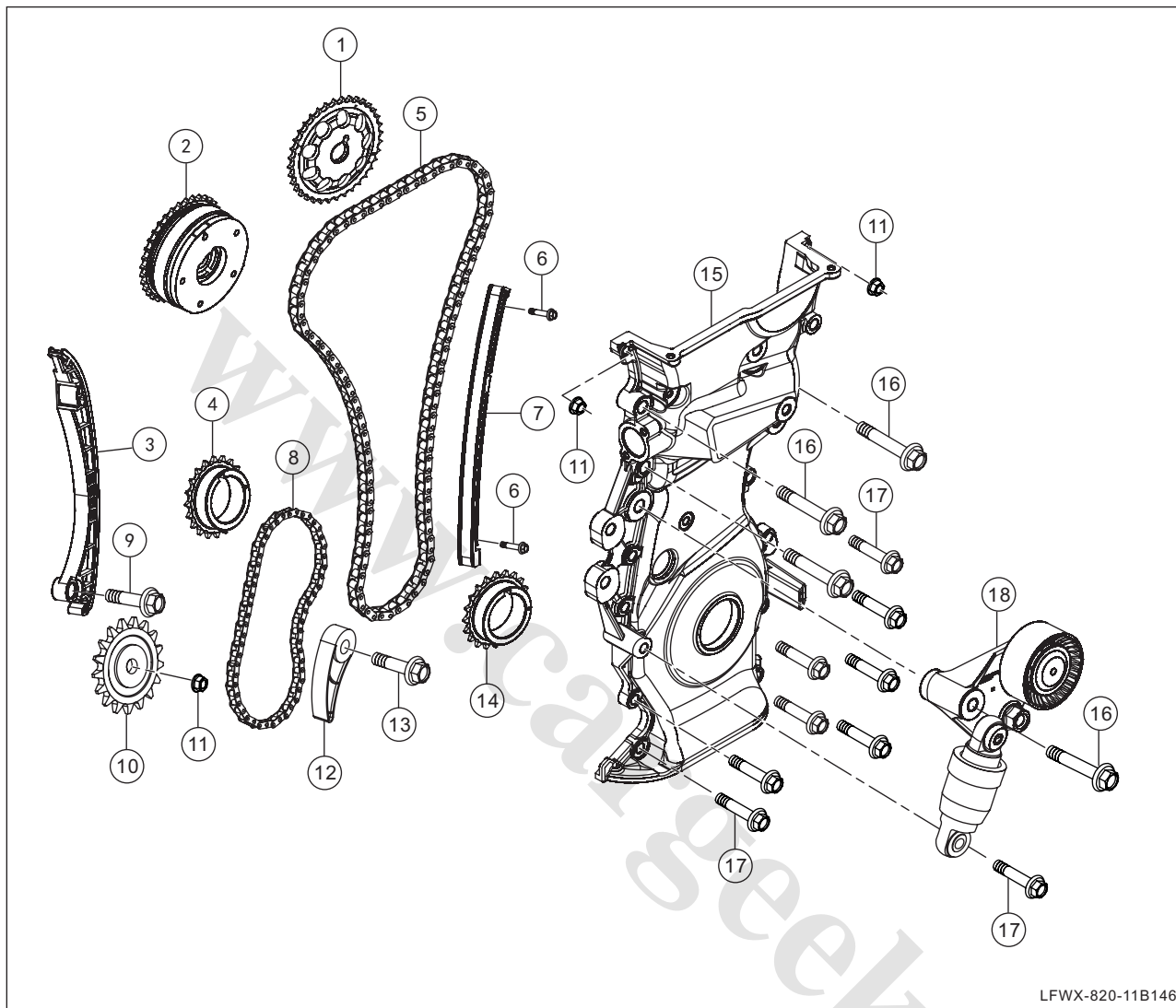
**Torque: 10N•m-12N•m**

11B

- (e) Install vacuum booster hose.
- (f) Install the throttle position sensor connector.
- (g) Install the intake pressure and temperature sensor connector.
- (h) Install the trim panel of the upper rail of the water tank. (See 81- Interior and Exterior- Water Tank' s Upper cross member Trim Panel, Replacement)

# Timing Part

## Components



LFWX-820-11B146

1	Exhaust timing sprocket
2	Intake phaser assembly
3	Chain slipper unit
4	Crankshaft oil pump sprocket
5	Timing chain
6	Hexagonal flange bolt
7	Chain guide unit
8	Oil pump chain
9	Slipper locating bolt

10	Oil pump sprocket
11	Oil pump sprocket nut
12	Moving rail for oil pump chain
13	Location bolts for moving rail of oil pump chain
14	Crankshaft timing sprocket
15	Timing cover
16	Hexagonal flange bolt
17	Hexagonal flange bolt
18	Tensioner assembly

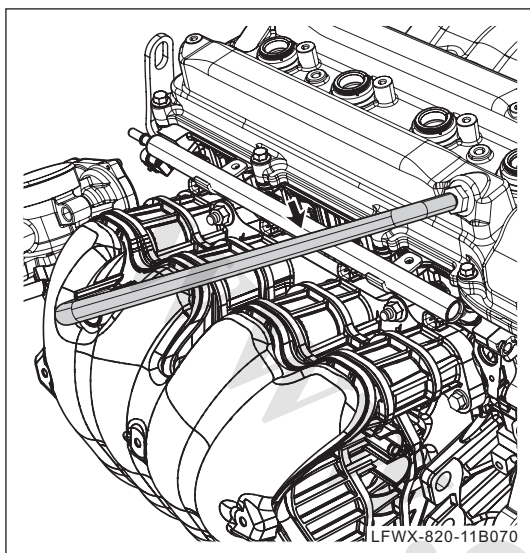
## Remarks:

The teeth of oil pump sprocket for crankshaft are thin.

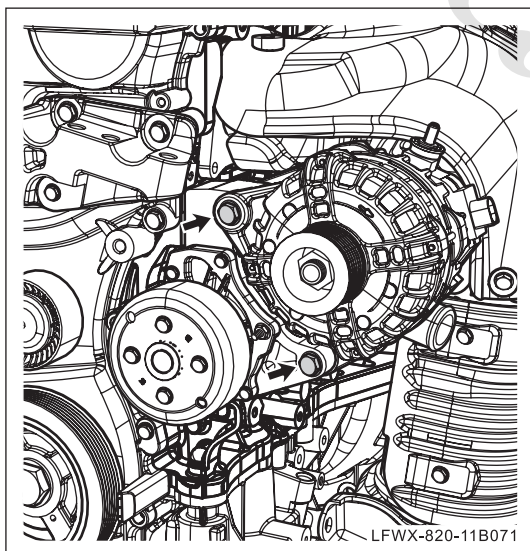
## Overhaul

### 1. Remove sprocket mechanism components

(a) Remove the spark plugs. (See 18 - Ignition System Spark Plug, Replacement)

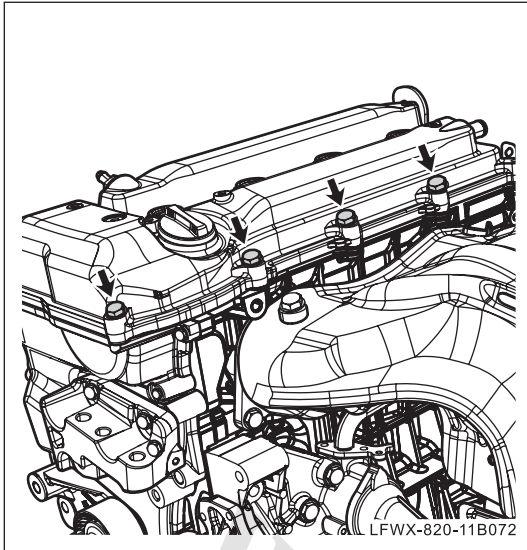


(b) Remove the PCV valve hose clamp and remove the hose.

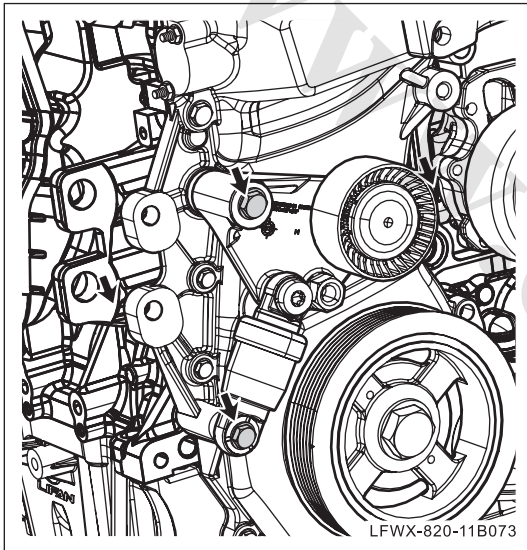
**11B**

(c) Remove engine belt.

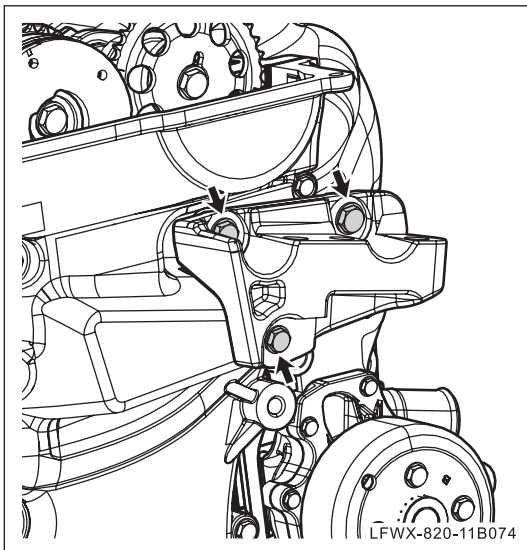
(d) Remove the fixing bolts of the alternator assembly, and then remove the alternator assembly.



- (e) Remove the bolts from the cylinder head cover, and remove the cylinder head cover.

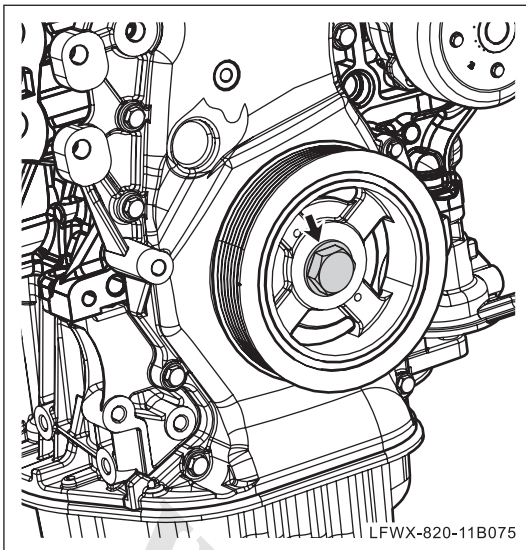


- (f) Remove the tensioner assembly.



- (g) Remove the right mounting bracket of the engine.





(h) Remove the crankshaft pulley bolt module.

△ HINT:

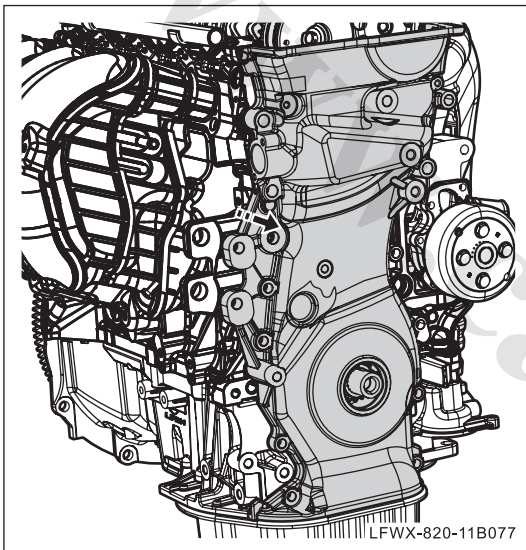
**When removing the crankshaft pulley bolt module, to prevent the crankshaft from rotating, fix the drive plate in advance.**

(i) Use a puller to remove crankshaft pulley remove.

ⓘ **Note:**

**When using a puller, do not damage crankshaft pulley.**

11B



(j) Remove the retaining nut from the tensioner, and remove the timing chain tensioner.

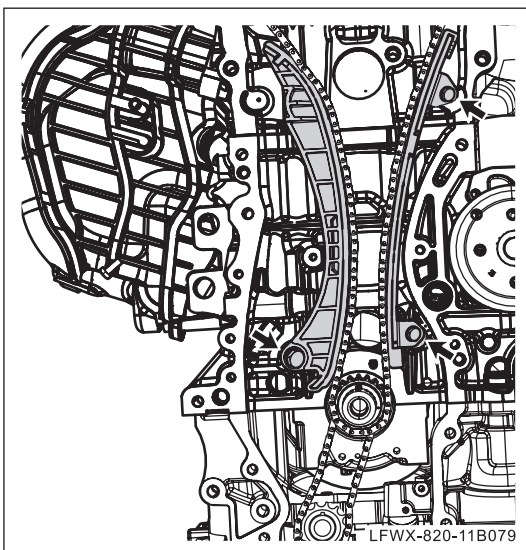
(k) Remove the bolts from the timing cover and remove the timing cover.

△ HINT:

**When removing the timing cover, due to the sealant, it may be uneasy to remove it. For the convenience for removal, tap the timing cover with a rubber hammer.**

ⓘ **Note:**

**Do not tap it with an iron hammer or a hard tool.**

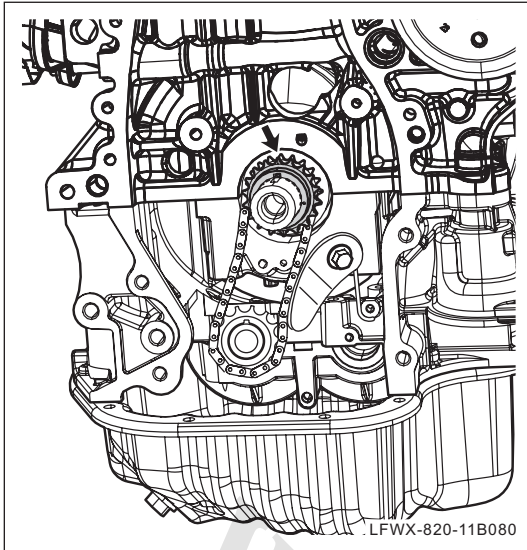


(l) Remove the bolts from the moving rail module and fixed rail module of the timing chain, and remove the moving rail module and fixed rail module.

ⓘ **Note:**

**To prevent any valve tappet or other part from striking piston due to rotation of crankshaft or camshaft when removing the timing part, be sure to crank the crankshaft before removal, so that all pistons do not stay at TDC or BDC positions.**

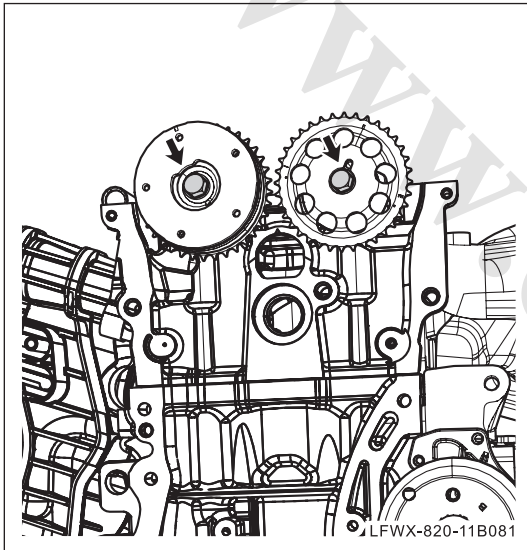
(m) Remove the timing chain.



- (n) Remove the crankshaft timing sprocket and woodruff key.

△ HINT:

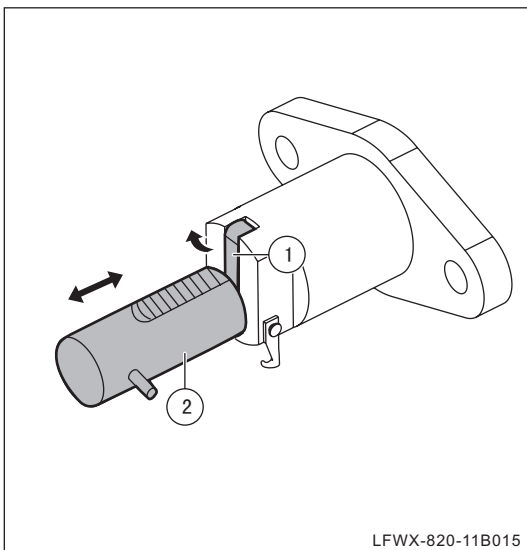
It is difficult to remove the woodruff key embedded in the keyway. In this case, it is unnecessary to remove the woodruff key. If removed at this step, do not miss it when installing.



- (o) Remove the exhaust timing sprocket bolts, and remove the exhaust timing sprocket.
- (p) Remove the phaser bolts, and remove the intake phaser assembly.

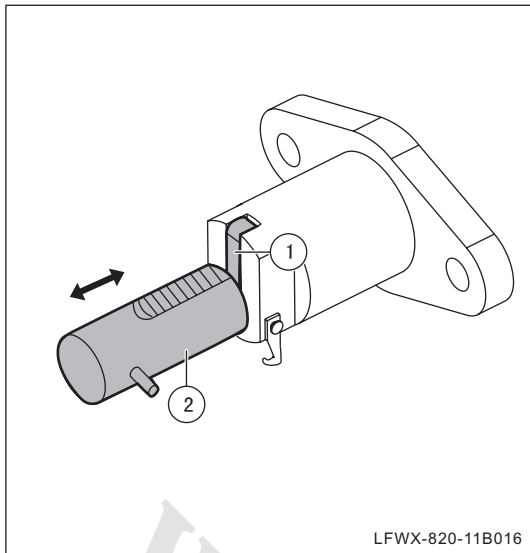
ⓘ Note:

To prevent the camshaft from rotating when removing, apply an opposing force to the camshaft using a wrench.



## 2. Check tensioner

- (a) Lift the tensioning shaft locking plate ①, and check whether the tensioning shaft ② can do telescopic movement. If not, replace the tensioner.



- (b) Let the locking plate ① lock the tensioning shaft ②, and check whether the tensioning shaft ② can do telescopic movement. If so, replace the tensioner.

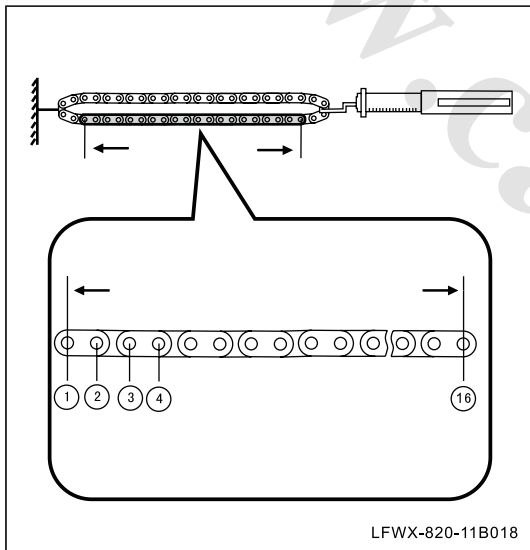
**Note:**

**This tensioning shaft can only move inwards but cannot extend outwards.**

**11B**

**3. Check the timing chain.**

- (a) Check the sprocket for damage. If any, replace it.

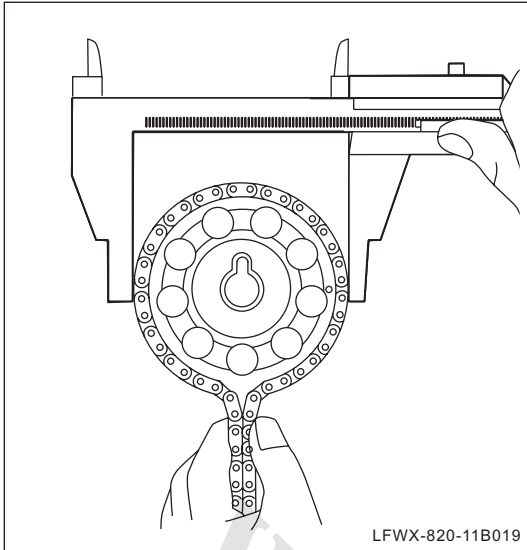


- (b). As shown in the figure, use spring pressure gauge to exert 140N force to the sprocket, and then use vernier caliper to check its length. If the length exceeds maximum extension length, replace the chain.

**Maximum extension of the chain:  
114.5mm**

**△ HINT:**

**According to the method shown in left figure, select 3 or more points as samples to measure chain length.**



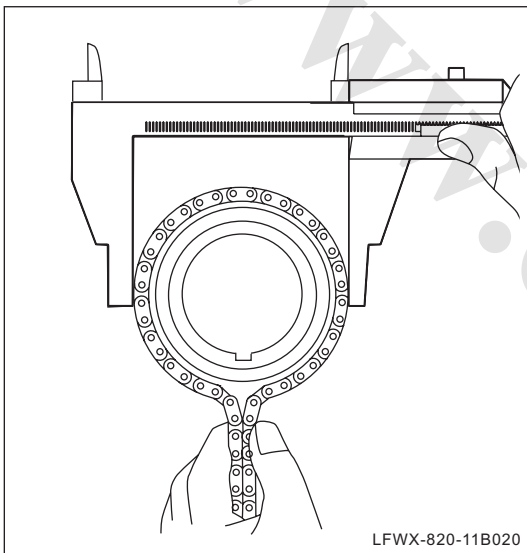
#### 4. Check the exhaust timing sprocket

- (a) Install the chain onto the exhaust timing sprocket.
- (b) Measure the diameter of the exhaust timing sprocket with timing chain using the calipers. If less than the predetermined value, replace the exhaust timing sprocket.

**Minimum diameter: 97.2mm**

#### ⓘ Note:

**When measuring, 2 measuring legs of vernier caliper must tightly contact with chain roller.**



#### 5. Check crankshaft sprocket

- (a). As shown in the figure, make the chain wind around the exhaust camshaft sprocket.
- (b). Use vernier caliper to check the diameter of camshaft sprocket when a sprocket is equipped. If this value is lower than the specified value, replace the camshaft sprocket.

**Minimum diameter: 51.5mm**

#### ⓘ Note:

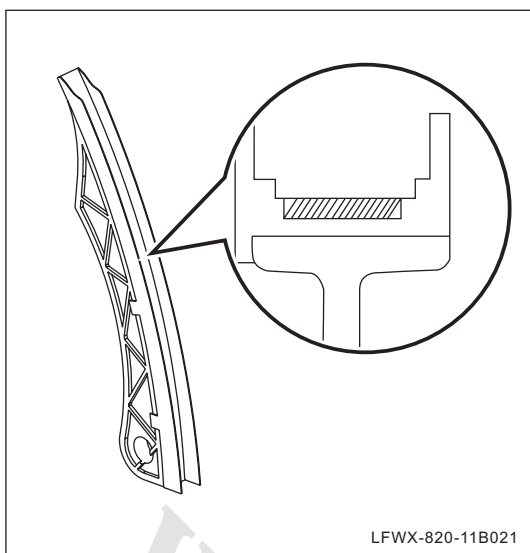
**When measuring, 2 measuring legs of vernier caliper must tightly contact with chain roller.**

#### △ HINT:

**Check the crankshaft pump sprocket and the oil pump sprocket in the same way.**

**Minimum diameter of the crankshaft pump sprocket: 48.3mm**

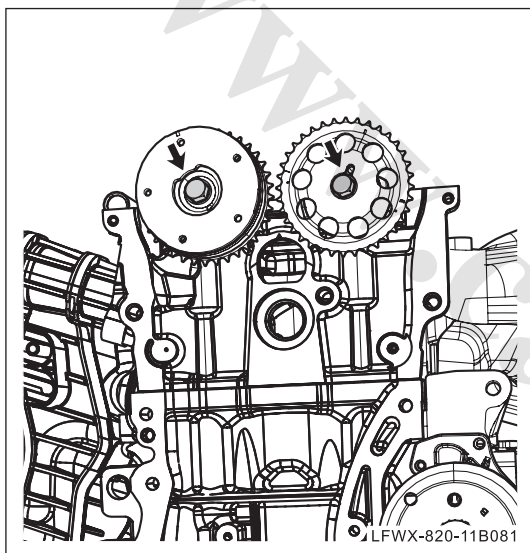
**Minimum diameter of oil pump sprocket: 48.3mm**



**6. Check the moving rail module of the timing chain.**

- (a) Check the moving rail for wear. If badly worn, replace it.

11B



**7. Install sprocket mechanism components**

- (a) Install the exhaust timing sprocket in place, and install and tighten the exhaust timing sprocket bolts.

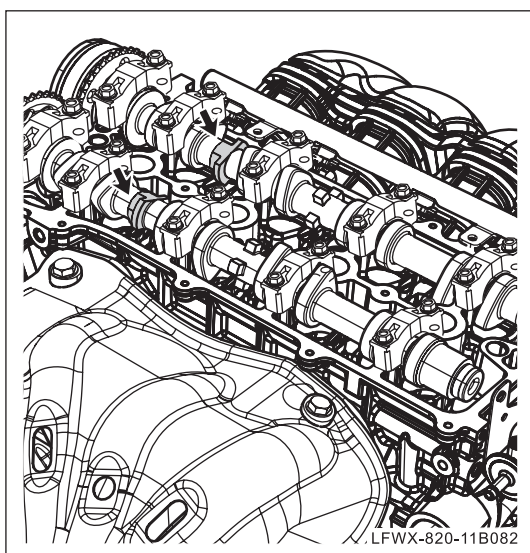
**Torque: 54 N.m**

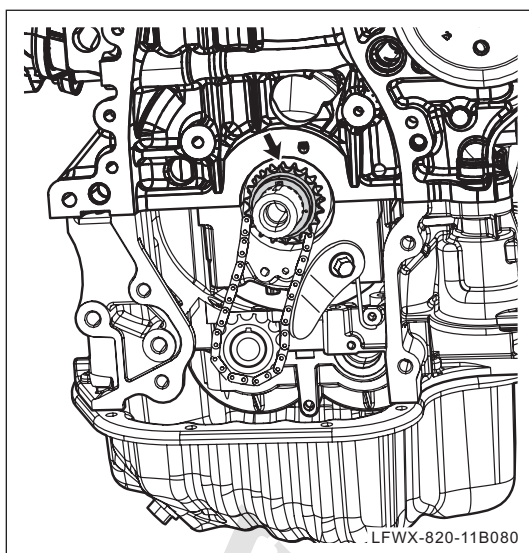
- (b) Install the intake phaser assembly in place, install and tighten the phaser bolts.

**Torque: 60 N.m**

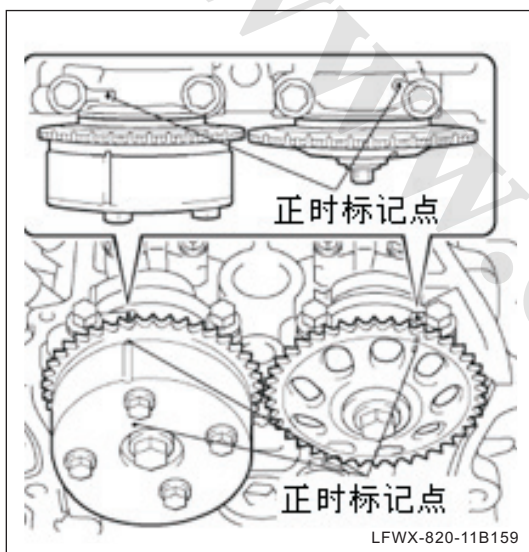
**Note:**

To avoid rotation of camshaft, it is necessary to use wrench to exert reversing force to camshaft (exert force to the position in left figure).





(c) Install the crankshaft timing sprocket.

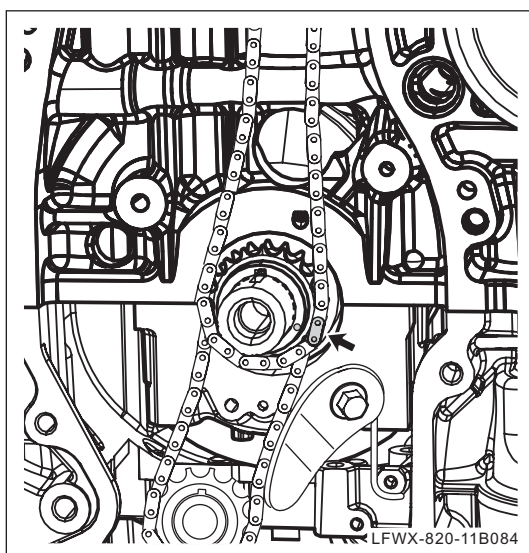


(d) Install timing chain.

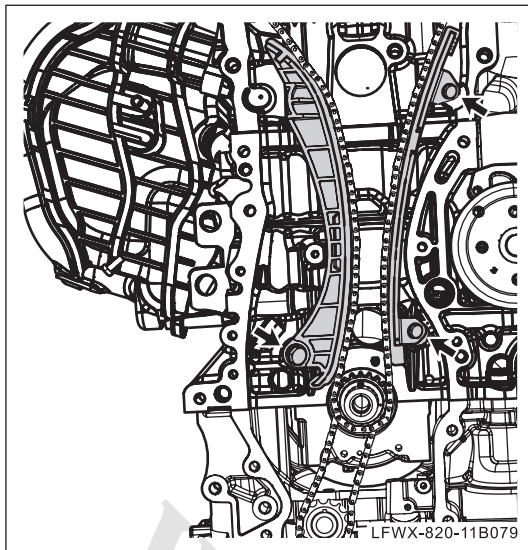
**Note:**

As shown in the figure, align the timing marks when installing the sprocket.

- Timing mark for installing camshaft sprocket.



- Mark for installing crankshaft timing sprocket.

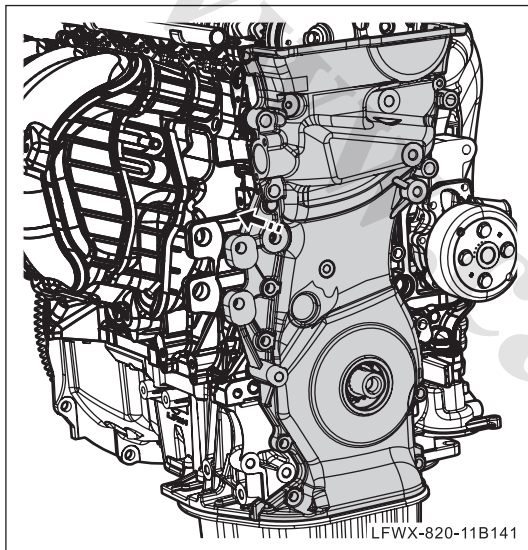


- (e) Install the moving rail module and fixed rail module of the timing chain, and install and tighten the bolts.

**Torque: 23N • m (moving rail)**

**11N • m (fixed rail)**

**11B**



- (f) Apply sealant on the bonding surface of timing cover uniformly.

**Note:**

**Before applying new sealant, it is necessary to remove old sealant.**

- (g) Fix the timing cover to the engine, and install and tighten the bolts.

**Torque for pulley nuts M6 (2): 23N • m**

**Torque for pulley bolts M8 × 30 (8): 25N•m**

**Torque for pulley bolts M10 × 40 (3): 55N•m**

**Torque for pulley bolts M6 × 30: 11N•m**

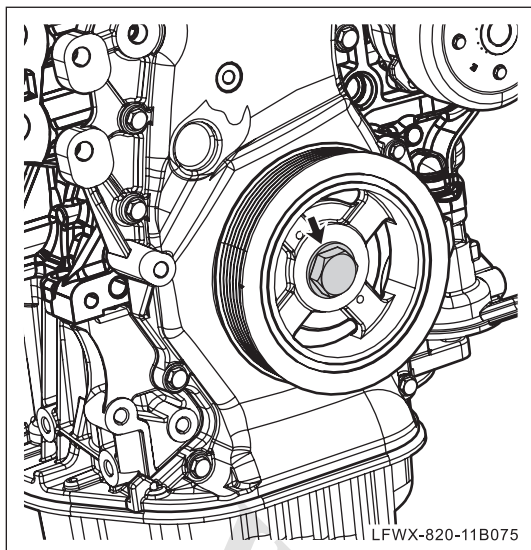
- (h) Install the timing chain tensioner in place, and install and tighten the nuts.

**Torque: 11N.m**

**△ HINT:**

When installing timing chain tensioner, lock the tensioner plunger piston by using locking plate at first. After tightening bolts of the tensioner is installed, rotate crankshaft counter clockwise to release locking plate.

- (i) Rotate crankshaft clockwise to check if the timing chain tensioner is installed correctly.

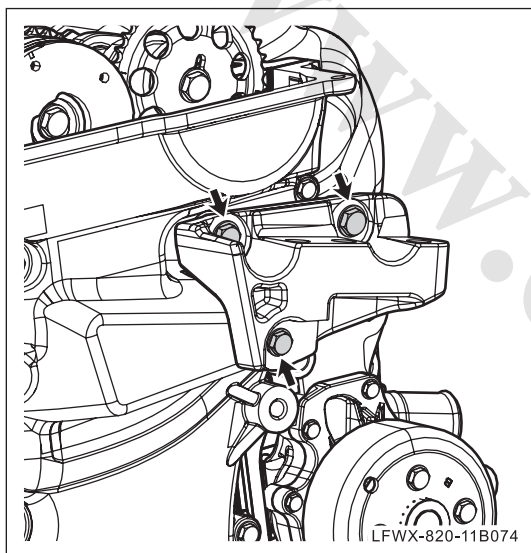


- (j) Install the crankshaft pulley in place, and install and tighten the bolt module.

**Torque: 150N.m**

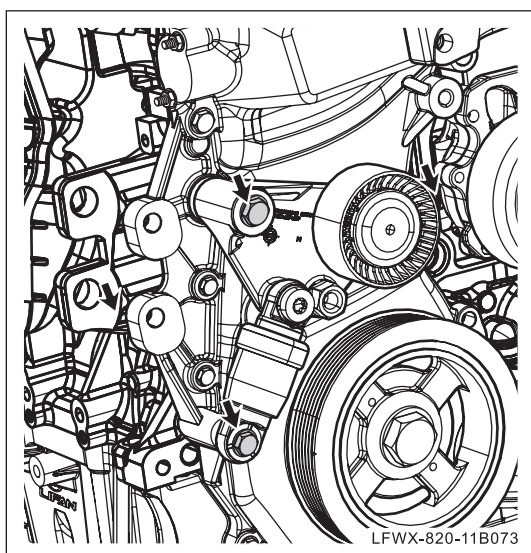
△ HINT:

When installing the bolt module for crankshaft pulley, to prevent the crankshaft from rotating, fix the drive plate in advance.



- (k) Install the right mounting bracket of the engine in place, and install and tighten the bolts.

**Torque: 52N.m**

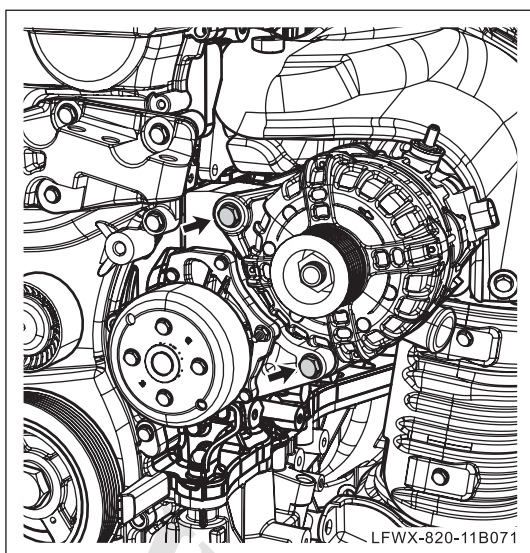


- (l) Install the tensioner assembly in place, and install and tighten the mounting bolts.

**Torque for pulley bolts M10×80: 53N•m**

**Torque for pulley bolts M8×70: 30N•m**



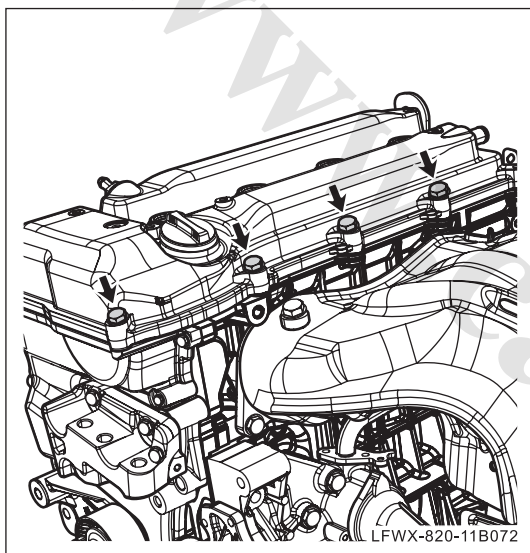


- (m) Install the alternator assembly in place, and mount & tighten the fixing bolts.

**Torque for pulley bolts M10 × 80: 52N•m**

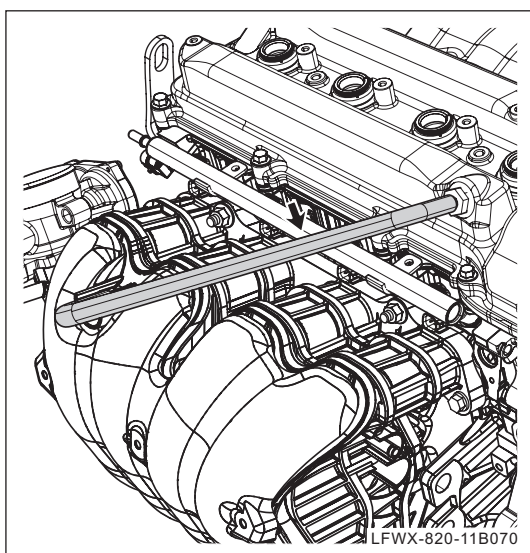
**Torque for pulley bolts M8 × 40: 21N•m**

11B



- (n) Install the cylinder head cover in place, install and tighten the bolts and nuts according to the specified order.

**Torque: 11N.m**

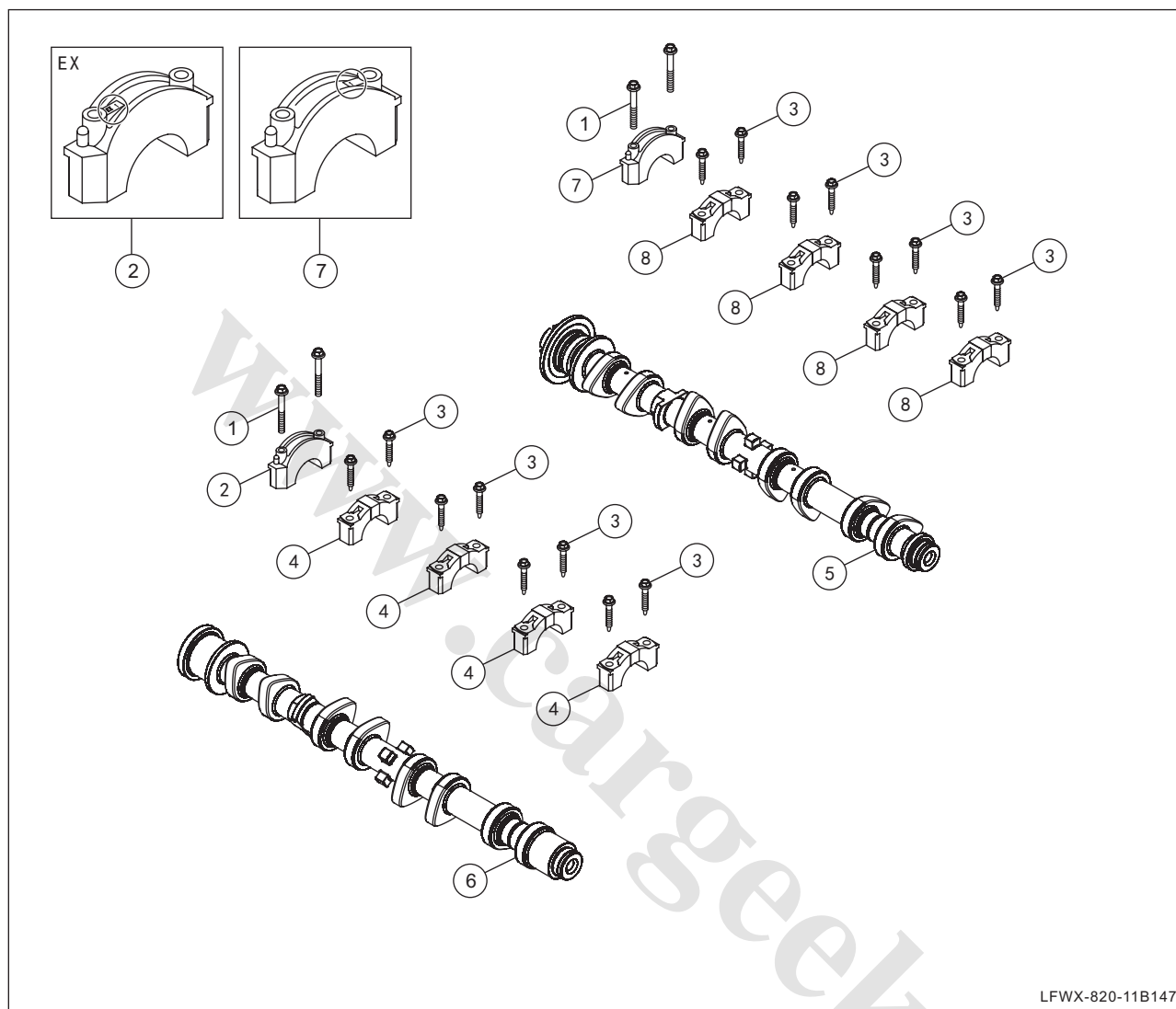


- (o) Install the PCV valve hose and clamp in place.

- (p) Install the spark plug. (See 18 - Ignition System Spark Plug, Replacement)

# Camshaft

## Components



LFWX-820-11B147

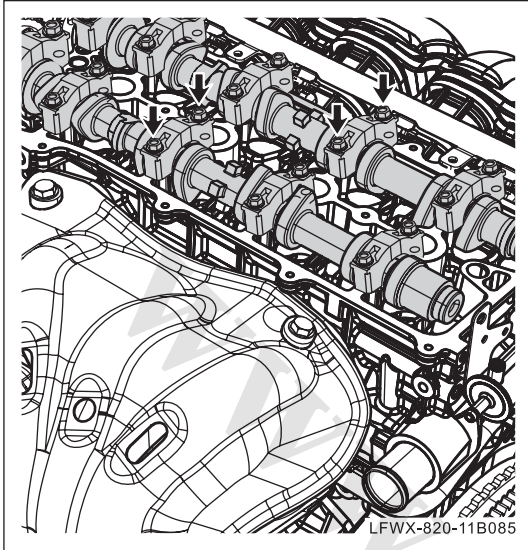
1	Bolts for camshaft cover I
2	No. 1 camshaft bearing cap (exhaust)
3	Bolts for camshaft cover
4	Camshaft bearing cap (exhaust)

5	Intake camshaft
6	Exhaust camshaft
7	No.1 Camshaft bearing cap (intake)
8	Camshaft bearing cap (intake)

## Overhaul

### 1. Remove camshaft assembly

- (a) Remove the timing sprocket mechanism module. (See 11B- Engine Mechanical System-Timing Part, Check and Repair)



- (b). Remove bolts of camshaft bearing cap, and remove all camshaft bearing caps.

**11B**

**Note:**

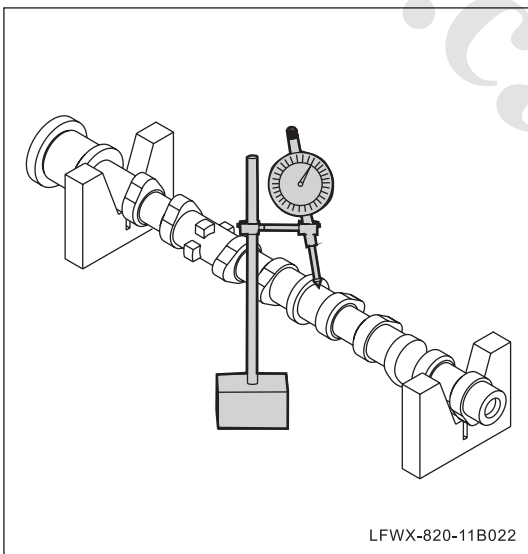
- Remove the camshaft cap bolts in pairs.
- Put the removed camshaft bearing caps in order. Be careful to distinguish the intake/exhaust camshaft bearing caps, exhaust camshaft bearing cap.

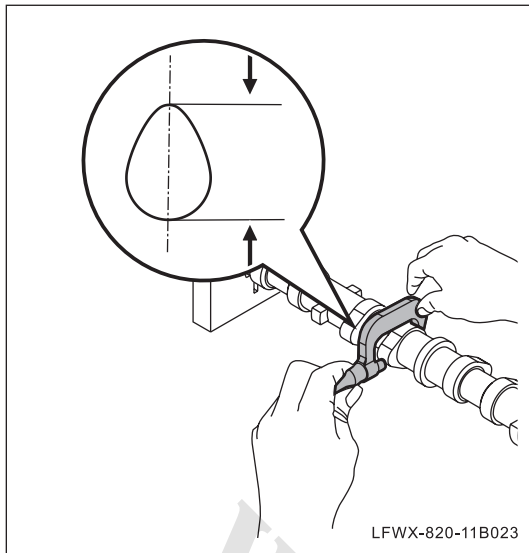
- (c). Remove intake and exhaust camshafts.

### 2. Check camshaft radial run-out

- (a) Place the camshaft on a V block, measure its circumference radial run-out at intermediate journal with a dial gauge. If radial run-out is larger than the maximum value, replace the camshaft.

**Maximum value: 0.03mm**



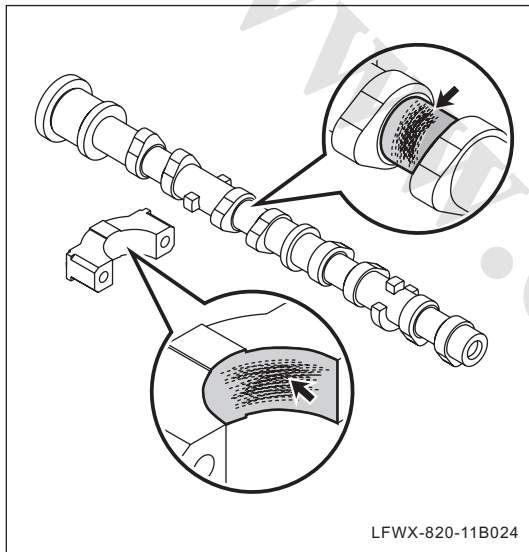


### 3. Check maximum lift of intake/exhaust camshaft

- (a). As shown in the figure , measure maximum lift of intake/exhaust camshaft with a screw micrometer. If it does not conform to the specification, replace it.

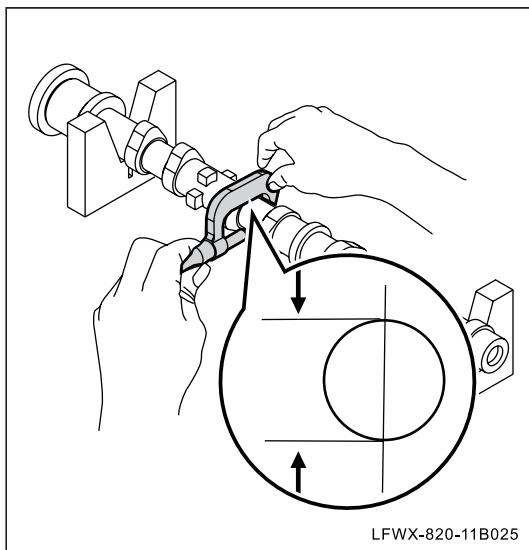
**Intake: 10.1037mm**

**Exhaust: 9.0231mm**



### 4. Check camshaft journal

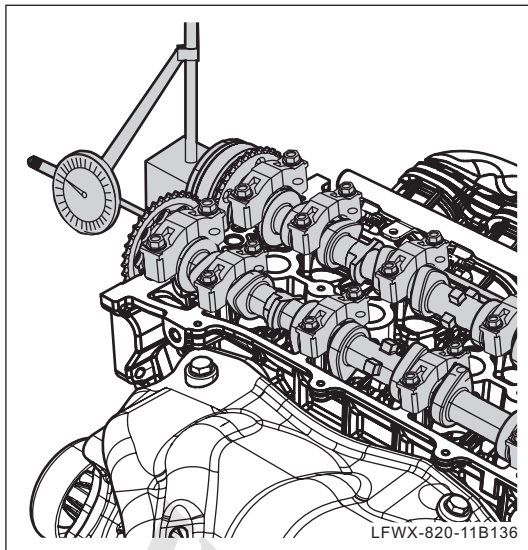
- (a). Check if camshaft journal and bearing cap have rusting, abrasion and other damage. If any, replace it. If necessary, replace the cylinder head.



- (b). Measure the camshaft journal with the screw micrometer. If it is inconsistent with the specified value, check the clearance of oil film.

**No.1 Exhaust: 35.971mm - 35.985mm**

**Other: 22.959mm - 22.975mm**

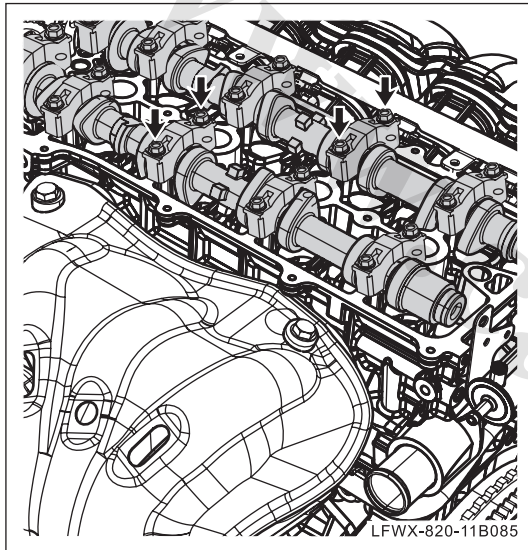


### 5. Check camshaft axial clearance

- (a). Install intake/exhaust camshaft on cylinder head.
- (b). Make the camshaft in alternate motion, and measure the axial clearance of camshaft. If it is inconsistent with the specified value, replace the camshaft. If necessary, replace the cylinder head.

**Standard axial clearance: 0.08mm - 0.135mm**

**Maximum axial clearance: 0.15mm**

**11B**


### 6. Install camshaft assembly

#### ⓘ Note:

**Before installing the camshaft assembly, make sure that all pistons do not stay at TDC or BDC positions.**

- (a). Install intake and exhaust camshafts on the cylinder head.

#### ⓘ Note:

- **Apply clean oil onto each contact surface of the camshaft evenly.**
  - **Be careful to distinguish intake and exhaust camshafts.**
- (b). Install the camshaft bearing cap in place, and install and tighten the bolts.

**Torque for pulley bolts M8 × 50 (4): 25N•m**

**Torque for pulley bolts M6 × 40 (16): 25N•m**

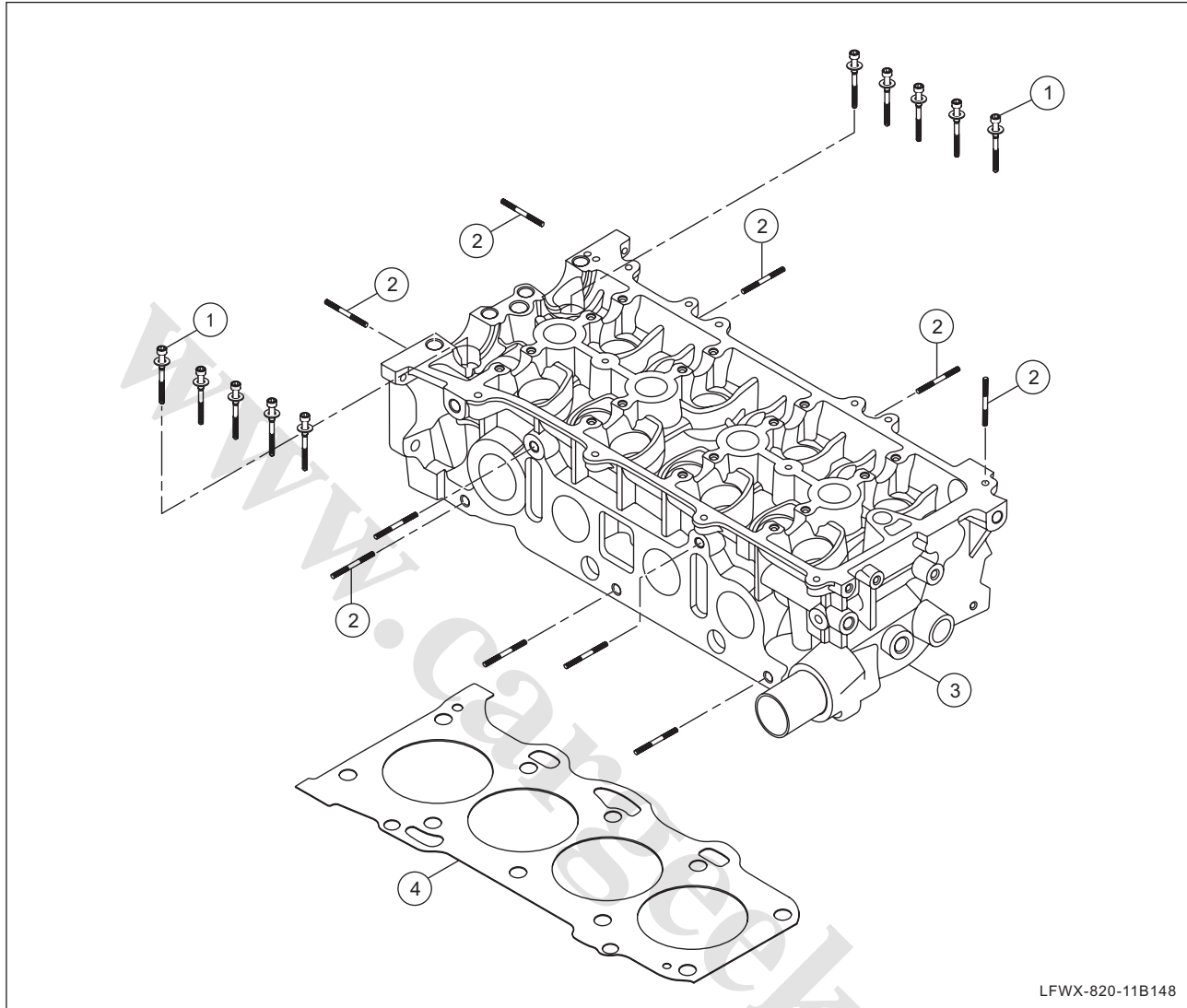
**ⓘ Note:**

- **Be sure to distinguish the intake and exhaust camshaft bearing caps and the sequence of bearing caps to avoid confusion. Intake side is marked by Letter I, and exhaust side by Letter E.**
- **Tighten fixing bolts of camshaft bearing cap in pair.**
- **After tightening the bolt of the camshaft bearing caps, make sure that the camshafts will rotate smoothly without seizure.**

- (c) Install the timing sprocket mechanism module. (See 11B- Engine Mechanical System-Timing Part, Check and Repair)

# Cylinder Head

## Components



11B

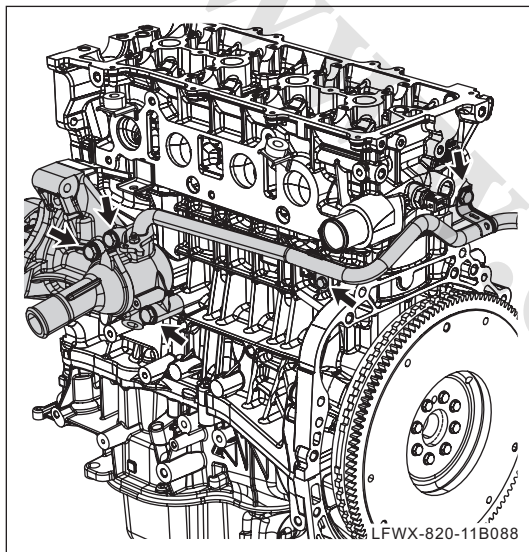
1	Cylinder head bolt I
2	Stud bolt

3	Cylinder head assembly
4	Cylinder head gasket

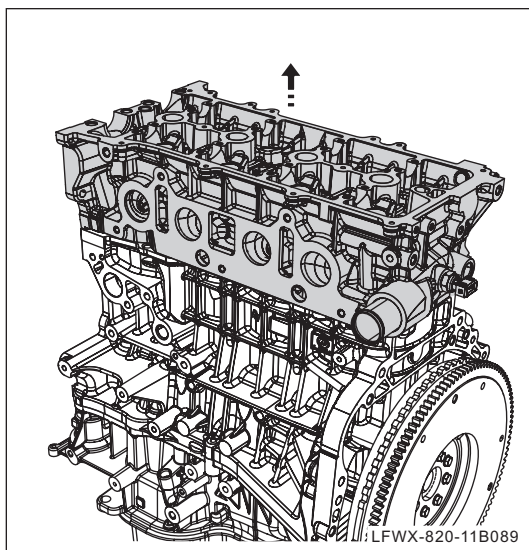
## Overhaul

### 1. Removal of cylinder head

- (a) Remove the canister solenoid valve. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)
- (b) Remove the injector. (See 13- Fuel System-Injectors, Replacement)
- (c) Remove intake manifold. (See 11B- Engine Mechanical System-Intake Manifold, Check and Repair)
- (d) Remove the exhaust manifold.
- (e) Remove the camshaft. (See 11B- Engine Mechanical System-Camshaft, Check and Repair)

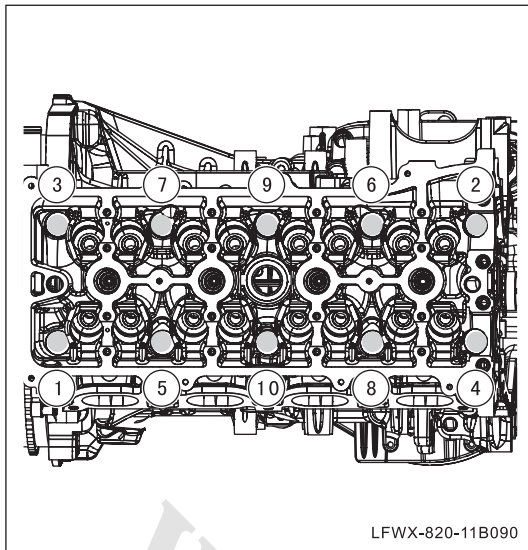


- (f) Remove the water pump module and the heater pipes.



- (g) Remove the cylinder head bolts and remove the cylinder head and gasket.





**Note:**

When removing cylinder head bolt, unscrew and remove cylinder head bolt in order shown in the figure.

11B

- (h) Remove the valve module. (See 11B- Engine Mechanical System-Valves, Check and Repair)

**2. Check cylinder head components**

- (a) Clean the sealant and engine oil on the cylinder head.  
 (b) Clean the carbon deposits inside the cylinder head combustion chamber.

**Note:**

**Do not use any sharp tool to scrape the carbon deposits. When removing the carbon, be careful not to scrape or damage the metal surface.**

- (c) Use high-pressure water gun to clean the cylinder head.

△ HINT:

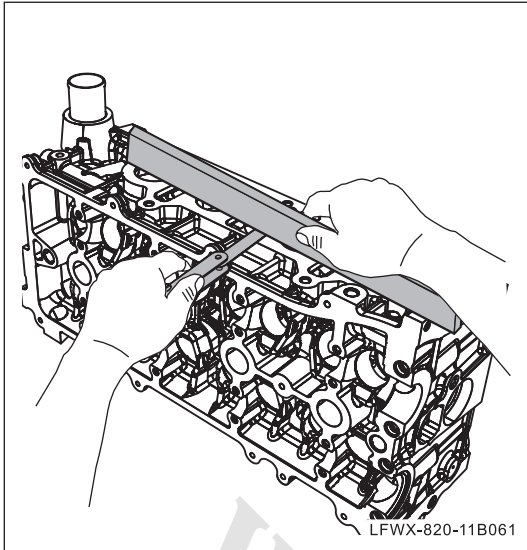
Mainly means the water pipe and the fuel pipe

- (d) Dry the cylinder head with compressed air.

**Note:**

**When using compressed air, we recommend you wear goggles and protective masks to avoid personal injury due to flying debris or dirt.**

- (e) Check the cylinder head fixing bolts for damage. If any, replace them.



- (f) Check the cylinder block interface and the intake and exhaust sides for flatness with the ruler and feeler gauge. If the flatness exceeds the maximum value, replace the cylinder head.

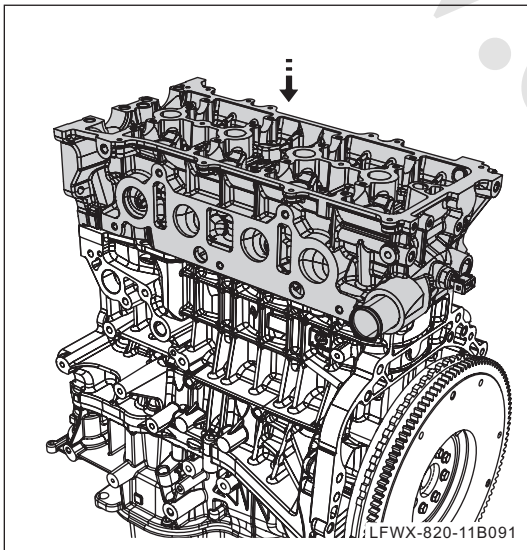
**Block interface: 0.03mm**

**Intake side:0.06mm**

**Exhaust side:0.06mm**

### 3. Installation of cylinder head

- (a) Install valve components. (See 11B- Engine Mechanical System-Valves, Check and Repair)



- (b) Install cylinder head pad onto the cylinder block.

△ HINT:

Before installation, check whether the cylinder head locating pins are installed.

ⓘ Note:

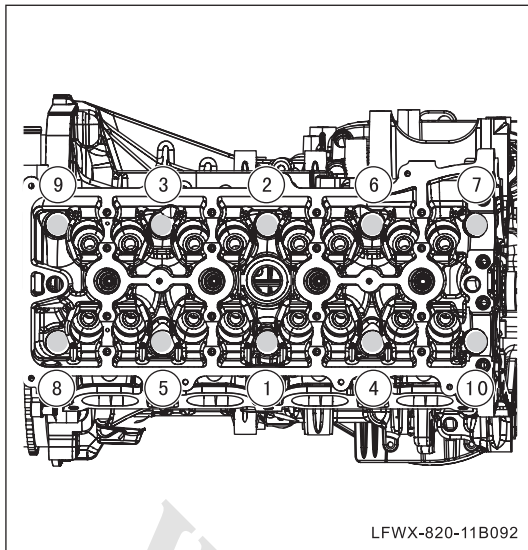
**Pay attention to replace with new cylinder head pad; meanwhile pay attention to the face and back sides to ensure correct installation.**

- (c) Fix the cylinder head to the cylinder block, and install and tighten the cylinder head bolts.

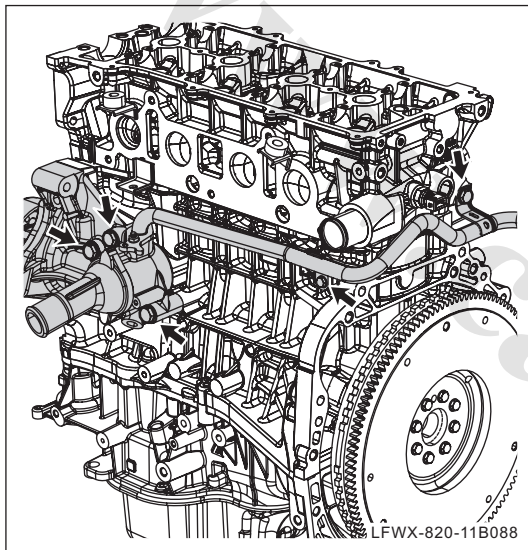
**First time: 30N•m**

**Second time: 70N • m**

**Third time: 100N•m**


**Note:**

- Apply appropriate amount of clean oil onto the threaded portion of the cylinder head bolts.
- When tightening cylinder head bolt, tighten twice according to the order shown in the figure.

**11B**

- (d) Install the water pump module and heater pipe in place, and install and tighten the mounting bolts and nuts.

**Torque: 45 N.m**

**Note:**

The torque for heater pipe bolt is 11N • m.

- (e) Install the camshaft. (See 11B- Engine Mechanical System-Camshaft, Check and Repair)
- (f) Install the exhaust manifold.
- (g) Install the intake manifold. (See 11B- Engine Mechanical System-Intake Manifold, Check and Repair)
- (h) Install the injector. (See 13- Fuel System-Injectors, Replacement)
- (i) Install the canister solenoid valve. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)

# Valve

## Components



LFWX-820-11B149

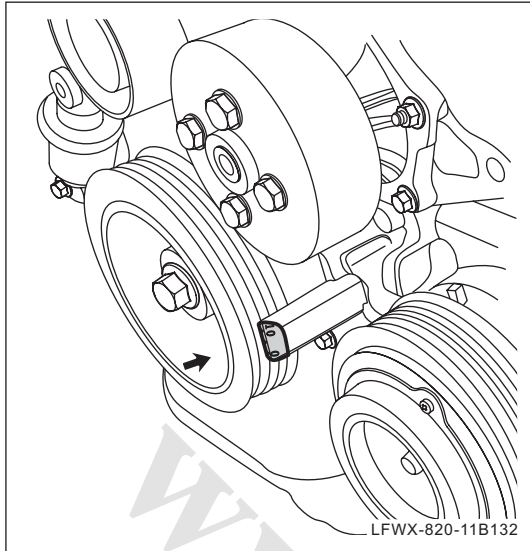
1	Tappet
2	Valve cotter
3	Valve spring seat
4	Exhaust valve oil seal

5	Valve seat
6	Valve spring
7	Exhaust valve
8	Intake valve

### Remarks:

Intake valve disc surface is larger, but that of the exhaust valve is smaller.

## Adjustment



### 1. Check and adjust valve clearance

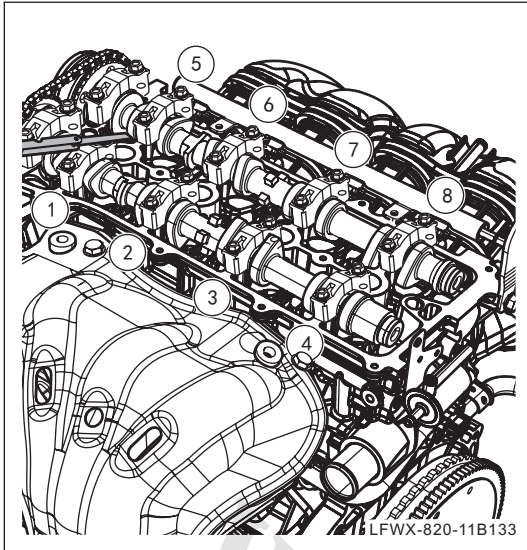
- (a) Adjust the No.1 cylinder piston to the top dead center position of the compression stroke.

△ HINT:

The timing mark on the crankshaft pulley is the notch on the pulley. The timing cover is marked with "0, 5 and 10", respectively. When aligning the timing marks, make sure the notch is in alignment with the "0".

**11B**

- (b) Determine whether the piston of No.1 cylinder or No.4-cylinder is at the TDC of the compression stroke.
- **Remove the cylinder head cover. (See 11B- Engine Mechanical System-Timing Part, Check and Repair)**
  - **Observe the cam position of the exhaust camshaft of No.1 cylinder or No.4-cylinder. If the cam position of the exhaust camshaft of No.1 cylinder faces downwards (i.e., the exhaust valve is about to open), then the piston of No.4 cylinder is at the TDC of compression stroke. If the cam position of the exhaust camshaft of No.4 cylinder faces downwards (i.e., the exhaust valve is about to open), then the piston of No.1 cylinder is at the TDC of compression stroke.**



(c) Check valve clearance.

- When the piston of No.1 cylinder is at the TDC of compression stroke, use a feeler gauge to measure the valve clearance of valve 1, 3, 5 and 6, and record the results.
- Rotate the crankshaft by  $360^\circ$ , measure valve clearance of the other eight valves with a feeler gauge and record them.

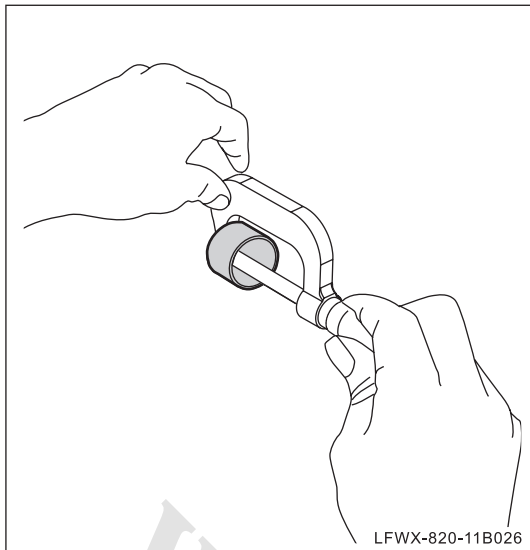
**Standard intake valve clearance (cold):  
0.20mm - 0.25mm**

**Standard exhaust valve clearance  
(cold): 0.30mm - 0.35mm**

△ HINT:

If the valve clearance is inconsistent with the standard value, you can replace the mechanical tappet of the valve head to make its valve clearance reach the standard value.

- When the piston of No.4 cylinder is at the TDC of compression stroke, use a feeler gauge to measure the valve clearance of valve 2, 4, 7 and 8, and record the results.
- Rotate the crankshaft by  $360^\circ$ , measure valve clearance of the other eight valves with a feeler gauge and record them.



- (d) Adjust valve clearance.
- Remove the camshaft. (See 11B- Engine Mechanical System-Camshaft, Check and Repair)
  - Remove the mechanical tappet to be replaced.
  - Measure tappet top end thickness with a screw micrometer.
  - Calculate new tappet top end thickness.

11B

Calculation method:

New mechanical tappet top end thickness = measured clearance value - standard clearance value + replaced tappet top end thickness

- (e) Re-install the engine.

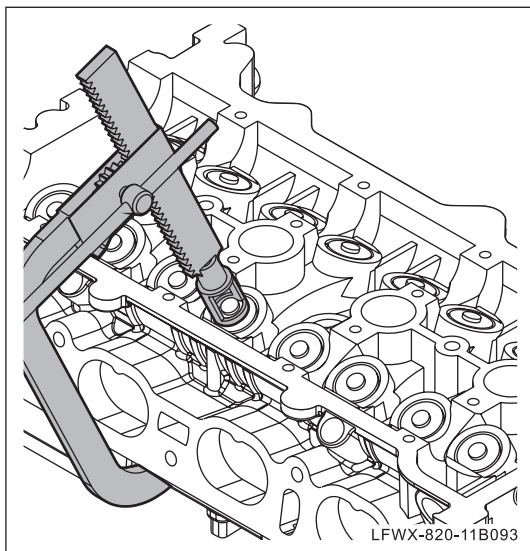
## Overhaul

### 1. Remove valve components

- (a) Remove the cylinder head. (See 11B- Engine Mechanical System-Cylinder Head, Check and Repair)
- (b) Remove all the tappets in turn.

#### **Note:**

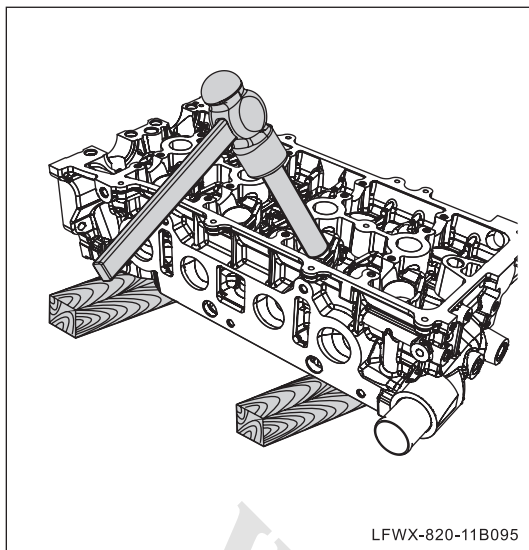
Place the removed tappets in turn in accordance with their mounting positions for subsequent installation.



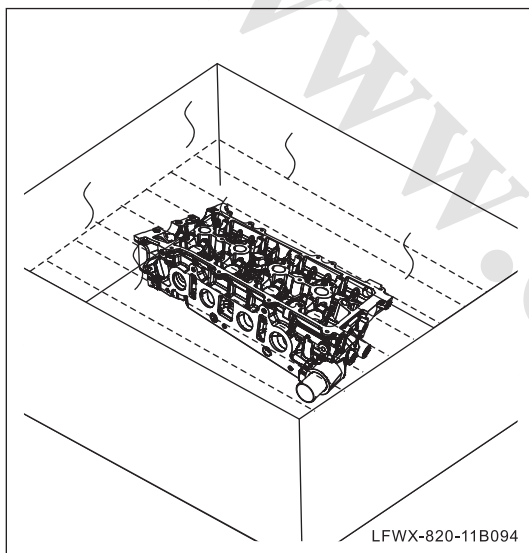
- (c) Remove valve keeper with special tool.
- (d). Remove valve, valve retainer, valve spring and valve oil seal in turn.

#### **Note:**

Once the oil seal is removed, it cannot be used any longer. A new oil seal must be used for installation.



(e) Heat the cylinder head to 80°C - 100°C .



(f) Put cylinder head onto a wooden plate, and use special tool to take out valve guide.

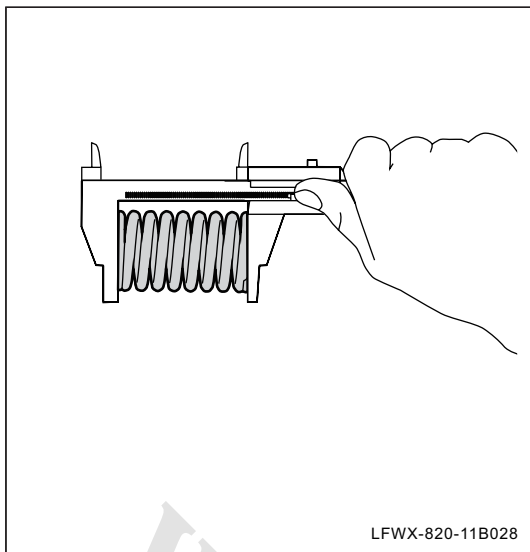
**Note:**

- The valve guide cannot be used again once it's removed.
- The interference fit between the valve guide and the cylinder head is applied, so a valve guide with a enlarged size will be required when installing the new valve guide.

## 2. Check valve components

(a) Check the valve cotter for cracks or damage. If any, replace it.

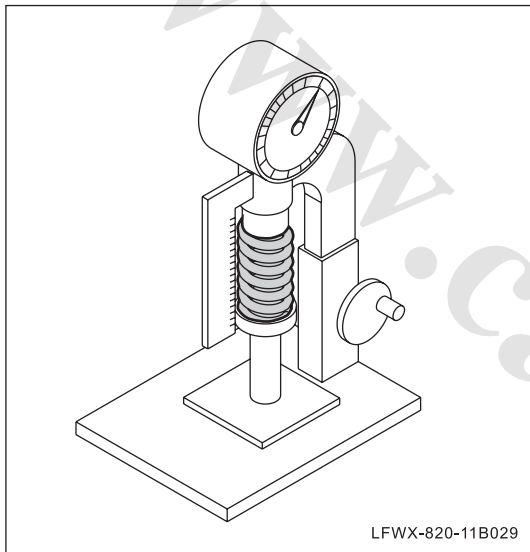




- (b) Measure the free length of valve spring with a dial caliper. If it does not conform to the specification, replace it.

**Free length: 45mm**

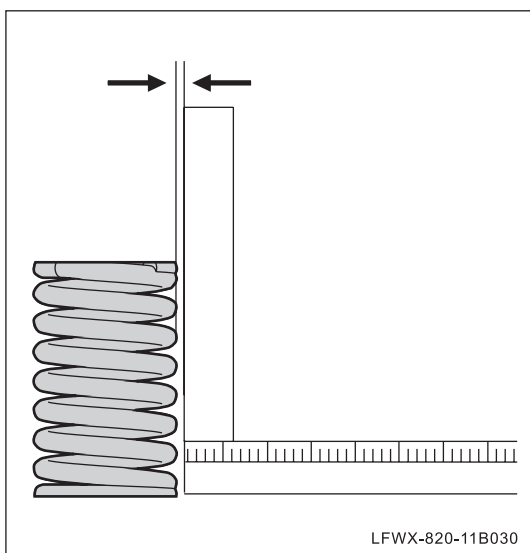
11B



- (c) Measure spring force at standard compression length with a spring-loaded thrust meter. If it does not conform to the specification, replace it.

**Elastic force for installation: 136Nm - 148Nm**

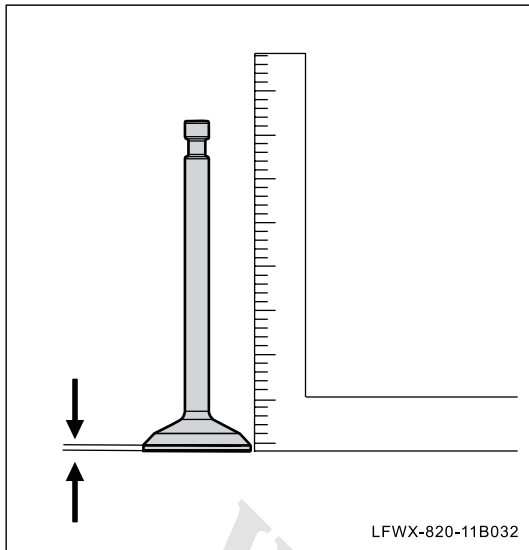
**Maximum operating force: 316 Nm - 348 Nm**



- (d) With a ruler and flat plate, according to the clearance between valve spring end and the ruler, check perpendicularity of each spring. If it does not conform to the specification, replace it.

**Maximum deviation: 1.5mm**

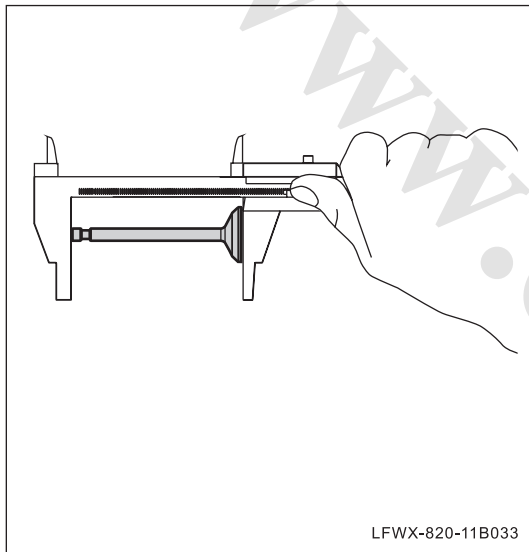
- (e) Clean all carbon deposits on the valve. Check if the working surface and valve stem of each valve are worn, burnt or deformed. If so, repair them. If necessary, replace them.



- (f) Measure valve edge thickness with a try square. If the measured value is less than the minimum value, replace the valve.

**Standard thickness: 1.05~1.45mm**

**Minimum thickness: 0.6mm**



- (g) Measure valve length with a dial caliper. If it does not conform to the specification, replace it.

**Standard length:**

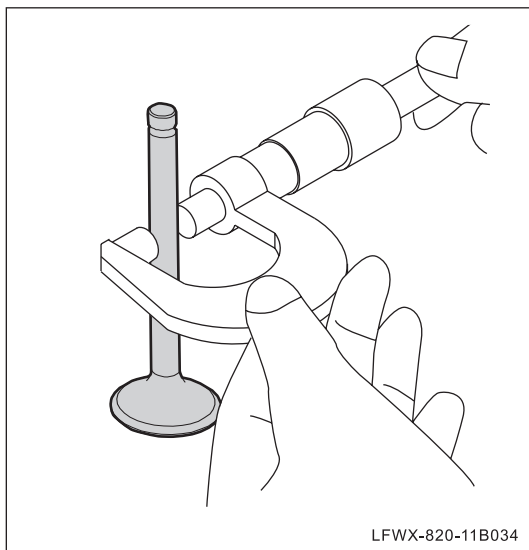
**Intake valve: 101.7mm**

**Exhaust valve: 101.4mm**

**Minimum length:**

**Intake valve: 101.4mm**

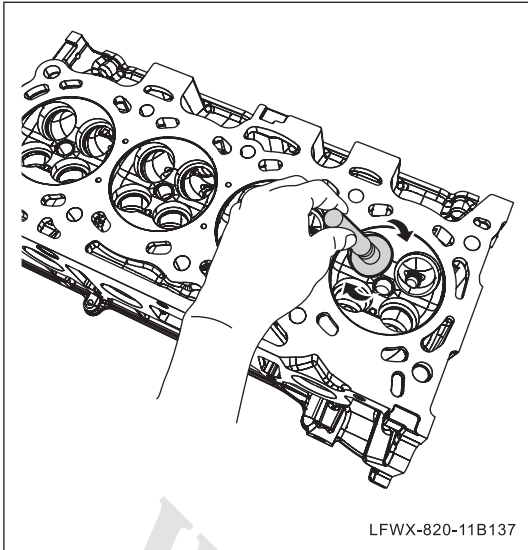
**Exhaust valve: 101.1mm**



- (h) Measure valve stem diameter with a micrometer. If it does not conform to the specification, replace it.

**Intake valve: 5.465mm - 5.480mm**

**Exhaust valve: 5.470mm - 5.485mm**

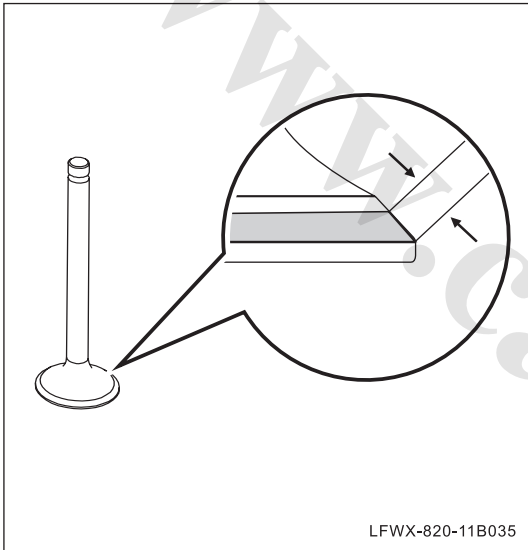


(i) Check the width of valve-seat contact.

△ HINT:

- Apply a layer of blotting membrane to valve seat and then install the valve on cylinder head.
- Rotate the valve in 1/4 turns for several times with the valve grinding tool, and then remove the valve.

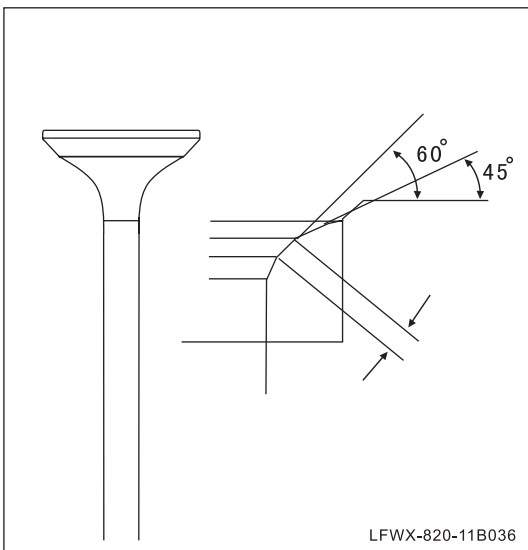
11B



ⓘ Note:

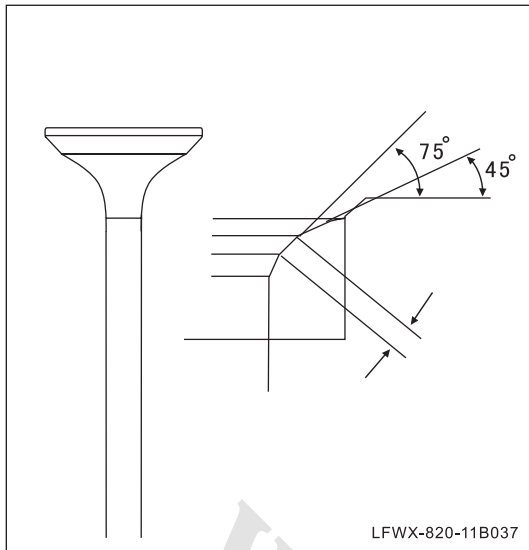
- The imprint on valve fitting surface must be continuously annular, and the annular imprint width must be within specified range. If the imprint between valve seat and valve is not uniform or the imprint width is not within the specified range, it is necessary to regrind or cut, grind or polish the valve seat.

Intake valve seat width: 1.1mm - 1.3mm



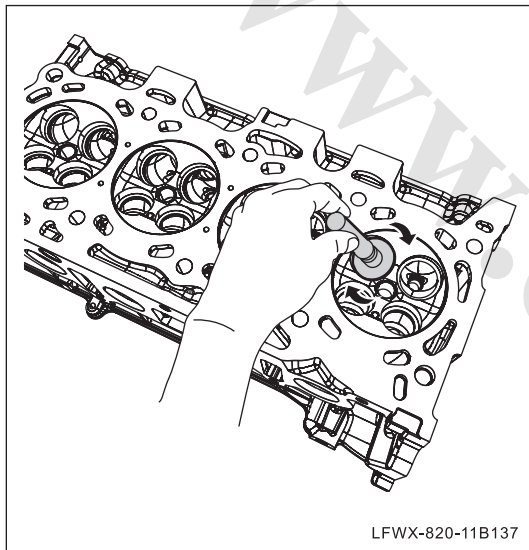
- Intake valve seat: repair it twice with a valve seat reamer. Two reamers must be used for repairing: one for 15° and one for 45°. At the second time, it is a must to get the required width.

Intake valve seat width: 1.1mm - 1.3mm



- **Exhaust valve seat: repairing procedure is the same as that of intake valve.**

**Exhaust valve seat width: 1.1mm - 1.4mm**

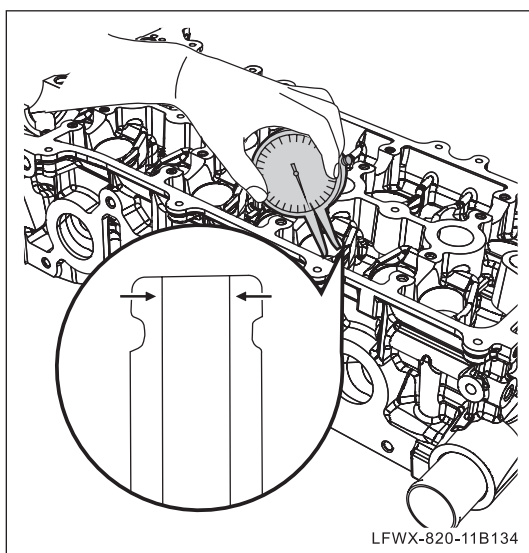


- (j) Grind valve.

△ HINT:

Firstly apply rough abrasive paste on valve seat surface, grind the valve with a grinding tool, then apply fine abrasive paste and go on grinding until the valve and valve seat are perfectly matched.

- (k) After grinding, completely clean valve and valve seat.



- (l) Measure the valve guide inner diameter with the internal micrometer.

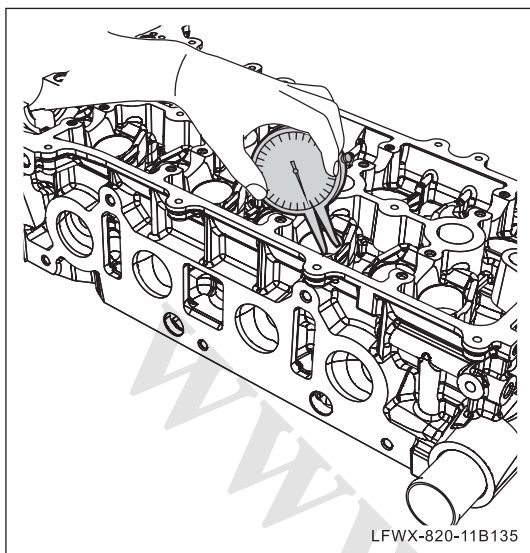
**Valve guide inner diameter: 5.510mm - 5.530mm**

- (m) Inner diameter of valve guide pipe minus diameter of valve rod gets the oil clearance of valve guide pipe. If the oil clearance is more than the maximum value, replace the valve and the guide.

**Standard oil clearance:**

**Intake valve: 0.030mm - 0.065mm**

**Exhaust valve: 0.030mm - 0.065mm**

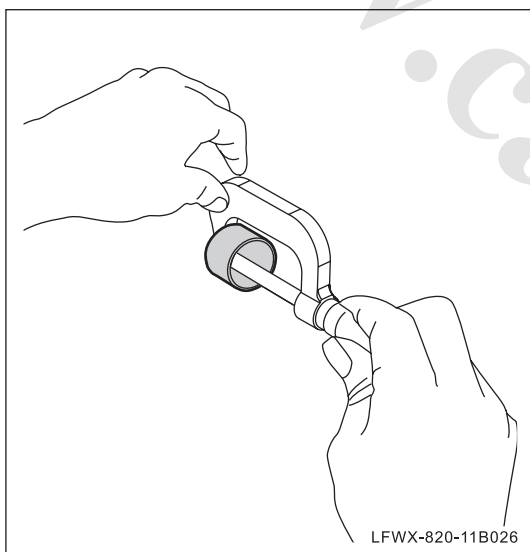
**Maximum oil clearance:****Intake valve: 0.090mm****Exhaust valve: 0.090mm**

- (n) Measure the valve-guide mounting-hole inner diameter with the internal micrometer.

**Inner diameter: 10.285mm - 10.306mm****11B**

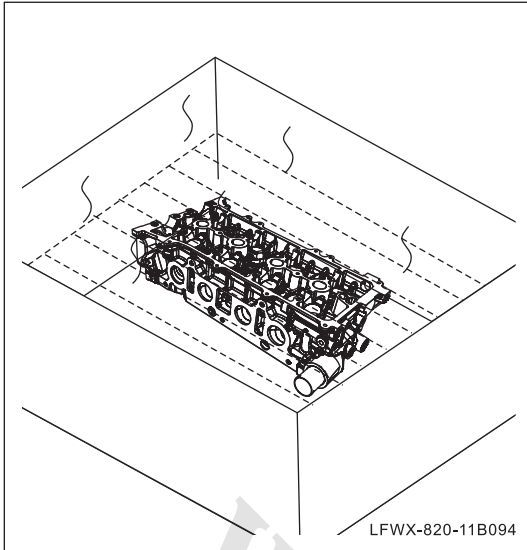
## △ HINT:

If the inner diameter of the guide mounting hole exceeds the maximum, process the guide hole of the cylinder head to 10.335 -10.350mm for installing a larger valve guide.



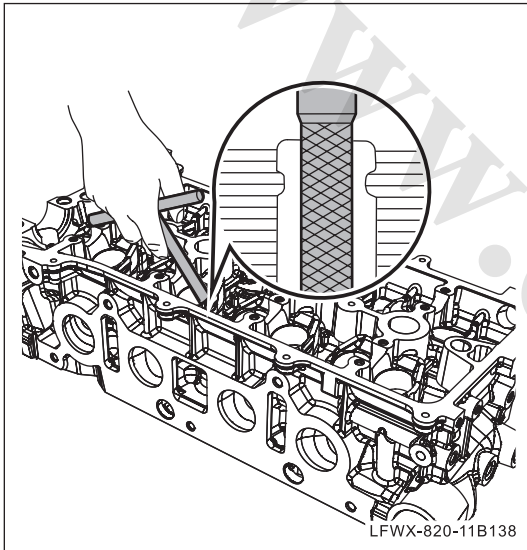
- (o) Check the thickness of top section of tappet. If it does not conform to the specification, replace it.

**Standard value: 506mm - 574mm**



### 3. Install valve components

- (a) Heat the cylinder head to 80°C - 100°C .
- (b) Remove cylinder head and put it on a wood plate.



- (c) Ream valve guide hole with special tool (11mm reamer) to remove burrs before installing valve guide in the cylinder head.

- (d) Use special tool, and press the new valve guide in the valve guide hole with the specified pressing-in depth until the special tool contacts the cylinder head.

**Specified press-in: 10.1mm - 10.5mm**

- (e) Ream the valve guide bore to the standard oil clearance using the special tools.

**Standard oil clearance:**

**Intake valve: 0.030mm - 0.065mm**

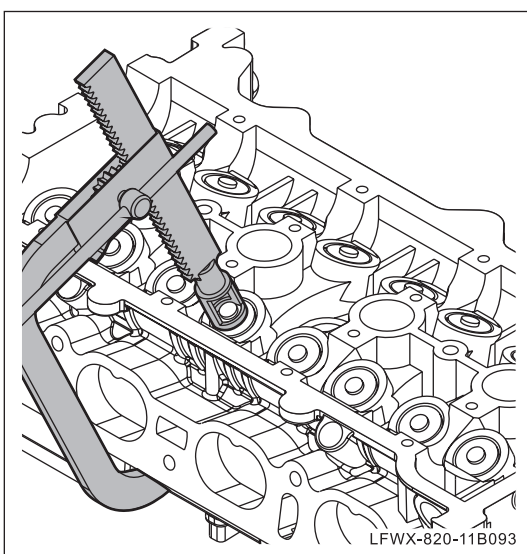
**Exhaust valve: 0.030mm - 0.065mm**

- (f) Install valve, valve spring, valve oil seal and valve spring seat in turn.

- (g). Install valve cotter with special tool.

#### ⓘ Note:

- **Once the oil seal is removed, it cannot be used any longer. A new oil seal must be used for installation.**





- It is forbidden to tap or strike the special tool with the hammer or other object during installation. Install the oil seal to the valve guide just by pressing the special tool by hand gently. Tapping or striking the special tool may cause damage to the oil seal.

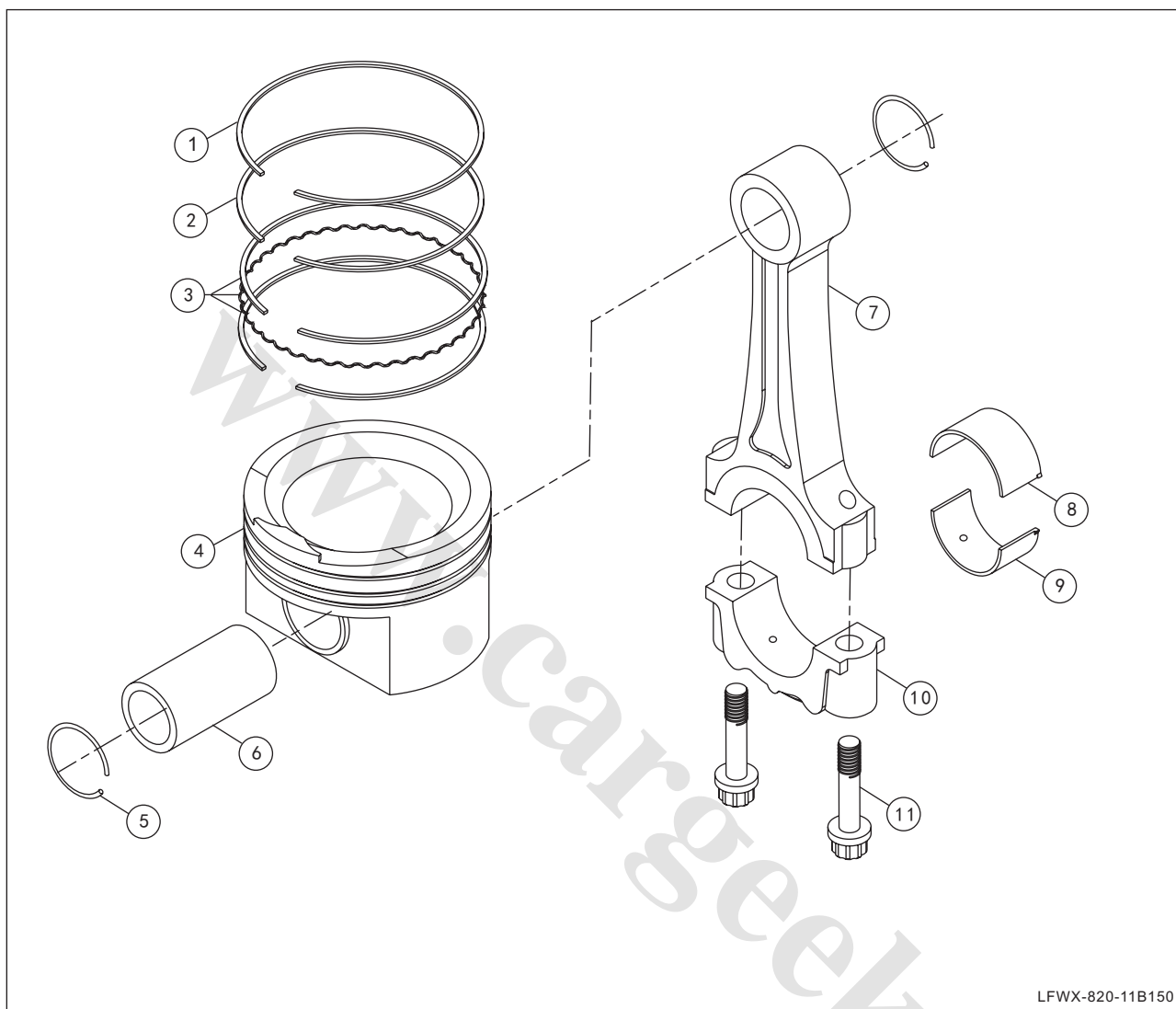
11B

- (h) Fix the tappet to the cylinder head.
- (i) Install the cylinder head cover. (See 11B- Engine Mechanical System-Cylinder Head, Check and Repair)

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# Piston and Connecting Rod

## Components



LFWX-820-11B150

1	Piston ring I
2	Piston ring II
3	Combined oil ring
4	Piston
5	Retainer of piston pin
6	Piston pin

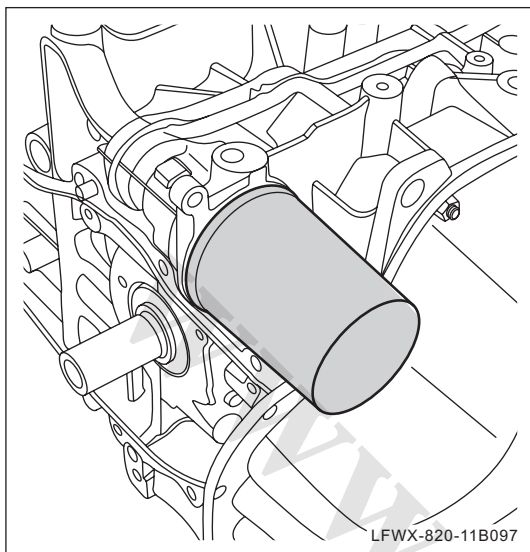
7	Connecting rod body
8	Connecting-rod bush (upper)
9	Lower bush of connecting-rod bearing bush
10	Connecting rod cap
11	Connecting rod bolt



## Overhaul

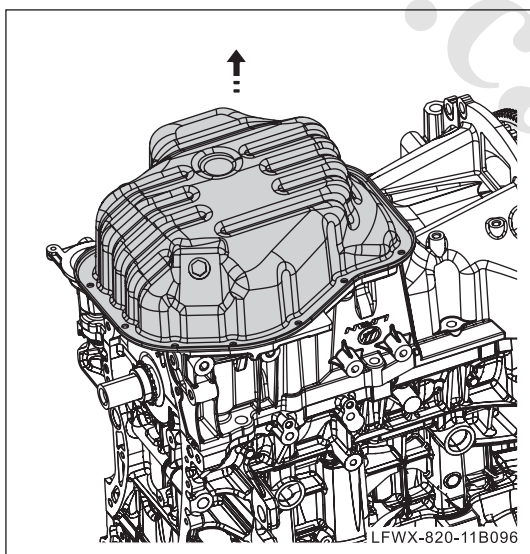
### 1. Remove piston and connecting rod assembly.

- (a) Remove the cylinder head. (See 11B- Engine Mechanical System-Cylinder Head, Check and Repair)

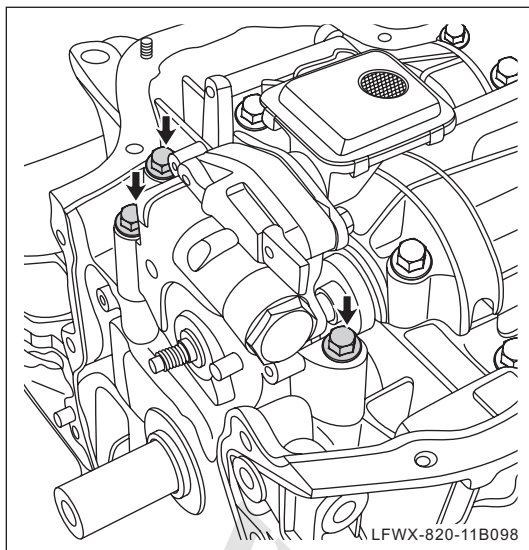


- (b) Remove the oil filter.

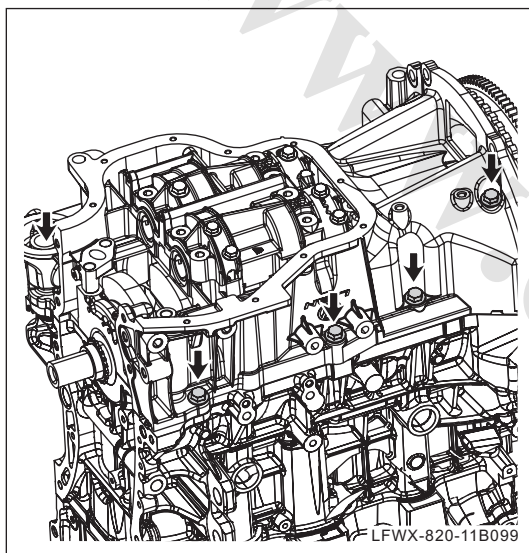
11B



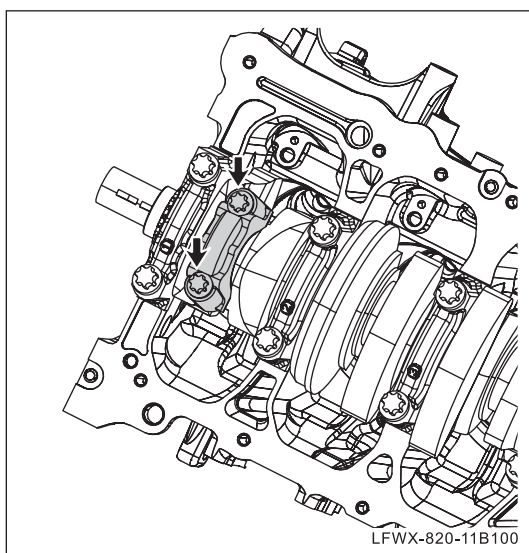
- (c) Remove the oil pan bolts, and remove the oil pan using the remover.



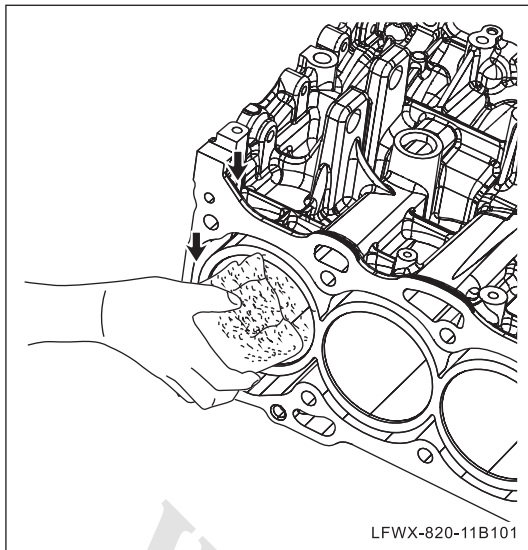
- (d) Remove the oil pump chain and the oil pump bolts, and remove the oil pump.



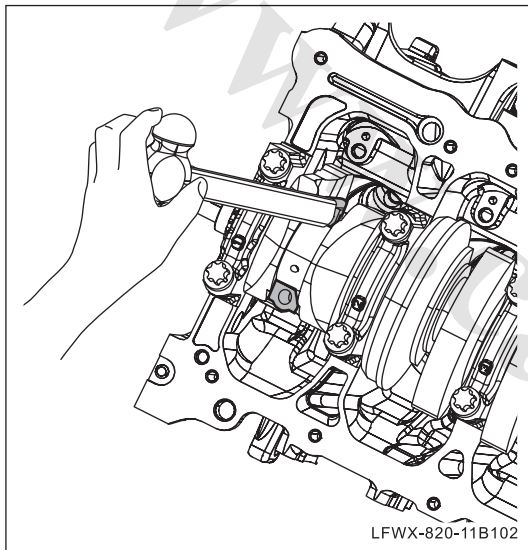
- (e) Remove the fixed bolts from the lower cylinder block, and remove the lower cylinder block and balance shaft module.



- (f) Rotate crankshaft, make pistons of No. 1 and No. 4 cylinders in lowest point (it means No. 1 and No. 4 connecting rod cap are exposed vertically).
- (g) Remove the connecting-rod bolts, and remove the connecting-rod cap and bearing bush.
- (h) Use the same method to remove other connecting rod cap and bearing.



- (i) Clear all carbon deposits on the top of cylinder.



- (j) Push out piston assembly.

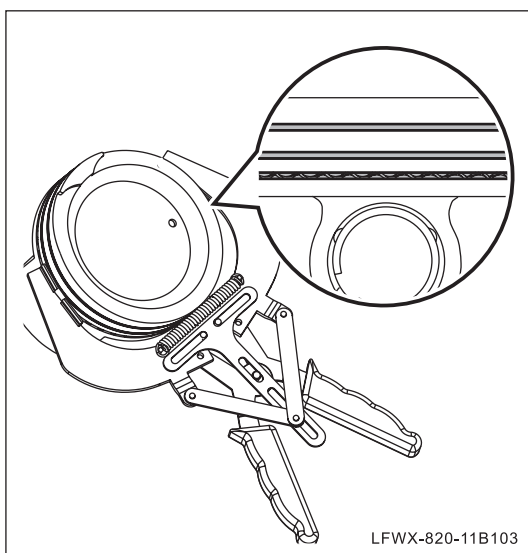
**Note:**

To avoid damage to connecting rod end face, make sure to use wooden or rubber object instead of metallic object to push out the piston assembly.

- (k) Take out the piston assembly from the other side.

**Note:**

Place the piston and connecting rod components in correct sequence. Do not mix them.

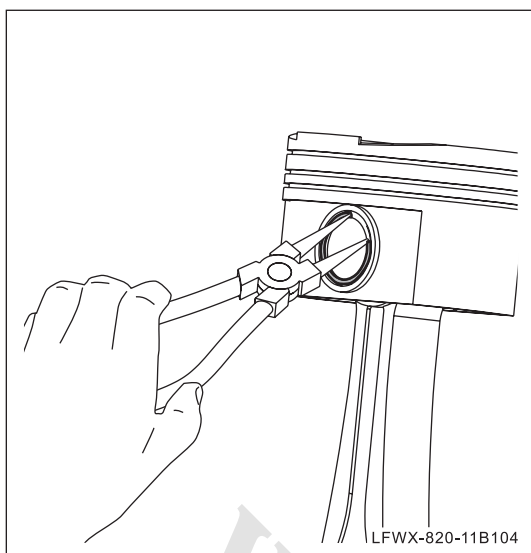


**2. Dismantling of piston and connecting rod assembly**

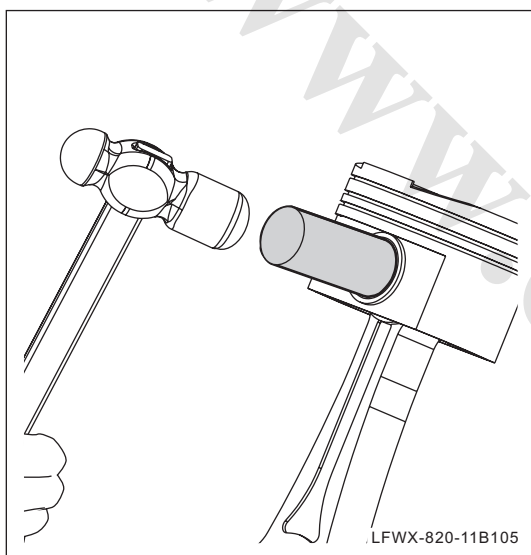
- (a) Use piston ring expander to remove top ring, second ring and combined oil ring.

**Note:**

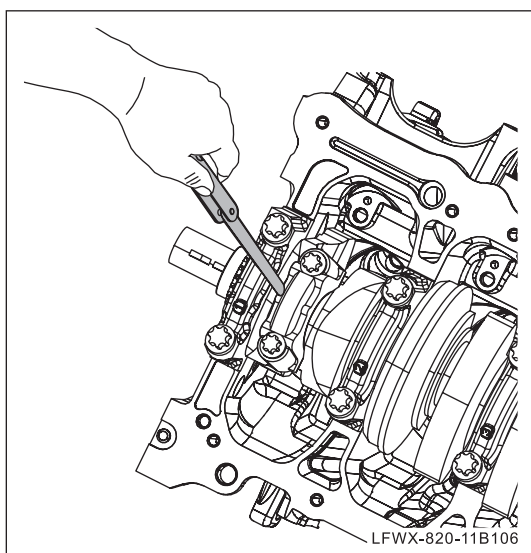
Put piston rings and combined oil ring in the correct sequence and make marks.



- (b). Remove two piston pin retainer with circlip pliers.



- (c) Drive out piston pin with a punch bar.

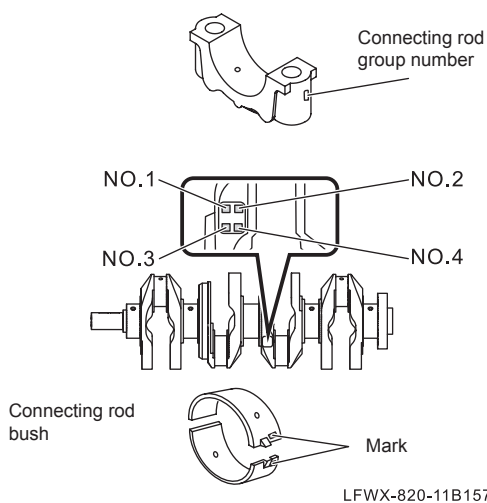
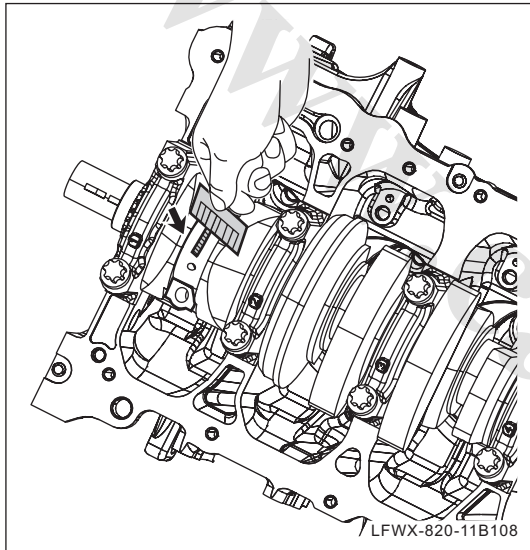
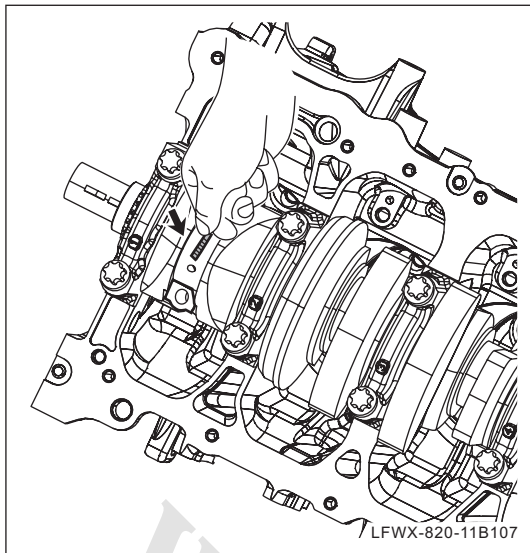


### 3. Check axial clearance of piston connecting rod

- (a) As shown in the figure, use a feeler gauge to measure axial clearance of piston connecting rod. If the axial clearance is more than the maximum value, replace the connecting rod group.

**Standard axial clearance: 0.16mm - 0.34mm**

**Maximum axial clearance: 0.36mm**



#### 4. Check connecting rod oil-film clearance

- (a) Remove bolt of connecting-rod, and then remove the connecting rod cap with bearing bush assembly.
- (b) A section of plastic oil clearance gauge goes through crankshaft connecting rod journal.
- (c) Install the connecting-rod cap and tighten the connecting-rod bolts.

**Torque: 53N•m**

- (d) Remove bolt of connecting-rod, and then remove the connecting rod cap with bearing bush assembly.
- (e) Measure the plastic oil clearance at the widest position. If the oil clearance is more than the maximum value, replace the bearing. If necessary, polish or replace the crankshaft.

**Standard oil-film clearance:  
0.030mm~0.056mm**

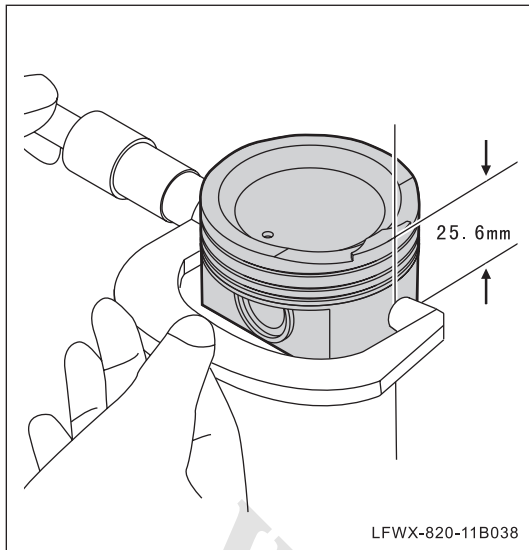
**Maximum oil film clearance: 0.56mm**

- (f) Remove all plastic oil gauges.

#### ⓘ Note:

- If the number of bearing bush is unclear or the bearing bush needs to be re-matched after the crankshaft/connecting-rod is replaced, let the number on the connecting-rod plus that on the crankshaft minus 1 (Calculation: Number of connecting-rod bush= Number of connecting-rod journal+ Number of connecting-rod big-end hole -1). This will guarantee to choose the correct bearing bushing.

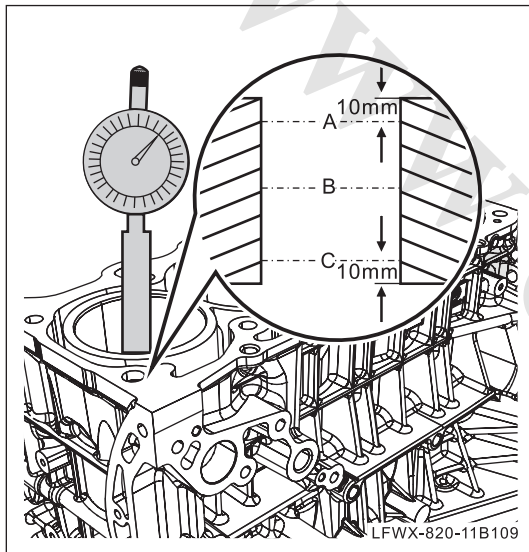
**11B**



### 5. Check piston diameter

- (a) At the 25.6mm position from the top of piston, use a screw micrometer to check piston diameter which is vertical to center line of piston pin.

**Standard piston diameter: 88.656mm - 88.670mm**



### 6. Check piston oil film clearance

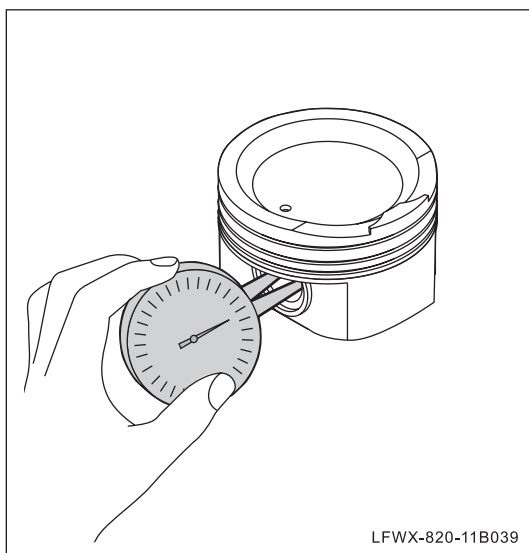
- (a) Measure the diameter of the cylinder bore at the positions of A, B and C by using cylinder bore gauge.

**Standard diameter: 88.7mm - 88.713mm**

- (b) Cylinder hole diameter value minus piston diameter measurement is the piston oil film clearance. If it is greater than the maximum oil film clearance, replace all 4 pistons, and take cylinder reboring. If necessary, replace cylinder block.

**Standard oil-film clearance:  
0.030mm~0.057mm**

**Maximum oil film clearance: 0.090mm**

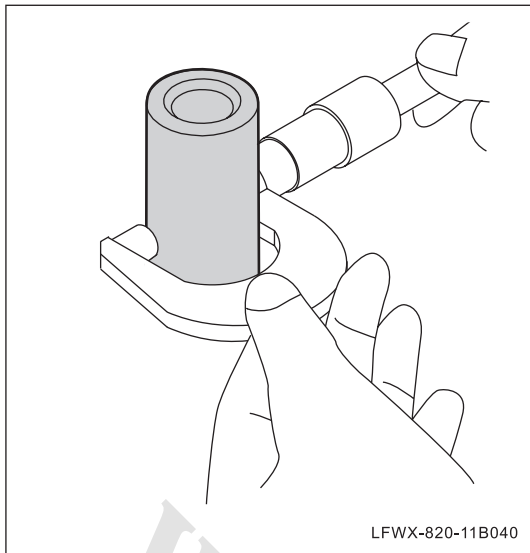


### 7. Check piston pin oil film clearance

- (a) Measure piston pin mounting hole diameter with an inner diameter micrometer. Piston pin hole diameter:

**A:22.008mm~22.011mm**

**B:22.011mm~22.014mm**



- (b) Measure piston pin outer diameter with a screw micrometer.

**Piston pin outer diameter:**

**A:22.004mm~22.007mm**

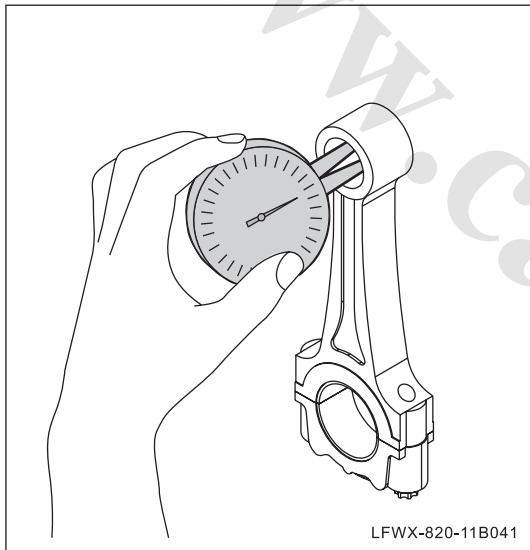
**B:22.007mm~22.010mm**

- (c) Piston pin mounting hole minus piston pin excircle diameter is piston pin oil film clearance. If it is larger than the maximum value, replace the piston pin. If necessary, replace the piston.

**Standard oil-film clearance:**

**0.001mm~0.007mm**

**Maximum oil film clearance: 0.010mm**



- (d) Measure inner diameter of connecting rod small end hole with an internal micrometer.

**Connecting-rod small end hole inner diameter**

**A:22.012mm~22.016mm**

**B:22.016mm~22.020mm**

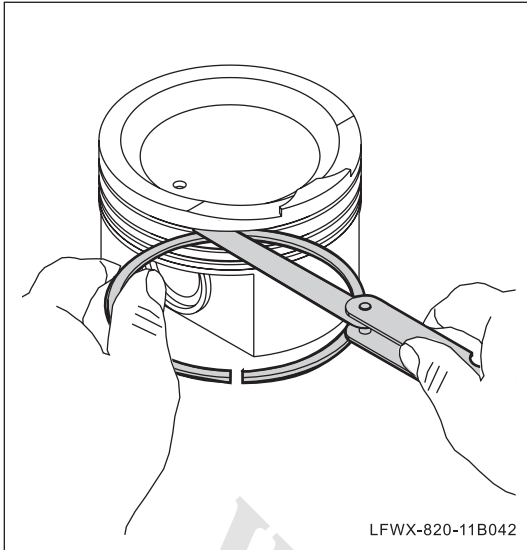
- (e) Subtract the outer diameter of the piston pin from the inner diameter of the connecting rod small end to the piston pin oil film clearance. If it is larger than the maximum value, replace the connecting rod. If necessary, replace the piston and connecting rod.

**Standard oil-film clearance:**

**0.005mm~0.012mm**

**Maximum oil film clearance: 0.012mm**

**11B**



### 8. Check piston ring groove gap

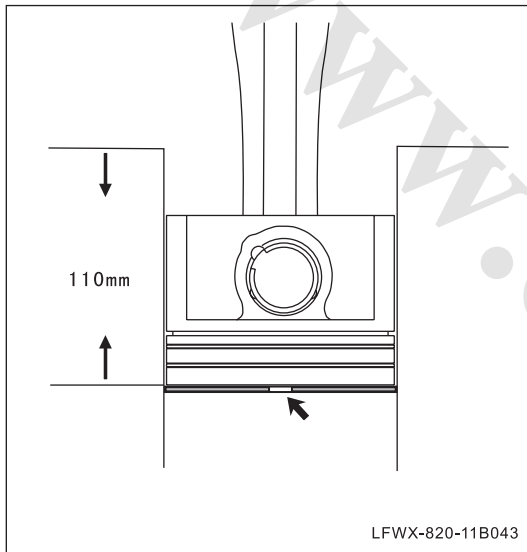
- (a) Measure the gap between piston ring and wall with a feeler gauge. If it exceeds the maximum value, replace the piston.

#### Clearance of ring groove:

**Top ring groove: 0.035mm - 0.085mm**

**2nd ring groove: 0.03mm-0.07mm**

**Oil ring: 0.02mm - 0.06mm**



### 9. Check piston ring gap

- (a) Insert piston ring into cylinder hole.
- (b) As shown in the figure, push the ring into the cylinder bore with the piston to make it exceed the bottom of ring stroke slightly.
- (c) Measure piston ring gap with a feeler gauge. If it is larger than the maximum value, replace piston ring.

#### Standard end play:

**Top ring: 0.20mm - 0.35mm**

**2nd ring groove: 0.30mm~0.45mm**

**Oil ring: 0.20mm - 0.40mm**

#### Maximum piston ring gap:

**Top ring: 0.75mm**

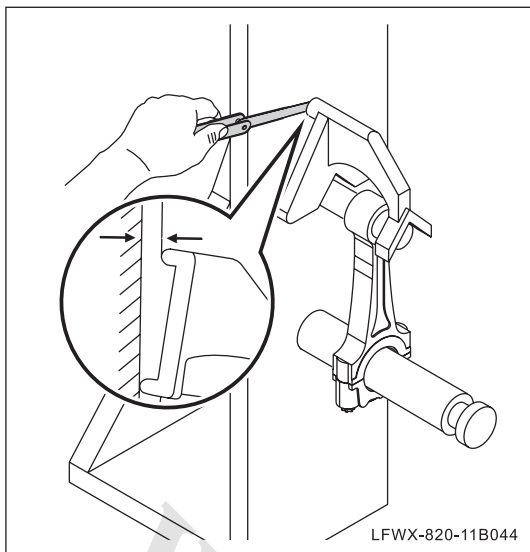
**Second compression ring: 0.85mm**

**Oil ring: 0.72mm**

#### ⓘ Note:

If new piston ring is used, but the ring gap still exceeds the maximum value, rebore 4 cylinders or replace cylinder block.



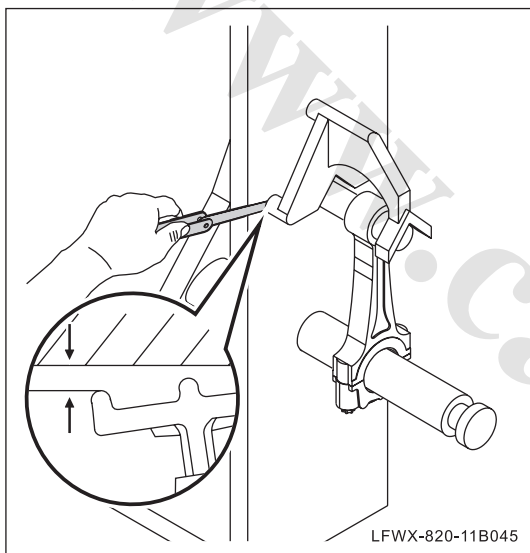


## 10. Check connecting rod

- (a) Use connecting rod collimator and feeler gauge to check the curvature of connecting rod. If it exceeds the maximum value, replace connecting rod components.

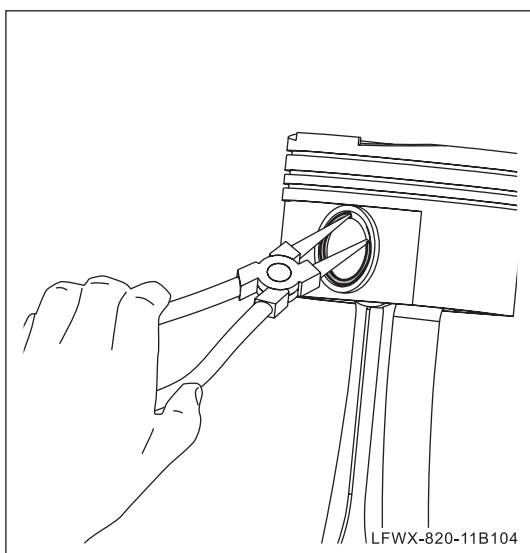
**Maximum bending: 0.05mm (length per 100mm)**

**11B**



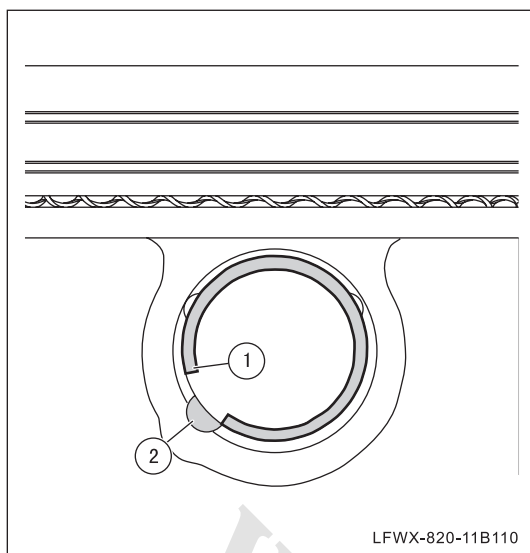
- (b) Use connecting rod collimator and feeler gauge to check the curvature of connecting rod. If it exceeds the maximum value, replace connecting rod components.

**Maximum torsion resistance: 0.15mm (length per 100mm)**

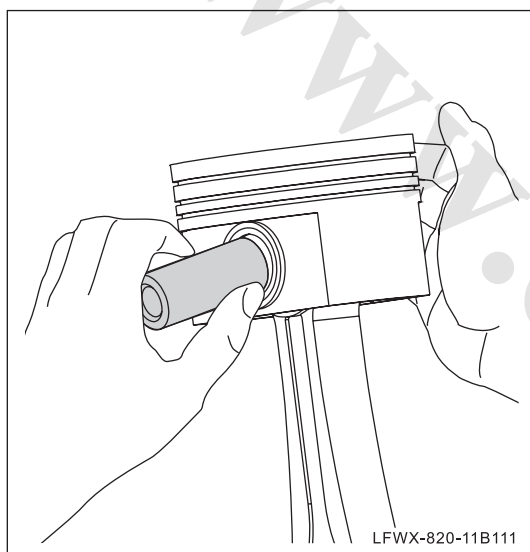


## 11. Assembling of piston and connecting rod assembly

- (a) Use circlip pliers to install retainer of piston pin onto one end of piston pin hole.


**ⓘ Note:**

As shown in the figure, make sure that the retaining ring end ① of the piston pin stays at the piston pin hole opening ② .

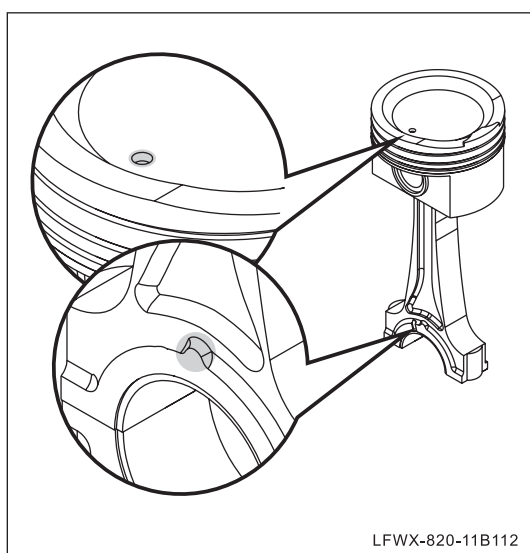


(b). Coat a layer of clean oil onto the piston pin evenly.

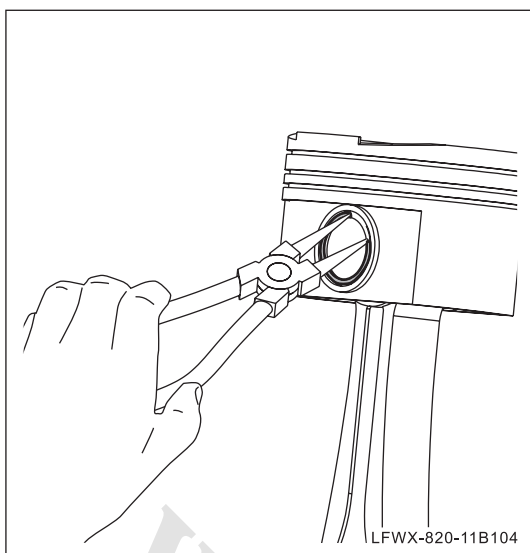
(c). Align the small end of connecting rod to piston pin hole, and insert piston pin into pin hole.

**ⓘ Note:**

- After installation, rotate the piston pin to make sure that the piston pin is free to rotate.



- Take care to align the forward marks of piston and connecting rod during installation.

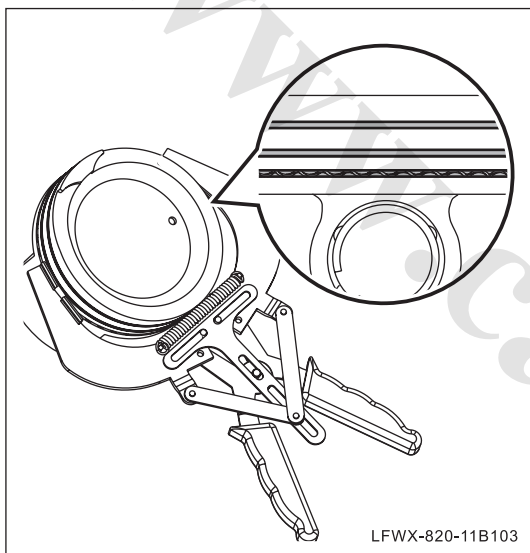


- (d) Use circlip pliers to install the other end of retainer of piston pin hole.

**Note:**

**Make sure that the end of retainer of piston pin is located at the opening of piston pin hole.**

11B

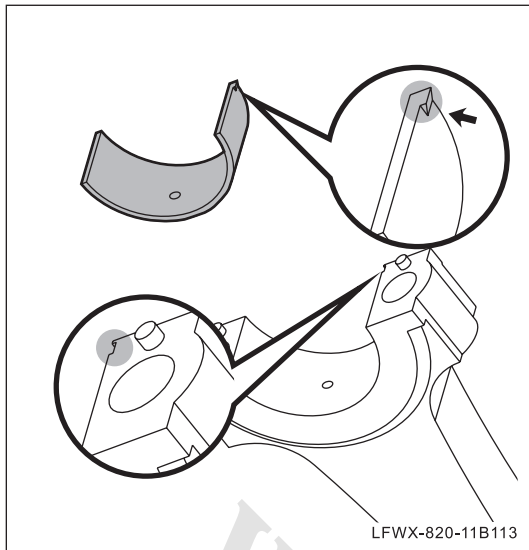


- (e) Using clean oil to lubricate piston ring and piston skirt.

- (f) Using the piston ring expander, install the top ring, second ring and the combined oil ring.

**Note:**

**Install the piston rings and the combined ring properly according to the marks made at the time of removal.**



## 12. Installation of piston and connecting rod assembly

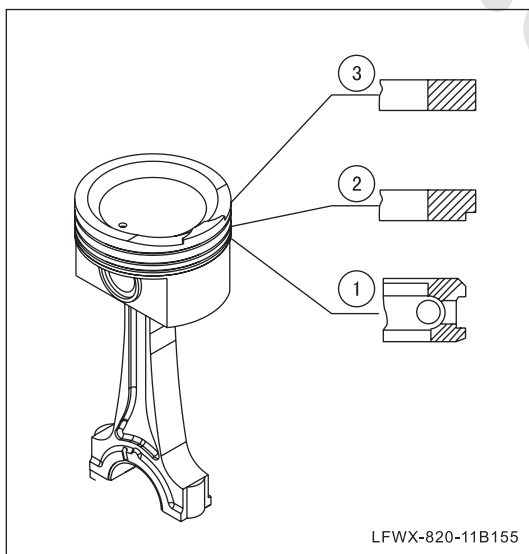
- (a) Install the upper bearing bush of the connecting-rod bush.

### ⓘ Note:

- Make sure that the connecting rod and the connecting rod bearing back are clean without any debris.
- It is forbidden to lubricate the bearing back.
- During installation, make sure that the positioning tongue of the bearing is in alignment with the positioning groove on the connecting rod.

### △ HINT:

Drop clean oil onto the inside of the connecting rod bearing bush.

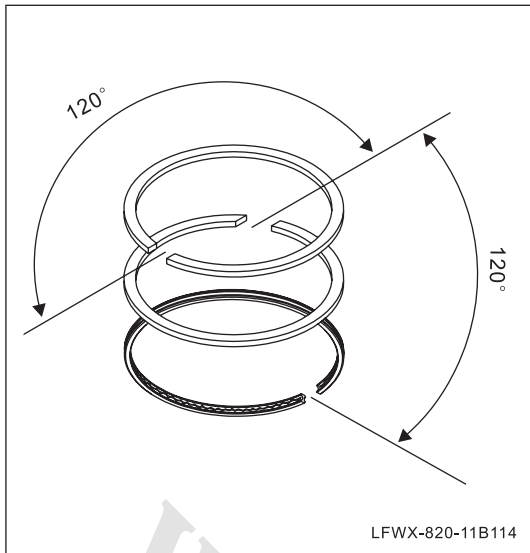


- (b) Using the piston ring expander, install the three piston rings according to the numerical sequence in the figure.

- ① Combined oil ring, ② Second ring  
③ Top ring

### ⓘ Note:

- When installing the top/second ring, let the marked side face up.
- Apply oil onto the piston ring surface. Check whether the piston ring can move smoothly in its groove.

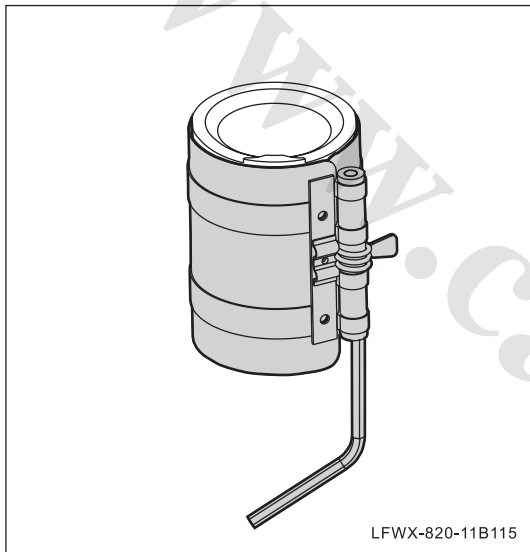


- (c) As shown in the left figure, rotate and adjust the position of the piston ring joint.

**Note:**

Each piston ring joint is not permitted to align to the piston pin or other piston ring joint. Otherwise, the sealing efficiency of the piston ring cannot be achieved.

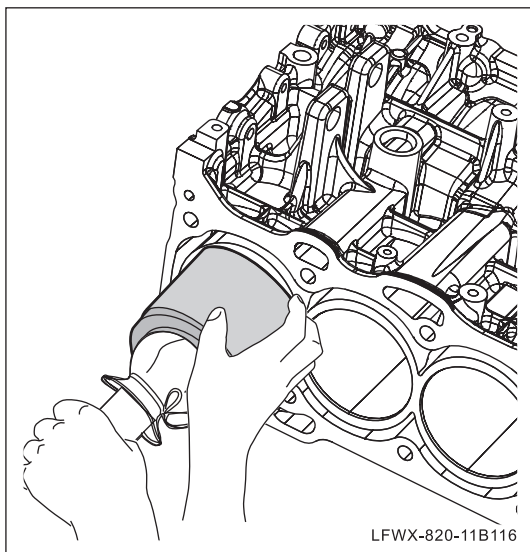
11B



- (d) Compress the piston ring to its working position with the piston ring compressor.

**HINT:**

If there is no special tool, make a ring barrel with sheet iron.



- (e) Rotate crankshaft to make connecting rod journal to be installed locate at the bottom dead center.

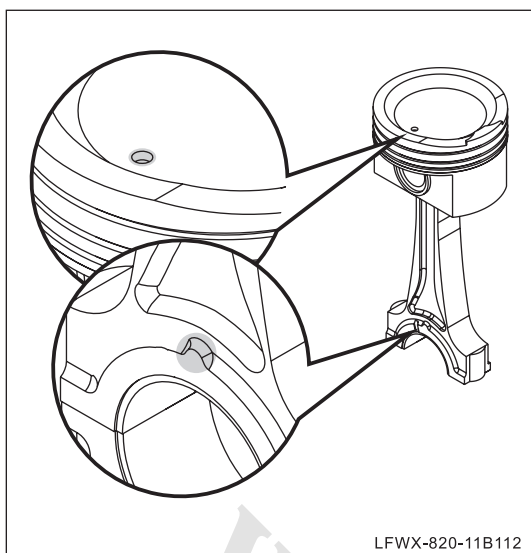
- (f) Push the piston assembly into the cylinder with the mounting tool for piston and the wooden bar.

**HINT:**

Before installation, apply one thin layer of engine oil to cylinder wall.

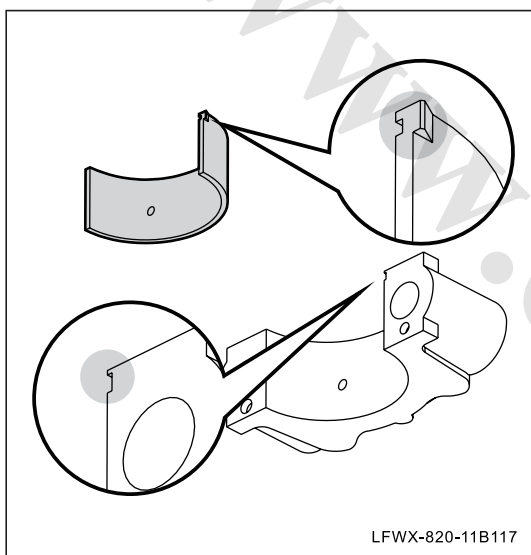
**Note:**

Be sure to push the piston assembly with wooden or rubber material instead of metallic material.



**Note:**

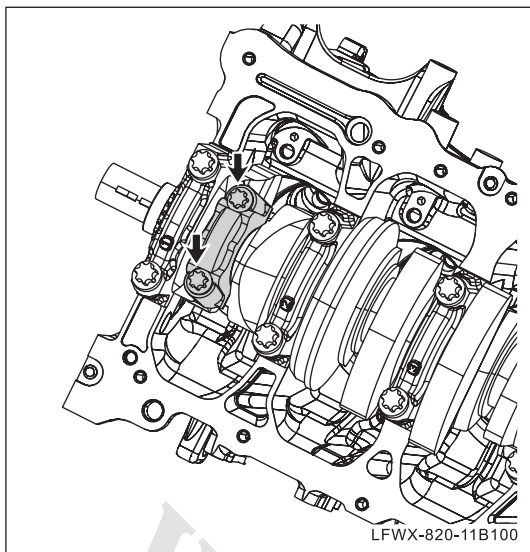
- As shown in the figure, make the forward mark of piston forward.
- Follow the marks made at the time of removal to install piston, and do not make sequence mistakes.



- (g) Install the lower shell of the connecting rod bearing to the connecting rod cap.

**Note:**

- Make sure that the connecting rod end cap and the connecting rod bearing back are clean without any debris.
  - It is forbidden to lubricate the bearing back.
  - During installation, make sure that the positioning tongue of the bearing is in alignment with the positioning groove on the connecting rod end cap.
- (h) Use clean oil to lubricate the inside of lower bush of connecting rod bearing.



- (i) Install the connecting-rod cap and tighten its bolts.

**Torque: 53N•m**

△ HINT:

When installing the connecting-rod bolts, apply thread-locking glue to the 10 threads in the front of the bolts.

**11B**

ⓘ Note:

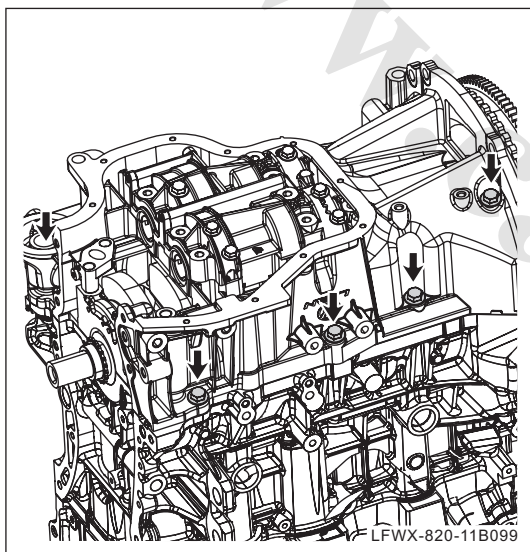
**Make sure to install the connecting rod cap in place to make its positioning groove in alignment with the connecting rod locating pin.**

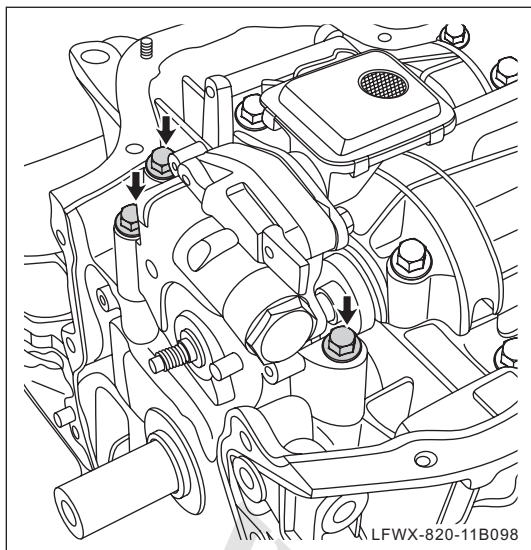
- (j). Install other connecting rod caps in the same way.

- (k) Fix the lower cylinder block and balance shaft module to the upper cylinder block, and install and tighten the fixed bolts.

**Torque of bolts for balance shaft cover:  
40N • m**

**Torque of cylinder connecting bolts:  
25N • m**

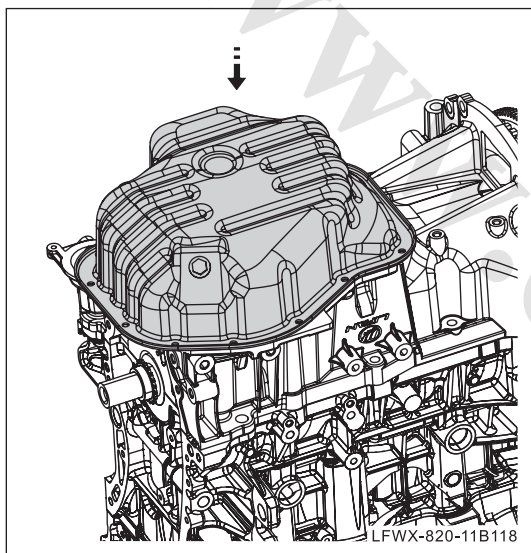




- (l) Install the oil pump in place, and install and tighten the mounting bolts.

**Torque: 25 N.m**

- (m) Install the oil pump chain in place.



- (n) Fix the oil pan to the cylinder block, and install and tighten the mounting bolts and nuts.

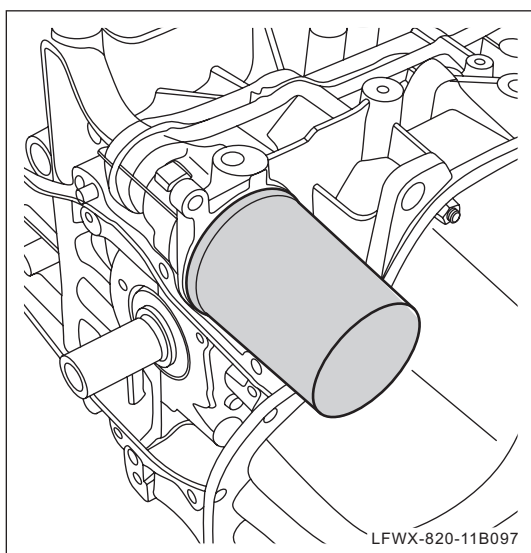
**Torque: 11N.m**

△ HINT:

When installing the mounting bolts of the oil pan, coat the bolt thread with clean oil.

ⓘ Note:

**When tightening the bolt, start the tightening in the middle and then to both sides.**



- (o) Install the oil filter.

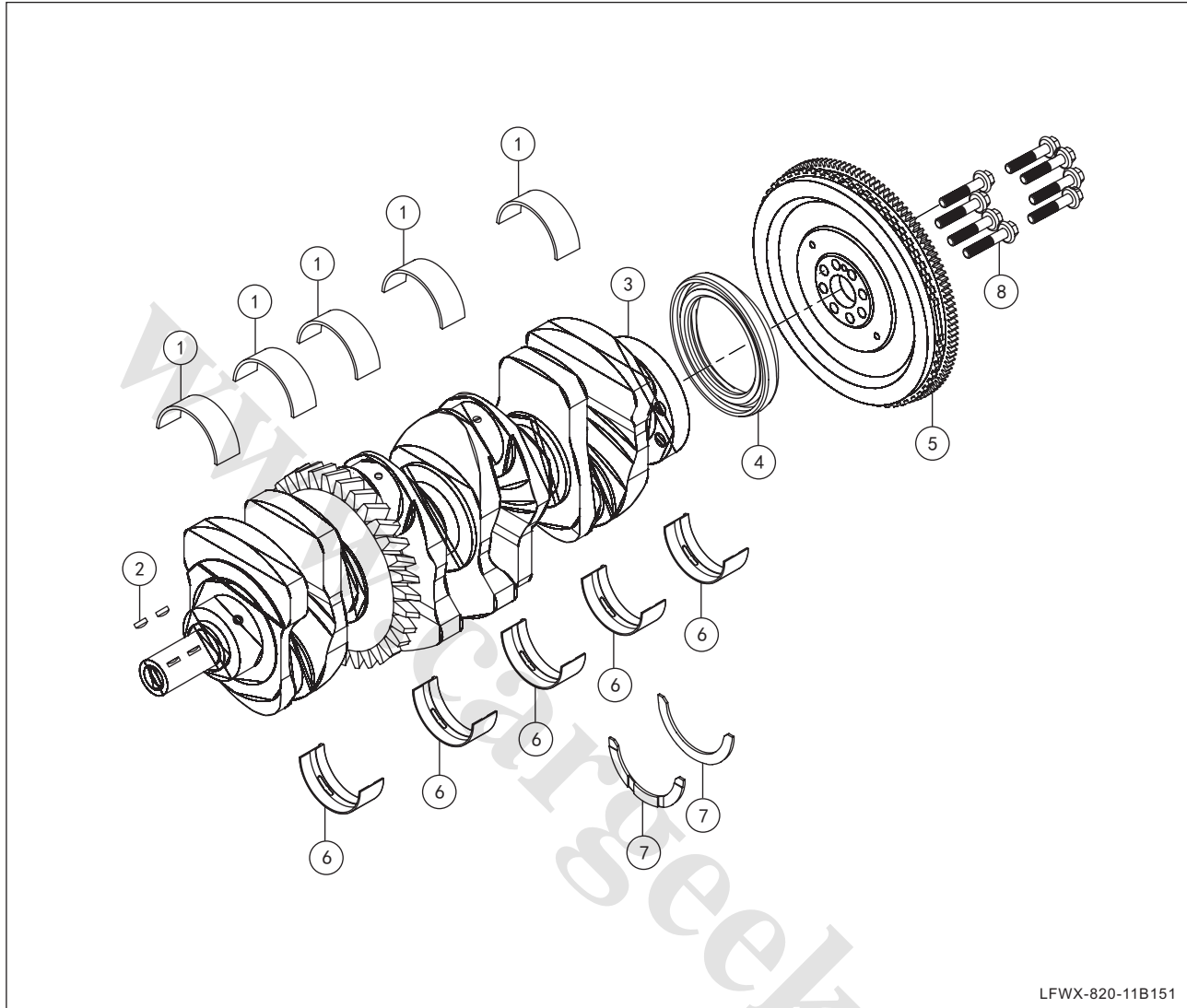
**Torque: 25 N.m**

- (p) Install the cylinder head. (See 11B- Engine Mechanical System-Cylinder Head, Check and Repair)



# Crankshaft and Drive Plate

## Components



11B

LFWX-820-11B151

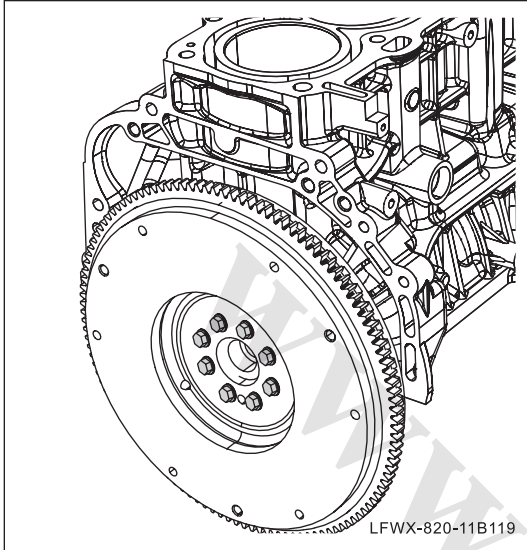
1	Upper main bearing bush
2	Woodruff key
3	Crankshaft assembly
4	Crankshaft rear oil seal

5	Driver disk assembly
6	Lower main bearing bush
7	Lower thrust plate
8	Driver disk bolt

## Overhaul

### 1. Remove the crankshaft and the drive plate.

- (a) Remove the piston and connecting-rod assembly. (See 11B- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)



- (b) Remove the drive plate bolts, and remove the drive plate assembly.

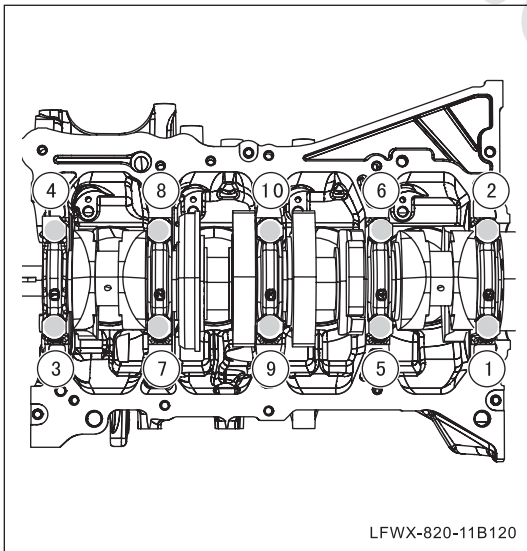
△ HINT:

When removing the drive plate assembly, to prevent rotation of the drive plate, fix the drive plate in advance or fix the crankshaft with rubber material or wooden tools.

- (c) Use a "flat-blade" screwdriver to pry rear oil seal of crankshaft.

ⓘ **Note:**

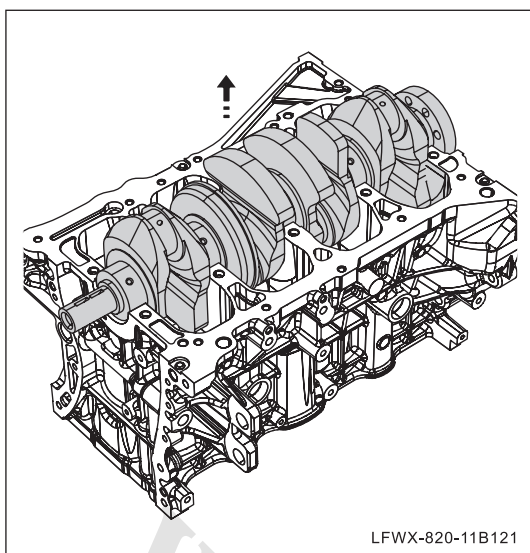
Do not reuse the removed oil seal. Replace it with a new one during installation.



- (d) As shown in the figure, remove the crankshaft main bearing cap bolts.

△ HINT:

Tighten and loosen the bolts for several times.

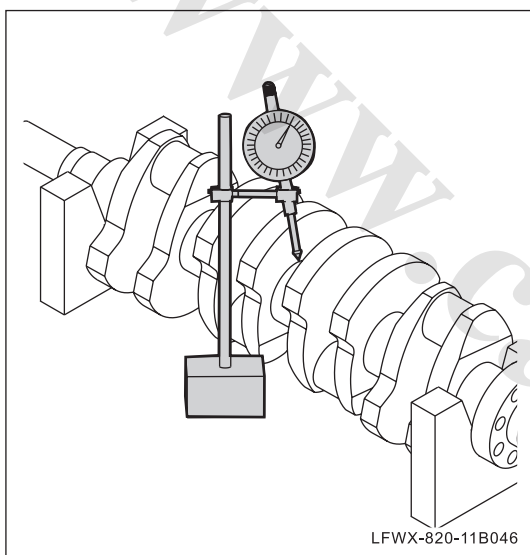


- (e) Remove crankshaft assembly.
- (f) Remove the upper main bearing bush.

**Note:**

Place the main bearing bush in the specified order for ease of subsequent installation.

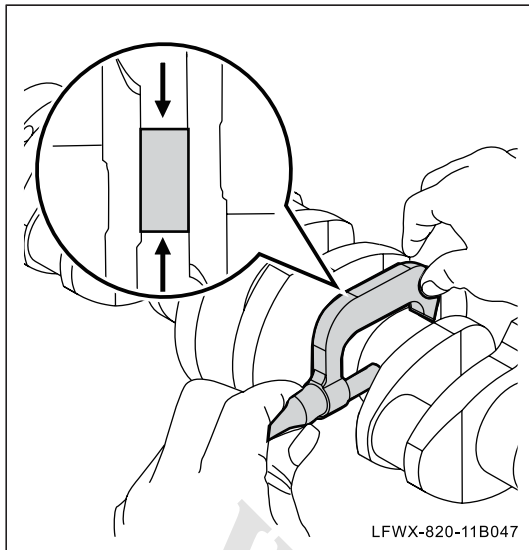
11B



**2. Check crankshaft radial run-out**

- (a) Place crankshaft on V block.
- (b) Measure radial run-out of intermediate journal with a micrometer gauge. If radial run-out is larger than the maximum value, replace the crankshaft.

**Maximum radial run-out: 0.03mm**



### 3. Check the main journal diameter of crankshaft

- (a) Use a screw micrometer to check the diameter of each main journal. If it does not meet requirement, check oil film clearance. If necessary, grind or replace the crankshaft.

#### Standard diameter:

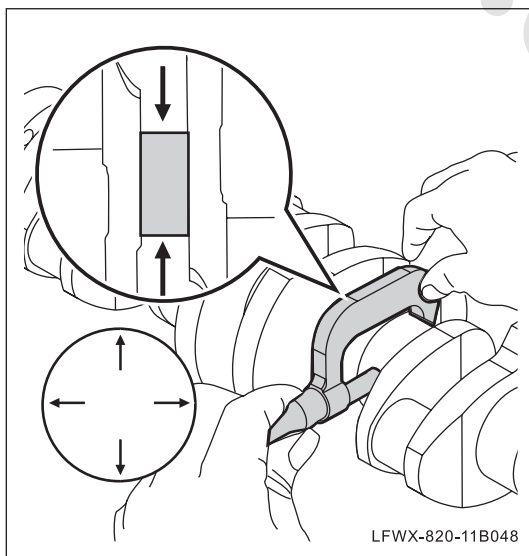
**1:54.794mm~54.800mm**

**2:54.788mm~54.794mm**

**3:54.782mm~54.788mm**

#### △ HINT:

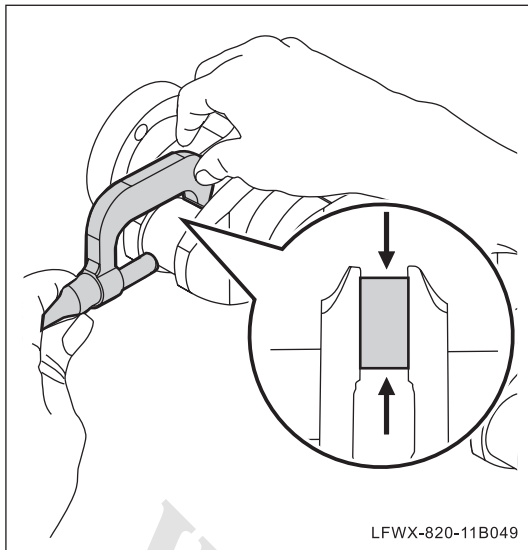
If the main journal or the connecting rod journal is inconsistent with the specified standard, be sure to grind the crankshaft and connecting rod journal. According to the grinding situations, select the thickened bearing of different levels.



### 4. Inspect ovality of main journal of crankshaft.

- (a) As shown in the figure, check each main journal ovality. If it is greater than the maximum value, replace the crankshaft.

**Maximum ovality:0.006mm**



### 5. Check connecting rod journal diameter of crankshaft

- (a) Use a screw micrometer to check the diameter of each connecting rod journal, if it doesn't meet requirement, check oil film clearance. If necessary, grind or replace crankshaft.

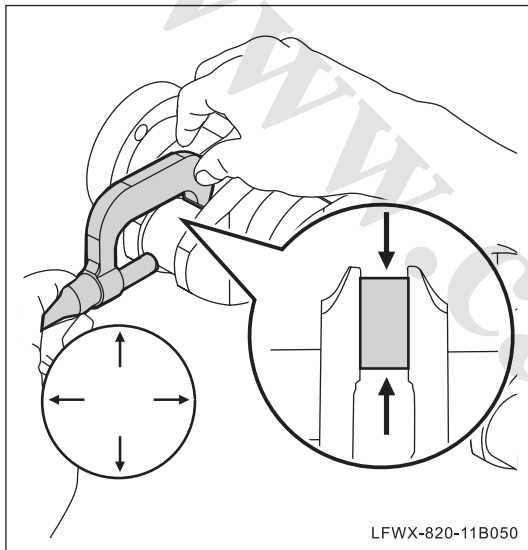
11B

#### Connecting rod neck diameter:

1:47.994mm~48.00mm

2:47.988mm~47.994mm

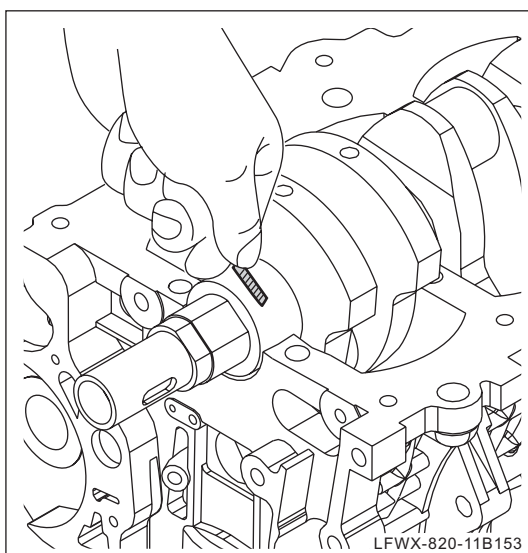
3:47.982mm~47.988mm



### 6. Check ovality of connecting rod journal of crankshaft.

- (a) As shown in the figure, check each connecting-rod journal ovality. If it is greater than the maximum, replace the crankshaft.

**Maximum ovality:0.006mm**

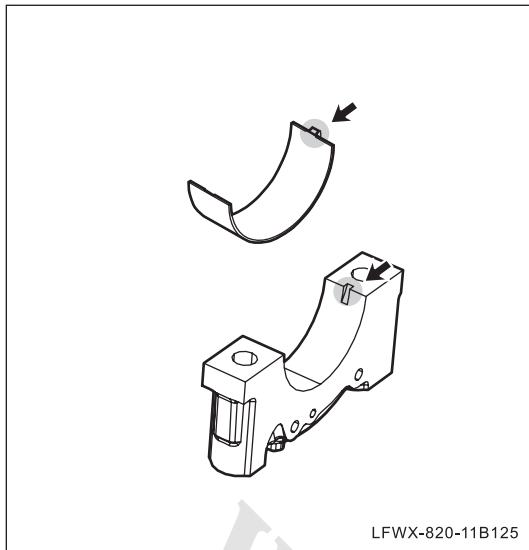


### 7. Check crankshaft oil film clearance

- (a). Clean the crankshaft journal and all crankshaft bearing bushes thoroughly.
- (b) Install the upper bearing of crankshaft onto the upper block of cylinder block, and install crankshaft onto the upper block of cylinder block.
- (c) A section of plastic oil clearance gauge goes through main journal of the crankshaft.

#### ⓘ Note:

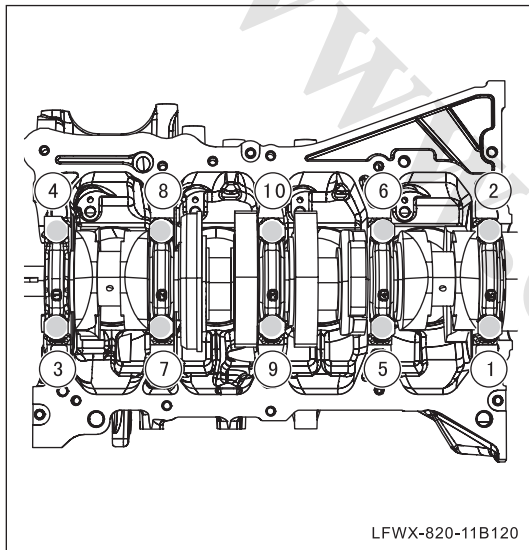
**Do not rotate the crankshaft.**



- (d) Install the lower bush of the main bearing bush to the crankshaft main bearing cap.

**Note:**

- **Make sure that the back side of bearings clean and without any scrap. Do not use oil to lubricate the back side of bearing.**
- **When installing, make sure that the positioning tongue of the lower bush of the main bearing bush is in alignment with the positioning tongue groove on the main bearing cap.**



- (e) Install the crankshaft main bearing cap, and tighten its 10 fastening bolts in turn in reverse order as shown in the figure.

**Torque:**

**First 40 N.m**

**Second time: 70N • m**

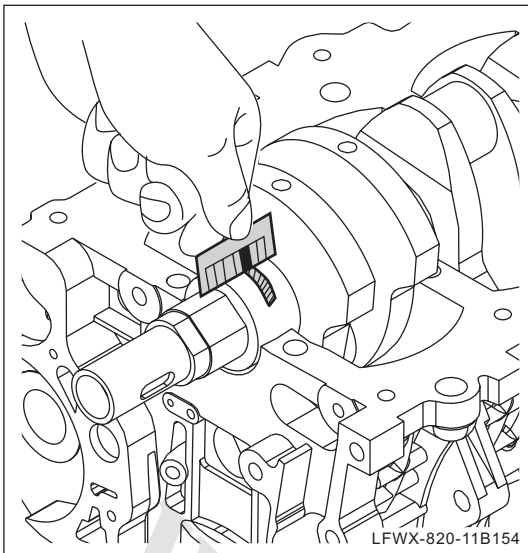
**△ HINT:**

Tightening the tightening bolt of the main bearing cap twice.

- (f) As shown in the figure, remove the crankshaft main bearing cap bolts.

**△ HINT:**

Tighten and loosen the bolts for several times.

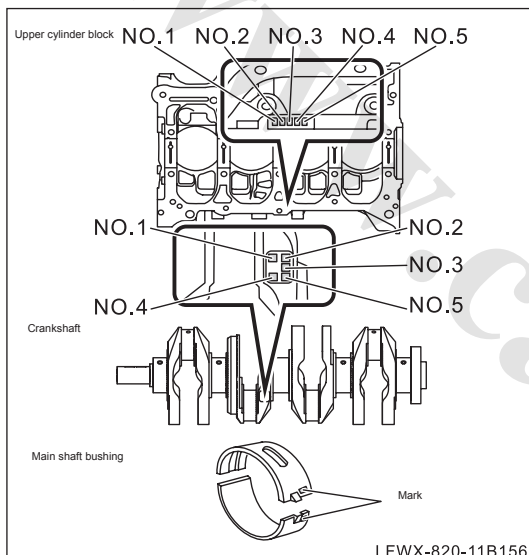


- (g) Measure the plastic oil film clearance at the widest position. If it is greater than the maximum value, replace the bearing bush. If necessary, grind or replace the crankshaft.

**Standard oil-film clearance:**  
0.020mm~0.038mm

**Maximum oil film clearance: 0.050mm**

11B



**Note:**

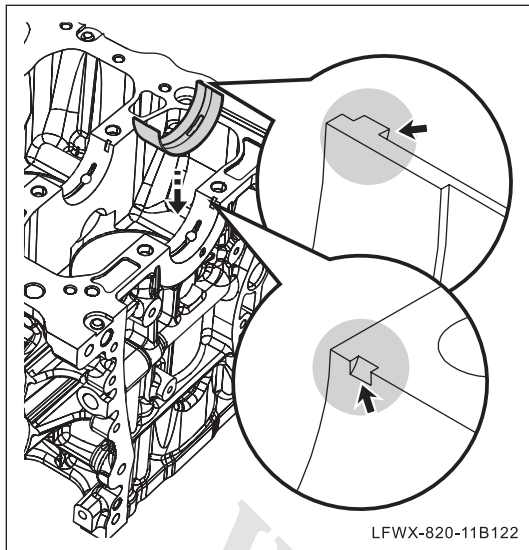
- If a standard bearing bushing is used, replace it with the bearing bushing with the same number.
- If you are not sure of the number of bearing bush, you can let the number on the cylinder block plus that on the crankshaft minus 2 for matching (Calculation method: Number of main bearing bush = Number of main journal + Number of main shaft hole - 2), and then select the bearing bush whose number is the same as the calculated result to ensure correct choice of the bearing bush.

**8. Install the crankshaft and the drive plate.**

- (a) Use compressed air to blow foreign matter, coolant and oil inside block of cylinder.

**Note:**

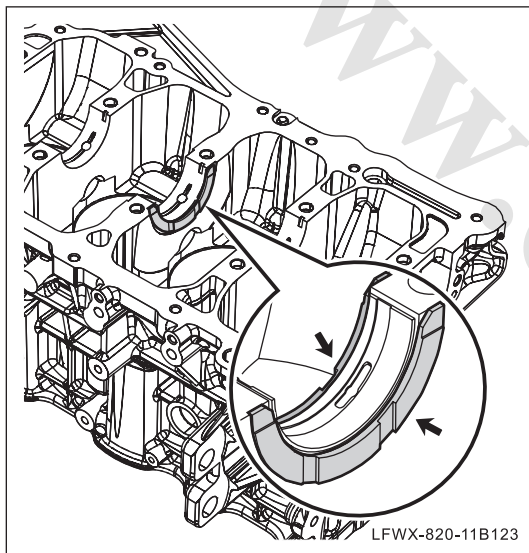
When using compressed air, we recommend you wear goggles and protective masks to avoid personal injury due to flying debris or dirt.



(b) Fix the upper main bearing bush to the upper part of cylinder block.

**Note:**

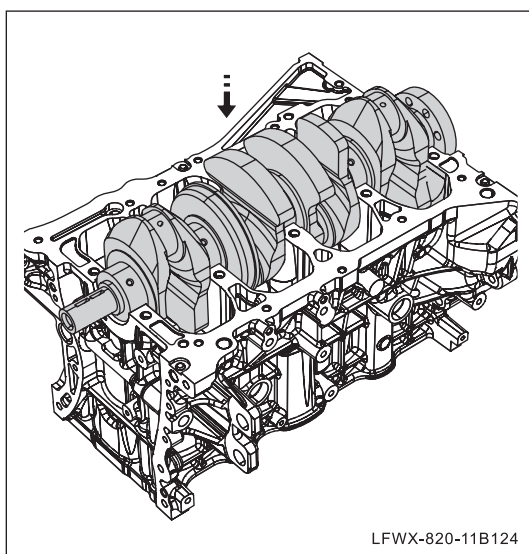
- Install the parts in the placement sequence achieved during removal.
- Make sure that the back side of bearings is clean and without any scrap. Do not use oil to lubricate the back side of bearing.
- During installation, make sure that the position tongue of bearing is in alignment with positioning tongue groove of cylinder block.



(c) Install the lower thrust plate.

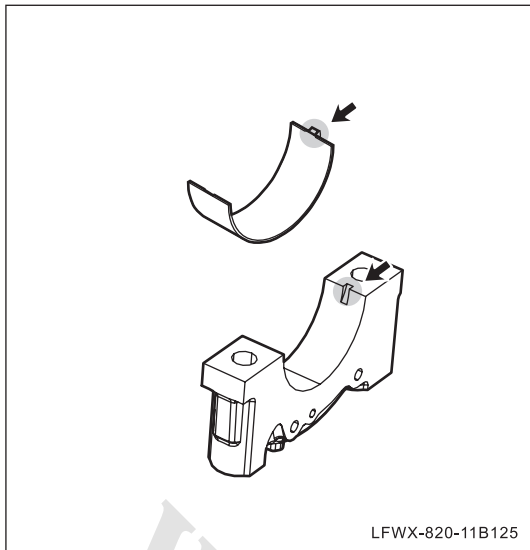
**Note:**

As shown in the figure, make sure that the thrust plates' oil groove faces outwards and thrust plates are correctly installed.



(d) Install the crankshaft assembly.



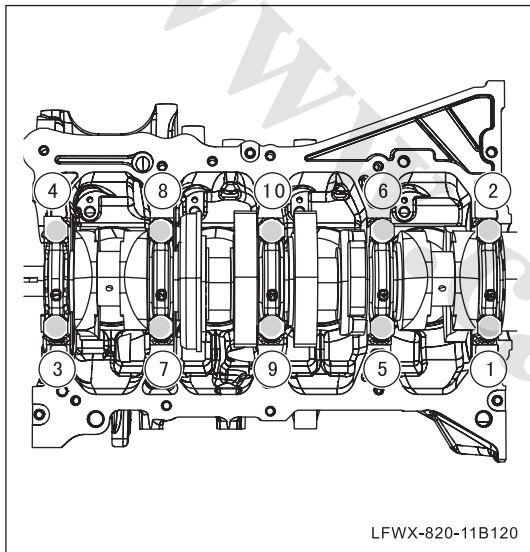


- (e) Install the bush of the main lower bearing bush to the crankshaft main bearing cap.

**Note:**

- **Make sure that the back side of bearings clean and without any scrap. Do not use oil to lubricate the back side of bearing.**
- **When installing, make sure that the positioning tongue of the bush of the bearing bush is in alignment with the positioning tongue groove on the main bearing cap.**

11B



- (f) Install the crankshaft main bearing cap, and tighten its 10 fastening bolts in turn in reverse order as shown in the figure.

**Torque:**

**First 40 N.m**

**Second time: 70N • m**

**HINT:**

Tightening the tightening bolt of the main bearing cap twice.

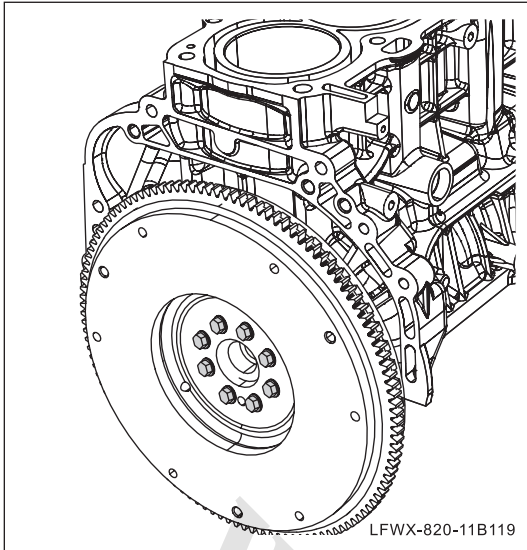
- (g) Install the rear oil seal of crankshaft with the mounting tool for oil seal.

**Note:**

**Be sure to install the seal vertically. Do not install it obliquely.**

**HINT:**

Before installation, apply a layer of clean oil to the seal lip.



- (h) Install the drive plate assembly in place, and install and tighten the drive plate bolts.

**First time: 30N•m**

**Second time: 70N • m**

**Third time: 90N•m**

**ⓘ Note:**

**When installing the drive plate, align the drive plate to the positioning pin on the crankshaft.**

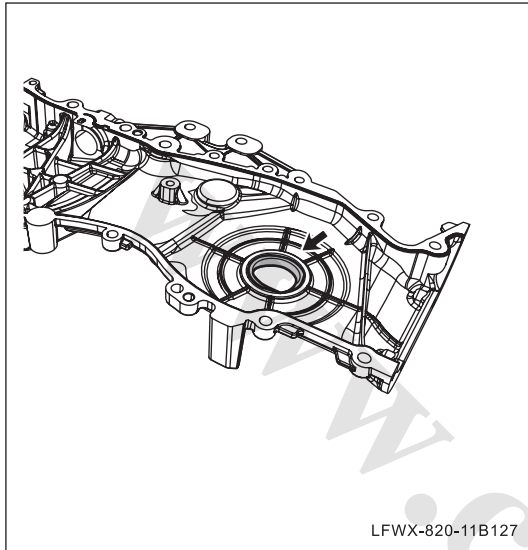
- (i) Install the piston and connecting-rod assembly. (See 11B- Engine Mechanical System-Piston and Connecting-rod, Check and Repair)

## Crankshaft Oil Seal

### Replacement

#### 1. Remove crankshaft front oil seal

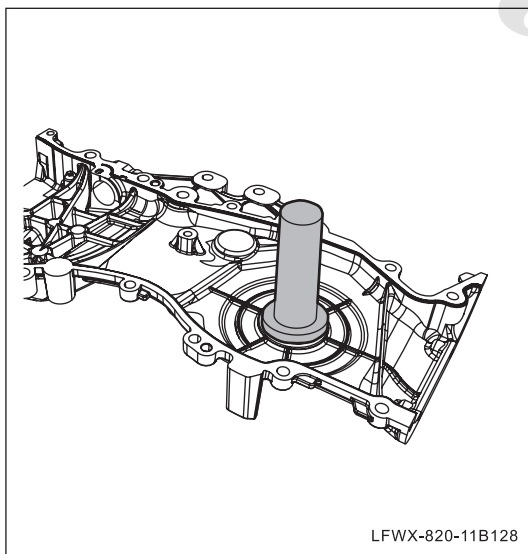
- (a) Remove the timing cover. (See 11B- Engine Mechanical System-Timing Part, Check and Repair)



- (b) Use a "flat-blade" screwdriver to pry front oil seal of crankshaft.

**Note:**

Do not reuse the removed oil seal. Replace it with a new one during installation.



#### 2. Install crankshaft front oil seal

- (a). Install the crankshaft front oil seal with the mounting tool for oil seal.

**HINT:**

Before installation, apply a layer of clean oil to the seal lip.

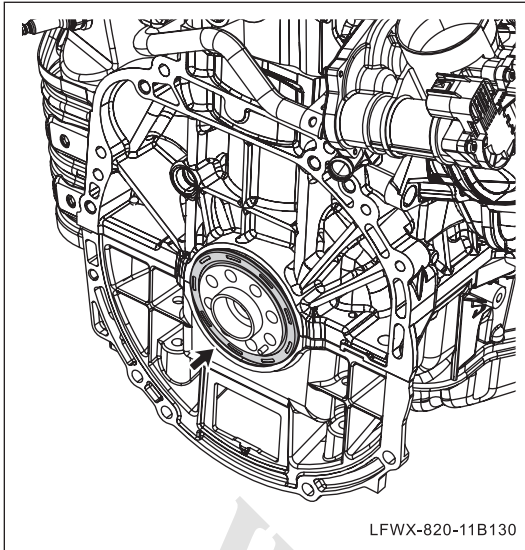
**Note:**

Be sure to install the seal vertically. Do not install it obliquely.

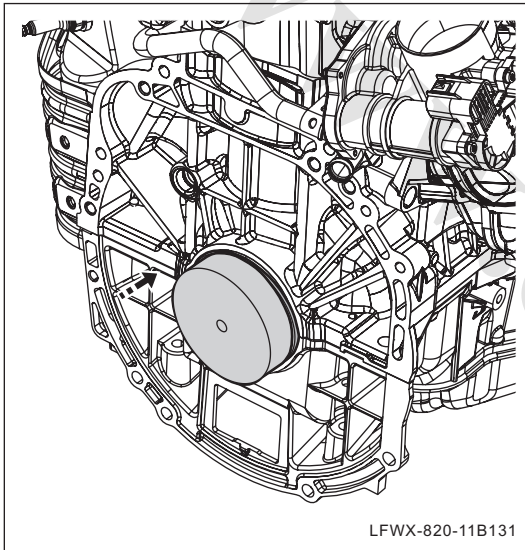
- (b) Install the timing cover. (See 11B- Engine Mechanical System-Timing Part, Check and Repair)

#### 3. Remove rear oil seal of crankshaft

- (a) Remove the drive plate assembly. (See 11B- Engine Mechanical System - Crankshaft and Drive Plate, Check and Repair)



- (b) Use a "flat-blade" screwdriver to pry rear oil seal of crankshaft.



#### 4. Install rear oil seal of crankshaft

- (a) Install the rear oil seal of crankshaft with the mounting tool for oil seal.

△ HINT:

Before installation, apply a layer of clean oil to the seal lip.

ⓘ Note:

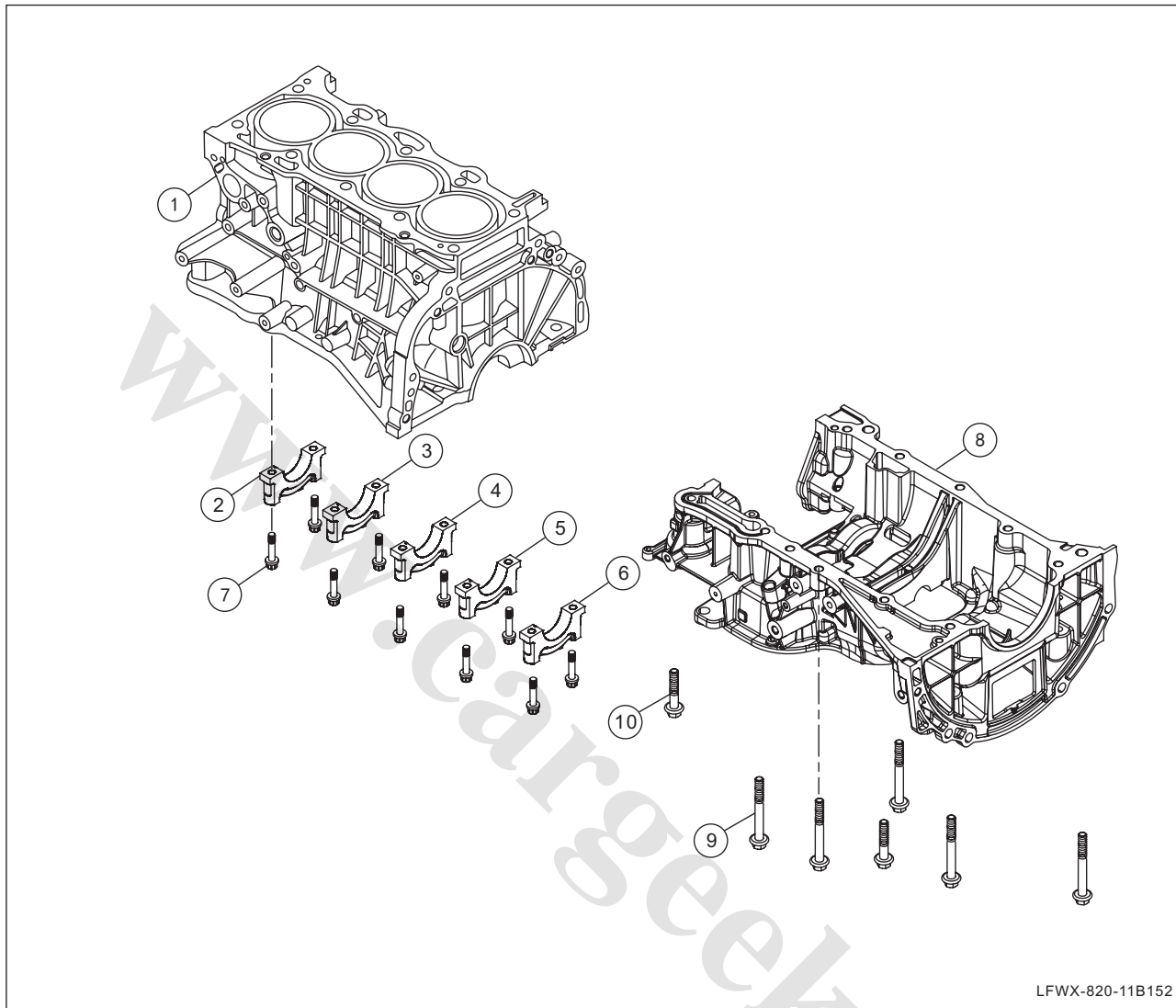
**Be sure to install the seal vertically. Do not install it obliquely.**

- (b) Install the drive plate assembly. (See 11B- Engine Mechanical System - Crankshaft and Drive Plate, Check and Repair)

# Cylinder Block

## Components

11B



LFWX-820-11B152

1	Upper block of cylinder block
2	Main bearing cap I
3	Main bearing cap II
4	Main bearing cap III
5	Main bearing cap IV

6	Main bearing cap V
7	Main bearing cap bolt
8	Lower block of cylinder block
9	Lower connecting bolt
10	Hexagon bolt with flange

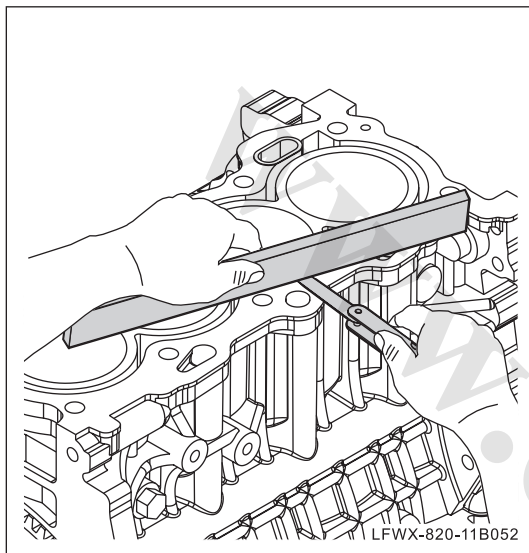
## Overhaul

### 1. Check surface warping of upper block of cylinder block.

- (a) Clean all pad materials on the cylinder block head, and clean the cylinder block thoroughly with soft brush and solvent.

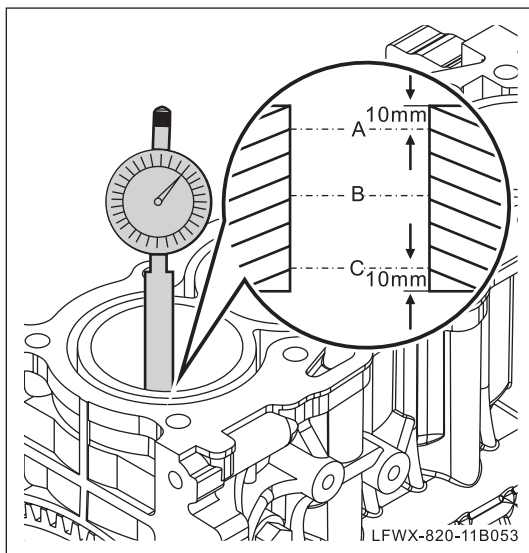
#### ⓘ Note:

When cleaning it with solvent, acid or alkaline materials, follow the manufacturer's recommendations.



- (b) Use a ruler or feeler gauge to check the top plane warping of cylinder block. If the warping value is greater than the maximum value, replace cylinder block.

**Maximum warping value: 0.05mm**



### 2. Check cylinder bore diameter of upper part of cylinder block

- (a) Measure the diameter of the cylinder bore at the positions of A, B and C by using cylinder bore gauge.

**Standard diameter: 88.7mm - 88.713mm**

#### △ HINT:

Measure once along the axial direction and the thrust direction at each position respectively.

# 12A- Engine Control System

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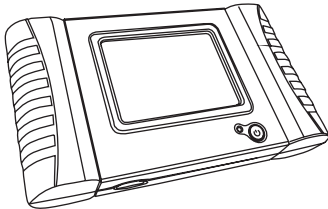
[www.cargeek.ir](http://www.cargeek.ir)



## Engine Control System

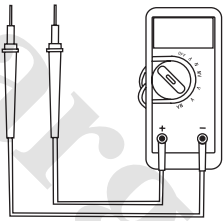
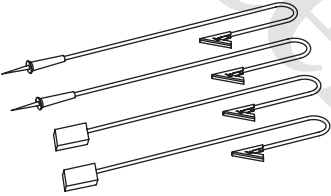
### Preparation

#### 1. Special tool

S/N	Tools	Outline diagram	Description
1	Diagnostic scanner		Read engine control system fault code and data flow, etc.

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#### 2. Recommended tools

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Line group		Testing circuits

## Service data

### 1. Technical specifications table

Working voltage of OCV	11V~14V
OCV Resistance	9.4 Ω ~10.6 Ω
Resistance of intake air temperature sensor at 20° C	2.5kΩ ± 5%(20°C )
Working voltage of canister control valve	8V~16V
Resistance of the canister control valve	22 Ω ~30 Ω
Working temperature at exhaust end of oxygen sensor	200°C ~850°C
Resistance of oxygen sensor heater	7 Ω ~11 Ω
Coil resistance of crankshaft position sensor	860 Ω ± 130 Ω
Working voltage of camshaft position sensor	4.5V~5.5V
Low electric level output of camshaft position sensor	0~700mV
High electric level output of camshaft position sensor	3.2V~5V
Maximum air flow (at standard atmospheric pressure, pressure difference ΔP = 600mar)	≤ 3.0kg /h (throttle mechanical BDC)
Throttle opening (idle)	10 ± 4%
Opening range of throttle position sensor	Opening between 5% -95%
Working voltage of throttle position sensor	5V ± 0.1V
Throttle' s DC motor voltage range	8V~16V
Capacitance of knock sensor	950pF~1350pF
Resistance of knock sensor	4.9MΩ ± 20%
Pressure settings of fuel pressure regulator in non-return fuel system	400kPa
Resistance of injector at 20° C	12 Ω ± 0.6 Ω
Primary resistance of ignition coil	0.53 Ω ± 12%
Secondary resistance of ignition coil	9.3kΩ ± 12%
Primary current of ignition coil	After 2.35ms ± 0.025ms, 7.3A ± 0.5A
Secondary voltage of ignition coil	When ignition coil igniting, ≥ 34kV

## 2. Table of tightening torque

Item	N•m
ECM fixing bolts	10 ± 2
Fixing bolts of intake pressure and temperature sensor	10 ± 2
Water temperature sensor bolt	20
Fixing bolt of crankshaft position sensor	6~10
Fixing bolt of camshaft position sensor	6~10
Oxygen sensor	40~60
Knock sensor	15~25

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## Precautions

- Maintenance shall be performed according to the standard diagnostic procedures.
- When a part of the electronic fuel injection system is detected faulty, it should be wholly replaced, and decomposing operation is strictly prohibited. Otherwise it may affect the normal operation of other components.
- Replace the specified parts only. Failure to do so can cause improper operation of the EFI system.
- Do not arbitrarily dismantle any parts or connector clips of the electrical fuel injection system from their installed locations to avoid damage or prevent moisture, oil stain and other foreign substances from entering, affecting the normal operation of the electrical injection system.
- When disconnect or connect the connector clips, the ignition switch must be placed in "OFF" position, otherwise, it may damage the electrical components.
- If it is required to dismantle the negative battery cable or ground, it is necessary to turn ignition switch to OFF, and all electric load shall be turned off. After negative pole earthing wire is dismantled for 60s, other electrical equipment can be maintained.
- Parts in the EFI system have high reliability, and if any exception occurred on the complete vehicle or engine, firstly check related mechanical parts is in good condition, system connectors, wire harness and earth wire are in good.
- The system fault, mainly the fault of the harness and connector. Generally, broken harness, poor contact of connector, connector terminal unplugged or not plugged to the end or part grounding.
- It is unusual that wire harness is broken in the middle. Normally, it is broken

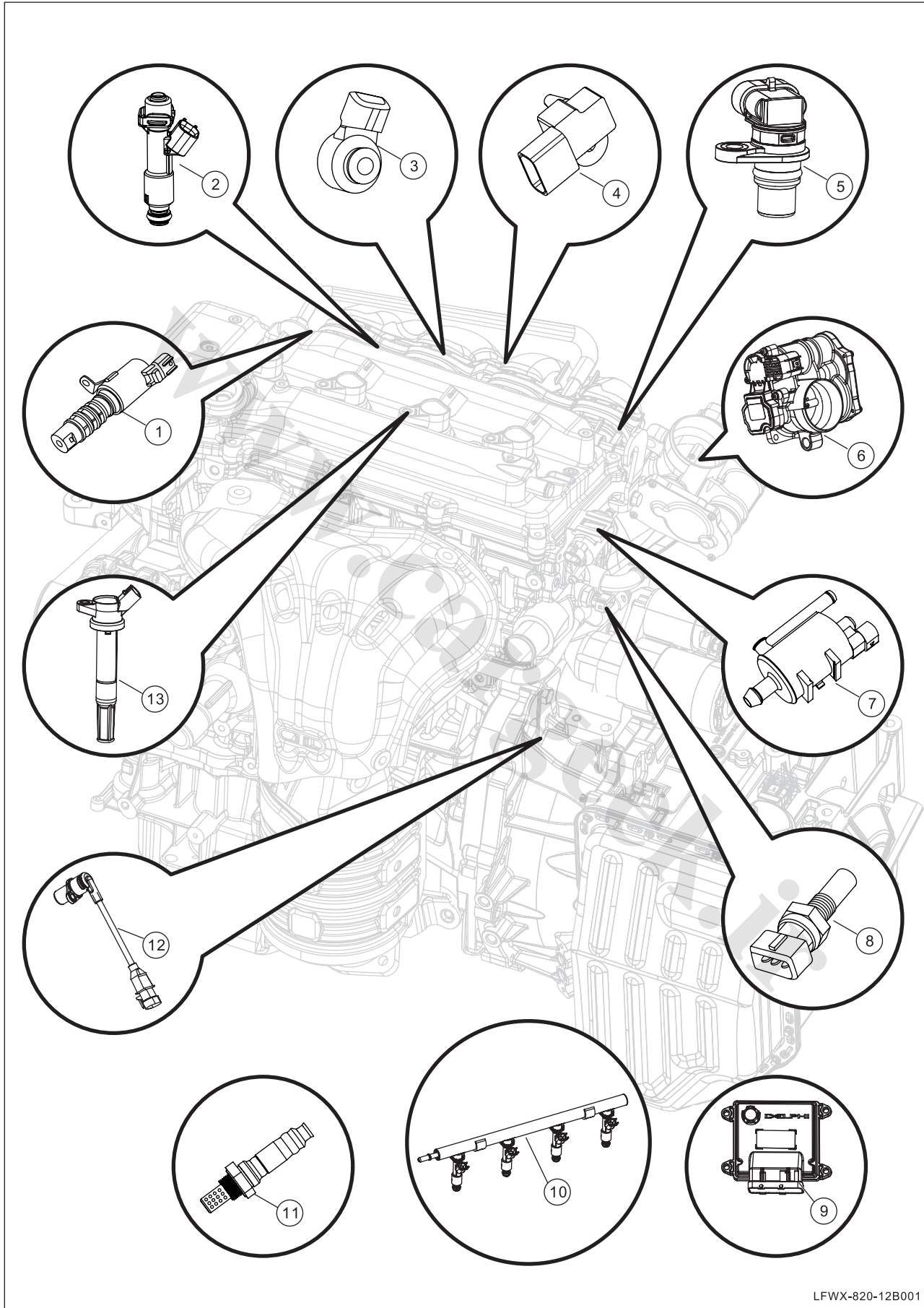
at the connector. Therefore, check wire harness at the sensor and connector carefully.

10. Poor contact may be due to connector terminal corrosion, external dirt intruding into the terminal or contact pressure reduction between connector plug and socket. Disconnect the connector and then reconnect it. Normal contact restored. When performing fault diagnosis, check whether the wire harness and the connector clips occur abnormalities; if the fault disappears after connected again, this fault belongs to poor connector contact.
11. Do not puncture the wire harness with fine needle to check electrical signal of the system.
12. When transporting and installing the sensor, to ensure that it is not damaged, it must be handled carefully, and any shock, falling may seriously affect its performance.
13. Before installing, remove the sundries on mounting surface with sealant scraper or steel brush, and confirm the sealing surface is smooth without oil stain.
14. When installing the sensor and actuator, tighten fixing bolts or nut according to specified value.
15. The oxygen sensor shall not contact with water or other liquids during dismantling and replacing. Maintenance of the oxygen sensor should be performed after the engine is cooled completely, otherwise, it may cause personal injury.
16. Due to high oil pressure (about 400kPa) of the electrical injection system, all fuel pipes are used with high pressure resistant fuel pipes. Even if the engine is not running, there still remains a higher fuel pressure in the oil lines. Therefore, pay attention not to disassemble the oil pipes during maintenance, and when the fuel system is needed for maintenance, it should be performed pressure relief treatment before disassembling the oil pipes.
17. Disassembling the oil pipe and replacing the fuel filter should be performed by the qualified service personnel in the place with good ventilation and away from open fire. Fuel shall be kept from falling to the engine and its high-temperature exhaust pipeline during the operation.
18. Fuel pump can not be tested in a state without gasoline or in the water. At any time the positive and negative poles of the fuel pump can not be connected reversely.
19. When checking the ignition system, spark plug flashover test is performed only when necessary, and the time should be as short as possible; otherwise, it will cause a lot of unburned gasoline to enter in the exhaust pipe and damage to the three-way catalytic converter.
20. When the battery power is low or the engine is faulty, never start the engine

with the help of the external force for a long time to prevent damage to the three-way catalytic converter.

21. When a vehicle equipped with electronic control engine is required to bridge power supply of any other vehicle for starting, first turn off ignition switch and all electrical loads on electronic control vehicle, then dismantle and install the jumper.
22. When performing arc welding on the vehicle, be sure to disconnect the positive and negative pole cables of the battery, remove ECM if necessary, thus avoiding damage to ECM by the high voltage during arc welding.
23. When repairing the body near ECM or sensor, take care to avoid the electronic components from being damaged.
24. When mounting or dismounting ECM, the operator should make himself ground connected; otherwise, iron build, otherwise, static electricity of the human body may cause damage to the ECM circuit.
25. Precautions for starting after disconnecting the negative battery cable: When starting, turn on the ignition switch and hold it there for more than 30s, and then turn off it and pause for about 30s before trying to start again. to ensure the EFI system to complete self-learning detection of the throttle. If the EFI system cannot complete this detection, this will cause the vehicle starting problems (unable to start, idle instability) or the EFI system fault.
26. Power supply system used by the vehicle is negative ground, and pay special attention not to connect the positive and negative poles reversely when installing the battery, so as not to damage to the electronic components.
27. When the system has a fault, the diagnostic scanner will clear fault code. If the fault still exists, fault code will always exist when reading fault codes next time until the fault is eliminated. Meanwhile, be sure to clear the fault code after completion of the maintenance.

# Components



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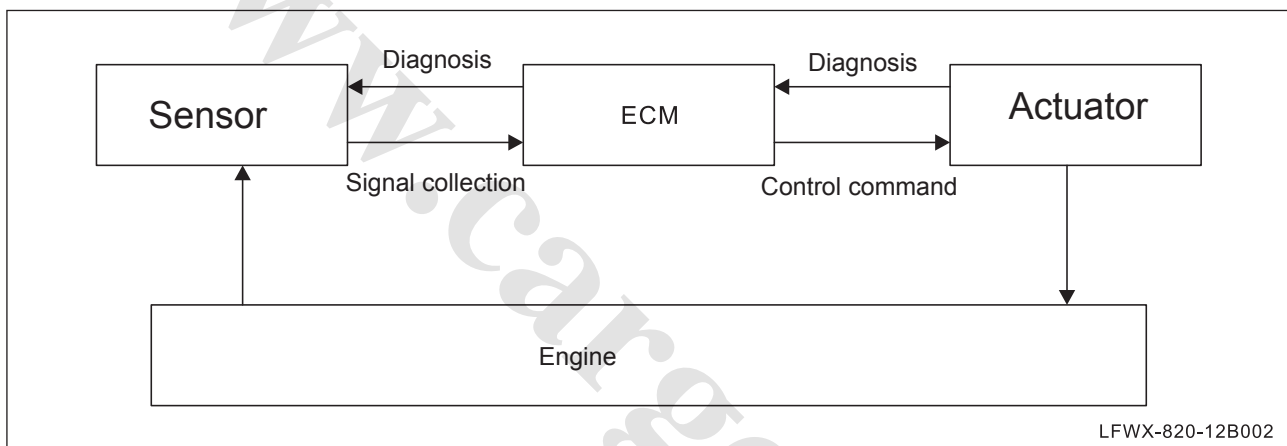
1	Intake pressure and temperature sensor
2	OCV
3	Injector
4	Ignition coil
5	Knock sensor
6	Canister control valve
7	Camshaft position sensor

8	Water temperature sensor
9	Crankshaft position sensor
10	Electronic Control Module (ECM)
11	Fuel rail
12	Oxygen sensor
13	Electronic throttle body

## Electronic control system description

### 1. Engine control system instruction

#### (a) System Block Diagram



- (b) Engine control system usually consists of three parts, namely, sensors, electronic control module (ECM) and actuator is composed of three parts. And it controls the air suction volume, injection volume and ignition advance angle when the engine is working.
- (c) In the electric control system of the engine, the sensors, as the input part, are used to measure various physical signals (temperature, pressure, etc.), and convert them into the corresponding electrical signals. ECM receives the input signals from the sensor, and performs computing according to the set procedures; the control signal generated accordingly is output to the power drive circuit, then the power drive circuit drives the respective actuators to perform corresponding actions, making the engine running in accordance with the set control strategy; while the ECM fault diagnosis system monitors the various parts or the control functions in the system, and once a fault is detected and confirmed, the fault code will be stored, and "Limp home" function will be invoked; it will be resumed to work normally only when the fault is eliminated.
- (d) Sensors mainly include intake pressure and temperature sensor, crankshaft position sensor, camshaft position sensor, throttle position sensor (integrated in the electronic throttle), coolant temperature sensor, knock sensor, accelerator pedal position sensor, oxygen sensor, etc..

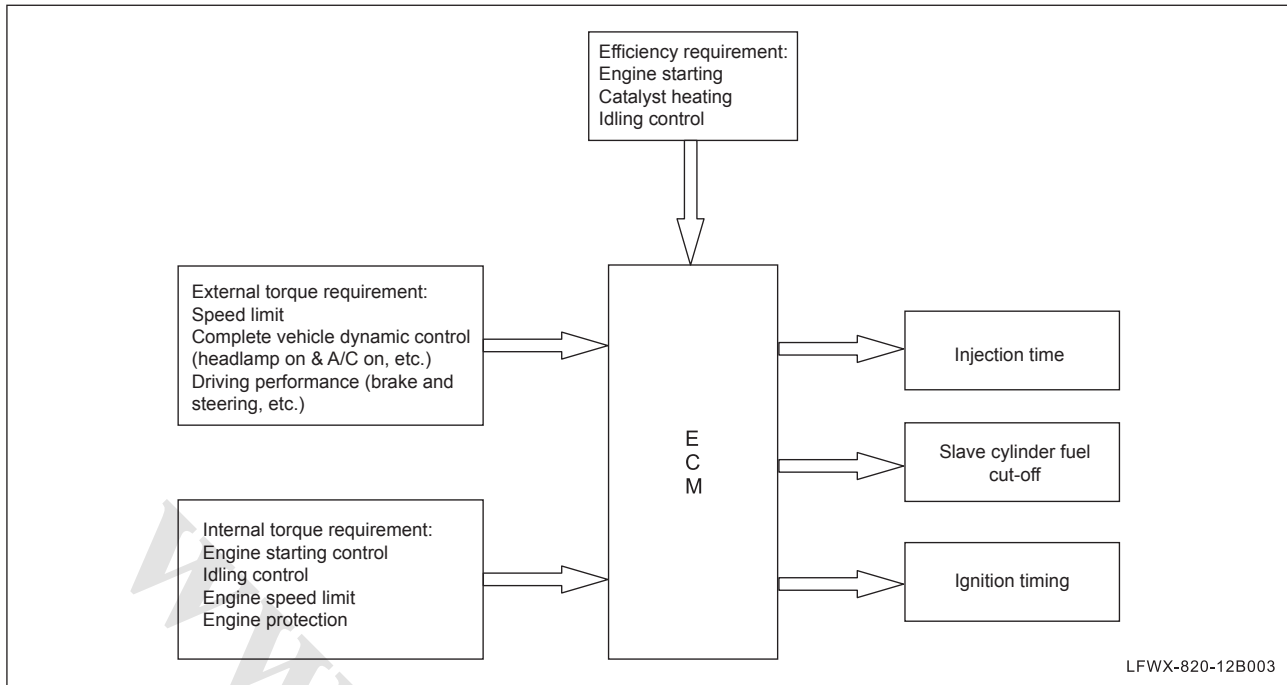
- (e) The actuator mainly consists of injector, ignition coil, throttle motor (integrated in electronic throttle), intake VVT valve, canister solenoid valve, etc.
- (f) Sensors and actuator instruction:

S/N	Parts	Quantity	Function
1	Electronic Control Module (ECM)	1	Optimize control system to be appropriate for working conditions of the engine according to signals provided by the sensor
2	Crankshaft position sensor	1	Check engine crankshaft rotation position and speed
3	Camshaft position sensor	1	It provides the crank & camshaft position information for the ECM , i.e. to distinguish the top dead center of the compression stroke and the top dead center of the exhaust stroke of the crankshaft.
4	Intake pressure and temperature sensor	1	Check the engine intake temperature and intake volume
5	Electronic throttle body	1	Test the throttle position and to adjust the throttle opening degree
6	Ignition coil	4	Ignition of the air-fuel mixture.
7	Fuel pump	1	Deliver fuel
8	Injector	4	Inject fuel according to ECM signals
9	Water temperature sensor	1	Check engine coolant temperature
10	Canister solenoid valve	1	Cause the fuel vapor in the canister into the intake duct according to the ECM digital pulse square wave
11	Fuel pump	1	Deliver fuel
12	OCV	1	Controlling the engine oil flow into the camshaft position actuator.
13	Oxygen sensor	2	Check oxygen concentration in exhaust gas
14	Knock sensor	1	Check if the engine has knock

## 2. Engine control system function

- (a) All the internal and external demands are defined with the torque or efficiency of the engine by adopting the control strategies based on torque. Various demands of the engine are converted to the control variables of the torque or efficiency; after processed in ECM, these control variables are converted to the engine control parameters such as ignition time, ignition timing, etc.





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(b) The main functions of system:

S/N	Function	S/N	Function
1	Starting control	6	Oil cut-off control for acceleration/deceleration and reverse towing
2	Idle speed control	7	Evaporative emission control
3	$\lambda$ closed-loop control	8	Overvoltage protection
4	Knock control	9	A/C compressor control
5	Heating control for warm-up and three-way catalytic converter	10	Fault diagnosis and limp home

### 3. System function introduction

(a) Starting control.

- During starting, adopt a special calculation method to control the charging amount, fuel injection and ignition timing.
- At the initial stage of this process, the air within the intake manifold is still and the internal pressure of intake manifold is indicated as ambient pressure. Electronic throttle opens to a certain angle, and its size is a set fixed parameter according to the starting temperature.
- The fuel injection amount changes with the engine temperature to promote the film formation of the intake manifold and the cylinder wall. Increase the enrichment of the mixture before the engine reaching to a certain speed. As soon as the engine starts, the system immediately begins to decrease the starting enrichment; starting enrichment will be canceled completely until the starting condition is finished (when the engine speed reaches 600~700r/min).

- **Under working conditions of starting, ignition angle is adjusted continuously and changes with the engine temperature, intake air temperature and engine speed.**

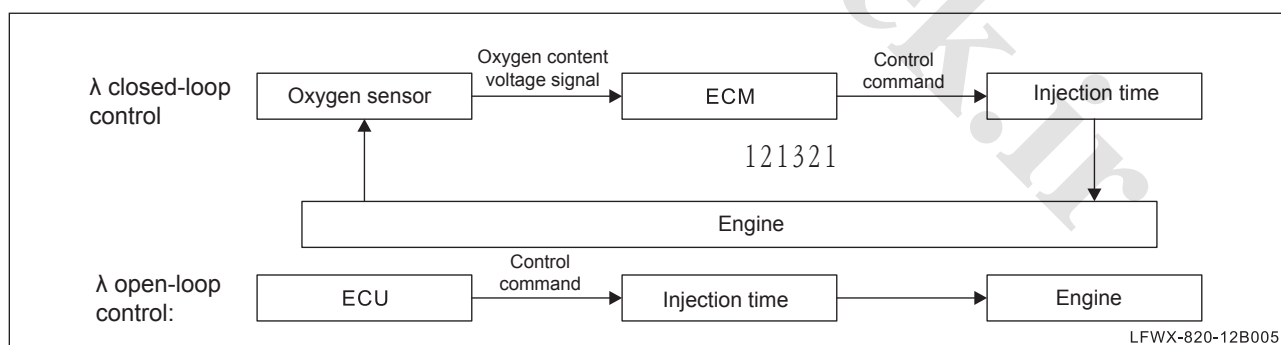
(b) Heating control for warm-up and three-way catalytic converter

- After cold start of the engine, air filling volume, fuel injection and ignition will be adjusted to compensate for the higher torque requirements of the engine. This process lasts until the engine temperature rises to certain threshold value (the engine temperature is approximately the engine coolant temperature).
- The function of three-way catalytic converter is to convert harmful gas from engine combustion into harmless gas and then discharge into the atmosphere.
- As the operating temperature of the three-way catalytic converter is above 300°C, the most important thing is to quickly heat the three-way catalytic converter during warm-up. Under this working condition, use the exhaust gas to perform "three-way catalytic heating" with the method of moderately delaying the ignition advance angle.

(c) Idling speed control.

- Idle speed control function refers to the control of the engine speed by the system when the accelerator pedal is not depressed.
- Idle speed control includes control over stabilizing the engine speed when the vehicle driving at idle speed. It also includes the idle speed control over opening air conditioning, power steering, opening headlamps, etc.. when increasing the load.
- The system uses a stepper motor (integrated in the electronic throttle) to automatically adjust the throttle opening, thus achieving high precision of idle speed control.

(d)  $\lambda$  closed-loop control.



- Oil supply to the engine uses a closed-loop control, thus making the engine always running in an ideal condition (air/fuel ratio is not much deviated from the theoretical value). Use open-loop control when the engine is just started or required at high speed. The advantages of the closed-loop control is to reduce emissions, and improve the vehicle's dynamic performance and economy.  $\lambda$  indicates air/fuel ratio of the mixture, when  $\lambda = 1$  the theoretical air/fuel ratio is 14.7:1.
- $\lambda$  closed-loop control system works equipped with front oxygen sensor. Front

oxygen sensor is used to monitor the oxygen content in the exhaust gas in the side of the three-way catalytic converter, lean mixture ( $\lambda > 1$ ) produces a sensor voltage of about 110mV, and rich mixture ( $\lambda < 1$ ) produces a sensor voltage of about 750mV. When  $\lambda = 1$ , the sensor voltage will have a jump.  $\lambda$  closed-loop control responds to the input signals ( $\lambda > 1$  indicates oxygen sensor voltage is below 100mV,  $\lambda < 1$  indicates oxygen sensor voltage is greater than 750mV) and modifies the control variables, producing a correction factor as a multiplier to correct the fuel injection duration.

- The exhaust after-treatment of the three-way catalytic converter is an effective way to reduce the concentration of the harmful substances in the exhaust gas.
  - Three-way catalytic converter can reduce HC, CO and NO<sub>x</sub> by 98% or more and convert them into H<sub>2</sub>O, CO<sub>2</sub> and N<sub>2</sub>. However, this high efficiency is achieved only when the excess air factor is in a narrow range of near  $\lambda = 1$ , and the aim of  $\lambda$  closed-loop control is to ensure the mixture concentration within this range.
- (e) Oil cut-off control for acceleration/deceleration and reverse towing
- A portion of the fuel injected into the intake manifold will not reach the cylinder in time to participate the subsequent combustion process. Instead, it forms a layer of film on the intake manifold wall. Fuel amount stored in the oil film will increase dramatically according to the increasing of the load and extension of the injection duration.
  - When the throttle opening increases, part of the injected fuel will be absorbed by the oil film. Therefore, corresponding supplementary fuel must be injected in for compensation and to prevent the mixture thinning when accelerating.
  - Once the load factor decreases, the additional fuel contained in the fuel film on the intake manifold wall will be re-released. While decelerating, corresponding injection duration must be decreased.
  - Reverse towing or towing working condition refers to situation that the power provided by the engine is a negative value in the flywheel. In this case, the friction of the engine and the rotation of the pump and crankshaft can be used to decelerate the vehicle. When the engine is in reverse towing or towing condition, fuel injection is cut off to decrease the fuel consumption and exhaust emissions, and more important, to protect the three-way catalytic converter. Once the speed drops at a specific oil recovery speed while above the idle speed, the fuel injection system will resume oil supply.
  - When the injection system resume to supply oil, the system begins to provide the complementary fuel with the initial injection pulse, and rebuilds oil film on the intake manifold wall. After resuming oil injection, torque-based control system makes the engine torque increase slowly and steadily (smooth transition).
- (f) Knock control
- The system detects the characteristic vibration generated from the knocking with the shock sensor installed between the cylinder 2 and the cylinder 3 of the engine, and it is converted into the electrical signals to be transmitted to ECM for

processing.

- ECM uses special calculation method to check if knock occurs during the course of each combustion cycle in each cylinder. Once knock is detected, knock closed-loop control is triggered. When knock risk is eliminated, affected cylinder will be advanced to preset ignition advance angle gradually.
- (g) Over voltage protection.
- When charging system has a fault which leads to high voltage, the system will go into protection state to limit engine speed in order to avoid ECM from being damaged.
- (h) A/C compressor control
- When air conditioner switch is turned on, ECM will receive signal of air conditioner request, and make preparation for adding load for air conditioner according to current engine working condition, and then switch on A/C compressor.
  - ECM will control the air conditioning to be connected or disconnected according to the self-protection needs of the air conditioning. In order to ensure power take-off and protect the engine, the system will cut off air conditioner under some special conditions.
- (i) Evaporative emission control.
- Due to the external radiation heat and the oil return heat transfer, the fuel in the oil tank will be heated to form fuel vapor.
  - As limited by the evaporative emission regulations, these vapors containing a large number of HC element are not allowed directly exhausted into the atmosphere. Fuel vapor in the system is collected in the charcoal canister through a tube and entered into the engine through flushing at the appropriate time to participate in the combustion process.
  - The flow of flushing air is achieved by controlling over the canister solenoid valve by ECM. This control works only in the condition of the system closed-loop controlled by  $\lambda$  closed-loop.
- (j) Cooling fan control
- The vehicle is equipped with the electric dual-speed engine cooling fan.
  - Electric fan control function: ECM determines if it is necessary to turn on the fan according to engine coolant temperature and actual conditions for turning on air conditioner to reduce power consumption in the engine.
- (k) On-board diagnosis
- Self-diagnosis of system fault is an essential function of engine control system. When one or several parts work abnormally, the system will remind the user of necessary check and maintenance by lighting fault indicator lamp. When a fault occurs, the system can adopt emergency plan to control the engine so as to ensure the driver drive the vehicle to a service station.

- When one sensor and actuator are detected to be abnormal, engine fault indicator lamp is lit to remind the driver.
- Read RAM data related to sensor and actuator in ECM by fault diagnostic scanner. In addition, in some cases, the actuator can be forced to drive.

#### 4. Principle of starting control

- After the ignition switch is turned on, the fuel pump will stop after running for about 2s.
- The engine starts to run, as soon as effective 58X signal is detected by ECM, the fuel pump will start running.
- After the speed signal disappears (analog signal is susceptible to interference) for 0.8s, the fuel pump stops running.

- Pre-injection:

Pre-inject only once during the course of normal starting (if fuel is absorbed by carbon deposit, gas mixture becomes thinner and it is not easy to start).

- At the initial stage of starting:

The pressure in intake manifold is shown as atmospheric pressure. The throttle valve is closed and the ECM appoints a fixed parameter that established according to the start-up temperature (coolant temperature).

- The process of starting:

Fuel injection quantity according to the engine coolant temperature varies, the ignition angle are also constantly adjust and as the engine coolant temperature, inlet temperature and engine speed varies.

- Starting process is over:

If engine speed is more than 800 r/min, end starting conditions.

#### 5. Fuel injection control principle.

- The ECM controls the drive time and injection timing of injectors to achieve the air mixture of best air-fuel ratio for the engine under all kinds of working conditions.
- In the fuel rail, fuel pressure regulator keeps injection pressure stable, the injector directly inject fuel into each cylinder of the airway. In each working circle (crankshaft rotates twice for each circle) of the engine, each cylinder injects once (injection sequence is 1-3-4-2), this injection is called sequential injection.
- When the engine running in a cold or heavy-duty state, to maintain good engine performance, the ECM will execute the open-loop control to provide richer gas mixture. When the engine is in the normal working state (with a small-and-medium load), the ECM will perform the closed-loop control through the feedback signal of the oxygen sensor to obtain the optimum air-fuel ratio to achieve the best purification efficiency of the three-way catalytic converter.

(d). Fuel-injection pulse width control.

Input signal	ECM	Control output
Air-fuel ratio correction	Calculate fuel injection amount	Fuel-injection pulse width
Closed-loop feedback correction		
Intake manifold pressure		
Air inflation temperature		
Air inflation efficiency		
Self-learning correction		
Power supply voltage correction		
Exhaust gas cycle		
Acceleration and thickening		
Deceleration and thinning		
Deceleration and fuel cut-off.		
Injector parameters		

(e) Control signal description.

Correction item	Content
Air-fuel ratio includes	<ul style="list-style-type: none"> <li>• Air-fuel ratio for starting</li> <li>• Air-fuel ratio when the engine runs</li> <li>• Air-fuel ratio at low coolant temperature of the engine</li> <li>• Air-fuel ratio at normal coolant temperature of the engine</li> <li>• Theoretical air-fuel ratio</li> <li>• Stronger air-fuel ratio</li> <li>• Overheating protection air-fuel ratio</li> </ul>
Closed-loop feedback correction	<ul style="list-style-type: none"> <li>• Control actual air-fuel ratio by oxygen sensor feedback signal to make it be close to theoretical air-fuel ratio</li> </ul>
Intake manifold pressure	<ul style="list-style-type: none"> <li>• Read directly through MAP installed on intake manifold</li> </ul>
Self-learning	<ul style="list-style-type: none"> <li>• Correct slow change, such as mechanical wear, in the engine due to long time running</li> </ul>
Power voltage	<ul style="list-style-type: none"> <li>• When the battery voltage changes, voltage correction can ensure correct fuel injection amount</li> </ul>
Acceleration and thickening	<ul style="list-style-type: none"> <li>• When ECM detects intake manifold pressure and throttle opening value is increased, fuel injection amount is increased to improve power performance in order to avoid engine gas mixture from becoming thinner instantly.</li> </ul>

Deceleration and thinning	<ul style="list-style-type: none"> <li>When the ECM detects the intake manifold pressure and the degree of throttle opening reduces substantially, in order to avoid the instantaneous thickening of air-fuel mixture of the engine, the fuel injection quantity will be decreased to improve emissions and driving performance</li> </ul>
Deceleration and fuel cut-off.	<ul style="list-style-type: none"> <li>Control to cut off the fuel when the system detects the vehicle enters into deceleration state. to reduce emissions and fuel consumption. When the engine speed is higher than the set value, start to cut off the fuel supply. When the ignition system fails, cut off the fuel supply.</li> </ul>
Fuel injection parameters	<ul style="list-style-type: none"> <li>Provide relation between the engine and fuel injection amount</li> </ul>

## (f) Correction of engine gas mixture

- When the engine is at normal working temperature, partial load control is closed-loop fuel control. Now, the system corrects fuel injection amount at real time by ECM according to voltage signal of oxygen sensor feedback so that adjusted gas mixture concentration is close to theoretical air-fuel ratio to ensure conversion efficiency of harmful gas through three-way catalytic converter reaches to optimal state and a better fuel economy.
- When the engine is within normal working temperature range, open-loop fuel control is used at full load. At the moment, to ensure the best power output of the engine, the system will control the fuel injected with a richer air-fuel ratio and increase the ignition advance angle moderately without engine knock. The system can control exhaust temperature through exhaust temperature mathematical model established when calibrating to protect the engine and three-way catalytic converter.
- The system determines full-load conditions of the engine according to signals provided by throttle position sensor. Normally, when throttle opening reaches 80%~90%, the system will consider that the engine is in full-load state. When the driver depresses on accelerator pedal, the system will increase fuel injection amount appropriately to ensure power required by the engine when accelerating. Increased fuel injection amount is directly proportional to throttle valve opening change rate. When accelerating, ECM first delays ignition advance angle appropriately, then restore it gradually in order to avoid increased torque from impacting drive system when the engine accelerates quickly.
- When working condition of accelerating is close to full load of the engine, the system will disconnect vehicle air conditioner system temporarily to ensure power takeoff of the engine when accelerating. No matter in any condition, when engine speed exceeds maximum speed set in system, the system will cut fuel supply to resist endless increase of speed, to protect engine and prevent "vehicle flying". When speed returns to maximum speed limit specified by the system, the system will immediately recover fuel supply.

## 6. Ignition control principle

### (a) Starting.

When the engine starts, one fixed ignition advance angle is used to ignite gas in the cylinder and provide positive torque. After the engine speed increases to a certain degree, ECM calculates ignition advance angle according to input signals.

### (b) Ignition advance angle control.

Correction signal	ECM	Control output
Coolant temperature correction	Calculate ignition advance angle	Ignition advance angle
Intake air temperature correction		
Idle speed correction		
Main ignition angle		
Decelerating and fuel cut-off correction		
Accelerating correction		
Power enrichment correction		
Air conditioner correction		

### (c) Main ignition advance angle.

After the engine reaches to normal value, main ignition angle when the throttle valve is opened is the minimum ignition angle at the optimal torque point. When the throttle valve is closed, ignition angle shall be decreased to obtain idle speed stability.

### (d) Ignition advance angle correction.

- Acceleration correction: when the vehicle is accelerating, ECM detects knock signal, correct ignition angle until no knock occurs. In addition, it is used to reduce engine speed fluctuation caused by drive system knock.
- Power enrichment corrected: In the vicinity of the engine-performance, to obtain a better power and torque, the enriched air-fuel ratio can reach the thinnest one with the best torque value.
- Decelerating and fuel cut-off correction: when exiting deceleration and fuel cut-off, correct ignition advance angle to ensure stable transition.
- Air conditioner control correction: when the engine is idling, turn off air conditioner. Correct ignition advance angle to ensure stable transition.

## 7. Idling-speed control principle

### (a) Idle speed control.

According to idle speed conditions and engine load changing at idle speed, control throttle bypass air amount to keep idle speed optimal. According to the engine coolant temperature and air conditioning load, ECM drives the throttle's motor to allow



the engine to run at the preset idling speed. Further, if the air conditioning switch is turned on or off when the engine is idling, ECM drives the throttle's motor to adjust the air amount according to the load condition of the engine to avoid idle instability.

(b) Calculate target idle speed.

Input signal	ECM	Control output
Basic target idle speed	Calculate target idle speed	Target idle speed
Voltage compensation		
Vehicle speed compensation		
Headlamps compensation		
Fan compensation		
A/C compensation		
Decelerating adjustment		

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- Voltage compensation: When the voltage is less than 12V, the system will increase target idle speed automatically to increase generated energy of the alternator.
  - A/C compensation: When parking vehicle at idle speed and opening air condition, to compensate power consumption of compressor, aim idle speed will increase by 150r/min.
  - Headlamps compensation: With the low-beam Headlamps on, in order to compensate for their power consumption, the target idling-speed will rise to about 50r/min.
  - Fan compensation: when coolant temperature is increasing, the fan is running. In order to compensate power consumption of fan running, target idle speed will be increased by 50r/min.
- (c) Idle speed control parameters:
- Idle speed air amount.
  - Fuel injection amount.
  - Ignition timing
- (d) Idle speed design control opportunity:
- Idle speed stability calibration.
  - Accelerating working condition calibration.
  - Decelerating working condition calibration.
  - Decelerating and fuel cut-off.
  - Engine transient state transition working condition fuel supply calibration.

- Constant speed driving calibration.
- Mechanical and electrical load increasing / decreasing calibration.

(e) Decisive factors of target idle speed:

- When the engine coolant temperature is too low, the system will provide high target idle speed to speed up warming-up process.
- When external loads (e.g., headlights, air conditioning, cooling fans and other electrical equipment are turned on) are applied, the system will increase the idling speed to compensate for the increased load and keep the idling speed stable.

## 8. Knock control principle

(a) Knock sensor introduction:

Knock sensor is a vibration acceleration sensor, installed between No. 2 cylinder and No. 3 cylinder in favor of engine knock balance. ECM determines if knock occurs in the engine using vibration frequency signal output by the sensor and through filtering inside ECM. When knock signal is detected, ECM corrects ignition angle until no knock occurs.

(b) Knock control conditions:

- The vehicle is provided with knock sensor.
- Engine speed is larger than 800r/min.
- MAP>40kPa.

(c) Knock control mode:

- Steady-state control:

When the engine is running normally, ECM collects and analyzes noise during the course of engine combustion through knock sensor. After filtering, knock is detected. Once knock strength exceeds the limit, the system will retard ignition advance angle of the cylinder of knock to eliminate the knock.

- Transient state control:

In sudden acceleration or dramatical change in the engine speed, knock easily occurs. After predicting the possibility of knock, the system will defer the ignition advance angle automatically to avoid excessive (violent) knock.

- Quick-delay of ignition advance angle:

After detecting the knock, the system will delay the ignition advance angle quickly in accordance with different engine speed, and restore the ignition advance angle 2s ~ 3s later.

- Adaptability adjustment of ignition angle:

Due to manufacturing deviation and wear caused by long term usage (belt, toothed pulley and cam affecting phase angle relation), the engine has differences or chang-

es. If the system and engine are used initially or after ECM is charged, the engine may have knock. The system will record it. After a period of running-in, the system will generate ignition adjustment correction value (self-learning value) automatically. When the engine runs to the same working conditions, the system will adjust ignition advance angle automatically. Strong knock is forbidden. Adaptive learning of the system is continuously updated during the course of running.

## 9. Canister control valve control principle

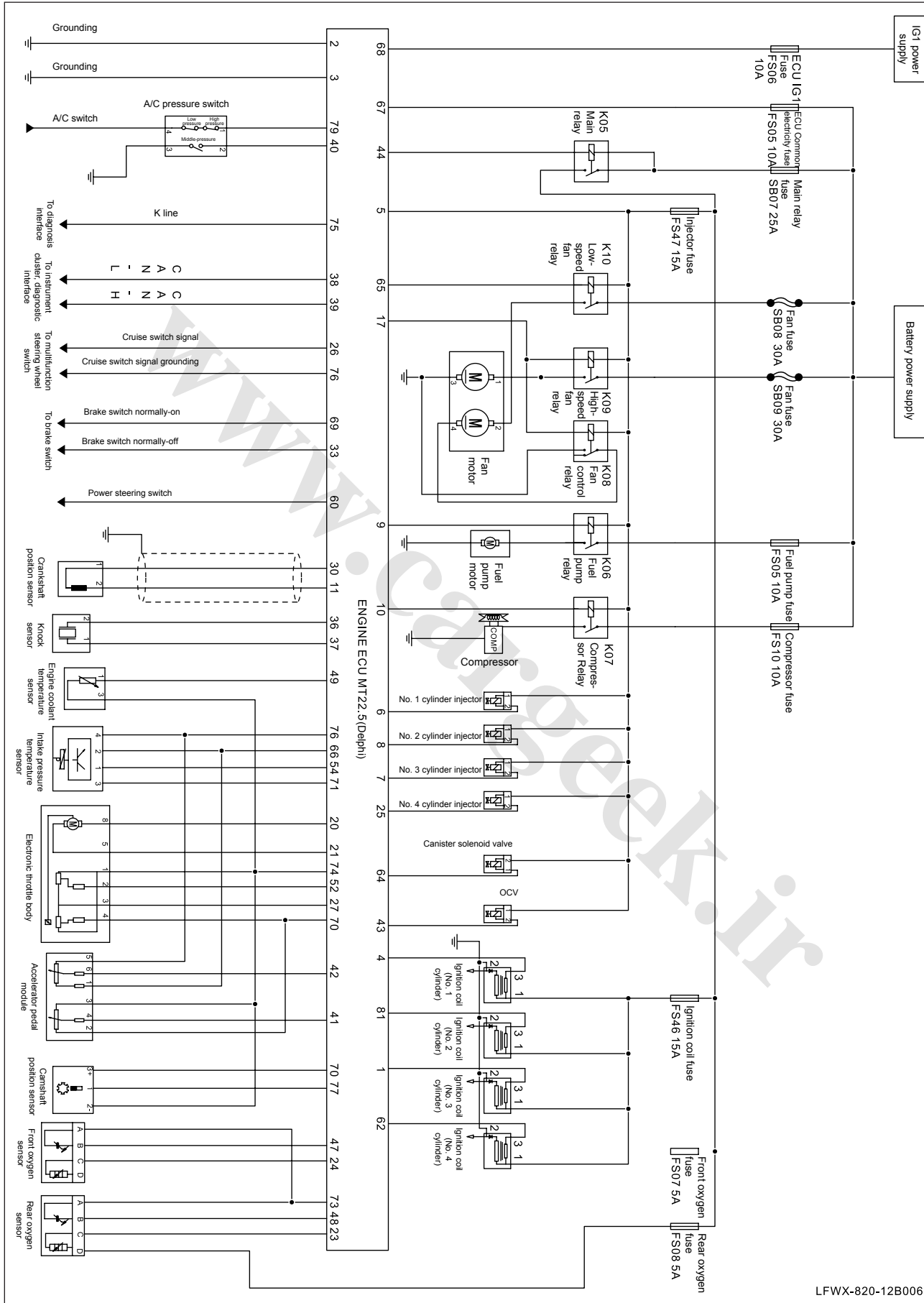
(a) Used to control the flow of canister cleaning airflow.

Based on the engine load, engine coolant temperature, engine speed and a series of signals, duration and frequency (duty cycle) of the electrical pulse to be sent through comprehensive calculation, the ECM will control the canister solenoid. Excessively-accumulated fuel vapor in the canister can cause gasoline leak resulting in environmental pollution. Therefore, the purpose of the canister control valve is to open at the right time to allow the excessive fuel vapor in the canister to mix with air before entering into the intake pipe to participate in combustion.

(b). Canister will not work in the following conditions:

- Within a period of time after engine cold start.
- Engine coolant temperature is too low.
- Engine idle.
- Engine load is high.
- Important sensor system faults.

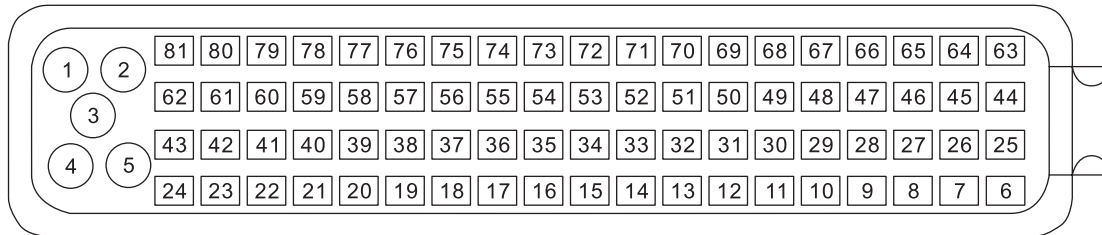
# Schematic diagram



LFWX-820-12B006

## Terminal definition

E01A to the engine ECM



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Terminal No.	Color	Function	Terminal No.	Color	Function
1	R/W	PCANH	26	-	-
2	-	-	27	-	-
3	-	-	28	Gr/V	A/C request signal (high-voltage/low-voltage switch)
4	-	-	29	Bl/G	Power steering switch signal
5	Y	Main relay ECU control	30	Gr	Signal of accelerator pedal position 2
6	P/B	Clutch switch signal (MT models)	31	W/R	High-speed fan relay ECU control
7	Bl/W	Signal ground of accelerator pedal position 1	32	R/W	Engine immobilizer input
8	-	-	33	-	-
9	-	-	34	-	-
10	-	-	35	B/W	ECUIG1 Power
11	-	-	36	R/W	Power supply (5V) for signal of accelerator pedal position 2
12	-	-	37	O/Bl	Power supply (5V) for signal of accelerator pedal position 1
13	-	-	38	-	-
14	-	-	39	-	-
15	Bl/R	Output power supply for main relay	40	-	-

Terminal No.	Color	Function	Terminal No.	Color	Function
16	Bl/R	Output power supply for main relay	41	Gr/Y	ECU controlled fuel pump relay
17	B/W	PCANL	42		NC
18	-	-	43	Br/R	Rear oxygen sensor signal ground
19	-	-	44		NC
20	R	Battery power supply	45	R/Y	Signal of accelerator pedal position 1
21	Gr	Rear oxygen sensor signal	46	-	-
22	O	Neutral switch signal	47	-	-
23	Gr/W	Brake switch signal (Normally Closed)	48	Gr/O	Rear oxygen sensor heating control
24	G	A/C medium-pressure switch signal	49	-	-
25	Gr/R	Brake light signal (normally open)	50	-	-
51	-	-	82	-	-
52	-	-	83	-	-
53	-	-	84	-	-
54	-	-	85	Y/R	Sensor signal ground (intake pressure and temperature, water temperature)
55	-	-	86	V	Throttle position sensor signal ground
56	W/B	Low-speed fan relay ECU control	87	R/G	Throttle actuator -
57	-	-	88	P/G	No. 2 cylinder ignition coil control
58	Gr/Bl	Compressor's electromagnetic clutch ECU control	89	Lg	Knock sensor terminal B
59	W/B	Signal ground of accelerator pedal position 2	90	Lg/B	Knock sensor terminal A
60	-	-	91	P/B	Intake pressure signal
61	-	-	92	-	-
62	-	-	93	R/Bl	Camshaft position sensor signal
63	B	Grounding	94	W/G	Canister solenoid valve control

Terminal No.	Color	Function	Terminal No.	Color	Function
64	B	Grounding	95	Lg/W	Camshaft position sensor signal ground
65	-	-	96	P/G	Crankshaft position sensor terminal A
66	-	-	97	Br	Crankshaft position sensor terminal B
67	Y/R	No. 2 cylinder injector control	98	Y/G	Camshaft position sensor 5V power supply
68	O/B	No. 1 cylinder injector control	99	Lg/W	No. 3 cylinder ignition coil control
69	-	-	100	Lg/R	No. 1 cylinder ignition coil control
70	-	-	101	Y/B	Water temperature sensor signal
71	Y/W	VVT valve control	102	Bl	Intake air temperature signal
72	P/Y	No. 3 cylinder injector control	103	-	-
73	V/W	Front oxygen sensor heating control	104	O/Y	Front oxygen sensor signal
74	G/Y	No. 4 cylinder injector control	105	-	-
75	P	Throttle actuator +	106	-	-
76	Br	No. 4 cylinder ignition coil control	107	R/B	Power supply (5V) for throttle position sensor
77	W/P	Throttle position sensor signal 1	108	-	-
78	Bl/G	Throttle position sensor signal 2	109	O/Bl	Power supply (5V) for intake pressure and temperature sensor
79	-	-	110	-	-
80	G/B	Front oxygen sensor signal ground	111	B	Grounding
81	-	-	112	B	Grounding

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## Basic check

△ HINT:

If the DTC isn't determined during inspection of DTC, all possible circuits must be considered as possible fault cause to analyze and eliminate fault. In most cases, basic check for the engine in the following table will be made to find fault location quickly and efficiently.

Steps	Inspection item		Recommended action
1	Check the battery voltage • The battery voltage shall be $\geq 9.6V$ . Inspect if the result is normal	Yes	Go to Step 2
		No	Charge or replace the battery.
2	Check if the engine starts • Start the engine. Inspect if the result is normal	Yes	Go to Step 3
		No	Go to Step 6
3	Check air filter • Take out air filter • Check if air filter is polluted or oily excessively visually. Inspect if the result is normal	Yes	Go to Step 4
		No	Clean or replace air filter
4	Check idle speed • Start the engine. • Keep the engine idling. Inspect if the result is normal	Yes	Go to Step 5
		No	See 12A- Engine Control System - Fault Diagnosis, Table of Symptoms.
5	Check ignition timing • Use timing lamp or ignition timing tester to check ignition timing. Inspect if the result is normal	Yes	Go to Step 6
		No	See 12A- Engine Control System - Fault Diagnosis, Table of Symptoms.
6	Check fuel pressure • Check fuel pressure with fuel pressure gauge. Inspect if the result is normal	Yes	Go to Step 7
		No	See 12A- Engine Control System - Fault Diagnosis, Table of Symptoms.
7	Check the spark plug • Remove the spark plugs one by one. • Test spark plug. Inspect if the result is normal	Yes	Basic check is over
		No	Replace spark plug



## Fault Diagnosis

### Diagnostic system description

#### 1. Overview of system

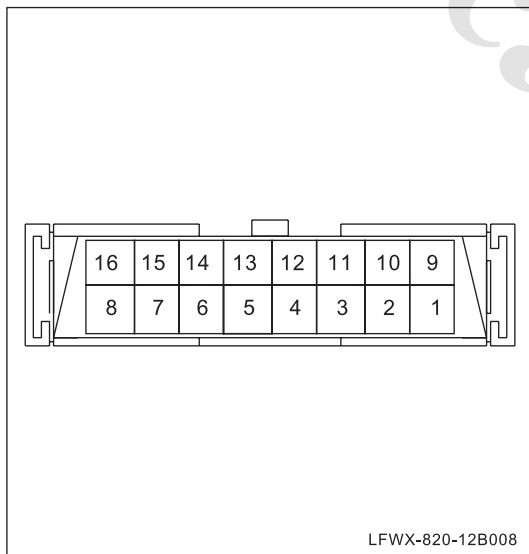
The engine EFI diagnosis system refers to the on-board (OBD) system for emission control. Its role is to identify the possible fault area, and store the information in the electronic control unit memory in the form of fault code.

#### 2. Information storage

- (a) In case a fault presents and is conformed by the system ,it will be stored in electronic control module (ECM) as a separate fault code.
- (b). Store fault information and engine state parameters when the fault occurs, including load value, engine speed, fuel pressure and correction, vehicle speed, coolant temperature, etc.

#### 3. Information reading

- (a). Connect a diagnostic scanner with the vehicle through diagnosis interface or a computer to read fault code and engine state parameters when the fault occurs.



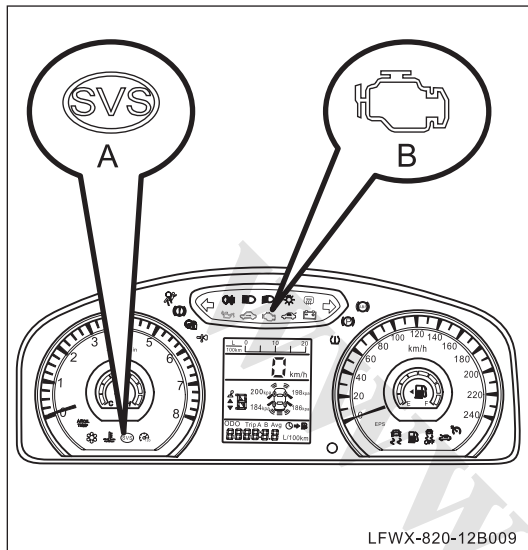
- (b). Diagnosis interface:

16-pin interface, located below the left lower dashboard.

- (c). Diagnosis interface description:

Terminal code	Function description	Inspection of data
4	Grounding (-)	Resistance : about 1 $\Omega$ or less
5	Grounding (-)	Resistance : about 1 $\Omega$ or less
6	CAN_H	2.5V - 3.5V voltage

7	KW2000 communication cable	Pulse Signal
8	IG1 power	Ground voltage 9V - 14V
14	CAN_L	1.5V - 2.5V voltage
16	Battery positive terminal (+)	Ground voltage 9V - 14V



#### 4. Malfunction indicator

##### (a). Position and symbol

Instrument panel contains 2 fault indicators: engine fault indicator lamp "SVS" (A), the other is OBD fault indicator lamp "MIL" (B) Both are controlled by ECM calibration. The difference is that OBD MIL is mandatory by national laws and regulations. When it is lit, it means there is a fault in electronic control system that deteriorates emission of complete vehicle. SVS light means there are other faults in electronic control system. During the course of normal running of the engine, when a fault occurs, both lights are lit according to its respective rules.

#### 5. Lighting type of malfunction indicator

##### △ HINT:

- Before starting the engine, turn the ignition switch to "ON" and pause for about 2s, and observe whether the indicators on the instrument performs a self-test.
  - The SVS and MIL lamps on the dashboard are to prompt the user whether the fault is related to the electronic control system. Their illumination will be controlled by the ECM internal calibration data.
- (a) When the system has no fault
- Turn ignition switch to ON, and MIL is always lit, SVS goes out after self check.
  - After starting, MIL lamp and SVS go out;
  - After flameout, then MIL and SVS go out.
- (b) When the system fails accordingly.
- If the ignition switch is turned to ON position, both MIL and SVS stays on.
  - After starting the engine, if the system is faulty, MIL light and SVS light will be on all the time in accordance with their respective rules.
  - All indicators will be off after flameout of the engine.

## 6. Classification of faults occurred in engine electronic control system

- (a) If the OBD fault indicator on the instrument is on, it indicates that a fault worsening the emission occurs in the engine electronic control system.
- (b) If the SVS fault indicator on the instrument is on, it indicates that the electronic control system is abnormal; in this case, continuous driving may cause damage to the engine, or result in personal injury.

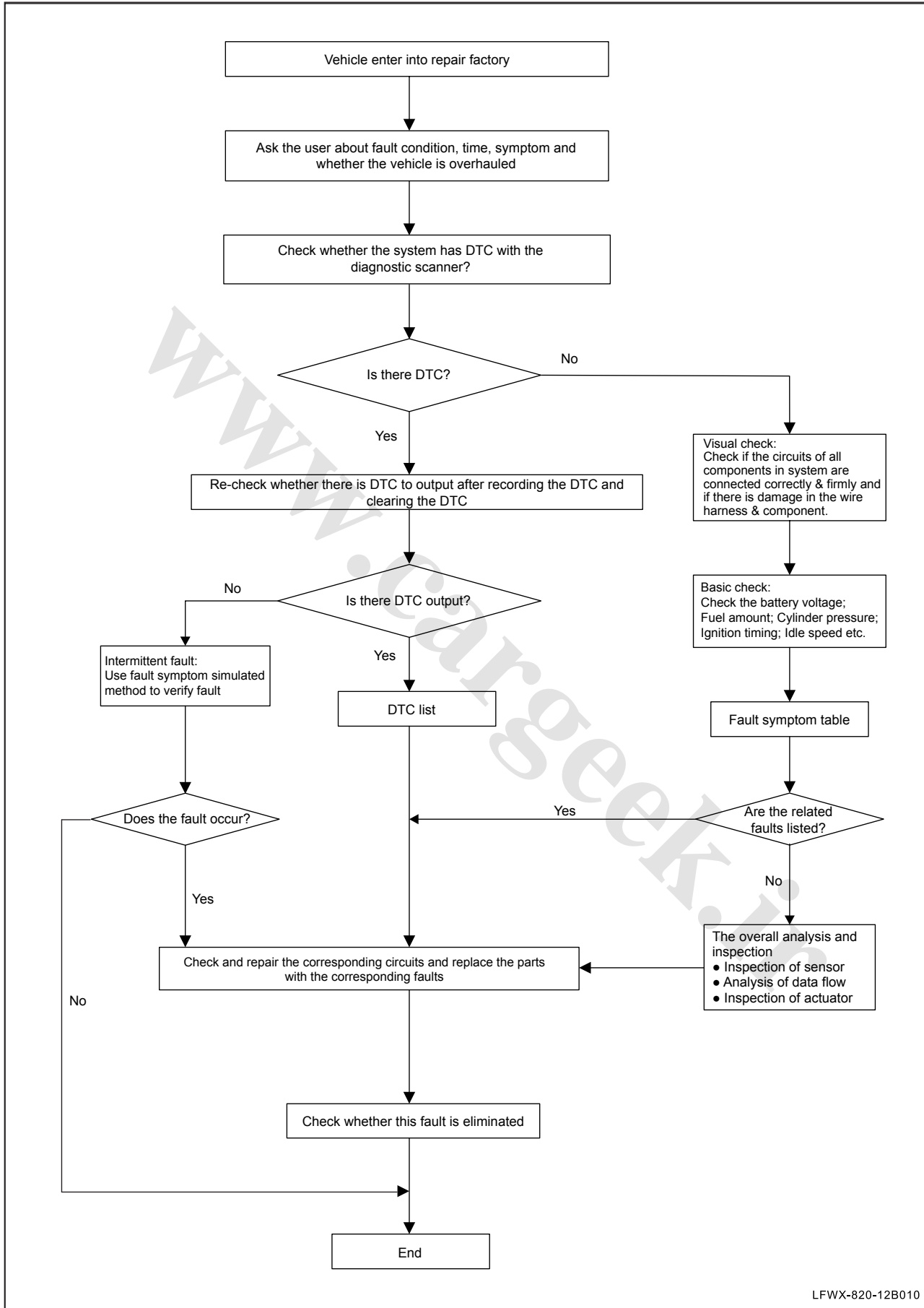
△ HINT:

The two faults require the user to go to the service station immediately authorized by LIFAN to have them checked with the diagnostic scanner or the special equipment with the equivalent function.

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## Fault diagnosis procedure



LFWX-820-12B010

## Fault diagnosis analysis

### △ HINT:

- Electronic control engine has common faults: difficult to start, flameout after starting, unstable idling, idle speed too high, driving poor, accelerating poor, backfire blasting, shaking gasp, smoking and high fuel consumption. Fault reasons are very complicated. So it is very important to analyze faults carefully.

### 1. Analyze and determine if the engine has a fault. General methods for determining engine fault as follows:

- When the engine cannot start or cannot run normally after starting, or the engine runs with exhaust pipe blasting, has intake pipe backfire and obvious knock, it means the engine has a fault.
- Whether engine fault indicator lamp of engine electronic control system is lit. If this light is lit, it means engine electronic control system has a fault;
- If the engine performance changes a lot in a short time, it means the engine has a fault. For example, the engine power decreases obviously and fuel consumption increases obviously.
- Engine performance changes a little, the following method can be used to test it: when the engine runs under various working conditions, check if exhaust pipe and intake pipe have abnormal noise; check if the engine has obvious shaking or metal knock, and engine speed changing.

### ① Note:

- **Step on the pedal slowly to increase engine speed gradually and check the above-mentioned phenomenon exists.**
- **If it exists, it means the engine may have a fault. It is necessary to make tests repeatedly and provide a basis to determine faults correctly.**
- **Step on accelerator pedal suddenly; check if the above-mentioned phenomenon exists and engine speed increases correctly. If any abnormal condition occurs or engine speed increase is slow, it means the engine has a fault.**
- **In both cases, if the engine has no abnormal phenomenon, release accelerator pedal and check engine running at idle speed: check if idle speed is too high, unstable, and if the engine shakes seriously.**

### △ HINT:

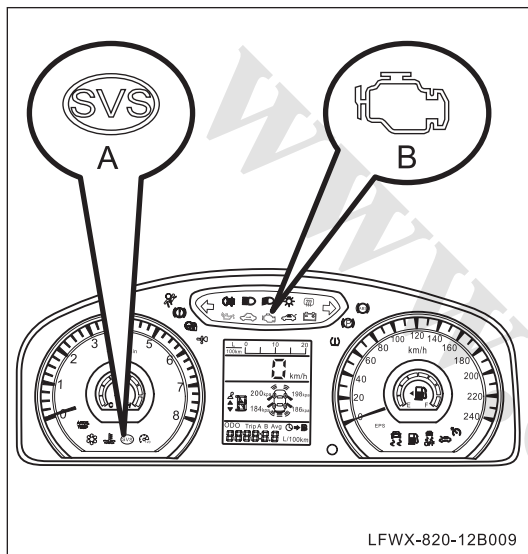
After the completion of the above operation, if no abnormal phenomenon has been detected, it is an indication that the engine works normally. If you want to carefully inspect dynamic performance, economy and emission condition of engine, it is necessary to use inspection line or special detector to inspect and diagnose fault.

### 2. Failure analyzing and determining

When there is a fault in the electronically-controlled engine, first of all, observe the situa-

tion of the fault self-diagnostic indicator lamp of the engine electronic control system. If the light is lit during engine running, it means electronic control engine has a fault that can be monitored by fault self-diagnosis system. The fault normally relates to electronic control system. Now fault code stored in the computer can be called out. Then find out the failure cause according to fault codes. If the engine does have a fault while engine fault indicator lamp on dashboard is not illuminated with engine running, it means the engine fault is not identified by electronic control unit self-diagnosis system. Then, its should be based on fault symptoms to make a preliminary diagnose, Analyze possible failure causes based on the principle of from external to internal and from simple to complicated.

## On-vehicle inspection



### 1. Checking the engine control system fault indicator

- (a) When the power status shifting from "ACC" to "ON", check whether the engine fault indicator and OBD emission indicator on the instrument cluster are on.
- (b) Check whether the engine control system fault indicator is off after starting the engine.

△ HINT:

If any inconformity occurs during checking, refer to Fault Symptom Table.

### 2. Check fuse and relay

- (a) Check whether the ECU fuse FS06 of the passenger compartment fuse box is blown.

△ HINT:

Replace the fuse with the same specification if it is blown.

- (b) Check whether the fuses SB08 / SB09 of electronic fan of central control box in the engine compartment, ECU power-on fuse FS05, compressor fuse FS10, fuel pump fuse FS09 and main relay fuse SB07 are blown.

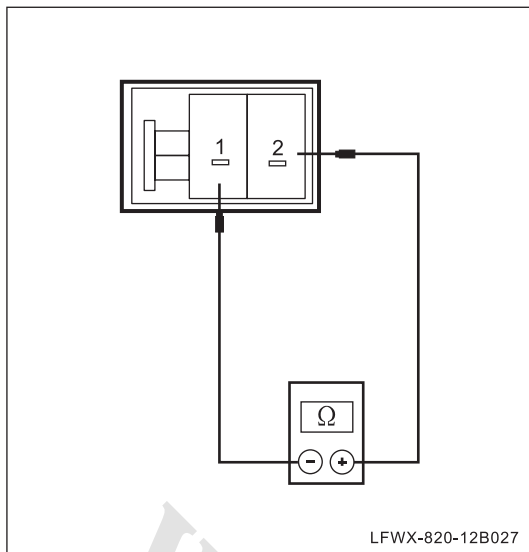
△ HINT:

Replace the fuse with the same specification if it is blown.

- (c) Check whether the main relay K05 in the engine compartment fuse box is damaged.

△ HINT:

If the relay is damaged, replace it with the same model.



### 3. Check injector

- (a) When the ignition switch in "OFF" position, press the injector connector clip snap ring to disconnect the injector connector.
- (b) Check the resistance between the No. 1 stitch and No. 2 stitch of the injector with a digital multimeter.

**Standard resistance:  $12 \Omega \pm 5\%$  ( $20^\circ \text{C}$ )**

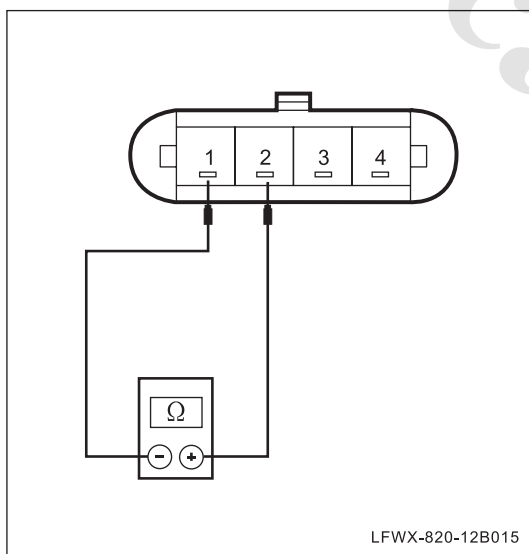
△ HINT:

If resistance value does not conform to the specification, replace injector.

- (c) Disconnect the fuel injector, and check whether the injector nozzle is clogged or damaged.

△ HINT:

If the fuel injector is unqualified, repair or replace it.



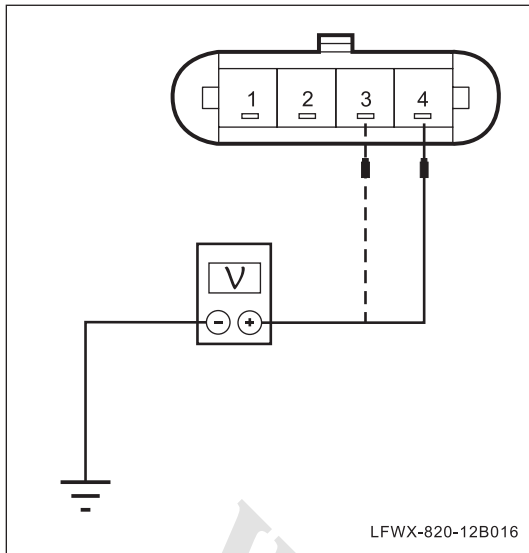
### 4. Check intake pressure and temperature sensor

- (a) Check the intake air temperature sensor.
  - **Switch the digital multimeter to  $\Omega$ , and connect the two probes to the No. 1 and No. 2 pin of the sensor, respectively.**
  - Rated resistance at  $20^\circ \text{C}$  :  $2.5\text{k} \Omega \pm 5\%$**
  - **Perform simulation blasting to the sensor with a electric blower ( be careful not to get too close), and observe the changes of the sensor resistance, while the resistance value should be decreased.**

△ HINT:

Be sure to disconnect the sensor connector clip before checking, and check the resistance on the side of the sensor with a multimeter.

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- (b) Check the pressure sensor part

The digital multimeter is set to DC voltage position, and the black probe is grounded, and the red probe is connected to No. 3 and No. 4 pin respectively.

Inspection condition		Terminal	Voltage
Idle speed		3- Ground	5V
		4- Ground	about 1.3V
No load	Open the throttle slowly	4- Ground	Basically does not change
	Open the throttle quickly	4- Ground	Instantly up to 4V, then down to 1.5V

△ HINT:

If the check does not meet the requirements, replace the intake pressure and temperature sensor.

## 5. Check the knock sensor.

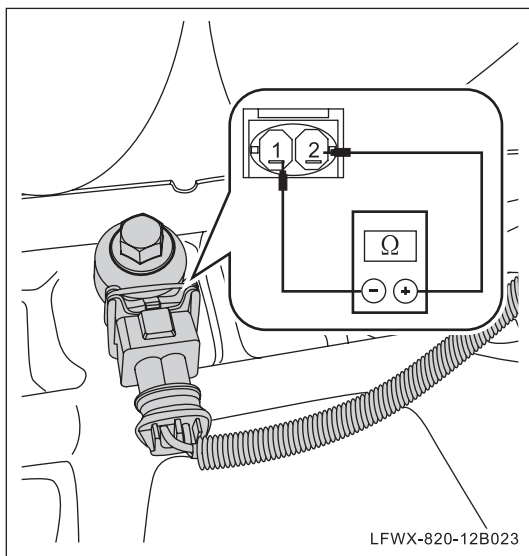
- (a) Disconnect the knock sensor connector.
- (b) Check the resistance between No. 1 and No. 2 pin of the knock sensor with the digital multimeter.

**Resistance:** > 1MΩ

- (c) Set the digital multimeter at millivolt scale, and knock slightly near the knock sensor with a hammer, then there should be voltage signal output.

△ HINT:

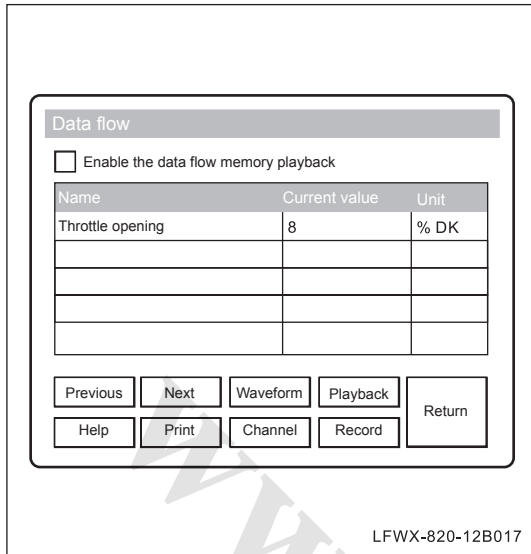
- Check the voltage or resistance on the side of the sensor component with a digital multimeter during checking.
- If the check does not meet the requirements, it indicates that the knock sensor is damaged, replace the knock sensor.





## 6. Check electronic throttle body

(a). Connect diagnostic scanner.

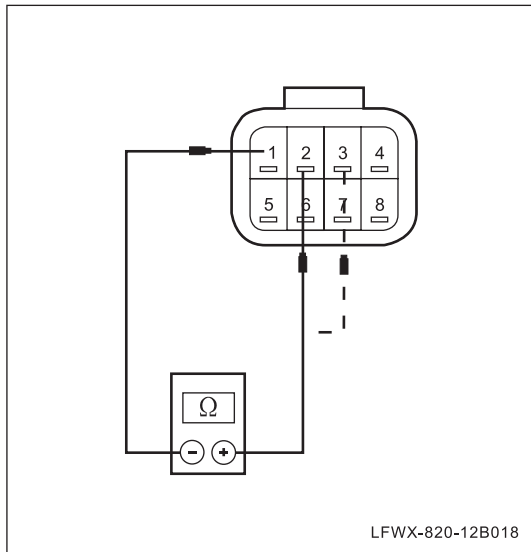


(b) Enter the "Engine System", and select the "Read Data Stream" menu item.

Items displayed by the diagnostic scanner	Check conditions (range)	Normal conditions
Throttle opening	Idling position	10% ± 4%
	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine doesn't run</li> </ul> The throttle opens gradually.	It's increased proportionally to the opening angle of the throttle.
	Fully open	About 93%

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(c) If the signal value does not conform to the provisions or there is no signal output, check the electric throttle body, wire harness and ECM.



(d) Remove the electronic throttle body.

(e) In the non-energized state, the valve plate should be located at the mechanical BDC position. If you operate the valve plate manually, it can rotate smoothly. If it gets stuck, this indicates that the internal parts may be damaged.

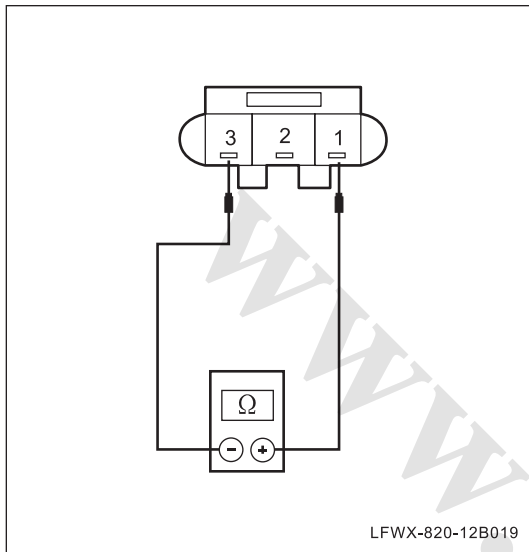
(f) Check respectively the resistances between the No. 2 stitch and the No. 5, No. 6 stitches of the electronic throttle body with a digital multimeter. Toggle the valve plate by hand, and the resistance should be slowly changing, changes of the two resistances are opposite.

△ HINT:

If the resistance is beyond the standard range or the resistance changes unsteadily, replace the electronic throttle body assembly.

## 7. Electric throttle body self-learning

- Turn the ignition switch to the ON position.
- Wait for 1min or longer.
- Turn the ignition switch to the "LOCK" position and wait for 1min or longer.
- Electronic throttle self-learning is completed.



## 8. Check the water temperature sensor.

- Dip the temperature probe of the coolant temperature sensor in hot water, and then measure the resistance between the Terminal 1 and Terminal 3 of the coolant temperature sensor with the digital multimeter.
- If the measurement results do not meet the standard, replace the temperature sensor.

Temperature (°C)	Standard resistance (Ω)	Temperature accuracy (± °C)	Temperature (°C)	Standard resistance (Ω)	Temperature Accuracy
-40	100865 ± 5912	0.7	-30	52594 ± 2314	0.7
-20	28582 ± 1143	0.7	-10	16120 ± 580	0.7
0	9399 ± 300	0.6	10	5658 ± 164	0.6
20	3511 ± 91	0.6	30	2240 ± 56	0.6
40	1465 ± 35	0.6	50	980.3 ± 23	0.6
60	670.9 ± 15	0.6	70	469.7 ± 9.8	0.6
80	333.8 ± 6.7	0.6	90	241.8 ± 5.1	0.7
100	178 ± 4.1	0.7	110	133.1 ± 3.3	0.9
120	100.9 ± 2.7	1.0	130	77.5 ± 2.2	1.1

### ⓘ Note:

Put the boiled water into the sensor working area, and do not allow the water to enter the terminal when performing simulation check. After checking, wipe off the sensor immediately.

## △ HINT:

- Be sure to disconnect the sensor connector clip before checking, and check the resistance on the side of the sensor with a multimeter.
- If unqualified, replace the water temperature sensor.

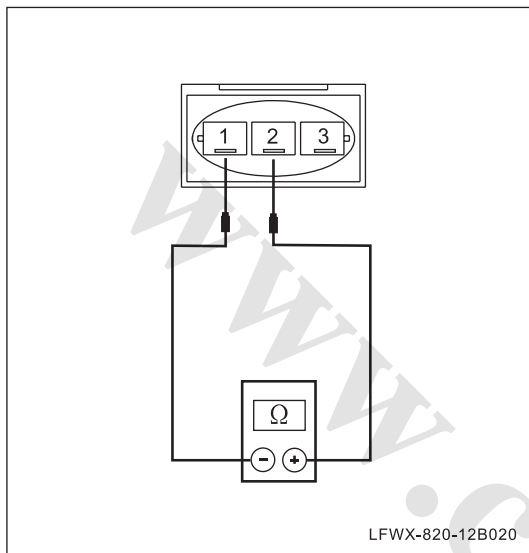
**9. Check crankshaft position sensor****12A**

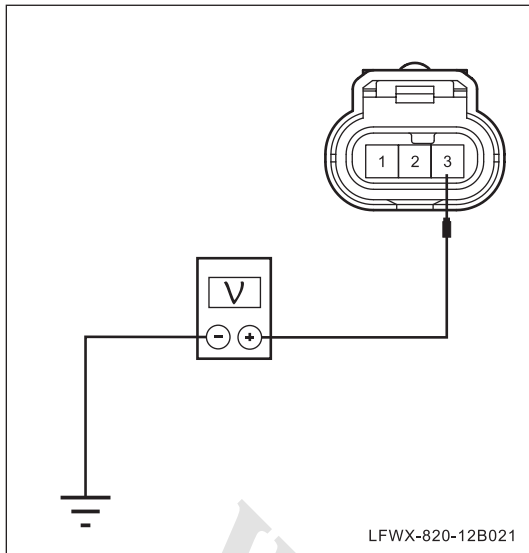
- Check whether the crankshaft position sensor connector is connected well, the terminal is in good condition and the wire harness is damaged.
- Disconnect crankshaft position sensor connector.
- Check the resistance between the No. 1 crankshaft position sensor and the No. 2 terminal.

**Resistance:  $860 \Omega \pm 130 \Omega$  (20°C )**

## △ HINT:

If the check does not meet the requirements, replace the crankshaft position sensor.





### 10. Check the camshaft position sensor

- (a) Disconnect camshaft position sensor connector.
- (b) When the power supply state is in "ON", check the resistance between the No. 3 camshaft position sensor and the grounding with a digital multimeter.

Voltage: 5V

Check the resistance between No. 1 pin of the camshaft position sensor and ground with the digital multimeter.

**Resistance: 0 Ω**

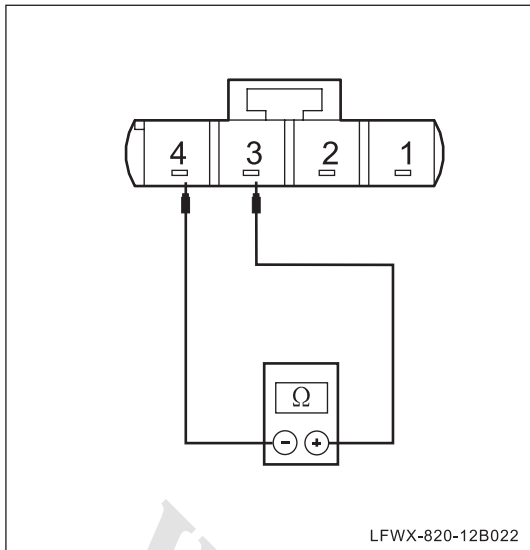
△ HINT:

Check voltage or resistance of the camshaft position sensor on the side of the engine wire harness with a digital multimeter.

- (c) Connect camshaft position sensor connector.
- (d) Connect the diagnostic scanner, and start the engine, then read the voltage of the camshaft position sensor on the diagnosis scanner and observe the waveform. The voltage waveform shall have regular continuous changes.

△ HINT:

If the check does not meet the requirements, it indicates that the camshaft position sensor is damaged, replace the crankshaft position sensor.



## 11. Check oxygen sensor

- (a) Connect the diagnostic scanner, and start the engine, then read the voltage of the oxygen sensor on the diagnosis scanner. When the oxygen sensor temperature reaches 350 °C and above (the engine is running for more than 3min), the oxygen sensor voltage should quickly change between 0.1V - 0.9V. Otherwise, it indicates the sensor fails due to "poisoning".
- (b) Check whether the oxygen sensor connector terminal becomes loose, corroded and uneven; or whether the wire harness is broken or connected virtually.

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### △ HINT:

This fault may lead to the diagnostic scanner displays the oxygen sensor signal fault or oxygen sensor heating fault.

- (c) Disconnect oxygen sensor connector. When the power supply state is in "OFF", check the resistance between the No. 3 stitch and the No. 4 stitch of the oxygen sensor with a digital multimeter.

**Resistance:  $7\ \Omega \pm 11\ \Omega (20^{\circ}\text{C})$**

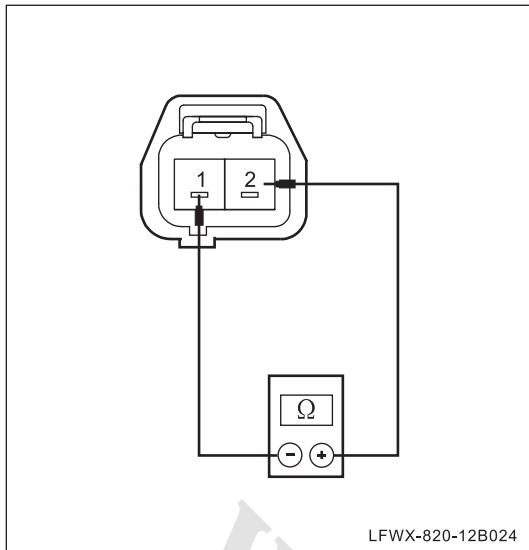
### △ HINT:

Check the resistance on the side of the sensor with a digital multimeter during checking.

- (d) Remove the oxygen sensor, and check whether its air intake is blocked, its ceramic surface is damaged, and its top color is light gray (any other color indicates the oxygen sensor is poisoned, such as silicon poisoning, lead poisoning, carbon deposit, etc.).

### △ HINT:

If the check does not meet the requirements, it indicates that the oxygen sensor is damaged, replace the oxygen sensor.



## 12. Check VVT valve

- (a) Disconnect the negative cable of battery terminal when power is at "OFF".

### ⓘ Note:

**When disconnecting and re-connecting negative cable of battery, the electric equipment switch shall be turned off firstly. For disconnecting the negative cable of battery, the tight nut of negative cable shall be unscrewed completely.**

- (b) Disconnect the VVT valve connector.
- (c) Remove the VVT valve fixing bolts, and take out the VVT valve.
- (d) Check the VVT valve filter for clogging or damage. If necessary, replace it.
- (e) Measure the resistance value between No. 1 and No. 2 terminals of VVT valve with the digital multimeter resistance scale.

**Standard resistance: 9.4 Ω - 10.6 Ω (20° C)**

### △ HINT:

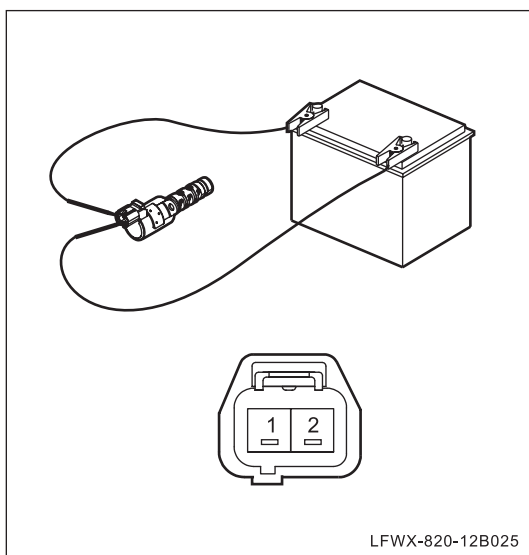
If resistance value does not conform to the specification, replace VVT valve.

- (f) Connect the battery positive pole with the No. 1 terminal of the VVT valve, the negative pole with the No. 2 terminal of the VVT valve, then check the VVT operation.

### △ HINT:

- The solenoid valve should move smoothly, without tackiness. If the solenoid valve does not move, replace the VVT valve assembly.
- A build-up of impurities can cause slight pressure leak. Pressure leak can cause the camshaft timing advance, and thus a DTC will be set.

- (g) Install the VVT valve and tighten its fixing bolts.



**Torque: 6N•m - 10N•m**

- (h) Connect the VVT valve connector.
- (i). Connect the negative cable of battery.

### 13. Check the ignition coil

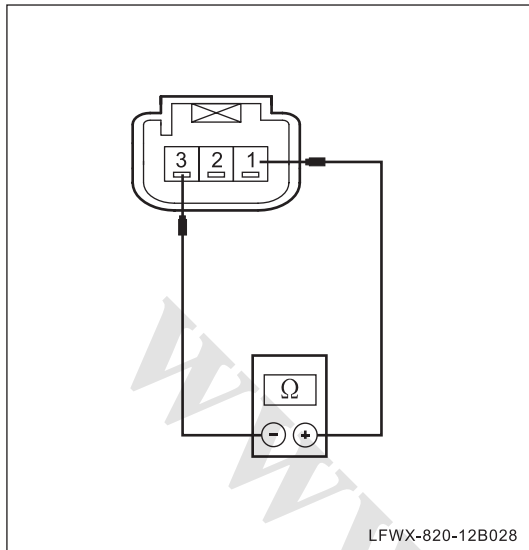
- (a) With the power "OFF", disconnect the negative battery cable, and then disconnect the ignition coil connector.
- (b) Check whether the ignition coil wire harness is damaged, and whether its surface has fissure.
- (c) Check the resistance between the No. 1 stitch and No. 2 stitch of the ignition coil with a digital multimeter.

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**Standard resistance: 0.4 Ω - 0.8 Ω**

#### △ HINT:

- If the resistance does not meet the requirement, it indicates that the ignition coil is damaged, replace the ignition coil.
- If the resistance meets the requirement, while the ignition system fault still exists, a resistor in line with, and ignition system is still faulty, further diagnosis is required for the ignition coil.



## Read and clear of DTCs

### 1. Description

- (a) The so-called fault code refers to the Auto computer self-diagnostic fault code. It is the code of the fault which has been detected by the auto computer performing performance testing on various vehicle parts before starting and during running. The code of the fault will be stored in the auto computer. For example, when water temperature sensor circuit is open, the computer will detect the sudden change of water temperature sensor interface signal or deviates from normal value. The computer will record the state. So, "reading fault code" means reading fault code information in vehicle computer and explains it correctly.
- (b) Contents of fault code. Normally, fault code of the instrument indicates fault position and fault character. For example, "P0107" fault code, "intake air pressure sensor" is

fault location; "low voltage or open circuit" is fault character. For some vehicles, fault characters defined in fault code are detailed, including short to ground, short to power supply, open circuit, poor contact, signal too high, signal too low, rapid change and slow change. In this way, maintenance staff can differentiate these items easily.

**① Note:**

- **Through reading fault code, possible reasons and locations for most of faults can be determined correctly. Sometimes, wrong judgment may happen which will cause misleading.**
- **In fact, DTC is only a conclusion, which does not give detailed reason of the fault. In order to determine fault location, it is necessary to make further analysis and check according to the engine fault symptom.**
- **Normally, after reading fault code, check corresponding sensor, line connector and line to find out and eliminate fault points of open circuit and short circuit. But, if the sensor sensitivity reduces due to certain reasons (although it is within the range set by ECM, it responds slowly. Output characteristic deviates), self diagnosis system cannot detect it.**
- **Although the engine really has a fault, self diagnosis system outputs normal code without any fault. In this case, it is necessary to analyze and determine the engine failure cause, and then make special test to the individual sensor to locate the failure part and eliminate the problem. For example, when engine idle speed is unstable with imbalanced running during driving and the system outputs no DTC, first it is worthy of considering that intake manifold pressure sensor has defects. because these two sensors have direct effect on basic fuel injection amount. Although no corresponding DTC is displayed, it is necessary to check them.**
- **Improper maintenance will cause wrong fault code. For example, during the course of running, if one sensor plug is pulled out for testing at random, ECM will record one DTC of the sensor.**
- **If old fault code is not cleared completely due to improper operation after repairing EFI engine, the remaining old fault code is still displayed again, which leads to confusion of maintenance staff.**
- **Before reading fault code, first execute "fault code clearing" operation.**
- **When the system has a fault, diagnostic scanner is used to clear the DTC. If the system fault is eliminated, the DTC will still appear when executing DTC operation again until the fault is eliminated.**

**2. Read and clear of DTCs**

- (a) Read diagnostic trouble codes (DTC) using the diagnostic scanner.
- Connect V30 diagnostic scanner to the diagnostic interface.
  - Select "Powertrain" and enter "Engine Management System".



- Read the DTC or clear the DTC.

## Read data flow

### 1. Description

The so-called data flow refers to the electrical signals sent out by the auto computer in a continuous manner based on various operating parameters and work status of a certain system. There are many data flows. Common data flow in engine system as follows:

- Ignition advance angle
- Throttle opening
- Fuel-injection pulse width
- Coolant temperature
- Intake air temperature
- Intake manifold pressure
- Atmospheric pressure
- Fuel injection start angle
- The battery voltage, etc.

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#### ① Note:

Reading the data table displayed on the diagnostic scanner, you can check the data values, including switches, sensors, actuators and other parts, without removing any part. First read data table so as to shorten diagnosis time.

### 2. Data flow

#### ① Note:

**Stationary state** refers to the data flow reference value when the engine is not started;

**Idle state** refers to the data flow reference value with the engine idling and without starting the air conditioner, and the transmission gear in the neutral position.

Item	Stationary state	Idling	Description
Battery voltage	12.9V	14.4V	ECM monitors the current operating status of the charging system
Engine RPM	0r/min	771r/min	Fault diagnosis scanner displays the current actual engine speed, calculated by ECM through the input of the crankshaft position sensor

Item	Stationary state	Idling	Description
Target idle (without compensation)	0r/min	770r/min	Fault diagnosis scanner displays the actual target value of the idle speed set by ECM, indicating the idle speed by the ECM instruction. ECM compensates the various engine loads based on the engine coolant temperature sensor signal and other signals to maintain the engine at an ideal idle speed.
Target idle (with compensation)	770r/min	750±50r/min	
Vehicle speed	0km/h	0km/h	-
Car acceleration	0.000m/s <sup>2</sup>	0.000m/s <sup>2</sup>	-
Engine coolant temperature	78Gradc	78Gradc	Fault diagnosis scanner displays from -40°C to 130°C . After the sensor is heated (internal resistance decreases), the voltage signal will be reduced, and ECM interprets the low voltage as a hot state of the engine. This signal is one of the conditions to determine whether the fuel system open the closed-loop control, and it is also an important reference signal of fuel injection time.
Intake air temperature sensor voltage	2V	0.4V~0.65V	The sensor voltage is the actual voltage value received by ECM, and the intake air temperature is calculated according to the program based on the received voltage signal. ECM adjusts the fuel transfer and the ignition timing with the intake air temperature sensor according to the intake air density. Intake air temperature also compares with ECT during starting to identify the starts of heating the oxygen sensor and the resistance wire and the cold start of the evaporative emission diagnosis. Temperature display range: -40°C - 130°C
Intake air temperature	36Gradc	35Gradc (changing with actual temperature)	
Ambient temperature	24Gradc	24Gradc	Vary according to the ambient temperatures
Engine oil temperature	3.85Gradc	0.94Gradc	Calculated by ECM according to the various operating parameters of the engine
Air intake volume	970Kg/h	310Kg/h	Calculated by ECM based on the intake manifold pressure signal combining with the known pressure and temperature curves

Item	Stationary state	Idling	Description
Actual intake manifold pressure sensor voltage	1V	1V	1. Equal to the atmospheric pressure when the engine is in stall state 2. The voltage first decreases, then increases when in rapid acceleration 3. The engine stalls after starting, and the data flow displays to close to the atmosphere pressure, the voltage close to 5V.
Actual intake manifold pressure	0hPa	0hPa	
Pedal position sensor 1 voltage	0V	0V	The sensor voltage is the actual voltage value received by ECM, and the accelerator pedal opening degree is calculated according to the program based on the received voltage signal.
Pedal position sensor 2 voltage	1V	1V	
Accelerator pedal opening degree	4%PED	4%PED	
Throttle potentiometer 1 voltage	3V	4V	Throttle potentiometer voltage is the actual measured voltage by ECM, while the opening degree is calculated according to the voltage. When the ignition switch is in "ON" position, the electronic throttle will move automatically to the mechanical bottom dead center (BDC). The throttle opening degree will increase with increasing of the voltage, and the learning value will be larger and larger with the throttle body becoming dirty, then the zero value will shift up; the computer will perform automatic re-learning after the throttle is cleaned. Idle throttle opening degree is $10 \pm 4\%$
Throttle potentiometer 2 voltage	6V	4V	
Desired throttle opening degree	61%DK	15%DK	
Throttle opening	61%DK	11%DK	
Throttle motor PWM control signal	0%	3%	ECM sends this signal to control the corresponding signals to the throttle
Average fuel injection pulse width	0.0ms	6.5ms	Fault diagnosis scanner displays from 0-16ms. It indicates the connect times of each injector according to the command of the ECU in each circle of the engine.  The larger the injector pulse width is, the more the fuel is injected. Fuel injector pulse width modulation (PWM) should increase with increased engine load. The engine will increase the fuel injection time if receiving a signal to increase the torque. There are many factors affecting the fuel injection time, such as water temperature sensor, intake air temperature sensor, power voltage, fuel pressure, etc.

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Item	Stationary state	Idling	Description
Cylinder 1 ignition advance angle	15.6GradKW	1.0GradKW	Current ignition advance angle of the ignition system, the ignition advance angle at the normal idle speed is 9 ° before the top dead center (TDC) of the cylinder 1, this value is only for reference during maintenance
Knock sensor signal	0.00V	0.00V	ECM detects the amplitude and frequency of the knock sensor to control the ignition timing. Ignition timing is arranged close to the knock position to obtain the maximum torque.
No. 1 cylinder delayed ignition knock control	0.00	0.00	ECM performs calculation according to the knock sensor signal, if it detects that the engine produces a knock, control the hysteresis of the ignition advance angle
No. 2 cylinder delayed ignition knock control	0.00	0.00	
No. 3 cylinder delayed ignition knock control	1	1	
No. 4 cylinder delayed ignition knock control	0	1	
Intake valve opening degree (relative to LWOT)	-42Gradkw	-44Gradkw	-
Camshaft overlap angle	0.0Gradkw	0.0Gradkw	-
Intake camshaft overlap factor	6.6	6.3	-
Intake camshaft PWM control	0%	0%	-
Group 1 oxygen sensor integral value (short-term correction)	0	0	A temporary value added or deducted in the basic injection duration based on the feedback of the oxygen sensor. It is useful only in the closed-loop control, ECM increases the fuel amount through increasing the injection duration when it is a positive value, while ECM decreases the injection duration to decrease the fuel amount when it is a negative value. When this short-term value is continuously lower or higher than the theoretical value, ECM shall add or deduct this value to or from the long-term fuel correction value, thus achieving the optimal air/fuel ratio control.

Item	Stationary state	Idling	Description
Group 1 oxygen sensor voltage (sensor 1)	1V	Changing between 0V - 1V.	HO2S output voltage is 0.1-0.9V under normal operating condition. ECM receives this voltage signal, and measures whether the air/fuel ratio is lean or rich. If the ECM input signal voltage is less than 0.45V, air-fuel ratio is lean; if the input signal voltage is higher than 0.45V, the air/fuel ratio is rich. During closed-loop control, ECM continuously detects the HO2S output signal to decrease or increase fuel injection control PWM for correction
Group 1 oxygen sensor voltage (sensor 2)	0.19V	0.19V	The rear HO2S is installed at the back of the catalytic converter or in the rear exhaust pipe to detect the efficiency of the catalytic converter. The rear HO2S output voltage is between 0V-1V. Detect the catalytic conversion capability with the rear HO2S signal. If the catalytic conversion efficiency is good, the rear HO2S signal will be smooth. If the catalytic conversion efficiency decreases due to aging, poisonous or misfire, the rear HO2S signal will be similar to the front HO2S signal.
Group 1 oxygen sensor integral value (long-term correction)	0	0	Long term fuel correction is stored in the ECM memory; as it is a part of the calculation of the basic injection duration, it will not be deleted when the ignition switch is in "OFF". It affects the injection duration controlled by the closed-loop and the open-loop. ECM uses short-term fuel correction value to change the long-term fuel correction value. It can not respond quickly to the instantaneous change, and only changes when ECM decide to use the short-term fuel correction value to change the long-term fuel correction value. Like short-term fuel correction, when the long-term value is 0%, it indicates that the basic injection duration need not any correction. Positive percentage indicates that ECM needs to increase the fuel injection amount; while negative percentage indicates that ECM needs to decrease the fuel injection amount.
Ultimate long-term correction factor 1	36.00kPa	35.25kPa	
Mixture addition self-learning value (small load)	99.75%	18.00%	
Engine relative load	0%	1%	-

Item	Stationary state	Idling	Description
Idling torque self-learning	0.00%	12.50%	-
Desired torque correction for idle speed control	0%	0%	-
Canister control valve duty ratio	0.0%	0.0	The canister solenoid valve opening degree is controlled in the form of duty ratio, the control signal is a pulse waveform, and can be detected with an oscilloscope. This parameter displays the power-on time or duty ratio of evaporating (EVAP) canister purge solenoid valve through the command of the control module. 0% indicates there is no clean-up, while 100% indicates clean-up has been carrying out all the time.
Relative injection amount controlled by the canister	0%	1%	
Canister purge rate	540	540	Fuel evaporation gases control system prevents the overflow of the hydrocarbons (HC) from the fuel tank from entering into the atmosphere to pollute the environment. Collect the fuel vapors in the charcoal canister. ECM controls the purge control solenoid valve (EVAP), and clear the vapors collected in the charcoal canister, making the vapors enter into the engine for combustion. Be sure to compare this data flow with the actual opening degree of the solenoid valve during the actual maintenance; if any leakage occurs, be sure to know how to judge it. Note that this data flow will change from small to large only when the engine reaches the normal water temperature; it will not be opened at idle speed or in cold state.
Canister load	837	834	
Running mileage	0km	0km	-
Running time	0min	0min	-
Running time after speed fault	0min	0min	-
Running mileage after speed fault	0km	0km	-

Item	Stationary state	Idling	Description
Number of DTC faults	0	0	Display the fault code and fault type code of the current system. The display is 0 under normal circumstance, indicating that the engine electronic control system is free from fault
DTC 1	0	0	
DTC 1 state	0	0	
DTC 2	0	0	
DTC 2 state	0	0	
Vehicle variant code	0000	0000	
Program state	Activate safety entry Variable word programmed CAN Vehicle configuration programmed VIN programmed	Activate safety entry Variable word programmed CAN Vehicle configuration programmed VIN programmed	-
Engine cooling system	-		Display the state of the cooling fan 1 (high speed) and the cooling fan 2 (low speed)
Engine steady-state condition	Ignition terminal 15 opens Main relay operating		Display current state of the engine
Engine dynamic condition	Throttle is at idling position		Display that the throttle is in "Idling" or "Full load" or "Deceleration fuel cut-off" or "Acceleration enrichment"
Emission control	-		Display whether the canister solenoid valve works, open-loop or closed-loop control of the fuel
Oxygen sensor	-		Display whether the oxygen sensor signal is strong or weak
Engine Idle Speed	Pedal position confirms idling		Display the accelerator pedal position and whether the electrical load is open
Indicator SVS/MIL	Fault indicator MIL is activated		Display the current SVS/MIL indicator is blinking or always on or off
Engine emergency condition	-		Display whether the throttle is faulty

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Item	Stationary state	Idling	Description
A/C system	-		Display opening of the air conditioner compressor
Automatic transmission/torque request	-		-

## Action test

### 1. Description

Action test is a type of self-learning process of the components. It does not require any part removal. It can perform testing on the components (including relays and actuators) and learn other special operations.

### 2. Test items

S/N	Name	Test mode	Description
1	Engine malfunction indicator lamp (MIL)	ON/OFF	Test if engine malfunction indicator light works normally
2	Canister control valve	0~635	Starting the engine, test whether the canister solenoid is working properly. Range: 0% to 100%
3	Fuel pump relay	ON/OFF	Test if fuel pump relay works normally
4	Cooling fan relay # 1	ON/OFF	Test whether the low-speed fan is working properly.
5	Cooling fan relay # 2	ON/OFF	Test whether the high-speed fan is working properly.
6	Vehicle immediate service indicator (SVS)	ON/OFF	Test whether the SVS indicator lamp is working properly.
7	Idle speed control	0~2550	Control the engine to rotate to the specified speed.
8	Throttle position valve	0~650	Do not start the engine, and measure whether the electronic throttle works properly Range: 0% to 100%
9	Reset the ECU self-learning value		Reset the learning value of the electronic control system to the factory setting.



## Diagnosis

△ HINT:

The causes of EFI engine failure phenomenon are various and complex. The common potential locations of the corresponding faults are listed in the following table. Following the described locations to troubleshoot one by one can allow most problems to be solved.

### Fault symptom table

Symptom	Suspected area	Recommended action
The diagnostic scanner cannot communicate with ECM	1. Diagnostic interface fuse (burned)	See 12- Engine Control System- Diagnosis, Fault Diagnosis (1. The diagnostic scanner cannot communicate with ECM)
	2. Wire harness or connector (loose, open or short circuit)	
	3. ECM (damaged)	
When starting, the engine does not run or run slowly	1. Battery (low voltage or damaged)	See 12- Engine Control System- Diagnosis, Fault Diagnosis (2. When starting, the engine does not run or run slowly)
	2. Starter motor (damaged)	
	3. Wire harness or ignition switch (loose, open or short circuit)	
	4. Mechanical part of the engine	
When starting, the engine can rotate but can't start successful	1. No fuel in fuel tank	See 12- Engine Control System- Diagnosis, Fault Diagnosis (3. When starting, the engine can rotate but can't start successful)
	2. Fuel pump (damaged)	
	3. Crankshaft position sensor (damaged)	
	4. Ignition coil (damaged)	
	5. Electronic throttle body (damaged)	
	6. Mechanical part of the engine	
Difficult start of hot engine	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (4. Difficult start of hot engine)
	2. Fuel pump	
	3. Water temperature sensor (damaged)	
	4. Fuel pressure regulator vacuum tube	
	5. Electronic throttle valve (deposit too much or damaged)	
	6. Ignition coil (damaged)	

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Symptom	Suspected area	Recommended action
Difficult start of cold engine	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (5. Difficult start of cold engine)
	2. Fuel pump (damaged)	
	3. Water temperature sensor (damaged)	
	4. Injector (damaged)	
	5. Ignition coil (damaged)	
	6. Electronic throttle valve body (deposit too much or damaged)	
	7. Mechanical part of the engine	
Start normally, while the idle speed is unstable during warm-up	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (6. Start normally, while the idle speed is unstable during warm-up)
	2. Water temperature sensor (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (damaged)	
	6. Mechanical part of the engine	
Speed is normal, while starting is difficult at any time	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (7. Speed is normal, while starting is difficult at any time)
	2. Fuel pump (damaged)	
	3. Water temperature sensor	
	4. Injector (damaged)	
	5. Ignition coil (damaged)	
	6. Electronic throttle valve body (deposit too much or damaged)	
	7. Intake duct (stuck)	
	8. Ignition timing (incorrect)	
	9. Spark plug (deposit too much or damaged)	
	10. Mechanical part of the engine	

Symptom	Suspected area	Recommended action
Start normally, while the idle speed is unstable at any time	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (8. Start normally, while the idle speed is unstable at any time)
	2. Injector (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Intake duct (stuck)	
	5. Electronic throttle valve body (deposit too much or damaged)	
	6. Ignition timing (incorrect)	
	7. Mechanical part of the engine	
Start normally, while the idle speed is unstable after warm-up	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (9. Start normally, while the idle speed is unstable after warm-up)
	2. Water temperature sensor	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (stuck)	
	6. Mechanical part of the engine	
Start normally, while the idle speed is unstable or stalling with partial load	1. A/C system (fault)	See 12- Engine Control System- Diagnosis, Fault Diagnosis (10. Start normally, while the idle speed is unstable or stalling with partial load)
	2. Electronic throttle valve body (deposit too much or damaged)	
	3. Injector (damaged)	
Start normally, while the idle speed is too high	1. Electronic throttle valve body (deposit too much or damaged)	See 12- Engine Control System- Diagnosis, Fault Diagnosis (11. Start normally, while the idle speed is too high)
	2. Vacuum tube (broken)	
	3. Water temperature sensor (damaged)	
	4. Ignition timing (incorrect)	

Symptom	Suspected area	Recommended action
Speed rise failure or flameout at time of acceleration	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (12. Speed rise failure or flameout at time of acceleration)
	2. Intake air pressure sensor (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (stuck)	
	6. Injector (damaged)	
	7. Ignition timing (incorrect)	
	8. Exhaust pipe	
Slow response at time of acceleration	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (13. Slow response at time of acceleration)
	2. Intake air pressure sensor	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (stuck)	
	6. Injector (damaged)	
	7. Ignition timing (incorrect)	
	8. Exhaust pipe	
Weak acceleration, poor performance	1. Fuel contains water	See 12- Engine Control System- Diagnosis, Fault Diagnosis (14. Weak acceleration, poor performance)
	2. Intake air pressure sensor (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Ignition coil (damaged)	
	5. Electronic throttle valve body (deposit too much or damaged)	
	6. Intake duct (stuck)	
	7. Injector (damaged)	
	8. Ignition timing (incorrect)	
	9. Exhaust pipe	

## Symptom diagnosis

### 1. The diagnostic scanner cannot communicate with ECM

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether to enter "Engine Management System"	Diagnosis end.	The diagnostic scanner cannot communicate with ECM	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check the diagnostic interface fuses FS17 and FS19, as well as ECM fuses FS05 and FS06 for blow.	Go to Step 2	Fuse is blown	Replace the fuse with the same specification.
2	Check the diagnosis interface power and ground circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Ignition switch ON: Check the voltage between No. 8/16 terminal of the diagnostic interface connector I17 and ground. Voltage: battery voltage</li> <li>Check the resistance between No. 4/5 terminal of I17 and ground.</li> </ul> Resistance: < 2 Ω	Go to Step 3	The wire harness or connector has open circuit point	Repair the corresponding wire harness, connector or terminal
3	Check the ECM power supply, grounding line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect ECM connector E01A.</li> <li>When the ignition switch is in "ON" position, check the voltages between the No. 15, No.16, No. 20 and No. 35 terminals of ECM connector and the grounding</li> </ul> Voltage: battery voltage <ul style="list-style-type: none"> <li>Check the resistance between No. 63, 64, 111/112 terminal of E01A and ground.</li> </ul> Resistance: < 2 Ω	Go to Step 4	The wire harness or connector has open circuit point	Repair the corresponding wire harness, connector or terminal
4	Check the ECM CAN diagnosis communication line.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>With the ignition switch "OFF", check the resistance between No. 6 and No. 14 terminals of diagnostic interface connector I17.</li> </ul> Resistance: 60 Ω <ul style="list-style-type: none"> <li>When the ignition switch is in "ON" position, check the voltages between the No. 6 terminal of I17 connector and the grounding</li> </ul> Voltage: 2.5V - 5V <ul style="list-style-type: none"> <li>When the ignition switch is in "ON" position, check the voltages between the No. 14 terminal of I17 connector and the grounding</li> </ul> Voltage: 0~2.5V	Go to Step 6	Diagnostic communication line is faulty	Go to Step 5

Steps	Inspection item	Inspection result		
5	Check the ECM CAN diagnosis communication line for open-circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect ECM connector E01A.</li> <li>Check the continuity between No. 1 terminal of E01A and No. 6, 17/14 terminal of I17 respectively.</li> </ul>	Go to Step 6	The wire harness or connector has open circuit point	Repair the circuit breaker between the interface and the ECM connector clip
6	Replacement and check	Normal	Faulty	Instruction
	Replace ECM with the same model, and check whether the fault code can be read with the diagnosis scanner	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 2. When starting, the engine does not run or run slowly

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	When starting the engine, measure the voltage between the two binding posts of the battery with a multimeter Voltage: 9V - 13V	Go to Step 1	The inspection voltage is out of the specified range	Replace the battery
1	Checking the starter motor voltage	Normal	Faulty	Instruction
	The ignition switch in the start position, and measure the binding post voltage of the starter motor positive pole with a multimeter Voltage: about 9V	Go to Step 2	The inspection voltage is out of the specified range	Repair or replace the fault harness
2	Check the starter motor	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Remove the starter motor and check whether the starter motor working condition has a short-circuit or poor lubrication stuck	Go to Step 3	Starter motor is faulty	Repair or replace the starter
3	Check lubricating oil	Normal	Faulty	Instruction
	If the fault only occurs in winter, check if the engine lubricating oil and the gearbox oil are qualified	Go to Step 4	The lubricating oil which is not qualified leads to the excessive motor resistance	Replace the lubricating oil with proper grade
4	Check the engine internal mechanical resistance	Normal	Faulty	Instruction
	Check whether no-rotation or slow rotation of starter motor is caused by too big internal mechanical resistance of engine.	Search the cause from other fault symptoms	Internal mechanical resistance of the engine is excessive	Inspect internal resistance of engine

### 3. When starting, the engine can rotate but can't start successful

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure 压力 :400KPa	Go to Step 1	The inspection pressure is out of the specified range	Overhaul the fuel system
1	Checking the speed signal	Normal	Faulty	Instruction
	Connect the diagnosis scanner, and observe the data item of "Engine Speed"; start the engine and observe whether there is a speed signal output	Go to Step 2	Crankshaft position sensor circuit failure	Check and repair crankshaft position sensor line
2	Check ignition system	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 3	Ignition system is faulty	Inspect ignition system
3	Check lubricating oil	Normal	Faulty	Instruction
	If the fault only occurs in winter, check if the engine lubricating oil and the gearbox oil are qualified	Go to Step 4	The lubricating oil which is not qualified leads to the excessive motor resistance	Replace the lubricating oil with proper grade
4	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and check whether the pressure in an engine cylinder is insufficient	Go to Step 5	Insufficient pressure fault in the engine cylinder	Removing engine mechanical trouble
5	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 & 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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#### 4. Difficult start of hot engine

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 1	The inspection pressure is out of the specified range	Check and repair the fuel supply system
1	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 2	Ignition system is faulty	Inspect ignition system
2	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the temperature sensor connector and try to start the engine, and then check whether the engine can be started successfully.	Go to Step 3	Water temperature sensor fault	Check and repair the line or replace the temperature sensor
3	Check the fuel pressure regulator vacuum tube	Normal	Faulty	Instruction
	Check whether the fuel pressure regulator vacuum tube is loose or leaking	Go to Step 4	Vacuum tube is faulty	Check, repair or replace the vacuum pipe
4	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 5	Fuel does not conform to the specification	Replace the fuel conforming to the specification
5	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 & 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 5. Difficult start of cold engine

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 1	The inspection pressure is out of the specified range	Check and repair the fuel supply system
1	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 2	Ignition system is faulty	Inspect ignition system
2	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the temperature sensor connector and try to start the engine, and then check whether the engine can be started successfully.	Go to Step 3	Water temperature sensor fault	Check and repair the line or replace the temperature sensor
3	Check the engine starting conditions.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Depress the accelerator lightly and observe for easier start of the engine	Go to Step 4	There is dirt around the throttle air duct.	Clean the throttle air duct.
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 5	The injector is faulty	Check and repair the injector or replace it
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and check whether the pressure in an engine cylinder is insufficient	Go to Step 7	Insufficient pressure fault in the engine cylinder	Removing engine mechanical trouble
7	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 & 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## 6. Start normally, while the idle speed is unstable during warm-up

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 2	The spark plug is faulty	Adjust or replace the spark plug
2	Check the throttle valve	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 3	Throttle valve body carbon deposit is too much	Clean the relevant parts
3	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the coolant temperature sensor joint, and start the engine, then observe whether the engine runs unstably at idle speed during warm-up	Go to Step 4	The water temperature sensor fails.	Check and repair circuit or replace sensor
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 5	The injector is faulty	Check and repair the injector or replace it
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and observe whether the pressure difference in engine cylinder is excessive	Go to Step 7	Engine cylinder is faulty	Removing engine mechanical trouble
7	Check the engine control unit	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V  Check No. 63, 64, 111 & 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## 7. Speed is normal, while starting is difficult at any time

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure  Pressure: 400kPa	Go to Step 2	The inspection pressure is out of the specified range	Check and repair the fuel supply system
2	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 3	Ignition system is faulty	Inspect ignition system
3	Check the spark plug	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 4	The spark plug is faulty	Adjust or replace the spark plug
4	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the temperature sensor connector and try to start the engine, and then check whether the engine can be started successfully.	Go to Step 5	The water temperature sensor fails.	Check and repair circuit or replace sensor
5	Check the engine starting conditions.	Normal	Faulty	Instruction
	Depress the accelerator lightly and observe for easier start of the engine	Go to Step 6	There is dirt around the throttle air duct.	Clean the throttle air duct.
6	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 7	The injector is faulty	Replace fuel injector
7	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 8	Fuel does not conform to the specification	Replace the fuel conforming to the specification
8	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and check whether the pressure in an engine cylinder is insufficient	Go to Step 9	Insufficient pressure fault in the engine cylinder	Removing engine mechanical trouble
9	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 10	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing

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Steps	Inspection item	Inspection result		
10	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

### 8. Start normally, while the idle speed is unstable at any time

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check electronic throttle body	Normal	Faulty	Instruction
	Check whether the electronic throttle body is stuck	Go to Step 2	Electric throttle body if faulty	Clean or replace the electronic throttle
2	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 3	The spark plug is faulty	Adjust or replace the spark plug
3	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 4	Throttle valve body carbon deposit is too much	Clean throttle valve body carbon deposit
4	Check injector	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Remove the injector, and check it for fuel leakage, blockage or over the flow tolerance	Go to Step 5	The injector is faulty	Replace fuel injector
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and observe whether the pressure difference in engine cylinder is excessive	Go to Step 7	Engine cylinder is faulty	Removing engine mechanical trouble
7	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 8	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
8	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 9. Start normally, while the idle speed is unstable after warm-up

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 2	The spark plug is faulty	Adjust or replace the spark plug
2	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 3	Throttle valve body carbon deposit is too much	Clean throttle valve body carbon deposit
3	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the coolant temperature sensor joint, and start the engine, then observe whether the engine runs unstably at idle speed during warm-up	Go to Step 4	The water temperature sensor fails.	Check and repair circuit or replace sensor
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage, blockage or over the flow tolerance	Go to Step 5	The injector is faulty	Replace fuel injector
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and observe whether the pressure difference in engine cylinder is excessive	Go to Step 7	Engine cylinder is faulty	Removing engine mechanical trouble
7	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 10. Start normally, while the idle speed is unstable or stalling with partial load

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check the engine power	Normal	Faulty	Instruction
	Connect the diagnosis scanner, and observe the ignition advance angle, fuel injection pulse width and change of the intake quantity, and then check whether the engine power increases when opening the air conditioning	Go to Step 3	Detection value is not in a reasonable range	Go to Step 2
2	Check the A/C system.	Normal	Faulty	Instruction
	Check whether the pressure of A/C system, the electromagnetic clutch of compressor, and A/C compressor are normal	Go to Step 3	A/C system is faulty	Repair the air-conditioning system
3	Check injector	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Remove the injector, and check it for fuel leakage, blockage or over the flow tolerance	Go to Step 4	The injector is faulty	Replace fuel injector
4	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

### 11. Start normally, while the idle speed is too high

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the electronic throttle is stuck	Go to Step 1	Electronic throttle is faulty	Adjust the electronic throttle
1	Check the intake system	Normal	Faulty	Instruction
	Check whether the intake system and the vacuum tube connecting to it is leaking	Go to Step 2	Intake system is faulty	Check and repair the intake system
2	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 3	Throttle valve body is faulty	Clean the relevant parts
3	Check the water temperature sensor.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Unplug the temperature sensor connector and start the engine, and then observe whether the engine is running at high idling speed.	Go to Step 4	The water temperature sensor fails.	Check and repair circuit or replace sensor
4	Check the engine ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition timing conforms to the specification	Go to Step 5	The engine ignition timing does not conform to the specification	Check and repair ignition timing
5	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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## 12. Speed rise failure or flameout at time of acceleration

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 2	The inspection pressure is out of the specified range	Check and repair the fuel supply system
2	Check the spark plug	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 3	The spark plug is faulty	Adjust or replace the spark plug
3	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 4	Throttle valve body is faulty	Clean throttle valve body relevant component
4	Check intake pressure sensor	Normal	Faulty	Instruction
	Check if the intake pressure sensor and its line are normal	Go to Step 5	Intake pressure sensor has faulty point	Check and repair circuit or replace sensor
5	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 6	The injector is faulty	Replace fuel injector
6	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 7	Fuel does not conform to the specification	Replace the fuel conforming to the specification
7	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 8	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
8	Check the exhaust pipe	Normal	Faulty	Instruction
	Check if the exhaust pipe exhausts smoothly	Go to Step 9	Exhaust pipe is faulty	Repair or replace the exhaust pipe
9	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V  Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 13. Slow response at time of acceleration

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 2	The inspection pressure is out of the specified range	Check and repair the fuel supply system
2	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 3	The spark plug is faulty	Adjust or replace the spark plug
3	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 4	Throttle valve body is faulty	Clean throttle valve body relevant component
4	Check intake pressure sensor	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check if the intake pressure sensor and its line are normal	Go to Step 5	Intake pressure sensor has faulty point	Check and repair circuit or replace sensor
5	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 6	The injector is faulty	Replace fuel injector
6	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 7	Fuel does not conform to the specification	Replace the fuel conforming to the specification
7	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 8	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
8	Check the exhaust pipe	Normal	Faulty	Instruction
	Check if the exhaust pipe exhausts smoothly	Go to Step 9	Exhaust pipe is faulty	Repair or replace the exhaust pipe
9	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line





#### 14. Weak acceleration, poor performance

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check for presence of faults such as clutch skid, low tyre pressure, braking stagnation, incorrect tyre size, and incorrect four-wheel alignments	Go to Step 1	There is a mechanical fault	Repair and eliminate mechanical fault
1	Check air filter	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 1	Intake system is faulty	Check and repair the intake system
2	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 3	The inspection pressure is out of the specified range	Check and repair the fuel supply system
3	Check the high-pressure fire intensity	Normal	Faulty	Instruction
	Pull out the ignition distribute wire of one of the cylinders, and connect the spark plug, leaving the spark plug electrode from the engine body for about 5mm; start the engine, and check whether the high-pressure fire intensity is normal	Go to Step 4	High-pressure fire intensity is not in a reasonable range	Inspect ignition system
4	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 5	The spark plug is faulty	Adjust or replace the spark plug
5	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 6	Throttle valve body is faulty	Clean throttle valve body relevant component

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Steps	Inspection item	Inspection result		
6	Check intake pressure sensor	Normal	Faulty	Instruction
	Check if the intake pressure sensor and its line are normal	Go to Step 7	Intake pressure sensor has faulty point	Check and repair circuit or replace sensor
7	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 8	The injector is faulty	Replace fuel injector
8	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 9	Fuel does not conform to the specification	Replace the fuel conforming to the specification
9	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 10	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
10	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.15, 16, 20, 35 terminals and the grounding  Voltage: 9V - 13V Check No. 63, 64, 111 and 112 terminals and grounding for conductivity	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## DTC list

DTC	Code interpretation	Cause of fault	Recommended action
P0010	VVT intake control valve circuit fault	<ol style="list-style-type: none"> <li>1. OCV</li> <li>2. OCV wire harness</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (1. Intake VVT solenoid valve fault)
P000A	The intake VVT responds slowly.	<ol style="list-style-type: none"> <li>1. Valve timing</li> <li>2. VVT solenoid valve</li> <li>3. Solenoid valve filter element</li> <li>4. VVT actuator assembly</li> <li>5. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (2. Intake VVT fault)
P0012	When starting, the OCV is not at the default position.	<ol style="list-style-type: none"> <li>1. Timing belt tensioner</li> <li>2. The assembly of timing belt is faulty</li> <li>3. Crankshaft pulley</li> <li>4. Camshaft pulley wheel</li> <li>5. VVT actuator</li> <li>6. ECM</li> </ol>	
P0016	Unreasonable relative position of camshaft and crankshaft installation	<ol style="list-style-type: none"> <li>1. Timing belt tensioner</li> <li>2. The assembly of timing belt is faulty</li> <li>3. Crankshaft pulley</li> <li>4. Camshaft pulley wheel</li> <li>5. VVT actuator</li> <li>6. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (3. Front oxygen sensor heating circuit fault)
P0030	Upstream oxygen sensor heating control circuit open (Bank1)	<ol style="list-style-type: none"> <li>1. Front oxygen sensor</li> <li>2. Front oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	
P0031	Upstream oxygen sensor heating control circuit is shorted to ground (Bank1).	<ol style="list-style-type: none"> <li>1. Front oxygen sensor</li> <li>2. Front oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	
P0032	Upstream oxygen sensor heating control circuit is shorted to power supply (Bank1).	<ol style="list-style-type: none"> <li>1. Front oxygen sensor</li> <li>2. Front oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	
P0053	Upstream oxygen sensor heating resistance is improper (Bank1).	<ol style="list-style-type: none"> <li>1. Front oxygen sensor</li> <li>2. Front oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	

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DTC	Code interpretation	Cause of fault	Recommended action
P0036	Downstream oxygen sensor heating control circuit is open (Bank1).	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor</li> <li>2. Rear oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (4. Rear oxygen sensor heating circuit fault)
P0037	Downstream oxygen sensor heating control circuit is shorted to ground (Bank1).	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor</li> <li>2. Rear oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	
P0038	Downstream oxygen sensor heating control circuit is shorted to power supply (Bank1).	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor</li> <li>2. Rear oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	
P0054	Unreasonable heated internal resistance of downstream oxygen sensor (Bank 1)	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor</li> <li>2. Rear oxygen sensor wire harness</li> <li>3. ECM</li> </ol>	
P0105	No fluctuation of intake pressure sensor signal	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. Pipe leaked or disengaged</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (5. Intake pressure sensor fault)
P0106	Intake pressure sensor unreasonable	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. ECM</li> </ol>	
P0107	Intake pressure sensor signal circuit voltage too low	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. ECM</li> </ol>	
P0108	Intake pressure sensor signal circuit voltage too high	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. ECM</li> </ol>	

DTC	Code interpretation	Cause of fault	Recommended action
P0111	Intake temperature sensor signal unreasonable	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (6. Intake air temperature sensor fault)
P0112	Low voltage of intake temperature sensor signal circuit	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. ECM</li> </ol>	
P0113	High voltage of intake temperature sensor signal circuit	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Air intake pressure temperature sensor wire harness</li> <li>3. ECM</li> </ol>	
P0116	Engine coolant temperature sensor signal is unreasonable.	<ol style="list-style-type: none"> <li>1. Water temperature sensor</li> <li>2. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (7. Water temperature sensor fault)
P0117	Engine coolant temperature sensor circuit voltage is too low.	<ol style="list-style-type: none"> <li>1. Water temperature sensor</li> <li>2. Water temperature sensor harness</li> <li>3. ECM</li> </ol>	
P0118	Engine coolant temperature sensor circuit voltage is too high.	<ol style="list-style-type: none"> <li>1. Water temperature sensor</li> <li>2. Water temperature sensor harness</li> <li>3. ECM</li> </ol>	

DTC	Code interpretation	Cause of fault	Recommended action
P0121	Unreasonable signal of electric throttle body position sensor 1	1. Electronic throttle valve	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (8. Electronic throttle signal fault)
P0122	Low voltage of signal circuit of electric throttle body position sensor 1	1. Electronic throttle valve 2. Electronic throttle body wire harness 3. ECM	
P0123	High voltage of signal circuit of electric throttle body position sensor 1	1. Electronic throttle valve 2. Electronic throttle body wire harness 3. ECM	
P0221	Unreasonable signal of electric throttle body position sensor 2	1. Electronic throttle valve	
P0222	Low voltage of signal circuit of electric throttle body position sensor 2	1. Electronic throttle valve 2. Electronic throttle body wire harness 3. ECM	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (8. Electronic throttle signal fault)
P0223	High voltage of signal circuit of electric throttle body position sensor 2	1. Electronic throttle valve 2. Electronic throttle body wire harness 3. ECM	
P0130	Unreasonable upstream oxygen sensor signal	1. Front oxygen sensor	
P0131	Low voltage of upstream oxygen sensor signal	1. Front oxygen sensor 2. Front oxygen sensor wire harness 3. ECM	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (9. Front oxygen sensor signal circuit fault)
P0132	High voltage of upstream oxygen sensor signal circuit	1. Front oxygen sensor 2. Front oxygen sensor wire harness 3. ECM	
P0133	Upstream oxygen sensor aging	1. Front oxygen sensor	
P0134	Upstream oxygen sensor circuit signal failure	1. Front oxygen sensor 2. Front oxygen sensor wire harness 3. ECM	



DTC	Code interpretation	Cause of fault	Recommended action
P0136	Unreasonable downstream oxygen sensor signal	1. Rear oxygen sensor	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (10. Rear oxygen sensor signal circuit fault)
P0137	Low voltage of downstream oxygen sensor signal	1. Rear oxygen sensor 2. Rear oxygen sensor wire harness 3. ECM	
P0138	High voltage of downstream oxygen sensor signal circuit	1. Rear oxygen sensor 2. Rear oxygen sensor wire harness 3. ECM	
P0140	Downstream oxygen sensor circuit signal failure	1. Rear oxygen sensor 2. Rear oxygen sensor wire harness 3. ECM	
P0170	Unreasonable self-learning of end of line test of air-fuel ratio closed-loop control	1. Electronic throttle valve 2. Electronic throttle body wire harness 3. Air intake pressure and temperature sensor	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (11. Rich or thin fuel concentration fault)
P0171	Over-thin self-learning of end of line test of air-fuel ratio closed-loop control	4. Air intake pressure temperature sensor wire harness 5. Oxygen sensor 6. Oxygen sensor wire harness 7. Intake air system hardware 8. Fuel system pressure 9. Injector hardware 10. ECM	

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DTC	Code interpretation	Cause of fault	Recommended action
P0172	Over-thick self-learning of end of line test of air-fuel ratio closed-loop control	<ol style="list-style-type: none"> <li>1. Injector leaks or is blocked</li> <li>2. Manifold pressure sensor</li> <li>3. Water temperature sensor</li> <li>4. Ignition system</li> <li>5. Fuel pressure</li> <li>6. Exhaust system gas leakage</li> <li>7. Oxygen sensor wire harness circuit is open or short</li> <li>8. Oxygen sensor</li> <li>9. Oxygen sensor heater</li> <li>10. Relay and wire harness</li> <li>11. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (11. Rich or thin fuel concentration fault)
P0201	No. 1 cylinder injector control circuit is open	<ol style="list-style-type: none"> <li>1. No.1 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (12. Injector fault)
P0202	No. 2 cylinder injector control circuit is open	<ol style="list-style-type: none"> <li>1. No.2 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	
P0203	No. 3 cylinder injector control circuit is open	<ol style="list-style-type: none"> <li>1. No.3 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	
P0204	No. 4 cylinder injector control circuit is open	<ol style="list-style-type: none"> <li>1. No.4 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	
P0261	No. 1 cylinder injector control circuit voltage is too low.	<ol style="list-style-type: none"> <li>1. No.1 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	
P0262	No. 1 cylinder injector control circuit voltage is too high.		
P0264	No. 2 cylinder injector control circuit voltage is too low.	<ol style="list-style-type: none"> <li>1. No.2 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	
P0265	No. 2 cylinder injector control circuit voltage is too high.		
P0267	No. 3 cylinder injector control circuit voltage is too low.	<ol style="list-style-type: none"> <li>1. No.3 cylinder injector</li> <li>2. Injector wire harness</li> <li>3. ECM</li> </ol>	
P0268	No. 3 cylinder injector control circuit voltage is too high.		



DTC	Code interpretation	Cause of fault	Recommended action
P0270	No. 4 cylinder injector control circuit voltage is too low.	<ol style="list-style-type: none"> <li>No.4 cylinder injector</li> <li>Injector wire harness</li> <li>ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (12. Injector fault)
P0271	No. 4 cylinder injector control circuit voltage is too high.		
P0219	Engine speed exceeds the maximum speed limit	1. Accelerator pedal or throttle is locked at the maximum position	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (13. Engine speed overrun fault)
		2. Engine speed calculation error	
		3. Driving operation error	
P0300	Several cylinders misfiring	<ol style="list-style-type: none"> <li>Engine wire harness</li> <li>Injector</li> <li>Ignition system</li> <li>Fuel pressure</li> <li>Air intake pressure and temperature sensor</li> <li>Compression pressure</li> <li>Valve mechanism timing</li> <li>Valve clearance</li> <li>Cylinder head</li> <li>Vent valve pipe</li> <li>Air intake system</li> <li>Vacuum hose</li> <li>ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (14. Multi-cylinder misfire fault)
P0301	No. 1 cylinder misfiring	<ol style="list-style-type: none"> <li>Inner cylinder combustion fault</li> <li>Internal ignition system fault</li> <li>Fuel supply system fault</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (15. Single-cylinder misfire fault)
P0302	No. 2 cylinder misfiring		
P0303	No. 3 cylinder misfiring		
P0304	No. 4 cylinder misfiring		
P0322	Speed sensor signal fault	<ol style="list-style-type: none"> <li>Crankshaft position sensor</li> <li>Crankshaft position sensor wire harness</li> <li>Flywheel</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (16. Crankshaft position sensor signal-loss fault)
P0327	Low voltage of knock sensor signal circuit	<ol style="list-style-type: none"> <li>Knock sensor</li> <li>Knock sensor wire harness</li> <li>ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (17. knock sensor fault)
P0328	High voltage of knock sensor signal circuit		

DTC	Code interpretation	Cause of fault	Recommended action
P0341	Unreasonable phase sensor signal	<ol style="list-style-type: none"> <li>1. Camshaft position sensor (CMP)</li> <li>2. Camshaft position sensor wire harness</li> <li>3. Incorrect position/clearance between signal wheel and sensor</li> <li>4. Signal wheel mechanical fault</li> <li>5. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (18. Camshaft position sensor fault)
P0420	Aging of oxygen storage capacity of three-way catalytic Converter (emissions overrun)	<ol style="list-style-type: none"> <li>1. Three-way catalytic converter</li> <li>2. Front oxygen sensor</li> <li>3. Rear oxygen sensor</li> <li>4. Exhaust leakage</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (19. Emissions overrun fault)
P0444	Canister solenoid's control circuit open-circuited	<ol style="list-style-type: none"> <li>1. Canister control valve wire harness</li> <li>2. Canister control valve</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (20. Canister control valve fault)
P0458	Low voltage of canister solenoid control circuit	<ol style="list-style-type: none"> <li>1. Canister control valve wire harness</li> <li>2. Canister control valve</li> <li>3. ECM</li> </ol>	
P0459	High voltage of canister solenoid control circuit	<ol style="list-style-type: none"> <li>1. Canister control valve wire harness</li> <li>2. Canister control valve</li> <li>3. ECM</li> </ol>	
P0480	Cooling fan relay control circuit is open (low speed)	<ol style="list-style-type: none"> <li>1. Circuit is open</li> <li>2. ECU hardware fault</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (21. Cooling fan fault)
P0481	Cooling fan relay control circuit is open (high speed)		
P0691	Low voltage of cooling fan relay control circuit (low speed)	<ol style="list-style-type: none"> <li>1. Cooling fan relay (low speed)</li> </ol>	
P0692	High voltage of cooling fan relay control circuit (low speed)	<ol style="list-style-type: none"> <li>2. Cooling fan relay (low speed) wire harness</li> <li>3. ECM</li> </ol>	
P0693	Low voltage of cooling fan relay control circuit (high speed)	<ol style="list-style-type: none"> <li>1. Cooling fan relay (high speed)</li> </ol>	
P0694	High voltage of cooling fan relay control circuit (high speed)	<ol style="list-style-type: none"> <li>2. Cooling fan relay (high speed) wire harness</li> </ol>	
		<ol style="list-style-type: none"> <li>3. ECM</li> </ol>	

DTC	Code interpretation	Cause of fault	Recommended action
P0501	Vehicle speed sensor signal fault	<ol style="list-style-type: none"> <li>1. ABS system is faulty</li> <li>2. Instrument cluster fault</li> <li>3. Wire harness fault</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (22. Vehicle speed signal fault)
P0317	Rough Road detects ABS signal fault.		
P0506	Speed of idle control less than target value	<ol style="list-style-type: none"> <li>1. Throttle is locked in a smaller opening due to stains or failure</li> <li>2. Exhaust manifold back pressure is too large.</li> <li>3. Injector is blocked.</li> <li>4. Fuel supply system pressure is too low.</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (23. Low/High idle speed fault)
P0507	Speed of idle control more than target value	<ol style="list-style-type: none"> <li>1. Throttle is locked in a larger opening due to stains or failure</li> <li>2. Intake air system leakage</li> <li>3. Injector leaks</li> <li>4. Fuel supply system pressure is too high.</li> </ol>	
P0560	Unreasonable battery voltage signal	<ol style="list-style-type: none"> <li>1. ECU pin and power supply (main relay) circuit are open</li> <li>2. Battery fed or damaged</li> <li>3. Engine fault</li> <li>4. Alternator voltage regulator fault</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (24. System supply voltage fault)
P0562	Low battery voltage		
P0563	High battery voltage		
P0571	Brake signal is improper.	<ol style="list-style-type: none"> <li>1. Wire harness or component fault</li> <li>2. Brake switch circuit shorted or is open</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (25. Brake lights signal fault)
P0604	ECU RAM fault	<ol style="list-style-type: none"> <li>1. ECU fault</li> <li>2. ECU inside error</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (26. ECM internal fault)
P0605	ECU ROM fault		

DTC	Code interpretation	Cause of fault	Recommended action
P0627	Pump relay control circuit is open	1. Open or short circuit	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (27. Oil pump relay fault)
		2. Fuel pump relay damaged	
		3. Fuse is blown	
		4. Wire harness or connector is loose	
		5. ECU hardware fault	
P0628	Low voltage of oil pump relay control circuit	1. Power short circuit	
		2. ECU hardware fault	
P00629	High voltage of oil pump relay control circuit	1. Open or short circuit	
		2. Fuel pump relay damaged	
		3. Fuse is blown	
		4. Wire harness or connector is loose	
		5. ECU hardware fault	
P0645	A/C compressor relay control circuit is open	1. A/C compressor relay 2. A/C compressor relay harness 3. ECM	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (28. Compressor relay fault)
P0646	Low voltage of A/C compressor relay control circuit		
P0647	High voltage of A/C compressor relay control circuit		
P0688	Master relay output voltage unreasonable	1. ECU pin and power supply (main relay) circuit are open 2. Battery fed or damaged 3. Engine fault 4. Alternator voltage regulator fault	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (29. Main relay output voltage fault)
P0704	Unreasonable clutch pedal switch signal	1. Clutch pedal switch fault 2. Line fault	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (30. Clutch switch fault)

DTC	Code interpretation	Cause of fault	Recommended action	
P0606	Electric throttle body safety monitoring function failed	<ol style="list-style-type: none"> <li>1. Electronic throttle valve</li> <li>2. ECM</li> <li>3. Harness</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (31. Electronic throttle fault)	
P1336	Torque limit of electric throttle body safety monitoring	<ol style="list-style-type: none"> <li>1. ECU fault</li> </ol>		
P1545	Overrun of deviation between the actual position and target position of electric throttle body	<ol style="list-style-type: none"> <li>2. Engine target torque limiting</li> <li>3. Electronic throttle valve</li> </ol>		
P1559	Electric throttle body self-learning process fault	<ol style="list-style-type: none"> <li>1. Component fault</li> </ol>		
P1564	System voltage do not meet electric throttle body self-learning conditions	<ol style="list-style-type: none"> <li>2. Sporadic throttle self-learning fault</li> <li>3. Battery voltage</li> </ol>		
P1565	Electric throttle body lower limit position initialized self-learning failed	<ol style="list-style-type: none"> <li>1. Wire harness and component fault</li> </ol>		
P1568	Excessive resistance of electric throttle body return			
P1579	Electric throttle body self-learning conditions are dissatisfied	<ol style="list-style-type: none"> <li>1. Component fault</li> <li>2. Sporadic lameness position signal unreasonable fault</li> </ol>		
P1610	ECM is not matched for immobilizer or something is wrong with eeprom.	<ol style="list-style-type: none"> <li>1. Remote key</li> <li>2. Electronic key chip</li> <li>3. PEPS controller</li> <li>4. Harness</li> <li>5. ECM</li> </ol>		See 12A- Engine Control System - Diagnosis, DTC Diagnosis (32. Engine immobilizer fault)
P1626	Anti-theft certification communication error or burglar alarm do not respond			
P1631	Key Error			
P1632	Checksum error during security authentication			
P1523	Interruption or error of information sent by airbags to ECU	<ol style="list-style-type: none"> <li>1. Instrument cluster fault</li> <li>2. Wire harness/component fault</li> </ol>	Check the CAN communication circuit between the instrument cluster and the ECM, as well as the airbag ECU, respectively.	
P1683	SRS communication information unreasonable	<ol style="list-style-type: none"> <li>3. Fault of SRS ECU</li> </ol>		
P2088	VVT intake control valve circuit voltage too low	<ol style="list-style-type: none"> <li>1. OCV</li> <li>2. OCV harness</li> <li>3. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (1. Intake VVT solenoid valve fault)	
P2089	VVT intake control valve circuit voltage too high			

DTC	Code interpretation	Cause of fault	Recommended action
P2106	Electric throttle body drive-circuit failed	<ol style="list-style-type: none"> <li>1. Electronic throttle valve</li> <li>2. ECM</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (33. Electronic throttle driving-stage circuit fault)
P2122	Low signal voltage of electronic accelerator pedal position sensor 1	1. Wire harness/component fault	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (34. Electronic accelerator pedal fault)
		2. Signal 1 circuit is short to ground or damaged	
		3. Signal 1 circuit power OFF	
P2123	High signal voltage of electronic accelerator pedal position sensor 1	1. Wire harness/component fault	
		2. Signal 1 circuit is short to power supply	
P2127	Low signal voltage of electronic accelerator pedal position sensor 2	1. Wire harness/component fault	
		2. Signal 2 circuit is short to ground or damaged	
		3. Signal 2 circuit power open	
P2128	High signal voltage of electronic accelerator pedal position sensor 2	1. Wire harness/component fault	
		2. Signal 2 circuit is short to power supply	
P2138	Unreasonable electronic accelerator pedal position sensor signal	1. Wire harness/component fault	
		2. Pedal signal is inconsistent	

DTC	Code interpretation	Cause of fault	Recommended action
P2177	Self-learning value of closed-loop control of air-fuel ratio exceeds the upper limit (in the middle load area)	<ol style="list-style-type: none"> <li>Internal circuit is open, broken</li> <li>Intake, ignition or fuel injection system fault</li> </ol>	See 12A- Engine Control System - Diagnosis, DTC Diagnosis (35. Air-fuel ratio overrun or oxygen sensor aging fault)
P2178	Self-learning value of closed-loop control of air-fuel ratio exceeds the lower limit (in the middle load area)		
P2187	Self-learning value of closed-loop control of air-fuel ratio exceeds the upper limit (in the low load area)		
P2188	Self-learning value of closed-loop control of air-fuel ratio exceeds the lower limit (in the low load area)		
P2195	Slow response of front oxygen sensor from thick to thin (thinner Bank1)		
P2196	Front oxygen sensor is unresponsive to the concentration from rich to thin (excessively thin Bank1)		
P2270	Rear oxygen sensor slow respond from thick to thin (thinner Bank1) )		
P2271	Rear oxygen sensor is unresponsive to the concentration from rich to thin (excessively thin Bank1)		
U0001	CAN communication related diagnosis		
U0121	Lost communication with ECU and ABS control modules		
U0140	Lost communication with FBCM or abnormal signal		

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## DTC Diagnosis

### 1. Intake VVT solenoid valve fault

P0010-VVT intake control valve circuit is open.

P0010-VVT intake control valve circuit voltage too low

P2089-VVT intake control valve circuit voltage is too high.

#### Description of fault code:

- The intake VVT solenoid valve controls the internal ground of the solenoid valve through the Terminal 71 of the ECM harness connector E01A.
- There is a feedback circuit inside the ECM. The engine ECM determines whether the control circuit is open-circuited, short-circuited to ground or short-circuited to power supply through monitoring the feedback signal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the ECU connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the OCV	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the VVT solenoid valve connector clip</li> <li>Check the resistance value between the two terminals of the VVT solenoid valve.</li> </ul> Resistance: 9.4Ω~10.6Ω (20℃ ) <ul style="list-style-type: none"> <li>Remove the intake VVT solenoid valve, and check whether the intake VVT is normal</li> </ul>	Go to Step 3	VVT solenoid valve resistance is unreasonable, VVT filter is damaged or clogged, etc.	Replace VVT solenoid valve



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Check the VVT solenoid valve power supply wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the intake VVT valve connector E12A.</li> <li>Check the circuit between the fuse FS47 of central control box in the engine compartment and No.1 terminal of E12A for short-circuit and open-circuit.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Check the VVT solenoid valve power line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the intake VVT valve connector E12A and the ECU connector clip E01A</li> <li>Check whether the line between the No. 2 terminal of E12A and the No. 71 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 2. Intake VVT fault

P000A - Slow response of intake VVT

P0012 - Intake VVT is not at the default location when it starts.

P0016 - Unreasonable relative position of camshaft and crankshaft installation

Description of fault code:

1. ECU monitors the correlation of the positions between the crankshaft and the camshaft using the pulse signals of the crankshaft position sensor and the camshaft position

sensor (intake side) Crankshaft variable reluctance rotor has 60 teeth, in which two of them are missing and used as reference clearance. Evenly spacing between each tooth is  $6^\circ$ , except for the reference clearance only, whose spacing is  $12^\circ$ .

2. Camshaft signal plate has 4 teeth, whit two narrow and two wide. Evenly spacing of the 4 trailing edges for each tooth is  $90^\circ$ .
3. The intake camshaft position (CMP) actuator is connected to the intake camshaft and operated by the hydraulic pressure. The hydraulic pressure is provided by the oil pump in order to change the angle of the intake camshaft relative to the crankshaft position (CKP).
4. The intake VVT solenoid valve is powered by the main relay, and the ECM is grounded with the pulse width control signal. Thereby, the oil flow of the engine to the actuator of the camshaft position is controlled.
5. The engine oil pressure will drive a safety slide valve inside the camshaft position actuator mechanism fixed at the front of the camshaft to move. When the safety slide valve moving, the engine oil will be led into the camshaft position actuator to make the camshaft rotate.
6. The intake camshaft position actuator can change the cam operating angle by maximum  $40^\circ \pm 5^\circ$  (crankshaft angle).
7. ECU will continuously monitor the timing position of the camshaft, and check the relative position between the camshaft and the crankshaft. If dislocation of the relative position exceeds 1 tooth, the fault code will appear. Fault causes include the camshaft position sensor itself or its circuit fault, crankshaft position sensor in itself or its circuit fault, oil contaminated, timing belt assembly, etc.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the ECM connector clip, the camshaft position sensor and the crankshaft position sensor connector clips are loose or damaged, whether the wire harness terminal is corroded
2	Check engine oil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Check whether viscosity and cleanliness of the engine oil are normal</li> <li>Observe whether the engine oil level is within the operating range</li> <li>Check whether the engine oil is replaced timely, whether it contains additives or the viscosity is correct</li> </ul>	Go to Step 3	Oil unqualified oil or lubrication system fault	Replace the engine oil and oil filter, clean the engine lubrication system when necessary
3	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 4	The assembly of timing belt fault	Replace it with a new timing belt
4	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 5	The assembly of timing belt fault	Re-install the valve timing belt
5	Check the camshaft position sensor	Normal	Faulty	Instruction
	Check whether the O-ring of the intake camshaft position sensor is normal, whether the sensor is installed in place	Go to Step 6	O-ring is damaged and/or deformed	Replace the O-ring and clean the sensor
6	Check the camshaft position sensor signal wheel	Normal	Faulty	Instruction
	Check whether the signal wheel on the intake side camshaft position sensor is normal	Go to Step 7	Camshaft position sensor signal fault	Replace the intake camshaft assembly.
7	Replace and check (camshaft position sensor)	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace the intake camshaft position sensor, and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 8	Intake camshaft position sensor fault	Replace the intake camshaft position sensor
8	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	Check whether the O-ring of the crankshaft position sensor is normal, whether the sensor is installed in place	Go to Step 9	O-ring is damaged and/or deformed	Replace the O-ring and clean the sensor
9	Check the crankshaft position sensor signal wheel	Normal	Faulty	Instruction
	Check whether the crankshaft flywheel gear ring is deformed or damaged, whether the ring gear in itself has too thick sticky clay	Go to Step 10	Crankshaft flywheel gear ring fault	Replace the crankshaft flywheel gear ring
10	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	When the ignition switch is in "OFF" position, disconnect the crankshaft position sensor connector clip E11A, and check whether the resistance between the No. 1 terminal of E11A and the No. 2 terminal of E11A of the two stitches of the crankshaft position sensor is normal Resistance: 860 $\Omega$ - 130 $\Omega$	Go to Step 11	Crankshaft position sensor fault	Replace the crankshaft position sensor
11	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 3. Failed heating circuit of front oxygen sensor

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P0030-Upstream oxygen sensor heating control circuit open (Bank1)

P0031- Upstream oxygen sensor heating control circuit is shorted to ground (Bank1)

P0032- Upstream oxygen sensor heating control circuit is shorted to power supply (Bank1).

P0053- Upstream oxygen sensor heating resistance is improper (Bank1).

Description of fault code:

1. Upstream heated oxygen sensor, also called front oxygen sensor, is used to correct the fuel control; the sensor compares the oxygen content in the amendment air with the oxygen content in the exhaust flow, each heated oxygen sensor has an heating component to heat the sensor.
2. ECU controls the heating control circuit of the heated oxygen sensor, thus enabling the system to better enter the closed-loop mode, making the sensor perform calculation earlier. The engine control module commands the heating element to switch on or off, so that the heated oxygen sensor is always within the range of the specified working temperature.
3. Engine control module detects the temperature by measure the heater current. If the oxygen sensor does not reach the required temperature within a set time, or the ECU is unable to maintain the set temperature, this fault code will appear.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the front oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the front oxygen sensor power circuit	Normal	Faulty	Instruction
	Disconnect the front oxygen sensor connector clip E09A, when the ignition switch is in "ON", check the voltage between the No. 4 of E09A and the grounding Voltage: 9V - 13V	Go to Step 4	The voltage is out of the specified range	Go to Step 3
3	Check the front oxygen sensor circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the front oxygen sensor connector</li> <li>Disconnect the ECU connector clip E01A and the front oxygen sensor connector clip E09A</li> <li>Check whether the line between the No. 73 terminal of E01A and the No. 3 terminal of E09A has a short circuit or open circuit</li> <li>Check the circuit between No.4 terminal of E09A and the fuse FS07 of central control box in the engine compartment for short-circuit and open-circuit.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
4	Check front oxygen sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the front oxygen sensor connector</li> <li>At room temperature, measure whether the resistance between the No. 3 stitch of E09A and the No. 4 stitch of E09A of the front oxygen sensor connector clip (component side) is normal</li> </ul> Resistance: 7 $\Omega$ - 11 $\Omega$	Go to Step 5	Front oxygen sensor fault	Replace front oxygen sensor
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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#### 4. Rear oxygen sensor heating circuit fault

P0036- Downstream oxygen sensor heating control circuit is open (Bank1).

P0037- Downstream oxygen sensor heating control circuit is shorted to ground (Bank1).

P0038- Downstream oxygen sensor heating control circuit is shorted to power supply (Bank1).

P0054- Downstream oxygen sensor heating resistance is improper (Bank1).

Description of fault code:

- Downstream oxygen sensor (namely the rear oxygen sensor) is used for monitoring the working status of the three-way catalytic converter . The sensor compares the oxygen content in ambient air with the oxygen content in exhaust flow. Each heated oxygen sensor has an internal heating element for sensor heating.**

2. The engine control module controls the heated oxygen sensor's heating control circuit. This makes the system enter into the closed-loop control mode earlier, so that ECM can calculate Air-fuel ratio earlier.
3. The engine control module commands the heater to switch on or off, so that the heated oxygen sensor works within the specified working temperature range. Engine control module detects the temperature by measure the heater current.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11~14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the rear oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the rear oxygen sensor power circuit	Normal	Faulty	Instruction
	Disconnect the rear oxygen sensor connector clip I34, when the ignition switch is in "ON", check the voltage between the No. 4 of I34 and the grounding Voltage: 9V - 13V	Go to Step 4	The voltage is out of the specified range	Go to Step 3
3	Check the rear oxygen sensor line	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the rear oxygen sensor connector</li> <li>Disconnect the ECU connector clip E01A and the rear oxygen sensor connector clip I34</li> <li>Check whether the line between the No. 48 terminal of I34 and the No. 3 terminal of E13 has a short circuit or open circuit</li> <li>Check the circuit between No. 4 terminal of I34 and the fuse FS08 of the central control box in the engine compartment for short-circuit and open-circuit fault.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Check rear oxygen sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the rear oxygen sensor connector</li> <li>At room temperature, measure whether the resistance between the No. 3 stitch of I34 and the No. 4 stitch of I34 of the rear oxygen sensor connector clip (component side) is normal</li> </ul> Resistance: 7 Ω - 11 Ω	Go to Step 5	Rear oxygen sensor fault	Replace rear oxygen sensor
5	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li><b>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</b></li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 5. Air intake pressure sensor failure

P0105-No fluctuation of intake pressure sensor signal

P0106- Intake air pressure sensor is improper.

P0107-Intake pressure sensor signal circuit voltage too low

P0108-Intake pressure sensor signal circuit voltage too high

Description of fault code:

- Intake manifold pressure sensor measures the pressure in the intake manifold.
- ECU takes the difference (a linear relationship with the engine load) between the intake manifold pressure and the atmospheric pressure as a basis to determine the basic fuel injection amount of the injector, thus helping the engine reach the optimal air/fuel ratio under different loads.
- If ECU detects that the intake sensor signal voltage exceeds the normal range of calibration, the fault code will appear.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11~14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the intake pressure and temperature sensor connector is loose or damaged, and whether the wire harness terminal is corroded

Steps	Inspection item	Inspection result		
2	Check intake pressure sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the intake pressure and temperature sensor</li> <li>Check whether there is oil stain on the surface of intake pressure and temperature sensor</li> </ul>	Go to Step 3	There is dirt on the surface of intake pressure and temperature sensor	Clean the dirt of intake pressure and temperature sensor
3	Read the data flow.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnosis scanner, and read the intake pressure sensor data flow, then confirm whether the data flow is normal</li> <li>Intake pressure/output voltage</li> </ul> Reference 1: 20KPa/0.4V Reference 2: 45KPa/1.52V Reference 3: 80KPa/3.1V Reference 4: 115KPa/4.65V	Go to Step 4	Air intake pressure temperature sensor failure	Replace air intake pressure temperature sensor.
4	Check intake pressure sensor line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the intake pressure and temperature sensor E16A and the ECU connector E01A</li> <li>Check whether the lines between the No. 1 terminal of 1 and the No. 85 terminal of E01A, the No. 3 terminal of E16A and the No. 109 terminal of E01A, or the No. 4 terminal of E16A and the No. 91 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 6. Air intake temperature sensor fault

P0112 - Low voltage of intake air temperature sensor signal

P0113 - High voltage of intake air temperature sensor signal

Description of fault code:

- The intake air temperature sensor (IATS) undertakes to detect the intake air temperature and convert the intake air temperature signal into electric signal which will then be transmitted to the engine control module (ECM), so that the ECM could correct the time for fuel injection and ignition to make the engine working in the best condition.
- Intake air temperature sensor adopts thermistor with negative temperature coefficient (NTC) Its resistance value decreases with the temperature increasing.
- If ECU detects that the intake air temperature sensor signal voltage is lower than the minimum or maximum value of the self-test, this fault code will appear.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the intake pressure and temperature sensor connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the intake temperature sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the intake pressure and temperature sensor</li> <li>Check whether there is oil stain on the surface of intake pressure and temperature sensor</li> </ul>	Go to Step 3	There is dirt on the surface of intake pressure and temperature sensor	Clean the dirt of intake pressure and temperature sensor
3	Check the intake temperature sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Blow the intake pressure and temperature sensor (note that the distance can not be too close) with the heating gear of an electric blower, and observe whether the resistance between the No. 1 terminal of E16A and the No. 2 terminal of E16A of the intake pressure and temperature sensor changes, then the resistance should decrease</li> </ul> <p>Temperature and the corresponding resistance value</p> <p>20°C /2416Ω~2583Ω</p> <p>85°C /273Ω~286Ω</p>	Go to Step 4	Air intake pressure temperature sensor failure	Replace air intake pressure temperature sensor.

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Steps	Inspection item	Inspection result		
4	Check intake temperature sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the intake pressure and temperature sensor E16A and the ECU connector E01A</li> <li>Check whether the lines between the No. 1 terminal of E16A and the No. 85 terminal of E01A, or the No. 2 terminal of E16A and the No. 102 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 7. Water temperature sensor (faulty)

P0116- Engine coolant temperature sensor signal is improper.

P0117- Engine coolant temperature sensor circuit voltage is too low.

P0118- Engine coolant temperature sensor circuit voltage is too high.

Description of fault code:

- The function of coolant temperature sensor (ECT) is to transfer engine coolant temperature signal into electrical signal and then sends it to engine ECM so that ECM corrects fuel injection time and ignition time to ensure the engine is in optimal working state.
- Intake air temperature sensor adopts thermistor with negative temperature coefficient (NTC) Its resistance value decreases with the temperature increasing.
- If ECU detects that the engine coolant temperature sensor signal is lower or higher than the self-test value, this fault code will appear. Fault causes include sensor signal circuit shorted to ground, sensor fault, ECU fault, etc.



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the water temperature sensor connector becomes loose and damaged, whether the harness terminals are corroded.
2	Check the water temperature sensor.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the engine coolant temperature sensor.</li> <li>Perform heating test on the engine water temperature sensor. Check whether the resistance between No. 1 and No. 3 terminals of E06A of the engine water temperature sensor decreases with the temperature rise.</li> </ul> Temperature and the corresponding resistance value 30°C /2240Ω ±56Ω 80°C /333.8Ω ±6.7Ω	Go to Step 3	Air intake pressure temperature sensor failure	Replace the water temperature sensor.
3	Check the water temperature sensor circuit.	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the water temperature sensor connector E06A and the engine control unit connector E01A.</li> <li>Check whether the lines between the No. 1 terminal of E06A and the No. 85 terminal of E01A, or the No. 3 terminal of E06A and the No. 101 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 8. Electronic throttle signal fault

P0121-Unreasonable signal of electric throttle body position sensor 1

P0122-Low voltage of signal circuit of electric throttle body position sensor 1

P0123-High voltage of signal circuit of electric throttle body position sensor 1

P0221-Unreasonable signal of electric throttle body position sensor 2

P0222-Low voltage of signal circuit of electric throttle body position sensor 2

P0223-High voltage of signal circuit of electric throttle body position sensor 2

### Description of fault code:

- In the electronic throttle control (ETC) system, the accelerator pedal position (APP) sensor transmits the accelerator pedal position to the ECU. And ECU con-



controls the throttle valve opening by driving the throttle valve motor, and feedbacks to the ECU through the sensor signal.

2. The actual throttle position will be compared with the that determined according to the engine load. The engine control module (ECM) determines the engine load based on the signal of the intake manifold absolute pressure sensor (MAPS). A further comparison will determine whether the sensor is failed and set the corresponding DTC. Fault causes include sensor signal circuit open, sensor ground circuit open, or sensor fault in itself, ECU fault, etc.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the connector of electric throttle body for looseness, damage and check the terminal of wire harness for corrosion
2	Check electronic throttle body line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the electronic throttle connector E08A and the ECU connector clip E01A</li> <li>Check whether the lines between the No. 3 terminal of E08A and the No. 107 terminal of E01A, the No. 5 terminal of E08A and the No. 78 terminal of E01A, the No. 2 terminal of E08A and the No. 86 terminal of E01A, or the No. 6 terminal of E08A and the No. 77 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle body and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 4	DTC still exists	Replace the electric throttle body
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 9. Front oxygen sensor signal circuit failure

P0130- Unreasonable upstream oxygen sensor signal

P0131- Low voltage of upstream oxygen sensor signal

P0132- High voltage of upstream oxygen sensor signal circuit

P0133- Upstream oxygen sensor aging

## P0134 - Upstream oxygen sensor signal fault

**Description of fault code:**

1. Check the concentration of oxygen in the exhaust gas, and send feedback signal to ECU, then the ECU controls the injection amount of the injector, thus controlling the air/fuel ratio of the mixture close to the theoretical value.
2. After the vehicle starting, the ECM will work at the open-loop mode, in which the ECM will ignore the signal voltage of the front oxygen sensor when calculating the air-fuel ratio. The control module provides approximately 450mV reference voltage to the upstream oxygen sensor. The upstream oxygen sensor will be heated to generate a voltage of 0-0.1V when the engine running. The voltage fluctuates along the reference voltage.
3. Control module once found upstream oxygen sensor voltage than set threshold voltage in closed loop mode immediately. The control module will determine the air-fuel ratio with the upstream oxygen sensor voltage. If the upstream oxygen sensor voltage is increased to above the reference voltage (tend to 1 V), the air fuel mixture is too thick. If the upstream oxygen sensor voltage decreases to below the reference voltage (tend to 0mV), the mixture is too thin. If the reaction rate of the oxygen sensor voltage fluctuation is lower than the system value, it indicates that the oxygen sensor aging.

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Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the front oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check front oxygen sensor	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Remove the front oxygen sensor, visually observe whether the front oxygen sensor has a carbon deposit, whether it turns white, blown or black</li> </ul>	Go to Step 3	Front oxygen sensor with serious carbon deposit becomes white.	Replace the front oxygen sensor, and replace the fuel and clean the fuel tank
3	Check the front oxygen sensor circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the front oxygen sensor valve connector clip E09A and the ECU connector clip E01A</li> <li>Check whether the lines between the No. 1 terminal of E09A and the No. 80 terminal of E01A, or the No. 2 terminal of E09A and the No. 104 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check (oxygen sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the front oxygen sensor and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace front oxygen sensor	DTC still exists	Go to Step 5
5	Replacement and check (ECM)	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 10. Rear oxygen sensor signal circuit fault

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P0136- Unreasonable downstream oxygen sensor signal

P0137- Low voltage of downstream oxygen sensor signal

P0138- High voltage of downstream oxygen sensor signal circuit

P0140 - Downstream oxygen sensor signal failure

### Description of fault code:

- Downstream oxygen sensor (namely the rear oxygen sensor) is used for monitoring the working status of the three-way catalytic converter .
- The sensor compares the oxygen content in ambient air with the oxygen content in exhaust flow. Each heated oxygen sensor has an internal heating element for sensor heating. The engine control module controls the heated oxygen sensor's heating control circuit. This makes the system enter into the closed-loop control mode earlier, so that ECM can calculate Air-fuel ratio earlier.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then re-read the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the rear oxygen connector is loose or damaged, and whether the wire harness terminal is corroded

Steps	Inspection item	Inspection result		
2	Check three-way catalytic converter	Normal	Faulty	Instruction
	Check whether the three-way catalytic converter is replaced within the specified time	Go to Step 3	Three-way catalytic converter fault	Replace three-way catalytic converter
3	Check rear oxygen sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Remove the rear oxygen sensor, visually observe whether the rear oxygen sensor has a carbon deposit, whether it turns white, blown or black</li> </ul>	Go to Step 4	Rear oxygen sensor has serious carbon deposit, and turns white.	Replace the rear oxygen sensor, and replace the fuel and clean the fuel tank
4	Check the rear oxygen sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the rear oxygen sensor valve connector clip I34 and the ECU connector clip E01A</li> <li>Check whether the lines between the No. 2 terminal of I34 and the No. 21 terminal of E01A, or the No. 1 terminal of I34 and the No. 43 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check (oxygen sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the front oxygen sensor and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace front oxygen sensor	DTC still exists	Go to Step 6

Steps	Inspection item	Inspection result		
6	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 11. Too rich or too lean fuel fault

P0170 - Unreasonable self-learning of end of line test of air-fuel ratio closed-loop control

P0171 - Over-thin self-learning of end of line test of air-fuel ratio closed-loop control

P0172 - Over-thick self-learning of end of line test of air-fuel ratio closed-loop control

#### Description of fault code:

- ECU controls the measurement system of the closed-loop air/fuel ratio, allowing the manipulation performance, fuel economy and emission control to achieve the best fit. In closed loop mode, the ECU monitors the heated oxygen sensor voltage and adjust the fuel supply according to the signal voltage.
- Changes in fuel supply will change long-term or short-term fuel adjustment value.
- Short-term fuel adjustment value change rapidly by responding to the signal voltage of the heated oxygen sensor. These changes will perform fine adjustment the engine fuel supply.
- Long-term fuel adjustment value will change with the adjustment of the short-term fuel. Long-term fuel supply adjustment performs coarse adjustment, to return to the central value of the short-term fuel adjustment, and regain the control over the short-term fuel adjustment.
- Ideal fuel adjustment value is about 0%. Positive fuel adjustment value indicates that the ECU is adding the fuel to compensate for the too lean mixture. Negative fuel adjustment value indicates that the ECU is reducing the fuel amount to compensate for the too rich mixture.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine for road test, making the engine running under various operating conditions, then reread the fault code, and confirm whether the engine has other sensor or actuator fault code</li> </ul>	Go to Step 2	There is other sensor or actuator fault code	Refer to the corresponding chapter according to the DTC displayed on the diagnostic scanner to eliminate the fault, and then perform the inspection described in this chapter
2	Check air filter	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 3	Air filter blocked	Replace air filter assembly
3	Check the intake system pipeline	Normal	Faulty	Instruction
	Check whether the intake pipe leaks	Go to Step 4	Intake system pipe leakage fault	Repair the gas-leakage pipeline
4	Check the spark plug	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the spark plug</li> <li>Check the spark plug gap for normal working</li> </ul>	Go to Step 5	Spark plug clearance is too large	Replace spark plug
5	Check the ignition coil	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover, and whether the spark is normal</li> </ul>	Go to Step 6	Ignition coil fault	Replace ignition coil
6	Check the exhaust system pipeline	Normal	Faulty	Instruction
	Check the exhaust system pipeline for leakage	Go to Step 7	Exhaust system pipe leakage fault	Repair the gas-leakage pipeline



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
7	Check fuel system pressure	Normal	Faulty	Instruction
	Check if fuel system pressure is normal	Go to Step 8	Fuel system fault	Maintain the fuel system
8	Check injector	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the injector, connect the injector to the injector detector</li> <li>Check whether the injector performance is normal</li> </ul>	Go to Step 9	Injector fault	Replace the faulty injector
9	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 12. Injector fault

P0201-No. 1 cylinder's injector control open-circuited circuit

P0202-No. 2 cylinder's injector control open-circuited circuit

P0203-No. 3 cylinder's injector control open-circuited circuit

P0204-No. 4 cylinder's injector control open-circuited circuit

P0261-No. 1 cylinder injector control circuit voltage is too low.

P0262-No. 1 cylinder injector control circuit voltage is too high.

P0264-No. 2 cylinder injector control circuit voltage is too low.

P0265-No. 2 cylinder injector control circuit voltage is too high.

P0267-No. 3 cylinder injector control circuit voltage is too low.

P0268-No. 3 cylinder injector control circuit voltage is too high.

P0270-No. 4 cylinder injector control circuit voltage is too low.

P0271-No. 4 cylinder injector control circuit voltage is too high.

### Description of fault code:

1. The operating voltage of the injector is provided the main relay controlled by ECU, and

the battery voltage is supplied to all injector wire harness connectors via the main relay and supplied to the injector.

2. ECU connects the injector grounding wire through the wire harness, it is an internal grounding in ECU.
3. ECU monitors the status of each injector driver circuit, if the engine detects that the voltage corresponding to the injector driver circuit injector driver circuit command status is incorrect, set a fault diagnosis code for the cylinder injector control circuit fault.

**Note:**

**Before carrying out this diagnosis steps, observe the data list on the fault diagnostic scanner and analyze the accuracy of the data to help quick troubleshooting.**

**HINT:**

Detection method of the No. 1 cylinder injector fault is same with the method of the other cylinders, here it only describes No. 1 cylinder injector fault. No. 1 cylinder injector fault detection method and detection of several other cylinder in line described here is only for No. 1 cylinder injector failure

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the injector connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check injector power supply line	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect No.1 cylinder injector connector E18A.</li> <li>When the ignition switch is in "ON" position, check the voltage between the No. 1 terminal of E24 and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 3	The voltage is out of the specified range	Check whether the line between the engine compartment fuse box relay K05 and the No. 1 terminal of E18A has a short circuit or open circuit
3	Check injector	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect No.1 cylinder injector connector E18A.</li> <li>Measure whether the resistance between the two terminals of the injector is normal</li> </ul> Resistance: 12.0 Ω ±0.6 Ω	Go to Step 4	Injector fault	Replace fuel injector
4	Check the injector control circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A</li> <li>Check whether the line between the No. 68 terminal of the connector clip E01A and the No. 2 terminal of E18A has a short circuit or open circuit</li> </ul>	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 13. P0219 - Engine speed exceeds the maximum speed limit

#### Description of fault code:

- Engine control unit detects that the engine speed exceeds the maximum limit.
- Fault causes include the engine running at the wrong gear, the engine running in neutral at high speeds, the wheel slipping on wet or snowy ground at high speed.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic
2	Check the vehicle condition	Normal	Faulty	Instruction
	Confirm whether the engine runs at the wrong gear, the engine runs in neutral at high speeds, and the wheel slips on wet or snowy ground at high speed	Go to Step 3	Mis-operation fault	Clear fault code
3	Inspection of accelerator pedal position sensor	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Check whether the electronic accelerator pedal gets stuck at an larger opening and cannot return to its original position.</li> <li>Connect the diagnostic scanner, and depress/reset the accelerator pedal, and then read the pedal-related data stream. Check the accelerator pedal sensor-related data streams change normally.</li> </ul>	Go to Step 4	Accelerator pedal position sensor damaged	Replace the accelerator pedal position sensor
4	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and read data stream under various operating conditions.</li> <li>When stationary or idling, check whether the electronic throttle opening changes significantly or gets stuck at an larger opening and cannot return to its original position</li> </ul>	Go to Step 5	Electronic throttle damaged	Replace the electronic throttle body assembly.
5	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the crankshaft position sensor, and measure whether the resistance between the No. 1 terminal and the No. 2 terminal of the sensor is normal</li> </ul> Resistance: 860 $\Omega$ $\pm 130 \Omega$	Go to Step 6	Crankshaft position sensor fault	Replace the crankshaft position sensor
6	Replacement and check	Normal	Faulty	Instruction method

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

#### 14. Multi-cylinder misfire fault

P0300- Several cylinders misfiring

##### Description of fault code:

- Cylinder misfire is that the gas mixture can not combust normally in the cylinder due to various causes during the engine running.
- If the ECU detects a misfire which may damage to the catalytic converter, the fault indicator will flash, then the engine should be turned off immediately.
- When the engine running time >60s, and coolant temperature > 70°C , and the system detects the crankshaft position sensor speed fluctuation exceeds the set value, it will trigger the fault code. This fault code indicates that several cylinders misfire or the engine control m can not determine which cylinder misfires. Fault causes include mechanical fault, fuel metering error, too high or too low fuel pressure, vapor emission system fault, ignition system fault , intake system fault, etc.

Steps	Inspection item	Inspection result		
0	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> </ul> Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 2	Spark plug fault	Replace spark plug
2	Check the ignition coil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> </ul> Check whether the ignition coil has flash-over spark is normal	Go to Step 3	Ignition coil fault	Replace ignition coil
3	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 4	The assembly of timing belt fault	Replace it with a new timing belt
4	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 5	The assembly of timing belt fault	Re-install the valve timing belt
5	Check cylinder pressure	Normal	Faulty	Instruction
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 6	Cylinder pressure fault	Repair the cylinder pressure fault
6	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 7	Fuel system pressure fault	Overhaul the fuel system
7	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 8	Injector fault	Replace fuel injector
8	Check the intake system	Normal	Faulty	Instruction
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 9	The air leakage fault of intake system	Repair the faulty pipeline
9	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> </ul> Diagnose it again, read the DTC and check if there are DTCs & fault symptoms	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 15. Single-cylinder misfire fault

P0301- No. 1 cylinder misfiring

P0302- No. 2 cylinder misfiring

P0303- No. 3 cylinder misfiring

P0304- No. 4 cylinder misfiring

Description of fault code:

- Cylinder misfire is that the gas mixture can not combust normally in the cylinder due to various causes during the engine running. If the ECU detects a misfire which may damage to the catalytic converter, the fault indicator will flash, then the engine should be turned off immediately.**
- When the engine running time exceeds 60s, the coolant temperature  $> 70^{\circ}\text{C}$ , and after ignition of a cylinder TDC, if the crankshaft rotational speed difference exceeds the calibration value, it will produce a cylinder misfire fault code.**

Steps	Inspection item	Inspection result		
0	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic
1	Check the intake system	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 2	The air leakage fault of intake system	Repair the faulty pipeline
2	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 3	Spark plug fault	Replace spark plug
3	Check the ignition coil	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover spark is normal</li> </ul>	Go to Step 4	Ignition coil fault	Replace ignition coil
4	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 5	The assembly of timing belt fault	Replace it with a new timing belt
5	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 6	The assembly of timing belt fault	Re-install the valve timing belt
6	Check cylinder pressure	Normal	Faulty	Instruction
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 7	Cylinder pressure fault	Repair the cylinder pressure fault
7	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 8	Fuel system pressure fault	Overhaul the fuel system
8	Check injector	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 9	Injector fault	Replace fuel injector
9	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 16. Crankshaft position sensor signal loss fault

P0322-Speed sensor signal fault

### Description of fault code:

1. Crankshaft position sensor informs the ECU of the current speed and position of the crankshaft. Crankshaft position sensor generates AC voltage with different amplitude and frequency. Frequency depends on the crankshaft speed. Output AC voltage depends on crankshaft position sensor. There is one fixing 58X variable reluctance rotor on crankshaft position sensor and crankshaft.
2. The engine control unit can calculate the ignition timing, fuel injection timing and knock ignition control according to the input signal of the crankshaft position sensor and the camshaft position sensor. Crankshaft position sensor is also used to detect misfire and tachometer display.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the crankshaft position sensor connector is loose or damaged, and whether the wire harness terminal is corroded
2	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Remove the crankshaft position sensor, and measure whether the resistance between the No. 1 terminal and the No. 2 terminal of the sensor is normal</li> </ul> Resistance: $860 \Omega \pm 130 \Omega$	Go to Step 3	Crankshaft position sensor fault	Replace the crankshaft position sensor
3	Check the crankshaft position sensor shield wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the crankshaft position sensor connector clip E11A, and measure whether the resistance between the No. 3 terminal of E11A and the grounding is normal</li> </ul> Resistance: $< 2 \Omega$	Go to Step 4	Sensor signal shield wire open circuit to ground	Repair the wire harness between the crankshaft position sensor and the grounding

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
4	Check crankshaft position sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A and crankshaft position sensor connector E11A</li> <li>Measure whether the lines between the No. 2 terminal of E11A and the No. 97 terminal of E01A, or the No. 1 terminal of E11A and the No. 96 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 17. Knock sensor failure

P0327-Low voltage of knock sensor signal circuit

P0328-High voltage of knock sensor signal circuit

#### Description of fault code:

- Knock sensor detects the shock when the engine speed changes. Knock sensor will express the knock in the form of voltage. The ECU will delay ignition to avoid shock when necessary. If this voltage is lower or higher than the calibration value, the fault code will appear. Fault causes include knock sensor circuit fault, knock sensor loosening, knock sensor fault in itself, etc.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the knock sensor connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the knock sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the type and torque of the shock sensor fixing bolt are correct</li> <li>Disconnect the knock sensor connector clip E03A, and measure whether the resistance between the two terminals of sensor is normal</li> </ul> Resistance: 4.9MΩ ±20%	Go to Step 3	Knock sensor fault	Replace the bolts and tighten the knock sensor with the specified torque or replace the shock sensor
3	Check the knock sensor line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A and knock sensor connector E03A.</li> <li>Measure whether the lines between the No. 1 terminal of E03A and the No. 90 terminal of E01A, or the No. 2 terminal of E03A and the No. 89 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 18. Camshaft position sensor failure

P0341- Unreasonable phase sensor signal

### Description of fault code:

- Phase sensor, also called camshaft position sensor, transmits one cylinder TDC position (relative position of the valve) of the camshaft position to the ECU in the form of voltage signal.
- when the ECU detects that the camshaft sensor signal is abnormal in a set period of time, the fault code will appear. Fault causes include camshaft position sensor circuit, joint, or fault in itself, or ECU fault, etc.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the camshaft position sensor connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check timing belt	Normal	Faulty	Instruction
	Check the timing belt for looseness, jumped-out teeth and throw-out of teeth.	Go to Step 3	The assembly of timing belt fault	Replace it with a new timing belt
3	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 4	The assembly of timing belt fault	Re-install the valve timing belt
4	Check the camshaft position sensor	Normal	Faulty	Instruction
	Check whether the O-ring of the camshaft position sensor is normal, whether the sensor is installed in place	Go to Step 5	O-ring is damaged and/or deformed	Replace the O-ring and clean the sensor
5	Check the camshaft signal round	Normal	Faulty	Instruction
	Check whether the camshaft signal round is normal	Go to Step 6	Camshaft signal wheel damage	Replace camshaft assembly
6	Check the camshaft position sensor (intake side) line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A and camshaft position sensor connector E04A</li> <li>Check whether the lines between the No. 1 terminal of E04A and the No. 95 terminal of E01A, the No. 2 terminal of E04A and the No. 93 terminal of E01A, or the No. 3 terminal of E04A and the No. 98 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 7	Circuit is short or open	Repair the faulty wire harness
7	Replace and check (camshaft position sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the camshaft position sensor, and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace camshaft position sensor	DTC still exists	Go to Step 8
8	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 19. Emission overrun fault

P0420 - Aging of oxygen storage capacity of Three-Way Catalytic Converter (emissions overrun)

### Description of fault code:

1. ECU monitors the conversion efficiency of the three-way catalytic converter with the two



oxygen sensors (front oxygen sensor and rear oxygen sensor) installed respectively in the front and rear of the three-way catalytic converter.

2. ECU performs closed-loop control to the air/fuel ratio with the front oxygen sensor, while monitors the oxygen content of the exhaust gas without purified by the three-way catalytic converter. Rear oxygen sensor transmits the oxygen content of the gas purified by the three-way catalytic converter to the ECU via voltage signal.
3. ECU calculates whether the current three-way catalytic converter is in normal working condition by contrasting the signals of the front and rear oxygen sensors. When the engine running time greater than 60 seconds, the coolant temperature is above 70°C, if the system detects that the rear oxygen sensor signal is lower or higher than the system value, i.e., it detects that the conversion efficiency of the three-way catalytic converter is too low, the fault indicator will be on, then set the fault code.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the rear oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the exhaust pipe	Normal	Faulty	Instruction
	Check the exhaust pipeline for leakage	Go to Step 3	Exhaust pipe leakage fault	Check the exhaust pipe fault
3	Check rear oxygen sensor	Normal	Faulty	Instruction
	Check whether the rear oxygen sensor signal is normal	Go to Step 4	Rear oxygen sensor fault	Replace rear oxygen sensor
4	Check three-way catalytic converter	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the three-way catalytic converter is replaced within the specified time	Go to Step 5	Three-way catalytic converter fault	Replace three-way catalytic converter
5	Check the fuel	Normal	Faulty	Instruction
	Confirmed whether added the fuel which does not meet the engine model before, and did not replace the three-way catalytic converter	Go to Step 6	Three-way catalytic converter fault	Replace three-way catalytic converter
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 20. Canister control valve fault

P0444-canister solenoid control open-circuited circuit

P0458-Low voltage of canister solenoid control circuit

P0459-High voltage of canister solenoid control circuit

### Description of fault code:

- Vapor emission system guide the gasoline vapor in the fuel tank into the tank containing the activated carbon which can absorb the gasoline vapor. Engine will suck the gasoline vapor in the engine combustion chamber through the fresh air.
- If the ECU detects that the canister control valve circuit of the vapor emission system has a short circuit or open circuit, the fault code will appear. Fault causes include carbon canister control valve control circuit open circuit, canister control valve control circuit open or shorted to ground, canister control valve fault in itself, ECU fault, etc.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the canister control valve connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check canister control valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Remove the canister control valve, and measure whether the resistance value between two stitches of the solenoid valve is normal</li> </ul> Resistance: 22Ω~30Ω (20℃ )	Go to Step 3	Canister control valve fault	Replace the canister control valve.
3	Check canister control valve power supply line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the canister control valve connector E05A.</li> <li>When the ignition switch is in "ON" position, check the voltage between the No. 1 terminal of E05A and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 4	The voltage is out of the specified range	<ul style="list-style-type: none"> <li>Check whether the line between the engine compartment fuse box relay K05 and the No. 1 terminal of E05A has a short circuit or open circuit</li> </ul>

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Steps	Inspection item	Inspection result		
4	Check canister control valve control circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the ECU connector clip E01A and the canister control valve connector clip E05A</li> <li>Check whether the line between the No. 94 terminal of E01A and the No. 2 terminal of E05A has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 21. Cooling fan circuit fault

P0480 - Open circuit of cooling fan relay control circuit (low speed)

P0481 - Open circuit of cooling fan relay control circuit (high speed)

P0691-Low voltage of cooling fan relay control circuit (low speed)

P0692-High voltage of cooling fan relay control circuit (low speed)

P0693-Low voltage of cooling fan relay control circuit (high speed)

P0694-High voltage of cooling fan relay control circuit (high-speed)

### Description of fault code:

- Cooling fan high and low speed relay coil operating power is supplied by the main relay controlled by the ECU, and the ECU controls the relay through the wire harness connector. Engine control unit is provided with a driver circuit control relay coil grounding.
- Driver circuit is equipped with a feedback circuit for the ECU, and the ECU determines whether the control circuit has a open circuit, short circuit to ground or short circuit to voltage.
- When the coolant temperature is above 93°C , the low-speed fan is turned on. When

the coolant temperature is greater than 96°C , the high speed fan is turned on.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the connector of engine control unit for looseness, damage and check the terminal of wire harness for corrosion
2	Check fan relay	Normal	Faulty	Instruction
	Remove the engine compartment fuse box K08 (fan speed regulation), K09 (high-speed fan), and K10 (low-speed fan) relays, and check whether the relays are normal	Go to Step 3	Relay failure	Replace the faulty relay
3	Check the cooling fan control line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Unplug the relays of K10 (low-speed fan), K09 (high-speed fan), and disconnect the ECU connector clip E01A</li> <li>Measure whether the lines between the engine compartment fuse box K10 and the No. 56 terminal of E01A, or K09 and the No. 31 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Check the cooling fan circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the cooling fan connector U09.</li> <li>Check conduction between the No. 1 and No. 3 terminals, as well as No.2 and No. 4 terminals of the cooling fan.</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 22. Vehicle signal fault

P0501 - Vehicle speed sensor signal fault

P0317- Rough road detects ABS signal fault.

**Description of fault code:**

1. The speed signal detected by the wheel speed sensor and processed by ABS ECU is sent to the CAN bus. The engine control unit receives the speed signal from the CAN bus.
2. The fault code will appear when the ECU can not receive the speed signal.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the wheel speed sensors, ABS control unit and engine control unit connector become loose or damaged, and whether the harness terminals are corroded.
2	Read ABS data stream.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and enter the ABS system</li> <li>• Start the engine for road test. Check whether the speed display is normal under various operating conditions.</li> </ul>	Go to Step 3	ABS ECU or wheel speed sensor fault	Check the ABS control unit, wheel speed sensors and wire harnesses.
3	Check the ECUCAN communication line.	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>With the ignition switch "OFF", check the resistance between No. 1 and No. 17 terminals of E01A. Resistance: 120 Ω</li> <li>When the ignition switch is in "ON" position, check the voltage between the No. 1 terminal of E01A and the grounding Voltage: 2.5V - 5V</li> <li>When the ignition switch is in "ON" position, check the voltage between the No. 17 terminal and the grounding Voltage: 0~2.5V</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 23. Too low or too high idle speed fault

P0506 - Speed of idle control less than target value

P0507 - Speed of idle control more than target value

#### Description of fault code:

- The ECU calculates the current engine speed based on the current working condition, and controls the opening of the throttle by controlling the electronic throttle flap drive motor to control or adjust the target idle speed, thus adapting idle speeds under different conditions.
- If the ECU detects that the engine speed is lower or higher than the set value for a long time, the fault code will appear. Fault causes include electronic throttle control module, intake system, fuel system, ignition system, ECU, etc.



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the electronic throttle, accelerator pedal position sensor connector clip are loose or damaged, whether the wire harness terminal is corroded
2	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 3	Spark plug fault	Replace spark plug
3	Check the ignition coil	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover spark is normal</li> </ul>	Go to Step 4	Ignition coil fault	Replace ignition coil
4	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 5	The assembly of timing belt fault	Replace it with a new timing belt
5	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 6	The assembly of timing belt fault	Re-install the valve timing belt
6	Check cylinder pressure	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 7	Cylinder pressure fault	Repair the cylinder pressure fault
7	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 8	Fuel system pressure fault	Overhaul the fuel system
8	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 9	Injector fault	Replace fuel injector
9	Check the intake system	Normal	Faulty	Instruction
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 10	The air leakage fault of intake system	Repair the faulty pipeline
10	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

#### 24. System supply voltage fault

P0560 - Unreasonable battery voltage signal

P0562-Low system battery voltage

P0563-High system battery voltage

##### Description of fault code:

- When the ECU detects that the system voltage is continuously higher than 16V or lower than 9V for up to 5s, the fault code will appear. Fault causes include alternator fault, voltage regulator, ECU fault, etc.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, reread the fault code, and confirm whether the engine, ABS and other control modules appear the same fault code.</li> </ul>	If the other system occurs this fault code, go to Step 2	Other systems have no such fault code	Check whether the ECU power system line is normal, replace the ECU when necessary, and perform the fourth step
2	Check the alternator voltage output line	Normal	Faulty	Instruction
	Check whether the line between the alternator b + column and the battery is connected normally	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Read the data flow.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Clear the fault code, and connect the vehicle diagnosis scanner</li> <li>Read the alternator data flow, and observe whether the generating capacity is normal under various conditions</li> </ul>	Go to Step 4	Alternator fault	Replace the alternator
4	Check ECM fuse and relay	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS06, engine compartment fuse box fuse FS05, and relay K05 are in good conditions	Go to Step 5	Fuse or relay failure	Replace the fuse or relay with the same specification.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
5	Check ECM power supply cord	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A</li> <li>When the ignition switch is in "ON", check the voltages between the No. 16, No. 20, and No. 35 terminal of E01A and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Check the ECM grounding wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A</li> <li>Check the resistance between No. 63, 64, 111 and 112 terminals of E01A and grounding respectively.</li> </ul> Resistance: < 2 Ω	Go to Step 7	Circuit is short or open	Repair the faulty wire harness
7	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 25. Brake light signal irrationality fault

P0571- Improper brake signal

### Description of fault code:

- The ECU confirms whether the vehicle is in decelerating state via the brake signal, and cuts off the fuel injection to reduce fuel consumption and exhaust emission via this signal, thus protecting the three-way catalytic converter.
- If the ECU detects that the brake signal circuit voltage is lower or higher than the cali-



bration value, the fault code will appear.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the brake switch connector is loose or damaged, whether the wire harness terminal is corroded
2	Check fuse	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS17, FS19 is blown.	Go to Step 3	Fuse is blown	Replace the fuse with the same specification.
3	Check the brake switch	Normal	Faulty	Instruction
	Check whether the brake switch is installed in place.	Go to Step 4	Brake switch assembly fault	Reinstall the brake switch
4	Check the brake switch	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect the brake switch connector I05, and check whether the brake switch is functioning properly.</li> </ul>	Go to Step 5	Brake switch failure	Replace the brake switch
5	Check the brake switch power wire	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>With the ignition switch "OFF", disconnect the negative battery terminal, and disconnect the brake switch connector I05.</li> <li>When the ignition switch is in "ON" position, check the voltages between the No. 1 and No. 3 terminal of I05 and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 6	The voltage is out of the specified range	Repair the short circuit and open circuit between the brake switch and the passenger compartment fuse box
6	Check the brake switch signal wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A and brake switch connector I05</li> <li>Measure whether the lines between the No. 25 terminal of E01A and the No. 2 terminal of I05, or the No. 23 terminal of E01A and the No. 4 terminal of I05 has a short circuit or open circuit</li> </ul>	Go to Step 7	Circuit is short or open	Repair the faulty wire harness
7	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 26. ECM inside fault

P0604 - ECU RAM fault

P0605 - ECU ROM fault

**Description of fault code:**

1. ECU fault Fault causes include ECU fault, attempting to change the module calibration, module programming error, etc. When the fault code appears, delete it and observe whether it will appear again. If it appears again soon, it indicates that the electronic module needs to be replaced in most cases.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Whether ECM connector clip stitch is loose or corroded.
2	Check ECM power supply circuit	Normal	Faulty	Instruction
	Check whether ECM grounding and the power wire are normal	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Replace ECU and then perform road test</li> <li>• Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

**12A****27. Fuel pump relay failure**

P0627 - Open circuit of oil pump relay control circuit

P0628-Low voltage of oil pump relay control circuit

P0629-High voltage of oil pump relay control circuit

**Description of fault code:**

1. Pump relay coil operating power is supplied by the main relay controlled by ECM.
2. ECM controls the pump relay pull-in through the wire harness connector. Confirm wheth-

er the engine runs at the wrong gear, the engine runs in neutral at high speeds, and the wheel slips on wet or snowy ground at high speed

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the fuel pump relay is loose or corroded
2	Check fuse and relay	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS06 is normal	Go to Step 3	Fuse is blown	Replace the fuse with the same specification.
3	Check the fuel pump relay	Normal	Faulty	Instruction
	Unplug the fuel pump relay K06, and check whether the fuel pump relay is normal	Go to Step 4	Relay failure	Replace the fuel pump relay
4	Check the fuel pump relay power wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Unplug the fuel pump relay K06, and pull out the fuse FS09</li> <li>Check whether the line between FS09 and K06 is conducted</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Check the pump relay control line	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect ECM connector clip E01A, and pull out the fuel pump relay</li> <li>Measure whether the line between the engine compartment fuse box fuel pump relay K06 and the No. 41 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 28. Compressor electromagnetic clutch fault

P0645 - Open circuit of A/C compressor relay control circuit

P0646 - Low voltage of A/C compressor relay control circuit

P0647 - High voltage of A/C compressor relay control circuit

### Description of fault code:

- The air conditioning pulley is in idle running when the air conditioning is shut down, it will drive the compressor to run only when it combines with the air conditioning clutch (under the action of the solenoid valve) Air conditioning clutch relay controls the separation and combination of the clutch.
- If ECM still detects a significant current when the air conditioning clutch relay control circuit is grounded, or can not detect current when the air conditioning clutch relay control circuit is not grounded, the fault code will appear.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the compressor relay is loose or corroded
2	Check fuse	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS047 is normal	Go to Step 3	Fuse is blown	Replace the fuse with the same specification.
3	Check the compressor relay	Normal	Faulty	Instruction
	Remove the compressor relay K07, and check whether the compressor relay is normal	Go to Step 4	Relay failure	Replace compressor relay
4	Check the compressor relay power wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Unplug the compressor relay K07, and pull out the fuse FS47.</li> <li>Check the line between FS47 and K07 for conduction.</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Check the compressor relay control line	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect ECM connector clip E01A, and pull out the compressor relay</li> <li>Measure whether the line between the engine compartment central fuse box relay K73 and the No. 58 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 29. Main relay output voltage irrationality failure

### Description of fault code:

- With the ignition switch "ON", the main relay is closed. Main relay provides the voltage to various sensor actuators ensuring normal operation of the engine.
- If the ECM detects that the main relay output voltage is improper for some time, this fault code will be triggered.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction method
	Check if the battery voltage is normal Voltage: 11~14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction method

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine for road test and re-read the fault code, and then check whether the fault code still exists.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the main relay and ECU wire harness connectors are firmly connected.
2	Check the alternator voltage output line	Normal	Faulty	Instruction method
	Check whether the line between the alternator b + column and the battery is connected normally	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Read the data flow.	Normal	Faulty	Instruction method
	<ul style="list-style-type: none"> <li>Clear the fault code, and connect the vehicle diagnosis scanner</li> <li>Start the car and read the alternator data flow, and observe whether the generating capacity is normal under various conditions</li> </ul>	Go to Step 4	Alternator fault	Replace the alternator
4	Check ECM fuse and relay	Normal	Faulty	Instruction method
	Check whether the SB07 and FS47 fuses of the central control box in engine compartment and the relay K05 are in good conditions.	Go to Step 5	Fuse or relay failure	Replace the fuse or relay with the same specification.
5	Check the main relay output power line.	Normal	Faulty	Instruction method

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01A</li> <li>When the ignition switch is in "ON", check the voltage between the No. 15, 16 terminal of E01A and the grounding</li> </ul> Voltage: 9V - 13V <ul style="list-style-type: none"> <li>Check whether the circuit between No. 15/16 terminal of E01A and the fuse FS47 of the central control box in engine compartment is shorted to ground or power, respectively.</li> </ul>	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Replacement and check	Normal	Faulty	Instruction method
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 30. Clutch switch fault

P0704 - Unreasonable clutch pedal switch signal

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the clutch switch connector clip is loose or damaged, whether the wire harness terminal is corroded
2	Check the clutch switch line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect the ECM connector clip E01A and the clutch pedal switch connector clip I03</li> <li>Measure whether the lines between the No. 1 terminal of I03 and the No. 6 terminal of E01A, or the No. 2 terminal of I03 and the grounding has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check the clutch pedal switch	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the clutch switch connector I03.</li> <li>When depressing the clutch switch, the line between the two terminals of the clutch should be conducted, while it should not be conducted without depressing the clutch switch</li> </ul>	Go to Step 4	Clutch switch is damaged	Remove clutch switch
4	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 31. Electric throttle body self-learning failure

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P0606 - Electric throttle body safety monitoring function failed

P1336 - Torque limit of electric throttle body safety monitoring

P1545 - Overrun of deviation between the actual position and target position of electric throttle body

P1558 - Excessive resistance of electric throttle body opening

P1559 - Electric throttle body self-learning process failed

P1564 - System voltage do not meet electric throttle body self-learning conditions

P1565 - Electric throttle body lower limit position initialized self-learning failed

P1568 - Excessive resistance of electric throttle body return

P1579 - Electric throttle body self-learning conditions are dissatisfied

#### Description of fault code:

- In the electronic throttle control (ETC) system, the accelerator pedal position (APP) sensor transmits the accelerator pedal position to the throttle control module in the form of an electrical signal, as reference for the throttle actuator to control the throttle opening.
- Throttle actuator is a stepper motor, and controls the throttle opening according to the command of the throttle control module.
- If the desired throttle position has a greater difference to the actual throttle position under the steady state, and the throttle fails to achieve the due opening of return and starting test, the fault code may be recorded. While there may be accompanied by difficult start of the engine, etc.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery

Steps	Inspection item	Inspection result		
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the connector of electric throttle body for looseness, damage and check the terminal of wire harness for corrosion
2	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether the throttle flap is normal, its rotation is smooth or not, and check whether the electronic throttle body is dirty	Go to Step 3	Electronic throttle controller fault or excessive carbon deposit	Clean the electronic throttle body or replace the electronic throttle controller
3	Check the electronic throttle control circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the electronic throttle connector E08A and the engine control unit connector E01A.</li> <li>Check the circuit between each terminal of E08A and the corresponding terminal of E01A for short-circuit and open-circuit.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Check electronic throttle body controller	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle controller and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 5	Electric throttle body fault	Replace the electronic throttle controller, and perform self-learning to the electronic throttle
5	Check intake pressure and temperature sensor	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and read the "Intake Pressure/ Intake Temperature" data stream under various operating conditions.</li> <li>Compared with standard data streams, check the data streams for significant deviations.</li> </ul>	Go to Step 6	Intake pressure and temperature sensor is damaged or the circuit is shorted or open.	Replace the intake pressure and temperature sensor or repair the faulty harness.
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 32. Engine immobilizer fault

P1610-ECM anti-theft matching not processed /eeprom state error

P1626 - Anti-theft certification communication error or burglar alarm do not respond

P1631- Key error

P1632- Checksum error during immobilizer authentication

#### Description of fault code:

- Anti-theft control module ensures to allow the vehicle to be started only when there is a special key and it matches the various parts.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is an occasional one. Check whether PEPS ECU or RKE ECU, the engine control unit for looseness and corroded terminals.
2	Check the PEPS (RKE) system.	Normal	Faulty	Instruction
	Connect the diagnostic scanner and enter the PEPS (RKE) system, and then check if there is a fault code output.	Go to Step 3	With DTC output	Diagnose it according to the hint of DTC
3	Remote control match	Normal	Faulty	Instruction
	Re-match the remote control, and confirm whether the fault code and symptom exist	Go to Step 4	Remote control match fault	Re-match the remote controller
4	ECM anti-theft match	Normal	Faulty	Instruction
	Re-match the engine and PEPS (RKE) ECU, and check whether the fault code and symptom still exist.	Go to Step 5	Match fault	Re-match the control module
5	Check the immobilizer coil (PEPS switch).	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the immobilizer coil connector I49, (or PEPS button connector I29 (PEPS vehicle model))</li> <li>Check whether the resistance between No. 1 and No. 4 terminals of I49 (or No. 1 and No. 2 terminals of I29) is normal.</li> </ul>	Go to Step 6	Anti-theft coil fault	Replace the ignition switch assembly (or PEPS switch assembly)
7	Replace and check (PEPS / RKE ECU)	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace the PEPS / RKE ECU for road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 8	PEPS / RKE ECU fault	Replace PEPS / RKE ECU.
8	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 33. Electric throttle body drive failed

P2106 - Electric throttle body drive-circuit failed

#### Description of fault code:

- In the electronic throttle control (ETC) system, the accelerator pedal position (APP) sensor transmits the accelerator pedal position to the ECU. And ECU controls the throttle valve opening by driving the throttle valve motor, and feedbacks to the ECU through the sensor signal.
- Fault causes include sensor signal circuit open, sensor ground circuit open, or sensor fault in itself, ECU fault, etc.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11~14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the connector of electric throttle body control unit for looseness, damage and check the terminal of wire harness for corrosion

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
2	Check electronic throttle body line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the electronic throttle control module connector clip E08A and ECM connector clip E01A</li> <li>Check whether the lines between the No. 1 terminal of E08A and the No. 87 terminal of E01A, or the No. 4 terminal of E08A and the No. 75 terminal of E01A has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle body and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 4	DTC still exists	Replace the electronic throttle, and perform self-learning to the electronic throttle
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 34. Electronic accelerator pedal fault

P2122-Low signal voltage of electronic accelerator pedal position sensor 1

P2123-High signal voltage of electronic accelerator pedal position sensor 1

P2127-Low signal voltage of electronic accelerator pedal position sensor 2

P2128-High signal voltage of electronic accelerator pedal position sensor 2

P2138 - Unreasonable fault electronic accelerator pedal position sensor signal 1

### Description of fault code:

1. In the electronic throttle control system, the electronic accelerator pedal position sensor transmits the accelerator pedal position to the throttle control module in the form of an electrical signal, as reference for the throttle actuator to control the throttle opening.
2. For the security of the system, the accelerator pedal position sensor is a provided with a dual-sensor setting, and its type is slip resistance.
3. Fault causes include electronic accelerator pedal position circuit open, electronic accelerator pedal position sensor fault in itself, ECM fault, etc.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the accelerator pedal position sensor connector clip stitch is loose or corroded
2	Check the accelerator pedal position sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Disconnect the accelerator pedal position sensor connector clip E12A and ECM connector clip E01A</li> <li>• Check the circuit between each terminal of E12A and the corresponding terminal of E01A for short-circuit and open-circuit.</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Read the data flow.			
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnosis scanner, and read the data flow</li> <li>Respectively Check the opening of the accelerator pedal and the opening of the electronic throttle when depressing and not depressing the accelerator pedal</li> </ul> Hint: Electronic throttle opening should increase synchronously with the increasing of the accelerator pedal opening.	Go to Step 4	Accelerator pedal position sensor damaged	Replace the accelerator pedal position sensor
4	Replacement and check			
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 35. Unreasonable air-fuel ratio fault

P2177 - Air-fuel ratio closed-loop control self-learning value exceeding upper limit (medium load area)

P2178 - Air-fuel ratio closed-loop control self-learning value exceeding lower limit (medium load area)

P2187 - Air-fuel ratio closed-loop control self-learning value exceeding lower limit (low load area)

P2188 - Air-fuel ratio closed-loop control self-learning value exceeding lower limit (low load area)

P2195-Slow response of front oxygen sensor from thick to thin (thinner Bank1)

P2196-Slow response of front oxygen sensor from thin to thick (thicker Bank1)

P2270-Rear oxygen sensor slow respond from thick to thin (thinner Bank1) )

P2271-Rear oxygen sensor slow respond from thin to thick (thinner Bank1) )

**Description of fault code:**

1. Fuel correction refers to ECM to control the fuel delivery by increasing or decreasing the time to the injector, which allows the engine to obtain the optimal air/fuel ratio (ratio of air to gasoline is 14.7:1).
2. Too rich air/fuel ratio means that the fuel delivery amount is too large, while too lean air/fuel ratio meaning that the fuel delivery amount is too small. Too lean system means that the fuel amount (relative to intake quantity) is too low.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Reread the fault code, and confirm whether there is other sensor or actuator fault code</li> </ul>	Go to Step 2	DTC exists.	Refer to the corresponding chapter according to the DTC displayed on the diagnostic scanner to eliminate the fault, and then perform the inspection described in this chapter
2	Check air filter	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 3	Air filter blocked	Replace air filter assembly
3	Check the intake system	Normal	Faulty	Instruction
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 4	The air leakage fault of intake system	Repair the faulty pipeline
4	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 5	Spark plug fault	Replace spark plug
5	Check the ignition coil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover spark is normal</li> </ul>	Go to Step 6	Ignition coil fault	Replace ignition coil
6	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 7	The assembly of timing belt fault	Replace it with a new timing belt
7	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 8	The assembly of timing belt fault	Re-install the valve timing belt
8	Check cylinder pressure	Normal	Faulty	Instruction
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 9	Cylinder pressure fault	Repair the cylinder pressure fault
9	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 10	Fuel system pressure fault	Overhaul the fuel system
10	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 11	Injector fault	Replace fuel injector
11	Check oxygen sensor	Normal	Faulty	Instruction
	Check the oxygen sensor for severe poisoning or carbon deposit.	Go to Step 12	Oxygen sensor fault	Replace oxygen sensor.
12	Replacement and check	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 36. CAN communication fault

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U0001 - CAN communication-related diagnosis,

Loss of communication module of U0121-ECU with ABS control module

Loss or abnormal signal of communication of U0140-ECU with FBCM

#### Description of fault code:

- The engine control unit detects failure of communication with other control units. Fault causes include CAN data cable communication problem, or maybe ECM fault in itself.
- The signal sent by FBCM to the CAN bus is changed into the CAN communication signal received by ECM via the gateway module in the instrument cluster. Meanwhile, CAN signal sent by ECM is also converted via the gateway module in the instrument cluster.

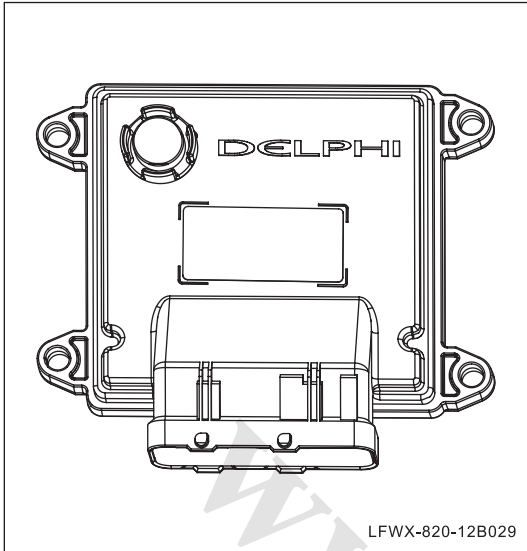
Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the engine control unit, FBCM, ABS ECU and instrument cluster connector for looseness, damage and corroded harness terminals.
2	Check the related control system.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner and enter the fault-related control system for diagnosis.</li> </ul> Read the fault code, and check whether the DTC can be read.	Go to Step 3	There is a fault code	Diagnose it according to the hint of DTC
3	Check the CAN communication line between ECM and the related control module.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> </ul> Disconnect the engine control unit connector E01A, combination instrument connector I07 and FBCM connector I12. <ul style="list-style-type: none"> <li>Check whether the resistance of communication line between the engine control unit and instrument cluster, as well as instrument cluster and FBCM t is correct, respectively.</li> <li>Check the CAN communication line for short circuit to power/ground.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace the fault-related control unit.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the faulty control unit.	Fault still exists	Go to Step 5
5	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## Electronic Control Module (ECM)



### 1. Parts drawing

### 2. Replacement

#### Note:

After the engine ECU (ECM) is replaced, connect the diagnostic scanner, and write the "VIN" consistent with the vehicle to be maintained in the engine ECU through the diagnostic scanner.

- (a) Turn the ignition switch to the OFF position.
- (b). Disconnect negative cable of battery.

#### ⓘ Note:

When disconnecting and re-connecting negative cable of battery, turn off ignition switch and all illumination switches first. And loosen the fastening nut of the battery negative terminal. Don't pry up the cable terminal when performing such operation.

- (c) Remove the glove box.
- (d) Disconnect ECM connector.

#### ⓘ Note:

After disconnecting the connector, make sure the connector does not contact dirt, water and other impurities.

- (e) Remove the four bolts on the ECM with bracket assembly.
- (f) Remove the ECM with bracket assembly.

#### ⓘ Note:

After dismantling ECM, do not immerse it in the water. When dismantling ECM, handle it with care.

- (g) Install the ECM in the reverse order.

**Torque:  $10\text{N}\cdot\text{m} \pm 2\text{N}\cdot\text{m}$**

**ⓘ Note: Pay attention to electrostatic protection during installation.**

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# 12B- Engine Control System

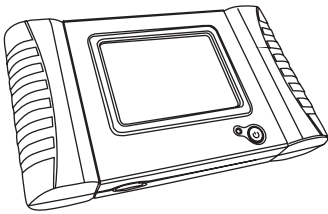
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## Engine Control System

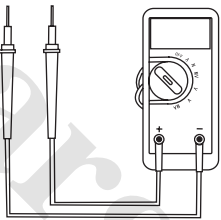
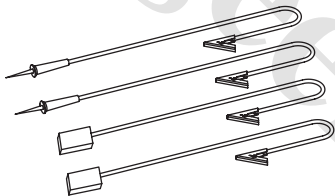
### Preparation

#### 1. Special tool

S/N	Tools	Outline diagram	Description
1	Diagnostic scanner		Read engine control system fault code and data flow, etc.

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#### 2. Recommended tools

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Line group		Testing circuits



## Service data

### 1. Technical specifications table

Working voltage of OCV	11V ~ 14V
OCV Resistance	6.9 Ω ~ 7.9 Ω
Resistance of intake air temperature sensor at 20° C	2.3k Ω ~ 2.75k Ω (20°C )
Working voltage of canister control valve	8V ~ 16V
Frequency of control pulse of canister solenoid	16Hz
Resistance of the canister control valve	19 Ω ~ 22 Ω
Working temperature at exhaust end of oxygen sensor	200°C ~ 850°C
Oxygen sensor heater resistance (at 20°C )	9.6 Ω ± 1.5 Ω
Crankshaft position sensor coil resistance (at 25°C ± 5°C )	1000 Ω ± 10%
Water temperature sensor operating voltage	5V
Water temperature sensor resistance (at 20°C )	3.51k Ω ± 2.6%
Working voltage of camshaft position sensor	4.75V ~ 5.25V
Low electric level output of camshaft position sensor	0 ~ 400mV
High electric level output of camshaft position sensor	4.75V ~ 5.25V
WOT max. air flow (at standard atmosphere)	70g/s
Throttle opening (idle)	10 ± 4%
Opening range of throttle position sensor	Opening between 5% -95%
Working voltage of throttle position sensor	5
Capacitance of knock sensor	900pF ~ 1300pF
Resistance of knock sensor	>1M Ω (25°C ± 5°C )
Pressure settings of fuel pressure regulator in non-return fuel system	400kPa
Resistance of injector at 20° C	12 Ω ± 0.6 Ω
Ignition coil resistance	0.71 Ω ± 0.071 Ω

## 2. Table of tightening torque

Item	N•m
ECM fixing bolts	10 ± 2
Fixing bolts of intake pressure and temperature sensor	10 ± 2
Water temperature sensor bolt	20
Fixing bolt of crankshaft position sensor	6 ~ 10
Fixing bolt of camshaft position sensor	6 ~ 10
Oxygen sensor	40 ~ 60
Knock sensor	15 ~ 25
VVT valve fixing bolt	6 ~ 10

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## Precautions

- Maintenance shall be performed according to the standard diagnostic procedures.
- When a part of the electronic fuel injection system is detected faulty, it should be wholly replaced, and decomposing operation is strictly prohibited. Otherwise it may affect the normal operation of other components.
- Replace the specified parts only. Failure to do so can cause improper operation of the EFI system.
- Do not arbitrarily dismantle any parts or connector clips of the electrical fuel injection system from their installed locations to avoid damage or prevent moisture, oil stain and other foreign substances from entering, affecting the normal operation of the electrical injection system.
- When disconnect or connect the connector clips, the ignition switch must be placed in "OFF" position, otherwise, it may damage the electrical components.
- If it is required to dismantle the negative battery cable or ground, it is necessary to turn ignition switch to OFF, and all electric load shall be turned off. After negative pole earthing wire is dismantled for 60s, other electrical equipment can be maintained.
- Parts in the EFI system have high reliability, and if any exception occurred on the complete vehicle or engine, firstly check related mechanical parts is in good condition, system connectors, wire harness and earth wire are in good.
- Faults in system are mainly wire harness and connector faults. Normally, wire harness is broken, connector is poor contact, connector terminal is pulled out or not inserted completely, parts earthing.
- It is unusual that wire harness is broken in the middle. Normally, it is broken at the connector. Therefore, check wire harness at the sensor and connector carefully.
- Poor contact may be due to connector terminal corrosion, external dirt intruding into

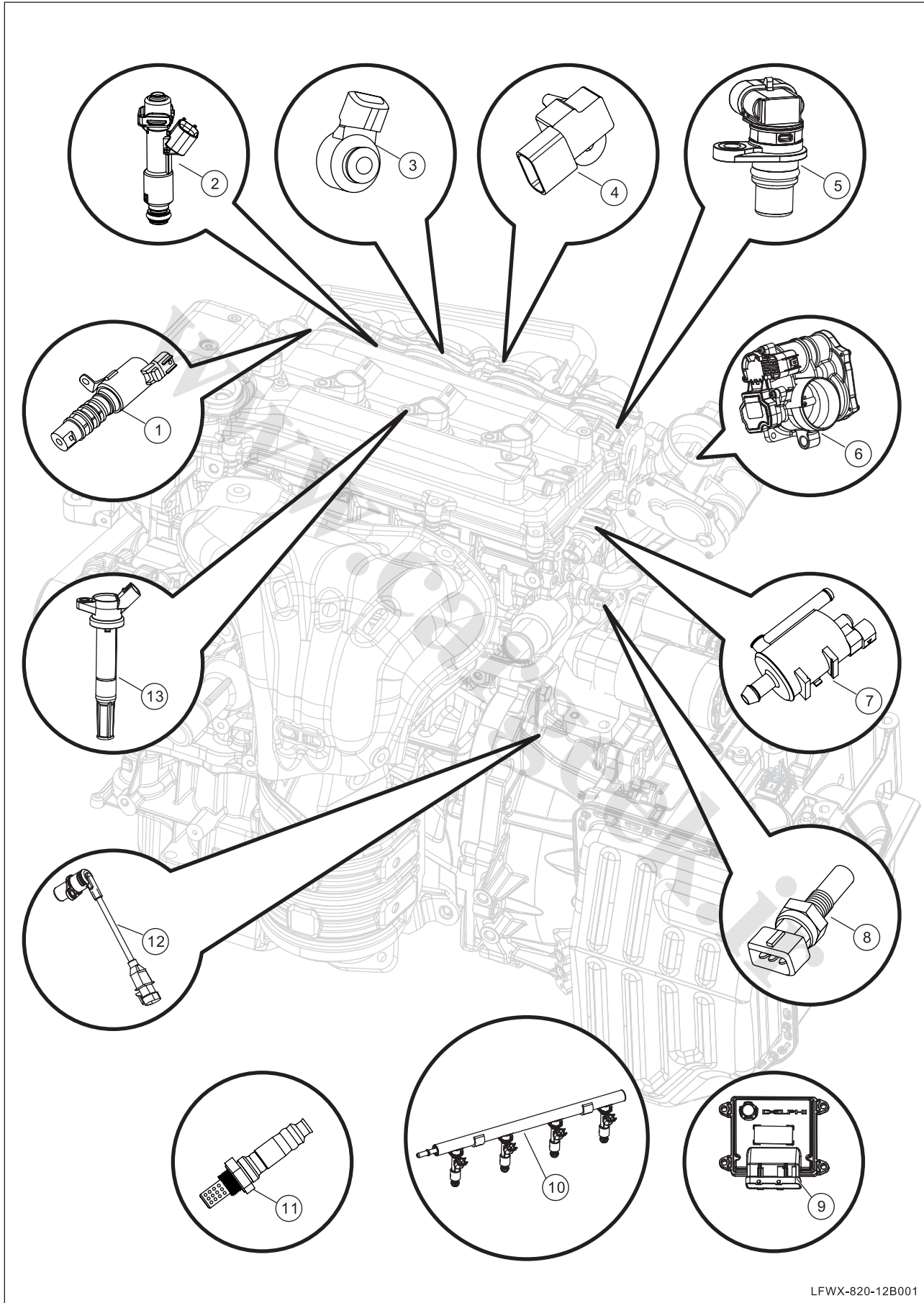
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the terminal or contact pressure reduction between connector plug and socket. Disconnect the connector and then reconnect it. Normal contact restored. When performing fault diagnosis, check whether the wire harness and the connector clips occur abnormalities; if the fault disappears after connected again, this fault belongs to poor connector contact.

11. Do not puncture the wire harness with fine needle to check electrical signal of the system.
12. When transporting and installing the sensor, to ensure that it is not damaged, it must be handled carefully, and any shock, falling may seriously affect its performance.
13. Before installing, remove the sundries on mounting surface with sealant scraper or steel brush, and confirm the sealing surface is smooth without oil stain.
14. When installing the sensor and actuator, tighten fixing bolts or nut according to specified value.
15. The oxygen sensor shall not contact with water or other liquids during dismantling and replacing. Maintenance of the oxygen sensor should be performed after the engine is cooled completely, otherwise, it may cause personal injury.
16. Due to high oil pressure (about 400kPa) of the electrical injection system, all fuel pipes are used with high pressure resistant fuel pipes. Even if the engine is not running, there still remains a higher fuel pressure in the oil lines. Therefore, pay attention not to disassemble the oil pipes during maintenance, and when the fuel system is needed for maintenance, it should be performed pressure relief treatment before disassembling the oil pipes.
17. Disassembling the oil pipe and replacing the fuel filter should be performed by the qualified service personnel in the place with good ventilation and away from open fire. Fuel shall be kept from falling to the engine and its high-temperature exhaust pipeline during the operation.
18. Fuel pump can not be tested in a state without gasoline or in the water. At any time the positive and negative poles of the fuel pump can not be connected reversely.
19. When checking the ignition system, spark plug flashover test is performed only when necessary, and the time should be as short as possible; otherwise, it will cause a lot of unburned gasoline to enter in the exhaust pipe and damage to the three-way catalytic converter.
20. When the battery power is low or the engine is faulty, never start the engine with the help of the external force for a long time to prevent damage to the three-way catalytic converter.
21. When a vehicle equipped with electronic control engine is required to bridge power supply of any other vehicle for starting, first turn off ignition switch and all electrical loads on electronic control vehicle, then dismantle and install the jumper.
22. When performing arc welding on the vehicle, be sure to disconnect the positive and negative pole cables of the battery, remove ECM if necessary, thus avoiding damage to ECM by the high voltage during arc welding.

23. When repairing the body near ECM or sensor, take care to avoid the electronic components from being damaged.
24. When mounting or dismounting ECM, the operator should make himself ground connected; otherwise, iron build, otherwise, static electricity of the human body may cause damage to the ECM circuit.
25. Power supply system used by the vehicle is negative ground, and pay special attention not to connect the positive and negative poles reversely when installing the battery, so as not to damage to the electronic components.
26. When the system has a fault, the diagnostic scanner will clear fault code. If the fault still exists, fault code will always exist when reading fault codes next time until the fault is eliminated. Meanwhile, be sure to clear the fault code after completion of the maintenance.
27. Precautions for starting after (battery) being disconnected
  - After the battery is connected, when starting, turn on the ignition switch and hold it there for more than 30s, and then turn off the ignition switch. Pause for more than 30s and then power on to start the vehicle.
  - The above steps must be completed to ensure the EFI system to complete throttle self-learning testing. If the EFI system fails to complete this testing, this will cause the vehicle starting problems (unable to start, idle instability) or the EFI system fault.

# Components



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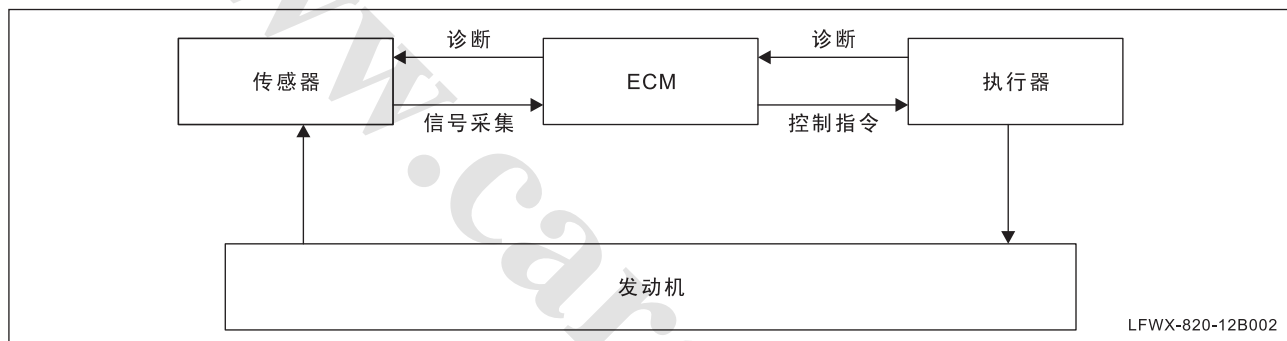
1	OCV
2	Injector
3	Knock sensor
4	Intake pressure and temperature sensor
5	Camshaft position sensor
6	Electronic throttle body
7	Canister control valve

8	Water temperature sensor
9	Electronic Control Module (ECM)
10	Fuel rail assembly
11	Oxygen sensor
12	Crankshaft position sensor
13	Ignition coil

## Electronic control system description

### 1. Engine control system instruction

#### (a) System Block Diagram



- (b) Engine control system usually consists of three parts, namely, sensors, electronic control module (ECM) and actuator is composed of three parts. And it controls the air suction volume, injection volume and ignition advance angle when the engine is working.
- (c) In the electric control system of the engine, the sensors, as the input part, are used to measure various physical signals (temperature, pressure, etc.), and convert them into the corresponding electrical signals. ECM receives the input signals from the sensor, and performs computing according to the set procedures; the control signal generated accordingly is output to the power drive circuit, then the power drive circuit drives the respective actuators to perform corresponding actions, making the engine running in accordance with the set control strategy; while the ECM fault diagnosis system monitors the various parts or the control functions in the system, and once a fault is detected and confirmed, the fault code will be stored, and "Limp home" function will be invoked; it will be resumed to work normally only when the fault is eliminated.
- (d) Sensors mainly include intake pressure and temperature sensor, crankshaft position sensor, camshaft position sensor, throttle position sensor (integrated in the electronic throttle), coolant temperature sensor, knock sensor, accelerator pedal position sensor, oxygen sensor, etc..
- (e) The actuator mainly consists of injector, ignition coil, throttle motor (integrated in

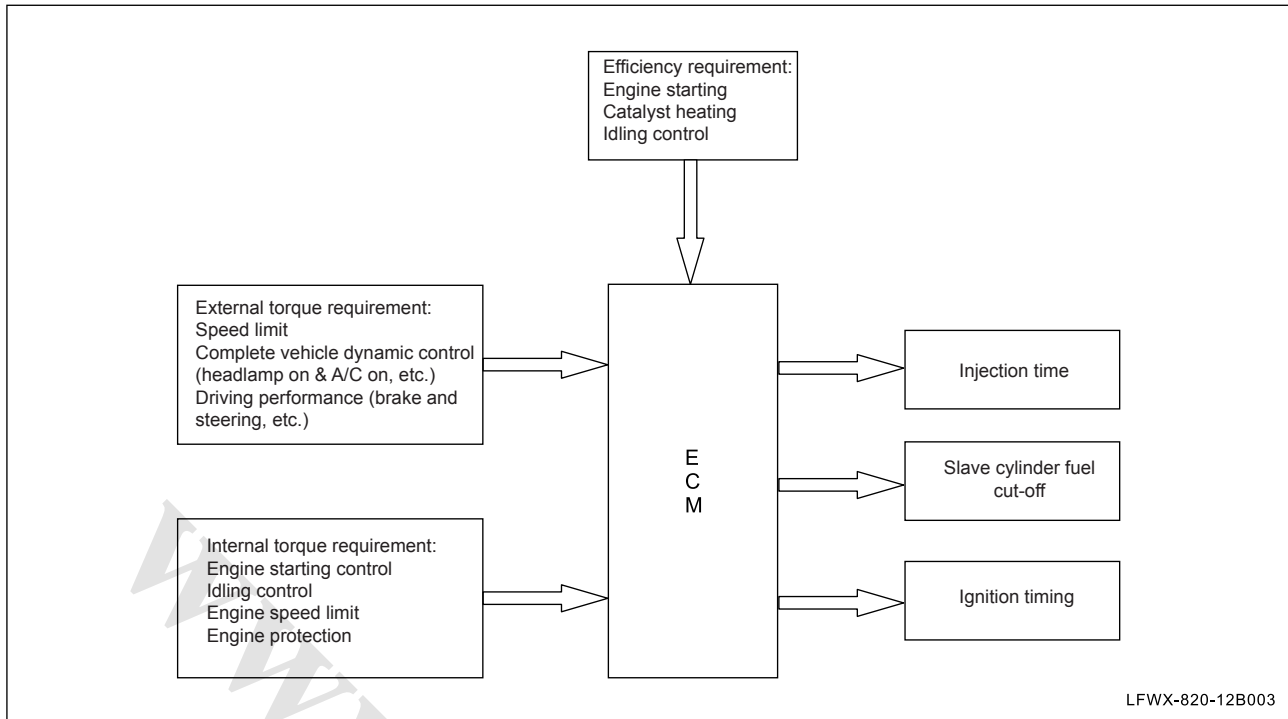
electronic throttle), intake VVT valve, canister solenoid valve, etc.

(f) Sensors and actuator instruction:

S/N	Parts	Quantity	Function
1	Electronic Control Module (ECM)	1	Optimize control system to be appropriate for working conditions of the engine according to signals provided by the sensor
2	Crankshaft position sensor	1	The system determines the crankshaft position and measures the engine speed according to 58X tooth signal, for precise control of ignition and fuel injection timing.
3	Camshaft position sensor	1	Working together with the ring gear mounted on the camshaft, it passes the message of TDC of No.1 cylinder to ECM which judges the working order of each cylinder accordingly.
4	Intake pressure and temperature sensor	1	Check the engine intake temperature and intake volume
5	Electronic throttle body	1	Detect the throttle position, while the ECU controls its internally-integrated motor to adjust the throttle opening
6	Ignition coil	4	Ignition of the air-fuel mixture.
7	Fuel pump	1	Deliver fuel
8	Injector	4	Inject fuel according to ECM signals
9	Water temperature sensor	1	Check engine coolant temperature
10	Canister solenoid valve	1	Cause the fuel vapor in the canister into the intake duct according to the ECM digital pulse square wave
11	Fuel pump	1	Deliver fuel
12	OCV	1	Controlling the engine oil flow into the camshaft position actuator.
13	Oxygen sensor	1	Check oxygen concentration in exhaust gas
14	Knock sensor	1	Check if the engine has knock

## 2. Engine control system function

(a) All the internal and external demands are defined with the torque or efficiency of the engine by adopting the control strategies based on torque. Various demands of the engine are converted to the control variables of the torque or efficiency; after processed in ECM, these control variables are converted to the engine control parameters such as ignition time, ignition timing, etc.



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(b) The main functions of system:

S/N	Function	S/N	Function
1	Starting control	6	Oil cut-off control for acceleration/deceleration and reverse towing
2	Idle speed control	7	Evaporative emission control
3	$\lambda$ closed-loop control	8	Overvoltage protection
4	Knock control	9	A/C compressor control
5	Heating control for warm-up and three-way catalytic converter	10	Fault diagnosis and limp home

### 3. System function introduction

(a) Starting control.

- During starting, adopt a special calculation method to control the charging amount, fuel injection and ignition timing.
- At the initial stage of this process, the air within the intake manifold is still and the internal pressure of intake manifold is indicated as ambient pressure. Electronic throttle opens to a certain angle, and its size is a set fixed parameter according to the starting temperature.
- The fuel injection amount changes with the engine temperature to promote the film formation of the intake manifold and the cylinder wall. Increase the enrichment of the mixture before the engine reaching to a certain speed. As soon as the engine starts, the system immediately begins to decrease the starting enrichment; starting enrichment will be canceled completely until the starting condition is fin-



ished (when the engine speed reaches 600~700r/min).

- Under working conditions of starting, ignition angle is adjusted continuously and changes with the engine temperature, intake air temperature and engine speed.

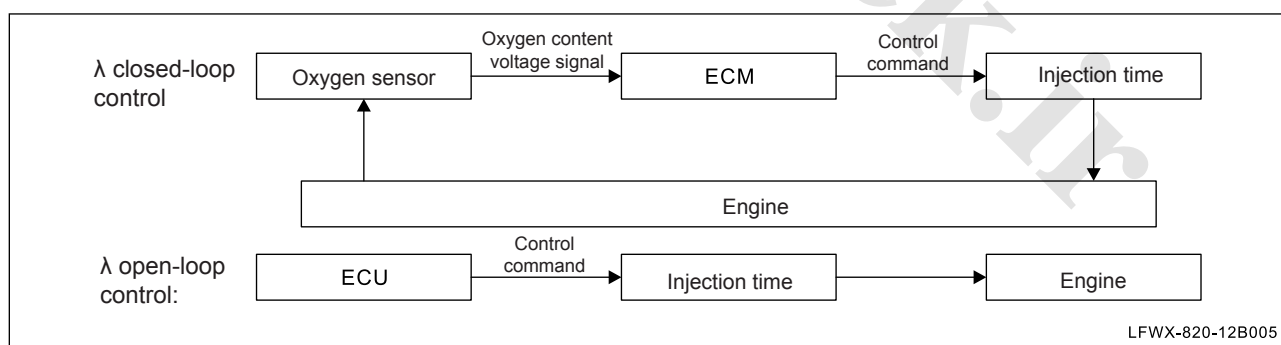
(b) Heating control for warm-up and three-way catalytic converter

- After cold start of the engine, air filling volume, fuel injection and ignition will be adjusted to compensate for the higher torque requirements of the engine. This process lasts until the engine temperature rises to certain threshold value (the engine temperature is approximately the engine coolant temperature).
- The function of three-way catalytic converter is to convert harmful gas from engine combustion into harmless gas and then discharge into the atmosphere.
- As the operating temperature of the three-way catalytic converter is above 300°C, the most important thing is to quickly heat the three-way catalytic converter during warm-up. Under this working condition, use the exhaust gas to perform "three-way catalytic heating" with the method of moderately delaying the ignition advance angle.

(c) Idling speed control.

- Idle speed control function refers to the control of the engine speed by the system when the accelerator pedal is not depressed.
- Idle speed control includes control over stabilizing the engine speed when the vehicle driving at idle speed. It also includes the idle speed control over opening air conditioning, power steering, opening headlamps, etc.. when increasing the load.
- The system uses a stepper motor (integrated in the electronic throttle) to automatically adjust the throttle opening, thus achieving high precision of idle speed control.

(d) closed-loop control.



- Oil supply to the engine uses a closed-loop control, thus making the engine always running in an ideal condition (air/fuel ratio is not much deviated from the theoretical value). Use open-loop control when the engine is just started or required at high speed. The advantages of the closed-loop control is to reduce emissions, and improve the vehicle's dynamic performance and economy.  $\lambda$  indicates air/fuel ratio of the mixture, when  $\lambda = 1$  the theoretical air/fuel ratio is 14.7:1.

- closed-loop control system works equipped with front oxygen sensor. Front oxygen sensor is used to monitor the oxygen content in the exhaust gas in the side of the three-way catalytic converter, lean mixture ( $\lambda > 1$ ) produces a sensor voltage of about 110mV, and rich mixture ( $\lambda < 1$ ) produces a sensor voltage of about 750mV. When  $\lambda = 1$ , the sensor voltage will have a jump.  $\lambda$  closed-loop control responds to the input signals ( $\lambda > 1$  indicates oxygen sensor voltage is below 100mV,  $\lambda < 1$  indicates oxygen sensor voltage is greater than 750mV) and modifies the control variables, producing a correction factor as a multiplier to correct the fuel injection duration.
  - The exhaust after-treatment of the three-way catalytic converter is an effective way to reduce the concentration of the harmful substances in the exhaust gas.
  - Three-way catalytic converter can reduce HC, CO and NO<sub>x</sub> by 98% or more and convert them into H<sub>2</sub>O, CO<sub>2</sub> and N<sub>2</sub>. However, this high efficiency is achieved only when the excess air factor is in a narrow range of near  $\lambda = 1$ , and the aim of  $\lambda$  closed-loop control is to ensure the mixture concentration within this range.
- (e) Oil cut-off control for acceleration/deceleration and reverse towing
- A portion of the fuel injected into the intake manifold will not reach the cylinder in time to participate the subsequent combustion process. Instead, it forms a layer of film on the intake manifold wall. Fuel amount stored in the oil film will increase dramatically according to the increasing of the load and extension of the injection duration.
  - When the throttle opening increases, part of the injected fuel will be absorbed by the oil film. Therefore, corresponding supplementary fuel must be injected in for compensation and to prevent the mixture thinning when accelerating.
  - Once the load factor decreases, the additional fuel contained in the fuel film on the intake manifold wall will be re-released. While decelerating, corresponding injection duration must be decreased.
  - Reverse towing or towing working condition refers to situation that the power provided by the engine is a negative value in the flywheel. In this case, the friction of the engine and the rotation of the pump and crankshaft can be used to decelerate the vehicle. When the engine is in reverse towing or towing condition, fuel injection is cut off to decrease the fuel consumption and exhaust emissions, and more important, to protect the three-way catalytic converter. Once the speed drops at a specific oil recovery speed while above the idle speed, the fuel injection system will resume oil supply.
  - When the injection system resume to supply oil, the system begins to provide the complementary fuel with the initial injection pulse, and rebuilds oil film on the intake manifold wall. After resuming oil injection, torque-based control system makes the engine torque increase slowly and steadily (smooth transition).
- (f) Knock control.
- The system detects the characteristic vibration generated from the knocking with the shock sensor installed between the cylinder 2 and the cylinder 3 of the en-

gine, and it is converted into the electrical signals to be transmitted to ECM for processing.

- ECM uses special calculation method to check if knock occurs during the course of each combustion cycle in each cylinder. Once knock is detected, knock closed-loop control is triggered. When knock risk is eliminated, affected cylinder will be advanced to preset ignition advance angle gradually.
- (g) Over voltage protection.
- When charging system has a fault which leads to high voltage, the system will go into protection state to limit engine speed in order to avoid ECM from being damaged.
- (h) A/C compressor control
- When air conditioner switch is turned on, ECM will receive signal of air conditioner request, and make preparation for adding load for air conditioner according to current engine working condition, and then switch on A/C compressor.
  - ECM will control the air conditioning to be connected or disconnected according to the self-protection needs of the air conditioning. In order to ensure power take-off and protect the engine, the system will cut off air conditioner under some special conditions.
- (i) Evaporative emission control.
- Due to the external radiation heat and the oil return heat transfer, the fuel in the oil tank will be heated to form fuel vapor.
  - As limited by the evaporative emission regulations, these vapors containing a large number of HC element are not allowed directly exhausted into the atmosphere. Fuel vapor in the system is collected in the charcoal canister through a tube and entered into the engine through flushing at the appropriate time to participate in the combustion process.
  - The flow of flushing air is achieved by controlling over the canister solenoid valve by ECM. This control works only in the condition of the system closed-loop controlled by  $\lambda$  closed-loop.
- (j) Cooling fan control
- The vehicle is equipped with the electric dual-speed engine cooling fan.
  - Electric fan control function: ECM determines if it is necessary to turn on the fan according to engine coolant temperature and actual conditions for turning on air conditioner to reduce power consumption in the engine.
- (k) On-board diagnosis
- Self-diagnosis of system fault is an essential function of engine control system. When one or several parts work abnormally, the system will remind the user of necessary check and maintenance by lighting fault indicator lamp. When a fault occurs, the system can adopt emergency plan to control the engine so as to en-

sure the driver drive the vehicle to a service station.

- When one sensor and actuator are detected to be abnormal, engine fault indicator lamp is lit to remind the driver.
- Read RAM data related to sensor and actuator in ECM by fault diagnostic scanner. In addition, in some cases, the actuator can be forced to drive.

#### 4. Principle of starting control

- After the ignition switch is turned on, the fuel pump will stop after running for about 2s.
- The engine starts to run, as soon as effective 58X signal is detected by ECM, the fuel pump will start running.
- After the speed signal disappears (analog signal is susceptible to interference) for 0.8s, the fuel pump stops running.

- Pre-injection:

Pre-inject only once during the course of normal starting (if fuel is absorbed by carbon deposit, gas mixture becomes thinner and it is not easy to start).

- At the initial stage of starting:

The pressure in intake manifold is shown as atmospheric pressure. The throttle valve is closed and the ECM appoints a fixed parameter that established according to the start-up temperature (coolant temperature).

- The process of starting:

Fuel injection quantity according to the engine coolant temperature varies, the ignition angle are also constantly adjust and as the engine coolant temperature, inlet temperature and engine speed varies.

- Starting process is over:

If engine speed is more than 800 r/min, end starting conditions.

#### 5. Fuel injection control principle.

- The ECM controls the drive time and injection timing of injectors to achieve the air mixture of best air-fuel ratio for the engine under all kinds of working conditions.
- Fuel pressure regulator keeps injection pressure stable, the injector directly inject fuel into each cylinder of the airway. In each working circle (crankshaft rotates twice for each circle)of the engine, each cylinder injects once (injection sequence is 1-3-4-2), this injection is called sequential injection.
- When the engine running in a cold or heavy-duty state, to maintain good engine performance, the ECM will execute the open-loop control to provide richer gas mixture. When the engine is in the normal working state (with a small-and-medium load), the ECM will perform the closed-loop control through the feedback signal of the oxygen sensor to obtain the optimum air-fuel ratio to achieve the best purification efficiency of

the three-way catalytic converter.

(d). Fuel-injection pulse width control.

Input signal	ECM	Control output
Air-fuel ratio correction	Calculate fuel injection amount	Fuel-injection pulse width
Closed-loop feedback correction		
Intake manifold pressure		
Air inflation temperature		
Air inflation efficiency		
Self-learning correction		
Power supply voltage correction		
Exhaust gas cycle		
Acceleration and thickening		
Deceleration and thinning		
Deceleration and fuel cut-off.		
Injector parameters		

(e) Control signal description.

Correction item	Content
Air-fuel ratio includes	<ul style="list-style-type: none"> <li>• Air-fuel ratio for starting</li> <li>• Air-fuel ratio when the engine runs</li> <li>• Air-fuel ratio at low coolant temperature of the engine</li> <li>• Air-fuel ratio at normal coolant temperature of the engine</li> <li>• Theoretical air-fuel ratio</li> <li>• Stronger air-fuel ratio</li> <li>• Overheating protection air-fuel ratio</li> </ul>
Closed-loop feedback correction	<ul style="list-style-type: none"> <li>• Control actual air-fuel ratio by oxygen sensor feedback signal to make it be close to theoretical air-fuel ratio</li> </ul>
Intake manifold pressure	<ul style="list-style-type: none"> <li>• Read directly through MAP installed on intake manifold</li> </ul>
Self-learning	<ul style="list-style-type: none"> <li>• Correct slow change, such as mechanical wear, in the engine due to long time running</li> </ul>
Power voltage	<ul style="list-style-type: none"> <li>• When the battery voltage changes, voltage correction can ensure correct fuel injection amount</li> </ul>
Acceleration and thickening	<ul style="list-style-type: none"> <li>• When ECM detects intake manifold pressure and throttle opening value is increased, fuel injection amount is increased to improve power performance in order to avoid engine gas mixture from becoming thinner instantly.</li> </ul>

Deceleration and thinning	<ul style="list-style-type: none"> <li>When the ECM detects the intake manifold pressure and the degree of throttle opening reduces substantially, in order to avoid the instantaneous thickening of air-fuel mixture of the engine, the fuel injection quantity will be decreased to improve emission and drivability. to improve emissions and driving performance</li> </ul>
Deceleration and fuel cut-off.	<ul style="list-style-type: none"> <li>Control to cut off the fuel when the system detects the vehicle enters into deceleration state. To reduce emissions and fuel consumption. When the engine speed is higher than the set value, start to cut off the fuel supply. When the ignition system fails, cut off the fuel supply.</li> </ul>
Fuel injection parameters	<ul style="list-style-type: none"> <li>Provide relation between the engine and fuel injection amount</li> </ul>

## (f) Correction of engine gas mixture

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- When the engine is at normal working temperature, partial load control is closed-loop fuel control. Now, the system corrects fuel injection amount at real time by ECM according to voltage signal of oxygen sensor feedback so that adjusted gas mixture concentration is close to theoretical air-fuel ratio to ensure conversion efficiency of harmful gas through three-way catalytic converter reaches to optimal state and a better fuel economy.
- When the engine is within normal working temperature range, open-loop fuel control is used at full load. At the moment, to ensure the best power output of the engine, the system will control the fuel injected with a richer air-fuel ratio and increase the ignition advance angle moderately without engine knock. The system can control exhaust temperature through exhaust temperature mathematical model established when calibrating to protect the engine and three-way catalytic converter.
- The system determines full-load conditions of the engine according to signals provided by throttle position sensor. Normally, when throttle opening reaches 80%~90%, the system will consider that the engine is in full-load state. When the driver depresses on accelerator pedal, the system will increase fuel injection amount appropriately to ensure power required by the engine when accelerating. Increased fuel injection amount is directly proportional to throttle valve opening change rate. When accelerating, ECM first delays ignition advance angle appropriately, then restore it gradually in order to avoid increased torque from impacting drive system when the engine accelerates quickly.
- When working condition of accelerating is close to full load of the engine, the system will disconnect vehicle air conditioner system temporarily to ensure power takeoff of the engine when accelerating. No matter in any condition, when engine speed exceeds maximum speed set in system, the system will cut fuel supply to resist endless increase of speed, to protect engine and prevent "vehicle flying". When speed returns to maximum speed limit specified by the system, the system will immediately recover fuel supply.

## 6. Ignition control principle

### (a) Starting.

When the engine starts, one fixed ignition advance angle is used to ignite gas in the cylinder and provide positive torque. After the engine speed increases to a certain degree, ECM calculates ignition advance angle according to input signals.

### (b) Ignition advance angle control.

Correction signal	ECM	Control output
Coolant temperature correction	Calculate ignition advance angle	Ignition advance angle
Intake air temperature correction		
Idle speed correction		
Main ignition angle		
Decelerating and fuel cut-off correction		
Accelerating correction		
Power enrichment correction		
Air conditioner correction		

### (c) Main ignition advance angle.

- After the engine coolant temperature is normal, usually, the main ignition angle with the throttle open is just the smallest ignition angle at Minimum spark advance for Best Torque (MBT), i.e., knock border line (KBL). With the throttle closed, the ignition angle should be less than MBT for idling stability.
- Provided that no influence on cold-state driving, to ignite catalytic converter as soon as possible, during the heating process of catalytic converter, the basic ignition angle may not be the MBT or KBL ignition angle, and it may be delayed as much as possible in the case of no influence on driving.

### (d) Ignition advance angle correction.

- Acceleration correction: when the vehicle is accelerating, ECM detects knock signal, correct ignition angle until no knock occurs. In addition, it is used to reduce engine speed fluctuation caused by drive system knock.
- Power enrichment corrected: In the vicinity of the engine-performance, to obtain a better power and torque, the enriched air-fuel ratio can reach the thinnest one with the best torque value.
- Decelerating and fuel cut-off correction: when exiting deceleration and fuel cut-off, correct ignition advance angle to ensure stable transition.
- Air conditioner control correction: when the engine is idling, turn off air conditioner. Correct ignition advance angle to ensure stable transition.

## 7. Idling-speed control principle

### (a) Idle speed control.

According to idle speed conditions and engine load changing at idle speed, control throttle bypass air amount to keep idle speed optimal. According to the engine coolant temperature and air conditioning load, ECM drives the throttle's motor to allow the engine to run at the preset idling speed. In addition, if the air conditioning switch is turned on or off when the engine is idling, the throttle motor adjusts the intake air based on the load condition of the engine to avoid idle instability.

### (b) Calculate target idle speed.

Input signal	ECM	Control output
Basic target idle speed	Calculate target idle speed	Target idle speed
Voltage compensation		
Vehicle speed compensation		
Headlamps compensation		
Fan compensation		
A/C compensation		
Decelerating adjustment		

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- Voltage compensation: When the voltage is less than 12V, the system will increase target idle speed automatically to increase generated energy of the alternator.
- A/C compensation: When parking vehicle at idle speed and opening air condition, to compensate power consumption of compressor, aim idle speed will increase by 150r/min.
- Headlamps compensation: With the low-beam Headlamps on, in order to compensate for their power consumption, the target idling-speed will rise to about 50r/min.
- Fan compensation: when coolant temperature is increasing, the fan is running. In order to compensate power consumption of fan running, target idle speed will be increased by 50r/min.

### (c) Idle speed control parameters:

- Idle speed air amount.
- Fuel injection amount.
- Ignition timing

### (d) Idle speed design control opportunity:

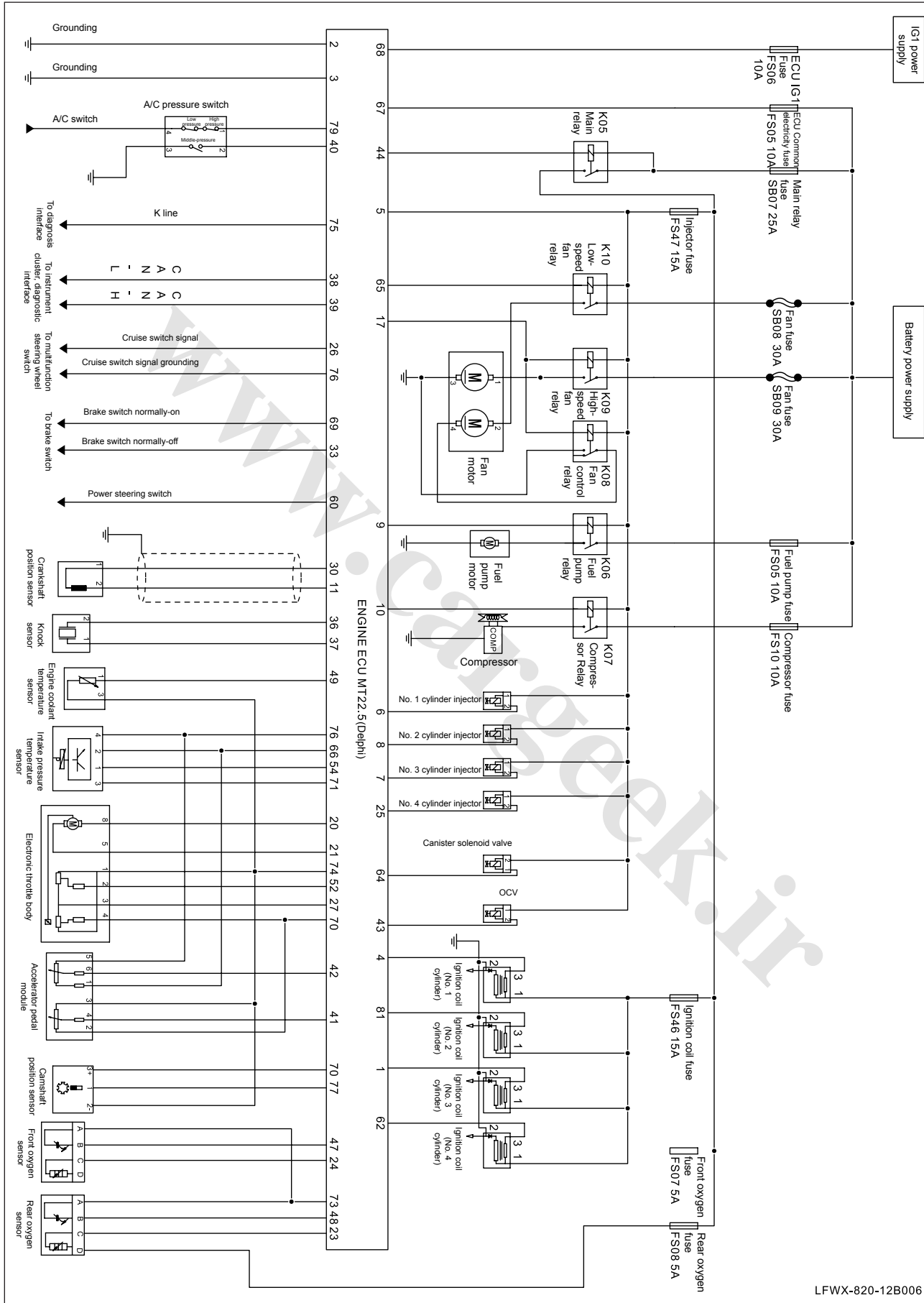
- Idle speed stability calibration.



- Accelerating working condition calibration.
  - Decelerating working condition calibration.
  - Decelerating and fuel cut-off.
  - Engine transient state transition working condition fuel supply calibration.
  - Constant speed driving calibration.
  - Mechanical and electrical load increasing / decreasing calibration.
- (e) Decisive factors of target idle speed:
- When the engine coolant temperature is too low, the system will provide high target idle speed to speed up warming-up process.
  - When the additional loads (such as: the headlamps, air conditioning, cooling fans and other electrical loads) are turned on, the system will increase the idling speed to compensate for the increased loads and to maintain the stability of idling-speed.
- 8. Knock control principle**
- (a) Knock sensor introduction:
- Knock sensor is a vibration acceleration sensor, installed between No. 2 cylinder and No. 3 cylinder in favor of engine knock balance. ECM determines if knock occurs in the engine using vibration frequency signal output by the sensor and through filtering inside ECM. When knock signal is detected, ECM corrects ignition angle until no knock occurs.
- (b) Knock control conditions:
- The vehicle is provided with knock sensor.
  - Engine speed is larger than 800r/min.
  - MAP>40kPa.
- (c) Knock control mode:
- Static control: When the engine is running normally, ECM collects and analyzes noise during the course of engine combustion through knock sensor. After filtering, knock is detected. Once knock strength exceeds the limit, the system will retard ignition advance angle of the cylinder of knock to eliminate the knock.
  - Transient state control: When emergent acceleration occurs or the engine speed changes rapidly, knock occurs easily. After predicting the possibility of knock, the system will defer the ignition advance angle automatically to avoid excessive (violent) knock.
  - Retard ignition angle rapidly: after the system detects knock, it will retard ignition advance angle rapidly according to different engine speed and then return to normal in 2s to 3s.

- Adaptive adjustment ignition angle: Due to manufacturing deviation and wear caused by long term usage (belt, toothed pulley and cam affecting phase angle relation), the engine has differences or changes. If the system and engine are used initially or after ECM is charged, the engine may have knock. The system will record it. After a period of running-in, the system will generate ignition adjustment correction value (self-learning value) automatically. When the engine runs to the same working conditions, the system will adjust ignition advance angle automatically. Strong knock is forbidden. Adaptive learning of the system is continuously updated during the course of running.
9. Canister control valve control principle
- (a) Used to control the flow of canister cleaning airflow.
- Based on the engine load, engine coolant temperature, engine speed and a series of signals, duration and frequency (duty cycle) of the electrical pulse to be sent through comprehensive calculation, the ECM will control the canister solenoid. Excessively-accumulated fuel vapor in the canister can cause gasoline leak resulting in environmental pollution. Therefore, the purpose of the canister control valve is to open at the right time to allow the excessive fuel vapor in the canister to mix with air before entering into the intake pipe to participate in combustion.
- (b). Canister will not work in the following conditions:
- Within a period of time after engine cold start.
  - Engine coolant temperature is too low.
  - Engine idle.
  - Engine load is high.
  - Important sensor system faults.

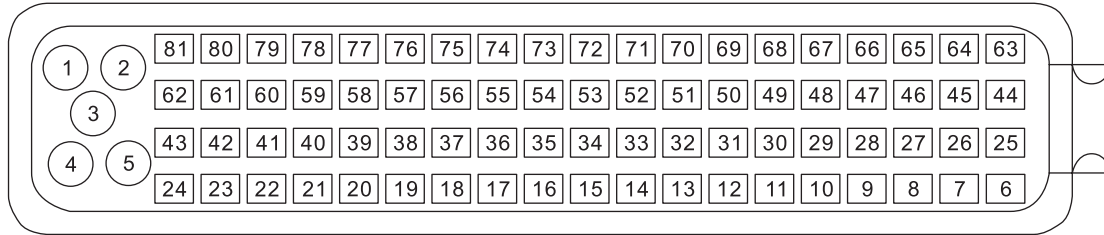
# Schematic diagram



LFWX-820-12B006

## Terminal definition

E01B to the engine ECM



12B

LFWX-820-12B007

Terminal No.	Color	Function	Terminal No.	Color	Function
1	Br	No. 3 cylinder ignition coil control	26	V	Cruise control switch signal
2	B	Grounding	27	P	Throttle position sensor signal 2
3	B	Grounding	28	-	-
4	Lg/R	No. 1 cylinder ignition coil control	29	-	-
5	Bl/R	Output power supply for main relay	30	G	High level of crankshaft position sensor
6	O/B	No. 1 cylinder injector control	31	-	-
7	P/Y	No. 3 cylinder injector control	32	-	-
8	Y/R	No. 2 cylinder injector control	33	-	-
9	B/O	ECU controlled fuel pump relay	34	-	-
10	W	Compressor relay ECU control	35	-	-
11	Bl	Low level of crankshaft position sensor	36	-	-
12	-	-	37	-	-
13	-	-	38	-	-
14	-	-	39	Bl/W	PCANH
15	-	-	40	G	A/C medium-pressure switch signal

Terminal No.	Color	Function	Terminal No.	Color	Function
16	-	-	41	R/Y	Signal of accelerator pedal position 1
17	O/Bl	High speed fan relay control	42	Gr	Signal of accelerator pedal position 2
18	-	-	43	Y/W	VVT intake valve control
19	-	-	44	Y	Main relay ECU control
20	V	Throttle motor -	45	-	-
21	Y	Throttle motor +	46	-	-
22	-	-	47	O/Y	Front oxygen sensor signal
23	G	Rear oxygen sensor heating control	48	Gr	Rear oxygen sensor signal
24	V/W	Front oxygen sensor heating control	49	Y/B	Water temperature sensor signal
25	G/Y	No. 4 cylinder injector control	50	-	-
51	-	-	67	R	Battery power supply
52	Bl/G	Throttle position sensor (1) signal	68	B/W	IG1 power
53	-	-	69	G/W	Brake switch signal (Normally Closed)
54	P	Intake pressure signal	70	R/B	5V power supply
55	-	-	71	Bl	Intake air temperature signal
56	-	-	72	-	-
57	-	-	73	V/B	Oxygen sensor signal ground
58	-	-	74	W	Sensor signal ground (accelerator pedal, camshaft and water temperature sensors)
59	-	-	75	P/G	Kw2000 diagnostic communication line
60	Bl/G	Power steering switch signal	76	R/B	Intake pressure and temperature sensor signal ground
61		NC	77	Lg/W	Crankshaft position sensor signal
62	Lg/G	No. 4 cylinder ignition coil control	78	-	-
63	-	-	79	R/G	A/C request signal (high-voltage/low-voltage switch)



Terminal No.	Color	Function	Terminal No.	Color	Function
64	W/G	Canister solenoid valve control	80	-	-
65	BI/Y	Low-speed fan relay ECU control	81	P/G	No. 2 cylinder ignition coil control
66	R/W	Power supply (5V) for intake pressure and temperature sensor			

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## Basic check

△ HINT:

If the DTC isn't determined during inspection of DTC, all possible circuits must be considered as possible fault cause to analyze and eliminate fault. In most cases, basic check for the engine in the following table will be made to find fault location quickly and efficiently.

Steps	Inspection item		Recommended action
1	Check the battery voltage • The battery voltage shall be $\geq 9.6V$ . Inspect if the result is normal	Yes	Go to Step 2
		No	Charge or replace the battery.
2	Check if the engine starts • Start the engine. Inspect if the result is normal	Yes	Go to Step 3
		No	Go to Step 6
3	Check air filter • Take out air filter • Check if air filter is polluted or oily excessively visually. Inspect if the result is normal	Yes	Go to Step 4
		No	Clean or replace air filter
4	Check idle speed • Start the engine. • Let the engine in idling state. Inspect if the result is normal	Yes	Go to Step 5
		No	See 12B- Engine Control System - Fault Diagnosis, Table of Symptoms.
5	Check ignition timing • Use timing lamp or ignition timing tester to check ignition timing. Inspect if the result is normal	Yes	Go to Step 6
		No	See 12B- Engine Control System - Fault Diagnosis, Table of Symptoms.
6	Check fuel pressure • Check fuel pressure with fuel pressure gauge. Inspect if the result is normal	Yes	Go to Step 7
		No	See 12B- Engine Control System - Fault Diagnosis, Table of Symptoms.
7	Check the spark plug • Remove spark plugs one by one. • Test spark plug. Inspect if the result is normal	Yes	Basic check is over
		No	Replace spark plug

## Fault Diagnosis

### Diagnostic system description

#### 1. Overview of system

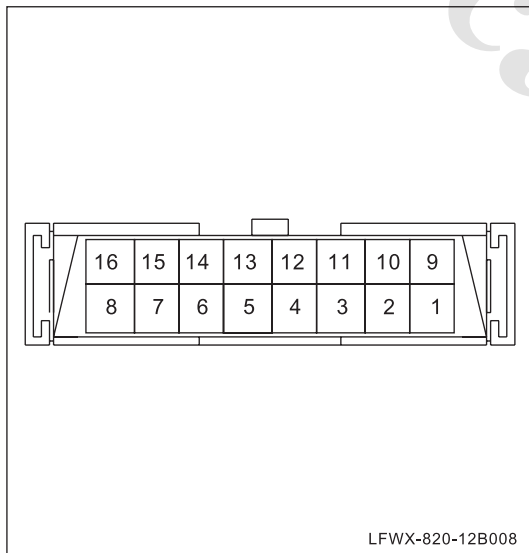
The engine EFI diagnosis system refers to the on-board (OBD) system for emission control. Its role is to identify the possible fault area, and store the information in the electronic control unit memory in the form of fault code.

#### 2. Information storage

- (a) In case a fault presents and is conformed by the system, it will be stored in electronic control module (ECM) as a separate fault code.
- (b) Store fault information and engine state parameters when the fault occurs, including load value, engine speed, fuel pressure and correction, vehicle speed, coolant temperature, etc.

#### 3. Information reading

- (a) Connect a diagnostic scanner with the vehicle through diagnosis interface or a computer to read fault code and engine state parameters when the fault occurs.



- (b). Diagnosis interface:

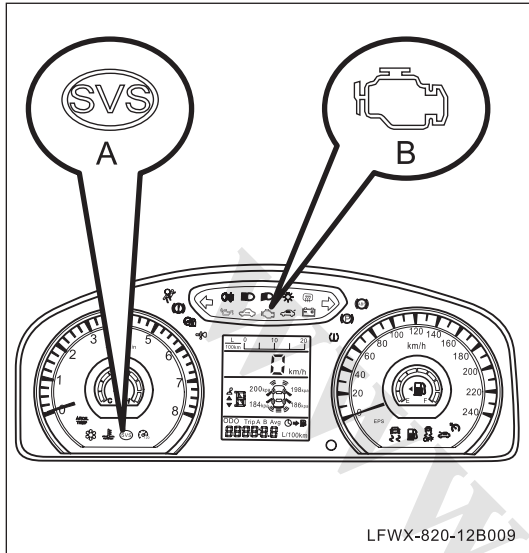
- 16-pin interface, located below the left lower dashboard.

- (c). Diagnosis interface description:

Terminal code	Function description	Inspection of data
4	Grounding (-)	Resistance : about 1 $\Omega$ or less
5	Grounding (-)	Resistance : about 1 $\Omega$ or less
6	CAN_H	2.5~3.5V voltage
7	KW2000 communication cable	Pulse Signal



Terminal code	Function description	Inspection of data
8	IG1 power	Ground voltage 9~14V
14	CAN_L	1.5~2.5V voltage
16	Battery positive terminal (+)	Ground voltage 9~14V



#### 4. Malfunction indicator

##### (a). Position and symbol

Instrument panel contains 2 fault indicators: engine fault indicator lamp "SVS" (A), the other is OBD fault indicator lamp "MIL" (B) Both are controlled by ECM calibration. The difference is that OBD MIL is mandatory by national laws and regulations. When it is lit, it means there is a fault in electronic control system that deteriorates emission of complete vehicle. SVS light means there are other faults in electronic control system. During the course of normal running of the engine, when a fault occurs, both lights are lit according to its respective rules.

#### 5. Lighting type of malfunction indicator

##### △ HINT:

- Before starting the engine, turn the ignition switch to "ON" and pause for about 2s, and observe whether the indicators on the instrument performs a self-test.
  - The SVS and MIL lamps on the dashboard are to prompt the user whether the fault is related to the electronic control system. Their illumination will be controlled by the ECM internal calibration data.
- (a) When the system has no fault
- Turn ignition switch to ON, and MIL is always lit, SVS goes out after self check.
  - After starting, MIL lamp and SVS go out;
  - After flameout, then MIL and SVS go out.
- (b) When the system fails accordingly.
- If the ignition switch is turned to ON position, both MIL and SVS stays on.
  - After starting, if there is a trouble in the system, both MIL and SVS come on or go out based on their respective rules.
  - All indicators will be off after flameout of the engine.

#### 6. Classification of faults occurred in engine electronic control system



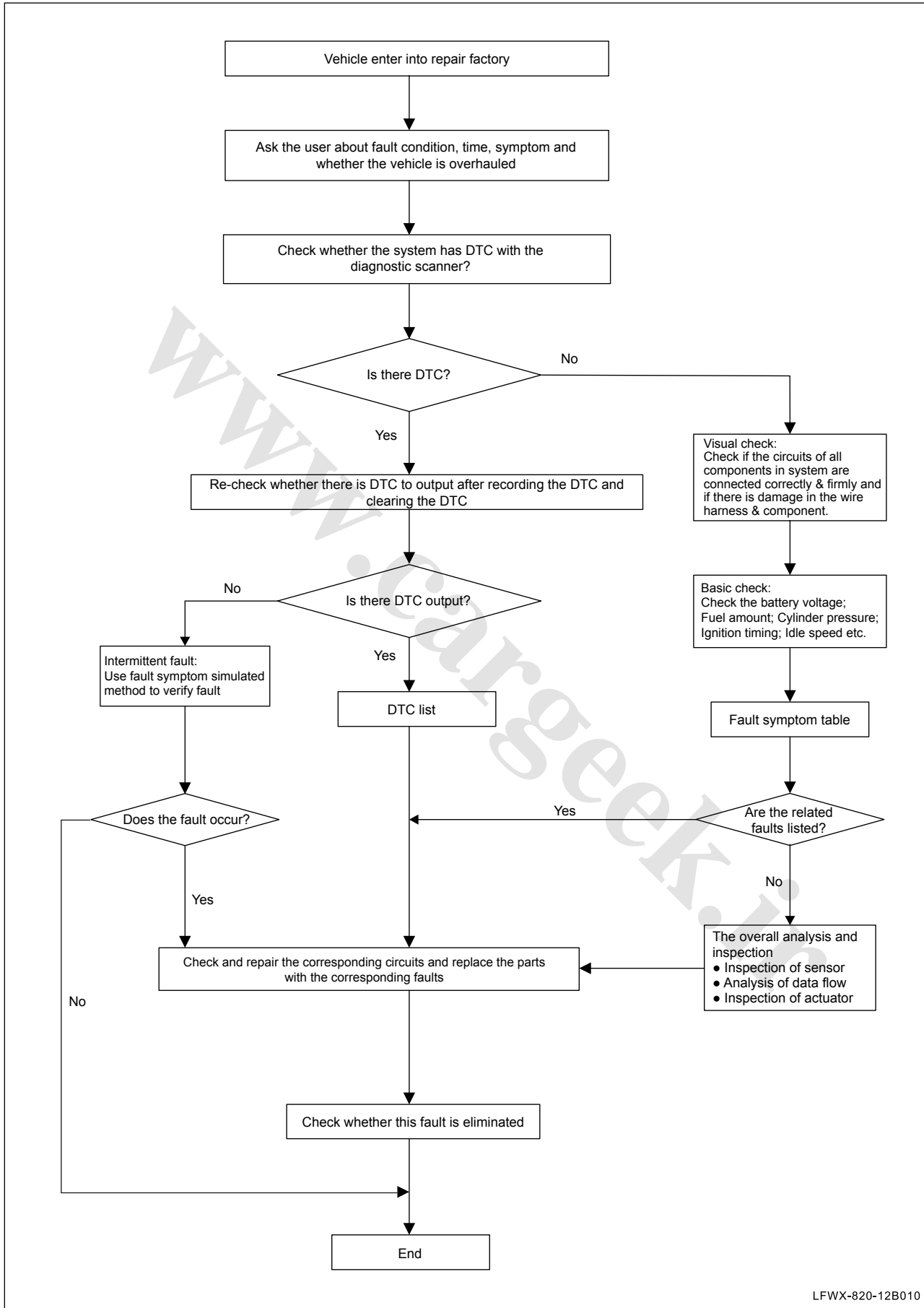
- (a) If the OBD fault indicator on the instrument is on, it indicates that a fault worsening the emission occurs in the engine electronic control system.
- (b) If the SVS fault indicator on the instrument is on, it indicates that the electronic control system is abnormal; in this case, continuous driving may cause damage to the engine, or result in personal injury.

△ HINT:

The two faults require the user to go to the service station immediately authorized by LIFAN to have them checked with the diagnostic scanner or the special equipment with the equivalent function.

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## Fault diagnosis procedure



LFWX-820-12B010

## Fault diagnosis analysis

### △ HINT:

- Electronic control engine has common faults: difficult to start, flameout after starting, unstable idling, idle speed too high, driving poor, accelerating poor, backfire blasting, shaking gasp, smoking and high fuel consumption. Fault reasons are very complicated. So it is very important to analyze faults carefully.
1. Analyzing and determining whether there is a fault in the engine
    - To determine whether there is a fault in the engine, the general methods include:
    - When the engine cannot start or cannot run normally after starting, or the engine runs with exhaust pipe blasting, has intake pipe backfire and obvious knock, it means the engine has a fault.
    - Whether engine fault indicator lamp of engine electronic control system is lit. If this light is lit, it means engine electronic control system has a fault;
    - If the engine performance changes a lot in a short time, it means the engine has a fault. For example, the engine power decreases obviously and fuel consumption increases obviously.
    - Engine performance changes a little, the following method can be used to test it: when the engine runs under various working conditions, check if exhaust pipe and intake pipe have abnormal noise; check if the engine has obvious shaking or metal knock, and engine speed changing.

12B

### 📌 Note:

- **Step on the pedal slowly to increase engine speed gradually and check the above-mentioned phenomenon exists.**
- **If it exists, it means the engine may have a fault. It is necessary to make tests repeatedly and provide a basis to determine faults correctly.**
- **Step on accelerator pedal suddenly; check if the above-mentioned phenomenon exists and engine speed increases correctly. If any abnormal condition occurs or engine speed increase is slow, it means the engine has a fault.**
- **In both cases, if the engine has no abnormal phenomenon, release accelerator pedal and check engine running at idle speed: check if idle speed is too high, unstable, and if the engine shakes seriously.**

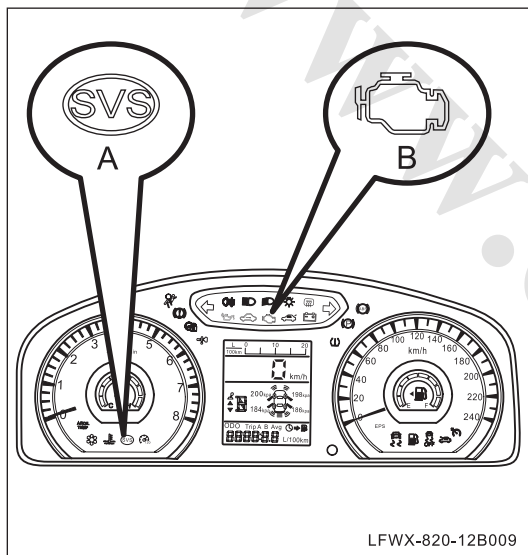
### △ HINT:

- After the completion of the above operation, if no abnormal phenomenon has been detected, it is an indication that the engine works normally. If you want to carefully inspect dynamic performance, economy and emission condition of engine, it is necessary to use inspection line or special detector to inspect and diagnose fault.

## 2. Failure analyzing and determining

When there is a fault in the electronically-controlled engine, first of all, observe the situation of the fault self-diagnostic indicator lamp of the engine electronic control system. If the light is lit during engine running, it means electronic control engine has a fault that can be monitored by fault self-diagnosis system. The fault normally relates to electronic control system. Now fault code stored in the computer can be called out. Then find out the failure cause according to fault codes. If the engine does have a fault while engine fault indicator lamp on dashboard is not illuminated with engine running, it means the engine fault is not identified by electronic control unit self-diagnosis system. Then, its should be based on fault symptoms to make a preliminary diagnose, Analyze possible failure causes based on the principle of from external to internal and from simple to complicated.

### On-vehicle inspection



#### 1. Checking the engine control system fault indicator

- (a) When the power status shifting from "ACC" to "ON", check whether the engine fault indicator and OBD emission indicator on the instrument cluster are on.
- (b) Check whether the engine control system fault indicator is off after starting the engine.

△ HINT:

If any inconformity occurs during checking, refer to Fault Symptom Table.

#### 2. Check fuse and relay

- (a) Check whether the ECU fuse FS06 of the passenger compartment fuse box is blown.

△ HINT:

Replace the fuse with the same specification if it is blown.

- (b) Check whether the fuses SB08 / SB09 of electronic fan of central control box in the engine compartment, ECM power-on fuse FS05, compressor fuse FS10, fuel pump fuse FS09 and main relay fuse SB07 are blown.

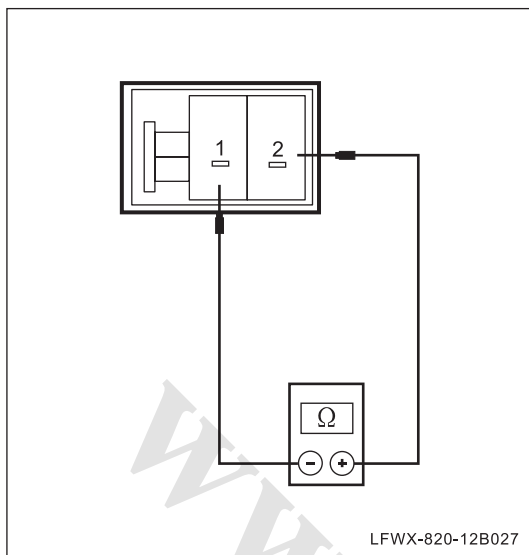
△ HINT:

Replace the fuse with the same specification if it is blown.

- (c) Check whether the main relay K05 in the engine compartment fuse box is damaged.

△ HINT:

If the relay is damaged, replace it with the same model.



### 3. Check injector

- (a) When the ignition switch in "OFF" position, press the injector connector clip snap ring to disconnect the injector connector.
- (b) Check the resistance between the No. 1 stitch and No. 2 stitch of the injector with a digital multimeter.

**Standard resistance:  $12\ \Omega \pm 0.6\ \Omega$  (at  $20^{\circ}\text{C}$ )**

**12B**

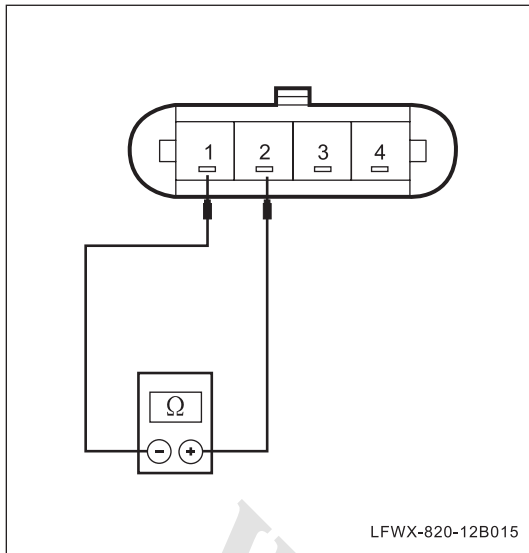
△ HINT:

If resistance value does not conform to the specification, replace injector.

- (c) Disconnect the fuel injector, and check whether the injector nozzle is clogged or damaged.

△ HINT:

If the fuel injector is unqualified, repair or replace it.



#### 4. Check intake pressure and temperature sensor

##### (a) Check the intake air temperature sensor.

- Switch the digital multimeter to  $\Omega$ , and connect the two probes to the No. 3 and No. 4 pin of the sensor, respectively.

**Rated resistance (20°C): 2.3k $\Omega$  - 2.75k $\Omega$**

- Perform simulation blasting to the sensor with a electric blower ( be careful not to get too close), and observe the changes of the sensor resistance, while the resistance value should be decreased.

##### △ HINT:

Be sure to disconnect the sensor connector clip before checking, and check the resistance on the side of the sensor with a multimeter.

##### (b) Table of no-load resistance - temperature characteristics of temperature sensor:

Temperature (°C)	Standard resistance ( $\Omega$ )	Min. resistance ( $\Omega$ )	Max.resistance ( $\Omega$ )	Temperature (°C)	Standard resistance ( $\Omega$ )	Min. resistance ( $\Omega$ )	Max.re-sistance ( $\Omega$ )
-40 ± 1	48153	42661	54224	50 ± 1	851.10	792.27	913.15
-35 ± 1	35763	31810	40118	55 ± 1	720.65	671.90	772.28
-30 ± 1	26885	23970	30115	60 ± 1	612.27	571.72	655.16
-25 ± 1	20376	18258	22685	65 ± 1	521.91	488.07	557.67
-20 ± 1	15614	14039	17333	70 ± 1	446.33	417.98	476.24
-15 ± 1	12078	10895	13365	75 ± 1	382.89	359.08	407.99
-10 ± 1	9428.0	8529.5	10339	80 ± 1	329.48	309.41	350.61
-5 ± 1	7419.0	6733.5	8161.4	85 ± 1	284.06	267.40	302.22
0 ± 1	5886.7	5358.1	6457.8	90 ± 1	246.15	231.76	261.27
5 ± 1	4706.9	4295.9	5149.8	95 ± 1	213.68	201.44	226.53
10 ± 1	3791.1	3469.2	4137.3	100 ± 1	186.00	175.52	196.95

Temperature (°C)	Standard resistance (Ω)	Min. resistance (Ω)	Max. resistance (Ω)	Temperature (°C)	Standard resistance (Ω)	Min. resistance (Ω)	Max. resistance (Ω)
15 ± 1	3074.9	2820.9	3347.5	105 ± 1	162.35	153.18	171.88
20 ± 1	2510.6	2308.8	2726.8	110 ± 1	142.08	134.01	150.43
25 ± 1	2062.9	1904.0	2235.6	115 ± 1	124.66	117.59	132.00
30 ± 1	1715.4	1586.1	1853.1	120 ± 1	109.65	103.12	116.12
35 ± 1	1431.8	1326.1	1544.1	125 ± 1	98.68	91.80	102.39
40 ± 1	1199.6	1113.0	1291.5	130 ± 1	85.45	80.58	90.51
45 ± 1	1008.6	937.41	1081.2				

12B

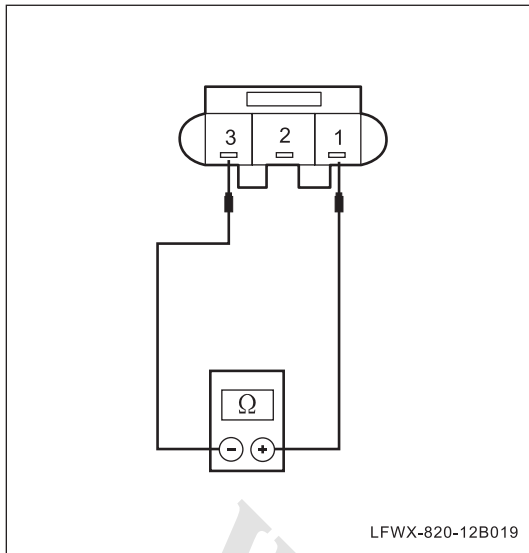
## (c) Check the pressure sensor part

- Connect the diagnostic scanner to the diagnostic interface, and turn the ignition switch to the ON position. Read the atmospheric pressure using the diagnostic scanner and the standard value should be comparable to the local atmospheric pressure. Otherwise, replace the sensor.
- Start the engine and let it run until the normal temperature. Read the atmospheric pressure using the diagnostic scanner: 25Kpa-45Kpa.

△ Hint:

If the check does not meet the requirements, replace the intake pressure and temperature sensor.





### 5. Check the water temperature sensor.

- (a) Dip the temperature probe of the coolant temperature sensor in hot water, and then measure the resistance between the Terminal 1 and Terminal 3 of the coolant temperature sensor with the digital multimeter.
- (b) If the measurement results do not meet the standard, replace the temperature sensor.

#### ⓘ Note:

**Put the boiled water into the sensor working area, and do not allow the water to enter the terminal when performing simulation check. After checking, wipe off the sensor immediately.**

#### △ HINT:

- Be sure to disconnect the sensor connector clip before checking, and check the resistance on the side of the sensor with a multimeter.
- If unqualified, replace the water temperature sensor.

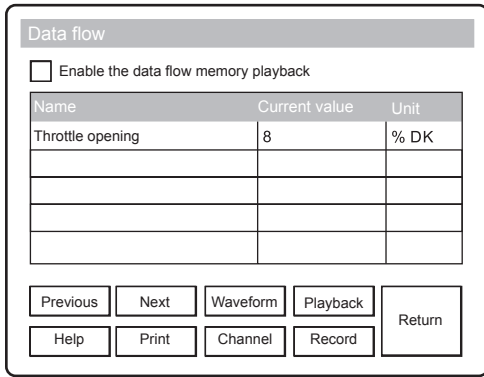
Measuring conditions (°C)	Standard resistance (kΩ)	Resistance Accuracy (±%)	Temperature accuracy (°C)	Measuring conditions (°C)	Standard resistance (kΩ)	Resistance Accuracy (±%)	Temperature accuracy (°C)
-40	100865	4.87	0.7	60	671	2.19	0.6
-35	72437	4.64	0.7	65	559	2.15	0.6
-30	52594	4.43	0.7	70	469	2.11	0.6
-25	38583	4.21	0.7	75	395	2.07	0.6
-20	28582	4.00	0.7	80	334	2.04	0.6
-15	21371	3.80	0.7	85	283	2.00	0.6
-10	16120	3.60	0.6	90	241.8	2.10	0.7
-5	12261	3.40	0.6	95	207.1	2.21	0.7
0	9399	3.21	0.6	100	178.0	2.31	0.8

Measuring conditions (°C)	Standard resistance (kΩ)	Resistance Accuracy (±%)	Temperature accuracy (°C)	Measuring conditions (°C)	Standard resistance (kΩ)	Resistance Accuracy (±%)	Temperature accuracy (°C)
5	7263	3.06	0.6	105	153.6	2.42	0.8
10	5658	2.92	0.6	110	133.1	2.52	0.9
15	4441	2.78	0.6	115	115.7	2.61	0.9
20	3511	2.64	0.6	120	100.9	2.68	1.0
25	2795	2.50	0.6	125	88.3	2.75	1.0
30	2240	2.45	0.6	130	77.5	2.80	1.1
35	1806	2.40	0.6	135	68.3	2.84	1.1
40	1465	2.36	0.6	140	60.3	2.87	1.2
45	1195	2.31	0.6	145	53.4	2.89	1.2
50	980	2.27	0.6	150	47.5	2.90	1.2
55	809	2.23	0.6				

12B

## 6. Check electronic throttle body

- (a) Turn the ignition switch to OFF.
- (b) Connect diagnostic scanner to fault diagnosis connector (16-pin) on the bottom left of dashboard.
- (c) Turn ignition switch to ON, and turn on the diagnostic scanner- use the latest software version.
- (d) Select the "Read data flow" menu item.



LFWX-820-12B017

Items displayed by the diagnostic scanner	Check conditions (range)		Normal conditions
Throttle opening	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine doesn't run</li> </ul>	Idling position	10 ± 4%
		The throttle opens gradually.	It's increased proportionally to the opening angle of the throttle.
		Fully open	About 93%

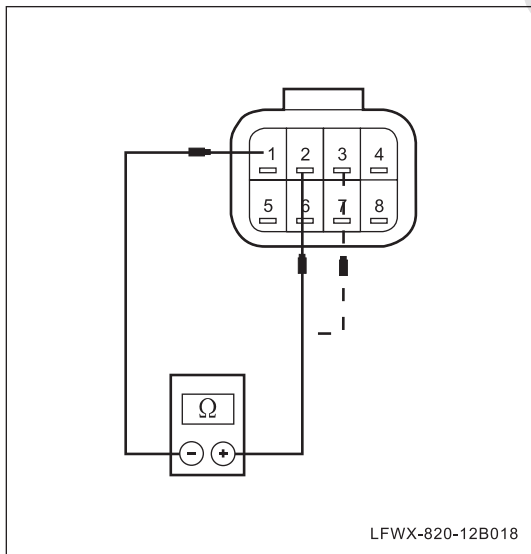
(e) If the signal value does not conform to the provisions or there is no signal output, check the electric throttle body, wire harness and ECM.

(f) Check respectively the resistances between the No. 1 stitch and the No. 2, No. 3 stitches of the electronic throttle body with a digital multimeter. Toggle the valve plate by hand, and the resistance should be slowly changing, changes of the two resistances are opposite.

△ HINT:

If the resistance is beyond the standard range or the resistance changes unsteadily, replace the electronic throttle body assembly.

(g) The throttle body fails due to excessive carbon-deposit. The valve block of the main duct of the throttle body assembly cannot close well or gets stuck due to the dirt accumulation in the intake system or poor quality fuel, or backfire of burning, thus affecting air flow and even shaft rotating which affect the idle flow and engine performance.



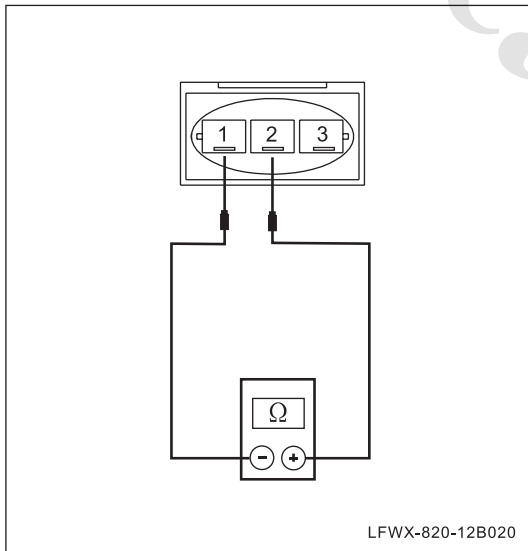
LFWX-820-12B018

## △ HINT:

Clean the throttle body using cleaning agent. Clean the throttle body using special cleaning agent every 10,000 km.

- (h) Read the relevant fault code through the diagnostic scanner. With the relevant fault code, determine the fault related to the motor and throttle position sensor or the input and output signals initially.
- (i) DC motor testing: If there are no diagnostic scanner and diagnostic software available, remove the air filter hose connected to ETC in the vehicle, and then turn the ignition key to KEYON from KEYOFF, while carefully observing or listening to whether the valve block moves in the course of ETC power-on. If there is no movement of the valve block, you can preliminarily judge there is a trouble in the motor or its input and output signals.

12B

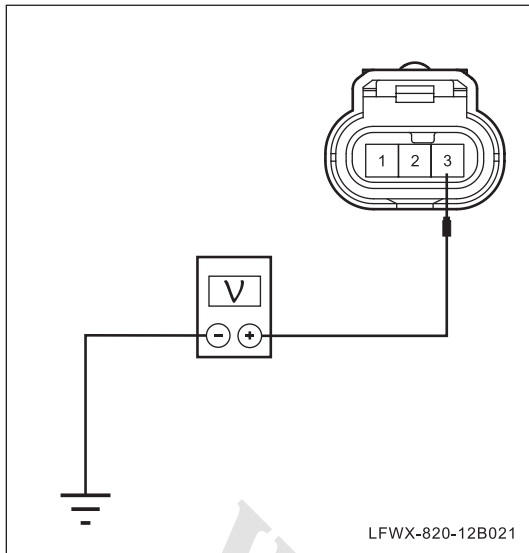
**7. Check crankshaft position sensor**

- (a) Check whether the crankshaft position sensor connector is connected well, the terminal is in good condition and the wire harness is damaged.
- (b) Disconnect crankshaft position sensor connector.
- (c) Check the resistance between the No. 1 crankshaft position sensor and the No. 2 terminal.

**Resistance: 900 Ω ~ 1100 Ω ( at 25°C ± 5°C )**

## △ HINT:

If the check does not meet the requirements, replace the crankshaft position sensor.



## 8. Check the camshaft position sensor

- (a) Disconnect camshaft position sensor connector.
- (b) When the power supply state is in "ON", check the resistance between the No. 3 camshaft position sensor and the grounding with a digital multimeter.

**Voltage: 5V**

Check the resistance between No. 2 pin of the camshaft position sensor and ground with the digital multimeter.

**Resistance: 0 Ω**

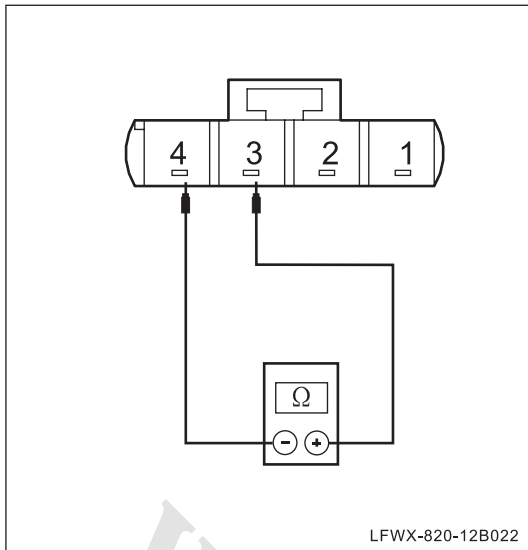
△ HINT:

Check voltage or resistance of the camshaft position sensor on the side of the engine wire harness with a digital multimeter.

- (c) Connect camshaft position sensor connector.
- (d) Connect the diagnostic scanner, and start the engine, then read the voltage of the camshaft position sensor on the diagnosis scanner and observe the waveform. The voltage waveform shall have regular continuous changes.

△ HINT:

If the check does not meet the requirements, it indicates that the camshaft position sensor is damaged, replace the crankshaft position sensor.



## 9. Check the oxygen sensor (front oxygen sensor).

- (a) Connect the diagnostic scanner, and start the engine, then read the voltage of the oxygen sensor on the diagnosis scanner. When the oxygen sensor temperature reaches 350 °C and above (the engine is running for more than 3min), the oxygen sensor voltage should quickly change between 0.1V - 0.8V. Otherwise, it indicates the sensor fails due to "poisoning".
- (b) Check whether the oxygen sensor connector terminal becomes loose, corroded and uneven; or whether the wire harness is broken or connected virtually.

12B

### △ HINT:

This fault may lead to the diagnostic scanner displays the oxygen sensor signal fault or oxygen sensor heating fault.

- (c) Disconnect oxygen sensor connector. When the power supply state is in "LOCK", check the resistance between the No. 3 stitch and the No. 4 stitch of the oxygen sensor with a digital multimeter.

**Resistance:  $9.6\ \Omega \pm 1.5\ \Omega$  (21°C )**

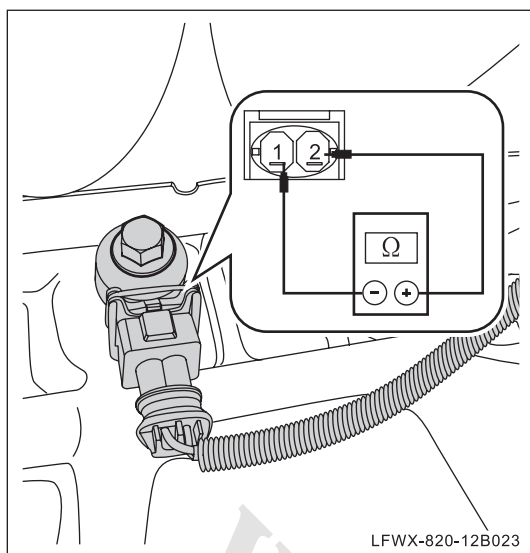
### △ HINT:

Check the resistance on the side of the sensor with a digital multimeter during checking.

- (d) Remove the oxygen sensor, and check whether its air intake is blocked, its ceramic surface is damaged, and its top color is light gray (any other color indicates the oxygen sensor is poisoned, such as silicon poisoning, lead poisoning, carbon deposit, etc.).

### △ HINT:

If unqualified, replace the oxygen sensor.

**10. Check the knock sensor.**

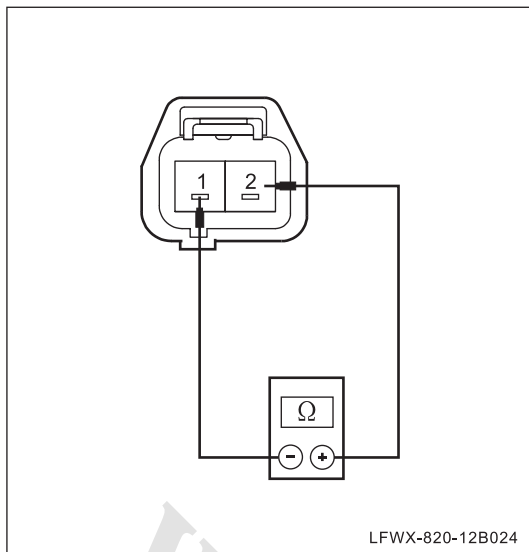
- (a) Disconnect the knock sensor connector.
- (b) Check the resistance between No. 1 and No. 2 pin of the knock sensor with the digital multimeter.

**Resistance: > 1MΩ (25°C ± 5%)**

- (c) Set the digital multimeter at millivolt scale, and knock slightly near the knock sensor with a hammer, then there should be voltage signal output.

## △ HINT:

- Check the voltage or resistance on the side of the sensor component with a digital multimeter during checking.
- If the check does not meet the requirements, it indicates that the knock sensor is damaged, replace the knock sensor.



## 11. Check VVT valve

- (a) Disconnect the negative cable of battery terminal when power is at "OFF".

### ⓘ Note:

When disconnecting and re-connecting negative cable of battery, the electric equipment switch shall be turned off firstly. For disconnecting the negative cable of battery, the tight nut of negative cable shall be unscrewed completely.

- (b) Disconnect the VVT valve connector.
- (c) Remove the VVT valve fixing bolts, and take out the VVT valve.
- (d) Check the VVT valve filter for clogging or damage. If necessary, replace it.
- (e) Measure the resistance value between No. 1 and No. 2 terminals of VVT valve with the digital multimeter resistance scale.

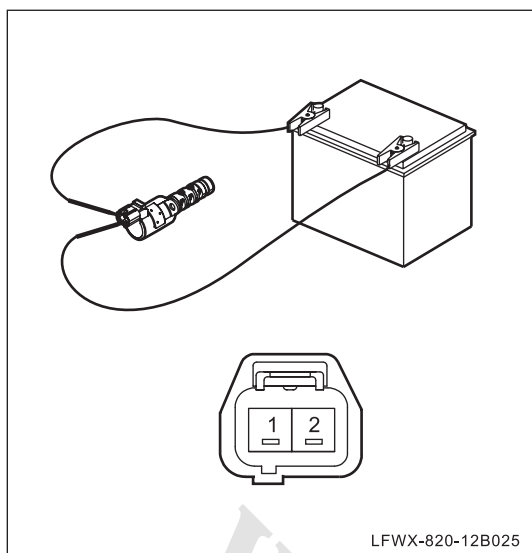
**Standard resistance:  $6.9\ \Omega \sim 7.9\ \Omega (20^{\circ}\text{C})$**

### △ HINT:

- If resistance value does not conform to the specification, replace VVT valve.

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- (f) Connect the battery positive pole with the No. 1 terminal of the VVT valve, the negative pole with the No. 2 terminal of the VVT valve, then check the VVT operation.

△ HINT:

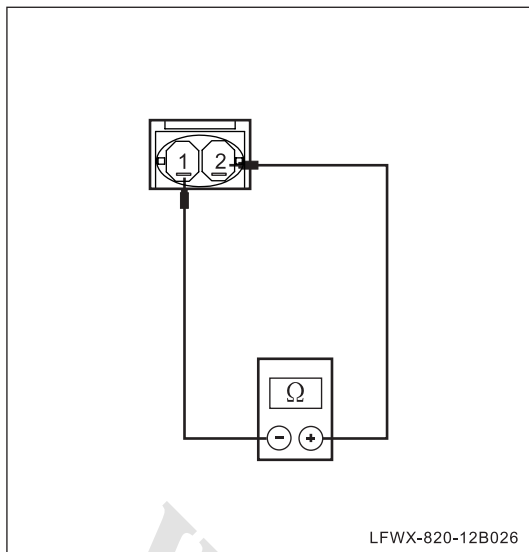
- The solenoid valve should move smoothly, without tackiness. If the solenoid valve does not move, replace the VVT valve assembly.
- A build-up of impurities can cause slight pressure leak. Pressure leak can cause the camshaft timing advance, and thus a DTC will be set.

- (g) Install the VVT valve and tighten its fixing bolts.

**Torque: 6N•m - 10N•m**

- (h) Connect the VVT valve connector.

- (i). Connect the negative cable of battery.



## 12. Check canister control valve

- (a) Disconnect the negative cable of battery terminal when power is at "OFF".

### ⓘ Note:

**When disconnecting and re-connecting negative cable of battery, the electric equipment switch shall be turned off firstly.**

- (b) Disconnect the connector of the canister solenoid.
- (c) Check the canister control valve resistance. Switch the digital multimeter to the resistance function, connect the two probes to the No. 1 and No. 2 terminals of the solenoid valve respectively, and then measure the resistance between the two terminals.

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**Standard resistance: 19 Ω ~ 22 Ω (20°C)**

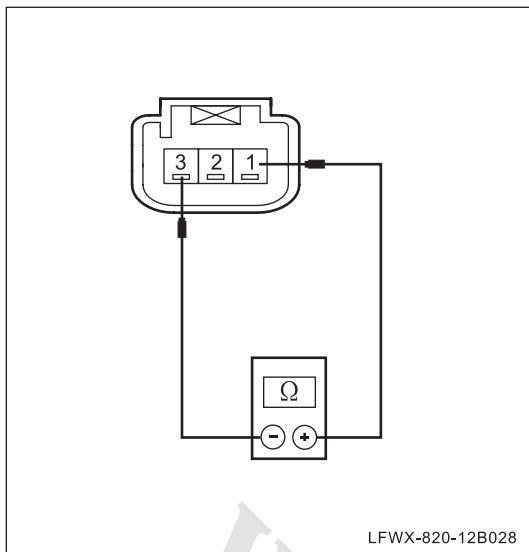
### △ HINT:

If resistance value does not conform to the specification, replace canister control valve.

- (d) Check the lower canister control valve by blowing air into it. Make sure the air cannot pass through the canister control valve. Apply the 12V battery voltage to the two terminals of the canister control valve while inhaling air into the canister control valve. In this case, make sure the air can aerate the canister control valve.

### △ HINT:

If the check does not meet the requirements, this indicates there is a trouble in the canister control valve. Replace it.



### 13. Check the ignition coil

- (a) Disconnect the negative cable of battery terminal when power is at "OFF".

**Note:**

**When disconnecting and re-connecting negative cable of battery, the electric equipment switch shall be turned off firstly. For disconnecting the negative cable of battery, the tight nut of negative cable shall be unscrewed completely.**

- (b) Disconnect the ignition coil connector.
- (c) Check whether the ignition coil wire harness is damaged, and whether its surface has fissure.
- (d) Check the resistance between the No. 1 stitch and No. 3 stitch of the ignition coil with a digital multimeter.

**Standard resistance:  $0.71 \Omega \pm 0.071 \Omega$**

**△ HINT:**

- If the resistance does not meet the requirement, it indicates that the ignition coil is damaged, replace the ignition coil.
- If the resistance meets the requirement, while the ignition system fault still exists, a resistor in line with, and ignition system is still faulty, further diagnosis is required for the ignition coil.

## Read and clear of DTCs

### 1. Description

- (a) The so-called fault code refers to the Auto computer self-diagnostic fault code. It is the code of the fault which has been detected by the auto computer performing performance testing on various vehicle parts before starting and during running. The code of the fault will be stored in the auto computer. For example, when water temperature sensor circuit is open, the computer will detect the sudden change of water temperature sensor interface signal or deviates from normal value. The computer will record the state. So, "reading fault code" means reading fault code information in vehicle computer and explains it correctly.
- (b) Contents of fault code. Normally, fault code of the instrument indicates fault position

and fault character. For example, "P0107" fault code, "intake air pressure sensor" is fault location; "low voltage or open circuit" is fault character. For some vehicles, fault characters defined in fault code are detailed, including short to ground, short to power supply, open circuit, poor contact, signal too high, signal too low, rapid change and slow change.

- In this way, maintenance staff can differentiate these items easily.

#### **Note:**

- **Through reading fault code, possible reasons and locations for most of faults can be determined correctly. Sometimes, wrong judgment may happen which will cause misleadings.**
- **In fact, DTC is only a conclusion, which does not give detailed reason of the fault. In order to determine fault location, it is necessary to make further analysis and check according to the engine fault symptom.**
- **Normally, after reading fault code, check corresponding sensor, line connector and line to find out and eliminate fault points of open circuit and short circuit. But, if the sensor sensitivity reduces due to certain reasons (although it is within the range set by ECM, it responds slowly. Output characteristic deviates), self diagnosis system cannot detect it.**
- **Although the engine really has a fault, self diagnosis system outputs normal code without any fault. In this case, it is necessary to analyze and determine the engine failure cause, and then make special test to the individual sensor to locate the failure part and eliminate the problem. For example, when engine idle speed is unstable with imbalanced running during driving and the system outputs no DTC, first it is worthy of considering that intake manifold pressure/temperature sensor has defects. because these two sensors have direct effect on basic fuel injection amount. Although no corresponding DTC is displayed, it is necessary to check them.**
- **Improper maintenance will cause wrong fault code. For example, during the course of running, if one sensor plug is pulled out for testing at random, ECM will record one DTC of the sensor.**
- **If old fault code is not cleared completely due to improper operation after repairing EFI engine, the remaining old fault code is still displayed again, which leads to confusion of maintenance staff.**
- **Before reading fault code, first execute "fault code clearing" operation.**
- **When the system has a fault, diagnostic scanner is used to clear the fault code. If the system fault is eliminated, the fault code will still appear when executing fault code operation again until the fault is eliminated.**

## **2. Read and clear of DTCs**

- (a). Connect V30 diagnostic scanner to the diagnostic interface.
- (b). Select "Powertrain" and enter "Engine Management System".

(c) Read the DTC or clear the DTC.

## Read data flow

### 1. Description

The so-called data flow refers to the electrical signals sent out by the auto computer in a continuous manner based on various operating parameters and work status of a certain system. There are many data flows. Common data flow in engine system as follows:

- Ignition advance angle
- Throttle opening
- Fuel-injection pulse width
- Coolant temperature
- Intake air temperature
- Intake manifold pressure
- Atmospheric pressure
- Fuel injection start angle
- The battery voltage.

#### ① Note:

Reading the data table displayed on the diagnostic scanner, you can check the data values, including switches, sensors, actuators and other parts, without removing any part. First read data table so as to shorten diagnosis time.

### 2. Data flow

#### ① Note:

**Stationary state** refers to the data flow reference value without starting the engine;

**Idle state** refers to the data flow reference value with the engine idling and without starting the air conditioner, and the transmission gear in the neutral position.

Item	Stationary state	Idling	Description
Battery voltage	12.9V	14.4V	ECM monitors the current operating status of the charging system
Engine RPM	0r/min	771r/min	Fault diagnosis scanner displays the current actual engine speed, calculated by ECM through the input of the crankshaft position sensor

Item	Stationary state	Idling	Description
Target idle speed	0r/min	770r/min	Fault diagnosis scanner displays the actual target value of the idle speed set by ECM, indicating the idle speed by the ECM instruction. ECM compensates the various engine loads based on the engine coolant temperature sensor signal and other signals to maintain the engine at an ideal idle speed.
Target idle (with compensation)	700r/min	700±50 r/min	
Vehicle speed	0km/h	0km/h	-
Car acceleration	0.000m/s <sup>2</sup>	0.000m/s <sup>2</sup>	-
Engine coolant temperature	78Grad c	78Grad c	
Intake air temperature sensor voltage	2V	0.4V ~ 0.65V	The sensor voltage is the actual voltage value received by ECM, and the intake air temperature is calculated according to the program based on the received voltage signal. ECM adjusts the fuel transfer and the ignition timing with the intake air temperature sensor according to the intake air density. Intake air temperature also compares with ECT during starting to identify the starts of heating the oxygen sensor and the resistance wire and the cold start of the evaporative emission diagnosis. Temperature range: -40°C -130°C
Intake air temperature	36Grad c	35Grad c	
Ambient temperature	24Grad c	24Grad c	Vary according to the ambient temperatures
Engine oil temperature	3.85Grad c	0.94Grad c	Calculated by ECM according to the various operating parameters of the engine
Air intake volume	970Kg/h	310Kg/h	Calculated by ECM based on the intake manifold pressure signal combining with the known pressure and temperature curves
Actual intake manifold pressure sensor voltage	1V	1V	<ol style="list-style-type: none"> <li>1. Equal to the atmospheric pressure when the engine is in stall state</li> <li>2. The voltage first decreases, then increases when in rapid acceleration</li> <li>3. The engine stalls after starting, and the data flow displays to close to the atmosphere pressure, the voltage close to 5V.</li> </ol>
Actual intake manifold pressure	0hPa	0hPa	

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Item	Stationary state	Idling	Description
Pedal position sensor 1 voltage	0V	0V	The sensor voltage is the actual voltage value received by ECM, and the accelerator pedal opening degree is calculated according to the program based on the received voltage signal.
Pedal position sensor 2 voltage	1V	1V	
Accelerator pedal opening degree	4%PED	4%PED	
Throttle potentiometer 1 voltage	3V	4V	Throttle potentiometer voltage is the actual measured voltage by ECM, while the opening degree is calculated according to the voltage. When the Ignition switch is in "ON" position, the electronic throttle will move automatically to the mechanical bottom dead center (BDC). The throttle opening degree will increase with increasing of the voltage, and the learning value will be larger and larger with the throttle body becoming dirty, then the zero value will shift up; the computer will perform automatic re-learning after the throttle is cleaned. Idle throttle opening degree is $10 \pm 2\%$
Throttle potentiometer 2 voltage	6V	4V	
Desired throttle opening degree	61%DK	15%DK	
Throttle opening	6% ~ 11%DK	16% ~ 11%DK	
Throttle motor PWM control signal	0%	3%	ECM sends this signal to control the corresponding signals to the throttle
Average fuel injection pulse width	0.0ms	6.5ms	<p>Fault diagnosis scanner displays from 0-16ms. It indicates the connect times of each injector according to the command of the ECU in each circle of the engine.</p> <p>The larger the injector pulse width is, the more the fuel is injected. Fuel injector pulse width modulation (PWM) should increase with increased engine load. The engine will increase the fuel injection time if receiving a signal to increase the torque. There are many factors affecting the fuel injection time, such as water temperature sensor, intake air temperature sensor, power voltage, fuel pressure, etc.</p>
Cylinder 1 ignition advance angle	15.6 Grad KW	1.0 Grad KW	Current ignition advance angle of the ignition system, the ignition advance angle at the normal idle speed is $9^\circ$ before the top dead center (TDC) of the cylinder 1, this value is only for reference during maintenance
Knock sensor signal	0.00V	0.00V	ECM detects the amplitude and frequency of the knock sensor to control the ignition timing. Ignition timing is arranged close to the knock position to obtain the maximum torque.

Item	Stationary state	Idling	Description
No. 1 cylinder delayed ignition knock control	0.00	0.00	ECM performs calculation according to the knock sensor signal, if it detects that the engine produces a knock, control the hysteresis of the ignition advance angle
No. 2 cylinder delayed ignition knock control	0.00	0.00	
No. 3 cylinder delayed ignition knock control	1	1	
No. 4 cylinder delayed ignition knock control	0	1	
Intake valve opening degree (relative to LWOT)	0 Grad KW	0 Grad KW	-
Camshaft overlap angle	0.0 Grad KW	0.0 Grad KW	-
Intake camshaft overlap factor	6.6	6.3	-
Intake camshaft PWM control	0%	0%	-
Group 1 oxygen sensor integral value (short-term correction)	0	0	A temporary value added or deducted in the basic injection duration based on the feedback of the oxygen sensor. It is useful only in the closed-loop control, ECM increases the fuel amount through increasing the injection duration when it is a positive value, while ECM decreases the injection duration to decrease the fuel amount when it is a negative value. When this short-term value is continuously lower or higher than the theoretical value, ECM shall add or deduct this value to or from the long-term fuel correction value, thus achieving the optimal air/fuel ratio control.
Group 1 oxygen sensor voltage (sensor 1)	1V	Change between: 0V - 1V	HO2S output voltage is 0.1-0.9V under normal operating condition. ECM receives this voltage signal, and measures whether the air/fuel ratio is lean or rich. If the ECM input signal voltage is less than 0.45V, air-fuel ratio is lean; if the input signal voltage is higher than 0.45V, the air/fuel ratio is rich. During closed-loop control, ECM continuously detects the HO2S output signal to decrease or increase fuel injection control PWM for correction

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Item	Stationary state	Idling	Description
Group 1 oxygen sensor voltage (sensor 2)	0.19V	0.19V	The rear HO2S is installed at the back of the catalytic converter or in the rear exhaust pipe to detect the efficiency of the catalytic converter. The rear HO2S output voltage is between 0V-1V. Detect the catalytic conversion capability with the rear HO2S signal. If the catalytic conversion efficiency is good, the rear HO2S signal will be smooth. If the catalytic conversion efficiency decreases due to aging, poisonous or misfire, the rear HO2S signal will be similar to the front HO2S signal.
Group 1 oxygen sensor integral value (long-term correction)	0	0	Long term fuel correction is stored in the ECM memory; as it is a part of the calculation of the basic injection duration, it will not be deleted when the ignition switch is in "OFF". It affects the injection duration controlled by the closed-loop and the open-loop. ECM uses short-term fuel correction value to change the long-term fuel correction value. It can not respond quickly to the instantaneous change, and only changes when ECM decide to use the short-term fuel correction value to change the long-term fuel correction value. Like short-term fuel correction, when the long-term value is 0%, it indicates that the basic injection duration need not any correction. Positive percentage indicates that ECM needs to increase the fuel injection amount; while negative percentage indicates that ECM needs to decrease the fuel injection amount.
Ultimate long-term correction factor 1	36.00kPa	35.25kPa	
Mixture addition self-learning value (small load)	99.75%	18.00%	
Engine relative load	0%	1%	-
Idling torque self-learning	0.00%	12.50%	-
Desired torque correction for idle speed control	0%	0%	-
Canister control valve duty ratio	0.0%	0.0	The canister solenoid valve opening degree is controlled in the form of duty ratio, the control signal is a pulse waveform, and can be detected with an oscilloscope. This parameter displays the power-on time or duty ratio of evaporating (EVAP) canister purge solenoid valve through the command of the control module. 0% indicates there is no clean-up, while 100% indicates clean-up has been carrying out all the time.
Relative injection amount controlled by the canister	0%	1%	

Item	Stationary state	Idling	Description
Canister purge rate	540	540	Fuel evaporation gases control system prevents the overflow of the hydrocarbons (HC) from the fuel tank from entering into the atmosphere to pollute the environment. Collect the fuel vapors in the charcoal canister. ECM controls the purge control solenoid valve (EVAP), and clear the vapors collected in the charcoal canister, making the vapors enter into the engine for combustion. Be sure to compare this data flow with the actual opening degree of the solenoid valve during the actual maintenance; if any leakage occurs, be sure to know how to judge it. Note that this data flow will change from small to large only when the engine reaches the normal water temperature; it will not be opened at idle speed or in cold state.
Canister load	837	834	
Running mileage	0km	0km	-
Running time	0min	0min	-
Running time after speed fault	0min	0min	-
Running mileage after speed fault	0km	0km	-
Number of DTC faults	0	0	Display the fault code and fault type code of the current system. The display is 0 under normal circumstance, indicating that the engine electronic control system is free from fault
DTC 1	0	0	
DTC 1 state	0	0	
DTC 2	0	0	
DTC 2 state	0	0	
Vehicle variant code	0000	0000	
Program state	Activate safety entry Variable word programmed CAN Vehicle configuration programmed VIN programmed	Activate safety entry Variable word programmed CAN Vehicle configuration programmed VIN programmed	-
Engine cooling system	-		Display the state of the cooling fan 1 (high speed) and the cooling fan 2 (low speed)

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Item	Stationary state	Idling	Description
Engine steady-state condition	Ignition terminal 15 opens Main relay operating		Display current state of the engine,
Engine dynamic condition	Throttle is at idling position		Display that the throttle is in "Idling" or "Full load" or "Deceleration fuel cut-off" or "Acceleration enrichment"
Emission control	-		Display whether the canister solenoid valve works, open-loop or closed-loop control of the fuel
Oxygen sensor	-		Display whether the oxygen sensor signal is strong or weak
Engine Idle Speed	Pedal position confirms idling		Display the accelerator pedal position and whether the electrical load is open
Indicator SVS/MIL	Fault indicator MIL is activated		Display the current SVS/MIL indicator is blinking or always on or off
Engine emergency condition	-		Display whether the throttle is faulty
A/C system	-		Display opening of the air conditioner compressor
Automatic transmission/torque request	-		-

## Action test

### 1. Description

- Action test is a type of self-learning process of the components. It does not require any part removal. It can perform testing on the components (including relays and actuators) and learn other special operations.

### 2. Test items

S/N	Name	Test mode	Description
1	Engine malfunction indicator lamp (MIL)	ON/OFF	Test if engine malfunction indicator light works normally

S/N	Name	Test mode	Description
2	Canister control valve	0 ~ 635	Starting the engine, test whether the canister solenoid is working properly. Range: 0% to 100%
3	Fuel pump relay	ON/OFF	Test if fuel pump relay works normally
4	Cooling fan relay # 1	ON/OFF	Test whether the low-speed fan is working properly.
5	Cooling fan relay # 2	ON/OFF	Test whether the high-speed fan is working properly.
6	Vehicle immediate service indicator (SVS)	ON/OFF	Test whether the SVS indicator lamp is working properly.
7	Idle speed control	0 ~ 2550	Control the engine to rotate to the specified speed.
8	Throttle position valve	0 ~ 650	Do not start the engine, and measure whether the electronic throttle works properly Range: 0% to 100%
9	Reset the ECU self-learning value		Reset the learning value of the electronic control system to the factory setting.

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## Diagnosis

△ HINT:

The causes of EFI engine failure phenomenon are various and complex. The common potential locations of the corresponding faults are listed in the following table. Following the described locations to troubleshoot one by one can allow most problems to be solved.

### Fault symptom table

Symptom	Suspected area	Recommended action
The diagnostic scanner cannot communicate with ECM	1. Diagnostic interface fuse (burned)	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (1. The diagnostic scanner cannot communicate with ECM)
	2. Wire harness or connector (loose, open or short circuit)	
	3. ECM (damaged)	
When starting, the engine does not run or run slowly	1. Immobilizer authentication fails.	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (2. When starting, the engine does not run or run slowly)
	2. Battery (low voltage or damaged)	
	3. Starter motor (damaged)	
	4. Wire harness or connector (loose, open or short circuit)	
	5. Engine mechanical system fault	
When starting, the engine can rotate but can't start successful	1. No fuel in fuel tank	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (3. When starting, the engine can rotate but can't start successful)
	2. Fuel pump (damaged)	
	3. Crankshaft position sensor (damaged)	
	4. Ignition coil (damaged)	
	5. Electronic throttle body (damaged)	
	6. Engine mechanical system fault	

Symptom	Suspected area	Recommended action
Difficult start of hot engine	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (4. Difficult start of hot engine)
	2. Fuel pump	
	3. Water temperature sensor (damaged)	
	4. Fuel pressure regulator vacuum tube	
	5. Electronic throttle valve (deposit too much or damaged)	
	6. Ignition coil (damaged)	
Difficult start of cold engine	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (5. Difficult start of cold engine)
	2. Fuel pump (damaged)	
	3. Water temperature sensor (damaged)	
	4. Injector (damaged)	
	5. Ignition coil (damaged)	
	6. Electronic throttle valve body (deposit too much or damaged)	
	7. Engine mechanical system fault	
Start normally, while the idle speed is unstable during warm-up	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (6. Start normally, while the idle speed is unstable during warm-up)
	2. Water temperature sensor (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (damaged)	
	6. Mechanical part of the engine	

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Symptom	Suspected area	Recommended action
Speed is normal, while starting is difficult at any time	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (7. Speed is normal, while starting is difficult at any time)
	2. Fuel pump (damaged)	
	3. Water temperature sensor	
	4. Injector (damaged)	
	5. Ignition coil (damaged)	
	6. Electronic throttle valve body (deposit too much or damaged)	
	7. Intake duct (stuck)	
	8. Ignition timing (incorrect)	
	9. Spark plug (deposit too much or damaged)	
	10. Mechanical part of the engine	
Start normally, while the idle speed is unstable at any time	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (8. Start normally, while the idle speed is unstable at any time)
	2. Injector (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Intake duct (stuck)	
	5. Electronic throttle valve body (deposit too much or damaged)	
	6. Ignition timing (incorrect)	
	7. Mechanical part of the engine	
Start normally, while the idle speed is unstable after warm-up	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (9. Start normally, while the idle speed is unstable after warm-up)
	2. Water temperature sensor	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (stuck)	
	6. Mechanical part of the engine	
Start normally, while the idle speed is unstable or stalling with partial load	1. A/C system (fault)	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (10. Start normally, while the idle speed is unstable or stalling with partial load)
	2. Electronic throttle valve body (deposit too much or damaged)	
	3. Injector (damaged)	

Symptom	Suspected area	Recommended action
Start normally, while the idle speed is too high	1. Electronic throttle valve body (deposit too much or damaged)	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (11. Start normally, while the idle speed is too high)
	2. Vacuum tube (broken)	
	3. Water temperature sensor (damaged)	
	4. Ignition timing (incorrect)	
Speed rise failure or flameout at time of acceleration	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (12. Speed rise failure or flameout at time of acceleration)
	2. Intake air pressure sensor (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (stuck)	
	6. Injector (damaged)	
	7. Ignition timing (incorrect)	
	8. Exhaust pipe	
Slow response at time of acceleration	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (13. Slow response at time of acceleration)
	2. Intake air pressure sensor	
	3. Spark plug (deposit too much or damaged)	
	4. Electronic throttle valve body (deposit too much or damaged)	
	5. Intake duct (stuck)	
	6. Injector (damaged)	
	7. Ignition timing (incorrect)	
	8. Exhaust pipe	

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Symptom	Suspected area	Recommended action
Weak acceleration, poor performance	1. Fuel contains water	See 12B- Engine Control System-Diagnosis, Fault Diagnosis (14. Weak acceleration, poor performance)
	2. Intake air pressure sensor (damaged)	
	3. Spark plug (deposit too much or damaged)	
	4. Ignition coil (damaged)	
	5. Electronic throttle valve body (deposit too much or damaged)	
	6. Intake duct (stuck)	
	7. Injector (damaged)	
	8. Ignition timing (incorrect)	
	9. Exhaust pipe	

## Symptom diagnosis

### 1. The diagnostic scanner cannot communicate with ECM

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether to enter "Engine Management System"	Diagnosis end.	The diagnostic scanner cannot communicate with ECM	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the diagnostic interface fuses FS17 and FS19, ECM fuses SB07, FS05, FS06 and FS47 are blown.	Go to Step 2	Fuse is blown	Replace the fuse with the same specification.
2	Check the diagnosis interface power and ground circuit	Normal	Faulty	Instruction



	<ul style="list-style-type: none"> <li>When the ignition switch is in "ON" position, check the voltages between the No. 8 and No. 16 terminal of I22 connector and the grounding</li> </ul> <p>Voltage: Battery power</p> <ul style="list-style-type: none"> <li>Check the resistance between No. 4 terminal of I22 and grounding.</li> </ul> <p>Resistance: &lt; 2 Ω</p>	Go to Step 3	The wire harness or connector has open circuit point	Repair the corresponding wire harness, connector or terminal
3	Check the ECM power supply, grounding line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect ECM connector E01A.</li> <li>When the ignition switch is in "ON" position, check the voltages between the No. 44, No. 67 and No. 68 terminals of ECM connector and the grounding</li> </ul> <p>Voltage, Battery power supply</p> <ul style="list-style-type: none"> <li>Check the resistance between No. 2 and No.3 terminal of E01B and grounding</li> </ul> <p>Resistance: &lt; 2 Ω</p>	Go to Step 4	The wire harness or connector has open circuit point	Repair the corresponding wire harness, connector or terminal
4	Check the ECM CAN diagnosis communication line.	Normal	Faulty	Instruction

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	<ul style="list-style-type: none"> <li>With the ignition switch "OFF", check the resistance between No. 6 and No. 14 terminals of diagnostic interface connector I17.</li> </ul> Resistance: 60 $\Omega$ <ul style="list-style-type: none"> <li>When the ignition switch is in "ON" position, check the voltages between the No. 6 terminal of I17 connector and the grounding</li> </ul> Voltage: 2.5V - 5V <ul style="list-style-type: none"> <li>When the ignition switch is in "ON" position, check the voltages between the No. 14 terminal of I17 connector and the grounding</li> </ul> Voltage: 0-2.5V	Go to Step 6	Diagnostic communication line is faulty	Go to Step 5
5	Check the ECM CAN diagnosis communication line for open-circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect ECM connector E01B.</li> <li>Check the continuity between No. 1 terminal of E01B and No. 6, 17/14 terminal of I17 respectively.</li> </ul>	Go to Step 6	The wire harness or connector has open circuit point	Repair the circuit breaker between the interface and the ECM connector clip
6	Replacement and check	Normal	Faulty	Instruction
	Replace ECM with the same model, and check whether the fault code can be read with the diagnosis scanner	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 2. When starting, the engine does not run or run slowly

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	When starting the engine, measure the voltage between the two binding posts of the battery with a multimeter Voltage: 9V - 13V	Go to Step 1	The inspection voltage is out of the specified range	Replace the battery
1	Checking the starter motor voltage	Normal	Faulty	Instruction
	The ignition switch in the start position, and measure the binding post voltage of the starter motor positive pole with a multimeter Voltage: about 9V	Go to Step 2	The inspection voltage is out of the specified range	Repair or replace the fault harness
2	Check the starter motor	Normal	Faulty	Instruction
	Remove the starter motor and check whether the starter motor working condition has a short-circuit or poor lubrication stuck	Go to Step 3	Starter motor is faulty	Repair or replace the starter
3	Check lubricating oil	Normal	Faulty	Instruction
	If the fault only occurs in winter, check if the engine lubricating oil and the gearbox oil are qualified	Go to Step 4	The lubricating oil which is not qualified leads to the excessive motor resistance	Replace the lubricating oil with proper grade
4	Check the engine internal mechanical resistance	Normal	Faulty	Instruction
	Check whether no-rotation or slow rotation of starter motor is caused by too big internal mechanical resistance of engine.	Search the cause from other fault symptoms	Internal mechanical resistance of the engine is excessive	Inspect internal resistance of engine

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### 3. When starting, the engine can rotate but can't start successful

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 1	The inspection pressure is out of the specified range	Check and repair the fuel supply system
1	Checking the speed signal	Normal	Faulty	Instruction
	Connect the diagnosis scanner, and observe the data item of "Engine Speed"; start the engine and observe whether there is a speed signal output	Go to Step 2	Crankshaft position sensor circuit failure	Check and repair crankshaft position sensor line
2	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 3	Ignition system is faulty	Inspect ignition system
3	Check lubricating oil	Normal	Faulty	Instruction
	If the fault only occurs in winter, check if the engine lubricating oil and the gearbox oil are qualified	Go to Step 4	The lubricating oil which is not qualified leads to the excessive motor resistance	Replace the lubricating oil with proper grade
4	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and check whether the pressure in an engine cylinder is insufficient	Go to Step 5	Insufficient pressure fault in the engine cylinder	Removing engine mechanical trouble
5	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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#### 4. Difficult start of hot engine

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 1	The inspection pressure is out of the specified range	Check and repair the fuel supply system
1	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 2	Ignition system is faulty	Inspect ignition system
2	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the temperature sensor connector and try to start the engine, and then check whether the engine can be started successfully.	Go to Step 3	Water temperature sensor fault	Check and repair the line or replace the temperature sensor
3	Check the fuel pressure regulator vacuum tube	Normal	Faulty	Instruction
	Check whether the fuel pressure regulator vacuum tube is loose or leaking	Go to Step 4	Vacuum tube is faulty	Check, repair or replace the vacuum pipe
4	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 5	Fuel does not conform to the specification	Replace the fuel conforming to the specification
5	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 5. Difficult start of cold engine

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 1	The inspection pressure is out of the specified range	Check and repair the fuel supply system
1	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 2	Ignition system is faulty	Inspect ignition system
2	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the temperature sensor connector and try to start the engine, and then check whether the engine can be started successfully.	Go to Step 3	Water temperature sensor fault	Check and repair the line or replace the temperature sensor
3	Check if the engine starts	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Depress the accelerator lightly and observe for easier start of the engine	Go to Step 4	There is dirt around the throttle air duct.	Clean the throttle air duct.
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 5	The injector is faulty	Check and repair the injector or replace it
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and check whether the pressure in an engine cylinder is insufficient	Go to Step 7	Insufficient pressure fault in the engine cylinder	Removing engine mechanical trouble
7	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## 6. Start normally, while the idle speed is unstable during warm-up

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 2	The spark plug is faulty	Adjust or replace the spark plug
2	Check the throttle valve	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 3	Throttle valve body carbon deposit is too much	Clean the relevant parts
3	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the coolant temperature sensor joint, and start the engine, then observe whether the engine runs unstably at idle speed during warm-up	Go to Step 4	The water temperature sensor fails.	Check and repair circuit or replace sensor
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 5	The injector is faulty	Check and repair the injector or replace it
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and observe whether the pressure difference in engine cylinder is excessive	Go to Step 7	Engine cylinder is faulty	Removing engine mechanical trouble
7	Check the engine control unit	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding  Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## 7. Speed is normal, while starting is difficult at any time

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 2	The inspection pressure is out of the specified range	Check and repair the fuel supply system
2	Check ignition system	Normal	Faulty	Instruction
	Pull out the ignition coil of one of the cylinders and connect the spark plug, let the spark plug contact the engine block. Start the engine, and then check for presence of blue-white high voltage spark	Go to Step 3	Ignition system is faulty	Inspect ignition system
3	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 4	The spark plug is faulty	Adjust or replace the spark plug



Steps	Inspection item	Inspection result		
4	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the temperature sensor connector and try to start the engine, and then check whether the engine can be started successfully.	Go to Step 5	The water temperature sensor fails.	Check and repair circuit or replace sensor
5	Check if the engine starts	Normal	Faulty	Instruction
	Depress the accelerator lightly and observe for easier start of the engine	Go to Step 6	There is dirt around the throttle air duct.	Clean the throttle air duct.
6	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 7	The injector is faulty	Replace fuel injector
7	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 8	Fuel does not conform to the specification	Replace the fuel conforming to the specification
8	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and check whether the pressure in an engine cylinder is insufficient	Go to Step 9	Insufficient pressure fault in the engine cylinder	Removing engine mechanical trouble
9	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 10	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
10	Check the engine control unit	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

### 8. Start normally, while the idle speed is unstable at any time

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check electronic throttle body	Normal	Faulty	Instruction
	Check whether the electronic throttle body is stuck	Go to Step 2	Electric throttle body if faulty	Clean or replace the electronic throttle
2	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 3	The spark plug is faulty	Adjust or replace the spark plug
3	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 4	Throttle valve body carbon deposit is too much	Clean throttle valve body carbon deposit
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage, blockage or over the flow tolerance	Go to Step 5	The injector is faulty	Replace fuel injector

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and observe whether the pressure difference in engine cylinder is excessive	Go to Step 7	Engine cylinder is faulty	Removing engine mechanical trouble
7	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 8	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
8	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 9. Start normally, while the idle speed is unstable after warm-up

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 2	The spark plug is faulty	Adjust or replace the spark plug
2	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 3	Throttle valve body carbon deposit is too much	Clean throttle valve body carbon deposit
3	Check the water temperature sensor.	Normal	Faulty	Instruction
	Unplug the coolant temperature sensor joint, and start the engine, then observe whether the engine runs unstably at idle speed during warm-up	Go to Step 4	The water temperature sensor fails.	Check and repair circuit or replace sensor
4	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage, blockage or over the flow tolerance	Go to Step 5	The injector is faulty	Replace fuel injector
5	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 6	Fuel does not conform to the specification	Replace the fuel conforming to the specification
6	Check the cylinder pressure of the engine	Normal	Faulty	Instruction
	Check the pressure in each engine cylinder and observe whether the pressure difference in engine cylinder is excessive	Go to Step 7	Engine cylinder is faulty	Removing engine mechanical trouble
7	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding  Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 10. Start normally, while the idle speed is unstable or stalling with partial load

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged and check the intake duct for gas leakage	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check the engine power	Normal	Faulty	Instruction
	Connect the diagnosis scanner, and observe the ignition advance angle, fuel injection pulse width and change of the intake quantity, and then check whether the engine power increases when opening the air conditioning	Go to Step 2	Detection value is not in a reasonable range	Go to Step 3
2	Check the A/C system.	Normal	Faulty	Instruction
	Check whether the pressure of A/C system, the electromagnetic clutch of compressor, and A/C compressor are normal	Go to Step 3	A/C system is faulty	Repair the air-conditioning system
3	Check injector	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Remove the injector, and check it for fuel leakage, blockage or over the flow tolerance	Go to Step 4	The injector is faulty	Replace fuel injector
4	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

### 11. Start normally, while the idle speed is too high

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the electronic throttle is stuck	Go to Step 1	Electronic throttle is faulty	Adjust the electronic throttle
1	Check the intake system	Normal	Faulty	Instruction
	Check whether the intake system and the vacuum tube connecting to it is leaking	Go to Step 2	Intake system is faulty	Check and repair the intake system
2	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 3	Throttle valve body is faulty	Clean the relevant parts
3	Check the water temperature sensor.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Unplug the temperature sensor connector and start the engine, and then observe whether the engine is running at high idling speed.	Go to Step 4	The water temperature sensor fails.	Check and repair circuit or replace sensor
4	Check the engine ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition timing conforms to the specification	Go to Step 5	The engine ignition timing does not conform to the specification	Check and repair ignition timing
5	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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## 12. Speed rise failure or flameout at time of acceleration

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 2	The inspection pressure is out of the specified range	Check and repair the fuel supply system
2	Check the spark plug	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 3	The spark plug is faulty	Adjust or replace the spark plug
3	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 4	Throttle valve body is faulty	Clean throttle body relevant parts
4	Check intake pressure sensor	Normal	Faulty	Instruction
	Check if the intake pressure sensor and its line are normal	Go to Step 5	Intake pressure sensor has faulty point	Check and repair circuit or replace sensor
5	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 6	The injector is faulty	Replace fuel injector
6	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 7	Fuel does not conform to the specification	Replace the fuel conforming to the specification
7	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 8	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
8	Check the exhaust pipe	Normal	Faulty	Instruction
	Check if the exhaust pipe exhausts smoothly	Go to Step 9	Exhaust pipe is faulty	Repair or replace the exhaust pipe
9	Check the engine control unit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

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### 13. Slow response at time of acceleration

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 1	Intake system is faulty	Check and repair the intake system
1	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 2	The inspection pressure is out of the specified range	Check and repair the fuel supply system
2	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 3	The spark plug is faulty	Adjust or replace the spark plug
3	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 4	Throttle valve body is faulty	Clean throttle body relevant parts
4	Check intake pressure sensor	Normal	Faulty	Instruction
	Check if the intake pressure sensor and its line are normal	Go to Step 5	Intake pressure sensor has faulty point	Check and repair circuit or replace sensor
5	Check injector	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 6	The injector is faulty	Replace fuel injector
6	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 7	Fuel does not conform to the specification	Replace the fuel conforming to the specification
7	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 8	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
8	Check the exhaust pipe	Normal	Faulty	Instruction
	Check if the exhaust pipe exhausts smoothly	Go to Step 9	Exhaust pipe is faulty	Repair or replace the exhaust pipe
9	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## 14. Weak acceleration, poor performance

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check for presence of faults such as clutch skid, low tyre pressure, braking stagnation, incorrect tyre size, and incorrect four-wheel alignments	Go to Step 1	There is a mechanical fault	Repair and eliminate mechanical fault
1	Check air filter	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 1	Intake system is faulty	Check and repair the intake system
2	Check fuel pressure gauge	Normal	Faulty	Instruction
	Connect the fuel pressure gauge, start the engine and check the fuel pressure Pressure: 400kPa	Go to Step 3	The inspection pressure is out of the specified range	Check and repair the fuel supply system
3	Check the high-pressure fire intensity	Normal	Faulty	Instruction
	Pull out the ignition distribute wire of one of the cylinders, and connect the spark plug, leaving the spark plug electrode from the engine body for about 5mm; start the engine, and check whether the high-pressure fire intensity is normal	Go to Step 4	High-pressure fire intensity is not in a reasonable range	Inspect ignition system
4	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plugs of each cylinder and observe whether their models and clearance are qualified	Go to Step 5	The spark plug is faulty	Adjust or replace the spark plug
5	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether there is carbon deposit in the throttle valve body	Go to Step 6	Throttle valve body is faulty	Clean throttle body relevant parts

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Steps	Inspection item	Inspection result		
6	Check intake pressure sensor	Normal	Faulty	Instruction
	Check if the intake pressure sensor and its line are normal	Go to Step 7	Intake pressure sensor has faulty point	Check and repair circuit or replace sensor
7	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check it for fuel leakage or blockage	Go to Step 8	The injector is faulty	Replace fuel injector
8	Check the fuel	Normal	Faulty	Instruction
	Check the fuel and observe whether the fault is caused by fuel filling	Go to Step 9	Fuel does not conform to the specification	Replace the fuel conforming to the specification
9	Check the ignition sequence and ignition timing	Normal	Faulty	Instruction
	Check whether the engine ignition sequence and ignition timing conform to the specification	Go to Step 10	The ignition sequence or ignition timing do not conform to the specification	Check and repair ignition timing
10	Check the engine control unit	Normal	Faulty	Instruction
	Disconnect the engine control unit connector, turn on the ignition switch, and check the voltage between No.44, 67, 68 terminals and the grounding Voltage: 9V - 13V • Check No. 2 and No.3 terminals for conduction to ground	Search the cause from other fault symptoms	The inspection voltage is out of the specified range or the grounding line is faulty	Check and repair the faulty line

## DTC list

DTC	Code interpretation	Cause of fault	Recommended action
P0012	Intake VCP camshaft phase with large error	<ol style="list-style-type: none"> <li>1. Abnormal hydraulic oil line pressure</li> <li>2. Intake VVT hydraulic valve gets stuck.</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis 1. Intake VVT fault
P0016	Intake VCP camshaft study error exceeds specified range	<ol style="list-style-type: none"> <li>1. Timing belt tensioner</li> <li>2. The assembly of timing belt is faulty</li> <li>3. Crankshaft pulley</li> <li>4. Camshaft pulley wheel</li> <li>5. VVT actuator</li> <li>6. ECM</li> </ol>	
P0026	Intake VCP hydraulic control is held	<ol style="list-style-type: none"> <li>1. OCV valve cleaning function is not actuated.</li> </ol>	
P0076	Intake VCP hydraulic control valve coil has low voltage or short-circuit	<ol style="list-style-type: none"> <li>1. Intake VVT valve damaged</li> <li>2. Intake VVT valve harness shorted or open</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (2. Intake VVT solenoid valve circuit fault)
P0077	Intake VCP hydraulic control valve coil high voltage	<ol style="list-style-type: none"> <li>3. ECM (damaged)</li> </ol>	
P0031	Front oxygen sensor heater has short-circuit to low voltage	<ol style="list-style-type: none"> <li>1. Front oxygen sensor damaged</li> <li>2. Front oxygen sensor harness shorted or open</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (3. Failed heating circuit of front oxygen sensor)
P0032	Front oxygen sensor heater has short-circuit to high voltage	<ol style="list-style-type: none"> <li>3. ECM (damaged)</li> </ol>	
P0134	Front oxygen sensor open circuit	<ol style="list-style-type: none"> <li>1. Front oxygen sensor harness shorted or open</li> <li>2. Oxygen sensor heater circuit or heater fault</li> <li>3. Exhaust leaks</li> <li>4. Fuel contamination</li> <li>5. Excessive oil consumption</li> </ol>	
P0037	Rear oxygen sensor heater has short-circuit to low voltage	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor damaged</li> <li>2. Rear oxygen sensor harness shorted or open</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (4. Rear oxygen sensor heating circuit fault)
P0038	Rear oxygen sensor heater short-circuit to high voltage	<ol style="list-style-type: none"> <li>3. ECM</li> </ol>	
P0140	Rear oxygen sensor open circuit	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor improperly installed or damaged</li> <li>2. Rear oxygen sensor harness shorted or open</li> <li>3. ECM</li> </ol>	

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DTC	Code interpretation	Cause of fault	Recommended action
P0105	Intake air pressure sensor signal clamped	<ol style="list-style-type: none"> <li>1. The intake air temperature and pressure sensor is damaged</li> <li>2. Intake pressure and temperature sensor harness shorted or open</li> <li>3. Pipe leaked or disengaged</li> <li>4. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (5. Intake pressure sensor fault)
P0106	Intake pressure/throttle position rationality fault	<ol style="list-style-type: none"> <li>1. The intake air temperature and pressure sensor is damaged</li> <li>2. Intake pressure and temperature sensor harness shorted or open</li> <li>3. Sensor hole clogged</li> <li>4. ECM (damaged)</li> </ol>	
P0107	Intake pressure sensor circuit has low voltage, short-circuit	<ol style="list-style-type: none"> <li>1. Air intake pressure and temperature sensor</li> <li>2. Intake pressure and temperature sensor harness shorted or open</li> </ol>	
P0108	Intake air pressure sensor line high voltage	<ol style="list-style-type: none"> <li>3. Abnormal engine intake system</li> <li>4. ECM (damaged)</li> </ol>	
P0112	Intake air temperature sensor line low voltage	<ol style="list-style-type: none"> <li>1. The intake air temperature and pressure sensor is damaged</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (6. Air intake temperature sensor fault)
P0113	Intake air temperature sensor line high voltage or open circuit	<ol style="list-style-type: none"> <li>2. Intake pressure and temperature sensor harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	
P0117	Low voltage of water temperature sensor circuit	<ol style="list-style-type: none"> <li>1. Water temperature sensor</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (7. Water temperature sensor fault)
P0118	High voltage of water temperature sensor circuit or open circuit	<ol style="list-style-type: none"> <li>2. Water temperature sensor harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	



DTC	Code interpretation	Cause of fault	Recommended action
P0122	Low voltage of electronic throttle position sensor 1 (TPS1) circuit	<ol style="list-style-type: none"> <li>1. Electronic throttle body (damaged)</li> <li>2. Electronic throttle harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (8. Electronic throttle position sensor fault)
P0123	High voltage of electronic throttle position sensor 1 (TPS1) circuit	<ol style="list-style-type: none"> <li>1. Electronic throttle body (damaged)</li> <li>2. Electronic throttle harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	
P0222	Low voltage of electronic throttle position sensor 2 (TPS1) circuit	<ol style="list-style-type: none"> <li>1. Electronic throttle valve</li> <li>2. Electronic throttle harness shorted or open</li> <li>3. ECM</li> </ol>	
P0223	Low voltage of electronic throttle position sensor 2 (TPS2) circuit	<ol style="list-style-type: none"> <li>1. Electronic throttle valve</li> <li>2. Electronic throttle harness shorted or open</li> </ol>	
P2135	Electronic throttle position sensors 1 # and 2 # circuit-related fault	<ol style="list-style-type: none"> <li>3. ECM (damaged)</li> </ol>	
P0131	Front oxygen sensor signal has short-circuit to low voltage	<ol style="list-style-type: none"> <li>1. Front oxygen sensor harness shorted or open</li> <li>2. Insufficient fuel supply due to pump, fuel supply line or fuel injector clogging</li> <li>3. Fuel pressure regulator damaged</li> <li>4. Poor ground of ECM to engine block</li> <li>5. Intake vacuum leak</li> <li>6. Exhaust pipe leak</li> <li>7. Fuel contamination</li> <li>8. Front oxygen sensor damaged</li> <li>9. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis 9. Front oxygen sensor signal circuit failure
P0132	Front oxygen sensor has short circuit to high voltage	<ol style="list-style-type: none"> <li>1. High fuel pressure</li> <li>2. Injector leak</li> <li>3. Fuel pressure regulator damaged</li> <li>4. Front oxygen sensor harness shorted or open</li> <li>5. Front oxygen sensor damaged</li> <li>6. ECM (damaged)</li> </ol>	

DTC	Code interpretation	Cause of fault	Recommended action
P0133	Front oxygen sensor response is too slow	1. Front oxygen sensor damaged	See 12B- Engine Control System - Diagnosis, DTC Diagnosis 9. Front oxygen sensor signal circuit failure
P0137	Rear oxygen sensor short circuit to low voltage	1. Rear oxygen sensor improperly installed or damaged	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (10. Rear oxygen sensor signal circuit fault)
P0138	Rear oxygen sensor short circuit to high voltage	2. Rear oxygen sensor harness shorted or open 3. ECM	
P0171	The fuel system is too thin under non-idling working conditions	1. Air intake system leak 2) The fuel pressure is insufficient. 3. Positive crankcase ventilation valve gets stuck. 4. Injector clogging	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (11. Too rich or too lean fuel fault)
P0172	The fuel system is too thick under non-idling working conditions	1. Air inlet system (clogged) 2. Injector leak 3. High fuel pressure	
P0261	Low-voltage fault of No.1 cylinder nozzle circuit	1. No.1 cylinder injector damaged 2. Injector harness shorted or open 3. ECM (damaged)	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (12. Injector fault)
P0262	High-voltage fault of No.1 cylinder nozzle circuit		
P0264	Low voltage of 2# injector circuit has fault	1. No.2 injector damaged 2. Injector harness shorted or open 3. ECM (damaged)	
P0265	High-voltage fault of No.2 cylinder nozzle circuit		
P0267	Low-voltage fault of No.3 cylinder nozzle circuit	1. No.3 cylinder injector damaged 2. Injector harness shorted or open 3. ECM (damaged)	
P0268	High-voltage fault of No.3 cylinder nozzle circuit		
P0270	Low-voltage fault of No.4 cylinder nozzle circuit	1. No.4 cylinder injector damaged 2. Injector harness shorted or open 3. ECM (damaged)	
P0271	High-voltage fault of No.4 cylinder nozzle circuit		

DTC	Code interpretation	Cause of fault	Recommended action
P0300	Single-cylinder or multi-cylinder fire	<ol style="list-style-type: none"> <li>1) Failure in ignition system;</li> <li>2. Air intake system leak</li> <li>3. Incorrect crankshaft position sensor air gap</li> <li>4. Ignition timing (incorrect)</li> <li>5. Injector fault</li> <li>6. Incorrect fuel pressure</li> <li>7. Incorrect engine compression ratio</li> <li>8) ECM fault</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (13. Misfire fault)
P0324	Knock control system failure	<ol style="list-style-type: none"> <li>1. The knock sensor is damaged</li> <li>2. Knock sensor harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (14. Knock sensor circuit fault)
P0325	Knock sensor fault	<ol style="list-style-type: none"> <li>1. Knock sensor</li> <li>2. Knock sensor harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	
P0335	No crankshaft position sensor line signal	<ol style="list-style-type: none"> <li>1. Crankshaft position sensor (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (15. Crankshaft position sensor circuit fault)
P0336	Fault of crankshaft position sensor circuit rationality	<ol style="list-style-type: none"> <li>2. Crankshaft position sensor harness shorted or open</li> <li>3. Flywheel signal tooth wear</li> </ol>	
P0340	No signal of camshaft position sensor circuit / intake VCP camshaft position sensor status diagnosis	<ol style="list-style-type: none"> <li>1. Camshaft position sensor (CMP)</li> <li>2. Camshaft position sensor wire harness</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (16. Camshaft position sensor circuit fault)
P0341	Fault of camshaft position sensor circuit rationality / VCP intake target wheel diagnosis	<ol style="list-style-type: none"> <li>3. Incorrect position/clearance between signal wheel and sensor</li> <li>4. Signal wheel mechanical fault</li> <li>5. ECM (damaged)</li> </ol>	
P0351	No.1 cylinder ignition coil fault		See 12B- Engine Control System - Diagnosis, DTC Diagnosis (17. Ignition coil circuit fault)
P0352	No. 2 cylinder ignition coil fault	<ol style="list-style-type: none"> <li>1. Ignition coil (faulty)</li> <li>2. Harness or connector damaged</li> </ol>	
P0353	No. 3 cylinder ignition coil fault	<ol style="list-style-type: none"> <li>3. ECU fault</li> </ol>	
P0354	No. 4 cylinder ignition coil fault		

DTC	Code interpretation	Cause of fault	Recommended action
P0420	Catalytic converter has low convention efficiency	<ol style="list-style-type: none"> <li>1. Three-way catalytic converter damaged</li> <li>2. Front oxygen sensor damaged</li> <li>3. Rear oxygen sensor damaged</li> <li>4. Exhaust leakage</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (18. Emission overrun fault)
P0458	Canister solenoid valve output short to low voltage or open	<ol style="list-style-type: none"> <li>1. Canister control valve harness shorted or open</li> <li>2. Canister control valve damaged</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (19. Canister control valve circuit fault)
P0459	Canister solenoid valve output is shorted to high voltage.	<ol style="list-style-type: none"> <li>3. ECM (damaged)</li> </ol>	
P0480	Low-speed fan failure	<ol style="list-style-type: none"> <li>1. Cooling fan relay circuit open</li> <li>2. ECU is damaged</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (20. Cooling fan relay circuit fault)
P0481	Low-speed fan failure		
P1502	Speed signal source fault (speed signal from TCM / ABS / ESP via CAN)	<ol style="list-style-type: none"> <li>1. ABS system is faulty</li> <li>2. CAN communication harness shorted or open</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (21. Vehicle signal fault)
P0506	Idle speed rotation is low	<ol style="list-style-type: none"> <li>1. Throttle is locked in a smaller opening due to stains or failure</li> <li>2. Intake manifold leaks.</li> <li>3. Exhaust manifold back pressure is too large.</li> <li>4) The injector is blocked.</li> <li>5. Fuel supply system pressure is too low.</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (22. Low or high idling-speed fault)
P0507	Idle speed rotation is high	<ol style="list-style-type: none"> <li>1. Throttle is locked in a larger opening due to stains or failure</li> <li>2. Vacuum leak</li> <li>3. Failure in ignition system;</li> </ol>	
P0551	Power steering switch circuit voltage range/ performance fault	<ol style="list-style-type: none"> <li>1. Steering system fault</li> <li>2. Power steering switch damaged</li> <li>3. Short circuit or open circuit</li> <li>4. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (23. Power steering switch circuit fault)
P0562	Low system voltage	<ol style="list-style-type: none"> <li>1. Charging system fault</li> <li>2. ECM harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis 24. System supply voltage fault
P0563	High system voltage		

DTC	Code interpretation	Cause of fault	Recommended action
P0564	Cruise control input circuit fault	<ol style="list-style-type: none"> <li>1. Cruise control switch damaged</li> <li>2. Strong electromagnetic interference, cruise switch aging</li> <li>3. Cruise switch shorted or open</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (25. Cruise control switch fault)
P0565	Cruise "ON /OFF" signal stuck /interfered		
P0566	Cruise "Cancel" signal stuck/interfered		
P0567	Cruise "Resume" signal stuck/interfered		
P0568	Cruise "Set" signal stuck/interfered		
P0504	Brake switch correlation fault	<ol style="list-style-type: none"> <li>1. Wire harness or component fault</li> <li>2. Brake switch circuit shorted or is open</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (26. Brake lights signal fault)
P0571	There is no change in the state of the brake light switch when braking		
P0602	ECM programming error (mismatched software version)	<ol style="list-style-type: none"> <li>1. ECU fault</li> <li>2. ECU inside error</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (27. ECM inside fault)
P0606	ECM processor fault		
P060A	ECM processor fault		
P0230	Fuel pump relay failure	<ol style="list-style-type: none"> <li>1. Open or short circuit</li> <li>2. Fuel pump relay damaged</li> <li>3. Fuse is blown</li> <li>4. Wire harness or connector is loose</li> <li>5. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (28. Fuel pump relay fault)
P0646	Air conditioning clutch relay circuit shorted to low voltage or open	<ol style="list-style-type: none"> <li>1. A/C compressor relay</li> <li>2. A / C compressor relay harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (29. Compressor relay circuit fault)
P0647	Air conditioning clutch relay circuit shorted to high voltage		
P0685	Main relay failure	<ol style="list-style-type: none"> <li>1. Main relay</li> <li>2. Main relay harness shorted or open</li> <li>3. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (30. Main relay fault)
P0700	ECU and TCU communication failure	<ol style="list-style-type: none"> <li>1. CAN communication circuit fault</li> <li>2. TCU damaged</li> <li>3. ECM (damaged)</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (31. ECU and TCU communication fault)
U0101	Loss of communication of ECM with TCM (C101)		

DTC	Code interpretation	Cause of fault	Recommended action
P0641	ETC reference voltage A # amplitude fault	1. B circuit (5V reference voltage) is shorted.	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (32. Electronic throttle body fault)
P0651	ETC reference voltage B # amplitude fault	2. Strong external electromagnetic interference 3. ECM internal B circuit (5V reference voltage) is damaged .	
P1516	ETC driver' s steady diagnosis error	1. Strong external electromagnetic interference	
P2101	ETC drive' s second-order diagnosis error	2. The electronic throttle gets stuck by foreign matter (even if for a short time). 3. Electronic throttle is driven abnormally (even for a short time).	
P2119	Electronic throttle return fault	1. Electronic throttle return spring fault 2. The electronic throttle gets stuck by foreign matter.	
P2104	Forced engine idling	1. Accelerator pedal position sensor (1) shorted or open 2. Pedal position sensor (2) shorted or open 3. Pedal position sensor (1) and pedal position sensor (2) show mismatched position (correlation check fault of two inputs)	
P2105	Forced engine shutdown	1. Throttle drive fault 2. MAP sensor fault 3. Throttle sensor fault 4. Very strong external electromagnetic	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (34. Forced engine shutdown fault)



DTC	Code interpretation	Cause of fault	Recommended action
P0068	Electronic throttle air flow error	1. Failed heating circuit of front oxygen sensor	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (35. Fault of engine in "Follow Me Home" mode)
P2106	Engine performance limits	1. Accelerator pedal position sensor (1) shorted or open 2. Pedal position sensor (2) shorted or open 3. Pedal position sensor (1) and pedal position sensor (2) show mismatched position (correlation check fault of two inputs) 4. Strong external electromagnetic interference	
P2110	Engine power management	1. Throttle sensor (1) shorted or open 2. Throttle sensor (2) shorted or open 3. Strong external electromagnetic interference	
P2122	Electric accelerator pedal position sensor 1# circuit has low voltage	1. Electronic accelerator pedal sensor damaged 2. Signal 1 circuit is short to ground or damaged 3. ECM (damaged)	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (36. Electronic accelerator pedal circuit fault)
P2123	Electric accelerator pedal position sensor 1# circuit has high voltage		
P2127	Electric accelerator pedal position sensor 2# circuit has low voltage	1. Electronic accelerator pedal sensor damaged 2. Signal 2 circuit is short to ground or damaged 3. ECM (damaged)	
P2128	Electric accelerator pedal position sensor 2# circuit has high voltage		
P2138	Fault related to electric accelerator pedal position sensor 1#, 2# wire harness	1. Strong external electromagnetic interference 2. Electronic accelerator pedal sensor damaged 3. Accelerator pedal position sensor harness connected badly	
P1167	Enrichment of front oxygen during fuel cut for deceleration	1. Circuit between oxygen sensor and ECU shorted to power supply 2. High fuel pressure 3. Injector leak 4. Fuel pressure regulator damaged	



DTC	Code interpretation	Cause of fault	Recommended action
P1171	Dilution of front oxygen during enriching for acceleration	<ol style="list-style-type: none"> <li>1. Circuit between oxygen sensor and ECM shorted to ground</li> <li>2. Insufficient fuel supply due to pump, fuel supply line or fuel injector clogging</li> <li>3. Fuel pressure regulator damaged</li> <li>4. Poor ground of ECM to engine block</li> <li>5. Intake vacuum leak</li> <li>6. Exhaust pipe leak</li> <li>7. Fuel contamination</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (37. Air-fuel ratio overrun or oxygen sensor aging fault)
P2187	The fuel system is too thin under idling working conditions	<ol style="list-style-type: none"> <li>1. Lack of fuel in the tank</li> <li>2. Fuel pressure (too low)</li> </ol>	
P2188	The fuel system is too thick under idling working conditions		
P2A01	The rear oxygen sensor response is too slow for deceleration and fuel cutoff	<ol style="list-style-type: none"> <li>1. Rear oxygen sensor poisoning</li> <li>2. Rear oxygen sensor installed improperly</li> </ol>	
P1336	58-tooth gear error not learnt	<ol style="list-style-type: none"> <li>1. After the ECM or crankshaft position sensor is replaced, the vehicle has not performed the tooth message learning program.</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (38. Crankshaft position sensor tooth message unlearned)
U0001	CAN communication fault (C001)	<ol style="list-style-type: none"> <li>1. CAN short/open circuit to the ground or power supply</li> <li>2. Wire harness loose</li> <li>3. ECU fault</li> <li>4. Corresponding control module fault</li> </ol>	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (39. CAN communication fault)
U0073	CAN Bus Off (C073)		
U0121	Loss of communication of ECU with ABS control module (C121)		
U0140	Loss of communication of ECU with body control module (C140)		
U0151	Loss of communication of ECU with airbag control module (C140)		
U0155	Loss of communication of ECM with dashboard control module (C155)		

DTC	Code interpretation	Cause of fault	Recommended action
P0633	Burglar alarm not learning fault	1. Remote key	See 12B- Engine Control System - Diagnosis, DTC Diagnosis (40. Engine immobilizer fault)
U0167	No response of immobilizer (C167)	2. Electronic key chip	
U0426	防盗器无响应 (C426)	3. PEPS / RKE controller	
		4. Wire harness	
		5. ECM	

## DTC Diagnosis

### 1. Intake VVT fault

P0012- Intake VCP camshaft phase has big error

P0016- Intake VCP camshaft gear study exceeds limit range

P0026- Intake VCP hydraulic control valve is held.

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#### Description of fault code:

- ECU monitors the correlation of the positions between the crankshaft and the camshaft using the pulse signals of the crankshaft position sensor and the camshaft position sensor (intake side). Crankshaft variable reluctance rotor has 60 teeth, in which two of them are missing and used as reference clearance. Evenly spacing between each tooth is  $6^\circ$ , except for the reference clearance only, whose spacing is  $12^\circ$ .
- Camshaft signal plate has 4 teeth, with two narrow and two wide. Evenly spacing of the 4 trailing edges for each tooth is  $90^\circ$ .
- The intake camshaft position (CMP) actuator is connected to the intake camshaft and operated by the hydraulic pressure. The hydraulic pressure is provided by the oil pump in order to change the angle of the intake camshaft relative to the crankshaft position (CKP).
- The intake VVT solenoid valve is powered by the main relay, and the ECM is grounded with the pulse width control signal. Thereby, the oil flow of the engine to the actuator of the camshaft position is controlled.
- The engine oil pressure will drive a safety slide valve inside the camshaft position actuator mechanism fixed at the front of the camshaft to move. When the safety slide valve moving, the engine oil will be led into the camshaft position actuator to make the camshaft rotate.
- The intake camshaft position actuator can allow the cam working angle to change  $50^\circ$  maximally.
- ECU will continuously monitor the timing position of the camshaft, and check the relative position between the camshaft and the crankshaft. If dislocation of the relative position exceeds 1 tooth, the fault code will appear. Fault causes include the camshaft position sensor itself or its circuit fault, crankshaft position sensor in itself or its

circuit fault, oil contaminated, timing belt assembly, etc.

### The setting conditions of DTC:

1. When the engine is in operation, without VVT component failure, crankshaft position sensor fault and system voltage fault, and the variation rate of the current VVT opening is less than  $15^{\circ}/s$ , the ECM monitors the VVT phase error is greater than  $15^{\circ}$ , or the actual VVT opening  $> 5^{\circ}$  but  $< 50^{\circ}$ , the fault code P0012 is set.
2. After the VVT system completes the tooth deviation learning, without VVT component failure, crankshaft position sensor failure and system voltage failure, and the engine is in operation, if the ECM monitors the VVT cam tooth learning deviation is less than 0.2 or greater than 0.35, the fault code DTC P0016 is set.
3. When the engine is in operation, without VVT component failure, crankshaft position sensor failure and system voltage failure, as well as OCV valve cleaning function unused, if the ECM monitors the actual VVT phase ( $> 50^{\circ}$ ) and the phase error ( $< -20^{\circ}$ ), or the actual VVT phase ( $< 10^{\circ}$ ) and the phase error ( $> 20^{\circ}$ ), the fault code P0026 is set.
4. When the fault codes P0012 and P0016 appear and the intake VCP works in default mode, the oil control valve will not move.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the ECM connector and camshaft position sensor connector for looseness, damage and corroded harness terminals.
1	Check engine oil	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether viscosity and cleanliness of the engine oil are normal</li> <li>Observe whether the engine oil level is within the operating range</li> <li>Check whether the engine oil is replaced timely, whether it contains additives or the viscosity is correct</li> </ul>	Go to Step 2	Oil unqualified oil or lubrication system fault	Replace the engine oil and oil filter, clean the engine lubrication system when necessary
2	Check timing belt	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 3	The assembly of timing belt fault	Replace it with a new timing belt
3	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 4	The assembly of timing belt fault	Re-install the valve timing belt
4	Check the intake VVT valve.	Normal	Faulty	Instruction
	Check whether the intake VVT valve is installed correctly. After removal, check the filter screen of the VVT valve for damage or foreign matter.	Go to Step 5	Improperly-installed VVT valve, or filter screen damaged, clogged by foreign matter	Replace the intake VVT valve.
5	Check the camshaft position sensor	Normal	Faulty	Instruction
	Check whether the O-ring of the intake camshaft position sensor is normal, whether the sensor is installed in place	Go to Step 6	O-ring is damaged and/or deformed	Replace the O-ring and clean the sensor
6	Check the camshaft position sensor signal wheel	Normal	Faulty	Instruction
	Check whether the signal wheel on the intake side camshaft position sensor is normal	Go to Step 7	Camshaft position sensor signal fault	Replace the side camshaft assembly
7	Replace and check (camshaft position sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the intake camshaft position sensor, and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 8	Intake camshaft position sensor fault	Replace the intake camshaft position sensor

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
8	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	Check whether the O-ring of the crankshaft position sensor is normal, whether the sensor is installed in place	Go to Step 9	O-ring is damaged and/or deformed	Replace the O-ring and clean the sensor
9	Check the crankshaft position sensor signal wheel	Normal	Faulty	Instruction
	Check whether the crankshaft flywheel gear ring is deformed or damaged, whether the ring gear in itself has too thick sticky clay	Go to Step 10	Crankshaft flywheel gear ring fault	Replace the crankshaft flywheel gear ring
10	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 2. Intake VVT solenoid circuit fault

P0076 - Intake VCP hydraulic control valve coil has low voltage or short-circuit.

P0077 - Intake VCP hydraulic control valve coil has high voltage.

### Description of fault code:

- The intake VVT solenoid valve is powered by the main relay, and the ECM is grounded with the pulse width control signal. Thereby, the oil flow of the engine to the actuator of the camshaft position is controlled.
- The intake VVT solenoid valve controls the internal ground of the solenoid valve through the Terminal 43 of the ECM harness connector E01A.
- There is a feedback circuit inside the ECM. The engine ECM determines whether the control circuit is open-circuited, short-circuited to ground or short-circuited to voltage through monitoring the feedback signal.
- If the engine ECM detects the voltage of the control circuit within the predefined range when the control circuit is disconnected by commands, this DTC will occur.

### The setting conditions of DTC:

1. When the engine runs for > 0.5s, and the system voltage is greater than 11V but less than 16V, if the ECM monitors the intake VCP hydraulic control valve coil is low in voltage or open-circuited, the fault code P0076 is set.
2. When the engine running time > 0.5s, and system voltage greater than 11V but less than 16V, if the ECM monitors the intake VCP hydraulic control valve coil is shorted to the 12V power supply, the fault code P0077 is set.
3. When the fault codes P0076 and P0077 appear, and the intake VCP works in default mode, the oil control valve will not move.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the ECU connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check the OCV	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• When ignition switch is in the "OFF" position, unplug the VVT solenoid valve connector clip</li> <li>• Check the resistance value between the two terminals of the VVT solenoid valve. 电阻 :6.9Ω ~ 7.9Ω (20°C )</li> <li>• Remove the intake VVT solenoid valve, and check whether the intake VVT is normal</li> </ul>	Go to Step 2	VVT solenoid valve resistance is unreasonable, VVT filter is damaged or clogged, etc.	Replace VVT solenoid valve
2	Check the VVT solenoid valve power supply wire	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the intake VVT valve connector E02B.</li> <li>Check the circuit between the fuse FS47 of central control box in the engine compartment and No.1 terminal of E02B for short-circuit and open-circuit.</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check the VVT solenoid valve power line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the intake VVT valve connector E02B and the ECU connector clip E01B</li> <li>Check whether the line between the No. 2 terminal of E02B and the No. 43 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 3. Failed heating circuit of front oxygen sensor

P0031- front oxygen sensor heater has short-circuit or low voltage.

P0032-front oxygen sensor heater has short-circuit or high voltage.

P0131- Front oxygen sensor signal has open-circuit.

#### Description of fault code:

1. Front oxygen sensor, is used to correct the fuel control; the sensor compares the oxygen content in the amendment air with the oxygen content in the exhaust flow, each heated oxygen sensor has an heating component to heat the sensor.

2. ECU controls the heating control circuit of the heated oxygen sensor, thus enabling the system to better enter the closed-loop mode, making the sensor perform calculation earlier. The engine control module commands the heating element to switch on or off, so that the heated oxygen sensor is always within the range of the specified working temperature.
3. Engine control module detects the temperature by measure the heater current. If the oxygen sensor does not reach the required temperature within a set time, or the ECU is unable to maintain the set temperature, this fault code will appear.

#### The setting conditions of DTC:

1. When the engine running time > 0.5s, and the system voltage greater than 11V but less than 16V, if the ECM monitors the front oxygen sensor heating circuit is shorted to ground, the fault code P0031 is set.
2. When the engine running time > 0.5s, and the system voltage greater than 11V but less than 16V, if the ECM monitors the front oxygen sensor heating circuit is shorted to the 12V power supply, the fault code P0032 is set.
3. Without P0106, MAP sensor, CTS sensor, TPS sensor, P0171, P0172, injector, misfire, crankshaft position sensor, ignition system, idle speed control system, canister purge circuit or other related fault code, if the coolant temperature higher than 70°C, system voltage above 11V and engine running time > 60s, the ECM monitors the oxygen sensor signal voltage is greater than 1.3V but less than 3.8V, the fault code P0134 is set.
4. After the fault codes P0031 and P0032 appear, the system will enable the fuel control to work in open-loop mode, disable the fuel corrected pulse width and will not updated the self-learning value. After the fault code P0134 appears, the system will stop the closed-loop fuel control.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the front oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check the front oxygen sensor power circuit	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Disconnect the front oxygen sensor connector clip E09b, when the ignition switch is in "ON", check the voltage between the No. 4 of E09b and the grounding Voltage: 9V - 13V	Go to Step 3	The voltage is out of the specified range	Go to Step 2
2	Check the front oxygen sensor circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• When ignition switch is in the "OFF" position, unplug the front oxygen sensor connector</li> <li>• Disconnect the ECM connector E01B and the front oxygen sensor connector E09B.</li> <li>• Check whether the line between the No. 24 terminal of E01B and the No. 3 terminal of E09B has a short circuit or open circuit</li> <li>• Check the circuit between No.4 terminal of E09B and the fuse FS07 of central control box in the engine compartment for short-circuit and open-circuit.</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check front oxygen sensor	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the front oxygen sensor connector</li> <li>At room temperature, measure whether the resistance between the No. 3 stitch of E09B and the No. 4 stitch of E09B of the front oxygen sensor connector clip (component side) is normal</li> </ul> Resistance: $9.6 \Omega \pm 1.5 \Omega$	Go to Step 4	Front oxygen sensor fault	Replace front oxygen sensor
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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#### 4. Rear oxygen sensor heating circuit fault

P0037- Rear oxygen sensor heater has short-circuit to low voltage.

P0038- Rear oxygen sensor heater has short-circuit to high voltage.

P0140 - Rear oxygen sensor has open-circuit.

##### Description of fault code:

- Downstream oxygen sensor (namely the rear oxygen sensor) is used for monitoring the working status of the three-way catalytic converter. The sensor compares the oxygen content in ambient air with the oxygen content in exhaust flow. Each heated oxygen sensor has an internal heating element for sensor heating.
- The engine control module controls the heated oxygen sensor's heating control circuit. This makes the system enter into the closed-loop control mode earlier, so that ECM can calculate Air-fuel ratio earlier.
- The engine control module commands the heater to switch on or off, so that the heated oxygen sensor works within the specified working temperature range. Engine con-

trol module detects the temperature by measure the heater current.

### The setting conditions of DTC:

1. When the engine running time > 0.5s and the system voltage greater than 11V but less than 16V, if the ECM monitors the oxygen sensor heating circuit is shorted to ground, the fault code P0037 is set.
2. When the engine running time > 0.5s, and the system voltage greater than 11V but less than 16V, if the ECM monitors the oxygen sensor heating circuit is shorted to the 12V power supply, the fault code P0038 is set.
3. Without P0106, MAP sensor, CTS sensor, TPS sensor, P0171, P, injector, misfire, crankshaft position sensor, ignition system, idle speed control system, canister purge circuit, rear oxygen sensor heater or other related fault code, when the coolant temperature is above 70°C, the system voltage is higher than 11V and the engine operating time is greater than 600s, the ECM monitors the oxygen sensor signal voltage is greater than 1.3V but less than 3.8V, the fault code P0140 is set.
4. After the P0037 and P0038 fault codes appear, the system will enable the fuel control to work in open-loop mode, disable the fuel corrected pulse width and will not update the self-learning value. After the P0140 appears, the system will disable the rear oxygen sensor signal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the rear oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check the rear oxygen sensor power circuit	Normal	Faulty	Instruction
	Disconnect the rear oxygen sensor connector clip I34, when the ignition switch is in "ON", check the voltage between the No. 4 of I34 and the grounding Voltage: 9V - 13V	Go to Step 3	The voltage is out of the specified range	Go to Step 2
2	Check the rear oxygen sensor line	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the rear oxygen sensor connector</li> <li>Disconnect the ECU connector clip E01B and the rear oxygen sensor connector clip I34</li> <li>Check whether the line between the No. 23 terminal of E01B and the No. 3 terminal of I34 has a short circuit or open circuit</li> <li>Check the circuit between No. 4 terminal of I34 and the fuse FS08 of the central control box in the engine compartment for short-circuit and open-circuit fault.</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check rear oxygen sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When ignition switch is in the "OFF" position, unplug the rear oxygen sensor connector</li> <li>At room temperature, measure whether the resistance between the No. 3 stitch of I34 and the No. 4 stitch of I34 of the rear oxygen sensor connector clip (component side) is normal</li> </ul> Resistance: $9.6 \Omega \pm 1.5 \Omega$	Go to Step 4	Rear oxygen sensor fault	Replace rear oxygen sensor
4	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Replace ECU and then perform road test</li> <li>• Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 5. Intake pressure sensor circuit fault

P0105 - intake pressure sensor signal is held.

P0106-Reasonable failure of intake pressure/throttle position

P0107 - intake pressure sensor circuit has low voltage

P0108 - intake pressure sensor circuit has high voltage.

### Description of fault code:

1. Intake manifold pressure sensor measures the pressure in the intake manifold.
2. ECU takes the difference (a linear relationship with the engine load) between the intake manifold pressure and the atmospheric pressure as a basis to determine the basic fuel injection amount of the injector, thus helping the engine reach the optimal air/fuel ratio under different loads.
3. If ECU detects that the intake sensor signal voltage exceeds the normal range of calibration, the fault code will appear.

### The setting conditions of DTC:

1. After starting the engine, there is no change in the intake manifold pressure within a certain time, the fault code P0105 is set.
2. When the system has no fault codes related to manifold absolute pressure sensor, throttle position sensor and water temperature sensor, if the altitude compensating intake pressure value is outside the limit set by the control system in accordance with the engine speed and throttle opening, the fault code P0106 is set.
3. When the system has no throttle position sensor failure, the battery voltage is higher than 11.5V, and the engine speed is less than or equal to 1000RPM and the throttle opening is greater than 0%, or the engine speed is higher than 1000RPM and the throttle opening is greater than 10%, if the ECM monitors the MAP sensor signal value is less than 6.5%, the fault code P0107 is set.
4. When the system has no throttle position sensor failure, the engine is in operation, the engine speed is less than or equal to 2400RPM and the throttle opening is less than 15%, or the engine speed is greater than 2400RPM and the throttle opening is greater than 35%, if the ECM monitors the MAP sensor signal value is greater than 94.5%, the fault code P0108 is set.

5. When the fault code P0105, P0106, P0107, or P0108 appears, the system will disable the fuel corrected pulse width, not update the self-learning value, prohibit adjustment of the target idle speed, not update the atmospheric pressure and use the default of absolute manifold pressure.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the intake pressure and temperature sensor connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check intake pressure sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the intake pressure and temperature sensor</li> <li>Check whether there is oil stain on the surface of intake pressure and temperature sensor</li> </ul>	Go to Step 2	There is dirt on the surface of intake pressure and temperature sensor	Clean the dirt of intake pressure and temperature sensor
2	Read the data flow.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnosis scanner, and read the intake pressure sensor data flow, then confirm whether the data flow is normal</li> <li>Intake pressure/output voltage</li> </ul> <p>Reference 1: 20KPa/0.8V Reference 2: 40KPa/1.61V Reference 3: 60KPa/2.42V Reference 4: 80KPa/3.23V Reference 5: 100KPa/4.04V Reference 6: 120KPa/4.85V</p>	Go to Step 3	Air intake pressure temperature sensor failure	Replace air intake pressure temperature sensor.
3	Check intake pressure sensor line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the intake pressure and temperature sensor E16B and the ECU connector E01B</li> <li>Check whether the lines between the No. 4 terminal of E16B and the No. 76 terminal of E01B, the No. 2 terminal of E16B and the No. 66 terminal of E01B, or the No. 1 terminal of E16B and the No. 54 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 6. Air intake temperature sensor fault

P0112- intake temperature sensor circuit has low voltage.

P0113- intake temperature sensor circuit has high voltage or open-circuit.

### Description of fault code:

- The intake air temperature sensor (IATS) undertakes to detect the intake air temperature and convert the intake air temperature signal into electric signal which will then be transmitted to the engine control module (ECM), so that the ECM could correct the time for fuel injection and ignition to make the engine working in the best condition.
- Intake air temperature sensor adopts thermistor with negative temperature coefficient (NTC) Its resistance value decreases with the temperature increasing.
- If ECU detects that the intake air temperature sensor signal voltage is lower than the minimum or maximum value of the self-test, this fault code will appear.

### The setting conditions of DTC:

- When the system has no vehicle speed signal fault, the vehicle speed is greater than 50km/h and the engine operating time is greater than 120s, if the ECM monitors the IAT intake temperature sensor signal value is less than 2.0%, the fault code P0112 is set.

2. When the system has no vehicle speed signal failure, water temperature sensor and other related failure, the vehicle speed is below 25km/h, the coolant temperature is above 50°C and the engine operating time is greater than 120s, if the ECM monitors the IAT sensor signal value is greater than 98%, the fault code P0113 is set.
3. When the fault code P0112 or P0113 appears, the system will use the default value of the intake air temperature set by the system.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the intake pressure and temperature sensor connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check the intake temperature sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the intake pressure and temperature sensor</li> <li>Check whether there is oil stain on the surface of intake pressure and temperature sensor</li> </ul>	Go to Step 2	There is dirt on the surface of intake pressure and temperature sensor	Clean the dirt of intake pressure and temperature sensor
2	Check the intake temperature sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Blow the intake pressure and temperature sensor (note that the distance can not be too close) with the heating gear of an electric blower, and observe whether the resistance between the No. 4 terminal of E16B and the No. 3 terminal of E16B of the intake pressure and temperature sensor changes, then the resistance should decrease</li> <li>Temperature and the corresponding resistance value</li> </ul> <p>Refer to the On-vehicle Inspection - Check the intake pressure and temperature sensor</p>	Go to Step 3	Air intake pressure temperature sensor failure	Replace air intake pressure temperature sensor.

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Steps	Inspection item	Inspection result		
3	Check intake temperature sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the intake pressure and temperature sensor E16B and the ECU connector E01B</li> <li>Check whether the lines between the No. 4 terminal of E16B and the No. 76 terminal of E01B, or the No. 3 terminal of E16B and the No. 71 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 7. Water temperature sensor (faulty)

P0117- Low voltage of water temperature sensor circuit

P0118- High voltage or open circuit of water temperature sensor circuit

### Description of fault code:

- The function of coolant temperature sensor (ECT) is to transfer engine coolant temperature signal into electrical signal and then sends it to engine ECM so that ECM corrects fuel injection time and ignition time to ensure the engine is in optimal working state.
- Coolant temperature sensor adopts thermistor with negative temperature coefficient (NTC) Its resistance value decreases with the temperature increasing.
- If ECU detects that the engine coolant temperature sensor signal is lower or higher than the self-test value, this fault code will appear. Fault causes include sensor signal circuit shorted to ground, sensor fault, ECU fault, etc.

### The setting conditions of DTC:

- When the engine running time is greater than 120s, if the ECU detects the CTS sensor signal value is less than 2.0%, the fault code P0117 is set.
- When the engine running time is greater than 120s, if the ECM detects the CTS sensor signal value is greater than 97.5%, the fault code P0118 is set.

3. When the fault code P0112 or P0113 appears, the system will estimate the water temperature sensor in accordance with the default formula based on the engine running time and the intake air temperature, to a maximum of 90.75°C . After the fault code is set, the high-speed fan delay s 0.5s and then starts working.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection			
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the water temperature sensor connector becomes loose and damaged, whether the harness terminals are corroded.
1	Check the water temperature sensor.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the engine coolant temperature sensor.</li> <li>Perform heating test on the engine water temperature sensor. Check whether the resistance between No.1 and No. 3 terminals of the engine water temperature sensor decreases with the temperature rise.</li> <li>Temperature and the corresponding resistance value</li> </ul> Refer to the On-vehicle Inspection - Check the water temperature sensor	Go to Step 2	Water temperature sensor fault	Replace the water temperature sensor.
2	Check the water temperature sensor circuit.	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the water temperature sensor connector E06B and the engine control unit connector E01B.</li> <li>Check whether the lines between the No. 3 terminal of E06B and the No. 74 terminal of E01B, or the No. 1 terminal of E06B and the No. 49 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 8. Electronic throttle position sensor failure

P0122- Low voltage of electronic throttle position sensor 1 (TPS1) circuit

P0123-High voltage of electronic throttle position sensor 1 (TPS1) circuit

P0222- Low voltage of electronic throttle position sensor 2 (TPS2) circuit

P0223-High voltage of electronic throttle position sensor 2 (TPS2) circuit

P2135- Electronic throttle position sensor 1 #/2 # circuit-related failure

### Description of fault code:

- In the electronic throttle control (ETC) system, the accelerator pedal position (APP) sensor transmits the accelerator pedal position to the ECU. And ECU controls the throttle valve opening by driving the throttle valve motor, and feedbacks to the ECU through the sensor signal.
- The actual throttle position will be compared with the that determined according to the engine load. The engine control module (ECM) determines the engine load based on the signal of the intake manifold absolute pressure sensor (MAPS) A further comparison will determine whether the sensor is failed and set the corresponding DTC. Fault causes include sensor signal circuit open, sensor ground circuit open, or sensor fault

in itself, ECU fault, etc.

### The setting conditions of DTC:

1. With the engine in operation, if the ECM monitors the TPS sensor signal (1) value is less than 3.5%, the fault code P0122 is set.
2. With the engine in operation, if the ECM monitors the TPS sensor signal (1) value is more than 96.5%, the fault code P0123 is set.
3. With the engine in operation, if the ECM monitors the TPS sensor signal (2) value is less than 3.5%, the fault code P0222 is set.
4. With the engine in operation, if the ECM monitors the TPS sensor signal (2) value is less than 96.5%, the fault code P0223 is set.
5. When the fault code P0122, P0123, P0222, or P0223 appears, the system will estimate the throttle opening in accordance with engine speed.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check the connector of electric throttle body control unit for looseness, damage and check the terminal of wire harness for corrosion
1	Check electronic throttle body line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• When the ignition switch is in "OFF" position, disconnect the electronic throttle connector E08B and the ECU connector clip E01B</li> <li>• Check whether the lines between the No. 3 terminal of E08B and the No. 27 terminal of E01B, the No. 2 terminal of E08B and the No. 52 terminal of E01B, the No. 1 terminal of E08B and the No. 74 terminal of E01B, or the No. 4 terminal of E08B and the No. 70 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 2	Circuit is short or open	Repair the faulty wire harness

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
2	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle body and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 3	DTC still exists	Replace the electric throttle body
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 9. Front oxygen sensor signal circuit failure

P0131- Front oxygen sensor signal has short-circuit to low voltage.

P0132- Front oxygen sensor signal has short-circuit to high voltage.

P0133- Front oxygen sensor has slow response.

### Description of fault code:

- Front oxygen sensor is used to check the concentration of oxygen in the exhaust gas, and send feedback signal to ECU, then the ECU controls the injection amount of the injector, thus controlling the air/fuel ratio of the mixture close to the theoretical value.
- After the vehicle starting, the ECM will work at the open-loop mode, in which the ECM will ignore the signal voltage of the front oxygen sensor when calculating the air-fuel ratio.
- Control module once found upstream oxygen sensor voltage than set threshold voltage in closed loop mode immediately. The control module will determine the air-fuel ratio with the upstream oxygen sensor voltage. If the upstream oxygen sensor voltage is increased to above the reference voltage (tend to 1 V), the air fuel mixture is too thick. If the upstream oxygen sensor voltage decreases to below the reference voltage (tend to 0mV), the mixture is too thin. If the reaction rate of the oxygen sensor voltage fluctuation is lower than the system value, it indicates that the oxygen sensor aging.

### The setting conditions of DTC:

- When the system has no P0106, MAP sensor, CTS sensor, TPS sensor, P0171, P0172, injector, misfire, crankshaft position sensor, ignition system, idle speed control system, canister purge circuit or other related fault code, the coolant temperature is

higher than 70°C , the system voltage is greater than 11V and the engine running time is greater than 60s, if the ECM monitors the oxygen sensor signal voltage is less than 0.03V, the fault code P0122 is set. If the oxygen sensor signal voltage is higher than 3.8V, the fault code P0132 is set.

2. If the system detects the Lean to Rich Average (LRA) of front oxygen sensor output signal is > 0.4s or the Rich to Lean Average (RLA) of front oxygen sensor output signal is > 0.13s, or the ratio of LRA to RLA is <0.2 or> 8, and the number of times of LRA of front oxygen sensor output signal is <15 times or that of RLA is <15, the fault code P0133 is set.
3. When the fault code P0131, P0132, P0133, or P0223 appears, the system will stop the closed-loop fuel control.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the front oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check front oxygen sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>• Remove the front oxygen sensor, visually observe whether the front oxygen sensor has a carbon deposit, whether it turns white, blown or black</li> </ul>	Go to Step 2	Front oxygen sensor has serious carbon deposit. Turn white	Replace the front oxygen sensor, and replace the fuel and clean the fuel tank
2	Check the front oxygen sensor circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the front oxygen sensor valve connector clip E09B and the ECU connector clip E01B</li> <li>Check whether the lines between the No. 1 terminal of E09B and the No. 73 terminal of E01B, or the No. 2 terminal of E09B and the No. 47 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check (oxygen sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the front oxygen sensor and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace front oxygen sensor	DTC still exists	Go to Step 4
4	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECM and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 10. Rear oxygen sensor signal circuit fault

P0137 - Rear oxygen sensor has short-circuit to low voltage.

P0138 - Rear oxygen sensor has short-circuit to high voltage.

### Description of fault code:

- Rear oxygen sensor is used to monitor the three-way catalytic converter working conditions.
- The sensor compares the oxygen content in ambient air with the oxygen content in exhaust flow. Each heated oxygen sensor has an internal heating element for sensor

heating. The engine control module controls the heated oxygen sensor's heating control circuit. This makes the system enter into the closed-loop control mode earlier, so that ECM can calculate Air-fuel ratio earlier.

### The setting conditions of DTC:

1. When the system has no P0106, MAP sensor, CTS sensor, TPS sensor, P0171, P0172, injector, misfire, crankshaft position sensor, ignition system, idle speed control system, canister purge circuit or other related fault code, the coolant temperature is higher than 70°C, the system voltage is higher than 11V and the engine operating time is greater than 600s, if the ECM monitors the oxygen sensor signal voltage is less than 0.03V, the fault code P0137 is set. If the rear oxygen sensor signal voltage is higher than 3.8V, the fault code P0138 is set.
2. When the fault code P0137 or P0138 appears, the system will disable the rear oxygen sensor signal.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the rear oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check three-way catalytic converter	Normal	Faulty	Instruction
	Check whether the three-way catalytic converter is replaced within the specified time	Go to Step 2	Three-way catalytic converter fault	Replace three-way catalytic converter
2	Check rear oxygen sensor	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Remove the rear oxygen sensor, visually observe whether the rear oxygen sensor has a carbon deposit, whether it turns white, blown or black</li> </ul>	Go to Step 3	Rear oxygen sensor has serious carbon deposit, and turns white.	Replace the rear oxygen sensor, and replace the fuel and clean the fuel tank
3	Check the rear oxygen sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the rear oxygen sensor valve connector clip I34 and the ECU connector clip E01B</li> <li>Check whether the lines between the No. 2 terminal of I34 and the No. 48 terminal of E01B, or the No. 1 terminal of I34 and the No. 73 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check (oxygen sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the rear oxygen sensor for road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace rear oxygen sensor	DTC still exists	Go to Step 5
5	Replacement and check (ECM)	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 11. Too rich or too lean fuel fault

P0171- Lean fuel system under non-idling condition

P0172- Rich fuel system under non-idling condition

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### Description of fault code:

- ECU controls the measurement system of the closed-loop air/fuel ratio, allowing the manipulation performance, fuel economy and emission control to achieve the best fit. In closed loop mode, the ECU monitors the heated oxygen sensor voltage and adjust the fuel supply according to the signal voltage.
- Changes in fuel supply will change long-term or short-term fuel adjustment value.
- Short-term fuel adjustment value change rapidly by responding to the signal voltage of the heated oxygen sensor. These changes will perform fine adjustment the engine fuel supply.
- Long-term fuel adjustment value will change with the adjustment of the short-term fuel. Long-term fuel supply adjustment performs coarse adjustment, to return to the central value of the short-term fuel adjustment, and regain the control over the short-term fuel adjustment.
- Ideal fuel adjustment value is about 0%. Positive fuel adjustment value indicates that the ECU is adding the fuel to compensate for the too lean mixture. Negative fuel adjustment value indicates that the ECU is reducing the fuel amount to compensate for the too rich mixture.

### The setting conditions of DTC:

- When the system has no P0106, MAP sensor, IAT sensor, CTS sensor, TPS sensor, oxygen sensor, injector, crankshaft position sensor, camshaft position sensor, idle speed control system, misfire, canister purge circuit or other related fault code, the system goes into the closed-loop fuel control condition, the intake air temperature is greater than  $-7^{\circ}\text{C}$ , the atmospheric pressure is greater than 72kPa and the system voltage is greater than 11V, if the learning value of closed-loop fuel control is greater than 1.45 and lasts for more than 5s, the fault code P0171 is set. If the closed-loop fuel control learning value is less than 0.76 and lasts for more than 5s, the fault code P0172 is set.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine for road test, making the engine running under various operating conditions, then reread the fault code, and confirm whether the engine has other sensor or actuator fault code</li> </ul>	Go to Step 1	There is other sensor or actuator fault code	Refer to the corresponding chapter according to the DTC displayed on the diagnostic scanner to eliminate the fault, and then perform the inspection described in this chapter
1	Check air filter	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 2	Air filter blocked	Replace air filter assembly
2	Check the intake system pipeline	Normal	Faulty	Instruction
	Check whether the intake pipe leaks	Go to Step 3	Intake system pipe leakage fault	Repair the gas-leakage pipeline
3	Check the spark plug	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the spark plug</li> <li>Check the spark plug gap for normal working</li> </ul>	Go to Step 4	Spark plug clearance is too large	Replace spark plug
4	Check the ignition coil	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover, and whether the spark is normal</li> </ul>	Go to Step 5	Ignition coil fault	Replace ignition coil
5	Check the exhaust system pipeline	Normal	Faulty	Instruction
	Check the exhaust system pipeline for leakage	Go to Step 6	Exhaust system pipe leakage fault	Repair the gas-leakage pipeline
6	Check fuel system pressure	Normal	Faulty	Instruction
	Check if fuel system pressure is normal	Go to Step 7	Fuel system fault	Maintain the fuel system

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
7	Check injector	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Remove the injector, connect the injector to the injector detector</li> <li>Check whether the injector performance is normal</li> </ul>	Go to Step 8	Injector fault	Replace the faulty injector
8	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 12. Injector fault

P0261- No.1 cylinder injector circuit has low voltage fault

P0262- No.1 cylinder injector circuit has high voltage fault

P0264- No.2 cylinder injector circuit has low voltage fault

P0265- No.2 cylinder injector circuit has high voltage fault

P0267- No.3 cylinder injector circuit has low voltage fault

P0268- No.3 cylinder injector circuit has high voltage fault

P0270- No.4 cylinder injector circuit has low voltage fault

P0271- No.4 cylinder injector circuit has high voltage fault

### Description of fault code:

- The operating voltage of the injector is provided the main relay controlled by ECU, and the battery voltage is supplied to all injector wire harness connectors via the main relay and supplied to the injector.
- ECU connects the injector grounding wire through the wire harness, it is an internal grounding in ECU.
- ECU monitors the status of each injector driver circuit, if the engine detects that the voltage corresponding to the injector driver circuit injector driver circuit command status is incorrect, set a fault diagnosis code for the cylinder injector control circuit fault.

### The setting conditions of DTC:

- When engine running time > 0.5s, system voltage greater than 11V but less than 16V,

if the ECM detects the No.1 cylinder injection nozzle circuit is shorted to ground, the fault code P0261 is set. If the ECM detects the No.2 cylinder injection nozzle circuit is shorted to the 12V power supply, the fault code P0262 is set.

- After the fault code P0261 or P0262 appears, the system will disable the output driver of this injection nozzle and disable the closed-loop fuel control.

**Note:**

**Before carrying out this diagnosis steps, observe the data list on the fault diagnostic scanner and analyze the accuracy of the data to help quick troubleshooting.**

**HINT:**

Detection method of the No. 1 cylinder injector fault is same with the method of the other cylinders, here it only describes No. 1 cylinder injector fault. No. 1 cylinder injector fault detection method and detection of several other cylinder in line described here is only for No. 1 cylinder injector failure

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the injector connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check injector power supply line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect No.1 cylinder injector connector E18B.</li> <li>When the ignition switch is in "ON" position, check the voltage between the No. 1 terminal of E18B and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 2	The voltage is out of the specified range	Check the circuit between the fuse FS47 of central control box in the engine compartment and No.2 terminal of E18B for short-circuit and open-circuit.
3	Check injector	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect No.1 cylinder injector connector E18B.</li> <li>Measure whether the resistance between the two terminals of the injector is normal</li> </ul> Resistance: 12.0 Ω ±0.6 Ω	Go to Step 4	Injector fault	Replace fuel injector
4	Check the injector control circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B</li> <li>Check whether the line between the No. 6 terminal of the connector clip E01B and the No. 2 terminal of E18B has a short circuit or open circuit</li> </ul>	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 13. Misfire fault

P0300-Single-cylinder or multi-cylinder fire

#### Description of fault code:

1. Cylinder misfire is that the gas mixture can not combust normally in the cylinder due to various causes during the engine running.
2. If the ECU detects a misfire which may damage to the catalytic converter, the fault indicator will flash, then the engine should be turned off immediately.

3. When the engine running time >60s, and coolant temperature > 70°C , and the system detects the crankshaft position sensor speed fluctuation exceeds the set value, it will trigger the fault code. This fault code indicates that several cylinders misfire or the engine control m can not determine which cylinder misfires. Fault causes include mechanical fault, fuel metering error, too high or too low fuel pressure, vapor emission system fault, ignition system fault , intake system fault, etc.

#### The setting conditions of DTC:

1. When the system has no MAP sensor, CTS sensor, TPS sensor, crankshaft position sensor, camshaft position sensor, vehicle speed sensor or other related fault code, if in a stable operating condition, the ECM monitors the fluctuation of crankshaft rotation speed exceeds the threshold set by the system, the fault code P0300 is set.
2. After the system displays the fault code P0300, if the relatively low degree of misfire has only an impact on the emissions, only the fault code and is recorded and the data stream is frozen, and the MIL is lit. If the relatively high degree of misfire could cause the catalytic converter overheating, the system will be forced go into the fuel open-loop control condition and disable the correction learning of rear oxygen sensor. When the engine speed exceeds 2000r / min or 50 kPa MAP 超过 time, MIL lamp at 1Hz, prompting the driver immediately reduce engine speed and load, the repair station maintenance as soon as possible.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 2	Spark plug fault	Replace spark plug
2	Check the ignition coil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover spark is normal</li> </ul>	Go to Step 3	Ignition coil fault	Replace ignition coil
3	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 4	The assembly of timing belt fault	Replace it with a new timing belt
4	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 5	The assembly of timing belt fault	Re-install the valve timing belt
5	Check cylinder pressure	Normal	Faulty	Instruction
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 6	Cylinder pressure fault	Repair the cylinder pressure fault
6	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 7	Fuel system pressure fault	Overhaul the fuel system
7	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 8	Injector fault	Replace fuel injector
8	Check the intake system	Normal	Faulty	Instruction
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 9	The air leakage fault of intake system	Repair the faulty pipeline
9	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

#### 14. Knock sensor circuit fault

P0324-knock control system fault

P0325-knock sensor fault

##### Description of fault code:

- Knock sensor detects the shock when the engine speed changes. Knock sensor will express the knock in the form of voltage. The ECU will delay ignition to avoid shock when necessary. If this voltage is lower or higher than the calibration value, the fault code will appear. Fault causes include knock sensor circuit fault, knock sensor loosing, knock sensor fault in itself, etc.

##### The setting conditions of DTC:

- When the system has no knock-related failure, the engine running time is greater than 5s, the coolant temperature is greater than 50 °C, the engine speed is greater than 1600rpm and the average effective indicated pressure value is greater than 600kPa, the ECM detects the average value of the maximum signal of the knock sensor of each cylinder falls below the minimum threshold value set by the system, or exceeds the maximum threshold value set by the system, the fault code P0324 is set.
- When the difference between the engine speed is higher than 1600rpm, the coolant temperature is higher than 50 °C, engine running time is greater than 5s, indicate mean effective pressure is greater than 600kPa, no knock related failures, ECM monitored knock sensor signal of each cylinder less than the minimum threshold set by the system, set the fault code P0325.
- After the system displays the fault code P0324 or P0325, the default value set by the system is used as the ignition advance angle.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11~14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the knock sensor connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the knock sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the type and torque of the shock sensor fixing bolt are correct</li> <li>Disconnect the knock sensor connector clip E03B, and measure whether the resistance between the two terminals of sensor is normal</li> </ul> Resistance: > 1MΩ	Go to Step 3	Knock sensor fault	Replace the bolts and tighten the knock sensor with the specified torque or replace the shock sensor
3	Check the knock sensor line	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B and knock sensor connector E03B.</li> <li>Measure whether the lines between the No. 1 terminal of E03B and the No. 37 terminal of E01B, or the No. 2 terminal of E03B and the No. 36 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 15. Crankshaft position sensor circuit fault

P0335-Crankshaft position sensor circuit has no signal

P0336-crankshaft position sensor wire signal interference

#### Description of fault code:

1. Crankshaft position sensor informs the ECU of the current speed and position of the crankshaft. Crankshaft position sensor generates AC voltage with different amplitude and frequency. Frequency depends on the crankshaft speed. Output AC voltage depends on crankshaft position sensor. There is one fixing 58X variable reluctance rotor on crankshaft position sensor and crankshaft.
2. The engine control unit can calculate the ignition timing, fuel injection timing and knock ignition control according to the input signal of the crankshaft position sensor and the camshaft position sensor. Crankshaft position sensor is also used to detect misfire and tachometer display.

#### The setting conditions of DTC:

1. When the system has no camshaft position sensor failure, and the system is in the process of starting the engine, the ECM cannot monitor the valid engine speed pulse

signal within a certain time, the fault code P0335 is set.

2. When the engine is in operation, the sensor detects the number of cylinders is equal to 4. If the sensor detects the tooth signal deviation is too large, the fault code P0336 is set.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the crankshaft position sensor connector is loose or damaged, and whether the wire harness terminal is corroded
1	Inspect crankshaft position sensor.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>• Remove the crankshaft position sensor, and measure whether the resistance between the No. 1 terminal and the No. 2 terminal of the sensor is normal</li> </ul> Resistance: 1000 Ω ± 100 Ω	Go to Step 2	Crankshaft position sensor fault	Replace the crankshaft position sensor
2	Check the crankshaft position sensor shield wire	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the crankshaft position sensor connector clip E11B, and measure whether the resistance between the No. 3 terminal of E11B and the grounding is normal</li> </ul> Resistance: < 2 Ω	Go to Step 3	Sensor signal shield wire open circuit to ground	Repair the wire harness between the crankshaft position sensor and the grounding
3	Check crankshaft position sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B and crankshaft position sensor connector E11B</li> <li>Measure whether the lines between the No. 1 terminal of E11B and the No. 30 terminal of E01B, or the No. 2 terminal of E11B and the No. 11 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 16. Camshaft position sensor circuit fault

P0340- No signal of camshaft position sensor circuit/ intake VCP camshaft position sensor status diagnosis

P0341- Fault of camshaft position sensor circuit rationality/intake VCP target wheel diagnosis fault

**Description of fault code:**

1. Camshaft position sensor, transmits one cylinder TDC position (relative position of the valve) of the camshaft position to the ECU in the form of voltage signal.
2. when the ECU detects that the camshaft sensor signal is abnormal in a set period of time, the fault code will appear. Fault causes include camshaft position sensor circuit, joint, or fault in itself, or ECU fault, etc.

**The setting conditions of DTC:**

1. When the system has no crankshaft position sensor failure, the engine is in operation and the system finishes the judgment of No.1 cylinder signal, if the ECM monitors the camshaft status signals are the same for successive two times, the fault code P0340 is set.
2. When the system has no crankshaft position sensor failure, the engine is in operation and there is no no-camshaft sensor signal fault, the ECM detects the camshaft status signals are the same after the crankshaft rotating by two turns, the fault code P0341 is set.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the camshaft position sensor connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check the camshaft position sensor (intake side) line	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B and camshaft position sensor connector E04B</li> <li>Check whether the lines between the No. 1 terminal of E04B and the No. 77 terminal of E01B, the No. 2 terminal of E04B and the No. 74 terminal of E01B, or the No. 3 terminal of E04B and the No. 70 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 2	Circuit is short or open	Repair the faulty wire harness
2	Check the camshaft position sensor	Normal	Faulty	Instruction
	Check whether the O-ring of the camshaft position sensor is normal, whether the sensor is installed in place	Go to Step 3	O-ring is damaged and/or deformed	Replace the O-ring and clean the sensor
3	Replace and check (camshaft position sensor)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the camshaft position sensor, and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace camshaft position sensor	DTC still exists	Go to Step 4
4	Check the camshaft signal round	Normal	Faulty	Instruction
	Check whether the camshaft signal round is normal	Go to Step 5	Camshaft signal wheel damage	Replace camshaft assembly
5	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 6	The assembly of timing belt fault	Replace it with a new timing belt
6	Check the valve timing	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
		Go to Step 7	The assembly of timing belt fault	Re-install the valve timing belt
7	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 17. Ignition coil circuit fault

P0351-No. 1 cylinder ignition coil fault

P0352-No. 2 cylinder ignition coil fault

P0353-No. 3 cylinder ignition coil fault

P0354-No. 4 cylinder ignition coil fault

#### The setting conditions of DTC:

- When the engine running time > 0.5s and the system voltage greater than 11V but less than 16V, if the ignition circuit of No. 1 cylinder is short-circuited or open-circuited to the power supply or ground, the fault code P0351 is set. If the ignition circuit of No. 2 cylinder is short-circuited or open-circuited to the power supply or ground, the fault code P0352 is set. If the ignition circuit of No. 3 cylinder is short-circuited or open-circuited to the power supply or ground, the fault code P0353 is set. If the ignition circuit of No.4 cylinder is short-circuited or open-circuited to the power supply or ground, the fault code P0354 is set.
- When the system displays the fault code P0351, P0352, P0353, or P0354, the system will stop fuel injection of the corresponding cylinder and disable closed-loop fuel control which will produce the misfire fault code.

#### △ HINT:

- The detection method for No.1 cylinder's ignition coil failure is consistent with that for other cylinders. Here describes that for the failure of the ignition coil of No.1 cylinder only.



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	Check the ignition coil and ECM connectors for looseness, and check the harness terminals for corrosion and damage.
1	Check the ignition coil	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the ignition coil connector E22B.</li> <li>Measure the resistance between the two terminals of the ignition coil.</li> </ul> Primary coil resistance $0.71\ \Omega \pm 0.071\ \Omega$ Secondary winding resistance $8.7\text{k}\Omega \pm 0.87\text{k}\Omega$	Go to Step 2	The resistance is out of the specified range	Replace ignition coil
2	Check ignition coil power	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the ignition coil connector E22B.</li> <li>When the ignition switch is in the "ON" position, measure the voltage between No. 1 terminal of E22B wire harness and ground.</li> </ul> Voltage: 9V - 13V	Go to Step 3	The voltage is out of the specified range	Check the circuit between the ignition coil's wire harness connector E22B and the fuse FS46 of the central control box of the engine.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Check the ignition coil circuit.			
	<ul style="list-style-type: none"> <li>• Disconnect the engine control unit connector E01B and the ignition coil connector E22B.</li> <li>• Measure whether the lines between the No. 3 terminal of E22B and the No. 4 terminal of E01B, or the No. 2 terminal of E22B and the grounding has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check			
	<ul style="list-style-type: none"> <li>• Replace ECU and then perform road test</li> <li>• Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 18. Emission overrun fault

P0420- Low conversion efficiency of the catalytic converter

### Description of fault code:

1. ECU monitors the conversion efficiency of the three-way catalytic converter with the two oxygen sensors (front oxygen sensor and rear oxygen sensor) installed respectively in the front and rear of the three-way catalytic converter.
2. ECU performs closed-loop control to the air/fuel ratio with the front oxygen sensor, while monitors the oxygen content of the exhaust gas without purified by the three-way catalytic converter. Rear oxygen sensor transmits the oxygen content of the gas purified by the three-way catalytic converter to the ECU via voltage signal.
3. ECU calculates whether the current three-way catalytic converter is in normal working condition by contrasting the signals of the front and rear oxygen sensors. When the engine running time greater than 60 seconds, the coolant temperature is above 70°C, if the system detects that the rear oxygen sensor signal is lower or higher than the system value, i.e., it detects that the conversion efficiency of the three-way cata-

lytic converter is too low, the fault indicator will be on, then set the fault code.

### The setting conditions of DTC:

- When the system has no MAP sensor, temperature sensor, TPS sensor, cooling system, oxygen sensor, fuel correction, vehicle speed sensor, injector, misfire, crankshaft position sensor, camshaft position sensor, ignition system, idle speed control system, system voltage or other related fault code, the coolant temperature is higher than 70°C, the engine running time is greater than 440s, the fuel system is in the closed-loop mode, and the vehicle stops and the engine idles after the vehicle driving a certain distance at a constant speed, the system computes the oxygen storage time of the catalytic converter by comparing front and rear oxygen sensor signals. When the weighted oxygen storage time is less than the pre-set threshold, the system sets the fault code P0420.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether the rear oxygen connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the exhaust pipe	Normal	Faulty	Instruction
	Check the exhaust pipeline for leakage	Go to Step 3	Exhaust pipe leakage fault	Check the exhaust pipe fault
3	Check rear oxygen sensor	Normal	Faulty	Instruction
	Check whether the rear oxygen sensor signal is normal	Go to Step 4	Rear oxygen sensor fault	Replace rear oxygen sensor
4	Check three-way catalytic converter	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the three-way catalytic converter is replaced within the specified time	Go to Step 5	Three-way catalytic converter fault	Replace three-way catalytic converter
5	Check the fuel	Normal	Faulty	Instruction
	Confirmed whether added the fuel which does not meet the engine model before, and did not replace the three-way catalytic converter	Go to Step 6	Three-way catalytic converter fault	Replace three-way catalytic converter
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 19. Canister control valve circuit fault

P0458- Canister solenoid circuit shorted to low voltage or open-circuited

P0459- Canister solenoid valve output shorted to high voltage

#### Description of fault code:

- Vapor emission system guide the gasoline vapor in the fuel tank into the tank containing the activated carbon which can absorb the gasoline vapor. Engine will suck the gasoline vapor in the engine combustion chamber through the fresh air.
- If the ECU detects that the canister control valve circuit of the vapor emission system has a short circuit or open circuit, the fault code will appear. Fault causes include carbon canister control valve control circuit open circuit, canister control valve control circuit open or shorted to ground, canister control valve fault in itself, ECU fault, etc.

#### The setting conditions of DTC:

- When the engine running time > 0.5s and the system voltage greater than 11V but less than 16V, if the ECM monitors the canister solenoid circuit is shorted to high voltage of 12V, the system sets the fault code P0459. If the ECU detects the canister solenoid valve circuit is shorted to ground, the system sets the fault code P0458.
- After the system displays the fault code P0458 or P0459, the system will disable the function of the canister control valve circuit.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection			
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the canister control valve connector is loose or damaged, and whether the wire harness terminal is corroded
1	Check canister control valve			
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Remove the canister control valve, and measure whether the resistance value between two stitches of the solenoid valve is normal</li> </ul> Resistance: 19Ω~22Ω (20℃ )	Go to Step 2	Canister control valve fault	Replace the canister control valve.
2	Check canister control valve power supply line			
	<ul style="list-style-type: none"> <li>Disconnect the canister control valve connector E05B.</li> <li>When the ignition switch is in "ON" position, check the voltage between the No. 2 terminal of E05B and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 3	The voltage is out of the specified range	Check the circuit between the fuse FS47 of central control box in the engine compartment and No.2 terminal of E05B for short-circuit and open-circuit.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Check canister control valve control circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the ECU connector clip E01B and the canister control valve connector clip E05B</li> <li>Check whether the line between the No. 64 terminal of E01B and the No. 1 terminal of E05B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 20. Cooling fan relay circuit failure

P0480- Low speed fan fault.

P0481-High speed fan fault.

### Description of fault code:

- Cooling fan high and low speed relay coil operating power is supplied by the main relay controlled by the ECU, and the ECU controls the relay through the wire harness connector. Engine control unit is provided with a driver circuit control relay coil grounding.
- Driver circuit is equipped with a feedback circuit for the ECU, and the ECU determines whether the control circuit has a open circuit, short circuit to ground or short circuit to voltage.
- When the engine running time is greater than 60s, and the coolant temperature is greater than 93°C , the low-speed fan will be turned on. When the engine running time is greater than 60s, and the coolant temperature is greater than 196°C , the high-speed fan will be turned on.

### The setting conditions of DTC:

- When the engine running time > 0.5s and the system voltage greater than 11V but

less than 16V, if the ECM monitors the control circuit is short-circuited to the power supply or ground, the system sets the fault code P0480. If the ECM detects that the circuit is short-circuited or open-circuited to the power supply or ground, the system sets the fault code P0481.

2. After the system displays the fault code P0480, the system will turn on the high-speed fan.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection			
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then re-read the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check the connector of engine control unit for looseness, damage and check the terminal of wire harness for corrosion
1	Check fan relay			
	Remove the engine compartment fuse box K08 (fan speed regulation), K09 (high-speed fan), and K10 (low-speed fan) relays, and check whether the relays are normal	Go to Step 2	Relay failure	Replace the faulty relay
2	Check the cooling fan control line			
		Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Unplug the relays of K10 (low-speed fan), K09 (high-speed fan), and disconnect the ECU connector clip E01B</li> <li>Measure whether the lines between the engine compartment fuse box K10 and the No. 65 terminal of E01B, or K09 and the No. 17 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Check the cooling fan circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the cooling fan connector U09.</li> <li>Check whether the appearance of the cooling fan is in good condition.</li> <li>Check conduction between the No. 1 and No. 3 terminals, as well as No.2 and No. 4 terminals of the cooling fan.</li> </ul>	Go to Step 4	The existence of short-circuit, open circuit failure or damage to the cooling fan	Repair the faulty wire harness or replace the cooling fan.
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 21. Vehicle signal fault

P1502- Vehicle-speed sensor signal failure

### Description of fault code:



1. The speed signal checked by the wheel speed sensor is sent to the ECU after processing of ABS and the instrument cluster.
2. The fault code will appear when the ECU can not receive the speed signal.

#### The setting conditions of DTC:

1. When the engine is in operation, the system voltage is greater than 11V but less than 16V, the water temperature is greater than 60°C, and the system has no intake pressure sensor, water temperature sensor, electronic throttle position sensor, injector, ignition coil or misfire fault:

In deceleration mode: Intake pressure compensation value  $\leq$  22kPa, engine speed  $>$  1600rpm but  $<$  6500rpm, electronic throttle position  $<$  0.8%, engine speed fluctuation  $<$  75rpm, vehicle speed less than 5km / h (for more than 7.5s).

In acceleration mode: Intake pressure compensation value  $>$  60kPa, engine speed  $>$  1600rpm but  $<$  4500rpm, electronic throttle position  $<$  70% but  $>$  20%, vehicle speed less than 5km/h (for more than 45s).

The system sets the fault code P1502.

2. When the system displays the fault code P1502, the vehicle speed output is the default value.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the wheel speed sensors, ABS control unit and engine control unit connector become loose or damaged, and whether the harness terminals are corroded.
1	Read ABS data stream.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and enter the ABS system</li> <li>Start the engine for road test. Check whether the speed display is normal under various operating conditions.</li> </ul>	Go to Step 2	ABS ECU or wheel speed sensor fault	Check the ABS control unit, wheel speed sensors and wire harnesses.
2	Check the ECUCAN communication line.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>With the ignition switch "OFF", check the resistance between No. 38 and No. 39 terminals of E01B.</li> </ul> Resistance: 120 Ω	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 22. Too low or too high idle speed fault

P0506-Low idle speed

P0507- High idle speed

### Description of fault code:

- The ECU calculates the current engine speed based on the current working condition, and controls the opening of the throttle by controlling the electronic throttle flap drive motor to control or adjust the target idle speed, thus adapting idle speeds under different conditions.
- If the ECU detects that the engine speed is lower or higher than the set value for a long time, the fault code will appear. Fault causes include electronic throttle control module, intake system, fuel system, ignition system, ECU, etc.

### The setting conditions of DTC:

1. When the system has no MAP sensor, water temperature sensor, TPS sensor, cooling system, oxygen sensor, fuel correction, vehicle speed sensor, injector, misfire, crankshaft position sensor, camshaft position sensor, ignition system or other related fault code, if the fuel concentration of the canister is less than 100%, the atmospheric pressure is greater than 72KPa, the engine running time is greater than 60s, the intake air temperature is greater than  $-20^{\circ}\text{C}$ , the coolant temperature is greater than  $60^{\circ}\text{C}$ , the intake manifold pressure is less than 60KPa, the battery voltage is greater than 11V but less than 16V and the engine speed is lower than the target idling speed by more than 100rpm, the system sets the fault code P0506.
2. When the system has no MAP sensor, water temperature sensor, TPS sensor, cooling system, oxygen sensor, fuel correction, vehicle speed sensor, injector, misfire, crankshaft position sensor, camshaft position sensor, ignition system or other related fault code, if the fuel concentration of the canister is less than 100%, the atmospheric pressure is greater than 72KPa, the engine running time is greater than 60s, the intake air temperature is greater than  $-20^{\circ}\text{C}$ , the coolant temperature is greater than  $60^{\circ}\text{C}$ , the intake manifold pressure is less than 22KPa, the battery voltage is greater than 11V but less than 16V and the engine speed is lower than the target idling speed by more than 200rpm, the system sets the fault code P0507.
3. When the system displays the fault code P0506 or P0507, the system disables the function to adjust idling-speed.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Restart the engine to perform road test, making the engine running under various operating conditions, then reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the electronic throttle, accelerator pedal position sensor connector clip are loose or damaged, whether the wire harness terminal is corroded
1	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 2	Spark plug fault	Replace spark plug
2	Check the ignition coil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover spark is normal</li> </ul>	Go to Step 3	Ignition coil fault	Replace ignition coil
3	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 4	The assembly of timing belt fault	Replace it with a new timing belt
4	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 5	The assembly of timing belt fault	Re-install the valve timing belt
5	Check cylinder pressure	Normal	Faulty	Instruction
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 6	Cylinder pressure fault	Repair the cylinder pressure fault
6	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 7	Fuel system pressure fault	Overhaul the fuel system
7	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 8	Injector fault	Replace fuel injector
8	Check the intake system	Normal	Faulty	Instruction
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 9	The air leakage fault of intake system	Repair the faulty pipeline
9	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 23. Power-assisted steering switch circuit fault

P0551-Power steering switch circuit voltage range/ performance fault

#### Description of fault code:

- When steering, the power-assisted steering switch is turned on, and the ECU controls the engine speed rise to compensate for the idling-speed.
- When the internal detection circuit of the ECM detects the circuit is normally open or normally closed, this fault code will appear.

#### The setting conditions of DTC:

- When the engine is in operation, the vehicle speed is greater than 60km/h and the accelerator pedal opening is between 20% -50%, and all the above conditions are satisfied and last 6s or more, if the ECM monitors the power-assisted steering switch moves, the system sets the fault code P0551.
- When the system displays the fault code P0551, the system will turn off the function for cutting off the air conditioning when power-assisted steering, and turn off the idling compensation related to the power-assisted steering (such as idling speed boost compensation).

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the power-assisted steering switch connector for looseness and damage, and check the harness terminals for corrosion.
1	Check the power-assisted steering switch.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	When the ignition switch is in the "OFF" position, check whether the power-assisted steering switch is installed in place.	Go to Step 2	Power-assisted steering switch assembly failure	Reinstall the power-assisted steering switch.
2	Check the brake switch	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect the power-assisted steering switch connector E17B, and check whether the power-assisted steering switch is in good condition.</li> </ul>	Go to Step 3	Power-assisted steering switch failure	Replace the power-assisted steering switch.
3	Check the power-assisted steering switch circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connector E01B and the power-assisted steering switch connector E17B.</li> <li>Check whether the line between the No. 60 terminal of E01B and the No. 1 terminal of E17B has a short circuit or open circuit</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 24. System supply voltage fault

P0562- System voltage is low

P0563-System voltage is high

### Description of fault code:

- When the ECU detects that the system voltage is continuously higher than 16V or lower than 9V for up to 5s, the fault code will appear. Fault causes include alternator fault, voltage regulator, ECU fault, etc.

### The setting conditions of DTC:

- When the engine is running and the system voltage is below 11V, the system sets the fault code P0562. When the system voltage is greater than 16V, the system sets the fault code P0563.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine to perform road test, reread the fault code, and confirm whether the engine, ABS and other control modules appear the same fault code.</li> </ul>	If the other system occurs this fault code, go to Step 2	Other systems have no such fault code	Check whether the ECU power system line is normal, replace the ECU when necessary, and perform the fourth step
2	Check the alternator voltage output line	Normal	Faulty	Instruction
	Check whether the line between the alternator b + column and the battery is connected normally	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Read the data flow.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Clear the fault code, and connect the vehicle diagnosis scanner</li> <li>Read the alternator data flow, and observe whether the generating capacity is normal under various conditions</li> </ul>	Go to Step 4	Alternator fault	Replace the alternator
4	Check ECM fuse and relay	Normal	Faulty	Instruction
	Check whether the fuse FS06 of the central control box in the driver's compartment, the fuse FS05 of the central control box in the engine compartment, the main relay's fuse SB07 and the main relay K05 are in good conditions.	Go to Step 5	Fuse or relay failure	Replace the fuse or relay with the same specification.
5	Check ECM power supply cord	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B</li> <li>When the ignition switch is in "ON", check the voltages between the No. 44, No. 67, and No. 68 terminal of E01B and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Check the ECM grounding wire	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B</li> <li>Check the resistance between No. 2 and No.3 terminal of E01B and grounding Resistance: <math>&lt; 2 \Omega</math></li> </ul>	Go to Step 7	Circuit is short or open	Repair the faulty wire harness
7	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 25. Cruise control switch circuit fault

P0564- Cruise control input circuit fault

P0565- Cruise "ON /OFF" signal stuck /interfered

P0566- Cruise "Cancel" signal stuck/interfered

P0567- Cruise "Resume" signal stuck/interfered

P0568- Cruise "Set" signal stuck/interfered

### The setting conditions of DTC:

- When the ignition switch is turned to "ON", if the input voltage of cruise switch exceeds the normal range, the fault code P0564 is set. If the system detects that the cruise switch button is pressed and held there for a long time, or the signal is interfered, then the appropriate fault code is set.
- When the fault code P0564, P0565, P0566, P0567, or P0568 appears, the system disables the cruise function.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the steering wheel's multifunction switch connector for looseness and damage, and check the harness terminals for corrosion.
2	Check the steering wheel's cruise switch.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in the "OFF" position, disconnect the clock spring connector I18.</li> <li>Press the cruise switch button accordingly to measure the resistance between the No. 11 and No. 12 terminals of the clock spring connector.</li> </ul>	Go to Step 3	Resistance value is fixed, or changes abnormally.	Replace the steering wheel's cruise switch.
3	Check the cruise switch circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the clock spring connector I18 and the ECM connector E01B</li> <li>Check the continuity between No. 11 terminal of I18 and No. 26 terminal of E01B, and between No. 12 terminal of I18 and No. 76 terminal of E01B.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Replacement and check	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Replace ECU and then perform road test</li> <li>• Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 26. Brake light signal irrationality fault

P0504- brake switch correlation fault

P0571 - Brake switch signal circuit failed or correlation not synchronized

### Description of fault code:

1. The ECU confirms whether the vehicle is in decelerating state via the brake signal, and cuts off the fuel injection to reduce fuel consumption and exhaust emission via this signal, thus protecting the three-way catalytic converter.
2. If the ECU detects that the brake signal circuit voltage is lower or higher than the calibration value, the fault code will appear.

### The setting conditions of DTC:

1. When the vehicle speed is greater than 20km/h and keeps it for more than 1s, the system detects the vehicle deceleration is greater than 6m/s<sup>2</sup> until the vehicle speed slows down below 3km/h, and the ECM monitors the state of the brake pedal is not changed within a certain time, the fault code P0571 is set.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the brake switch connector is loose or damaged, whether the wire harness terminal is corroded
1	Check fuse	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS17, FS19 is blown.	Go to Step 2	Fuse is blown	Replace the fuse with the same specification.
2	Check the brake switch	Normal	Faulty	Instruction
	When the ignition switch is in "OFF" position, check whether the brake switch is installed in place	Go to Step 3	Brake switch assembly fault	Reinstall the brake switch
3	Check the brake switch	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the brake switch connector clip I05, and remove the brake switch, check whether the brake switch is normal</li> </ul>	Go to Step 4	Brake switch failure	Replace the brake switch
4	Check the brake switch power wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect the brake switch connector I05.</li> <li>When the ignition switch is in "ON" position, check the voltages between the No. 1 and No. 3 terminal of I05 and the grounding</li> </ul> Voltage: 9V - 13V	Go to Step 5	The voltage is out of the specified range	Repair the short circuit and open circuit between the brake switch and the passenger compartment fuse box

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
5	Check the brake switch signal wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B and brake switch connector I05</li> <li>Measure whether the lines between the No. 33 terminal of E01B and the No. 2 terminal of I05, or the No. 69 terminal of E01B and the No. 4 terminal of I05 has a short circuit or open circuit</li> </ul>	Go to Step 6	Circuit is short or open	Repair the faulty wire harness
6	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 27. ECM inside fault

P0602-ECM programming error (mismatched software version)

P0606-ECM processor fault

P060A-ECM processor fault

### Description of fault code:

- ECU fault Fault causes include ECU fault, attempting to change the module calibration, module programming error, etc. When the fault code appears, delete it and observe whether it will appear again. If it appears again soon, it indicates that the electronic module needs to be replaced in most cases.

### The setting conditions of DTC:

- When the ignition switch is turned to "ON", the ECU detects the calibration file and the program file are mismatched, the fault code P0602 is set. If the ECM detects that the primary processor function module fails, the fault code P0606 is set. If the ECM detects the safety monitoring logic fails, the fault code P060A is set.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Whether ECM connector clip stitch is loose or corroded.
2	Check ECM power supply circuit	Normal	Faulty	Instruction
	Check whether ECM grounding and the power wire are normal	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## 28. Oil pump relay circuit failure

P0230- fuel pump relay fault

### Description of fault code:

- Pump relay coil operating power is supplied by the main relay controlled by ECM.
- ECM controls the pump relay pull-in through the wire harness connector. Confirm whether the engine runs at the wrong gear, the engine runs in neutral at high speeds, and the wheel slips on wet or snowy ground at high speed

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the fuel pump relay is loose or corroded
1	Check fuse and relay	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS09 is normal	Go to Step 2	Fuse is blown	Replace the fuse with the same specification.
2	Check the fuel pump relay	Normal	Faulty	Instruction
	Unplug the fuel pump relay K06, and check whether the fuel pump relay is normal	Go to Step 3	Relay failure	Replace the fuel pump relay
3	Check the fuel pump relay power wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the negative battery terminal.</li> <li>Unplug the fuel pump relay K06, and pull out the fuse FS09</li> <li>Check whether the line between FS09 and K06 is conducted</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Check the pump relay control line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect ECM connector clip E01B, and pull out the fuel pump relay</li> <li>Measure whether the line between the engine compartment fuse box fuel pump relay K06 and the No. 9 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
5	Replacement and check			
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

## 29. Compressor relay circuit failure

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P0646- Air-conditioning clutch relay circuit short-circuited to low voltage or open circuited,

P0647- Air-conditioning clutch relay circuit short-circuited to high voltage

### Description of fault code:

- The air conditioning pulley is in idle running when the air conditioning is shut down, it will drive the compressor to run only when it combines with the air conditioning clutch (under the action of the solenoid valve) Air conditioning clutch relay controls the separation and combination of the clutch.
- If ECM still detects a significant current when the air conditioning clutch relay control circuit is grounded, or can not detect current when the air conditioning clutch relay control circuit is not grounded, the fault code will appear.

### The setting conditions of DTC:

- When the engine running time > 0.5s and the system voltage greater than 11V but less than 16V, if the ECM monitors the air-conditioning clutch relay circuit is short-circuited to ground or open-circuited, the system sets the fault code P0646. If the ECM detects the air-conditioning clutch relay circuit is shorted to 12V voltage, the system sets the fault code P0647.
- When the fault code P0646 or P0647 appears, the system will disable drive of the air-conditioning clutch relay.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection			
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check the compressor relay for looseness and corroded terminals.



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check fuse	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS047 is normal	Go to Step 2	Fuse is blown	Replace the fuse with the same specification.
2	Check compressor relay	Normal	Faulty	Instruction
	Remove the compressor relay K07, and check whether the compressor relay is normal	Go to Step 3	Relay failure	Replace compressor relay
3	Check the compressor relay power wire	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Unplug the compressor relay K07, and pull out the fuse FS47.</li> <li>Check the line between FS47 and K07 for conduction.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
4	Check the compressor relay control line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect ECM connector clip E01B, and pull out the compressor relay</li> <li>Measure whether the line between the engine compartment central fuse box relay K73 and the No. 10 terminal of E01B has a short circuit or open circuit</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 30. Main relay output voltage irrationality failure

P0685- Main relay fault

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#### Description of fault code:

- With the ignition switch "ON", the main relay is closed. Main relay provides the voltage to various sensor actuators ensuring normal operation of the engine.
- If the ECM detects that the main relay output voltage is improper for some time, this fault code will be triggered.

#### The setting conditions of DTC:

- When the ignition switch is in the "ON" position, or the engine is in operation, the system voltage is greater than 11V and less than 16V, if the ECM monitors the failures of the equipment powered by the main relay are larger than a certain number of failures, the system set the fault code P0685.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Restart the engine for road test and re-read the fault code, and then check whether the fault code still exists.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the main relay and ECU wire harness connectors are firmly connected.
1	Check the alternator voltage output line	Normal	Faulty	Instruction
	Check whether the line between the alternator b + column and the battery is connected normally	Go to Step 2	Circuit is short or open	Repair the faulty wire harness

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
2	Read the data flow.			
	<ul style="list-style-type: none"> <li>Clear the fault code, and connect the vehicle diagnosis scanner</li> <li>Start the car and read the alternator data flow, and observe whether the generating capacity is normal under various conditions</li> </ul>	Go to Step 3	Alternator fault	Replace the alternator
3	Check ECM fuse and relay			
	Check whether the SB07 and FS47 fuses of the central control box in engine compartment and the relay K05 are in good conditions.	Go to Step 4	Fuse or relay failure	Replace the fuse or relay with the same specification.
4	Check the main relay output power line.			
	<ul style="list-style-type: none"> <li>Disconnect the engine control unit connectors E01B</li> <li>When the ignition switch is in "ON", check the voltage between the No. 5 terminal of E01B and the grounding Voltage: 9V - 13V</li> <li>Check the circuit between No. 5 terminal of E01B and the fuse FS47 of the central control box in the engine compartment for short-circuit to ground or power supply.</li> </ul>	Go to Step 5	Circuit is short or open	Repair the faulty wire harness
5	Replacement and check			
		Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 31. Fault of communication of ECM with TCU

P0700-TCU and ECU communication failure

Loss of communication of U0101-ECM with ECU (C101)

12B

#### Description of fault code:

- ECM detects a communication fault of TCU. Fault causes include CAN data cable communication problem, or maybe ECM fault in itself.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check whether ECM and TCM connector clips are loose or damaged, whether the terminals are corroded
2	Check the CAN communication line between ECM and TCU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> <li>Disconnect the engine control unit connectors E01B and the transmission control unit connector U16</li> <li>Measure whether the lines between the No. 39 terminal of E01B and the No. 10 terminal of U16, or the No. 38 terminal of E01B and the No. 20 terminal of U16 has a short circuit or open circuit</li> </ul>	Go to Step 3	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the transmission control unit for road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the transmission control unit.	Fault still exists	Go to Step 4
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 32. Electronic throttle body failure

P0641-ETC reference voltage A # amplitude fault

P0651-ETC reference voltage B # amplitude fault

P1516-ETC drive steady diagnosis error

P2101-ETC drive second-order diagnosis error

P2119- Electronic throttle return failure

#### Description of fault code:

1. In the electronic throttle control (ETC) system, the accelerator pedal position (APP) sensor transmits the accelerator pedal position to the throttle control module in the form of an electrical signal, as reference for the throttle actuator to control the throttle opening.
2. Throttle actuator is a stepper motor, and controls the throttle opening according to the command of the throttle control module.
3. if the desired throttle position has a greater difference to the actual throttle position under the steady state, and the throttle fails to achieve the due opening of return and starting test, the fault code may be recorded. While there may be accompanied by difficult start of the engine, etc.

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#### The setting conditions of DTC:

1. When the ignition switch is in the "ON" position, if the B voltage of the 5V reference voltage powered by the sensor is higher than 5.5V or below 4.5V and this state lasts for more than 500ms, the system sets the fault code P0651.
2. When the ignition switch is in the "ON" position, the throttle opening fluctuation is less than 5% and lasts for at least 1s, and the difference between the actual throttle opening and the estimated one (absolute value) exceeds a certain value (e.g,20%) and this state lasts for more than 300ms, the fault code P1516 is set.
3. When the ignition switch is in the "ON" position, the difference between the actual throttle opening and the estimated one (absolute value) exceeds a certain value (e.g,5%) and this state lasts for more than 240ms, the fault code P2101 is set.
4. When the ignition switch is in the "ON" position, the default position of the electronic throttle is between 10%~34%, and the time for the throttle to return to the default position is greater than a certain value (e.g. 1s) and this state lasts for over 240ms, the fault code P2119 is set.
5. When the system displays the fault code P0651, P1516, P2101 or P2119, if there is no other fault, the engine will work in a normal state. But if either the throttle position sensor failure or MAP sensor failure appears at the same time, the electronic throttle will work in protected mode, so that the engine will run in Follow Me Home mode and its engine output torque will be limited.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is sporadic. Check the connector of electric throttle body for looseness, damage and check the terminal of wire harness for corrosion
2	Check the throttle valve body	Normal	Faulty	Instruction
	Check whether the throttle flap is normal, its rotation is smooth or not, and check whether the electronic throttle body is dirty	Go to Step 3	Electronic throttle controller fault or excessive carbon deposit	Clean the electronic throttle body or replace the electronic throttle controller
3	Check electronic throttle body controller	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle controller and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 4	Electric throttle body fault	Replace the electronic throttle controller, and perform self-learning to the electronic throttle
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 33. Forced engine idling failure

P2104- Forced engine idling

### The setting conditions of DTC:

1. When the ignition switch is in the "ON" position, if two or more of the following conditions are detected, you can determine the problem is:
  - Pedal position sensor (1) short-circuited or open-circuited
  - Pedal position sensor (2) short-circuited or open-circuited
  - Throttle position sensor (1) and pedal position sensor (2) display mismatched positions (correlation checkout fault of two inputs).
  - Throttle sensor (1) short-circuited or open-circuited
  - Throttle sensor (2) short-circuited or open-circuited
  - If the throttle position sensor (1) and pedal position sensor (2) display mismatched positions (correlation checkout fault of two inputs), the system sets the fault code P2104.
2. When the system displays the fault code P2104, the electronic throttle will work in protected mode, so that the engine will run in Follow Me Home mode and its engine output torque will be limited. If the engine does not respond to the accelerator pedal signal, the engine can only work in the idling state around 800rpm. If you carefully engage the transmission, the vehicle can move at very low speed.

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Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	For an occasional failure, check the electronic accelerator pedal and electronic throttle connector for looseness and corroded terminals.
2	Check the data flow	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, read the data streams of the accelerator pedal position and the electronic throttle position.</li> <li>Depress the accelerator pedal, and check whether the data streams of the accelerator pedal position and the electronic throttle position change.</li> </ul>	Go to Step 6	Data stream is abnormal.	Go to Step 3
3	Check the accelerator pedal position sensor and its line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the accelerator pedal position sensor is installed properly.</li> <li>Disconnect the accelerator pedal position sensor connector E12B and the ECM connector E01B.</li> <li>Check whether the resistance between the terminals of accelerator pedal position sensor is normal.</li> <li>Check the harness between the accelerator pedal position sensor connector and the ECM connector for short circuit or open circuit</li> </ul>	Go to Step 4	Accelerator pedal position sensor is damaged or its circuit is short-circuited or open-circuited.	Replace the accelerator pedal position sensor assembly or repair the faulty harness.
4	Check the throttle valve body	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
	Check whether the throttle flap is normal, its rotation is smooth or not, and check whether the electronic throttle body is dirty	Go to Step 5	Electronic throttle controller fault or excessive carbon deposit	Clean the electronic throttle body or replace the electronic throttle controller
5	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle controller and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 6	Electric throttle body fault	Replace the electronic throttle controller, and perform self-learning to the electronic throttle
6	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 34. Forced engine shutdown failure

P2105- Forced engine shutdown

#### The setting conditions of DTC:

- When the ignition switch is in the "ON" position, if the following fault is detected at the same, you can determine:
  - MAP sensor fault
  - If the throttle sensor fails or throttle drive fails, the system sets the fault code P2105.
- When the system displays the fault code P2105, the ECM cuts off the ignition for injection and turns off the control over the electronic throttle. Then, the engine shuts down immediately.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, and then read and clear the DTC</li> <li>Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	For an occasional failure, check the intake pressure and temperature sensor and electronic throttle connector for looseness and corroded terminals.
2	Check the data flow	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the diagnostic scanner, read the data streams of the intake pressure and throttle position sensors.</li> <li>Depress the accelerator pedal, and check whether the data stream of the throttle position changes accordingly.</li> </ul>	Go to Step 6	Data stream is abnormal.	Go to Step 3
3	Check the intake pressure and temperature sensor and its harness.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the intake pressure and temperature sensor is installed properly.</li> <li>Disconnect the intake air pressure and temperature sensor connector E16B and ECM connector E01B.</li> <li>Check the harness between the intake pressure and temperature sensor connector and the ECM connector for short circuit or open circuit.</li> </ul>	Go to Step 4	Intake pressure and temperature sensor is damaged or its circuit is short-circuited or open-circuited.	Replace the intake pressure and temperature sensor or repair the faulty harness.
4	Check the throttle valve body	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the throttle flap is normal, its rotation is smooth or not, and check whether the electronic throttle body is dirty	Go to Step 5	Electronic throttle controller fault or excessive carbon deposit	Clean the electronic throttle body or replace the electronic throttle controller
5	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle controller and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 6	Electric throttle body fault	Replace the electronic throttle controller, and perform self-learning to the electronic throttle
6	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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### 35. Fault of engine in "Follow Me Home " mode

P0068- Electronic throttle air flow error

P2106- Engine performance limit

P2110- Engine power management

#### The setting conditions of DTC:

- When the engine running time is  $> 0.5s$ , there is no intake pressure sensor fault (P0105, P0106, P0107, P0108) or intake temperature sensor fault (P0112, P0113), and the difference between the air flow calculated by using the speed density method and that forecasted based on the electronic throttle position is  $> 9g/s$  and this state lasts for  $> 4s$ , if the ECM monitors the front oxygen sensor heating circuit is shorted to the 12V power supply, the system sets the fault code P0068.
- When the ignition switch is turned to "ON" from "ACC", the system detects the pedal position sensor (1) short-circuited or open-circuited and the pedal position sensor (2) is short-circuited or open-circuited, and the pedal position sensor (1) and the pedal position sensor (2) display mismatched positions, the system sets the fault code P2106.

3. When the ignition switch is turned to "ON" from "ACC" and the system detects the throttle position sensor (1) short-circuited or open-circuited, the system sets the fault code P2110.
4. When the system displays the fault code P0068, P2106, or P2110, the electronic throttle will work in protected mode so that the engine operates in Follow Me Home mode. The engine output torque will be limited. When idling, the engine output fluctuation is relatively obvious, and this mode ensures that the vehicle can be driven reluctantly, but it is difficult to control driving in normal traffic or climbing a steep slope.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	For an occasional failure, check the intake pressure and temperature sensor and electronic throttle connector for looseness and corroded terminals.
2	Check the data flow	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and read the data streams of the accelerator pedal sensor, throttle position sensor and front oxygen sensor.</li> <li>• Depress the accelerator pedal, and check whether the data stream of the throttle position changes accordingly.</li> </ul>	Go to Step 6	Data stream is abnormal.	Go to Step 3
3	Check the front oxygen sensor and its harness.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the front oxygen sensor connector E09B and ECM connector E01B.</li> <li>Check whether the resistance between terminals 3 and 4 of front oxygen sensor are normal.</li> <li>Check the wire harness between front oxygen sensor connector and ECM connector for short-circuit or open-circuit.</li> </ul>	Go to Step 4	Front oxygen sensor is damaged or its circuit is short-circuited or open-circuit.	Replace the front oxygen sensor or repair the faulty harness.
4	Check the accelerator pedal position sensor and its line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the accelerator pedal position sensor is installed properly.</li> <li>Disconnect the accelerator pedal position sensor connector E12B and the ECM connector E01B.</li> <li>Check whether the resistance between the terminals of accelerator pedal position sensor is normal.</li> <li>Check the harness between the accelerator pedal position sensor connector and the ECM connector for short circuit or open circuit</li> </ul>	Go to Step 5	Accelerator pedal position sensor is damaged or its circuit is short-circuited or open-circuited.	Replace the accelerator pedal position sensor assembly or repair the faulty harness.
5	Check the throttle valve body	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	Check whether the throttle flap is normal, its rotation is smooth or not, and check whether the electronic throttle body is dirty	Go to Step 6	Electronic throttle controller fault or excessive carbon deposit	Clean the electronic throttle body or replace the electronic throttle controller
6	Check electronic throttle body	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the electronic throttle controller and perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 7	Electric throttle body fault	Replace the electronic throttle controller, and perform self-learning to the electronic throttle
7	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 36. Electronic accelerator pedal circuit fault

P2122- Electronic accelerator pedal position sensor 1# circuit has low voltage.

P2123- Electronic accelerator pedal position sensor 1# circuit has high voltage.

P2127- Electronic accelerator pedal position sensor 2# circuit has low voltage.

P2128- Electronic accelerator pedal position sensor 2# circuit has low voltage.

P2138- Electronic accelerator pedal position sensor 1#, 2# has relative fault.

#### Description of fault code:

- In the electronic throttle control system, the electronic accelerator pedal position sensor transmits the accelerator pedal position to the throttle control module in the form of an electrical signal, as reference for the throttle actuator to control the throttle opening.
- For the security of the system, the accelerator pedal position sensor is a provided with a dual-sensor setting, and its type is slip resistance.
- Fault causes include electronic accelerator pedal position circuit open, electronic accelerator pedal position sensor fault in itself, ECM fault, etc.

### The setting conditions of DTC:

1. When the engine is running, if the ECM detects the signal value of APS sensor circuit (1) is less than 3.5%, the system sets the fault code P2122. If the ECM detects the signal value of APS sensor circuit (1) is greater than 97.5%, the system sets the fault code P2123.
2. When the engine is running, if the ECM detects the signal value of APS sensor circuit (2) is less than 3.5%, the system sets the fault code P2127. If the ECM detects the signal value of APS sensor circuit (2) is greater than 97.5%, the system sets the fault code P2128.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check whether the accelerator pedal position sensor connector clip stitch is loose or corroded
1	Check the accelerator pedal position sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Disconnect the accelerator pedal position sensor connector clip E12B and ECM connector clip E01B</li> <li>• Measure whether the lines between respective terminals of E12B and E01B have short circuit or open circuit</li> </ul>	Go to Step 2	Circuit is short or open	Repair the faulty wire harness
2	Read the data flow.	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnosis scanner, and read the data flow</li> <li>Respectively Check the opening of the accelerator pedal and the opening of the electronic throttle when depressing and not depressing the accelerator pedal</li> </ul> <p>Hint: Electronic throttle opening should increase synchronously with the increasing of the accelerator pedal opening.</p>	Go to Step 3	Accelerator pedal position sensor damaged	Replace the accelerator pedal position sensor
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 37. Air-fuel ratio overrun or oxygen sensor aging

P1167-Enrichment of front oxygen during fuel cut for deceleration

P1171-Dilution of front oxygen during enriching for acceleration

P2187- Lean fuel system under idling condition

P2188- Rich fuel system under idling condition

P2A01- Slow response of rear oxygen sensor to fuel cutoff for deceleration

#### Description of fault code:

- Fuel correction refers to ECM to control the fuel delivery by increasing or decreasing the time to the injector, which allows the engine to obtain the optimal air/fuel ratio (ratio of air to gasoline is 14.7:1).
- Too rich air/fuel ratio means that the fuel delivery amount is too large, while too lean air/fuel ratio meaning that the fuel delivery amount is too small. Too lean system

means that the fuel amount (relative to intake quantity) is too low.

### The setting conditions of DTC:

1. When the system has no P0106, MAP sensor, CTS sensor, TPS sensor, P0171, P0172, injector, misfire, crankshaft position sensor, ignition system, idle speed control system, canister purge circuit or other related fault code, the the coolant temperature is greater than 70°C, the engine running time is greater than 60s, if the ECM monitors the signal voltage of the oxygen sensor is higher than 0.55V when the engine goes into the DFCO (deceleration fuel cut off) condition, the system set the fault code P1167. When the engine goes into the power enriched (PE) condition and the air-fuel ratio is less than 13.5, if the ECM monitors the signal voltage of the oxygen sensor is higher than 0.35V, the system sets the fault code P1171.
2. When the engine is idling, the atmospheric pressure is greater than 72kpa, the intake air temperature is greater than -7°C and the battery voltage is greater than 11V, if the ECM monitors the fuel learning value is greater than 1.4, the system sets the fault code P2187. If the ECM monitors the fuel learning value is less than 0.7, the system sets the fault code P2188.
3. When the system displays the fault code P1167, P1171, P2187, or P2188, the ECM will disable the diagnosis of catalytic converter and stop closed-loop fuel control.

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Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Reread the fault code, and confirm whether there is other sensor or actuator fault code</li> </ul>	Go to Step 1	DTC exists.	Refer to the corresponding chapter according to the DTC displayed on the diagnostic scanner to eliminate the fault, and then perform the inspection described in this chapter
1	Check air filter	Normal	Faulty	Instruction
	Check if air filter is clogged	Go to Step 2	Air filter blocked	Replace air filter assembly
2	Check the intake system	Normal	Faulty	Instruction
	Start the engine, and check the intake system for presence of gas leakage	Go to Step 3	The air leakage fault of intake system	Repair the faulty pipeline
3	Check the spark plug	Normal	Faulty	Instruction
	Check the spark plug gap for normal working	Go to Step 4	Spark plug fault	Replace spark plug
4	Check the ignition coil	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Remove the ignition coil and install new spark plug.</li> <li>Check whether the ignition coil has flashover spark is normal</li> </ul>	Go to Step 5	Ignition coil fault	Replace ignition coil
5	Check timing belt	Normal	Faulty	Instruction
	Check whether the timing belt is loose, jumping over teeth, jumping out teeth or damaged	Go to Step 6	The assembly of timing belt fault	Replace it with a new timing belt
6	Check the valve timing	Normal	Faulty	Instruction
	Check whether the installation of valve timing is correct	Go to Step 7	The assembly of timing belt fault	Re-install the valve timing belt
7	Check cylinder pressure	Normal	Faulty	Instruction
	Connect the cylinder pressure tester and check whether the cylinder pressure is normal	Go to Step 8	Cylinder pressure fault	Repair the cylinder pressure fault
8	Check fuel system pressure	Normal	Faulty	Instruction
	Start the engine, and check if engine fuel system pressure is normal	Go to Step 9	Fuel system pressure fault	Overhaul the fuel system
9	Check injector	Normal	Faulty	Instruction
	Remove the injector, and check whether the injector is normal using the injector detector	Go to Step 10	Injector fault	Replace fuel injector
10	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

### 38. Crankshaft position system variation unlearned

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## P1336-58-tooth gear error unlearned

## Description of DTC:

1. When the system has no temperature sensor, throttle position sensor, crankshaft position sensor, vehicle speed sensor, injector, ignition system or other related fault code, if the coolant temperature is above 60 °C , the engine running time is greater than 10s and the flag bit of the tooth message learning is not set, the fault code P1336 is set.
2. Replace the engine control unit, the crankshaft position sensor and other, and then perform the tooth message learning process.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>• Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 1	The fault is sporadic. Check whether the brake switch connector is loose or damaged, whether the wire harness terminal is corroded
1	Perform tooth message learning	Normal	Faulty	Instruction
	<p>The vehicle starts and the water temperature reaches 60° C. After the vehicle operates for more than 10s, other loads on the vehicle shall be closed;</p> <ul style="list-style-type: none"> <li>• The diagnostic scanner gives the "Tooth Message Learning" command.</li> </ul> <p>Quickly press the accelerator down all the way and hold it there. Then, the ECM should perform the tooth message learning. The engine rotates from 1300 to 4500 for 2 to 5 cycles and oscillating around 4500rpm finally, and then the learning finishes. (These are typical characteristics of the engine speed during the tooth message learning. On this basis, you can determine whether the tooth message learning goes on or finishes.)</p>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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**39. CAN communication fault**

U0001-CAN communication failure

U0073-CAN bus OFF

Loss of communication of U0121-ECU with ABS control module

Loss of communication of U0140-ECU with body control module

Loss of communication of U0151-ECU with airbag control module

**Description of fault code:**

1. If the engine control unit detects the bus is turned off or the message from the corresponding node cannot be received, such a fault code is set. Fault causes include CAN data cable communication problem, or maybe ECM fault in itself. Conversion

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 1	The fault is sporadic. Check the ECM, FBCM and ABSECU and other connectors for looseness and damage and corroded harness terminals.
1	Check the related control system.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner and enter the fault-related control system for diagnosis.</li> </ul> Read the fault code, and check whether the DTC can be read.	Go to Step 2	There is a fault code	Diagnose it according to the hint of DTC
2	Check the CAN communication line between ECM and the related control module.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>When the ignition switch is in "OFF" position, disconnect the negative terminal (-) of the battery</li> </ul> Disconnect the engine control unit connector E01B, combination instrument connector I07 and FBCM connector I12. <ul style="list-style-type: none"> <li>Check whether the resistance of communication line between the engine control unit and instrument cluster, as well as instrument cluster and FBCM t is correct, respectively.</li> <li>Check the CAN communication line for short circuit to power/ground.</li> </ul>	Go to Step 4	Circuit is short or open	Repair the faulty wire harness
3	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the fault-related control unit.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the faulty control unit.	Fault still exists	Go to Step 4
4	Replacement and check	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test.</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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#### 40. Engine immobilizer fault

P0633- Immobilizer unlearned

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U0167-No response of immobilizer (C167)

U0426- No response of immobilizer (C426)

**Description of fault code:**

1. Anti-theft control module ensures to allow the vehicle to be started only when there is a special key and it matches the various parts.

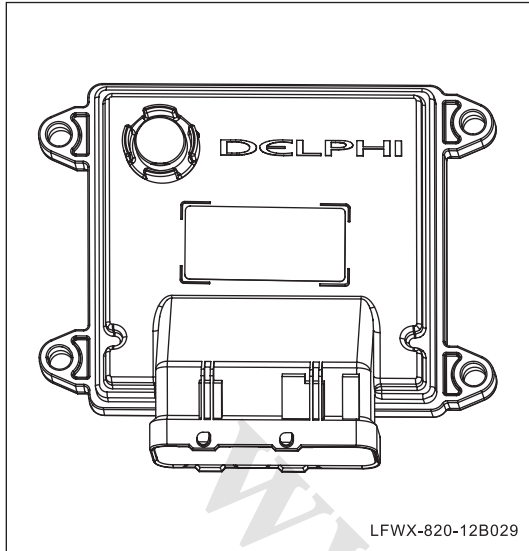
Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check if the battery voltage is normal Voltage: 11V - 14V	Go to Step 1	The inspection voltage is out of the specified range	Charge or replace the battery
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Connect the diagnostic scanner, and then read and clear the DTC</li> <li>• Re-read the fault code, and check whether to read the DTC.</li> </ul>	The fault is sporadic	If there is DTC, go to Step 2	The fault is an occasional one. Check whether PEPS ECU or RKE ECU, the engine control unit for looseness and corroded terminals.
2	Check the PEPS (RKE) system.	Normal	Faulty	Instruction
	Connect the diagnostic scanner and enter the PEPS (RKE) system, and then check if there is a fault code output.	Go to Step 3	With DTC output	Diagnose it according to the hint of DTC
3	Remote control match	Normal	Faulty	Instruction
	Re-match the remote control, and confirm whether the fault code and symptom exist	Go to Step 4	Remote control match fault	Re-match the remote controller
4	ECM anti-theft match	Normal	Faulty	Instruction
	Re-match the engine and PEPS (RKE) ECU, and check whether the fault code and symptom still exist.	Go to Step 5	Match fault	Re-match the control module
5	Check the immobilizer coil (PEPS switch).	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the immobilizer coil connector I49, (or PEPS button connector I29 (PEPS vehicle model))</li> <li>Check whether the resistance between No. 1 and No. 4 terminals of I49 (or No. 1 and No. 2 terminals of I29) is normal.</li> </ul>	Go to Step 6	Anti-theft coil fault	Replace the ignition switch assembly (or PEPS switch assembly)
7	Replace and check (PEPS / RKE ECU)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace the PEPS / RKE ECU for road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Go to Step 8	PEPS / RKE ECU fault	Replace PEPS / RKE ECU.
8	Replacement and check (ECM)	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace ECU and then perform road test</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace the ECM.	Fault still exists	Search the cause from other fault symptoms

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## Electronic Control Module (ECM)



### 1. Parts drawing

### 2. Replacement

#### ⓘ Note:

After the engine ECU (ECM) is replaced, connect the diagnostic scanner, and write the "VIN" consistent with the vehicle to be maintained in the engine ECU through the diagnostic scanner.

- (a) Turn the ignition switch to the OFF position.
- (b) Disconnect negative cable of battery.

#### ⓘ Note:

When disconnecting and re-connecting negative cable of battery, turn off ignition switch and all illumination switches first. And loosen the fastening nut of the battery negative terminal. Don't pry up the cable terminal when performing such operation.

- (c) Remove the glove box.
- (d) Disconnect ECM connector.

#### ⓘ Note:

After disconnecting the connector, make sure the connector does not contact dirt, water and other impurities.

- (e) Remove the 4 fixing bolts of the ECM.
- (f) Take down ECM.

#### ⓘ Note:

After dismantling ECM, do not immerse it in the water. When dismantling ECM, handle it with care.

(g) Install the ECM in the reverse order.

**Torque: 8N•m-12N•m**

**ⓘ Note:**

- **Provide proper electrostatic protection in installation.**



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## 13- Fuel System

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# Fuel System

## System description

### 1. Function

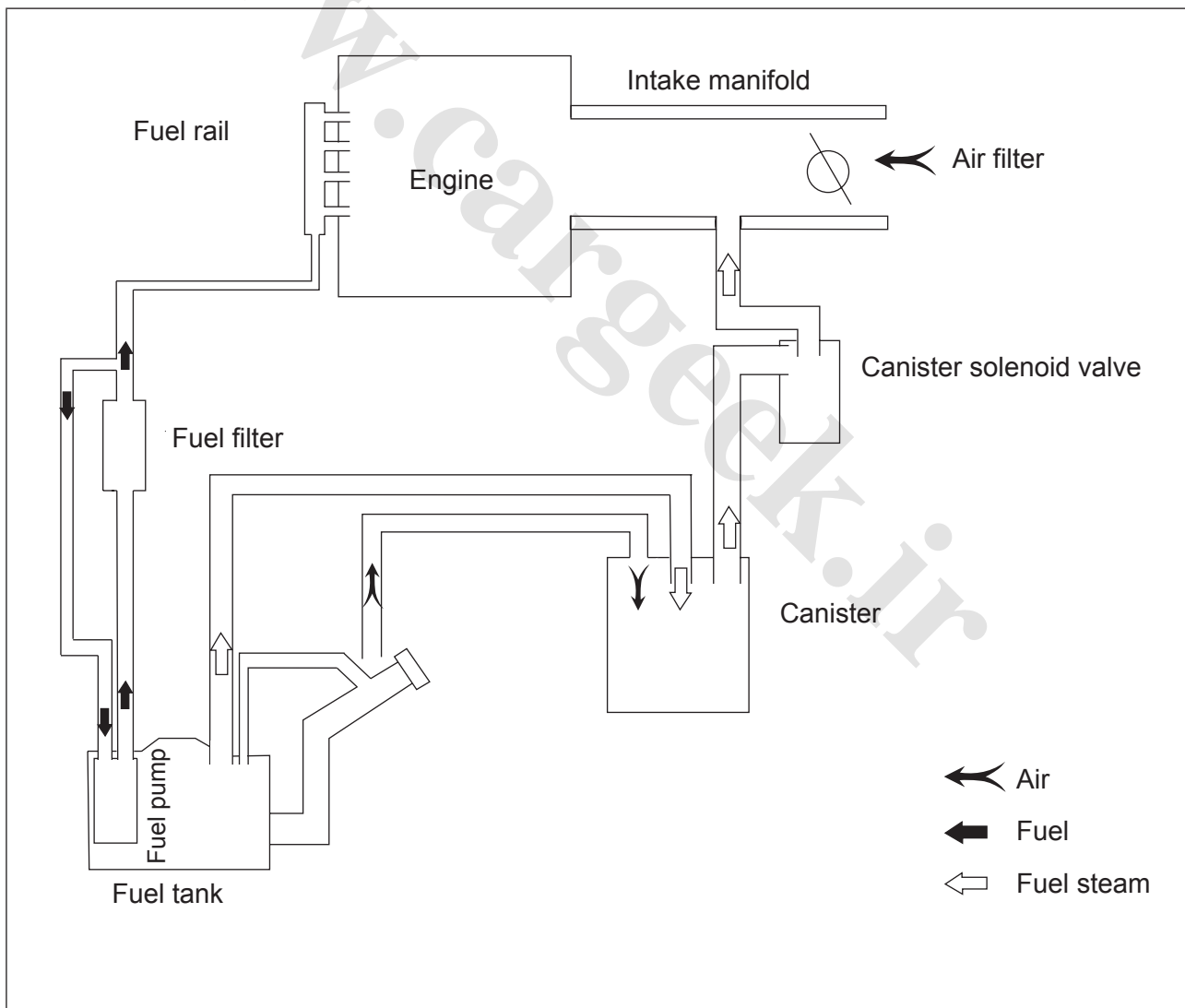
The fuel system serves the following functions:

- Store the fuel and deliver it to engine after filtered.
- According to the needs of different engine operating conditions, timely configure the appropriate amount of fuel.

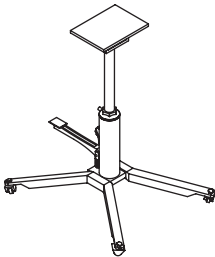
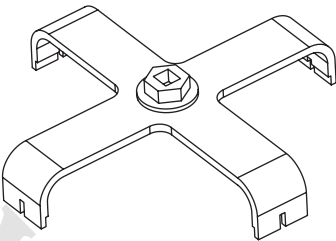
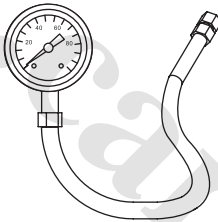
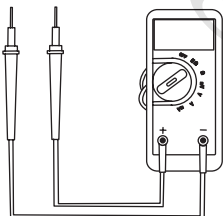
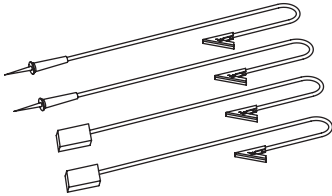
### 2. Components

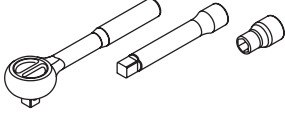
Fuel system consists of the fuel tank, fuel pump, fuel filter and fuel lines and other components.

### 3. Principle



## Preparation

S/N	Tools	Outline diagram	Description
1	Bracket		To lift fuel tank
2	Remover for fuel pump compression cap		Remove and install the fuel pump compression cap
3	Fuel pressure gauge		Measuring fuel system fuel pressure
4	Digital multimeter		Measuring current, voltage and resistance value
5	Wiring set		Assist to measure voltage or resistance

S/N	Tools	Outline diagram	Description
6	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts

## Service data

### 1. Technical specifications table

Standard value of fuel pressure	0.4MPa
Resistance value of fuel level sensor	300 Ω (lowest position); 40 Ω (highest position)

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### 2. Table of tightening torque

Item	N•m
Fixed bolts for fuel tank bracket assembly	35~40
Fixed nuts for fuel tank heat shield	6~12
Fixing bolt of fuel filter	6~12
Filter bracket bolts	6~12
Fuel rail fixing bolts	10~12
Refueling tube bracket (I) bolts	20~25
Refueling tube bracket (II) bolts	20~25

## Precautions

### 1. Precautions before repair

- (a) Whether the engine runs or not, with ignition switch ON, any component is not allowed to be plugged, such as any cable of the battery, injector, fuel pump, ignition system wire, electronic control unit (ECU) circuit, etc.

### 2. Cautions in repair

- (a) When fuel system is working, smoking is strictly prohibited, and keep away from open fire. Keep good ventilation at maintenance site and provide proper fire protection.
- (b) After the engine stall, high residual pressure remains in the fuel system. To remove



any component from the fuel system, release the fuel system pressure first to prevent the fuel in the system from spraying.

- (c) Never let any rubber or leather tool and part contact with gasoline during maintenance.
- (d) Clean the dust and dirt on or near the fuel pipeline before disconnecting it.
- (e) Seal the pipe joint to prevent foreign matter after disconnecting the fuel pipeline if necessary.
- (f) Replace all cracked, scratched or damaged fuel pipe during maintenance. Do not attempt to repair any fuel pipe segment.
- (g) Before installing the fuel system, be sure to perform air-bleeding operation as follows:
  - (a). Use a clean cloth to wrap the fuel rail inlet pipe.
  - Slowly pull out the inlet pipe for fuel rail (do not remove it).
  - Turn on the ignition switch to enable the fuel pump to start working.
  - Observe the joint of the inlet pipe for fuel rail until fuel spills smoothly, and then turn off the ignition switch.
  - Re-install the fuel rail inlet pipe .
- (h) Do not use hammer to directly strike the fuel pipe clamps at mounting new fuel pipes or it will damage the fuel pipe and result in fuel leakage.
- (i) When connecting the joints of the fuel line, apply an appropriate force to squeeze the male and female joints. If you hear a "click" sound, this indicates that the fuel line is installed in place and the connection is completed.

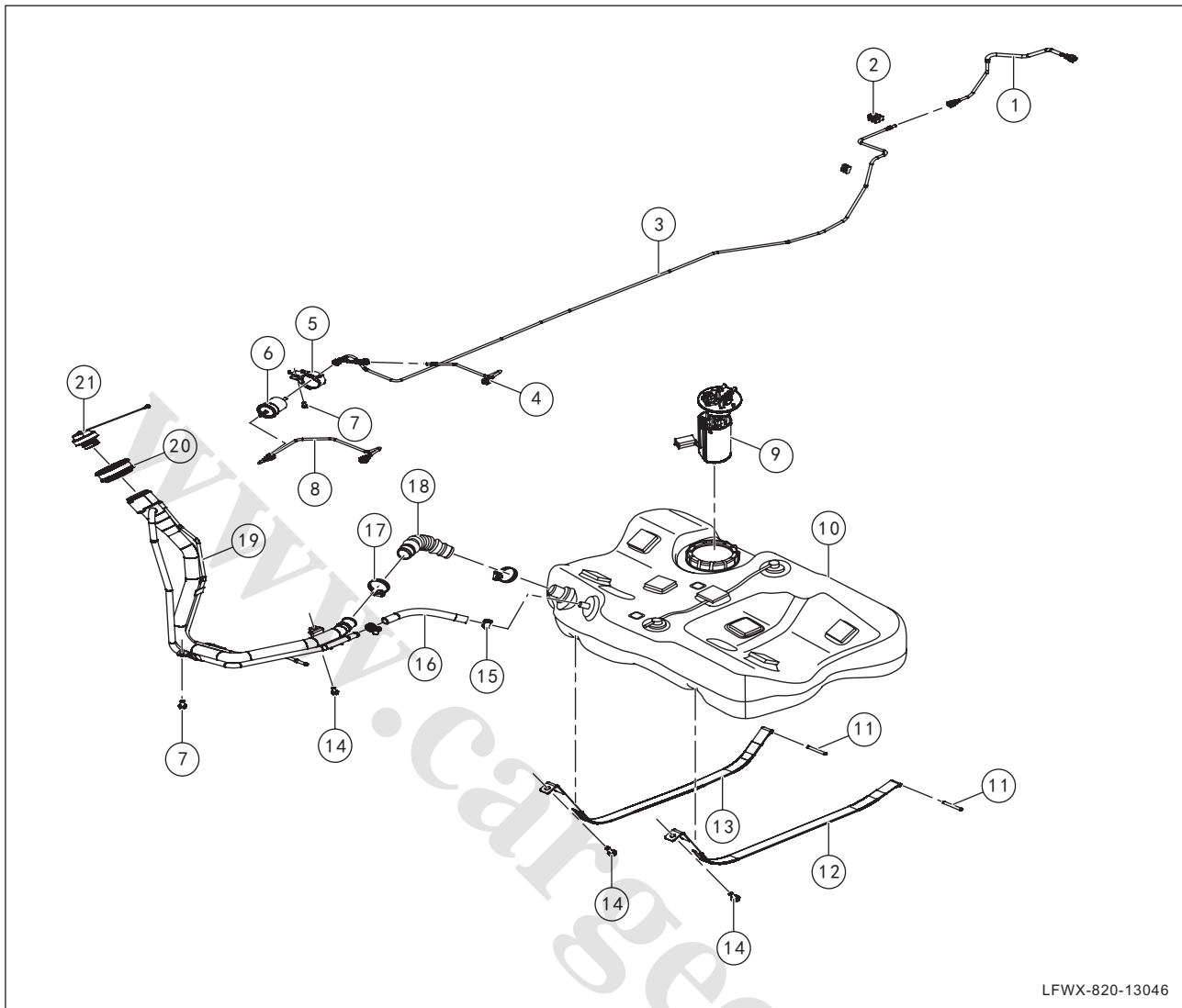
### 3. Precautions after Maintenance

- (a) If you finish, check each fuel line is connected reliably and tightened.

### 4. Other precautions

- (a) In order to prevent accidental fire or explosion, fuel shall not be placed in an open container.
- (b) Fuel vapor is toxic. Do not breathe the fuel vapor.

## Components



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1	Engine inlet pipe assembly	12	Tank bracket assembly II
2	Dual-clamp assembly	13	Tank bracket assembly
3	Filter outlet assembly	14	Hexagon head bolt, spring washer and plain washer assembly
4	Fuel return pipe assembly	15	B-type worm drive type hose hoop
5	Filter support component	16	Return gas hose
6	Fuel filter assembly	17	B-type and C-type worm drive type hose hoop
7	Hexagon bolt with flange	18	Fuel filler hose
8	Fuel tank outlet pipe assembly	19	Oil filling pipe
9	Fuel pump assembly	20	Sealing cap for filler
10	Fuel tank	21	Fuel filler cap
11	Tank bracket cross pin		

## General Check

### Check the system

#### 1. Check whether the system has leakage

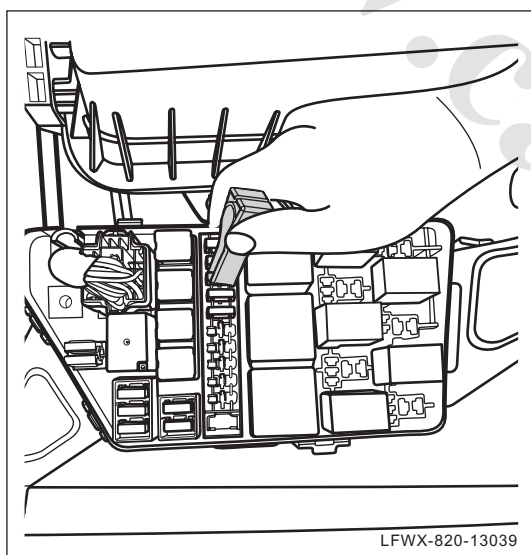
- (a) Check the fuel tank and fuel lines for leakage. If any, replace the damaged parts.

#### 2. Check system components

- (a) Check system for obvious mechanical or electrical damage. If any, repair it.  
 (b) Check system for obvious collision and deformation. If any, repair it.  
 (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 3. Check wire harness

- (a) Check system wire harness connector for secure and reliable installation. If any, re-install it.  
 (b) Check system wire harness for crack or damage. If any, fix it.

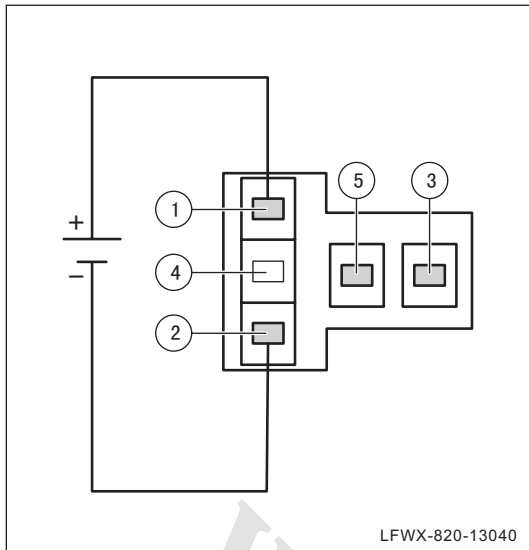


#### 4. Check the fuse

- (a) Check whether the fuse FS09 for fuel pump is blown. If blown, replace it with one of the same rating.

△ HINT:

The fuse for fuel pump is located in the fuse box of in the engine compartment.

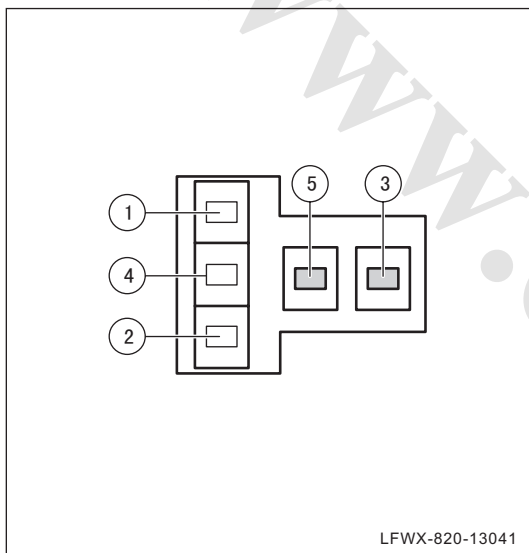


### 5. Check the relay.

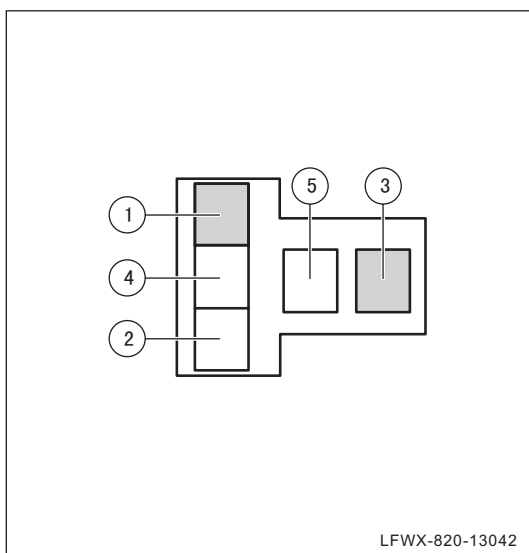
- (a) Disconnect the fuel pump relay K06. Switch on the power as shown in the figure and turn the digital multimeter to its resistance function, and then check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.

△ HINT:

The relay for fuel pump is located in the fuse box of in the engine compartment.

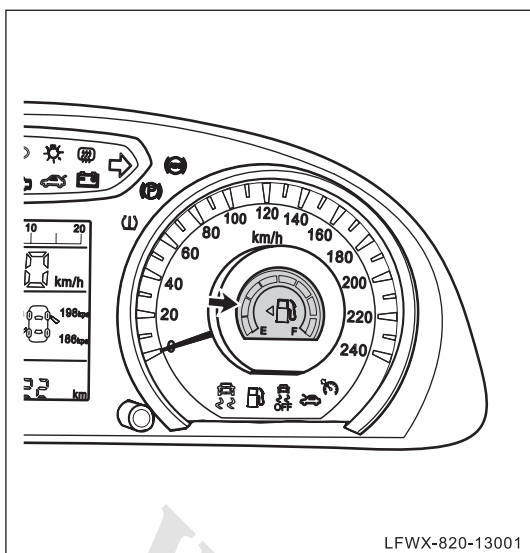


- (b) Disconnect the fuel pump relay K06. Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.



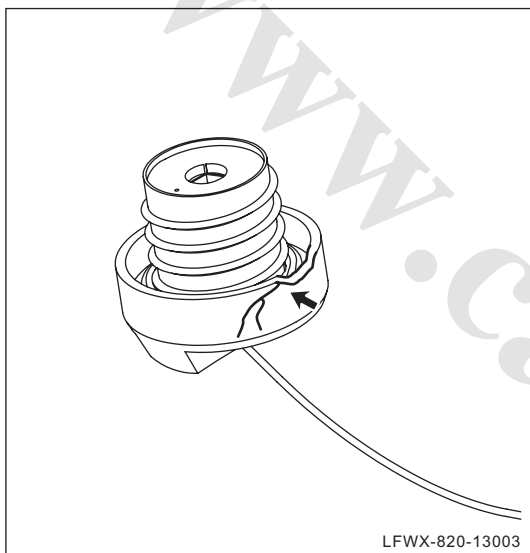
### 6. Check the power lines for the relay.

- (a) Disconnect the fuel pump relay K06. Turn the digital multimeter to its voltage function and check if there is a voltage between No. 1 terminal of the relay mounting slot and body ground. If the voltage is zero, check and repair the related harness according to the circuit diagram.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to circuit book.



### 7. Check the fuel level

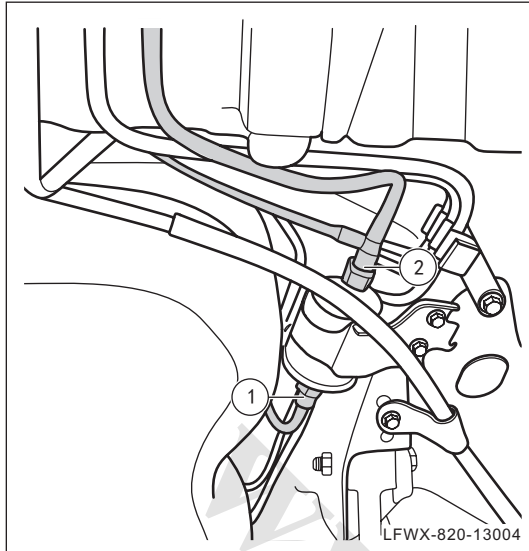
- (a) There are eight display bars within the range between F and E as showed in the figure. When the ignition switch is turned to the "ON" position, as well as the oil level reaches the last segment of display bar, the fuel warning light goes on and it is necessary to refill fuel.



### 8. Check the filler cap.

- (a) Check whether the fuel tank filler cap and its gasket are installed correctly. Otherwise, reinstall it.
- (b) Check the fuel tank filler cap and its gasket for damage. If any, replace it.

## Inspection of fuel filter



### 1. Check the fuel filter working conditions.

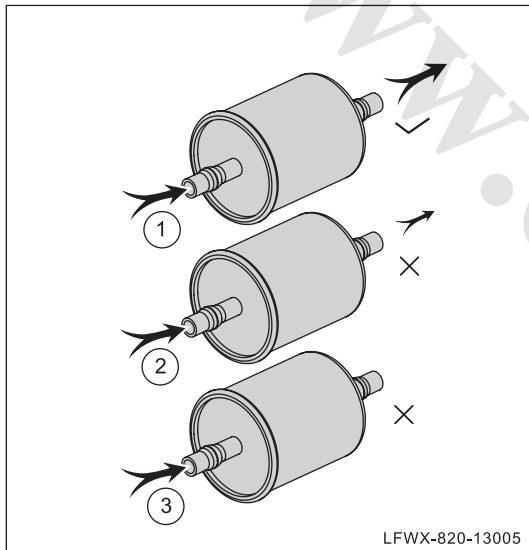
△ HINT:

Maintain the fuel filter based on its maintenance period.

(a) Check the fuel filter is installed correctly. If not, re-install it.

① : Filter inlet

② : Filter outlet



(b) Check whether the fuel filter is clogged. If so, replace it.

- As shown in the figure, blow into the inlet pipe joint port to check it for ventilation. If it is difficult to ventilate or it is blocked, replace it.

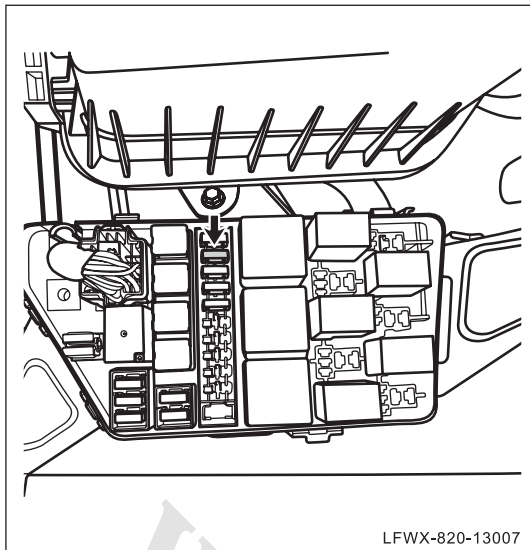
## Check fuel system pressure

### 1. Check the fuel system pressure

(a) Check the battery voltage which should be about 12V. (See 19- Battery-General Check, Checking the Battery)

**Note:**

The voltage value can affect the fuel-supply pressure of the fuel pump directly.



- (b). Release the pressure of the fuel system.
- Start the engine and make it run at idle speed.
  - When the engine is running, disconnect the fuel pump relay or fuel pump fuse to turn off the engine itself.
  - Start the engine again 2~3 times. In this way, the pressure of the fuel system can be released completely.
  - Turn off the ignition switch and install the fuel pump relay or fuse.

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- (c). Disconnect negative cable of battery.

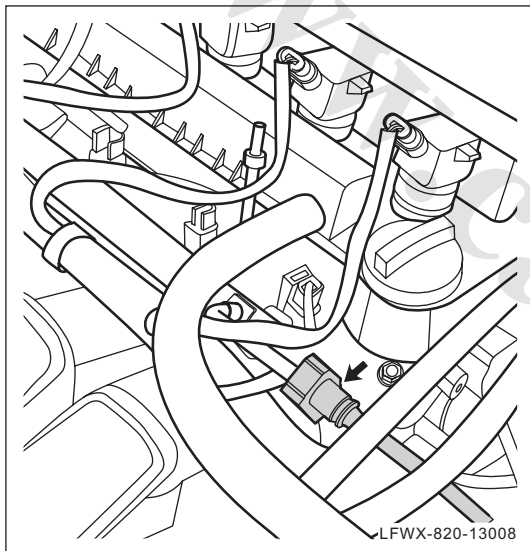
- (d). Remove the inlet pipe from the fuel rail.

△ HINT:

After releasing the fuel pressure, there may be some residual fuel in the pipes. Therefore, when disconnecting fuel pipes, wrap the pipe joints with clean cloth to avoid fuel spilling.

ⓘ Note:

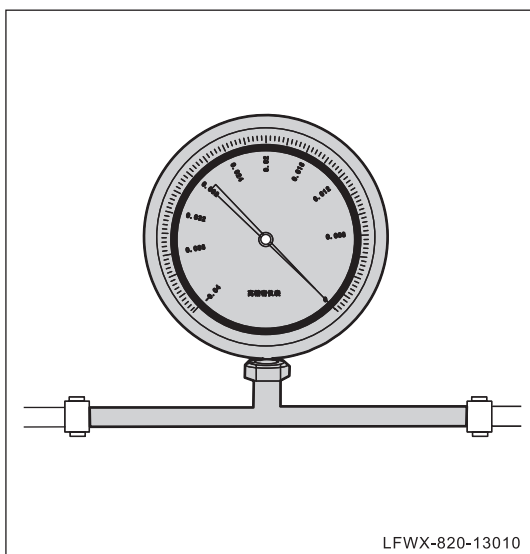
- Do not bend or distort the fuel pipe.
- Never let any rubber or leather tool and part exposed to gasoline.



- (e). Connect a special pressure gauge to the fuel system.

△ HINT:

The special oil pressure gauge should be connected as shown in the figure (schematic diagram).





- (f). Connect the negative cable of battery.
- (g). Connect the diagnostic scanner to the diagnosis interface to allow the system power supply to be in the "ON" state.
- (h). Operate the diagnostic scanner to access to the active test function of the engine menu.
- (i). Select the "Fuel Pump Relay" to allow the fuel pump to run, and keep the fuel pump running for 10s.
- (j). Read the value indicated by the oil pressure gauge. If inconsistent with the standard value, replace the fuel pump.

#### Fuel pressure rating: 0.4MPa

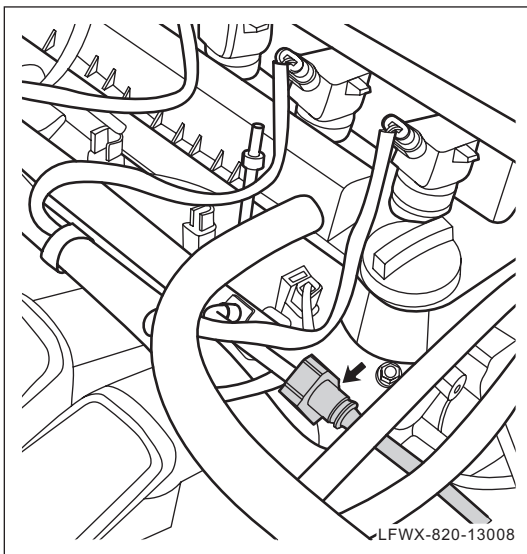
- (k). Keep the system power supply being in "LOCK" position, and release the fuel system pressure.
- (l). Disconnect negative cable of battery.
- (m). Remove the special fuel pressure gauge and re-install the fuel system.

#### △ HINT:

When you hear a clear "click" sound, it indicates that the fuel pipe joint has been installed in place.

#### ⓘ Note:

**Pull out the pipe connectors on both ends of the oil pressure gauge and take it out.**



- (n). Connect the negative battery cable.

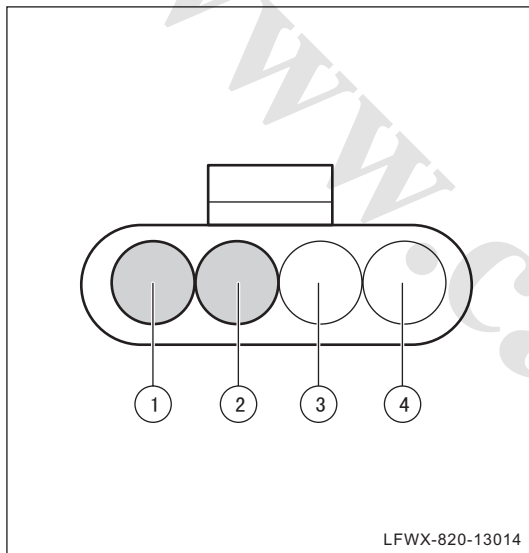
## Check the fuel pump

### 1. Checking the fuel pump working conditions.

- Connect a diagnostic scanner to the diagnosis interface.
- Keep the system power in the "ON" state.
- Operate the diagnostic scanner to access to the active test function of the engine menu.
- Select the "Fuel Pump Relay" to allow the fuel pump to run.

△ HINT:

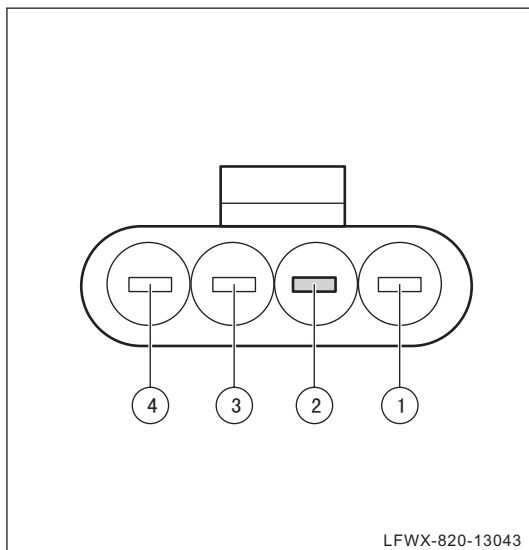
Check whether you can hear the sound of the fuel flow in the tank. If not, check the fuel pump relay, the fuel pump fuse, the fuel pump or the engine control module ECM.



- Disconnect the fuel pump harness connector.
- Apply the battery voltage between No. 1 and No. 2 terminals of the fuel pump. Check whether the fuel pump is operating. Otherwise, replace it.

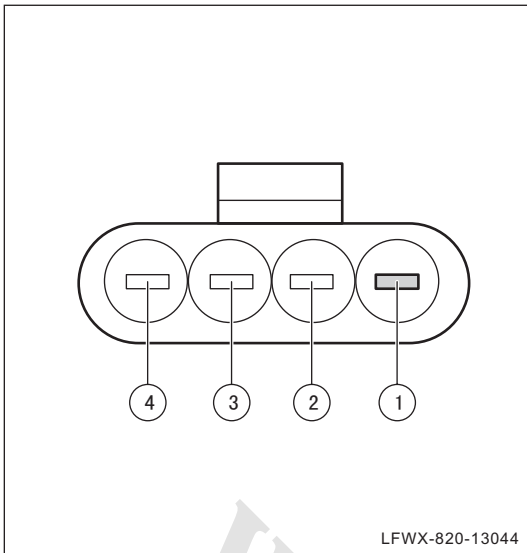
#### ⓘ Note:

**The fuel pump can not run for a long time without fuel, nor run in the air with fuel, so the inspection should not last too long ( ≤ 10s) to prevent the motor from being burnt.**



### 2. Check the power lines for fuel pump.

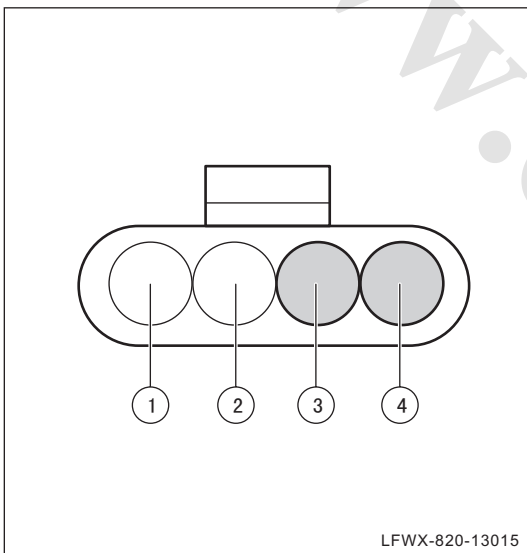
- With the system power supply in the "LOCK" status, disconnect the fuel pump harness connector.
- With the system power supply in the "ON" state, turn the digital multimeter to its voltage function and check the voltage between No.2 terminal of the fuel pump harness connector and the body ground. If the voltage is zero, check and repair the related harness according to the schematic.



### 3. Check the ground wire for fuel pump.

- (a) With the system power supply in the "LOCK" status, disconnect the fuel pump harness connector.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 1 terminal of the fuel pump harness connector and the body ground. If not conducted, check and repair the related harness according to the schematic.

### Check the fuel level sensor.



#### 1. Check the resistance of the fuel level sensor.

- (a) With the system power supply in the "LOCK" status, disconnect the fuel pump harness connector.
- (b) Turn the digital multimeter to its resistance function and check the resistance of the fuel level sensor.

#### △ HINT:

Connect the two probes of the digital multimeter to No.3 and No. 4 terminals of the fuel pump, respectively, and lift the fuel floater slowly up from the lowest position and observe the change in resistance value.

**Lowest position: 300 Ω**

**Highest position: 40 Ω**

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Strong fuel smell	1. Filler cap (damaged)	See 13- Fuel System-Diagnosis, Fault Diagnosis (1. Strong fuel smell)
	2. Fuel system (leak)	
	3. Connecting hose between the canister and the canister solenoid valve (damaged)	
Fuel pump won't work.	1. Fuse (blown)	See 13- Fuel System-Diagnosis, Fault Diagnosis (2. Fuel pump won't work)
	2. Relay (damaged)	
	3. Wire harness (faulty)	
	4. Fuel pump (fault)	
	5. Engine ECU (fault)	
The fuel system pressure is low	1. The fuel filter is blocked	See 13- Fuel System-Diagnosis, Fault Diagnosis (3 fuel system pressure is low)
	2. Fuel pump (fault)	

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### Fault diagnosis

#### 1. Strong fuel smell

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Start the engine and check the fuel smell.	Diagnosis end.	Strong fuel smell	Go to Step 1
1	Check the filler cap.	Normal	Faulty	Instruction
	Check the fuel filler and gasket status (see 13- Fuel System-General Check, Checking the System)	Go to Step 2	<ul style="list-style-type: none"> <li>The filler cap or gasket is installed incorrectly</li> <li>Filler cap or gasket ruptured or damaged</li> </ul>	<ul style="list-style-type: none"> <li>Reinstall (see 13- Fuel System-Filler Pipe, Replacement)</li> <li>Replace (see 13- Fuel System-Filler Pipe, Replacement)</li> </ul>
2	Check the fuel system.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the fuel system for leaks. (see 13- Fuel System-General Check, Checking the System)	Go to Step 3	<ul style="list-style-type: none"> <li>Fuel tank or fuel line leak</li> <li>Fuel filter interface leaking</li> <li>Injector's O-ring damage and leakage</li> </ul>	<ul style="list-style-type: none"> <li>Replace the damaged parts.</li> <li>Reinstall the fuel filter inlet and outlet pipes.</li> <li>Replace the fuel injector's O-ring.</li> </ul>
3	Check the canister and the canister solenoid valve.	Normal	Faulty	Instruction
	Check the connecting hose between the canister and the canister solenoid valve for leakage (see 14- Emission Control System- General Check, Checking the system).	Go to Step 4	Leakage of the connecting hose between the canister and the canister solenoid valve	Reinstall the connecting hose between the canister and the canister solenoid valve (see 14- Emission Control System- Emission Control Pipeline, Replacement)
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. The fuel pump won't work.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the fuel pump is functioning (see Fuel System 13- general inspection, check the fuel pump).	Diagnosis end.	Fuel pump won't work.	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the fuel pump fuse is blown (see 13- Fuel System-General Check, Checking the system).	Go to Step 3	FS09 fuse is blown.	Go to Step 2
2	Check the FS09 circuit.	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check the FS09 circuit working conditions according to the circuit diagram.	Go to Step 3	The circuit is short	According to the circuit diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check relay	Normal	Faulty	Instruction
	Check whether the fuel pump relay is damaged (see 13- f Fuel System-General Check, Checking the system).	Go to Step 4	Fuel pump relay damaged	Replace the fuel pump relay
4	Check ing the harness	Normal	Faulty	Instruction
	Check the power cord of the fuel pump relay for continuity (see 13- Fuel System-General Check, Checking the system).	Go to Step 5	No continuity	Overhaul relevant wire harness according to circuit book.
5	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the fuel pump for continuity (see 13- Fuel System-General Check, Checking the fuel pump).	Go to Step 6	No continuity	Overhaul relevant wire harness according to circuit book.
6	Check the wire harness	Normal	Faulty	Instruction
	Check the ground wire of the fuel pump for continuity (see 13- Fuel System-General Check, Checking the fuel pump).	Go to Step 7	No continuity	Overhaul relevant wire harness according to circuit book.
7	Check the fuel pump	Normal	Faulty	Instruction
	Check the fuel pump working conditions (see 13- Fuel System-General Check, Checking the fuel pump).	Go to Step 8	Fuel pump damage	Replacement (See 13- Fuel System Fuel Pump, Replacement)
8	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Fuel system pressure low

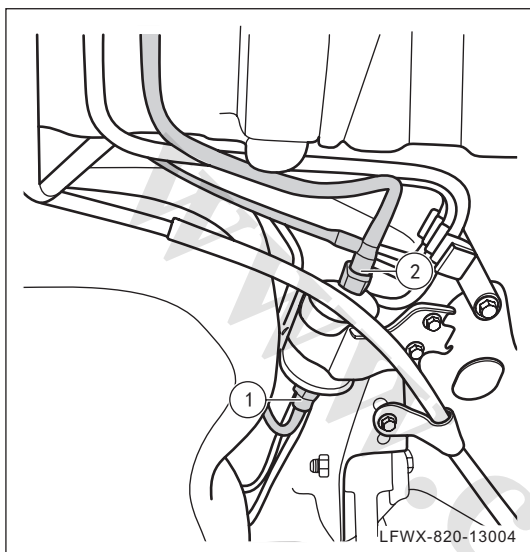
Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check fuel system pressure.	Diagnosis end.	The fuel system pressure is low	Go to Step 1
1	Inspection of fuel filter	Normal	Faulty	Instruction
	Check the condition of the fuel filter.	Go to Step 2	Fuel filter blocked	Replace fuel filter
2	Check the fuel pump	Normal	Faulty	Instruction
	Check the fuel pump condition.	Go to Step 3	Fuel pump failure	Replace fuel pump
3	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Fuel Tank

### Replacement

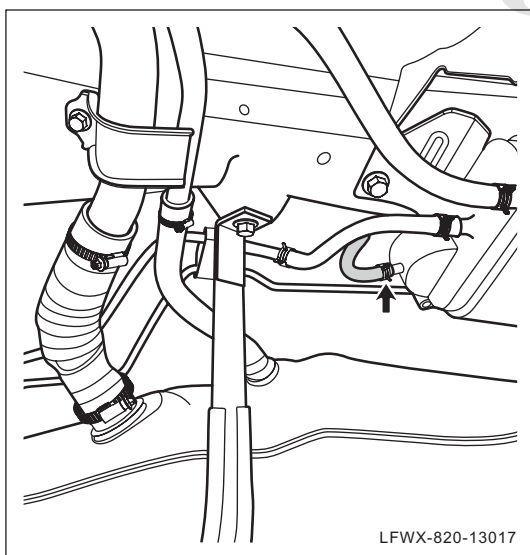
#### 1. Removal of fuel tank

- (a). Remove the fuel pump. ( Refer to 13- Fuel System Fuel Pump, Replacement)
- (b) Remove the pre-muffler. (See 15-Intake/Exhaust System-Pre-muffler, Replacement)



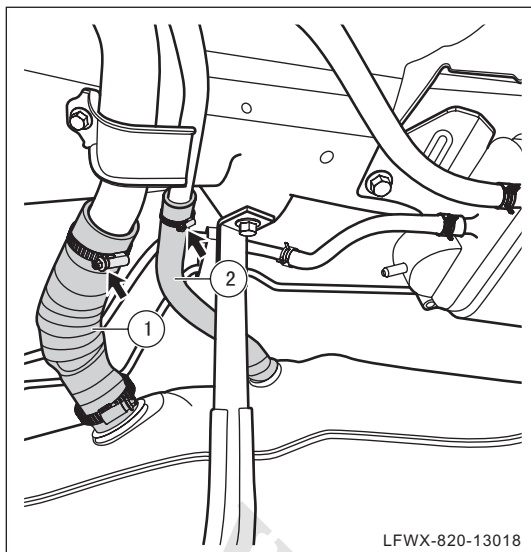
- (c) Remove the fuel tank outlet pipe ① and the filter outlet pipe ② from their mounting positions.

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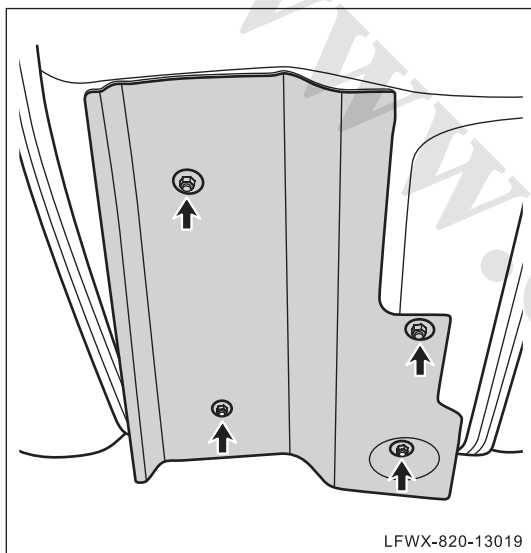


- (d) Remove the connecting pipe between the fuel tank and the canister.
  - Remove the elastic clamp and pull out the connecting hose from its mounting position.

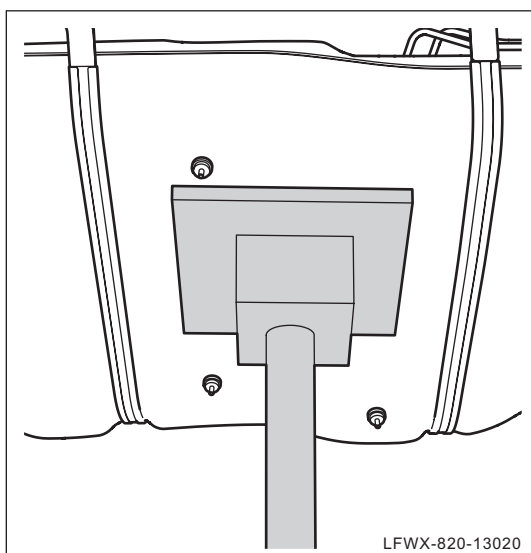




- (e) Remove the fuel tank's filler hose ① .
- Loosen the hoop of the filler hose ① , and pull out the filler hose ① from its mounting position.
- (f) Remove the fuel return hose ② from the fuel tank.
- Unscrew the hoop of fuel return hose ② and pull out it from the installation position.



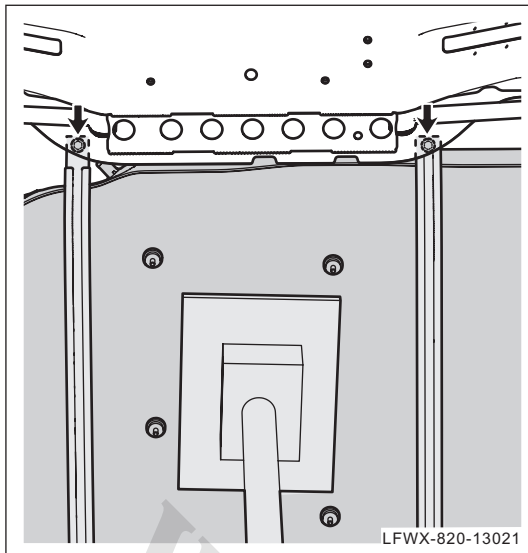
- (g) Remove the fixed nuts from the heat shield and remove it.



- (h) Support the fuel tank with the hydraulic bracket.

△ HINT:

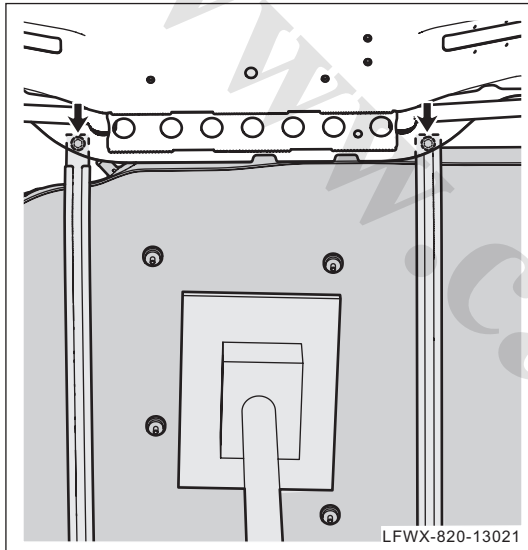
We recommend you add wood to the recessed area at the bottom of the fuel tank so that the bottom can bear force evenly.



- (i) Remove the fixed bolts from the fuel tank bracket module I and the bracket module II .
- (j) Lower the hydraulic bracket slowly to remove the fuel tank.

**Note:**

**To avoid damage to the tank pipeline, be sure to check it when lowering the hydraulic bracket.**



## 2. Installation of fuel tank

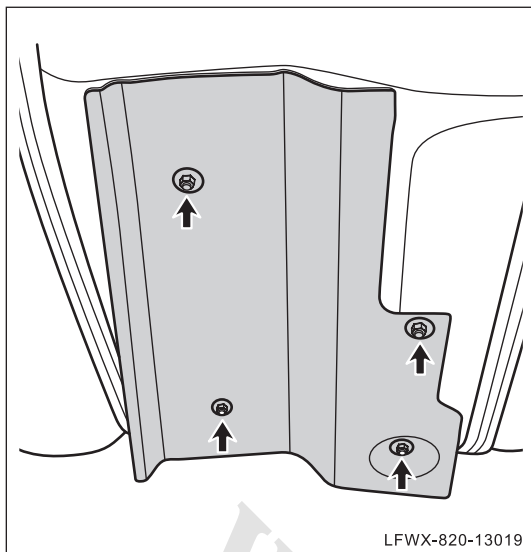
- (a) Lift the fuel tank up slowly to the mounting position using the hydraulic bracket.
- (b) Install the fuel tank bracket module I and the bracket module II .
  - Place the fuel tank bracket module I and the bracket module II to the mounting positions and make sure the bolt holes of the bracket modules are in alignment with those on the body.
  - Install and tighten the fixed bolts of the fuel tank bracket module I and the bracket module II .

**Torque: 35N•m - 40N•m**

**Note:**

**To avoid damage to the tank pipeline, be sure to check it when lifting the hydraulic bracket.**

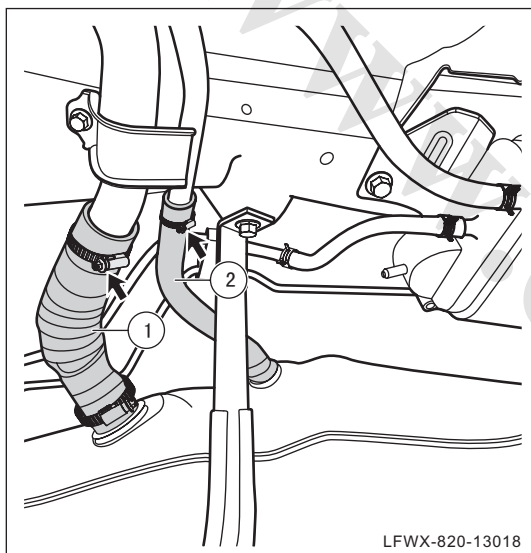
- (c) Let the hydraulic bracket go down slowly, and remove it.



(d) Install the fuel tank heat shield.

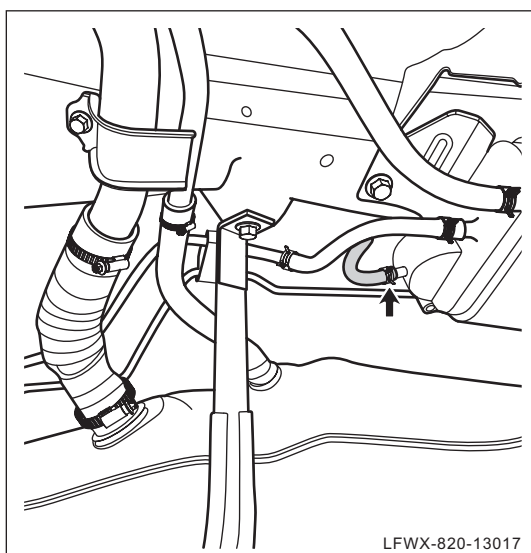
- Fix the heat shield to the bottom of the fuel tank, and make sure that all the bolt holes are in alignment with the studs on the bottom of the tank.
- Install fixing nuts and tighten them.

**Torque: 6N•m - 12N•m**

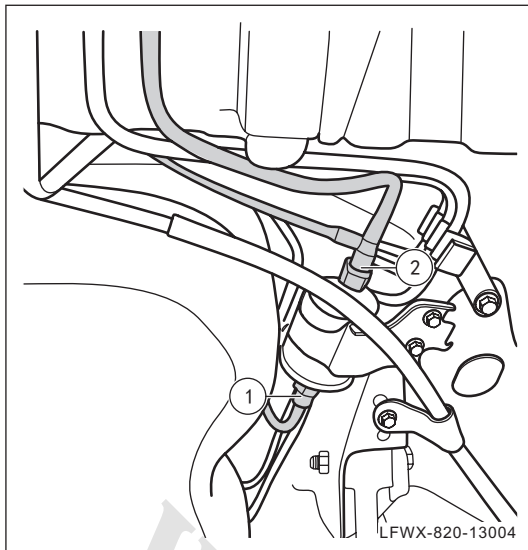


(e) Install the filling hose ① and hoop on the fuel tank and tighten the hoop.

(f) Fix the return hose ② and hoop to the fuel tank and tighten the hoop.



(g) Fix the connecting pipe (between the fuel tank and the canister) and flexible clamp to the canister.



- (h) Install the fuel tank outlet pipe ① and the filter outlet pipe ② in place.
- (i) Install the fuel pump. ( Refer to 13- Fuel System Fuel Pump, Replacement)
- (j) Install the pre-muffler. (See 15-Intake/Exhaust System-Pre-muffler, Replacement)

### 3. Inspection

- (a) Check if the fuel tank interferes with other parts.If any, re-install it.

## Fuel Pump

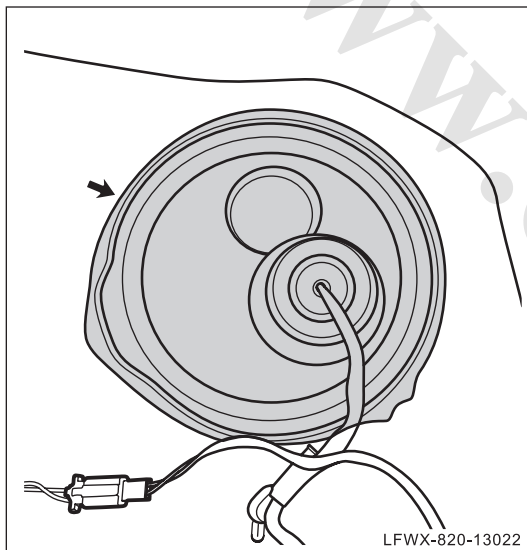
### Replacement

#### 1. Removal of fuel pump

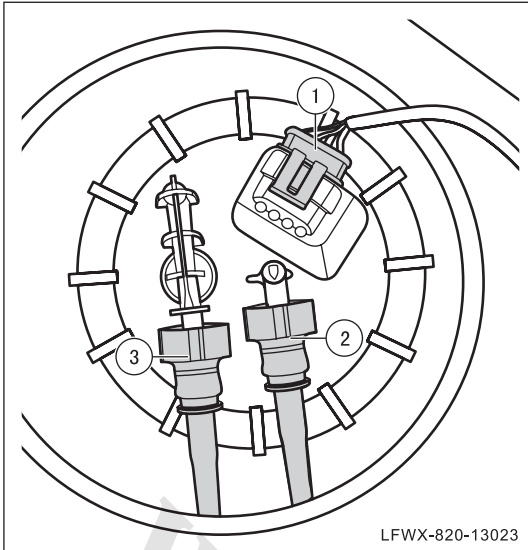
△ HINT:

Before removing the fuel pump, wrap all the seats with plastic cover to avoid fuel adherence.

- (a) Release the fuel pressure. (See 13- Fuel System-General Check, Checking the Fuel System Pressure)
- (b). Disconnect negative cable of battery.
- (c). Remove the cushion assembly of rear seat. (See 83- Seats and Seats Belts- Rear Seat Cushion, Replacement)



- (d) Pry up the maintenance cover plate with a flathead screwdriver.



- (e) Disconnect the fuel pump connector ① .
- (f) Remove the fuel pump' s outlet pipe ② and return pipe ③ .

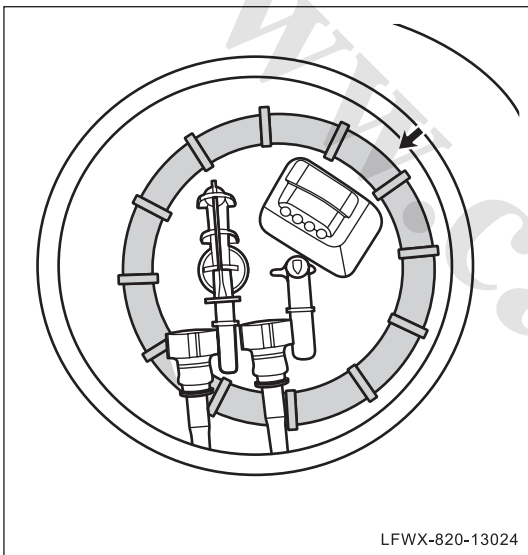
△ HINT:

After releasing the fuel pressure, there may be some residual fuel in the pipes. Therefore, when disconnecting fuel pipes, wrap the pipe joints with clean cloth to avoid fuel spilling.

**Note:**

- Do not bend or distort the fuel pipe.
- Never let any rubber or leather tool and part exposed to gasoline.

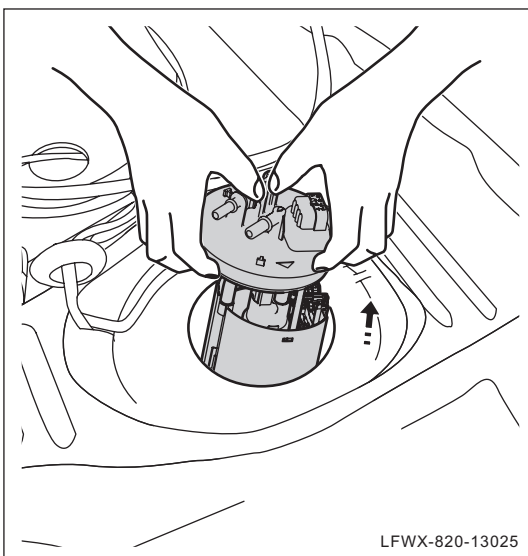
**13**



- (g) Remove the fuel pump compression cap.

△ HINT:

For removal, use the remover for the fuel pump cap.



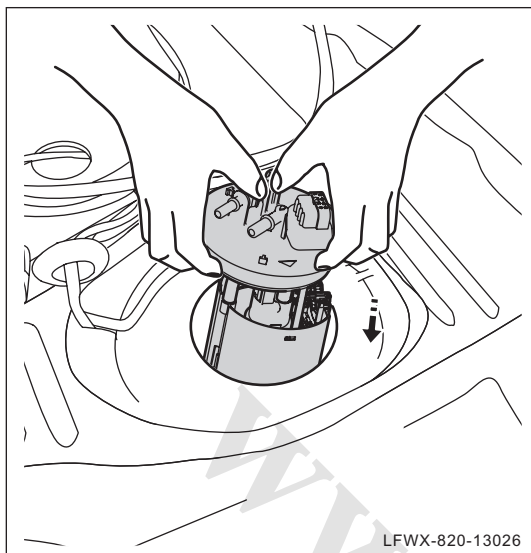
- (h) Remove the fuel pump.

- (h) Take out the fuel pump slowly and vertically. When the fuel float occurs at the outlet, tilt and remove the fuel pump.

**Note:**

- Do not bump the fuel float when taking out the fuel bump.
- Never let any rubber or leather tool and part exposed to gasoline.

- (i) Drain the fuel in fuel pump into the recovery.

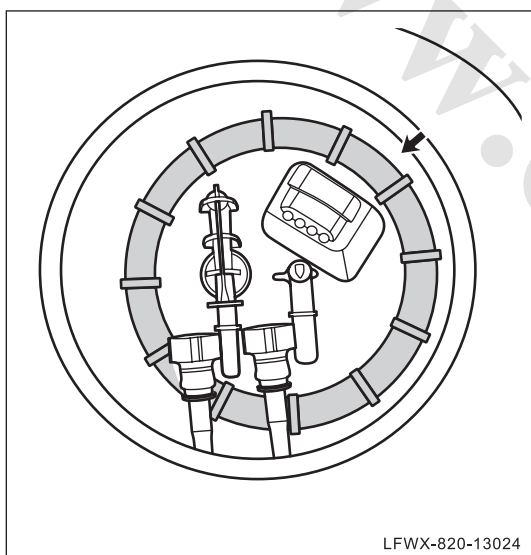


## 2. Install the fuel pump.

- (a) Install the fuel pump into the fuel tank.
- (a) Install the fuel pump into the fuel tank vertically and slowly.

### ⓘ Note:

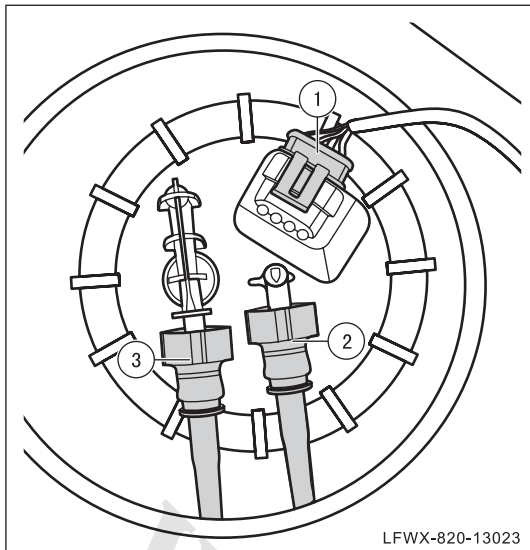
- Put the fuel float of the fuel pump into the fuel tank slowly and then install the fuel pump in place.
- Do not pump the fuel float during installation.



- (b) Install the fuel pump cap.

### △ HINT:

For installation, use the installer for the fuel pump cap.



(c) Connect fuel pump connector ① .

**Note:**

If you finish, move the connector gently and make sure the connector is connected securely and reliably.

(d) Install the fuel pump's outlet pipe ② and inlet pipe ③ .

**HINT:**

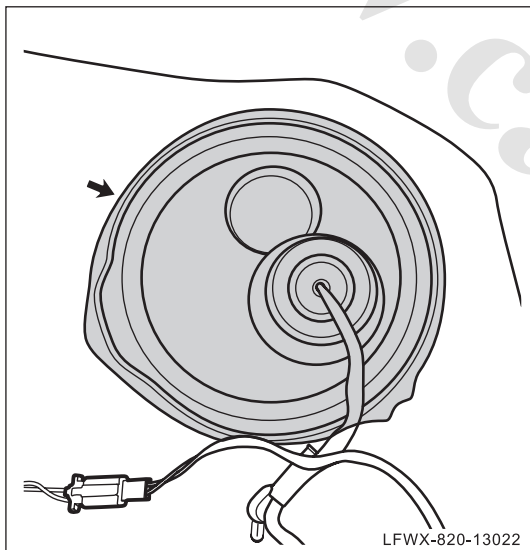
When you hear a clear "click" sound, it is an indication that the pipe joint has been installed in place.

**Note:**

- Do not bend or distort the fuel pipe.
- Don't confuse the outlet pipe ② and return pipe ③ .

(e) Install the inspection cover for the fuel pump.

- Clean the adhesive glue residue on the inspection cover.
- Apply new adhesive glue on the inspection cover.
- Fix the inspection cover to the maintenance port on the fuel pump.



(f) Install rear seat cushion assembly. (See 83- Seats and Seats Belts- Rear Seat Cushion, Replacement)

**HINT:**

If you finish, remove the plastic housings on all the seats.

(g). Connect the negative cable of battery.

### 3. Inspection

(a) After the accumulation of fuel pressure , start the engine to check whether the fuel pump operates properly.

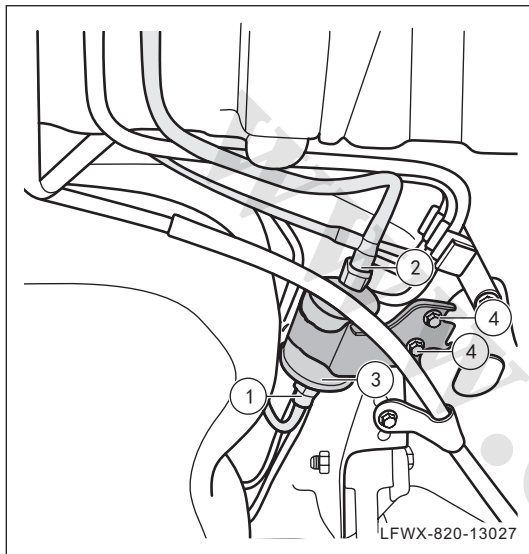


## Fuel Filter

### Replacement

#### 1. Removal of fuel filter

- (a) Release the fuel pressure. (See 13- Fuel System-General Check, Checking the Fuel System Pressure)
- (b). Disconnect negative cable of battery.



- (c) Remove the fuel tank outlet pipe ① and the filter outlet pipe ② .

△ HINT:

After releasing the fuel pressure, there may be some residual fuel in the pipes. Therefore, when disconnecting fuel pipes, wrap the pipe joints with clean cloth to avoid fuel spilling.

ⓘ Note:

- Do not bend or distort the fuel pipe.
  - Never let any rubber or leather tool and part exposed to gasoline.
- (d) Remove the fixing bolt ④ of the fuel filter bracket, and the fuel filter with bracket assembly.
  - (e) Remove the fuel filter bolts, and remove the fuel filter ③ .

#### 2. Re-installation of fuel filter

- (a) Install the fuel filter onto the bracket and install and tighten the fixing bolts and nuts.

**Torque: 6N•m - 12N•m**

- (b) Install the fuel filter with bracket assembly in place, and install and tighten the bolts.

**Torque: 6N•m - 12N•m**

- (c) Install the fuel tank outlet pipe and the filter outlet pipe.

△ HINT:

When you hear a clear "click" sound, it is an indication that the pipe joint has been installed in place.

- (d). Connect the negative cable of battery.

### 3. Inspection

- (a) After the fuel pressure stored, start the engine and check whether the fuel filter is installed properly and check for fuel leakage.

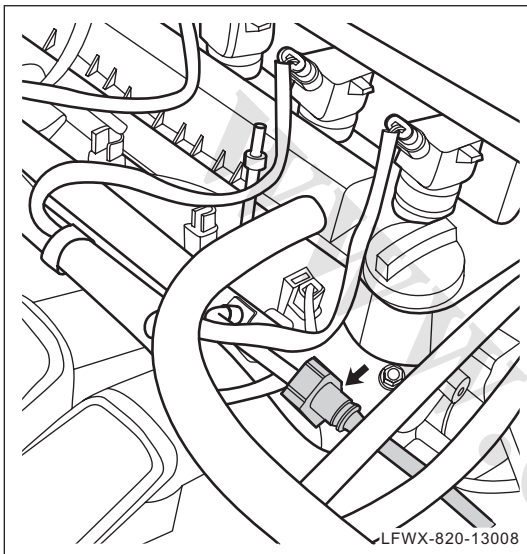
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# Injector

## Replacement

### 1. Remove the injector.

- (a) Release the fuel pressure. (See 13- Fuel System-General Check, Checking the Fuel System Pressure)
- (b). Disconnect negative cable of battery.



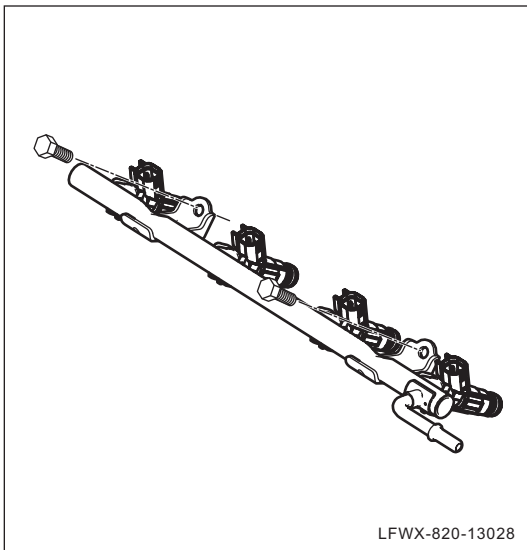
- (c) Remove the inlet pipe from the fuel rail.

△ HINT:

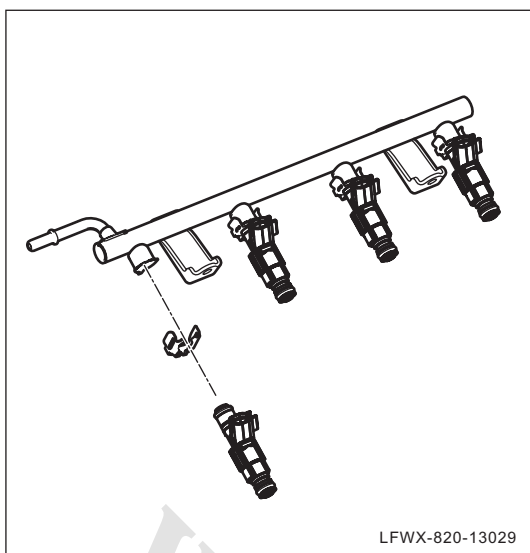
After releasing the fuel pressure, there may be some residual fuel in the pipes. Therefore, when disconnecting fuel pipes, wrap the pipe joints with clean cloth to avoid fuel spilling.

ⓘ Note:

- Do not bend or distort the fuel pipe.
- Never let any rubber or leather tool and part exposed to gasoline.



- (d) Remove the fuel rail fixing bolts, and then take down the fuel rail with injector assembly.



- (e) Remove the snap ring of injector and take down the injector.

## 2. Installation of injector

- (a) Install the injector on the fuel rail and mount the snap ring of the injector.
- (b) Install the fuel rail with injector assembly on the intake manifold and mount and tighten the fixing bolts of fuel rail.

**Torque: 10N•m-12N•m**

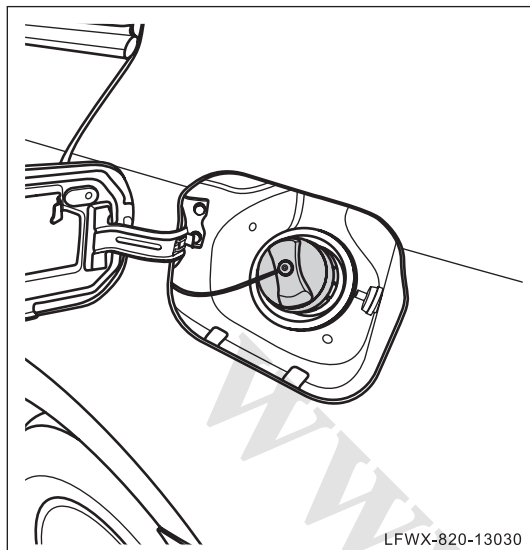
- (c) Install inlet pipe of fuel rail.

## 3. Inspection

- (a) After the fuel pressure stored, start the engine and check whether the fuel rail and injector are installed properly and check for fuel leakage.

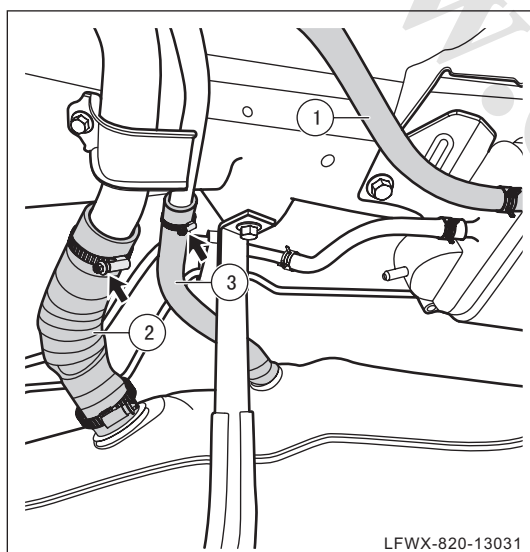
## Filling Hose

### Replacement



#### 1. Removal of filling pipe

(a). Remove the fuel filler cap.



(b) Remove the connection hose ① from the canister vent.

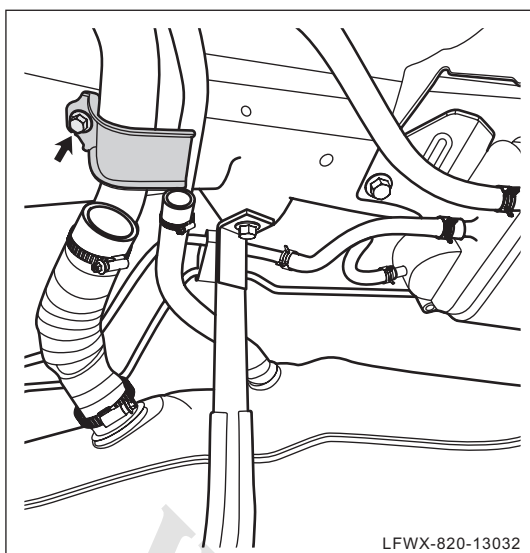
- Remove the elastic clamp, and remove the connection hose from its mounting position.

(c) Remove the fuel tank's filler hose ② .

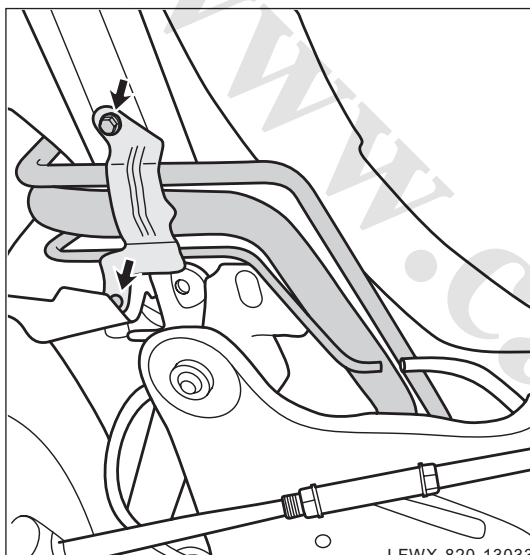
- Tighten the filler hose ② hoop, and remove the filler hose ② from its mounting position.

(d) Remove the fuel tank's return hose ③ .

- Tighten the return hose ③ hoop, and remove the return hose ③ from its mounting position.



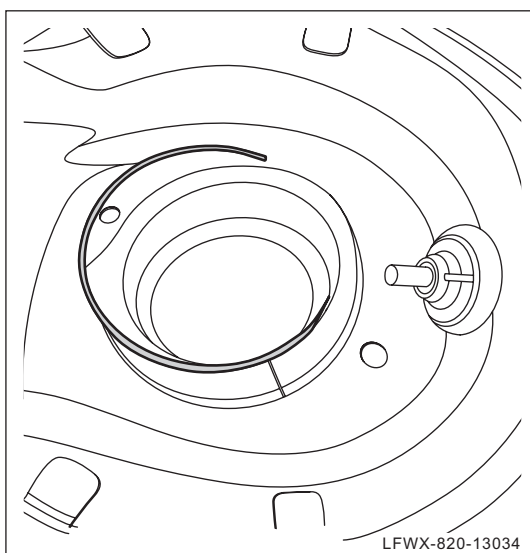
- (e) Remove the fixed bolts from the filler pipe bracket I .



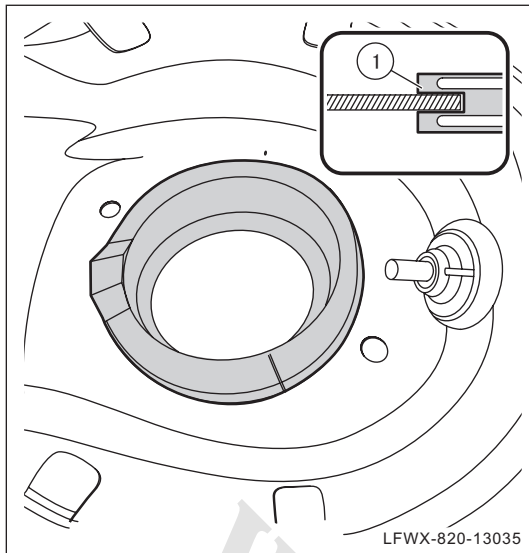
- (f) Remove the fixed bolts and nuts from the filler pipe bracket II , and remove the filler pipe.

△ HINT:

The fixed nuts for the filler pipe bracket II are located on the inside of the fender.



- (g) Remove the snap ring of fuel filler cover.  
(h) Push out the filler shield inward and remove the filler shield.

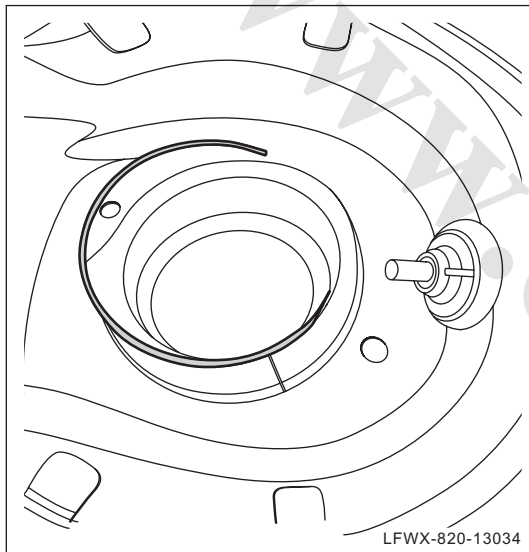


## 2. Installation of filling pipe

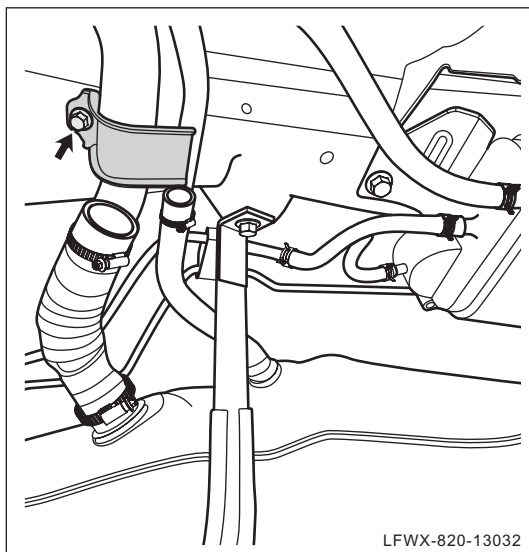
(a) Install the filler shield on the fuel filler.

△ HINT:

As shown in the figure, clamp the filler shield part ① in the vehicle body.

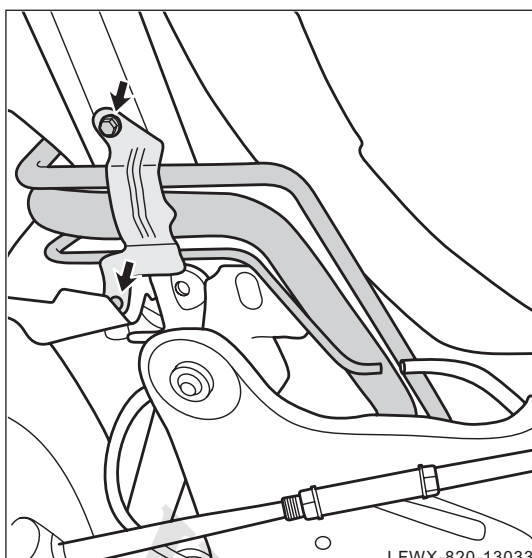


(b) Install the snap ring of fuel filler shield.



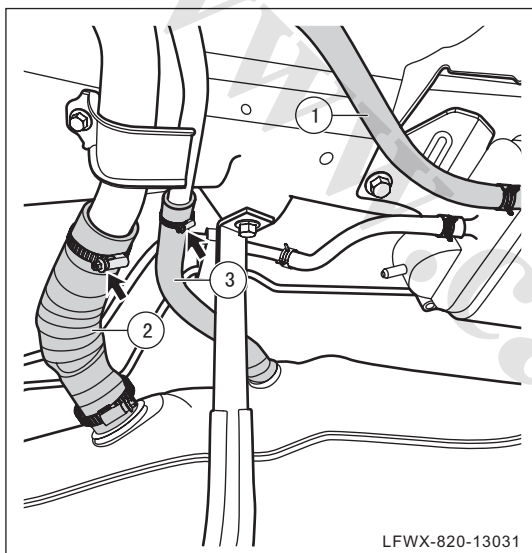
(c) Install the filling pipe bracket I in place, and mount & tighten the fixing bolts.

**Torque: 20N•m - 25N•m**



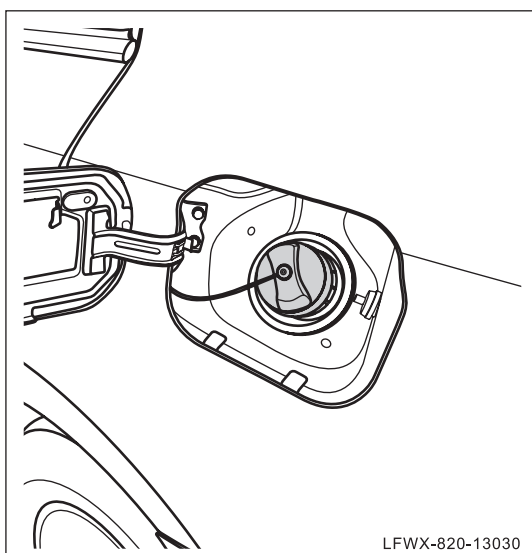
- (d) Install and tighten the fixed bolts and nuts for filler pipe bracket II .

**Torque: 20N•m - 25N•m**



- (e) Install the connection hose ① for the canister vent and its elastic clamp in place.
- (f) Install the fuel tank's filler hose ② and hoop in place.
- (g) Install the fuel tank's return hose ③ and hoop in place.

**13**



- (h) Install fuel filler cap.



## Fuel Pipeline

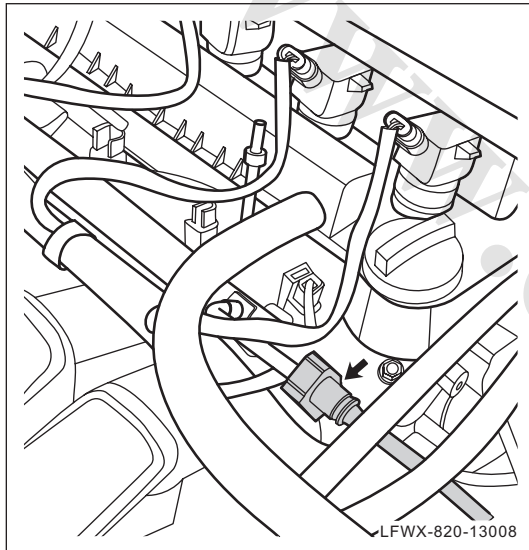
### Replacement

**Note:**

- Do not bend or distort the fuel pipe.
- Never let any rubber or leather tool and part exposed to gasoline.

**1. Remove the filter outlet pipe.**

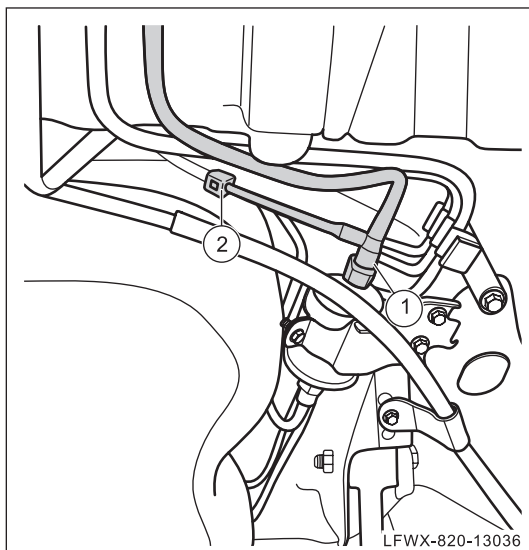
- Release the fuel pressure. (See 13- Fuel System-General Check, Checking the Fuel System Pressure)
- Disconnect negative cable of battery.



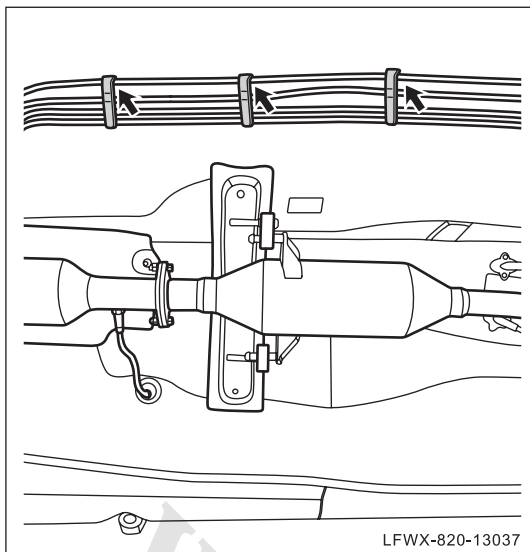
- Remove the engine inlet pipe.

△ HINT:

After releasing the fuel pressure, there may be some residual fuel in the pipes. Therefore, when disconnecting fuel pipes, wrap the pipe joints with clean cloth to avoid fuel spilling.



- Disconnect the connections from the interfaces of the fuel filter's outlet pipes ① and ②.



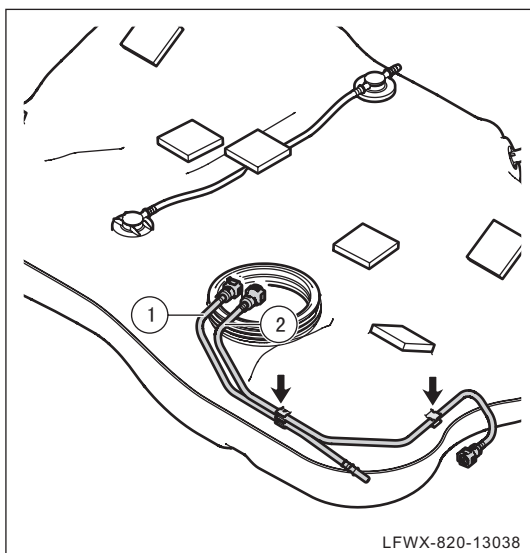
- (e) Remove the filter outlet pipe from each clamp.
- (f) Remove the filter outlet pipe.

## 2. Install the filter outlet pipe.

- (a) Install the filter outlet pipe in place.
- (b) Install each interface for the filter outlet pipe in place.
- (c) Fix the engine inlet pipe to the fuel rail.
- (d) Fix the filter outlet pipe with each clamp.

## 3. Remove the return pipe and outlet pipe from the fuel pump.

- (a) Remove the fuel tank. (See 13- Fuel System- Fuel Tank,Replacement)
- (b) Remove the fuel pump' s return pipe ① and outlet pipe ② from each clamp.



**4. Install the fuel pump' s return pipe and outlet pipe.**

- (a) Fix the fuel pump' s return pipe and outlet pipe with each clamp.

△ HINT:

When installing, measure the distance between the fuel pipe interface and the fuel pump.

- (b). Install the fuel tank. (See 13- Fuel System- Fuel Tank,Replacement)

**5. Inspection**

- (a) After the fuel pressure stored, check whether the fuel pipe is installed properly and check for fuel leakage.

# 14- Emission Control System

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# Emission Control System

## System description

### 1. Function

Emission control system has the following effects:

Reduce harmful exhaust gases (CO, HC and NOx) discharged into the atmosphere.

### 2. Components

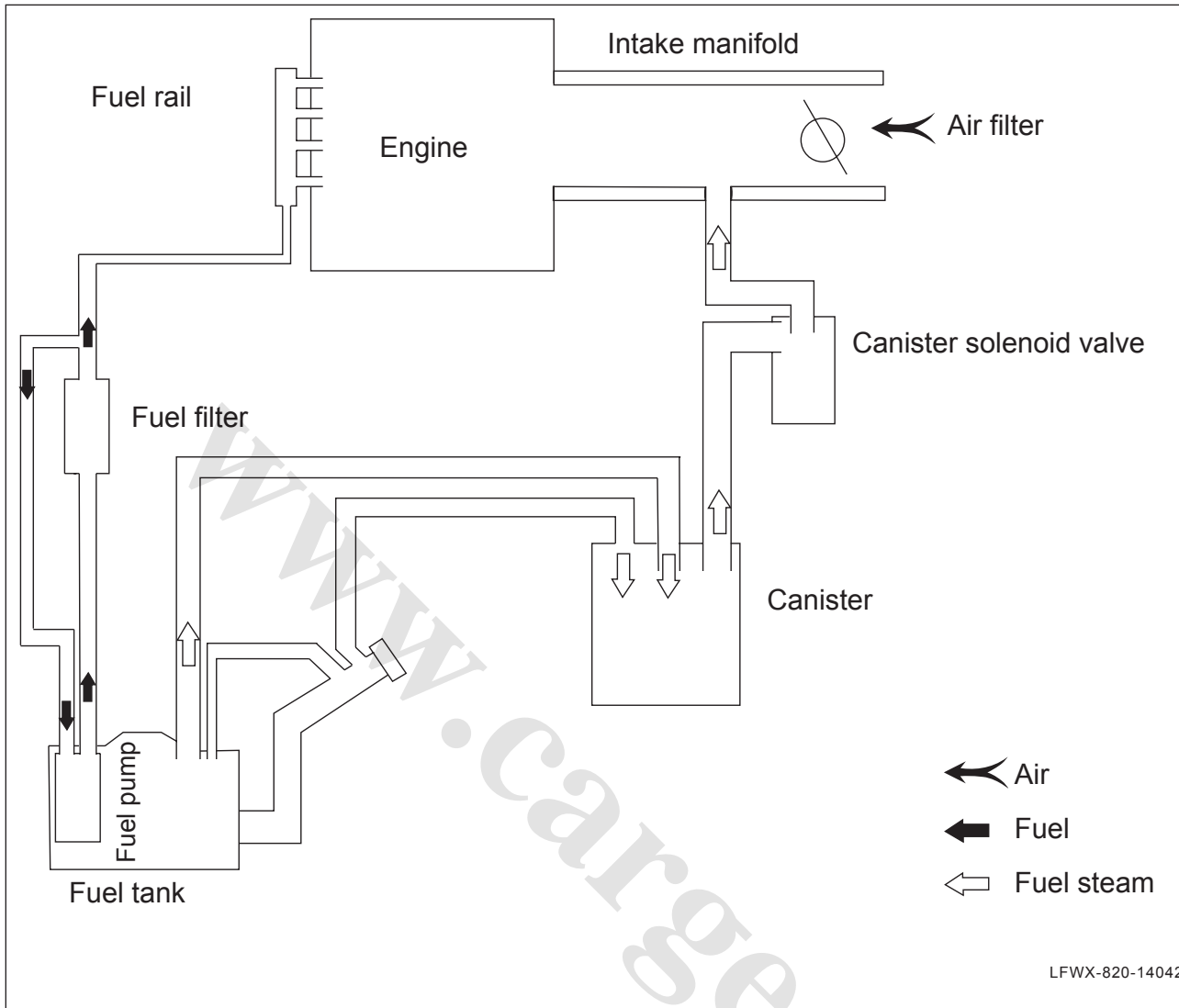
Emission control system consists of the positive crankcase ventilation (PCV) system, the evaporative emission control (EVAP) system as well as the three-way catalytic converter (TWC) system.

Positive crankcase ventilation system: This system is used to prevent the "exhaust" in the crankcase from being discharged into the atmosphere, and to allow the blow-by gas in the crankcase to run back to the intake manifold for combustion through the special channels.

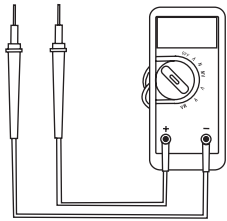
Evaporative emission control system: This system is used to collect the the fuel vapor escaping the fuel tank and the fuel system and introduce it into the intake manifold and into the combustion chamber, thus preventing the fuel vapor from polluting the atmosphere.

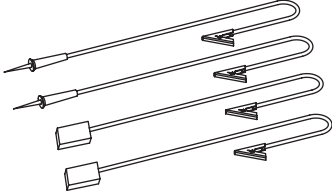
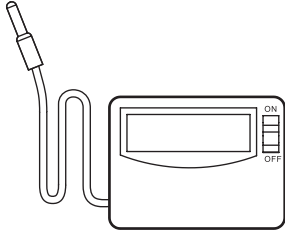
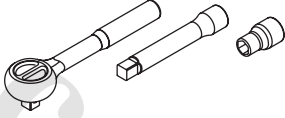
Catalytic converter system: This system converts the CO, HC and NOx, and other harmful gases in the exhaust into harmless carbon dioxide, water and nitrogen through oxidation and reduction, reducing exhaust emissions.

### 3. Principle



### Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance

S/N	Tools	Outline diagram	Description
2	Wiring set		Testing circuits
3	Digital temperature meter		Check the exhaust temperature.
4	Quick wrench		Used for removing and installing the fixing bolts

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## Service data

### 1. Technical specifications table

Front oxygen sensor voltage	100mV~900mV
Rear oxygen sensor voltage	100mV~900mV

### 2. Table of tightening torque

Item	N•m
Fixing bolt of small canister bracket	6~8
Fixing bolt of large canister bracket	6~8
Bolts for canister with bracket assembly	8~12
Bolts for counterbalance of rear sub-frame	8~12
Fixing nuts of catalytic converter	35~40
Fixing bolts of upper heat shield of catalytic converter	15~20



Item	N•m
Bolts for connecting catalytic converter to rear-stage purifier	65~85
Front oxygen sensor	38~42
Rear oxygen sensor	40~60

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## Precautions

### 1. Precautions before repair

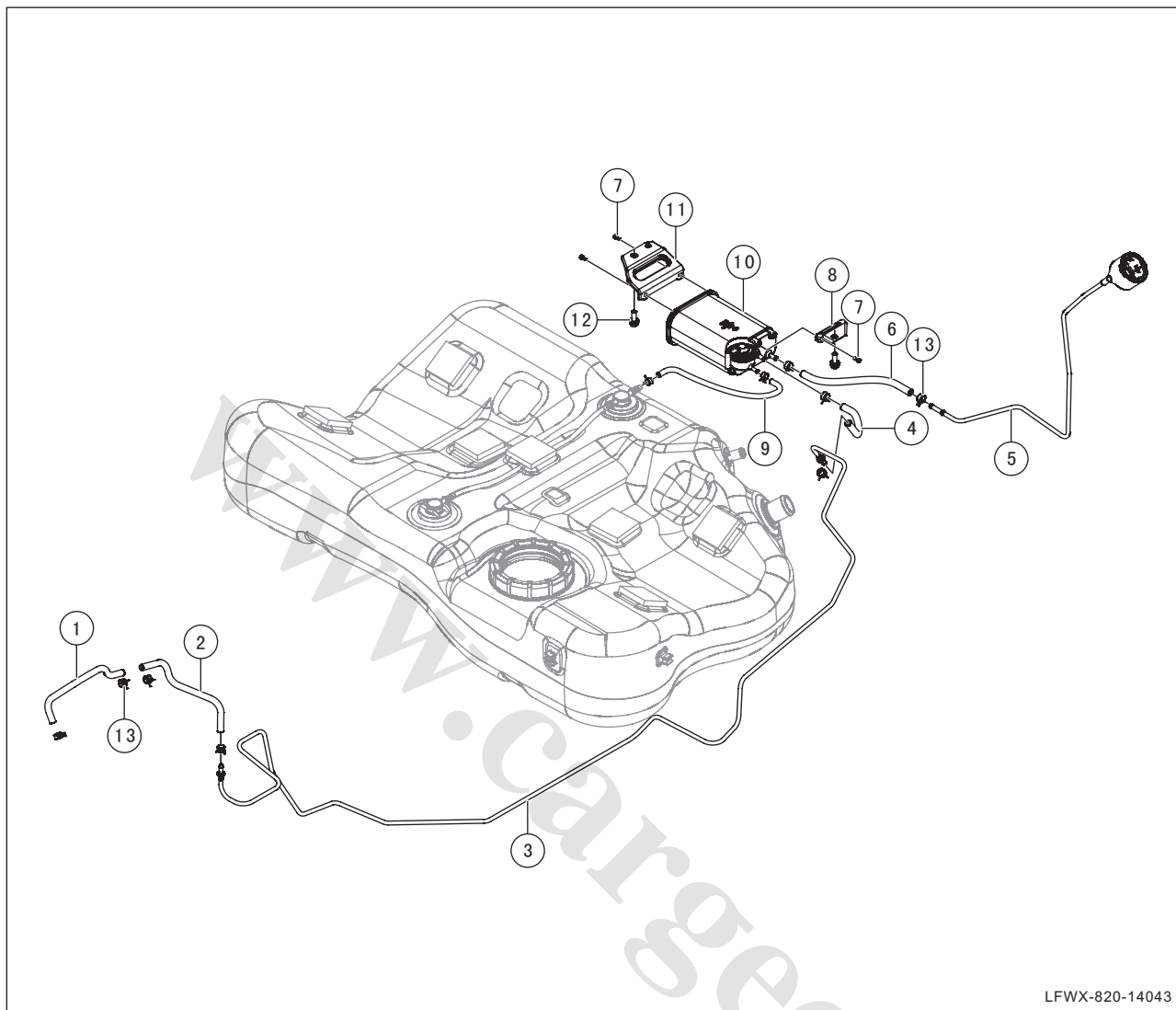
- (a) Regardless of whether the engine is running, as long as the ignition switch is turned on, disable any one of the following components in the plug system:

any cable of the battery, injectors, the fuel pump, ignition system leads, electronic control unit (ECU) lines, etc..

### 2. Other precautions

- (a) Fuel vapor is toxic. Do not breathe the fuel vapor.

## Components



LFWX-820-14043

1	Connecting hose between the canister solenoid valve and the engine
2	Connecting hose between the hard tube for evaporation and the canister solenoid valve
3	Connecting pipe of fuel evaporation
4	Connecting hose of fuel evaporation
5	Canister vent pipe
6	Connecting hose for canister breather pipe
7	Bolt

8	Small bracket
9	Fuel -tank- to- canister connecting hose
10	Canister
11	Large bracket
12	Bolt
13	Elastic clamp

## General Check

### Check the system

#### 1. Check system components

- (a) Check system for obvious mechanical or electrical damage. If any, repair it.
- (b) Check system for obvious collision and deformation. If any, repair it.
- (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 2. Check the positive crankcase ventilation pipe.

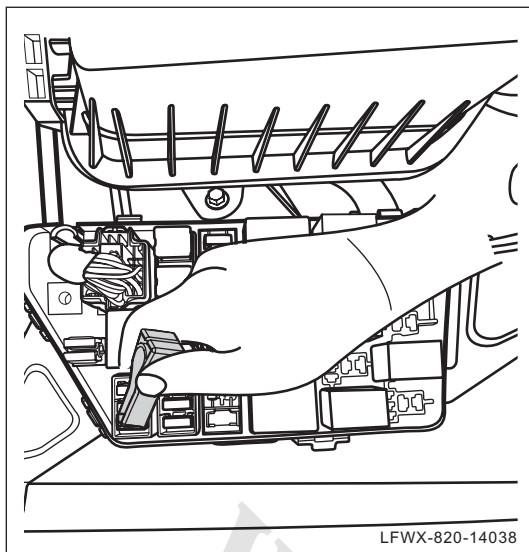
- (a) Check whether the positive crankcase ventilation pipe is installed properly. If not, re-install it.
- (b) Check the positive crankcase ventilation pipe for rupture and damage. If any, replace it.

#### 3. Check the fuel evaporation control line.

- (a) Check whether the fuel evaporation control line is installed correctly. If not, re-install it.
- (b) Check the fuel evaporation control line for rupture and damage. If any, replace it.

#### 4. Check wire harness

- (a) Check the harness connector for the canister solenoid valve is securely installed. If not, re-install it.
- (b) Check the canister solenoid valve harness for rupture and damage. If any, repair it.
- (c) Check whether the oxygen sensor connector is securely installed. If not, re-install it.
- (d) Check the oxygen sensor harness for rupture and damage. If any, repair it.

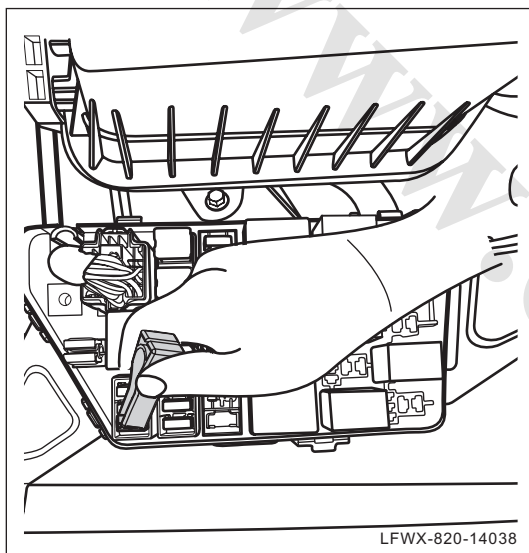


## 5. Check the fuse

- (a) Check whether the fuse FS47 for the canister solenoid valve is blown. If blown, replace it with one of the same rating.

△ HINT:

The fuse for the canister solenoid valve is located in the fuse box in the engine compartment.



- (b) Check whether the fuse FS07 for front oxygen sensor is blown. If blown, replace it with one of the same rating.

△ HINT:

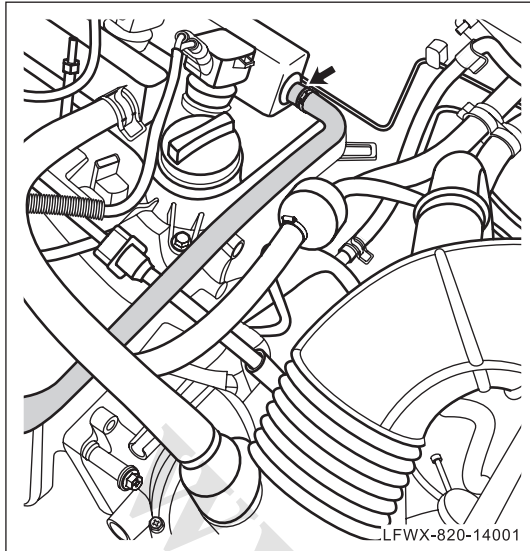
The fuse for front oxygen sensor is located in the fuse box in the engine compartment.

- (c) Check whether the fuse FS08 for rear oxygen sensor is blown. If blown, replace it with one of the same rating.

△ HINT:

The fuse for rear oxygen sensor is located in the fuse box in the engine compartment.

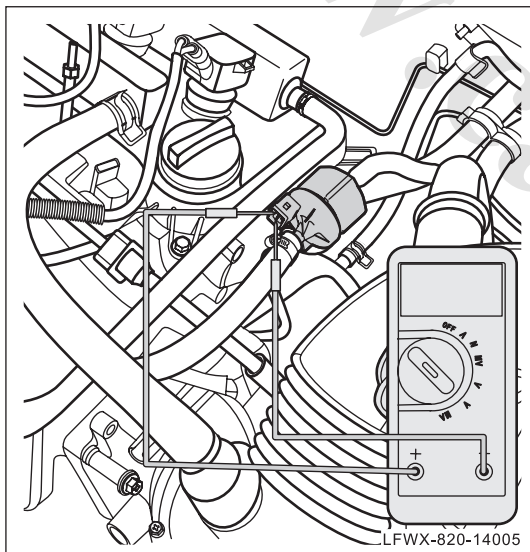
## Check the PCV valve.



1. **Check the PCV valve working conditions.**
  - (a). Start the engine and keep it idling.
  - (b). Pull out the PCV valve with pipe assembly.
  - (c). Check whether the PCV valve is clogged. If so, you clean or replace it.
  - (d). Put your finger into the PCV valve interface. Your finger can feel a strong vacuum suction. Otherwise, replace it.

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## Check the canister solenoid valve



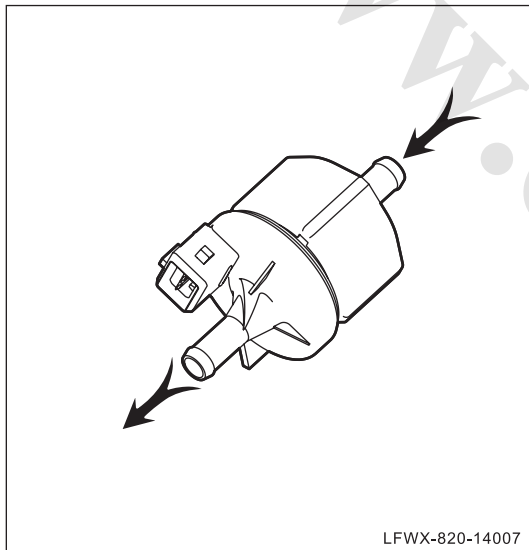
1. **Check the resistance of the canister solenoid valve.**
  - (a). Keep the power status in the "LOCK" position, and disconnect the harness connector for the canister solenoid valve.
  - (b). Turn the digital multimeter to its resistance function and check the conduction between the two terminals of the canister solenoid valve. If not conducted, replace it.

## 2. Check the working conditions of the canister solenoid valve

- (a) Connect a diagnostic scanner to diagnosis interface.
- (b) Keep the system power in the "ON" state.
- (c) Operate the diagnostic scanner to access to the active test function of the engine menu. Do the canister solenoid valve actuation test.

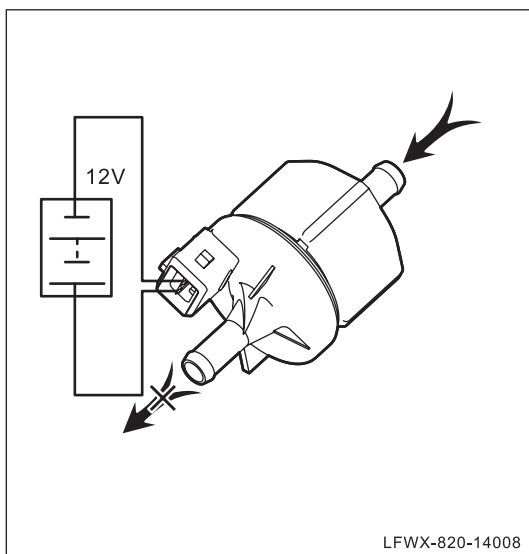
### △ HINT:

Check the canister solenoid valve for slight vibration. Otherwise, check the canister solenoid valve, the harness and the engine control module ECM.

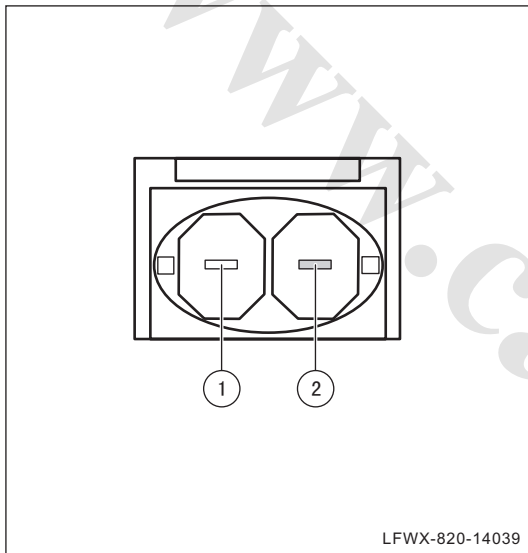
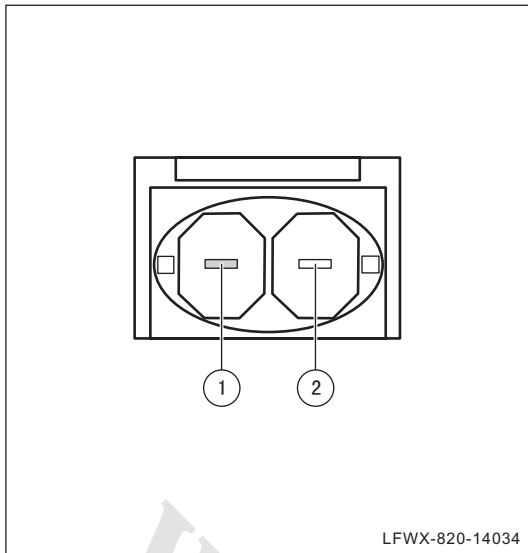


- (d) Remove the canister solenoid valve. (See 14- Emission Control System-Canister Solenoid Valve, Replacement)

- (e) Blow air into the intake port for the canister solenoid valve and check its ventilation is smooth. Otherwise, replace it.



- (f) Apply the 12V battery voltage between the two terminals of the canister solenoid valve. Blow air into the intake port for the canister solenoid valve and check its ventilation is smooth. Otherwise, replace it.



### 3. Check the power line for the canister solenoid valve.

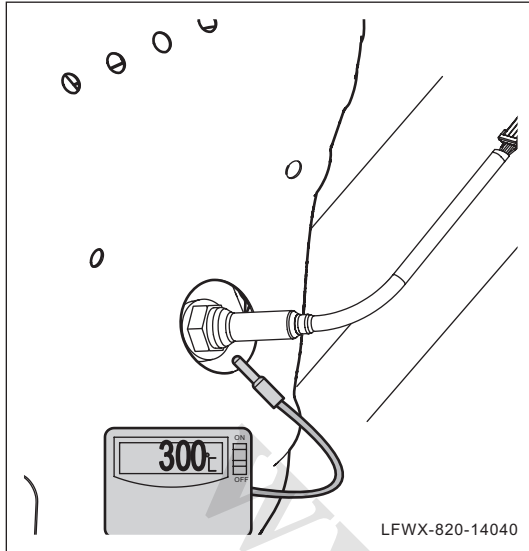
- (a) Keep the power status in the "LOCK" position, and disconnect the harness connector for the canister solenoid valve.
- (b) Keep the power status in the "ON" position. Turn the digital multimeter to its resistance function and check the voltage between No. 1 terminal of the harness connector for the canister solenoid valve and the body ground. If zero voltage, check and repair the related harness according to the schematic.

### 4. Check the signal line for the canister solenoid valve.

- (a) Keep the power status in the "LOCK" position, and disconnect the harness connector for the canister solenoid valve.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 2 terminal of the harness connector for the canister solenoid valve and No. 94 terminal of ECM. If not conducted, check and repair the related harness according to the schematic.



## Check the catalytic converter.



### 1. Check the working conditions of the catalytic converter

- (a) Measure the intake and exhaust temperature of catalytic converter with the digital temperature meter.

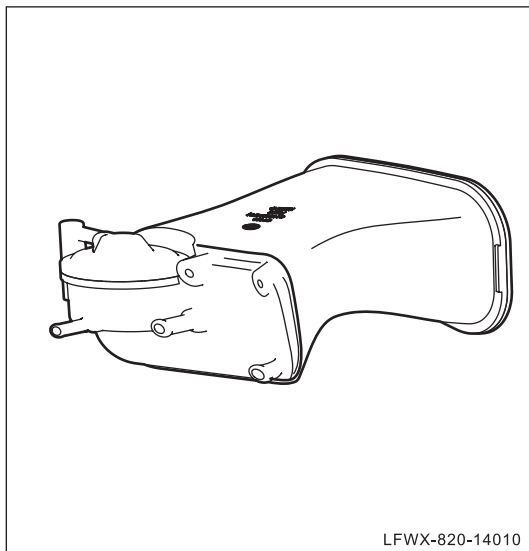
#### △ HINT:

The temperature of the catalytic converter outlet should be 10%-15% higher than that of intake at least (generally, the temperature of catalytic converter outlet is 20%-25% higher than that of intake). If the temperature of outlet is below the above parameter, or that of intake, the catalytic converter fails or is clogged.

#### ⓘ Note:

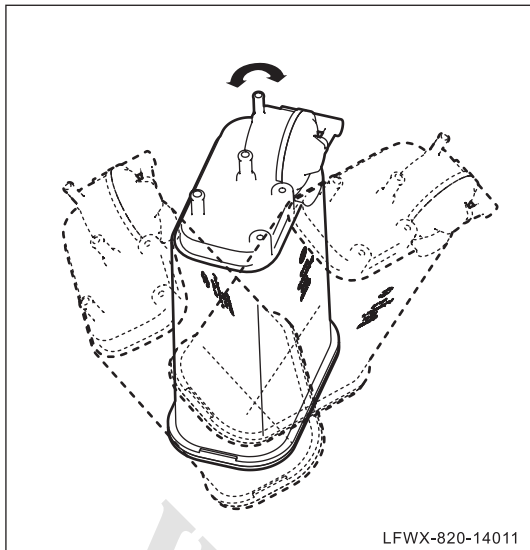
During measurement, the sensor probe of the digital temperature meter should be placed as close to the intake or outlet of the catalytic converter as possible (within 50 mm).

## Check the canister

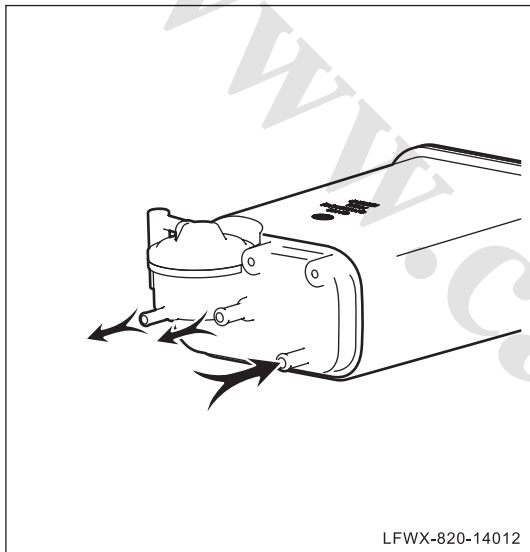


### 1. Check the canister working conditions.

- (a) Remove the canister. (See 14- Emission Control System- Canister, Replacement)
- (b) Check the canister for cracks, deformation and other damage. If any, replace it.



- (c) Shake the canister by hand and check whether there is a noise inside the canister. If any, replace it.



- (d) Blow air into one of the interfaces of the canister, and check the other two interfaces for air flow. If no air flows out, replace the canister.

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## Check oxygen sensor

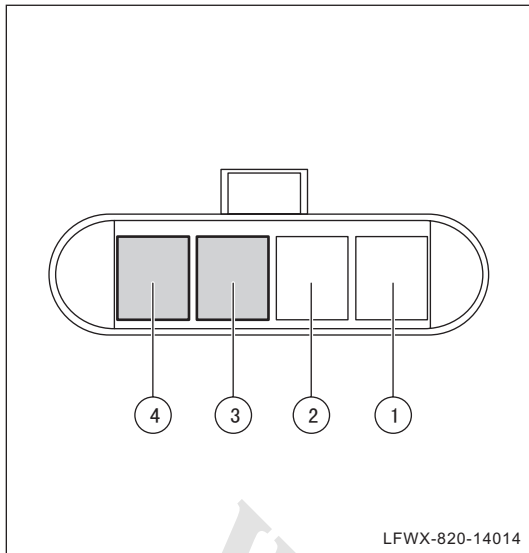
△ HINT:

The inspection method for front/rear oxygen sensor is basically the same. This section only takes the rear oxygen sensor as an example.

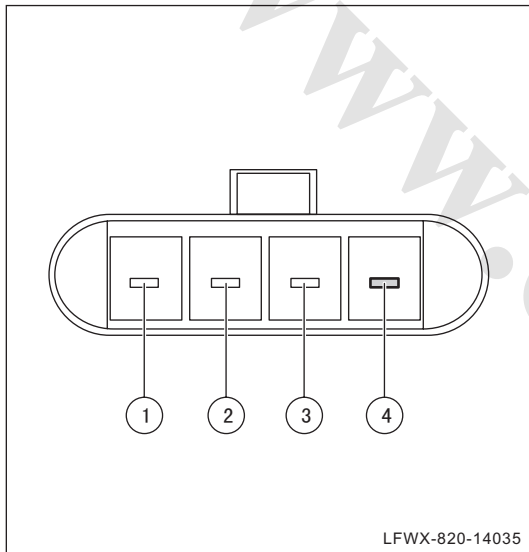
### 1. Check the rear oxygen sensor working conditions

- Keep the system power supply in the "LOCK" state.
- Connect a diagnostic scanner to diagnosis interface.
- Start the engine and let it idle for 5min.
- Operate the diagnostic scanner and enter the item for reading data stream. Check the rear oxygen sensor for voltage. If unqualified, check the rear oxygen sensor.

**Voltage: 100mV - 900mV**

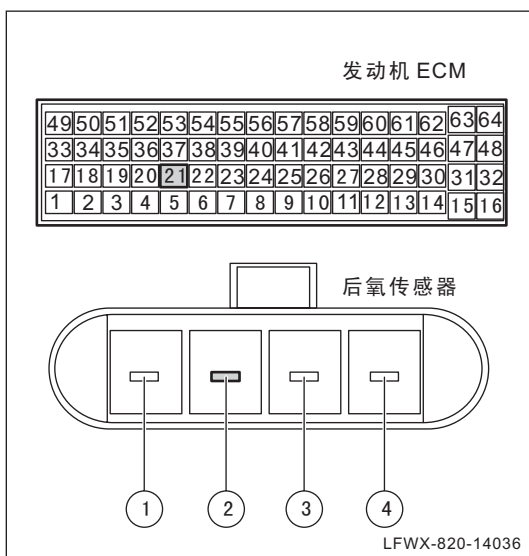


- (e) Remove rear oxygen sensor. (See 14-Emission Control System-Oxygen Sensor, Replacement)
- (f) Turn the digital multimeter to its resistance function, and check the conduction between No. 3 and No. terminals of the rear oxygen sensor. If not, replace it.



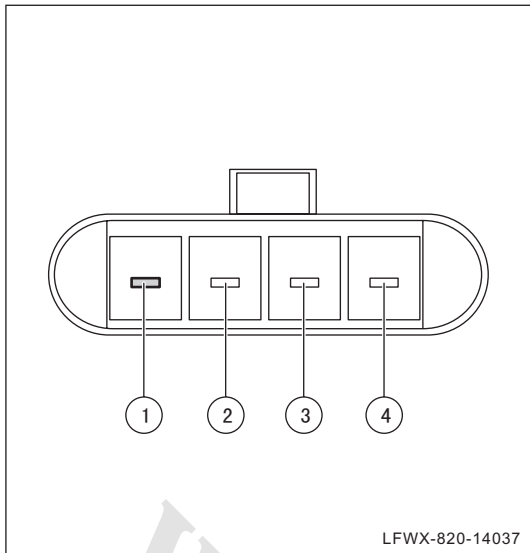
**2. Check the power line for the rear oxygen sensor.**

- (a) With the system power in the "LOCK" status, disconnect the harness connector for the rear oxygen sensor.
- (b) With the system power in the "ON" status, turn the digital multimeter to its voltage function and check whether the voltage between No. 4 terminal of the harness connector of rear oxygen sensor and the body ground is equal to the battery voltage. If the voltage is 0, check and repair the related harness according to the schematic.



**3. Check the signal line of rear oxygen sensor.**

- (a) With the system power supply in the "LOCK" status, disconnect the rear oxygen sensor's harness connector and the engine ECM's harness connector.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 2 terminal of the harness connector for the rear oxygen sensor and No. 21 terminal of the engine ECM's harness connector. If not conducted, check and repair the related harness according to the schematic.



**4. Check the ground wire of the rear oxygen sensor signal.**

- (a) With the system power in the "LOCK" status, disconnect the harness connector for the rear oxygen sensor.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 1 terminal of the harness connector for the rear oxygen sensor and the body ground. If not conducted, check and repair the related harness according to the schematic.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Canister solenoid valve won't work	1. Fuse (blown)	See 14- Emission Control System-Diagnosis, Fault Diagnosis (1. Canister solenoid valve won't work)
	2. Canister solenoid valve (faulty)	
	3. Wire harness (short circuit or open-circuit)	
	4. Engine ECU (fault)	
Clogging of positive crankcase ventilation (PCV) system	1. PCV valve (clogged)	See 14- Emission Control System-Diagnosis, Fault Diagnosis (2. Clogging of PCV system)
	2. PCV pipe (clogged)	
Oxygen sensor won't work	1. Fuse (blown)	See 14- Emission Control System-Diagnosis, Fault Diagnosis (3. Oxygen sensor fault)
	2. Wire harness (short circuit or open-circuit)	
	3. Oxygen sensor fault	
	4. Engine ECU (fault)	

### Fault diagnosis

#### 1. Canister solenoid valve won't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the canister solenoid valve working conditions using the diagnostic scanner (See 14- Emission Control System-General Check, Checking the Canister Solenoid Valve).	Diagnosis end.	Canister solenoid valve won't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the fuse of the canister solenoid valve is blown (See 14- Emission Control System-General Check, Checking the System).	Go to Step 3	FS47 保险丝熔断	Go to Step 2



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
2	检查 FS47 线路	Normal	Faulty	Instruction
	Check working condition of FS47 circuit	Go to Step 3	The circuit is short	According to the wiring diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check the canister solenoid valve	Normal	Faulty	Instruction
	Check whether the canister solenoid valve is damaged (See 14- Emission Control System-General Check, Checking the Canister Solenoid Valve).	Go to Step 4	Canister solenoid valve is damaged	Replace (See 14- Emission Control System- Canister Solenoid Valve, Replacement)
4	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the canister solenoid valve for continuity (See 14- Emission Control System-General Check, Checking the Canister Solenoid Valve)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check the signal line of the canister solenoid valve for continuity (See 14- Emission Control System-General Check, Checking the Canister Solenoid Valve)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Clogging of PCV system

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the PCV system operating conditions (See 14- Emission Control System-General Check, Checking the System).	Diagnosis end.	Clogging of positive crankcase ventilation (PCV) system	Go to Step 1
1	Check the PCV valve.	Normal	Faulty	Instruction
	Check the PCV valve working conditions (See 14- Emission Control System-General Check, Checking the PCV valve).	Go to Step 2	PCV valve is clogged or damaged.	Replace (see 14- Emission Control System-PCV Valve, Replacement)
2	Check the pipeline.	Normal	Faulty	Instruction
	Check the PCV pipe (See 14- Emission Control System-General Check, Checking the System).	Go to Step 3	PCV pipe is clogged or installed improperly.	Replace the PCV pipe or re-install it (See 14- Emission Control System-Emission Control Pipe, Replacement)
3	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 3. Oxygen sensor won' t work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the oxygen sensor working conditions using the diagnostic scanner (See 14- Emission Control System-General Check, Checking the Oxygen Sensor).	Diagnosis end.	Oxygen sensor won' t work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check whether the fuse of the oxygen sensor is blown (See 14- Emission Control System-General Check, Checking the System).	Go to Step 3	Fuses FS07 and FS08 are blown.	Go to Step 2
2	Check the circuits for FS07 and FS08.	Normal	Faulty	Instruction
	Check the working conditions of the circuits for FS07 and FS08.	Go to Step 3	The circuit is short	According to the circuit diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the oxygen sensor for continuity (See 14- Emission Control System-General Check, Checking the Oxygen Sensor)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check the signal line of the oxygen sensor for continuity (See 14- Emission Control System-General Check, Checking the Oxygen Sensor).	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check oxygen sensor	Normal	Faulty	Instruction
	Check the oxygen sensor for damage (See 14- Emission Control System-General Check, Checking the Oxygen Sensor).	Go to Step 6	Oxygen sensor is damaged	Replace (See 14- Emission Control System-Front/Rear Oxygen Sensor, Replacement)
6	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

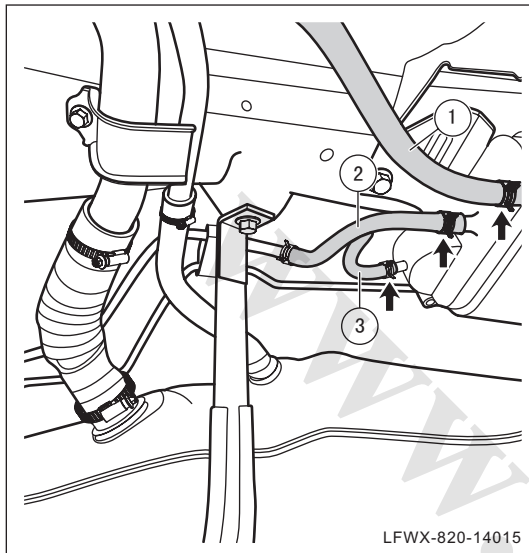


## Canister

### Replacement

#### 1. Removal of canister

##### (a) Lift the vehicle



(b) Remove the connecting hose ① from the canister breather pipe.

- Remove the elastic clamp for the connecting hose, and pull out the connecting hose from its mounting location.

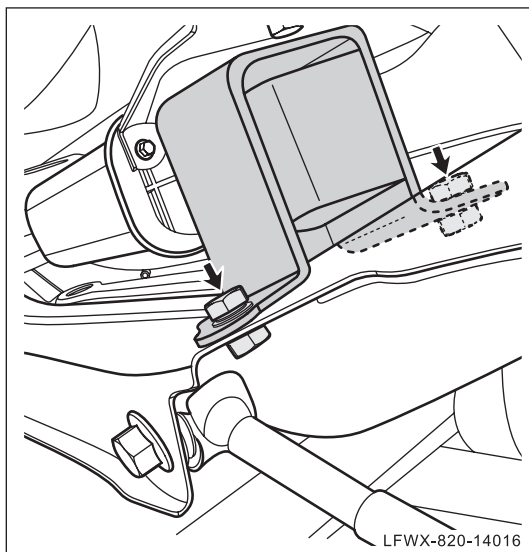
(c) Remove the connecting hose ② for fuel evaporation.

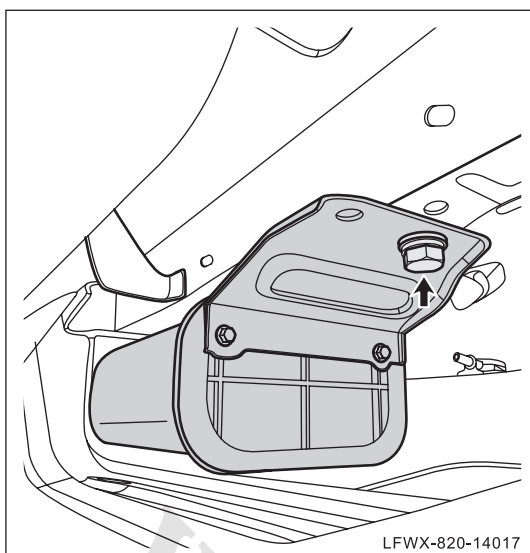
- Remove the elastic clamp for the connecting hose, and pull out the connecting hose from its mounting location.

(d) Remove the connecting hose ③ between the fuel tank and the canister.

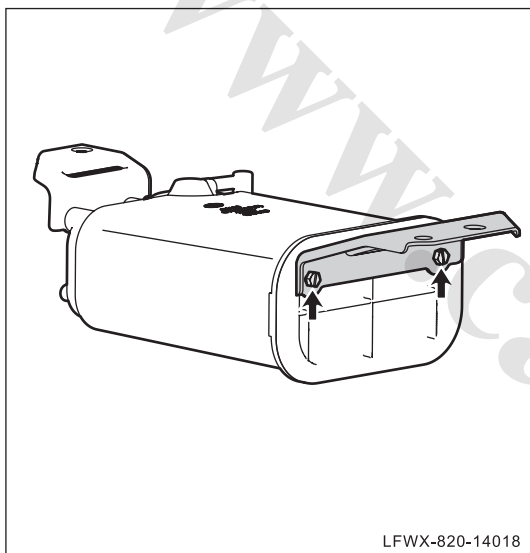
- Remove the elastic clamp for the connecting hose, and pull out the connecting hose from its mounting location.

(e) Remove the bolts from rear sub-frame counterbalance, and remove the counterbalance.



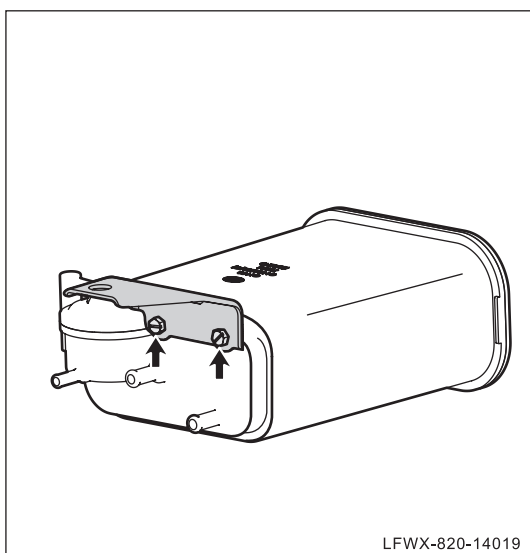


- (f) Remove fixing bolts of canister with bracket assembly, and take down the canister with bracket assembly.

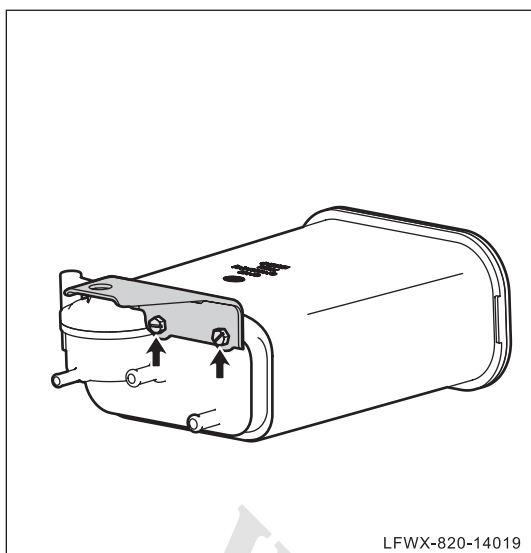


- (g) Remove the bolts from the large canister bracket, and remove the large canister bracket.

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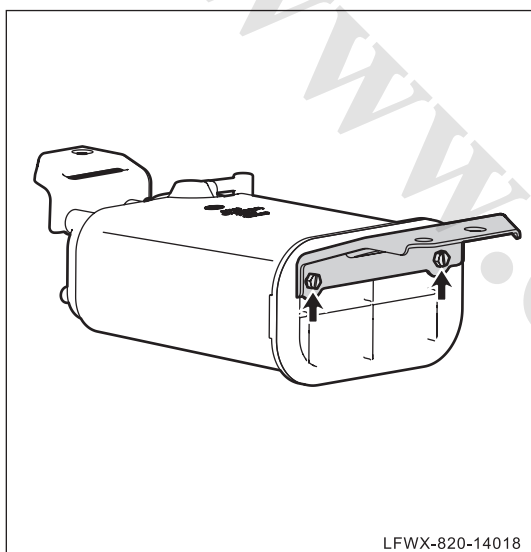
- (h) Remove the bolts from the small canister bracket, and remove the small canister bracket.



## 2. Re-installation of canister

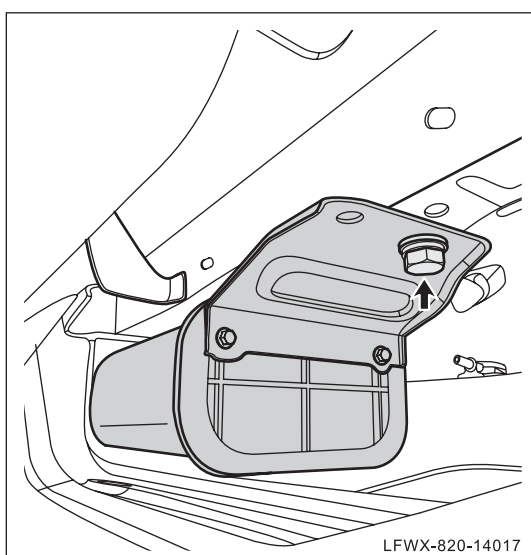
- (a) Fix the small canister bracket to the canister, and install and tighten the bolts.

**Torque: 6N•m-8N•m**



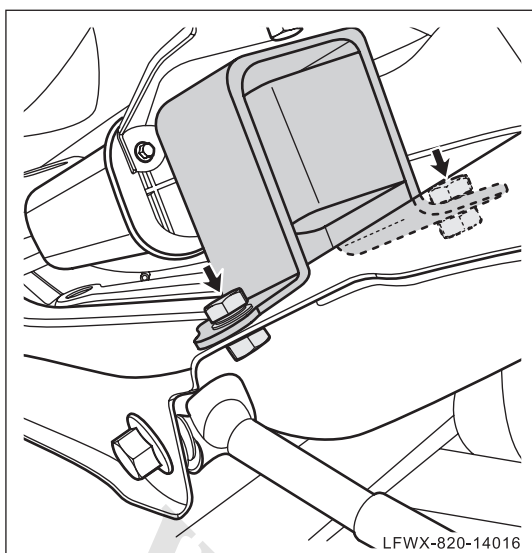
- (b) Fix the large canister bracket to the canister, and install and tighten the bolts.

**Torque: 6N•m-8N•m**



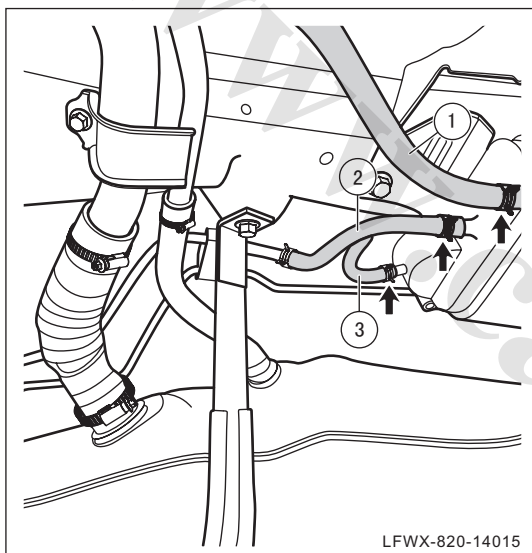
- (c) Install the canister with bracket assembly in place, and mount & tighten the fixing bolts of canister bracket.

**Torque: 8N•m-12N•m**



- (d) Install the rear sub-frame counterbalance in place, and install and tighten the bolts.

**Torque: 8N•m-12N•m**



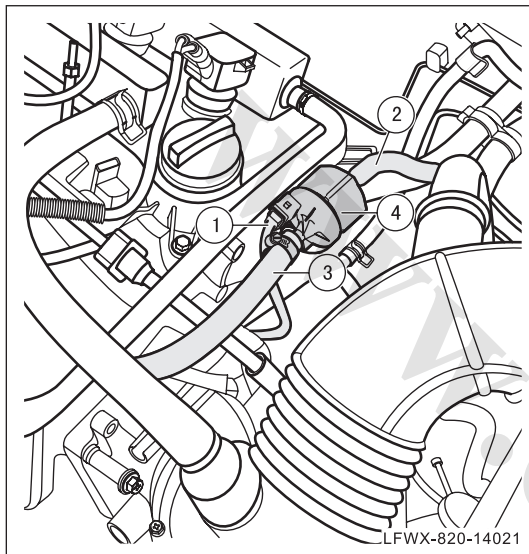
- (e) Fix the connecting hose ① and elastic clamp to the canister.
- (f) Install the fuel evaporation connecting hose ② and spring clamp on the canister.
- (g) Install the connecting hose ③ and elastic clamp in place.

# Canister Solenoid Valve

## Replacement

### 1. Removal of canister solenoid valve

- (a) Keep the power supply in "LOCK" position.
- (b) Remove the engine decorative shroud. (See 81-Interior and Exterior, Engine Decorative Shroud, Replacement)



- (c) Disconnect the connector ① from the canister solenoid valve.
- (d) Remove the intake pipe ② from the canister solenoid valve.
  - Loosen the intake pipe ② hoop, and remove the intake pipe ② .
- (e) Remove the outlet pipe ③ from the canister solenoid valve.
  - Loosen the outlet pipe ③ hoop, and remove the outlet pipe ③ .
- (f) Remove the canister solenoid valve ④ .

### 2. Re-installation of canister solenoid valve

- (a) Install the canister solenoid valve in place.
- (b) Connect the canister solenoid valve connector.
- (c) Fix the intake pipe and hoop to the canister solenoid valve, and tighten the hoop.
- (d) Fix the exhaust pipe and hoop to the canister solenoid valve, and tighten the hoop.
- (e) Install the engine decorative shroud. (See 81-Interior and Exterior, Engine Decorative Shroud, Replacement)

### 3. Inspection

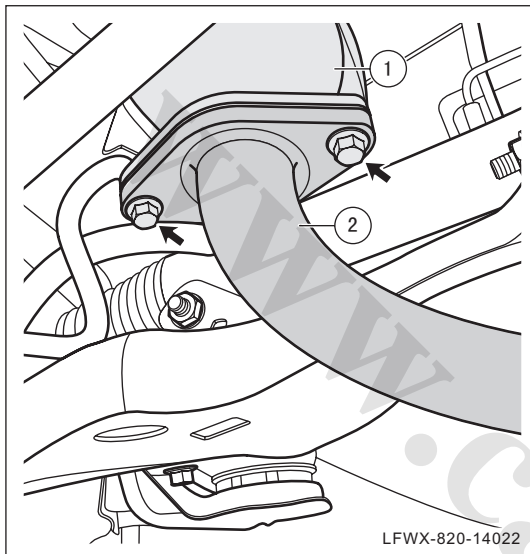
- (a) Start the engine and check the working conditions of the canister solenoid valve. (See 14- Emission Control System-General Check, Checking the Canister Solenoid Valve)

## Catalytic Converter

### Replacement

#### 1. Removal of catalytic converter

- (a) Keep the power supply in "LOCK" position.
- (b) Remove the front oxygen sensor. (See 14- Emission Control System- Front Oxygen Sensor, Replacement)

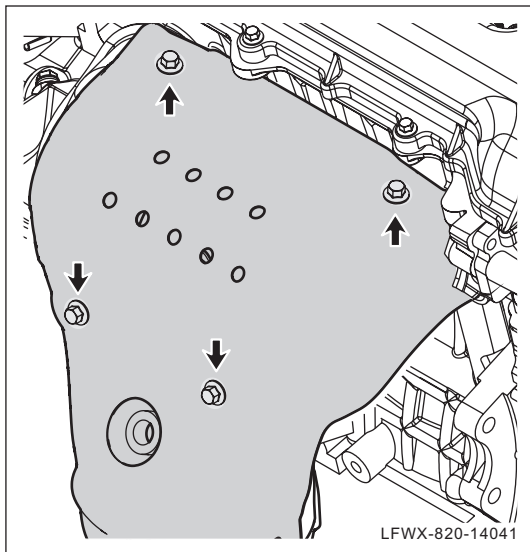


- (c) Remove the fixing bolts from the connection between the catalytic converter ① and the rear-stage purifier ②, and remove the gasket.

△ HINT:

Do not re-use the removed gasket. Be sure to replace it with a new one during installation.

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- (d) Remove the fixing bolts of the catalytic converter upper heat shield, and take down the catalytic converter upper heat shield.
- (e) Remove the fixing nuts of the catalytic converter, and take down the catalytic converter and gasket.

△ HINT:

Do not re-use the removed gasket. Be sure to replace it with a new one during installation.

#### 2. Installation of catalytic converter

- (a) Install the catalytic converter and gasket on the engine and mount & tighten the fixing nuts.

**Torque: 35N•m - 40N•m**

- (b) Install the upper heat shield of catalytic converter on the catalytic converter and mount & tighten the fixing bolts.

**Torque: 15N•m-20N•m**

- (c) Install the gasket between the rear catalytic converter and the rear-stage purifier, install and tighten the connecting bolts.

**Torque: 65N•m - 85N•m**

- (d) Install the front oxygen sensor. (See 14- Emission Control System- Front Oxygen Sensor, Replacement)

### 3. Inspection

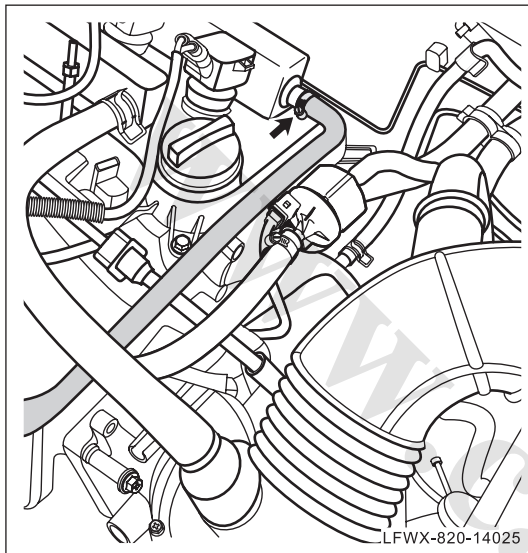
- (a) Start the engine and check the catalytic converter working conditions. (See 14- Emission Control System-General Check, Checking the Catalytic Converter)

## PCV Valve

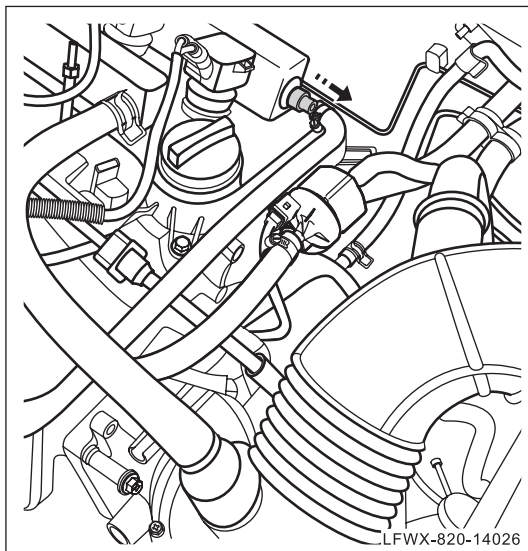
### Replacement

#### 1. Removing the PCV valve

- (a) Keep the power supply in "LOCK" position.
- (b) Remove the engine decorative shroud. (See 81-Interior and Exterior, Engine Decorative Shroud, Replacement)



- (c) Loosen the hose hoop of the PCV valve, and pull out the hose from the PCV valve.



- (d) Pull out the PCV valve.

#### 2. Installing the PCV valve

- (a) Install the PCV valve in place.
- (b) Fix the hose and hoop to the PCV valve, and tighten the hoop.
- (c) Install the front oxygen sensor. (See 14- Emission Control System- Front Oxygen Sensor, Replacement)

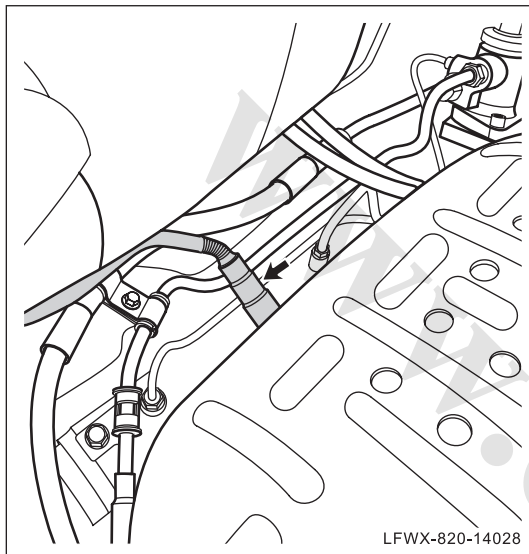


## Front Oxygen Sensor

### Replacement

#### 1. Removal of front oxygen sensor

- (a) Keep the power supply in "LOCK" position.
- (b) Remove the engine decorative shroud. (See 81-Interior and Exterior, Engine Decorative Shroud, Replacement)



- (c) Disconnect front oxygen sensor connector.
- (d) Remove the front oxygen sensor.

#### 2. Install front oxygen sensor

- (a) Install the front oxygen sensor in place.

**Torque: 38N•m - 42N•m**

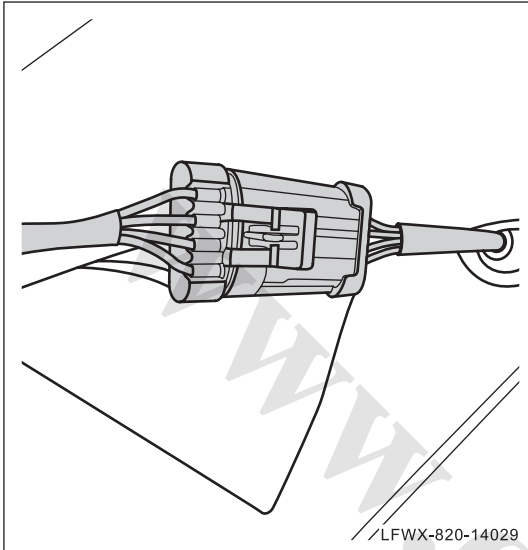
- (b) Connect front oxygen sensor connector.
- (c) Install the front oxygen sensor. (See 14- Emission Control System- Front Oxygen Sensor, Replacement)

## Rear Oxygen Sensor

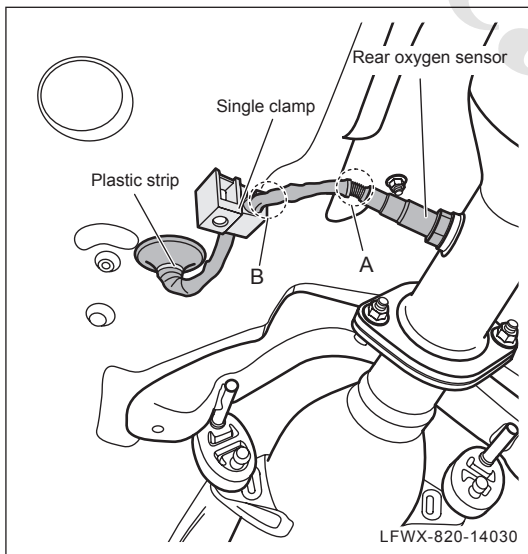
### Replacement

#### 1. Removal of the rear oxygen sensor.

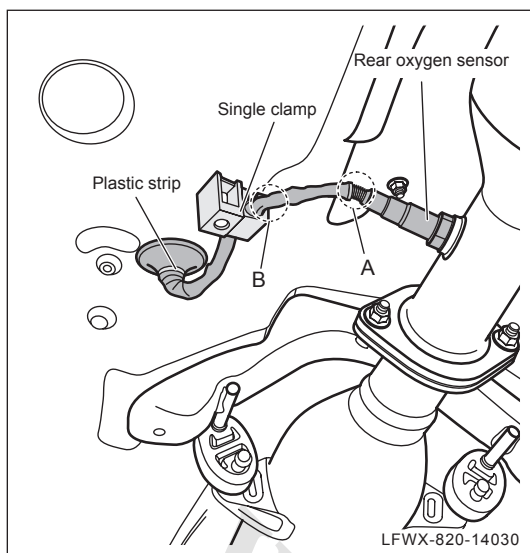
(a) Remove the sub-dashboard. (See 84 - Dashboard/Console, Console, Replacement)



(b). Disconnect the rear oxygen sensor connector.



(c) Remove the rear oxygen sensor and take it out of the vehicle.



## 2. Install rear oxygen sensor

- (a) Pass the rear oxygen sensor through the mounting hole in vehicle.
- (b) Install the rear oxygen sensor.

**Torque: 40N•m-60N•m**

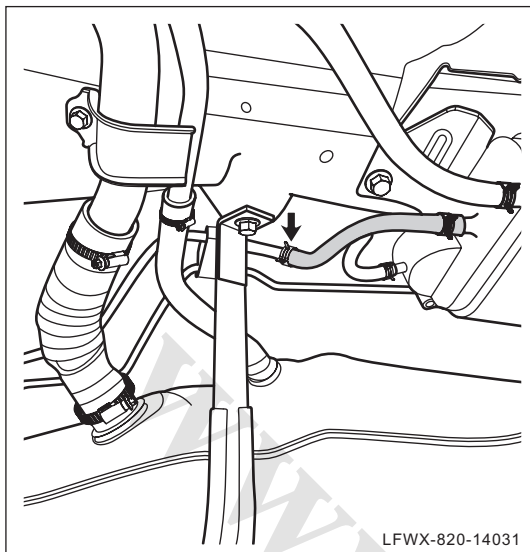
### ⓘ Note:

During installation, leave the wire harness margin between the rear of sensor and the single clamp (between A and B shown in the figure) to keep the sensor harness some slack, and make sure the harness jacket can not fall out of the oxygen sensor rubber jacket.

- (c) Connect rear oxygen sensor connector.
- (d) Install the sub-dashboard. (See 84 - Dashboard/Console, Console, Replacement)

## Emission Control Line

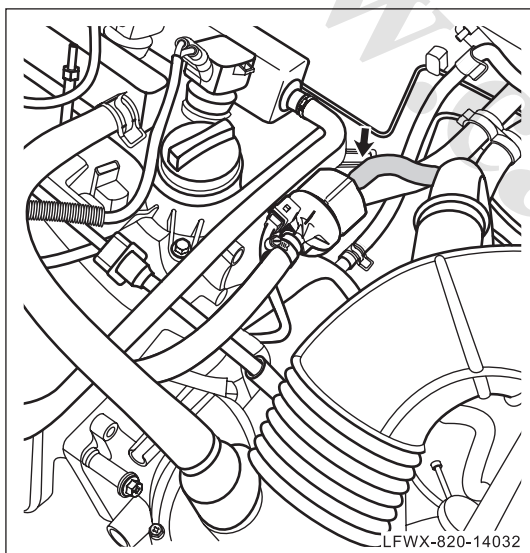
### Replacement



#### 1. Removing the emission control line

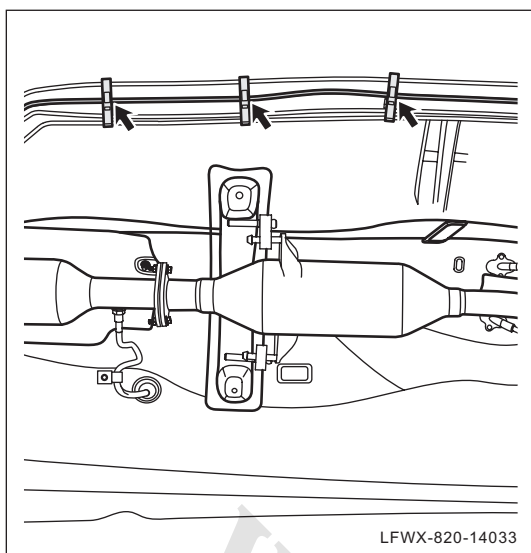
(a) Remove the connecting hose for fuel evaporation.

- Remove the hose clamp, and pull out the hose.

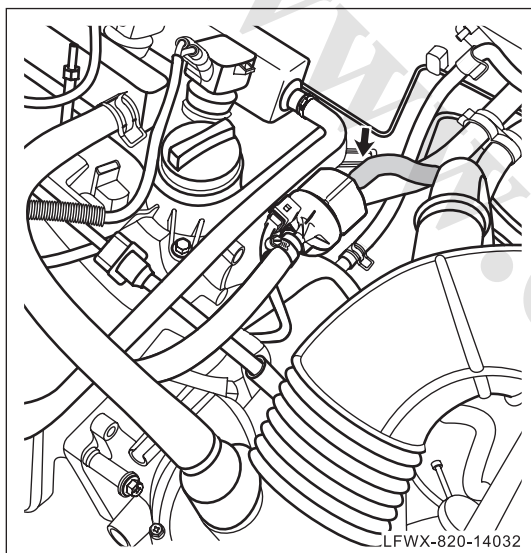


(b) Remove the inlet hose from the canister solenoid valve.

- Remove the hose clamp, and pull out the hose.

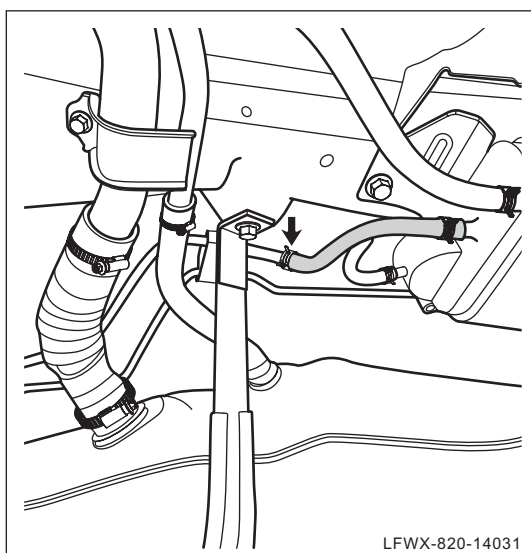


- (c) Remove the hard tube module for fuel evaporation from the clamp.

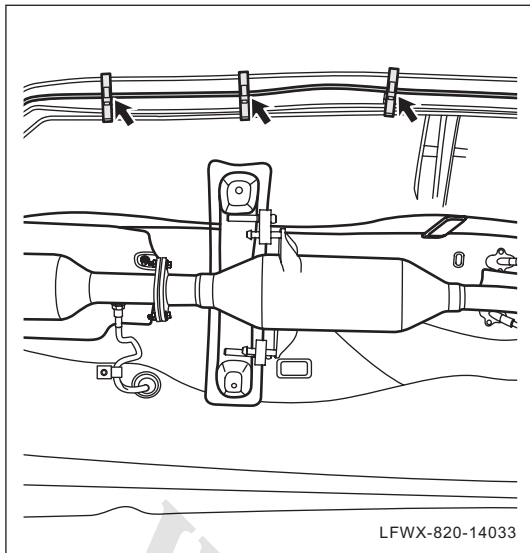


## 2. Installing the emission control line

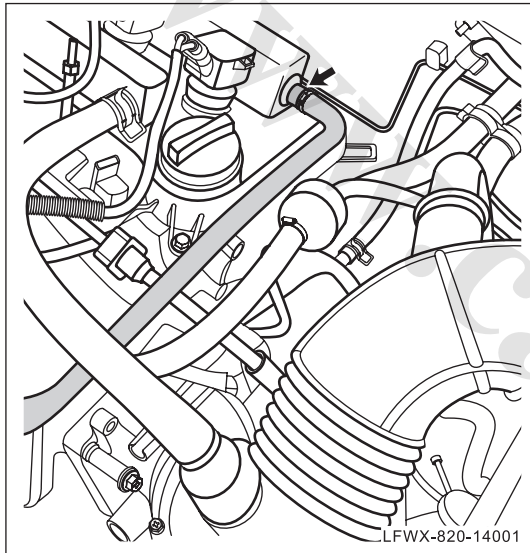
- (a) Fix the intake hose and clamp to the canister solenoid valve.



- (b) Fix the hose and clamp for fuel evaporation to the canister.



- (c) The emission control line to the pipe installation folder.



**3. Removing the breather pipe from the PCV valve**

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- (a) Loosen the hoops on both ends of the pipe for PCV valve, and remove the pipe.

**4. Installing the breather pipe of the PCV valve**

- (a) Install the pipe and hoops on both ends in place, and tighten the hoops.



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# 15- Intake/Exhaust System

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# Intake and Exhaust System

## System description

△ HINT:

Lifan 820 series model includes LF7186, LF7240, and LF7240B, equipped with LFB479Q/LF489Q engine and 5MT manual transmission or 6AT automatic transmission. The intake /exhaust system depends on the engine model and the transmission model, but it can be checked and repaired basically in the same way. This section takes the LF7186 model equipped with the LFB479Q engine and 5MT transmission as an example.

### 1. Function

Function of intake system is: to provide clean and dry air to the engine and maintain the optimal engine performance by greatly reducing the engine wear.

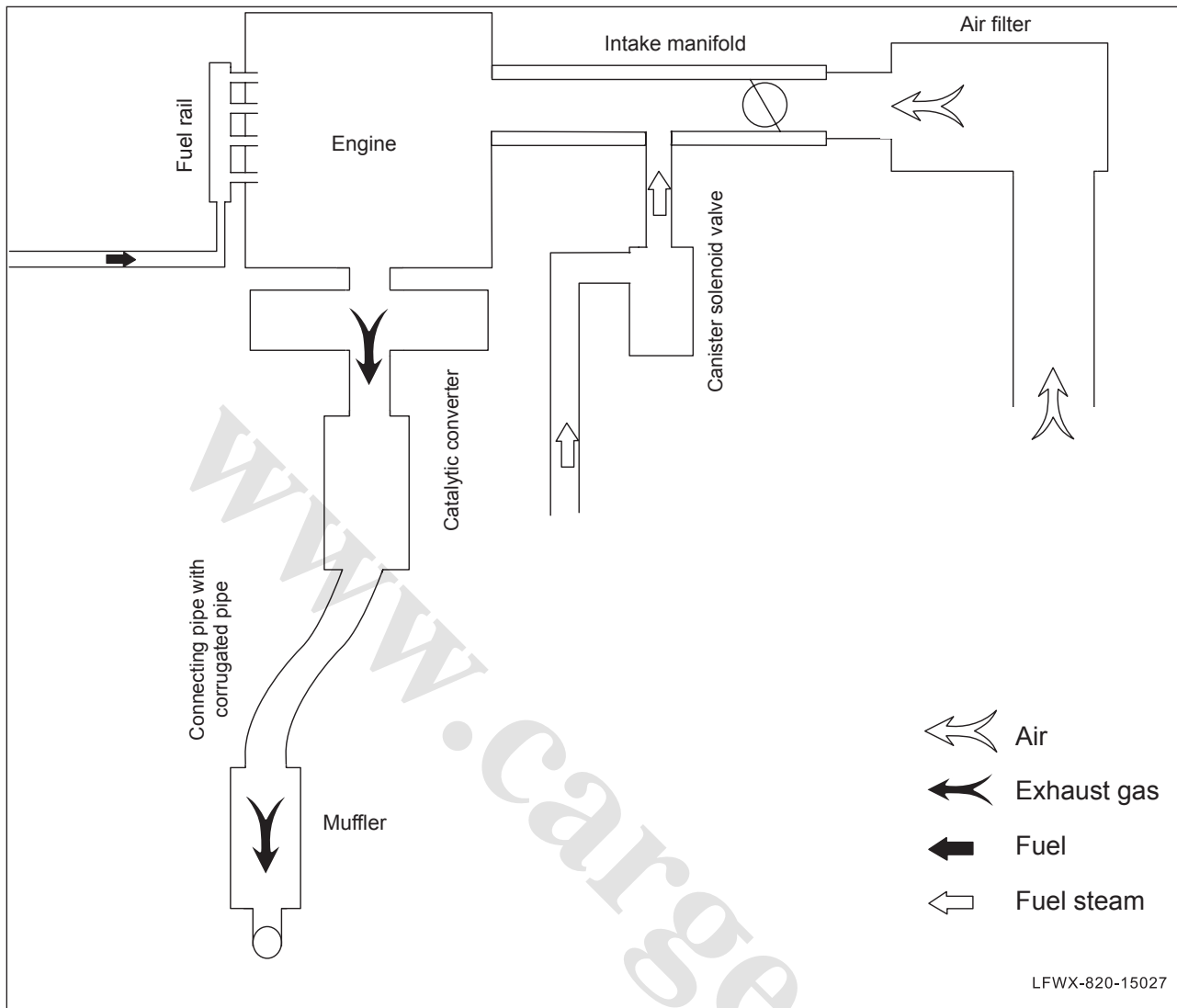
Function of exhaust system is: exhaust the the waster gas generated by engine operation and minimize the pollution and noise of the waste gas.

### 2. Components

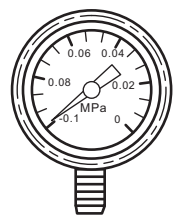
The intake system mainly consists of air filter, intake pipeline and resonant cavity, etc.

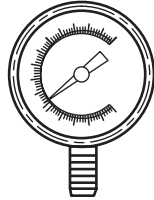
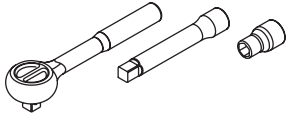
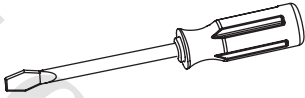
Exhaust system mainly consists of the catalytic converter, rear-stage purifier, pre-muffler and rear muffler and other component.

### 3. Principle



### Preparation

S/N	Tools	Outline diagram	Description
1	Vacuum gauge		Detects the degree of vacuum

S/N	Tools	Outline diagram	Description
2	Exhaust back-pressure gauge		Detects exhaust backpressure
3	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts
4	Screwdriver		Remove the fixing screws

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## Service data

### 1. Technical specifications table

Vacuum of intake system when idling	60kPa~70kPa
Exhaust back-pressure value (2500r/min)	2kPa (no load)

### 2. Table of tightening torque

Item	N•m
Mounting bolts for intake manifold with resonant cavity assembly	8~12
Mounting bolts for lower housing of air filter	10~12
Throttle valve fixing bolts	10~12
Intake pressure and temperature sensor	8~10
Mounting bolts and nuts between rear-stage purifier and pre-muffler	60~70

Item	N•m
Mounting bolts between catalytic converter and rear-stage purifier	60~70
Mounting bolts between pre-muffler and rear muffler	60~70
Rear oxygen sensor	40~60

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## Precautions

### 1. Precautions before repair

- (a) Regardless of whether the engine is running, as long as the power supply switch is turned on, disable any one of the following components in the plug system:  
any cable of the battery, injectors, the fuel pump, ignition system leads, electronic control unit (ECU) lines, etc..
- (b) Check the tightness of the connector between the intake pipeline and air filter frequently. In the event of leakage, deal with it immediately, and tighten the connector to avoid abnormal wear.
- (c) Stop the vehicle at a place without wind and dust when maintaining and replacing the filter element.
- (d) Check the exhaust pipeline frequently. In the event of leakage, deal with it immediately, tighten the connector to avoid abnormal damage.

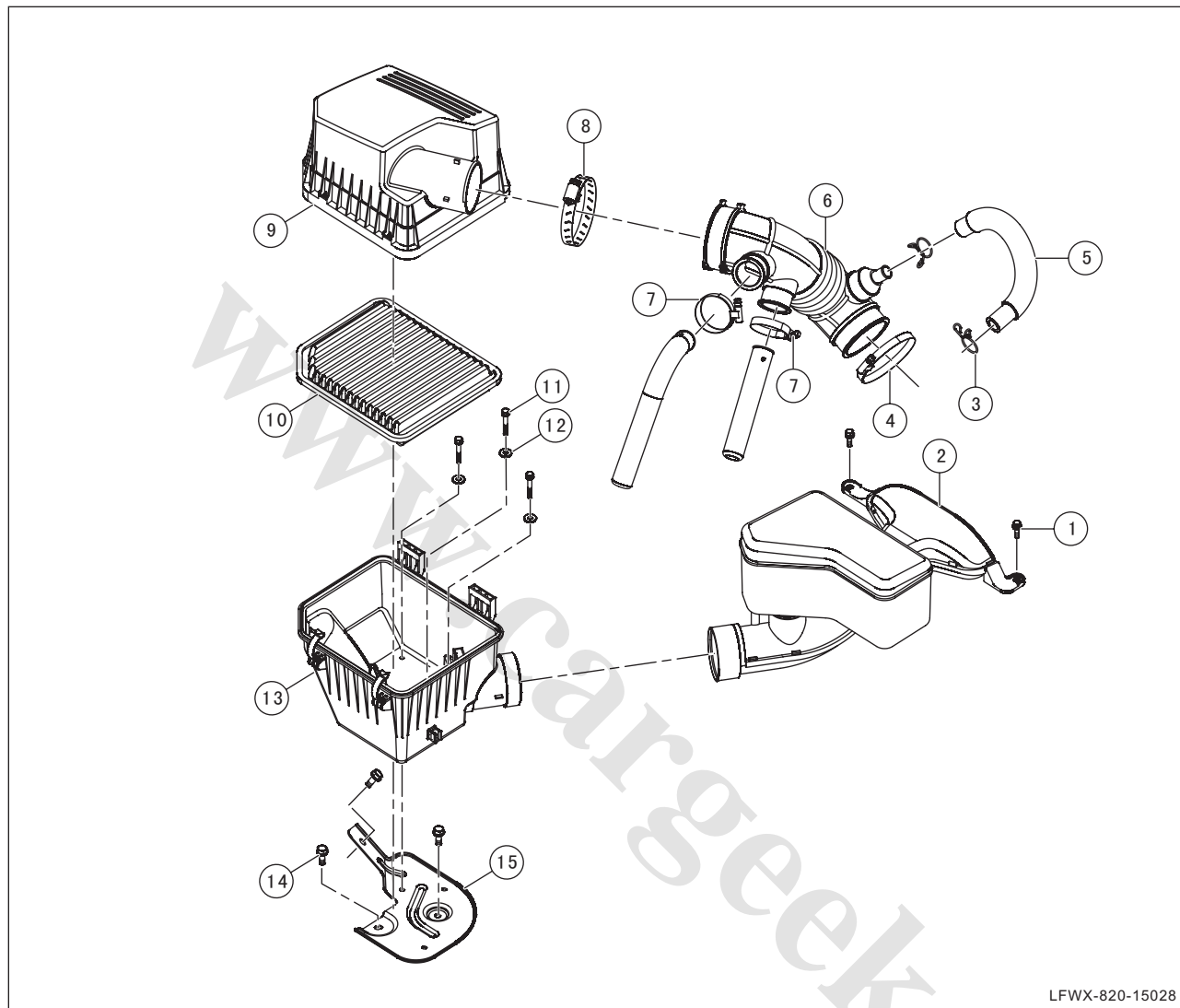
### 2. Precautions for maintenance

- (a) Because the exhaust system is very hot when the engine is running, operation shall be performed after the engine and the exhaust system has stopped and cooled down.

## Component (I)

△ HINT:

Vehicles equipped with the LFB479Q engine.



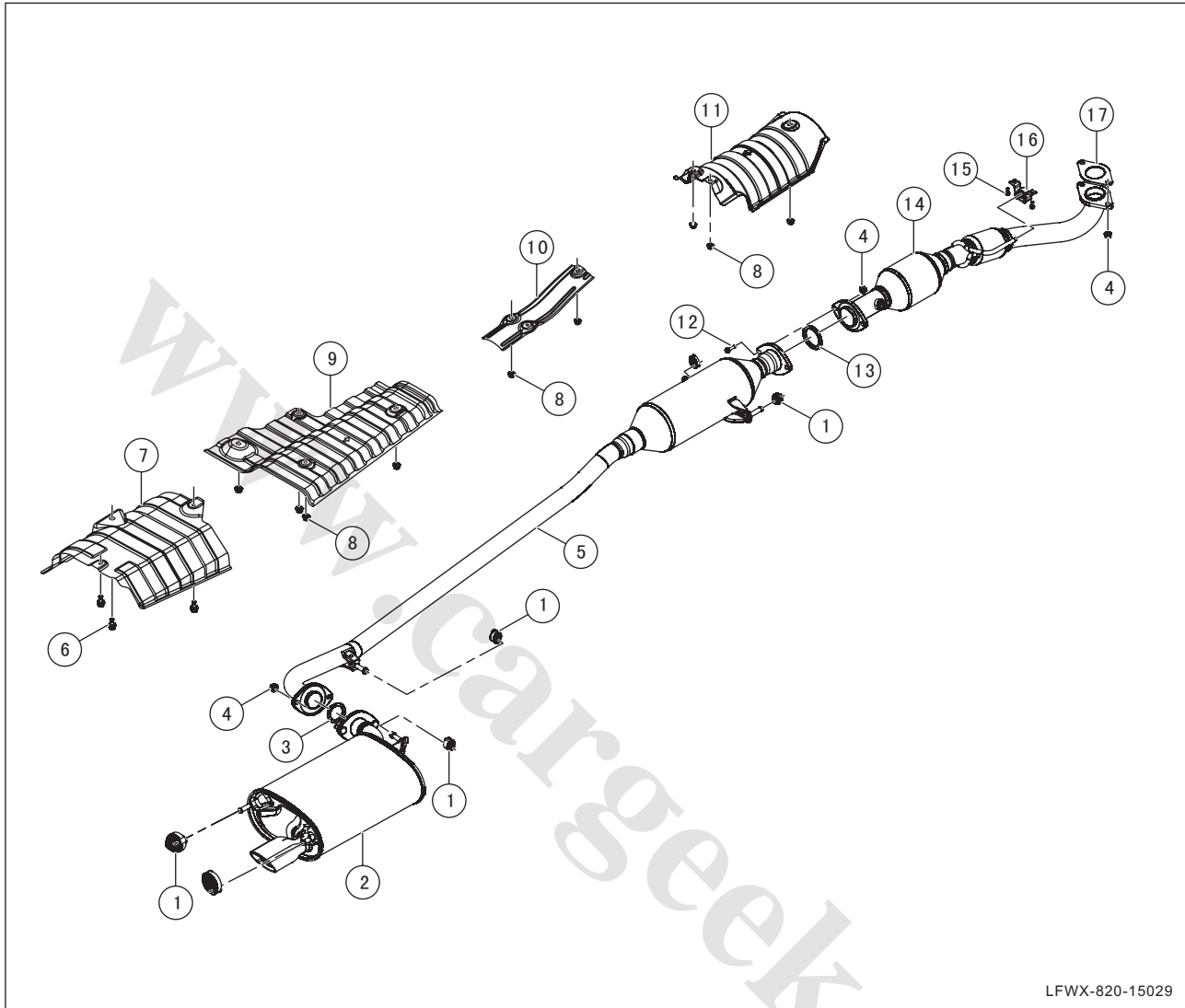
1	Bolt
2	Intake manifold with resonant cavity assembly
3	Spiral hoop
4	Hoop
5	Crankshaft ventilation module
6	Air intake pipe assembly of engine
7	Hoop
8	Hoop

9	Upper housing for air filter
10	Air filter element
11	Bolt
12	Washer
13	空气滤清器下壳体
14	Bolt
15	Installing support of air filter

## Component (II)

△ HINT:

Vehicles equipped with the LFB479Q engine.



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1	Rubber suspension block
2	Rear muffler assembly
3	Gasket
4	Nut
5	Front muffler assembly
6	Bolt
7	Rear muffler heat shield
8	Nut
9	Heat insulator of fuel tank

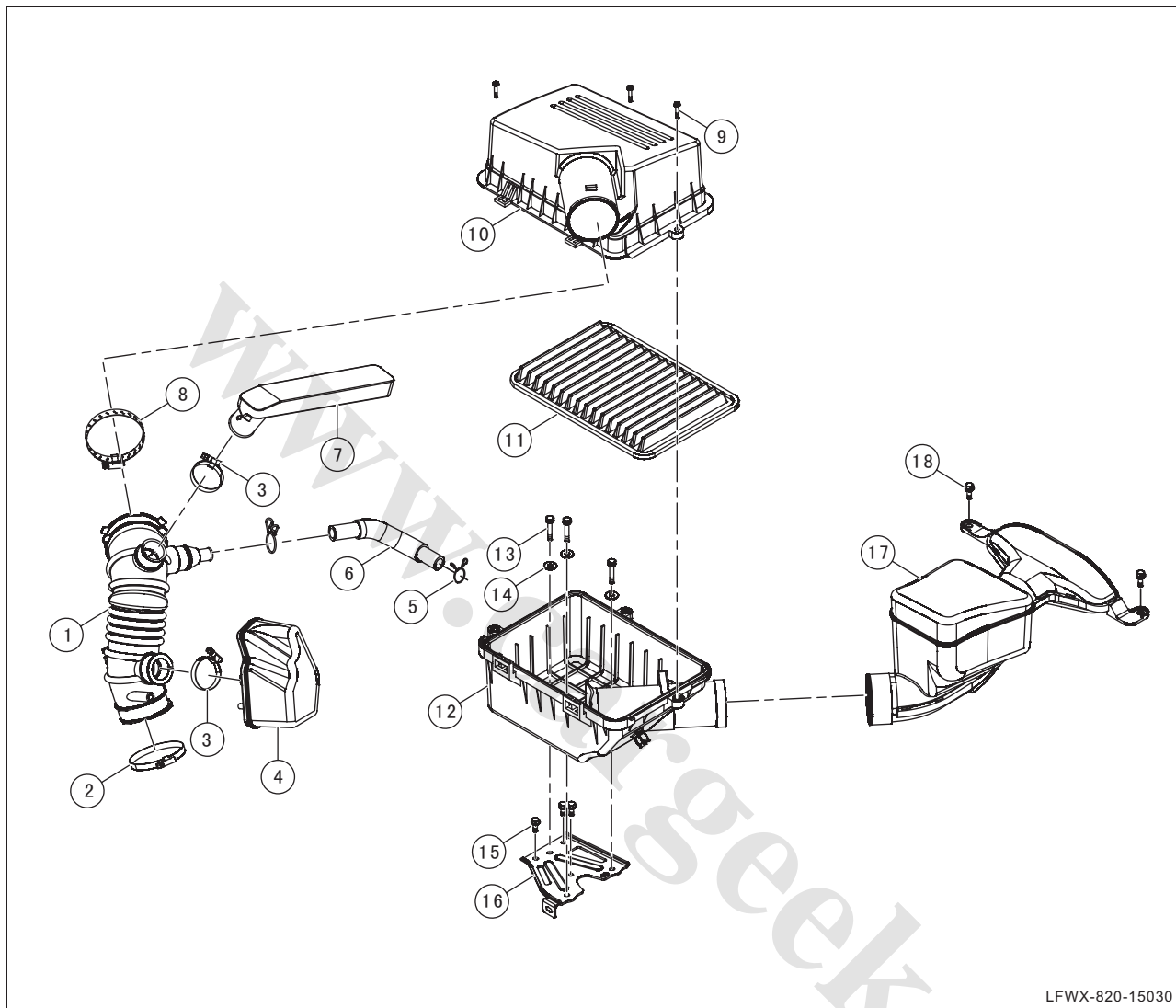
10	Middle heating insulation board
11	Front heat baffle
12	Bolt
13	Gasket
14	Final stage catalytic converter with corrugated pipe assembly
15	Bolt
16	Suspended block for front exhaust pipe
17	Gasket



## Components (III)

△ HINT:

Vehicle with engine of LF489Q



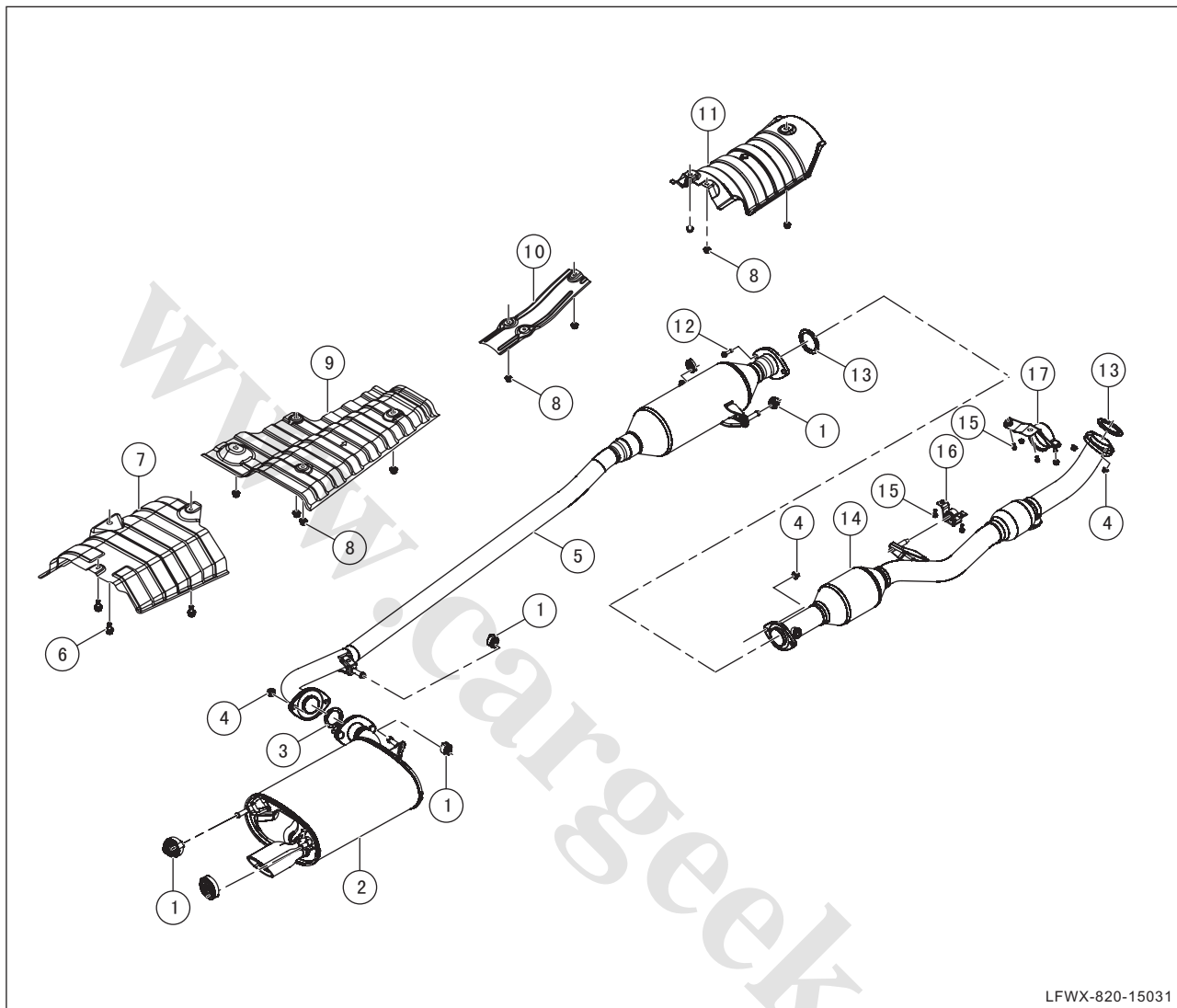
1	Engine intake hose
2	Hoop
3	Hoop
4	Rear resonant cavity
5	Spiral hoop
6	Crankshaft ventilation pipe
7	1/4 wavelength pipe
8	Hoop
9	Bolt

10	Upper housing for air filter
11	Air filter element
12	Lower housing of air filter
13	Bolt
14	Washer
15	Bolt
16	Air filter support
17	Intake manifold with resonant cavity assembly
18	Bolt

## Components (IV)

△ HINT:

Vehicle with engine of LF489Q



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1	Rubber suspension block
2	Rear muffler assembly
3	Gasket
4	Nut
5	Front muffler assembly
6	Bolt
7	Rear muffler heat shield
8	Nut
9	Heat insulator of fuel tank

10	Middle heating insulation board
11	Front heat baffle
12	Bolt
13	Gasket
14	Catalytic converter
15	Bolt
16	Suspended block for front exhaust pipe
17	Mounting bracket for exhaust pipe

## General Check

### Check the system

#### 1. Check the air filter inlet pipe assembly

- (a) Check whether the inlet pipe for air filter is installed properly. Otherwise, reinstall it.
- (b) Check the inlet pipe for air filter and the resonant cavity for rupture and damage. If any, replace it.
- (c) Check whether the inlet pipe for air filter is blocked. If so, clean it.

#### 2. Checking the engine intake manifold module

- (a) Check whether the intake manifold is installed improperly. Otherwise, reinstall it.
- (b) Check the engine intake pipe for rupture and damage. If any, replace it.
- (c) Check whether the engine intake pipe is blocked. If so, clean it.

#### 3. Inspection of air filter cluster

- (a) Check the air filter housing for rupture and damage. If any, replace it.

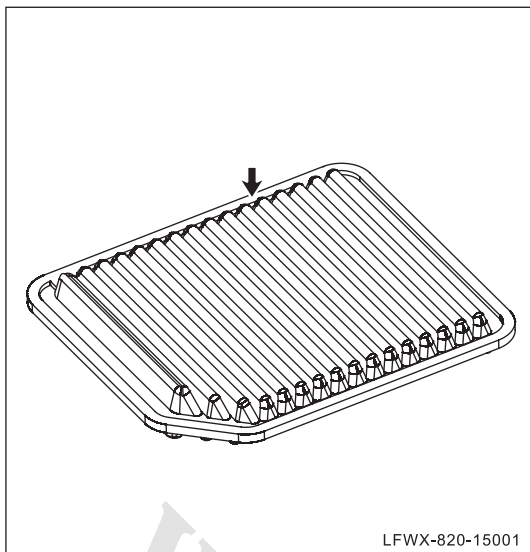
#### 4. Checking the throttle working conditions

- (a) Check the throttle inside for dirt and seizure. If any, clean or replace it.

#### 5. Inspection of exhaust system

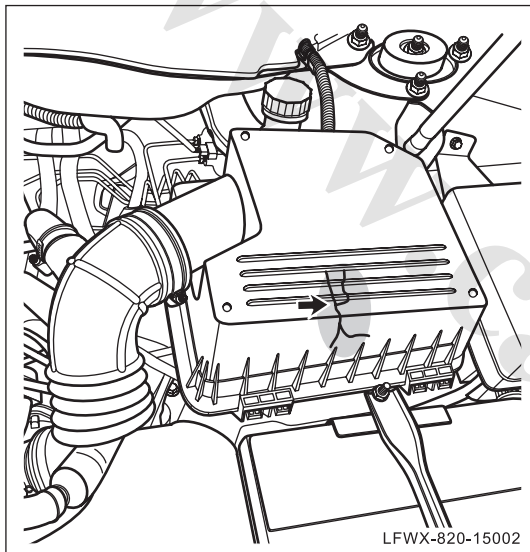
- (a) Check the exhaust system for leakage. If any, repair it.
- (b) Check the welded part of the exhaust system weldment for break. If any, repair it.
- (c) Check the exhaust pipe for clogging or bending. If any, clean or replace it.
- (d) Check any bolt for the exhaust system for looseness or loss. If so, re-install it.

### Check air filter element.



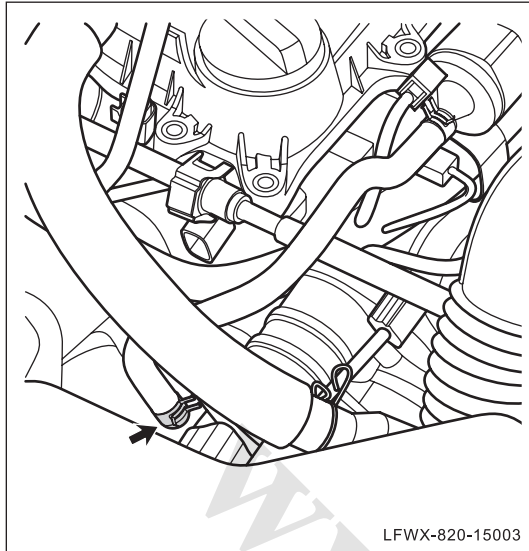
**1. Checking the air filter working conditions**

- (a) Remove the air filter element.
- (b) Check the air filter for dirt. If any, clean it.



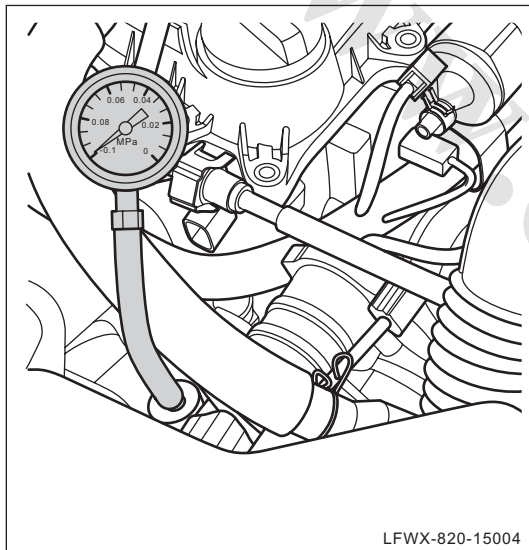
- (c) Check the air filter for rupture and damage. If any, replace it.

## Checking the vacuum level of the intake system



### 1. Checking the working conditions of the intake system

- (a) Loosen the hoop of the outlet pipe for canister valve solenoid, and remove the outlet pipe from the intake manifold.



- (b) As shown in the figure, install the vacuum gauge.
- (c) Start the engine and detects the intake system vacuum when idling.

**Standard value: 60kPa - 70kPa**

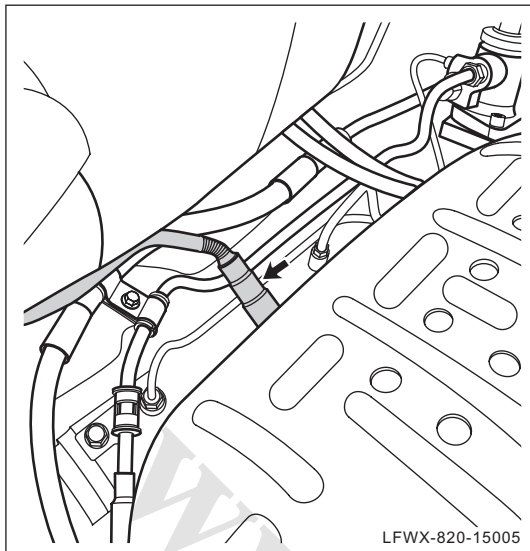
#### △ HINT:

If the measurement result is high, check the intake pipe or the air filter for clogging. If the measurement result is low, check the air intake system for leakage or the exhaust system for clogging.

#### 📌 Note:

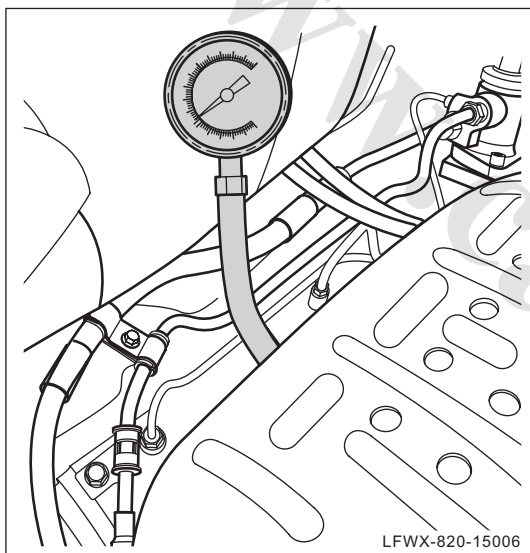
To ensure reliability and comparability of the measured results, usually keep the engine water temperature at 80 °C and above when measuring. If the temperature is low, let the engine idle in Neutral position until the temperature reaches 80 °C and above before measuring.

## Check the exhaust backpressure.



### 1. Checking the working conditions of the exhaust system

- (a) Remove the front oxygen sensor.
- (b) Fix the exhaust backpressure gauge to the front oxygen sensor.



- (c) Start the engine and keep it idling.
- (d) Let the engine run until it reaches the operating temperature, keep the engine speed at 2500r/min.
- (e) Read the exhaust backpressure value.

**Standard value: 2kPa (no load)**

△ HINT:

If the measurement result is high, check whether the catalytic converter is blocked and whether the exhaust pipe and muffler is bent or blocked.

## Check intake pressure and temperature sensor

1. Check the intake pressure and temperature sensor working conditions (See 12A- Engine Control System-Engine Control System, General Check)

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## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Intake system leak	1. Intake pipe (installed improperly)	See 15- Intake/Exhaust System- Diagnosis, Fault Diagnosis (1. intake system leak)
	2. Air filter (installed improperly)	
	3. Intake pipe (rupture damage)	
Intake system clogged	1. Intake pipe (installed improperly)	See 15- Intake/Exhaust System- Diagnosis, Fault Diagnosis (2. Intake system clogged)
	2. Air filter is clogged	
	3. Intake pipe (clogged)	
	4. Throttle (clogged)	
Exhaust system clogged	1. Catalytic converter is clogged	See 15-Intake/Exhaust System- Diagnosis, Fault Diagnosis (3. Exhaust system clogged)
	2. Rear-stage purifier (clogged)	
	3. Muffler (clogged)	
Exhaust system leakage	1. Exhaust pipe (installed improperly)	See 15- Intake/Exhaust System- Diagnosis, Fault Diagnosis (4. Exhaust system leak)
	2. Welding part of exhaust system component (cracking)	
	3. Exhaust pipe gasket ruptured (damaged)	

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### Fault diagnosis

#### 1. Intake system leak

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the intake system vacuum (See 15- Intake/Exhaust System-General Check, Checking the Intake System Vacuum)	Diagnosis end.	Low intake system vacuum	Go to Step 1
1	Checking the intake pipe	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check the intake pipe for installation (See 15- Intake/Exhaust System-General Check, Checking the system).	Go to Step 2	The intake pipe is installed and sealed poorly, resulting in leakage.	Reinstall it (See 15- Intake/Exhaust System-Intake Pipe, Replacement).
2	Check air filter	Normal	Faulty	Instruction
	Check the air filter for installation (See 15- Intake/Exhaust System-General Check, Checking the system).	Go to Step 3	The air filter is installed and sealed poorly, resulting in leakage.	Reinstall it (See 15- Intake/Exhaust System-Air Filter, Replacement)
3	Checking the intake pipe	Normal	Faulty	Instruction
	Check the intake pipe working conditions (See 15- Intake/Exhaust System-General Check, Checking the system).	Go to Step 4	Intake pipe rupture and damage	Replace the damaged part (See 15- Intake/Exhaust System-Intake Pipe, Replacement).
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Air inlet system (clogged)

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the intake system vacuum (See 15- Intake/Exhaust System-General Check, Checking the Intake System Vacuum)	Diagnosis end.	High intake system vacuum	Go to Step 1
1	Checking the intake pipe	Normal	Faulty	Instruction
	Check the intake pipe for installation (See 15- Intake/Exhaust System-General Check, Checking the system).	Go to Step 2	The intake pipe is installed improperly, resulting in clogging.	Reinstall it (See 15- Intake/Exhaust System-Intake Pipe, Replacement).
2	Check air filter	Normal	Faulty	Instruction

	Check the air filter working conditions (See 15- Intake/Exhaust System-General Check, Checking the Air Filter Element).	Go to Step 3	Air filter element is dirty.	Replace it (See 15-Intake/Exhaust System-Air Filter, Replacement)
3	Checking the intake pipe	Normal	Faulty	Instruction
	Check the intake pipe working conditions (See 15- Intake/Exhaust System-General Check, Checking the system).	Go to Step 4	The intake pipe is clogged	Dredge the inlet pipe.
4	Check the throttle valve	Normal	Faulty	Instruction
	Check the throttle operating conditions (See 15- Intake/Exhaust System-General Check, Checking the system).	Go to Step 5	There are foreign matters inside the throttle, resulting in clogging.	Cleaning the throttle
5	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Exhaust system (clogged)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the backpressure of the exhaust system using the exhaust backpressure gauge (See 15- Intake/Exhaust System-General Check, Checking the Exhaust Backpressure).	Diagnosis end.	High exhaust backpressure	Go to Step 1
1	Check the catalytic converter.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the catalytic converter operating conditions. (See 14- Emission Control System-General Inspection, Checking the Catalytic Converter)	Go to Step 2	Catalytic converter is clogged	Replace it (See 14- Emission Control System- Catalytic Converter, Replacement)
2	Checking the rear-stage purifier.	Normal	Faulty	Instruction
	Check the rear-stage purifier working conditions (See 15- Intake/ Exhaust System-General Check, Checking the System).	Go to Step 3	<ul style="list-style-type: none"> <li>• Rear-stage purifier bending</li> <li>• Rear-stage purifier clogged</li> </ul>	<ul style="list-style-type: none"> <li>• Replace it (See 15- Intake /Exhaust System-Rear-stage Purifier with Bellows Assembly, Replacement)</li> <li>• Dredge the rear-stage purifier.</li> </ul>
3	Checking the muffler	Normal	Faulty	Instruction
	Check the pre- muffler and rear muffler working conditions (See 15- Intake/Exhaust System-General Check, Checking the System).	Go to Step 4	<ul style="list-style-type: none"> <li>• Muffler bending</li> <li>• Muffler clogged</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the muffler (See 15- Intake/ Exhaust System-General Check, Checking the System).</li> <li>• Dredge the muffler.</li> </ul>
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

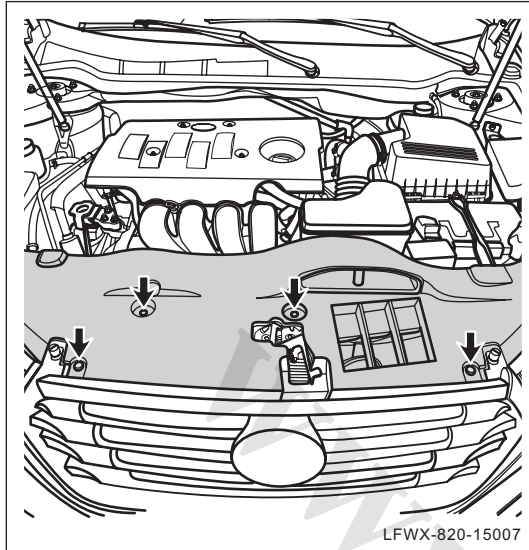
#### 4. Exhaust system leak

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the exhaust system for leakage(See 15- Intake/Exhaust System-General Check, Checking the System).	Diagnosis end.	Exhaust system leak	Go to Step 1
1	Check the exhaust pipe	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the exhaust pipe for installation (See 15- Intake/Exhaust System-General Check, Checking the System).	Go to Step 2	Exhaust pipe is misplaced and sealed poorly.	Reinstall them.
2	Checking the welding parts of the exhaust system	Normal	Faulty	Instruction
	Check the working conditions of the welding parts of the exhaust system (See 15- Intake/Exhaust System-General Check, Checking the System).	Go to Step 3	Welding portion of welded part cracks.	Re-welding
3	Checking the exhaust pipe gasket	Normal	Faulty	Instruction
	Check the working conditions of the exhaust pipe gasket (See 15- Intake/Exhaust System-General Check, Checking the System).	Go to Step 4	Exhaust pipe gasket rupture and damage	Replace the exhaust pipe gasket.
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

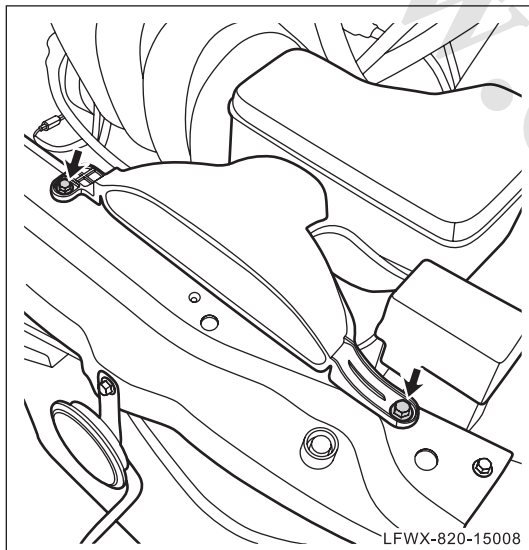
## Intake Manifold with Resonant Cavity Assembly

### Replacement



1. Remove the intake pipe with resonant cavity assembly.

- (a) Remove the buckle from the trim panel of the upper rail of the water tank, and remove the trim panel of the upper rail.



- (b) Remove the mounting bolts from the intake pipe with resonant cavity assembly, and remove the intake pipe with resonant cavity assembly.

### 2. Installing the intake pipe with resonant cavity assembly

- (a) Install the intake pipe with resonant cavity assembly in place, and install and tighten the bolts.

**Torque: 8N•m-12N•m**

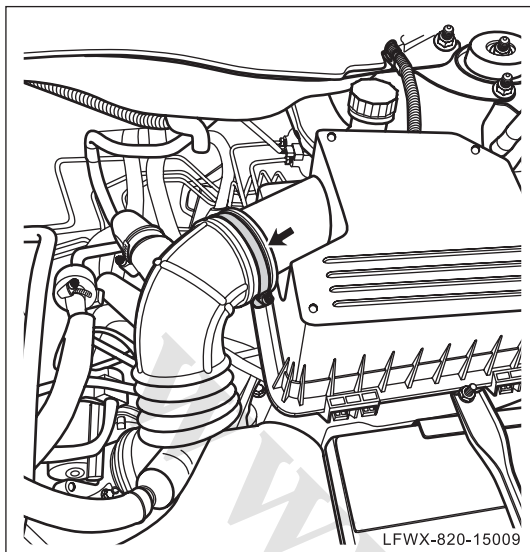
- (b) Install the trim panel of the upper rail of the water tank in place, and install the buckle.

### 3. Inspection

- (a) Start the engine to check whether the engine operates properly.

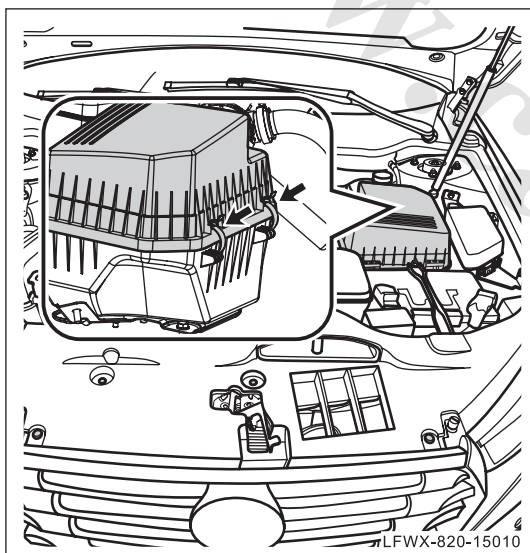
## Air Filter

### Replacement

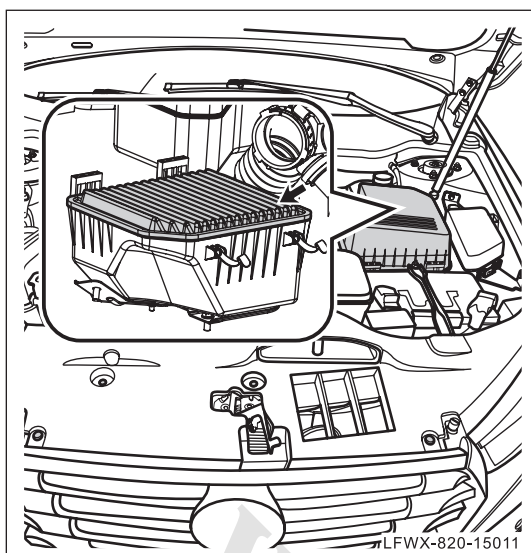


**1. Remove the air filter.**

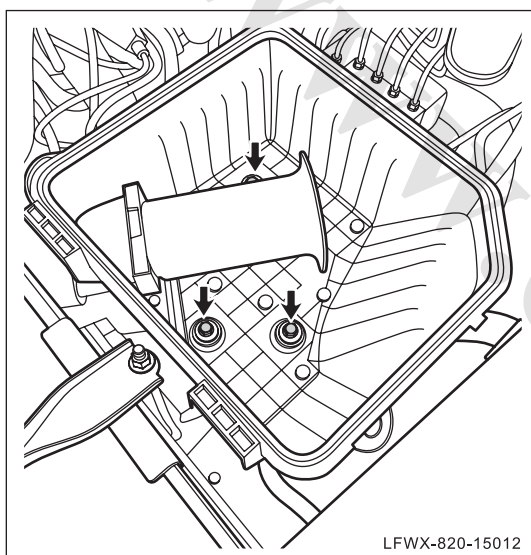
- (a) Unscrew the engine intake pipe hoop and pull out the engine intake pipe from the installation position.



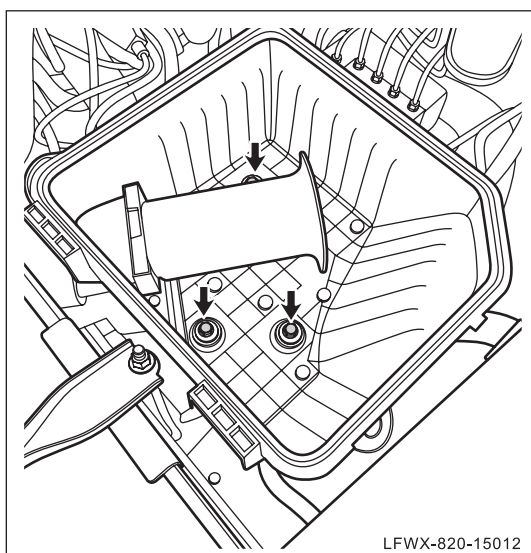
- (b) Remove the clamp fixing the upper and lower housings of the air filter, and remove the upper housing.



(c) Remove the air filter element.



(d) Remove the fixing bolts of the lower housing for air filter, and remove the lower housing.



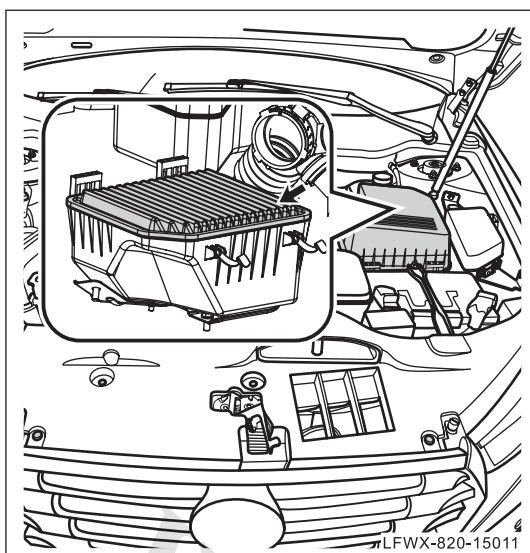
## 2. Installation of air filter

(a) Fix the lower housing to the air filter bracket, and install and tighten the bolts.

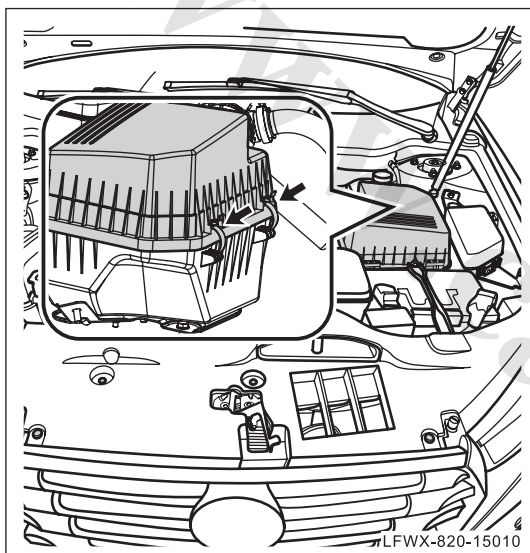
**Torque: 10N•m-12N•m**

△ HINT:

When installing, make sure the inlet pipe is properly connected with the lower housing.



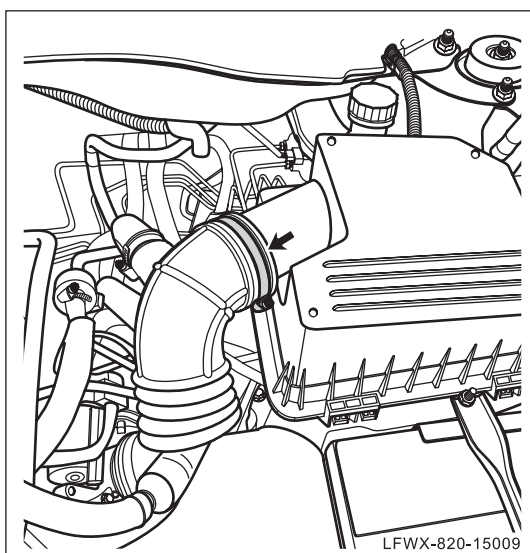
- (b) Fix the air filter element to the lower housing.



- (c) Install the upper housing of the air filter in place, and install the clamp fixing the upper and lower housings.

△ HINT:

As shown in the figure, when installing the upper housing of the air filter, insert the positioning tongue into the slot, and then install the upper housing.



- (d) Re-install the intake pipe and hoop of the engine on the air filter upper cover and tighten the hoop.



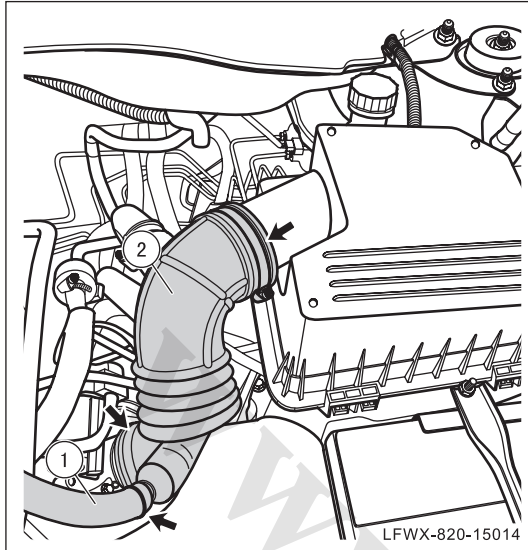
### 3. Inspection

- (a) Start the engine to check whether the engine operates properly.

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## Engine Intake Pipe

### Replacement



#### 1. Removal of engine intake pipe

- (a) Remove the clamp from the crankcase ventilation pipe, and pull out the crankcase ventilation pipe ① .
- (b) Unscrew the hoops on both ends of the engine intake pipe and take down the engine intake pipe ② .

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#### 2. Installation of engine intake pipe

- (a) Install the engine intake pipe and hoops on both ends on the installation position and tighten the hoops.

#### △ HINT:

When installing, make sure the engine intake pipe interfaces are properly connected.

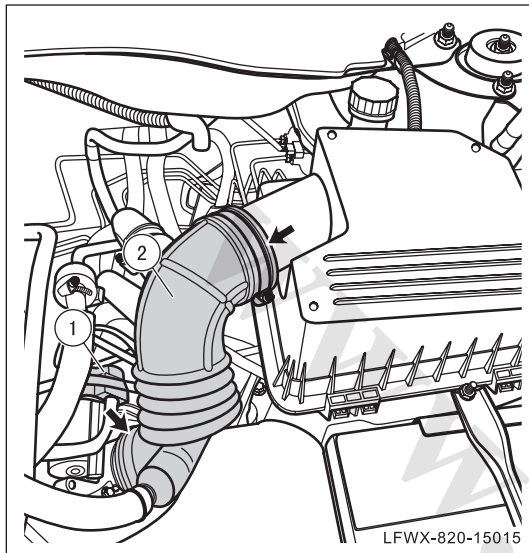
- (b) Fix the crankcase ventilation pipe and clamp to the engine intake pipe.

## Throttle

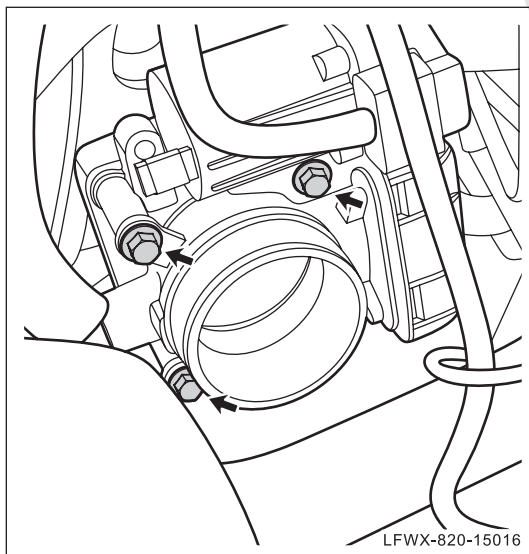
### Replacement

#### 1. Removing the throttle

- (a) Turn power supply to “LOCK “position.



- (b) Disconnect the connector ① of electronic throttle body.
- (c) Loosen the engine intake pipe ② hoop, and pull out the intake pipe ② .



- (d) Remove the fixing bolt of throttle body and take down the throttle body.

#### 2. Installing the throttle

- (a) Install the electronic throttle body on the intake manifold and mount and tighten the fixing bolts.

**Torque: 10N•m-12N•m**

- (b) Install the intake pipe and hoop of the engine on the throttle body and tighten the hoop.

Throttle



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(c) Connect the electronic throttle valve connector.

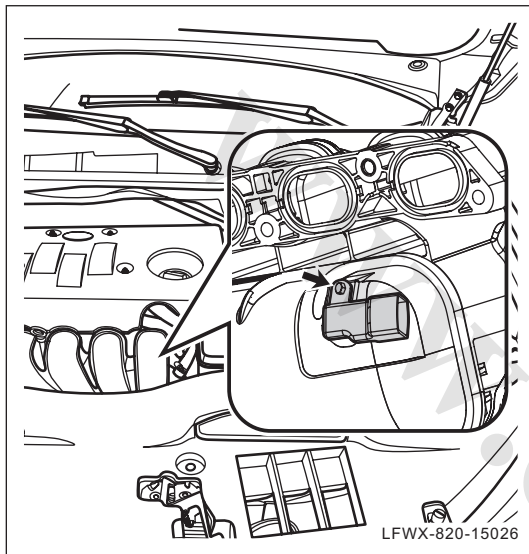
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# Intake Pressure and Temperature Sensor

## Replacement

### 1. Removal of the air intake pressure and temperature sensor

- (a). Disconnect negative cable of battery.
- (b). Remove the engine intake pipe. (See 11A- Engine Mechanical System-Intake Manifold, Replacement)



- (c). Disconnect intake pressure and temperature sensor wire harness connector.
- (d). Remove the intake pressure and temperature sensor.

△ HINT:

Air intake pressure and temperature sensor connector is located at the back of intake manifold.

### 2. Installation of the intake pressure and temperature sensor

- (a). Install the intake pressure and temperature sensor in place, and install and tighten the bolt.

**Torque: 8N•m - 10N•m**

- (b). Connect intake pressure and temperature sensor wire harness connector.
- (c). Install the engine intake manifold. (See 11A- Engine Mechanical System-Intake Manifold, Replacement)
- (d). Connect the negative cable of battery.

## Exhaust Manifold (catalytic converter)

### Replacement

△ HINT:

See 14- Emission Control System- Catalytic Converter, Replacement.

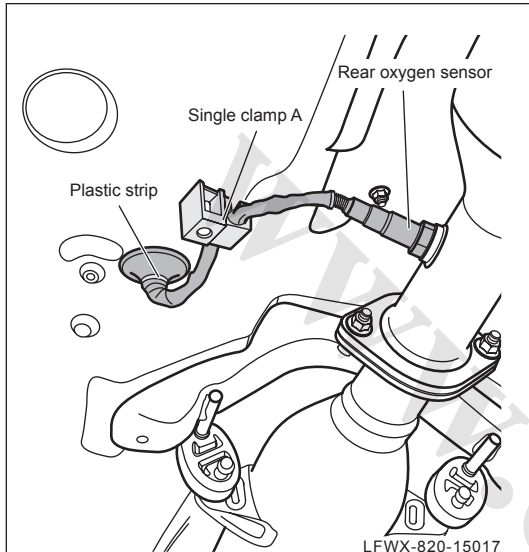
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# Final Stage Catalytic Converter with Corrugated Pipe Assembly

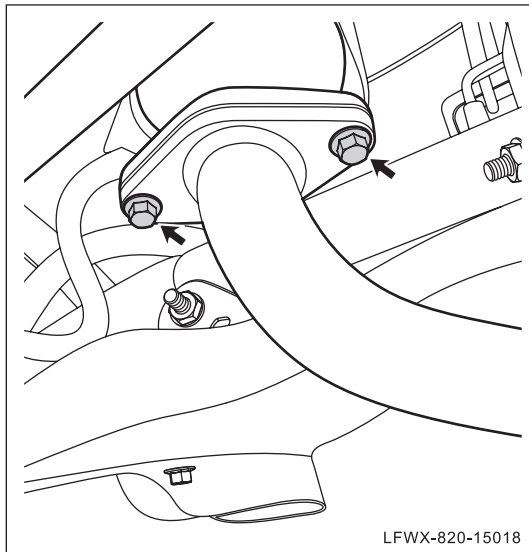
## Replacement

### 1. Removing the rear-stage purifier with bellows assembly

(a) Turn power supply to “LOCK” position.



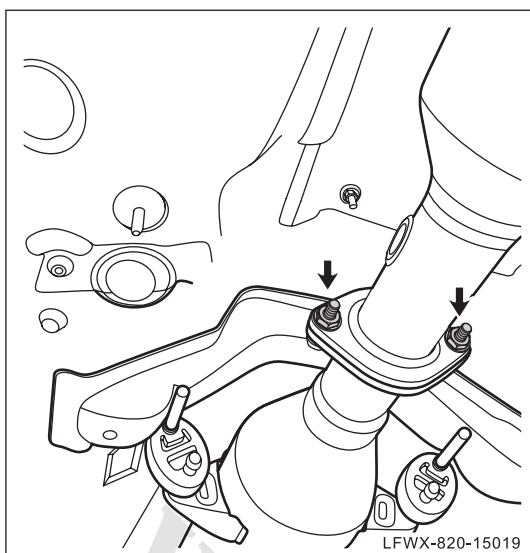
(b) Remove rear oxygen sensor.



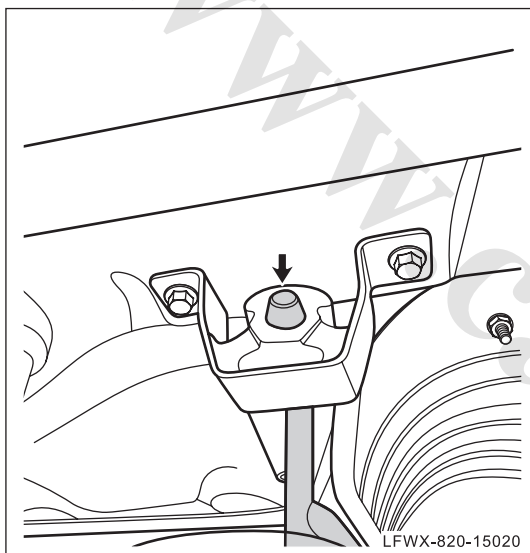
(c) Remove the bolts connecting the catalytic converter with the rear-stage purifier, and remove the gasket.

△ HINT:

Do not re-use the removed gasket. Be sure to replace it with a new one during installation.

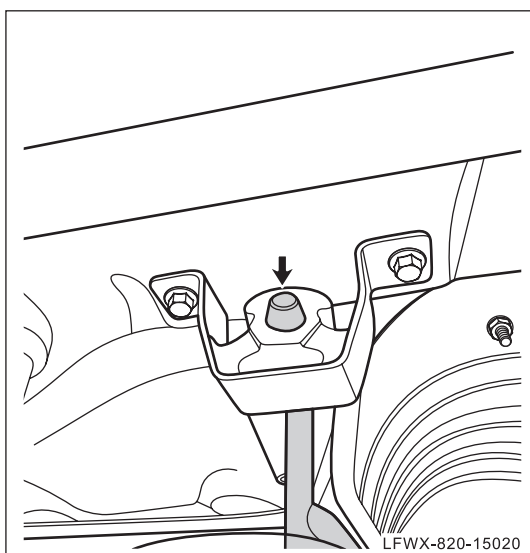


- (d) Remove the bolts connecting the rear-stage purifier with the pre-muffler, and remove the gasket.



- (e) Remove the suspended hook of the rear-stage purifier from the rubber suspension, and remove the rear-stage purifier.

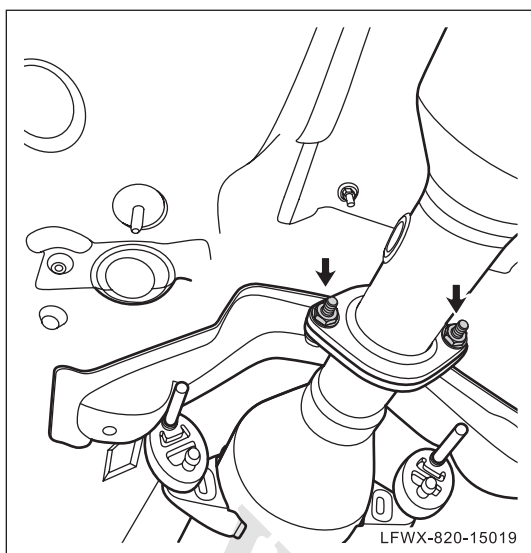
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## 2. Installing the rear-stage purifier

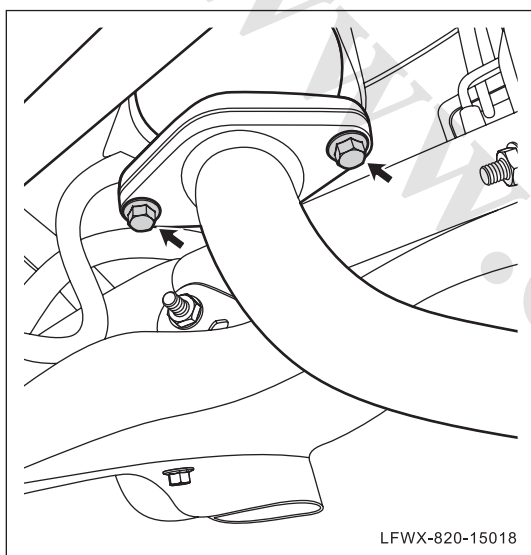
- (a) Install the rear-stage purifier in place and install the suspended hook into the rubber suspension.





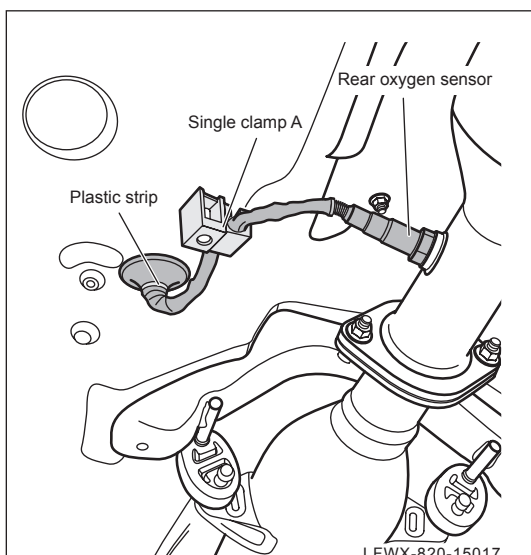
- (b) Install the gasket between the rear-stage purifier and the pre-muffler, and install and tighten the bolt and nut.

**Torque: 60 N.m - 70N•m**



- (c) Install the gasket between the catalytic converter and the rear-stage purifier, and install and tighten the bolt.

**Torque: 60 N.m - 70N•m**

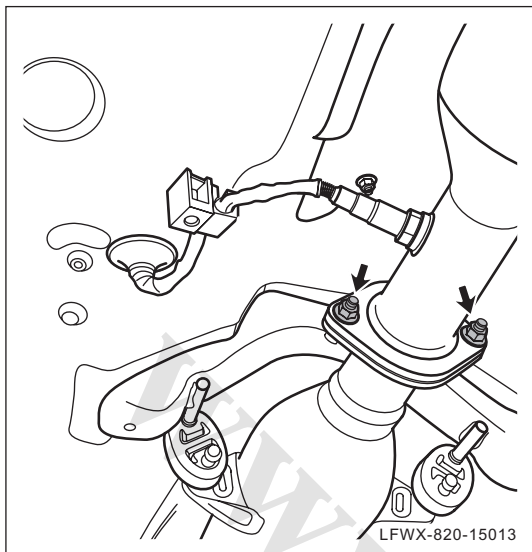


- (d) Install the rear oxygen sensor.

**Torque: 40N•m-60N•m**

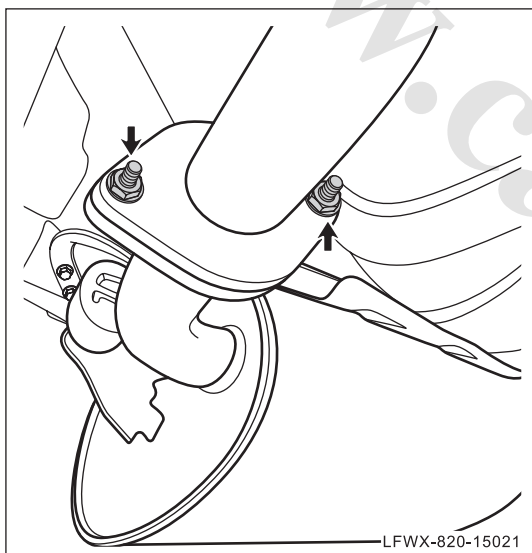
## Front Muffler

### Replacement

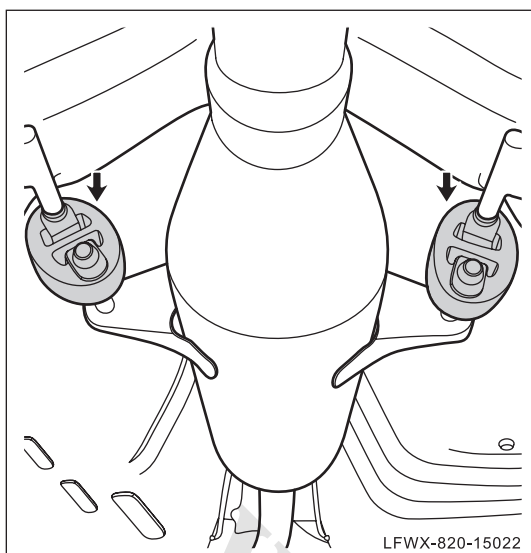


#### 1. Removal of front muffler

- (a) Remove the bolts connecting the rear-stage purifier with the pre-muffler, and remove the gasket.



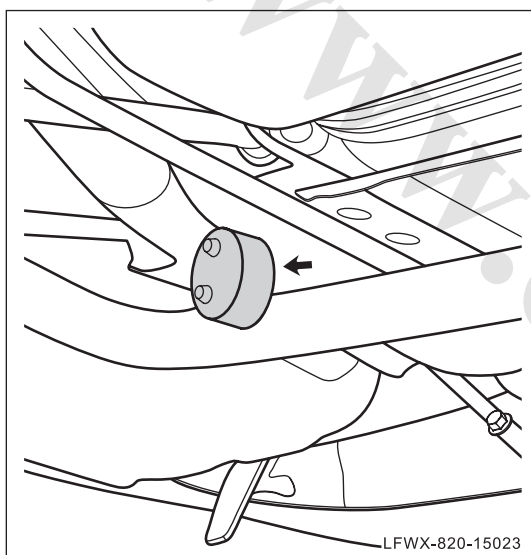
- (b) Remove the locknut connecting the pre-muffler with rear muffler, and remove the gasket.



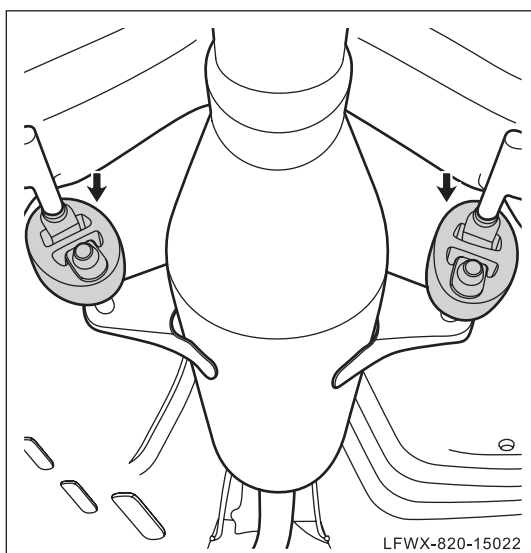
- (c) Remove the suspended hook of the pre-muffler from the rubber suspension.

**Note:**

After the front suspended hook is removed, do not carry out subsequent operation without assistant or supporting the pre-muffler through support equipment.

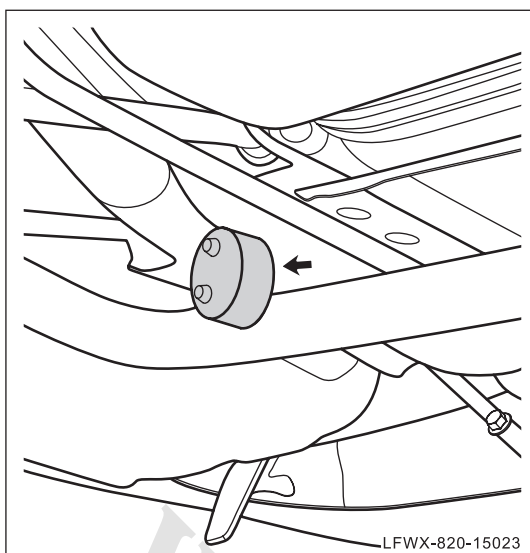


- (d) Remove the rear suspended hook of the pre-muffler from the rubber suspension, and remove the pre-muffler.

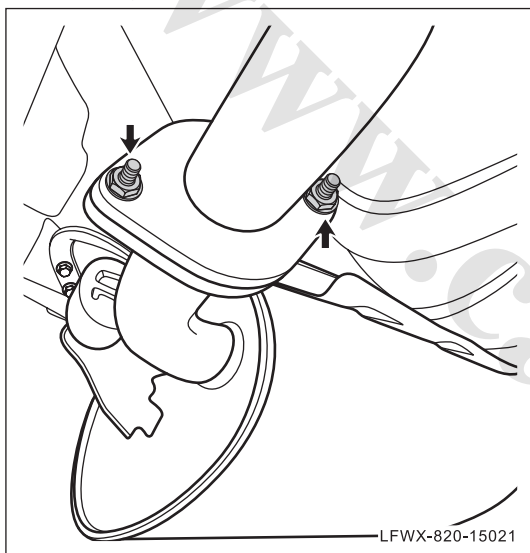


## 2. Installation of front muffler

- (a) With the help of assistant or support equipment, install the pre-muffler in place to allow its front suspended hook to be installed into the rubber suspension.



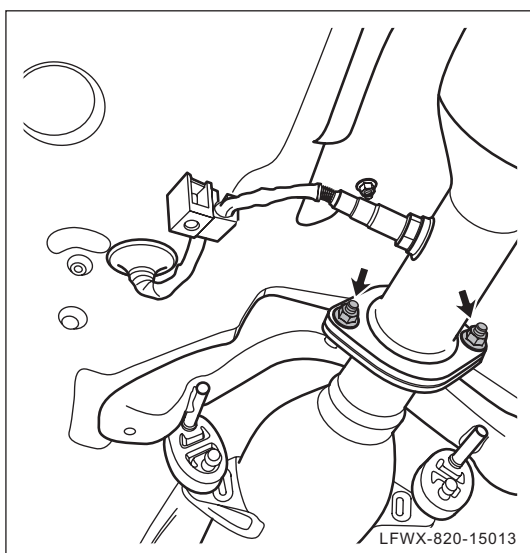
- (b) Install the rear suspended hook of the pre-muffler into the rubber suspension.



- (c) Install the gasket between the pre-muffler and rear muffler, and install and tighten the nut.

**Torque: 60 N.m - 70N•m**

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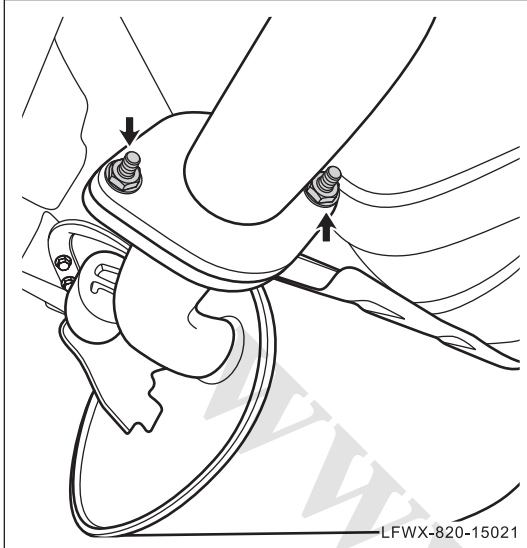


- (d) Install the gasket between the rear-stage purifier and the pre-muffler, and install and tighten the bolt and nut.

**Torque: 60 N.m - 70N•m**

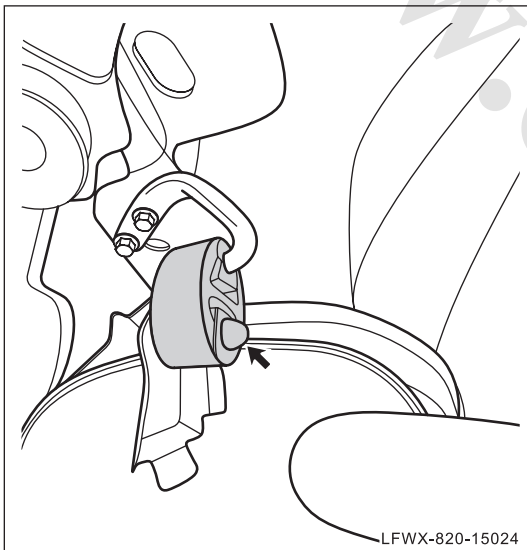
## Rear Muffler

### Replacement

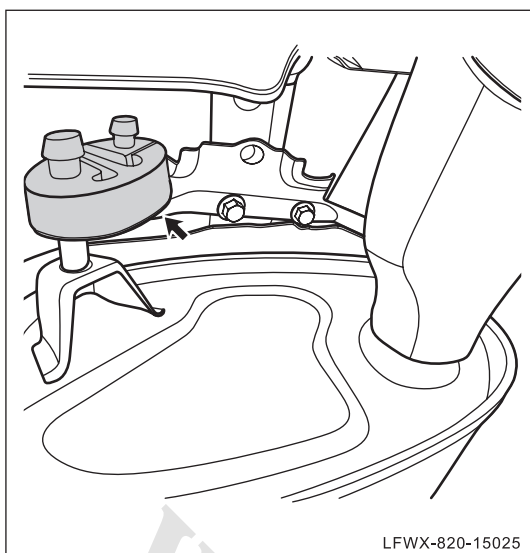


#### 1. Removal of rear muffler

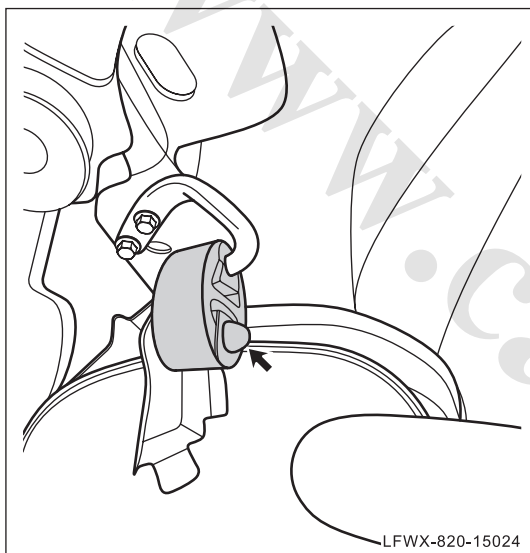
- (a) Remove the locknut connecting the pre-muffler with rear muffler, and remove the gasket.



- (b) Remove the front suspended hook of the rear muffler from the rubber suspension.



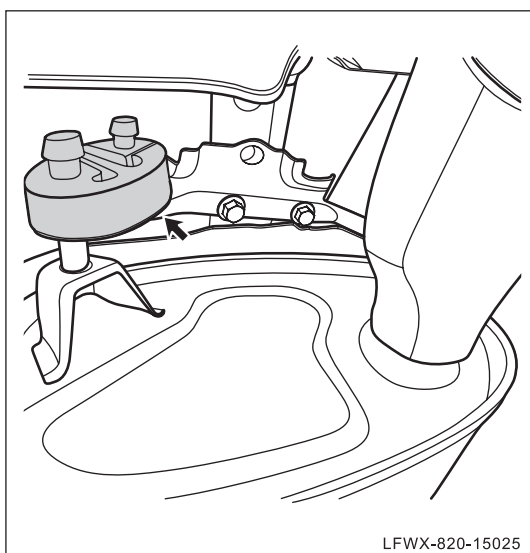
- (c) Remove the rear suspended hook of the rear muffler from the rubber suspension, and remove the rear muffler.



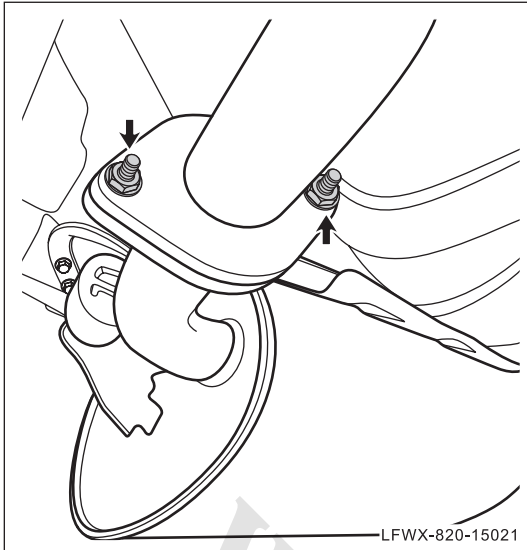
## 2. Installation of rear muffler

- (a) Install the rear muffler in place to allow its front suspended hook into the rubber suspension.

15



- (b) Install the rear suspended hook of the rear muffler into the rubber suspension.



- (c) Install the gasket between the pre-muffler and rear muffler, and install and tighten the nut.

**Torque: 60 N.m - 70N•m**

# 16- Cooling System

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## Cooling System

### System description

△ HINT:

Lifan 820 series model includes LF7186, LF7240, and LF7240B, equipped with LFB479Q/LF489Q engine and 5MT manual transmission or 6AT automatic transmission. The cooling pipe layout depends on the engine model and the transmission model, but it can be checked and repaired basically in the same way. This section takes the LF7186 model equipped with the LFB479Q engine and 5MT transmission as an example.

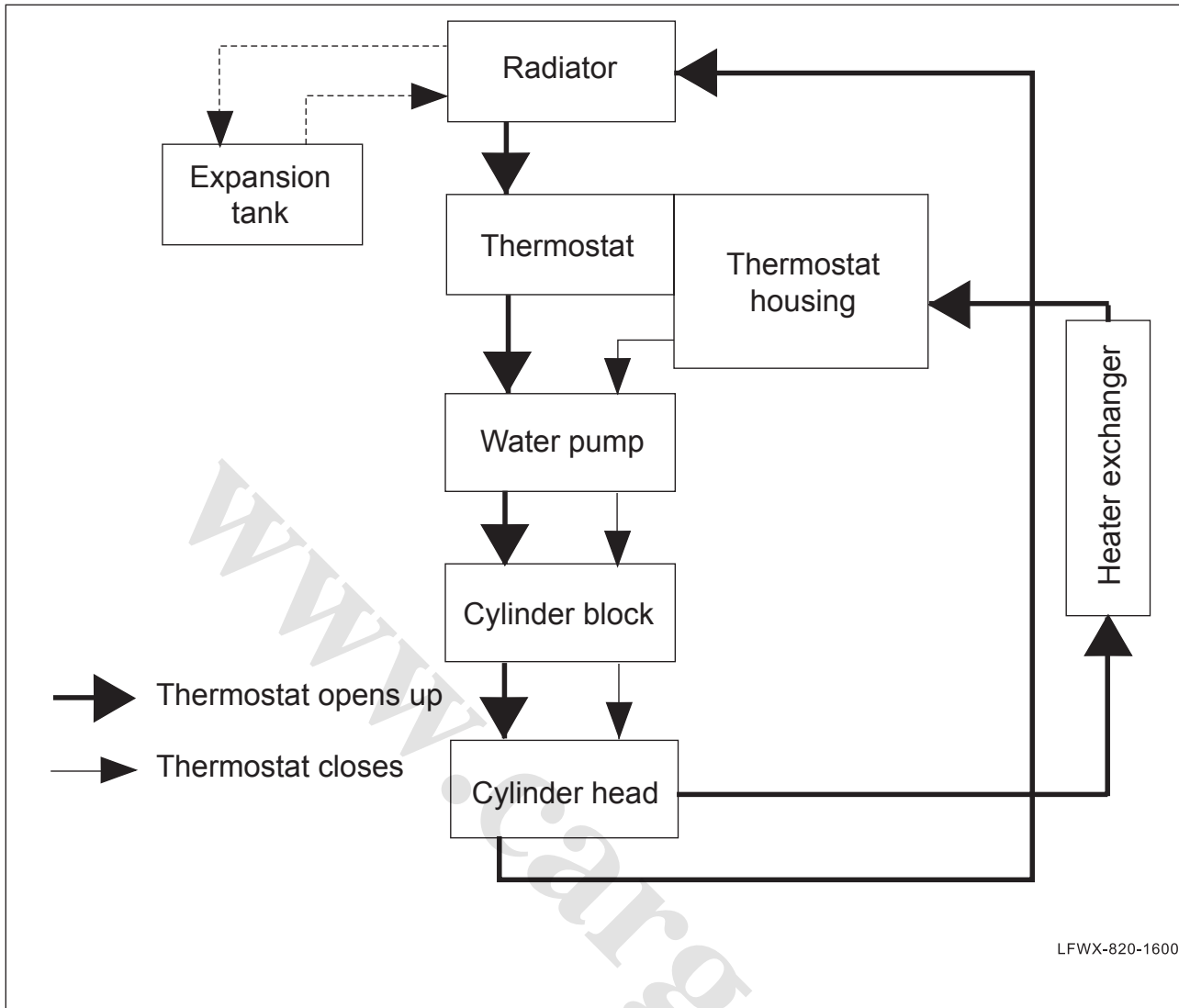
#### 1. Function

The purpose of the cooling system is to disperse some heat absorbed by the heated parts timely to ensure that the engine operates at the optimum temperature. Besides, the cooling system also provides a means of heating the inside of the vehicle.

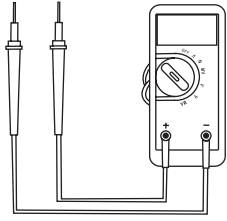
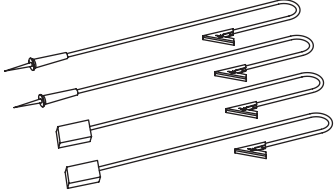
#### 2. Components

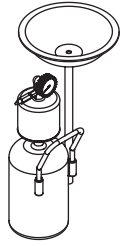
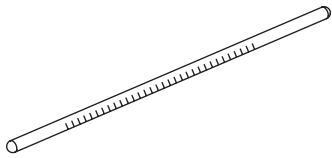
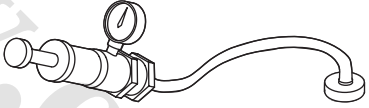
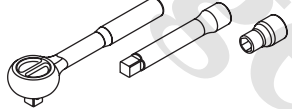
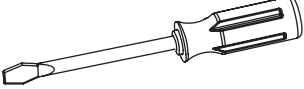
The cooling system mainly consists of coolant, radiator, cooling fan, water pump, thermostat and cooling lines.

#### 3. Principle



## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Used for measuring voltage or resistance.
2	Wiring set		Assist to measure voltage or resistance

S/N	Tools	Outline diagram	Description
3	Recovery		Recover coolant
4	Temperature gauge		Measure the coolant temperature
5	Cooling system pressure detector		Being used for checking the cooling system and the water tank cap for leakage
6	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts
7	Screwdriver		Remove the fixing screws

## Service data

### 1. Technical specifications table

Coolant Specifications	Lucent 100
------------------------	------------

Filling amount of coolant	6L~7L
Temperature when the thermostat valve opens	80°C ~85°C
Temperature when the thermostat valve fully opens	95°C
Thermostat valve lift	≥ 8mm

## 2. Table of tightening torque

Item	N•m
Condenser fixing bolt	6~8
Fixing nuts of the cooling fan	20~26
Fixing bolts of engine inlet hose	20~25
coolant temperature sensor	20

## Precautions

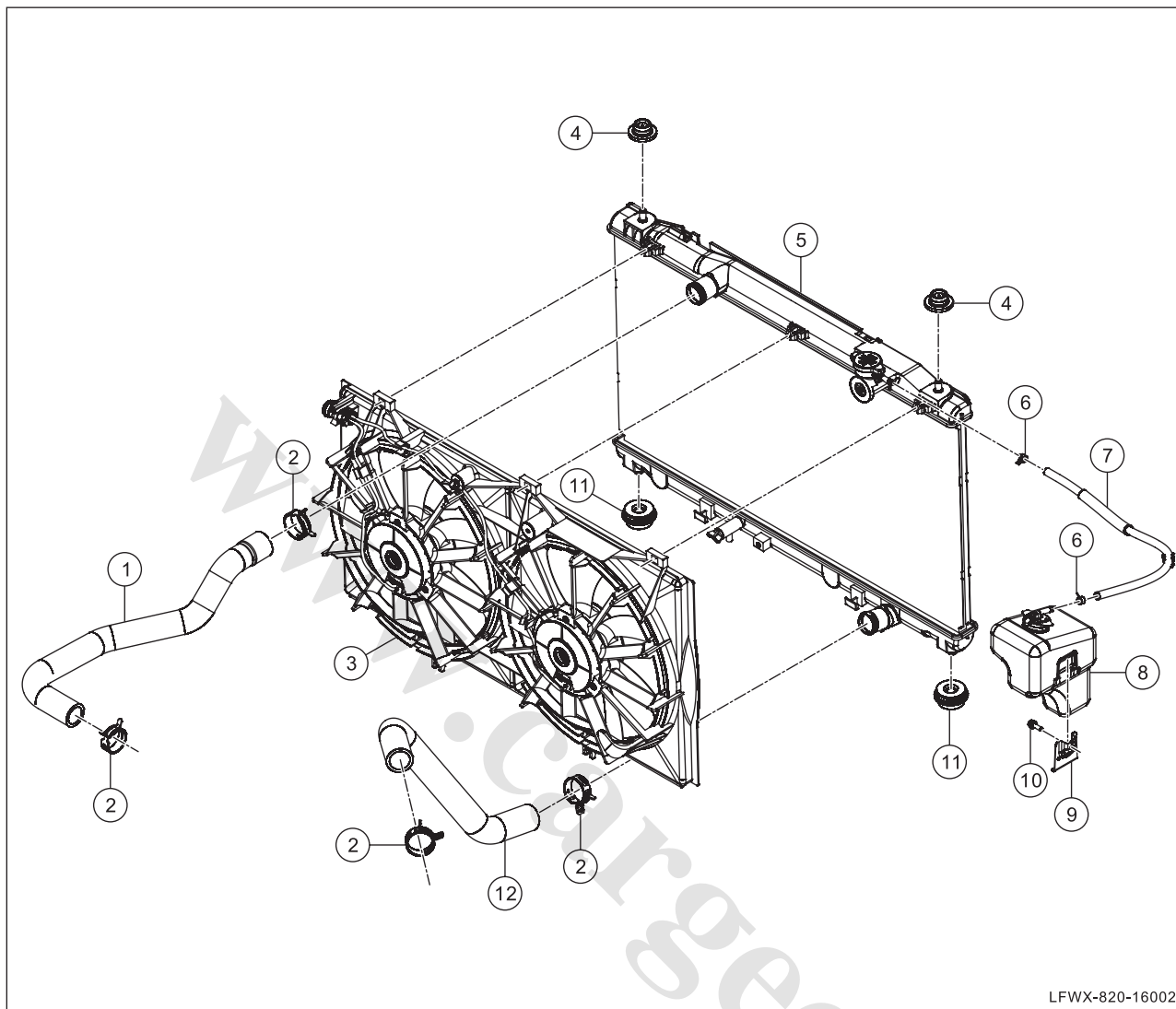
### 1. Precautions before repair

- (a) Whether the engine runs or not, with ignition switch ON, any component is not allowed to be plugged, such as any cable of the battery, injector, fuel pump, ignition system wire, electronic control unit (ECU) circuit, etc.

### 2. Precautions for maintenance

- (a) Make sure the engine is cool before operating on the cooling system.
- (b) Don't let the coolant spill to the drive belt when operating.
- (c) When removing the radiator, be careful not to scratch or damage the radiator cell
- (d) Be sure to connect each hose clamp securely and firmly and install the hose hoop in place when re-installing the cooling system.

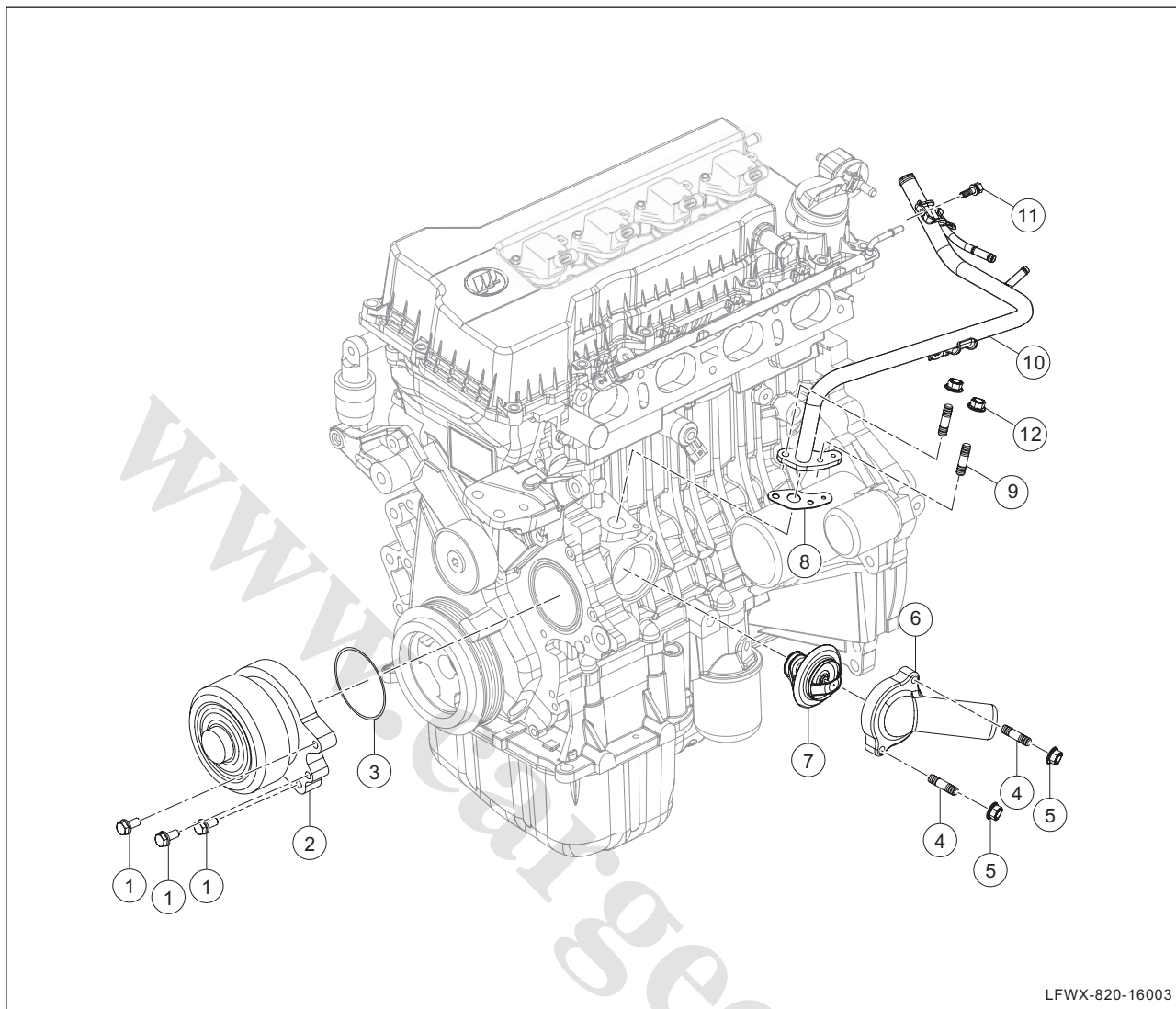
## Component (I)



1	Radiator inlet hose
2	Hoop
3	Radiator fan assembly
4	Radiator upper mounting
5	Radiator assembly
6	Hoop

7	Hose module connecting expansion tank with radiator
8	Expansion tank assembly
9	Mounting bracket for expansion tank assembly
10	Bolt
11	Radiator lower mounting
12	Radiator outlet hose

## Component (II)



LFWX-820-16003

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1	Hexagon bolt with flange
2	Water pump assembly
3	O-ring for water pump
4	Equilong studs
5	Hexagon nut with flange
6	Water inlet pipe

7	Thermostat assembly
8	Air heating water inlet pipe sealing washer
9	Stud bolt
10	Air heating water inlet pipe unit
11	Hexagon bolt with flange
12	Hexagon nut with flange



## General Check

### Check the system

#### 1. Check the working condition of system

- (a) Connect the diagnostic scanner to access to the active test function of the engine menu. Check whether the cooling fan is working properly. Otherwise, check and repair it referring to the following related diagnostic contents.

#### 2. Check whether the system has leakage

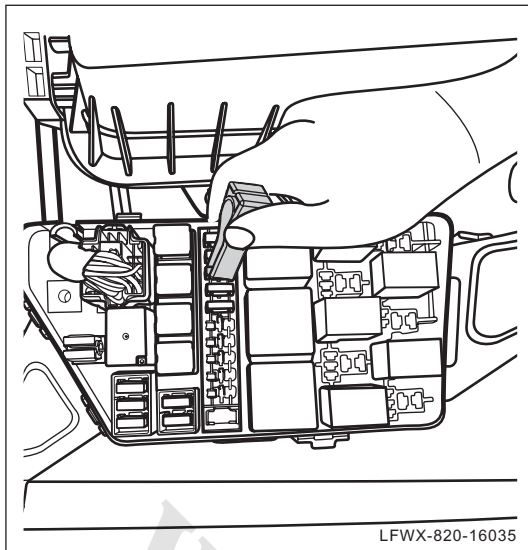
- (a) Check the radiator, expansion tank, cooling hoses, water pump, thermostat and temperature sensor surface for coolant leakage. If any, replace the damaged parts.

#### 3. Check system components

- (a) Check system for obvious mechanical or electrical damage. If any, repair it.
- (b) Check system for obvious collision and deformation. If any, repair it.
- (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 4. Check wire harness

- (a) Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b) Check system wire harness for crack or damage. If any, fix it.



## 5. Check the fuse

- (a) Check whether the fuse SB08 for high-speed fan is blown. If so, replace the fuse with one of the same rating.

△ HINT:

The fuse for high-speed fan is located in the fuse box in the engine compartment.

- (b) Check whether the fuse SB09 for low-speed fan is blown. If so, replace the fuse with one of the same rating.

△ HINT:

The fuse for low-speed fan is located in the fuse box in the engine compartment.

- (c) Check whether the relay fuse FS47 is blown. If so, replace the fuse with one of the same rating.

△ HINT:

The FS47 fuse is located in the fuse box in the engine compartment.

- (d) Check whether the main relay fuse SB07 is blown. If so, replace the fuse with one of the same rating.

△ HINT:

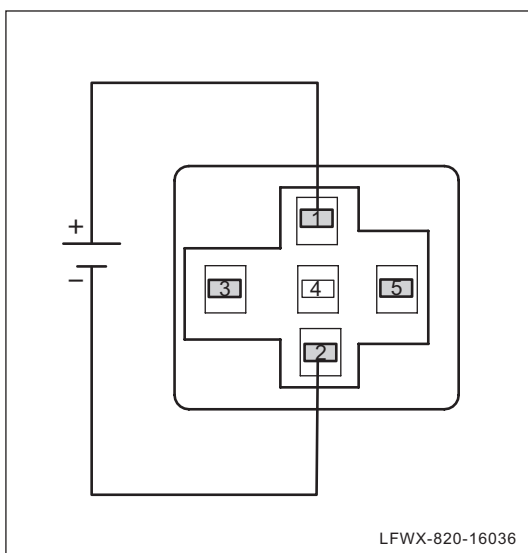
The main relay fuse is located in the fuse box in the engine compartment.

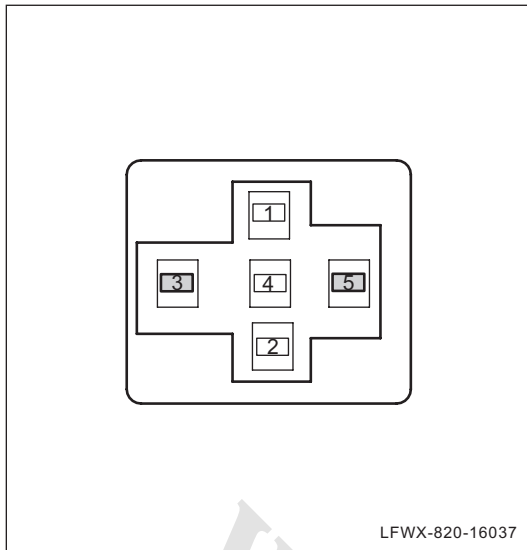
## 6. Checking the high-speed fan relay

- (a) Disconnect the high-speed fan relay K09. Switch on the power as shown in the figure and turn the digital multimeter to its resistance function, and then check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.

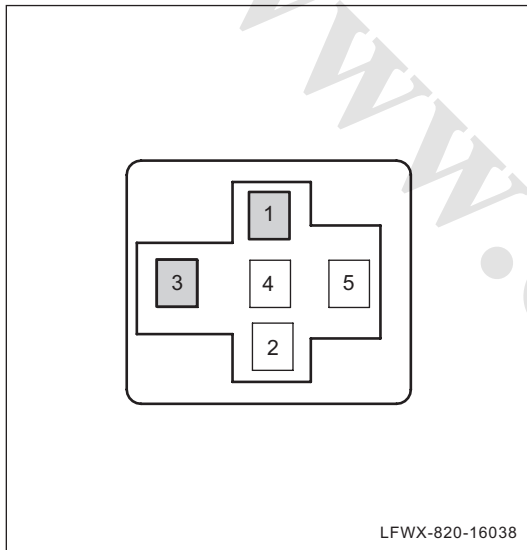
△ HINT:

The high-speed fan relay is located in the fuse box in the engine compartment.



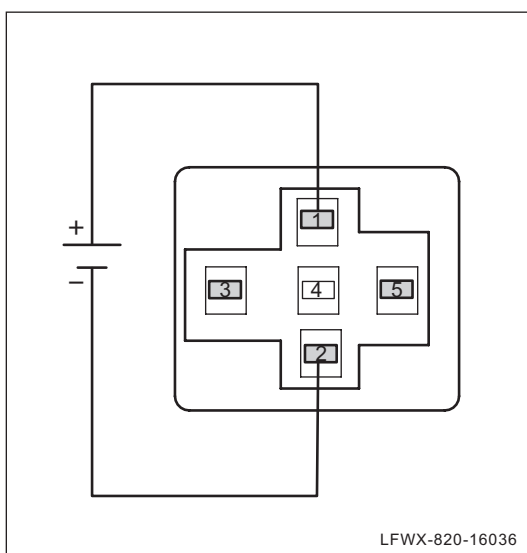


- (b) Disconnect the high-speed fan relay K09. Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.



## 7. Checking the power line of the high-speed fan relay

- (a) Disconnect the high-speed fan relay K09. Turn the digital multimeter to its voltage function and check if there is a voltage between No. 1 terminal of the relay mounting slot and body ground. If the voltage is zero, check and repair the related harness according to the circuit diagram.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to wiring diagram.

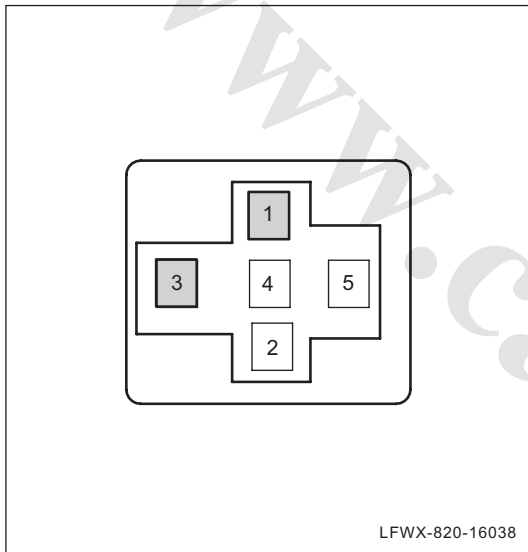
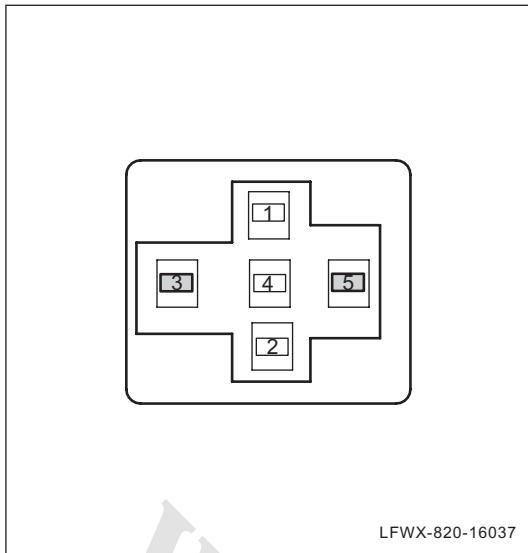


## 8. Checking the low-speed fan relay

- (a) Disconnect the low-speed fan relay K10. Switch on the power as shown in the figure and turn the digital multimeter to its resistance function, and then check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.

△ HINT:

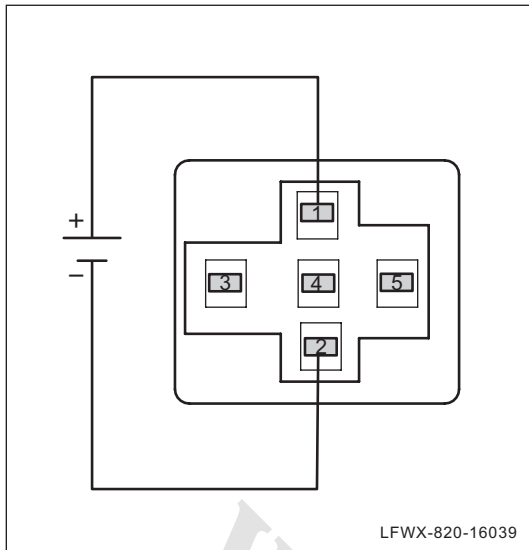
The low-speed fan relay is located in the fuse box in the engine compartment.



- (b) Disconnect the low-speed fan relay K10. Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.

### 9. Checking the power line of the low-speed fan relay

- (a) Disconnect the low-speed fan relay K10. Turn the digital multimeter to its voltage function and check if there is a voltage between No. 1 terminal of the relay mounting slot and body ground. If the voltage is zero, check and repair the related harness according to the circuit diagram.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to wiring diagram.

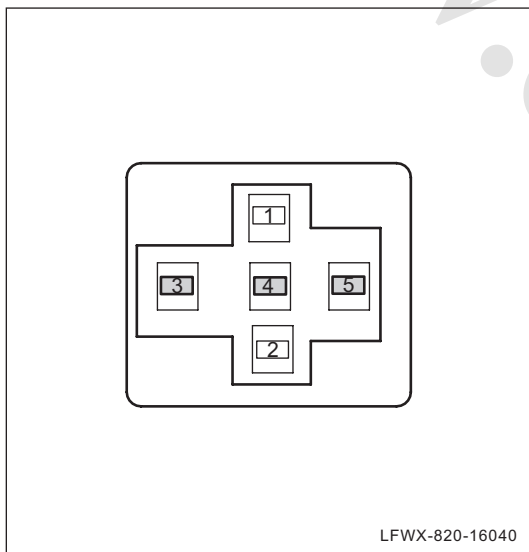


### 10. Checking the fan speed-governing relay

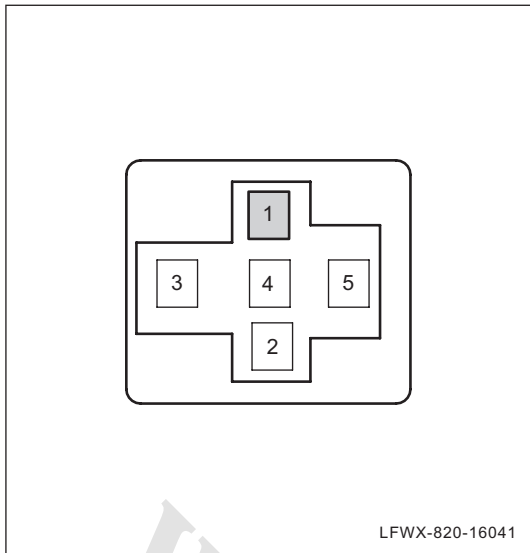
- (a) Disconnect the fan speed-governing relay K08. Switch on the power as shown in the figure and turn the digital multimeter to its resistance function, and then check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 4 terminals of the relay. If conducted, replace the relay with one of the same rating.

△ HINT:

The fan speed-governing relay is located in the fuse box in the engine compartment.

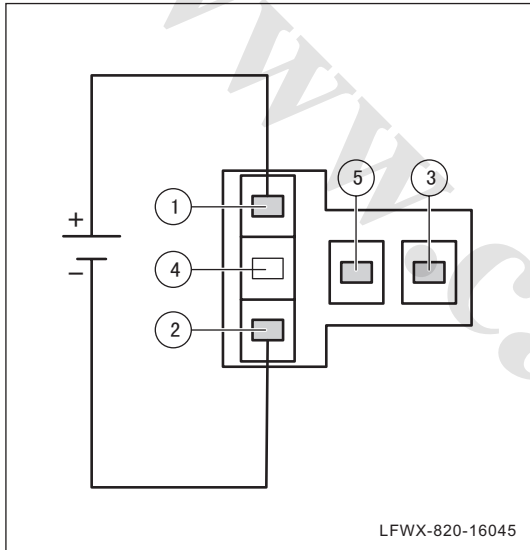


- (c) Disconnect the fan speed-governing relay K08. Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.
- (d) Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 4 terminals of the relay. If conducted, replace the relay with one of the same rating.



### 11. Checking the power line of the fan speed-governing relay

- (a) Disconnect the fan speed-governing relay K08. Turn the digital multimeter to its voltage function and check if there is a voltage between No. 1 terminal of the relay mounting slot and body ground. If the voltage is zero, check and repair the related harness according to the circuit diagram.



### 12. Checking the main relay

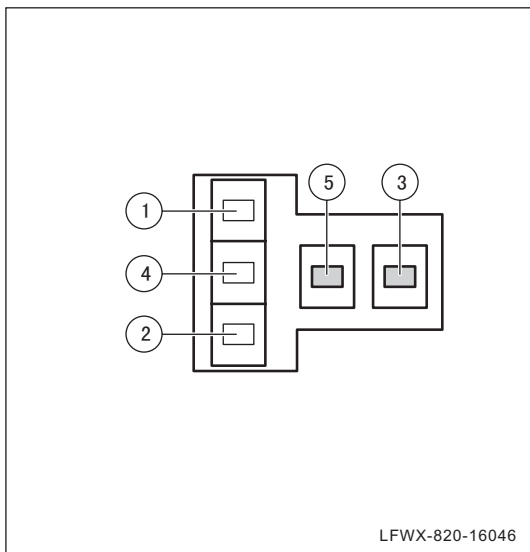
- (a) Disconnect the main relay K05. Switch on the power as shown in the figure and turn the digital multimeter to its resistance function, and then check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.

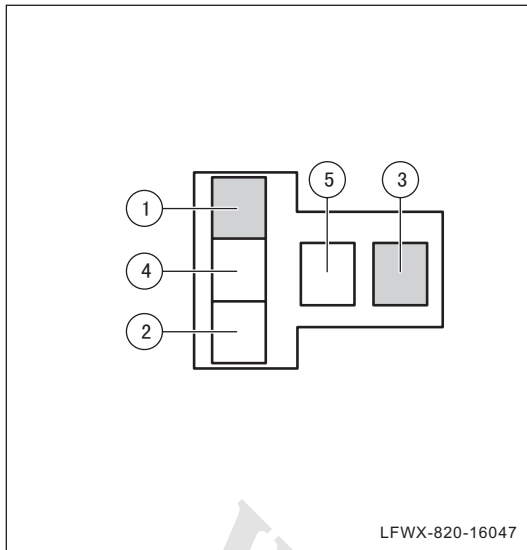
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△ HINT:

The main relay is located in the fuse box in the engine compartment.

- (b) Disconnect the main relay K05. Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 5 terminals of the relay. If conducted, replace the relay with one of the same rating.

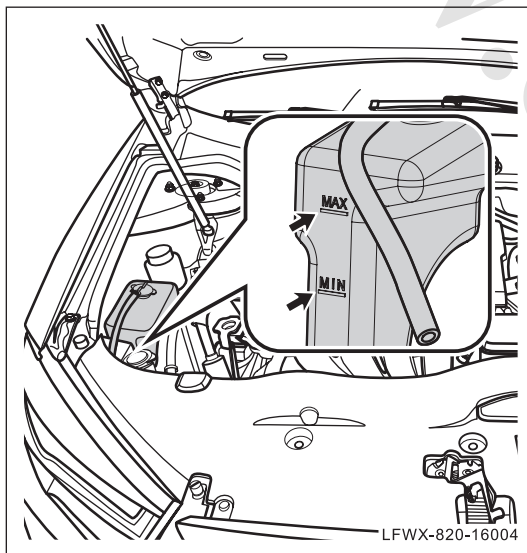




### 13. Checking the power line of the main relay

- (a) Disconnect the main relay K05. Turn the digital multimeter to its voltage function and check if there is a voltage between No. 1 terminal of the relay mounting slot and body ground. If the voltage is zero, check and repair the related harness according to the circuit diagram.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to wiring diagram.

## Check the coolant



### 1. Check coolant level

- (a) Start the engine and keep it idling.
- (b) The coolant level in the expansion tank should be between "MAX" and "MIN" marks. If it is below the "MIN" mark, add coolant and check the cooling system for leakage.

### 2. Checking the coolant quality

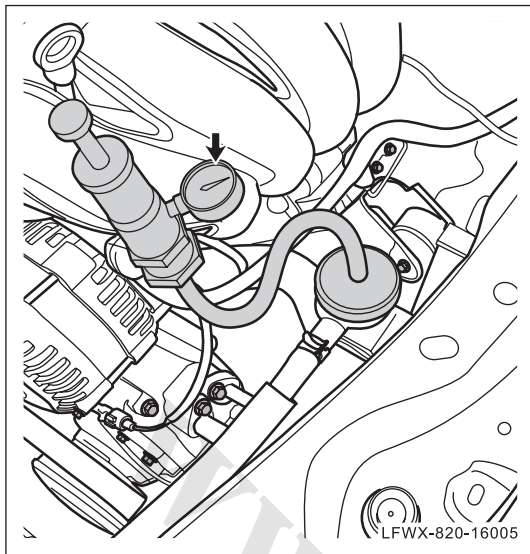
- (a) Drain a little coolant into an appropriate container.
- (b) Check the drained coolant for scale, rust, impurities, oil or discoloration (the normal coolant is aqua) Have the coolant replaced if necessary.

## Checking the cooling system for leakage

### 1. Checking the cooling system operating conditions

- (a) Check the coolant level to ensure it is normal.

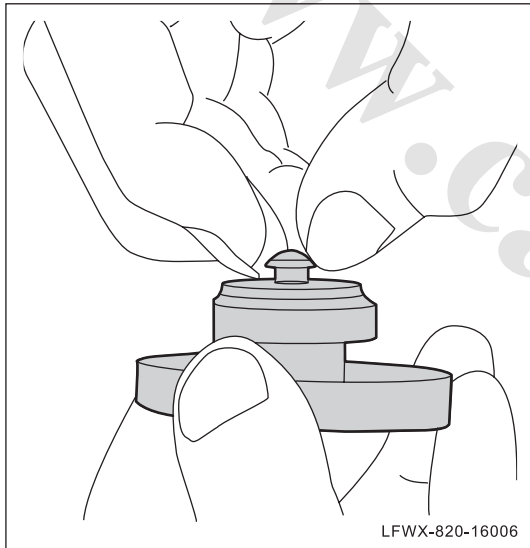
- (b) Remove upper cross beam trim panel of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



- (c) Connect the radiator cover detector and adjust the pressure up to 50~100kPa, and then observe whether the pressure value will fall.

△ HINT:

- Check the cooling line, radiator and water pump for leakage if the pressure decreases.
- Check the radiator core, cylinder block and cylinder head for leakage if there are no leaking traces of coolant outside the engine.



**2. Check the filler cap**

- (a) Check the filler cap inside for scale or impurities. If any, clean it.
- (b) Check the filler cap for cracks, deformation or other damage. If any, replace it.
- (c) Draw out the negative pressure valve and open it. After releasing its pressure, check whether the negative pressure valve can be fully closed and have it replaced if not.

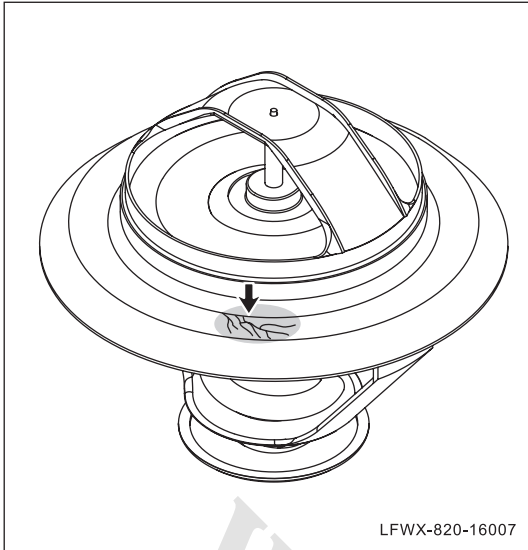
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## Check the thermostat

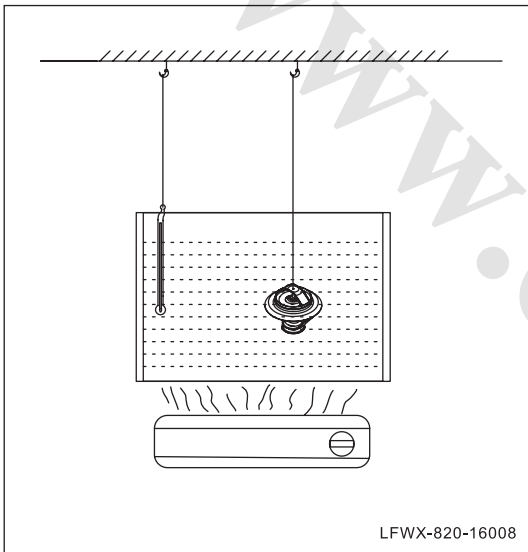
### 1. Check the working conditions of the thermostat

- (a) Remove the thermostat. (See 16- Cooling System-Thermostat, Replacement)





- (b) Check the thermostat body for cracks and other damage and have it replaced if necessary.

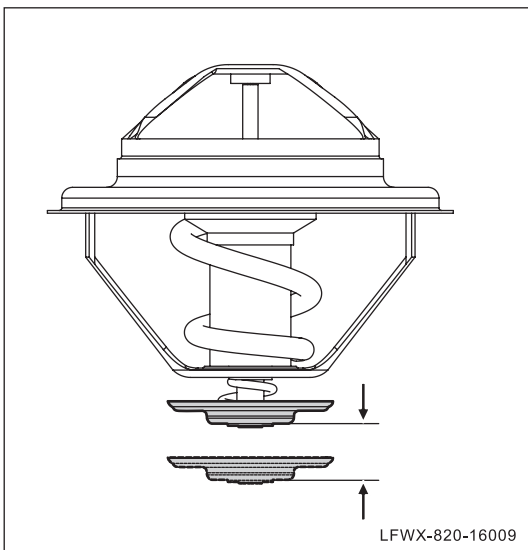


- (c) Put the thermostat into a container filled with water. Heat the water gradually, and check the temperature when the thermostat valve opens.

**Temperature for thermostat valve opening:**  
**80°C ~ 85°C**

△ HINT:

If the thermostat valve opening temperature is inconsistent with the specified value or the thermostat cannot open, replace the thermostat.



- (d) Measure the temperature and lift when the thermostat valve fully opens.

**Temperature for thermostat valve opening fully : 95°C**

**Thermostat valve lift L: 8mm**

△ HINT:

If the thermostat valve lift is inconsistent with the specified value, replace the thermostat.

- (e) When the thermostat is in lower temperature (less than 40 ° C), check the valve whether it is closed completely and have it repaired if not closed or not closed completely.

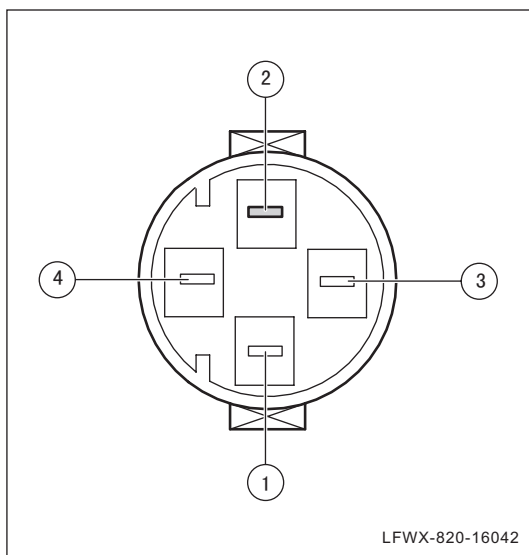
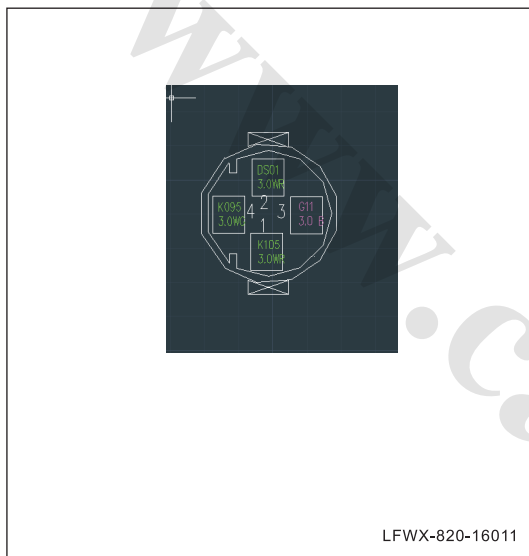
## Check the cooling fan

### 1. Checking the cooling fan working conditions

- (a) Connect a diagnostic scanner to the diagnosis interface.
- (b) Keep the system power in the "ON" state.
- (c) Operate the diagnostic scanner to access to the active test function of the engine menu. Check the cooling fan for low or high-speed running.

#### △ HINT:

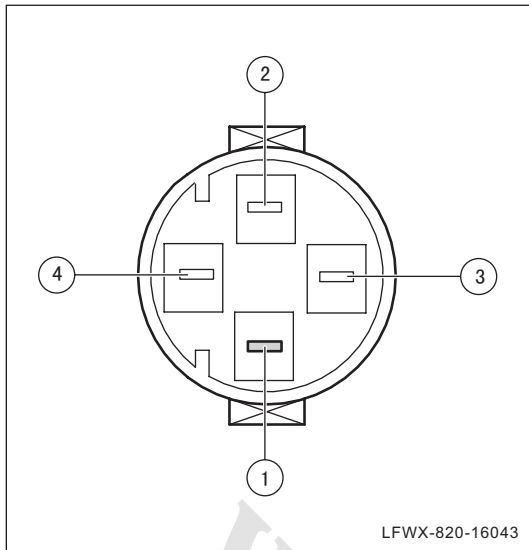
If the cooling fan does not work, check its fuse, relay, cooling fan or engine control module ECM.



- (d) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the cooling fan.
- (e) Apply the battery voltage between No. 1 and No. 3 terminals of the cooling fan and check whether the fan is running at low speed. Otherwise, replace the low-speed fan motor.
- (f) Apply the battery voltage between No. 2 and No. 4 terminals of the cooling fan and check whether the fan is running at high speed. Otherwise, replace the high-speed fan motor.

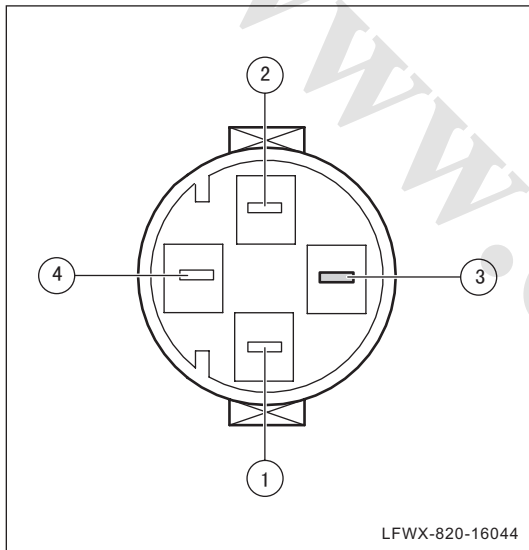
### 2. Checking the power line of the low-speed fan

- (a) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the cooling fan.
- (b) Keep the system power supply in "ON" position. Turn the digital multimeter to its voltage function and check whether there is a voltage between No. 1 terminal of the cooling fan harness connector and body ground. If the voltage is 0, check and repair the the related harness according to the circuit diagram.



### 3. Checking the power line of the high-speed fan

- (a) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the cooling fan.
- (b) Keep the system power supply in "ON" position. Turn the digital multimeter to its voltage function and check whether there is a voltage between No. 2 terminal of the cooling fan harness connector and body ground. If the voltage is 0, check and repair the the related harness according to the circuit diagram.

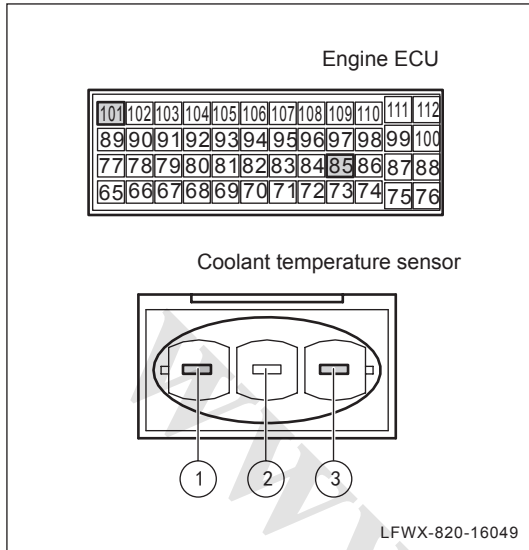


### 4. Checking the ground wire of the cooling fan

- (a) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the cooling fan.
- (b) Turn the digital multimeter to its resistance function. Check the conduction between No. 3 terminal of the cooling fan harness connector and body ground. If not conducted, check and repair the related harness according to the circuit diagram.

## Check the coolant temperature sensor.

1. Check the coolant temperature sensor operating conditions (See 12A- Engine Control System- Engine Control System, General Check).



2. Checking the signal line of the coolant temperature sensor

- (a) Keep the system power supply in "LOCK" position, and disconnect harness connectors from the coolant temperature sensor and the engine ECM, respectively.
- (b) Turn the digital multimeter to its resistance function. Check the conduction between No. 1 terminal of the coolant temperature sensor harness connector and No. 85 terminal of the engine ECM harness connector. If not conducted, check and repair the related harness according to the circuit diagram.
- (c) Turn the digital multimeter to its resistance function. Check the conduction between No. 3 terminal of the coolant temperature sensor harness connector and No. 101 terminal of the engine ECM harness connector. If not conducted, check and repair the related harness according to the circuit diagram.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
High/low-speed fan won't work	1. Fuse (blown)	See 16- Cooling System-Diagnosis, Fault Diagnosis (1. High/low-speed fan won't work)
	2. Relay (fault)	
	3. Wire harness (faulty)	
	4. Cooling fan (damaged)	
	5. ECM fault	
High-speed fan won't work	1. Fuse (blown)	See 16- Cooling System-Diagnosis, Fault Diagnosis (2. High-speed fan won't work)
	2. Relay (fault)	
	3. Wire harness (faulty)	
	4. Cooling fan (damaged)	
	5. ECM fault	
Low -speed fan won't work	1. Fuse (blown)	See 16- Cooling System-Diagnosis, Fault Diagnosis (3. Low-speed fan won't work)
	2. Relay (fault)	
	3. Wire harness (faulty)	
	4. Cooling fan (damaged)	
	5. ECM fault	
The low-speed fan keeps working all the time.	1. coolant temperature sensor (faulty)	See 16- Cooling System-Diagnosis, Fault Diagnosis (4. Low-speed fan keeps working)
	2. Relay (fault)	
	3. Wire harness (faulty)	
	4. ECM fault	
High-speed fan keeps working	1. coolant temperature sensor (faulty)	See 16- Cooling System-Diagnosis, Fault Diagnosis (5. High-speed fan keeps working)
	2. Relay (fault)	
	3. Wire harness (faulty)	
	4. ECM fault	

## Fault diagnosis

### 1. High/low speed fan won't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the cooling fan is working properly (See 16-Cooling System-General Check, Checking the System).	Diagnosis end.	High/low-speed fan won't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the cooling fan fuse is blown (See 16-Cooling System-General Check, Checking the System).	Go to Step 3	Fuse SB07, SB08, SB09 and FB47 are blown	Go to Step 2
2	Checking the circuits for SB07, SB08, SB09 and FB47	Normal	Faulty	Instruction
	Check the working conditions of the circuits for SB07, SB08, SB09 and FB47 according to the circuit diagram.	Go to Step 3	The circuit is short	According to the wiring diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check relay	Normal	Faulty	Instruction
	Check whether the main relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 4	Relay (damaged)	Replace the relay with one of the same rating.
4	Check relay	Normal	Faulty	Instruction
	Check whether the fan speed-governing relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 5	Relay (damaged)	Replace the relay with one of the same rating.
5	Check relay	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the high-speed fan relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 6	Relay (damaged)	Replace the relay with one of the same rating.
6	Check relay	Normal	Faulty	Instruction
	Check whether the low-speed fan relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 7	Relay (damaged)	Replace the relay with one of the same rating.
7	Check the cooling fan.	Normal	Faulty	Instruction
	Check the cooling fan working condition (See 61 – General Check of Cooling System, Check of Cooling Fan)	Go to Step 8	High/low speed fan damaged	Replace the fan (See 16-Cooling System-Cooling Fan, Replacement)
8	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the main relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check the wire harness	Normal	Faulty	Instruction
	Check the power line of the fan speed-governing relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 10	No continuity	Overhaul relevant wire harness according to wiring diagram.
10	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the high-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 11	No continuity	Overhaul relevant wire harness according to wiring diagram.
11	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the power cord of the low-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 12	No continuity	Overhaul relevant wire harness according to wiring diagram.
12	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the low-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan)	Go to Step 13	No continuity	Overhaul relevant wire harness according to wiring diagram.
13	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the high-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan)	Go to Step 14	No continuity	Overhaul relevant wire harness according to wiring diagram.
14	Check the wire harness	Normal	Faulty	Instruction
	Check the the ground wire of the cooling fan for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan).	Go to Step 15	No continuity	Overhaul relevant wire harness according to wiring diagram.
15	Check the wire harness	Normal	Faulty	Instruction
	Check the engine ECM operating circuit according to the circuit diagram.	Go to Step 16	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.
16	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms



## 2. High-speed fan won't work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the cooling fan is working properly (See 16-Cooling System-General Check, Checking the System).	Diagnosis end.	High-speed fan won't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the cooling fan fuse is blown (See 16-Cooling System-General Check, Checking the System).	Go to Step 3	SB08 保险丝熔断	Go to Step 2
2	Checking the SB08 circuit	Normal	Faulty	Instruction
	Check the working conditions for the SB08 circuit according to the circuit diagram.	Go to Step 3	The circuit is short	According to the wiring diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check relay	Normal	Faulty	Instruction
	Check whether the high-speed fan relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 4	Relay (damaged)	Replace the relay with one of the same rating.
4	Check the cooling fan.	Normal	Faulty	Instruction
	Check the cooling fan working condition (See 61 – General Check of Cooling System, Check of Cooling Fan)	Go to Step 5	High-speed fan damaged	Replace the fan (See 16-Cooling System-Cooling Fan, Replacement)
5	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the high-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the power cord of the high-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check the the ground wire of the cooling fan for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan).	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check the engine ECM operating circuit according to the circuit diagram.	Go to Step 9	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.
9	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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### 3. Low-speed fan won' t work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the cooling fan is working properly (See 16-Cooling System-General Check, Checking the System).	Diagnosis end.	Low -speed fan won' t work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the cooling fan fuse is blown (See 16-Cooling System-General Check, Checking the System).	Go to Step 3	SB09 保险丝熔断	Go to Step 2

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
2	Checking the SB09 circuit	Normal	Faulty	Instruction
	Check the working conditions for the SB09 circuit according to the circuit diagram.	Go to Step 3	The circuit is short	According to the wiring diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check relay	Normal	Faulty	Instruction
	Check whether the low-speed fan relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 4	Relay (damaged)	Replace the relay with one of the same rating.
4	Check the cooling fan.	Normal	Faulty	Instruction
	Check the cooling fan working condition (See 61 – General Check of Cooling System, Check of Cooling Fan)	Go to Step 5	Low-speed fan damaged	Replace the fan (See 16-Cooling System-Cooling Fan, Replacement)
5	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the low-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the low-speed fan relay for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the the ground wire of the cooling fan for continuity (See 16-Cooling System-General Check, Checking the Cooling Fan).	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check the engine ECM operating circuit according to the circuit diagram.	Go to Step 9	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.
9	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. Low-speed fan keeps working

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the cooling fan is working properly (See 16-Cooling System-General Check, Checking the System).	Diagnosis end.	The low-speed fan keeps working all the time.	Go to Step 1
1	Check the coolant temperature sensor.	Normal	Faulty	Instruction
	Check the coolant temperature sensor operating conditions (See 16-Cooling System-General Check, Checking the coolant temperature Sensor).	Go to Step 2	coolant temperature sensor damaged	Replacement (See 16- Cooling System-coolant temperature Sensor, Replacement)
2	Check the coolant temperature sensor.	Normal	Faulty	Instruction
	Check the signal line of the coolant temperature sensor for continuity.	Go to Step 3	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Check relay	Normal	Faulty	Instruction
	Check whether the low-speed fan relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 4	Relay (damaged)	Replace the relay with one of the same rating.
4	Check the wire harness	Normal	Faulty	Instruction
	According to the circuit diagram, check whether the circuit between the cooling fan harness connector and the low-speed fan relay is shorted.	Go to Step 5	The circuit is short	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	According to the circuit diagram, check whether the low-speed fan control circuit is shorted.	Go to Step 6	The circuit is short	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check the engine ECM operating circuit according to the circuit diagram.	Go to Step 7	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.
7	Replacement and check	Normal	Faulty	Instruction
	Replace the engine control module ECM with one of the same type, and check whether the fault is removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 5. High-speed fan keeps working

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the cooling fan is working properly (See 16-Cooling System-General Check, Checking the System).	Diagnosis end.	High-speed fan keeps working	Go to Step 1
1	Check the coolant temperature sensor.	Normal	Faulty	Instruction
	Check the coolant temperature sensor operating conditions (See 16-Cooling System-General Check, Checking the coolant temperature Sensor).	Go to Step 2	coolant temperature sensor damaged	Replacement (See 16- Cooling System-coolant temperature Sensor, Replacement)
2	Check the coolant temperature sensor.	Normal	Faulty	Instruction
	Check the signal line of the coolant temperature sensor for continuity.	Go to Step 3	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.
3	Check relay	Normal	Faulty	Instruction
	Check whether the high-speed fan relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 4	Relay (damaged)	Replace the relay with one of the same rating.
4	Check the wire harness	Normal	Faulty	Instruction
	According to the circuit diagram, check whether the circuit between the cooling-fan harness connector and the high-speed fan relay is shorted.	Go to Step 5	The circuit is short	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	According to the circuit diagram, check whether the high-speed fan control circuit is shorted.	Go to Step 6	The circuit is short	Overhaul relevant wire harness according to wiring diagram.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
6	Check the wire harness	Normal	Faulty	Instruction
	Check the engine ECM operating circuit according to the circuit diagram.	Go to Step 7	Short circuit or open circuit	Overhaul relevant wire harness according to wiring diagram.
7	Replacement and check	Normal	Faulty	Instruction
	Replace the engine control module ECM with one of the same type, and check whether the fault is removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Coolant

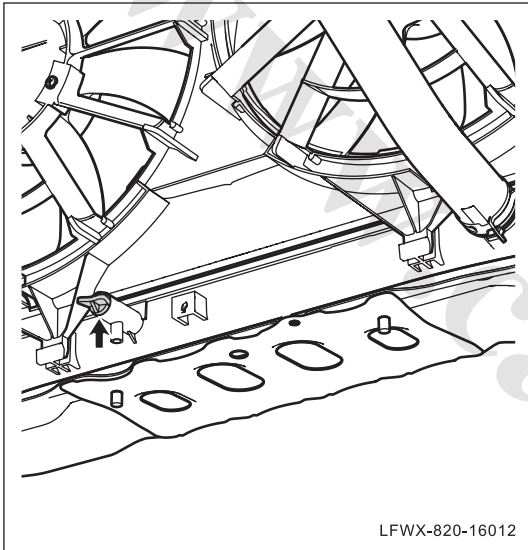
### Drain

#### ⓘ Note:

- Never start to work before the engine is cooled down completely.
- Cover the filler cap with a piece of thick rag and open it carefully. First release the pressure inside the radiator and then open it completely.

#### 1. Draining coolant

- (a) Remove the left lower guard of the engine. (See 81 - Interiors and Exteriors - Engine Lower Panel, Replacement)

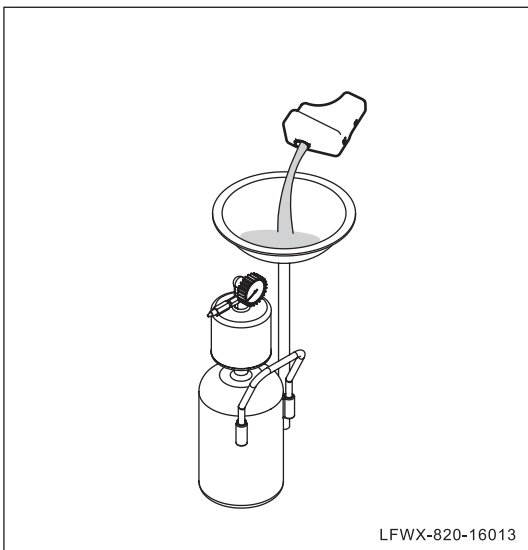


- (b) Put a recovery under the drain plug of the radiator.
- (c) Remove the radiator drain plug and drain the coolant into the recovery.

#### △ HINT:

In order to drain the coolant out quickly, open the radiator filler cap to release the pressure of the cooling system.

- (d) Install the radiator drain tap.



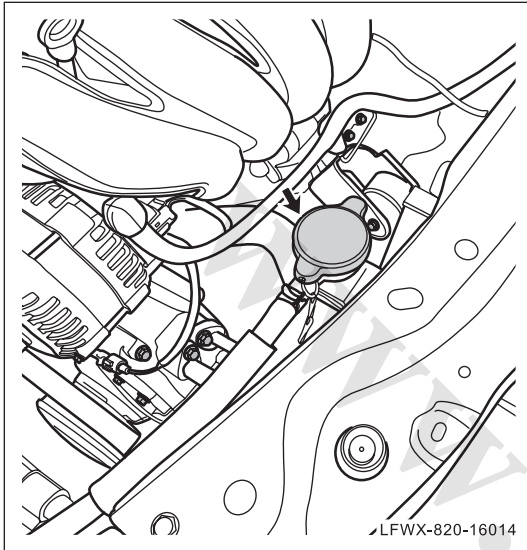
- (e) Remove the coolant reservoir. (see 16 - Cooling System, Coolant Reservoir, Replacement)
- (f) Pour the coolant in the coolant reservoir into the recovery.
- (g) Install the fluid reservoir. (see 16 - Cooling System, Coolant Reservoir, Replacement)



## Filling

### 1. Refilling coolant

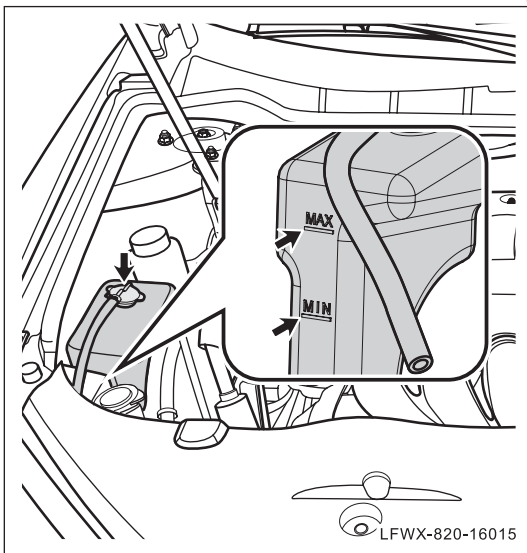
- (a) Check the joints of each line in the cooling system for being connected firmly.
- (b) Remove upper cross beam trim panel of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



- (c) Open the radiator filler cap.
- (d) Fill coolant into the radiator slowly until the coolant level is flush with the filler.

**Coolant Specifications: Lucent 100**

**Coolant volume: 6L ~ 7L**



- (e) Open the coolant reservoir cap.
- (f) Fill coolant into the coolant reservoir slowly until the coolant level is nearly at the MAX mark.
- (g) Install the fluid reservoir cap.

- (h) Crank the engine to its operating temperature and observe the coolant level at the radiator filler. Fill more coolant in time if the coolant level decreases.

△ HINT:

We recommend turn on the air conditioning and adjust its temperature to the maximum.

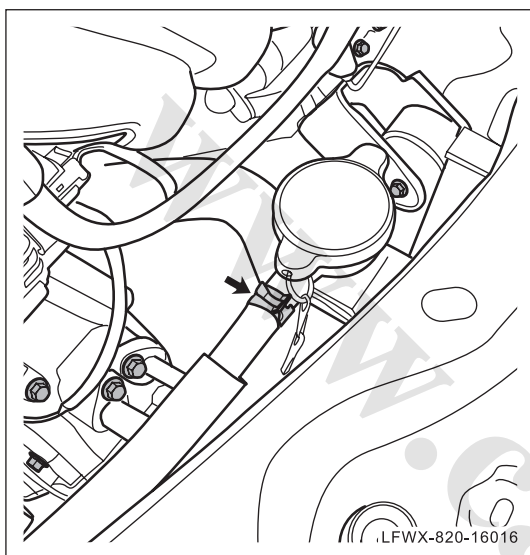
- (i) Install the radiator filler cap.
- (j) Install the trim panel of the upper rail of the water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)

## Radiator

### Overhaul

#### 1. Remove the radiator assembly

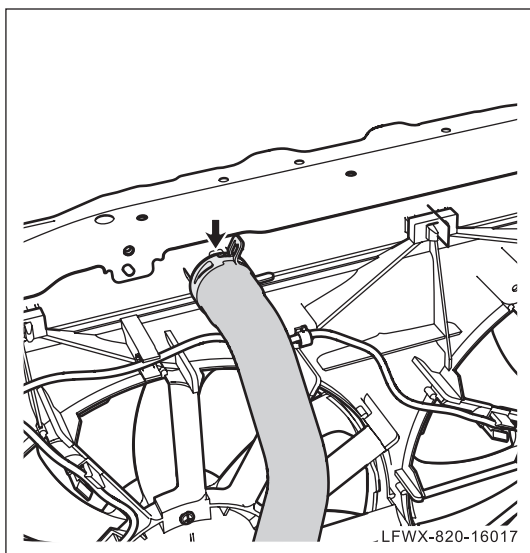
- (a) Drain the coolant. (See 16- Cooling System-Coolant, Drainage)
- (b) Remove the intake manifold with resonant cavity assembly. (See 15- Intake /Exhaust System- Intake Pipe with Resonant Cavity Assembly, Replacement)



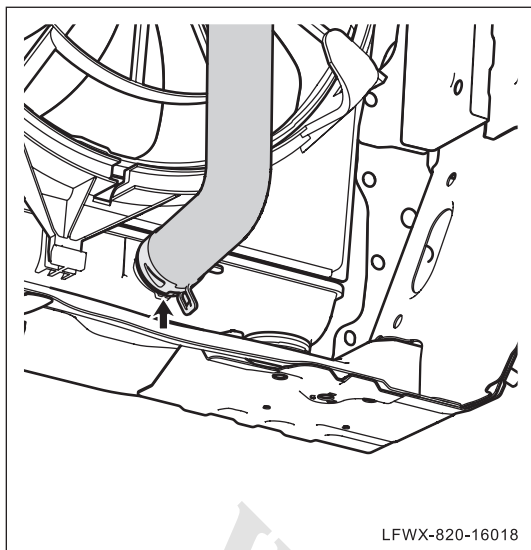
- (c) Remove the hose connecting the expansion tank with the radiator.

- Remove the clamps at both ends of the connecting hose, and pull out the connecting hose from its mounting position.
- Remove the connecting hose from the clamps.

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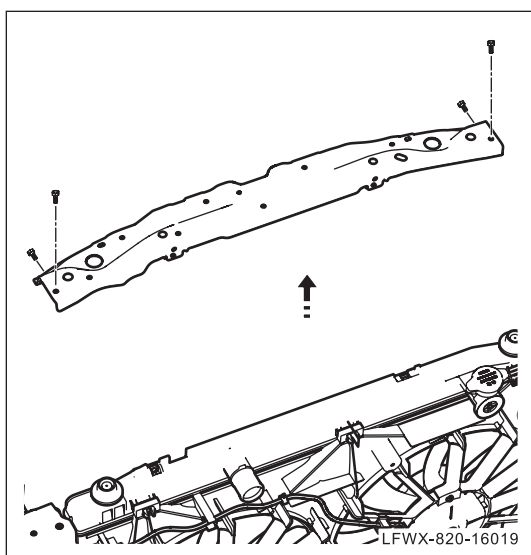


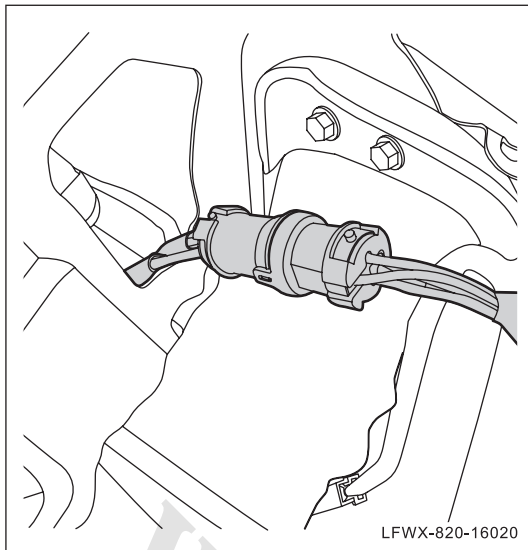
- (d) Remove the spring clamp of the radiator inlet hose and pull the inlet hose out.



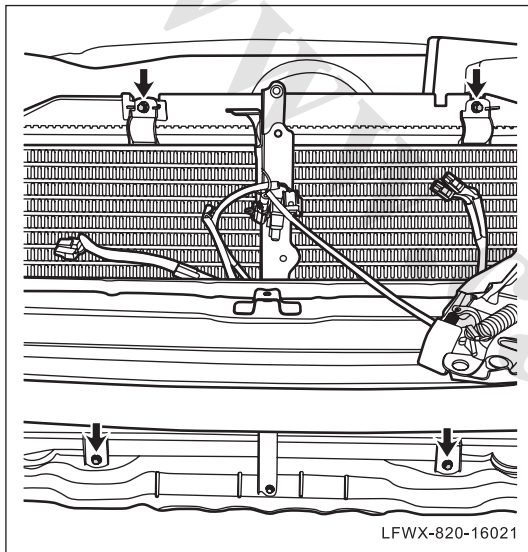
- (e) Remove the spring clamp of the radiator outlet hose and pull the water outlet hose out.

- (f) Remove the front grille. (See 81- Interiors and Exteriors, Front Bumper, Replacement).
- (g) Remove the alt and bass horns. (See 77- Horn System-Alt and Bass Horns, Replacement)
- (h) Remove engine hood lock. (See 82- Doors /Hatches /Door Locks-Engine Hood Lock, Replacement)
- (i) Remove the bolts from the upper rail of the water tank, and remove the upper rail.





(j) Disconnect cooling fan connector.



(k) Remove the condenser bolts to separate the condenser from the radiator.

(l) Remove the radiator assembly upwards slowly.

**Note:**

**Don't scratch or damage the radiator core.**

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## 2. Checking the radiator assembly

(a) Clean the radiator.

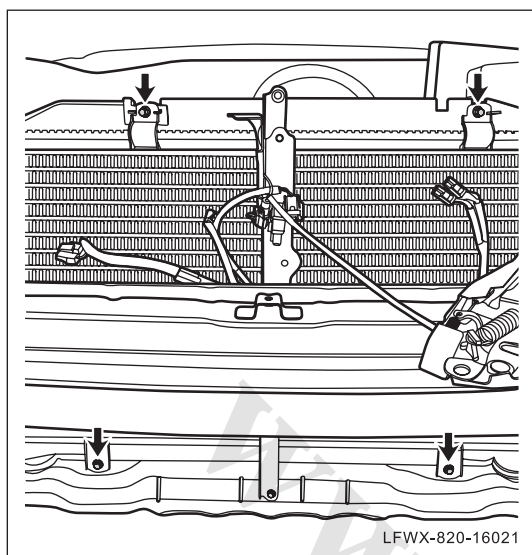
- Wipe off the dirt in the radiator core gently using a brush and soapy water.

**Note:**

**Be sure to clean the radiator along its thread. Otherwise, the radiator core will be deformed.**

- If you finish, rinse it slowly with clean water to ensure all the dirt to be washed away.
- Pour clean water into the radiator filler until it is full.
- Drain the water in the radiator into a recoverer.
- Repeat the filling and draining procedures until the drained water becomes clean.

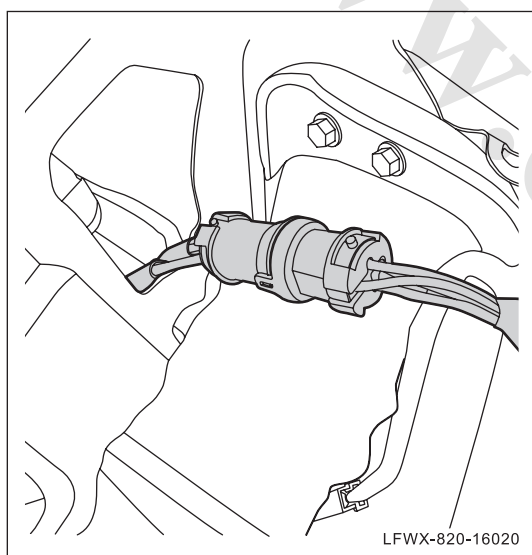
- (b) Check the radiator filler for rupture and damage. If any, replace the radiator.
- (c) Check the radiator core for bending deformation. If any, repair or replace the radiator.



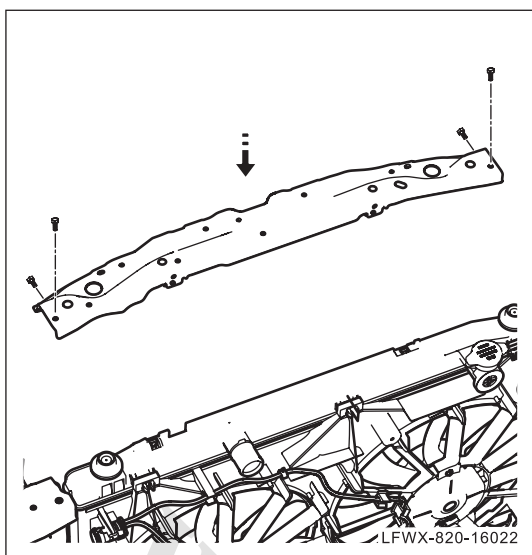
### 3. Installation of radiator assembly

- (a) Install the radiator assembly to its mounting position.
- (b) Install the condenser fixing bolts and tighten them.

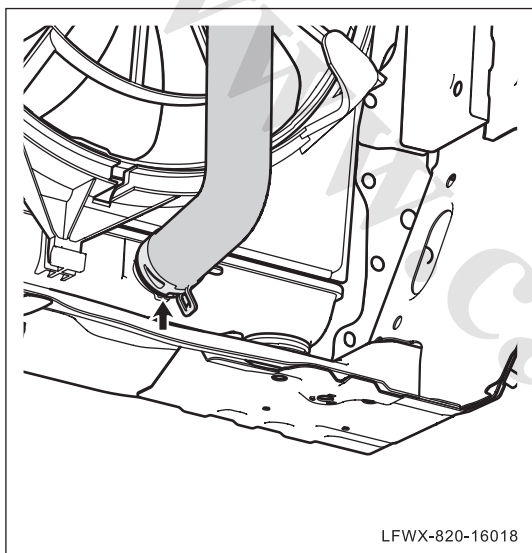
**Torque: 6N•m-8N•m**



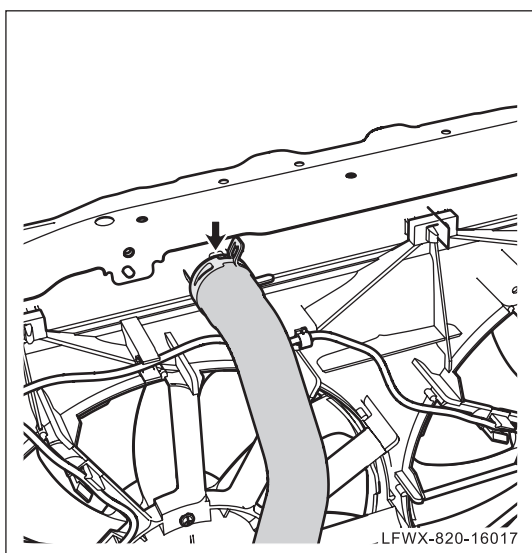
- (c) Connect the cooling fan connectors.



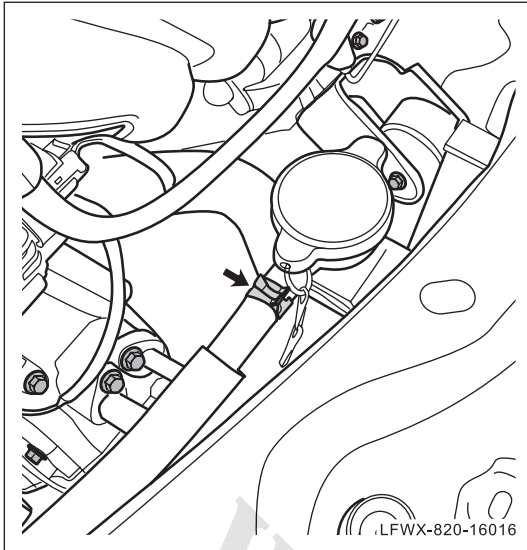
- (d) Install the upper rail of the water tank in place, and install and tighten the bolts.
- (e) Install engine hood lock. (See 82- Doors / Hatches / Door Locks-Engine Hood Lock, Replacement)
- (f) Install the alt and bass horns. (See 77- Horn System-Alt and Bass Horns, Replacement)
- (g) Install the front grille. (See 81- Interiors and Exteriors, Front Bumper, Replacement).



- (h) Install the radiator water outlet pipe and its spring clamp on the radiator.



- (i) Install the radiator water inlet pipe and its spring clamp on the radiator



- (j) Install the connecting hose and clamps of the expansion tank and radiator in place.
- (k) Install the connecting hose of the expansion tank and radiator into the clamps.

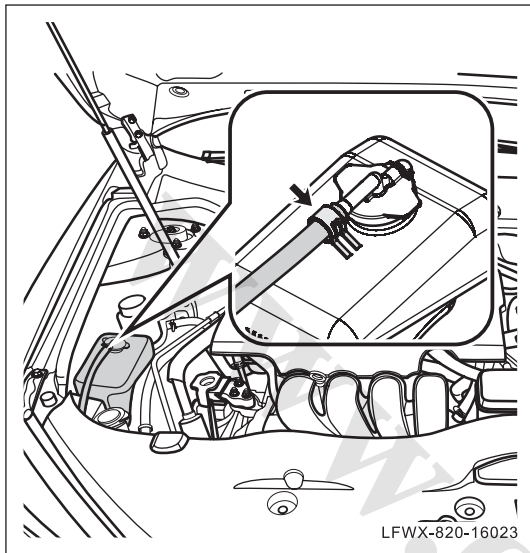
- (l) Refill the coolant. (See 16—Cooling System-Cooling, Filling)

## Expansion Tank

### Replacement

#### 1. Removing the expansion tank.

(a) Drain the coolant. (See 16- Cooling System-Coolant, Drainage)



(b) Remove the hose connecting the expansion tank with the radiator.

- Remove the connecting hose clamps, and remove the hose from the expansion tank.
- Remove the connecting hose from the clamps.

(c) Remove the expansion tank upward.

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#### 2. Install the fluid reservoir.

- (a) Fix the expansion tank to its bracket.
- (b) Fix the hose and clamps to the expansion tank.
- (c) Install the connecting hose of the expansion tank and radiator into the clamps.
- (d) Refill the coolant. (See 16—Cooling System-Cooling, Filling)

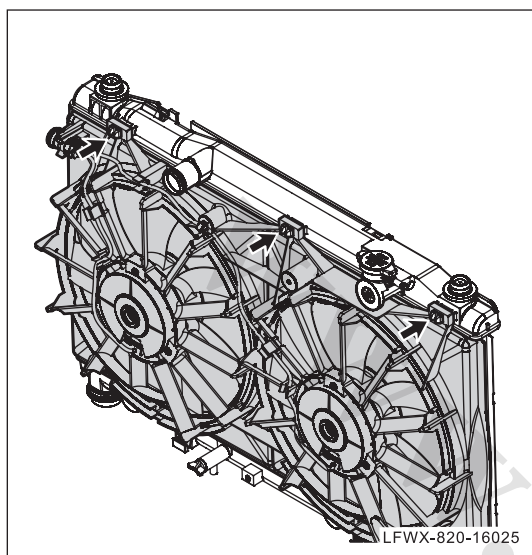


## Cooling Fan

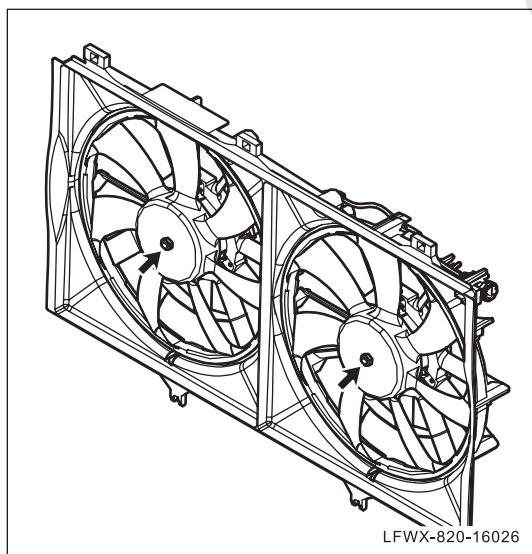
### Replacement

#### 1. Removal of cooling fan

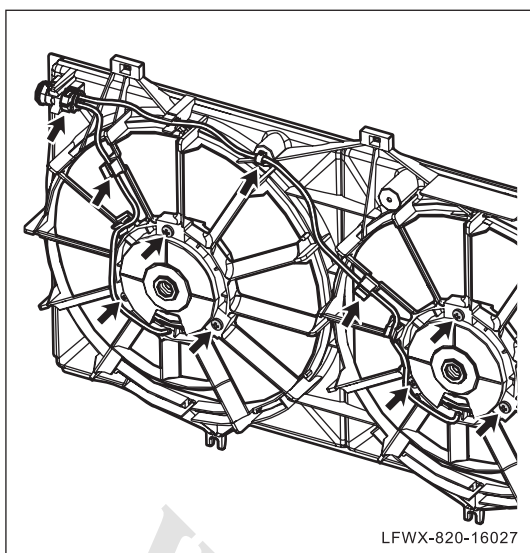
(a) Remove the radiator assembly. (see 16 - Cooling System, Radiator, Replacement)



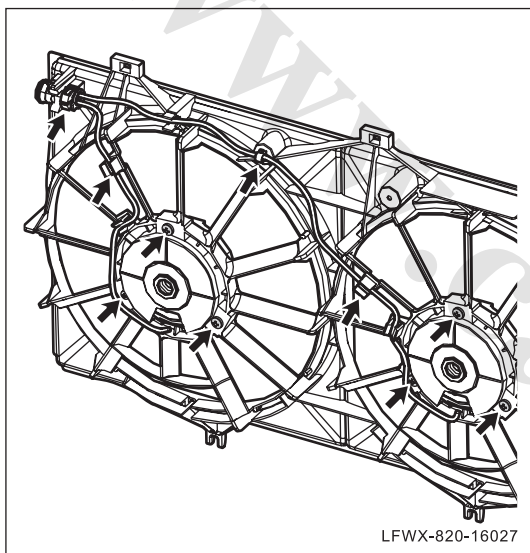
(b) Remove the buckles of the radiator fan shroud, and remove the radiator fan shroud with fan assembly.



(c) Remove the fixed nuts of the cooling fans and two cooling fans.



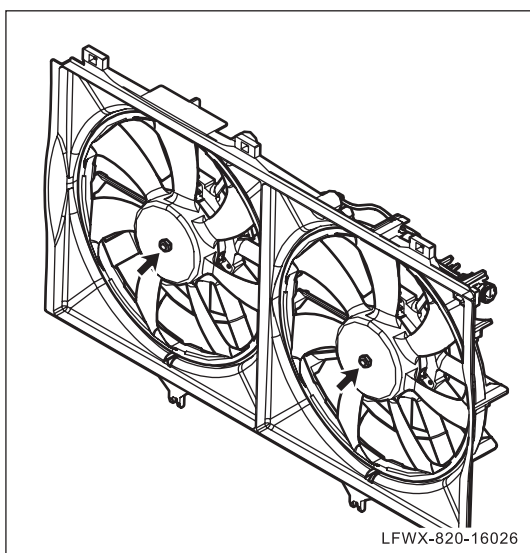
- (d) Push out the fan motor wire harness terminals from the fan motor connector from inner to outer.
- (e) Remove the fan motor harness from its clamp.
- (f) Remove the fixing screws of the fan motor. Remove the fan motor assembly.



## 2. Installation of cooling fan

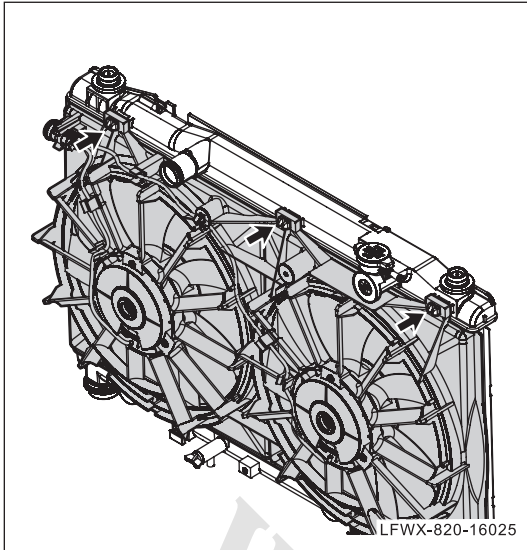
- (a) Install each fan motor to the cooling fan shrouds and install & tighten the fixing bolts.
- (b) Re-install the fan motor wire harness terminals back to the motor connectors.
- (c) Install the fan motor harness into its clamp.

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- (d) Install cooling fan onto its cover, and then mount and fasten the fixing nut.

**Torque: 20N•m - 26N•m**



- (e) Fix the fan shroud with fan assembly to the radiator and ensure that each buckle is installed in place.
- (f) Install the radiator assembly. (see 16 - Cooling System, Radiator, Replacement)

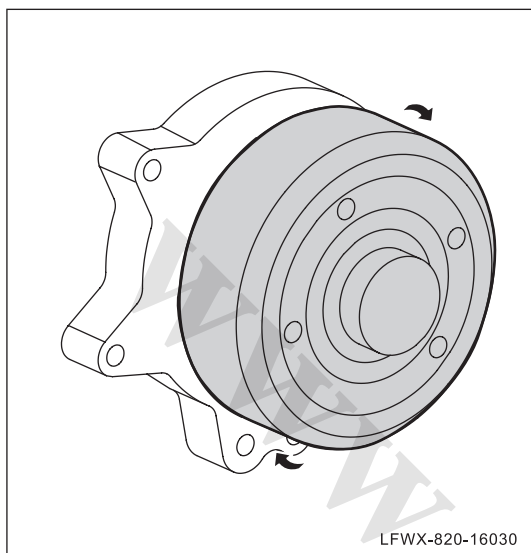
### 3. Inspection

- (a) Check the cooling fan working conditions. (See 16- Cooling System-General Check, Checking the Cooling Fan)

## Water Pump

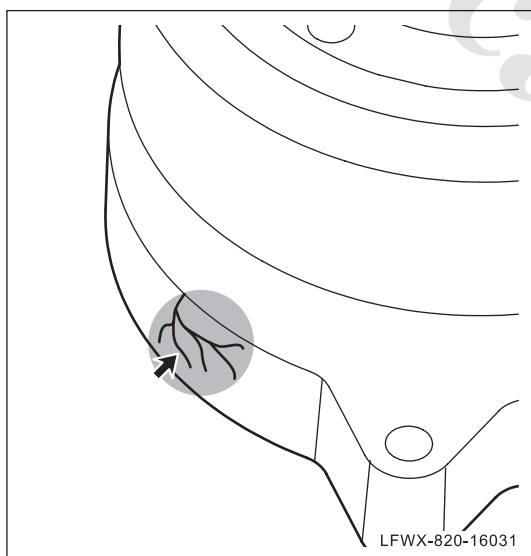
### Overhaul

1. Remove the water pump assembly (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair)



2. Check the water pump assembly

- (a) Rotate the water pump pulley. Check the rotation of the water-pump bearing for smoothness or noise. If there is abnormal noise , repair or replace as required.



- (b) Check the water-pump casing for crack or damage. If there is , repair or replace as required.

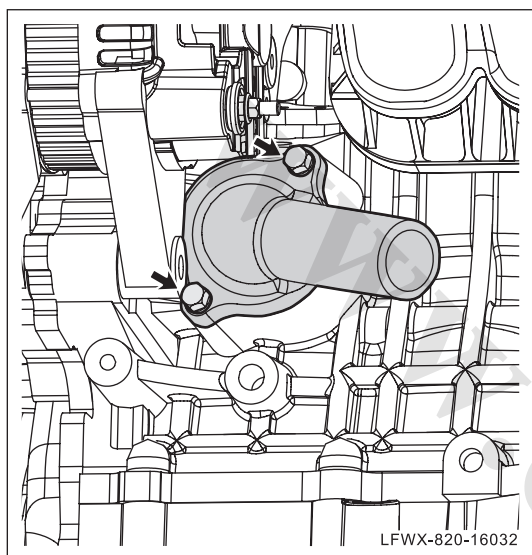
3. Install the water pump assembly (See 11A- Engine Mechanical System-Timing Sprocket, Check and Repair).

# Thermostat

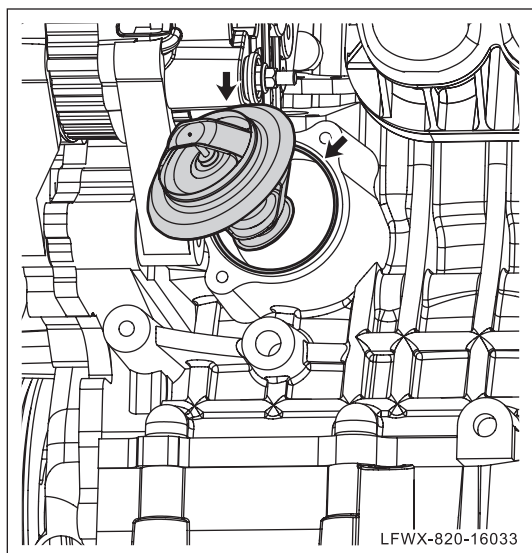
## Replacement

### 1. Removal of thermostat

- (a) Drain the coolant. (See 16- Cooling System-Coolant, Drainage)
- (b) Remove the clamp from the engine inlet hose, and pull out the inlet hose from its mounting position.



- (c) Remove the fixing bolts of engine inlet hose and take off the inlet hose.



- (d) Take out the thermostat and O-ring.

△ HINT:

Do not re-use the removed seal. Be sure to replace it with a new one during installation.



## 2. Installation of thermostat

- (a) Re-install the thermostat and O-ring back to the engine.
- (b) Install the inlet hose of the engine in place, and install & tighten the fixing bolts.

**Torque: 20N•m - 25N•m**

- (c) Install the water inlet rubber pipe of the engine and clamp to the inlet hose.
- (d) Refill the coolant. (See 16- Cooling System-Coolant, Filling)

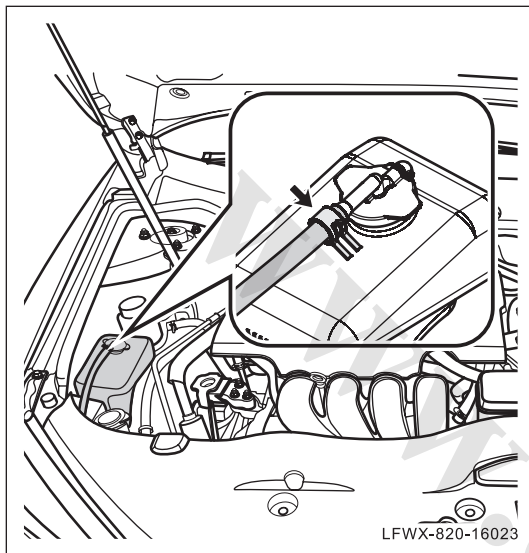
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## Cooling Line

### Replacement

△ HINT:

Before removing the cooling lines, first drain the coolant, and fill coolant after replacing the cooling lines.



**1. Removing the hose connecting the expansion tank with the radiator**

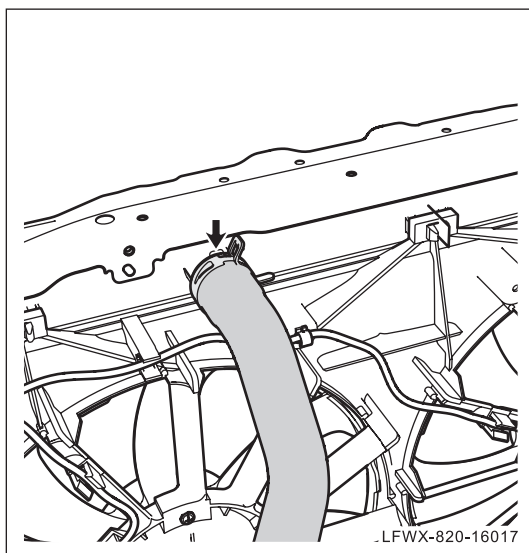
- (a) Remove the clamps at both ends of the hose, and pull out the hose pulled from its mounting position.
- (b) Remove the hose from the clamps.

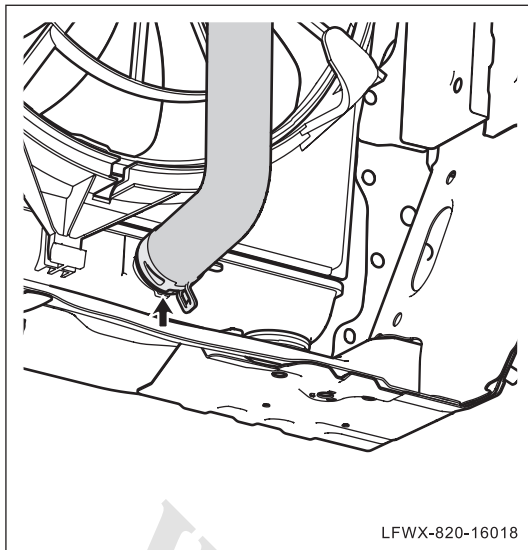
**2. Installing the hose connecting the expansion tank with the radiator**

- (a) Install the connecting hose and clamps of the expansion tank and radiator in place.
- (b) Install the hose into the clamps.

**3. Remove the radiator inlet hose**

- (a) Remove the spring clamps on both ends of radiator inlet hose and take off radiator inlet hose.





- (b) Remove the spring clamps on both ends of the radiator outlet hose and take off radiator outlet hose.

#### 4. Install the radiator inlet and outlet hose

- (a) Install radiator inlet hose and the spring clamps on its two ends in place.
- (b) Install the radiator inlet hose and the spring clamps on its two ends in place.

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#### 5. Inspection

- (a) Start the engine and check each cooling pipe mounting position for leakage. If any, re-install it.

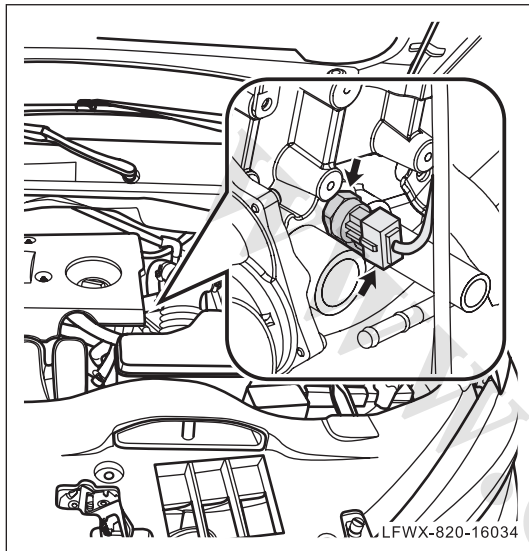


# Coolant Temperature Sensor

## Replacement

### 1. Removing the coolant temperature sensor

- (a) Disconnect negative cable of battery.
- (b) Drain the coolant. (See 16- Cooling System-Coolant, Drainage)



- (c) Disconnect the harness connector from the coolant temperature sensor.
- (d) Remove the coolant temperature sensor.

### 2. Install coolant temperature sensor

- (a) Apply sealant on the threads of the coolant temperature sensor.
- (b) Install the coolant temperature sensor in its mounting hole.

**Torque: 20N•m**

- (c) Connect the harness connector of the coolant temperature sensor.
- (d) Connect the negative cable of battery.
- (e) Refill the coolant. (see 16 - Cooling System, Coolant, Replacement)

### 3. Inspection

- (a) Start the engine. Check the installation position of the coolant temperature sensor for leakage and have it reinstalled if necessary.

# 17- Lubrication System

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# Lubrication System

## System description

△ HINT:

Lifan 820 series model includes LF7186, LF7240, and LF7240B, equipped with LFB479Q/LF489Q engine and 5MT manual transmission or 6AT automatic transmission. The lubrication system depends on the engine model and the transmission model, but it can be checked and repaired basically in the same way. This section takes the LF7186 model equipped with the LFB479Q engine and 5MT transmission as an example.

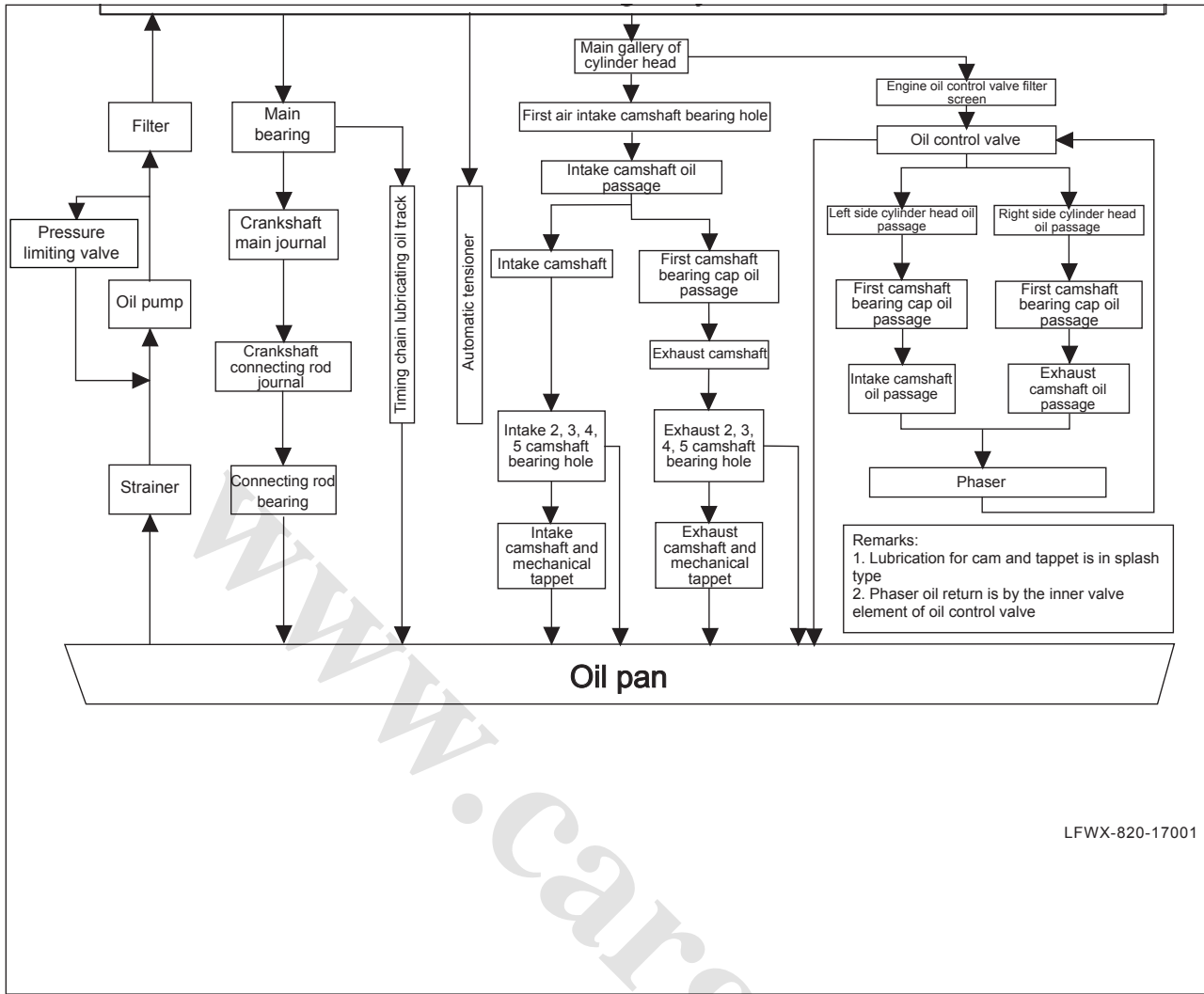
### 1. Function

The lubrication system delivers clean and quantitative oil to the surfaces of parts with relative motion to achieve fluid friction, reducing frictional resistance and mechanical wear, and clean and cool the the part surfaces and prevent the parts from being corroded.

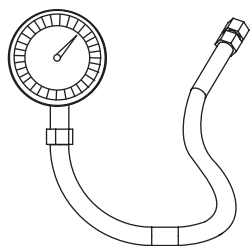
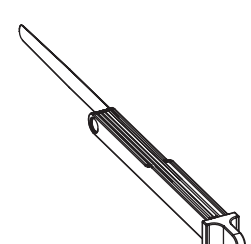
### 2. Components

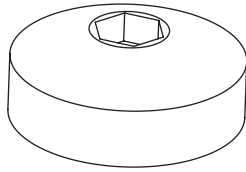
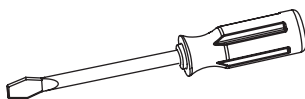
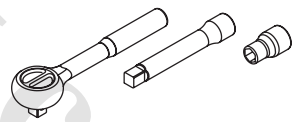
The lubrication system mainly consists of the oil strainer, oil pan, oil pump and oil filter and other component.

### 3. Principle



## Preparation

S/N	Tools	Outline diagram	Description
1	Fuel pressure gauge		Measuring oil pressure
2	Feeler gauge		Measuring component gap

S/N	Tools	Outline diagram	Description
3	Oil filter remover		Removing and installing oil filter
4	Screwdriver		Remove the fixing screws
5	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts

## Service data

### 1. Technical specifications table

Oil quality	Naturally-aspirated engines (LFB479Q, LF489Q): APISM
Amount of oil filling	3.5L(LFB479Q)、4L(LF489Q)
Oil pressure at idle speed	80kPa~300kPa
Oil pressure at rated speed	330kPa~430kPa
Top clearance between the oil pump drive rotor and driven rotor	0.023mm~0.069mm
Top gap between rotor and housing of oil pump	0.025mm~0.071mm
Gap between driven rotor and housing of oil pump	0.260mm~0.325mm

### 2. Table of tightening torque

Item	N•m
Engine oil pressure alarm	14~16
Oil drain bolt of oil pan	42~46
Oil filter	25~30
Engine oil pump relief valve screw plug	37
Oil pump cap fixing screws	11
Dipstick guide tube fixing bolts	10~12

## Precautions

### 1. Precautions before repair

- (a) Wait till the engine is cooled down before operating on the lubricating system.

### 2. Precautions for maintenance

- (a) Avoid oil spilling over the drive belt when performing operation.
- (b) Collect and store the used oil of the engine together, and always keep the working field clean.

### 3. Other precautions

- (a) Observe the following to use sealant:
- Remove the residual sealant on the installation surfaces of the oil pan and the cylinder block (including the grooves, fixing bolts and bolt installation holes of the

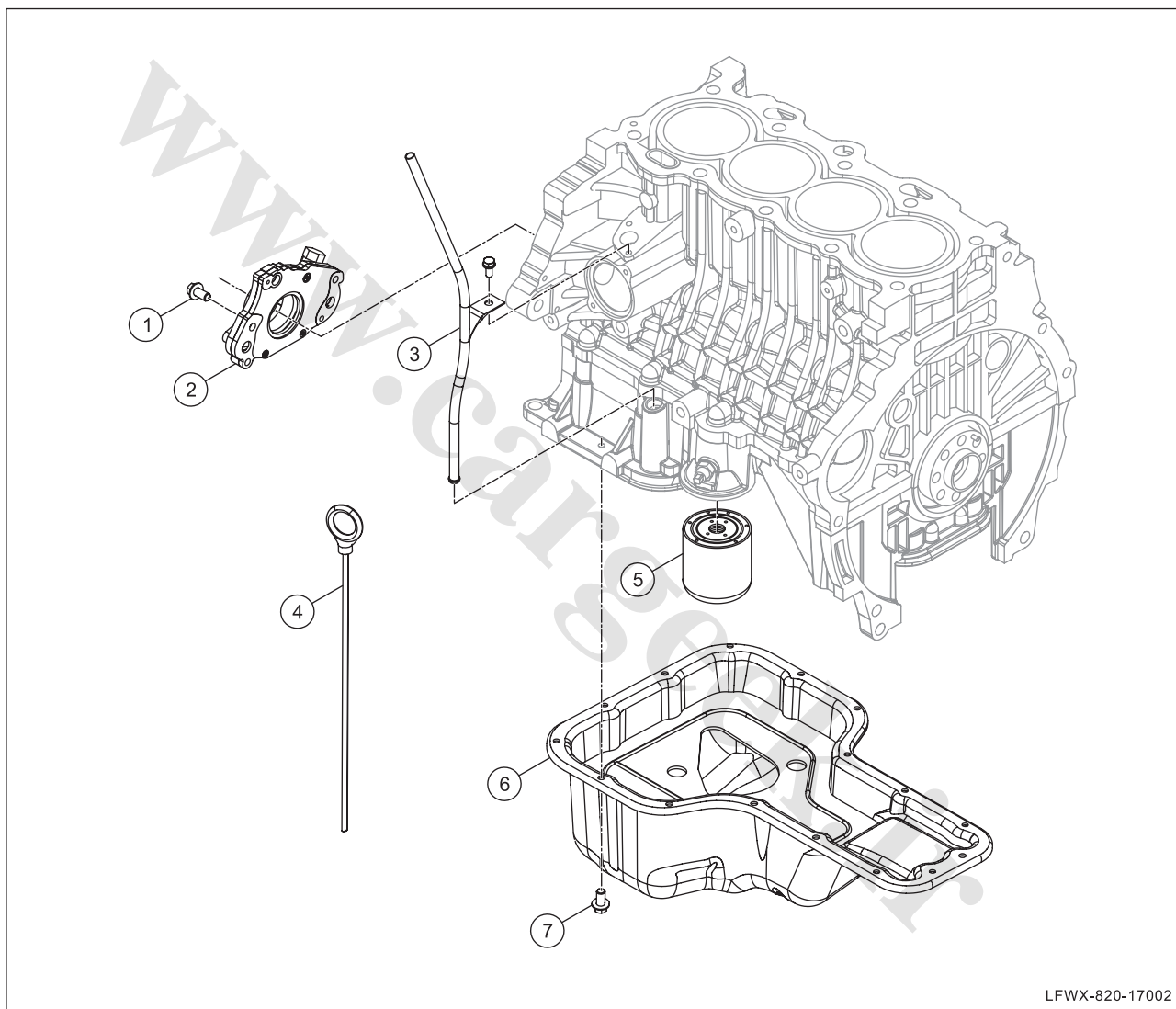
sealant application surfaces) thoroughly with the scraper.

- When using sealant, be sure to wipe the sealant application surfaces clean. Remove the water or other foreign objects attached to the application surfaces.
- If there is any foreign object in the sealant, immediately remove it completely.

## Component (I)

△ HINT:

Vehicles equipped with the LFB479Q engine.



1	Bolt
2	Oil pump
3	Dipstick guide tube
4	Oil dipstick

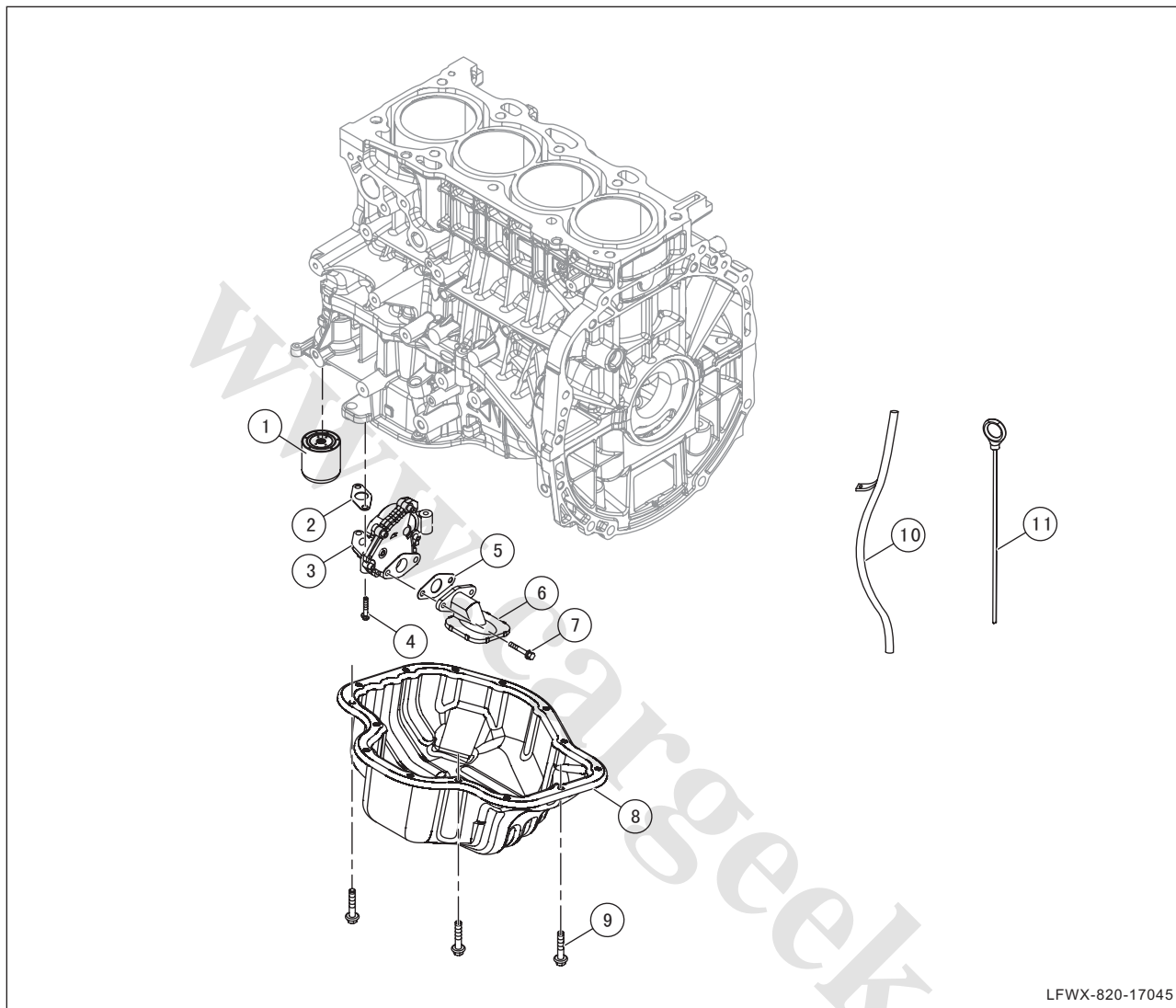
5	Oil filter
6	Oil pan
7	Bolt



## Component (II)

△ HINT:

Vehicle with engine of LF489Q



1	Oil filter
2	Washer
3	Oil pump
4	Bolt
5	Washer
6	Oil strainer

7	Bolt
8	Oil pan
9	Bolt
10	Dipstick guide tube
11	Oil dipstick

## General Check

### Check the system

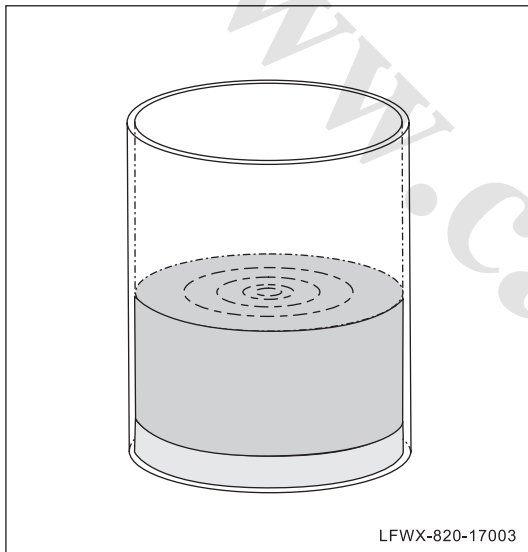
#### 1. Check whether the system has leakage

- (a) Check the oil pan and oil filter for leakage. If any, replace the damaged parts.

#### 2. Check system components

- (a) Check system for obvious mechanical or electrical damage. If any, repair it.  
 (b) Check system for obvious collision and deformation. If any, repair it.  
 (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

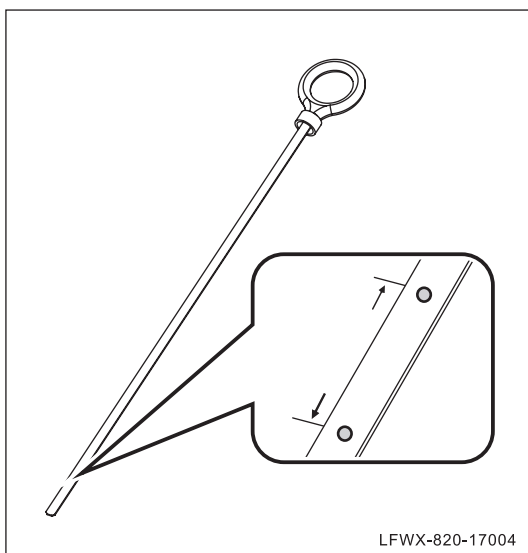
### Check engine oil



#### 1. Check the oil quality

- (a) Drain some oil into a transparent container and let it sit for some time, and then check the oil for water or other impurities. If any, replace the oil.

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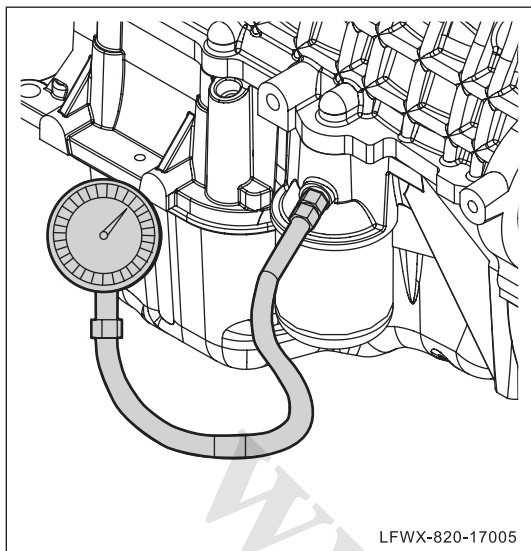
#### 2. Checking the oil level

- (a) Start the engine and warm it up, and then shut off the engine. Pause for 5min, and then check the oil level should be between the MAX and Min marks on the dipstick.

#### △ HINT:

If the oil level above the MAX mark, drain some oil until the oil level is between the MAX and Min marks. If the oil level below the MIN mark, add oil until the oil level is between the MAX and Min marks.

## Checking the oil pressure



### 1. Check engine oil pressure

- (a) Disconnect the harness connector from the oil pressure alarm.
- (b) Remove the oil pressure alarm and install the oil pressure gauge.
- (c) Warm up the engine and observe the engine oil pressure gauge.

**Oil pressure at idling speed: 80kPa - 300kPa**

**Oil pressure at rated speed: 330kPa ~ 430kPa**

△ HINT:

If the engine oil pressure is not within the specified range, check the engine oil pump.

- (d) Remove the pressure gauge, and install the oil pressure alarm and connect the sensor connector.

**Torque for oil pressure alarm: 14N • m ~ 16N • m**

△ HINT:

When installing the oil pressure alarm, apply sealant onto the thread of the sensor.

ⓘ **Note:**

**Do not start the engine just after installing the engine oil pressure alarm. Be sure to wait for a period of time before starting the engine.**

## Check oil filter

### 1. Check the working conditions of the oil filter

- (a) Check whether the oil filter is dirty. If so, replace it.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Abnormal oil pressure	Oil pressure alarm (damaged)	See 17- Lubrication System-Diagnosis, Fault Diagnosis (1. Abnormal oil pressure)
	Oil (abnormal level)	
	Low oil viscosity	
	Oil filter clogged	
	Excessively large clearance between main bearing bush and connecting-rod bearing bush.	
	Oil pump (fault)	
Excessive oil consumption	Each sealing part (poorly sealed)	See 17- Lubrication System-Diagnosis, Fault Diagnosis (1. Excessive oil consumption)
	Engine (mechanical failure)	

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### Fault diagnosis

#### 1. Abnormal oil pressure

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the oil pressure (See 17- Lubrication System-General Check, Checking the Oil Pressure).	Diagnosis end.	Abnormal oil pressure	Go to Step 1
1	Check the engine oil	Normal	Faulty	Instruction
	Check whether the oil level is normal (See 17- Lubrication System-General Check, Checking the Engine Oil).	Go to Step 2	Abnormal oil level	Add or drain oil to the required level (See 17- Lubrication System-Oil, Replacement)
2	Check the engine oil	Normal	Faulty	Instruction
	Check the oil quality (See 17- Lubrication System-General Check, Checking the Engine Oil).	Go to Step 3	Low oil viscosity	Replace the engine oil (see 17 - Oil lubrication system engine oil, replacement)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Check oil filter	Normal	Faulty	Instruction
	Check the oil filter for clogging (See 17- Lubrication System-General Check, Checking the Oil Filter).	Go to Step 4	Oil filter clogged	Replace (See 17- Lubrication System-Oil filter, Replacement)
4	Checking the bearing shells	Normal	Faulty	Instruction
	Check the operating conditions of the main bearing shell and connecting-rod bearing shell (See 11A- Engine Mechanical System-Piston and Connecting-rod/Crankshaft and Flywheel, Check and Repair)	Go to Step 5	Large bearing shell gap	Replace it (See 11A- Engine Mechanical System-Piston and Connecting-rod/Crankshaft and Flywheel, Check and Repair).
5	Check oil pump	Normal	Faulty	Instruction
	Check whether the oil pump is working properly (See 17- Lubrication System-Oil Pump, Check and Repair).	Go to Step 6	Oil pump damage	Replace it (See 17- Lubrication System-Oil Pump, Check and Repair)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	The trouble still exists.	Search the cause from other symptoms

## 2. Excessive oil consumption

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the system for leakage (See 17- Lubrication System-General Check, Checking the System).	Go to Step 1	There is oil leakage.	Check and repair the leaking part.
1	Checking the engine	Normal	Faulty	Instruction
	Check the exhaust for blue smoke when the engine running.	Go to Step 2	There is blue smoke in the exhaust.	Check and repair the engine.
2	Verification and check	Normal	Faulty	Instruction

Diagnosis



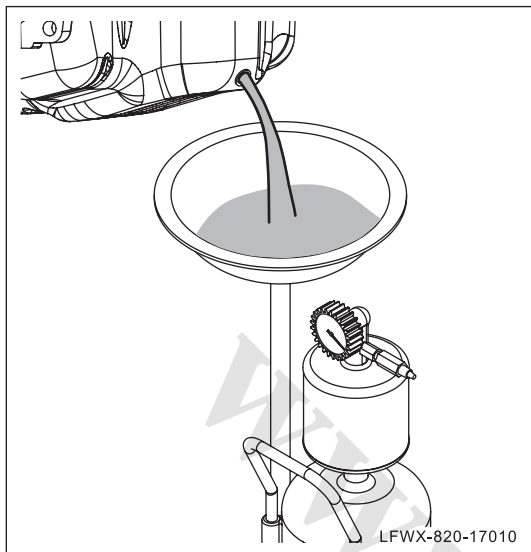
力帆汽车  
LIFAN MOTORS

	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	The trouble still exists.	Search the cause from other symptoms
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## Engine Oil

### Replacement



#### 1. Drain oil

- (a) Remove oil pan oil drain bolt to drain engine oil to the recoverer.

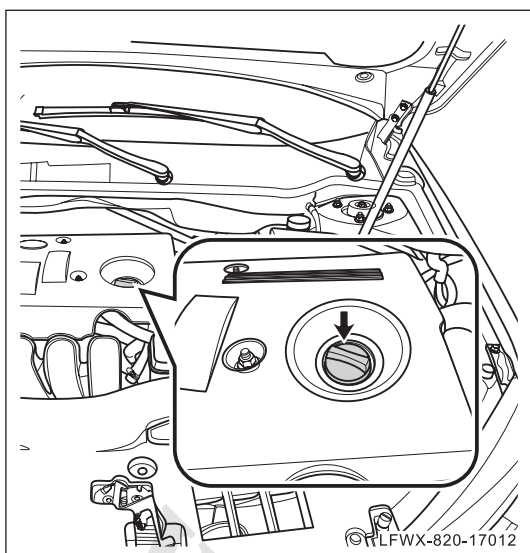
#### ⓘ Note:

- Never start to work before the engine has cooled down completely.
- During operation, prepare a piece of cloth to clean up spilled or splashed engine oil.
- Never spill the engine oil onto the transmission belt.
- Completely clean off the engine oil spilled onto the engine or vehicle.



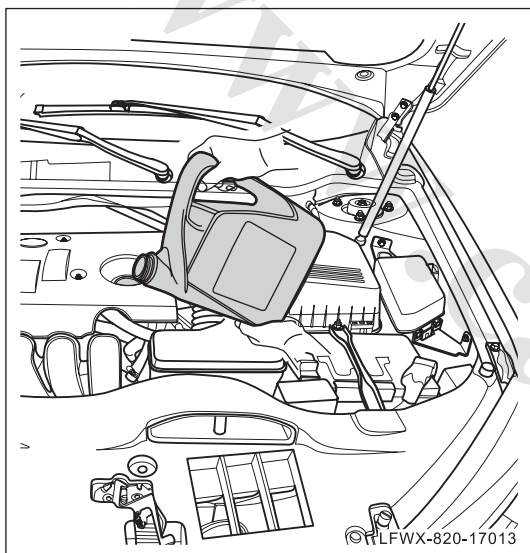
- (b) Install the oil drain plug of the sump and tighten it.

**Torque: 42N•m - 46N•m**



## 2. Filling oil

- (a) Remove engine oil filling cap of cylinder head cover.



- (b) Fill the engine oil.

### Oil quality:

**Naturally-aspirated engines (LFB479Q, LF489Q): APISM**

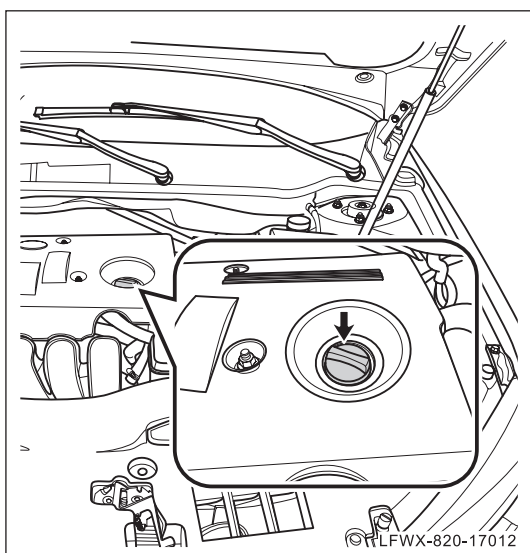
**Oil filling volume (LFB479Q): 3.5L**

**Oil filling volume (LF489Q): 4L**

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### **Note:**

**Use the oil dipstick to check whether the oil is appropriately filled.**



- (c) Reinstall the engine oil filling cap of washer fluid reservoir.

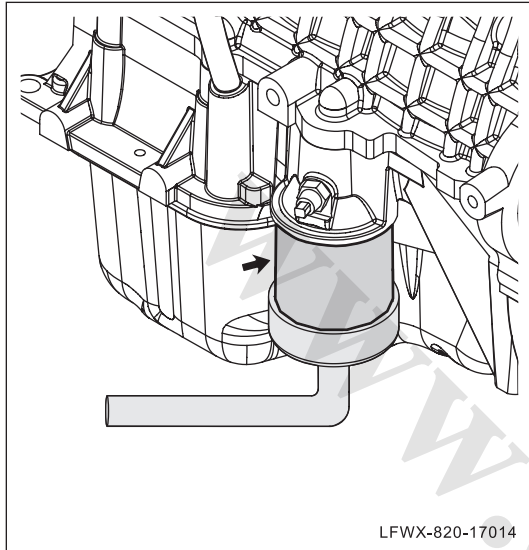


## Oil Filter

### Replacement

#### 1. Removal of oil filter

- (a) Drain the engine oil into an appropriate container. (see 17 - Lubrication System, Engine Oil, Replacement)



- (b). Remove the oil filter with the oil filter remover.

**Note:**

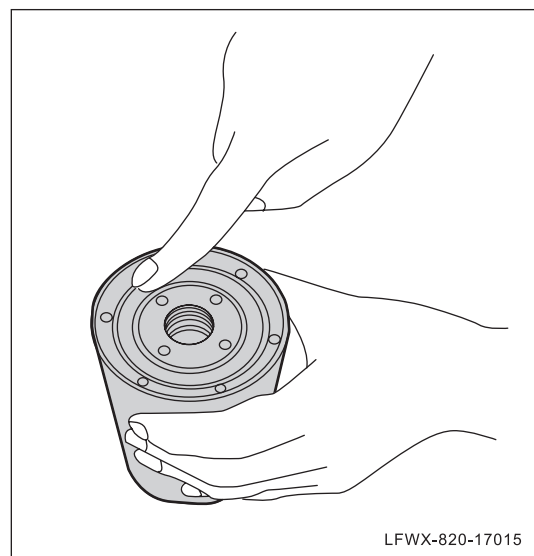
- Never start to work before the engine has cooled down completely.
- During operation, prepare a piece of cloth to clean up spilled or splashed engine oil.
- Never spill the engine oil onto the transmission belt.
- Completely clean off the engine oil spilled onto the engine or vehicle.

#### 2. Installation of oil filter

- (a) Clean up the oil filter installed on the surface of the foreign body
- (b) Coat the new oil filter seal surface with a layer of clean oil.

**Note:**

**Apply original oil filter.**



- (c) Install the oil filter with the oil filter remover.

**Torque: 25 N.m -30N•m**

**Note:**

**While mounting the oil filter, first mount the oil filter by hand onto the filter base, until the O-ring has completely located on the filter base. Then use dismantling tool for oil filter to tighten oil filter.**

- (d) Fill the engine oil. (see 17 - Lubrication System, Engine Oil, Replacement)

## Oil Pan

### Replacement

△ HINT:

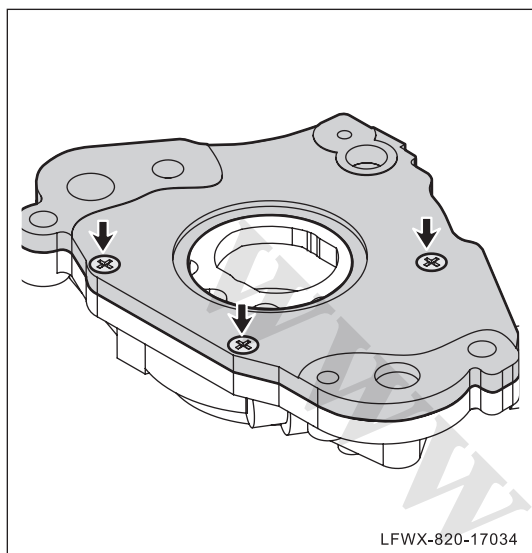
See 11A- engine piston and connecting rod mechanical system overhaul

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## Oil Pump

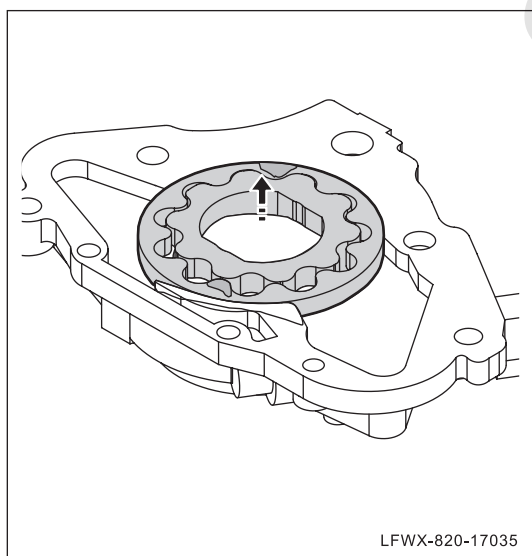
### Overhaul

1. Remove the oil pump (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair).

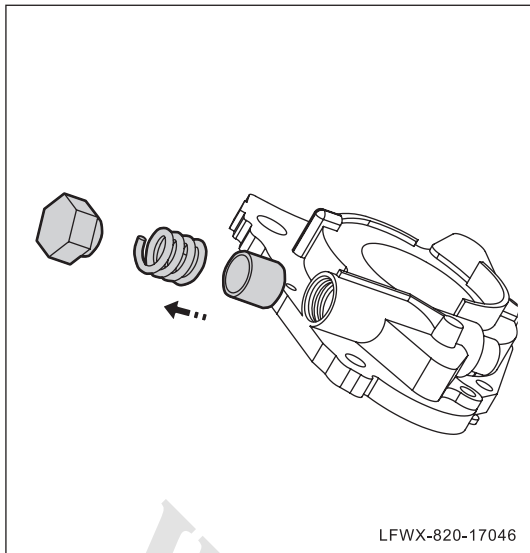


2. Dismantling oil pump

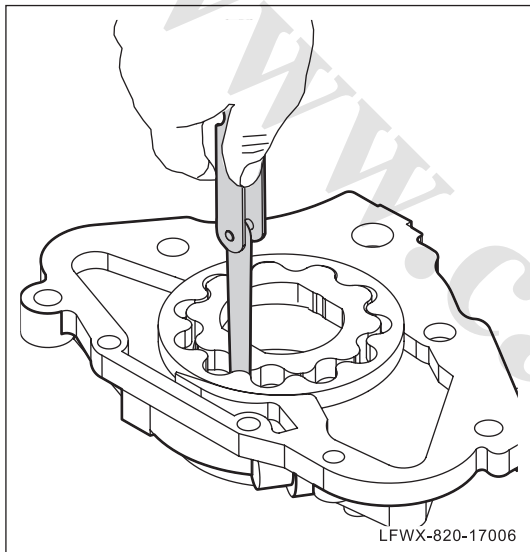
- (a) Remove fixing screws of oil pump and remove oil pump cover.



- (b) Remove drive rotor and driven rotor of oil pump.



- (c) As shown in the figure, dismantle oil pump relief valve screw plug and take out relief valve spring and relief valve.

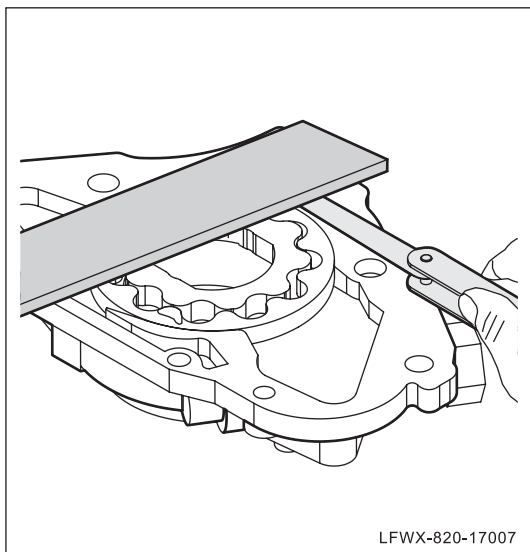


**3. Check the top gap between the drive rotor and driven rotor of the oil pump.**

- (a) As shown in Fig., measure top clearance between drive rotor and driven rotor of oil pump with a feeler gauge. If it exceeds the maximum, replace oil pump.

**Standard value: 0.023mm - 0.069mm**

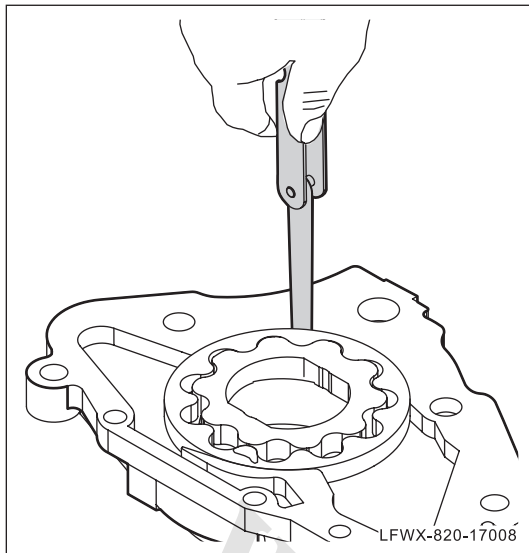
**17**



**4. Check the top gap between the rotor and housing of the oil pump.**

- (a) As shown in Fig., measure top clearance between two rotors and pump housing with a feeler gauge. If it exceeds the maximum, replace oil pump.

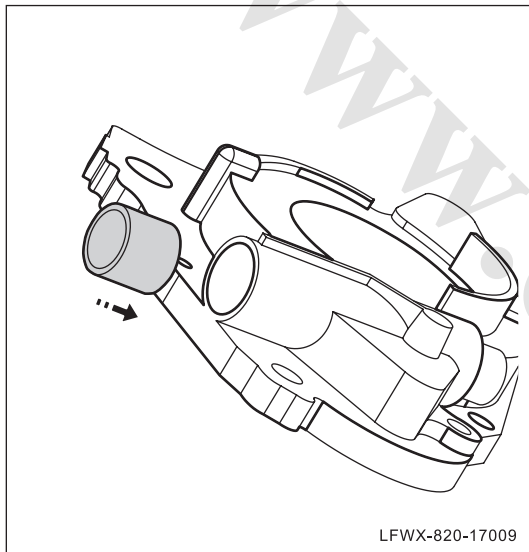
**Standard value: 0.025mm - 0.071mm**



**5. Check the gap between the driven rotor and housing of the oil pump.**

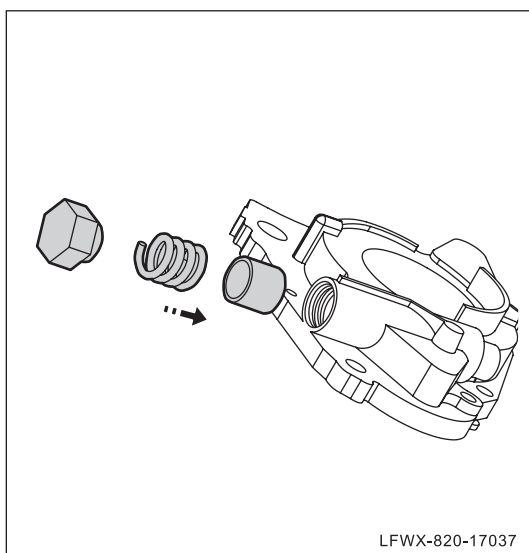
- (a) As shown in Fig., measure the clearance between driven rotor and oil pump housing with a feeler gauge. If it exceeds the maximum, replace oil pump.

**Standard clearance: 0.260mm - 0.325mm**



**6. Checking the oil pressure release valve**

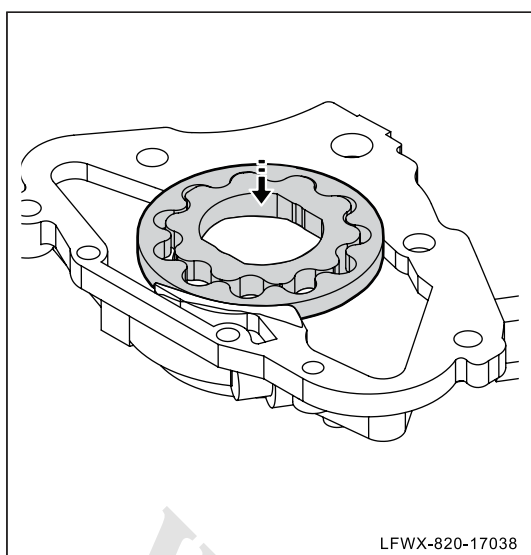
- (a) Apply a layer of clean engine oil on relief valve of oil pump, check and confirm engine oil valve slides into valve hole with its weight. If impossible, replace oil pump.



**7. Reassembling oil pump**

- (a) Install relief valve and spring of oil pump into valve opening.
- (b) Install and tighten the plug of the pressure release valve of the oil pump.

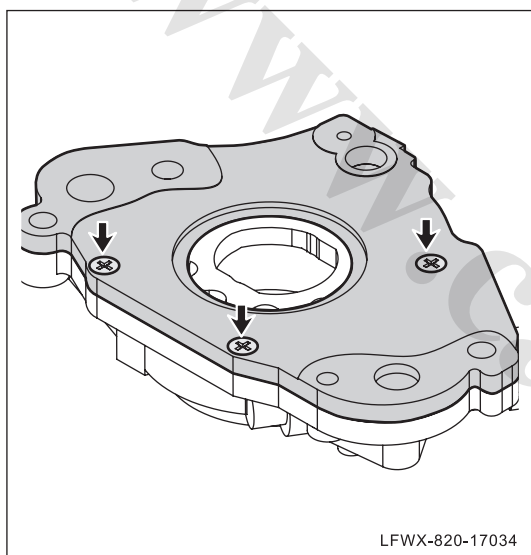
**Torque: 37 N.m**



(c). Install the oil pump drive rotor and driven rotor.

**Note:**

When installing, align with installation identification as shown in the Fig.



(d) Install the oil pump cover in place, and install and tighten the fixing screw.

**Torque: 11N.m**

8. Install the oil pump (See 11A- Engine Mechanical System-Piston and Connecting-rod, Check and Repair).

## Engine Oil Pressure Alarm

### Replacement

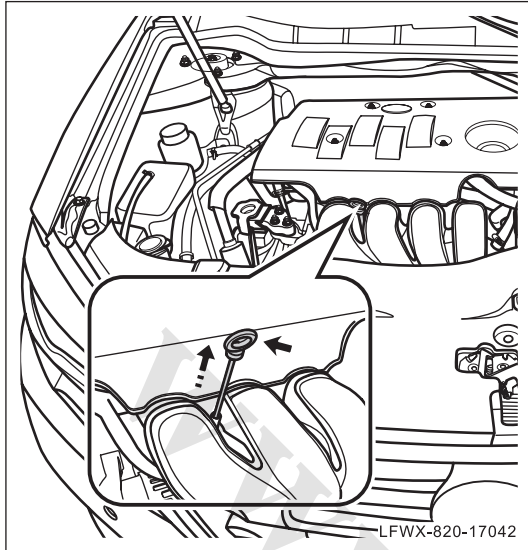
△ HINT:

See 11A- Engine Mechanical System- Wire harnesses and Sensors, Replacement v

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## Oil Dipstick

### Replacement



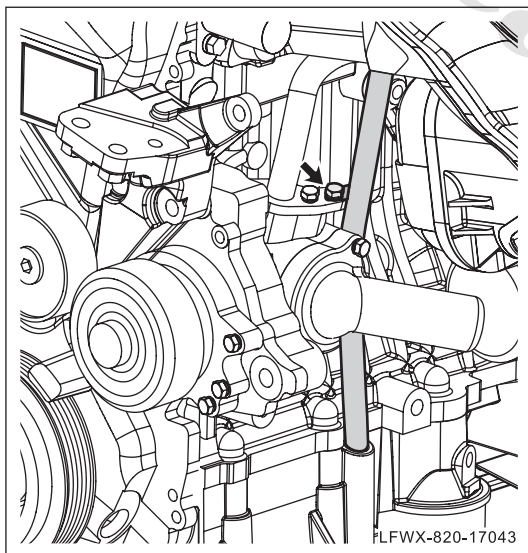
#### 1. Remove the dipstick and its tube.

(a). Remove the dipstick.

(b) Remove the alternator assembly. (See 19- Starter /Alternator-Alternator, Replacement)

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(c) Remove fixing bolts of engine oil dipstick conduit and then remove engine oil dipstick conduit.



#### 2. Installation of dipstick and its tube

(a) Install the dipstick conduit in place, and install the fixing bolts and tighten them.

**Torque: 10N•m-12N•m**

(b) Install the alternator assembly. (See 19- Starter /Alternator-Alternator, Replacement)

(c). Install the dipstick.





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# 18- Ignition System

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# Ignition System

## System description

### 1. Function

Ignition system can:

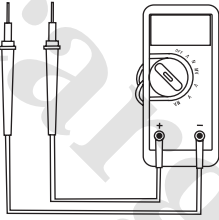
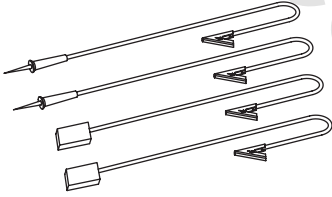
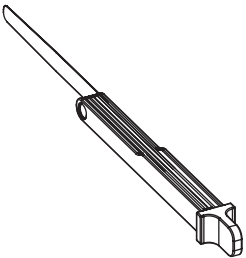
Provide a high voltage for the engine ignition to ignite the compressed gas in the cylinder at the end of the compression stroke.

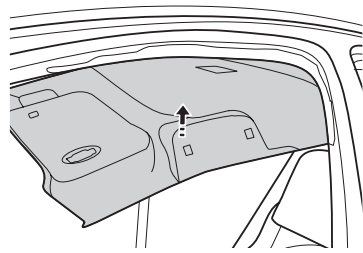
Ignite compressed gas at the right time according to the engine operating conditions to increase power and improve fuel efficiency.

### 2. Components

The ignition system consists of the ignition coil and spark plugs.

## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Used for measuring voltage or resistance.
2	Wiring set		Assist to measure voltage or resistance
3	Feeler gauge		Checking the spark plug gap

S/N	Tools	Outline diagram	Description
4	Spark plug re-mover		For removing and installing the spark plug

## Service data

### 1. Technical specifications table

Spark plug gap	0.85mm~0.95mm
----------------	---------------

### 2. Table of tightening torque

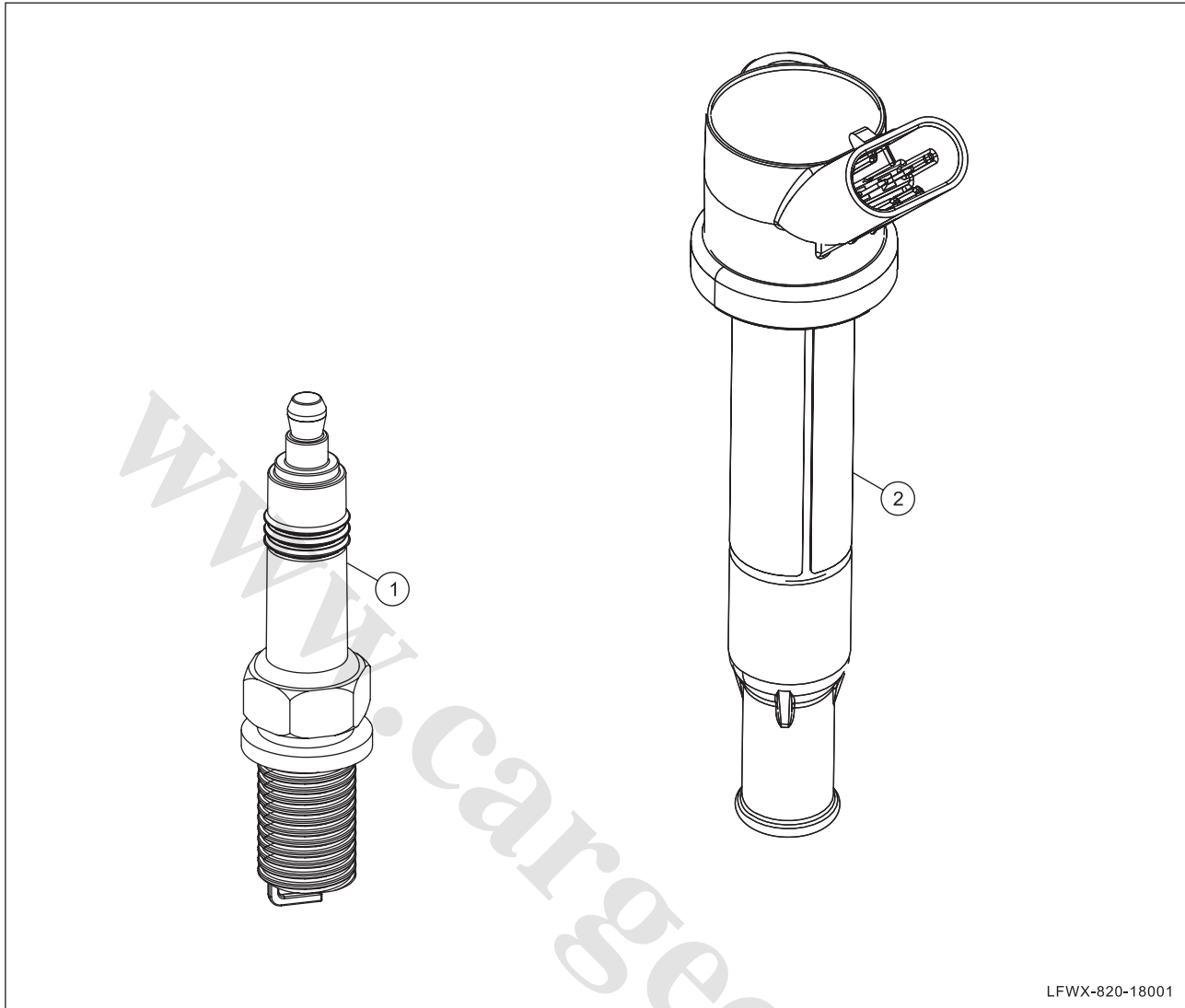
Item	N•m
Fixing bolt of ignition coil	10~12
Spark plug	25~31

## Precautions

### 1. Precautions for maintenance

- (a) Tighten the fixing bolts for spark plugs and other components of the ignition system to the specified torques.
- (b) When removing the ignition coil, avoid damage to its insulation sleeve.
- (c) When removing the spark plug, avoid bumping it.

## Components



1	Spark plug
---	------------

2	Ignition coil
---	---------------

## General Check

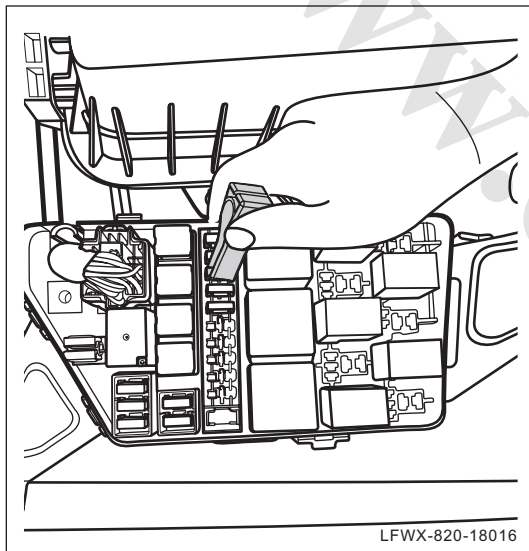
### Check the system

#### 1. Check system components

- (a) Check the system for obvious mechanical or electrical damage. If any, replace it.
- (b) Check the system for obvious collision deformation. If any, replace it.
- (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 2. Check wire harness

- (a) Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b) Check system wire harness for crack or damage. If any, fix it.



#### 3. Check the fuse

- (a) Check whether the ignition coil FS46 fuse is blown. If so, replace it with one of the same rating.

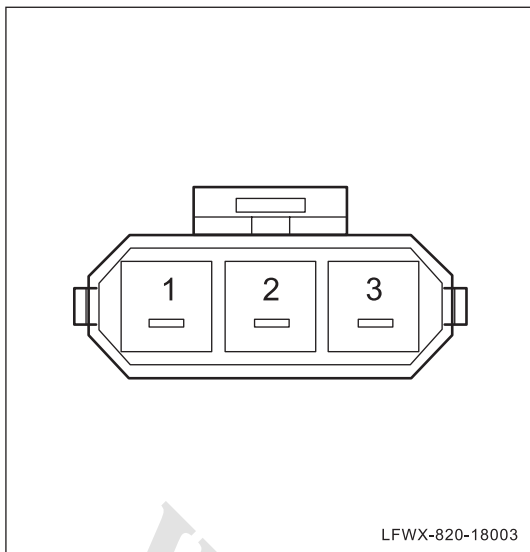
△ HINT:

The ignition coil fuse is located in the fuse box in the engine compartment.

### Check the ignition coil

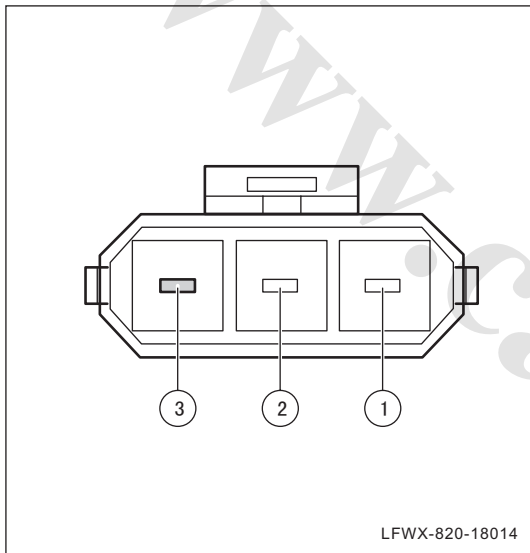
△ HINT:

Each ignition coil can be checked basically in the same way. This section takes the ignition coil of No. 1 cylinder as an example.



### 1. Checking the power line of the ignition coil

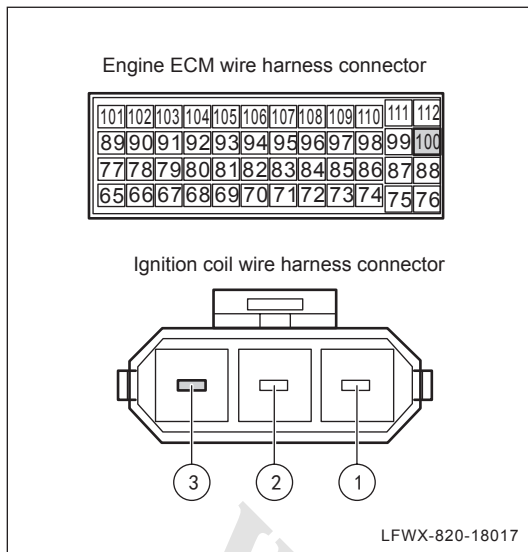
- (a) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the ignition coil.
- (b) Keep the system power in "ON" position. Turn the digital multimeter to its voltage function and check if there is a voltage between No. 2 terminal of the ignition coil harness connector and the body ground. If the voltage is zero, check and repair the related harness according to the circuit diagram.



### 2. Checking the ground wire of the ignition coil

- (a) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the ignition coil.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 3 terminal of the ignition coil harness connector and the body ground. If not conducted, check and repair the related harness according to the circuit diagram.





### 3. Checking the control line of the ignition coil

- Keep the system power supply in "LOCK" position, and disconnect the harness connectors from the ignition coil and the engine ECM, respectively.
- Turn the digital multimeter to its resistance function and check the conduction between No. 1 terminal of the ignition coil harness connector and No. 100 terminal of the engine ECM harness connector. If not conducted, check and repair the related harness according to the circuit diagram.

#### △ HINT:

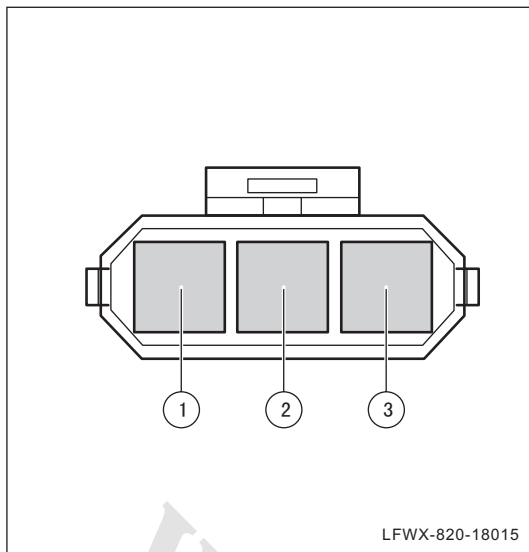
The terminal number to be checked depends on the ignition coil, which is detailed as follows:

Ignition coil of No. 1 cylinder: Check No. 1 terminal of the ignition coil harness connector and No. 100 terminal of the engine ECM harness connector.

Ignition coil of No. 2 cylinder: Check No. 1 terminal of the ignition coil harness connector and No. 88 terminal of the engine ECM harness connector.

Ignition coil of No. 3 cylinder: Check No. 1 terminal of the ignition coil harness connector and No. 99 terminal of the engine ECM harness connector.

Ignition coil of No. 4 cylinder: Check No. 1 terminal of the ignition coil harness connector and No. 76 terminal of the engine ECM harness connector.



#### 4. Check the working conditions of the ignition coil

- (a) Keep the system power supply in "LOCK" position, and disconnect the harness connector from the ignition coil.
- (b) Turn the digital multimeter to its resistance function and check the conduction between No. 1 and No. 2 terminals of the ignition coil. If not conducted, replace the ignition coil.

## Check the spark plug

### 1. Check the working conditions of the spark plug

- (a) Remove the ignition coil and spark plug of each cylinder in turn.
- (b) Install the spark plug of No.1 cylinder to the ignition coil, and connect the connector of the ignition coil.
- (c) Make the sparking plug earthing to check whether the spark plug can spark in the process of the engine starting.

#### ⓘ Note:

**For a non-PEPS vehicle, do not exceed 2s in the process of starting the engine.**

- (d) Check the spark plugs of No. 2, 3 & 4 cylinders in the same way.

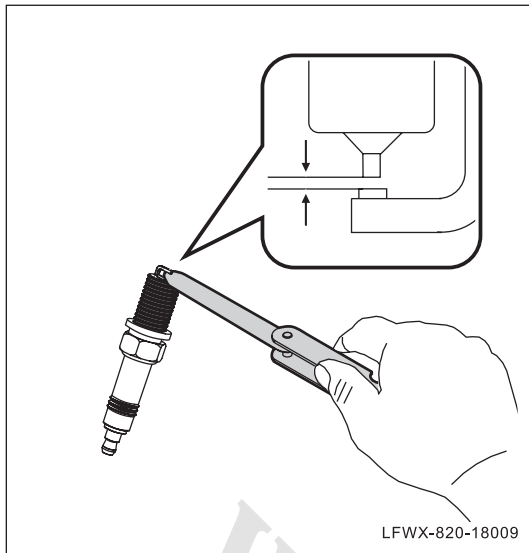
### 2. Checking the spark plug for damage

- (a) Clean the spark plug with a brush.

#### ⓘ Note:

**Do not apply a force between electrodes, otherwise, the central electrode may be damaged.**

- (b) Check the spark plug thread for damage and have it replaced if necessary
- (c) Check the spark-plug electrode surroundings for deposits and have it replaced if necessary.
- (d) Check the spark-plug electrode for serious damage and have it replaced if necessary.
- (e) Check the ceramic insulator of spark plug for damage and have it replaced if necessary.



- (f) Measure the electrode gap of the spark plug using a feeler gauge. If unqualified, replace the spark plug.

**Spark plug clearance: 0.85mm - 0.95mm**

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Spark plug won't spark.	1. Fuse (blown)	See 18- Ignition System-Diagnosis, Fault Diagnosis (1. Spark plug won't spark)
	2. Relay (fault)	
	3. Wire harness (faulty)	
	4. Ignition coil (damaged)	
	5. Spark plug (faulty)	
	6. Engine ECU (fault)	

### Fault diagnosis

#### 1. Spark plug won't spark

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the spark plug operating conditions. (See 18- Ignition System- General Inspection, Checking the Spark Plugs)	Diagnosis end.	Spark plug won't spark.	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the ignition coil fuse is blown (See 18- Ignition System- General Check, Checking the System)	Go to Step 3	Fuse FS46 is blown	Go to Step 2
2	Check FS46 circuit	Normal	Faulty	Instruction
	Check the working conditions of the circuits for FS46 according to the circuit diagram.	Go to Step 3	The circuit is short	According to the wiring diagram, check and repair the related harness, and replace the fuse with one of the same rating.
3	Check relay	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the main relay is damaged (See 16-Cooling System-General Check, Checking the System).	Go to Step 4	Relay (damaged)	Replace the relay with one of the same rating.
4	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the main relay for continuity (See 16-Cooling System-General Check, Checking the System).	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check the power cord of the ignition coil for continuity (See 18- Ignition System- General Check, Checking the Ignition Coil).	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check the grounding wire of the ignition coil for continuity (See 18- Ignition System- General Check, Checking the Ignition Coil).	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check the control wire of the ignition coil for continuity (See 18- Ignition System- General Check, Checking the Ignition Coil).	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the ignition coil	Normal	Faulty	Instruction
	Check the ignition coil for damage (See 18- Ignition System- General Check, Checking the Ignition Coil).	Go to Step 9	Ignition coil is damaged	Replacement (See 18- Ignition System- Ignition Coil, Replacement)
9	Check the spark plug	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check the spark plug for damage (See 18-Ignition System- General Check, Checking the Spark Plug).	Go to Step 10	Spark plug (deposit too much or damaged)	Replacement (See 18 - Ignition System Spark Plug, Replacement)
10	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same type, and check whether the fault has been removed.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

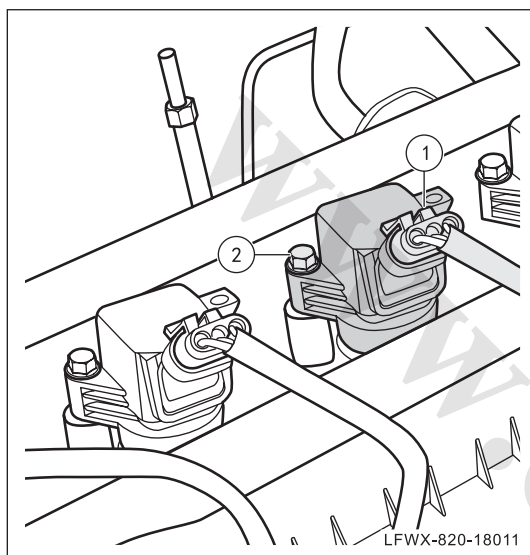
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## Ignition Coil

### Replacement

#### 1. Removing the ignition coil

- (a). Disconnect negative cable of battery.
- (b). Remove the engine decorative shroud. (See 81- Interior and Exterior- Engine Decorative Shroud, Replacement)



- (c). Disconnect the ignition coil harness connector ① .
- (d). Remove the ignition coil ② fixing bolt, and take out all the ignition coil ② .

#### 2. Installing ignition coil

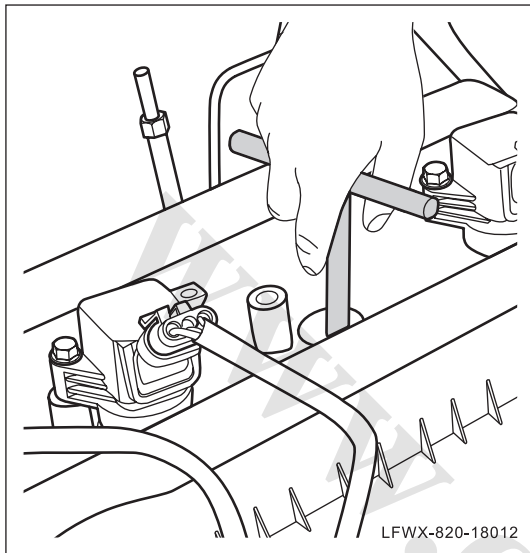
- (a). Install the ignition coil in place, and mount and tighten the fixing bolts.  
**Torque: 10N•m-12N•m**
- (b). Connect the ignition coil harness connector.
- (c). Install the engine decorative shroud. (See 81- Interior and Exterior- Engine Decorative Shroud, Replacement)

## Spark Plug

### Replacement

#### 1. Removal of spark plug

- (a) Remove the ignition coil. (See 18 - Ignition System Ignition Coil, Replacement)



- (b) Remove the spark plug with spark plug remover.

△ HINT:

If it is hard to remove the spark plug, use the ignition coil to help remove it.

ⓘ Note:

**Avoid bumping the spark plug.**

#### 2. Install the spark plug

- (a) Install and tighten the spark plug using the special tools for removing/installing spark plugs.

**Torque: 25 N.m -31N•m**

- (b) Install the ignition coil. (See 18 - Ignition System Ignition Coil, Replacement)





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## 19- Starting/Charging System

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# Battery

## System description

### 1. Function

The battery can:

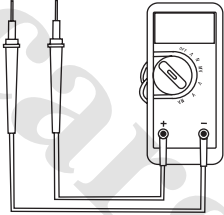
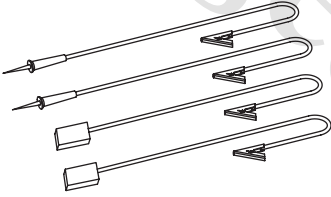
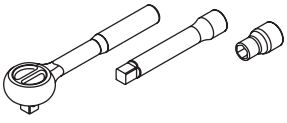
Store the electric energy generated by the alternator when the engine operating.

Provide power to start the engine and power the vehicle-mounted electrical equipment.

### 2. Components

Battery

## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring current, voltage and resistance value
2	Wiring set		Assist to measure voltage or resistance
3	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts

## Service data

### 1. Technical specifications table

Battery standard voltage:	12V
---------------------------	-----

### 2. Table of tightening torque

Item	N•m
Fixing nut of battery pressure plate	8~12

## Precautions

### 1. Precautions before repair

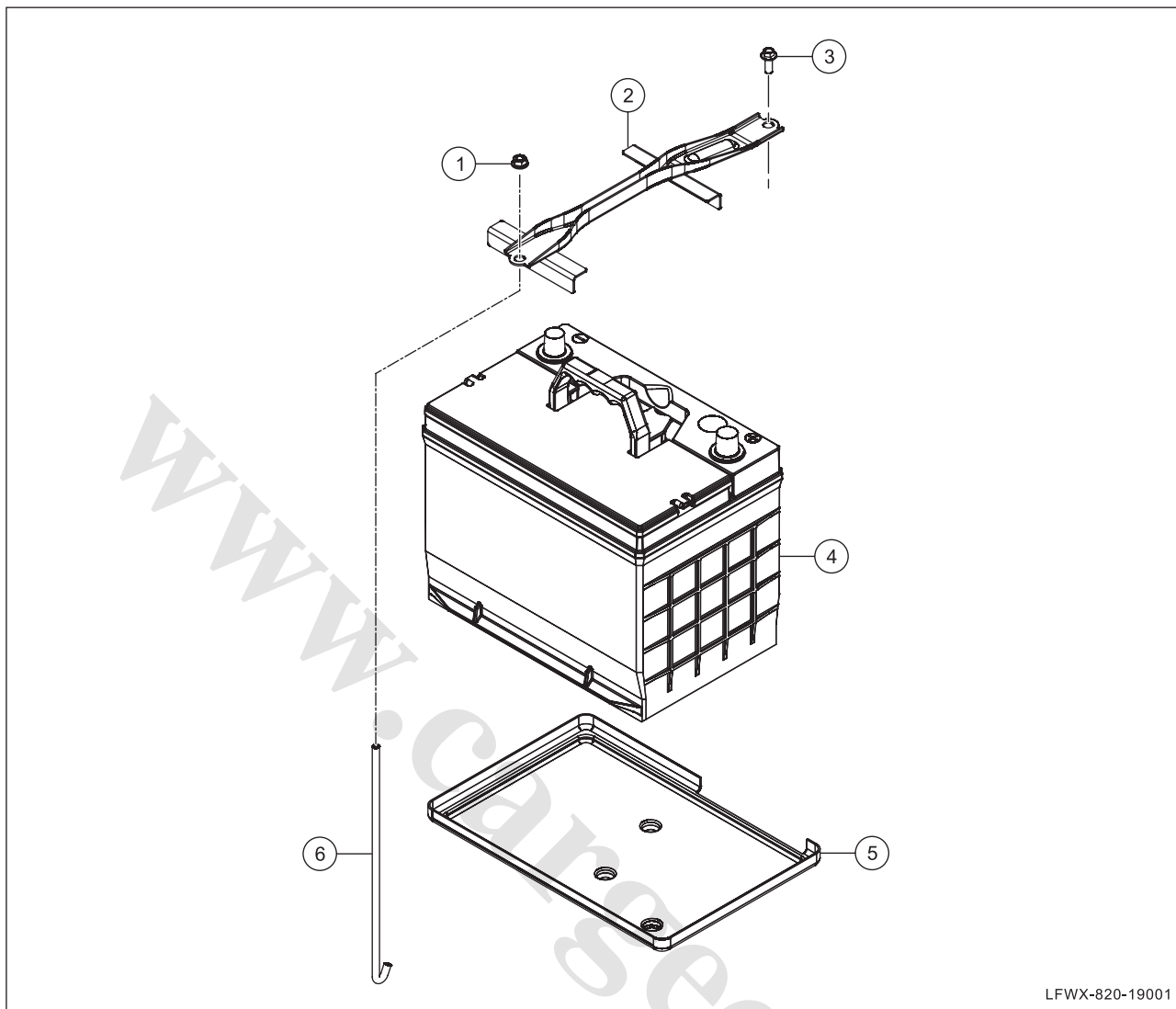
- (a) Regardless of whether the engine is running, as long as the ignition switch is turned on, disable any one of the following components in the plug system:

any cable of the battery, injectors, the fuel pump, ignition system leads, electronic control unit (ECU) lines, etc..

### 2. Other precautions

- (a) The battery gives off explosive hydrogen gas. Keep away from a spark or flame when checking and repairing the battery system.
- (b) Be sure to avoid getting electrolyte on the vehicle body, or in your eyes or on your skin when checking and repairing the battery system. If you get electrolyte in your eyes or on your skin, flush the eye or skin with large quantities of water. Call a physician immediately.

## Components



LFWX-820-19001

1	Hexagon nut with flange
2	Pressure plate subassembly of battery 1
3	Flange-faced hex-bolts with bearing face toothed

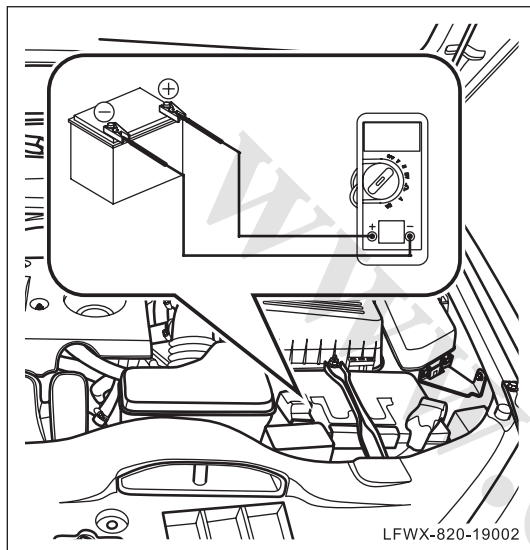
4	Battery assembly
5	Battery holder
6	Pulling rod of battery

## General Check

### Check the battery

#### 1. Check the battery working conditions.

- (a) Check the battery casing for cracks and damage, if any, replace the battery timely.
- (b) Check the battery terminals for corrosion, if any, promptly clean or replace it.



- (c) Turn the digital multimeter to its voltage function and check the battery voltage. If the voltage is low, charge or replace the battery.

**Standard voltage: 12V**

#### 2. Check the load voltage of the battery.

- (a) Connect the two probes of the digital multimeter to the positive and negative battery terminals, respectively. Read the battery voltage and turn on the headlights. Check whether the battery voltage drops rapidly. After 2min, check whether the battery voltage is greater than 10V. If less than 10V, replace the battery.

### Charge the battery

#### 1. Constant-voltage charging

- (a) Charge the battery with a constant voltage of 14.8V. After the charging current drops to 3A, continue charging it for another 3h.

#### **Note:**

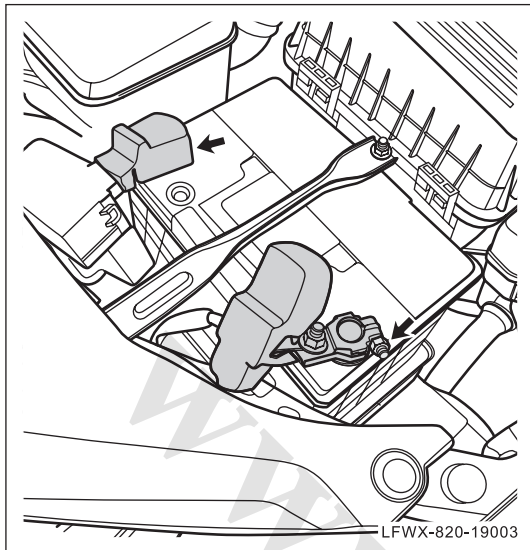
**Charging current cannot exceed 25A.**

#### 2. Constant-current charging

- (a) Charge the battery with a constant current of 6A until it reaches 14.8V, and then charge it with a constant current of 3A for 3h.

## Battery

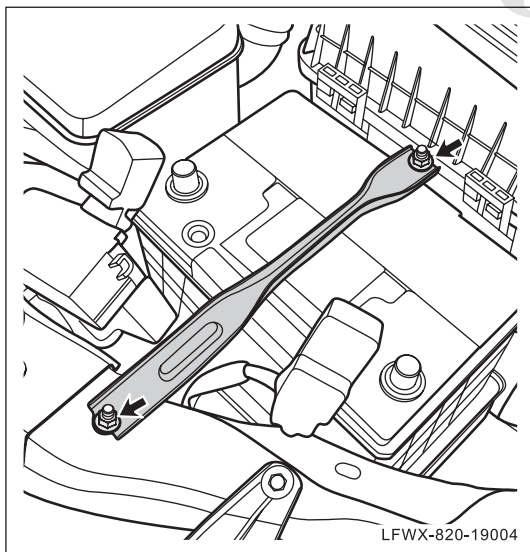
### Replacement



#### 1. Remove battery

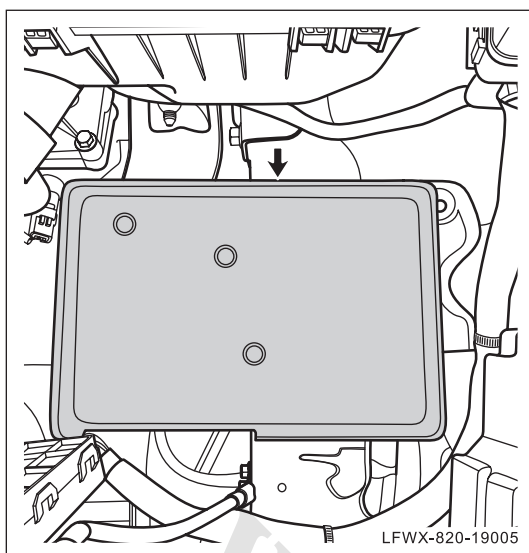
- (a) With the system power supply in "LOCK" position, disconnect the positive and negative battery cables.

- (b) Remove upper cross beam trim panel of water tank. (See 81- Interior and Exterior-Water Tank's Upper cross member Trim Panel, Replacement)

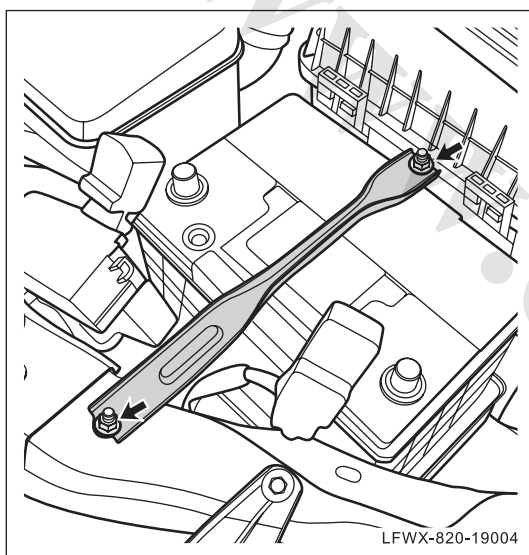


- (c) Remove the pull-rod nuts and pressing-plate nuts from the battery.
- (d) Remove the pull rod and pressing plate.
- (e) Take out battery.





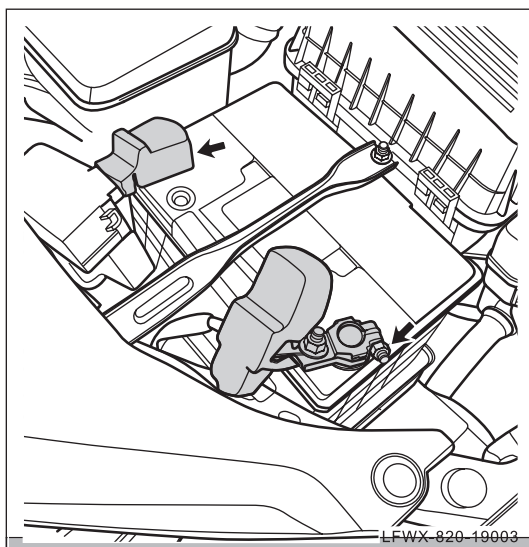
- (f) Take out battery holder.



## 2. Installing battery

- (a) Install the battery tray in place.  
 (b) Install the battery onto the tray.  
 (c) Install battery pull rod and pressure plate, and mount & tighten the nuts.

**Torque: 8N•m-12N•m**



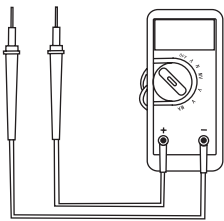
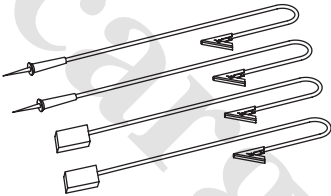

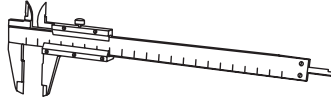
- (d) Install the trim panel of the upper rail of the water tank. (See 81- Interior and Exterior-Water Tank's Upper cross member Trim Panel, Replacement)  
 (e) Connect battery positive and negative cables.

## Starter/Alternator

△ HINT:

Lifan 820 series model includes LF7186, LF7240, and LF7240B, equipped with LFB479Q/LF489Q engine and 5MT manual transmission or 6AT automatic transmission. The starter depends on the engine model and the transmission model, but it can be checked and repaired basically in the same way. This section takes the LF7186 model equipped with the LFB479Q engine and 5MT transmission as an example.

### Preparation

S/N	Tools	Outline diagram	Description
1	Multimeter		Check the starter and alternator.
2	Conducting wire		Assist to measure voltage or resistance
3	Dial indicator		Measure the runout of the gear ring for the commutator of the starter.
4	Calipers		Measure the diameter and length.

## Service data

### 1. Technical specifications table

Commutator ring gear run-out		0.05mm
Diameter of commutator		29mm~30mm
Starter brush length		10mm~15.5mm
Alternator brush exposed length		1.5mm~10.5mm
Slip ring diameter	Standard diameter	14.2mm~14.4mm
	Minimum diameter	12.8mm
Slip ring resistance		2.1Ω ~ 2.5Ω (cold state)

### 2. Table of tightening torque

Item	N•m
Commutator cap bolt	20~25
Commutator cap screw	9~11
Magnetic switch fixing screws	9~11
Starter lead bolt	20~25
Starter fixing bolts	80~86
Pulley nut	110.5
整流器端架固定螺栓	3~4
Rectifier end frame screw	3~4
Fixing nut of alternator rear end cap	9~11
Fixing screw of alternator rear end cap	5~6
Fixing bolt of alternator assembly	45~49

## Precautions

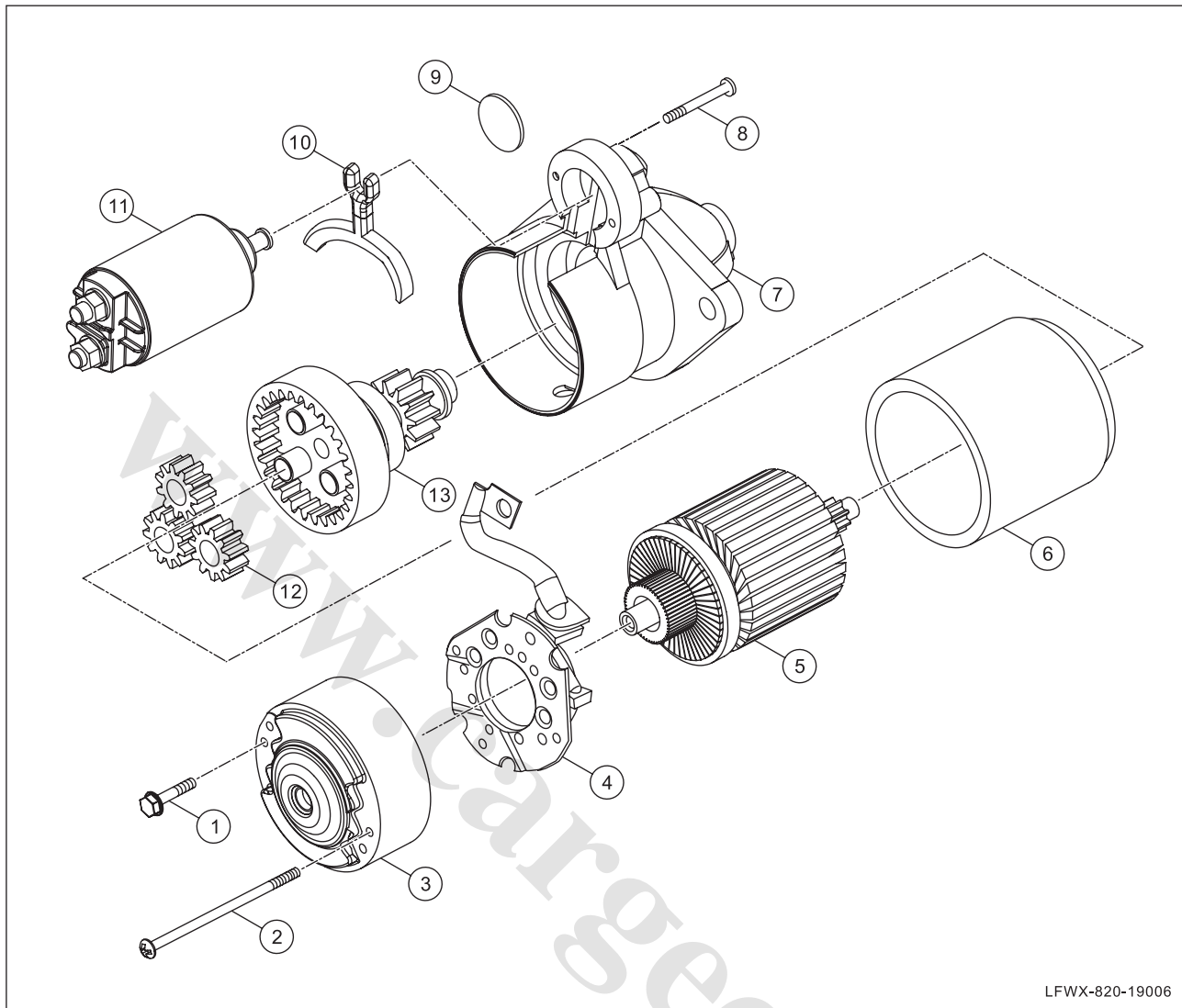
### 1. Precautions before repair

- (a) Whether the engine runs or not, with ignition switch ON, any component is not allowed to be plugged, such as any cable of the battery, injector, fuel pump, ignition system wire, electronic control unit (ECU) circuit, etc.

### 2. Other precautions

- (a) Be sure to finish testing the starter within 5s.
- (b) Avoid damage to the insulating parts when dismantling the starter and the alternator.

## Components (starter)

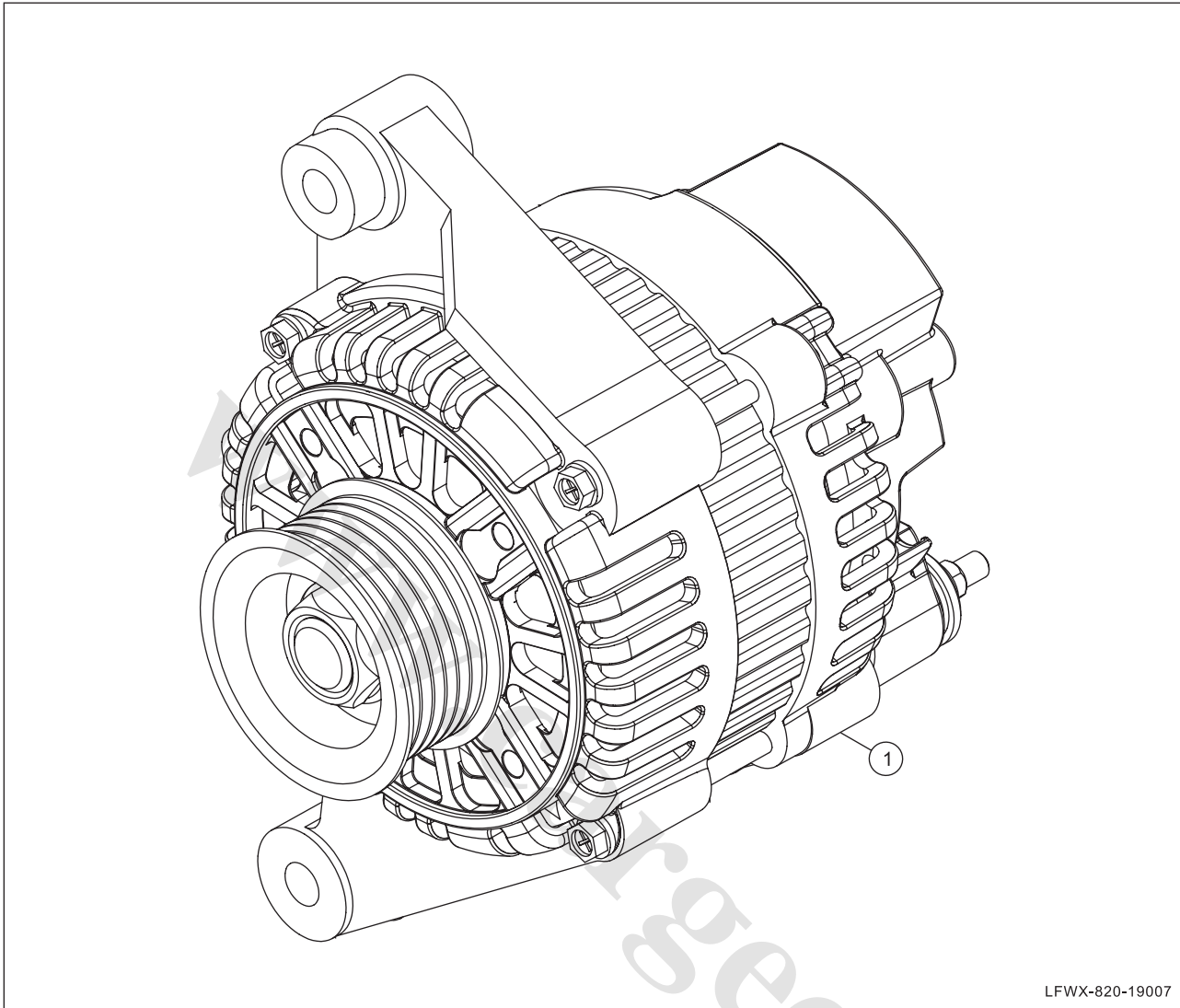


LFWX-820-19006

1	Commutator end cap fixing bolts
2	Commutator end cap fixing screws
3	Commutator end cap
4	Brush holder
5	Armature
6	Starter magnetic yoke
7	Starter drive end cap

8	Magnetic switch fixing screws
9	Washer
10	Starter pinion drive rod
11	Magnetic switch
12	Gear
13	Intermediate bearing clutch sub-assembly

## Components (Alternator)

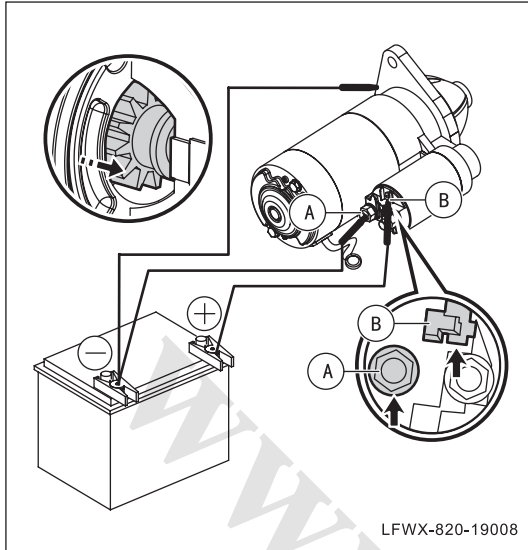


LFWX-820-19007

1	Alternator assembly
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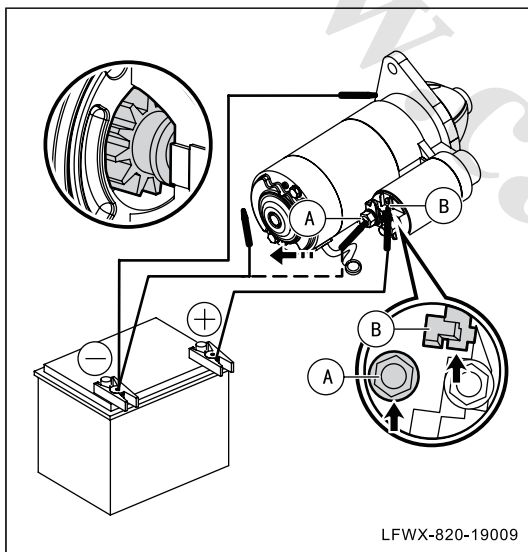
## General Check

### Check the starter

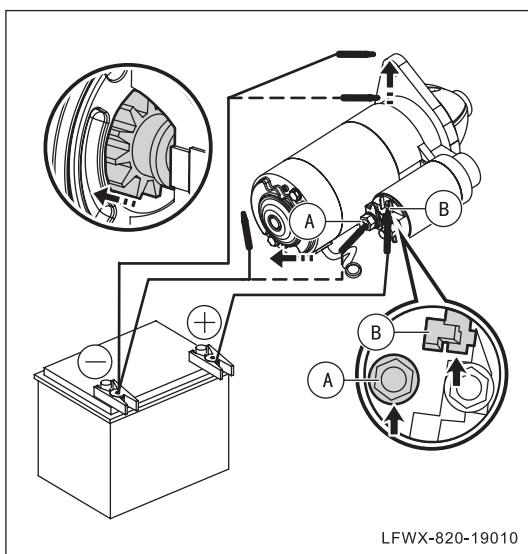


#### 1. Inspection of starter assembly

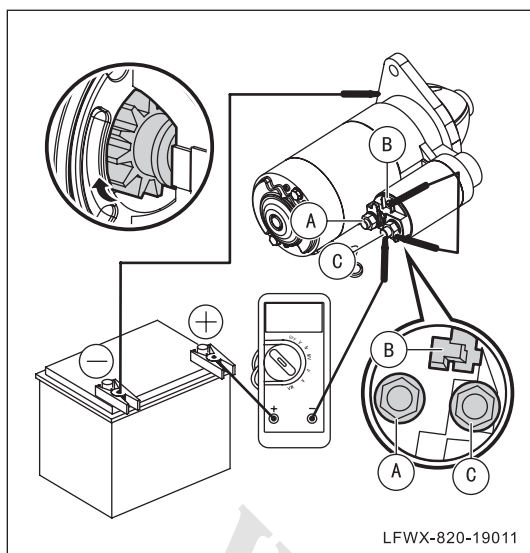
- (a) As shown in Fig., connect the battery to both terminals A and B of the starter to check if clutch pinion moves outwards. If the clutch pinion cannot rotate or move outward, replace the electromagnetic starter switch assembly.



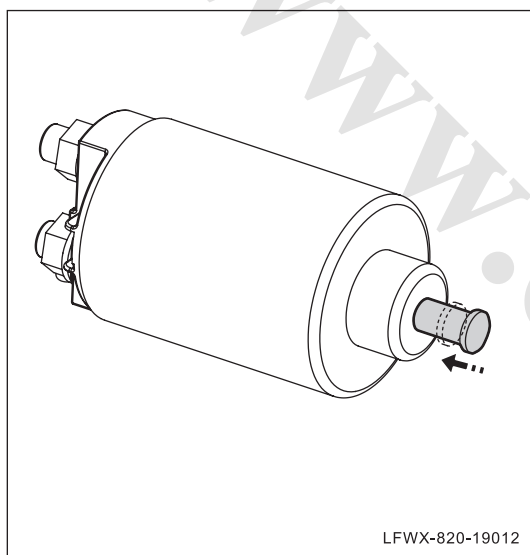
- (b) As shown in the figure, disconnect the lead of Terminal A and check whether the clutch pinion can remain in place. Otherwise, replace the magnetic starter switch assembly.



- (c) As shown in the figure, disconnect the lead of Terminal A and the grounding wire of the housing and check whether the clutch pinion can return. Otherwise, replace the magnetic starter switch assembly.

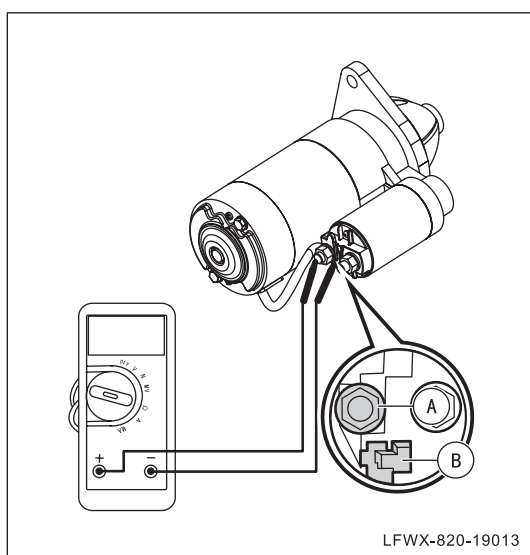


- (d) As shown in the figure, test the starter under no-load, and observe and record the current value.



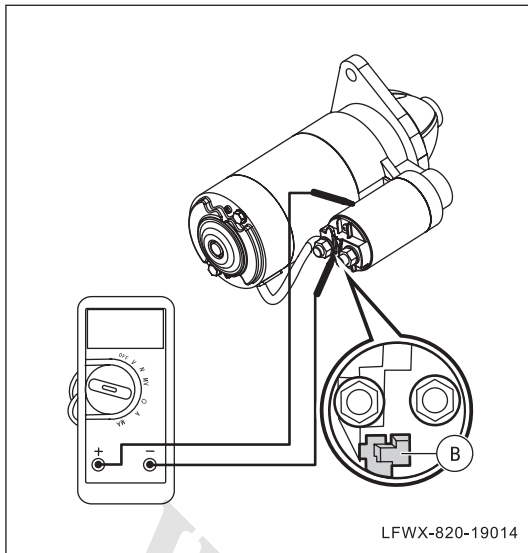
## 2. Checking the starter magnetic switch

- (a). As shown in the figure, push into the iron core and check whether the iron core can return to its original position quickly. If not, replace the magnetic switch assembly.



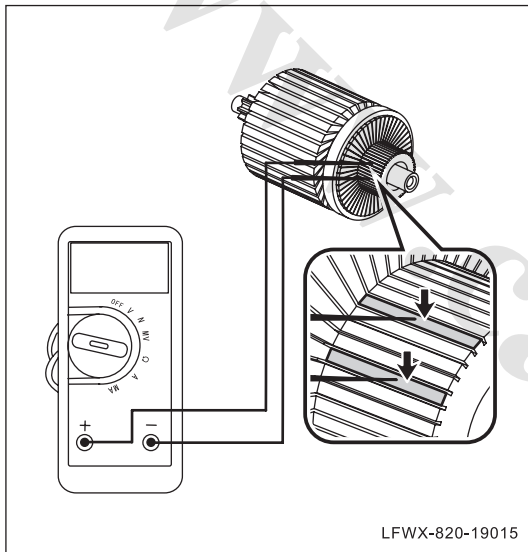
- (b) As shown in Fig., measure the resistance between terminals A and B with the resistance position of a multimeter. If it does not conform to the requirement, replace the magnetic switch.

**Resistance value : <math><1 \Omega</math>**



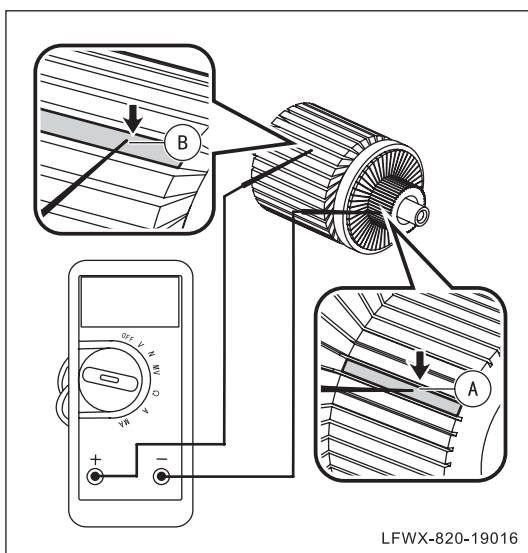
- (c) As shown in Fig., measure the resistance between terminal B and the housing with the resistance position of a multimeter. If it does not conform to the requirement, replace the magnetic switch.

**Resistance:  $<2\ \Omega$**



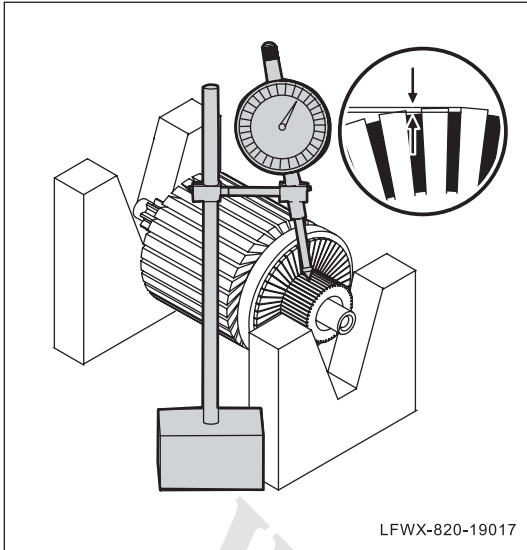
### 3. Checking armature coil

- (a) As shown in the figure, check the continuity between any two commutator laminas by switching the digital multimeter to the resistance function. If no continuity, replace the armature windings.



- (b) As shown in Fig., check if the commutator (as shown in Fig. A) and armature coil core (as shown in Fig. B) have continuity with the resistance position of a multimeter. If they have, replace armature winding.

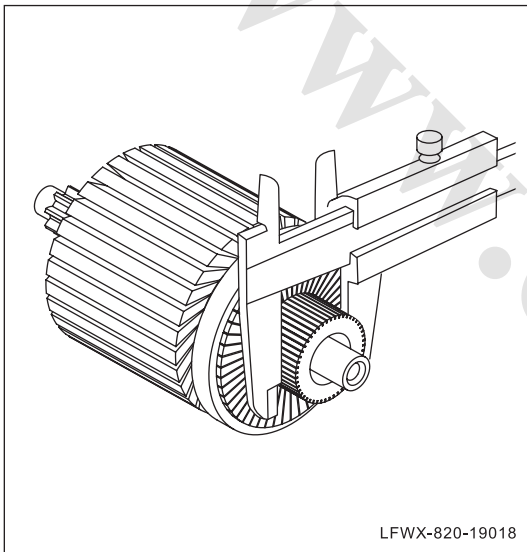




#### 4. Checking commutator

- (a). Check the surface of the commutator for pollution as well as burn, if any, use sandpaper to repair it.
- (b). Put the commutator on the V-shaped block, and measure the run-out of the commutator ring gear with a dial indicator. If the run-out is greater than the maximum value, be sure to repair the commutator ring gear. If necessary, replace it.

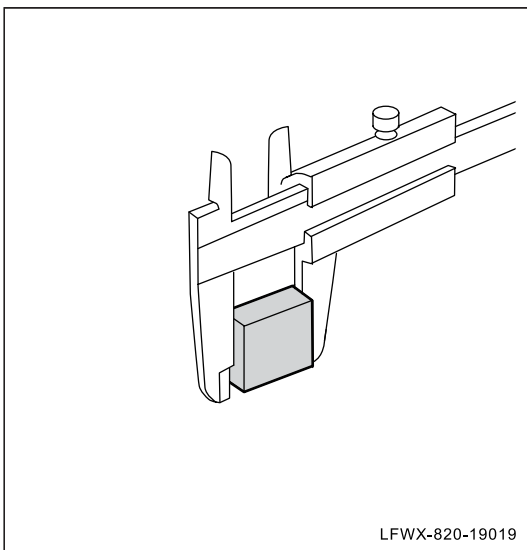
**Maximum run-out of commutator ring gear: 0.05mm**



- (c). Measure the diameter of the commutator with a dial caliper. If the diameter is less than the minimum, replace the armature.

**Standard diameter: 30mm**

**Minimum diameter: 29mm**



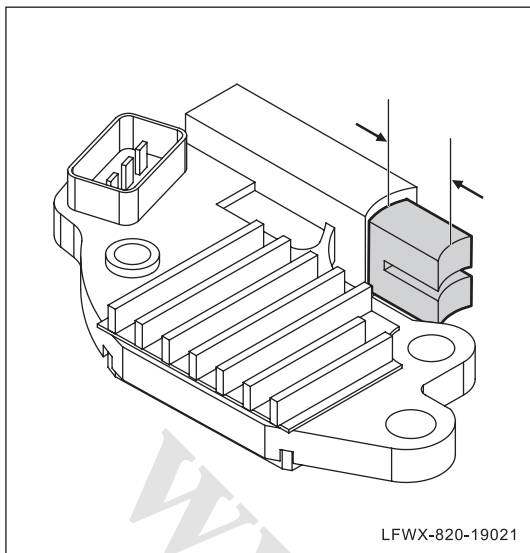
#### 5. Checking starter brush

- (a). Check the length of the starter brush with a dial caliper. If the length less than the minimum, replace the brush. If necessary, replace the brush holder and the starter magnetic yoke assembly.

**Standard value: 15.5mm**

**Minimum value: 10mm**

## Check the alternator

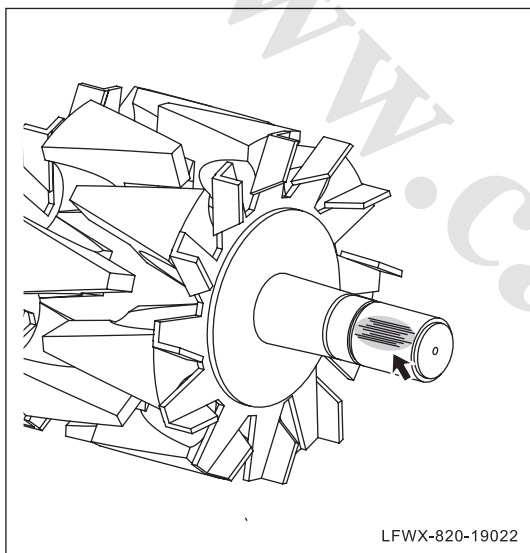


### 1. Checking alternator brush

- (a) Measure the exposed length of the alternator brush with a dial caliper. If the length is less than the minimum, replace the brush. If necessary, replace the brush holder.

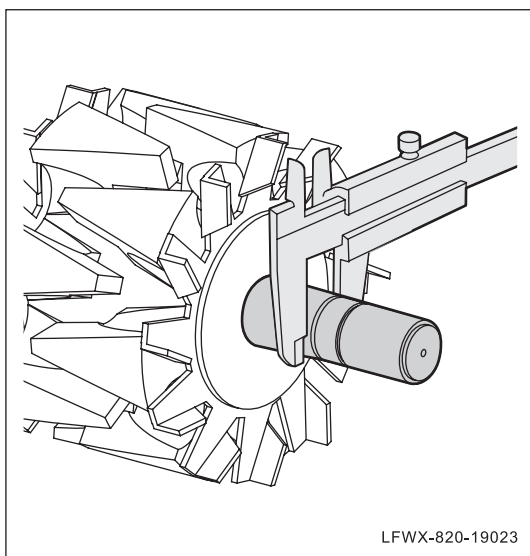
**Standard exposed length: 10.5mm**

**Standard exposed length: 1.5mm**



### 2. Checking alternator rotor assembly

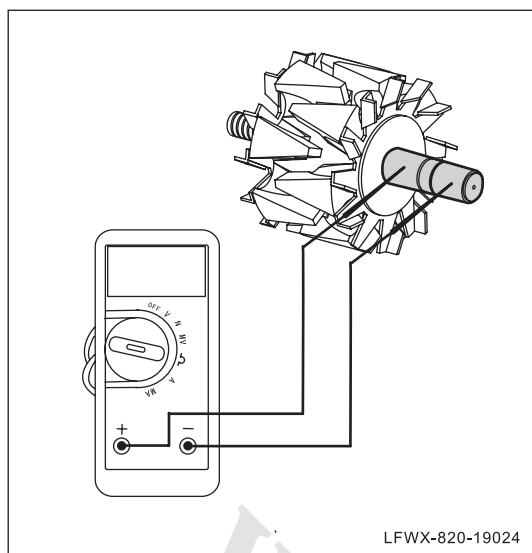
- (a). Visually inspect the slip-ring surface for crack or other damage, if any, replace the rotor assembly.



- (b) Measure the slip-ring diameter with a dial caliper. If the diameter is less than the minimum, replace the rotor assembly.

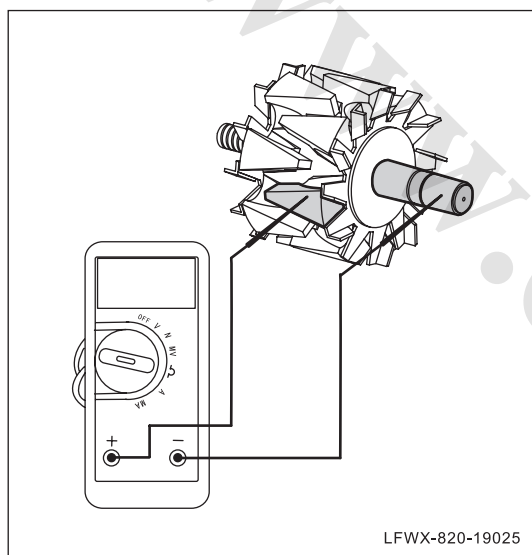
**Standard diameter: 14.2mm - 14.4mm**

**Minimum diameter: 12.8mm**



- (c).As shown in the figure, measure the resistance between the slip rings by switching the digital multimeter to the resistance function. If the resistance is inconsistent with the specified value, replace the rotor assembly.

**Standard value (cold): 2.1~2.5 Ω**



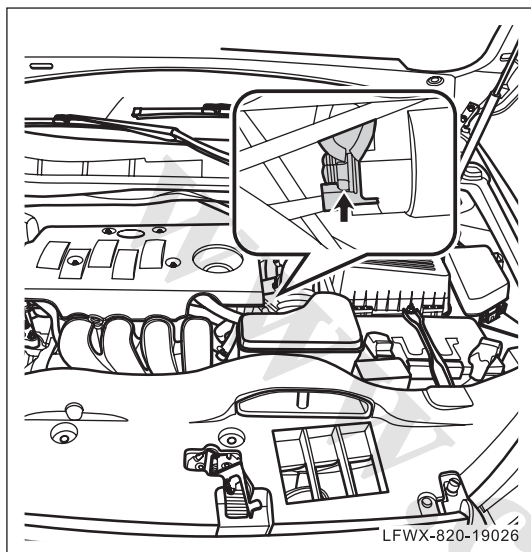
- (d) As shown in the figure, check the conductivity between the slip ring and the rotor with a multimeter. If conductivity exists, replace the rotor assembly.

## Starter

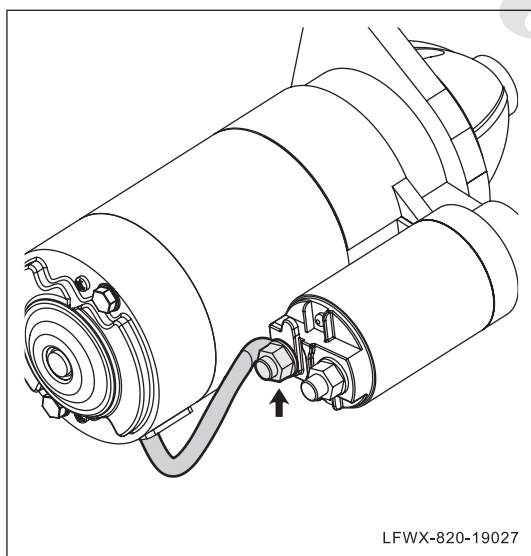
### Overhaul

#### 1. Disassembling the starter

- (a) With the system power supply in "LOCK" position, disconnect the negative battery cable.

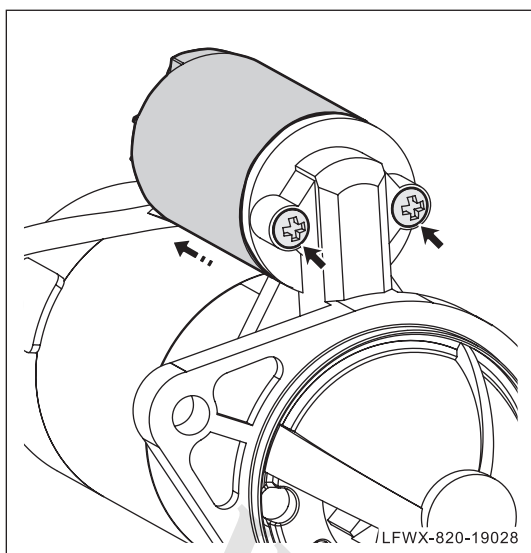


- (b) Remove the starter power leads, and disconnect the starter wire harness connector.
- (c) Remove the two fixing bolts of the starter, and then remove the starter assembly.



#### 2. Dismantle the starter.

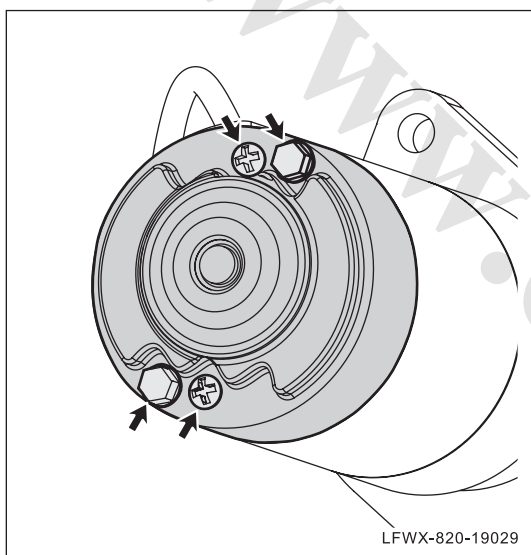
- (a) Remove the lead bolt, and disconnect the lead connection.



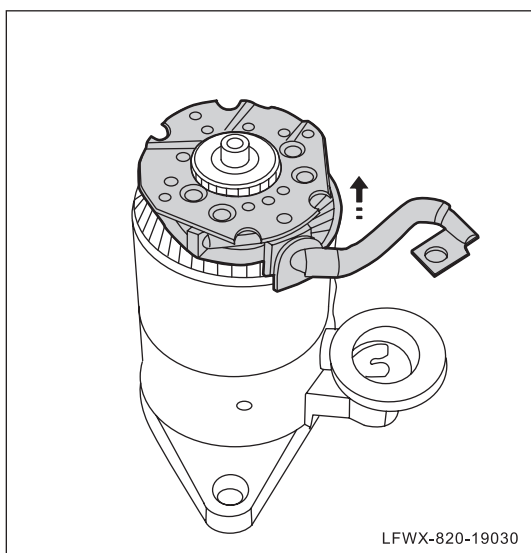
- (b) Remove the two fixing screws of the starter magnetic switch, and then remove the magnetic switch.

△ HINT:

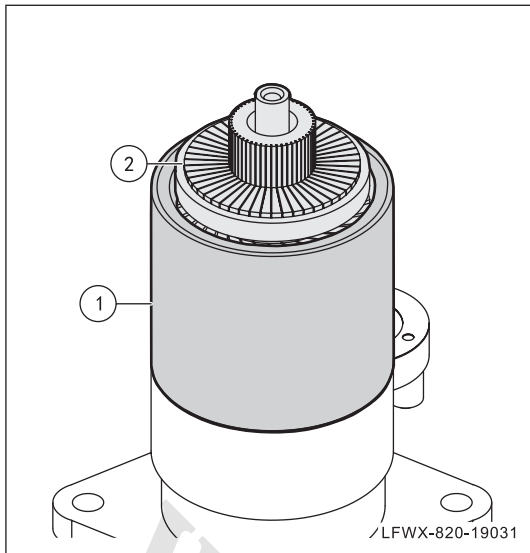
When removing the magnetic switch, be sure to raise the front of the magnetic switch firstly to make it disengage the hook, and then, remove the magnetic switch.



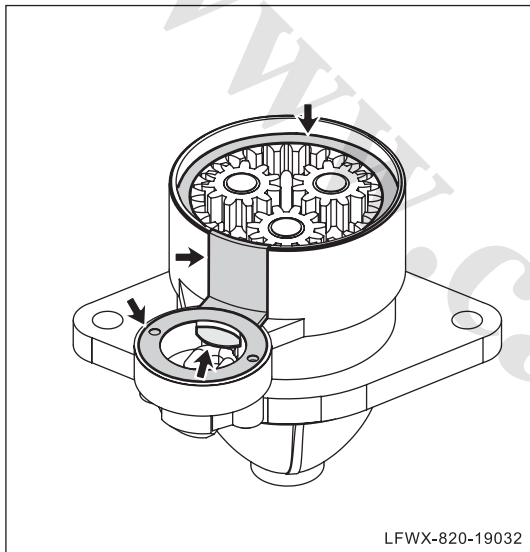
- (c) Remove the fixing bolts and screws of the starter commutator end cap, and then remove the commutator end cap.



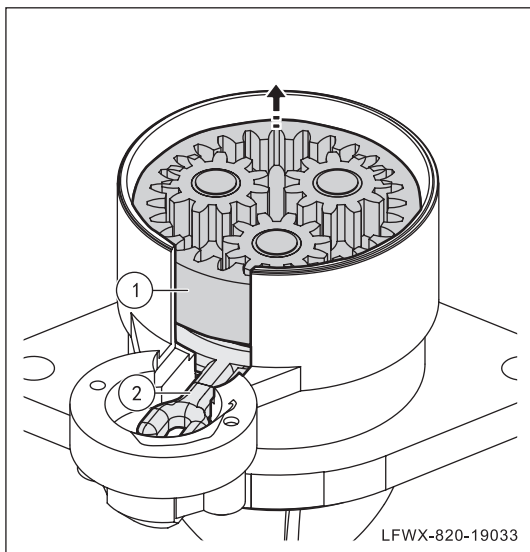
- (d) Remove the starter brush holder assembly.



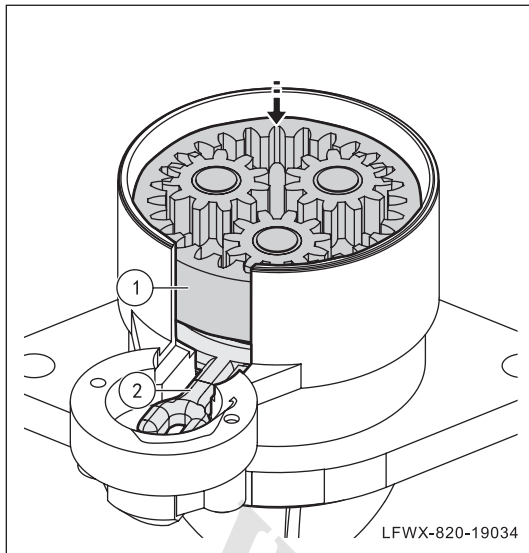
- (e) Remove the starter magnet yoke assembly ① and the armature assembly ② .



- (f) As shown in the figure, remove the rubber seal and gasket.

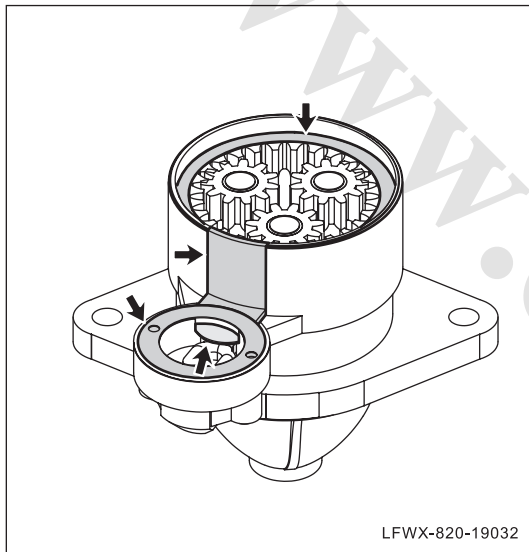


- (g) Remove intermediate bearing clutch sub-assembly ① and starter pinion drive rod ② .

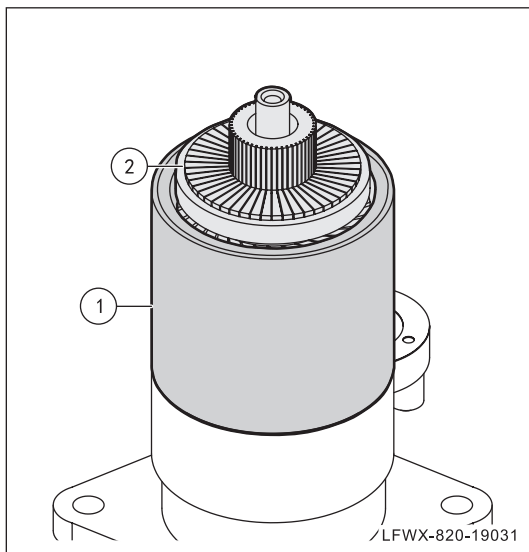


### 3. Assembling starter assembly

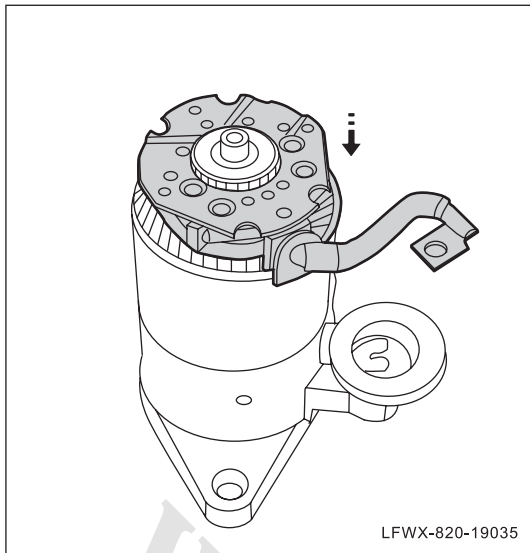
- (a) Install the starter pinion drive rod ② and the intermediate bearing clutch subassembly ① back to the starter drive-end cap.



- (b) Install the gasket and rubber seal.



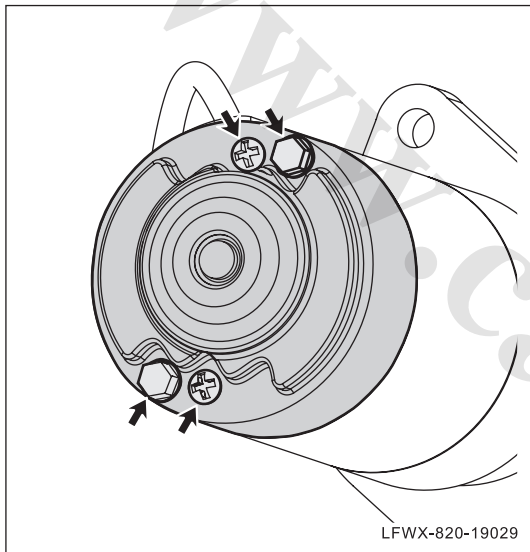
- (c) Install the starter armature into the starter magnetic yoke.
- (d) Install the starter magnet yoke assembly ① and the armature assembly ② in place.



- (e) Install the starter brush holder assembly onto the starter armature.

**Note:**

Be sure to let the wire harness rubber component of the brush holder seat into the snap-ring groove of the starter magnetic yoke when installing.



- (f) Install the starter commutator end cover and tighten its fixing bolts and screws.

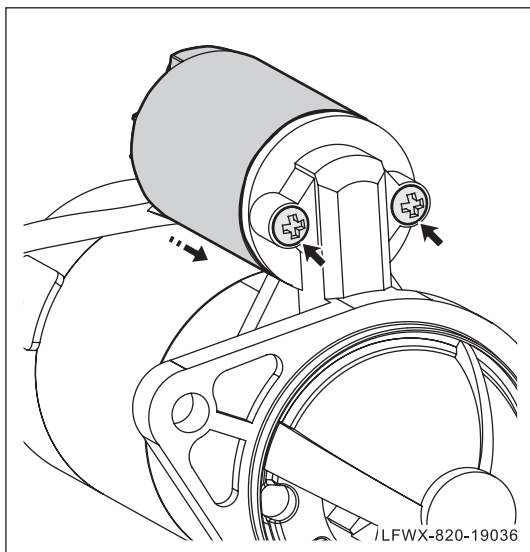
**Torque:**

20N•m~25N•m(bolt)

9N•m~11N•m (screw)

**Note:**

Be sure to let the wire harness rubber component of the brush holder seat into the snap-ring groove of the commutator end cap.



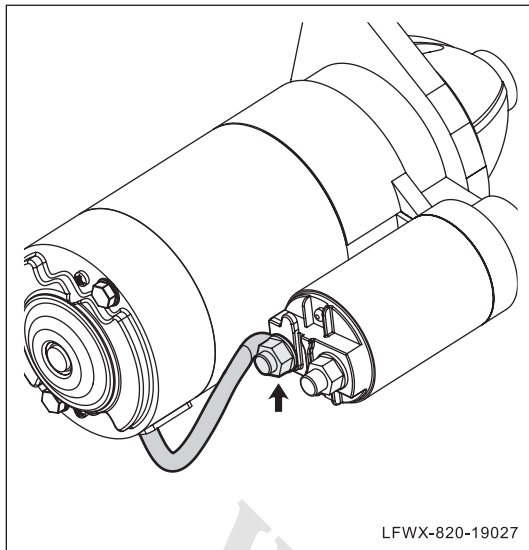
- (g). Install the starter magnetic switch, and tighten its fixing screws.

**Torque: 9N•m~11N•m**

**Note:**

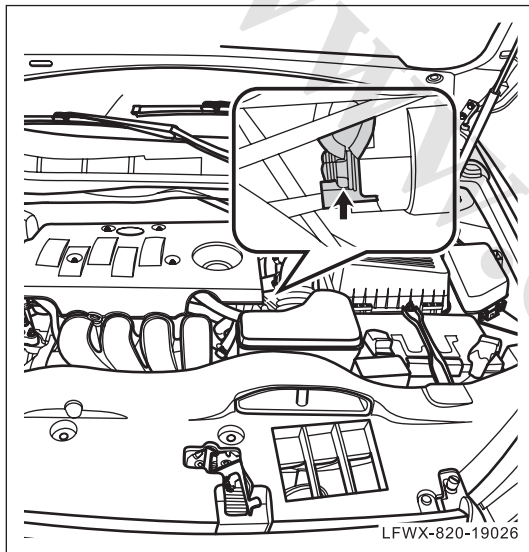
Be sure to make the iron core of the starter magnetic switch engage the drive rod when installing.





- (h) As shown in the figure, install the lead and tighten its fixing bolt.

**Torque: 20N•m - 25N•m**



#### 4. Installing starter assembly

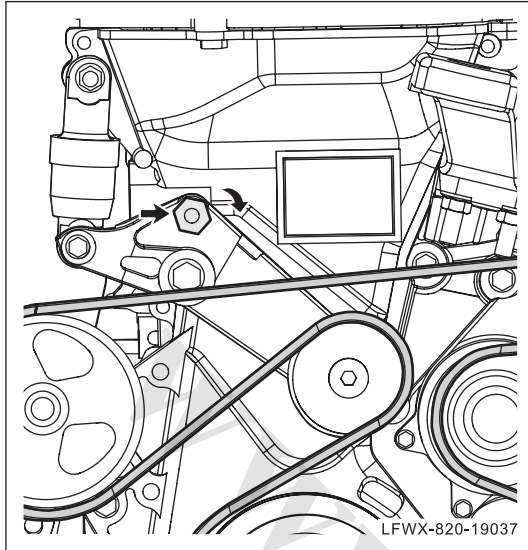
- (a) Install the starter assembly in place, and mount & tighten fixing bolts.

**Torque: 80N•m - 86N•m**

- (b) Install the starter power leads and connector.

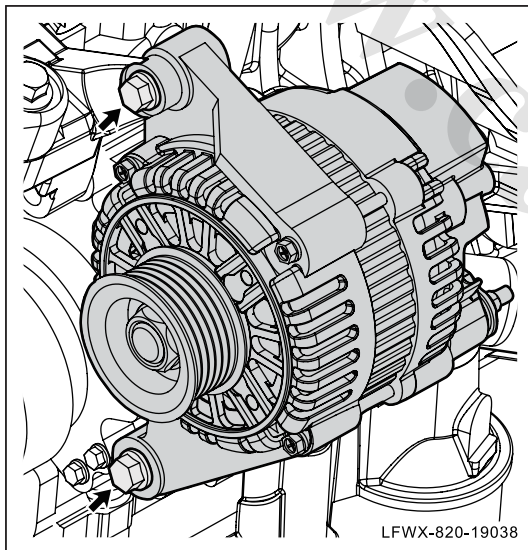
## Alternator

### Overhaul

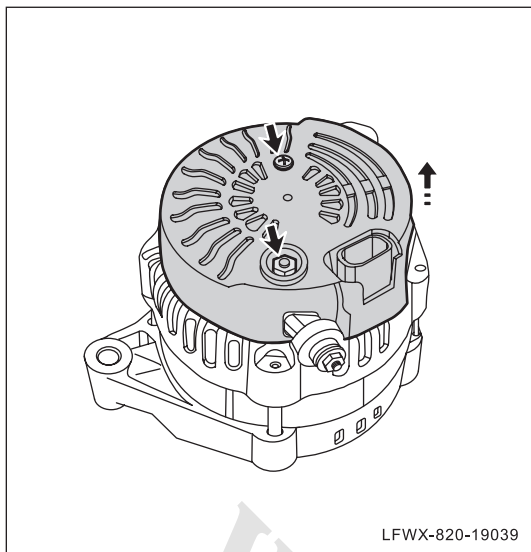


#### 1. Removing alternator assembly

- (a) Use a box wrench to exert force to tensioner in clockwise, and remove drive belt.

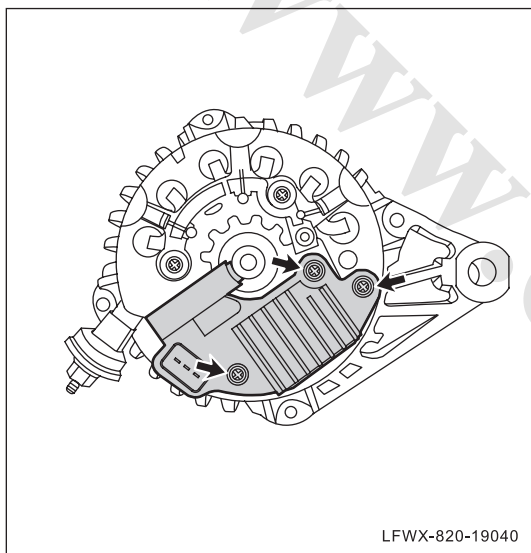


- (b) Remove the fixing bolts of the alternator assembly, and then remove the alternator assembly.

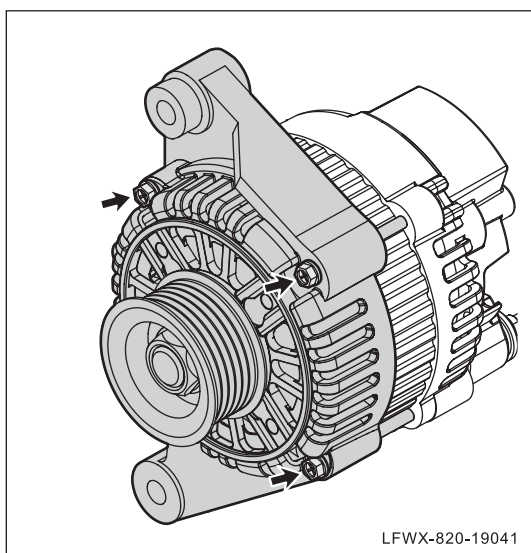


## 2. Disassembling alternator assembly

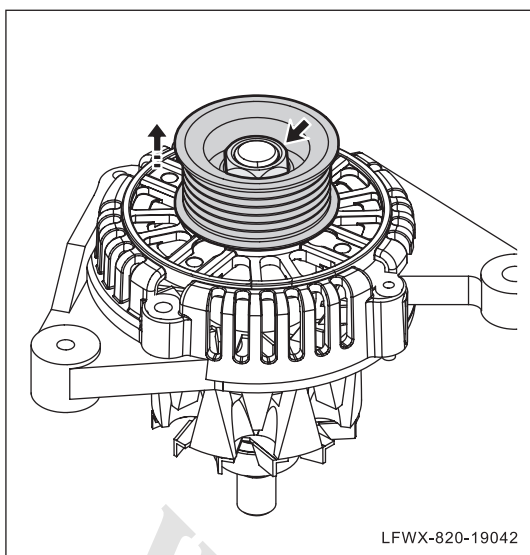
- (a) Remove the fixing nuts and screws of the alternator rear end cap, and then remove the rear end cap.



- (b) Remove the fixing screws of the alternator brush holder, and then remove the alternator brush holder (with brush).



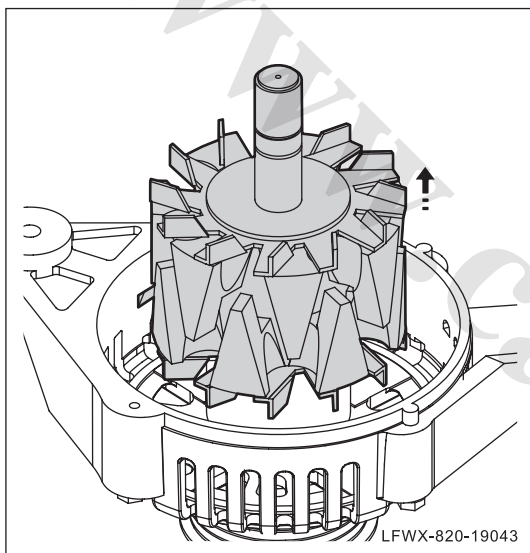
- (c) Remove the fixing bolts of the alternator coil assembly, and then remove the alternator coil assembly.



- (d) Remove the fixing nuts of the alternator pulley, and then remove the alternator pulley.

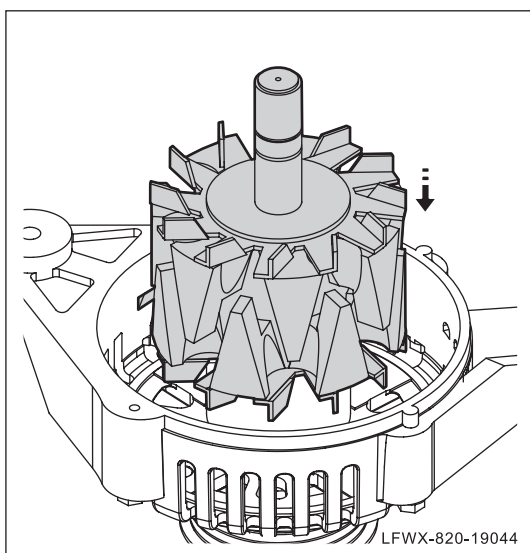
**Note:**

**In order to prevent the pulley from rotating, fix the alternator rotor shaft beforehand when removing.**



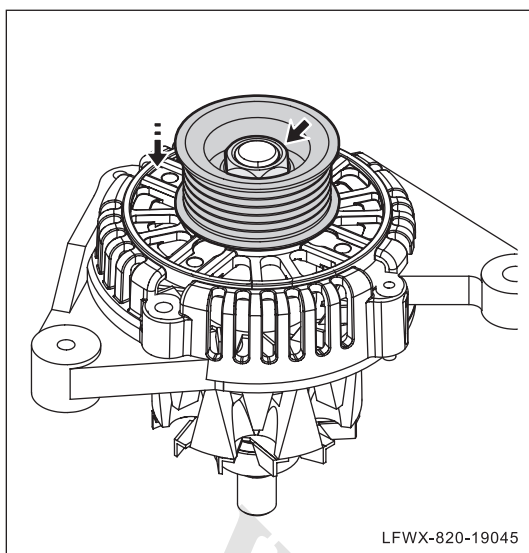
- (e) Remove the alternator rotor washer, rotor rear bearing cap and rotor rear bearing in turn.

- (f) Remove the alternator rotor assembly.



**3. Assembling alternator assembly**

- (a) Install the alternator rotor assembly to the drive end holder (stator).
- (b) Install the alternator rotor rear bearing, rear bearing cap and washer to the alternator rotor in turn.

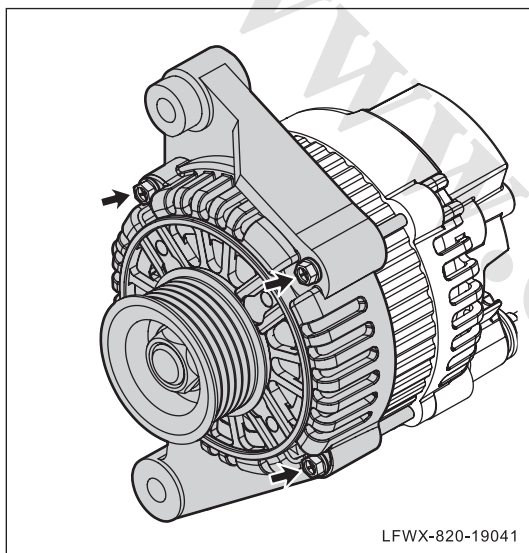


- (c) Install the alternator pulley and tighten the pulley fixing nuts.

**Torque: 110.5N.m**

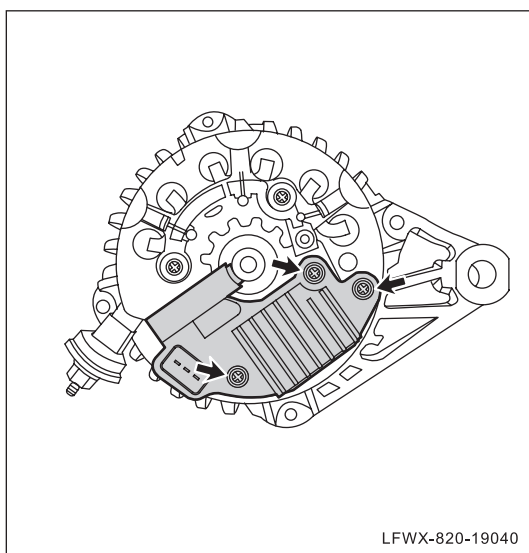
**Note:**

In order to prevent the pulley from rotating, fix the alternator rotor shaft beforehand when installing.



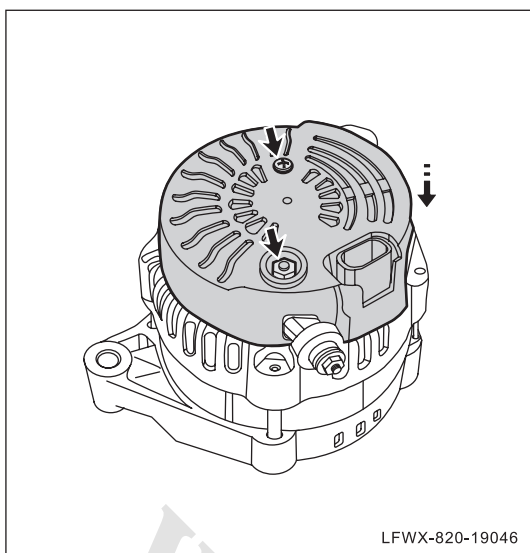
- (d). Install the alternator coil assembly to the rectifier end holder and tighten the fixing bolts.

**Torque: 3N•m~4N•m**



- (e) Install the alternator brush holder to the rectifier end holder and tighten the fixing screws.

**Torque: 3N•m~4N•m**

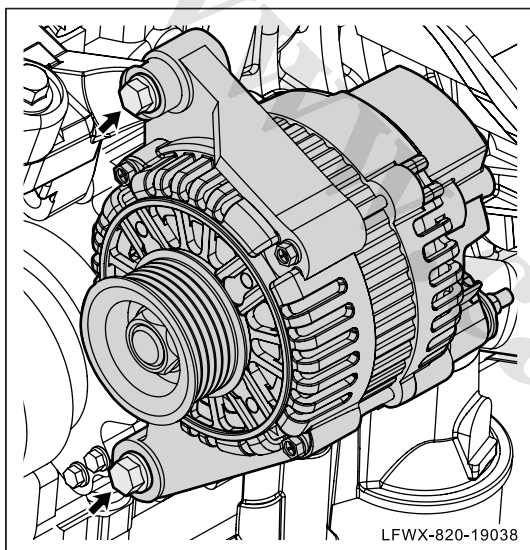


- (f) Install the alternator rear end cap and tighten its fixing nuts and screws.

**Torque:**

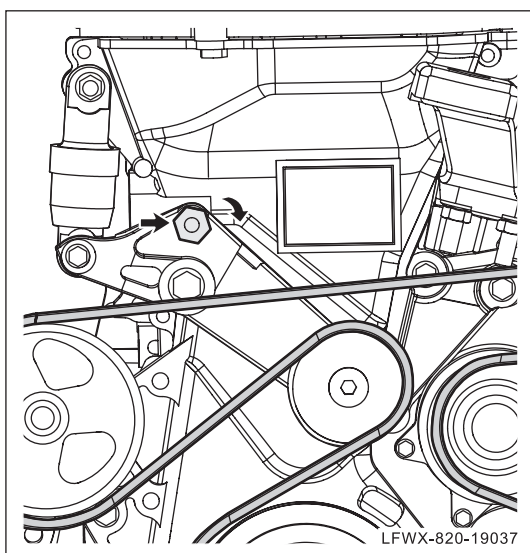
**9N•m~11N•m (nut)**

**5N•m~6N•m (screw)**



4. Installing the alternator assembly.
- (a) Install the alternator assembly in place, and tighten the fixing bolts.

**Torque: 45N•m- 49N•m**



- (b) As shown in the figure, use box spanner to apply force to tensioner clockwise, and install drive belt.

## Passive-Entry-Passive-Start (PEPS) System

### System description

#### 1. Function

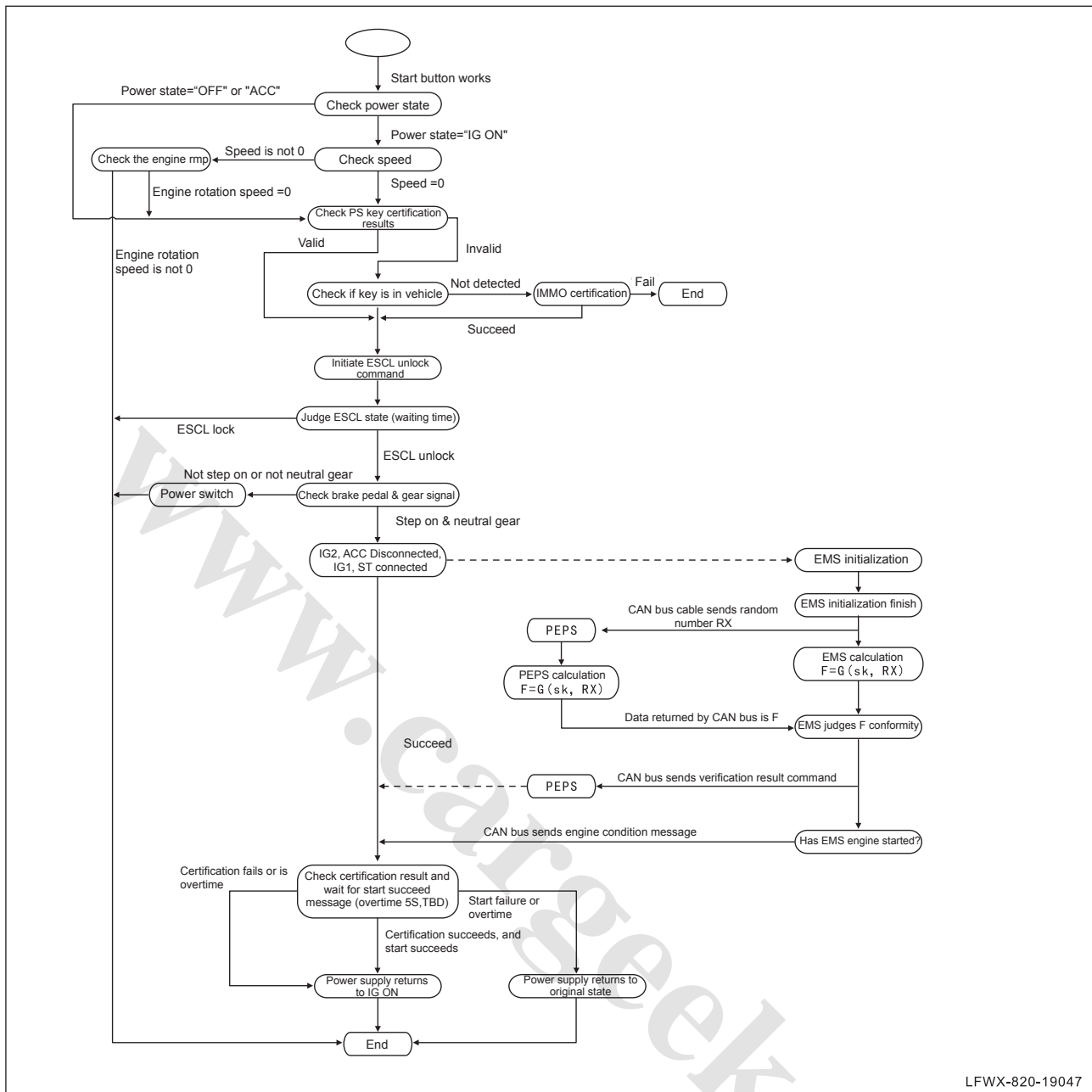
The PEPS system provides ease for the occupants to get on/off and start the vehicle.

#### 2. Components

The PEPS system consists of the PEPS ECU module, steering lock, in-vehicle antenna of low-frequency magnetic fields, antenna of front left door handle, trunk, low-frequency antenna, neutral switch and other component.

#### 3. Principle

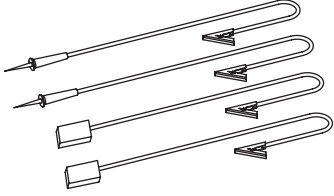
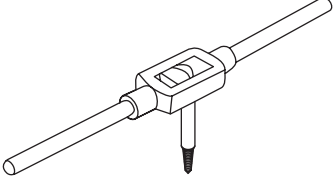
PEPS system is passive entry passive start system. After internal antenna detects the key fob, the on-board control device will activate the power system of the complete vehicle. When the starting conditions are met, PEPS ECU controls the electronic steering lock unlocking, and controls the engine starting together with ECM communication.



### Preparation

S/N	Tools	Outline diagram	Description
1	Multimeter		Check the starter and alternator.



S/N	Tools	Outline diagram	Description
2	Conducting wire		Assist to measure voltage or resistance
3	The thread tap		Remove the steering lock bolt.

## Service data

### 1. Table of tightening torque

Item	N•m
PEPS ECU module bolt	8~12
Fixing bolt of Low-frequency magnetic field antenna	10~12
Neutral switch	44~49

## Precautions

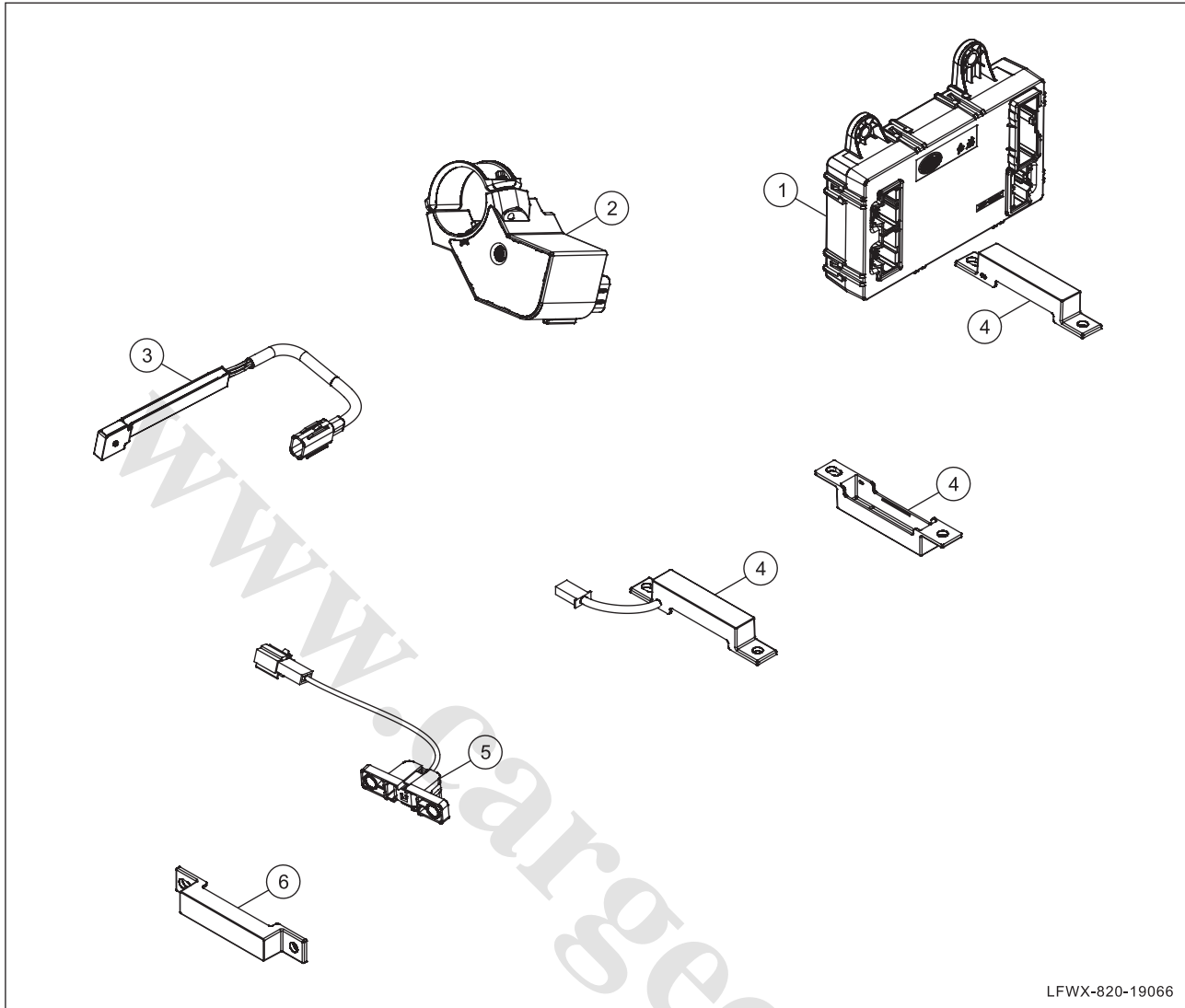
### 1. Precautions before repair

- (a) Before repairing PEPS system, turn off the ignition switch and disconnect battery negative cable.

### 2. Other precautions

- (a) After re-installing battery, wait for at least 10s and then start engine.

## Components



LFWX-820-19066

1	PEPS controller module
2	Electronic steering shaft lock
3	Left front door handle antenna

4	Internal low-frequency magnetic field antenna
5	Trunk microswitch
6	Trunk low-frequency magnetic field antenna

## General Check

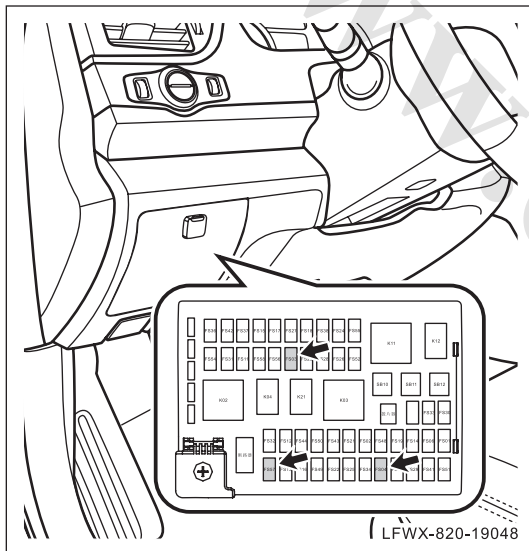
### Check the system

#### 1. Check system components

- (a) Check system for obvious mechanical or electrical damage. If any, repair it.
- (b) Check system for obvious collision and deformation. If any, repair it.
- (c) Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 2. Check wire harness

- (a) Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b) Check system wire harness for crack or damage. If any, fix it.



#### 3. Check the fuse

- (a) Check whether the fuse FS04 of the electronic steering lock is blown. If blown, replace it with one of the same rating.

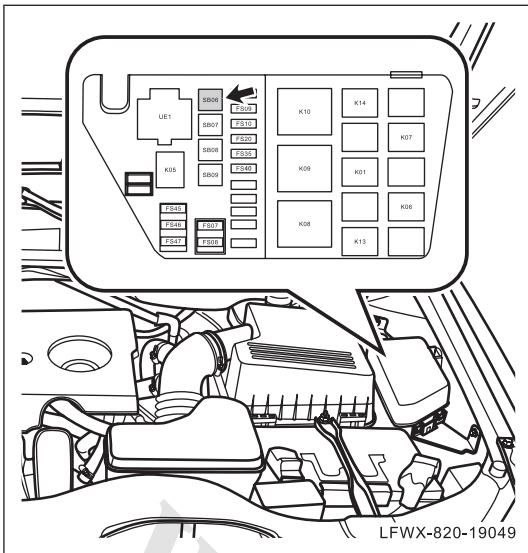
△ HINT:

The fuse FS04 of the electronic steering lock is located in the fuse box of the driver's compartment.

- (b) Check PEPS power fuse FS57 and FS03 for blowing. If yes, install fuse with the same specification.

△ HINT:

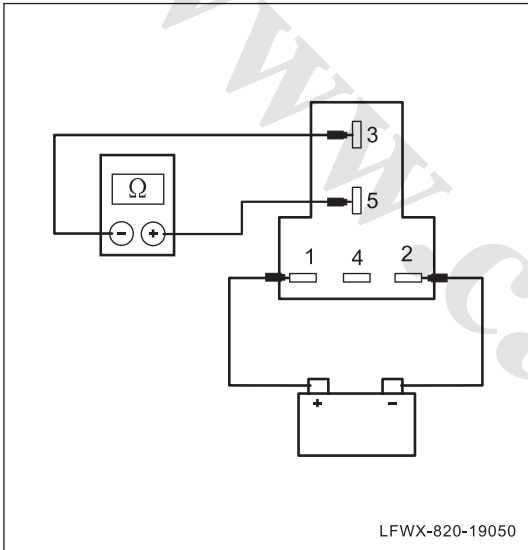
PEPS power fuse is in cab fuse box.



(c) Check start fuse SB06 for blown. If yes, replace the fuse with the same specification.

△ HINT:

Start fuse is located in the engine compartment fuse box.



(d) Check the ACC relay K02, IG1 relay K03 and IG2 relay K04 of the fuse box of the instrument panel.

(e) Check the starter relay K01 of the fuse box in the front compartment.

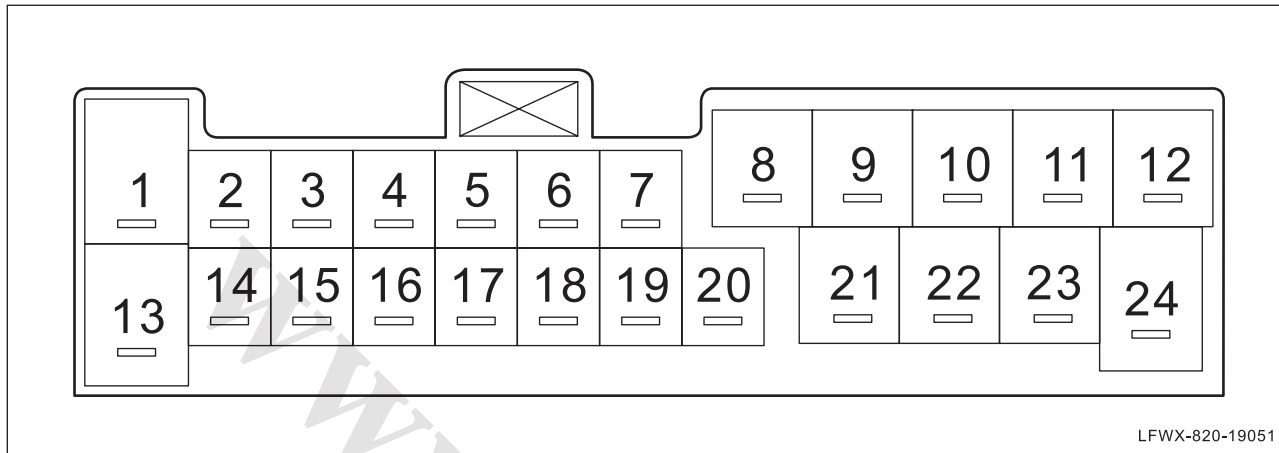
△ HINT:

Disconnect the starter relay K01. Switch on the power supply as shown in the figure. Turn the digital multimeter to its resistance function and check the conduction between No. 3 and No. 5 terminals of the relay. If not, replace the key with one of the same rating.

## Function definitions and signal formats for PEPS external connector pins

### 1. Function definition and signal format for P1 connector pin

(a) P1 connector pin position is shown in the figure.

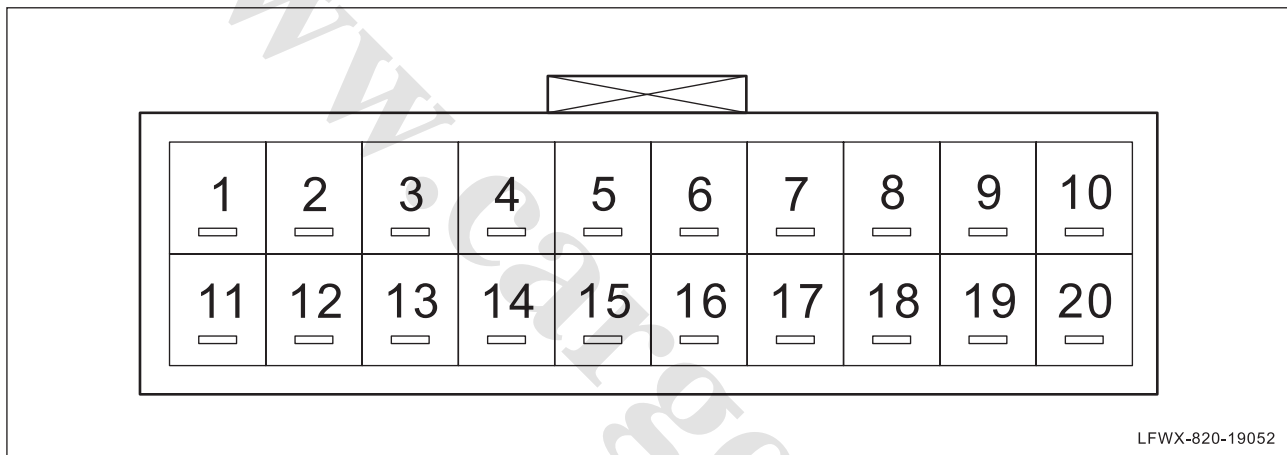


Mark No.	Type	PIN	Electric type and description	Function description
1	IN	P1-01	V_V_ESCL_PWR_IN	ESCL power supply input
2	OUT	P1-02	O_P_ST_REQ	Start request
3	IN	P1-03	I_S_ST_BACK	Start feedback
4	IN	P1-04	I_S_BRAKE_H	High brake signal
5		P1-05	Reserved	Reserved
6	IN	P1-06	I_S_SSB_SW1	Start button switch 1
7	OUT	P1-07	O_S_ESCL_EN	ESCL enabled
8	IN	P1-08	V_V_VBAT	Battery power supply
9	OUT	P1-09	B_F_IMMO_ANT_N	Negative IMMO antenna
10	OUT	P1-10	B_F_IMMO_ANT_P	Positive IMMO antenna
11	IN	P1-11	I_S_TRUNK_OPEN	Trunk unlock switch
12	OUT	P1-12	V_V_ESCL_GND	ESCL power supply-ground output
13	OUT	P1-13	V_V_ESCL_PWR_OUT	ESCL power supply output
14	IN	P1-14	I_S_ESCL_BACK	ESCL feedback
15	I/O	P1-15	B_D_KLINE	ESCLLIN line
16	I/O	P1-16	B_D_CANH	CAN-H
17	I/O	P1-17	B_D_CANL	CAN-L

Mark No.	Type	PIN	Electric type and description	Function description
18	IN	P1-18	I_V_IG1	IG1 power supply feedback
19	IN	P1-19	I_V_IG2	IG2 power supply feedback
20	IN	P1-20	I_V_ACC	ACC power supply feedback
21	OUT	P1-21	O_S_IG1_RELAY	IG1 relay control
22	OUT	P1-22	O_S_IG2_RELAY	IG2 relay control
23	OUT	P1-23	O_S_ACC_RELAY	ACC relay control
24	OUT	P1-24	V_V_GND	Battery ground

**2. Function definition and signal format for P2 connector pin**

(a) P2 connector pin position is shown in the figure.



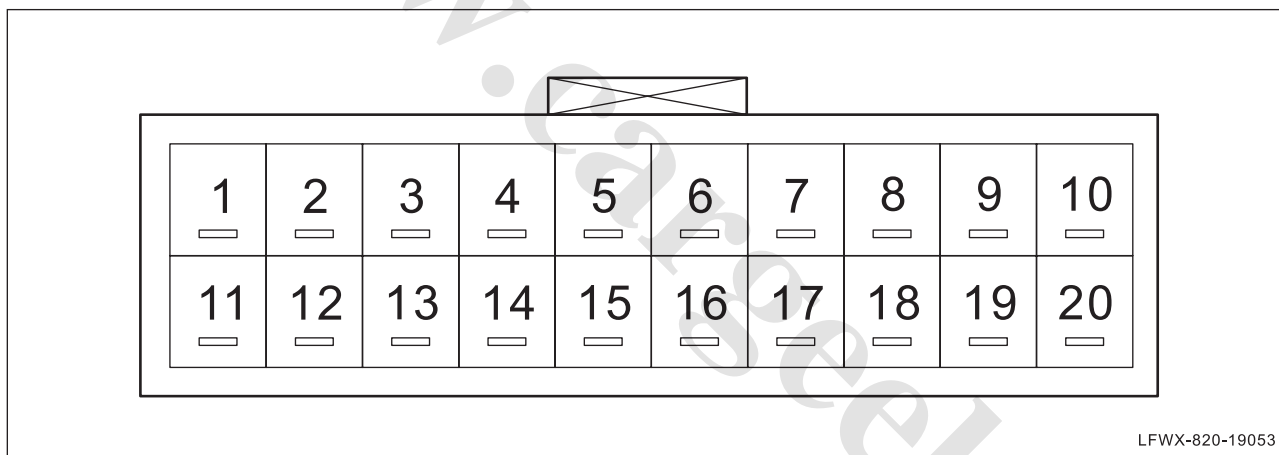
19

Mark No.	Type	PIN	Electric type and description	Function description
1		P2-01	Reserved	Reserved
2		P2-02	Reserved	Reserved
3		P2-03	Reserved	Reserved
4		P2-04	Reserved	Reserved
5		P2-05	Reserved	Reserved
6		P2-06	Reserved	Reserved
7		P2-07	Reserved	Reserved
8		P2-08	Reserved	Reserved
9		P2-09	Reserved	Reserved
10		P2-10	Reserved	Reserved
11		P2-11	Reserved	Reserved

Mark No.	Type	PIN	Electric type and description	Function description
12	OUT	P2-12	O_F_RR_TPMS_P	Rear right TPMS antenna P
13	OUT	P2-13	O_F_RR_TPMS_N	Rear right TPMS antenna N
14	OUT	P2-14	O_F_FL_TPMS_P	Front left TPMS antenna P
15	OUT	P2-15	O_F_FL_TPMS_N	Front left TPMS antenna N
16	OUT	P2-16	O_F_RL_TPMS_P	Rear right TPMS antenna P
17	OUT	P2-17	O_F_RL_TPMS_N	Rear left TPMS antenna N
18	OUT	P2-18	O_F_FR_TPMS_P	Front right TPMS antenna P
19	OUT	P2-19	O_F_FR_TPMS_N	Front right TPMS antenna N
20		P2-20	Reserved	Reserved

### 3. Function definition and signal format for P3 connector pin

(a) P3 connector pin position is shown in the figure.



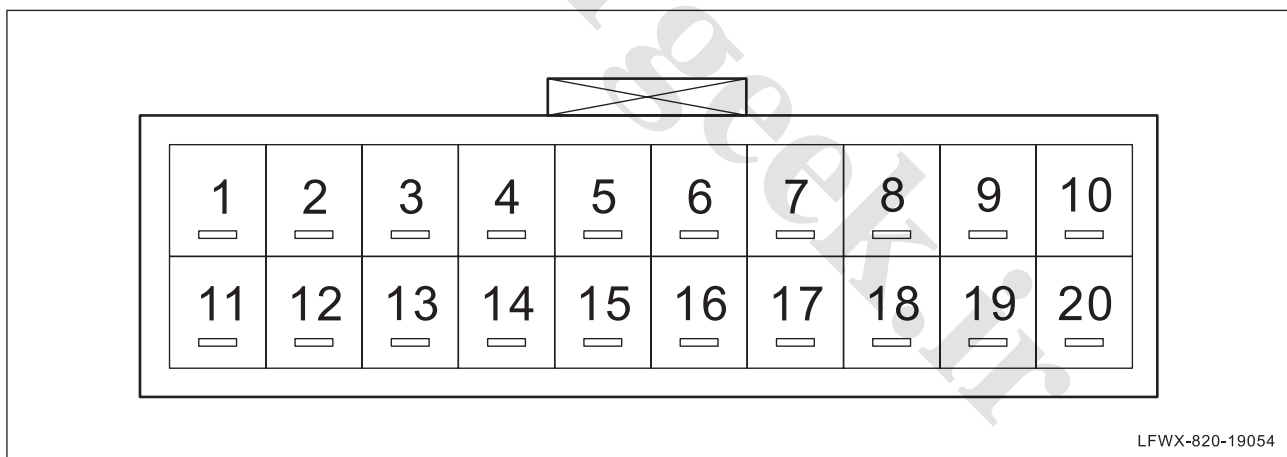
Mark No.	Type	PIN	Electric type and description	Function description
1	IN	P3-01	V_V_VBAT	Battery power supply
2		P3-02	Reserved	Reserved
3	IN	P3-03	I_F_SPEED	Wheel speed signal
4	IN	P3-04	I_S_P/N	P/N gear switch collection
5	IN	P3-05	I_S_SSB_SW2	Start button switch 2
6	IN	P3-06	I_S_P	P gear switch collection
7	OUT	P3-07	O_V_SSB_LED_PWR	LED power supply for start button
8	OUT	P3-08	O_V_SSB_GREEN_LED	Green LED control for start button

Mark No.	Type	PIN	Electric type and description	Function description
9	OUT	P3-09	O_V_SSB_AMBER_LED	Amber LED control for start button
10	OUT	P3-10	O_S_ST_RELAY	Starter relay control
11	OUT	P3-11	I_S_SSB_GND	Start button switch ground
12		P3-12	Reserved	Reserved
13		P3-13	Reserved	Reserved
14	IN	P3-14	I_V_ST	Power supply feedback for starter relay
15		P3-15	Reserved	Reserved
16		P3-16	Reserved	Reserved
17		P3-17	Reserved	Reserved
18		P3-18	Reserved	Reserved
19		P3-19	Reserved	Reserved
20	IN	P3-20	V_V_GND	Battery ground

#### 4. Function definition and signal format for P4 connector pin

(a) P4 connector pin position is shown in the figure.

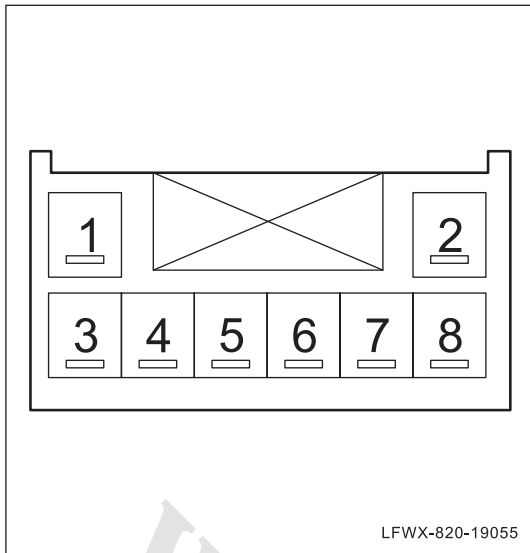
19



Mark No.	Type	PIN	Electric type and description	Function description
1		P4-01	Reserved	Reserved
2		P4-02	Reserved	Reserved
3	OUT	P4-03	O_V_FL_SW_GND	Micro Switch GND
4		P4-04	Reserved	Reserved
5		P4-05	Reserved	Reserved



Mark No.	Type	PIN	Electric type and description	Function description
6		P4-06	Reserved	Reserved
7		P4-07	Reserved	Reserved
8		P4-08	Reserved	Reserved
9	IN	P4-09	I_S_FL_LOCK_SW	Front left micro switch input
10	OUT	P4-10	O_F_BOOT_ANT_P	Trunk low frequency positive antenna
11		P4-11	Reserved	Reserved
12	OUT	P4-12	O_F_INT_ANT1_P	In-vehicle antenna 1, positive
13	OUT	P4-13	O_F_INT_ANT1_N	In-vehicle antenna 1, negative
14	OUT	P4-14	O_F_INT_ANT3_P	In-vehicle antenna 3, positive
15	OUT	P4-15	O_F_INT_ANT3_N	In-vehicle antenna 3, negative
16	OUT	P4-16	O_F_LF_ANT_P	Low-frequency antenna on the door handle on the driver's side, positive
17	OUT	P4-17	O_F_LF_ANT_N	Low-frequency antenna on the door handle on the driver's side, negative
18	OUT	P4-18	O_F_INT_ANT2_P	In-vehicle antenna 2, positive
19	OUT	P4-19	O_F_INT_ANT2_N	In-vehicle antenna 2, negative
20	OUT	P4-20	O_F_BOOT_ANT_N	Trunk low frequency negative antenna



**5. Function definitions and signal formats for PEPS switch connector pin**

- (a) PEPS switch connector pin position is shown in the figure.

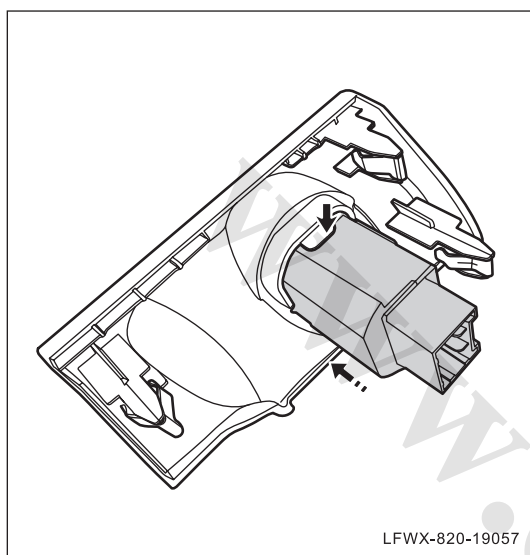
Mark No.	Type	PIN	Electric type and description	Function description
1	IN	1	B_F_IMMO_ANT_N	Negative IMMO antenna
2	IN	2	B_F_IMMO_ANT_P	Positive IMMO antenna
3	OUT	3	O_S_SSB_SW1	Start button switch 1
4	IN	4	I_V_SSB_AMBER_LED	Amber LED control for start button
5	IN	5	I_V_SSB_GREEN_LED	Green LED control for start button
6	IN	6	I_V_SSB_LED_PWR	LED power supply for start button
7	OUT	7	V_V_GND	GND
8	OUT	8	O_S_SSB_SW2	Start button switch 2

## PEPS Switch

### Replacement

#### 1. Removing the PEPS switch

- (a) Remove the PEPS panel. (See 84- Dashboard /Sub-dashboard- PEPS Panel, Replacement)



- (b) Press the buckle to remove the PEPS switch.

#### 2. Installing the PEPS switch

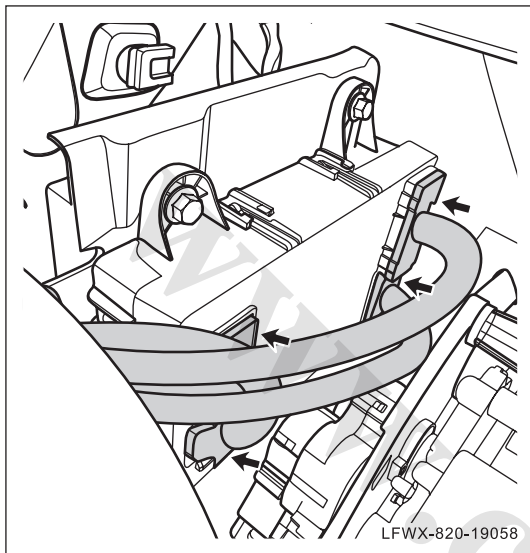
- (a) Install the PEPS switch into the PEPS panel.
- (b) Install the PEPS panel. (See 84- Dashboard /Sub-dashboard- PEPS Panel, Replacement)

## PEPS ECU Module

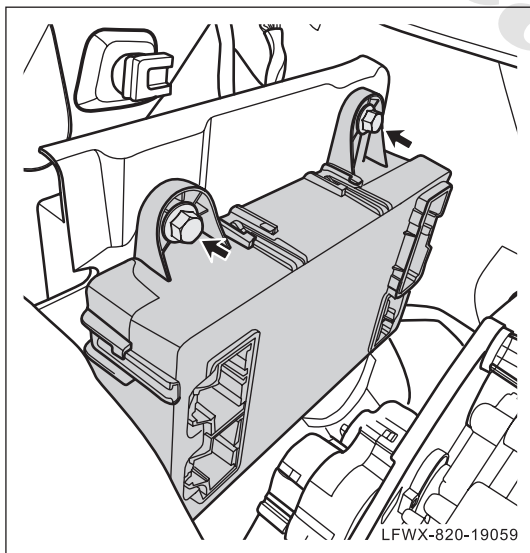
### Replacement

#### 1. Removing the PEPS ECU module

- (a) Remove dashboard upper panel. (See 84 - Dashboard and Console, Dashboard Upper Panel, Replacement)



- (b) Disconnect the harness connector from the PEPS ECU module.



- (c) Remove the PEPS ECU module bolt and remove the PEPS ECU module.

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#### 2. Installing the PEPS ECU module

- (a) Install the PEPS ECU module in place, install and tighten the bolt.

**Torque: 8N•m-12N•m**

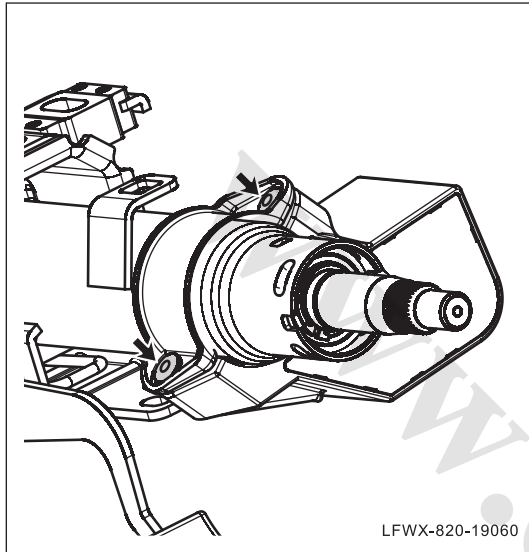
- (b) Connect the harness connector for the PEPS ECU module.
- (c) Install dashboard upper panel. (See 84 - Dashboard and Console, Dashboard Upper Panel, Replacement)

## Electronic Steering Lock

### Replacement

#### 1. Removing the electronic steering lock

- (a) Remove the upper steering shaft. (See 61- Hydraulic Steering System-Steering Shaft, Replacement)



- (b) Drill the fixed bolt on the electronic steering lock.
- (c) Remove the clamp bolt from the electronic steering lock using the special tap, and remove the electronic steering lock.

△ HINT:

The bolt for the electronic steering lock is special-purpose. Be sure to replace it after removal.

#### 2. Installing the steering lock

- (a) Fix the electronic steering lock to the upper steering shaft, and install and tighten the bolt until the bolt head is fractured.

ⓘ **Note:**

**When tightening the bolt for the electronic steering lock, avoid abrupt failure of the bolt which can result in personal injury.**

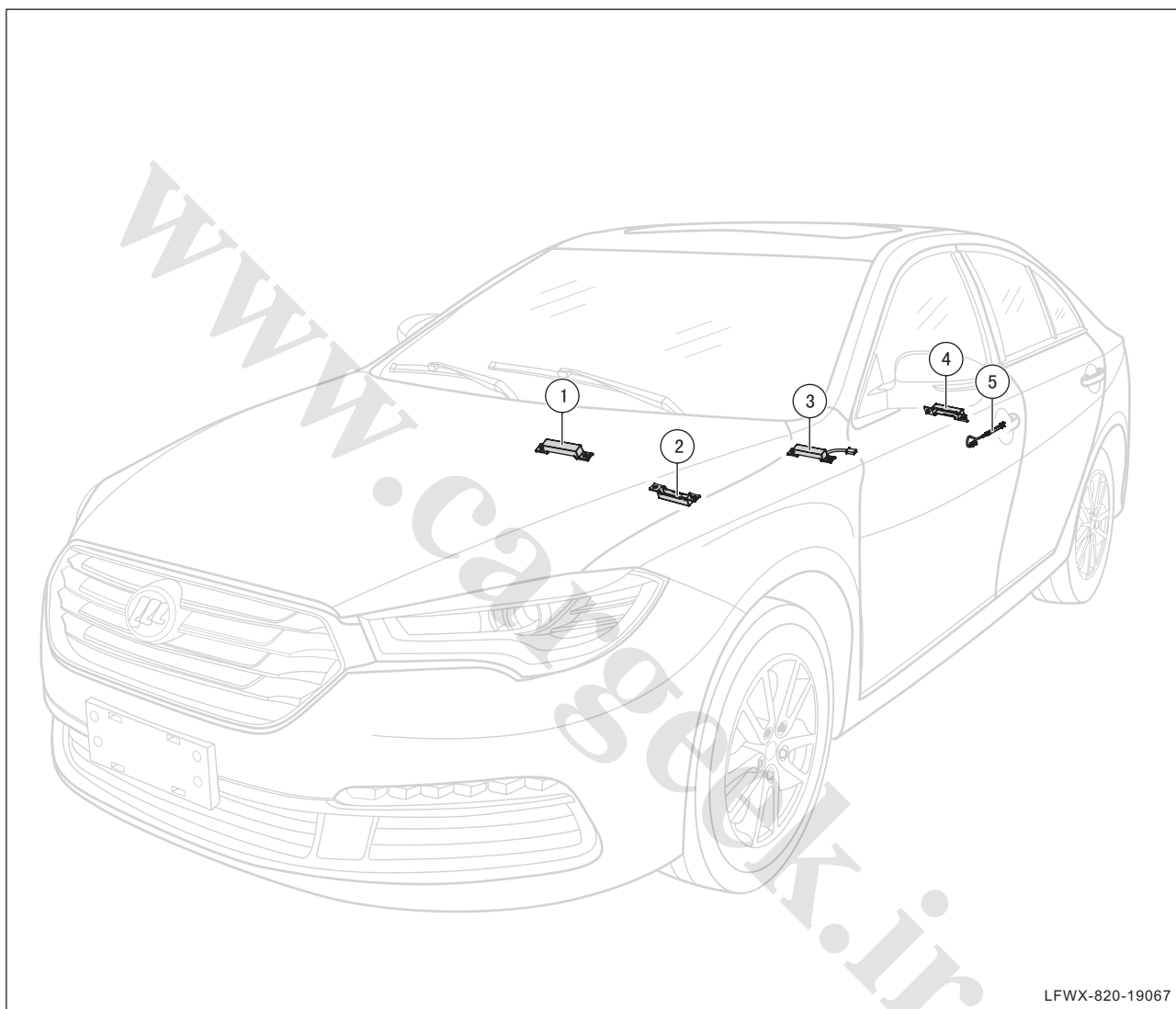
- (b) Install the upper steering shaft. (See 61- Hydraulic Steering System-Steering Shaft, Replacement)

## Internal Low-frequency Magnetic Field Antenna

### Replacement

△ HINT:

The replacement methods of all antennas are basically the same. This chapter only takes dashboard antenna as example.



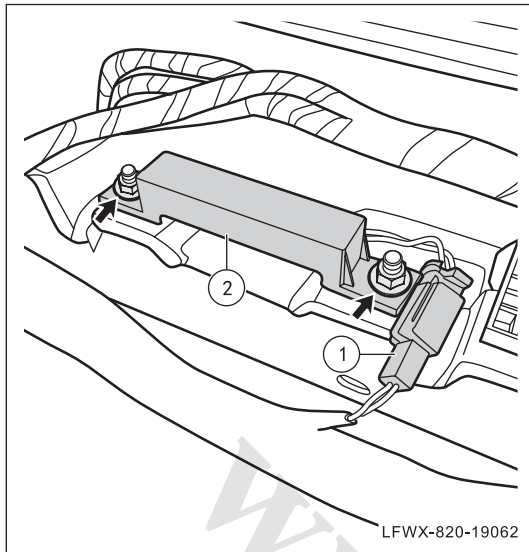
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- ① : Dashboard antenna
- ② : Console antenna
- ③ : Lower antenna of rear seats
- ④ : Rear bumper antenna
- Left front door handle antenna

#### 1. Remove internal low-frequency magnetic field antenna

- (a) Remove dashboard upper panel. (See 84 - Dashboard and Console, Dashboard Up-

per Panel, Replacement)



- (b) Disconnect wire harness connector of internal low-frequency magnetic field antenna, remove the fixing bolts of internal low-frequency magnetic field antenna, and take off internal low-frequency magnetic field antenna

## 2. Install internal low-frequency magnetic field antenna

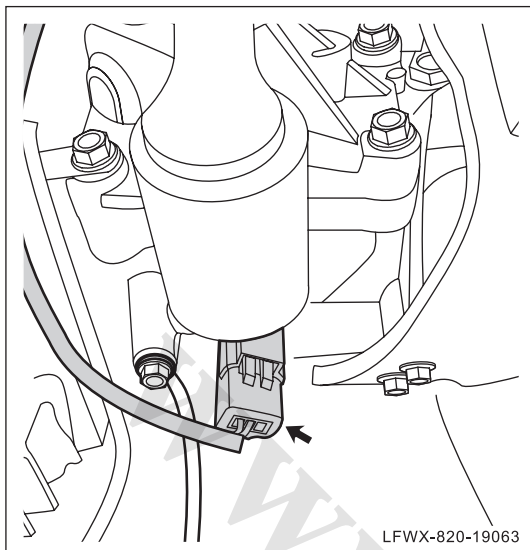
- (a) Install internal low-frequency magnetic field antenna to the installation position, and install and tighten fixing bolts.

**Torque: 10N•m-12N•m**

- (b) Connect the harness connector for the in-vehicle antenna of low-frequency magnetic fields.
- (c) Install dashboard upper panel. (See 84 - Dashboard and Console, Dashboard Upper Panel, Replacement)

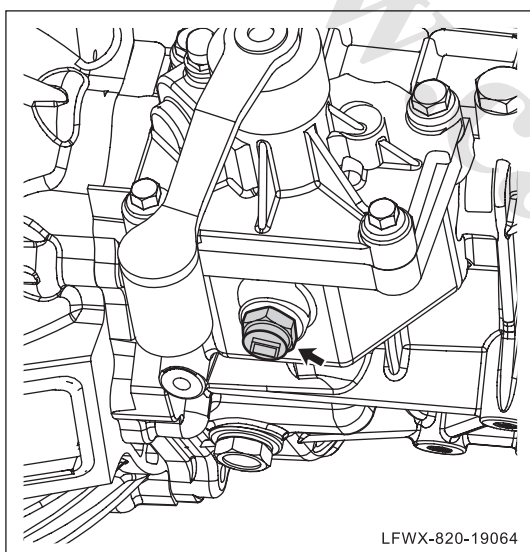
## Neutral Switch

### Replacement



#### 1. Removing the neutral switch

- (a) With the system power supply in "LOCK" position, disconnect the neutral switch harness connector.



- (b) Remove the neutral switch.

#### 2. Installing the neutral switch

- (a) Install the neutral switch in place.

**Torque: 44N•m- 49N•m**

- (b) Connect the neutral switch harness connector.





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## 22-Automatic Transmission

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# Automatic Transmission

## System description

### 1. Function

The vehicle with automatic transmission can change speed and torque automatically according to road condition, so the driver can focus on the traffic condition instead of being in a flurry due to gear shifting.

### 2. Components

Automatic transmission consists of hydraulic torque converter, planetary gear set, clutch/brake and control mechanism (solenoid valve, oil line) and changes speed and torque through hydraulic transmission and gear combination.

- (a) Automatic transmission consists of six forward gears and one reverse gear with the following characters:
- One hydraulic torque converter, which consists of one lockup clutch to control sliding and friction.
  - Adopt electronic gear shifting and pressure control.
  - One single-row planetary gear set.
  - One double-row planetary gear set.
  - One hydraulic controlled brake strap and one multiple-friction-disc brake.
  - Four multiple-disc wet clutch (clutch C1, C2, C3 and brake B1).
- (b) All hydraulic functions are controlled by solenoid valve:
- Adjust to engage.
  - Regulating the smoothness of gearshift.
  - Selection mode of shifting curve.
  - Regulating the clutch of torque converter.
- (c) The automatic transmission uses synthetic automatic transmission fluid (ATF) to ensure its normal running within its service life. So, change the fluid every 60000km.
- (d) The power of engine is transmitted to the automatic transmissions via the torque converter with lock-up clutch.
- (e) The automatic transmission realizes its operation of six drive gears and a reverse gear via a single-row of drive planetary gear and a double-row of driven planetary gear. This kind of gear device is commonly called Lepelletier planetary gear set.
- (f) The automatic transmission is electrically controlled, whose control system is composed by the parts as follows:

- Input shaft speed sensor and output shaft speed sensor.
- Four switch solenoid valves and six variable flow solenoid valves.
- Torque converter (TC).
- Automatic transmission control unit (TCU).
- Embedded memory module (EMM).

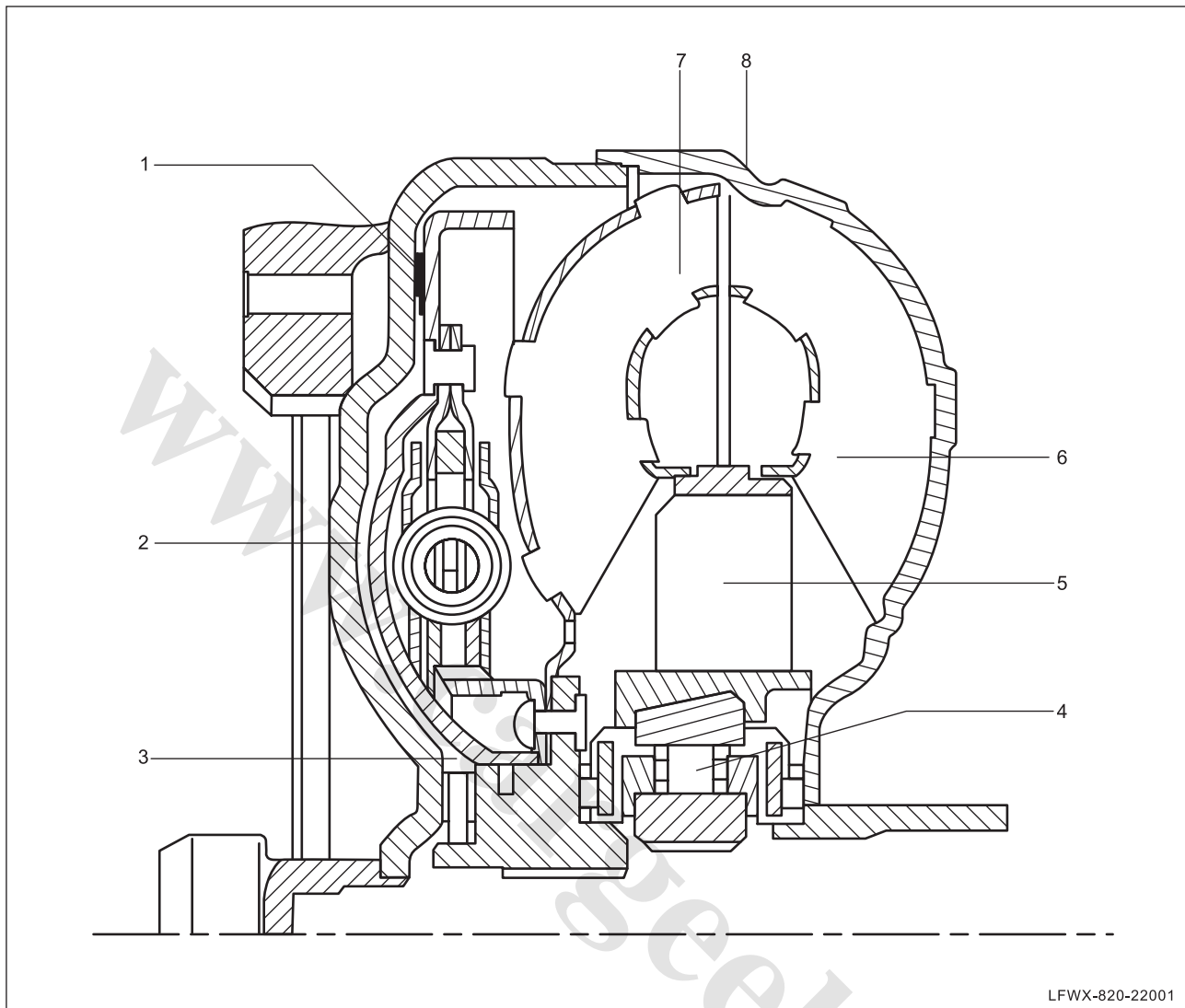
The gearshift can be achieved via controlling the pressure and direction of the automatic transmission fluid, thus to operate its inner clutch and brake cables. The transmission control unit (TCU) can control all electronic components, as well as the selection of gears, the pressure of gearshift and the running of torque converter.

If systematic faults happen in transmission, the TCU can keep maximizing the functional running of the transmission via the fault module effects control (FMEC). If the TCU loses its control completely or the power is off, the transmission can still remain its fundamental transmission functions (i.e. parking, reverse, neutral and driving at Gear 4) Gear 4 of driving, reverse and the opening of torque converter clutch can all be achieved via simple hydraulic system, completely without the assistance from electronic control.

- (h). The transmission also consists of an external range selector sensor (range switch) which is used to park, reverse and drive the vehicle and an internal temperature sensor.
- (i) In the manual mode, the TCU also needs to obtain information from the movement of the ball head of range selector or the steering of the steering wheel (depending on the shifting mode) to determine when the driver carries out the manual range selecting. The TCU can also communicate with other electronic modules on the car via CAN system.
- (j) If the severe failure happens, the “Limp home” mode will be activated to ensure that the vehicle can be driven to the distributor for maintenance. Under “Limp home” mode, the indicator of “MIL” or the indicator of engine fault check on dashboard will be lighted up and the function of transmission will be limited. The error grade is determined by the error diagnosis. If the “Limp home” is activated, the indicator of transmission will flash. If the battery voltage is lowered than 8V, the “Limp home” mode will also be activated.
- (k) If the transmission is over heated, the shift mode will change automatically to make the transmission cool down quickly. If the transmission is over heated, the position of range selector will be shown on the dashboard and the warning lights of ATF temperature – TCU will be lighted up to show the transmission is over heated until the transmission reaches the normal working temperature. Under the condition of extremely over-heated, the transmission will prohibit all the shifting function and keep in neutral status until the transmission cool down to safe temperature.
- (l) If failures happen, do not tow the vehicle before the front wheel is lifted up. Otherwise, the transmission will be damaged because of lack of sufficient bearing lubrication.

### 3. Principle

#### Section of torque converter



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1	Liner of lock-up clutch
2	Piston of lock-up clutch
3	Back chamber of lock up clutch
4	Stator of non-return clutch

5	Guide wheel
6	Pump wheel
7	Worm wheel
8	Lip of torque converter

#### (b) Working principle of torque converter.

The torque converter contains a single lock-up clutch, which can control and achieve clutch lock-up in any driving gear. It can transfer the oil pressure of transmission in the torque converter from one side of the clutch to another side, and add pressure to another side, thus to achieve the control to the clutch of the torque converter. The torque of converter can be transmitted and increased. A torque converter consists of three parts:

- Impeller

- Guide pulley
- Turbine

(c) The torque converter works as follows.

- The impeller is driven by the engine to make transmission fluid in torque converter flow.
- The transmission fluid drives the blades of turbine to change the flowing direction of transmission fluid.
- The transmission fluid flows out of the turbine towards the center, drives the guide pulley, and changes the direction, in order to make the transmission fluid enter pump pulley again.
- The change of direction at the guide pulley results in torque reaction, which adds the torque reaching turbines.
- The torque ratio between turbine and impeller is called magnitude of torque or converting ratio of torque, or torque conversion ratio.
- The greater the difference between the speed in impeller and turbine, the more that the torque increases. When the turbine is static, the torque increases to its maximum peak. As the increase of the speed of the impeller in the turbine, the magnitude of the torque decreases.
- When the turbine is rotating at 85% of its speed, the torque conversion coefficient is 1. That is to say, the torque of turbine is no longer greater than the torque of impeller.
- A non-return clutch is used to prevent inversion of the starter. Its shaft is in the housing of the torque converter, and it can rotate freely in the transmission fluid, surpassing the rotation speed of the single clutch. During the process of torque transformation, the starter drives the bearing to rotate relatively to the housing, depending on the single clutch.

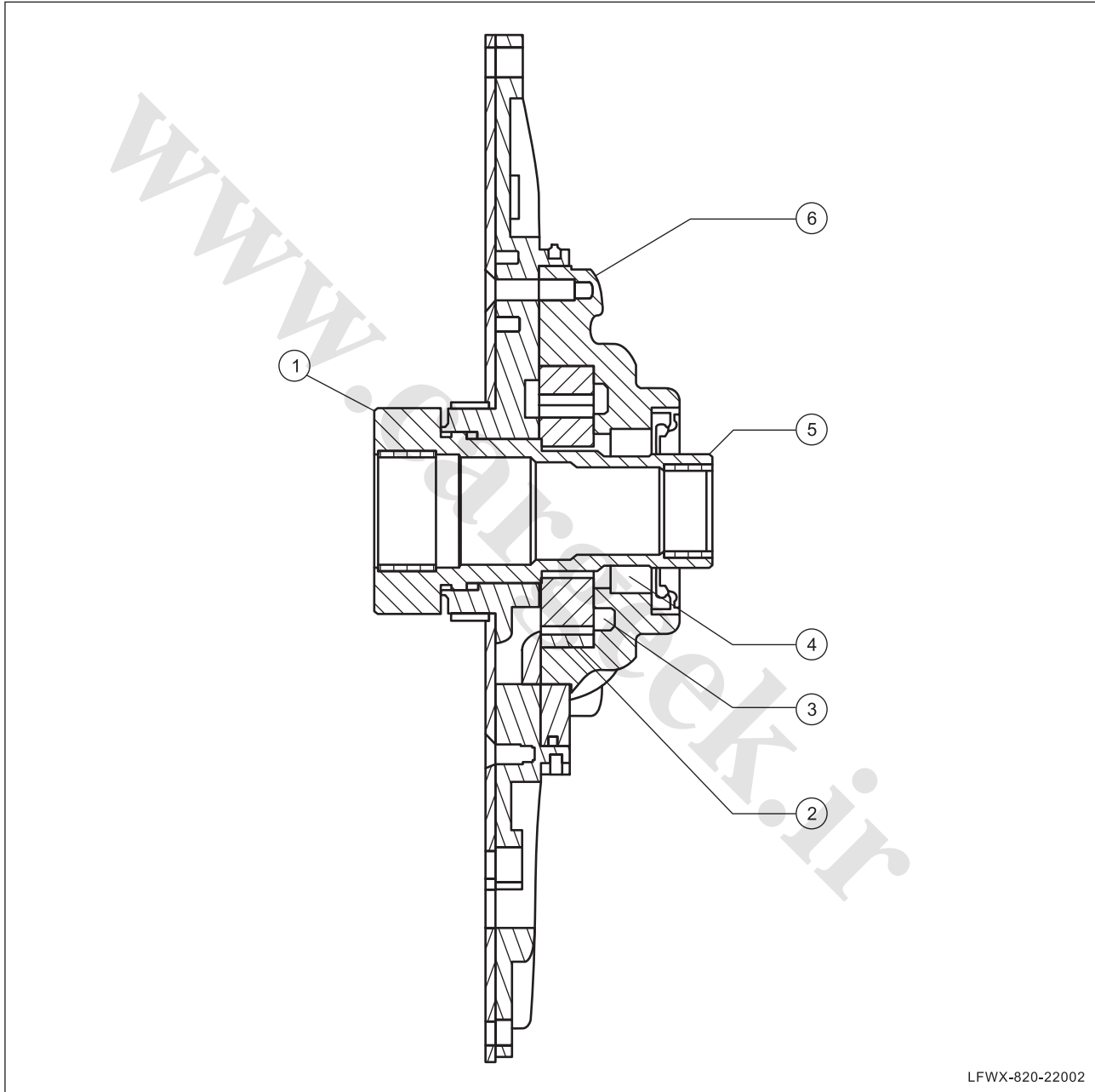
(d) Torque converter lock-up clutch.

- The torque converter lock-up clutch is a device that can eliminate the mutual sliding friction of clutches in torque converter. Therefore, it can reduce the consumption of fuels.
- The torque converter lock-up clutch can carry out sliding friction under the condition that its rotation speed is lowered than the engine normal rotation speed, thus to reduce the consumption of fuel.
- The torque converter lock-up clutch meshes and releases via the hydraulic system.
- The pressure of the piston of torque converter lock-up clutch depends on the VBS.
- In any driving gear, the torque converter lock-up clutch can be controlled to lock

up.

- When the pressure in the back chamber of the piston of the torque converter lock-up clutch is discharged, the hydraulic pressure extends from the turbine towards the piston of the fluid torque converter lock-up clutches, pressing on the housing of the torque converter. Thus the clutch between the piston and the house is locked up, and the sliding friction of the clutch can be controlled at normal temperature, and the torque can be transmitted towards the planetary gear sets.

Section of the oil pump





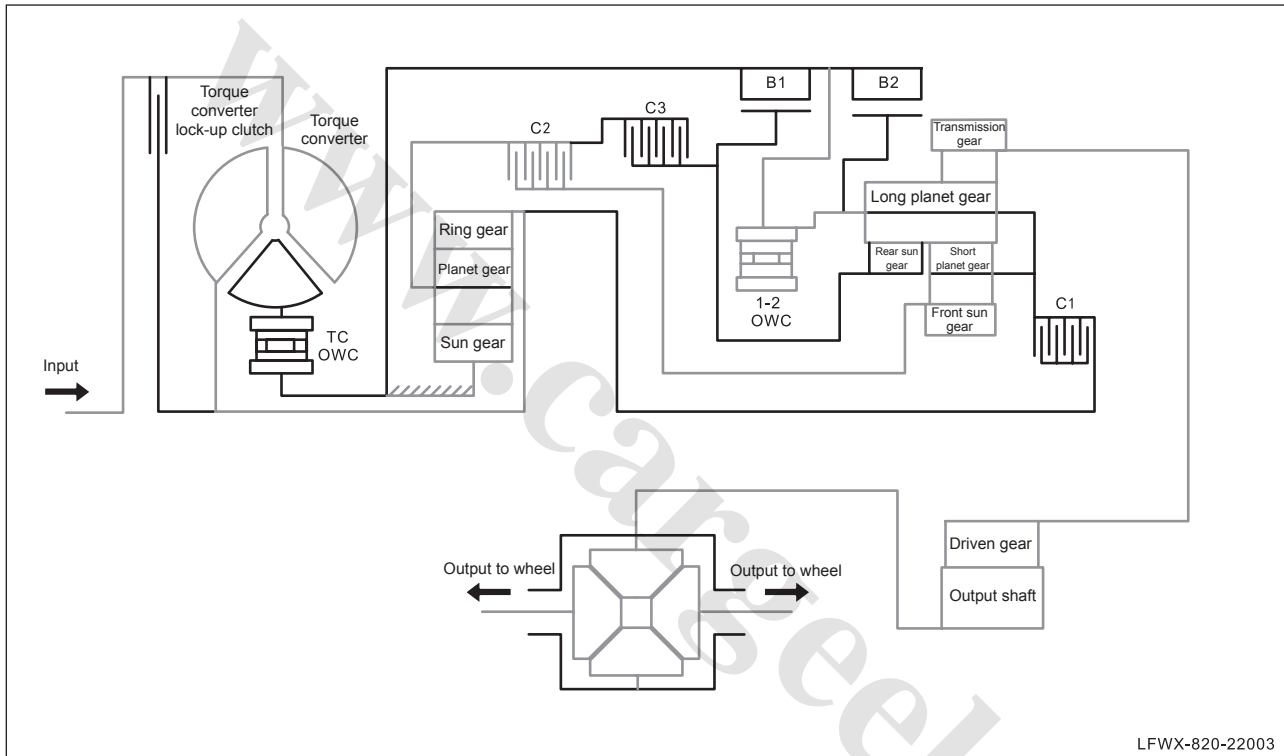
1	Sun gear (single planetary gear mechanism)	4	Support ring
2	Driven gear of the oil pump	5	Oil seal
3	Drive gear of the oil pump	6	Housing of oil pump

(f) Working principle of gear-shifting

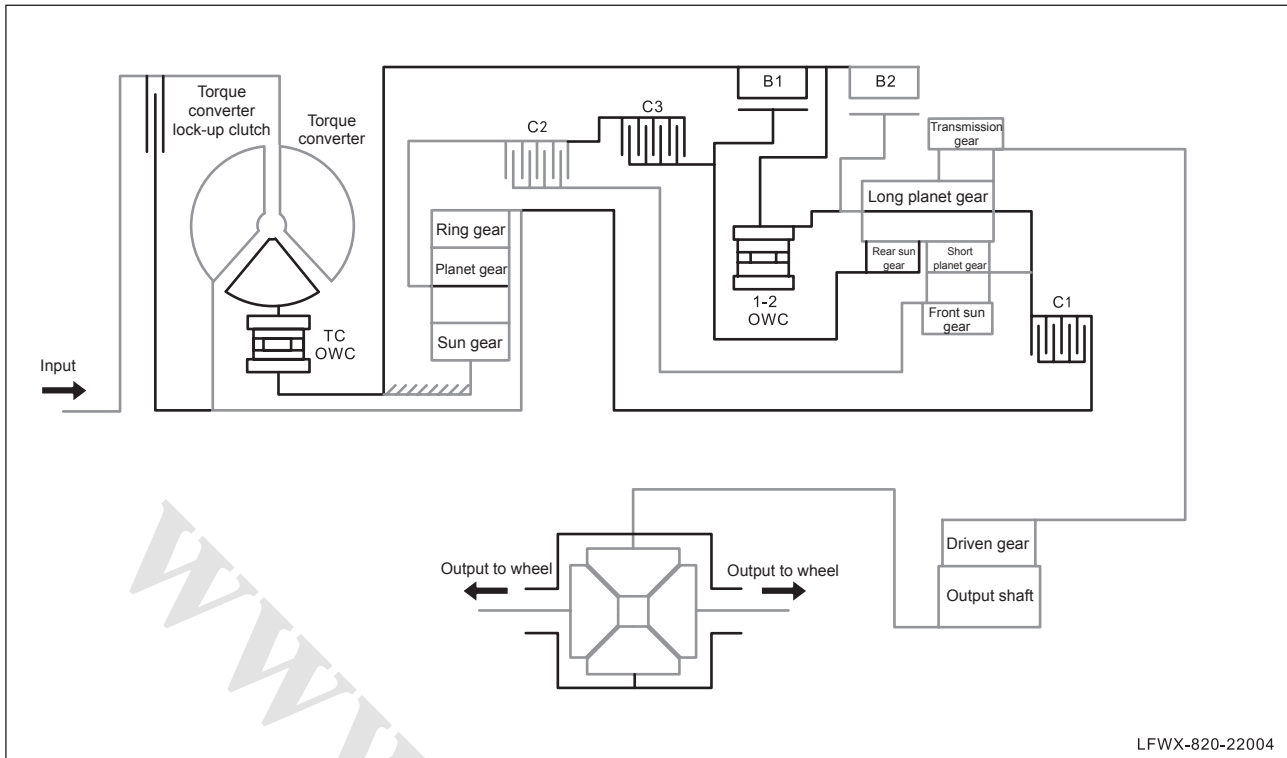
**Note:**

Gray lines stands for the power transmitting path.

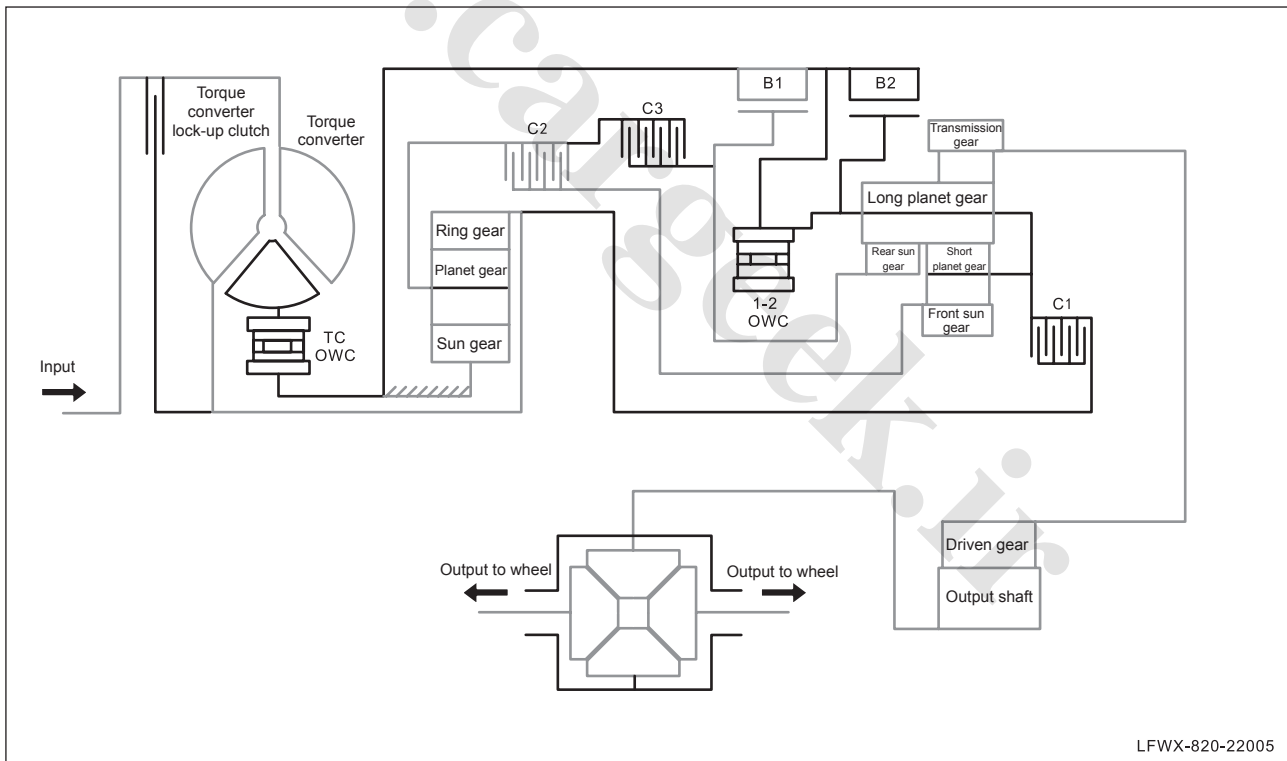
Power transmitting path of Gear 1 (Drive ratio 4.155:1)



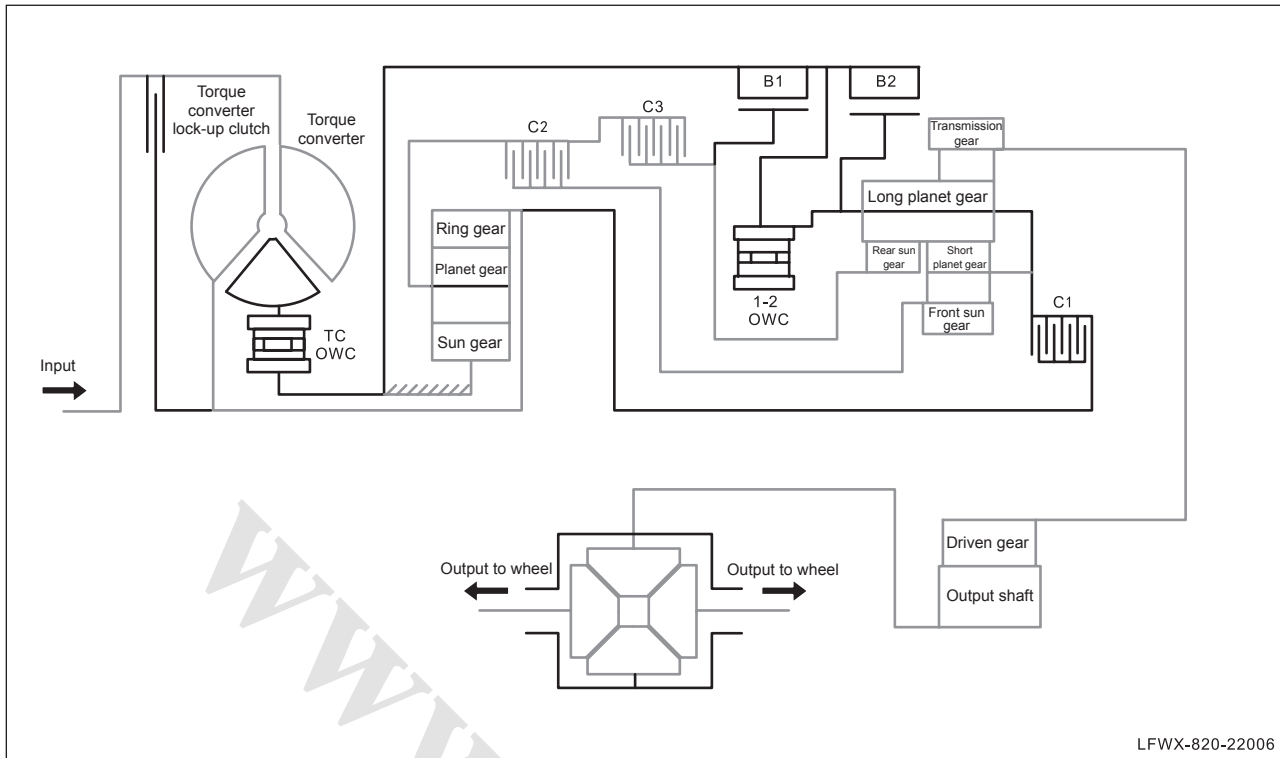
Power transmitting path of Gear 1 in manual mode (Drive ratio 4.155:1)



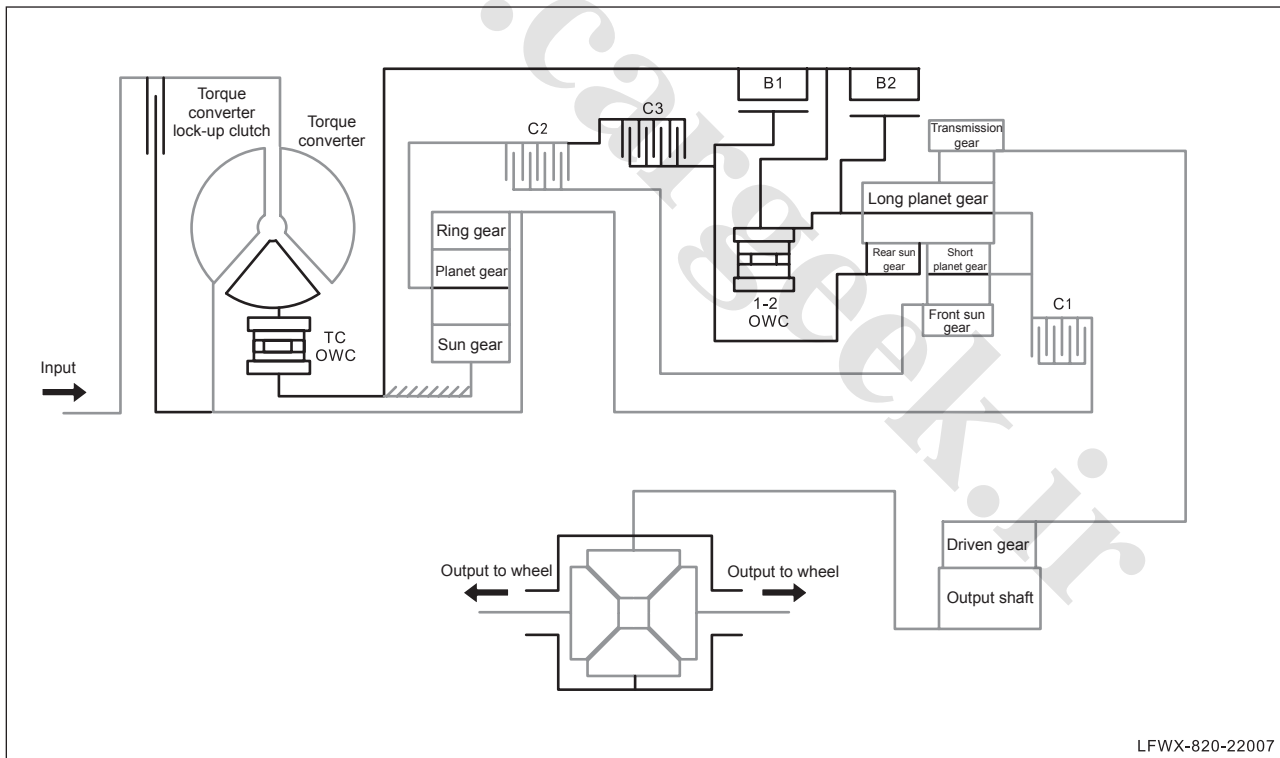
Power transmitting path of Gear 2 (Drive ratio 2.375:1)



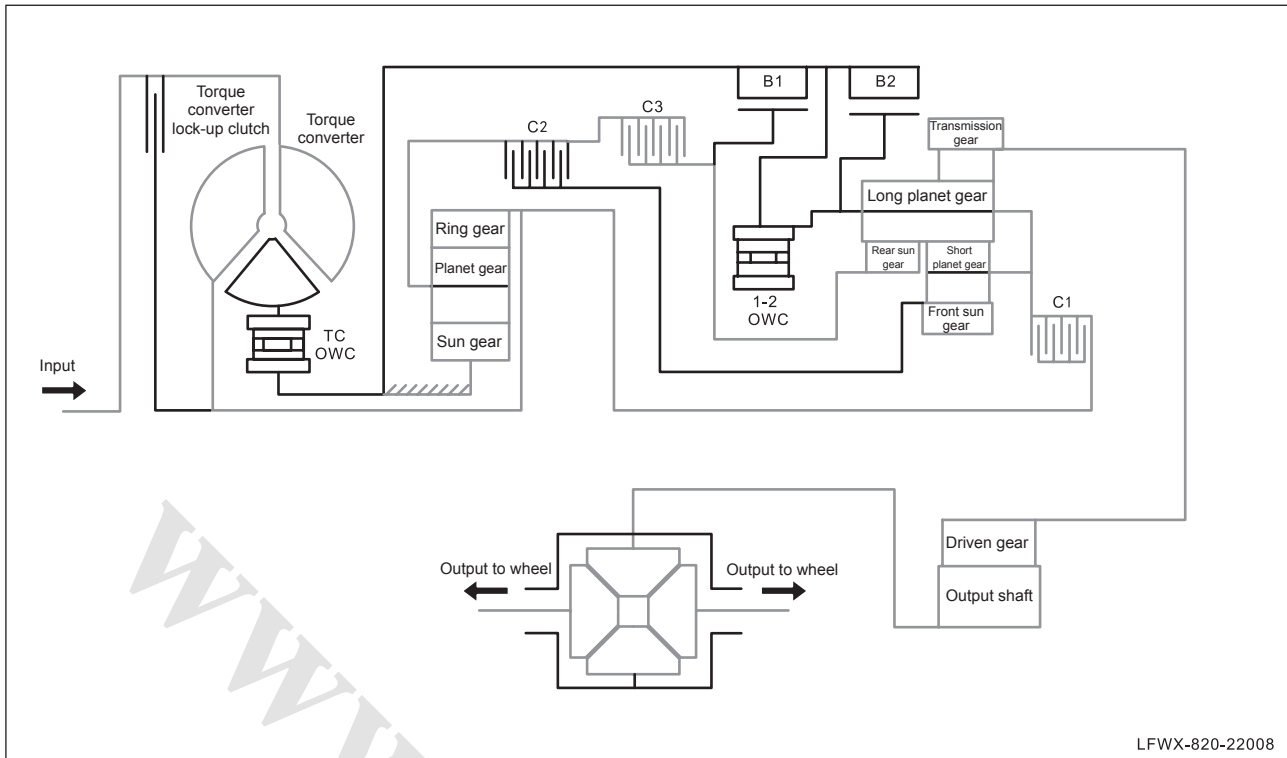
Power transmitting path of Gear 3 (Drive ratio 1.522:1)



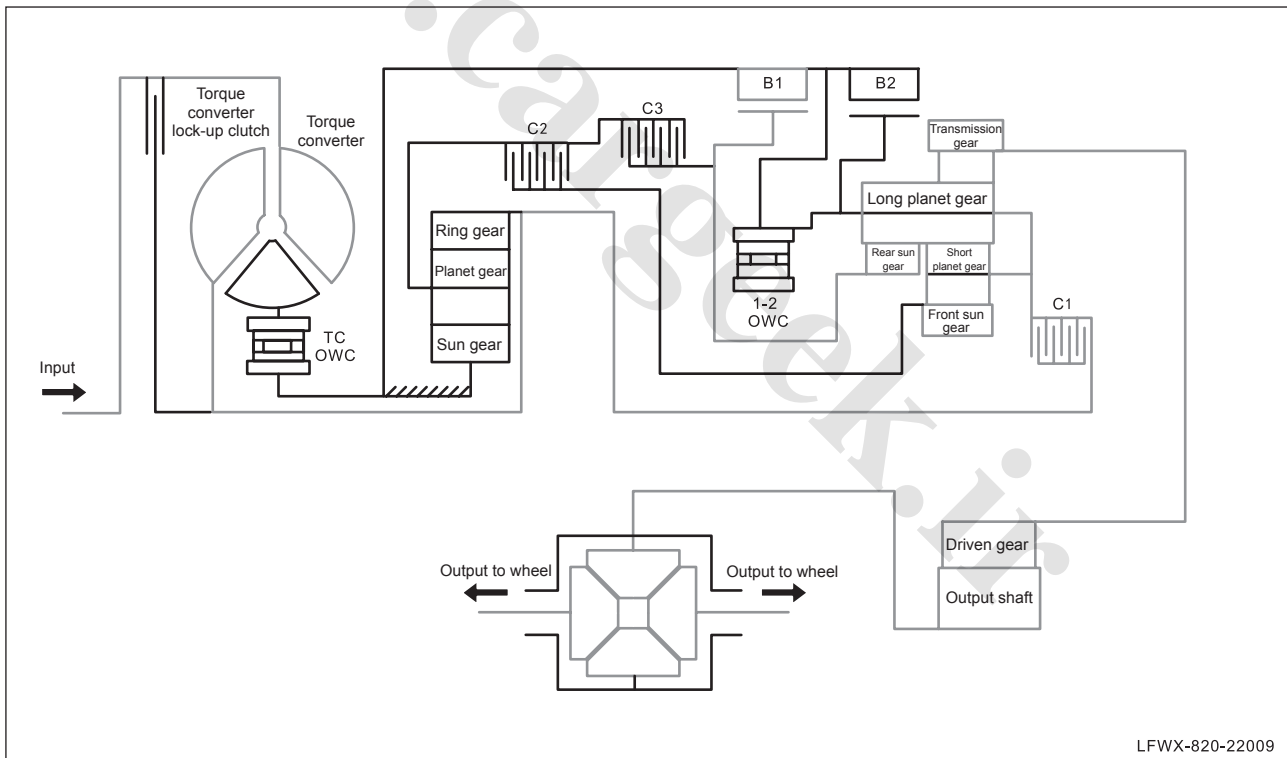
Power transmitting path of Gear 4 (Drive ratio 1.144:1)



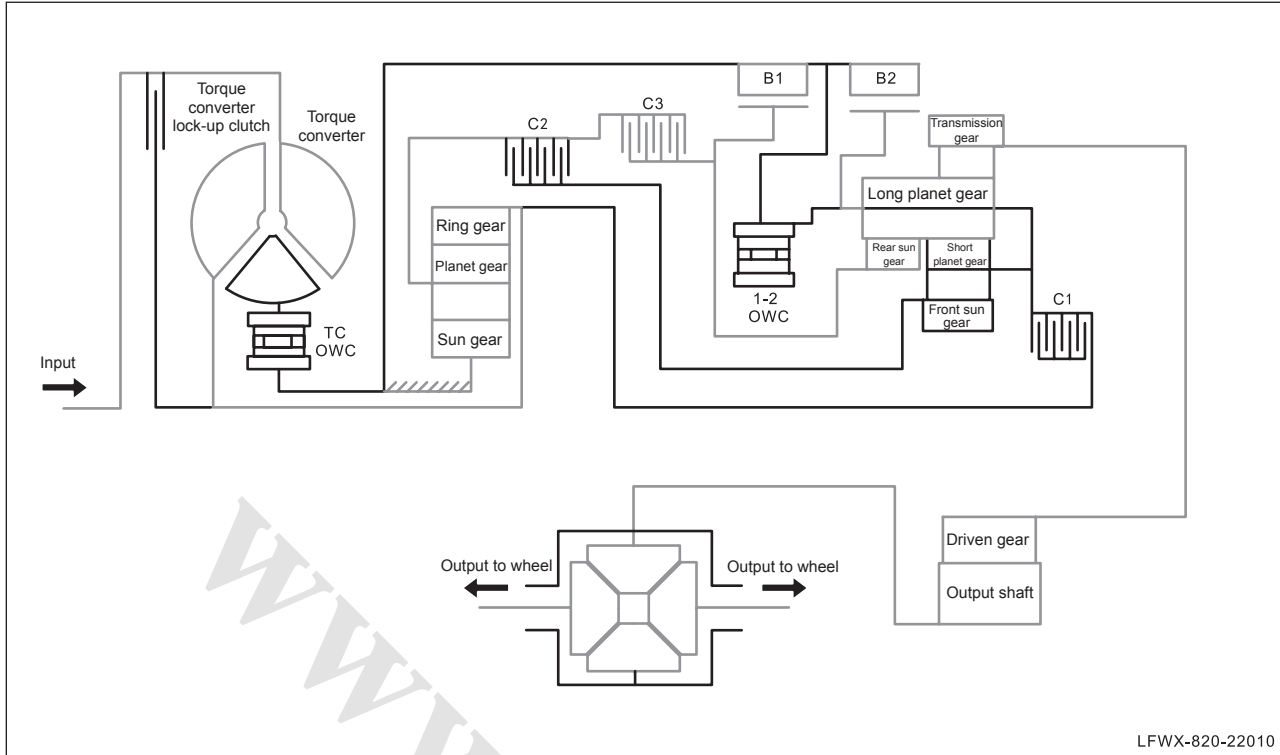
Power transmitting path of Gear 5 (Drive ratio 0.859:1)



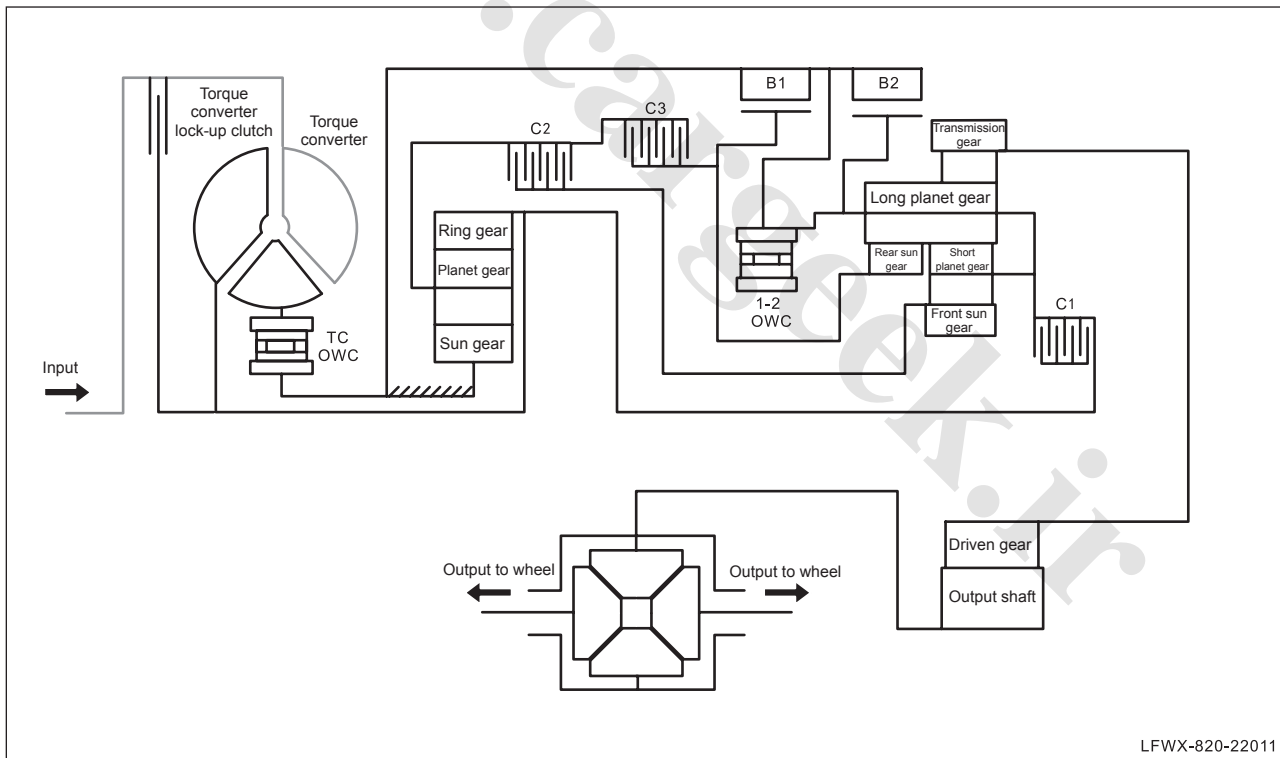
Power transmitting path of Gear 6 (Drive ratio 0.676:1)



Power transmitting ratio of Reverse Gear (Drive ratio 3.178:1)



Power transmitting ratio of Parking / Neutral



(g) Shift mode.

- Normal mode:

Normal mode is a kind of mode that the shift lever is placed in gear D and the temperature of transmission is controlled in normal range. This mode is more economical than other modes and can satisfy the regular drive.

- Uphill and downhill mode:

This kind of mode is determined by the load of the vehicle. In this mode, the transmission control unit can automatically choose different shifting-range, thus to adjust the shifting point and lock point of torque converter gradually.

- High altitude mode:

Due to the influence of air pressure and temperature variation at high altitude, the torque generated by the engine will be decreased. Thus, the shifting point will be adjusted automatically at high altitude to modify the change of torque decrease generated by the engine.

- Gear-skipping mode:

The transmission provides a function of shifting gears by two or three gears, such as shifting from gear 5 to gear 3, gear 6 to gear 4 or gear 2 to gear 4 etc., thus to modify the change of torque decrease generated by the engine.

- Pre-heating mode:

This kind of mode is commonly used under the condition when the oil temperature of transmission is lower than 20 °C . If this mode is activated, the torque converter will not be locked even if the oil temperature is lower than 20 °C in order to shorten the time of preheating.

- High temperature mode:

The high temperature mode will be activated if the oil temperature is between 110 °C and 145 °C . The locking range of torque converter will be increased to prevent generating too much heat caused by the increase of torque converter. Other components and parts which are used to relieve the high temperature of transmission fluid will be activated. If the oil temperature exceeds 110 °C , the radiator fan will be activated. If the oil temperature exceeds 130 °C , the torque of the engine will be decreased. If the oil temperature exceeds 145 °C , the transmission will stop working until the temperature is lower than 120 °C . It is the final safeguard. Many functions of transition, including the correction of uphill and downhill mode and high altitude mode, will be restrained if the high temperature mode is activated. If the torque converter is locked during gear shift, it may decrease the sense of shifting. Exit from the high temperature mode only when the ATF temperature is lower than 105°C .

- Cruise mode:

After activating cruise mode, engine ECU requests transmission to downshift, at the moment, the accelerator pedal is in automatic constant condition to improve the engine brake.

#### (h) Transmission control system elements.

- Transmission control unit (TCU);

TCU and its input/output bus control the following operation:

Gear control;

Oil pressure control;

Clutch pressure control;

Control of hydraulic torque converter lockup clutch

In addition, TCU determines drive operation method through receiving the relevant sensor signal and switch input signal.

Based on these input signals, TCU can judge whether the gear shift requirements are satisfied or the working condition for the hydraulic torque converter lockup clutch is satisfied. At the same time, TCU can calculate the working pressure to make the gearshift smoothly and comfortably. TCU controls gear shifting through six pressure-adjustable solenoid valves and four on/off solenoid valves.

- Embedded memory module;

Embedded memory module is matched with the valve body of transmission in the process of manufacturing.

EMM is installed on the input shaft speed sensor of the valve body of transmission.

The data in EMM includes specific feature information of transmission. After installation, the data will be uploaded through EMM and used when the transmission is working.

- Solenoid valve and variable flow solenoid valve solenoid;

The valve body includes four on/off solenoid valves and six variable flow solenoid valves solenoid. On/off solenoid valve can realize two functions, which are to open and close. These valves are used to change the flow and the on/off of the hydraulic system. The variable flow solenoid valves can convert the current into the hydraulic pressure equally.

- Speed sensor;

The input shaft speed sensor and the output shaft speed sensor are integrated together, and both of them are Hall sensors. The sensors are installed in the transmission, under the valve body.

- Transmission fluid temperature sensor;

The fluid temperature sensor of transmission is installed on the wiring harness of the valve body. TCU will activate different gear-shifting strategies according to the input of its oil temperature sensor. The sensor consists of a temperature sensor,

which tests the reasonableness of the readings. If the input signal of the temperature sensor is not within the normal working range, it may be resulted by short circuit or broken circuit of the temperature sensor.

- Gears switch;

TCU determines the position of shift lever according to the position of gear switch.

The gear switch is connected with the shift shaft, and the selector can realize the

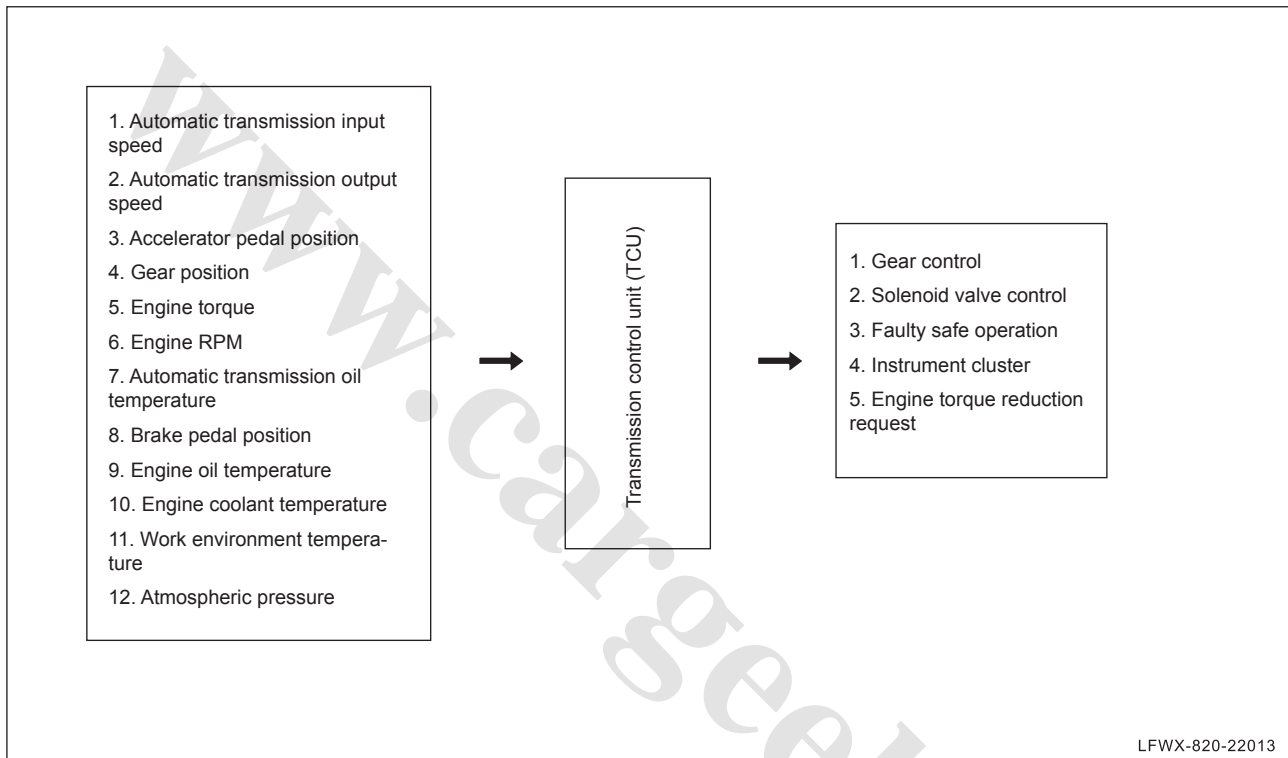
movement of changeover among gears P, R, N, and D through controlling the gear switches.

As for manual mode, the gear switch will detect the driver's selection range between "+" or "-" and sends the detected signal to TCU.

**Note:**

The engine cannot be started if the gear switch is not located on the position of gear P or gear N or the connection of gear switch breaks.

**Electrical diagram**



**Service data**

**1. Technical specifications table**

ATF specification	ATF3292
ATF filling amount	7.5L

**2. The relationship between the temperature and the electric resistance of the fluid temperature sensor of automatic transmission**

Temperature	Min. resistance	Max. resistance	Temperature	Min. resistance	Max. resistance
-40°C	1467mΩ	1896mΩ	60°C	11.53kΩ	12.73kΩ



Temperature	Min. resistance	Max.resistance	Temperature	Min. resistance	Max.resistance
-30°C	778.4kΩ	984.2kΩ	70°C	8.161kΩ	8.916kΩ
-20°C	430.7kΩ	533.9kΩ	80°C	5.880kΩ	6.360kΩ
-10°C	247.3kΩ	301.1kΩ	90°C	4.306kΩ	4.614kΩ
0°C	146.8kΩ	175.7kΩ	100°C	3.201kΩ	3.399kΩ
10°C	89.95kΩ	106kΩ	110°C	2.392kΩ	2.562kΩ
20°C	56.74kΩ	65.86kΩ	120°C	1.811kΩ	1.955kΩ
30°C	36.76kΩ	42.10kΩ	130°C	1.388kΩ	1.510kΩ
40°C	24.43kΩ	27.61kΩ	140°C	1.075kΩ	1.179kΩ
50°C	16.60kΩ	18.54kΩ	150°C	0.843kΩ	0.930kΩ

### 3. Table of tightening torque

Item	N•m
Oil level inspection bolt	25~30
Oil drain plug	25~30
Gear switch lever fixing nut	14~20
Transmission fixing bolt	40~60
Torque converter fixing bolt	33~36
Gear shifting flexible shaft sealing pressure plate fixing bolt	8~12
Gear shift flexible shaft fixing nut	14~20
Gear shifter assembly fixing bolt	22~28
Automatic transmission control module fixing bolt	8~12
Oil cooler fixing bolt	8~12
Fixing bolts of oil pipe clamp	20~26

## Precautions

- Automatic transmission should be applied with special automatic transmission fluid (ATF) to ensure that the transmission works normally within its service life. ATF must be replaced every 60000km.**
- When the vehicle can not drive due to fault, please do not make the transmission work forcibly, otherwise, the transmission will be damaged.**

3. Gear shift lever is forbidden to shift to P gear when the vehicle with AT is running or the vehicle is not stopped completely.
4. The automatic transmission consists of many components with high precision, so be careful to avoid scratch or damage when removing and reinstalling them.
5. Cover rubber pad onto the working table.
6. When removing and installing parts, do not wear gloves and use any cleaning cloth; if necessary, use nylon cloth or paper.
7. Clean all removed parts. Use common solvent to wash mental parts and dry then with compressed air.
8. Use ATF to wash clutch disc, thrust plate and rubber parts and keep clean after washing. If the transmission is damaged and needed to be repaired, remove and wash the ATF cooler system.
9. Replace gasket, O-ring and oil seal after removing them.
10. During final assembly of transmission, it is forbidden to use any lubricating grease to lubricate or maintain parts except blue Vaseline oil or white Vaseline oil.
11. Before installation, apply ATF onto the friction parts, rotating parts or sliding parts and before installing clutch driven disc or brake disc, immerse then into ATF for at least 2 hours.
12. It is forbidden to apply sealant or adhesive onto the gasket.
13. If it is needed to replace the lining, replace the lining components assembly.
14. Replace ATF in the transmission cooler and oil inlet and outlet pipes as well.
15. Before towing the vehicle with 6AT, remove the drive shaft or lift the drive axle; reverse towing is forbidden.

## Gear shift strategy

### 1. Gear change

Transmission gear change is controlled by TCU. Transmission Control Unit (TCU) receives different signals from the engine and each sensor, select appropriate gear curve and control gear shift quality and action of hydraulic torque converter clutch during every gear shift process.

### 2. Coasting downshifting

Coasting downshifting happens during the process from coasting to stop of vehicle. Release accelerator pedal completely to make the transmission downshift automati-

cally during vehicle coasting deceleration.

### 3. Torque requirements

When the required torque is larger than the torque supplied by the engine under the drive ratio, transmission will activate the hydraulic torque converter clutch to supply extra torque output.

### 4. Manual mode

- (a) Different from the manual transmission, the manual mode of automatic transmission includes some automatically controlled factors to avoid too high engine RPM and damage to transmission.
- (b) When gear shift lever is in M position, the driver can define the appropriate gear through "+" or "-" on the lever. When the shift lever is moved to "M" position firstly, the transmission will select the lowest applicable gear.

#### ⓘ Note:

- **If quite higher gear is selected under the condition of too low speed or quite lower gear is selected under the condition of too high speed, the gear shift will not be performed in view of vehicle safety.**
- **If the engine RPM or vehicle speed is too low, the transmission will downshift automatically to keep the lowest engine RPM. Downshifting process is the same with the automatic control process of D gear.**
- (c) In the manual mode functions, the upshifting should meet some speed requirements to avoid the influence on normal engine running and safety due to low engine RPM, otherwise, the upshifting will not be realized.

The following table is the upshifting min. speed under the manual mode (the actual speed has deviation probably).

Up-shift	1-2	2-3	3-4	4-5	5-6
Speed km/h	>0	>12	>38	>45	>69

- (d) In the manual mode functions, the downshifting should meet some speed requirements to avoid the influence on normal engine running and safety due to high engine RPM, otherwise, the downshifting will not be realized.

The following table is the upshifting min. speed under the manual mode (the actual speed has deviation probably).

Downshifting	6-5	5-4	4-3	3-2	2-1
Speed km/h	<170	<146	<110	<70	<40

- (e) When keeping the gear shift lever in the upshifting or downshifting position for more than 500ms, the system will default to running in max. or min. speed desired by driv-

er, at the moment, even if the manual operation is not performed again, the gear will gradually shift between max. speed and min. speed allowed by the current speed.

- (f) When the accelerator pedal position is over 80%, the system will exit the manual mode , and at the moment, the D gear control will be performed.

During manual shifting of automatic transmission, there is slight impact sometimes, but this is not always the AT fault.

- (g) When gear shift lever is in M position, the driver can define the appropriate gear through "+" or "-" on the lever.

When the shift lever is moved to "M" position firstly, the transmission will keep the current gear.

- (h) When the highest engine speed is achieved, the transmission will control the upshifting automatically whatever the driver selects.

- (i) 1st gear state.

1st gear state will display on the instrument cluster. Different from the 1st gear under the automatic mode, engine brake can be used under the manual state.

- (j) 2nd gear state.

2nd gear state will display on the instrument cluster. 2-1 automatic kickdown can be realized through depress accelerator pedal abruptly and engine brake can be used under the 2nd gear state.

- (k) 3rd gear state.

3rd gear state will display on the instrument cluster. 3-1 or 3-2 automatic kickdown can be realized through depress accelerator pedal abruptly and engine brake can be used under the 3rd gear state.

- (l) 4th gear state.

4th gear state will display on the instrument cluster. 4-3 or 4-2 automatic kickdown can be realized through depress accelerator pedal abruptly and engine brake can be used under the 4th gear state.

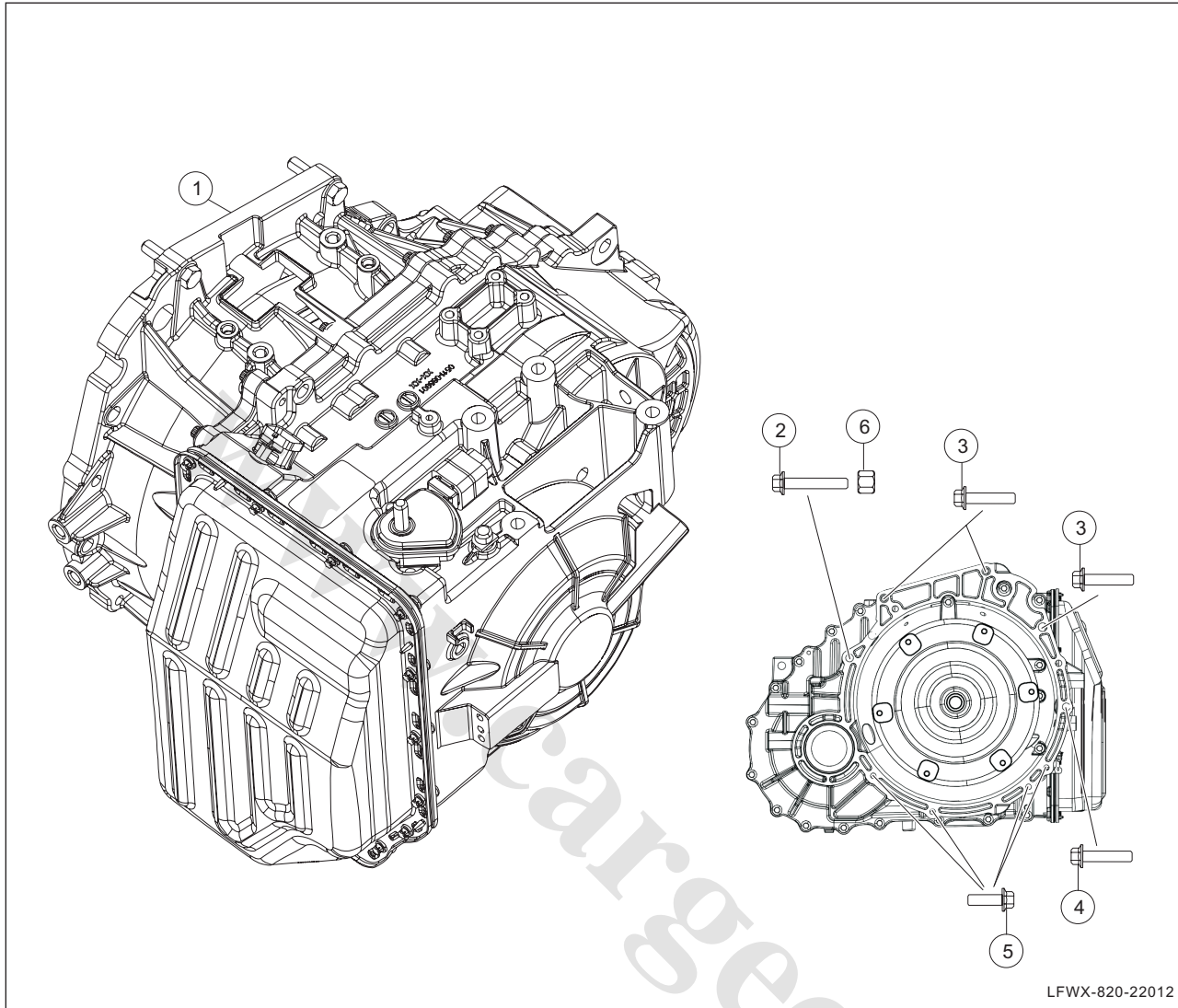
- (m) 5th gear state.

5th gear state will display on the instrument cluster. 5-4 or 5-3 automatic kickdown can be realized through depress accelerator pedal abruptly and engine brake can be used under the 5th gear state.

- (n) 6th gear state.

6th gear state will display on the instrument cluster. 6-5 or 6-4 automatic kickdown can be realized through depress accelerator pedal abruptly and engine brake can be used under the 6th gear state.

## Components



1	Transmission assembly
2	Hexagon bolt with flange
3	Hexagon bolt with flange

4	Hexagon bolt with flange
5	Hexagon bolt with flange
6	Hexagon nut with flange

## Diagnosis

### Diagnostic Description

△ HINT:

Begin the system diagnosis after being familiar with the automatic transmission system function and operation, which is helpful to confirm correct fault diagnosis steps after fault occurs and confirm whether the described condition by the client is normal.

#### 1. Diagnosis introduction:

- (a) If the following symptoms of the automatic transmission occurs suddenly, maybe they are caused by mechanical problems:
- Noise or vibration;
  - ATF leaks;
  - The vehicle can not drive or reverse.
- (b) The following problems maybe causes control system fault:
- EMC has fault;
  - Gear switch has fault;
  - Wire harness connector has fault.

### Control system check

#### 1. Strategy for searching diagnosis fault

△ HINT:

Please follow the following steps to check the automatic transmission fault.

- (a) Collect fault information from the owner as much as possible.
- (b) Verify the fault described by the owner.
- (c) Check the DTC of automatic transmission of vehicle.
- (d) If any DTC, please record the DTC.
- (e) Perform the road test and then verify the fault condition.
- (f) If DTC occurs again, refer to the DTC list and perform diagnosis according to the DTC.
- (g) After repair, perform road test again to ensure that the DTC has been eliminated.

## Stall test

△ HINT:

Stall test is allowed to perform to automatic transmission to make sure that the transmission - clutch can bear all torque of engine without slipping.

- (a) The time of stall test should not be more than 10s.
- (b) Start the parking brake.
- (c) Start the engine.
- (d) Depress the brake pedal and hold it.
- (e) Shift to "Drive" (D gear).
- (f) Depress the accelerator pedal completely and hold for 6s.
- (g) Observe the engine RPM.
- (h) Release the accelerator pedal.
- (i) Shift to "Reverse" (R gear).
- (j) Depress the accelerator pedal and hold for 6s.
- (k) Observe the engine RPM; if the RPM is more than 3000rpm, it indicates that there is hardware fault in the transmission.

## Transmission TCU reset

**Note:**

The following procedures shall be performed to reset the transmission TCU after replacing the automatic transmission assembly or transmission control unit (TCU).

### 1. Transmission TCU optional and reset self-adaptive value

- (a) Connect fault diagnostic scanner.
- (b) Place transmission gear shift lever in "P" position to make the system power in "ON" position (the engine does not start).
- (c) Enter "OFF-line optional process" - "Write transmission TCU\_VIN code code"; select corresponding option according to vehicle condition and operate according to hint.

**Note:**

Perform step (c) only when replacing transmission TCU.

### 2. Quick self-learning process

**Note:**

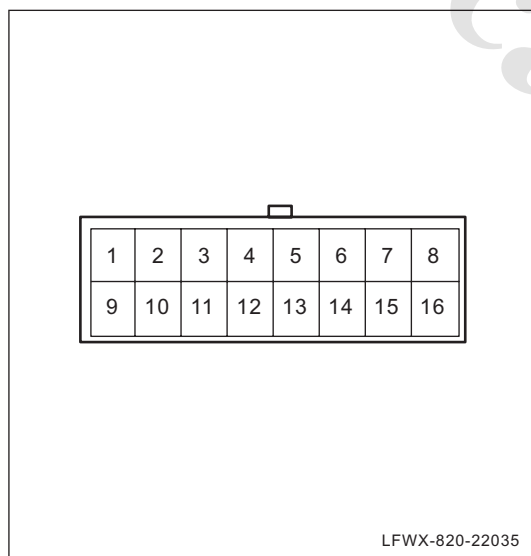
In the following operating process of self-learning, the oil temperature must be kept within the range of 70°C ~95°C , otherwise, the condition for the self-learning can not

**be satisfied.**

- (a) Perform static shifting in place (start the engine and depress the brake); shift from R to N and N to D for 15-20 times.
- (b) Perform self-learning of upshifting (1 → 2, 2 → 3, 3 → 4, 4 → 5, 5 → 6) and downshifting (6 → 5, 5 → 4, 4 → 3, 3 → 2 or 3 → 1, 2 → 1) for about 15-20 times in D gear with accelerator opening of about 20%-30%.

## △ HINT:

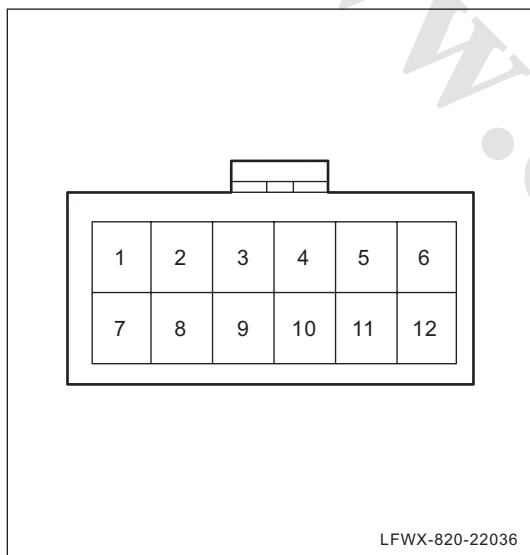
- When performing about 20% upshifting of accelerator pedal, the maximum engine RPM can reach about 2200.
  - Confirm whether the engine accelerator pedal is correct through observing tachometer and read the accelerator pedal opening through diagnostic scanner.
  - When depressing the pedal, keeping the accelerator pedal steady is very important. If change the accelerator pedal too much, self-learning can not be performed probably.
- (c) Perform some regular upshifting and downshifting driving with open accelerator.
- (d) Complete self-learning process.

**List of automatic transmission terminal definition**

Terminal No.	Color	Function
1	0.50 Bl/W	Signal of TCU variable flow control solenoid valve 9
2	0.50 Gr/R	Signal of TCU variable flow control solenoid valve 10
3	0.50 Y/R	Signal of TCU variable flow control solenoid valve 7
4	0.50 Br/W	Signal of TCU variable flow control solenoid valve 8
5	0.50 W/R	Signal of TCU variable flow control solenoid valve 5



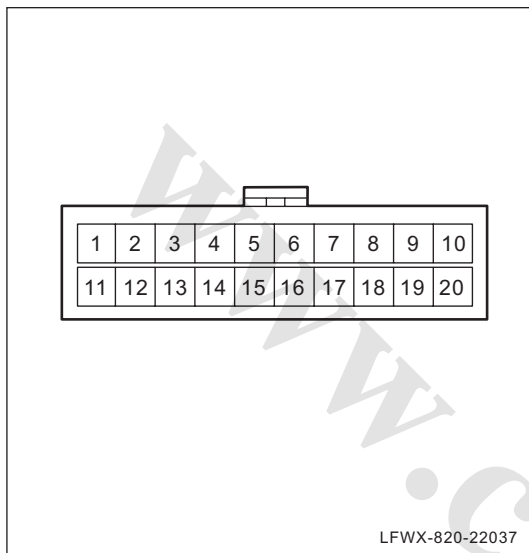
Terminal No.	Color	Function
6	0.50 G/W	Signal of TCU variable flow control solenoid valve 6
7	1.25 B/W	Circuit of TCU variable flow control solenoid valve
8	1.25 B	Power grounding
9	1.25 B/Y	Control signal of TCU on-off solenoid valve 2
10	1.25 O/W	Control signal of TCU on-off solenoid valve 1
11	0.50 R/B	Control signal of TCU on-off solenoid valve 4
12	0.50 W/B	Control signal of TCU on-off solenoid valve 3
13		NC
14		NC
15	1.25 V/W	Circuit of TCU on-off solenoid valve
16	1.25 R	TCU 控制器 IG1 电源



(b) To TCU-J2

Terminal No.	Color	Function
1		NC
2		NC
3		NC
4	0.50 BI	TCU manual mode signal (upshifting and downshifting)
5		NC
6		NC
7		NC

Terminal No.	Color	Function
8		NC
9		NC
10	0.50 Y	TCU automatic mode switch mode signal
11		NC
12		NC



(c) To TCU-J3

Terminal No.	Color	Function
1	0.50 V/B	Output shaft speed sensor signal
2	0.50 Br/R	EMM/Speed sensor power supply
3	0.50 Gr/Y	Input shaft speed sensor signal
4	0.50 G/R	EMM data communication line
5		NC
6	0.50 V	Snow mode switch signal
7	0.50 W/BI	TCU gear signal
8	0.50 O/B	TCU oil temperature sensor signal
9	0.50 G	TCU controller P gear lockup solenoid valve control
10	0.30 Y	TCU controller PCANH
11		NC
12	0.50 BI/R	EMM/Speed sensor power supply grounding
13		NC
14	0.50 Y/B	EMM clock signal

Terminal No.	Color	Function
15	0.50 W	Switch signal grounding (snow, manual P gear lock-up)
16		NC
17	0.50 R/Y	TCU gear signal grounding
18	0.50 B/R	TCU oil temperature sensor signal circuit
19		NC
20	0.30 Y/B	TCU controller PCANL

## DTC list

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
P0603	TCU self-adaptive data storage error	1. TCU power supply and grounding circuit fault 2. TCU assembly damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (1. P0603, P0604, P1604, P1701, P1703 - TCU internal circuit fault and TCU power supply fault)
P0604	TCU self-adaptive data limit is achieved		
P1701	TCU power voltage is low		
P1703	TCU power voltage high		
P1604	TCU EMM data error		
P0707	Gear shift lever position sensor voltage low	1. Gear switch damaged 2. Gear switch wire harness short circuit or open circuit 3. TCU assembly damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (2. P0707, P0708 - gear shift position sensor (gear switch) fault)
P0708	Gear shift lever position sensor voltage high (open circuit)		
P0711	Transmission fluid temperature too high	1. Automatic transmission coolant 2. Automatic transmission cooling system 3. Engine cooling system fault	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (3. P0711 - transmission fluid temperature too high)

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
P0712	Transmission fluid temperature sensor voltage low (short circuit)	<ol style="list-style-type: none"> <li>1. Solenoid valve and wire harness assembly</li> <li>2. TCU damaged</li> <li>3. Automatic transmission damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (3. P0712, P0713 - transmission fluid temperature sensor circuit fault)
P0713	Transmission fluid temperature sensor voltage high (open circuit)		
P1605	EMM data unmatched	<ol style="list-style-type: none"> <li>1. Solenoid valve and wire harness assembly</li> <li>2. TCU damaged</li> <li>3. Automatic transmission damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (5. P1605, P1611 - transmission internal memory module (EMM) fault)
P1610	EMM communication error		
P1611	EMM data error		
P09A3	EMM and speed sensor short circuit		
P0500	Drive shaft speed sensor value	<ol style="list-style-type: none"> <li>1. Solenoid valve and wire harness assembly</li> <li>2. TCU damaged</li> <li>3. Automatic transmission damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (6. P0716, P0717 - input shaft speed sensor fault)
P0503	Drive shaft speed sensor value unstable		
P0716	Input shaft/turbine speed value		
P0717	Input shaft/turbine speed sensor signal unstable		
P071D	Manual upshifting and downshifting control (gear shift lever) stuck	<ol style="list-style-type: none"> <li>1. Gear shift mechanism assembly</li> <li>2. Gear shift mechanism assembly wire harness</li> <li>3. TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (7. P0721, P0722 - output shaft speed sensor fault)
P071E	Manual upshifting and downshifting control (gear shift lever) signal low		
P071F	Manual upshifting and downshifting control (gear shift lever) signal high (open circuit)		
P0721	Output shaft speed sensor value	<ol style="list-style-type: none"> <li>1. Solenoid valve and wire harness assembly</li> <li>2. TCU damaged</li> <li>3. Automatic transmission damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (8. P071D, P071E, P071F - manual and automatic gear selector mode switch circuit fault)
P0722	Output shaft speed sensor signal unstable		

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
P0729	Gear ratio of gear 6 error	<ol style="list-style-type: none"> <li>Automatic transmission fluid quality poor</li> <li>Automatic transmission fluid level unqualified</li> <li>Automatic transmission assembly damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (9. P0729, P0731, P0732, P0733, P0734, P0735, P0736 - gear ratio error)
P0731	Gear ratio of gear 1 and M1 error		
P0732	Gear ratio of gear 2 error		
P0733	Gear ratio of gear 3 error		
P0734	Gear ratio of gear 4 error		
P0735	Gear ratio of gear 5 error		
P0736	Gear ratio of reverse gear error		
P0741	Hydraulic torque converter clutch circuit can not be closed	<ol style="list-style-type: none"> <li>Automatic transmission fluid quality</li> <li>Automatic transmission fluid level</li> <li>Automatic transmission assembly</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (10. P0741, P0742. P0744 - hydraulic torque converter clutch fault)
P0742	Hydraulic torque converter clutch circuit can not be opened		
P0744	Clutch of torque converter sliding error		
P0962	Variable flow solenoid valve S9 short circuit	<ol style="list-style-type: none"> <li>S9 solenoid valve damaged</li> <li>Solenoid valve wire harness (short circuit or open circuit)</li> <li>TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (11. P0962, P0963 - variable flow solenoid valve (VBS) S9 circuit fault)
P0963	Variable flow solenoid valve S9 open circuit		
P0966	Variable flow solenoid valve S10 short circuit	<ol style="list-style-type: none"> <li>S10 solenoid valve damaged</li> <li>Solenoid valve wire harness (short circuit or open circuit)</li> <li>TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (12. P0966, P0967 - variable flow solenoid valve (VBS) S10 circuit fault)
P0967	Variable flow solenoid valve S10 open circuit		
P0985	Variable flow solenoid valve S5 short circuit	<ol style="list-style-type: none"> <li>S5 solenoid valve damaged</li> <li>Solenoid valve wire harness (short circuit or open circuit)</li> <li>TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (13. P0985, P0996 - variable flow solenoid valve (VBS) S5 circuit fault)
P0986	Variable flow solenoid valve S5 open circuit		

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
P0998	Variable flow solenoid valve S6 short circuit	1. S6 solenoid valve damaged 2. Solenoid valve wire harness (short circuit or open circuit) 3. TCU damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (14. P0998, P0999 - variable flow solenoid valve (VBS) S6 circuit fault)
P0999	Variable flow solenoid valve S6 open circuit		
P099B	Variable flow solenoid valve S7 short circuit	1. S7 solenoid valve damaged 2. Solenoid valve wire harness (short circuit or open circuit) 3. TCU damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (15. P099B, P099C - variable flow solenoid valve (VBS) S7 circuit fault)
P099C	Variable flow solenoid valve S7 open circuit		
P099E	Variable flow solenoid valve S8 short circuit	1. S8 solenoid valve damaged 2. Solenoid valve wire harness (short circuit or open circuit) 3. TCU damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (16. P099E, P099F - variable flow solenoid valve (VBS) S8 circuit fault)
P099F	Variable flow solenoid valve S8 open circuit		
P0973	ON-OFF solenoid valve S1 short circuit	1. S1 solenoid valve damaged 2. Solenoid valve wire harness (short circuit or open circuit) 3. TCU damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (17. P0973, P0974 - ON/OFF solenoid valve S1 circuit fault)
P0974	ON/OFF solenoid valve S1 open circuit		
P0976	ON-OFF solenoid valve S2 short circuit	1. S2 solenoid valve damaged 2. Solenoid valve wire harness (short circuit or open circuit) 3. TCU damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (18. P0976, P0977 - ON/OFF solenoid valve S2 circuit fault)
P0977	ON/OFF solenoid valve S2 open circuit		

<b>Fault code (DTC)</b>	<b>Description of DTCs</b>	<b>Possible causes</b>	<b>Recommended action</b>
P0979	ON-OFF solenoid valve S3 short circuit	<ol style="list-style-type: none"> <li>1. S3 solenoid valve damaged</li> <li>2. Solenoid valve wire harness (short circuit or open circuit)</li> <li>3. TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (19. P0979, P0980 - ON/OFF solenoid valve S3 circuit fault)
P0980	ON/OFF solenoid valve S3 open circuit		
P0982	ON-OFF solenoid valve S4 short circuit	<ol style="list-style-type: none"> <li>1. S4 solenoid valve damaged</li> <li>2. Solenoid valve wire harness (short circuit or open circuit)</li> <li>3. TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (20. P0982, P0983 - ON/OFF solenoid valve S4 circuit fault)
P0983	ON/OFF solenoid valve S4 open circuit		
P09A1	P-LOCK solenoid valve S11 short circuit	<ol style="list-style-type: none"> <li>1. Gear P lock-up solenoid valve damaged</li> <li>2. Solenoid valve wire harness (short circuit or open circuit)</li> <li>3. TCU damaged</li> </ol>	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (21. P09A1, P09A2 - gear P lock-up solenoid valve circuit fault)
P09A2	P-LOCK solenoid valve S11 open circuit		

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
U0100	CAN bus information of EMS can not be obtained	1. TCU damaged 2. ECM, ABS ECU damaged 3. CAN bus wire harness (short circuit or open circuit)	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (22. U0100, U0121, U0146, U0415 - CAN bus communication error)
U0102	CAN information of transmission transfer case can not be obtained		
U0110	CAN bus information of EMS-1 can not be obtained		
U0120	CAN bus information of EMS-2 can not be obtained		
U0121	CAN information of brake system ECU(ABS/ESP/TCS) can not be obtained		
U0122			
U0123			
U0124			
U0130	CAN bus information of EMS-3 can not be obtained		
U0140	CAN bus information of EMS-4 can not be obtained		
U0146	Lose gateway communication		
U0150	CAN bus information of EMS-5 can not be obtained		
U0160	CAN bus information of EMS-6 can not be obtained		
U0401	CAN signal from EMS is invalid		
U0415	CAN signal from brake system controller is invalid		
,	TCU application software can not be found or be invalid	1. TCU damaged	See 22 - Automatic Transmission Diagnosis, DTC Diagnosis (23. U1601, U1606, U1607, U1608, U1609 - TCU internal software error)
U1606	TCU calibration error		
U1607	TCU calibration error - activated version		
U1608	TCU VIN code error		
U1609	TCU hardware calibration error		
U160E	The contained information of DTC is only relevant to BOSCH		

## DTC diagnosis

### 1. P0603, P0604, P1604, P1701, P1703 - TCU internal circuit fault and TCU power



## supply fault

### Description of DTC:

Transmission control unit (TCU) controls transmission through variable flow solenoid valve and ON/OFF solenoid valve. Working voltage of transmission control unit is 8V - 16V, and current consumption is usually less than 4A; but gear shifting is needed when the current exceeds 10A.

If the transmission control unit internal elements are worn to a certain extent, TCU can compensate these damages within the transmission service life by self-learning to ensure the gear shifting quality. But once the internal elements of TCU are worn to some limit, TCU can not ensure gear shifting quality by all means of self-learning; at the moment, TCU will report DTC.

### The setting conditions of DTC:

1. Place ignition switch in ON position, detect the internal fault and set DTC P0603, P0604, P1604.
2. When placing ignition switch in ON position, the engine speed is more than 300r/min, and TCU power supply voltage is lower than 8V and holds for more than 0.5s, set the DTC P1701.
3. When placing ignition switch in ON position, and TCU power supply voltage is more than 17V and holds for more than 60s, set the DTC P1703.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0603, P0604, P1701, P1703.	Go to Step 1	Refer to DTC table	
1	Check the battery voltage	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Check whether the positive and negative terminals of battery are in poor connection</li> <li>• Check whether the alternator wire harness connector is damaged or loose.</li> </ul>	Go to Step 2	Wire harness is loose or poor connection of connectors	Connect the wire harness connectors again or replace the wire harness
2	Check the TCU power supply circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U17(J-1) of the TCU wire harness with the ignition switch turned to "OFF" position</li> <li>Measure the resistance between the Terminal 16 of automatic transmission connector U17(J-1) and grounding.</li> </ul> <p><b>Standard value:</b> <b>&gt;1MΩ</b></p> <ul style="list-style-type: none"> <li>Turn the ignition switch to ON position, measure the voltage between the Terminal 16 of the automatic transmission connector U17(J-1) and grounding</li> </ul> <p><b>Standard value: 11V-14V</b></p>	Go to Step 3	The voltage is too high or the resistance is too low	Check and repair the faulty circuit
3	Check the TCU grounding circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U17(J-1) of the TCU wire harness with the ignition switch turned to "OFF" position</li> <li>Turn the ignition switch to ON position, measure the resistance between the Terminal 8 of the automatic transmission connector U17(J-1) and grounding</li> </ul> <p><b>Standard value:</b> &lt; 0 Ω</p> <ul style="list-style-type: none"> <li>Measure the voltage between the Terminal 8 of automatic transmission connector U17(J-1) and grounding.</li> </ul> <p><b>Standard value:</b> 0 V</p>	Go to Step 4	Fault still exists	Check and repair the faulty circuit
4	Check the TCU by replacing	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 5	-	-
5	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 2. P0707, P0708 - Gear shift position sensor (gear switch) fault

### Description of DTC:

Gear switch assembly provides TCU with gear shift position data and the system will prohibit the starter from running. When applying R gear, the circuit of reverse lamp is switched on. For the above functions, the gear switch has the independent circuit. Functions above can only be realized when the circuit is connected to TCU correctly.

TCU provides 5V reference signal to gear switch to measure the voltage in circuit and confirm the gear position. The resistance value differs at different gears.

### The setting conditions of DTC:

1. When ignition switch is in ON position and TCU detects the gear switch voltage is not within the proper range, then the DTC is set.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0707 and P0708	Go to Step 1	Refer to DTC table	
1	Inspect gear switch	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Inspect the resistance between Terminals No.4 and No.5 of gear switch wire connector U33 at various gears.</li> </ul> <b>Standard value:</b> <b>P gear 16.79K<math>\Omega</math> <math>\pm</math> 8%</b> <b>R gear 8.953K<math>\Omega</math> <math>\pm</math> 8%</b> <b>N gear 5.036K<math>\Omega</math> <math>\pm</math> 8%</b> <b>D gear 2.686K<math>\Omega</math> <math>\pm</math> 8%</b> <b>M gear 1.119K<math>\Omega</math> <math>\pm</math> 8%</b>	Go to Step 2	The detected result is not within the standard range	Replace the gear switch
2	Inspect signal circuit of gear switch	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect connector U33 of gear switch wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Inspect the voltage between Terminals No.4 and No.5 of gear switch wire harness connector U33.</li> </ul> <p><b>Standard value:</b> <b>5V±0.2V</b></p>	Go to Step 3	The detected voltage is not within the standard range	Replace TCU See the Replacement of Automatic Transmission Control Unit
3	Inspect gear switch circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position, disconnect the gear switch wire harness connector U33 and measure the resistance between Terminal No. 4 of U33 and Terminal No. 17 of automatic transmission control unit U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 5 of U33 and Terminal No. 7 of automatic transmission control unit U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Inspect short circuit of gear switch circuit to power supply	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Turn the ignition switch to ON position, measure the voltage between the Terminal 4 of the gear switch wire harness connector U33 and grounding Standard value: 0 V	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Check the TCU by replacing	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 3. P0711 - High transmission fluid temperature

#### Description of DTC:

TCU inspects the temperature of transmission fluid. If the cooling system cannot cool transmission fluid temperature down to a normal level, the automatic transmission control system will take prevention measures to protect the transmission and other parts from damage.

Automatic transmission control system inspects the current running condition of current circuit and calculates the change rate of transmission fluid temperature. If the performance of temperature sensor is beyond the predicted normal value, the DTC is set.

#### The setting conditions of DTC:

- When the ignition switch is in "ON" position and transmission fluid temperature is above 130°C, the DTC is set.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0711	Go to Step 1	Refer to DTC table	
1	Inspect the automatic transmission fluid level and quality	Normal	Faulty	Instruction
	See 22 - ATF, inspection	Go to Step 2	The inspection does not conform to the standard	Refill or replace the automatic transmission fluid
2	Check the engine coolant	Normal	Faulty	Instruction
	Check the engine coolant conforms to the standard	Go to Step 3	The inspection does not conform to the standard	Refill or replace the engine coolant
3	Check automatic transmission cooling system	Normal	Faulty	Instruction
	Check the A/T cooling system for leakage, blockage or pipe breakage	Go to Step 4	The A/T cooling system has leakage, blockage or pipe breakage	Repair or replace the faulty part
4	Verification and check	Normal	Faulty	Instruction
	Connect the diagnostic scanner to clear the DTC; after idling for 5 min, read the DTC again to confirm if the DTC still exists	Diagnosis end.	There is a fault code	Search the cause from other symptoms

#### 4. P0712, P0713 - Transmission fluid temperature sensor circuit fault

##### Description of DTC:

Transmission fluid temperature sensor is installed on the solenoid valve body wire harness. Transmission fluid temperature sensor is a NTC thermostat. The lower the transmission fluid temperature, the larger the sensor resistance. The sensor resistance lowers as the temperature rises.

TCU provides 5V reference signal to ATF temperature sensor to measure the voltage drop in circuit. The sensor resistance decreases as the ATF temperature rises.

##### The setting conditions of DTC:

1. When ignition switch is in "ON" position and oil temperature circuit voltage is improper, the DTC is set.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0712, P0713	Go to Step 1	Refer to DTC table	
1	Inspect oil temperature sensor resistance	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness with the ignition switch in "OFF" position</li> <li>Measure the resistance between Terminals No. 25 and No. 26 of the solenoid valve wire harness connector (part end) Standard resistance</li> </ul> <b>Standard value:</b> <b>56.74K<math>\Omega</math>~65.86K<math>\Omega</math></b>	Go to Step 2	The detected result is not within the standard range	Replace the solenoid valve assembly
2	Inspect oil temperature sensor signal voltage	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No. 25 and No. 26 of the solenoid valve wire harness connector U32</li> </ul> <b>Standard value:</b> <b>5V<math>\pm</math>0.2V</b>	Go to Step 3	The detected result is not within the standard range	Repair the wire harness between TCU and oil temperature sensor or replace TCU
3	Inspect oil temperature sensor circuit	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness with the ignition switch turned to "OFF" position</li> <li>Measure the resistance between Terminal No. 25 of solenoid valve wire harness connector U32 and Terminal No. 18 of automatic transmission control unit U16 (J-3) <b>Standard value:</b> &lt; 2 Ω</li> <li>Measure the resistance between Terminal No. 26 of solenoid valve wire harness connector U32 and Terminal No. 8 of automatic transmission control unit U16 (J-3) <b>Standard value:</b> &lt; 2 Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Inspect short circuit of oil temperature circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 25 of the solenoid valve wire harness connector U32 and grounding <b>Standard value: 0 V</b></li> <li>Measure the voltage between Terminal No. 26 of the solenoid valve wire harness connector U32 and grounding <b>Standard value: 5V ± 0.2V</b></li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Check the TCU by replacing	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace TCU and conduct automatic transmission refresh program	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

#### 5. P09A3, P1605, P1610, P1611 - Transmission internal embedded memory module (EMM) fault

##### The setting conditions of DTC:

1. During manufacturing, EMM module is integrated together with transmission solenoid valve body. When ignition switch is in ON position and TCU inspects EMM module data does not match pre-stored data inside TCU or communicate, the DTC is set.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P1605, P1610, P1611	Go to Step 1	Refer to DTC table	
1	Inspect EMM module circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U16 of TCU</li> <li>Measure the resistance between Terminal No. 12 of U32 and Terminal No. 4 of U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 13 of U32 and Terminal No. 14 of U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Inspect EMM module circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U16 of TCU</li> <li>Measure the resistance between Terminal No. 8 of U32 and Terminal No. 12 of U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 9 of U32 and Terminal No. 2 of U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No.8, No.9, No.12, No. 13 of the solenoid valve wire harness connector U32 (part end) and grounding</li> </ul> <p><b>Standard value:</b> 0 V</p>	Go to Step 3	The detected result is not within the standard range	Check and repair the faulty circuit

Steps	Inspection item	Inspection result		
3	Connect the diagnostic scanner and reset the self-learning value; if the fault cannot be solved still, check TCU by replacing	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 4	If the fault still exists, replace the transmission assembly	After replacing the transmission assembly, connect the diagnostic scanner and conduct "transmission self-learning value reset"
4	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 6. P0500, P0503, P0716, P0717 - Input shaft speed sensor fault

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### Description of DTC:

Input shaft speed sensor is a Hall Effect sensor and is installed (integrated with output shaft speed sensor) on the main housing of automatic transmission (under valve body) TCU uses input shaft speed sensor signal to determine pipe pressure, transmission gear shift mode, torque converter clutch slip speed and drive speed.

### The setting conditions of DTC:

- When ignition switch is in ON position, engine speed is above 3000r/min, if input shaft speed is improper, the DTC is set.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0716, P0717	Go to Step 1	Refer to DTC table	
1	Inspect input shaft speed sensor voltage	Normal	Faulty	Instruction

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Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No. 8 and No. 9 of the solenoid valve wire harness connector U32</li> </ul> <b>Standard value: &gt;10V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit. If the circuit is in good condition, replace the TCU
2	Inspect input shaft speed sensor signal voltage	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No. 8 and No. 11 of the solenoid valve wire harness connector U32</li> </ul> <b>Standard value: 5V ± 0.2V</b>	Go to Step 3	The detected result is not within the standard range	Check and repair the faulty circuit. If the circuit is in good condition, replace the TCU
3	Inspect input shaft speed sensor circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U32 of the solenoid valve wire harness and the connector U16 (J-3) of TCU wire harness</li> <li>• Measure the resistance between Terminal No. 8 of U32 and Terminal No. 12 of U16 (J-3) <b>Standard value:</b> &lt; 2Ω</li> <li>• Measure the resistance between Terminal No. 9 of U32 and Terminal No. 2 of U16 (J-3) <b>Standard value:</b> &lt; 2Ω</li> <li>• Measure the resistance between Terminal No. 11 of U32 and Terminal No. 3 of U16 (J-3) <b>Standard value:</b> &lt; 2Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Inspect short circuit of input shaft speed sensor circuit to grounding	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U16 (J-3) of TCU wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between terminals No.8, No.9, No. 11 of the solenoid valve wire harness connector U32 and grounding respectively</li> </ul> <p><b>Standard value: 0 V</b></p>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Inspect input shaft speed sensor output waveform	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Connect the oscilloscope to Terminals No. 3 and No. 12 of TCU wire harness connector U16 (J-3)</li> <li>Re-connect the TCU wire harness connector</li> <li>Start the engine and increase the engine speed to observe if the oscilloscope waveform has a jump (5V-0V)</li> </ul>	If the oscilloscope waveform has a jump of 5V-0V, go to step 6	If the oscilloscope waveform has no jump of 5V-0V	Replace the automatic transmission assembly
6	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 8	-	-

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
7	Confirm if DTC is stored again			
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena



## 7. P0721, P0722 - Output shaft speed sensor fault

### Description of DTC:

Output shaft speed sensor is a Hall Effect sensor and is installed (integrated with input shaft speed sensor) on the main housing of automatic transmission (under valve body) TCU uses input shaft speed sensor signal to determine pipe pressure, transmission gear shift mode, torque converter clutch slip speed and drive speed.

### The setting conditions of DTC:

1. When ignition switch is in ON position and input shaft speed is improper, the DTC is set.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0721, P0722	Go to Step 1	Refer to DTC table	
1	Inspect the reference voltage of output shaft speed sensor	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U32 of the solenoid valve wire harness</li> <li>• Turn the ignition switch to "ON" position</li> <li>• Measure the voltage between Terminals No. 8 and No. 9 of the solenoid valve wire harness connector U32</li> </ul> <b>Standard value: &gt;10V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit. If the circuit is in good condition, replace the TCU
2	Inspect output shaft speed sensor signal voltage	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No. 8 and No. 10 of the solenoid valve wire harness connector U32</li> </ul> <b>Standard value:</b> $5V \pm 0.2V$	Go to Step 3	The detected result is not within the standard range	Check and repair the faulty circuit. If the circuit is in good condition, replace the TCU
3	Inspect output shaft speed sensor circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U16 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 8 of U32 and Terminal No. 12 of U16 (J-3)</li> </ul> <b>Standard value:</b> $< 2 \Omega$ <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 9 of U32 and Terminal No. 2 of U16 (J-3)</li> </ul> <b>Standard value:</b> $< 2 \Omega$ <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 10 of U32 and Terminal No. 1 of U16 (J-3)</li> </ul> <b>Standard value:</b> $< 2 \Omega$	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Inspect short circuit of output shaft speed sensor circuit to grounding	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U16 (J-3) of TCU wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No.8, No.9, No. 10 of the solenoid valve wire harness connector U32 (part end) and grounding</li> </ul> <b>Standard value: 0 V</b>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Inspect output shaft speed sensor output waveform	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Connect the oscilloscope to Terminals No. 1 and No. 12 of connector U16 (J-3) of automatic transmission control unit wire harness</li> <li>Re-connect the TCU wire harness connector</li> <li>Start the engine and increase the engine speed to observe if the oscilloscope waveform has a jump (5V-0V)</li> </ul>	If the oscilloscope waveform has a jump of 5V-0V, go to step 6	If the oscilloscope waveform has no jump of 5V-0V	Replace the automatic transmission assembly
6	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 7	-	-
7	Confirm if DTC is stored again	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 8. P071D, P071E, P071F - Manual and automatic gear selector mode switch circuit fault

### Description of faulty circuit:

When gear selector lever is in M position, the driver can define the highest use speed ratio through "+" or "-" on shifter. When the shift lever is moved to "M" position, the transmission will select the lowest applicable speed ratio. When the highest engine speed is achieved, the transmission will control the upshifting automatically whatever the driver selects.

### The setting conditions of DTC:

- When ignition switch is in "ON" switch, if TCU inspects gear shift control information does not conform to current gear or manual shift control up/down switch maintains for a long time, the DTC is set as P071D.
- When ignition switch is in "ON" position, if TCU inspects the circuit voltage of manual shift control up/down switch is between 5V-12V or 0V and maintains for a certain time, the DTC is set as P071E or P071F.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P071D, P071E, P071F	Go to Step 1	Refer to DTC table	
1	Check gear selector mechanism assembly	Normal	Faulty	Instruction
	Shift to each gear using shifter in turn and check for mechanism fault	Go to Step 2	There is a mechanical fault	Replace gear selector mechanism assembly
2	Inspect the resistance of shifter under manual mode	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connectors U23 (J-2) and U16 (J-3) of TCU wire harness</li> <li>Measure the resistance between Terminal No. 4 of U23 (J-2) and Terminal No.15 of U16 (J-3)</li> </ul> <p>When key "+" is pressed, resistance between two terminals is 972Ω-1188Ω .</p> <p>When key "-" is pressed, resistance between two terminals is 499Ω-611Ω .</p> <p>When no key is pressed, resistance between two terminals is 2916Ω-3564Ω .</p>	Go to Step 3	The detected result is not within the standard range	Replace gear selector mechanism assembly
3	Inspect the shifter circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector I43 of gear selector mechanism wire harness and connector U23 (J-2) of TCU wire harness</li> <li>Measure the resistance between Terminal No. 11 of I43 and Terminal No. 4 of U23 (J-2)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 10 of I43 and Terminal No. 10 of U23 (J-2)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 3 of I43 and Terminal No. 15 of U16 (J-3)</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
4	Inspect short circuit of shifter circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector I43 of gear selector mechanism wire harness and connector U23 (J-2) of TCU wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminals No. 11 and No.10 of the gear selector mechanism wire harness connector (part side) and grounding</li> </ul> <b>Standard value: 0 V</b>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 9. P0729, P0731, P0732, P0733, P0734, P0735, P0736 - Drive ration error

### Description of faulty circuit:

Transmission gear change is controlled by TCU. TCU receives the engine speed signal and other sensor signals on vehicle and selects the shift time, controls the operation of

shift timing and hydraulic torque converter and clutch at each gearshift.

### The setting conditions of DTC:

1. When ignition switch is in ON position, engine speed is above 300r/min and engine is not in "limp home" mode.
2. Transmission fluid temperature  $>0^{\circ}\text{C}$  , transmission output shaft speed is more than 300 r/min and transmission shift lever is not in "N" or "P" gear.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0729, P0731, P0732, P0733, P0734, P0735, P0736	Go to Step 1	Refer to DTC table	
1	Check automatic transmission fluid	Normal	Faulty	Instruction
	Check the automatic transmission for oil leakage	Go to Step 2	Oil leakage exists	Repair or replace the faulty part
2	Check the automatic transmission fluid level and quality conform to the standard	Normal	Faulty	Instruction
	See 22 - A/T, ATF, Inspection	Go to Step 3	Not conform to the standard	Refill or replace the automatic transmission fluid
3	Check automatic transmission	Normal	Faulty	Instruction
	Check the automatic transmission for obvious mechanical damage	Go to Step 4	Obvious damage exists	Repair or replace the damaged part
4	Replace the automatic transmission assembly	Normal	Faulty	Instruction
	Replace automatic transmission assembly and conduct automatic transmission TCU - "transmission self-learning value reset"	Go to Step 5	-	-
5	Confirm if DTC is stored again	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 10. P0741, P0742, P0744 - Hydraulic torque converter clutch fault

#### Description of faulty circuit:

The automatic transmission controls the lock and release of hydraulic torque converter through hydraulic control system.

The piston pressure for hydraulic torque converter to lock clutch is determined by Variable Bleed Solenoid (VBS). During operation, TCU calculates the speed of TCU slip sheet to compare with the predicted value, if torque converter slip sheet is not within pre-defined parameter, a DTC of hydraulic torque converter is set.

#### The setting conditions of DTC:

- When ignition switch is in ON position, engine speed is above 300r/min and engine is not in "limp home" mode.
- Transmission fluid temperature  $>0^{\circ}\text{C}$ , transmission is not in gearshift and transmission shift lever is in "D" position.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0741, P0742, 0744	Go to Step 1	Refer to DTC table	
1	Check the automatic transmission for oil leakage	Normal	Faulty	Instruction
	Check the automatic transmission for oil leakage	Go to Step 2	Oil leakage exists	Repair or replace the faulty part



Steps	Inspection item	Inspection result		
2	Check the automatic transmission fluid level and quality conform to the standard	Normal	Faulty	Instruction
	See 22 - A/T, ATF, Inspection	Go to Step 3	Not conform to the standard	Refill or replace the automatic transmission fluid
3	Check automatic transmission	Normal	Faulty	Instruction
	Check the automatic transmission for obvious mechanical damage	Go to Step 4	Obvious damage exists	Repair or replace the damaged part
4	Replace the automatic transmission assembly	Normal	Faulty	Instruction
	Replace automatic transmission assembly and conduct automatic transmission TCU - "transmission self-learning value reset"	Go to Step 5	-	-
5	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 11. P0962, P0963 - Variable Bleed Solenoid (VBS) S9 circuit fault

### Description of faulty circuit:

TCU uses VBS to adjust hydraulic pressure. Hydraulic system controls the clutch inside the transmission to realize torque transmission.

TCU control certain voltage value to be charged into clutch by adjusting solenoid valve current. Transmission of clutch torque relates to the current of solenoid valve directly.

During operation, TCU evaluates the current transferred to solenoid valve and compares it

with the predicted value. If the comparison result is not within the pre-defined parameter, it is set as abnormal TCU load.

### The setting conditions of DTC:

1. The ignition switch is in the "ON" position.
2. Solenoid valve is energized.
3. TCU power voltage is normal.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0962 and P0963	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U17 of TCU wire harness</li> <li>• Check the resistance between Terminal No. 8 of U17 and grounding <b>Standard value:</b> &lt; 2 Ω</li> <li>• Turn the ignition switch to "ON" position</li> <li>• Check the voltage between Terminal No. 16 of U17 and the grounding <b>Voltage:</b> 9V - 14V</li> </ul>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Inspect the resistance of S9 solenoid valve	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 6 terminal and No. 1 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value: <math>4.7 \Omega \pm 0.8 \Omega</math></b>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of S9 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU</li> <li>Measure the resistance between Terminal No. 6 of U32 and Terminal No. 1 of U17 (J-1)</li> </ul> <b>Standard value: <math>&lt; 2 \Omega</math></b> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 1 of U32 and Terminal No. 7 of U17 (J-1)</li> </ul> <b>Standard value: <math>&lt; 2 \Omega</math></b>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect the condition that S9 solenoid valve circuit is short circuit to power	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 6 of the solenoid valve wire harness connector (part terminal) and grounding</li> </ul> <b>Standard value: 0 V</b>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 12. P0966, P0967 - Variable Bleed Solenoid (VBS) S10 circuit fault

### The setting conditions of DTC:

1. The ignition switch is in the "ON" position.
2. Solenoid valve is energized.
3. TCU power voltage is normal.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0966 and P0967	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value:</b> < 2 $\Omega$ <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect the resistance of S10 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 7 terminal and No. 1 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value:</b> 4.7 $\Omega$ $\pm$ 0.8 $\Omega$	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of S10 solenoid valve	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 7 of U32 and Terminal No. 2 of U17 (J-1) <b>Standard value:</b> &lt; 2Ω</li> <li>Measure the resistance between Terminal No. 1 of U32 and Terminal No. 7 of U17 (J-1) <b>Standard value:</b> &lt; 2Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect the condition that S10 solenoid valve circuit is short circuit to power	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 7 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value: 0 V</b></li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-

Steps	Inspection item	Inspection result		
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 13. P0985, P0986 - Variable Bleed Solenoid (VBS) S5 circuit fault

#### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0985 and P0986	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value: &lt; 2Ω</b> <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit

Steps	Inspection item	Inspection result		
2	Detect the resistance of S5 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 2 terminal and No. 1 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value: <math>4.7 \Omega \pm 0.8 \Omega</math></b>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of S5 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 2 of U32 and Terminal No. 5 of U17 (J-1)</li> </ul> <b>Standard value: <math>&lt; 2 \Omega</math></b> <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 1 of U32 and Terminal No. 7 of U17 (J-1)</li> </ul> <b>Standard value: <math>&lt; 2 \Omega</math></b> <ul style="list-style-type: none"> <li>Measure the resistance between No. 1 terminal of U32 and grounding</li> </ul> <b>Standard value: <math>&lt; 2 \Omega</math></b>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect the condition that S5 solenoid valve circuit is short circuit to power	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 2 of the solenoid valve wire harness connector (part terminal) and grounding</li> </ul> <b>Standard value: 0 V</b>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

#### 14. P0998, P0999 - Variable Bleed Solenoid (VBS) S6 circuit fault

##### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0998 and P0999	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value: &lt;math&gt;&lt; 2 \Omega&lt;/math&gt;</b> <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect the resistance of S6 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 2 terminal and No. 1 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value: &lt;math&gt;4.7 \Omega \pm 0.8 \Omega&lt;/math&gt;</b>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of S6 solenoid valve	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 3 of U32 and Terminal No. 6 of U17 (J-1)</li> </ul> <b>Standard value:</b> < 2 Ω <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 1 of U32 and Terminal No. 7 of U17 (J-1)</li> </ul> <b>Standard value:</b> < 2 Ω	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect the condition that S6 solenoid valve circuit is short circuit to power	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 3 of the solenoid valve wire harness connector (part terminal) and grounding</li> </ul> <b>Standard value:</b> 0 V	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 15. P099B, P099C - Variable Bleed Solenoid (VBS) S7 circuit fault

#### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P099B and P099C	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value:</b> < 2Ω <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect the resistance of S7 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 4 terminal and No. 1 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value:</b> 4.7 Ω ± 0.8 Ω	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly See the Replacement of Automatic Transmission Assembly
3	Detect the circuit of S7 solenoid valve	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 4 of U32 and Terminal No. 3 of U17 (J-1) <b>Standard value:</b> &lt; 2 Ω</li> <li>Measure the resistance between Terminal No. 1 of U32 and Terminal No. 7 of U17 (J-1) <b>Standard value:</b> &lt; 2 Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect the condition that S7 solenoid valve circuit is short circuit to power	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 4 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value:</b> 0 V</li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Connect fault diagnostic scanner to diagnosis interface</li> <li>• Clear the DTC</li> <li>• Start the engine and run it idly to warm up for 5 min</li> <li>• Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 16. P099E, P099F - Variable Bleed Solenoid (VBS) S8 circuit fault

#### The setting conditions of DTC:

1. The ignition switch is in the "ON" position.
2. Solenoid valve is energized.
3. TCU power voltage is normal.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P099E and P099F	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value: &lt;math&gt;&lt; 2 \Omega&lt;/math&gt;</b> <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect the resistance of S8 solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 5 terminal and No. 1 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value: 4.7 <math>\Omega</math> <math>\pm</math> 0.8 <math>\Omega</math></b>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of S8 solenoid valve	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 5 of U32 and Terminal No. 4 of U17 (J-1) <b>Standard value:</b> &lt; 2 <math>\Omega</math></li> <li>Measure the resistance between Terminal No. 1 of U32 and Terminal No. 7 of U17 (J-1) <b>Standard value:</b> &lt; 2 <math>\Omega</math></li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect the condition that S8 solenoid valve circuit is short circuit to power	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 5 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value:</b> 0 V</li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
6	Confirm if DTC is stored again			
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 17. P0973, P0974 - ON-OFF solenoid valve S1 circuit fault

#### Description of faulty circuit:

TCU selects one of the different components in the transmission by using ON-OFF solenoid valve. During operation, TCU detects the present actual transmitted current of ON-OFF solenoid valve and compare it to the expected value. If the current is out of the range of specified parameter, a DTC related to TCU load fault shall be set.

#### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection			
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0973 and P0974	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit			

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value:</b> < 2Ω <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect its resistance of ON-OFF solenoid valve S1	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 21 terminal and No. 20 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value: 23 Ω ± 1.5 Ω</b>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of ON-OFF solenoid valve S1	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position, and then disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between No. 21 terminal of U32 and No. 10 terminal of U17 <b>Standard value:</b> &lt; 2Ω</li> <li>Measure the resistance between No. 20 terminal of U32 and No. 15 terminal of U17 and the resistance between No. 20 terminal of U32 and the grounding respectively <b>Standard value:</b> &lt; 2Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect short circuit of S1 solenoid valve circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 21 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value: 0 V</b></li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 18. P0976, P0977 - ON-OFF solenoid valve S2 circuit fault

The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0976 and P0977	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value: &lt;math&gt; &lt; 2 \Omega &lt;/math&gt;</b> <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect its resistance of ON-OFF solenoid valve S2	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 22 terminal and No. 20 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <b>Standard value: 23 <math>\Omega</math> <math>\pm</math> 1.5 <math>\Omega</math></b>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of ON-OFF solenoid valve S2	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>Measure the resistance between Terminal No. 22 of U32 and Terminal No. 9 of U17 (J-1) <b>Standard value:</b> &lt; 2 Ω</li> <li>Measure the resistance between Terminal No. 20 of U32 and Terminal No. 15 of U17 (J-1) <b>Standard value:</b> &lt; 2 Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect short circuit of S2 solenoid valve circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 22 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value:</b> 0 V</li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 19. P0979, P0980 - ON-OFF solenoid valve S3 circuit fault

#### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0979 and P0980	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <p><b>Standard value:</b> &lt; 2 Ω</p> <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and grounding</li> </ul> <p><b>Voltage: 9V - 14V</b></p>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect its resistance of ON-OFF solenoid valve S3	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U32 of the solenoid valve wire harness</li> <li>Measure the resistance between No. 23 terminal and No. 20 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <p><b>Standard value: 23 Ω ± 1.5 Ω</b></p>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of ON-OFF solenoid valve S3	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>• Measure the resistance between Terminal No. 23 of U32 and Terminal No. 12 of U17 (J-1) <b>Standard value:</b> &lt; 2 Ω</li> <li>• Measure the resistance between Terminal No. 20 of U32 and Terminal No. 15 of U17 (J-1) <b>Standard value:</b> &lt; 2 Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect short circuit of S3 solenoid valve circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Disconnect the connector U32 of the solenoid valve wire harness</li> <li>• Turn the ignition switch to "ON" position</li> <li>• Measure the voltage between Terminal No. 23 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value:</b> 0 V</li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 20. P0982, P0983 - ON-OFF solenoid valve S4 circuit fault

### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P0982 and P0983	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U17 of TCU wire harness</li> <li>• Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <p><b>Standard value:</b> &lt; 2Ω</p> <ul style="list-style-type: none"> <li>• Turn the ignition switch to "ON" position</li> <li>• Check the voltage between Terminal No. 16 of U17 and the grounding</li> </ul> <p><b>Voltage:</b> 9V - 14V</p>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Detect its resistance of ON-OFF solenoid valve S4	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U32 of the solenoid valve wire harness</li> <li>• Measure the resistance between No. 24 terminal and No. 20 terminal of the solenoid valve wire harness connector (part terminal)</li> </ul> <p><b>Standard value:</b> 23 Ω ± 1.5 Ω</p>	Go to Step 3	The detected result is not within the standard range	Replace the automatic transmission assembly
3	Detect the circuit of ON-OFF solenoid valve S4	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U32 of the solenoid valve wire harness and the connector U17 of TCU wire harness</li> <li>• Measure the resistance between Terminal No. 24 of U32 and Terminal No. 11 of U17 (J-1) <b>Standard value:</b> &lt; 2Ω</li> <li>• Measure the resistance between Terminal No. 20 of U32 and Terminal No. 15 of U17 (J-1) <b>Standard value:</b> &lt; 2Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair the faulty circuit
4	Detect short circuit of S4 solenoid valve circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Disconnect the connector U32 of the solenoid valve wire harness</li> <li>• Turn the ignition switch to "ON" position</li> <li>• Measure the voltage between Terminal No. 24 of the solenoid valve wire harness connector (part terminal) and grounding <b>Standard value:</b> 0 V</li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 21. P09A1, P09A2 - P gear lock-up solenoid valve circuit fault

### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- Solenoid valve is energized.
- TCU power voltage is normal.

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Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except P09A1、P09A2	Go to Step 1	Refer to DTC table	
1	Inspect the TCU power circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U17 of TCU wire harness</li> <li>Check the resistance between Terminal No. 8 of U17 and grounding</li> </ul> <b>Standard value:</b> < 2Ω <ul style="list-style-type: none"> <li>Turn the ignition switch to "ON" position</li> <li>Check the voltage between Terminal No. 16 of U17 and grounding</li> </ul> <b>Voltage: 9V - 14V</b>	Go to Step 2	The detected result is not within the standard range	Check and repair the faulty circuit
2	Check the resistance of Gear P lock-up solenoid valve	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> <li>Disconnect the connector U16 of TCU wire harness</li> <li>Measure the resistance between Terminals No. 9 and No. 15 of TCU wire harness connector U16 (wire harness side)</li> </ul>	Go to Step 5	No continuity or zero	Go to Step 3
3	Check the circuit of P gear lock-up solenoid valve	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Turn the ignition switch to "OFF" position</li> </ul> Disconnect the wire harness connector I43 of gear selector mechanism assembly and connector U16 (J-3) of TCU wire harness <ul style="list-style-type: none"> <li>Measure the resistance between Terminal No. 5 of I43 and Terminal No. 9 of U16 (J-3) <b>Standard value:</b> &lt; 2 Ω</li> <li>Measure the resistance between Terminal No. 6 of I43 and Terminal No. 15 of U16 (J-3) <b>Standard value:</b> &lt; 2 Ω</li> </ul>	Go to Step 4	The detected result is not within the standard range	Check and repair faulty line or replace P gear lock-up solenoid valve
4	Inspect the short circuit of P gear lock-up solenoid valve circuit to power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the connector U16 (J-3) of TCU wire harness</li> <li>Turn the ignition switch to "ON" position</li> <li>Measure the voltage between Terminal No. 9, No. 15 of TCU wire harness connector U16 (J-3) (wire harness side) and grounding <b>Standard value:</b> 0 V</li> </ul>	Go to Step 5	The detected result is not within the standard range	Check and repair the faulty circuit
5	Replace TCU	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 6	-	-
6	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## 22. U0100, U0102, U0110, U0120, U0121, U0122, U0123, U0124, U0130, U0140, U0146, U0150, U0160, U0415-CAN Bus communication error

### Description of DTC:

CAN bus is used to share vehicle system information in control unit which is connected to the bus. If TCU has not received specific information sent from related control unit to CAN bus, TCU will set a TCD correspondingly.

### The setting conditions of DTC:

- The ignition switch is in the "ON" position.
- The communication signal is lost and signal logic is incorrect.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except U0100, U0121, U0146, U0415	Go to Step 1	Refer to DTC table	
1	Inspect the CAN bus circuit of TCU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Turn the ignition switch to "OFF" position</li> <li>• Disconnect the connector U16 of TCU wire harness</li> </ul> <p>Measure the resistance between Terminal No. 6 of diagnostic interface connector I17 and Terminal No. 10 of TCU wire harness connector U16, Terminal No. 14 of I14 and Terminal No. 20 of U16 respectively</p> <p><b>Standard value:</b> &lt; 0 Ω</p> <ul style="list-style-type: none"> <li>• Turn the ignition switch to "ON" position</li> <li>• Measure the voltage between Terminal No. 10 of U16 and the grounding</li> </ul> <p><b>Voltage: 2.5V - 5V</b></p> <ul style="list-style-type: none"> <li>• Measure the voltage between Terminal No. 20 of U16 and the grounding</li> </ul> <p><b>Voltage: 0V - 2.5V</b></p>	Go to Step 2	Open-circuit or short-circuit exists	Troubleshoot the line faults
2	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 3	-	-
3	Confirm if DTC is stored again	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

### 23. U1601, U1606, U1607, U1608, U1609-TCU Internal embedded software error

#### Description of DTC:

TCU software or calibration software is upgrading through online service This DTC protects TCU, preventing the corrupted file from being loaded to TCU. They also ensure only correct calibration parameter and software version are loaded to current TCU.

#### The setting conditions of DTC:

- If the CRC is invalid with the ignition switch in "ON" position, DTCs of U1601, U1606 or U1607 are triggered.
- If VIN is not consistent with the calibration content with ignition switch in ON position, DTC of U1608 is triggered.
- If TCU manufacturing information does not exist with ignition switch in ON position, DTC of U1609 is triggered.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect the diagnostic scanner, read the DTC again and check the system for DTC except U1601, U1606, U1607, U1608 and U1609	Go to Step 1	Refer to DTC table	
1	Replace TCU calibration software	Normal	Faulty	Instruction
	Connect diagnostic scanner and update TCU calibration software	Go to Step 2	-	-

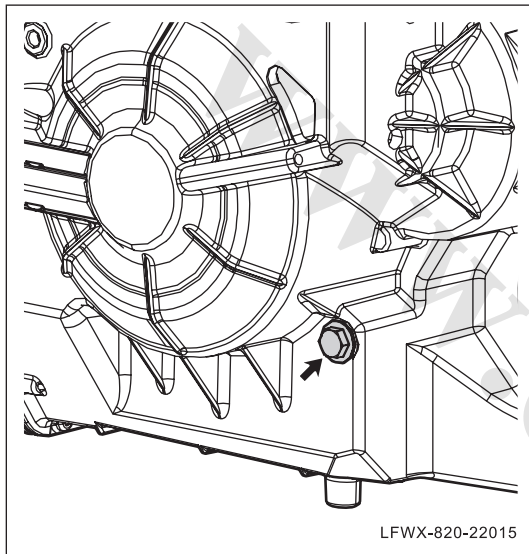
Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
2	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Turn the ignition switch to "ON" position</li> <li>Clear fault code</li> <li>Start the engine and run it idly to warm up for at least 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	If there is no DTC output, it indicates the fault is eliminated.	Fault code still exists	Go to Step 3
3	Replace TCU	Normal	Faulty	Instruction
	Replace TCU, conduct TCU selecting and matching (write transmission TCU-VIN code in) and reset the self-learning value of transmission	Go to Step 4	-	-
4	Confirm if DTC is stored again	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect fault diagnostic scanner to diagnosis interface</li> <li>Clear the DTC</li> <li>Start the engine and run it idly to warm up for 5 min</li> <li>Read the DTC of control system again and confirm there is no DTC output</li> </ul>	Troubleshooting	With DTC output	Refer to the DTC table or find out the cause from the other phenomena

## Automatic Transmission Fluid

### Check

#### ⓘ Note:

- ATF temperature has great influence on oil level. Therefore, only check the oil level when the ATF temperature is lower than 50°C . If ATF temperature is higher than 50°C , but no revision procedure is conducted on oil level later, the oil level reading will have great deviation.
- When checking oil level, keep the vehicle level.



#### 1. Check the ATF level

- Lift the vehicle
  - Place oil collector under ATF level inspection bolt and then loosen the ATF level inspection bolt.
- (c) If ATF flows out from the hole, it indicates the oil level is normal, re-install oil level inspection bolt and tighten it; if no ATF flows out from the hole, it indicates the oil level is too low, refill ATF until there is oil flowing out from the hole.
- Torque: 25 N.m -30N•m**
- Place shift lever to N position, start the engine and idle it for 5min; re-check the ATF level and if the oil level is too low, re-fill ATF.
  - After the vehicle has run for 10min, connect the fault diagnostic scanner to read ATF temperature data.
    - If the oil temperature is lower than 50°C , idle the engine until the oil temperature reaches 50°C ; then place shift lever to N position, shut down the engine and re-check ATF level.
    - If oil level is too low, refill ATF.
    - If there is oil flowing out, keep this state for 50s.
    - If there is still oil flowing out from the inspection bolt hole 50s later, it indicates the oil level is proper.

- If there is no oil flowing out 50s later, refill ATF and conduct this step until there is oil flowing out.

(f) Tighten the oil level inspection bolt.

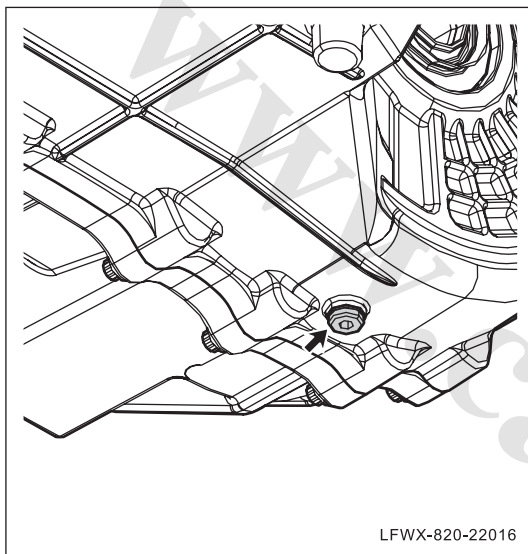
## 2. Inspection

(a) Conduct road test and check for oil leakage.

## Replacement

### ⓘ Note:

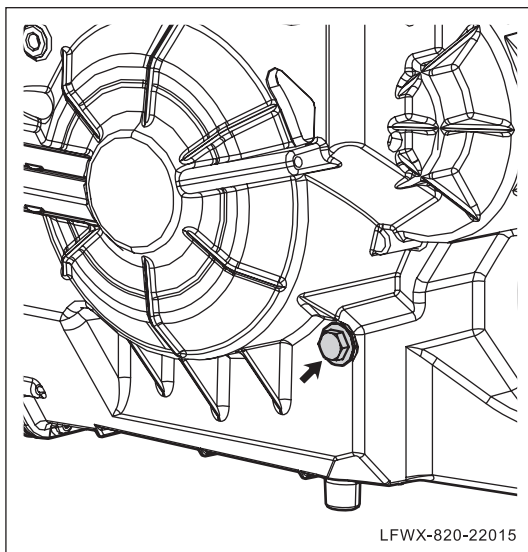
Replace ATF every 60,000km to prevent A/T component from damage.



### 1. Drain ATF

- Lift the vehicle
- Place a oil collector under ATF drain plug and remove oil drain plug to drain ATF.
- Install ATF drain plug and tighten it after draining.

**Torque: 25 N.m -30N•m**



### 2. Refill ATF

- Remove ATF level inspection bolt and refill ATF from the inspection hole.

**Specification: ATF3292**

**Filling amount: 7.5 L**

(b) Check the ATF level. (See 22 - A/T, ATF, Inspection)

(c) Install ATF level inspection bolt and tighten it.

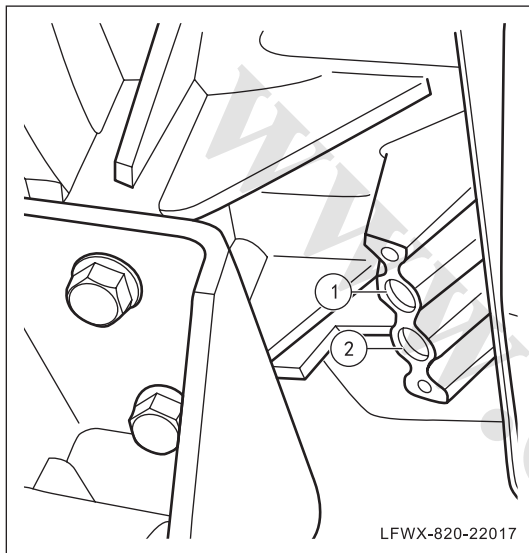
**Torque: 25 N.m -30N•m**

## Automatic Transmission Cooling System

### Cleaning

#### ⓘ Note:

- To prevent pollutants in cooling pipe and hydraulic pipe from damaging A/T, clean the cooling pipe and hydraulic pipe.
- After replacing the A/T assembly or overhauling A/T, clean the A/T cooling system.



#### 1. Clean the cooling system

- Lift the vehicle
- Clean the residual ATF in cooling pipe with compressed air.
- Connect ATF outlet pipe to outlet and install the fixing bolts and tighten them.

① : Oil inlet

② : Oil outlet

**Torque: 10N•m-13N•m**

- Connect the oil inlet to a container by hose to collect ATF flowed out.

- Start the engine and idle it for 30s; collect the ATF flowed out and refill ATF while the engine is idling.

#### △ HINT:

ATF temperature will reach 50°C 30s later and there will be at least 2.5L ATF flowing out.

- After collecting, connect A/T inlet pipe to inlet.

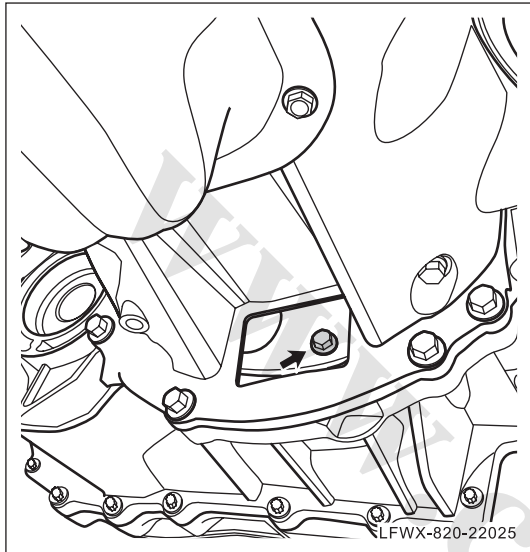
#### 2. Check ATF level (See 22 - A/T, ATF, Inspection)

# Automatic Transmission Assembly

## Replacement

### 1. Remove automatic transmission assembly

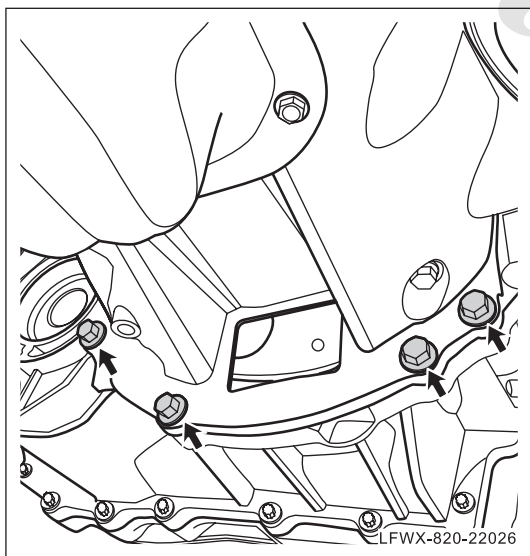
- (a) Remove engine with transmission assembly (See 11B - Engine Mechanical System, Engine assembly, Removal)



- (b) Remove the fixing bolt of flywheel and hydraulic torque converter from under the engine.

**Note:**

During removal, rotate the flywheel clockwise after removing one fixing bolt and then remove another fixing bolt. Never rotate the flywheel counterclockwise.

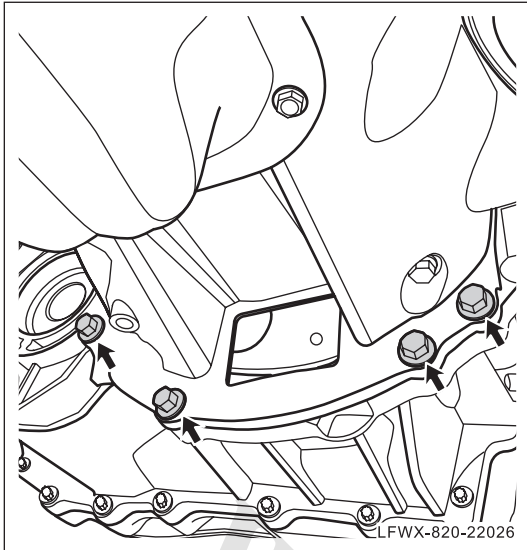


- (c) Remove the bolt connecting the transmission with engine and take down A/T assembly and hydraulic torque converter.

**HINT:**

Check if the two location pins at engine flywheel side fall off.

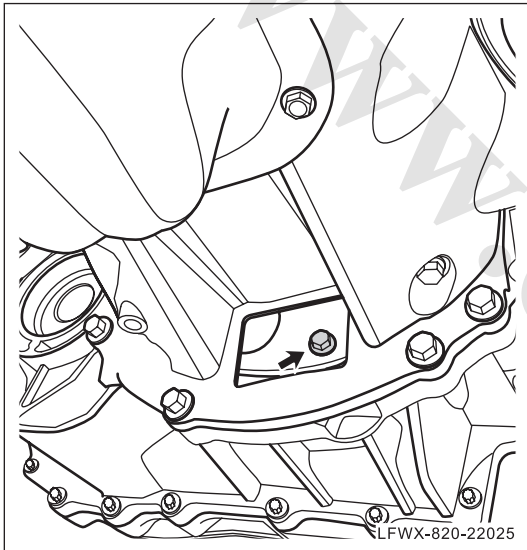




## 2. Install automatic transmission assembly

- (a) Install the hydraulic torque converter and A/T assembly to engine and install and tighten the fixing bolts of transmission.

**Torque: 40N•m-60N•m**



- (b) Install and tighten the fixing bolt of flywheel and hydraulic torque converter from under the engine.

**Toque: 33N•m-36N•m**

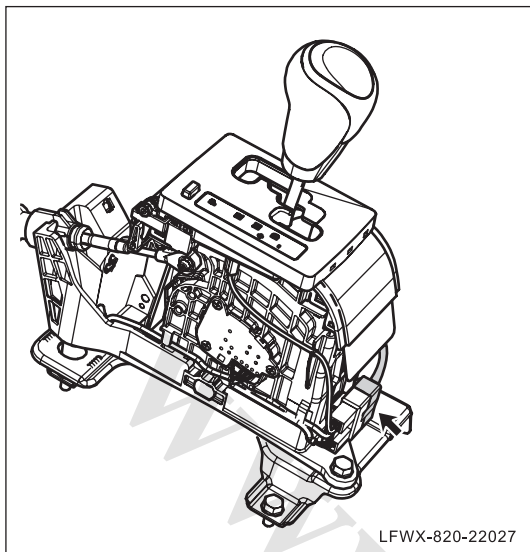
### ⓘ Note:

During installation, rotate the flywheel clockwise after installing one fixing bolt and then install another fixing bolt. Never rotate the flywheel counterclockwise.

- (c) Install engine with transmission assembly (See 11B - Engine Mechanical System, Engine assembly, Removal)

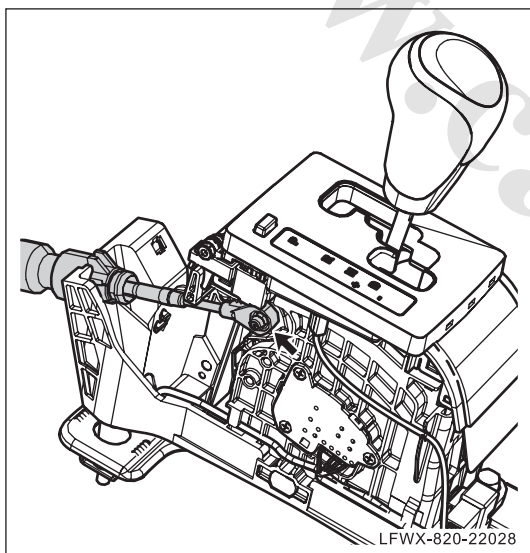
## Shifter and Shifting Flexible Shaft

### Replacement

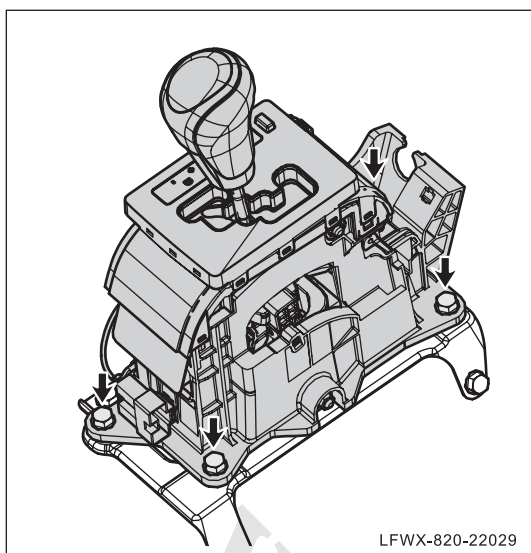


#### 1. Remove shifter and shifting flexible shaft

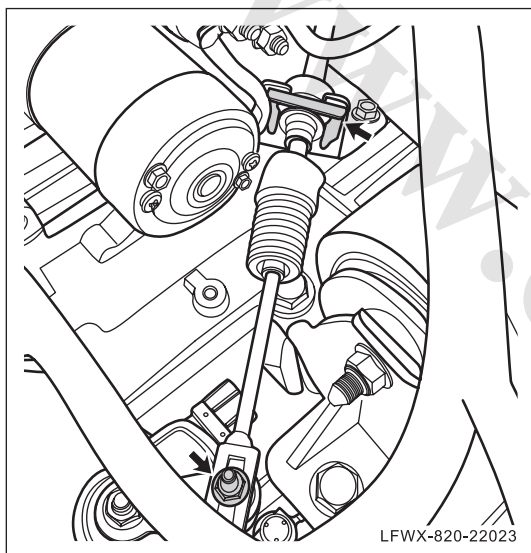
- (a). Remove the console. (See 84 - Dashboard/Console, Console, Replacement)
- (b). Disconnect the connector of shifter and instrument wire harness.



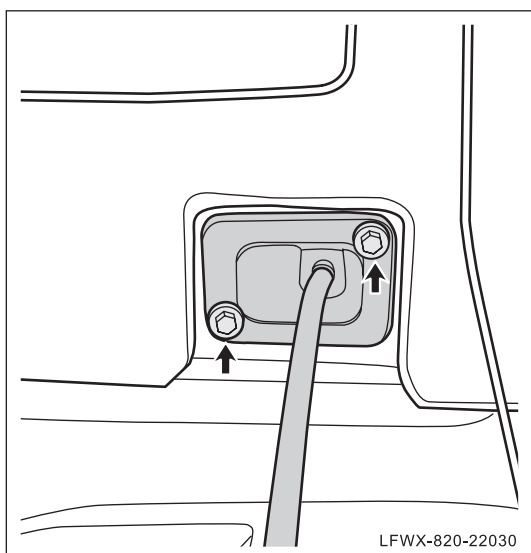
- (c). Remove the shifting flexible shaft.



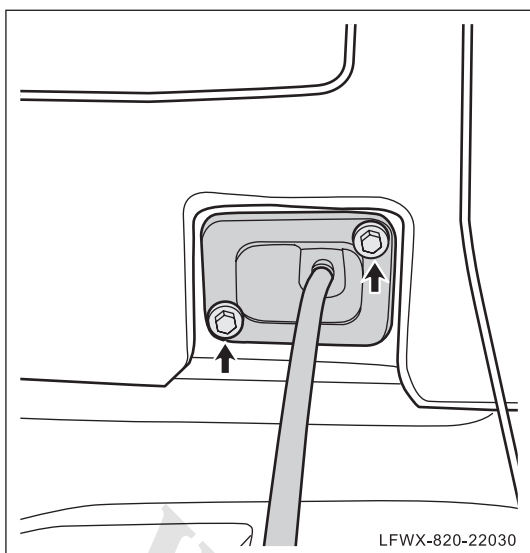
- (d) Remove the shifter fixing bolt and take down the shifter assembly.



- (e) Disconnect the shifting flexible shaft and gear switch lever.
- (f) Remove E-type clip of shifting flexible shaft.



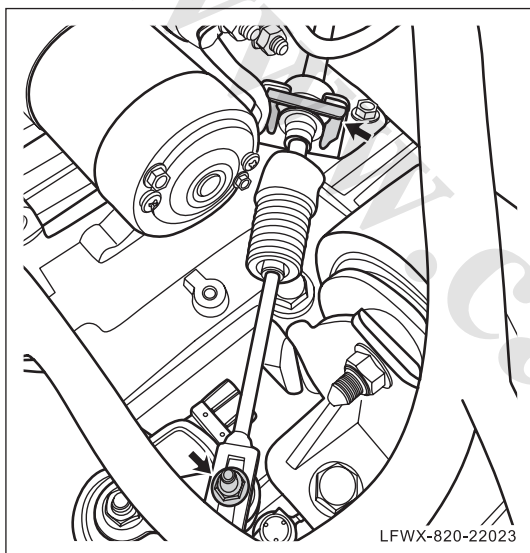
- (g) Remove the fixing bolt of sealing pressing plate of shifting flexible shaft and remove the shifting flexible shaft from the body floor.



## 2. Install the shifter and shifting flexible shaft

- (a) Install the shifting flexible shaft and flexible shaft sealing pressing plate onto the vehicle floor, install the fixing bolts and tighten them.

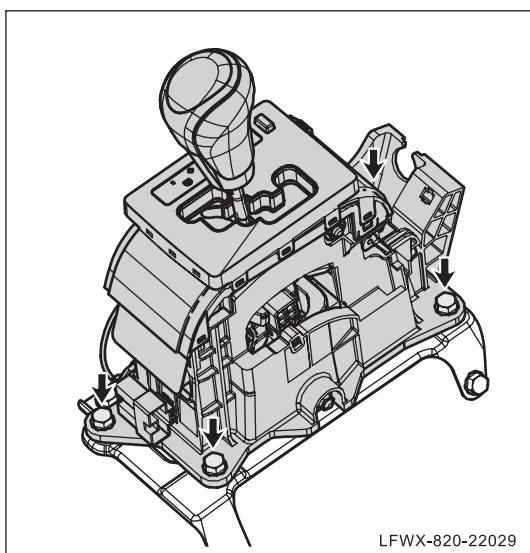
**Torque: 8N•m-12N•m**



- (b) Install the shifting flexible shaft onto gear switch lever, install fixing nuts and tighten them.

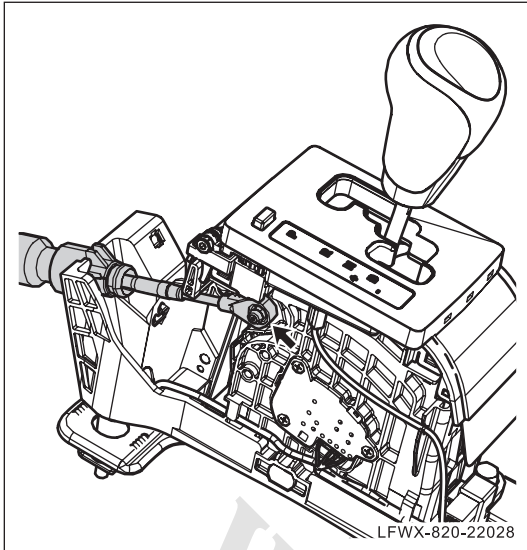
**Torque: 14N•m-20N•m**

- (c) Install E-type clip of shifting flexible shaft.

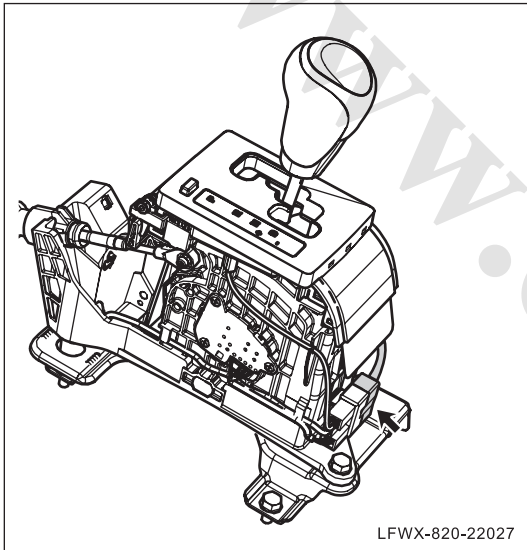


- (d) Install the shifter assembly in place, install the fixing bolts and tighten them.

**Torque: 22N•m-28N•m**



(e) Install shifting flexible shaft onto shifter.

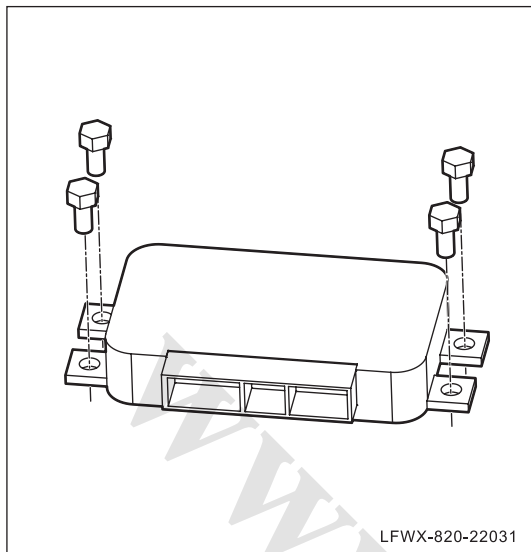


(f) Install the wire harness connector of shifter and instrument wire harness.

(g) Install the console. (See 84 - Dashboard/ Console, Console, Replacement)

# Automatic Transmission Control Unit

## Replacement



### 1. Remove automatic transmission control unit

- (a). Disconnect negative cable of battery.
- (b). Disconnect wire harness connector of automatic transmission control unit.
- (c). Remove fixing bolts of automatic transmission control unit and remove automatic transmission control unit.

### 2. Install automatic transmission control unit

- (a). Install the automatic transmission control unit in place, install the fixing bolts and tighten them.  
**Torque: 6N•m-8N•m**
- (b). Connect wire harness of automatic transmission control unit.
- (c). Connect the negative cable of battery.

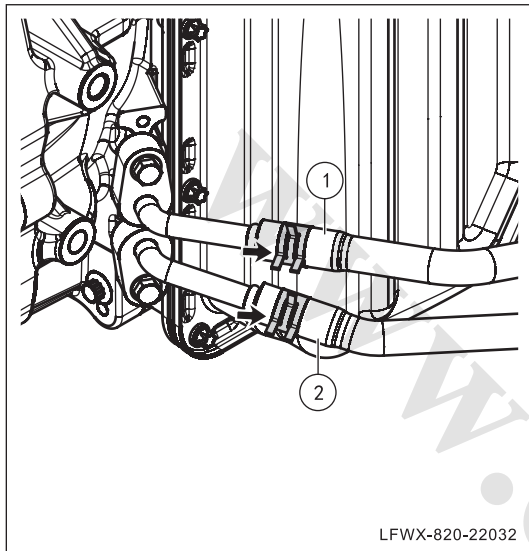
## Oil Cooler

### Replacement

#### 1. Remove oil cooler

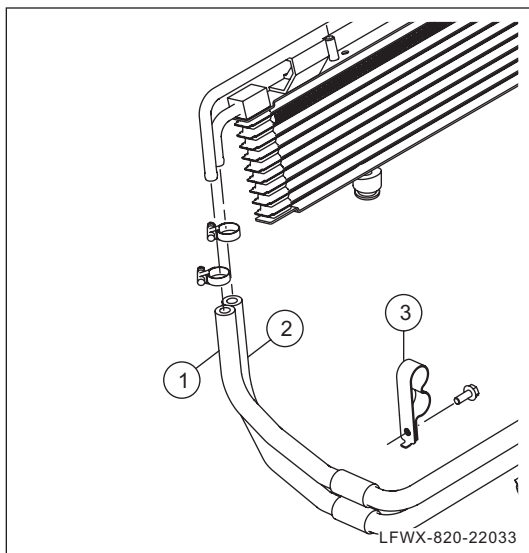
(a) Drain ATF. (See 22 - A/T, ATF, Inspection)

(b). Remove front bumper. (See 81- Interiors and Exteriors, Front Bumper, Replacement).

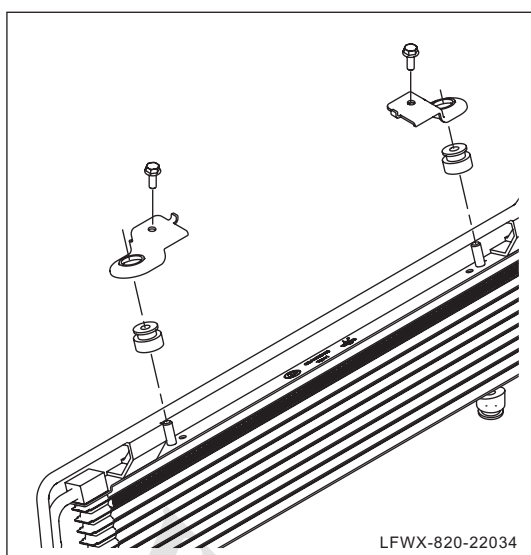


(c) Remove automatic transmission fluid pipe.

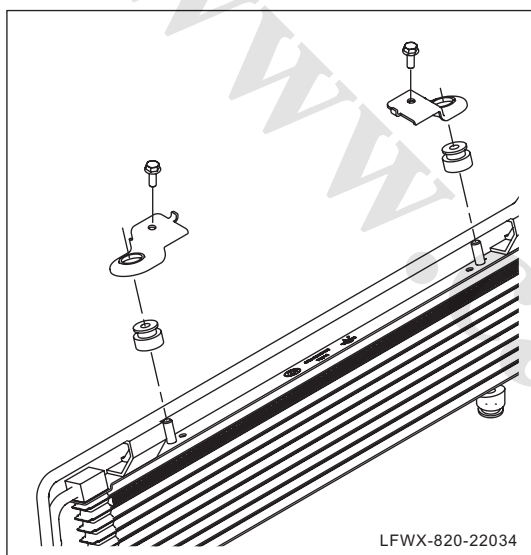
- Remove the elastic clamps of outlet hose ① and inlet hose ② of oil cooler connected with A/T and pull out the outlet hose ① and inlet hose ② of oil cooler.



- Remove the drive hoops of outlet hose ① and inlet hose ② of oil cooler connected with oil cooler and pull out the outlet hose ① and inlet hose ② of oil cooler.
- Remove fixing bolts of oil pipe clamp ③ and remove outlet hose ① and inlet hose ② of oil cooler.



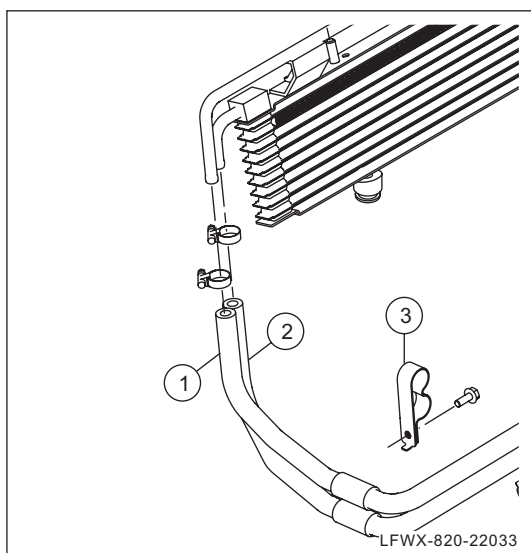
- (d) As shown in the figure, remove the fixing bolts of oil cooler assembly and take down the oil cooler assembly.



## 2. Install oil cooler assembly

- (a) Install the oil cooler assembly in place, install the fixing bolts and tighten them.

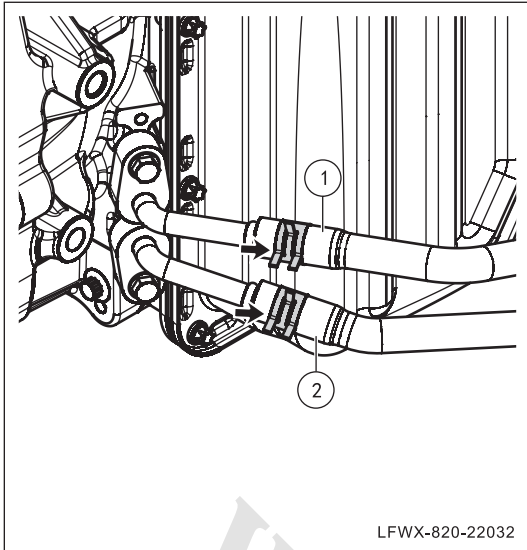
**Torque: 8N•m-12N•m**



- (b) Install automatic transmission fluid pipe.
- Install outlet hose ①, inlet hose ② and elastic clamps of oil cooler onto oil cooler.
  - Install the fixing bolts of oil pipe clamp and tighten them.

**Torque: 20N•m - 26N•m**





- Install outlet hose ① , inlet hose ② and elastic clamps of oil cooler onto A/T.

- (c) Install front bumper. (See 81- Interiors and Exteriors, Front Bumper, Replacement).
- (d) Fill ATF. (See 22 - A/T, ATF, Inspection)

## 23-Clutch

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# Clutch System

## System description

### 1. Function

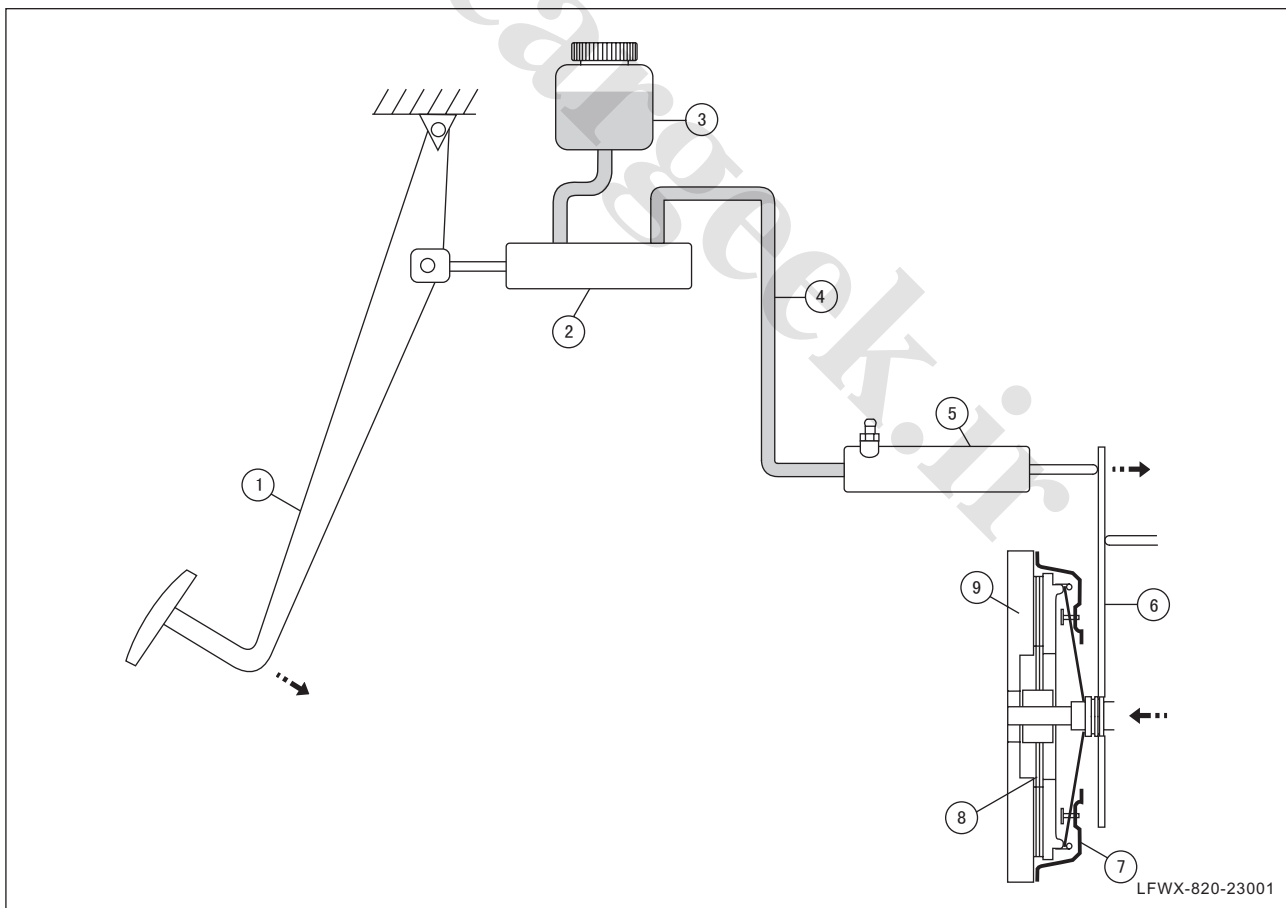
Clutch is installed between engine and transmission and is the component that directly connects with engine in automobile drive train. The clutch has the following functions:

- Engage the engine and drive train gradually and ensure that the automobile starts stably.
- Ensure drive train operates smoothly during gearshift.
- Limit the torque transferred to prevent overloading of drive train.

### 2. Components

Clutch system mainly consists of clutch pedal, clutch master cylinder, clutch oil pipe, clutch slave pump, release fork, release bearing, clutch pressure plate, clutch driven plate, etc.

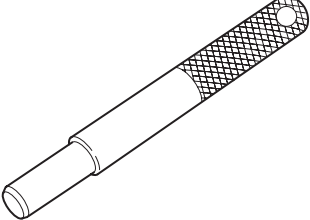
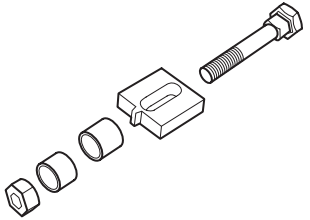
### 3. Principle

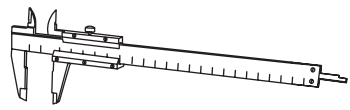

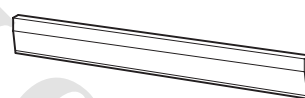

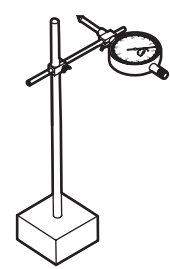
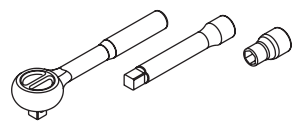


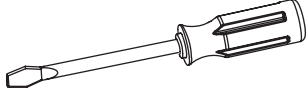
1	Clutch pedal	6	Release fork
2	Clutch master cylinder	7	Clutch pressure plate
3	Fluid reservoir	8	Clutch driven plate
4	Clutch oil pipe	9	Flywheel
5	Clutch slave cylinder		

Function of clutch is to disconnect and connect engine power transfer. When clutch is connected, the pedal is located at the highest position and there is clearance between release fork and release bearing. Pressure plate press driven plate tightly under the action of diaphragm spring. Torque of engine is transferred to driven plate through flywheel and pressure plate and then to input shaft of transmission from driven plate. When disconnecting clutch, depress clutch pedal. After removing the clearance through push rod, release fork and release bearing, outer end of release fork push pressure plate to move rearward overcoming pressure of press spring and there is clearance between pressure plate and driven plate which indicates that friction torque disappears. Then clutch drive and driven parts are disconnected, cutting power transfer. When power transfer is required, release clutch pedal slowly. Under the action of diaphragm, pressure plate moves forward and press driven plate tightly gradually as well as friction force increases gradually. When pressure plate and driven plate comes into contact, friction torque is small. Clutch drive and driven parts cannot rotate synchronously and clutch slips. As press force increases gradually, rotation speed of clutch drive and driven parts becomes the same gradually until connected completely and stop slipping.

## Preparation

S/N	Tools	Outline diagram	Description
1	Alignment tool for clutch driven plate assembly		Installation and location of clutch driven plate assembly
2	Flywheel stopper		Prevent flywheel from rotating

S/N	Tools	Outline diagram	Description
3	Vernier caliper		Check clutch driven plate
4	Feeler gauge		Check clutch pressure plate
5	High precision crossed ruler		Check clutch pressure plate
6	Pipe wrench		Remove oil pipe nut
7	Dial gauge		Measure runout.
8	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts

S/N	Tools	Outline diagram	Description
9	Screwdriver		Install and remove fixing screws

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## Service data

### 1. Technical specifications table

Clutch fluid	Specification	DOT4
	Filling amount	0.6L~0.75L
Clutch pedal height		120mm~125mm
Free play of clutch pedal		小于 10mm
Clutch pressure plate flatness		0.2mm
Thickness at the end of diaphragm spring of clutch pressure plate		0.8mm
Thickness of clutch driven plate		6.6mm~7mm
Flatness at the end of diaphragm spring of clutch pressure plate		0.2mm
Clutch driven plate rivet depth		1.5mm
Round runout of driven plate surface		
Clearance between clutch driven plate spline and transmission input shaft		

### 2. Table of tightening torque

Item	N•m
Fixing bolt of clutch pedal assembly	20~26
Fixing nut of clutch pedal assembly	20~26
Locknut of clutch switch	20~26
Oil pipe nut	10~14
Fixing bolt of clutch slave cylinder and bracket	20~26
Clutch pressure plate fixing bolt	30~34



## Precautions

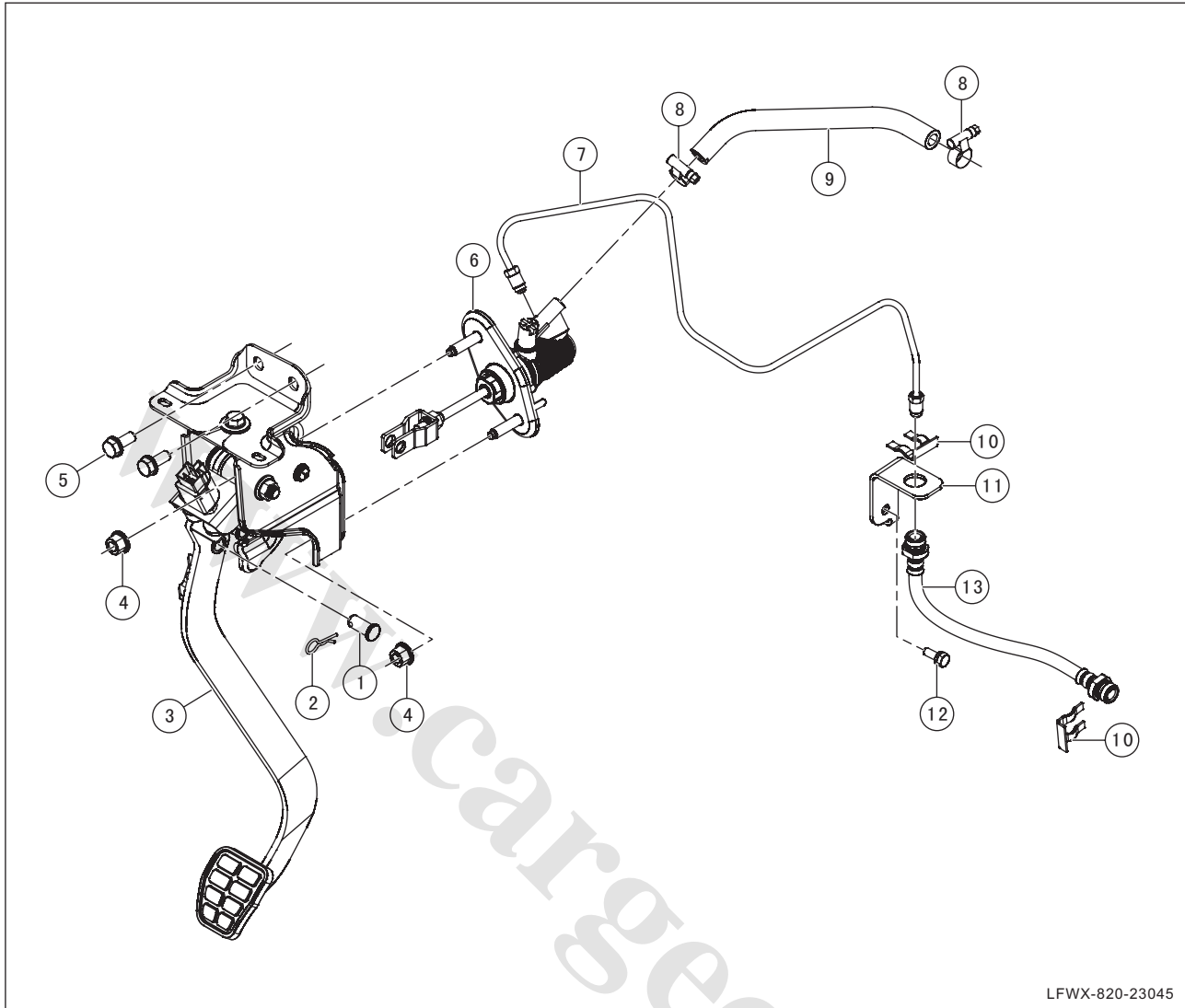
### 1. Cautions in repair

- (a) Don't spray hydraulic oil on the surface of the car; otherwise it may damage oil paint. If the hydraulic oil is sprayed on the oil paint, immediately use clean water to flush the surface.
- (b) Clutch pressure plate can't be washed with gasoline.
- (c) Don't clean the release bearing with oil or liquid substances because the release bearing is filled with grease.
- (d) To ensure the driven plate to move along the spline of the transmission input shaft smoothly, be sure to lubricate the driven plate spline and the transmission input shaft spline properly with temperature-proof and pressure-proof grease when installing the clutch. Excessive lubrication will result in slippage of the friction plates.
- (e) When the friction plate is worn down to the prescribed limit, the driven plate assembly should be replaced timely, in order to avoid scratches on the pressure plate and fly-wheel surfaces due to slipping of the clutch.

### 2. Other precautions

- (a) Drained out brake fluid cannot be reused.
- (b) It is necessary to use the specified model of hydraulic oil. If other model of hydraulic oil is used, it may cause corrosion and shorten the service life of clutch system.

## Components



LFWX-820-23045

1	Pin shaft
2	Locking pin
3	Clutch pedal assembly
4	Nut
5	Bolt
6	Clutch master cylinder
7	clutch operating tube I

8	Hoop
9	Clutch master cylinder inlet pipe I
10	E-shaped card
11	Bracket
12	Bolt
13	Clutch operating oil pipe II

## General Check

### Check the system

#### 1. Check the working condition of system

- (a) Step the clutch pedal and check whether you feel the pedal is soft, if yes, overhaul it according to the following diagnosis steps.
- (b) Step the clutch pedal and check whether you feel the pedal is hard enough to be stepped, if no, overhaul it according to the following diagnosis steps.
- (c) Step the clutch pedal and inspect whether the clutch is released, if no, overhaul it according to the following diagnosis steps.
- (d) Step the clutch pedal and release it, and inspect whether the clutch pedal can return normally. If no, overhaul it according to the following diagnosis steps.
- (e) Start the engine, step the clutch pedal and shift gear to speed 1. Don't release the parking brake, and then slowly release clutch pedal until it can be raised up fully. At this moment, the engine should flame out. If the engine doesn't flame out, it indicates that the clutch is skidding and should be inspected and repaired according to the following diagnosis steps.
- (f) Step the clutch pedal to inspect whether the clutch has abnormal sound. If yes, overhaul it according to the following diagnosis steps.

#### 2. Check system components

- (a). Check system for obvious mechanical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

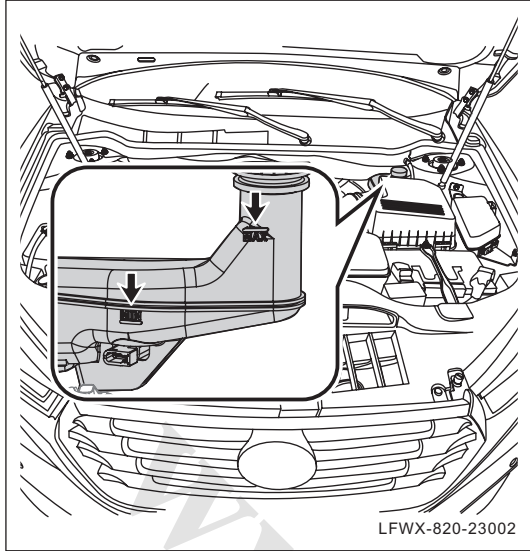
#### 3. Check whether system has oil leakage

- (a) Check whether the system has oil leakage. If yes, overhaul it.

#### 4. Check hydraulic pipe of the system.

- (a) Check whether the hydraulic pipe of system is installed correctly. If no, re-install it.
- (b) Check whether the hydraulic pipe of system has cracks or damage. If yes, replace it.

## Check clutch fluid (brake fluid).



1. **Check the working condition of clutch fluid (brake fluid).**
  - (a) Check whether the level of clutch fluid is between “MAX” and “MIN” . If no, fill fluid.

**Specification: D0T4**

**Filling amount: 0.6L~0.75L.**

- (b) Drain a little amount of clutch fluid to a transparent container and inspect whether the clutch fluid is contaminated. If yes, replace it.

## Check clutch slave pump

1. **Check the working condition of clutch slave cylinder.**
  - (a) Check whether there is oil stain around the clutch slave cylinder. If no, it indicates that the clutch slave cylinder is in good condition. If yes, wipe the oil stain away. After stepping the clutch pedal for several times, re-inspect whether there is oil stain around the clutch slave cylinder, if it still exists, it indicates that the clutch slave cylinder is damaged and needs to be replaced.

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## Check clutch master pump

### 1. Check clutch master cylinder without using equipment.

- (a) Disconnect the oil inlet pipe from the clutch master cylinder and drain all air out, and then use a screw to plug it. You feel it is hard to step the pedal and unable to step it furthermore except within the free stroke of pedal. It indicates that the clutch master cylinder doesn't leak. Otherwise, it indicates that the clutch master cylinder leaks and needs to be replaced.

#### **Note:**

**Before making the air exhausted, inspect whether clutch master cylinder has free travel. This inspection is effective only when the clutch master cylinder is installed correctly.**

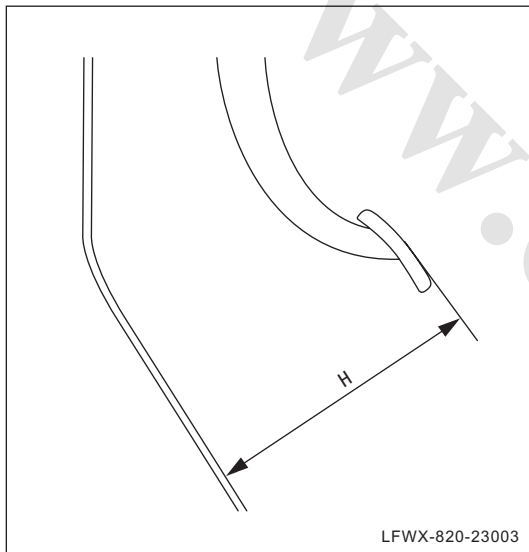
## 2. Check clutch master cylinder by using equipment.

- (a) Install a special pressure gauge onto the oil outlet of clutch master cylinder, fully drain air out, and tighten the connector of pressure gauge.
- (b) Step the clutch pedal until the pressure gauge show pressure reading of 3MPa~6MPa, fix the pedal and check the gauge pressure reading.

△ HINT:

Due to the factors of pedal, bracket, dash panel, oil expansion, etc., the reading of pressure gauge may drop, but will keep stable after dropping to certain degree. After the pressure is stable, keep this condition for 30s, and the pressure is not allowed to drop 0.2MPa. If the pressure keeps dropping to 0MPa, it indicates that the cup of master cylinder is damaged. Replace clutch master cylinder.

## Check clutch pedal



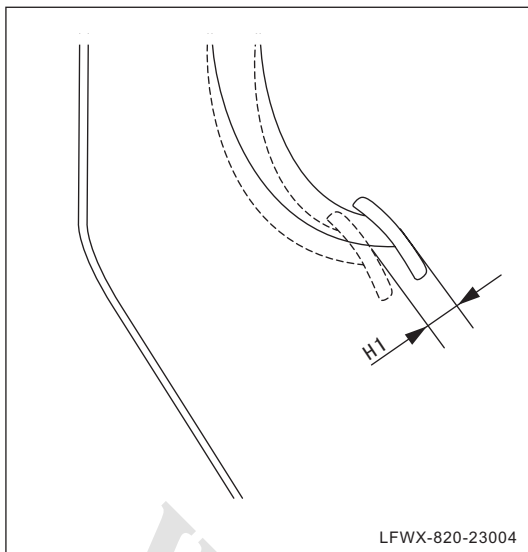
### 1. Measure the height of clutch pedal.

- (a) Take away the carpet under clutch pedal.
- (b) Measure the height of clutch pedal H.

**Standard value: 120mm-125mm**

△ HINT:

If clutch pedal height does not conform to the standard, adjust clutch pedal. (See 23 - Clutch, Clutch Pedal, Adjustment)



## 2. Measure the free travel of clutch pedal.

- (a). If clutch pedal height is correct, press down clutch pedal by hand until there is resistance and check clutch pedal free play H1.

**Standard value: less than 10mm**

### △ HINT:

- When pressing pedal by hand, the process to gradually feel resistance of pedal is divided into two steps as follows:

Step 1: Move the pedal until the pull rod of pedal contacts with piston of master cylinder.

Step 2: Move the pedal until the master cylinder makes the hydraulic up.

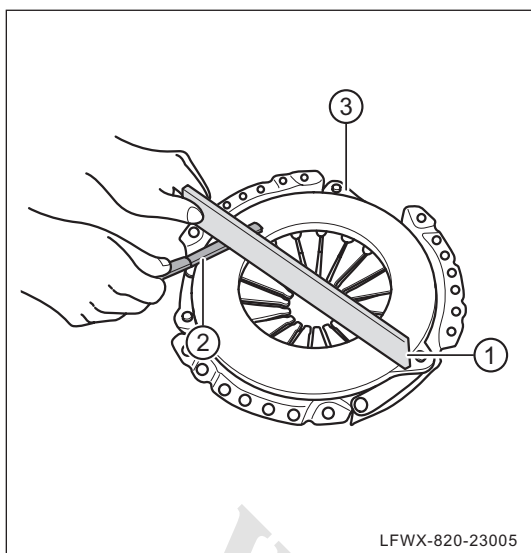
Before clutch release bearing pushes diaphragm spring, movement along with pedal is the free play of clutch pedal.

- If clutch pedal free play does not conform to the standard, adjust clutch pedal. (See 23 - Clutch, Clutch Pedal, Adjustment)

## Check clutch pressure plate

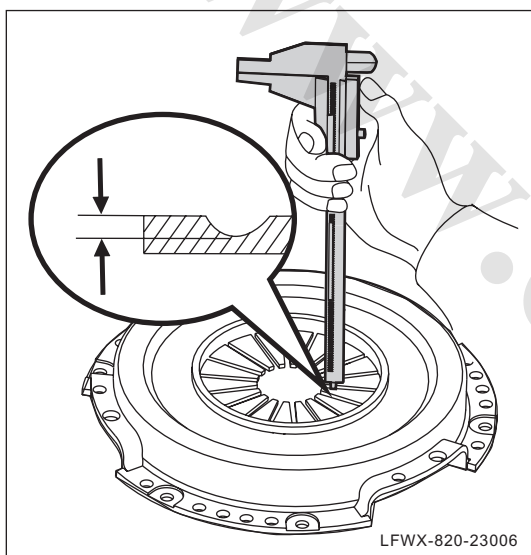
### 1. Check the working condition of clutch pressure plate.

- (a) Check whether the surface of clutch pressure plate has oil stain. If yes, clean the oil stain.
- (b) Check whether the surface of clutch pressure plate has cracks. If yes, repair or replace it.
- (c) Check whether the diaphragm spring has leaf broken, burns or crack defects. If yes, replace it.



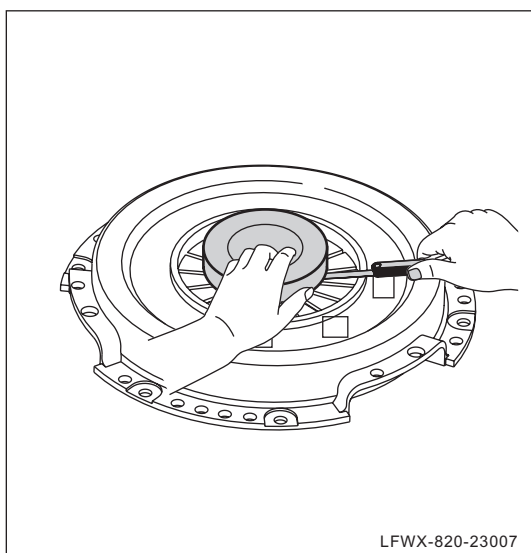
- (d) Measure the flatness of clutch pressure plate ③ on different positions by using high-precision ruler ① and feeler gauge ② .

**Standard value: 0.2mm**



- (e) Check the thickness at the end of diaphragm spring of clutch pressure plate.

**Standard value: 0.8mm**



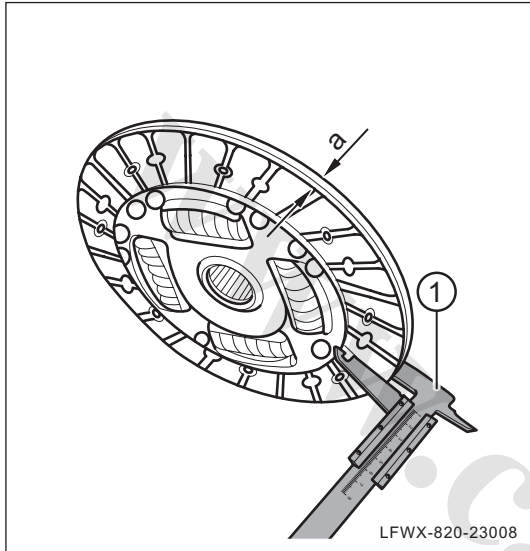
- (f) Check the flatness at the end of diaphragm spring of clutch pressure plate.

**Standard value: 0.2mm**

## Check clutch driven plate

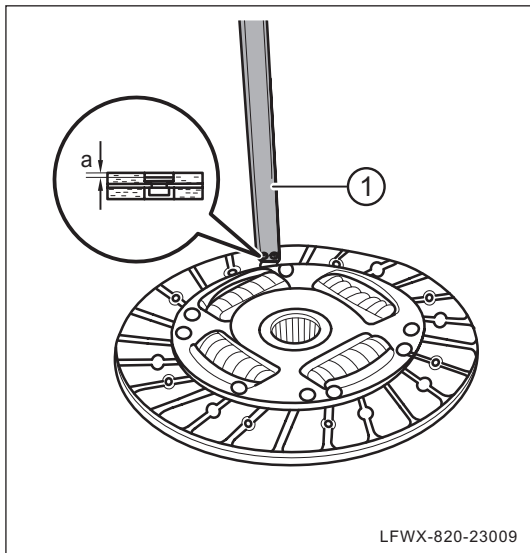
### 1. Check the working condition of clutch driven plate.

- (a) Check whether the surface of clutch driven plate has oil stain. If yes, wipe it away.
- (b) Check whether the surface of clutch driven plate has burns. If yes, replace it.
- (c) Check whether the torque spring of clutch pressure plate is loose or soft. If yes, replace the clutch driven plate.



- (d) Measure the thickness of clutch driven plate by using dial caliper ①. If the thickness is less than the limit value for repair, replace driven plate.

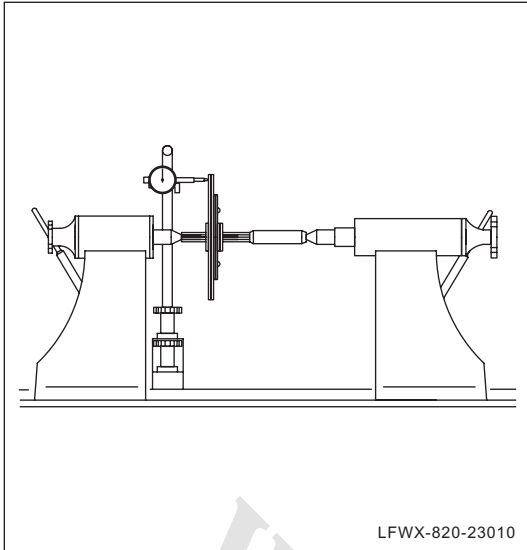
**Standard value: 6.6mm-7mm**



- (e) Measure the depth on both sides of friction plate by using dial caliper ①. If the depth is less than the limit value for repair, replace clutch driven plate.

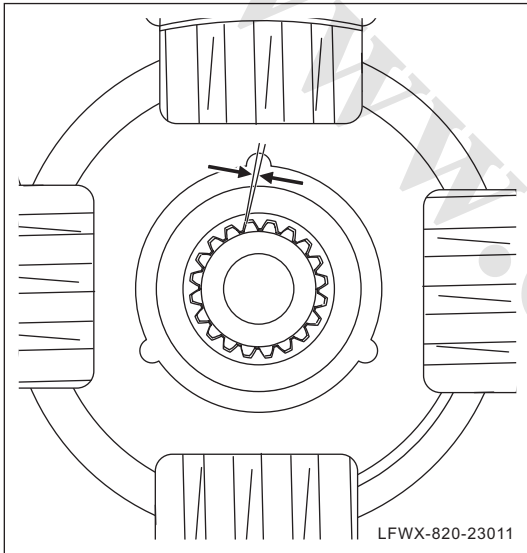
**Standard value: 1.5mm**





- (f) Measure the round runout of the surface of driven plate by using a dial indicator.

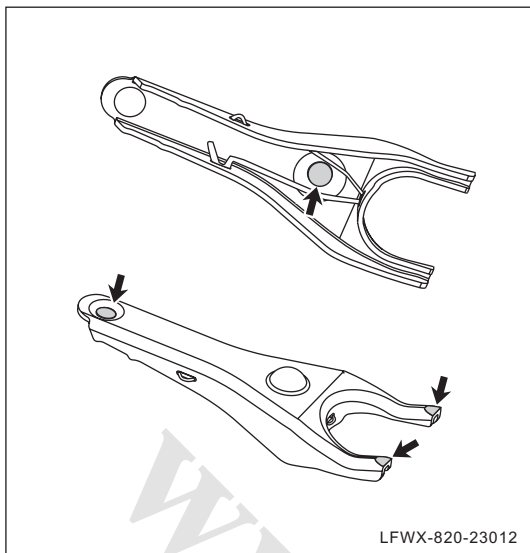
**Standard value:**



- (g) Check the clearance between clutch driven plate spline and transmission input shaft.

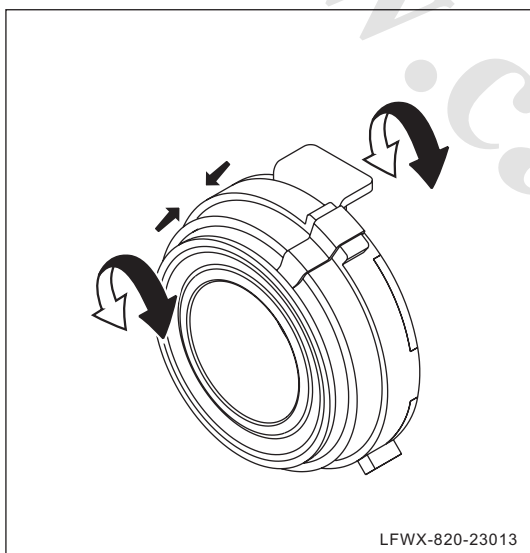
**Standard value:**

## Check clutch release fork.



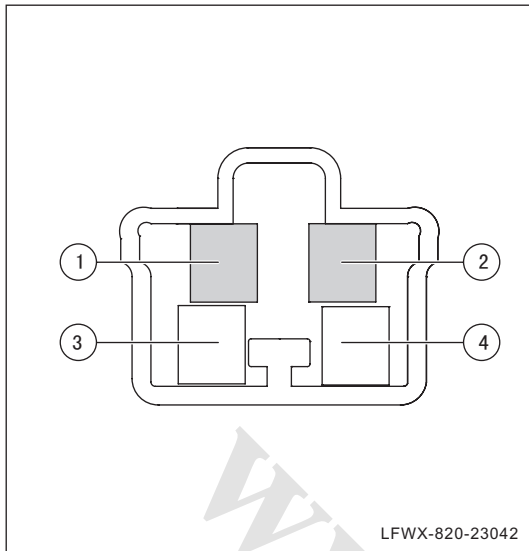
1. **Check the working condition of clutch release fork.**
  - (a) Check the clutch release fork for wear or deformation and replace it if any.

## Inspection of clutch release bearing



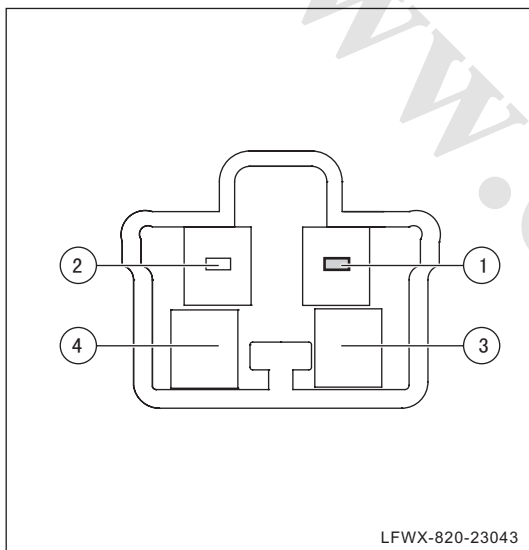
1. **Check the working condition of clutch release bearing.**
  - (a) Apply force in the axial direction and at the same time rotate the release bearing; Check if the release bearing has seizure or abnormal sound; replace it if necessary.
  - (b) Check clutch release bearing outer diameter surface and inner diameter surface and replace with new parts in case of deformation or damage.

## Check clutch switch



### 1. Check the working condition of clutch switch.

- (a) Keep the power supply on “LOCK” position, and disconnect wire harness connector of clutch switch.
- (b) Detect whether terminal No. 1 and terminal No. 2 of clutch switch are conducted. If no, replace clutch switch.



### 2. Detect the signal circuit of clutch switch.

- (a) Keep the power supply on “LOCK” position, and disconnect wire harness connector of clutch switch.
- (b) Turn power supply to “ON” position.
- (c) Measure whether there is voltage between terminal No.1 of wire harness connector of clutch switch and body grounding by using a digital multimeter voltage scale. If no, overhaul relevant wire harness according to electric schematic diagram catalogue.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Clutch pedal is loose	1. Clutch fluid (too little)	See 23- diagnosis of clutch - diagnosis (1. Clutch pedal is loose)
	2. System (oil leakage)	
	3. Clutch hydraulic system (with air)	
	4. Clutch slave cylinder (damaged)	
Vehicle vibration during start	1. Engine mounting (bolt is loose.)	See 23- Diagnosis of Clutch - Fault Diagnosis (2. Vehicle vibrates during start)
	2. Connection between engine and transmission (bolt is loose.)	
	3. Clutch driven plate (fault)	
	4. Clutch pressure plate (fault)	
	5. Flywheel (fault)	
Clutch pedal is hard to be depressed	1. Clutch fluid (wrong in model or contaminated)	See 23- diagnosis of clutch - diagnosis (3. Clutch pedal is hard to be depressed)
	2. Clutch pedal (fault)	
	3. Clutch hydraulic hose (damaged)	
	4. Clutch driven plate (fault)	
Clutch cannot be disengaged	1. Clutch fluid (too little)	See 23- diagnosis of clutch - diagnosis 4. Clutch cannot be disengaged
	2. System (oil leakage)	
	3. Clutch pedal (fault)	
	4. Clutch slave cylinder (fault)	
	5. Clutch master cylinder (fault)	
	6. Clutch driven plate (fault)	
	7. Clutch pressure plate (fault)	
	8. Clutch release bearing (fault)	
	9. Clutch release fork (fault)	

Symptom	Suspected area	Recommended action
The pedal cannot return to its position (but clutch has been disengaged)	1. Clutch hydraulic hose (incorrect installation)	See 23- diagnosis of clutch - diagnosis (5. Pedal can't return)
	2. Clutch slave cylinder (fault)	
	3. Clutch master cylinder (fault)	
	4. Clutch pressure plate (fault)	
	5. Clutch release bearing (fault)	
	6. Clutch release fork (fault)	
Clutch slips	1. Clutch driven plate (fault)	See 23- diagnosis of clutch - diagnosis 6. Clutch slips
	2. Clutch pressure plate (fault)	
	3. Flywheel (fault)	
Abnormal clutch noise	1. Clutch release bearing (fault)	See 23- diagnosis of clutch - diagnosis 7. Abnormal clutch noise
	2. Clutch release fork (fault)	
	3. Clutch driven plate (fault)	
Shock caused by gear shifting is obvious.	1. Wire harness fault	See 23- diagnosis of clutch - diagnosis (8. Shock caused by gear shifting is obvious)
	2. Clutch switch (damaged)	
	3. Engine ECM (fault)	

## Fault diagnosis

### 1. Clutch pedal is loose

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether clutch pedal is soft (See 23 –General Check of Clutch, Check of System)	Diagnosis end.	Clutch pedal is loose	Go to Step 1
1	Check clutch fluid.	Normal	Faulty	Instruction
	Check the clutch fluid amount (See 23 –General Check of clutch, Check of Clutch Fluid)	Go to Step 3	Clutch fluid is too little.	Go to Step 2
2	Check whether oil leakage of clutch system.	Normal	Faulty	Instruction



	Check whether the clutch system has oil leakage (See 23 – General Check of Clutch, Check of System)	Fill clutch fluid and proceed with step 3.	The system has oil leakage.	Repair the oil leakage position of the system, and fill clutch fluid (See 23 – Filling of Clutch Hydraulic Fluid)
3	Check clutch slave cylinder.	Normal	Faulty	Instruction
	Depress clutch pedal to check operation condition of clutch slave pump	Go to Step 4	The pedal is loose and clutch slave pump does not operate	System air exhaust (See 23 – Clutch Hydraulic Fluid, Air Exhaust)
4	Check clutch slave cylinder.	Normal	Faulty	Instruction
	Check the working condition of clutch slave cylinder (See 23 – General Check of Clutch, Check of Clutch Slave Cylinder)	Go to Step 5	Clutch slave cylinder is damaged.	Replace clutch slave cylinder (See 23 – Clutch Slave Cylinder, Replacement)
5	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Vehicle vibrates during start

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Ask the user about the vehicle vibration condition	Diagnosis end.	Vibration occurs when starting	Go to Step 1
1	Check engine mounting	Normal	Faulty	Instruction
	Check engine mounting bolts for tightening condition	Go to Step 2	Bolt is loose	Tighten the loose bolts
2	Check connecting bolts of transmission and engine	Normal	Faulty	Instruction
	Check connecting bolts of transmission and engine for tightening condition	Go to Step 3	Bolt is loose	Tighten the loose bolts

Steps	Inspection item	Inspection result		
3	Check clutch driven plate	Normal	Faulty	Instruction
	Check the working condition of clutch driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 4	Driven plate is worn excessively	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)
4	Check torque spring of driven plate	Normal	Faulty	Instruction
	Check the working condition of torque spring of driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 5	<ul style="list-style-type: none"> <li>Torque spring is broken.</li> <li>Torque spring is obviously ineffective.</li> </ul>	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)
5	Check clutch pressure plate	Normal	Faulty	Instruction
	Check the working condition of clutch pressure plate (See 23 – General Check of Clutch, Check of Clutch Pressure Plate)	Go to Step 6	Clutch pressure plate is excessively worn	Replace clutch pressure plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)
6	Check flywheel	Normal	Faulty	Instruction
	Check the working condition of flywheel (See 11A – General Check of Engine Mechanical System, Check of System)	Go to Step 7	<ul style="list-style-type: none"> <li>Flywheel fixing bolt is loose</li> <li>Flywheel is worn excessively</li> </ul>	<ul style="list-style-type: none"> <li>Tighten flywheel bolt</li> <li>Replace flywheel (See 11A – Crankshaft and Flywheel of Engine Mechanical System, Overhaul)</li> </ul>
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Clutch pedal is hard to be depressed

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the clutch pedal can be pushed (See 23 – General Check of Clutch, Check of System)	Diagnosis end.	Clutch pedal is hard to be depressed	Go to Step 1
1	Check clutch fluid.	Normal	Faulty	Instruction
	Check the brand of clutch fluid and contamination condition (See 23 – General Check of Clutch, Check of Clutch Fluid)	Go to Step 2	<ul style="list-style-type: none"> <li>The brand is incorrect.</li> <li>Fluid is contaminated.</li> </ul>	Replace clutch fluid (See 23 – Clutch Fluid, Drainage/ filling)
2	Check clutch pedal	Normal	Faulty	Instruction
	Check the working condition of clutch pedal (See 23- General Check of Clutch, Check of Clutch Pedal)	Go to Step 3	<ul style="list-style-type: none"> <li>Clutch pedal height and free play parameter are incorrect</li> <li>Clutch pedal is in poor lubrication condition and mechanically damaged</li> </ul>	<ul style="list-style-type: none"> <li>Adjust clutch pedal (See 23 - Clutch, Clutch Pedal, Adjustment)</li> <li>Replace clutch pedal (See 23 - Clutch, Clutch Pedal, Replacement)</li> </ul>
3	Check clutch hydraulic hose	Normal	Faulty	Instruction
	Check the installation of clutch hydraulic hose (See 23 – General Check of Clutch, Check of System)	Go to Step 4	Hose is damaged.	Replace clutch hydraulic hose (see 23 - Clutch, Clutch oil pipe, Replacement)
4	Check clutch driven plate	Normal	Faulty	Instruction
	Check the working condition of clutch driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 5	Driven plate is excessively worn	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate, Replacement)
5	Verification and check	Normal	Faulty	Instruction



	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms
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#### 4. Clutch cannot be disengaged

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether clutch can be released (See 23 – General Check of Clutch, Check of System)	Diagnosis end.	Clutch can't be released.	Go to Step 1
1	Check clutch fluid.	Normal	Faulty	Instruction
	Check the clutch fluid amount (See 23 –General Check of clutch, Check of Clutch Fluid)	Go to Step 3	Clutch fluid is too little.	Go to Step 2
2	Check whether oil leakage of clutch system.	Normal	Faulty	Instruction
	Check whether the clutch system has oil leakage (See 23 –General Check of Clutch, Check of System)	Fill clutch fluid and proceed with step 3.	The system has oil leakage.	Repair the oil leakage position of the system, and fill clutch fluid (See 23 – Filling of Clutch Hydraulic Fluid)
3	Check clutch pedal	Normal	Faulty	Instruction
	Check the working condition of clutch pedal (See 23- General Check of Clutch, Check of Clutch Pedal)	Go to Step 4	<ul style="list-style-type: none"> <li>Clutch pedal height and free play parameter are incorrect</li> <li>Clutch pedal is in poor lubrication condition and mechanically damaged</li> </ul>	<ul style="list-style-type: none"> <li>Adjust clutch pedal (See 23 - Clutch, Clutch Pedal, Adjustment)</li> <li>Replace clutch pedal (See 23 - Clutch, Clutch Pedal, Replacement)</li> </ul>
4	Check clutch slave pump	Normal	Faulty	Instruction
	Depress clutch pedal to check operation condition of clutch slave pump	Go to Step 5	The pedal is loose and clutch slave pump does not operate	System air exhaust (See 23 – Clutch Hydraulic Fluid, Air Exhaust)

Steps	Inspection item	Inspection result		
5	Check clutch slave pump	Normal	Faulty	Instruction
	Check the working condition of clutch slave cylinder (See 23 – General Check of Clutch, Check of Clutch Slave Cylinder)	Go to Step 6	Clutch slave cylinder is damaged.	Replace clutch slave cylinder (See 23 – Clutch Slave Cylinder, Replacement)
6	Check clutch master pump	Normal	Faulty	Instruction
	Check the working condition of clutch master cylinder (See 23 – General Check of Clutch, Check of Clutch Master Cylinder)	Go to Step 7	Clutch master cylinder is damaged	Replace clutch master cylinder (See 23 – Clutch Master Cylinder, Replacement)
7	Check clutch driven plate	Normal	Faulty	Instruction
	Check the working condition of clutch driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 8	Driven plate is worn excessively	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate, Replacement)
8	Check clutch pressure plate	Normal	Faulty	Instruction
	Check the working condition of clutch pressure plate (See 23 – General Check of Clutch, Check of Clutch Pressure Plate)	Go to Step 9	Clutch pressure plate is excessively worn	Replace clutch pressure plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate, Replacement)
9	Inspection of clutch release bearing	Normal	Faulty	Instruction
	Check the working condition of clutch release bearing (See 23 – General Check of Clutch, Check of Clutch Release Bearing)	Go to Step 10	Release bearing is worn	Replace clutch release bearing (see 23 - Clutch, Clutch Release Bearing and Release Fork , Replacement)
10	Check clutch release fork.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of clutch release fork (See 23 – General Check of Clutch, Check of Clutch Release Fork)	Go to Step 11	Release fork is worn or deformed.	Replace clutch release fork (see 23 - Clutch, Clutch Release Bearing and Release Fork , Replacement)
11	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 5. The pedal cannot return to its position (but clutch has been disengaged)

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether clutch pedal can return normally (See 23 – General Check of Clutch, Check of System).	Diagnosis end.	The clutch pedal can return	Go to Step 1
1	Check clutch hydraulic hose	Normal	Faulty	Instruction
	Check the installation of clutch hydraulic software (See 23 – General Check of Clutch, Check of System)	Go to Step 2	Hose is twisted or damaged	Replace clutch hydraulic hose (see 23 - Clutch, Clutch oil pipe, Replacement)
2	Check clutch slave pump	Normal	Faulty	Instruction
	Check the working condition of clutch slave cylinder (See 23 – General Check of Clutch, Check of Clutch Slave Cylinder)	Go to Step 3	Clutch slave cylinder is damaged.	Replace clutch slave cylinder (See 23 – Clutch Slave Cylinder, Replacement)
3	Check clutch master pump	Normal	Faulty	Instruction
	Check the working condition of clutch master cylinder (See 23 – General Check of Clutch, Check of Clutch Master Cylinder)	Go to Step 4	Clutch master cylinder is damaged	Replace clutch master cylinder (See 23 – Clutch Master Cylinder, Replacement)

Steps	Inspection item	Inspection result		
4	Check the diaphragm spring of clutch pressure plate	Normal	Faulty	Instruction
	Check the working condition of diaphragm spring of clutch pressure plate (See 23 – General Check of Clutch, Check of Clutch Pressure Plate)	Go to Step 5	Diaphragm spring is too weak	Replace clutch pressure plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate, Replacement)
5	Inspection of clutch release bearing	Normal	Faulty	Instruction
	Check the working condition of clutch release bearing (See 23 – General Check of Clutch, Check of Clutch Release Bearing)	Go to Step 6	Release bearing is worn	Replace clutch release bearing (see 23 - Clutch, Clutch Release Bearing and Release Fork , Replacement)
6	Check clutch release fork.	Normal	Faulty	Instruction
	Check the working condition of clutch release fork (See 23 – General Check of Clutch, Check of Clutch Release Fork)	Go to Step 7	Release fork is worn or deformed.	Replace clutch release fork (see 23 - Clutch, Clutch Release Bearing and Release Fork , Replacement)
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 6. Clutch slips

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the clutch is skidding (See 23 – General Check of Clutch, Check of System)	Diagnosis end.	Clutch slips	Go to Step 1
1	Check clutch driven plate	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of clutch driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 2	<ul style="list-style-type: none"> <li>Driven plate has oil stain</li> <li>Driven plate is polished</li> </ul>	<ul style="list-style-type: none"> <li>Clean or replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)</li> <li>Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)</li> </ul>
2	Check torque spring of driven plate	Normal	Faulty	Instruction
	Check the working condition of torque spring of driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 3	<ul style="list-style-type: none"> <li>Torque spring is broken.</li> <li>Torque spring is obviously ineffective.</li> </ul>	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)
3	Check clutch pressure plate	Normal	Faulty	Instruction
	Check the working condition of clutch pressure plate (See 23 – General Check of Clutch, Check of Clutch Pressure Plate)	Go to Step 4	Clutch pressure plate deformed	Replace clutch pressure plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)
4	Check flywheel	Normal	Faulty	Instruction
	Check the working condition of flywheel (See 11A – General Check of Engine Mechanical System, Check of System)	Go to Step 5	Flywheel deformed	Replace flywheel (See 11A – Crankshaft and Flywheel of Engine Mechanical System, Overhaul)
5	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 7. Abnormal clutch noise

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Ask the user whether he/she depresses the clutch frequently or depress the clutch by habit during driving	Go to Step 1	<ul style="list-style-type: none"> <li>Clean Depress the clutch frequently</li> <li>Clean Depress the clutch by habit</li> </ul>	Judge that abnormal clutch noise is resulted from release bearing wear and replace clutch release bearing (see 23 - Clutch, Clutch Release Bearing and Release Fork , Replacement)
1	Check abnormal clutch noise	Normal	Faulty	Instruction
	Depress clutch pedal to check abnormal clutch noise condition	Diagnosis end.	Hear abnormal noise from clutch clearly	Go to Step 2
2	Inspection of clutch release bearing	Normal	Faulty	Instruction
	Check the working condition of clutch release bearing (See 23 – General Check of Clutch, Check of Clutch Release Bearing)	Go to Step 3	Release bearing is worn	Replace clutch release bearing (see 23 - Clutch, Clutch Release Bearing and Release Fork , Replacement)
3	Check clutch release fork.	Normal	Faulty	Instruction
	Check the lubrication and return condition of clutch release fork (See 23 – General Check of Clutch, Check of Clutch Release Fork)	Go to Step 4	Release fork is in poor lubrication condition or cannot return to its position	Lubricate or replace clutch release fork (see 23 - Clutch, Clutch Release Bearing and Release Fork, Replacement)
4	Check clutch driven plate	Normal	Faulty	Instruction
	Check the working condition of the spline of clutch driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 5	Driven plate spline is worn	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate,Replacement)
5	Check torque spring of driven plate	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of torque spring of driven plate (See 23 – General Check of Clutch, Check of Clutch Driven Plate)	Go to Step 6	<ul style="list-style-type: none"> <li>Torque spring is broken.</li> <li>Torque spring is obviously ineffective.</li> </ul>	Replace clutch driven plate (see 23 - Clutch, Clutch Pressure Plate and Driven Plate, Replacement)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 8. Shock caused by gear shifting is obvious.

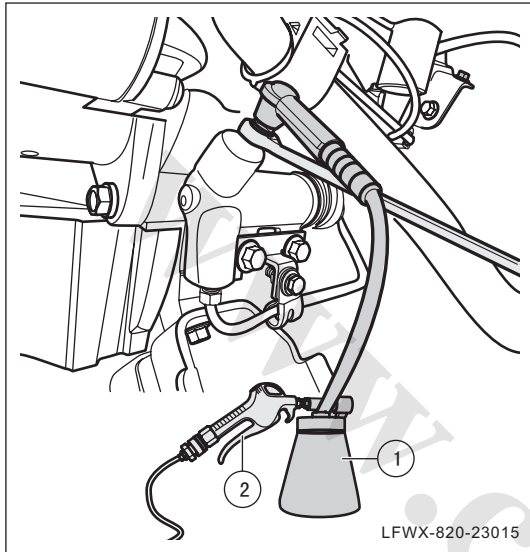
Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Inquire user whether shock caused by gear shifting is obvious.	Diagnosis end.	Shock caused by gear shift is obvious.	Go to Step 1
1	Check wire harness	Normal	Faulty	Instruction
	Check whether the signal circuit of clutch switch is conducted (See 23 – General Check of Clutch, Check of Clutch Switch)	Go to Step 2	No continuity	Overhaul relevant wire harness according to circuit book.
2	Check clutch switch.	Normal	Faulty	Instruction
	Check the working condition of clutch switch (See 23 – General Check of Clutch, Check of Clutch Switch)	Go to Step 3	Clutch switch is damaged	Replace clutch switch (See 23 – Clutch Switch, Replacement)
3	Replacement and check	Normal	Faulty	Instruction
	Replace the engine ECM with the same model and check the DTC.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Clutch Fluid (Brake Fluid)

### Exhaust

#### 1. Air exhaust of clutch system

- (a) Remove upper cross beam trim panel of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



- (b) Remove the bleeder screw boot of clutch slave pump.
- (c) Connect the exhaust device ① of brake fluid to the bleed screw of clutch slave cylinder, and trigger the exhaust device switch ② of brake fluid.
- (d) Release the bleed screw of clutch slave cylinder, to exhaust air from clutch system until there is no air inside the clutch system.

#### ⓘ Note:

**In the cause of air exhausts from system, fill clutch fluid to make sure that the fluid level in fluid tank is between “MAX” and “MIN” .**

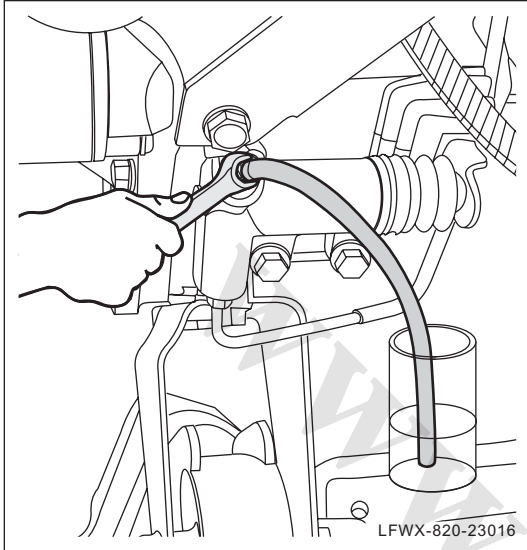
- (e) Tighten bleed screw of clutch slave cylinder, remove the exhaust device ① of brake fluid, and install dustproof cover of bleed screw.
- (f) Install trim panel of upper horizontal beam of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



## Drainage

### 1. Drain clutch fluid.

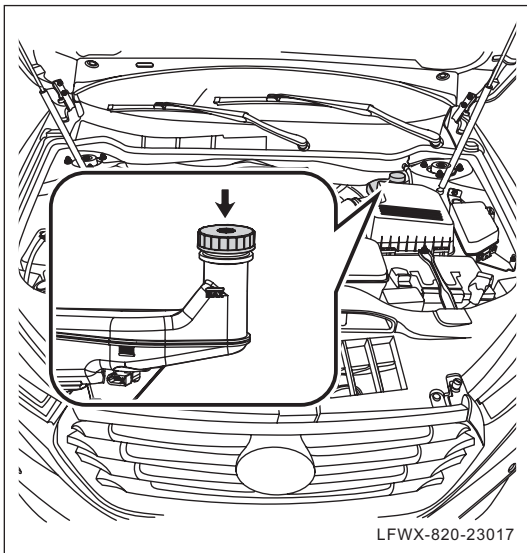
- (a) Remove upper cross beam trim panel of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



- (b) Remove the dustproof cover of bleed screw of clutch and connect one end of a hose to bleed screw of clutch, and the other to collecting container.
- (c) Open the lid of fluid tank, and release the bleed screw of clutch slave cylinder.
- (d) One technician repeatedly steps the clutch pedal with hard force until all clutch fluid are drained out.
- (e) Tighten the bleed screw and install the dustproof cover of bleed screw.

- (f) Install trim panel of upper horizontal beam of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)

## Filling



### 1. Fill clutch fluid.

- (a) Open the engine hood.
- (b) Remove the lid from fluid tank and fill clutch fluid to "MAX" position.

**Specification: D0T4**

**Filling amount: 0.6L~0.75L.**

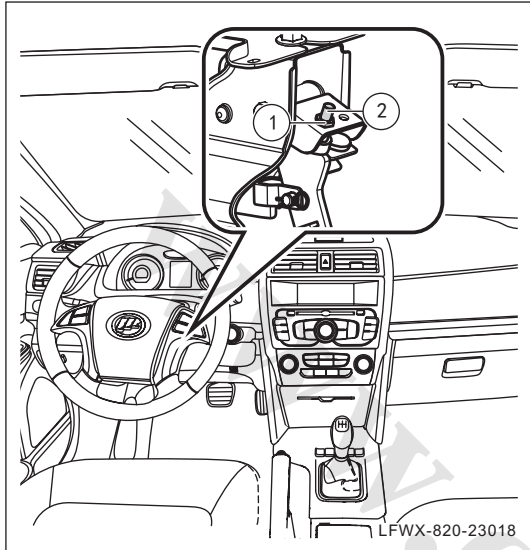
- (c) Exhaust air from the clutch system. (See 23 – Clutch Fluid, Air Exhaust)

## Clutch Pedal

### Adjustment

#### 1. Adjust the height of clutch pedal

- (a) Remove clutch switch. (See 23 – Clutch Switch, Replacement)



- (b) Release locknut ① and adjust the clutch pedal to proper height by using limit bolt ② .

**Pedal height: 120mm~125mm**

- (c) Tighten lock nut ① .

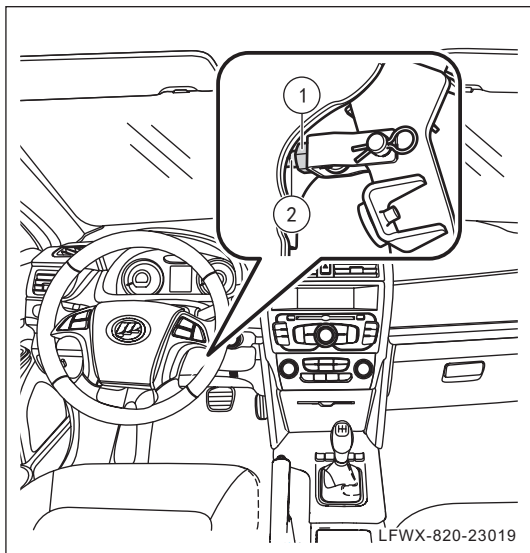
- (d) Install clutch switch. (See 23 – Clutch Switch, Replacement)

#### 2. Adjust free play of clutch pedal

- (a) Release locknut ① , and rotate pull rod ② to adjust the length until the free travel of pedal is within correct range.

**Free travel: less than 10mm**

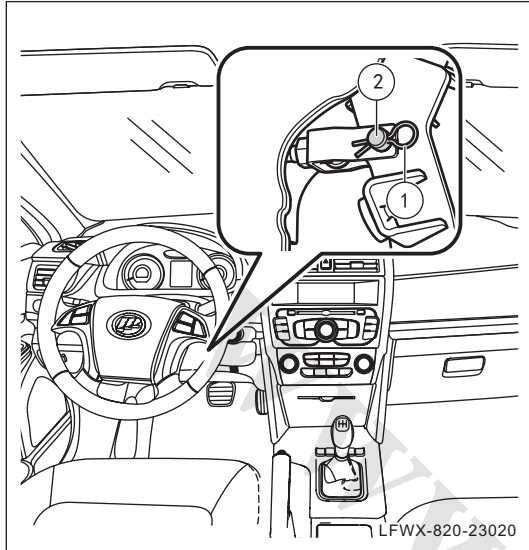
- (b) Tighten lock nut ① .



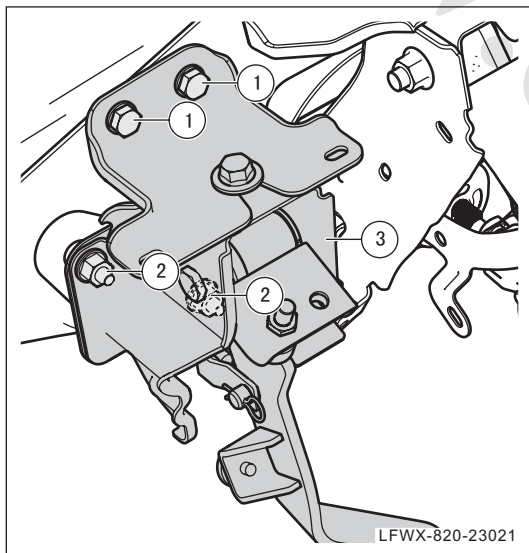
## Replacement

### 1. Remove clutch pedal assembly

(a) Remove clutch switch. (See 23 – Clutch Switch, Replacement)



(b) Remove lock pin of pull rod ① of clutch slave cylinder and remove pin shaft ② .



(c) Remove fixing bolt ① of clutch pedal assembly and fixing nut ② of clutch master cylinder.

(d) Remove clutch pedal assembly ③ .

### 2. Install clutch pedal assembly

(a) Install clutch pedal assembly to mounting position.

(b) Install fixing bolt of clutch pedal assembly and nut of master cylinder, and tighten them.

**Tightening torque: 20N•m~26N•m(bolt); 20N•m~26N•m(nut)**

(c) Install pin shaft and lock shaft of pull rod of clutch master cylinder to mounting positions.

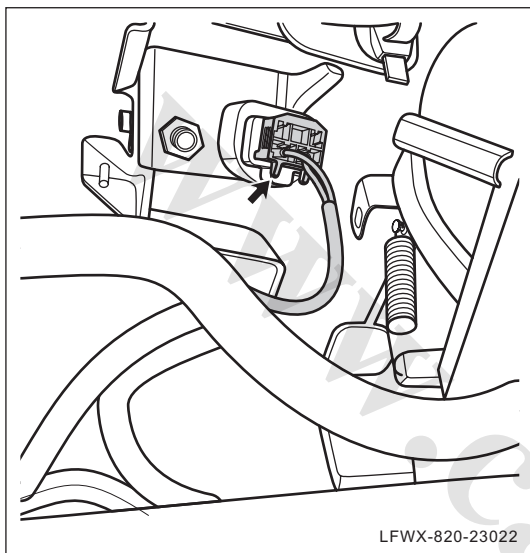
Adjust the clutch pedal height. (See 23 - Clutch, Clutch Pedal, Adjustment)

## Clutch Switch

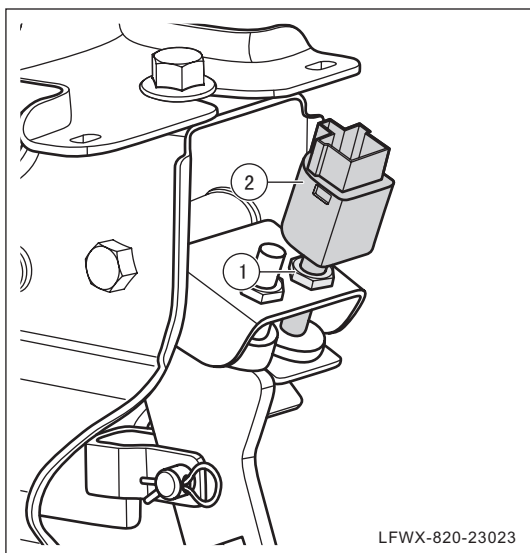
### Replacement

#### 1. Remove clutch switch

- (a) Turn power supply to "LOCK" position.
- (b) Remove lower panel of dashboard. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)



- (c) Disconnect wire harness connector of clutch switch.



- (d) Release locknut ① of clutch switch and remove clutch switch ② .

#### 2. Install clutch switch

- (a) Install clutch switch.

△ HINT:

After clutch switch is installed, it should not affect the height of clutch pedal and normal

working condition of clutch switch.

- (b) Tighten locknut of clutch switch.

**Torque: 20N•m - 26N•m**

- (c) Connect wire harness connector of clutch switch.
- (d) Install dashboard lower panel. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)

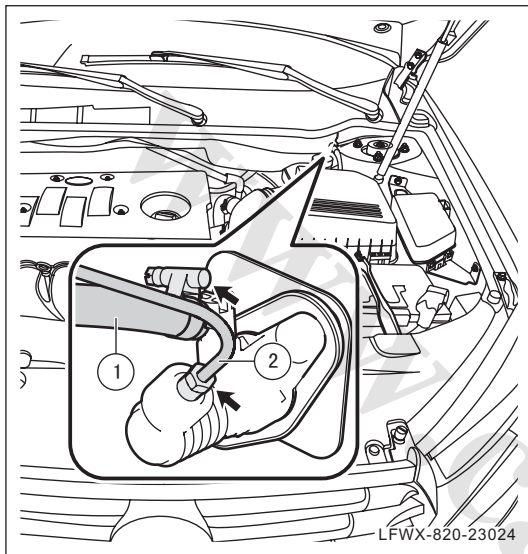
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# Clutch Master Cylinder

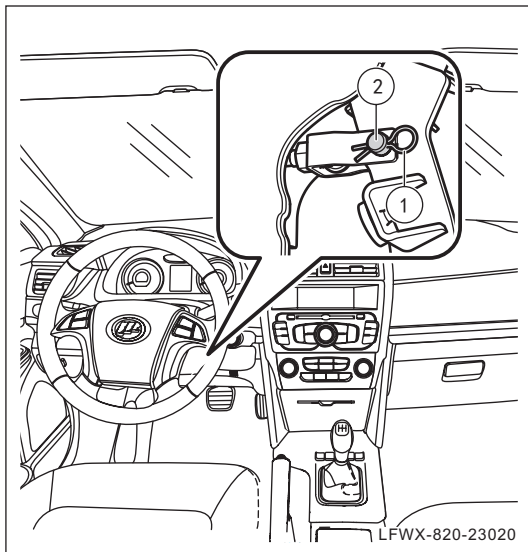
## Replacement

### 1. Remove clutch master cylinder

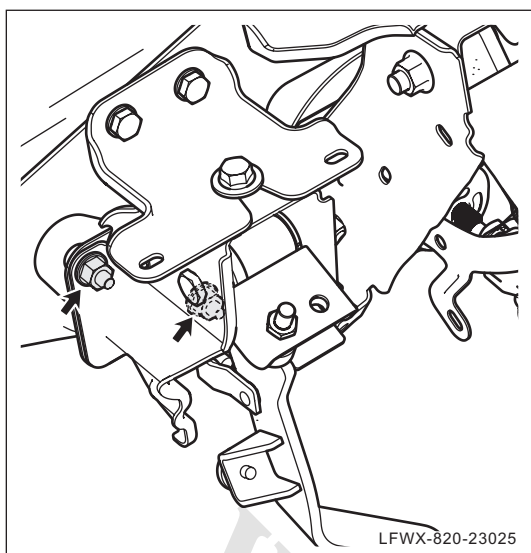
- (a) Drain clutch fluid. (See 23 – Clutch Fluid, Drainage)
- (b) Remove vacuum booster with brake master cylinder assembly. (See 51 – Vacuum Booster of Service Brake, Replacement)



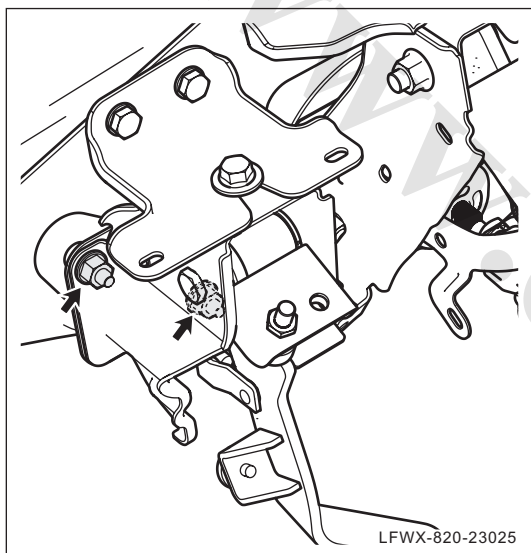
- (c) Remove loop of oil inlet pipe ① of clutch master cylinder, and remove oil inlet pipe ① of clutch master cylinder.
- (d) Remove nut of clutch operating oil pipe ② and move this pipe away.



- (e) Remove lock pin ① of pull rod of clutch master cylinder, and remove pin shaft ② and lock pin ①.



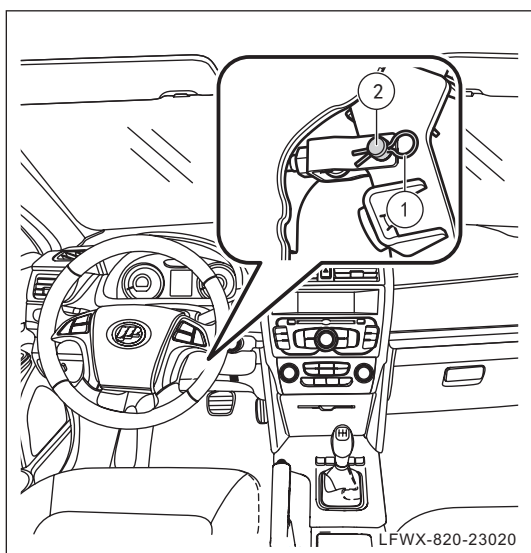
- (f) Remove fixing nut of cylinder master cylinder, and take out clutch master cylinder.



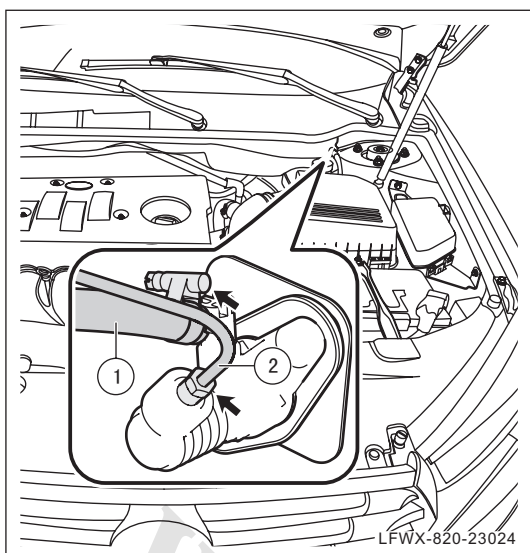
## 2. Install clutch master cylinder

- (a) Install clutch master cylinder onto proper mounting position.
- (b) Install fixing nut of clutch master cylinder and tighten it.

**Torque: 20N•m - 26N•m**



- (c) Install pin shaft ② of pull rod of clutch master cylinder and lock pin ①.



- (d) Install oil inlet pipe ① of clutch master cylinder and loop to proper mounting position.
- (e) Install clutch operating oil pipe ② to proper mounting position and tighten oil pipe nut.

**Torque: 10N•m~14N•m**

- (f) Install vacuum booster with brake master cylinder assembly (See 51 – Vacuum Booster of Service Brake, Replacement)
- (g) Fill clutch fluid. (See 23 – Clutch Fluid, Filling)

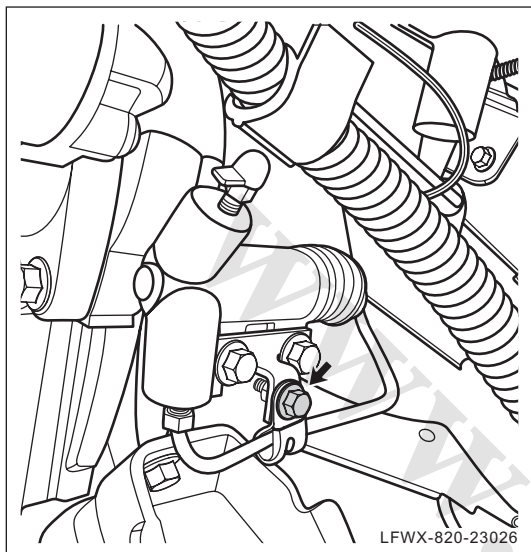


## Clutch Slave Cylinder

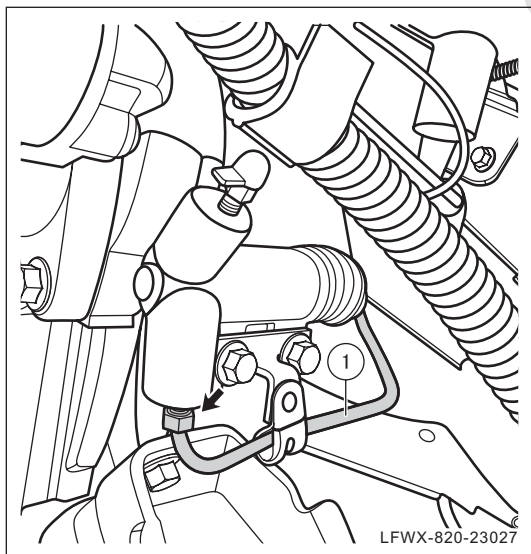
### Replacement

#### 1. Remove clutch slave pump

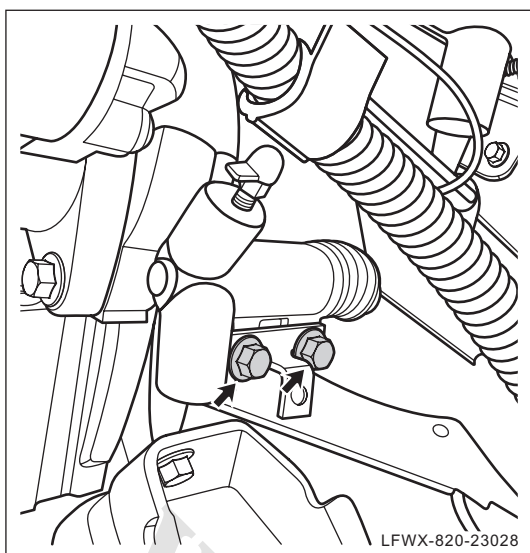
(a) Drain clutch fluid. (See 23 – Clutch Fluid, Drainage)



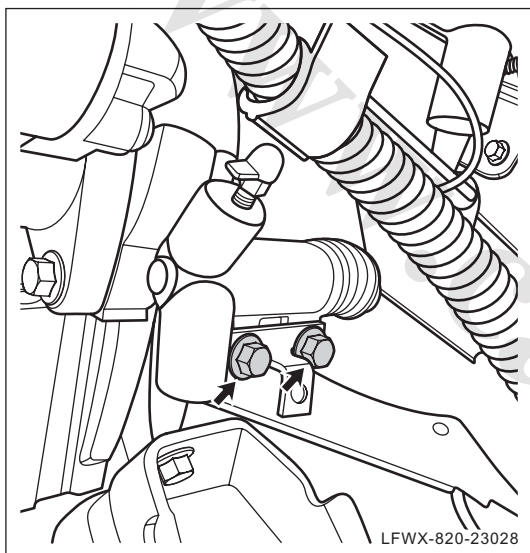
(b) Remove fixing bolt of oil pipe bracket of clutch slave cylinder.



(c) Remove nut of oil pipe ① of clutch slave cylinder, and move oil pipe of clutch slave cylinder away.



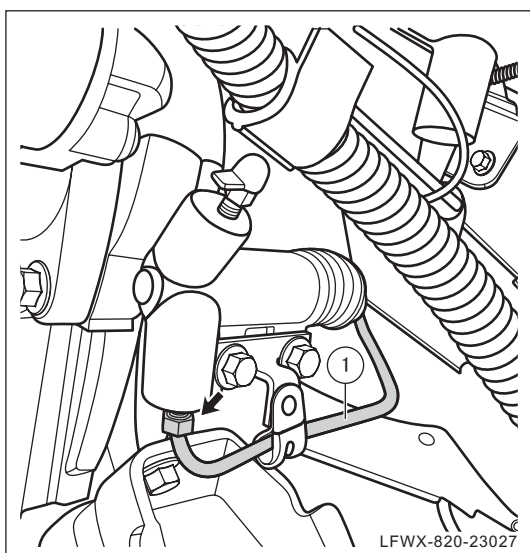
- (d) Remove fixing bolts of clutch slave pump and then take down the clutch slave pump.



## 2. Installation of clutch slave cylinder

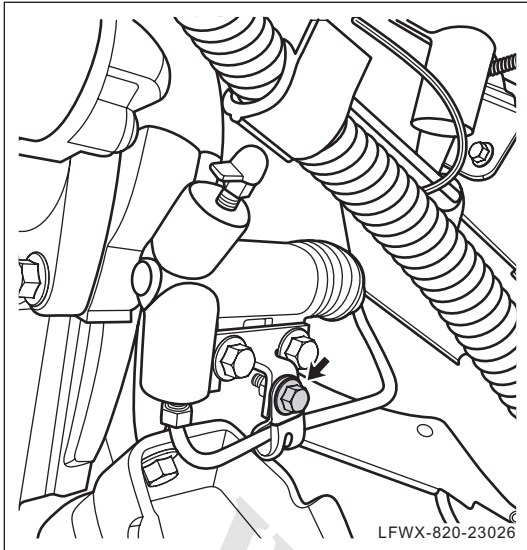
- (a) Install clutch slave cylinder and bracket onto proper mounting position, and install and tighten fixing bolts.

**Torque: 20N•m - 26N•m**



- (b) Install oil pipe ① of clutch slave cylinder onto proper mounting position, and tighten oil pipe nut.

**Torque: 10N•m-14N•m**



- (c) Install and tighten fixing bolt of oil pipe bracket of clutch slave cylinder.

**Torque: 20N•m - 26N•m**

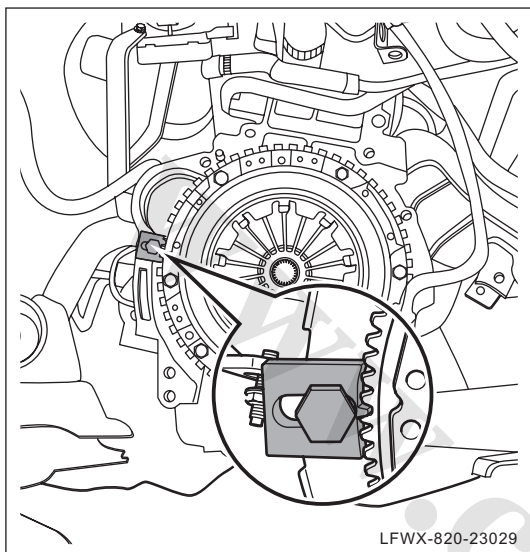
- (d) Fill clutch fluid. (See 23 – Clutch Fluid, Filling)

## Clutch Pressure Plate and Driven Plate

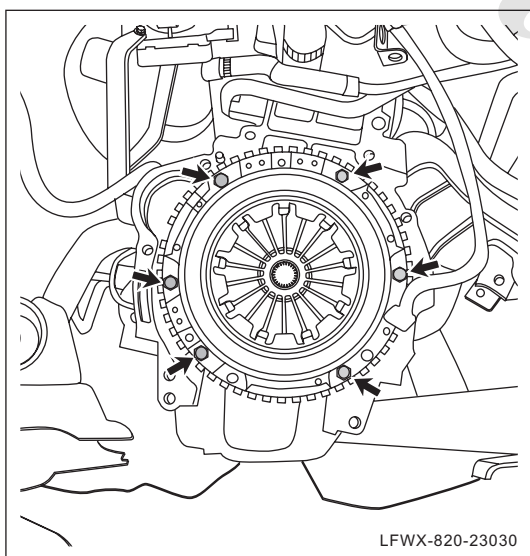
### Replacement

#### 1. Remove clutch pressure plate and driven plate

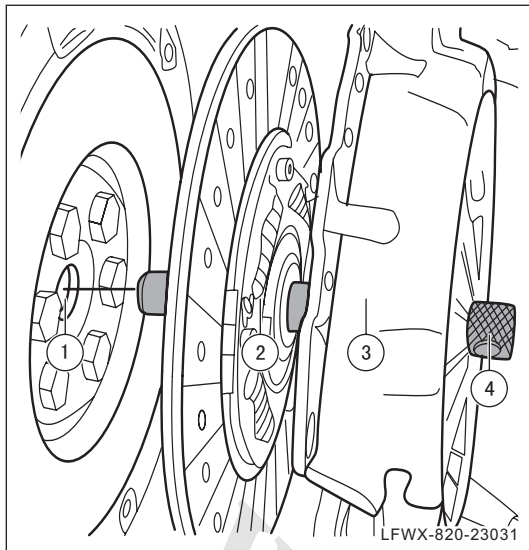
- (a) Remove transmission. (See 21 - Manual Transmission, Transmission Assembly, Replacement)



- (b) Lock the flywheel by using flywheel locking tool.

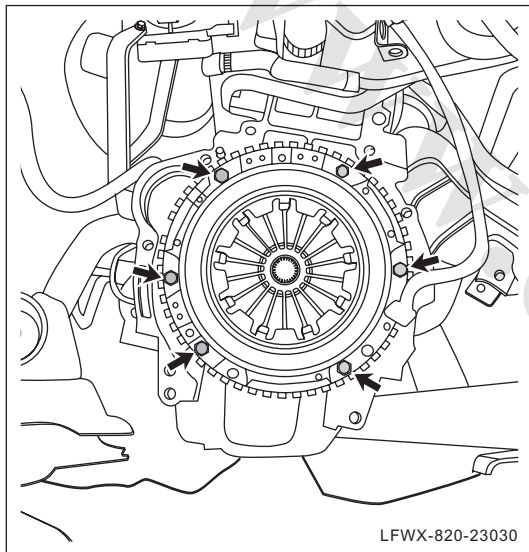


- (c) Remove the fixing bolts of the clutch pressure plate.  
(d) Remove clutch pressure plate and driven plate.



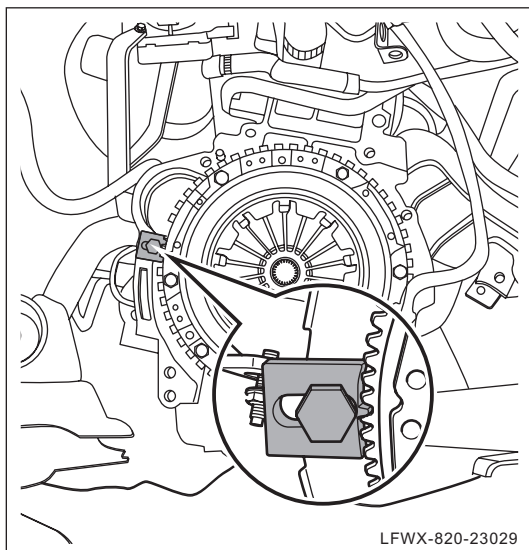
## 2. Install clutch pressure plate and driven plate

- (a) Install the clutch pressure plate ③ and clutch driven plate ② onto the centering tool ④ of clutch driven plate assembly.
- (b) Make the guide shaft of centering tool towards the center hole of flywheel ① and install the shaft into the crankshaft; meanwhile align the positioning hole of clutch pressure plate ③ with the positioning pin of flywheel.



- (c) Install and tighten fixing bolt of clutch pressure plate.

**Torque: 30N•m - 34N•m**



- (d) Remove the locking tool of flywheel.

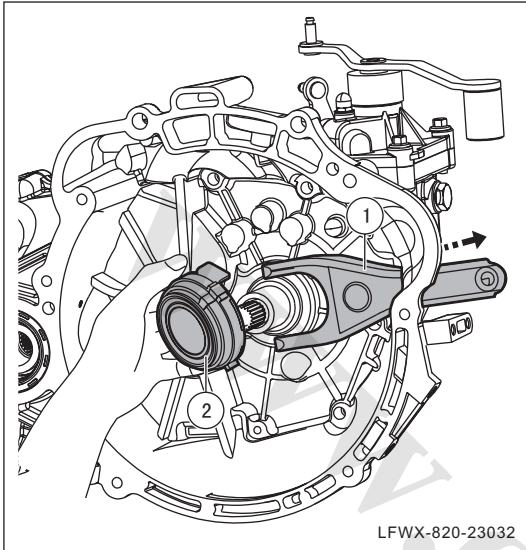
- (e) Install transmission. (See 21 - Manual Transmission, Transmission Assembly, Replacement)

## Clutch Release Bearing and Release Fork

### Replacement

#### 1. Remove clutch release bearing and release fork

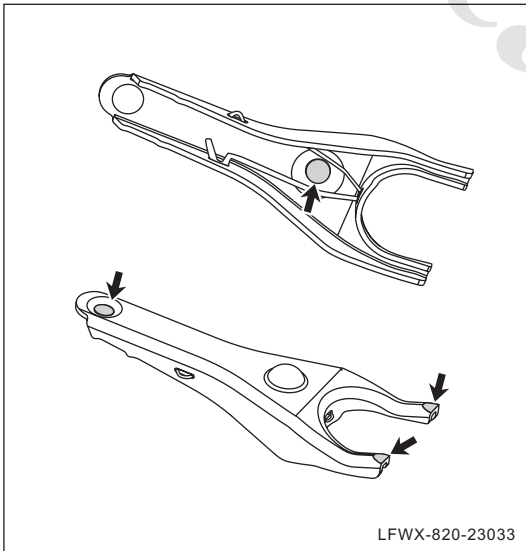
(a) Remove transmission.



(b) Draw out the clutch release fork from the transmission outward a little to allow it to disengage the release bearing.

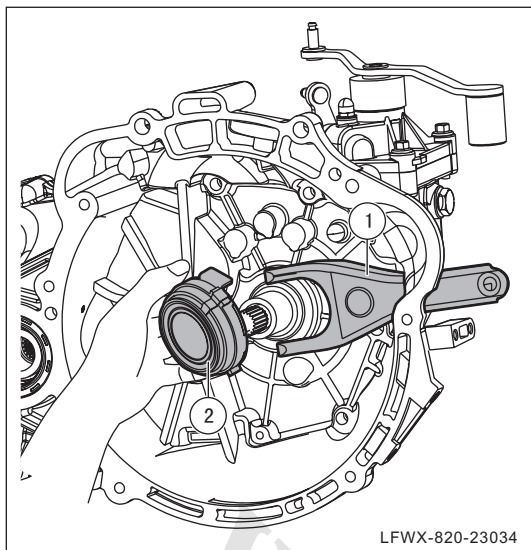
(c) Remove the release bearing from the transmission input shaft.

(d) Unplug the release fork from the jacket towards inside of shell, and remove the release fork.



#### 2. Install clutch release bearing and release fork

(a) Apply lubricating grease onto the contacting faces between the release fork and the release bearing and between the release fork and the push rod, as well as onto the release fork pivot.



- (b) Place clutch release fork ① into transmission fork hole and install release bearing ② on input shaft.

**ⓘ Note:**

**Pay attention to that clutch release bearing should be installed with face end facing fly-wheel.**

- (c) Install the release fork to the retaining groove of the release bearing and clip the fork snap ring to the release fork shore.

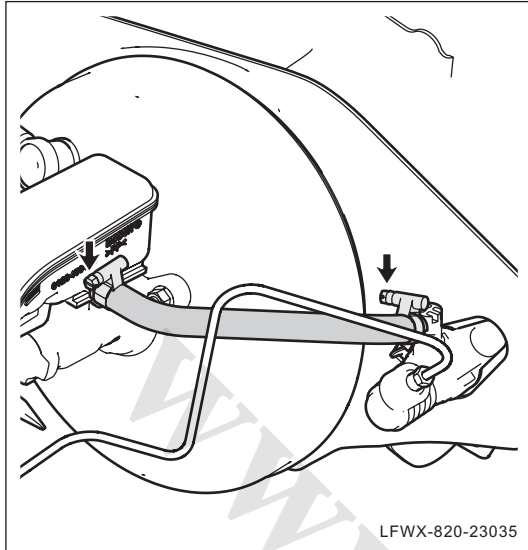
**ⓘ Note:**

**After installation, inspect whether the release bearing can slide freely. If no, please find out the root cause and eliminate it.**

- (d) Install transmission.

## Clutch Oil Pipe

### Replacement



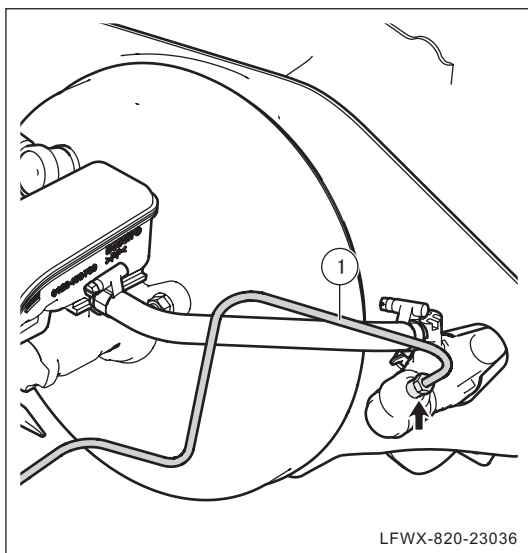
1. **Remove the oil inlet pipe of clutch master cylinder**
  - (a) Remove the loops on both sides of oil inlet pipe of clutch master cylinder, and remove the oil inlet pipe of clutch master cylinder.

2. **Install oil inlet pipe of clutch master cylinder.**

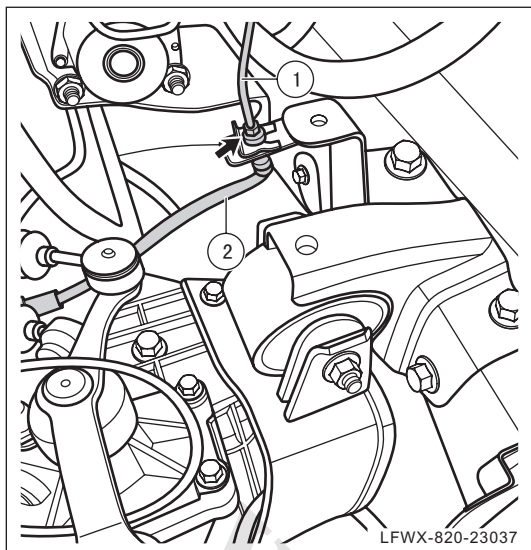
- (a) Install oil inlet pipe of clutch master cylinder and loops on both sides of pipe onto the mounting positions, and tighten loops.

3. **Remove clutch operating oil pipe |**

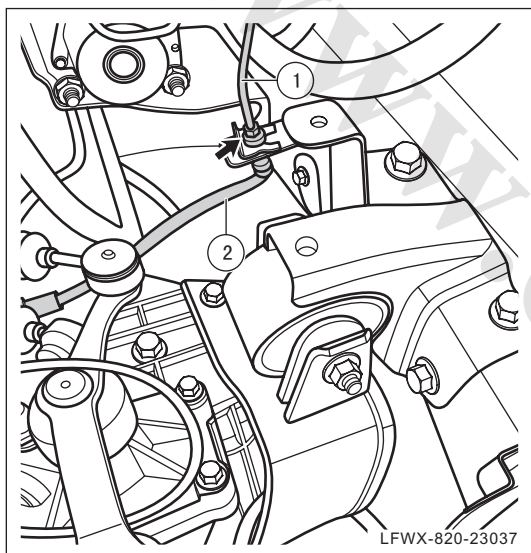
- (a) Remove nut of clutch operating oil pipe | ① (on clutch master cylinder end).







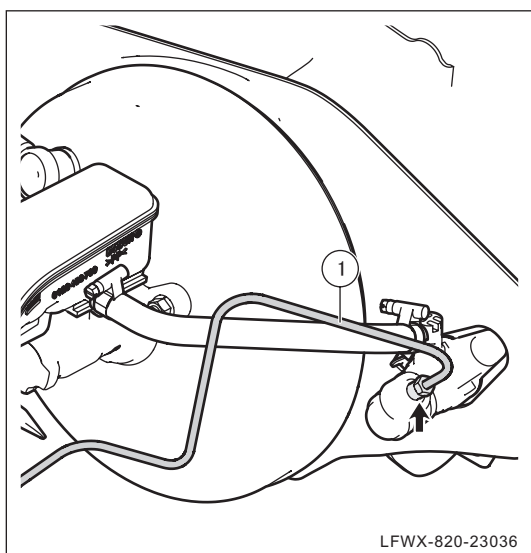
- (b) Remove locknut connecting clutch operating oil pipe I ① and II ②, and remove clutch operating oil pipe I ①.



#### 4. Install clutch operating oil pipe I

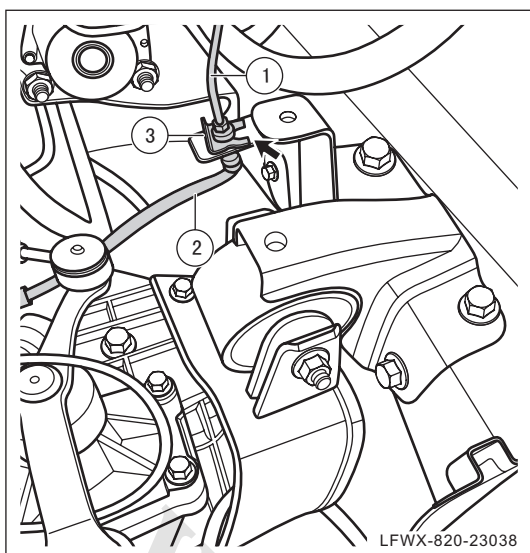
- (a) Install clutch operating oil pipe I ① on to proper mounting position.
- (b) Tighten the locknut connecting clutch operating oil pipe I ① and II ②.

**Torque: 10N•m-14N•m**

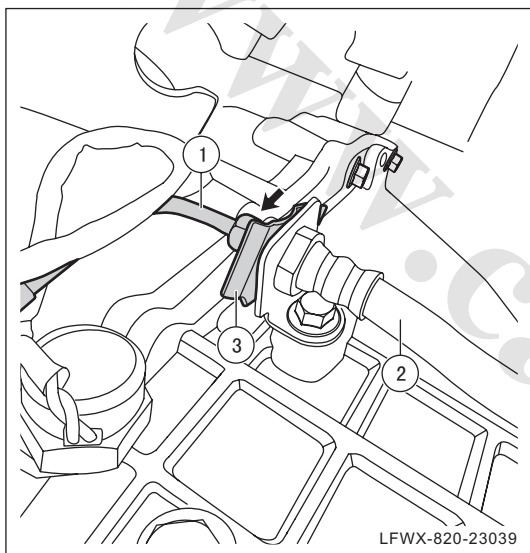


- (c) Install nut of clutch operating oil pipe I ① (on clutch master cylinder end)

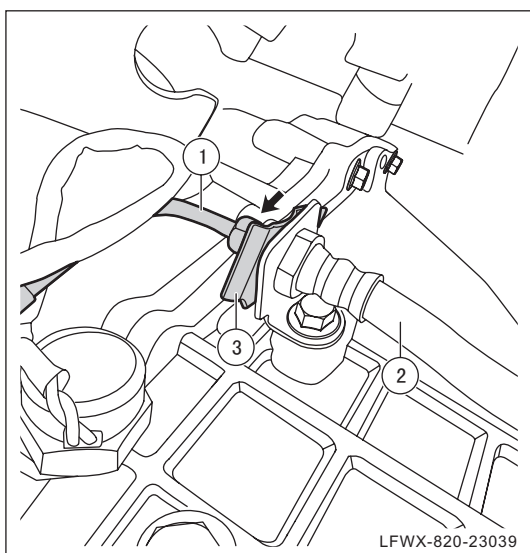
**Torque: 10N•m-14N•m**



5. Remove clutch operating oil pipe II
  - (a) Remove locknut connecting clutch operating oil pipe I ① and II ② .
  - (b) Remove E-card ③ .



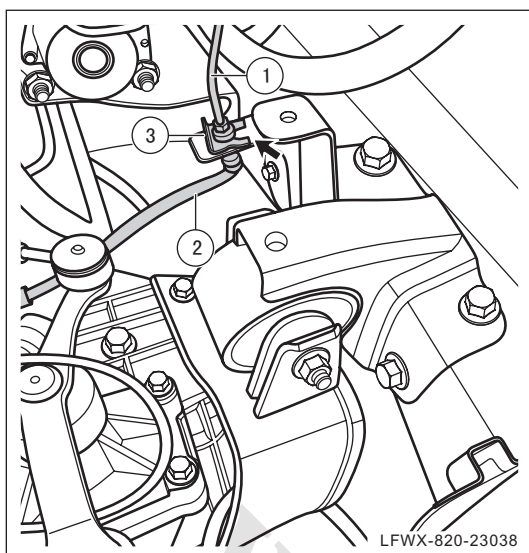
- (c) Remove locknut connecting clutch operating oil pipe III ① and II ② .
  - (d) Remove E-card ③ .
  - (e) Remove clutch operating oil pipe II ② .



6. Install clutch operating oil pipe II
  - (a) Install clutch operating oil pipe II ① on to proper mounting position.
  - (b) Tighten the locknut connecting clutch operating oil pipe III ① and II ② .

**Torque: 10N•m-14N•m**

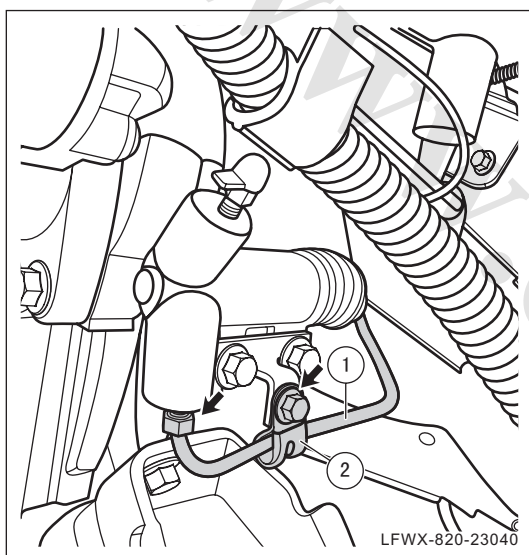
  - (c) Install E-clip ③ .



- (d) Tighten the locknut connecting clutch operating oil pipe I ① and II ② .

**Torque: 10N•m-14N•m**

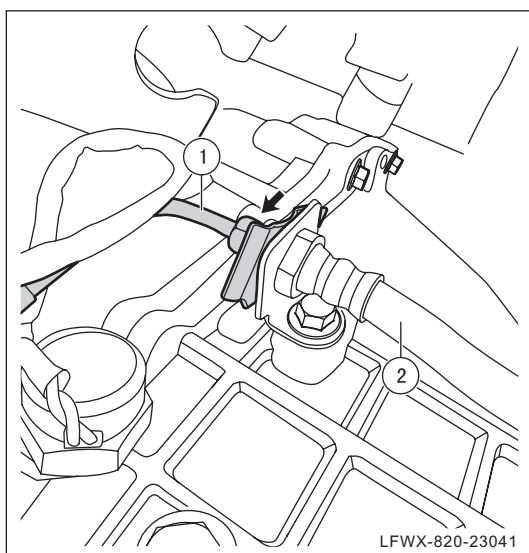
- (e) Install E-clip ③ .



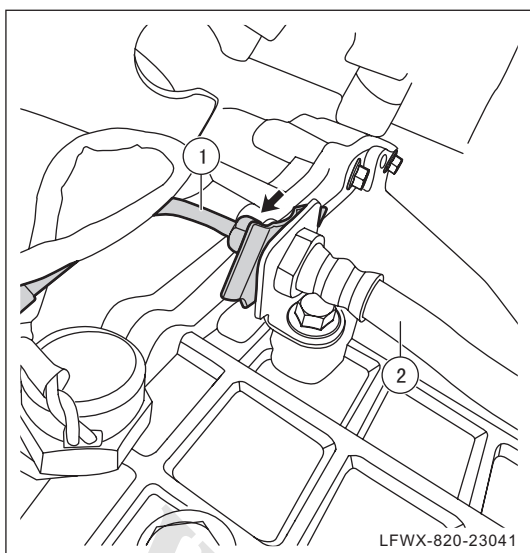
**7. Remove clutch operating oil pipe III**

- (a) Remove locknut connecting clutch operating oil pipe III ① and clutch slave cylinder.

- (b) Remove fixing bolt of oil pipe bracket ② and remove oil pipe bracket ② .

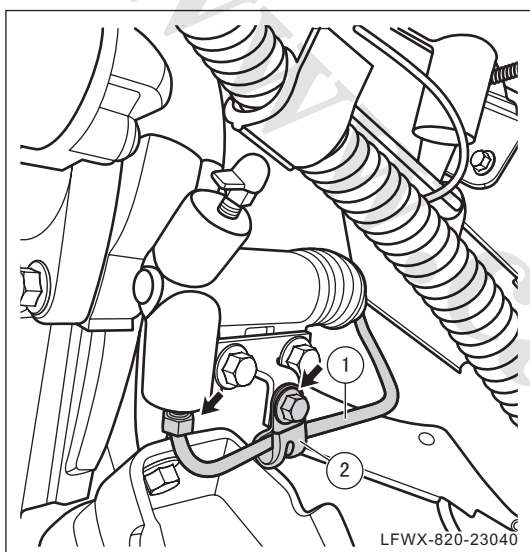


- (c) Remove locknut connecting clutch operating oil pipe III ① and II ② , and remove clutch operating oil pipe III ① .



- 8. Install clutch operating oil pipe III**
- (a) Install clutch operating oil pipe III ① on to proper mounting position.
  - (b) Tighten the locknut connecting clutch operating oil pipe I ① and II ② .

**Torque: 10N•m-14N•m**



- (c) Install oil pipe bracket ② onto proper mounting position, and install and tighten fixing bolt.

**Torque: 20N•m - 26N•m**

- (d) Tighten locknut connecting clutch operating oil pipe III ① and clutch slave cylinder.

**Torque: 10N•m-14N•m**



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## 31-Front Suspension

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<b>Sub Frame Assembly</b> .....	<b>31-39</b>
Replacement .....	31-39

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# Front Suspension

## System description

### 1. Function

Suspension is a power train device between the frame and wheel.

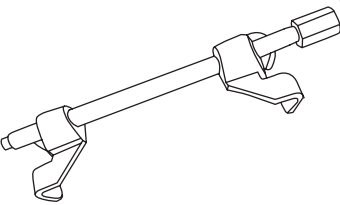
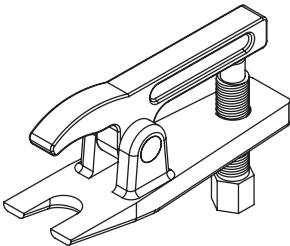
Suspension system has the following functions:

- Buffer the impact of frame or body from road surface and decrease the body vibration resulting from the impact to ensure the stability, comfort and safety during driving.
- Transmit drive force and brake force resulting from friction between road surface and wheel to frame and body.
- Support body and keep appropriate geometrical relationship between body and wheels.
- Absorb energy from wheel in vertical acceleration, keep the frame and body undisturbed when the car is jolting along the road.

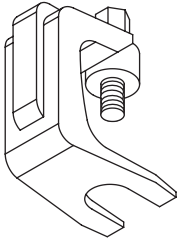
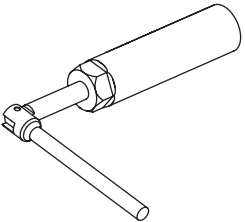

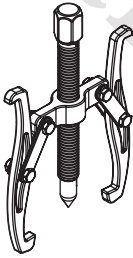
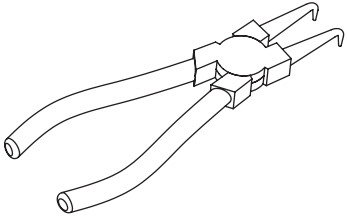
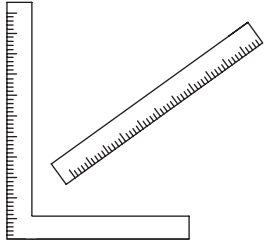
### 2. Components

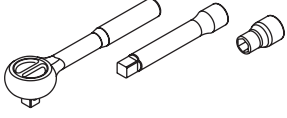
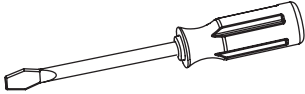
Front suspension mainly consists of absorber with spring assembly, sub frame, swing arm, front stabilizer bar, steering knuckle and hub, etc.

## Preparation

S/N	Tools	Outline diagram	Description
1	Spring compressor		Compress the absorber spring when removing it
2	Ball joint remover		Remove the ball joint



S/N	Tools	Outline diagram	Description
3	Wheel bolt re- mover		Remove and install the wheel bolts
4	Absorber nut remover		Remove and install the absorber fixing nut
5	Bracket		Support wheels and lift the frame
6	Puller		Remove the hub and hub bearing
7	Inner snap ring pliers		Remove the hub bearing fixing snap ring
8	Ruler, angle square		Measure length

S/N	Tools	Outline diagram	Description
9	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts
10	Screwdriver		Install and remove fixing screws

## Service data

### 1. Technical specifications table

Body height (front) (rear)	
Coil spring	372mm

### 2. Table of tightening torque

Item	N•m
Fixing nut of upper support of absorber	75~85
Upper fixing nuts of the front absorber assembly	82~89
Fixing bolts for connection of front absorber and steering knuckle	200~220
Ball nuts on both sides of front stabilizer bar link	70~80
Slotted nut connecting ball joint of swing arm and steering knuckle	110~120
Fixing bolt between the brake line and the wheel speed sensor wire harness bracket	20~26
Install front brake bottom plate fixing bolt	8~12
Fixing bolt and nut connecting swing arm ball joint and swing arm	90~100(bolt); 90~100(nut)
Fixing bolt and nut of swing arm assembly	150~170(bolt); 110~130(nut)

Item	N•m
Fixing bolt of loop of front stabilizer bar	30~40
Sub frame fixing bolt	75~85
Engine front mounting fixing bolt	85~90
Engine rear mounting fixing bolt	85~90

## Precautions

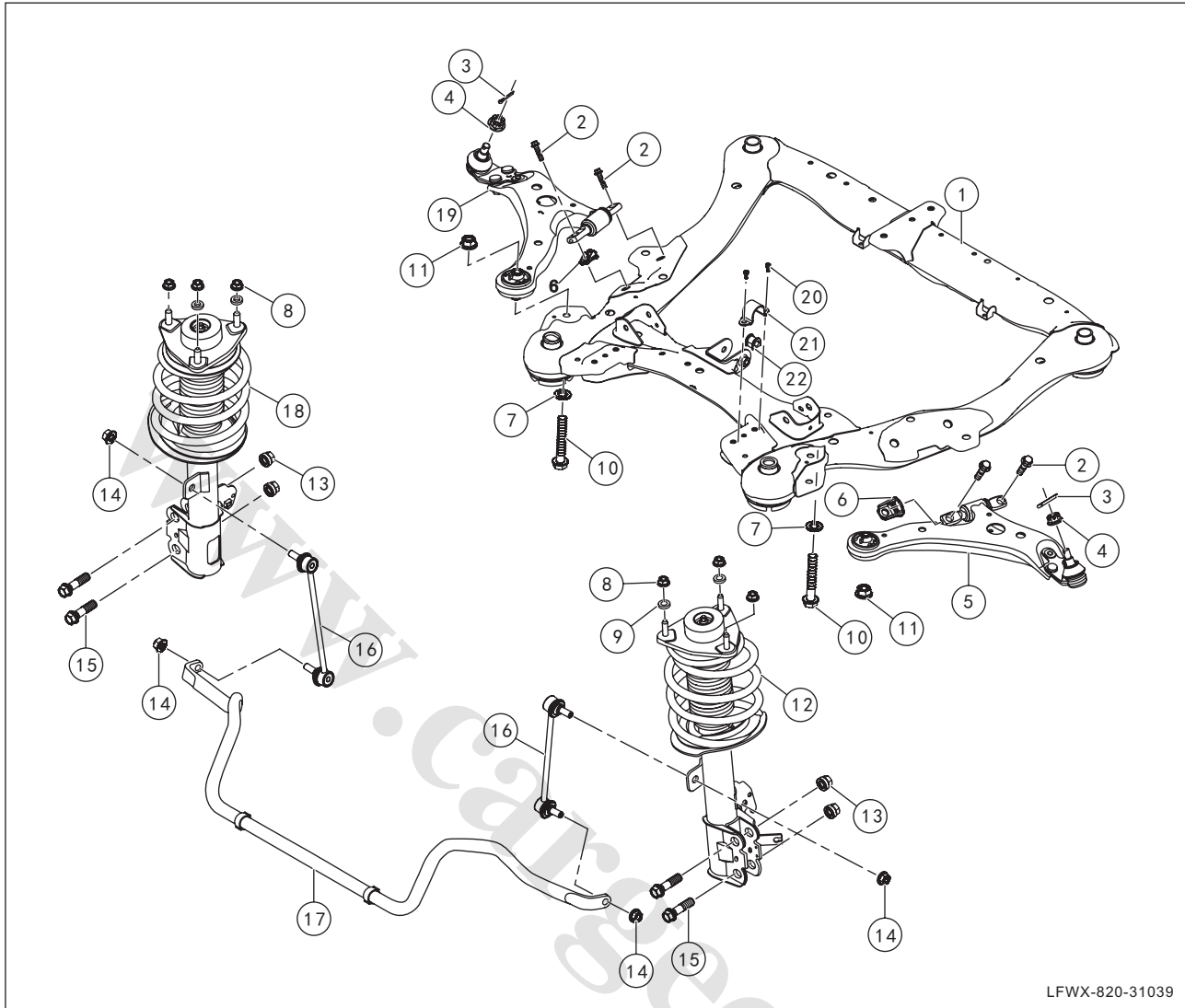
### 1. Precautions for maintenance

- (a) Check the components thoroughly before repairing or replacing them.
- (b) Don't reuse the non-reusable parts.
- (c) Clean the dismantled parts (excluding rubber parts) with gasoline and dry them.
- (d) After dismantling oil pipe, plug brake oil pipe with rubber cap to prevent brake fluid leakage.
- (e) After installation, be sure to check the fasteners for their specified torques.
- (f) Be sure to check the wheel alignment after maintaining the suspension components.

### 2. Other precautions

- (a) Be careful to perform operation on the parts to avoid dirt to the parts and to prevent the entrance of any foreign object.

# Components



LFWX-820-31039

1	Front sub frame welding assembly
2	Bolt
3	Cotter pin
4	Nut
5	Right swing arm assembly
6	Mounting bracket of swing arm assembly
7	Washer
8	Nut
9	Washer
10	Bolt
11	Nut

12	Right front absorber assembly
13	Nut
14	Nut
15	Bolt
16	Connecting rod component assembly of front stabilizer bar
17	Front stabilizer bar assembly
18	Front left absorber assembly
19	Left swing arm assembly
20	Bolt
21	Front stabilizer bar hoop
22	Rubber mounting jacket of front stabilizer bar

## General Check

### Check the system

#### 1. Check the working condition of system

- (a) Make a road test for the car, to inspect whether front wheel is swinging or vibrating. If yes, overhaul it according to the following diagnosis steps.
- (b) Make a road test for the car, to inspect whether the car deviates off track. If yes, overhaul it according to the following diagnosis steps.
- (c) Make a road test for the car, to inspect whether the suspension system has abnormal sound. If yes, overhaul it according to the following diagnosis steps.

#### 2. Check system components

- (a). Check system for obvious mechanical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.
- (d) Check whether connecting jacket is aged or damaged. If yes, replace it.

### Check front absorber

#### 1. Check the working condition of front absorber.

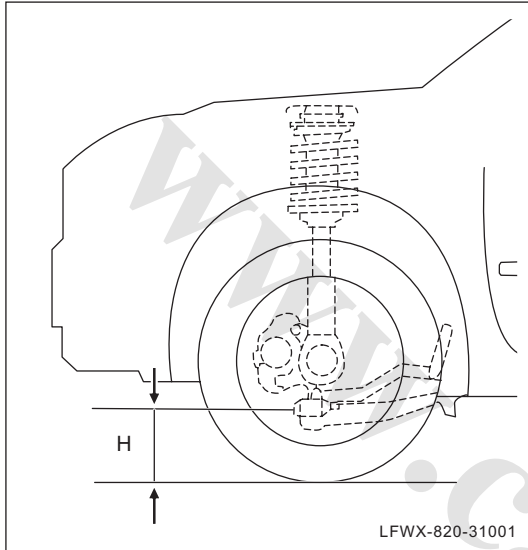
- (a) Press the front of the car with your hands and immediately release hands, the car should swing 2~3 times and keep stable. If the car swings for too many times, inspect the front absorber with spring assembly.
- (b) Road test inspection.
  - Drive the car on special test road or rather poor road for 10km and then stop it.
  - Check whether there is oil dripping from the front absorber to the ground. If yes, replace front absorber.
  - Touch the shell of front absorber. If the temperature difference between two absorbers is big, it indicates that the resistance difference is also big. The absorber with low temperature has smaller resistance. If the absorber temperature is low, it indicates that there is no resistance inside the front absorber or front absorber doesn't work and needs to be replaced.
- (c) Slowly travel the car and give it an emergency brake. If the car has dramatic vibration, it indicates that the absorber has fault and should be replaced.
- (d) If the absorber makes abnormal sound during traveling, this may be because of impact of absorber with spring and frame, damage of rubber cushion, deformation of dust-proof barrel and insufficiency of oil. Find out the root cause and eliminate it.

## Check front stabilizer bar

### 1. Check the working condition of front stabilizer bar

- (a) Shake the front stabilizer bar with hands and inspect whether the front stabilizer bar is loose. If yes, it indicates that the jacket of front stabilizer bar is aged and needs to be replaced.

## Measure the height of body.



### 1. Measurement of vehicle height

#### Body height (front) H:

##### △ HINT:

- Make sure the tyre comes up to the standard tyre pressure value before measuring the vehicle height.
- Measuring method:
- Keep the car at no-load condition, and measure the distance H between the ground and the center of mounting bolt of front swing arm.

##### ⓘ Note:

If the body height doesn't meet requirements, overhaul the body according to the following diagnosis steps.

### 2. Measurement of vehicle height

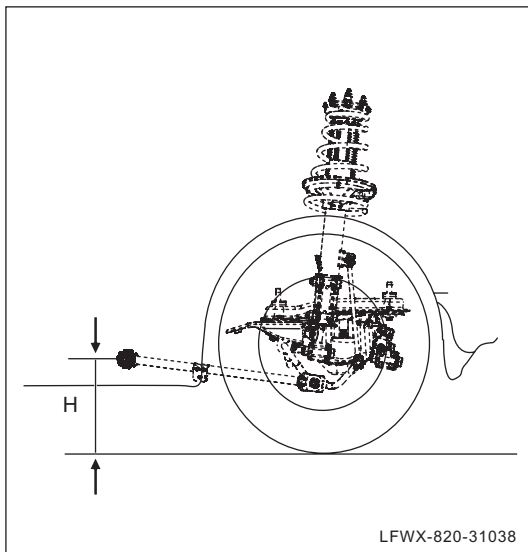
#### Body height (rear) H:

##### △ HINT:

- Make sure the tyre comes up to the standard tyre pressure value before measuring the vehicle height.
- Measuring method:
  - Keep the car at no-load condition, and measure the distance H between the ground and the center of mounting bolt of horizontal bar of rear suspension.

##### ⓘ Note:

If the body height doesn't meet requirements, overhaul the body according to the following diagnosis steps.



## Check the ball pin assembly of swing arm.

### Check the working condition of ball pin assembly of swing arm.

- (a) Place a pry between the ball joint of swing arm and steering knuckle and pry it up and down. If the ball pin of swing arm and steering knuckle are connected firmly, it indicates that the ball pin of swing arm works normally. If there is displacement between them or "click" sound is produced, replace the ball pin assembly of swing arm.

## Check the hub bearing

### 1. Check the working condition of hub bearing

- (a) Jack the car up and keep the wheel off the ground, and hold the upper and lower position of the tyre, and shake the tyre for several times. It is normal if there is no loose condition. If there is loose condition, replace the hub bearing.
- (b) Rapidly rotate wheel. If the wheel rotates free and makes no abnormal sound, it is normal. Otherwise, replace the hub bearing.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Body sinking/tilt	1. Tire (improper pressure)	See 31 - Front Suspension, Diagnosis, Fault Diagnosis (1. Body sinking/tilt)
	2. Vehicle (overload)	
	3. Spring (failed)	
	4. Absorbers (damaged)	
	5. Front stabilizer bar (bent or broken)	
Front wheel swing and shock	1. Tire (worn or improper pressure)	See 31 - Front Suspension, Diagnosis, Fault Diagnosis (2. Front wheels shakes and vibrates)
	2. Wheel (imbalanced)	
	3. Wheel alignment wrong	
	4. Steering gear ball joint (worn)	
	5. Wheel hub bearing (worn)	
	6. Steering gear (misaligned or damaged)	
Vehicle off tracking	1. Tire (worn or improper pressure)	See 31 - Front Suspension, Diagnosis, Fault Diagnosis (3. Vehicle off tracking)
	2. Wheel alignment wrong	
	3. Wheel hub bearing (worn)	
	4. Spring (failed)	
	5. Absorbers (damaged)	
	6. Sub frame or swing arm (deformed)	
Abnormal sound of suspension	1. tyre (excessive pressure)	See 31 - Front Suspension, Diagnosis, Fault Diagnosis (4. Abnormal sound of suspension)
	2. Suspension parts (loose bolts)	
	3. Absorber (loose or damaged bolts)	
	4. Upper bearing of absorber (damaged)	
	5. Front stabilizer link ball joint (worn)	



## Fault diagnosis

### 1. Body sinking/tilt

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the body is sinking or tilting (See 31 - General Check of Front Suspension, Measurement of Body Height)	Diagnosis end.	Body sinking or tilting	Go to Step 1
1	Check the system	Normal	Faulty	Instruction
	Check the working condition of fasteners of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 2	Connecting bolt is loose.	Re-tighten it.
2	Check the system	Normal	Faulty	Instruction
	Check the working condition of parts of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 3	Parts are deformed or damaged	Replace damaged parts.
3	Check the system	Normal	Faulty	Instruction
	Check the working condition of fasteners of rear suspension system (See 32 - General Check of Rear Suspension, Check of system)	Go to Step 4	Connecting bolt is loose.	Re-tighten it.
4	Check the system	Normal	Faulty	Instruction
	Check the working condition of parts of rear suspension system (See 32 - General Check of Rear Suspension, Check of System)	Go to Step 5	Parts are deformed or damaged	Replace damaged parts.
5	Check the system	Normal	Faulty	Instruction
	Check the working condition of connecting jacket of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 6	Connecting bush is aged and damaged	Replace connecting jacket (See 31 - Jacket of Front Stabilizer Bar Link of Front Suspension, Replacement)
6	Check the system	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of connecting jacket of rear suspension system (See 32 - General Check of Rear Suspension, Check of System)	Go to Step 7	Connecting bush is aged and damaged	Replace connecting jacket (See 32 - Jacket of Front Stabilizer Bar and Link of Rear Suspension, Replacement)
7	Check front absorber	Normal	Faulty	Instruction
	Check the working condition of front absorber (See 31 - General Check of Front Suspension, Check of Front Absorber)	Go to Step 8	Front absorber is ineffective.	Replace front absorber (See 31 - Front Absorber of Front Suspension, Overhaul)
8	Check rear absorber	Normal	Faulty	Instruction
	Check the working condition of rear absorber (See 32 - General Check of Rear Suspension, Check of Rear Absorber)	Go to Step 9	Rear absorber is ineffective.	Replace rear absorber (See 32 - Rear Absorber of Rear Suspension, Overhaul)
9	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Front wheel shakes and vibrates

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of front wheel (See 31 - General Check of Front Suspension, Check of System)	Diagnosis end.	Front wheel swing and shock	Go to Step 1
1	Check the tyre	Normal	Faulty	Instruction
	Check whether tyre pressure meets requirements (See 33 - General Check of Wheel and Tyre, Check of Wheel)	Go to Step 2	The tyre pressure is insufficient	Correct tyre pressure
2	Check the tyre	Normal	Faulty	Instruction
	Check the abrasion condition of tyre (See 33 - General Check of Wheel and Tyre, Check of Wheel)	Go to Step 3	Abnormal tyre wear	Find out the root cause of wire abrasion and replace the worn tyre.
3	Check the wheel alignment.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the wheel alignment (see 33 - Wheels and Tyres, Four Wheel Alignment, Inspection)	Go to Step 4	Wheel alignment is of large deviation	Conduct the wheel alignment operation(see 33 - Wheels and Tyres, Four Wheels Alignment, Adjustment)
4	Check wheel dynamic balance	Normal	Faulty	Instruction
	Check the wheel balance condition (see 33 - Wheels and Tyres, Wheel Balance, Inspection)	Go to Step 5	Wheel out-of-round	Adjust the wheel alignment (see 33 - Wheels and Tyres, Wheel Alignment, Adjustment)
5	Check the hub bearing	Normal	Faulty	Instruction
	Check the abrasion condition of hub bearing (See 31 - General Check of Front Suspension, Check of Hub Bearing)	Go to Step 6	Hub bearing is worn excessively	Replace the hub bearing (see 31 - Front Suspension, Hub Bearing, Replacement)
6	Check steering tie rod	Normal	Faulty	Instruction
	Check the working condition of ball joint of steering tie rod (See 61 - General Check of Hydraulic Steering System, Check of Steering Tie Rod)	Go to Step 7	Ball joint of steering tie rod has abnormal abrasion.	Replace steering tie rod (See 61 - Steering Tie Rod Assembly of Hydraulic System, Replacement)
7	Replacement and check	Normal	Faulty	Instruction
	Replace steering gear with the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Vehicle off tracking

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the car has deflection (See 31 - General Check of Front Suspension, Check of System)	Diagnosis end.	Vehicle off tracking	Go to Step 1
1	Check the tyre	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether tyre pressure meets requirements (See 33 - General Check of Wheel and Tyre, Check of Wheel)	Go to Step 2	The tyre pressure is insufficient	Correct tyre pressure
2	Check the tyre	Normal	Faulty	Instruction
	Check the abrasion condition of tyre (See 33 - General Check of Wheel and Tyre, Check of Wheel)	Go to Step 3	Abnormal tyre wear	Find out the root cause of wire abrasion and replace the worn tyre.
3	Check the wheel alignment.	Normal	Faulty	指导措施
	Check the wheel alignment (see 33 - Wheels and Tyres, Four Wheel Alignment, Inspection)	Go to Step 4	Wheel alignment is of large deviation	Conduct the wheel alignment operation(see 33 - Wheels and Tyres, Four Wheels Alignment, Adjustment)
4	Check the system	Normal	Faulty	Instruction
	Check the working condition of fasteners of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 5	Connecting bolt is loose.	Re-tighten it.
5	Check the system	Normal	Faulty	Instruction
	Check the working condition of parts of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 6	Parts are deformed or damaged	Replace damaged parts.
6	Check the system	Normal	Faulty	Instruction
	Check the working condition of connecting jacket of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 7	Connecting bush is aged and damaged	Replace connecting jacket (See 31 - Jacket of Front Stabilizer Bar Link of Front Suspension, Replacement)
7	Check front absorber	Normal	Faulty	Instruction
	Check the working condition of front absorber (See 31 - General Check of Front Suspension, Check of Front Absorber)	Go to Step 8	Front absorber is ineffective.	Replace front absorber (See 31 - Front Absorber of Front Suspension, Overhaul)
8	Check the hub bearing	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the abrasion condition of hub bearing (See 31 - General Check of Front Suspension, Check of Hub Bearing)	Go to Step 9	Hub bearing is worn excessively	Replace the hub bearing (see 31 - Front Suspension, Hub Bearing, Replacement)
9	Check brake system	Normal	Faulty	Instruction method
	Check whether car brake is dragging (See 51 - General Check of Service Brake, Check of System)	Go to Step 10	Brake is dragging	Eliminate this fault (See 51 - Diagnosis of Service Brake, Fault Diagnosis)
10	Verification and check	Normal	Faulty	Instruction method
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. Abnormal sound of suspension

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the suspension has abnormal sound (See 31 - General Check of Front Suspension, Check of System)	Diagnosis end.	Abnormal sound of suspension	Go to Step 1
1	Check the tyre	Normal	Faulty	Instruction
	Check whether tyre pressure meets requirements (See 33 - General Check of Wheel and Tyre, Check of Wheel)	Go to Step 2	Tyre pressure is too high	Correct tyre pressure
2	Check the system	Normal	Faulty	Instruction
	Check the working condition of fasteners of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 3	Connecting bolt is loose.	Re-tighten it.
3	Check the system	Normal	Faulty	Instruction
	Check the working condition of parts of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 4	Parts are deformed or damaged	Replace damaged parts.
4	Check the system	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of fasteners of rear suspension system (See 32 - General Check of Rear Suspension, Check of system)	Go to Step 5	Connecting bolt is loose.	Re-tighten it.
5	Check the system	Normal	Faulty	Instruction
	Check the working condition of parts of rear suspension system (See 32 - General Check of Rear Suspension, Check of System)	Go to Step 6	Parts are deformed or damaged	Replace damaged parts.
6	Check the system	Normal	Faulty	Instruction
	Check the working condition of connecting jacket of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 7	Connecting bush is aged and damaged	Replace connecting jacket (See 31 - Jacket of Front Stabilizer Bar Link of Front Suspension, Replacement)
7	Check the system	Normal	Faulty	Instruction
	Check the working condition of connecting jacket of rear suspension system (See 32 - General Check of Rear Suspension, Check of System)	Go to Step 8	Connecting bush is aged and damaged	Replace connecting jacket (See 32 - Jacket of Front Stabilizer Bar and Link of Rear Suspension, Replacement)
8	Check front absorber	Normal	Faulty	Instruction
	Check the working condition of front absorber (See 31 - General Check of Front Suspension, Check of Front Absorber)	Go to Step 9	Front absorber is ineffective.	Replace front absorber (See 31 - Front Absorber of Front Suspension, Overhaul)
9	Check rear absorber	Normal	Faulty	Instruction
	Check the working condition of rear absorber (See 32 - General Check of Rear Suspension, Check of Rear Absorber)	Go to Step 10	Rear absorber is ineffective.	Replace rear absorber (See 32 - Rear Absorber of Rear Suspension, Overhaul)
10	Verification and check	Normal	Faulty	Instruction method
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Front Absorber

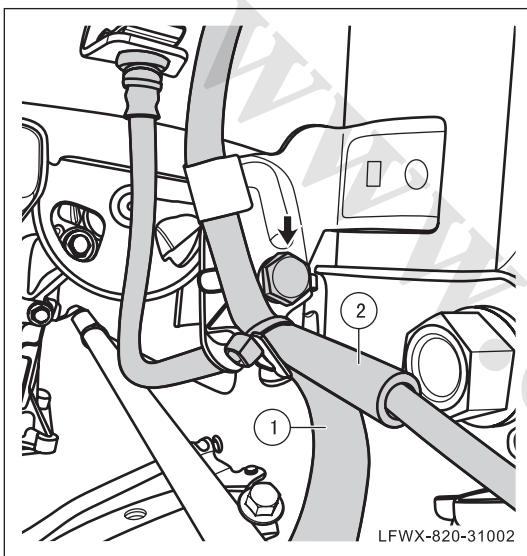
### Overhaul

△ HINT:

Front absorber has the same overhauling way as that of left and right absorbers. This section will introduce the overhauling of front left absorber as an example.

#### 1. Removal of front shock absorber assembly

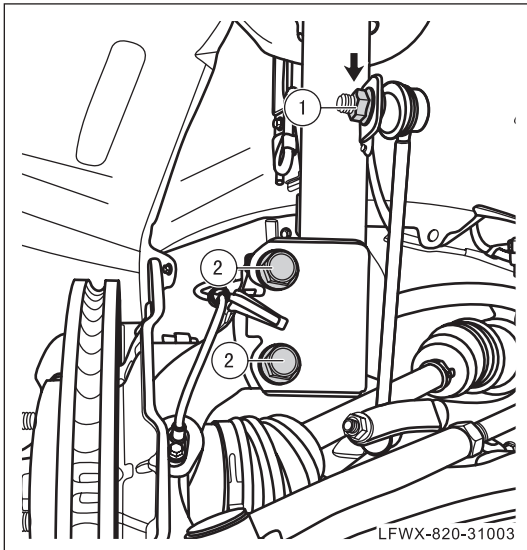
- (a) Lift up vehicle and dismantle front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



- (b) Remove fixing bolt of brake hose ① and bracket of wire harness ② of wheel speed sensor, and remove brake hose ① and bracket of wire harness ② of wheel speed sensor.

△ HINT:

After dismantling bolts, take out bracket of wire harness of wheel speed sensor and brake hose. It is unnecessary to disconnect hose joint and wire harness connector.



- (c) Remove the front stabilizer bar link upper ball joint fixing nut ① and then move the stabilizer bar link away.

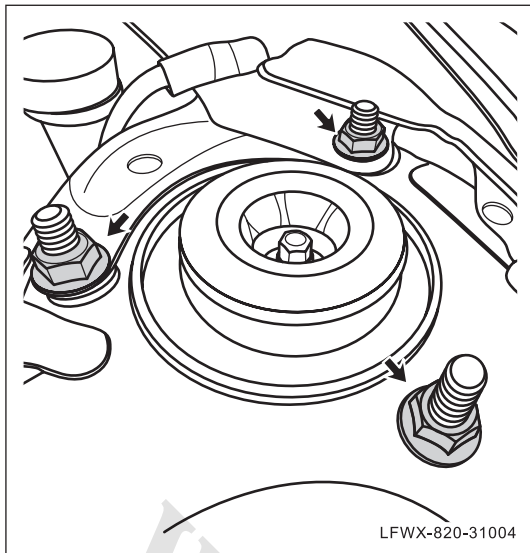
△ HINT:

To avoid rotation of ball joint, use open wrench to fix the joint.

- (d) Remove fixing bolt and nut ② of front absorber and steering knuckle.

△ HINT:

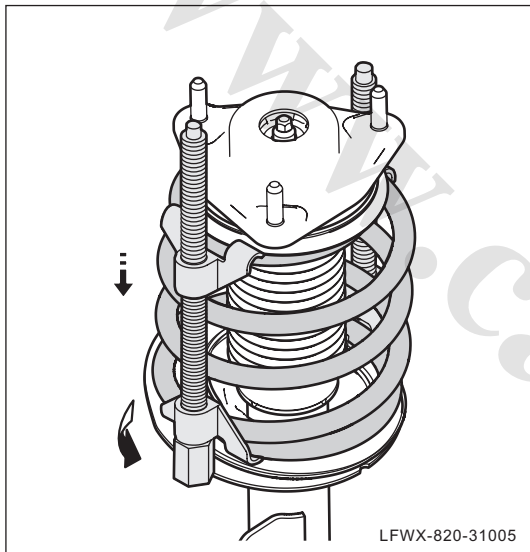
After removing the fixing nuts, you may lift up the front brake with the steering knuckle assembly, and then pull out the bolt with punch.



- (e) Open engine hood, dismantle fixing nut from the upper of front absorber, and take the front absorber from the bottom.

△ HINT:

When removing upper fixing nut of absorber, a worker shall hold the absorber beneath to prevent the absorber from falling down and being damaged.



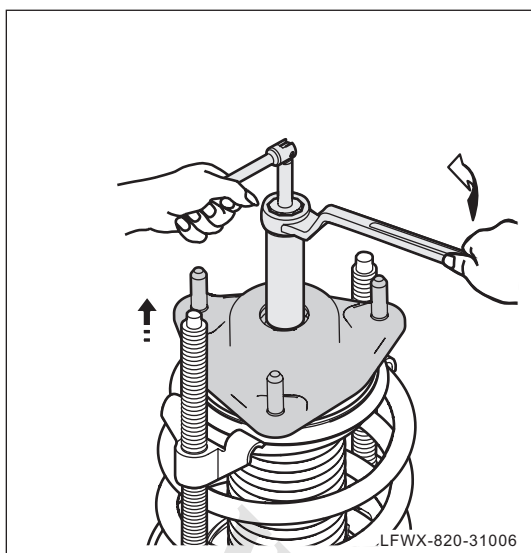
**2. Decompose the front absorber assembly**

- Remove dustproof cover of upper fixing nut of front absorber.
- Fix the front absorber assembly on the bench vice.
- Install the spring compressor.
- Compress coil spring until the spring separates from spring seat.

**Note:**

- Firstly, make sure the spring compressor is installed properly, and then begin to compress coil spring to avoid injury from spring disengagement.
- Do not use a pneumatic tool when tightening the spring compressor bolt.



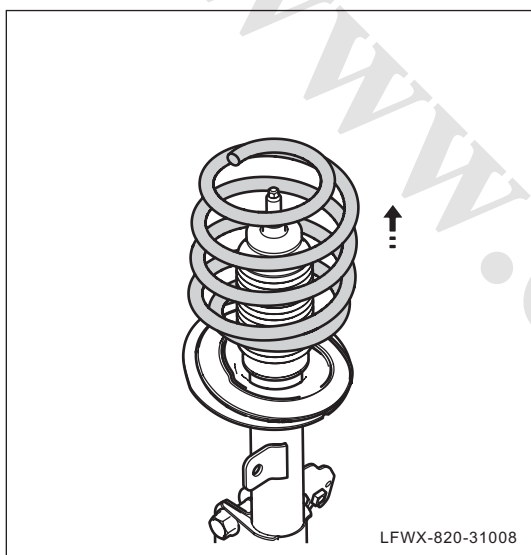


(e) Remove fixing nut of upper support of front absorber.

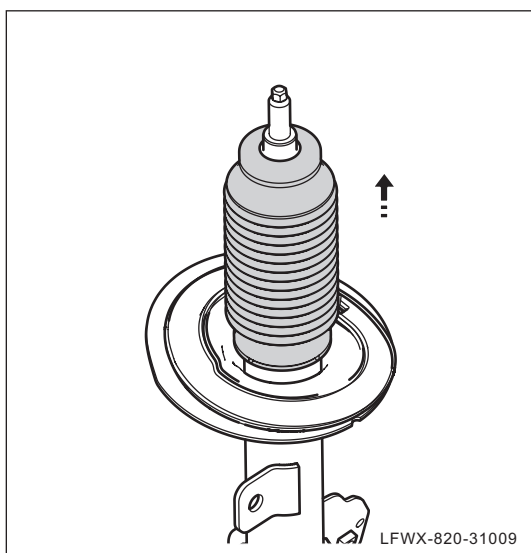
△ HINT:

Remove fixing nut of upper support of absorber by using a special tool.

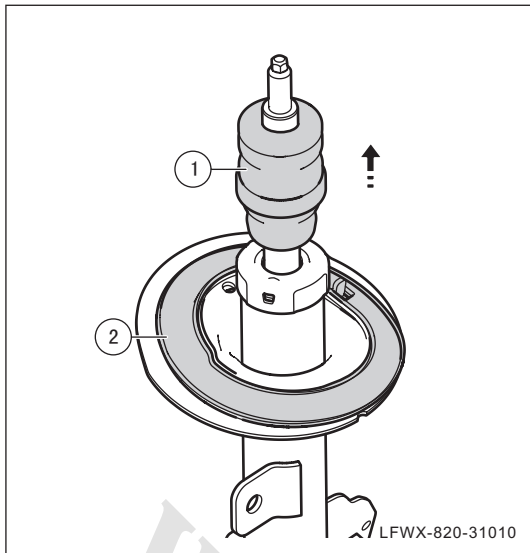
(f) Remove upper support of front absorber.



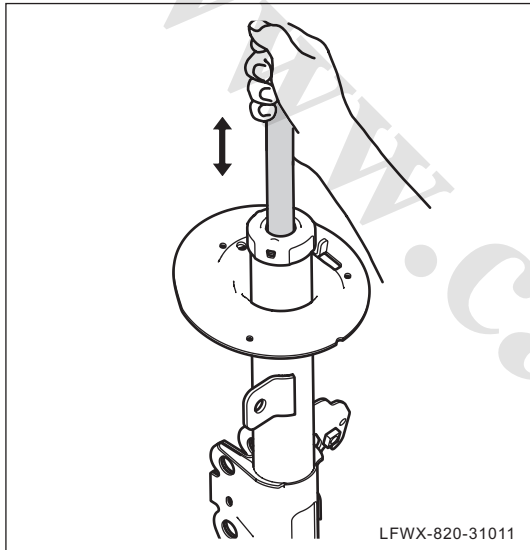
(g) Remove the spring compressor and take down the coil spring.



(h) Take down the boot of absorber.

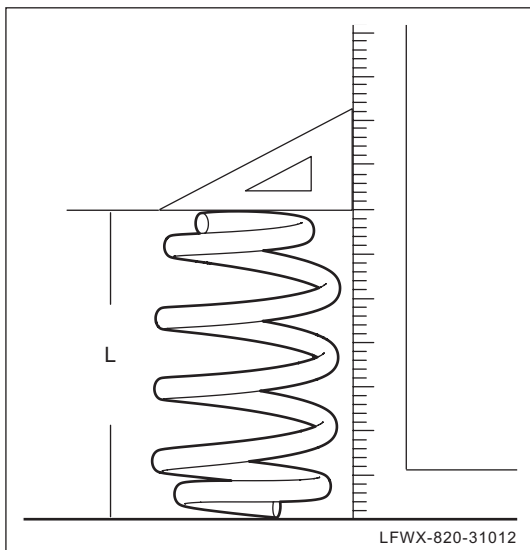


- (i) Remove limit block ① .
- (j) Remove lower rubber cushion ② of spring.



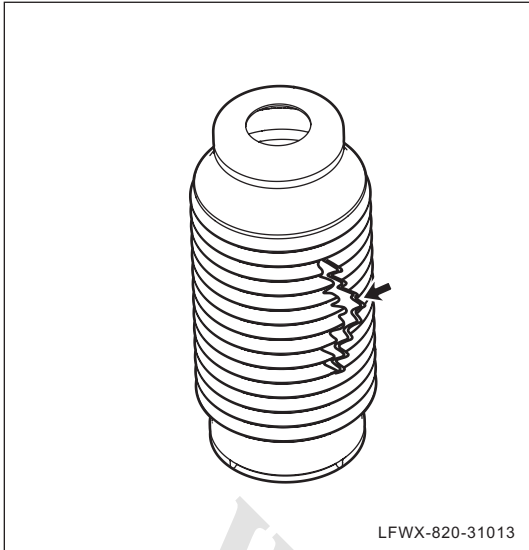
### 3.Check front absorber components

- (a) Compress and stretch the inner rod of absorber and inspect whether there is abnormal resistance or noise during this operation. If yes, replace absorber assembly.
- (b) Check whether absorber has oil leakage. If yes, replace absorber assembly.

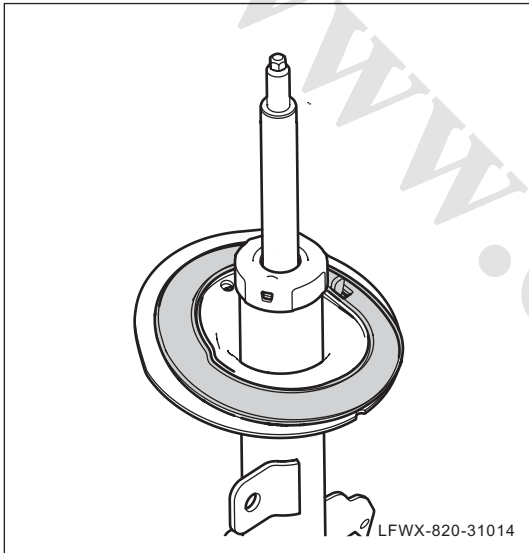


- (c) Check whether coil spring has crack. If yes, replace coil spring.
- (d) Measure the free length of coil spring. If the measured result is 5% less than standard free length, it indicates that the coil spring has permanent deformation and must be replaced.

**Standard free length of coil spring L:  
372mm**

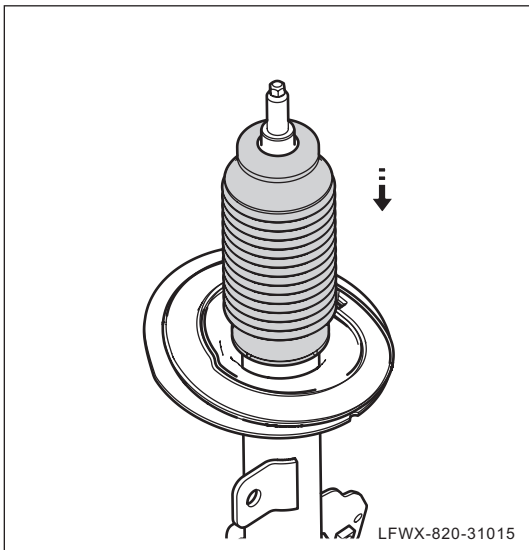


(e) Check whether dustproof cover of absorber is damaged. If yes, replace it.

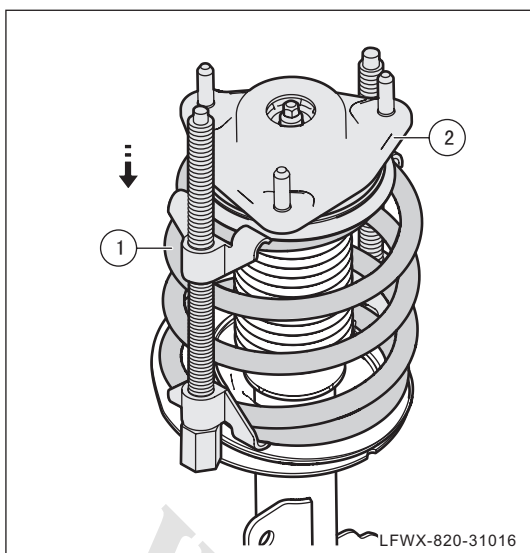


**4. Assemble the front absorber assembly**

(a) Install lower rubber cushion of spring.



(b) Assemble damper and dustproof cover and install them onto the absorber.



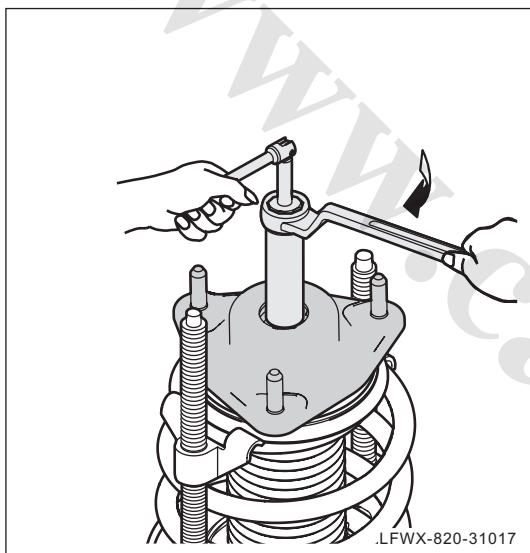
(c) Press coil spring ① with spring compressor.

(d) Install coil spring ① onto the absorber.

△ HINT:

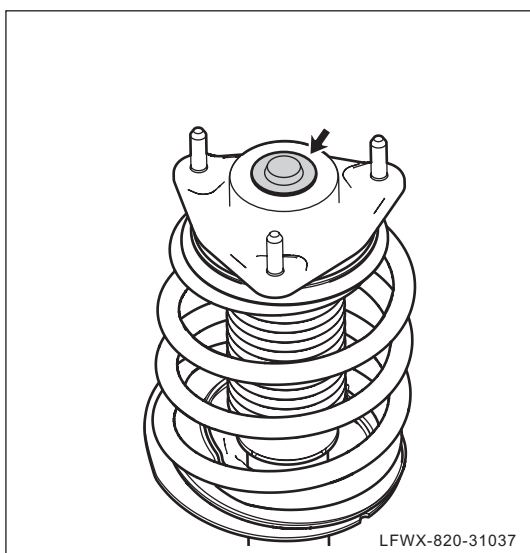
Install the lower end of spring of absorber into the slot of tray.

(e) Install upper support ② of front absorber.



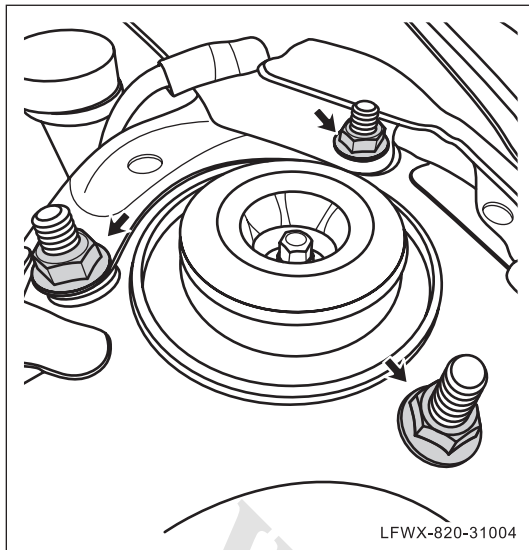
(f) Install and tighten fixing nut of upper support of absorber.

**Torque: 75N•m - 85N•m**



(g) Remove coil spring compressor.

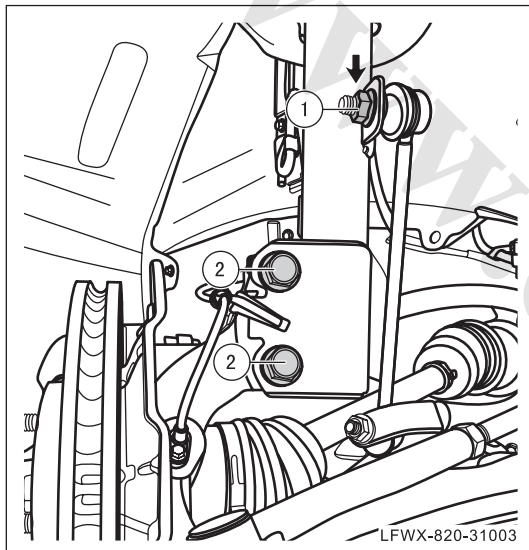
(h) Install the boot of fixing nut on the front absorber.



## 5. Installation of front shock absorber assembly

- (a) Install the front absorber below the vehicle body.
- (b) Install the front absorber upper fixing nuts and tighten them.

**Torque: 82N•m - 89N•m**



- (c) Install and tighten fixing bolts and nuts of front absorber and steering knuckle.

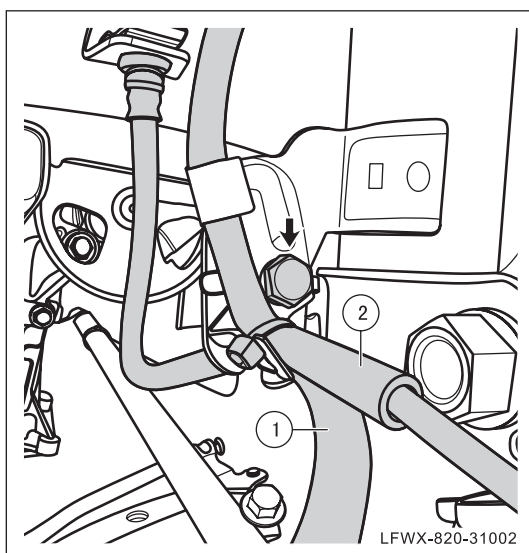
**Torque: 200N•m - 220N•m**

- (d) Install and tighten fixing nut ① of upper ball joint of front stabilizer link.

**Torque: 70N•m - 80N•m**

### △ HINT:

To avoid rotation of ball joint, use open wrench to fix the joint.



- (e) Install brake hose ① and wire harness ② of wheel speed sensor onto mounting position, and install and tighten fixing bolts of bracket.

**Torque: 20N•m - 26N•m**



- (f) Install the front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

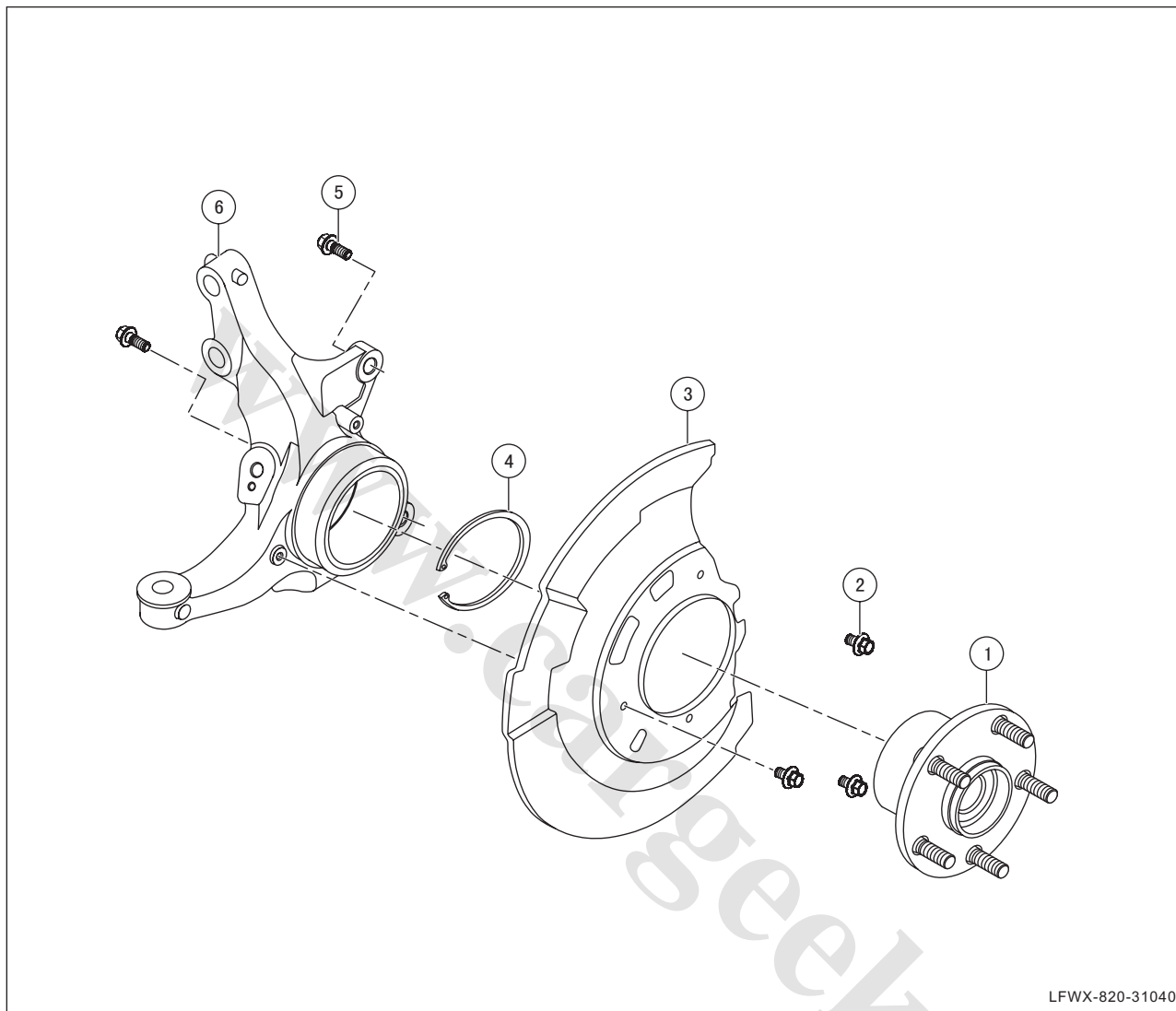
## 6. Inspection

- (a) Check the working condition of front absorber. (See 31 - General Check of front suspension, inspection of front absorber)

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# Steering Knuckle and Wheel Hub

## Components



1	Wheel hub components
2	Bolt
3	Dustproof plate of brake

4	Snap ring of bearing
5	Bolt
6	Steering knuckle

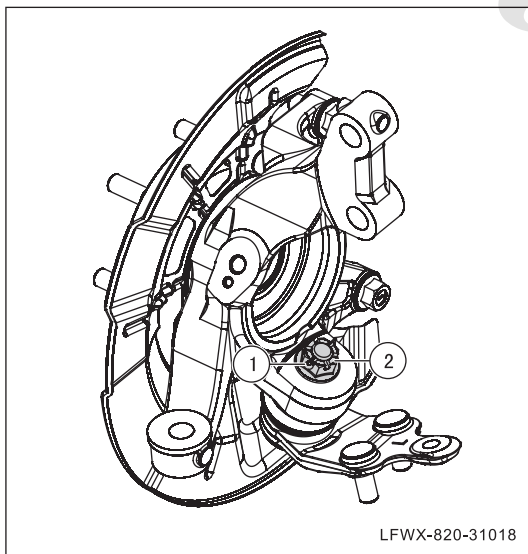
## Replacement

### △ HINT:

Replacement of left, right and front steering knuckles has the same methods. This section will introduce the replacement of front left steering knuckle and wheel hub as an example.

### 1. Remove steering knuckle and wheel hub.

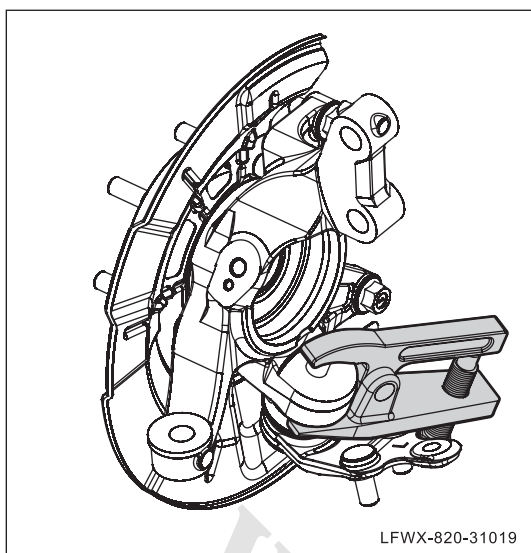
- (a) Lift up vehicle and dismantle front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (b) Remove wheel speed sensor. (See 53 - Wheel Speed Sensor of Anti-lock brake System, Replacement)
- (c) Remove front brake. (See 51 - Front Brake for Service Brake, Replacement)
- (d) Pull out the drive shaft in wheel side from the steering knuckle hub. (See 41 - Drive Shaft - Drive Shaft Assembly, Replacement)
- (e) Remove fixing bolts and nuts connecting front absorber and steering knuckle. (See 31 - Front Absorber of Front Suspension, Overhaul)
- (f) Remove ball joint of steering tie rod. (See 61 - Steering Knuckle with Tie Rod Assembly Hydraulic Steering System, Replacement)
- (g) Remove steering knuckle with wheel hub assembly.



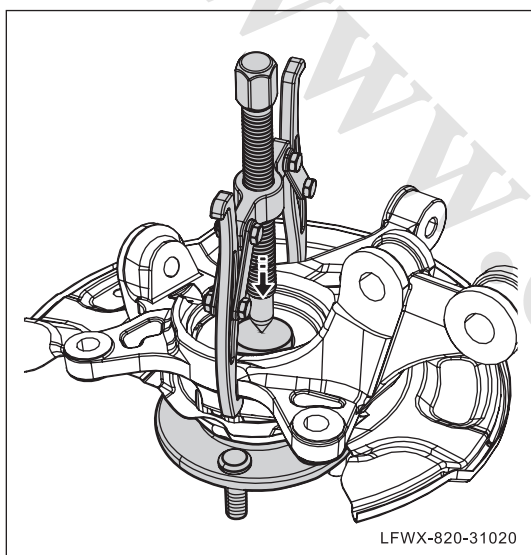
- (h) Remove the cotter pin ① of swing arm ball joint slotted nut.

- (a) Remove the swing arm ball joint slotted nut.





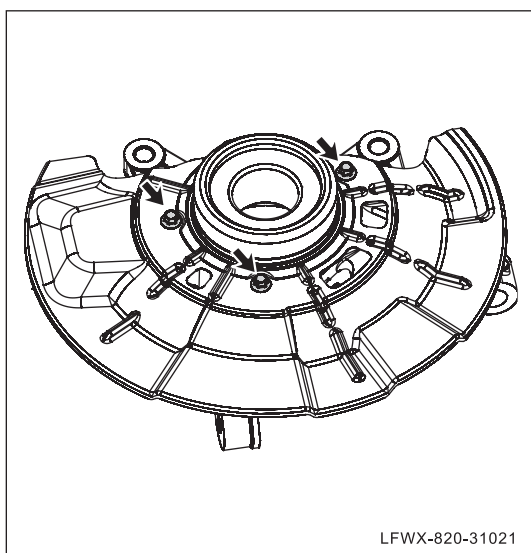
- (j) Remove the ball pin of swing arm by using ball joint detector, and remove the ball joint assembly of swing arm.



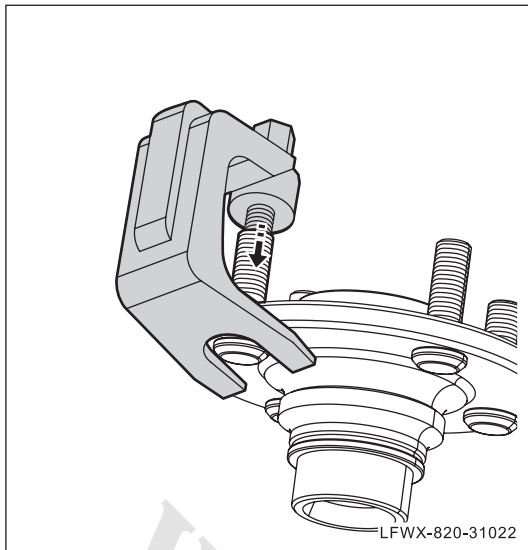
- (k) Put a circular steel plate on the hub end and use puller to push the front wheel hub assembly out.

△ HINT:

When pushing the front hub assembly out, half of hub bearing will be removed together; use puller to pull it out again.



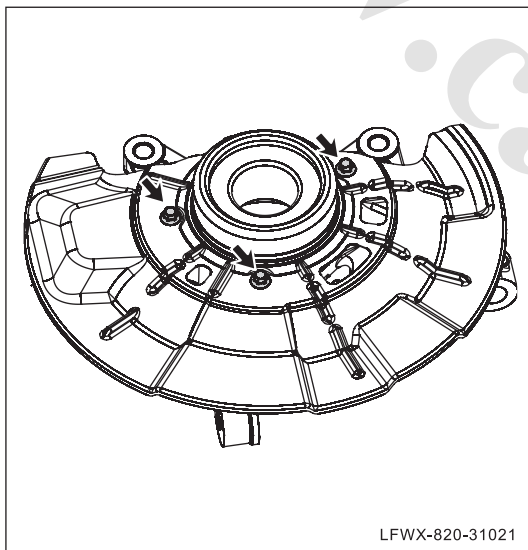
- (l) Remove the brake bottom plate fixing bolts and take out the bottom plate.



- (m) Use wheel bolt remover to remove wheel bolts.

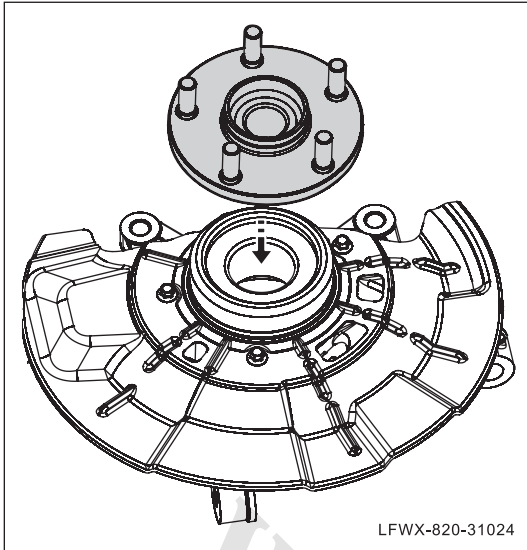
## 2. Install steering knuckle and wheel hub

- (a) Install the wheel bolts into the wheel bolt mounting holes and use the bolts remover to press them in place.

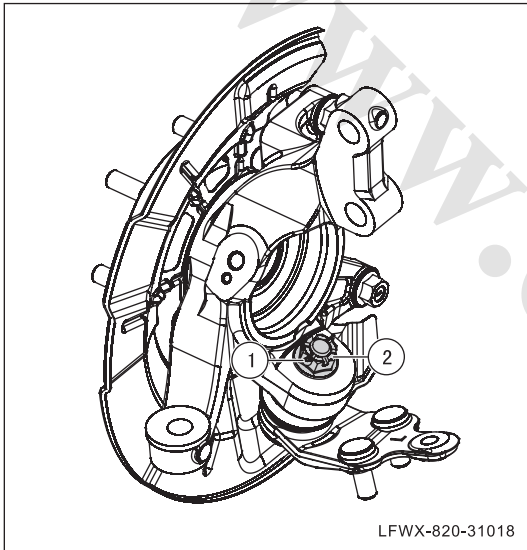


- (b) Install the front brake bottom plate onto the steering knuckle and install the fixing bolts to tighten them.

**Torque: 8N•m-12N•m**



- (c) Press into the front hub assembly on the hydraulic bench.



- (d) Install ball pin assembly of swing arm onto the steering knuckle, and install and tighten slotted nut ② of ball joint of swing arm.

**Torque: 110N•m-120N•m**

- (e) Install and lock the cotter pin ① of slotted nut of ball joint of swing arm.

- (f) Install steering knuckle with wheel hub assembly onto the mounting position.
- (g) Install ball joint of steering tie rod. (See 61 - Steering Knuckle with Tie Rod Assembly Hydraulic Steering System, Replacement)
- (h) Install fixing bolts and nuts connecting front absorber and steering knuckle. (See 31 - Front Absorber of Front Suspension, Overhaul)
- (i) Install drive shaft on wheel side onto the wheel hub on steering knuckle side. (See 41 - Drive Shaft - Drive Shaft Assembly, Replacement)
- (j) Install front brake. (See 51 - Front Brake for Service Brake, Replacement)
- (k) Install wheel speed sensor. (See 53 - Wheel Speed Sensor of Anti-lock brake System, Replacement)
- (l) Install front wheel and align four wheels. (See 33 - Wheels and tyres, Four Wheel Alignment, Adjustment)



### 3. Inspection

- (a) Make a road test to inspect working condition of the car.

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## Hub Bearing

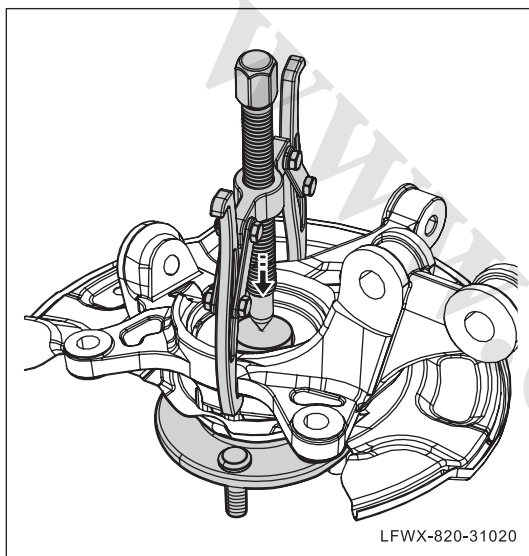
### Replacement

△ HINT:

Replacement of bearings of left and front right wheel hub has the same method. This section will introduce the replacement of bearing of front left wheel hub as an example.

#### 1. Remove wheel hub bearing components

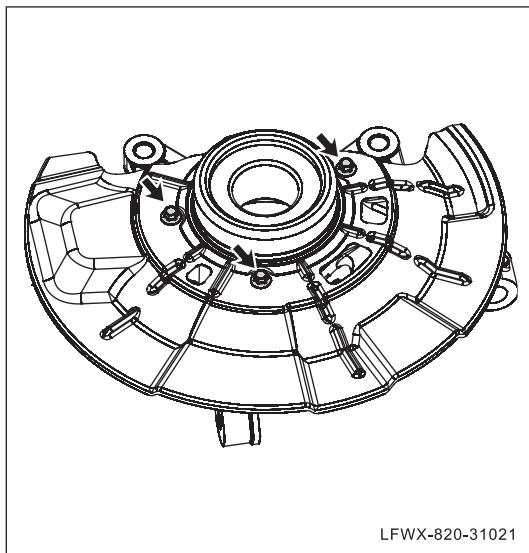
- (a) Remove steering knuckle with wheel hub assembly. (See 31 - Steering Knuckle and Wheel Hub of Front Suspension, Replacement)



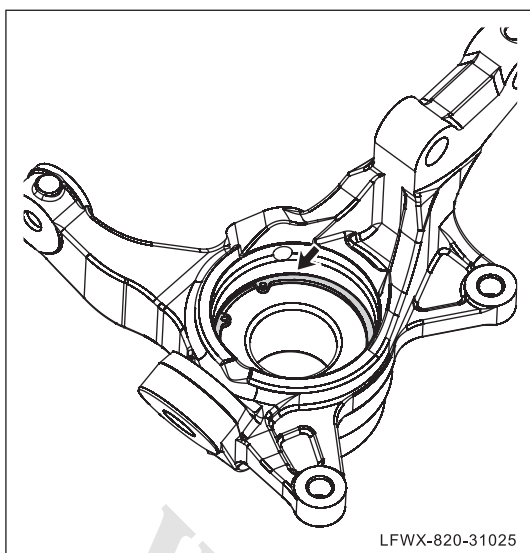
- (b) Put a circular steel plate on the hub end and use puller to push the front wheel hub assembly out.

△ HINT:

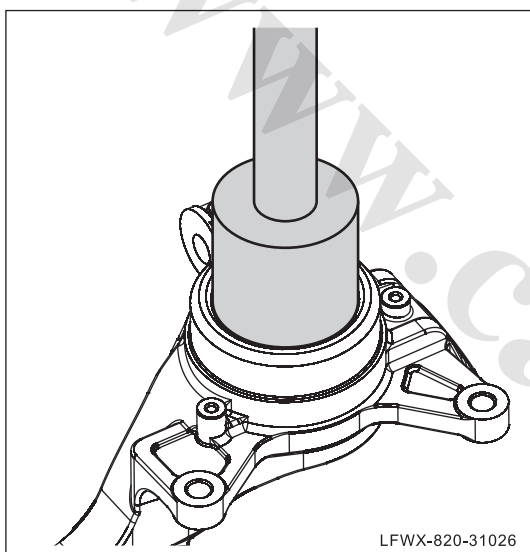
When pushing the front hub assembly out, half of hub bearing will be removed together; use puller to pull it out again.



- (c) Remove the brake bottom plate fixing bolts and take out the bottom plate.



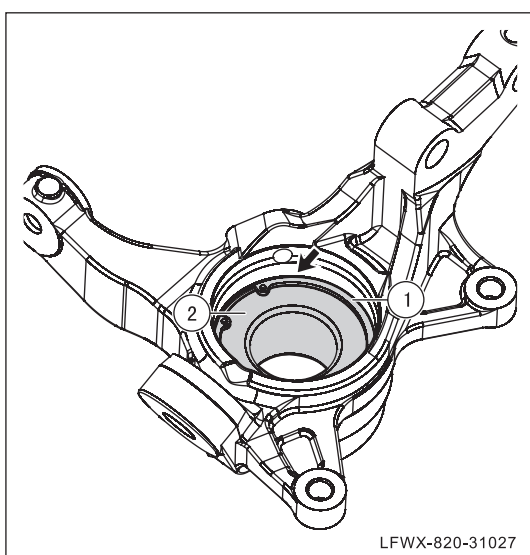
- (d) Remove the hub bearing snap ring with circlip plier.



- (e) Take advantage of hydraulic bench to press the hub bearing out.

△ HINT:

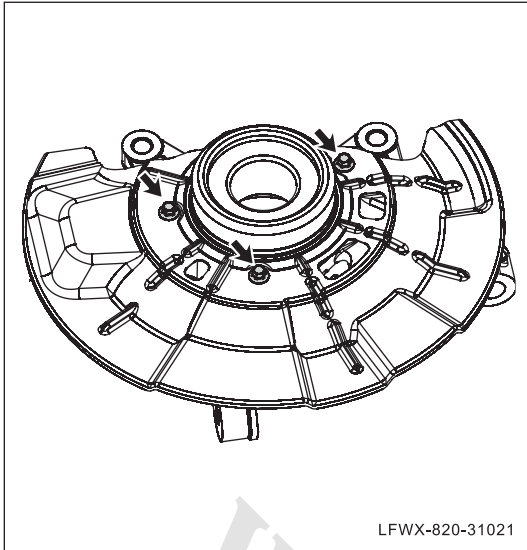
The dismantled hub bearing can't be reused.



## 2. Install wheel hub bearing assembly

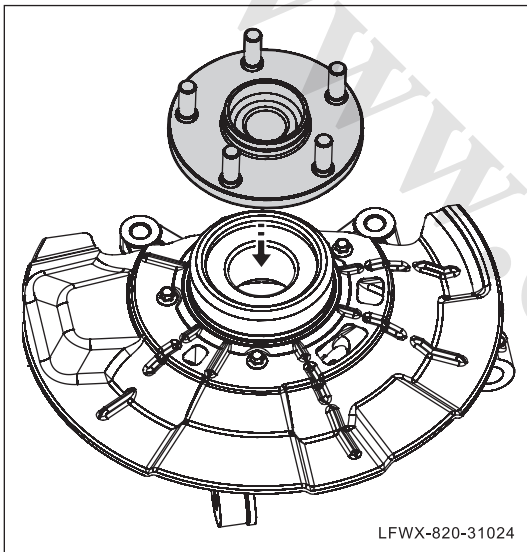
31

- (a) Take advantage of hydraulic bench to press into the hub bearing ① .
- (b) Install the hub bearing fixing snap ring ② with circlip plier.



- (c) Install the brake bottom plate onto the steering knuckle and install the fixing bolts to tighten them.

**Torque: 8N•m-12N•m**



- (d) Press into the front hub assembly on the hydraulic bench.

- (e) Install steering knuckle with wheel hub assembly. (See 31 - Steering Knuckle and Wheel Hub of Front Suspension, Replacement)

## Swing Arm Assembly

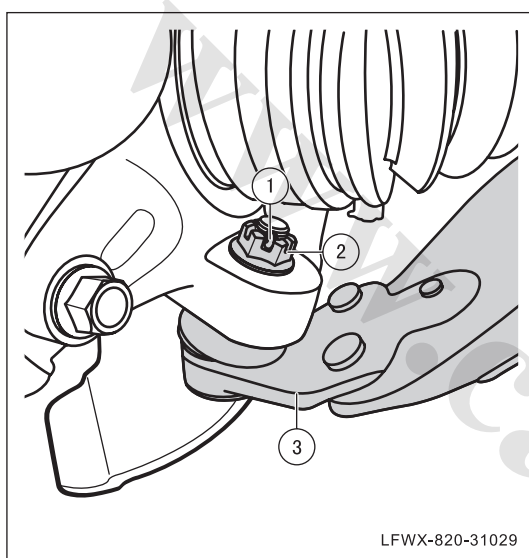
### Overhaul

△ HINT:

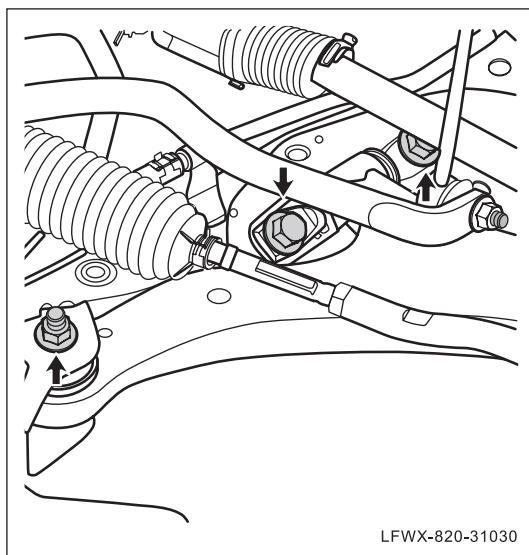
Replacement of left and front right swing arm has the same method. This section will introduce the replacement of front swing arm assembly as an example.

#### 1. Removal of swing arm assembly

- (a) Lift up vehicle and dismantle front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

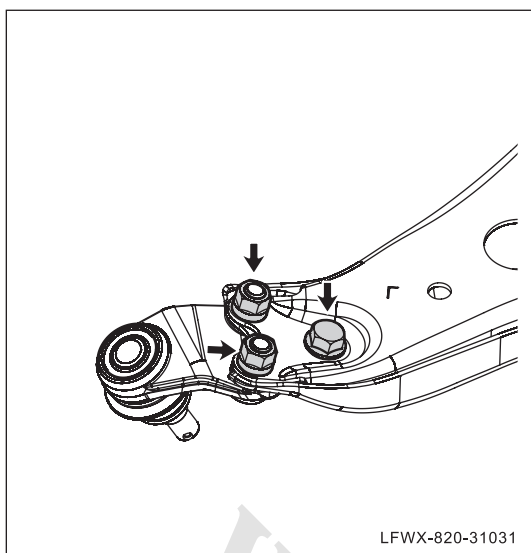


- (b) Remove the cotter pin ① of swing arm ball joint slotted nut.  
 (a) Remove the swing arm ball joint slotted nut.  
 (d) Remove the swing arm ball joint pin ③ using a ball joint remover.



- (e) Remove fixing bolt and nut of swing arm assembly, and remove swing arm assembly.





- (f) Remove fixing bolt and nut of ball pin assembly of swing arm, and remove ball pin assembly of swing arm.

## 2. Check swing arm assembly.

- (a) Check whether swing arm assembly is deformed. If yes, replace it.

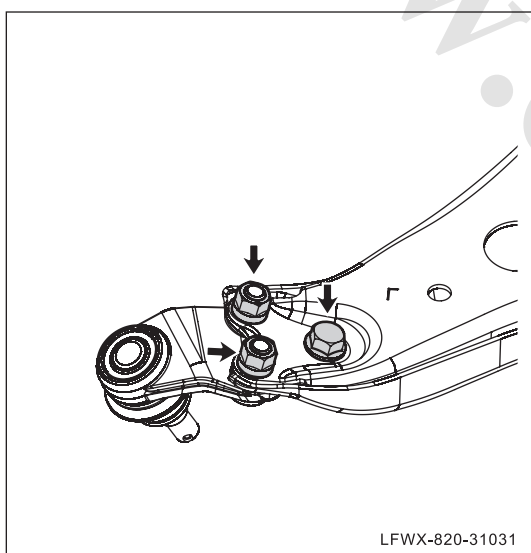
## 3. Install swing arm assembly

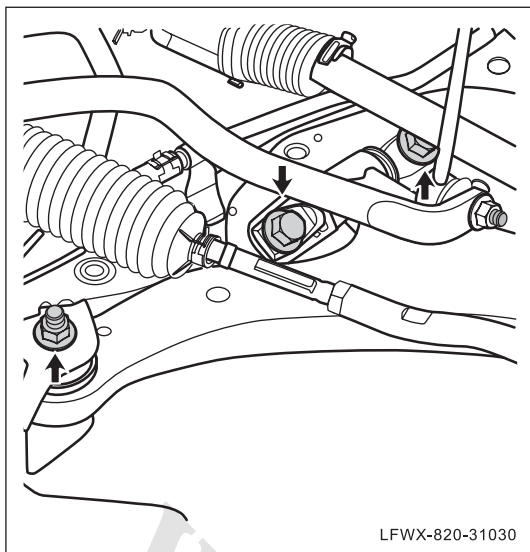
- (a) Install ball pin assembly onto the swing arm, and install and tighten fixing bolt and nut.

**Torque:**

**90N•m - 100N•m(bolt)**

**90N•m - 100N•m(nut)**



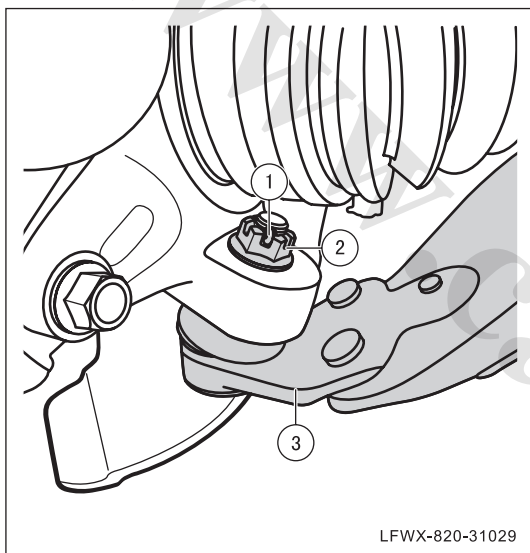


- (b) Install swing arm assembly onto the sub frame, and install and tighten fixing bolt and nut.

**Torque:**

**150N•m~170N•m(bolt)**

**110N•m - 130N•m(nut)**



- (c) Install ball pin assembly ③ of swing arm onto the mounting position, and install and tighten slotted nut ② of ball joint of swing arm.

**Torque: 110N•m-120N•m**

- (d) Install and lock the cotter pin ① of slotted nut of ball joint of swing arm.

- (e) Install front wheel and align four wheels. (See 33 - Wheels and tyres, Four Wheel Alignment, Adjustment)

#### 4. Inspection

- (a) Make a road test to inspect working condition of the car.

## Ball Pin of Swing Arm

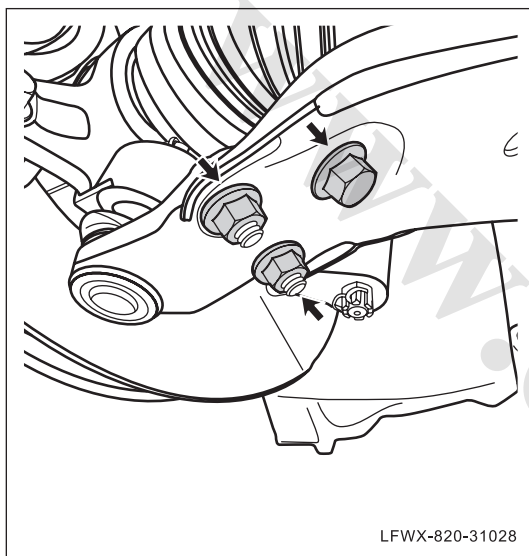
### Overhaul

△ HINT:

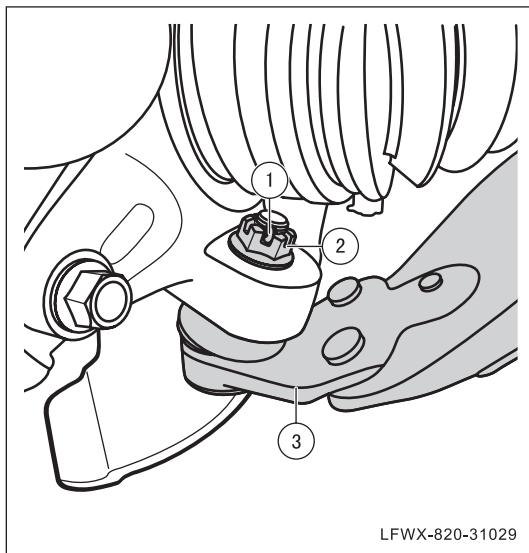
Replacement of left and front right ball pins of swing arm has the same method. This section will introduce the replacement of ball pin assembly of front swing arm as an example.

#### 1. Remove ball pin assembly of swing arm

- (a) Lift the vehicle to put bracket below the front wheel; lower down the vehicle slowly to have the front wheels supported slightly.



- (b) Remove fixing bolt and nut of ball pin assembly of swing arm.



- (c) Remove the cotter pin ① of swing arm ball joint slotted nut.
- (d) Remove the swing arm ball joint slotted nut.
- (e) Remove ball joint of swing arm by using a ball joint detector, and remove ball pin assembly ③ of swing arm.

#### 2. Check ball pin assembly of swing arm

- (a) Check whether ball pin assembly of swing arm is deformed. If yes, replace it.

### 3. Install ball pin assembly of swing arm

- (a) Install ball pin assembly of swing arm onto the mounting position, and install and tighten slotted nut of ball joint of swing arm.

**Torque: 110N•m-120N•m**

- (b) Install and lock cotter pin of slotted nut of ball joint of swing arm.
- (c) Install and tighten fixing bolt and nut of ball joint assembly of swing arm.

**Torque: 90 N.m - 100N•m**

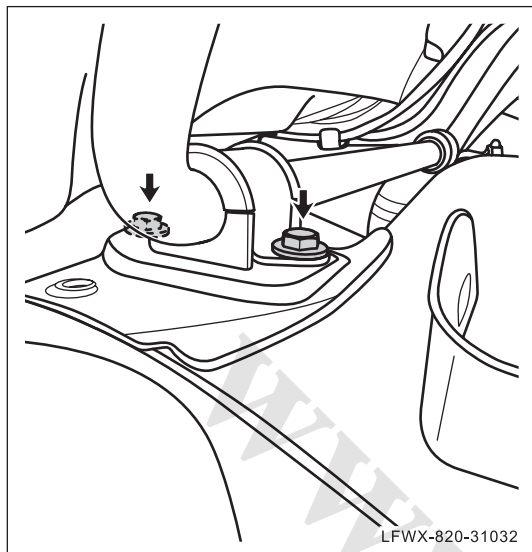
- (d) Jack the car, and take out the bracket to align four wheels. (See 33 - Wheels and tyres, Four Wheel Alignment, Adjustment)

### 4. Inspection

- (a) Make a road test to inspect working condition of the car.

## Front Stabilizer Bar Bush (Front Stabilizer Sleeve)

### Replacement



1. **Remove jacket of front stabilizer bar**
  - (a) Remove fixing bolt of loop of front stabilizer bar, and remove the loop of front stabilizer bar.
  - (b) Remove the jacket of front stabilizer bar.

2. **Install the jacket of front stabilizer bar.**

- (a) Install the jacket of front stabilizer bar onto mounting position.
- (b) Install the loop of front stabilizer bar onto the jacket, and install and tighten fixing bolt.

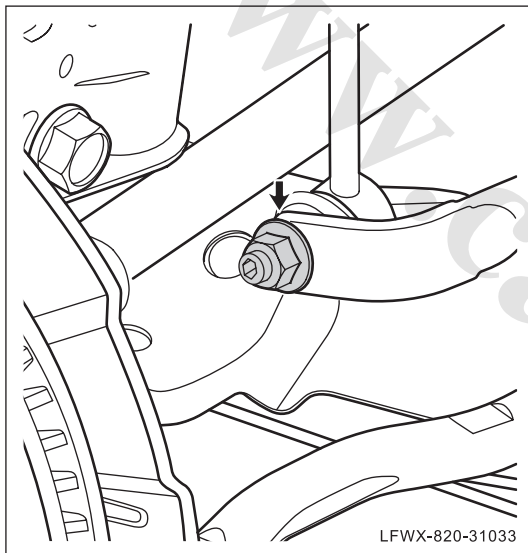
**Torque: 30N•m - 40N•m**

## Sub Frame Assembly

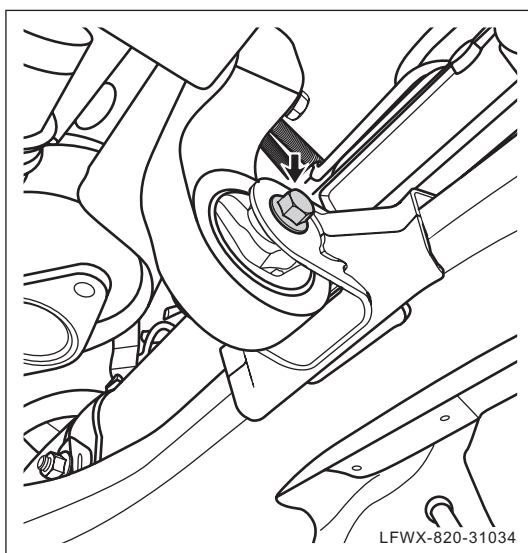
### Replacement

#### 1. Remove the sub frame assembly

- (a) Remove purifier with bellows assembly (See 15 - Purifier with Bellows Assembly of Intake/exhaust System, Replacement)
- (b) Remove steering gear with tie rod assembly (See 61 - Hydraulic Steering System with Steering Tie Rod Assembly, Replacement)
- (c) Remove front swing arm assembly. (See 31 - Swing Arm Assembly of Front Suspension, Overhaul)
- (d) Remove lower panel of engine. (See 81 - Interiors and Exteriors - Engine Lower Panel, Replacement)



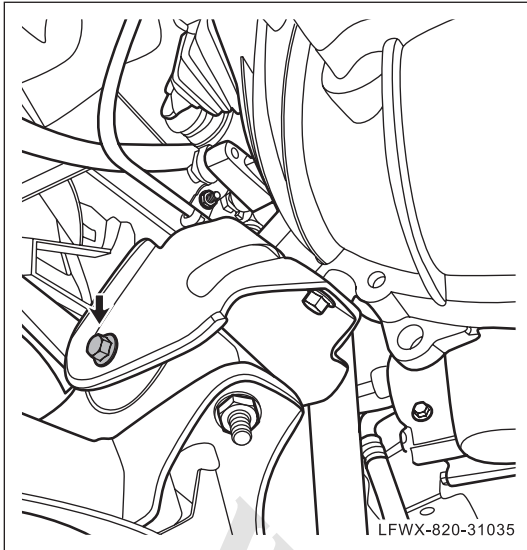
- (e) Remove fixing nut of lower ball joint of front stabilizer bar link, and disconnect the connection between front stabilizer bar link and front stabilizer bar.



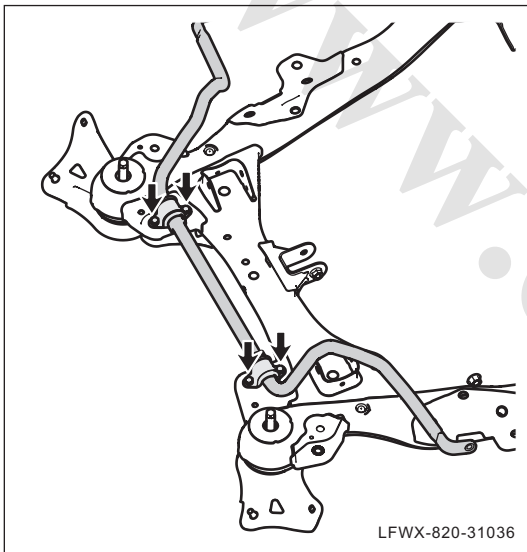
- (f) Remove the fixing bolts of the engine rear mounting.

#### **Note:**

Before dismantling, use a bracket to support engine, in order to avoid damage of other parts due to engine's lack of support.



- (g) Remove the fixing bolts of the engine front mounting.

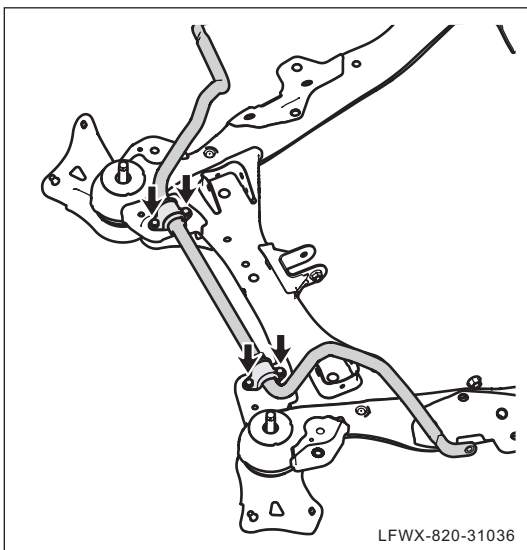


- (h) Support the sub frame by a bracket and remove the sub frame assembly fixing bolt; take the sub frame assembly down.

**Note:**

**Two or more persons are required to remove it in order to avoid drop of the sub frame.**

- (i) Remove fixing bolt of loop of front stabilizer bar, and remove front stabilizer bar and jacket.



**2. Install the sub frame assembly**

- (a) Install front stabilizer bar with jacket assembly as well as loop onto the sub frame, and install and tighten fixing bolt of loop.

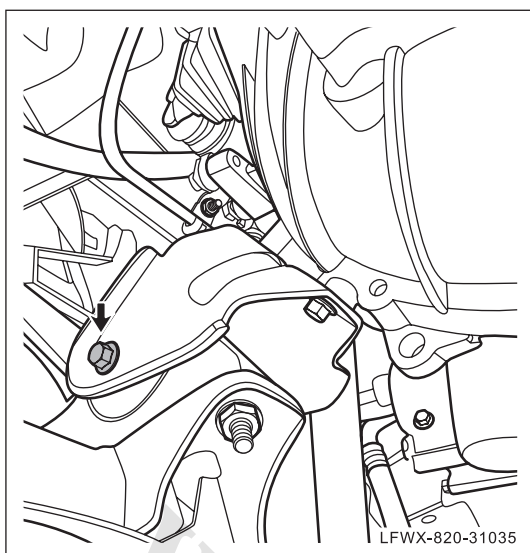
**Torque: 30N•m - 40N•m**

- (b) Use a bracket to support sub frame assembly, install sub frame assembly onto the mounting position, and install and tighten fixing bolt of sub frame.

**Torque: 75N•m - 85N•m**

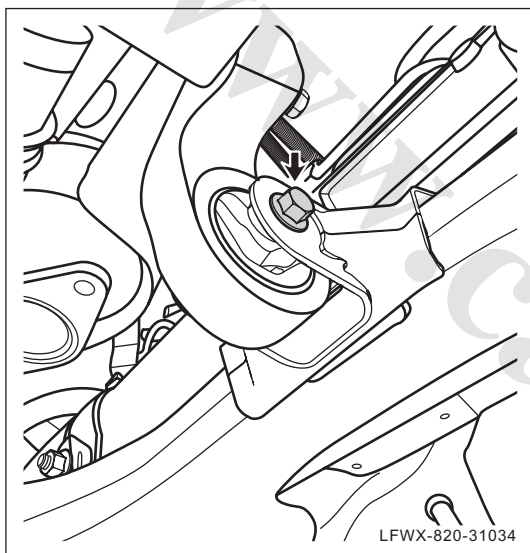
**Note:**

**Two or more persons are required to mount it in order to avoid falling of the subframe.**



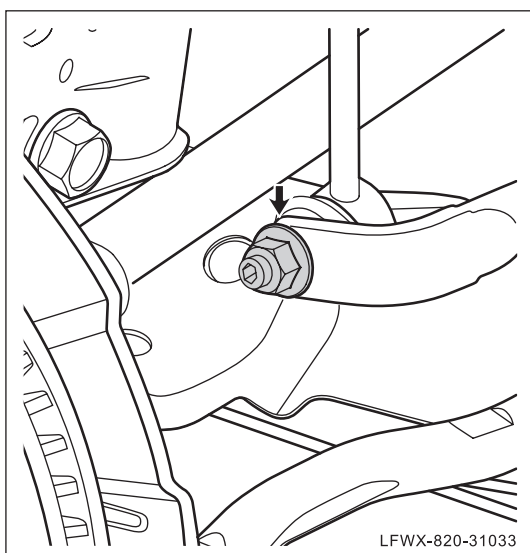
- (c) Install the fixing bolts of the engine front mounting and tighten them.

**Torque: 85N•m - 90N•m**



- (d) Install the fixing bolts of the engine rear mounting and tighten them.

**Torque: 85N•m - 90N•m**



- (e) Install front stabilizer bar link onto the front stabilizer bar, install and tighten fixing nut of lower ball joint of front stabilizer bar link.

**Torque: 70N•m - 80N•m**

- (f) Install lower panel of engine. (See 81 - Interiors and Exteriors - Engine Lower Panel, Replacement)



- (g) Install front swing arm assembly. (See 31 - Swing Arm Assembly of Front Suspension, Overhaul)
- (h) Install steering gear with tie rod assembly (See 61 - Steering Gear with Tie Rod Assembly of Hydraulic Steering System, Replacement)
- (i) Install purifier with bellows assembly (See 15 - Purifier with Bellows Assembly of Intake/exhaust System, Replacement)

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## 32-Rear Suspension

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# Rear Suspension

## System description

### 1. Function

Suspension is a power train device between the frame and wheel.

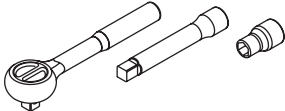
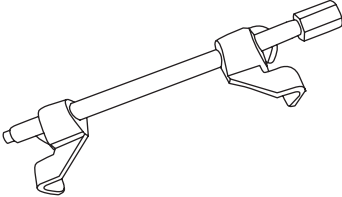
Suspension system has the following functions:


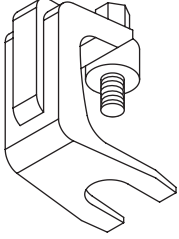
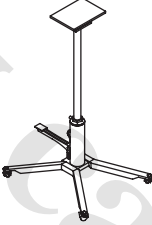
- Buffer the impact of frame or body from road surface and decrease the body vibration resulting from the impact to ensure the stability, comfort and safety during driving.
- Transmit drive force and brake force resulting from friction between road surface and wheel to frame and body.
- Support body and keep appropriate geometrical relationship between body and wheels.
- Absorb energy from wheel in vertical acceleration, keep the frame and body undisturbed when the car is jolting along the road.

### 2. Components

Rear suspension mainly consists of absorber with spring assembly, rear sub frame, rear stabilizer bar and link, rear suspension components, steering knuckle and wheel hub, etc.

## Preparation

S/N	Tools	Outline diagram	Description
1	Quick wrench		Remove bolt and nut
2	Spring compressor		Compress spiral spring

S/N	Tools	Outline diagram	Description
3	Pipe wrench		Remove oil pipe
4	Wheel bolt re-mover		Remove and install the wheel bolts
5	Bracket		Support rear sub frame

## Service data

### 1. Table of tightening torque

Item	N•m
Upper fixing nuts of rear absorber	35~45
Fixing bolt and nut connecting rear absorber and steering knuckle	200~220
Fixing bolt of loop of rear stabilizer bar	30~40
Nut of ball joint on both sides of rear stabilizer bar link	55~65
Fixing bolt and nut of front left lower longitudinal arm components of rear suspension	95~105
Fixing bolt and nut of front left lower horizontal arm components of rear suspension	110~130
Fixing bolt and nut of rear left lower horizontal arm components of rear suspension	110~130
Fixing bolt and nut of rear sub frame	55~65

## Precautions

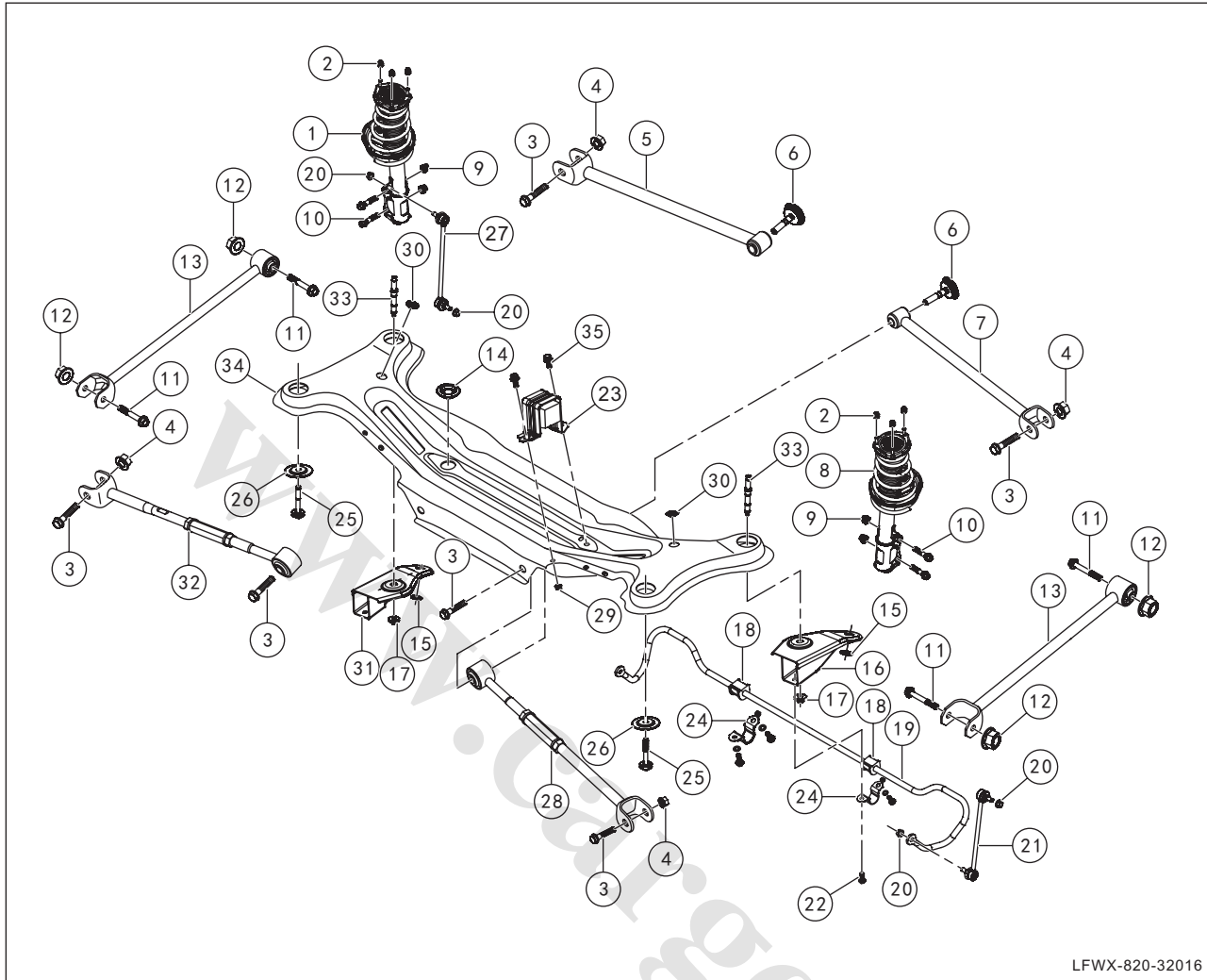
### 1. Precautions for maintenance

- (a) Check the components thoroughly before repairing or replacing them.
- (b) Don't reuse the non-reusable parts.
- (c) Clean the dismantled parts (excluding rubber parts) with gasoline and dry them.
- (d) After dismantling oil pipe, plug brake oil pipe with rubber cap to prevent brake fluid leakage.
- (e) After installation, be sure to check the fasteners for their specified torques.
- (f) Be sure to check the wheel alignment after maintaining the suspension components.

### 2. Other precautions

- (a) Be careful to perform operation on the parts to avoid dirt to the parts and to prevent the entrance of any foreign object.

## Component (I)



LFWX-820-32016

1	Rear left absorber with spring assembly
2	Hexagon nut with flange
3	Hexagon bolt with flange
4	Hexagon nut with flange
5	Front left lower horizontal arm components of rear suspension
6	Hex flange bolt, plain washer, and cap washer components Bolt assembly
7	Front left lower horizontal arm components of rear suspension
8	Rear right absorber with spring assembly

13	Front left lower longitudinal arm components of rear suspension
14	Plug II of rear sub frame
15	Big washer
16	Mounting plate II of rear sub frame
17	Hexagon nut with flange
18	Rear left stabilizer bar sleeve
19	Rear stabilizer bar assembly
20	Hexagon nut with flange



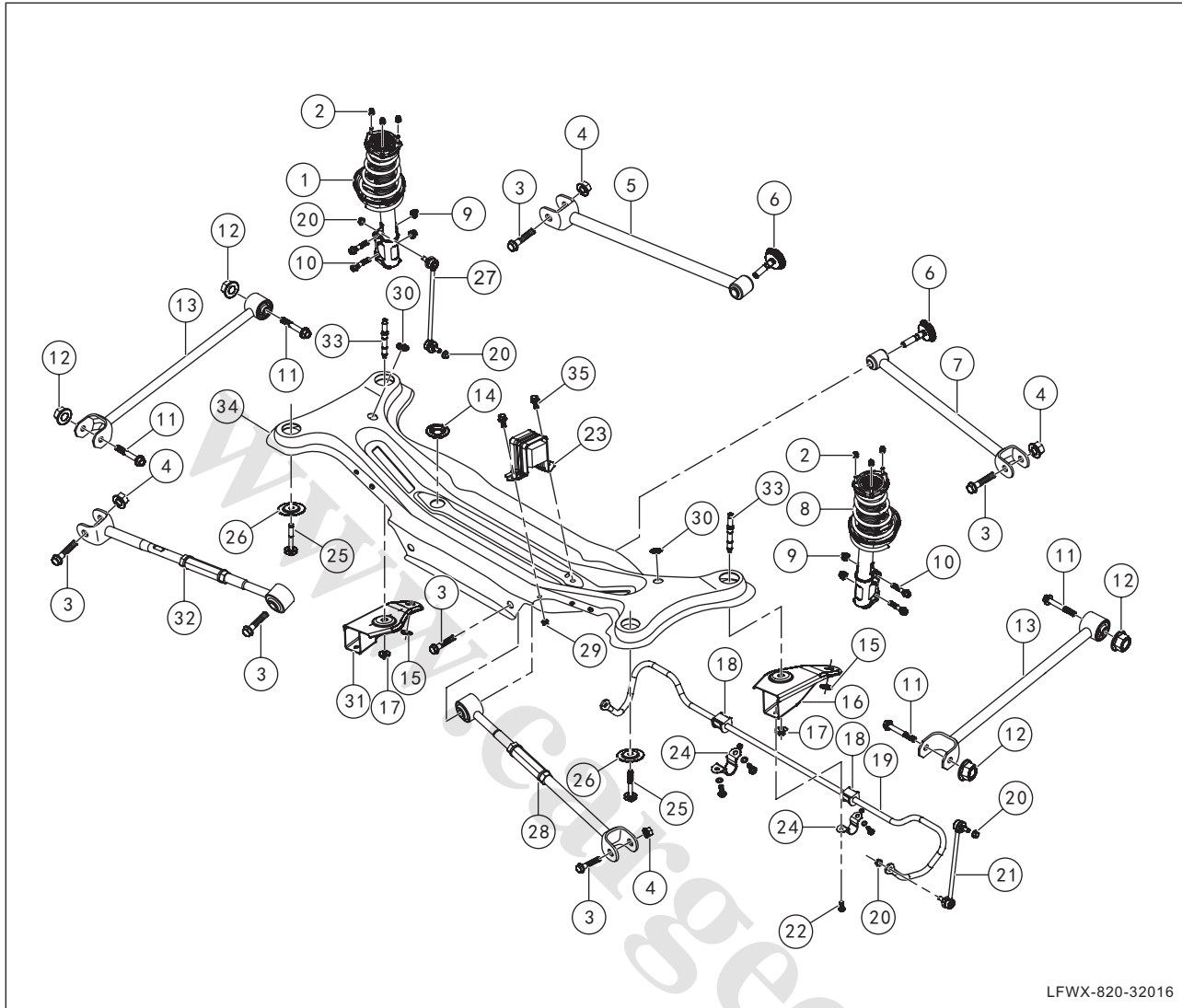
9	Hexagon nut with flange
10	Hexagon bolt with flange
11	Hexagon head bolt and plain washer assembly
12	Hexagon nut with flange

21	Connecting rod component of rear stabilizer bar
22	Hexagon bolt with flange
23	Rear sub frame balance block components
24	Upper pressure plate of damper of rear stabilizer bar

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## Component (II)



25	Hex flange bolt and large washer assembly
26	Mounting washer of rear suspension of rear sub frame
27	Connecting rod component of rear stabilizer bar
28	Rear left lower horizontal arm components of rear suspension
29	Hexagon nut with flange
30	Plug I of rear sub frame

31	Mounting plate of rear sub frame
32	Rear left lower horizontal arm components of rear suspension
33	Stud bolt
34	Rear subframe assembly
35	Hex flange bolt, spring washer, and plain washer components

## General Check

### Check the system

#### 1. Check system components

- (a). Check system for obvious mechanical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.
- (d). Check whether connecting jacket is aged or damaged. If yes, replace it.

### Check rear absorber

#### 1. Check the working condition of rear absorber

- (a) Press the rear of the car with your hands and immediately release hands, the car should swing 2~3 times and keep stable. If the car swings for too many times, inspect the rear absorber with spring assembly.
- (b) Road test inspection.
  - Drive the car on special test road or rather poor road for 10km and then stop it.
  - Check whether there is oil dripping from the rear absorber to the ground. If yes, replace rear absorber.
  - Touch the shell of rear absorber. If the temperature difference between two absorbers is big, it indicates that the resistance difference is also big. The absorber with low temperature has smaller resistance. If the absorber temperature is low, it indicates that there is no resistance inside the rear absorber or rear absorber doesn't work and needs to be replaced.
- (c) Slowly travel the car and give it an emergency brake. If the car has dramatic vibration, it indicates that the absorber has fault and should be replaced.
- (d) If the absorber makes abnormal sound during traveling, this may because of impact of absorber with spring and frame, damage of rubber cushion, deformation of dust-proof barrel and insufficiency of oil. Find out the root cause and eliminate it.

#### 1. Check rear stabilizer bar

##### 1. Check the working condition of rear stabilizer bar

- (a) Shake the rear stabilizer bar with hands and inspect whether the rear stabilizer bar is loose. If yes, it indicates that the jacket of rear stabilizer bar is aged and needs to be replaced.

## Measure the height of body.

△ HINT:

See 31 - General Check of Front Suspension, Measurement of Body Height.

## Check the hub bearing

△ HINT:

See 31 - General Check of Front Suspension, Check of Hub Bearing

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## Diagnosis

### Fault symptom table

△ HINT:

See 31 - Front Suspension - Diagnosis, Fault Symptom Table

### Fault diagnosis

△ HINT:

See 31 - Front Suspension - Diagnosis, Fault Diagnosis

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## Rear Absorber

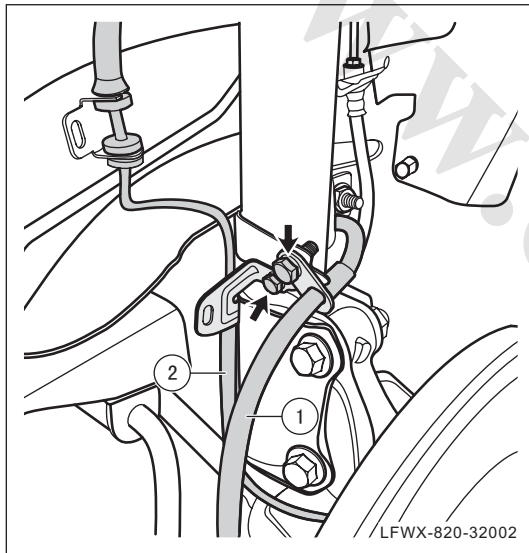
### Overhaul

△ HINT:

Overhauling of left, rear right absorbers has the same overhauling way. This section will introduce the overhauling of rear left absorber assembly as an example.

#### 1. Removal of rear shock absorber assembly

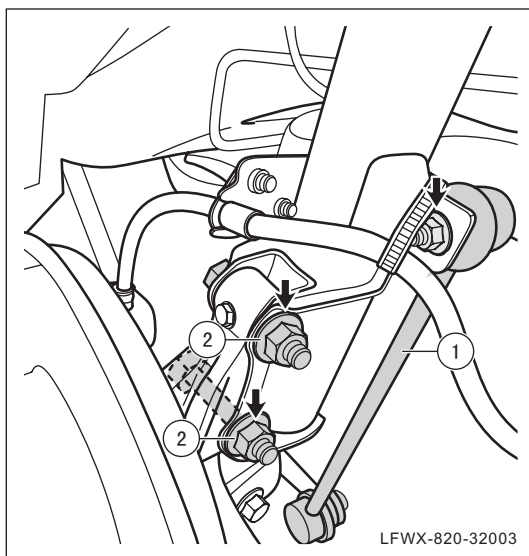
- (a) Jack the car and dismantle rear wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (b) Remove rear row seat backrest. (See 83 - Seat and belt and rear row seat backrest, replacement)



- (c) Remove fixing bolt of brake hose ① and bracket of wire harness ② of wheel speed sensor, and remove brake hose ① and bracket of wire harness ② of wheel speed sensor.

△ HINT:

After dismantling bolts, take out bracket of wire harness of wheel speed sensor and brake hose. It is unnecessary to disconnect hose joint and wire harness connector.

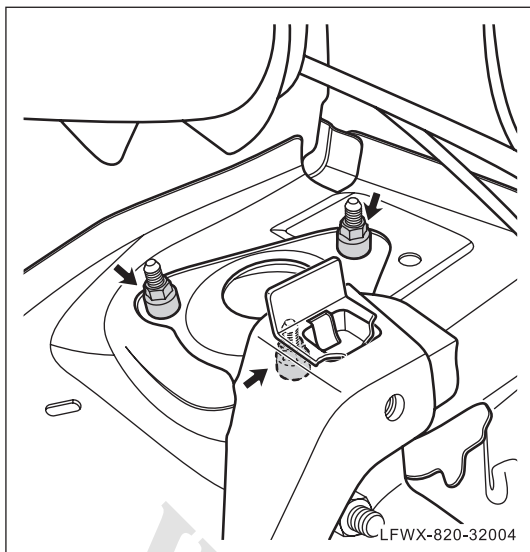


- (d) Remove fixing nut of upper ball joint of rear stabilizer bar link ① and remove rear stabilizer bar link ①.

△ HINT:

To avoid rotation of ball joint, use open wrench to fix the joint.

- Use a bracket to support rear suspension.
- (e) Remove fixing bolt and nut ② connecting rear absorber and steering knuckle.



- (f) Remove upper fixing bolt of rear absorber.
- (g) Lower the bracket, and take out the rear absorber assembly from the bottom.

## 2. Detach rear absorber assembly

△ HINT:

Detachment of front and rear absorbers is basically the same. (See 31 - Front Absorber of Front Suspension, Overhaul)

## 3. Check rear absorber component

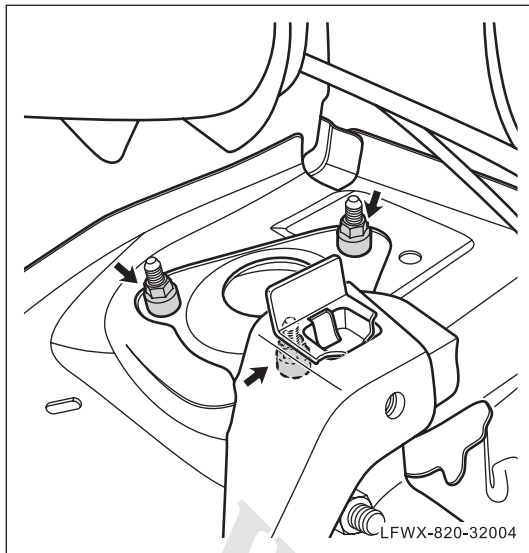
△ HINT:

Inspection of front and rear absorber components is basically the same. (See 31 - Front Absorber of Front Suspension, Overhaul)

## 4. Assemble rear absorber assembly

△ HINT:

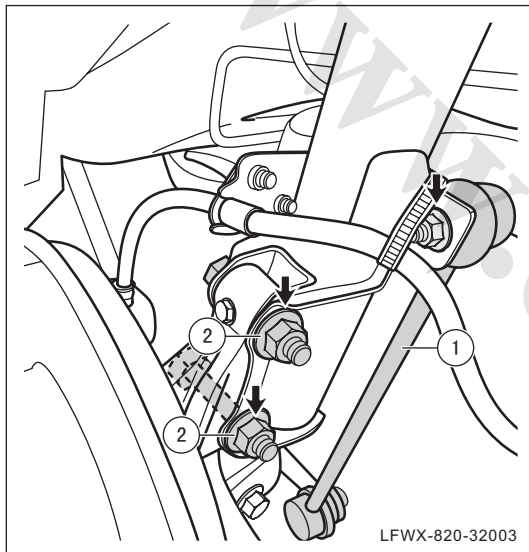
Assembly of front and rear absorbers is basically the same. (See 31 - Front Absorber of Front Suspension, Overhaul)



## 5. Installation of rear shock absorber assembly

- (a) Install the front absorber below the vehicle body.
- (b) Install the front absorber upper fixing nuts and tighten them.

**Torque: 35N•m - 45N•m**



- (c) Install and tighten fixing bolt and nut ② connecting rear absorber and steering knuckle.

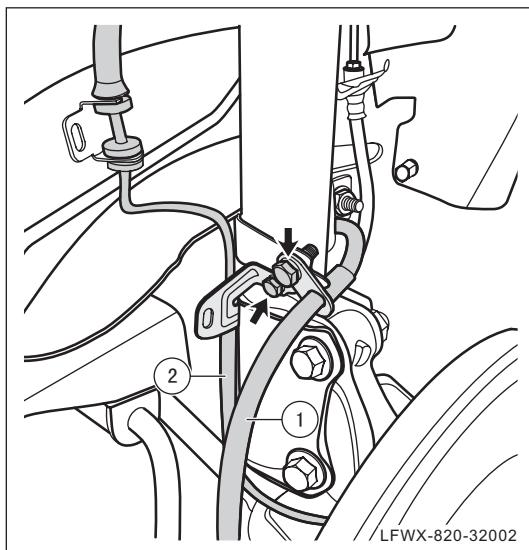
**Torque: 200N•m - 220N•m**

- (d) Install and tighten fixing nut of upper ball joint of rear stabilizer bar link ① .

**Torque: 55N•m - 65N•m**

△ HINT:

To avoid rotation of ball joint, use open wrench to fix the joint.



- (e) Install brake hose ① and wire harness ② of wheel speed sensor onto mounting position, and install and tighten fixing bolts of bracket.

**Torque: 20N•m - 26N•m**

- (f) Install rear row seat backrest. (See 83 - Seat and belt and rear row seat backrest, replacement)
- (g) Install rear wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

## 6. Inspection

- (a) Check the working condition of rear absorber. (See 32 - General Check of Rear Suspension, Check of Rear Absorber)

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## Steering Knuckle and Wheel Hub

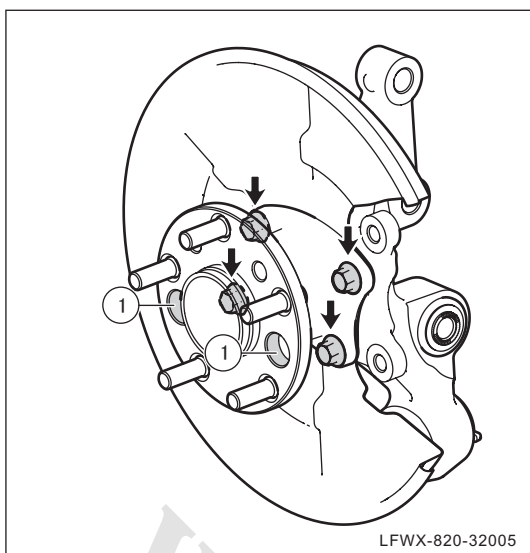
### Replacement

△ HINT:

Replacement of left and rear right steering knuckle is basically the same. This section will introduce replacement of rear left steering knuckle and wheel hub.

#### 1. Remove steering knuckle and wheel hub.

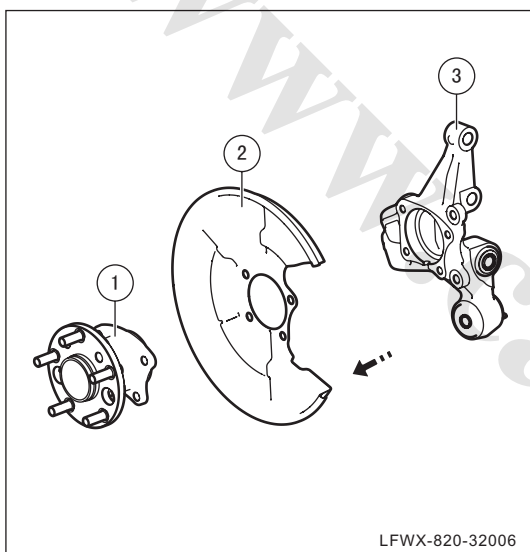
- (a) Jack the car and dismantle rear wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (b) Remove wheel speed sensor. (See 53 - Wheel Speed Sensor of Anti-lock brake System, Replacement)
- (c) Remove rear brake. (See 51 - Rear Brake for Service Brake, Replacement)
- (d) Remove fixing bolt of rear left horizontal lower arm component of rear suspension on wheel side, disconnect the connection between rear left lower arm component of rear suspension and steering knuckle. (See 32 - Component of Rear Suspension, Replacement)
- (e) Remove fixing bolt of front left lower horizontal arm component of rear suspension on wheel side, disconnect the connection between front left lower horizontal arm component of rear suspension and steering knuckle. (See 32 - Component of Rear Suspension, Replacement)
- (f) Remove fixing bolt of front left lower longitudinal arm component of rear suspension on wheel side, disconnect the connection between rear left lower longitudinal arm component of rear suspension and steering knuckle. (See 32 - Component of Rear Suspension, Replacement)
- (g) Remove fixing bolt and nut connecting rear absorber and steering knuckle. (See 32 - Rear Absorber of Rear Suspension, Overhauling)
- (h) Remove steering knuckle with wheel hub assembly.



- (i) Remove fixing bolt of rear wheel hub components.

△ HINT:

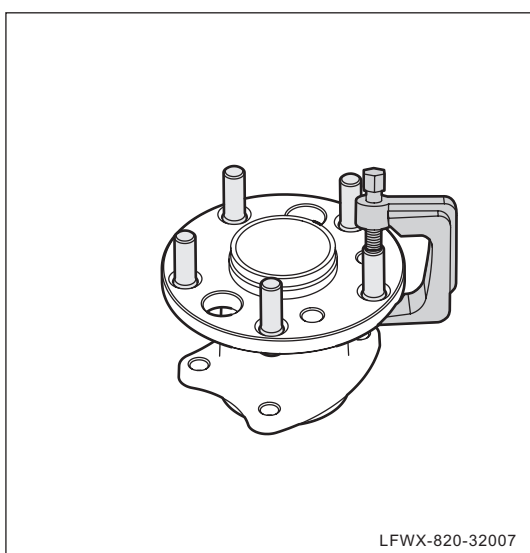
When dismantling fixing bolt of rear wheel hub component, dismantle it through operating hole ① of wheel hub flange plate by using a socket.



- (j) Remove rear wheel hub component ①, dustproof cover ② of rear brake and rear steering knuckle ③.

△ HINT:

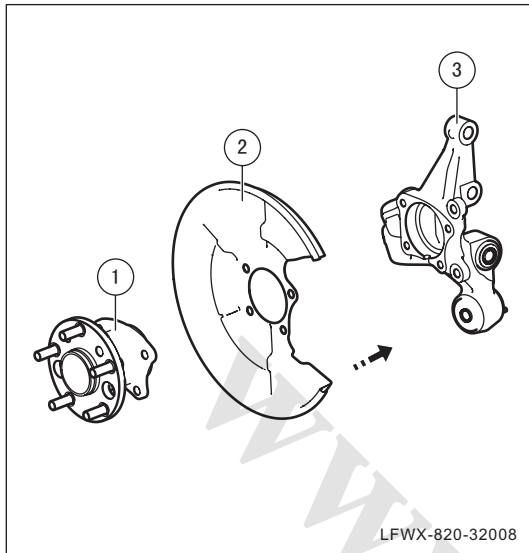
After dismantling, inspect whether the jacket of steering knuckle has aging and crack conditions. If yes, replace it.



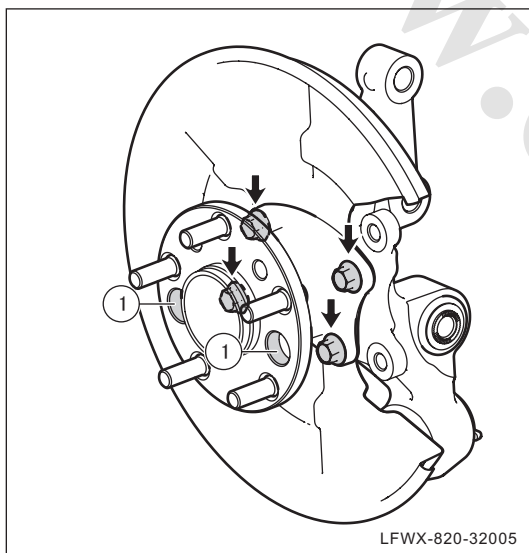
- (k) Use wheel bolt remover to remove wheel bolts.

## 2. Install steering knuckle and wheel hub

- (a) Install the wheel bolts into the wheel bolt mounting holes and use the bolts remover to press them in place.



- (b) Install dustproof cover ② of rear brake and rear wheel hub components ① onto the rear steering knuckle ③ in sequence.



- (c) Mount the rear wheel hub components fixing bolt and then tighten it.

**Torque: 80N•m - 100N•m**

△ HINT:

When installing fixing bolt of rear wheel hub component, install it through operating hole ① of wheel hub flange plate by using a socket.

- (d) Install steering knuckle with wheel hub assembly onto the mounting position.
- (e) Install fixing bolt and nut connecting rear absorber and steering knuckle. (See 32 - Rear Absorber of Rear Suspension, Overhauling)
- (f) Install front rear left longitudinal arm of rear suspension onto the steering knuckle. (See 32 - Component of Rear Suspension, Replacement)
- (g) Install front left lower longitudinal arm of rear suspension onto the steering knuckle. (See 32 - Component of Rear Suspension, Replacement)
- (h) Install front rear left horizontal arm of rear suspension onto the steering knuckle. (See 32 - Component of Rear Suspension, Replacement)
- (i) Install rear brake. (See 51 - Rear Brake for Service Brake, Replacement)

- (j) Install wheel speed sensor. (See 53 - Wheel Speed Sensor of Anti-lock brake System, Replacement)
- (k) Install rear wheel and align four wheels. (See 33 - Wheels and tyres, Four Wheel Alignment, Adjustment)

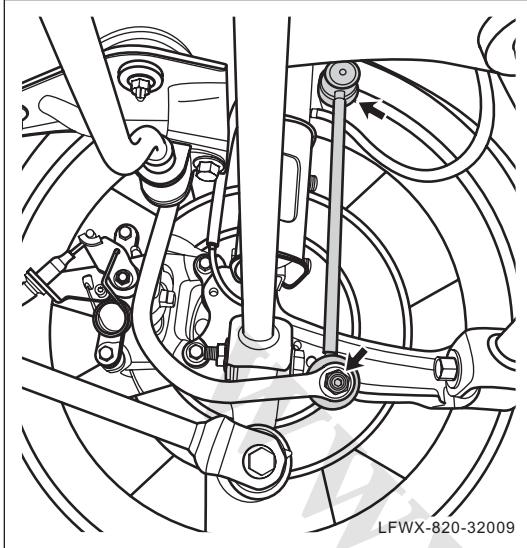
### 3. Inspection

- (a) Make a road test to inspect working condition of the car.

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## Rear Stabilizer Bar and Link

### Replacement



#### 1. Remove the rear stabilizer bar tie rod assembly.

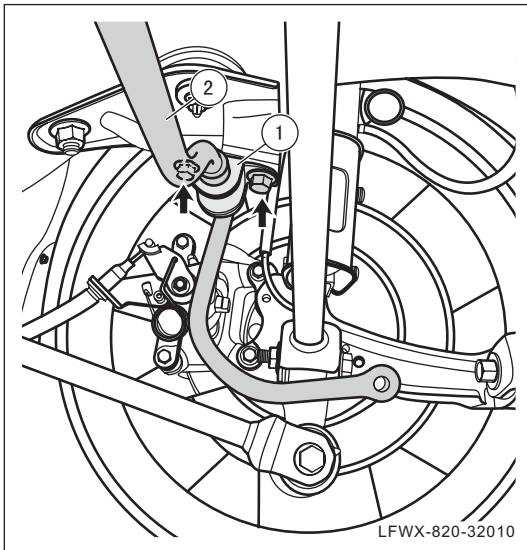
- (a) Jack the car, dismantle fixing nuts of ball joint at both ends of rear stabilizer bar link, and remove rear stabilizer bar link.

#### △ HINT:

To avoid rotation of ball joint, use open wrench to fix the joint.

#### 2. Remove rear stabilizer bar

- (a) Remove front muffler assembly. (See Chapter 15 Intake and Exhaust System - Front Muffler, Replacement)



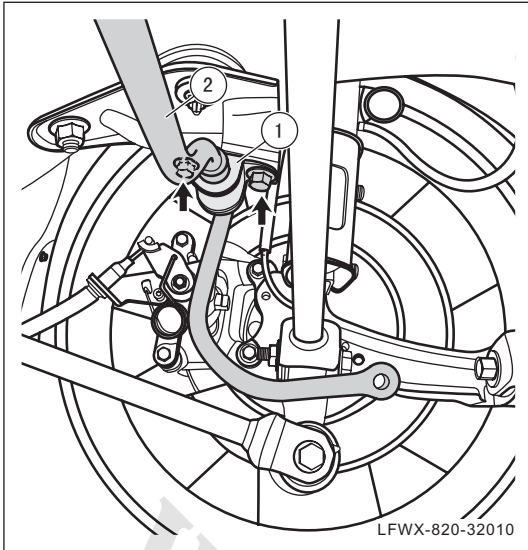
- (b) Remove fixing bolt of upper pressure plate ① of damper of rear stabilizer bar, and remove rear stabilizer bar ② and pressure plate ①.

- (c) Remove rear stabilizer bar sleeve.

- (d) Check whether rear stabilizer bar sleeve has aging or crack condition. If yes, replace it.

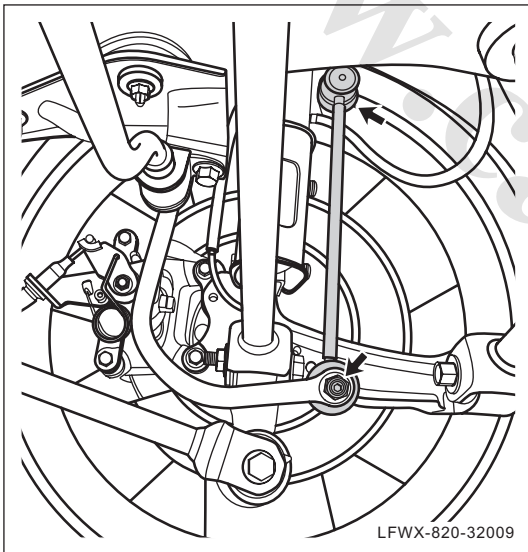
#### Mount the rear stabilizer bar.

- (a) Install rear stabilizer bar sleeve onto the rear stabilizer bar.



- (b) Install rear stabilizer bar ② and upper pressure plate ① of rear stabilizer bar damper onto the mounting position, and install and tighten fixing bolt of pressure plate ① .

**Torque: 30N•m - 40N•m**



- (c) Install front muffler assembly. (See Chapter 15 Intake and Exhaust System - Front Muffler, Replacement)

**4. Mount the rear stabilizer bar tie rod assembly.**

- (a) Install ball joints on both sides of rear stabilizer bar link, and install and tighten fixing nut.

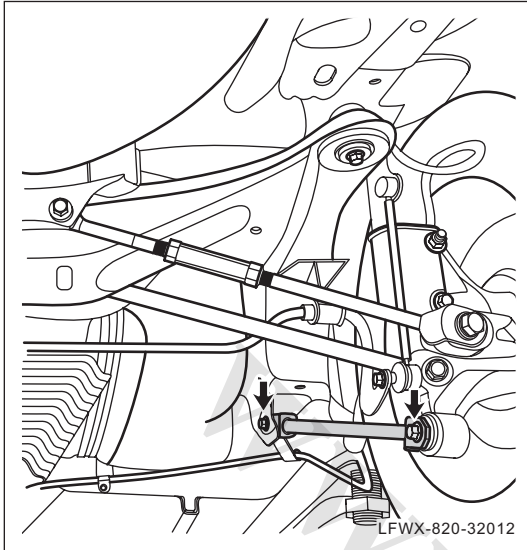
**Torque: 55N•m - 65N•m**

△ HINT:

To avoid rotation of ball joint, use open wrench to fix the joint.

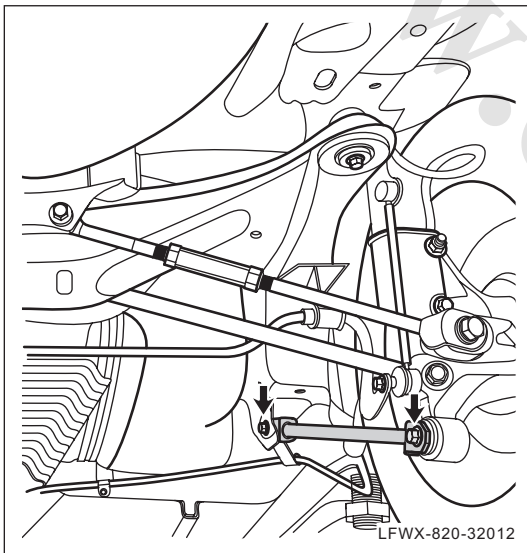
## Rear Suspension Components

### Replacement



#### 1. Remove front left lower longitudinal arm components of rear suspension

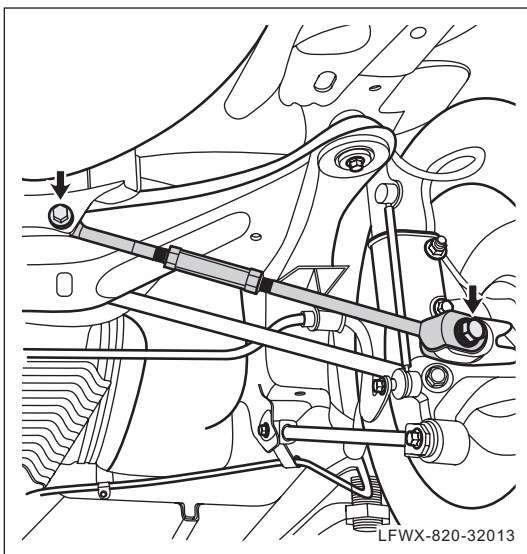
- (a) Jack the car, dismantle fixing bolts and nuts on both sides of front left lower longitudinal arm component of rear suspension, and remove front left lower longitudinal arm component of rear suspension.



#### 2. Install front left lower longitudinal arm component of rear suspension

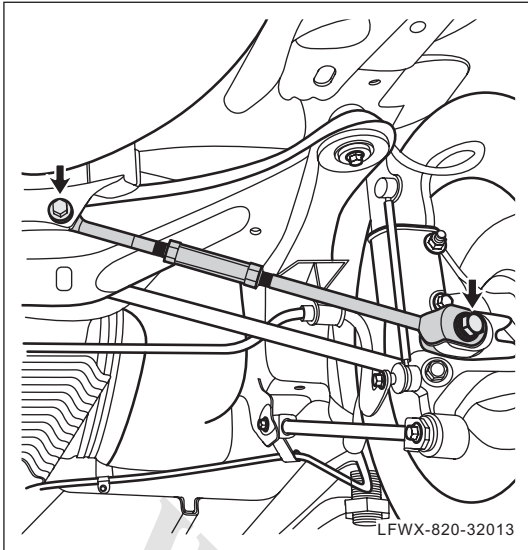
- (a) Install front left lower longitudinal arm components of rear suspension onto mounting position, and install and tighten fixing bolts and nuts on both sides.

**Torque: 95N·m - 105N·m**



#### 3. Remove rear left lower horizontal arm components of rear suspension

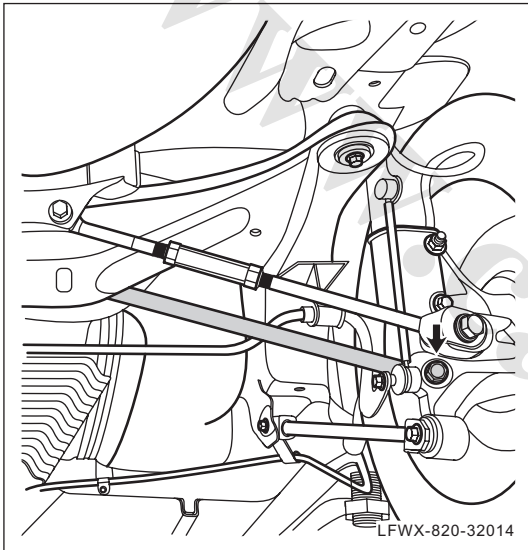
- (a) Jack the car, dismantle fixing bolts and nuts on both sides of rear left lower horizontal arm component of rear suspension, and remove rear left lower horizontal arm component of rear suspension.



**4. Install rear left lower horizontal arm component of rear suspension**

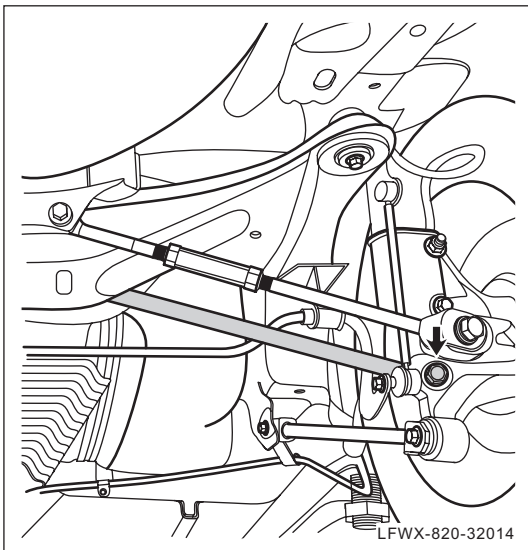
- (a) Install rear left lower horizontal arm components of rear suspension onto mounting position, and install and tighten fixing bolts and nuts on both sides.

**Torque: 110N•m-130N•m**



**5. Remove front left lower horizontal arm components of rear suspension.**

- (a) Jack the car, dismantle fixing bolts and nuts on both sides of front left lower horizontal arm component of rear suspension, and remove front left lower horizontal arm component of rear suspension.



**6. Install front left lower horizontal arm components of rear suspension.**

- (a) Install front left lower horizontal arm components of rear suspension onto mounting position, and install and tighten fixing bolts and nuts on both sides.

**Torque: 110N•m-130N•m**

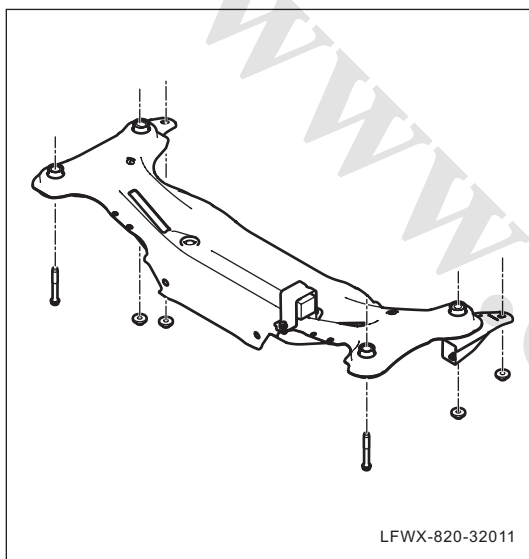


## Rear Sub Frame

### Replacement

#### 1. Remove the rear sub frame assembly

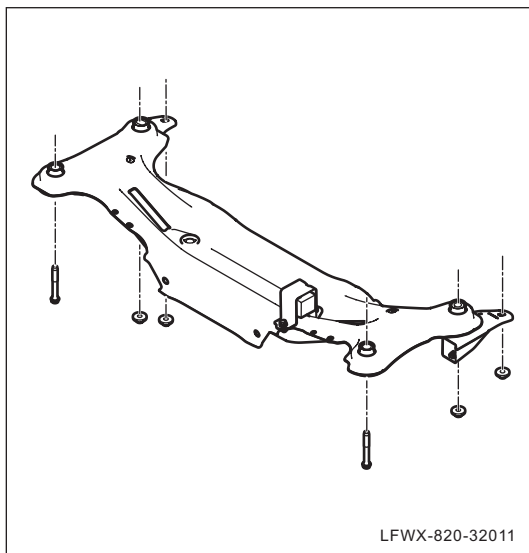
- (a) Remove rear stabilizer bar. (See 32 - Rear Stabilizer Bar and Link of Rear Suspension, Replacement)
- (b) Remove front left lower horizontal arm components of rear suspension. (See 32 - Component of Rear Suspension, Replacement)
- (c) Remove rear left lower horizontal arm components of rear suspension. (See 32 - Component of Rear Suspension, Replacement)



- (d) Support the rear sub frame by using a bracket, dismantle fixing bolt and nut of rear sub frame assembly, and remove rear sub frame assembly.

#### **Note:**

Two or more persons are required to remove it in order to avoid drop of the rear sub frame.



#### 2. Install the rear sub frame assembly

- (a) Support the rear sub frame by using a bracket, install fixing bolt and nut of rear sub frame assembly, and install and tighten fixing bolt and nut.

**Torque: 55N•m - 65N•m**

#### **Note:**

Two or more persons are required to mount it in order to avoid falling of the rear sub frame.



- (b). Install front left lower horizontal arm components of rear suspension. (See 32 - Component of Rear Suspension, Replacement)
- (c). Install rear left lower horizontal arm component of rear suspension. (See 32 - Component of Rear Suspension, Replacement)
- (d). Install rear stabilizer bar (See 32 - Rear Stabilizer Bar and Link of Rear Suspension, Replacement)

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## 33-Wheels and tyres

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# Wheels and Tyres

## System description

### 1. Function

The tyre comes into contact directly with the road surface and is one of the important components of automobiles.

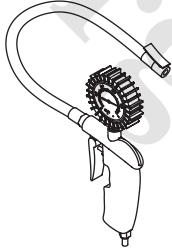
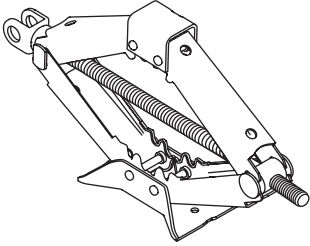
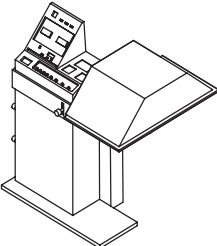
Functions of the tyre are listed as below:

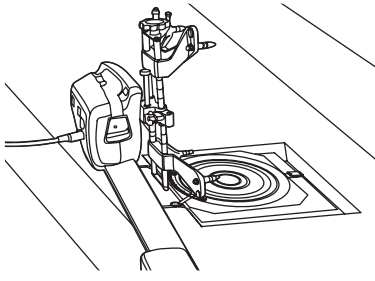
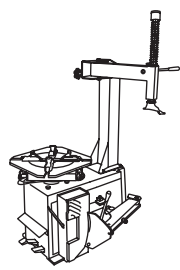
- To absorb the shock during driving and ensure the automobile riding comfort and running smoothness.
- To ensure good traction between wheel and road surface and improve the vehicle traction, braking and passability.
- To support the vehicle weight.

### 2. Components

Wheels and tyres mainly consists of wheels and spare tyres.

## Preparation

S/N	Tools	Outline diagram	Description
1	Tire pressure gauge		Checking the tyre pressure
2	Jack		Lifting and jacking up the vehicle.
3	Wheel balancing machine		Testing and adjusting wheel balance.

S/N	Tools	Outline diagram	Description
4	Four-wheel alignment indicator		Inspecting wheel alignment
5	Tire changer		Dismantling of tyre

## Service data

### 1. Technical specifications table

Tyre pressure		200kPa(前轮); 200kPa(后轮)
Tyre specification		215/60 R16
Wheel alignment	Toe-in of front wheel	0° ±30′
	Front wheel camber	-0° 30′ ±30′
	Kingpin caster	2° 45′ ±30′
	Kingpin inclination	11° 54′ ±30′
	Toe-in of rear wheel	0° 21′ ±30′
	Rear wheel camber	-1° 24′ ±30′
Steering angle		Outer wheel: 36° 54′ ~40° 54′ Inner wheel: 31° 54′ ~35° 54′

### 2. Table of tightening torque

Item	N•m
Fixing nut of tyre	120
Fixing nut of steering wheel	40~50
Fixing nut of low-frequency field antenna for monitoring of tyre pressure	6~10

## Precautions

### 1. Precautions before repair

- (a) Park the car on flat and solid ground and engage the parking brake and place the transmission at neutral position. If it is necessary, place a stopper under the tyre in the diagonal direction of the replaced tyre.
- (b) To stop wheels, place a block on the front of front wheel or rear of rear wheel.

### 2. Precautions for maintenance

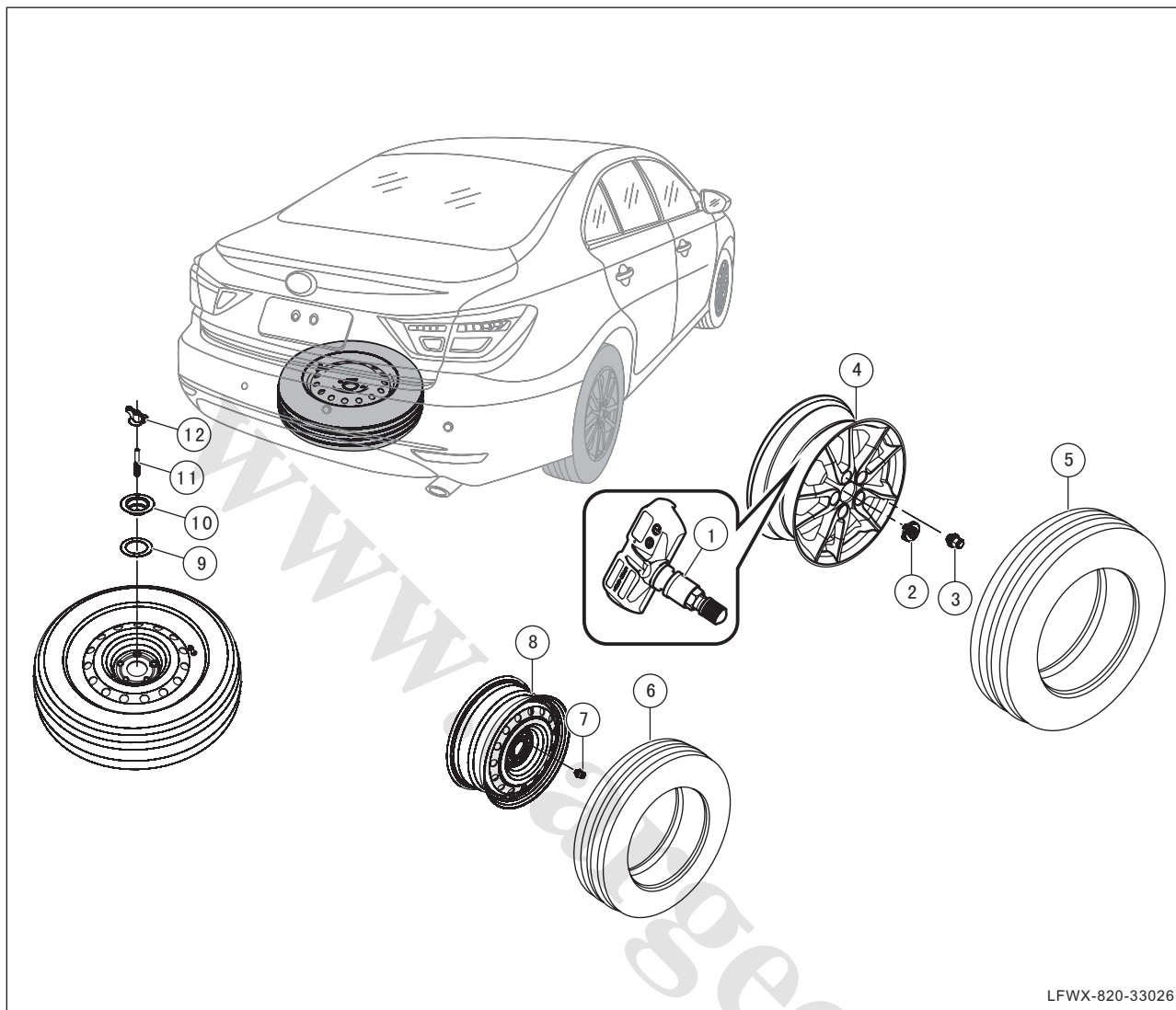
- (a) Use a jack according to its User's Manual.
- (b) Make sure to put the jack on a level and solid ground. Make sure that the jack is set at the point designated for proper lifting.
- (c) Don't let your body under the car which is supported only by a jack; otherwise it may cause injury.
- (d) If there is person inside the car, don't jack the car.
- (e) When jacking car by using a jack, please don't start or run the engine.
- (f) Please don't apply engine oil or lubricating oil on bolts or nuts.

### 3. Other precautions

- (a). Regular rotation of tyres shall be made to reduce eccentric wear of front tyres in order to ensure driving performance and prolong service life of tyres.
- (b). During the course of using, wash off mud and sand on the tyre in time to avoid wheels shaking at high speed from damaging tyres.
- (c) Don't mix use radial tyre, slant line pattern tyre or slant strip curtain layer tyre. Otherwise, it may cause typical operating hazard and cause the car out of control.
- (d) Just use special tyres. Don't use tyres with different specifications and pattern in the same car.



## Components



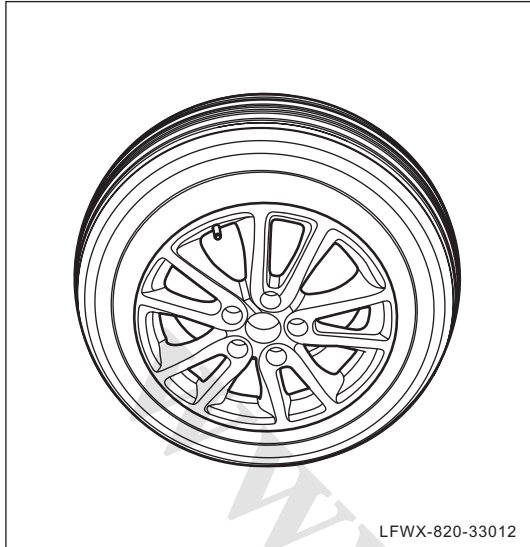
LFWX-820-33026

1	Tire valve with tyre pressure monitoring sensor assembly
2	Central trim cover of alloy wheel
3	Wheel nut
4	Aluminum alloy wheel
5	Tyre assembly
6	Tyre assembly

7	Wheel nut
8	Steel wheel
9	Sulfurized - rubber layer
10	Metal fixing cover
11	Screw stem
12	Metal rotating part

## General Check

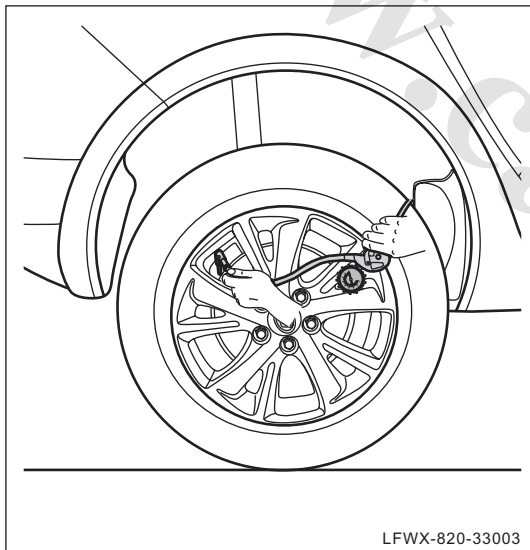
### Check wheel



LFWX-820-33012

1. Check wheel tyre and wheel hub
  - (a) Check the specifications and size of wheel tyre and wheel hub, and make sure that the car is equipped with tyres and wheel hub with recommended size.

Specifications of tyre: 215/60 R16



LFWX-820-33003

2. Check the working condition of wheel tyre
  - (a) Check whether tyre pressure meets standard. If no, adjust it.

Front wheel: 200kPa

Rear wheel: 200kPa

△ HINT:

The tyre pressure should not be lower than 10% of standard pressure under ambient temperature.

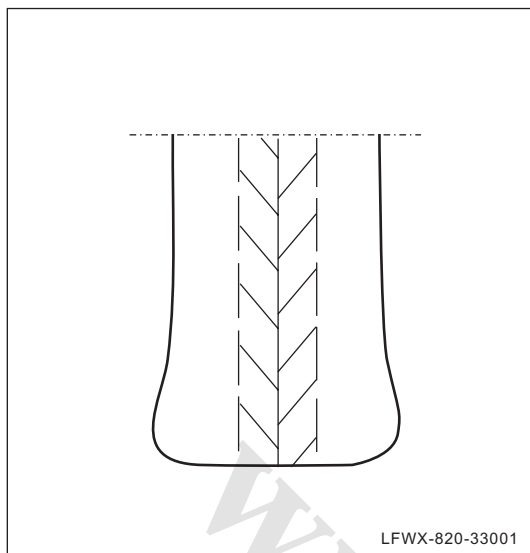
- (b) Check the tyre valve for air leakage with the soap water.

- Remove the tyre valve cover, apply proper soap water on each tyre valve and observe them for air leakage.

△ HINT:

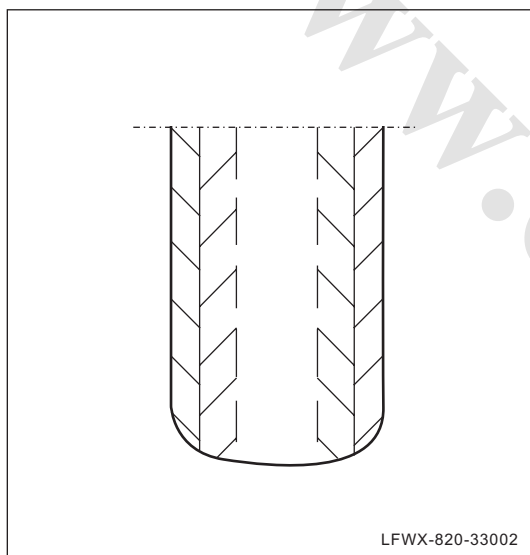
In case of leakage of tyre valve, replace the tyre.

- (c). Check the tyre for cracks or damage. If any, replace it.
- (d). Check the tyre surface for any nail, gravel or other foreign object. If any, be sure to clear it.

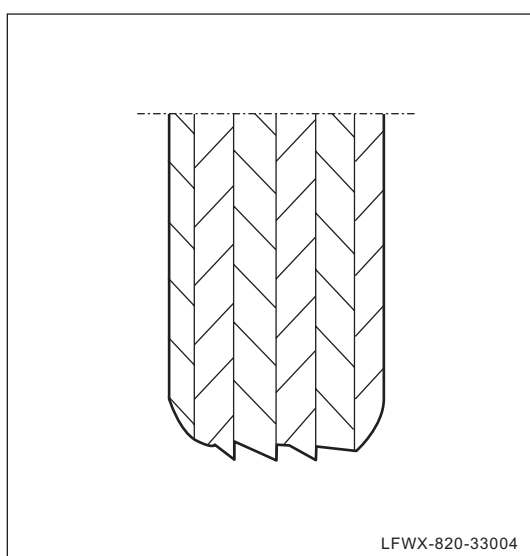


(e) Check the tyre for any abnormal wear. If any, be sure to find out the cause of the malfunction.

- Insufficient air pressure may cause rapid wear of tyre shoulder, tyre flexing and increase of rolling resistance.



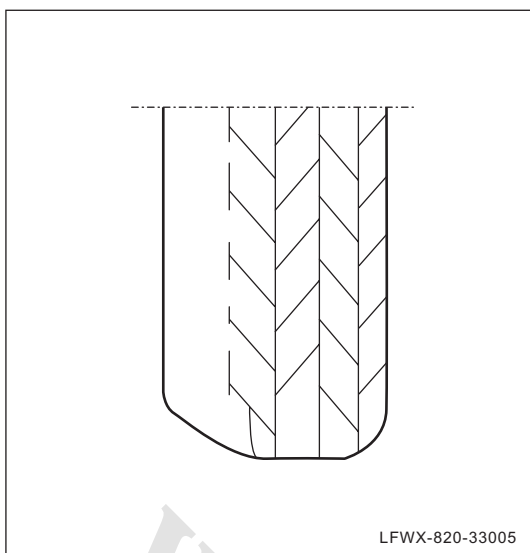
- Too much pressure may cause rapid wear of tyre tread center and reduce buffering capacity of the tyre.



- Tire has feather type wear and front wheel toe-in and rear wheel toe-in are too big (or small).

△ HINT:

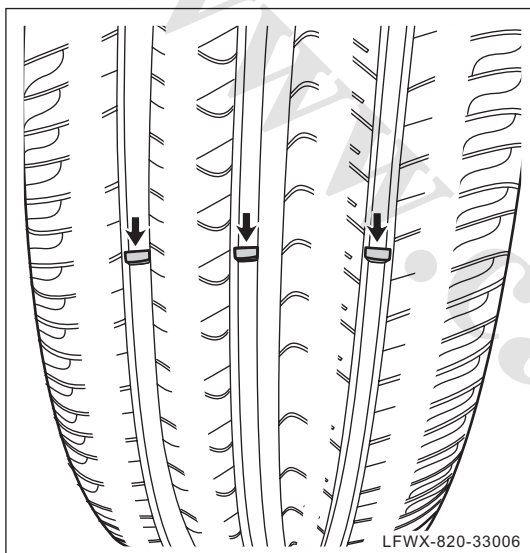
Adjust the toe-in and replace or rotate the tyres according to wear condition.



- Single side wear (camber angle problem)

△ HINT:

Adjust camber angle; replace or exchange tyres according to wear condition.



- (f) Observe the wear mark at the bottom of tyre groove and if the tread wear is up to the bottom wear mark, replace with a new tyre.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Tire abrasion	1. Driver (bad driving habits)	See 33 - Wheels and Tyres, Diagnosis, Fault Diagnosis (1. tyre wear)
	2. Tire specifications (incorrect)	
	3. Tire pressure (incorrect)	
	4. Front toe-in of front wheel, front toe-in of rear wheel (incorrect)	
	5. Wheel camber problem	

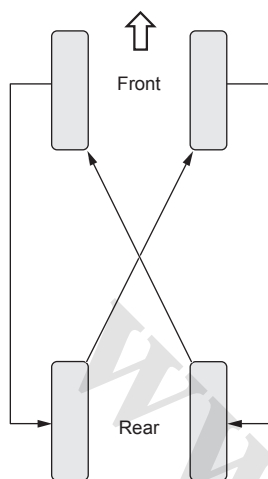
## Fault Diagnosis

### 1. Tire wear

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection			
	Ask the user about the related driving habits questions: <ul style="list-style-type: none"> <li>• Whether apply emergency brake frequently?</li> <li>• Whether drive at a high speed under poor road condition?</li> <li>• Whether drive at a high speed when cornering?</li> <li>• Whether drive at a high speed even in case of Inadequately inflated tyre?</li> </ul>	Go to Step 1	Bad driving habits exist	Judge the wheel wear is due to the bad driving habits and warn the user to correct the driving habits
1	Check the wheel specifications			
	Check whether all wheel specifications are correct (See 33 - General Check of Wheels and Tyres, Check of Wheels)	Go to Step 2	Specifications are incorrect.	Replace the wheels (see Chapter 33 Wheels and Tyres, Wheels Assembly, Replacement) .
2	Checking the tyre pressure			
	Check whether tyre pressure meets requirements (See 33 - General Check of Wheels and Tyres, Check of Wheels)	Go to Step 3	The tyre pressure do not conform to the standard	Correct tyre pressure
3	Check if tyre is worn			
	Carefully inspect tyre abrasion type (See 33 - General Check of Wheels and Tyres, Check of Wheels)	Go to Step 4	Tire shoulder is worn quickly	Overhaul it based on corresponding abrasion type.

## Wheel Assembly

### Tire rotation



LFWX-820-33007

#### 1. Tire rotation

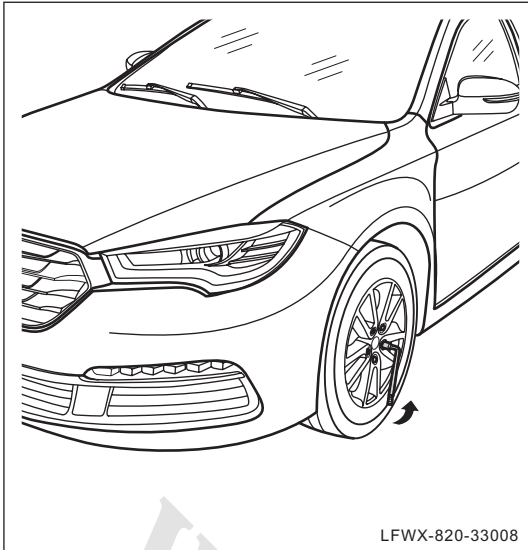
##### △ HINT:

To ensure even tyre wear and prolong tyre lifespan, it is recommended to rotate the tyres every 10000km. However, the most appropriate interval for tyre rotation depends on the driver's normal driving behaviors and road conditions.

### Replacement

##### △ HINT:

Dismantling and installation of all wheels are basically the same. This section will only introduce the dismantling and installation of front left wheel.



### 1. Removal of wheel

- (a) Park the car on flat ground, set the car in parking brake condition; meanwhile place block under the tyre in diagonal direction with front left wheel, to prevent car from sliding. Take a jack to support the car.

**Note:**

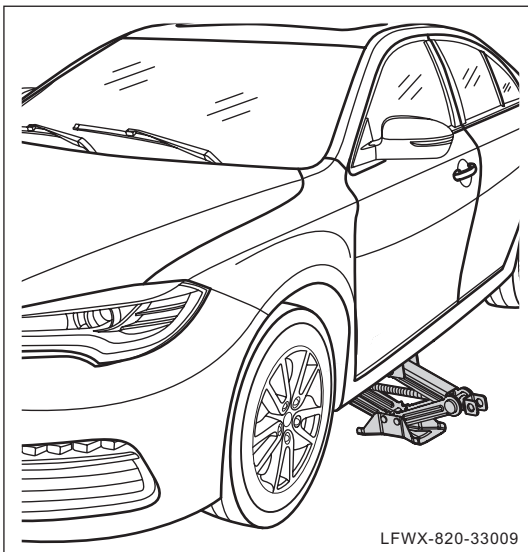
The stop block shall be placed in front of the front wheel or behind the rear wheel.

- (b) Unscrew the wheel nuts 1-2 circles by a wrench.

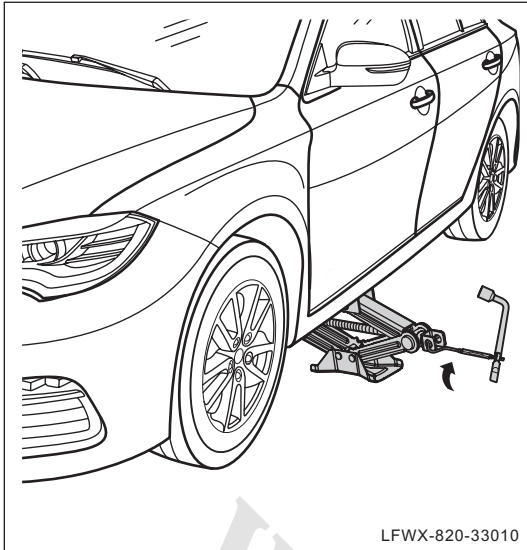
**Note:**

- Loosen the nuts without removing them.
- When dismantling, the wrench must be installed properly, to avoid wrench from sliding and cause nut damage or personal injury.
- Do not apply oil or grease onto the nuts. Failure to do so could cause the wheel nuts loose and the tyre falling off, resulting in serious accidents.

- (c) Put the jack at the jacking position of the car. Make sure to place the jack on level, firm ground.







- (d) Insert the handle of the jack into the jack, and clockwise rotate the handle to raise the jack slowly. Ensure the jack slot is clamping the edges under the vehicle. Jack up the vehicle to make tyre separate from the ground slightly.

- (e) Remove wheel nuts and remove wheel.

## 2. Installation of wheel

- (a) Before mounting the spare tyre, remove all corrosion from the mounting surface with a steel wire brush.
- (b) Install the wheel nuts and tighten with the tyre nut wrench. Don't apply too much force; pre-tightening is suitable.
- (c) Low down the car and tighten each wheel nut to the specified torque in turn diagonally.

**Torque: 120N•m**

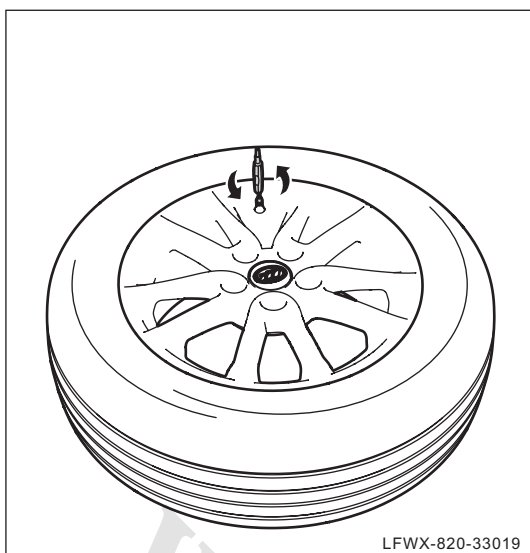
- (d) Take out the jack.

## 3. Inspection:

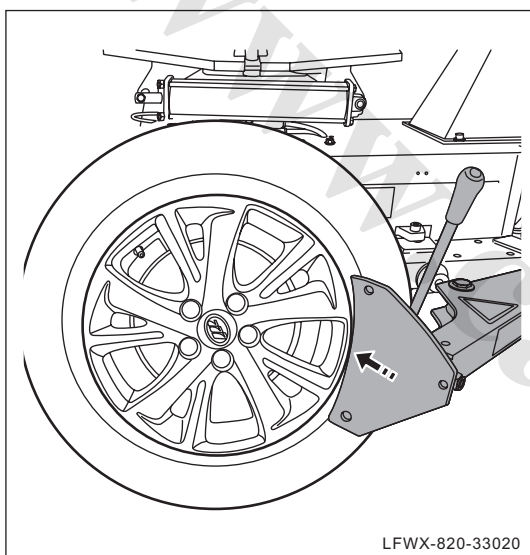
- (a) Check the pressure of replaced tyre. If the pressure doesn't meet requirement, adjust it.

## 4. Removal of tyre

- (a) Remove wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



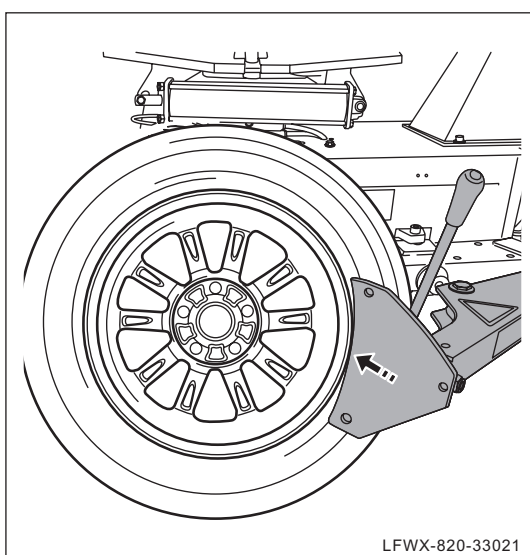
- (b) Rotate and take out valve cap.
- (c) Use a bleeding tool to rotate and take out the valve core in arrow direction, and exhaust all air.



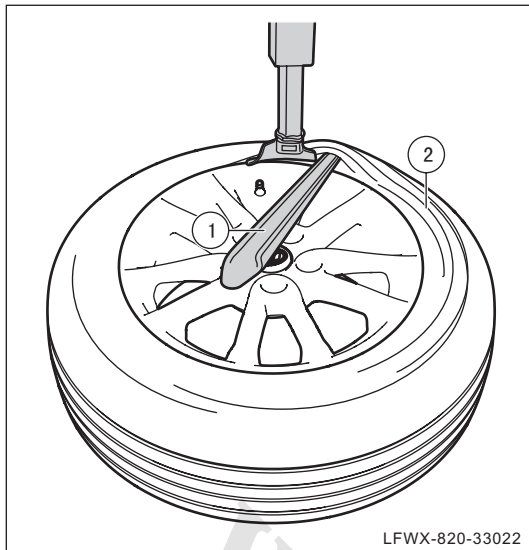
- (d) Use a tyre changer to pry the tyre out of aluminum ring slot in arrow direction.

△ HINT:

- When using a side press, don't touch the aluminum ring to avoid damage of aluminum.
- When using a side press, don't touch the tyre valve, to avoid damage of tyre pressure sensor.



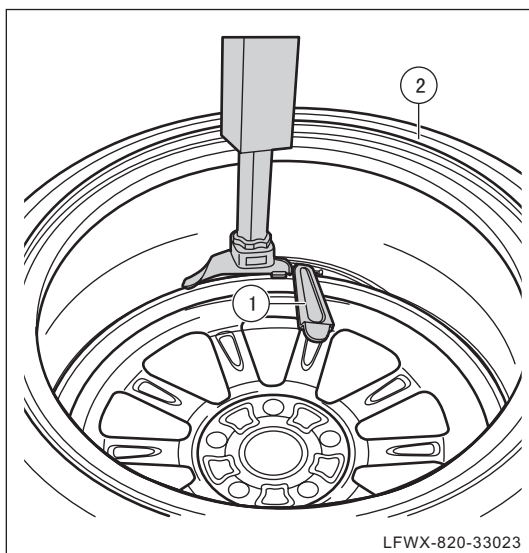
- (e) Use a tyre changer to pry the tyre out of aluminum ring slot in arrow direction.



- (f) Put the tyre onto the tyre changer and adjust it in proper position.
- (g) Use a tyre bar ① to pry tyre ②, press the tyre side against the pressing angle direction to let the tyre bead contact with the finest section of wheel hub, and step the rotating switch.

△ HINT:

- During installation or dismantling of tyre, pay attention to the distance between tip of tyre changer and wheel hub, to avoid the damage of surface of wheel hub.
- When separating tyre, hold the wheel hub firmly. Start the machine after inspection. When rotating, strictly forbid separate tyre with hands.
- When changing tyre, take care not to damage tyre bead to avoid tyre pressure leakage.



- (h) Use a tyre bar ① to pry tyre ②, and step the rotating switch to take out tyre ②.

## 5. Installation of tyre

- (a) Install it in reverse order of dismantling.

△ HINT:

Note: keep the wheel hub clean.

- (b) After tyre is installed, unscrew the valve core to inflate the tyre to 200kPa. Meanwhile hear the sound produced by tyre ring sliding vault dome of wheel hub. Tighten valve core.
- (c) Adjust wheel balance. (See 33 - Wheel and Balance of Wheel and Tyre, Adjustment)
- (d) Install wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

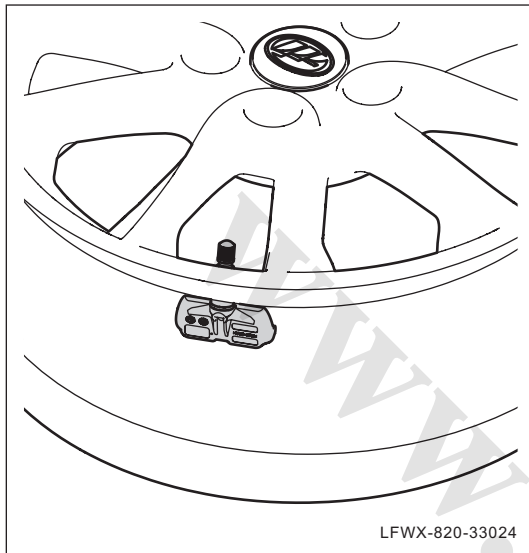
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## Tyre Pressure Monitoring Sensor

### Replacement

#### 1. Remove tyre pressure monitoring sensor

- (a) Remove tyre. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



- (b) Rotate and remove fixing bolt, and remove the valve and tyre pressure monitoring sensor assembly.

#### 2. Install tyre pressure monitoring sensor

- (a) Clean all stains or scraps from the mounting position of tyre pressure monitoring sensor.
- (b) Install valve and tyre pressure monitoring sensor assembly onto the mounting position.
- (c) Install tyre. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

△ HINT:

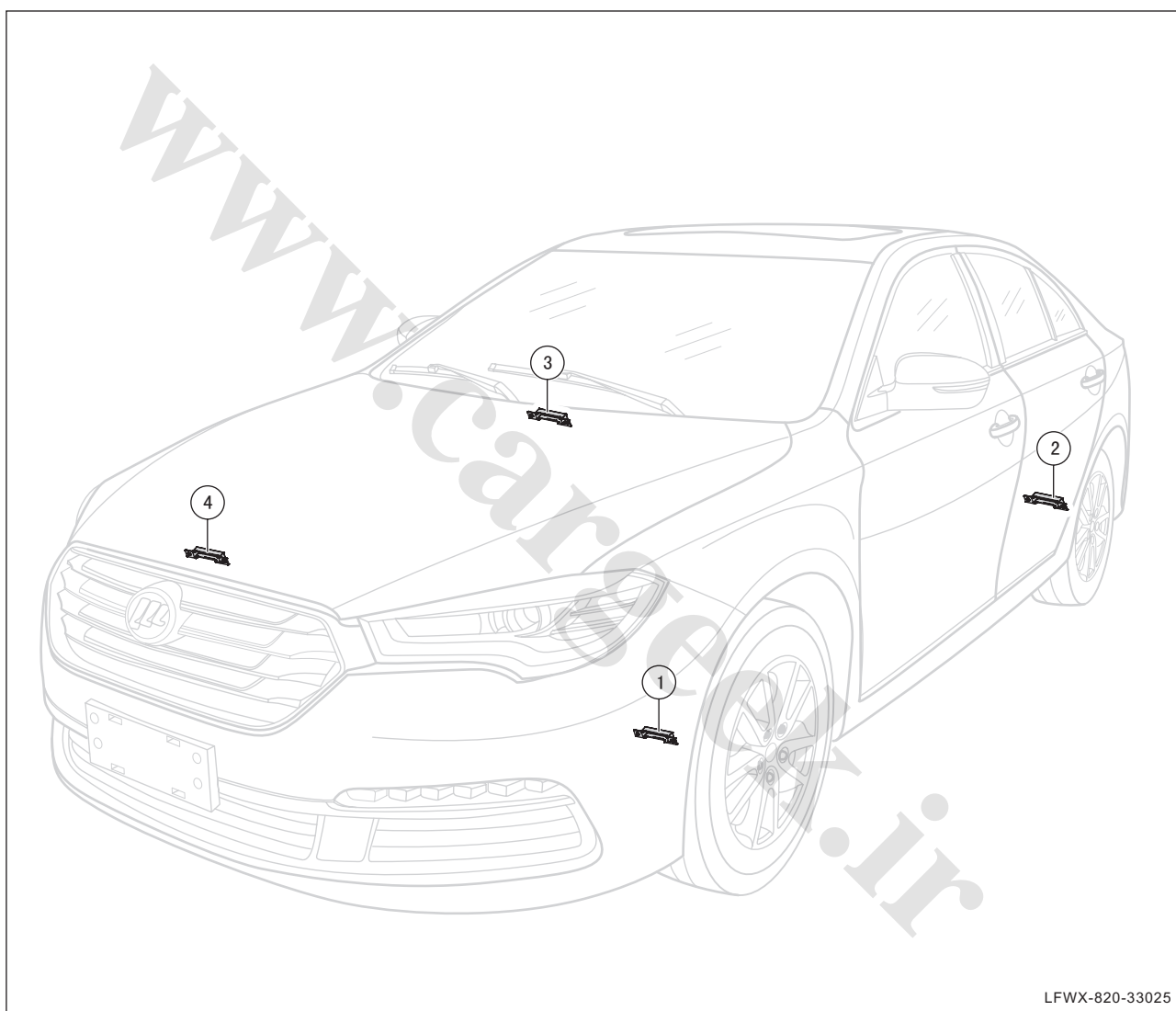
After the tyre pressure sensor is replaced, re-enter identification No.

# Low-frequency Field Antenna for Tyre Pressure Monitoring

## Replacement

△ HINT:

Replacement of various antennas is basically the same. This section will introduce replacement of low frequency field antenna for monitoring of front left tyre pressure as an example.



- ① : low frequency field antenna for monitoring of front left tyre pressure
- ② : Low frequency field antenna for rear left tyre pressure monitoring
- ③ : Low frequency field antenna for rear right tyre pressure monitoring
- ④ : Low frequency field antenna for front right tyre pressure monitoring

## 1. Remove internal low-frequency magnetic field antenna

- (a) Remove front left mudguard and rubber strip. (See 81 - Trim Mudguard and Rubber Strip, Replacement)
- (b) Disconnect the wire harness connector of low frequency field antenna for monitoring of front left tyre pressure.
- (c) Disconnect fixing nut of low frequency field antenna for monitoring of front left tyre pressure, and remove the low frequency field antenna for monitoring of front left tyre pressure.

## 2. Install internal low-frequency magnetic field antenna

- (a) Install low frequency field antenna for monitoring of front left tyre pressure onto mounting position and install and tighten fixing nut.

**Torque: 6N•m - 10N•m**

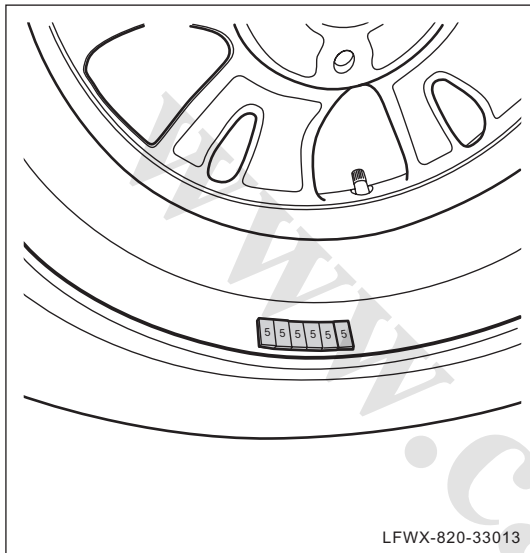
- (b) Connect wire harness connector of low frequency field antenna for monitoring of front left tyre pressure.
- (c) Install front left mudguard and rubber strip. (See 81 - Trim Mudguard and Rubber Strip, Replacement)

## Wheel Balance

### Inspection

△ HINT:

Tire imbalance of vehicle can cause vibration during high speed rotation of wheel, especially front wheel vibration which can cause front wheel swing and affect safety and smoothness during vehicle traveling; meanwhile, it will increase abrasion of tyres. Inspection of dynamic balance of tyre and adjustment are very important.



1. Pre-inspection preparation
  - (a). Clean the inspected wheels and remove dirt and gravel.

ⓘ Note:

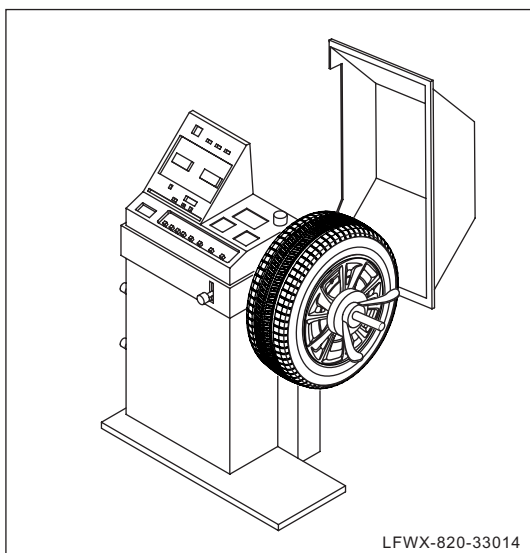
- If impurities in the tyre tread are not removed, they may fly out under action of centrifugal force, easily leading to personal injury.
- Check if tyre tread and sidewall are defective. These defects might impact balance of wheels.

- (b). Remove the old balance blocks.

(c). Inflate the tyres to standard pressure value.

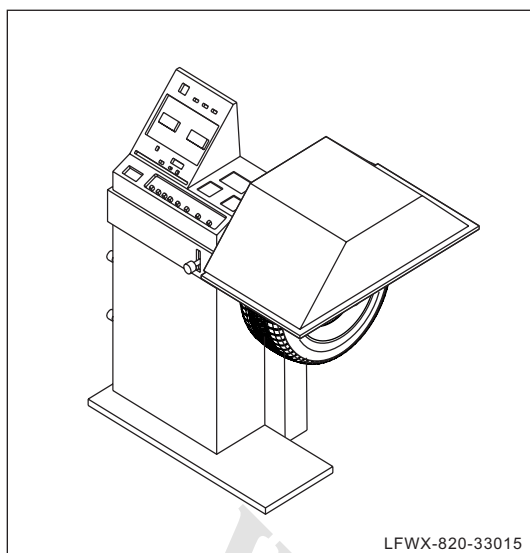
**Front wheel: 200kPa**

**Rear wheel: 200kPa**



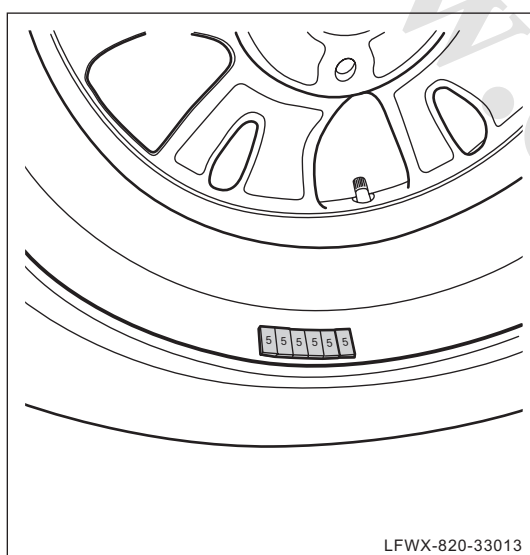
2. Check the wheel balance
  - (a). Mount the wheel correctly on the balancing machine.





- (b). Fix the tyres and enter three parameters - wheel rim width, diameter and distance of wheel rim edge from the balancing machine.
- (c). Lower down protective cover, start balancing machine, and begin to check.
- (d). Stop rotating tyres, and then open the protective cover; rotate the tyres by hands and read unbalance amount by the display screen in the left or right side; confirm the unbalance position.

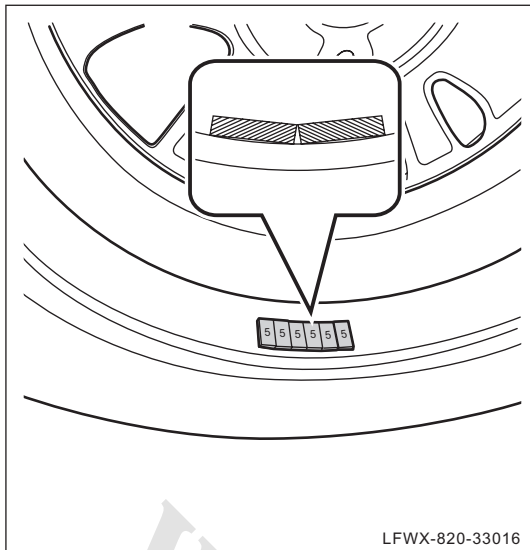
## Adjustment



1. Adjust wheel balance
  - (a). According to imbalance amount displayed in the balancing machine, add corresponding balance block on the imbalance position.

**Note:**

Before installing balance block, clean the mating surface of wheels.



- (b). When mounting balance blocks onto the wheels, align the balance block center with position (or angle) specified by the wheel balancing machine.
- (c). If balance weight calculated exceeds 50g, mount 2 balance blocks on a straight line.

**Note:**

- Balance weight can not be reused; always use a new one in each time of replacement.
  - Do not mount more than 3 balance blocks.
  - Always use original balance block.
  - Do not place one balance block onto another one.
- (d). Start again the wheel balancing machine to confirm that remaining imbalance value is below 10g; if remaining imbalance value in one side is above 10g, repeat installation steps of balance weight.

**Requirements for wheel dynamic balance:**

**Steel wheel (counterweight at single side  $\leq 35g$ , total counterweight  $\leq 75g$ )**

**Aluminum wheel (single side  $\leq 75g$ , left and right unbalance  $\leq 10g$ )**

# Four-wheel Alignment

## Inspection

### △ HINT:

- Four-wheel alignment is very important for maintaining the drive safety, steering stability and normal tyre wear. Incorrect alignment angle may cause off tracking or side sliding in emergency brake, resulting in serious accident. In normal running, it may shorten the tyre lifespan and misalignment or failure of the steering tyre rod usually lead to steering out of control which may beyond expectation. Therefore, four-wheel alignment is very important to vehicle.
- Carry out the vehicle measurement until the vehicle mileage reaches 1000km~2000km, so the settlement process of coil spring can be stopped after that.
- Four-wheel alignment includes front wheel alignment and rear wheel alignment. Front wheel alignment includes front wheel camber, kingpin caster, kingpin inclination angle and front wheel toe-in; rear wheel alignment includes rear wheel camber and rear wheel toe-in.

### 1. Pre-alignment inspection

- (a) Check that each axle uses the tyres with the same structure and tread type and the treadwear amount and general diameter should be the same. Check that the wheel radial and axial run-out do not exceed the tolerance. The tyre pressure should within the specified pressure range.
- (b) Check that the steering linkage and suspension do not have excessive clearance, steering tie rod end head and ball hinge for wear, spring is not loose and the swing arm and front pillar do not have excessive clearance.
- (c) Keep the car no additional load except for the filled oil and spare tyre.
- (d) Vibrate the front and rear of the vehicle for several times and make sure the vehicle is at the normal driving height.
- (e) Check that the corresponding height position of both sides of the vehicle is consistent.
- (f) When the wheel is at the straight forward direction, the steering wheel should be at the center. Remove the steering wheel for adjustment if necessary.
- (g) Hub bearing has proper pre-tensioning force, and make fixing nut reach the specified tightening torque.
- (h) Carry out the wheel dynamic balance test and re-install the wheel onto the vehicle after the test.

### 📌 Note:

**Please don't use straightening tool to align tyre, and the damaged parts must be replaced.**

## 2. Preparation before the alignment measurement

- (a) Carry out the rim offset compensation.
- (b) Return the steering wheel and fix the steering wheel with its fixing tool. Press down the brake pedal with brake pedal loading device at the same time.

## 3. Wheel alignment parameter

Wheel alignment (Curb status)	Front wheel	Toe-in of front wheel	$0^{\circ} \pm 30'$
		Front wheel camber	$-0^{\circ} 30' \pm 30'$
		Kingpin caster	$2^{\circ} 45' \pm 30'$
	Kingpin inclination	$11^{\circ} 54' \pm 30'$	
	Rear wheel	Toe-in of rear wheel	$0^{\circ} 21' \pm 30'$
		Rear wheel camber	$-1^{\circ} 24' \pm 30'$

## 4. Inspection

△ HINT:

- Check the wheel alignment according to the operation instruction of four-wheel alignment indicator.
- It is necessary to follow the following operation steps.
  - (a) Inspect the front wheel camber.
    - Be aware that the camber cannot be adjusted. (See 33 - Wheels and tyres, Four Wheel Alignment, Adjustment)
  - (b) Check the front wheel toe-in and carry out adjustment if necessary.
    - Adjust toe-in of front wheel (See 33 - Wheels and tyres, Four Wheel Alignment, Adjustment)

## Adjustment

### 1. Adjustment sequence

- (a) For four-wheel alignment, adjust the rear wheel first and then the front wheel.
- (b) For the rear wheels, adjust the camber first and then the toe-in.
- (c) Sequence for front wheel adjustment is: kingpin camber, kingpin inclination angle, front wheel camber and front wheel toe-in.

### ⓘ Note:

**Kingpin caster and inclination angle are designed to ensure the structure and doesn't require adjusting during use. If the parameter exceeds specified scope, replace the steering knuckle directly.**

## 2. Adjustment of wheel camber

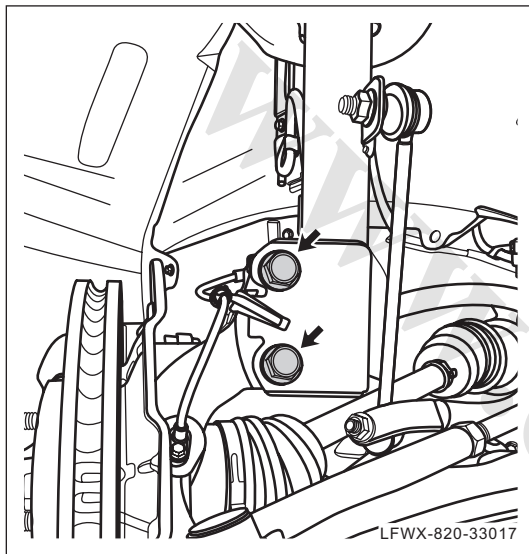
△ HINT:

The adjustment of cambers of front and rear wheel is basically the same. See 33- Wheel, Tyre and Four-wheel Alignment, Adjustment (Adjustment of Camber of Front Wheel).

## 3. Adjustment of toe-in of rear wheel

△ HINT:

The adjustment of cambers of front and rear wheel is basically the same. See 33- Wheel, Tyre and Four-wheel Alignment, Adjustment (Adjustment of Toe-in of Front Wheel).

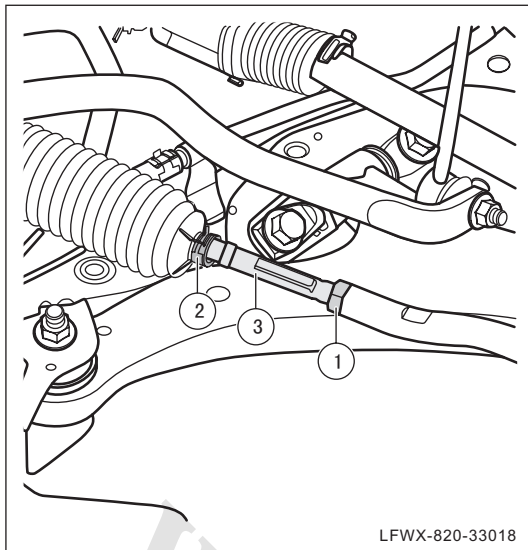


## 4. Adjustment of front wheel camber

△ HINT:

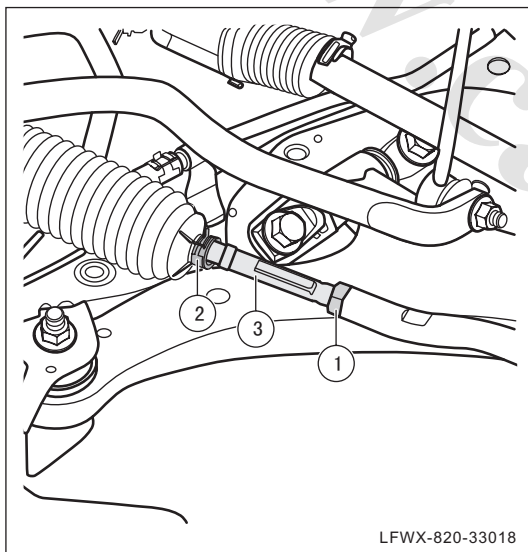
In normal condition, it's not necessary to adjust the camber after independent suspension and wheel steering knuckle assembly. If the camber defects over the tolerance due to other reasons, rectify it with independent suspension and the steering knuckle connecting bolt.

- (a) Check (visually) the driving components for damage and replace the damaged components before correction.
- (b) If the front wheel camber exceeds the tolerance, loosen the connecting bolt of the front shock absorber and steering knuckle and move the wheel to correct it.



5. Adjustment of front wheel toe-in
  - (a) Unscrew locknut ① and elastic clip ② of steering tie rod.
  - (b) Adjust the length of the toe-in adjusting rod ③ to specified value if necessary.
  - (c) Tighten the lock nut ①, re-install the elastic snap ring ②, and check the lock nut ① for tightness and the protection sleeve is at correct position.
  - (d) After adjustment of toe-in of front wheel, inspect whether steering wheel is in level condition. If no, unscrew fixing nut of steering wheel, adjust the steering wheel to level position, and tighten fixing nut of steering wheel to the specified torque.

Torque: 40N•m-50N•m



6. Adjustment of maximum front wheel steering angle
  - (a) Unscrew locknut ① and elastic clip ② of steering tie rod.
  - (b) Adjust the length of the adjusting rod ③ of steering angle at both sides to specified value if necessary.  
 Outer wheel: 36° 54' ~40° 54'  
 Inner wheel: 31° 54' ~35° 54'
  - (c) Tighten the lock nut ①, re-install the elastic snap ring ②, and check the lock nut ① for tightness and the protection sleeve is at correct position.
  - (d) Re-check the maximum steering angle and continue the adjustment in case of not conforming to the standard.
  - (e) Re-adjust the steering wheel to the horizontal position after adjustment.

## Spare Tyre

### Use

**ⓘ Note:**

Spare tyre only can be used in emergency condition. After spare tyre is installed, the maximum speed should not exceed 90km/h and travel distance should not exceed 50km. Avoid using emergency acceleration and brake.

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## 41 - Drive Shaft

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## Drive Shaft

### System description

△ HINT:

Lifan 820 series models include LF7186, LF7240, LF7240B with two types of engine (LF-B479Q and LF489Q) and 5MT manual transmission or 6AT automatic transmission. Drive shaft varies with the difference of engine and transmission installed, but the overhauling methods are basically the same. This section will mainly introduce LF7186 car equipped with LFB479Q engine and 5MT manual transmission.

#### 1. Function

Drive shaft transmits the power from transmission to wheels. Rzeppa universal joint in the drive shaft can ensure the direction variability and continuity of power transmission.

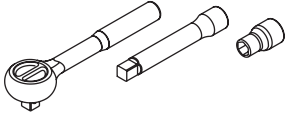
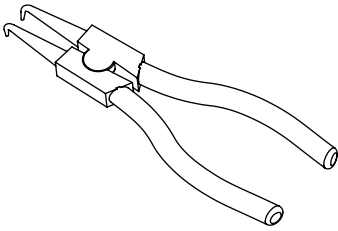
#### 2. Components

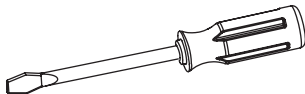
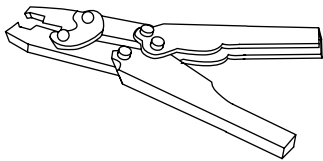
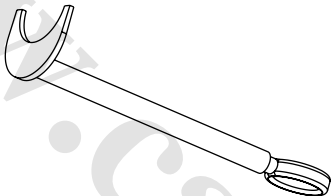
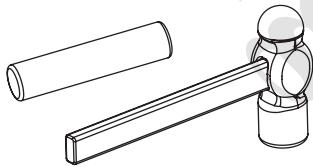
Drive shaft mainly consists of left and right mandrel, rzeppa universal joint and dust cover, etc.

#### 3. Principle

Transmission transmits the power from engine to drive shaft. Rzeppa universal joint on each side of drive shaft can ensure the stability of transmission under the condition that wheels change position constantly.

### Preparation

S/N	Tools	Outline diagram	Description
1	Quick wrench		Remove bolt and nut
2	Snap ring pliers		Remove spring collar

S/N	Tools	Outline diagram	Description
3	Screwdriver		Remove clip
4	Clamp tightening tool		Tighten clip
5	Drive shaft remover		Remove the drive shaft assembly
6	Copper bar and hammer		—

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolt and nut of ball pin of swing arm	90~100(bolt); 90~100(nut)
Drive shaft slotted nut	260

## Precautions

### 1. Precautions for maintenance

- (a) Do not have shield of drive shaft rubbed with other components for a long time when the vehicle is running. Avoid impacting with sharp objects when removing the shield, otherwise it will be damaged.
- (b) Don't reuse the non-reusable parts.
- (c) Clean the external surfaces of the components before dismantling or assembling drive shaft.
- (d) Do not contaminate parts in the process of repair and prevent foreign materials from entering.
- (e) Decomposed parts (except for rubber parts) should be cleaned by kerosene and then dried by air, or wiped by paper towel or cloth.

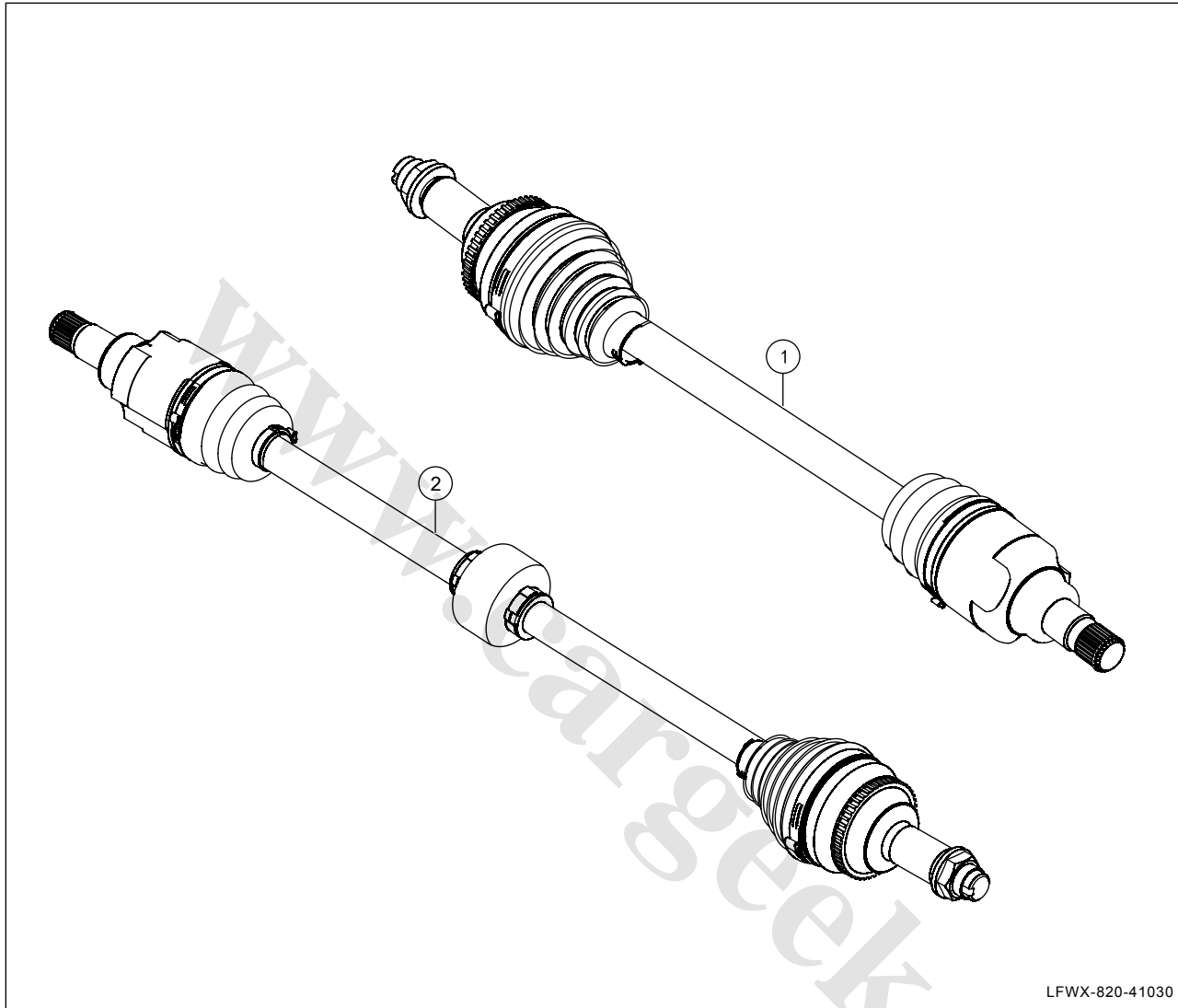
### 2. Other precautions

- (a) Frequently inspect drive shaft during daily inspection, observe whether it has cracks and clash with other parts.

## Component (I)

△ HINT:

Vehicle with engine of LFB479Q



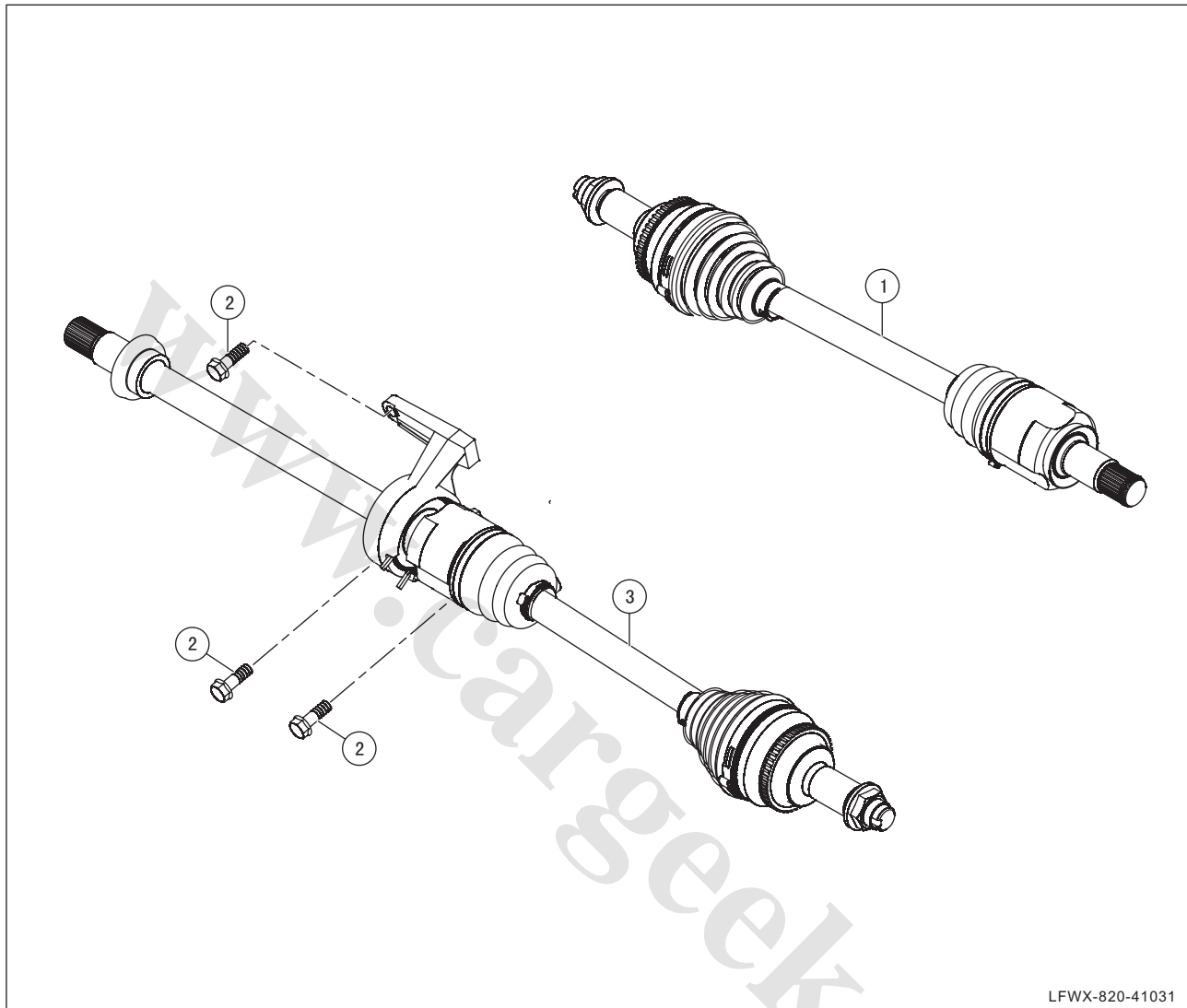
1	Left drive shaft assembly
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2	Right drive shaft assembly
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## Component (II)

△ HINT:

Vehicle with engine of LF489Q



1	Left drive shaft
2	Bolt

3	Right drive shaft
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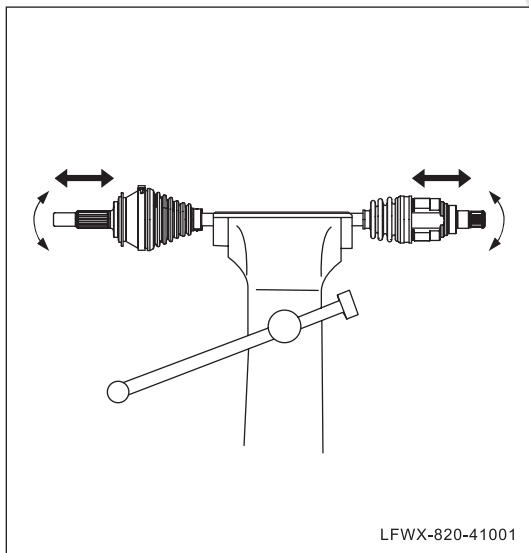
## General Check

### Check the system

#### 1. Check the working condition of system

- (a) Start parking brake and start the engine, step the accelerator pedal, and inspect whether the drive shaft shakes or vibrates during acceleration. If yes, overhaul it according to the following diagnosis steps.
- (b) Make a road test for the car, and inspect whether there is "clip" sound when drive shaft is working. If yes, overhaul it according to the following diagnosis steps.
- (c) Make a road test for the car, and inspect whether the drive shaft produces muffle sound when the car is sliding and accelerating. If yes, overhaul it according to the following diagnosis steps.
- (d) Check whether drive shaft is broken or falling off. If yes, overhaul it according to the following diagnosis steps.
- (e) Make a road test for the car, and inspect whether car has low speed swinging and vibrating condition. If yes, overhaul according to the following diagnosis steps.

### Inspection of drive shaft



#### 1. Check the working condition of drive shaft

##### △ HINT:

If any of abnormalities below is detected, always decompose the drive shaft and then repair or replace damaged parts. (See 41 - Drive Shaft Assembly, Overhaul)

- (a) Dustproof cover of drive shaft has cracks or other damage.
- (b) The clip of dustproof cover of drive shaft is loose.
- (c) Rzeppa universal joint is loose obviously.
- (d) Tripod universal joint is sticking in axial sliding movement.
- (e) Tripod universal joint is loose obviously.

##### 📌 Note:

Keep the drive shaft assembly in level in the process of inspection.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Shaking or vibration during acceleration	1. Suspension system (fault)	See 41 - Drive Shaft, Diagnosis, Fault Diagnosis (1. Shaking or vibration during acceleration)
	2. Drive shaft (fault)	
There is "click" when rotating	1. Drive shaft (fault)	See 41 - Drive Shaft, Diagnosis, Fault Diagnosis (2. There is "click" when rotating)
There is clunk during sliding acceleration	1. Drive shaft (fault)	See 41 - Drive Shaft, Diagnosis, Fault Diagnosis (3. There is clunk during sliding acceleration)
Drive shaft falls off	1. Suspension system (fault)	See 41 - Drive Shaft, Diagnosis, Fault Diagnosis (4. Drive shaft falls off)
Car is swinging or vibrating at low speed.	1. Wheel (fault)	See 41 - Drive Shaft, Diagnosis, Fault Diagnosis (5. Car is swinging or vibrating at low speed.)
	2. Wheel hub bearing (worn)	
	3. Suspension system (fault)	
	4. Drive shaft (fault)	

### Fault diagnosis

#### 1. Shaking or vibration during acceleration

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	When car is accelerating, inspect the working condition of drive shaft (See 41 - General Check of Drive Shaft, Check of System)	Diagnosis end.	1. Drive shaft is shaking or vibrating when accelerating speed.	Go to Step 1
1	Check installation condition of front suspension system	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check fastening condition of parts of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 2	Fixing bolt of system parts is loose.	Re-tighten it.
2	Check front absorber	Normal	Faulty	Instruction
	Check the working condition of front absorber (See 31 - General Check of Front Suspension, Check of Front Absorber)	Go to Step 3	Front absorber is ineffective.	Replace front absorber (See 31 - Front Absorber of Front Suspension, Overhaul)
3	Inspection of drive shaft	Normal	Faulty	Instruction
	Check whether the dustproof cover of drive shaft is damaged (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 4	Dustproof cover of drive shaft is damaged.	Replace dustproof cover of drive shaft (See 41 - Drive Shaft Assembly, Overhaul)
4	Inspection of drive shaft	Normal	Faulty	Instruction
	Check abrasion condition of rzeppa universal joint (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 5	Rzeppa universal joint has serious abrasion.	Replace rzeppa universal joint (See 41 - Drive Shaft Assembly, Overhaul)
5	Inspection of drive shaft	Normal	Faulty	Instruction
	Check the abrasion condition of tripod universal joint (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 6	Tripod universal joint has serious abrasion.	Replace tripod joint universal joint (See 41 - Drive Shaft Assembly, Overhaul)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. There is "click" when rotating.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Make a road test to inspect the working condition of drive shaft (See 41 - General Check of Drive Shaft, Check of System)	Diagnosis end.	"Clip" sound is produced when drive shaft is rotating.	Go to Step 1
1	Inspection of drive shaft	Normal	Faulty	Instruction
	Check whether the dustproof cover of drive shaft is damaged (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 2	Dustproof cover of drive shaft is damaged.	Replace dustproof cover of drive shaft (See 41 - Drive Shaft Assembly, Overhaul)
2	Inspection of drive shaft	Normal	Faulty	Instruction
	Check the working condition of rzeppa universal joint (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 3	Rzeppa universal joint has bad sliding function, sticking or obstacle in movement.	Replace rzeppa universal joint (See 41 - Drive Shaft Assembly, Overhaul)
3	Inspection of drive shaft	Normal	Faulty	Instruction
	Check the working condition of tripod universal joint (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 4	Tripod universal joint has bad sliding function, sticking or obstacle in movement.	Replace tripod joint universal joint (See 41 - Drive Shaft Assembly, Overhaul)
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. There is clunk during sliding acceleration

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Make a road test to inspect the working condition of drive shaft (See 41 - General Check of Drive Shaft, Check of System)	Diagnosis end.	There is clunk in the drive shaft	Go to Step 1
1	Inspection of drive shaft	Normal	Faulty	Instruction
	Check whether dustproof cover of drive shaft is damaged.	Go to Step 2	Dustproof cover of drive shaft is damaged.	Replace dustproof cover of drive shaft (See 41 - Drive Shaft Assembly, Overhaul)
2	Inspection of drive shaft	Normal	Faulty	Instruction
	Check the working condition of rzeppa universal joint (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 3	Rzeppa universal joint has bad sliding function, sticking or obstacle in movement.	Replace rzeppa universal joint (See 41 - Drive Shaft Assembly, Overhaul)
3	Inspection of drive shaft	Normal	Faulty	Instruction
	Check the working condition of tripod universal joint (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 4	Tripod universal joint has bad sliding function, sticking or obstacle in movement.	Replace tripod joint universal joint (See 41 - Drive Shaft Assembly, Overhaul)
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 4. Drive shaft falls off

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether drive shaft is broken or loose (See 41 - General Check of Drive Shaft, Check of System)	Diagnosis end.	Drive shaft is broken or loose.	Go to Step 1
1	Check installation condition of front suspension system	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check fastening condition of parts of front suspension system (See 31 - General Check of Front Suspension, Check of System)	Go to Step 2	Fixing bolt of system parts is loose.	Re-tighten it.
2	Check front absorber	Normal	Faulty	Instruction
	Check the working condition of front absorber (See 31 - General Check of Front Suspension, Check of Front Absorber)	Go to Step 3	Front absorber is ineffective.	Replace front absorber (See 31 - Front Absorber of Front Suspension, Overhaul)
3	Verification and check	Normal	Faulty	Instruction
	After replacing drive shaft, inspect the working condition of system.	Diagnosis end.	There are other faults.	Find root cause for fault.

### 5. Car is shaking or vibrating at low speed

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Make a road test to inspect whether car is shaking or vibrating at low speed (See 41 - General Check of Drive Shaft, Check of System)	Diagnosis end.	Car is swinging or vibrating at low speed.	Go to Step 1
1	Check wheel	Normal	Faulty	Instruction
	Check the wheel balance condition (see 33 - Wheels and Tyres, Wheel Balance, Inspection)	Go to Step 2	Imbalanced vehicle wheel	Adjust the wheel alignment (see 33 - Wheels and Tyres, Wheel Alignment, Adjustment)
2	Check wheel	Normal	Faulty	Instruction
	Check the front wheel alignment (see 33 - Wheels and Tyres, Four Wheel Alignment, Inspection)	Go to Step 3	Wheel alignment is of large deviation	Conduct the wheel alignment operation (see 33 - Wheels and Tyres, Four Wheels Alignment, Adjustment)
3	Check the hub bearing	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the abrasion condition of hub bearing (See 31 - General Check of Front Suspension, Check of Hub Bearing)	Go to Step 4	Hub bearing is worn excessively	Replace the hub bearing (see 31 - Front Suspension, Replacement)
4	Check the suspension	Normal	Faulty	Instruction
	Check the working condition of parts of front/ rear suspension system.	Go to Step 5	<ul style="list-style-type: none"> <li>Parts of front suspension system are deformed, loose or worn.</li> <li>Parts of rear suspension system are deformed, loose or worn.</li> </ul>	Replace damaged parts.
5	Inspection of drive shaft	Normal	Faulty	Instruction
	Check whether the dustproof cover of drive shaft is damaged (See 41 - General Check of Drive Shaft, Check of Drive Shaft)	Go to Step 6	Dustproof cover of drive shaft is damaged.	Replace dustproof cover of drive shaft (See 41 - Drive Shaft Assembly, Overhaul)
6	Inspection of drive shaft	Normal	Faulty	Instruction
	Check the working condition of drive shaft (See 41 - General Check of Drive Shaft, inspection of drive shaft)	Go to Step 7	Drive shaft has fault	Replace drive shaft assembly (See 41 - Drive Shaft Assembly, Overhaul)
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Drive Shaft Assembly

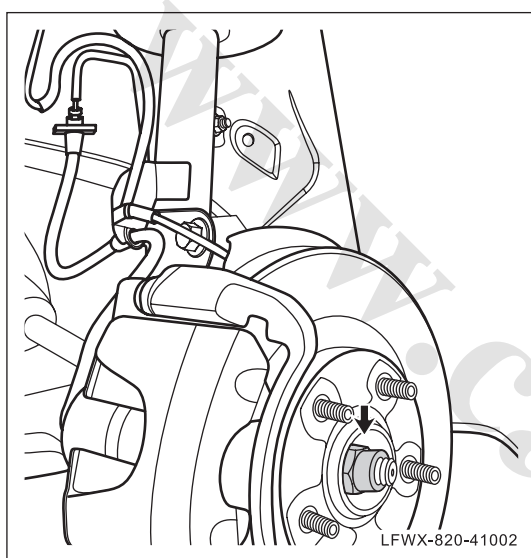
### Replacement

△ HINT:

Replacement and overhauling of left and right drive shafts are basically the same. This section will only introduce replacement and overhauling of left drive as an example.

#### 1. Remove the left drive shaft assembly

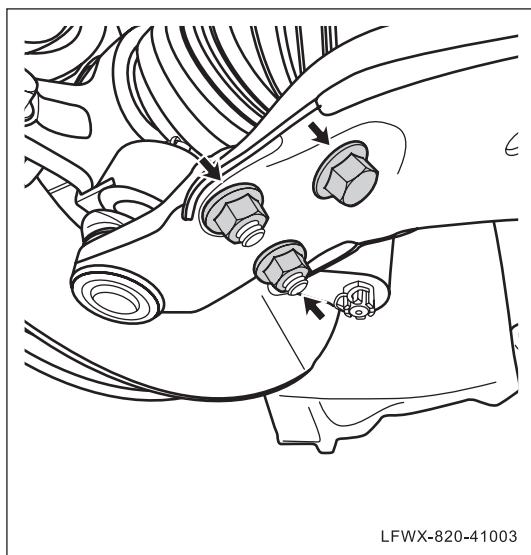
- (a) Lift the vehicle up to remove the front wheels (see 33 - Wheels and tyres, Wheels Assembly, Replacement)



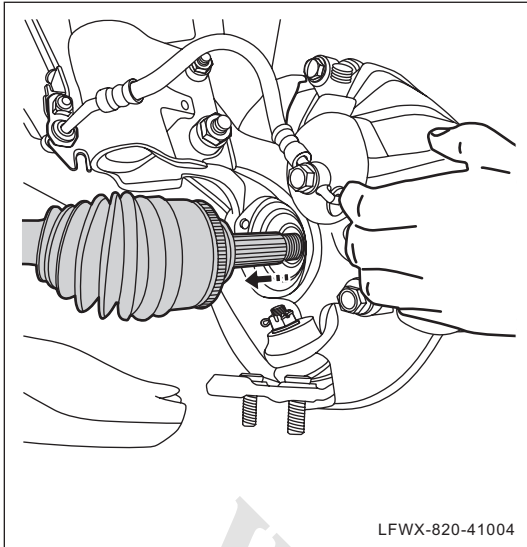
- (b) Remove fixing nut of left drive shaft.

△ HINT:

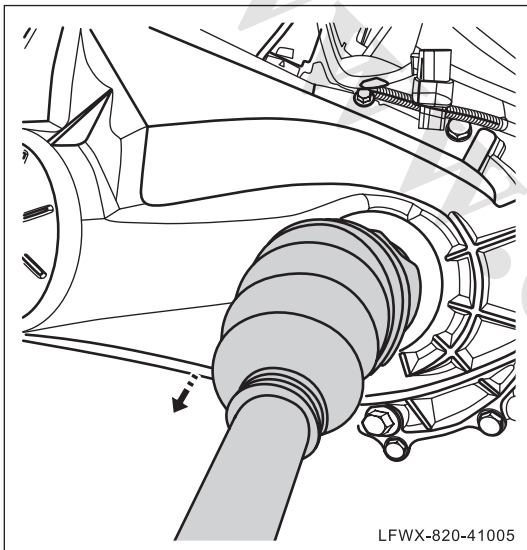
Pry the deal position of nut by using a chisel.



- (c) Remove fixing bolt and nut of ball pin assembly of left swing arm.



- (d) Rotate the front brake with steering knuckle assembly to proper angle, and unplug the drive shaft on wheel side.



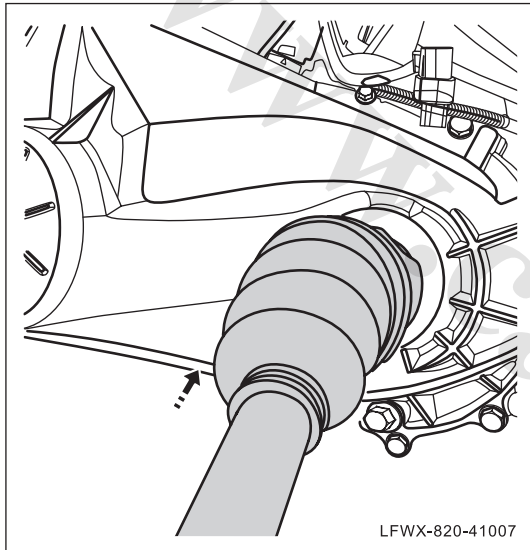
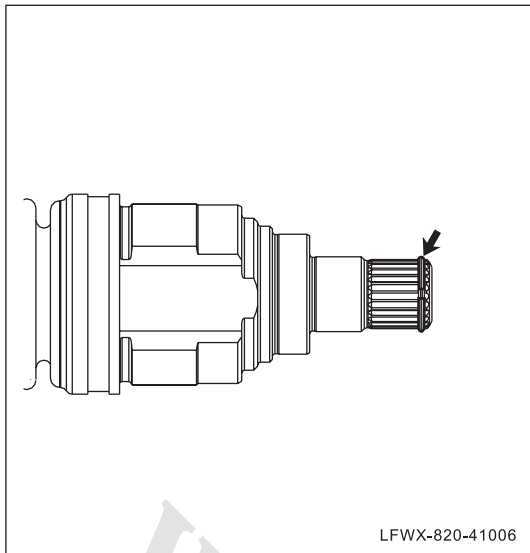
- (e) Pull out the drive shaft assembly from the transmission.

△ HINT:

Drive shaft detacher or equivalent tool must be used to remove the drive shaft assembly; do not use heavy-duty tool to knock directly the drive shaft assembly. Otherwise the drive shaft will be damaged.

ⓘ Note:

- Be careful not to damage dustproof cover and oil seal.
- Be careful not to make the drive shaft assembly falling down.
- Please don't pull the drive shaft assembly directly. Otherwise, it may cause the falling down of left and right tripod universal joint and even cause the damage of dustproof sleeve.



## 2. Install front left drive shaft assembly

- (a) Check if the spring retainer ring in the side of drive shaft assembly transmission is mounted to the correct position.

△ HINT:

Replace snap ring every time when dismantling it.

- (b) Smear gear oil on the universal joint spline shaft in the side of drive shaft and the transmission.

- (c) Align the internal end of drive shaft with the differential center hole; gently rotate the propeller shaft to fit the spline gear and then push it into with strong force; and then mount the universal joint spline shaft in the side of drive shaft and the transmission into the differential.

△ HINT:

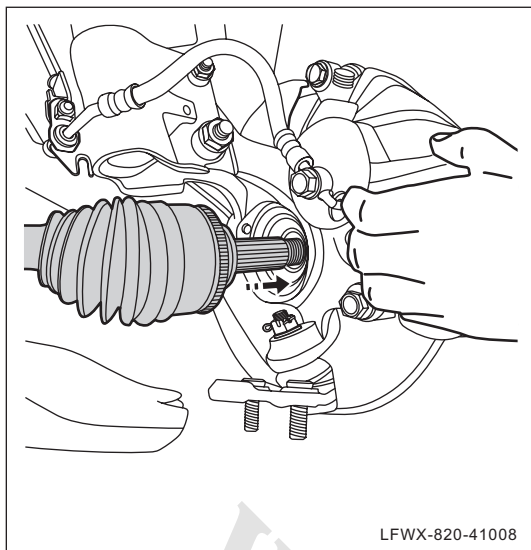
Through rotation of drive shaft, by hearing sound and feeling, you can know whether spine shaft of universal joint on transmission side is installed to proper position.

- You can use a rubber hammer to knock the drive shaft assembly to punch the universal joint spline shaft into the differential.

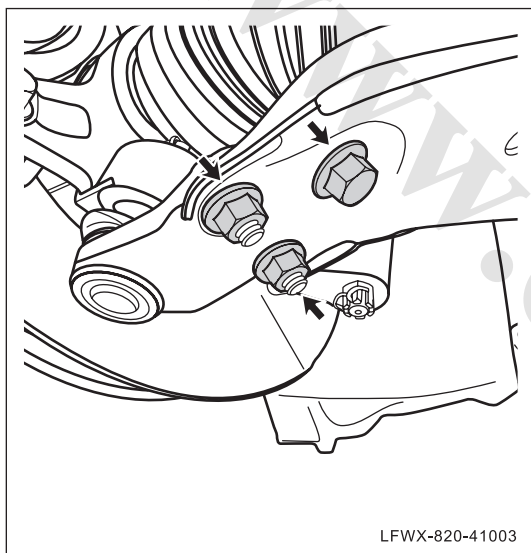
### ⓘ Note:

- While installing, opening of retainer ring of differential spring should be placed downwards.
- Pay attention not to damage dust cover and oil seal.





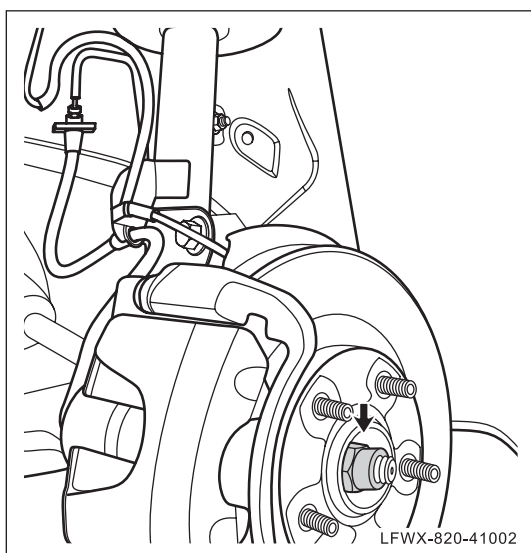
- (d) Rotate front steering knuckle, Install the drive shaft on wheel side into the wheel hub at steering knuckle side.



- (e) Install ball pin assembly of left swing arm onto the mounting position, and install and tighten fixing bolts and nuts.

**Torque: 90N•m - 100N•m(bolt)**

**90N•m - 100N•m(nut)**



- (f) Install and tighten slotted nut of drive shaft.

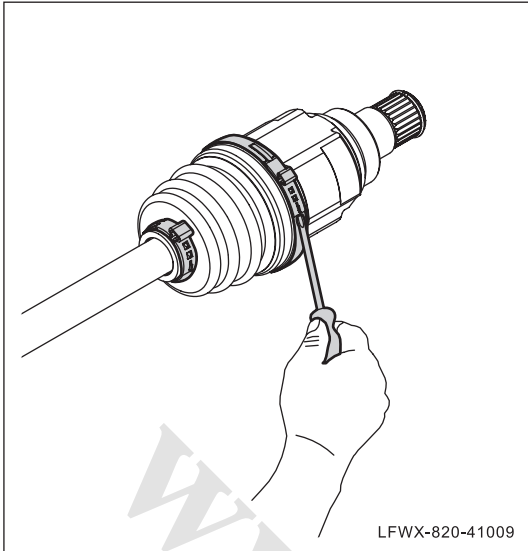
**Torque:260N•m**

△ HINT:

Lock the nut by using a chisel.

- (g) Install the front wheels (see 33 Wheels and tyres, Wheels Assembly, Replacement)

## Decompose and assemble

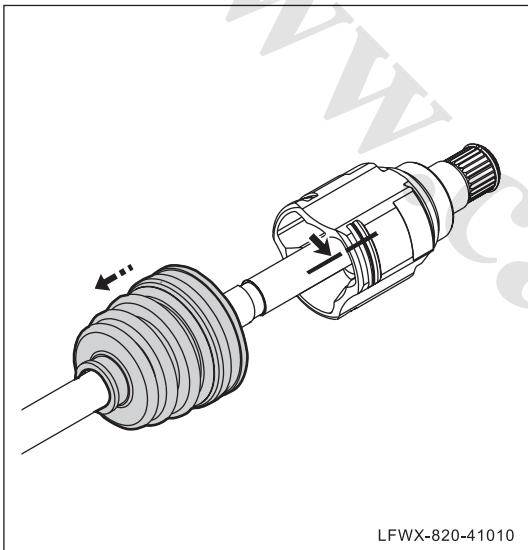


1. **Discompose the tripod universal joint assembly on the side of the transmission.**

- (a) Pry off large and small clamps in both sides of dust cover in the sliding end of the drive shaft by a screwdriver.

**Note:**

**After being dismantled, the clip must be replaced. When dismantling, do damage dust-proof cover.**



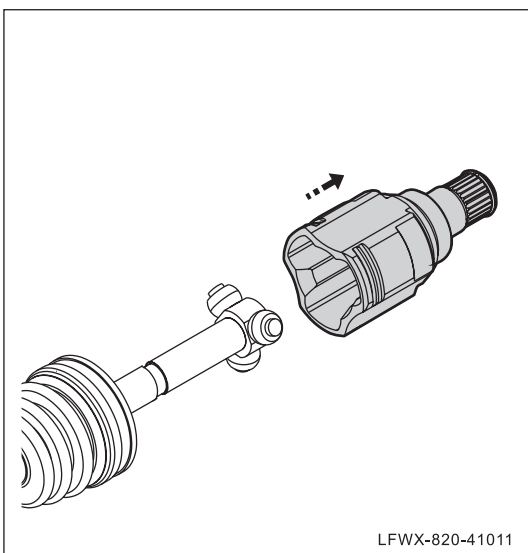
- (b) Pull out the dust cover from the tripod universal joint housing and move it toward the center of the drive shaft.

- (c) Wipe off grease in the tripod universal joint by a rag or paper towel.

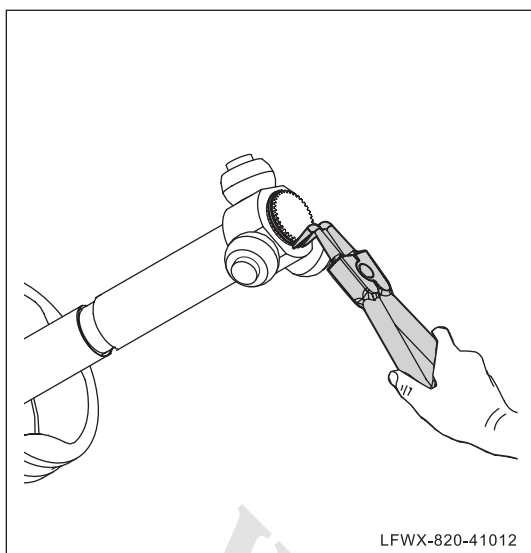
- (d) Draw fitting marks in the tripod universal joint housing and the drive shaft.

**Note:**

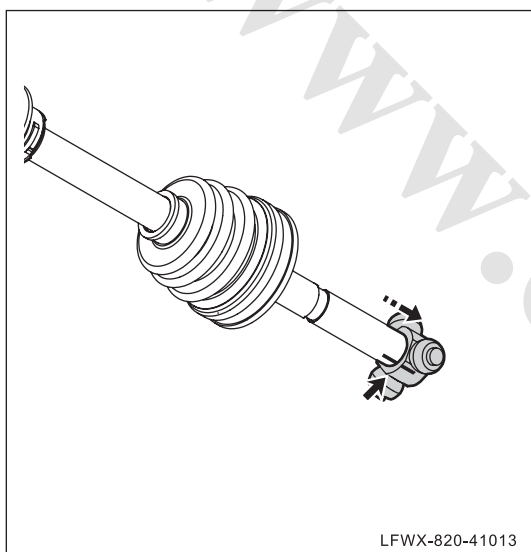
**Don't make mark by using punch or chisel, but make it by a pencil.**



- (e) Remove the tripod universal joint from the drive shaft.



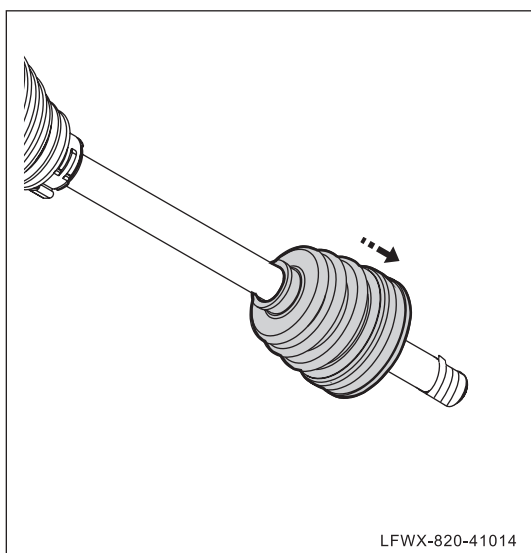
- (f) Remove the C-shaped retainer ring inside the drive shaft by a snap ring pliers.



- (g) Make marks on tripod shaft for subsequent installation.
- (h) Push off the trident shaft from the drive shaft by a copper rod or a rubber hammer.

**Note:**

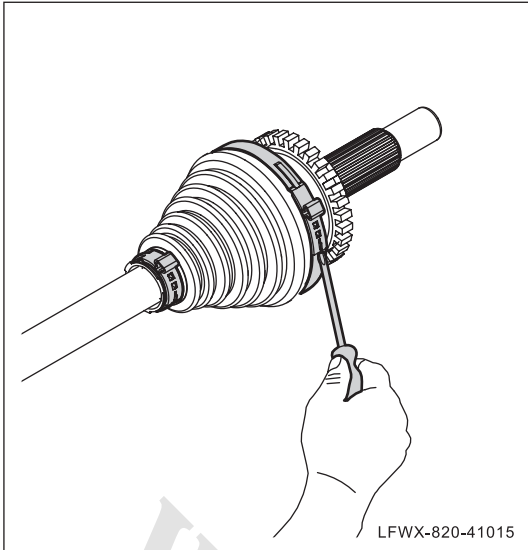
Do not tap the roller in the process of removal.



- (i) Take off the dust cover from the drive shaft.

**Note:**

Wrap the spline by tapes to avoid damage of dust cover.

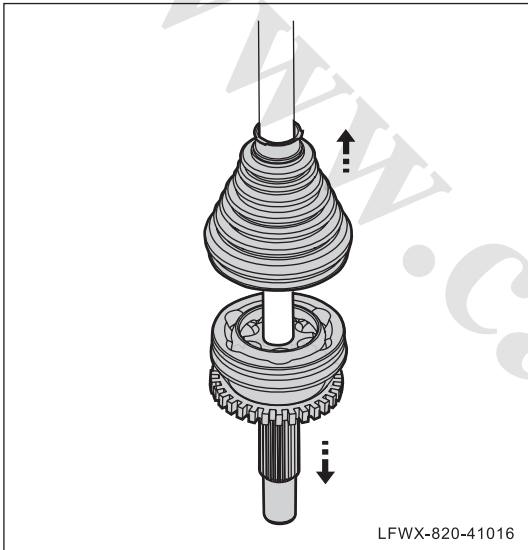


## 2. Decompose the wheel side rzeppa universal joint assembly

- (a) Pry off large and small clamps in both sides of dust cover in the on fixed end of the seal cover by a screwdriver.

### ⓘ Note:

**After being dismantled, the clip must be replaced. When dismantling, do damage dust-proof cover.**

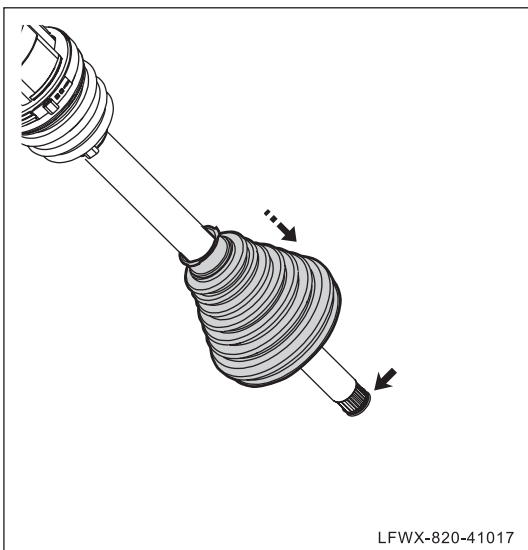


- (b) Pull out the dust cover from the rzeppa universal joint assembly and move it toward the center of the drive shaft.

- (c) Pull out the wheel side rzeppa universal joint assembly from the drive shaft.

### △ HINT:

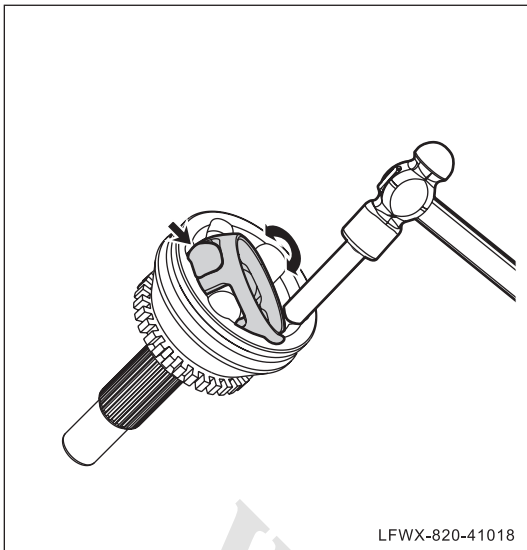
Fix the drive shaft by a vise; and then take out the rzeppa universal joint assembly vertically in axial direction by a rubber hammer or a copper rod.



- (d) Take off the steel wire retainer ring and the seal cover in the fixed end of the drive shaft.

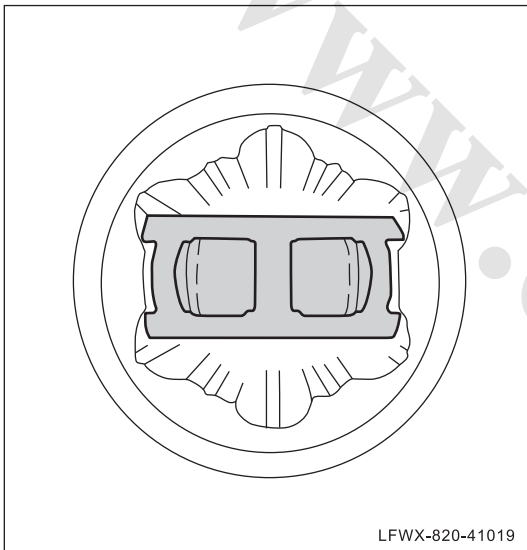
### ⓘ Note:

**Wrap the spline by tapes to avoid damage of dust cover.**

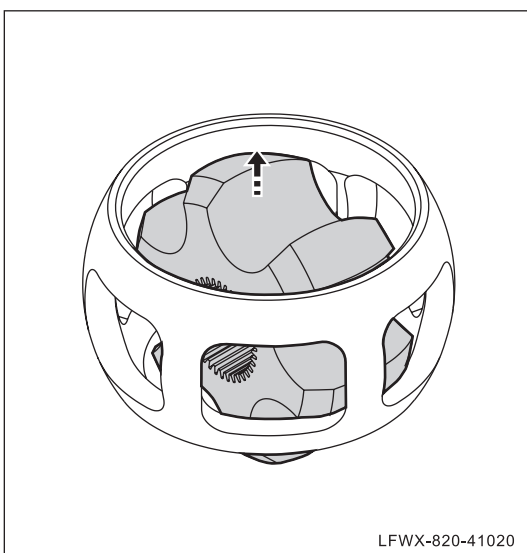


- (e) Knock the rzeppa universal joint rolling bearing retaining bracket by a copper rod or a hammer to tilt it.
- (f) When the rzeppa universal joint rolling bearing keeps tilting, take out the first steel ball.
- (g) Tilt the universal joint rolling bearing retaining bracket along reverse direction and then take out opposite steel balls.

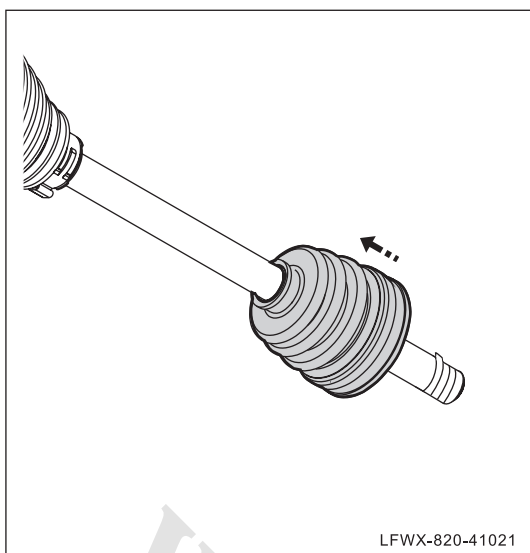
Take each of steel balls one by one through this method.



- (i) Turn the rzeppa universal joint rolling bearing retaining bracket and the inside wheels to a proper angle.



- (j) Take inside wheels from the rzeppa universal joint rolling bearing retaining bracket.
- (k) Clean decomposed parts and clear off grease and contaminants; dry all parts.
- (l) Check if parts of the rzeppa universal joint assembly are normally worn, broken or damaged; replace any part when necessary.

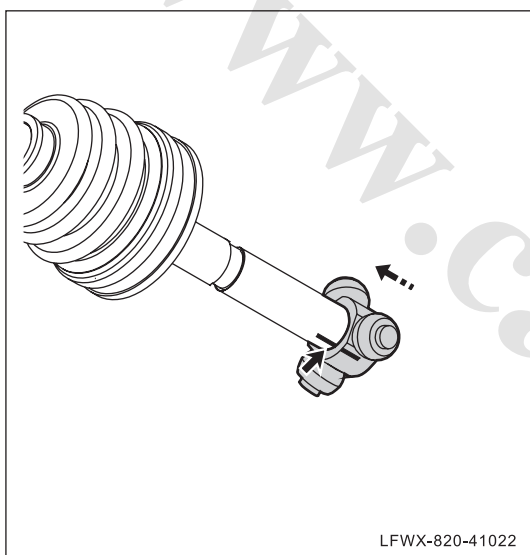


**3. Assemble the tripod universal joint assembly in the side of the transmission.**

- (a) Wrap the spline of drive shaft by tapes with attention to avoid damage of dust cover; mount the dust cover in the sliding end onto the shaft.

**Note:**

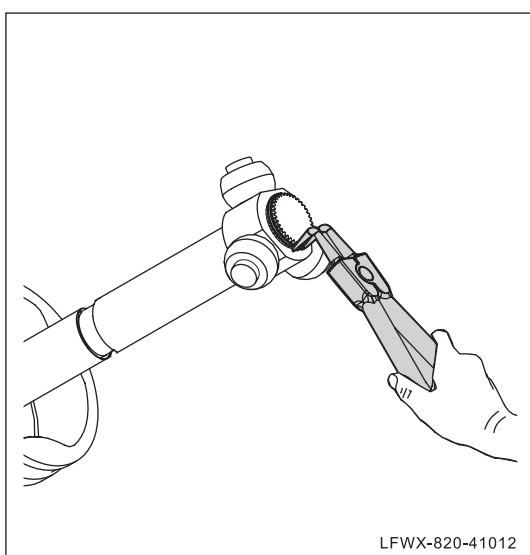
- **Clamp of dust cover can not be re-used.**
- **After installation, remove rubber adhesive around the spline of drive shaft.**



- (b) Install tripod shaft by aligning it with marks.

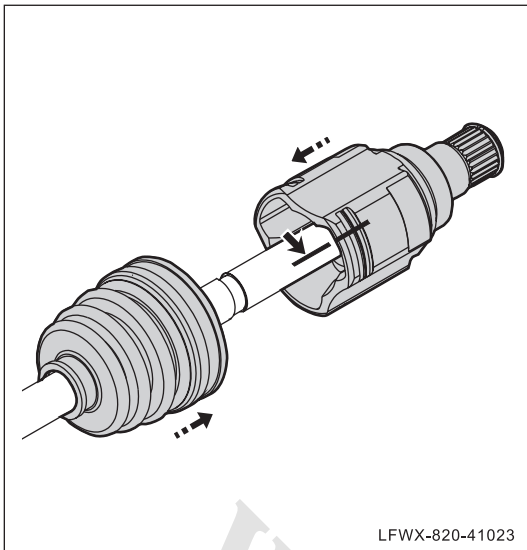
**Note:**

**Mount the trident shaft by a copper rod or a rubber hammer.**



- (c) Mount the C-shaped retainer ring inside the drive shaft.

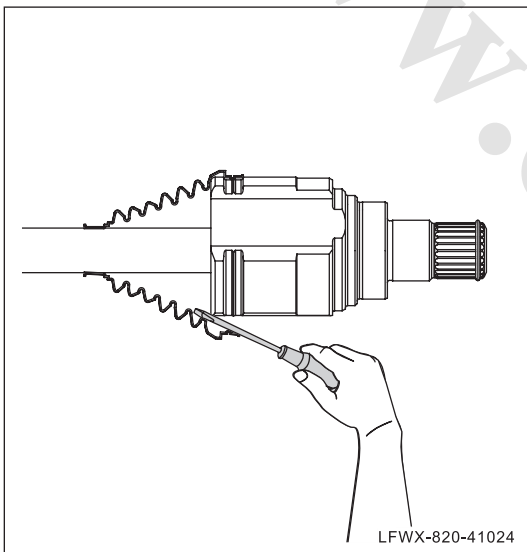
- (d) Smear grease on the trident shaft assembly.



- (e) Align marks and mount the drive shaft tripod universal joint in the side of transmission.
- (f) Add a proper amount of grease.
- (g) Mount the dust cover in the sliding end onto the constant velocity universal joint.

**Note:**

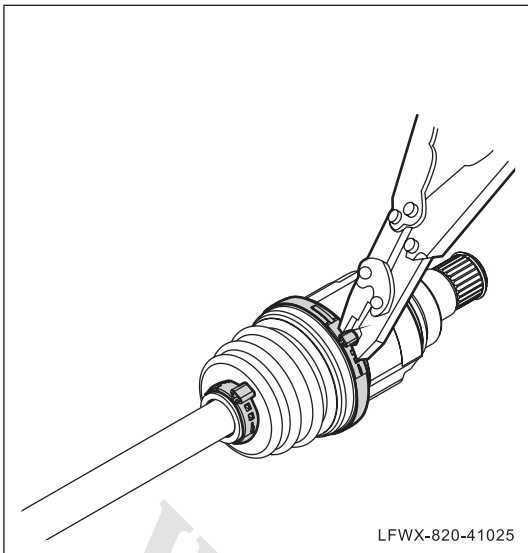
If the lubricating grease is stuck onto the fixing surface of dust cover, the cover maybe falls off. Therefore, have the grease cleaned off on the surface when installing the dust cover.



- (h) Insert the flat end screwdriver from the side with large diameter of the sliding end dust cover and release air inside; adjust mounting length of dust cover and avoid deformation of dust cover.

**Note:**

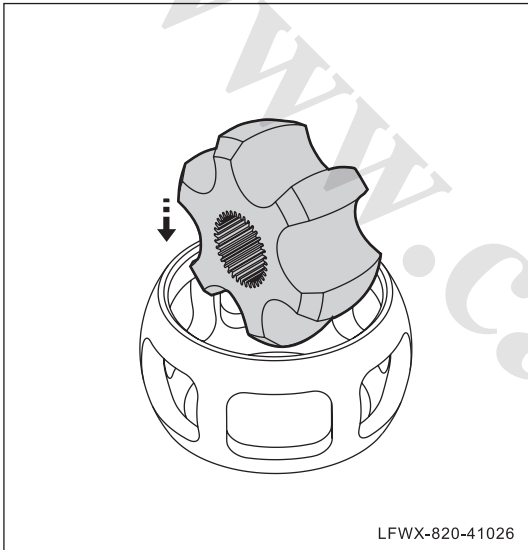
- If the dust cover mounting length is too big, it might cause damage of dust cover.
- Be careful to use a flat end screwdriver to avoid damage of the dust cover.



- (i) Mount the sliding end dust cover clamp.
- (j) Tighten the dust cover clamp by a tool.

**Note:**

The removed dust cover clamp shall be replaced, and the clamp can not be reused.

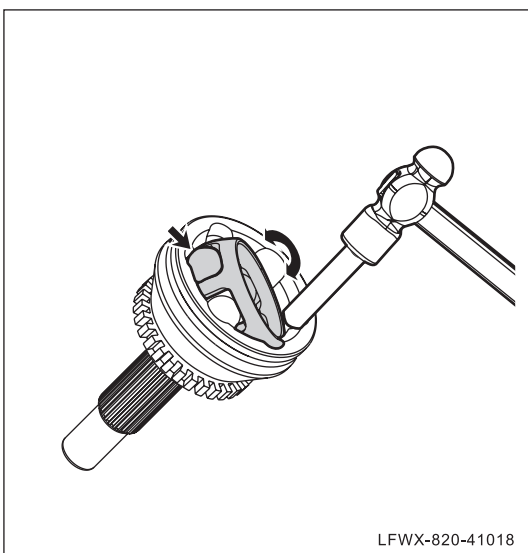


**4. Assemble the wheel side rzeppa universal joint assembly**

- (a) Mount the inside wheel to the rolling bearing retaining bracket.
- (b) Turn the rolling bearing retaining bracket and the inside wheels for a proper angle and mount it into the rzeppa universal joint.

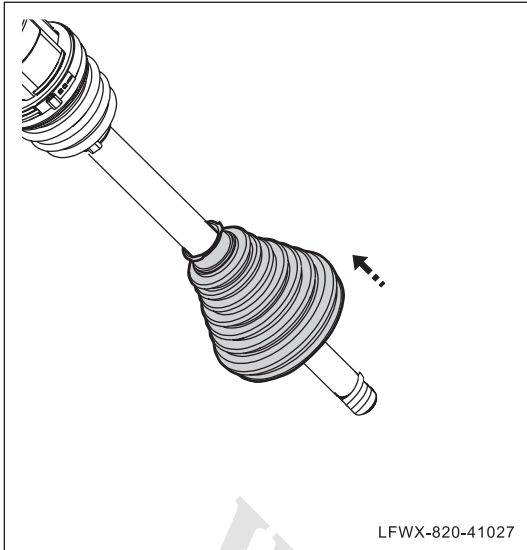
**Note:**

Ensure that the side with the inside wheel fixed ring should face the drive shaft journal.



- (c) Mount the first steel ball; and then tilt the universal joint rolling bearing retaining bracket along reverse direction and then fit opposite steel balls.
- (d) Mount each of steel balls one by one in this method.
- (e) Smear a proper amount of grease on the jagged holes of universal joint subassembly until grease starts flowing out from the circular groove and the jagged holes. After smearing grease, clean off overflowing grease by a cloth.

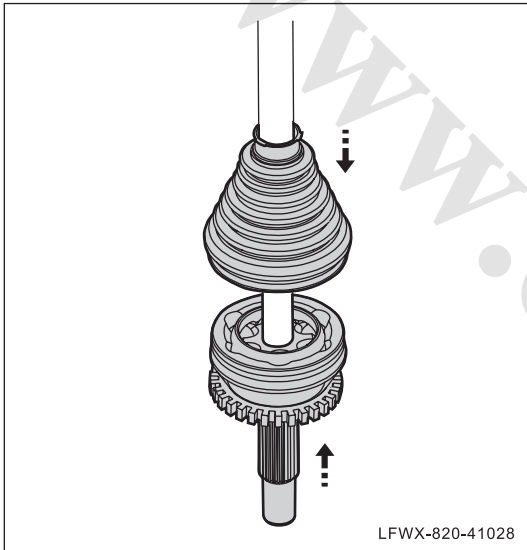




- (f) Use adhesive tape to wind spine on drive shaft, to avoid damage of sealing cover. And install dust cover at fixed end onto the shaft.

**Note:**

- Do not reuse dust cover clamps.
- Take off tapes around the drive shaft spline after mounting.



- (g) Mount the steel wire retainer ring in the fixed end onto the propeller shaft; place the rzeppa universal joint vertically and then mount the drive shaft into the center hole of the rzeppa universal joint until it is mounted to the bottom.

**HINT:**

Confirm that the universal joint subassembly is correctly engaged in rotating the drive shaft.

- (h) Fill the dust cover with a proper amount of grease evenly from the side with large diameter of the fixed end.

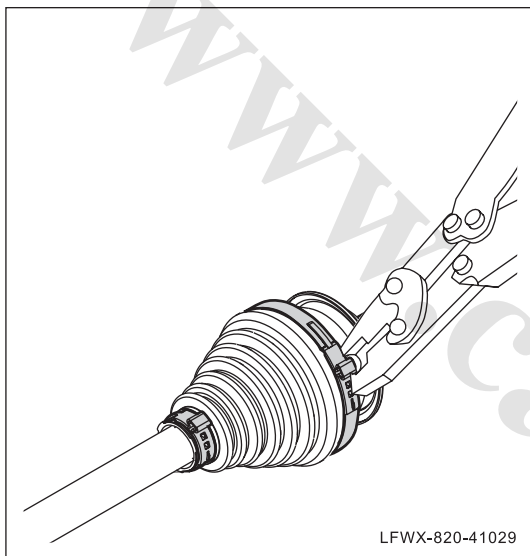
**Note:**

- If the lubricating grease is stucked onto the fixing surface of dust cover, the cover maybe falls off. Therefore, have the grease cleaned off on the surface when installing the dust cover.
- Clean off all the grease on the surface of dust cover.

- (i) Insert the flat end screwdriver from the side with large diameter of the fixed end dust cover and release air inside; adjust mounting length of dust cover and avoid deformation of dust cover.

**Note:**

- If the dust cover mounting length is too big, it might cause damage of dust cover.
- Be careful to use a flat end screwdriver to avoid damage of the dust cover.



- (j) Mount new fixed end dust cover clamp.
- (k) Tighten new dust cover clamp by a tool.

**Note:**

The removed dust cover clamp shall be replaced, and the clamp can not be reused.



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## 51 - Service Brake

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## Service Brake

### System description

#### 1. Function

Service brake system is one of systems necessary for traveling safety. Service brake system can reduce car speed and stop the car; meanwhile reduce car speed when an emergency occurs, so as to ensure the car makes proper reaction to emergency and ensures passenger's safety.

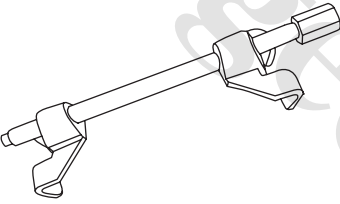
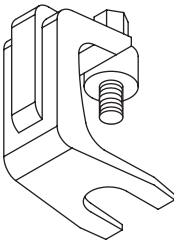

#### 2. Components

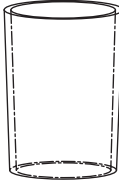
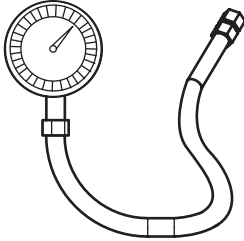
The service brake system mainly consists of brake pedal, vacuum booster mechanism, a brake master cylinder, brake pipeline, ABS, brake caliper, friction plate and brake disk.

#### 3. Working principle

The driver depresses the brake pedal activating the vacuum booster. And the vacuum booster pressurizes the fluid in the master cylinder to make it flow into the ABS control unit, then the fluid flows into the brake calipers of the four wheels after allocated and give force to the friction plate to compress the brake disc, so as to slow down the vehicle.

### Preparation

S/N	Tools	Outline diagram	Description
1	Pipe wrench		Remove the nuts of pipe joints
2	Dial gauge		For measuring the front and rear brake disc
3	Micrometer		For measuring the brake disc thickness

S/N	Tools	Outline diagram	Description
4	Cup		For collecting brake fluid
5	Pressure gauge		Measure the vacuum degree.

## Service data

### 1. Technical specifications table

Brake pedal height		110mm
Free stroke of brake pedal		7mm~15mm
Travel allowance of brake pedal		54mm
Brake Pedal Working Travel		50mm~70mm
Thickness of brake pad	Standard thickness	11mm
	Minimum thickness	2mm
Thickness of front brake disc	Standard thickness	22mm
	Minimum thickness	20mm
Thickness of rear brake disc	Standard thickness	9mm
	Minimum thickness	7mm
Maximum swinging amount of brake disc		0.2mm
Inner bore of wall of brake master cylinder		23.20mm
Outer diameter of piston of brake master cylinder		22.20mm
Piston clearance of brake master cylinder		1.00mm
Specifications and filling amount of brake fluid		DOT4; 0.6L~0.75L

## 2. Table of tightening torque

Item	N•m
Brake pedal fixing bolt	20~26(bolt), 20~26(nut)
Brake master cylinder fixing nut	20~26
Fixing nut of vacuum booster	20~26
Fixing bolt and nut of mounting plate of windshield cover plate	6~8(bolt), 82~89(nut)
Front brake caliper fixing bolt	30~36
Fixing bolt of rear brake caliper	30~36
Fixing bolt of front brake caliper with bracket	80~100
Hollow bolt of front brake hose	35~45
Fixing bolt of rear brake caliper with bracket	80~100
Hollow bolt for rear brake hose	35~45
Fixing bolt of brake hose bracket	20~26
Locknut of switch of brake pedal	20~26

## Precautions

### 1. Precautions for maintenance

- (a) Brake fluid is rather corrosive, so do not allow fluid to spill onto your skin and the vehicle body paint when maintaining the brake system. If contamination occurs by accident, rinse immediately with plenty of clean water.
- (b) Be sure to make the friction disc and the brake disc avoid being contaminated by oil dirt. If contamination occurs, grind it clean with a piece of gauze.
- (c) Do not depress the brake pedal while removing the brake caliper piston to prevent the piston from springing out, and damage the boot.
- (d) In the process of repair, the brake slave cylinder and the brake friction plates must be cleaned completely to minimize damage of particles in air or other substances.
- (e) Clean all parts of the brake slave cylinder by clear brake fluid when repairing the brake slave caliper.
- (f) Do not reuse the exhausted brake fluid and it should be stored in a special sealing container.
- (g) During air exhausting, observe the brake fluid level in brake fluid tank. If the level is lower than "MIN" scale, promptly fill brake fluid.
- (h) After bleeding the brake system and adding brake fluid, check the brake system for leak. In the case of leak, immediately repair it to ensure the driving safety.



## 2. Other precautions

- (a) The performance of the service brake seriously affects driving safety, so be sure to keep the service brake always at its best performing state. Repair it in time if it faults.
- (b) Be sure to maintain the service brake system regularly to eliminate potential safety hazard.
- (c) The brake fluid should not be mixed use with other model of brake fluid.
- (d) Never use other fluid to take place brake fluid to avoid damage of hydraulic system components.

## General Check

### Check the system

#### 1. Check the working condition of system

- (a) Make a road test for the car. Check whether there is noise when braking. If yes, overhaul it according to the following diagnosis steps.
- (b) Make a road test for the car. Check whether the car has brake deflection condition during braking the car. If yes, overhaul it according to the following diagnosis steps.
- (c) Start the engine, step the brake pedal, and inspect whether the brake pedal is hard to step. If yes, overhaul it according to the following diagnosis steps.
- (d) Make a road test for the car. Check whether the brake pedal is soft and brake force is insufficient during braking the car. If yes, overhaul it according to the following diagnosis steps.
- (e) Make a road test for the car. Check whether the brake pedal is dragging during braking the car. If yes, overhaul it according to the following diagnosis steps.

#### 2. Check system components

- (a). Check system for obvious mechanical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 3. Check whether system has oil leakage

- (a) Check whether the system has oil leakage. If yes, overhaul it.

#### 4. Check system pipe

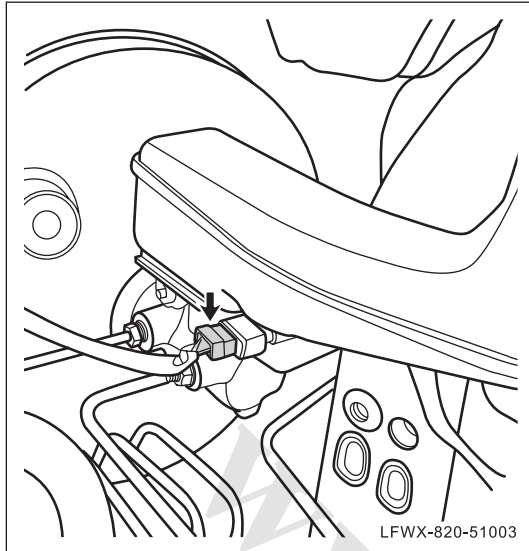
- (a) Check whether system pipe is installed corrected. If no, correctly re-install it.
- (b) Check whether system pipe has cracks or damage. If yes, replace it.

### Check brake fluid (clutch fluid)

△ HINT:

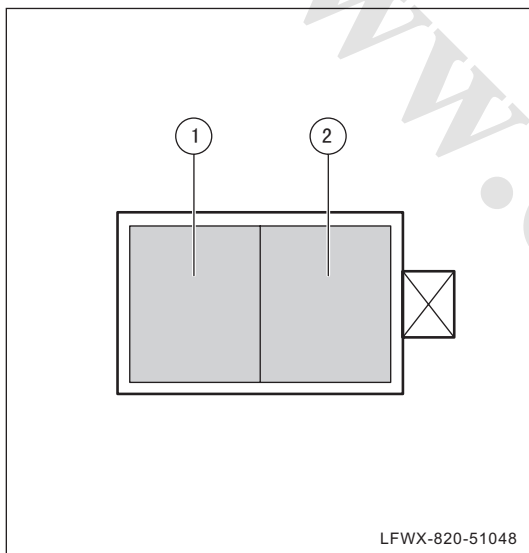
See 22 - General Check of Clutch, Check of Clutch Fluid (brake fluid).

## Check the brake fluid level switch



### 1. Check the working condition of brake fluid level switch

- (a) Turn the power supply to "LOCK" position, and disconnect the wire harness connector of brake fluid level switch.

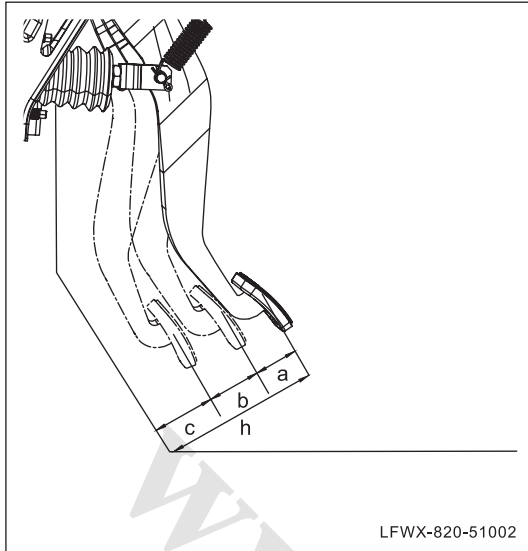


- (b) Turn the power supply to "ON" position, and fully drain all brake fluid out of brake fluid tank.

- (c) When the float is located at bottom, use a digital multimeter resistance scale to detect the resistance between terminal No.1 and No.2 of brake fluid level switch, two terminals should be conducted.

- (d) Fill brake fluid into brake fluid tank to keep the level at "MAX" scale and float at bottom. Use a digital multimeter resistance scale to detect the resistance between terminal No.1 and No.2 of brake fluid level switch, two terminals should not be conducted.

## Check brake pedal



### 1. Check brake pedal height

- (a) Measure the height H from brake pedal to the floor. If this height doesn't meet requirement, adjust the height of brake pedal.

**Pedal height: 110mm**

- (b) Turn the power supply to "LOCK" position, push the brake pedal until the pedal is hard to push, and measure the free travel a of brake pedal. If the measured value exceeds the specified value, adjust it.

**Free travel of pedal a: 7mm~15mm**

- (c) Use hard force to step the brake pedal, and measure the height c between the pedal and floor (pedal travel allowance)

**Pedal travel allowance c: 54mm**

- (d) Calculate the pedal's working travel b.

**Pedal's working travel b: 50mm~70mm**

△ HINT:

Use pedal height h minus pedal's free travel a and pedal's working allowance c, we can get the Pedal's working travel b.

## Check vacuum booster

### 1. Check the working condition of vacuum booster

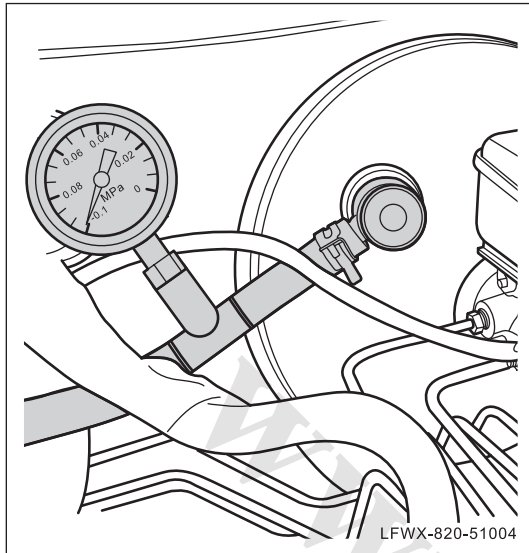
- (a) Stop the engine, and then step the brake pedal for several times (keep the vacuum in brake vacuum booster is equal to the barometric pressure) Step the brake pedal to limit position, start the engine, and observe whether the distance between brake pedal and floor is shortened.

#### ⓘ Note:

**Interval to depress the brake pedal is 5s.**

- (b) Make an airtight inspection. If there is any fault, replace vacuum booster.
- Start the engine and run it at idle speed for 1min, and stop the engine, and then step the brake pedal to eliminate vacuum. Confirm whether the distance between brake pedal and floor is gradually increased.

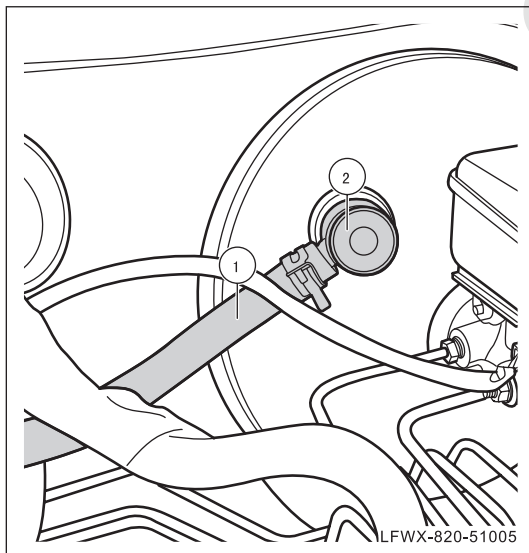
- When the engine is running, depress the brake pedal and then stop the engine. Depress the brake pedal 30s. If the brake stroke does not change, it indicates that the vacuum booster is well sealed.



- Install a vacuum gauge between vacuum booster and vacuum hose.
- Start the engine, adjust the engine rotation speed to make the reading of the vacuum meter is 40.0~66.7kPa using the accelerator pedal, and then shut the engine down and read the data on the vacuum meter. After 30s, if the reading of the vacuum meter decreases by 2.7kPa or more, check the check valve/vacuum hose, sealing element, vacuum booster and brake master cylinder for leakage.

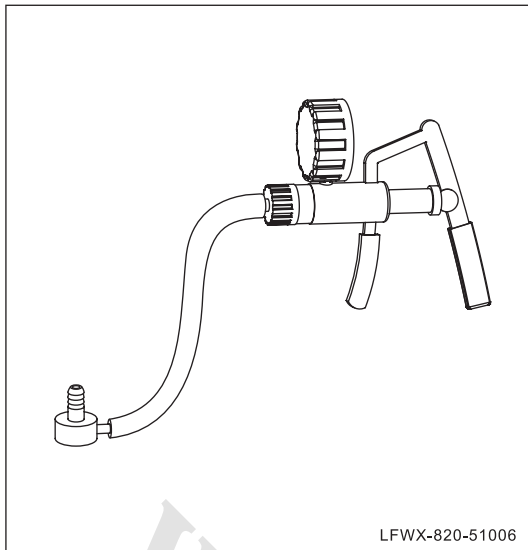
**Note:**

If the vacuum booster faults, replace the vacuum booster assembly rather than dismantle it.



**2. Inspect the vacuum hose check valve**

- Remove mounting plate of windshield cover plate.
- Remove elastic clip on both ends of vacuum pipe ①, and remove vacuum hose ①.
- Unplug one-way valve ②.



- (d) As shown in figure, connect vacuum hose, one-way pump and manual vacuum pump, and adjust the manual vacuum pump to pressing model (OUT scale), and trigger the handle of manual vacuum pump. At this moment, the pressure shown in manual vacuum pump should rise up with the increase of the times of triggering handle.

△ HINT:

When the pressure rises to certain value, if the pressure drops, it indicates that the vacuum hose and one-way valve have fault and one-way valve should be replaced.

- (e) Re-install vacuum hose and one-way valve.

## Check brake caliper

△ HINT:

The inspection of front and rear brake caliper is basically the same. This section will only introduce the inspection of front brake caliper as an example.

### 1. Check the working condition of brake caliper.

- (a) Check whether the caliper housing has cracks, abrasion or other damage. If yes, replace brake caliper. (See 51 - Service Brake, Front Brake, Replacement)
- (b) Check whether the sealing ring of dustproof cover of brake caliper piston has cracks, damage, ageing or other damage. If yes, replace brake caliper. (See 51 - Service Brake, Front Brake, Replacement)
- (c) Check whether the sealing ring of dustproof cover of brake caliper piston is installed correctly inside the brake caliper. If no, replace brake caliper. (See 51 - Service Brake, Front Brake, Replacement)
- (d) Check whether there is brake fluid around the sealing ring of dustproof cover of brake caliper piston and brake pad. If yes, replace brake caliper. (See 51 - Service Brake, Front Brake, Replacement)
- (e) Check whether brake caliper piston can be smoothly inserted into brake caliper cylinder with complete stroke. The brake caliper piston should move uniformly and smoothly. If the piston is sticking or hard to reach to the bottom, replace brake caliper. (See 51 - Service Brake, Front Brake, Replacement)
- (f) Check whether sliding pin of brake caliper has the following conditions. If any or some of the following conditions occurs, replace the sliding pin of brake caliper. (See 51 - Service Brake, Front Brake, Replacement)
  - Sticking

- Seizing
- Jacket has cracks or damage.
- Jacket is missing.

## Check brake pad and brake disc

△ HINT:

Inspection of front and rear brake pad and brake disc is basically the same. This section will only introduce the inspection of front brake pad and front brake disc as examples.

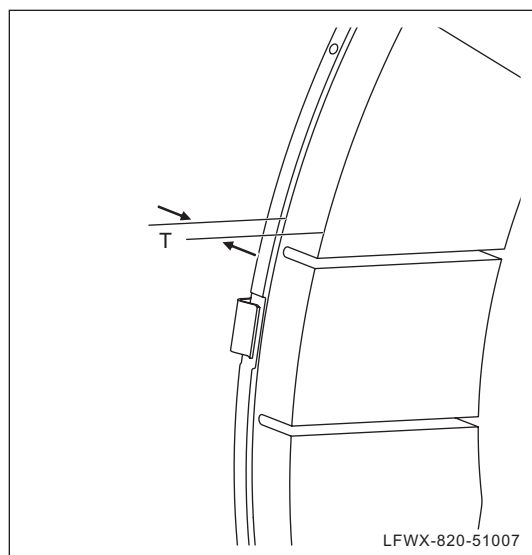
### 1. Check the working condition of brake pad

- Remove front brake pad. (See 51 - Service Brake, Front Brake, Replacement)
- Check whether the friction surface of brake pad has rusting stain, oil stain and other foreign matters. If yes, clean them away.

△ HINT:

If oil stain penetrates brake pad, it is necessary to replace the brake pad.

- Check whether the friction surface of brake pad has cracks, broken condition or damage. If yes, replace it. (See 51 - Service Brake, Front Brake, Replacement)
- Check whether the guide of brake pad is loose. If yes, re-install or replace it.



- Measure the thickness T of brake pad. If the measured value exceeds limit thickness, replace it.

Standard thickness: 11mm

Wear limit thickness: 2mm

### 2. Check the working condition of brake disc

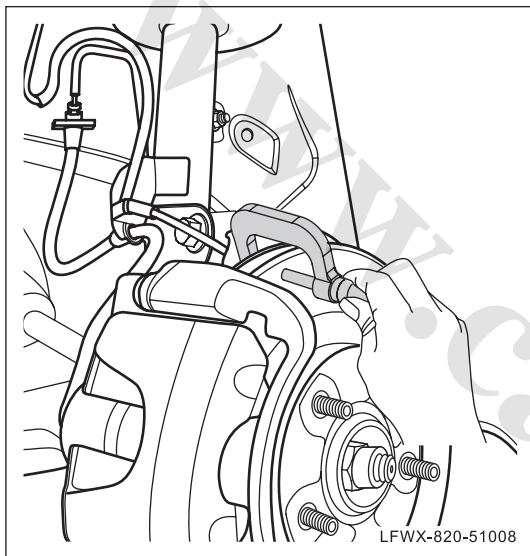
- Remove front brake disc. (See 51 - Service Brake, Front Brake, Replacement)
- Clean the surface of brake disc with a brush and inspect whether the brake disc has the following condition. If one or some of the following conditions occurs, replace

brake disc.

- Serious rusting mark or pitting corrosion.
- Slight rusting mark
- Surface has cracks or burns.
- Serious decoloration or become blue.
- Surface has cracks.

**Note:**

**After replacement of brake disc, corresponding brake pad should also be replaced at the same time.**



- (c) Measure the thickness of brake pad by using a screw micrometer. If the measured value exceeds limit value, replace brake disc.

Front brake disc standard thickness:  
22mm

Wear limit thickness: 20mm

Standard thickness of rear brake disc:  
9mm

Wear limit thickness: 7mm

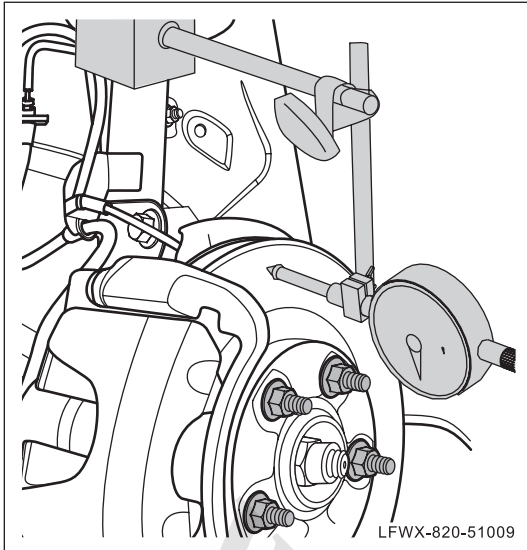
**HINT:**

The measuring points should be distributed in 4 or more positions around the brake disc; the measured result is subject to the minimum value.

**Note:**

**Make sure that the measuring points are distributed with the contact area of brake lining, and the distances between screw micrometer and the outer edge of brake disc are equal at each measurement.**





- (d). Install nuts to fix the brake disc, and measure swinging amount of brake disc at 10mm from the brake disc edge with dial gauge.

Brake disc maximum swing value: 0.2mm

△ HINT:

If swinging amount reaches or exceeds limit value, check radial gap of wheel hub bearing and vibration of wheel hub; if bearing and wheel hub work normally, replace the brake disc.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Brake system has noise.	1. Fixing bolt of bracket of brake caliper (loose)	See 51 - Service Brake, Diagnosis, Fault Diagnosis (1. Brake system has noise)
	2. Fixing bolt of brake caliper (loose)	
	3. Brake disc (fault)	
	4. Brake pad (fault)	
	5. Brake caliper (fault)	
Braking deviation	1. Brake pipe (distorted or deformed)	See 51 - Service Brake, Diagnosis, Fault Diagnosis (2. Braking deviation)
	2. Brake disc (fault)	
	3. Brake pad (fault)	
	4. Brake caliper (fault)	
Brake pedal is hard to depress	1. Brake pipe (distorted or deformed)	See 51 - Service Brake, Diagnosis, Fault Diagnosis (3. Brake pedal is hard to depress)
	2. Vacuum booster (fault)	
Brake pedal is soft and brake force is insufficient.	1. Brake fluid (too low)	See 51 - Service Brake, Diagnosis, Fault Diagnosis (4. Brake pedal is soft and brake force is insufficient)
	2. Air enters into the system	
	3. Brake disc (fault)	
	4. Brake pad (fault)	
	5. Brake master cylinder (fault)	
	6. Brake caliper (fault)	
Brake drag	1. Free travel of brake pedal (incorrect)	See 51 - Service Brake, Diagnosis, Fault Diagnosis (5. Brake is dragging)
	2. Brake pad (fault)	
	3. Brake caliper (fault)	
	4. Vacuum booster (fault)	
	5. Brake master cylinder (fault)	

## Fault diagnosis

### 1. Brake system has noise

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake system (See 51 - General Check of Service Brake, Check of System)	Diagnosis end.	Brake system has noise.	Go to Step 1
1	Check brake caliper	Normal	Faulty	Instruction
	Check the installation condition of bracket of brake caliper (See 51 - General Check of Service Brake, Check of System)	Go to Step 2	Fixing bolt of bracket of brake caliper is loose.	Re-tighten it.
2	Check brake caliper	Normal	Faulty	Instruction
	Check the installation condition of brake caliper (See 51 - General Check of Service Brake, Check of System)	Go to Step 3	Fixing bolt of brake caliper is loose.	Re-tighten it.
3	Check the brake disc	Normal	Faulty	Instruction
	Check the working condition of brake disc (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 4	<ul style="list-style-type: none"> <li>• Front brake disc has cracks.</li> <li>• Rear brake disc has cracks.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace front brake disc (See 51 - Service Brake, Front Brake, Replacement)</li> <li>• Replace the rear brake disc (See 51 - Parking Brake, Rear Brake, Replacement)</li> </ul>
4	Check brake pad	Normal	Faulty	Instruction
	Check the working condition of brake pad (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 5	<ul style="list-style-type: none"> <li>• Front brake pad has cracks, distortion or stains.</li> <li>• Rear brake pad has cracks, distortion or stains.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace front brake pad (See 51 -Service Brake, Front Brake Pad, Replacement)</li> <li>• Replace rear brake pad (See 51 -Service Brake, Rear Brake Pad, Replacement)</li> </ul>
5	Check brake pad	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the guide of brake pad is loose (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 6	<ul style="list-style-type: none"> <li>The guide of front brake pad is loose.</li> <li>The guide of rear brake pad is loose.</li> </ul>	<ul style="list-style-type: none"> <li>Re-install or replace the guide of front brake pad (See 51 - Service Brake, Front Brake Pad, Replacement)</li> <li>Re-install or replace the guide of rear brake pad (See 51 - Service Brake, Rear Brake Pad, Replacement)</li> </ul>
6	Check brake caliper	Normal	Faulty	Instruction
	•Check the working condition of sliding pin of brake caliper (See 51 - Service Brake, Front Brake Pad, Check of Brake Caliper)	Go to Step 7	<ul style="list-style-type: none"> <li>Sliding pin of front brake caliper is damaged.</li> <li>Sliding pin of rear brake caliper is damaged.</li> </ul>	<ul style="list-style-type: none"> <li>Replace sliding pin of front brake caliper (See 51 - Service Brake, Front Brake, Replacement)</li> <li>Replace sliding pin of rear brake caliper (See 51 - Service Brake, Rear Brake, Replacement)</li> </ul>
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Braking deviation

51

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake system (See 51 - General Check of Service Brake, Check of System)	Diagnosis end.	Braking deviation	Go to Step 1
1	Check the brake pipeline	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of brake pipe (See 51 - General Check of Service Brake, Check of System)	Go to Step 2	Brake pipe is distorted or deformed.	Check to repair or replace the brake pipeline (see 51 - Service Brake, Brake Pipeline, Replacement)
2	Check the brake disc	Normal	Faulty	Instruction
	Check the working condition of brake disc (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 3	<ul style="list-style-type: none"> <li>Front brake disc has cracks.</li> <li>Rear brake disc has cracks.</li> </ul>	<ul style="list-style-type: none"> <li>Replace front brake disc (See 51 - Service Brake, Front Brake, Replacement)</li> </ul> Replace the rear brake disc (See 51 - Parking Brake, Rear Brake, Replacement)
3	Check brake pad	Normal	Faulty	Instruction
	Check the working condition of brake pad (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 4	<ul style="list-style-type: none"> <li>Front brake pad has cracks, distortion or stains.</li> <li>Rear brake pad has cracks, distortion or stains.</li> </ul>	<ul style="list-style-type: none"> <li>Replace front brake pad (See 51 -Service Brake, Front Brake Pad, Replacement)</li> <li>Replace rear brake pad (See 51 -Service Brake, Rear Brake Pad, Replacement)</li> </ul>
4	Check brake caliper	Normal	Faulty	Instruction
	Check whether the brake caliper piston is sticking (See General Check of Service Brake, Check of Brake Caliper)	Go to Step 5	<ul style="list-style-type: none"> <li>Front brake caliper piston is sticking.</li> <li>Rear brake caliper piston is sticking.</li> </ul>	<ul style="list-style-type: none"> <li>Replace front brake caliper (See 51 - Service Brake, Front Brake, Replacement)</li> </ul> Replace the rear brake caliper (See 51 - Parking Brake, Rear Brake, Replacement)
5	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Brake pedal is hard to depress

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake system (See 51 - General Check of Service Brake, Check of System)	Diagnosis end.	Brake pedal is hard to depress	Go to Step 1
1	Check the brake pipeline	Normal	Faulty	Instruction
	Check the working condition of brake pipe (See 51 - General Check of Service Brake, Check of System)	Go to Step 2	Brake pipe is distorted or deformed.	Check to repair or replace the brake pipeline (see 51 - Service Brake, Brake Pipeline, Replacement)
2	Check vacuum booster	Normal	Faulty	Instruction
	Check the working condition of vacuum booster (See 51 - General Check of Service Brake, Check of Vacuum Booster)	Go to Step 3	Vacuum booster is ineffective.	Replace the vacuum booster (see 51 - Service Brake, Vacuum Booster, Replacement)
3	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 4. Brake pedal is soft and brake force is insufficient

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake system (See 51 - General Check of Service Brake, Check of System)	Diagnosis end.	Brake pedal is soft and brake force is insufficient.	Go to Step 1
1	Check brake fluid	Normal	Faulty	Instruction
	Check the brake fluid level (See 51 - General Check of Service Brake, Check of Brake Fluid)	Go to Step 3	Brake fluid is insufficient.	Go to Step 2
2	Check whether the system has oil leakage.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the system has oil leakage (See 51 - General Check of Service Brake, Check of System)	Fill brake fluid and proceed with step 3.	The system has oil leakage.	Repair oil leaking position and fill brake fluid.
3	Exhaust of system	Normal	Faulty	Instruction
	After air exhaust of system, inspect whether the fault is eliminated.	Diagnosis end.	Fault still exists	Go to Step 4
4	Check the brake disc	Normal	Faulty	Instruction
	Check the working condition of brake disc (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 5	<ul style="list-style-type: none"> <li>Front brake disc is seriously worn.</li> <li>Rear brake disc is seriously worn.</li> </ul>	<ul style="list-style-type: none"> <li>Replace front brake disc (See 51 - Service Brake, Front Brake, Replacement)</li> <li>Replace the rear brake disc (See 51 - Parking Brake, Rear Brake, Replacement)</li> </ul>
5	Check brake pad	Normal	Faulty	Instruction
	Check the working condition of brake pad (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 6	<ul style="list-style-type: none"> <li>The surface of brake pad has oil stain.</li> <li>Front brake pad is seriously worn.</li> <li>Rear brake pad is seriously worn.</li> </ul>	<ul style="list-style-type: none"> <li>Clean brake pad.</li> <li>Replace front brake pad (See 51 - Service Brake, Front Brake Pad, Replacement)</li> <li>Replace rear brake pad (See 51 - Service Brake, Rear Brake Pad, Replacement)</li> </ul>
6	Check the brake master cylinder	Normal	Faulty	Instruction
	Check the working condition of the brake master cylinder (see 51 - Service Brake, Brake Master Cylinder, Overhaul)	Go to Step 7	Brake master cylinder is damaged.	Replace brake master cylinder (See 51 - Service Brake, Brake Master Cylinder, Overhaul)
7	Check brake caliper piston	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of brake caliper piston (See 51 - General Check of Service Brake, Check of Brake Caliper)	Go to Step 8	<ul style="list-style-type: none"> <li>Sealing piece of front brake caliper piston is ineffective.</li> <li>Sealing piece of rear brake caliper piston is ineffective.</li> </ul>	<ul style="list-style-type: none"> <li>Replace front brake caliper (See 51 - Service Brake, Front Brake, Replacement)</li> </ul> Replace the rear brake caliper (See 51 - Parking Brake, Rear Brake, Replacement)
8	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 5. Brake is dragging

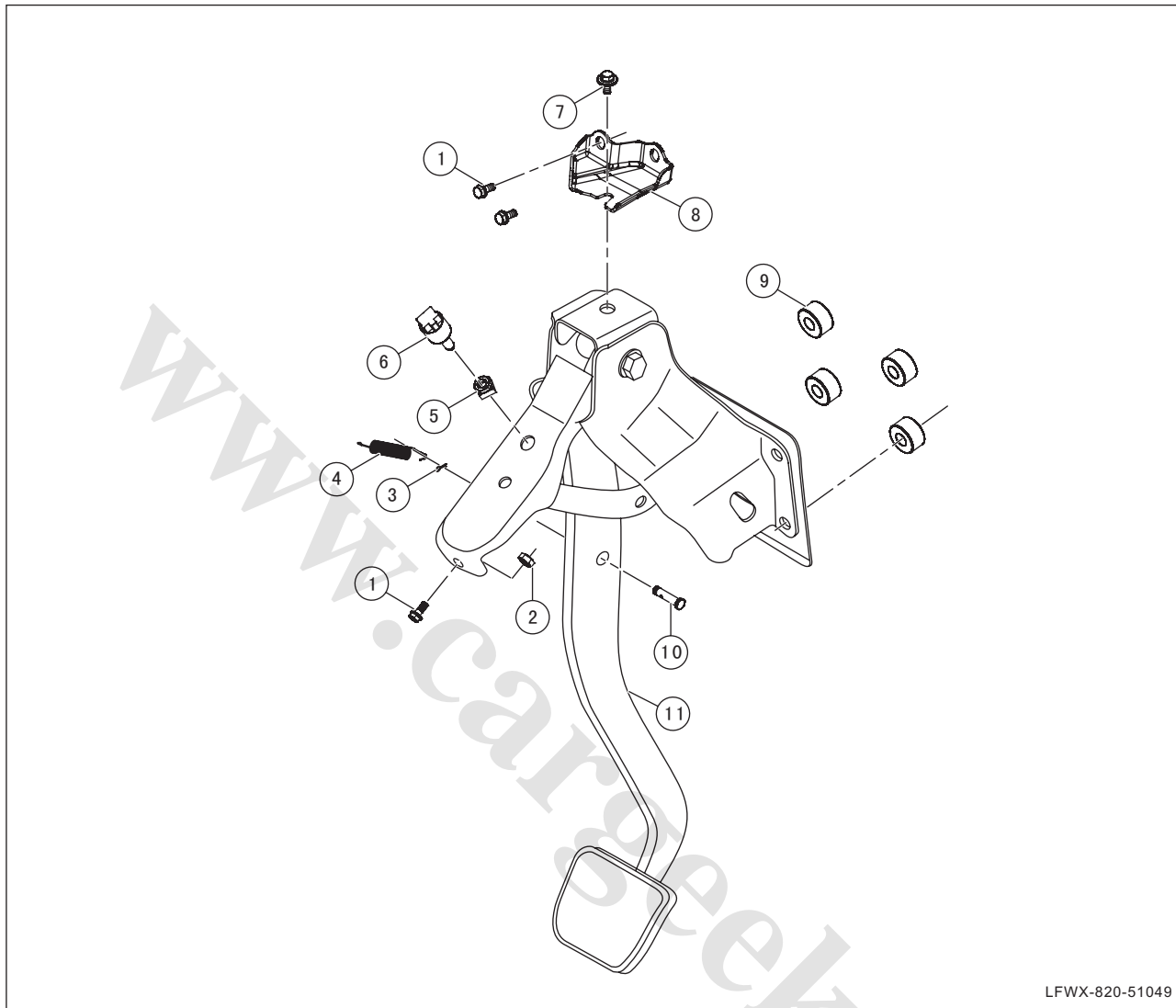
Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake system (See 51 - General Check of Service Brake, Check of System)	Diagnosis end.	Brake drag	Go to Step 1
1	Check brake pedal	Normal	Faulty	Instruction
	Check the free travel of brake pedal (See 51 - General Check of Service Brake, Check of Brake Pedal)	Go to Step 2	Free travel is insufficient.	Adjust the free stroke of the brake pedal (see 51 - Service Brake, Brake Pedal, Adjustment)
2	Check brake pad	Normal	Faulty	Instruction
	Check the working condition of brake pad (See 51 - General Check of Service Brake, Check of Brake Pad and Brake Disc)	Go to Step 3	<ul style="list-style-type: none"> <li>Front brake pad is sticking.</li> <li>Rear brake pad is sticking.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the guide of front brake pad (See 51 - Service Brake, Front Brake Pad, Replacement)</li> <li>Replace the guide of rear brake pad (See 51 - Service Brake, Rear Brake Pad, Replacement)</li> </ul>



Steps	Inspection item	Inspection result		
3	Check brake caliper piston	Normal	Faulty	Instruction
	Check whether the brake caliper piston is sticking (See General Check of Service Brake, Check of Brake Caliper)	Go to Step 4	<ul style="list-style-type: none"> <li>Front brake caliper piston is sticking.</li> <li>Rear brake caliper piston is sticking.</li> </ul>	<ul style="list-style-type: none"> <li>Replace front brake caliper (See 51 - Service Brake, Front Brake, Replacement)</li> </ul> Replace the rear brake caliper (See 51 - Parking Brake, Rear Brake, Replacement)
4	Check vacuum booster	Normal	Faulty	Instruction
	Check the working condition of vacuum booster (See 51 - General Check of Service Brake, Check of Vacuum Booster)	Go to Step 5	Vacuum booster is sticking	Replace the vacuum booster (see 51 - Service Brake, Vacuum Booster, Replacement)
5	Check the brake master cylinder	Normal	Faulty	Instruction
	Check the working condition of the brake master cylinder (see 51 - Service Brake, Brake Master Cylinder, Overhaul)	Go to Step 6	Brake master cylinder is damaged.	Replace brake master cylinder (See 51 - Service Brake, Brake Master Cylinder, Overhaul)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

# Brake Pedal

## Components

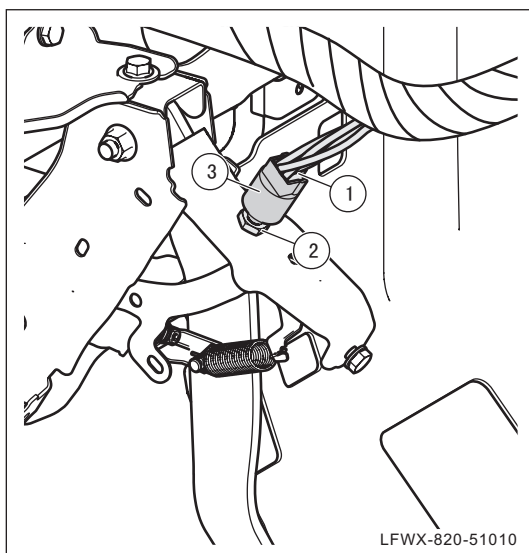
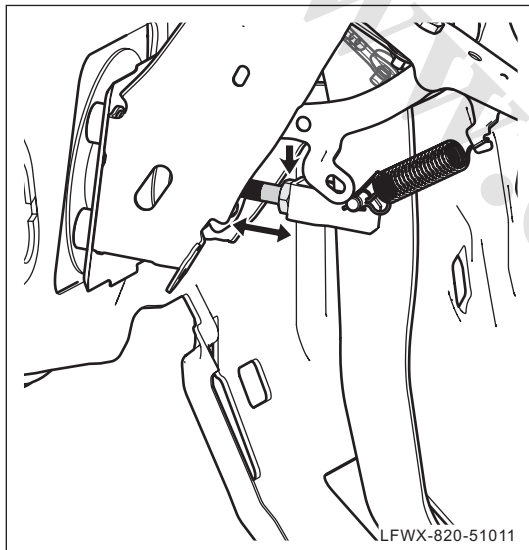
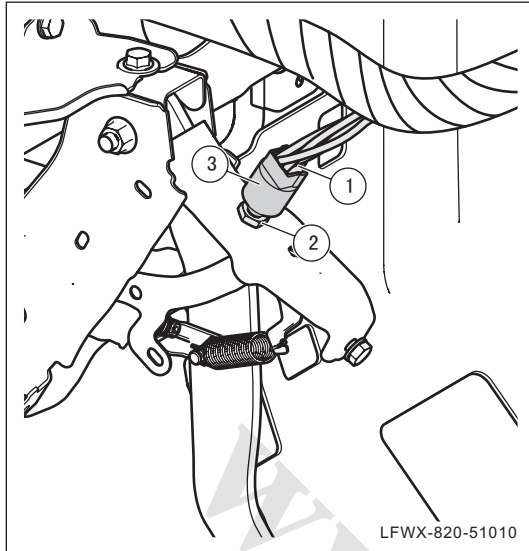


LFWX-820-51049

1	Bolt
2	Nut
3	Locking pin
4	Return spring
5	Nut
6	Brake light switch

7	Bolt
8	Bracket
9	Cushion block
10	Pin shaft
11	Brake pedal

## Adjustment



### 1. Adjust the height of brake pedal

- (a). Disconnect wire harness connector ① from brake pedal switch.
- (b). Unscrew the brake pedal switch locking nut ②.
- (c). Remove the brake pedal switch ③.

- (d). Loosen the vacuum booster push rod lock nuts, and rotate the push rod for length adjustment; so as to adjust the brake pedal to the proper height.

- (e). Tighten the vacuum booster push rod lock nuts.

- (f). Install brake pedal switch ③ to mounting position.

#### △ HINT:

Temporarily don't tighten locknut of brake pedal switch.

- (g). Connect wire harness connector ① of brake pedal switch.

- (h). Depress the brake pedal surface for 7~15mm, and then rotate the brake pedal switch until the brake light goes out; lock the lock nut at this position.

- (i). After installation, step the brake pedal to 7mm~15mm, and inspect whether brake lamp lights up. If no, re-install it.

## 2. Adjust the free play of brake pedal

△ HINT:

The method of adjusting the free stroke of the brake pedal is the same as adjusting the pedal height, so refer to the method of adjusting the pedal height to adjust the free stroke of the brake pedal.

## 3. Adjust the operating stroke of the brake pedal

△ HINT:

Incorrect working travel of brake pedal is generally caused by air existing in pipe of hydraulic system of brake. If the working travel of brake pedal is incorrect, find out the root cause and eliminate fault.

## 4. Adjust the brake pedal reserve

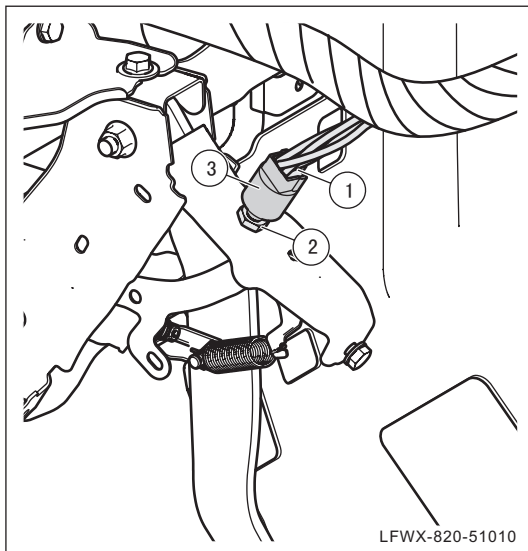
△ HINT:

Insufficient of the brake pedal reserve distance is caused by abnormal operating stroke and free stroke of the brake pedal. If the brake pedal reserve distance is abnormal, adjust the free stroke and operating stroke.

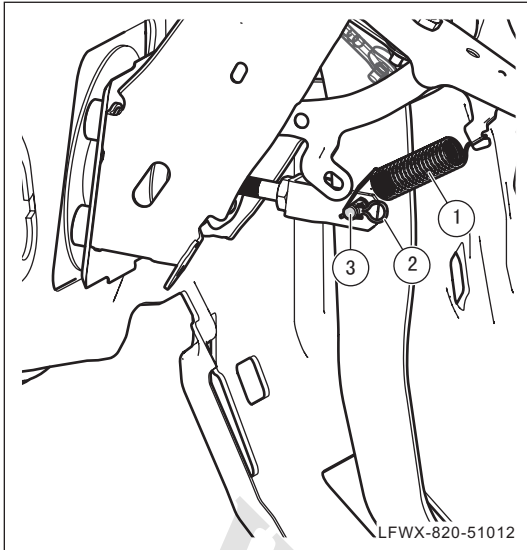
## Replacement

### 1. Removal of brake pedal

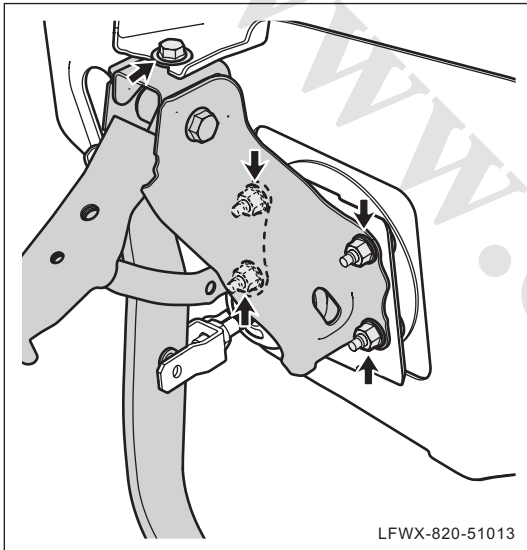
- (a) Remove lower panel of dashboard. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)



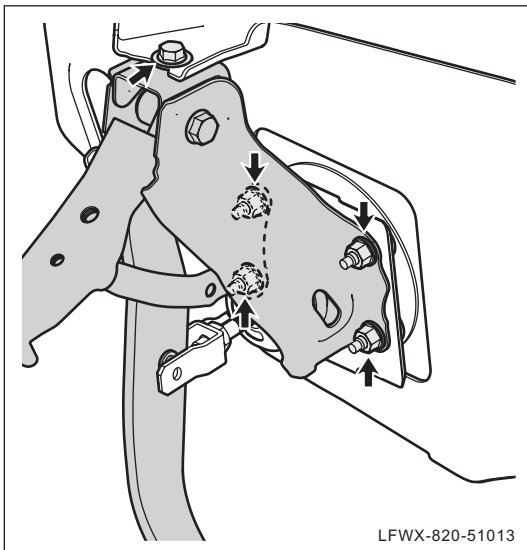
- (b). Disconnect wire harness connector ① from brake pedal switch.
- (c) Unscrew the brake pedal switch locking nut ②.
- (d). Remove the brake pedal switch ③.



- (e) Remove return spring ① of the brake pedal.
- (f) Remove the lockpin between the vacuum booster push rod and the brake pedal connecting axis pin ②, and then take off the axis pin ③.



- (g) Remove fixing bolt and nut of brake pedal, and remove brake pedal.



## 2. Install brake pedal

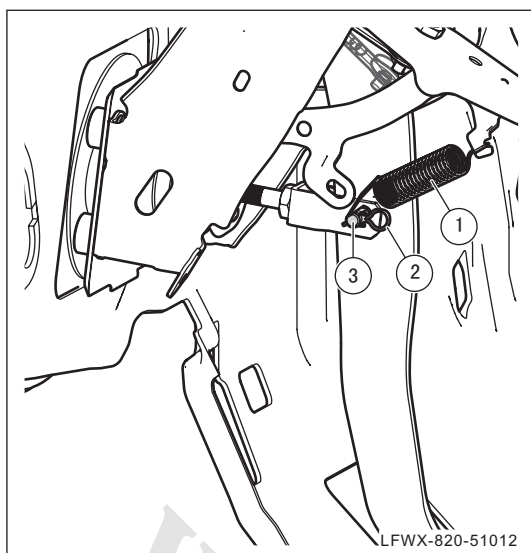
- (a) Install brake pedal onto mounting position, and install and tighten fixing bolt and nut.

Tightening torque: 20N•m~26N•m(bolt)

20N•m~26N•m(nut)

### ⓘ Note:

When installing the brake pedal, it is required to fix the vacuum booster by a person to prevent it from being pushed out by the brake pedal bracket.



- (b). Install the axis pin ③ connecting the vacuum booster push rod and the brake pedal and then install the lock pin ② .
- (c) Install return spring ① of brake pedal onto the mounting position.

△ HINT:

After installation, inspect and adjust the height of brake pedal.

- (d) Re-install brake pedal switch and adjust the clearance. (See 51 - Service Brake, Brake Pedal, Adjustment)
- (e) Install dashboard left lower panel. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)

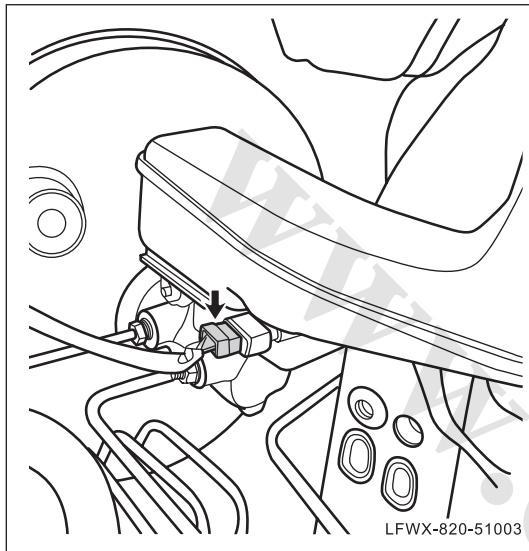
# Brake Master Cylinder

## Overhaul

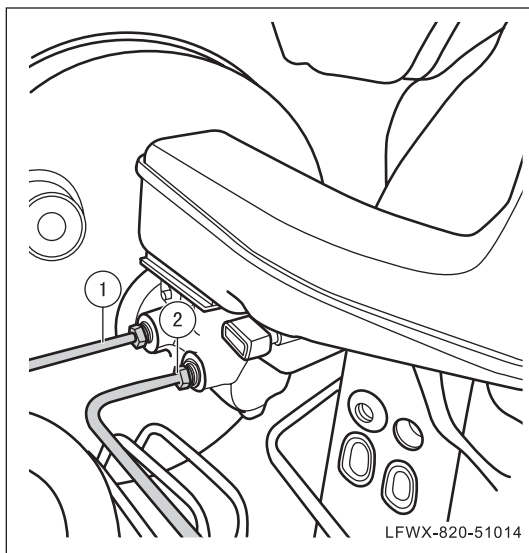
### 1. Remove brake master cylinder

(a) Remove air filter assembly. (See 15 - Intake / exhaust system, Air filter, Replacement)

(b). Discharge brake fluid. (See 51 - Service Brake, Brake Fluid, Replacement)



(c) Disconnect the wire harness connector of the brake fluid switch.

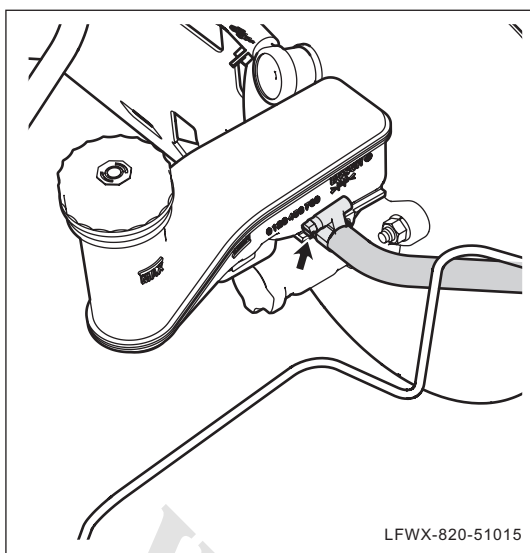


(d) Remove oil outlet pipe ① of the first chamber of brake master cylinder by using oil pipe wrench.

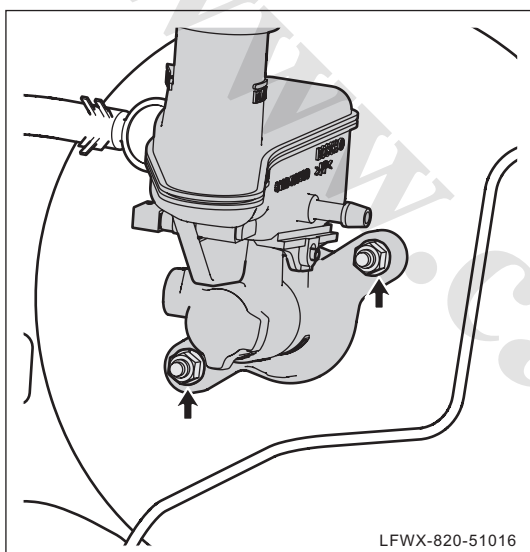
(e) Remove oil outlet pipe ② of the second chamber of brake master cylinder by using oil pipe wrench.

#### ⓘ Note:

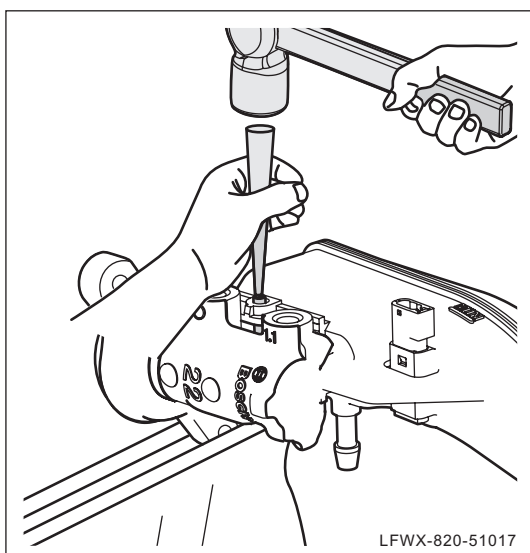
- After dismantling oil pipe, install the rubber cap or rubber plug onto the end of oil pipe, to prevent brake fluid from missing and pollution.
- When removing the brake master pipe, make marks to avoid mixed installation.



- (f) Unscrew the oil inlet pipe clip of clutch master cylinder, and unplug the oil inlet pipe of clutch master cylinder.

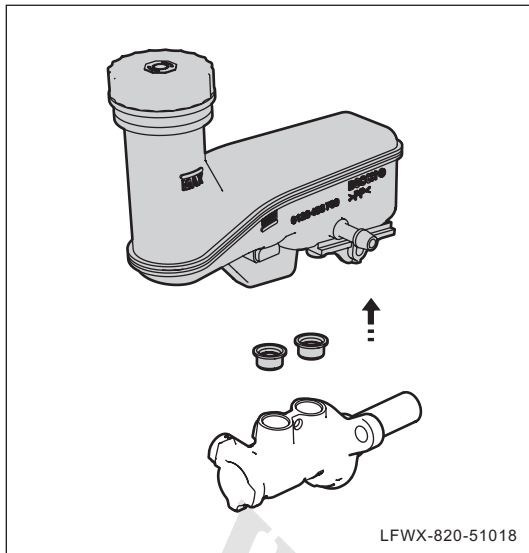


- (g) Remove fixing nut of brake master cylinder, and remove brake master cylinder with brake fluid tank assembly.
- (h) Drain the remaining brake fluid in the brake fluid reservoir.



- (i). Fix the brake master cylinder in the vise and then push off the brake fluid reservoir lockpin by a punch.





(j) Remove brake fluid reservoir and O-ring.

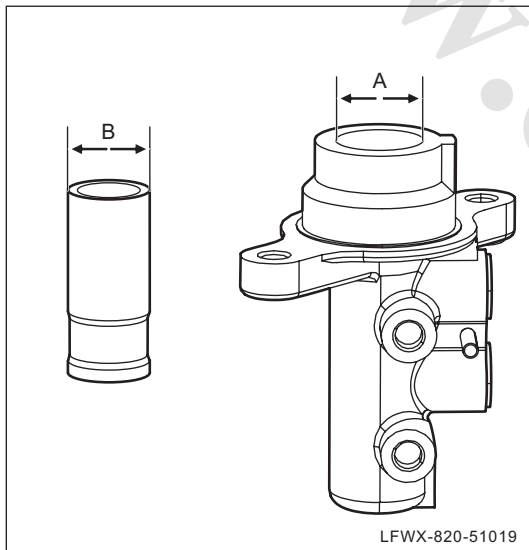
△ HINT:

Pull the brake fluid tank vertically up so that it can be removed from brake master cylinder and sealing ring can be dismantled from the groove of brake fluid tank.

After dismantling, inspect whether brake fluid tank has crack or deformation. If necessary, replace brake fluid tank.

## 2. Check brake master cylinder

(a) Check whether the cup of brake master cylinder is damaged. If yes, replace it.



(b) Check the clearance of piston of brake master cylinder.

- Measure the inner bore A of wall of brake master cylinder.
- Measure the outer diameter B of piston
- Use data A to minus data B, you can get brake the clearance of piston of brake master cylinder.

Inner bore of wall: 23.20mm

Outer diameter of piston: 22.20mm

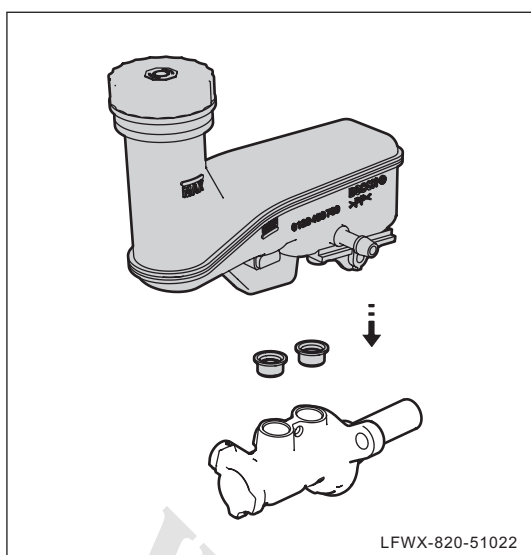
Clearance of piston: 1.00mm

## 3. Check brake fluid reservoir

(a) Clean the brake fluid tank with clean alcohol.

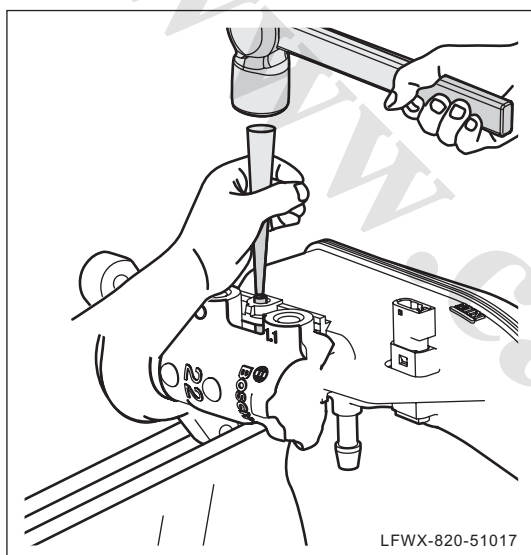
(b) Dry the brake fluid tank by using compressed air.

(c) Check whether brake fluid tank has cracks or deformation. If yes, replace it.

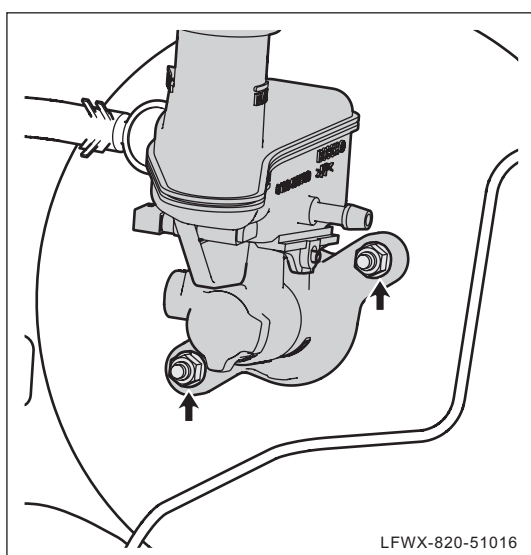


#### 4. Install brake master cylinder

- (a) Apply a layer of grease to the sealing ring of brake fluid tank, install the ring into the brake master cylinder, and then install brake fluid tank.

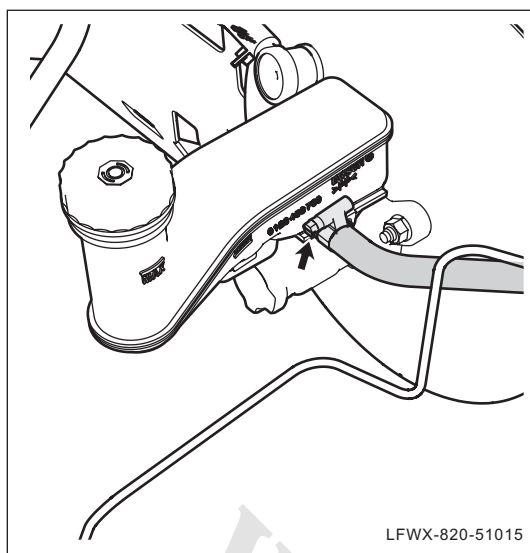


- (b) Fix the brake master cylinder on the bench vice, and install lockpin of brake fluid tank by using a punch.

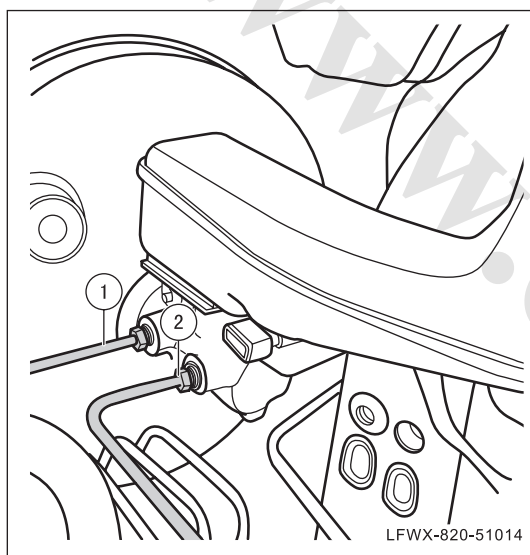


- (c) Install brake master cylinder with brake fluid tank assembly onto the vacuum booster, and install and tighten fixing nut.

Torque: 20N•m - 26N•m

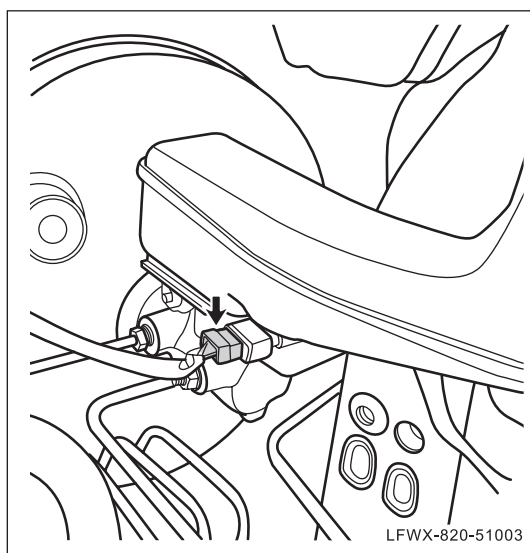


- (d) Install oil inlet pipe and clip of clutch master cylinder onto the brake master cylinder, and tighten the clip.



- (e) Install the oil outlet pipe ① of the first chamber of brake master cylinder onto the brake master cylinder by using an oil pipe wrench.

- (f) Install the oil outlet pipe ② of the second chamber of brake master cylinder onto the brake master cylinder by using an oil pipe wrench.



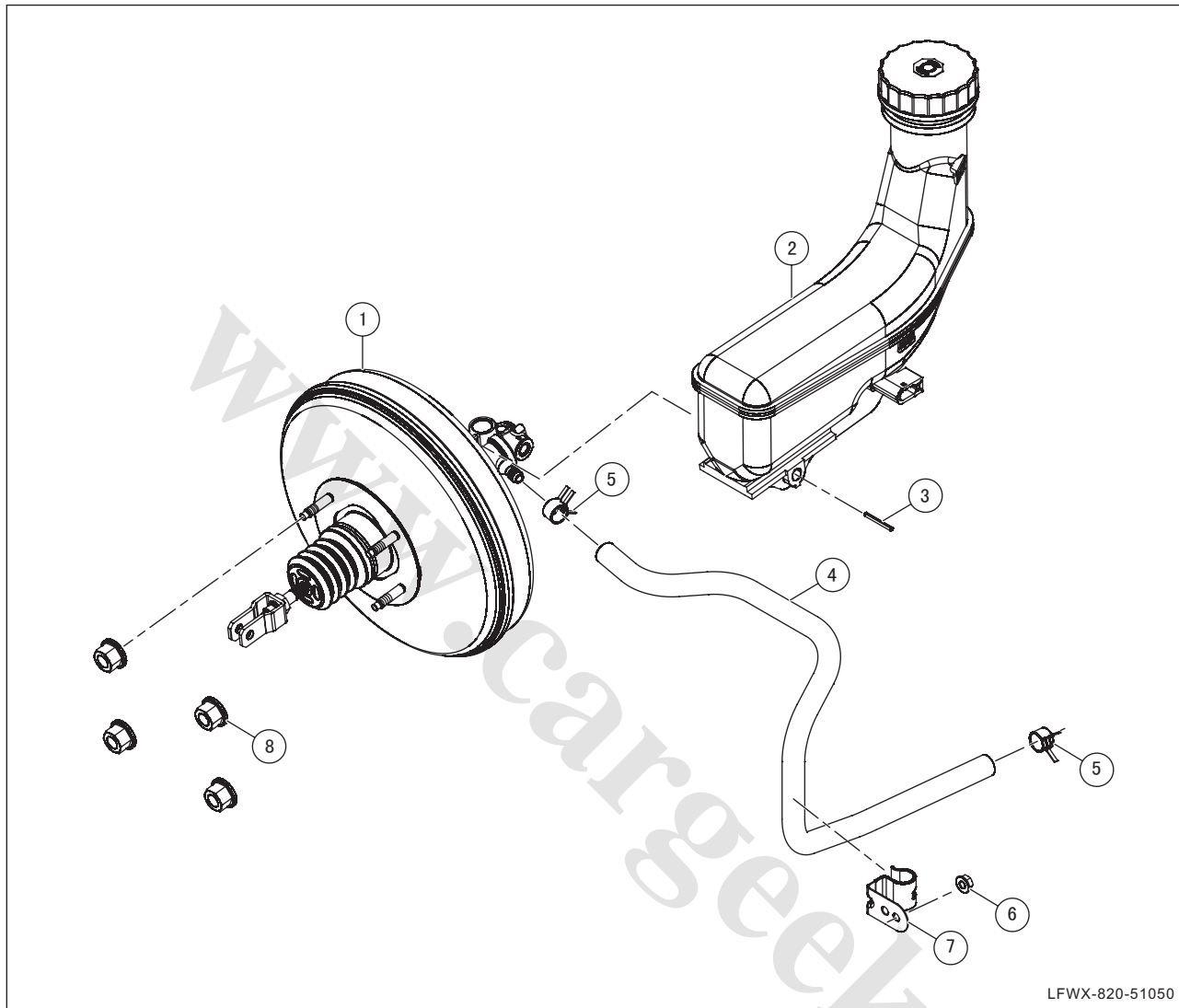
- (g) Connect the wire harness connector of the brake fluid switch.

- (h) Install air filter assembly. (See 15 - Intake / exhaust system, Air filter, Replacement)
- (i) Fill brake fluid, and exhaust air from the brake system. (See 51 -Service Brake Fluid, Air Exhaust)

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# Vacuum Booster

## Components



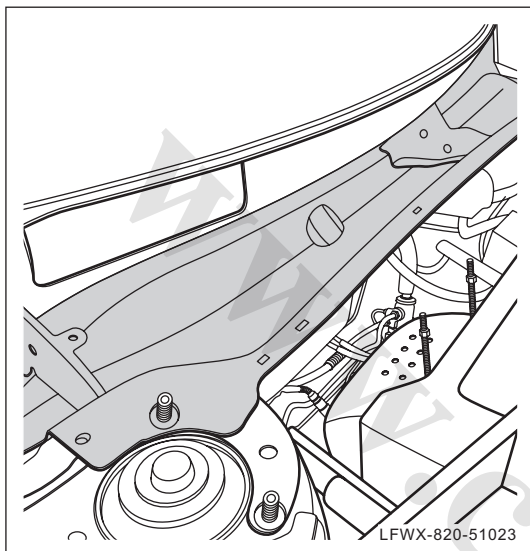
1	Vacuum booster with brake master cylinder assembly
2	Brake fluid reservoir
3	Connecting pin
4	Vacuum hose

5	Elastic clamp
6	Nut
7	Vacuum booster hose clamp
8	Nut

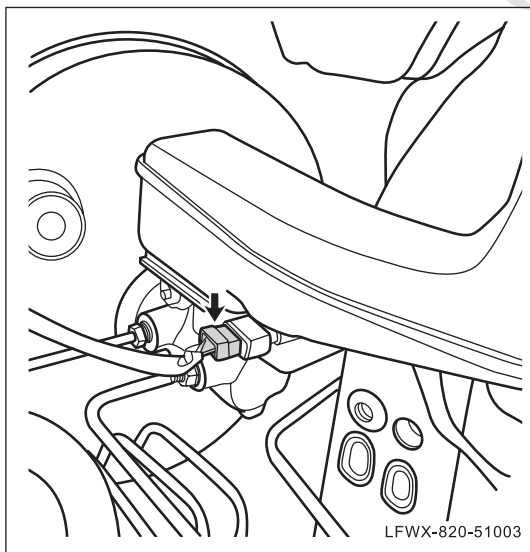
## Replacement

### 1. Remove vacuum hose

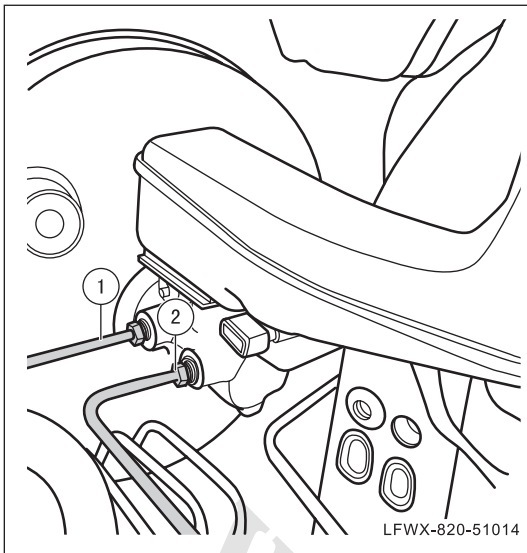
- (a) Remove air filter assembly. (See 15 - Intake / exhaust system, Air filter, Replacement)
- (b). Discharge brake fluid. (See 51 - Service Brake, Brake Fluid, Replacement)
- (c) Remove wiper link mechanism and motor assembly. (See 76 - Wiper Link Mechanism and Motor Assembly of Wiper and Washer System, Replacement)



- (d) Remove fixing bolt and nut of mounting plate of windshield cover plate, and remove mounting plate of windshield cover plate.



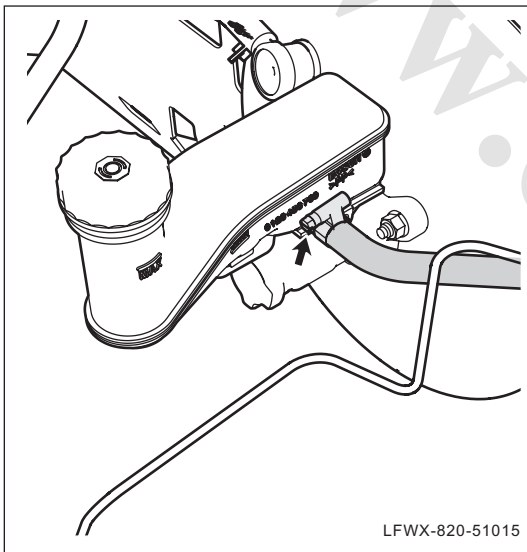
- (e) Disconnect the wire harness connector of the brake fluid switch.



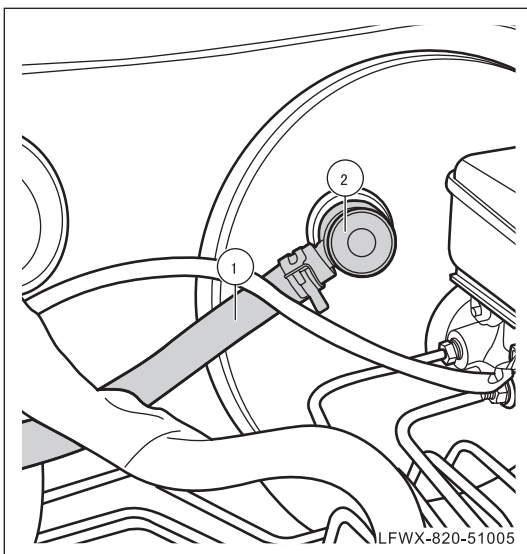
- (f) Remove oil outlet pipe ① of the first chamber of brake master cylinder by using oil pipe wrench.
- (g) Remove oil outlet pipe ② of the second chamber of brake master cylinder by using oil pipe wrench.

**Note:**

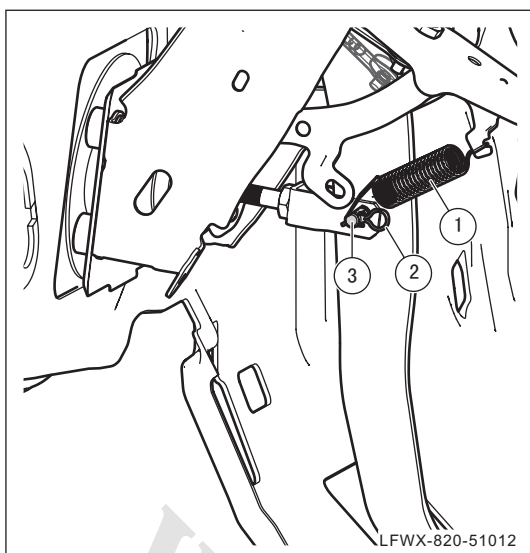
- After dismantling oil pipe, install the rubber cap or rubber plug onto the end of oil pipe, to prevent brake fluid from missing and pollution.
- When removing the brake master pipe, make marks to avoid mixed installation.



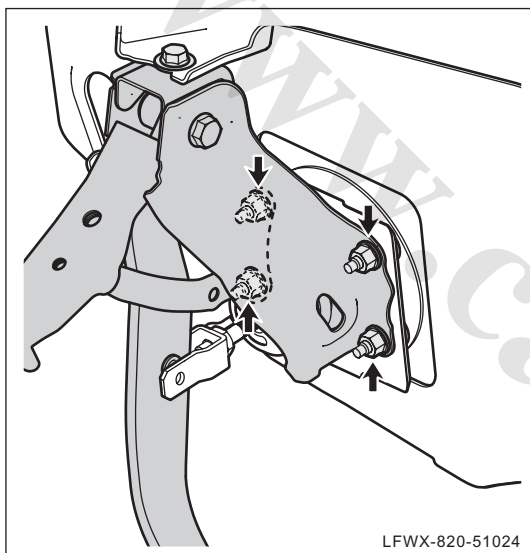
- (h) Unscrew the oil inlet pipe clip of clutch master cylinder, and unplug the oil inlet pipe of clutch master cylinder.



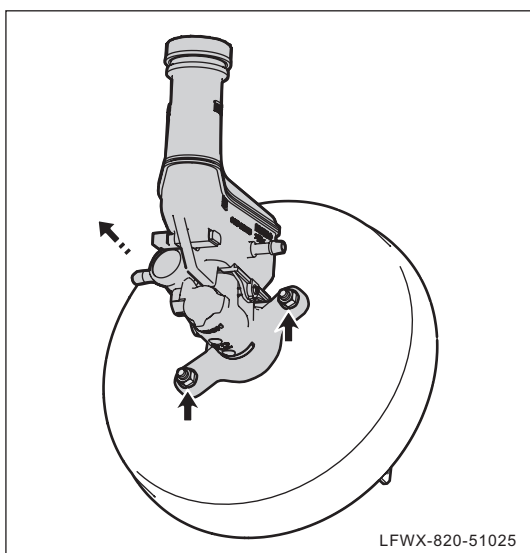
- (i) Remove elastic clip of vacuum hose ① , and unplug vacuum hose ① .
- (j) Unplug one-way valve ② .



- (k) Remove return spring ① of the brake pedal.
- (l). Remove the lockpin between the vacuum booster push rod and the brake pedal connecting axis pin ② , and then take off the axis pin ③ .

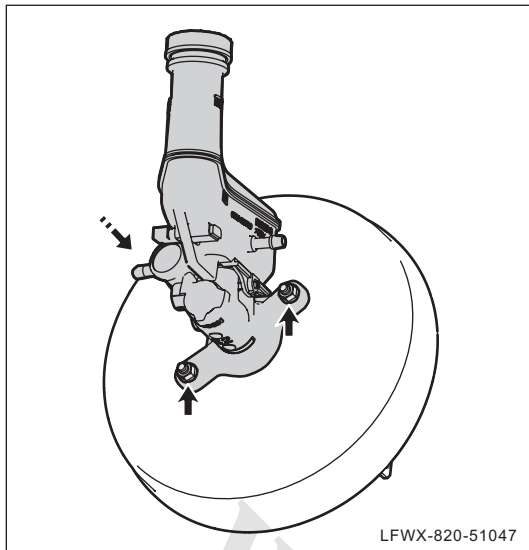


- (m) Remove fixing nut of vacuum booster.
- (n). Remove the vacuum booster with brake master cylinder assembly and the gasket from the engine compartment.



- (o) Remove fixing nut of brake master cylinder, and remove brake master cylinder with brake fluid tank assembly.

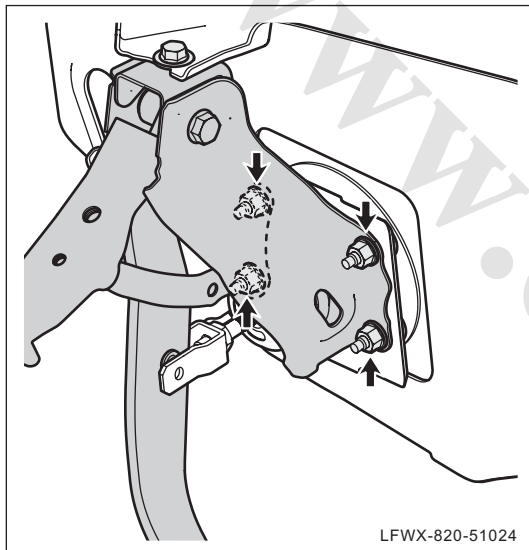




## 2. Install the vacuum booster

- (d) Install brake master cylinder with brake fluid tank assembly onto the vacuum booster, and install and tighten fixing nut.

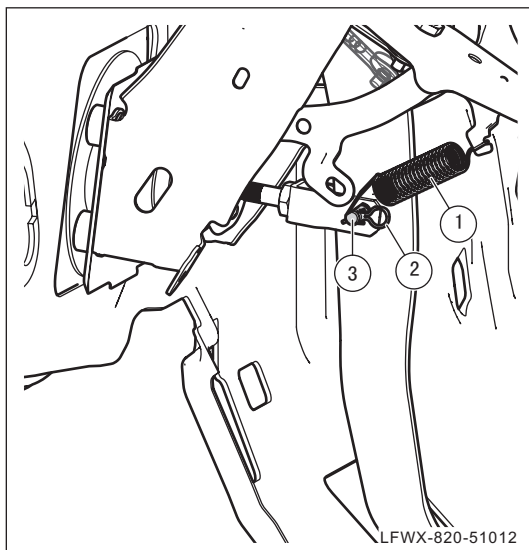
Torque: 20N•m - 26N•m



- (b) From the engine hood side, install vacuum booster with brake master cylinder assembly and cushion onto the mounting position.

- (c) Install and tighten fixing nut of vacuum booster.

Torque: 20N•m - 26N•m

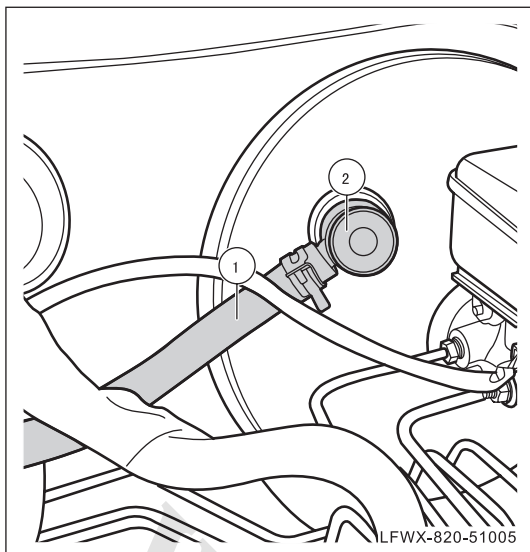


- (d). Install the axis pin ③ connecting the vacuum booster push rod and the brake pedal and then install the lock pin ② .

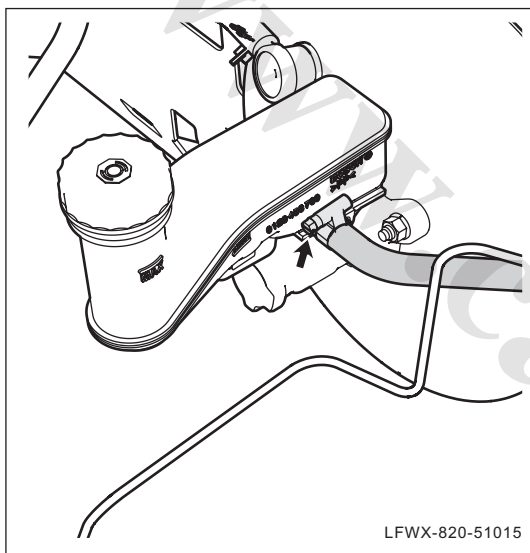
- (e) Install return spring ① of brake pedal onto the mounting position.

△ HINT:

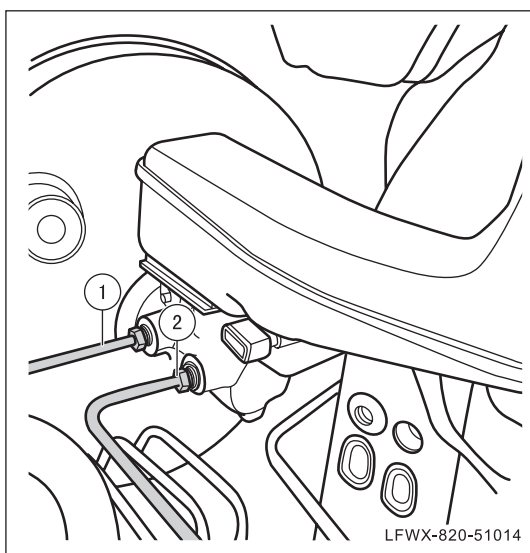
After installation, inspect and adjust the height of brake pedal.



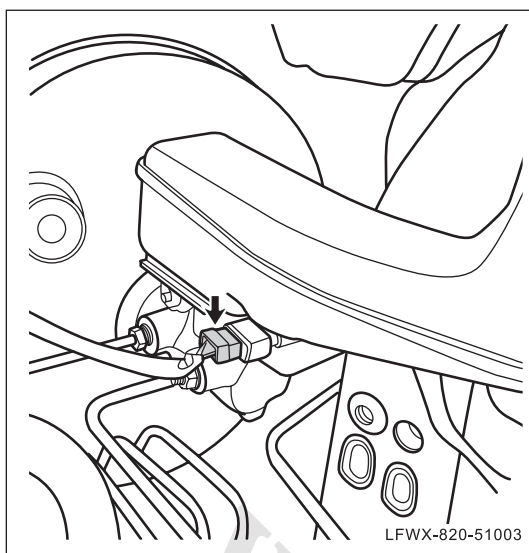
- (f) Install one-way valve ② onto the vacuum booster.
- (g) Install vacuum hose ② and elastic clip onto the one-way valve.



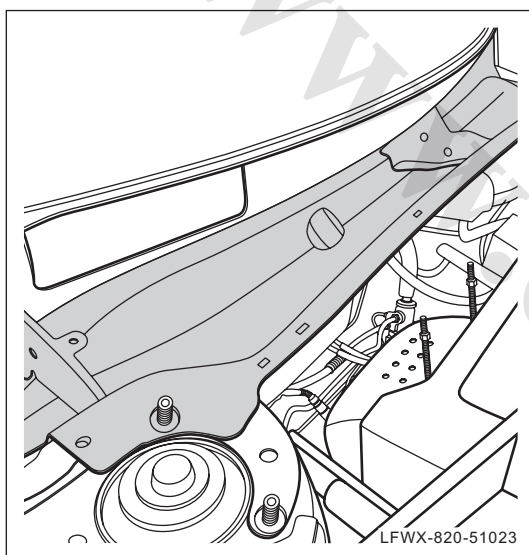
- (h) Install oil inlet pipe and clip of clutch master cylinder onto the brake master cylinder, and tighten the clip.



- (i) Install the oil outlet pipe ① of the first chamber of brake master cylinder onto the brake master cylinder by using an oil pipe wrench.
- (j) Install the oil outlet pipe ② of the second chamber of brake master cylinder onto the brake master cylinder by using an oil pipe wrench.



- (k) Connect the wire harness connector of the brake fluid switch.



- (l) Install the mounting plate of windshield cover plate onto the mounting position, and install and tighten fixing bolt and nut.

Torque: 6~8(bolt); 82~89(nut)

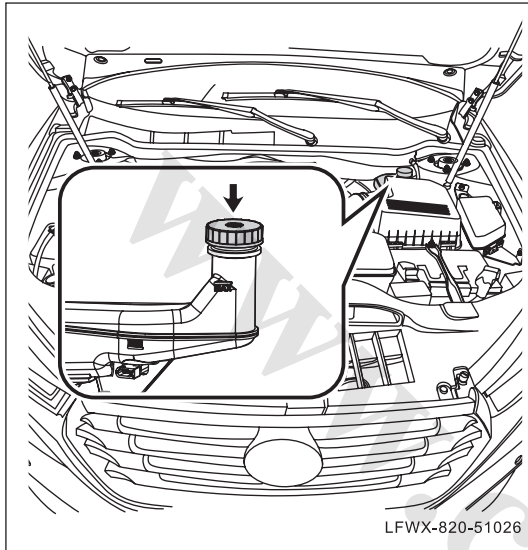
- (m) Install wiper link mechanism and motor assembly. (See 76 - Wiper Link Mechanism and Motor Assembly of Wiper and Washer System, Replacement)
- (n) Install air filter assembly (See 15 - Intake / exhaust system, Air filter, Replacement)
- (o) Fill brake fluid, and exhaust air from the brake system. (See 51 -Service Brake Fluid, Air Exhaust)

## Brake Fluid (Clutch Fluid)

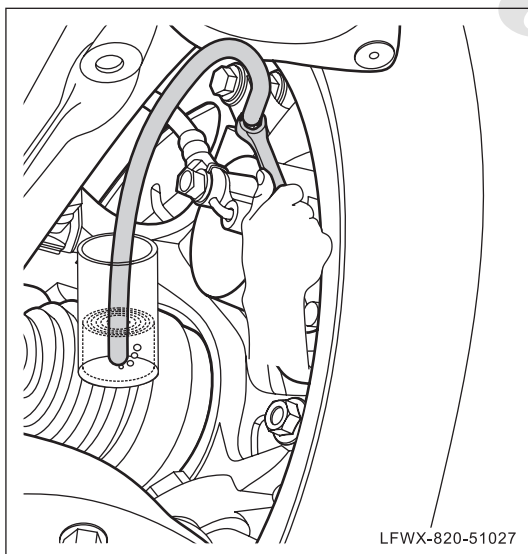
### Drain

#### 1. Drain brake fluid

- (a) Park the vehicle on a smooth road, switch the transmission to neutral position and enable the parking brake system.



- (b) Unscrew off the brake fluid filler cap.



- (c) Install a transparent plastic hose onto the bleed screw plug of brake, and insert the other end of the hose into the brake fluid container.
- (d) Unscrew the exhaust plug and depress the brake pedal continuously until there is no fluid to flow out.

**Note:**

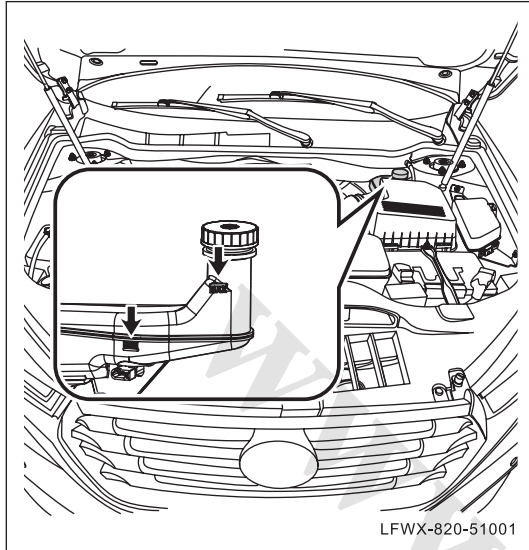
- This operation must be carried out for each brake, to ensure that the brake fluid can be drained fully out.
- The drained brake fluid can't be reused.

- (e) Install the brake fluid filler cap.

## Filling

### 1. Refill brake fluid

(a) Unscrew off the brake fluid filler cap.



(b) Fill brake fluid into the brake fluid reservoir and observe the height of fluid reservoir level to make sure that the brake fluid level is between "MAX" and "MIN" scales.

Specification: DOT4

Filling amount: 0.6L~0.75L.

#### ⓘ Note:

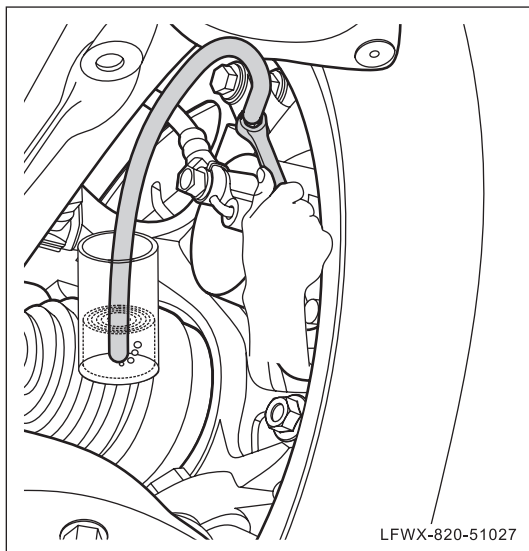
- **Never mix use brake fluid of different models.**
- **After filling brake fluid, be sure to exhaust air from the brake system.**
- **Brake fluid is rather corrosive, rinse immediately with plenty of clean water if fluid spills onto your skin or the vehicle body paint.**

(c) Install the brake fluid filler cap.

## Exhaust

### 1. Brake System Exhaust

(a) Lift the vehicle



(b) Install a transparent plastic hose onto the bleed screw plug of brake, and insert the other end of the hose into a container with clean brake fluid.

(c) Depress the brake pedal several times, and then keep depressing it; loosen the exhaust bolt.

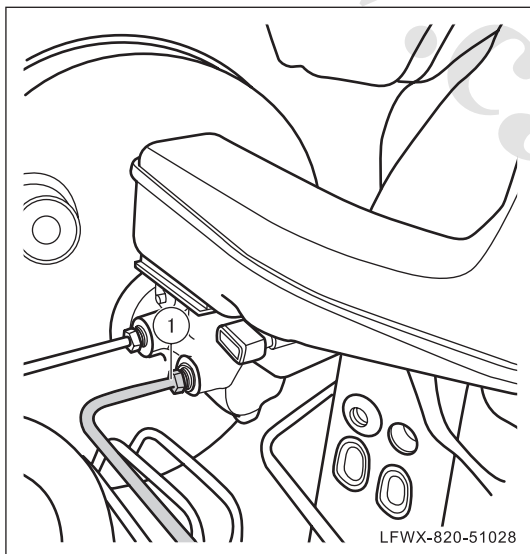
(d) When no more bubble comes out from the brake fluid container, loosen the exhaust bolt and release the brake pedal.

(e) Repeat steps (c) and (d) until there is no bubble come out from the container.

- (f) Repeat above steps, and exhaust air from brake system in sequence of rear right - rear left - front right - front left wheel.

**Note:**

- If air enters into the brake system when repairing or replacing brake parts, fully carry out all above steps to exhaust air.
- If air enters into the brake system due to lower fluid level or disconnection of pipe of brake master cylinder, air in all hydraulic system of brakes must be fully exhausted.
- If a pipe for some brake is disconnected, only exhaust air from the hydraulic system of this brake.
- If any brake pipeline connector between the master cylinder and the brake is disconnected, just exhaust air from the disconnected pipeline or the brake system related to the hose.
- During air exhausting, inspect whether brake fluid level in tank is lower than "MIN" scale. If yes, fill brake fluid.
- If air enters into the brake master cylinder, first exhaust air from it.



**2. Exhaust air from the brake master cylinder**

- (a) Unscrew oil outlet pipe ① of second chamber of brake master cylinder by using an oil pipe wrench. Place a piece of cloth under the oil pipe, and step the pedal until all air is exhausted completely.
- (b) Tighten oil outlet pipe ① of second chamber of brake master cylinder by using an oil pipe wrench

## Front Brake Pad

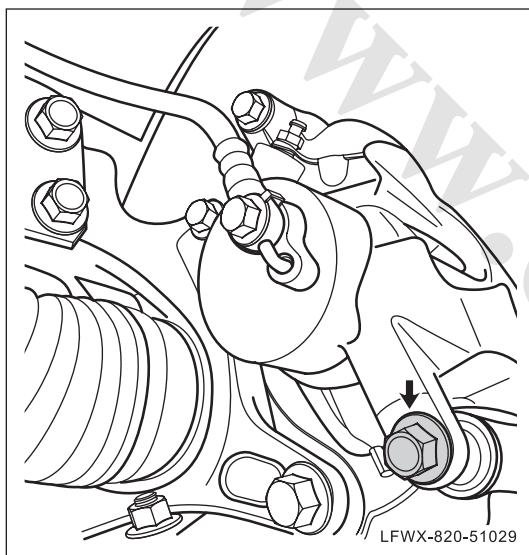
### Replacement

#### ⓘ Note:

- When replacing brake pad, replace brake pads of left and front right brakes at the same time.
- If you want to continue brake pad without replacement, please make assembly marks on it for subsequent installation when dismantling it. Otherwise, the brake effect is not desirable.

#### 1. Remove front brake pad

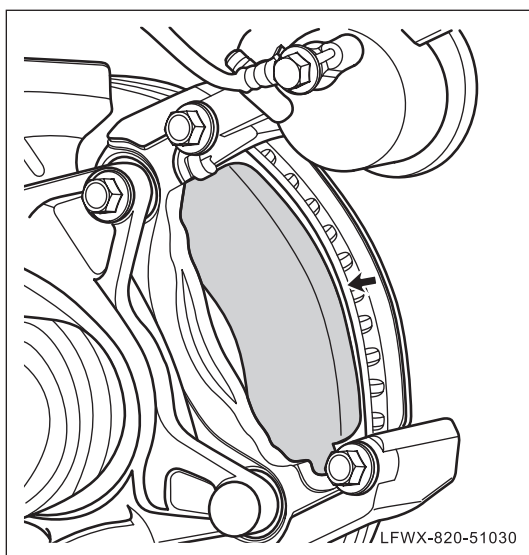
- (a) Remove front wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



- (b) Remove fixing bolt at the bottom of front brake caliper.

#### △ HINT:

When dismantling it, please use an open-end wrench to fix the sliding jacket.



- (c) Turn up the front caliper to take out brake pad.



## 2. Install front brake pad

- (a) Install brake pad onto mounting position.
- (b) Turn front brake caliper to make the mounting hole of front brake caliper align with the mounting hole on the bracket, and install and tighten bolt.

Torque: 30N•m - 36N•m

- (c) Install the front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (d) Step the brake pedal with hard force for more than two times, and inspect brake fluid level. If necessary, fill brake fluid.

## 3. Inspection

- (a) Make a road test to inspect whether brake system has good performance.

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## Rear Brake Pad

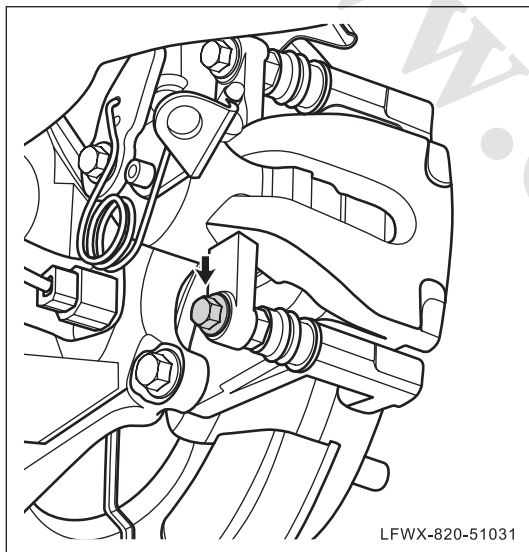
### Replacement

#### ⓘ Note:

- When replacing brake pad, replace brake pads of left and front right brakes at the same time.
- If you want to continue brake pad without replacement, please make assembly marks on it for subsequent installation when dismantling it. Otherwise, the brake effect is not desirable.

#### 1. Remove rear brake pad

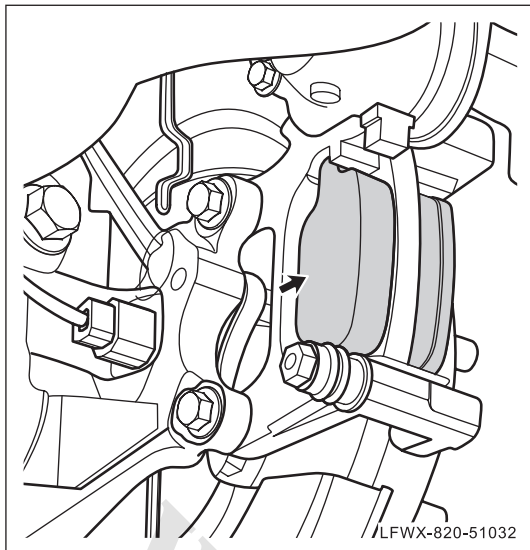
- (a). Remove the rear wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (b). Take down the parking brake cable from the rear brake. (see 52 - Parking Brake, Parking Brake Cable, Replacement)



- (c). Remove fixing bolt of rear brake caliper.

#### △ HINT:

When dismantling it, please use an open-end wrench to fix the sliding jacket.



- (d) Turn up rear brake caliper and take out brake pad.

## 2. Install rear brake pad

- (a) Install brake pad onto mounting position.
- (b) Turn rear brake caliper to make the mounting hole of rear brake caliper align with the mounting hole on the bracket, and install and tighten bolt.

Torque: 30N•m - 36N•m

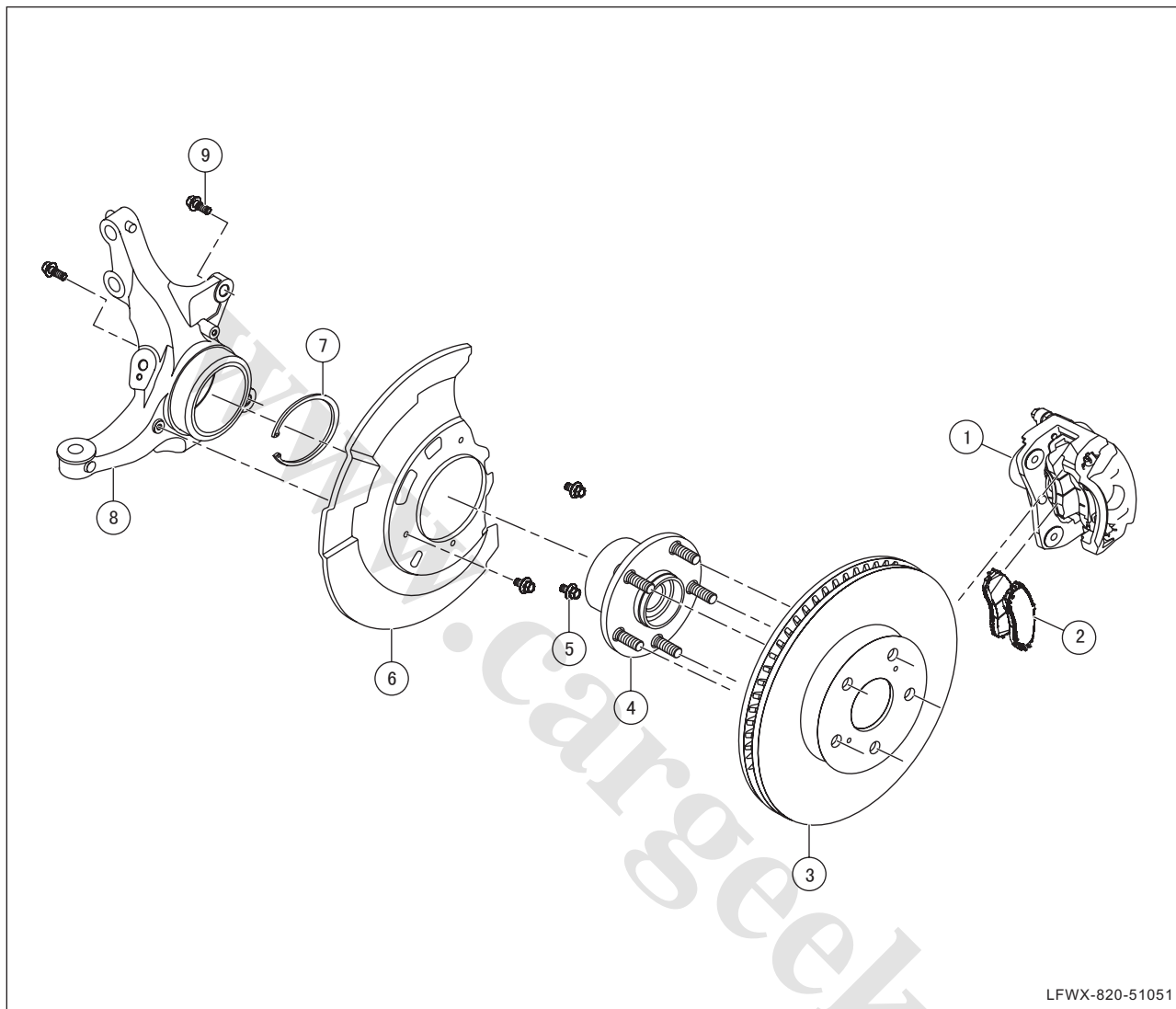
- (c) Install parking brake cable onto the rear brake. (see 52 - Parking Brake, Parking Brake Cable, Replacement)
- (d) Install rear wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (e) Depress the brake pedal with hard force for more than two times, and inspect brake fluid level. If necessary, fill brake fluid.

## 3. Inspection

- (a) Make a road test to inspect whether brake system has good performance.

# Front Brake

## Components



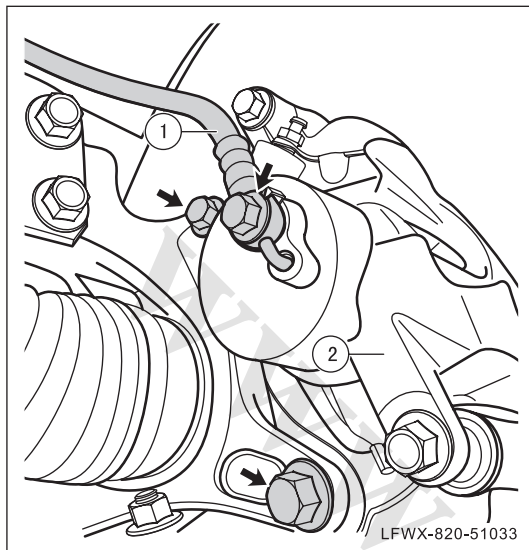
1	Brake caliper
2	Brake pad
3	Brake disc
4	Wheel hub components
5	Bolt

6	Dustproof plate of brake
7	Snap ring of bearing
8	Steering knuckle
9	Bolt

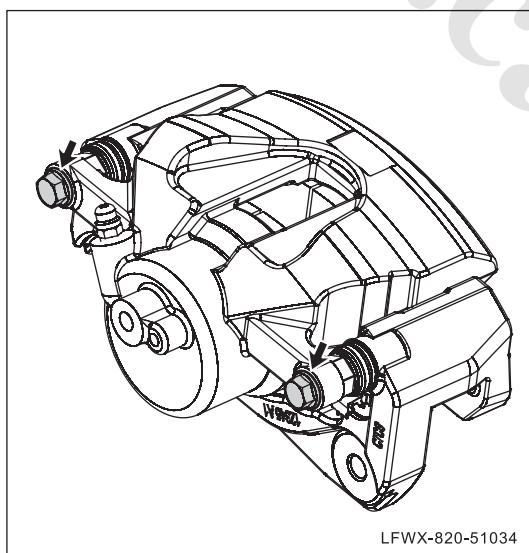
## Replacement

### 1. Remove the front brake caliper

- (a). Discharge brake fluid. (See 51 - Service Brake, Brake Fluid, Drainage)
- (b). Remove front wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



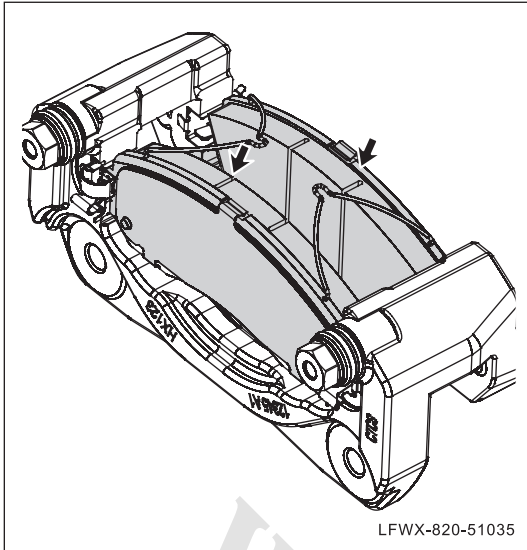
- (c). Remove the hollow bolt of brake hose ① and remove sealing ring.
- (d). Remove fixing bolt of front brake caliper with bracket assembly ② and remove front brake caliper with bracket assembly ②.



- (e). Remove the fixing bolts of the front brake caliper, and take off the front brake caliper.

△ HINT:

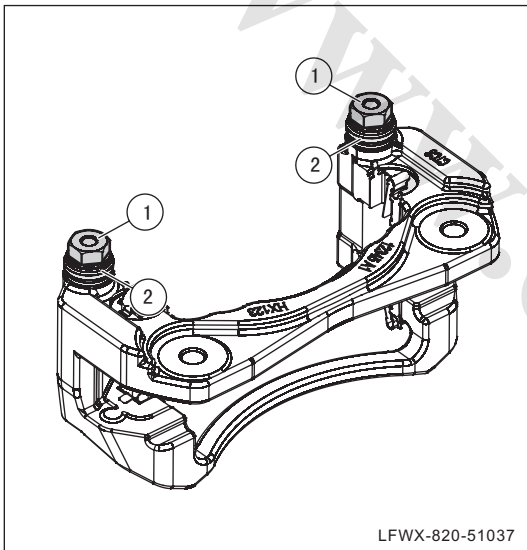
When dismantling, fix the sliding pin of front brake caliper by using a wrench, to facilitate fixing bolt of brake caliper.



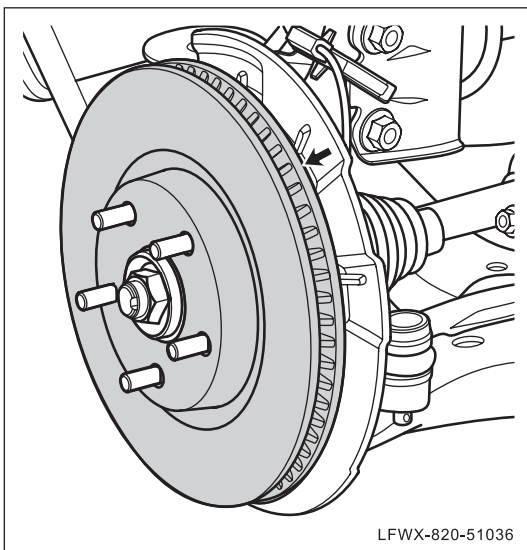
- (f) Remove brake pad from brake caliper bracket.

△ HINT:

- If you want to continue brake pad without replacement, please make assembly marks on it for subsequent installation when dismantling it. Otherwise, the brake effect is not desirable.
- Measure the thickness of brake pad. If the measured value exceeds the limit abrasion value, replace it.



- (g). Take out the sliding pin ① from the front brake caliper bracket.
- (h). Remove the sliding pin dust cover ② from the front brake caliper bracket.



**2. Remove the front brake disc**

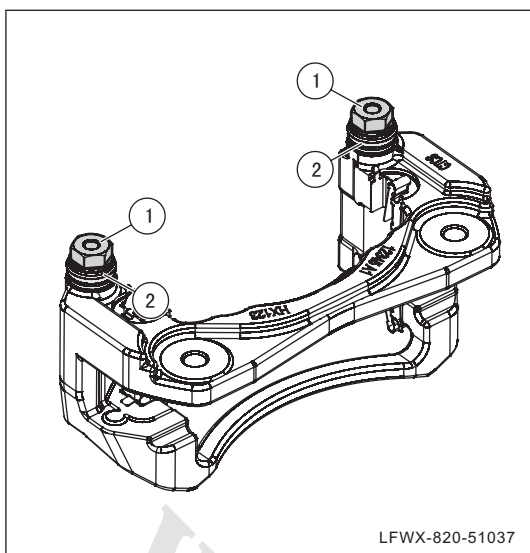
- (a) Remove front brake disc from front wheel hub.

**3. Install front brake disc**

- (a) Install the front brake disc onto the front wheel hub.

**ⓘ Note:**

**No oil dirt is allowed to stay on the contact surface between the brake disc and friction plate. If has, be sure to clean it off.**



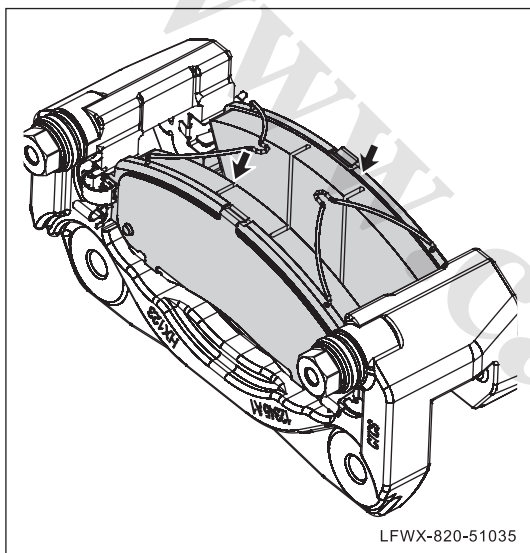
#### 4. Mount the front brake calipers

- (a) Install dustproof sleeve ② of sliding pin onto the bracket of front brake caliper.

△ HINT:

Before installing, apply a layer of grease onto the dust cover of sliding pin.

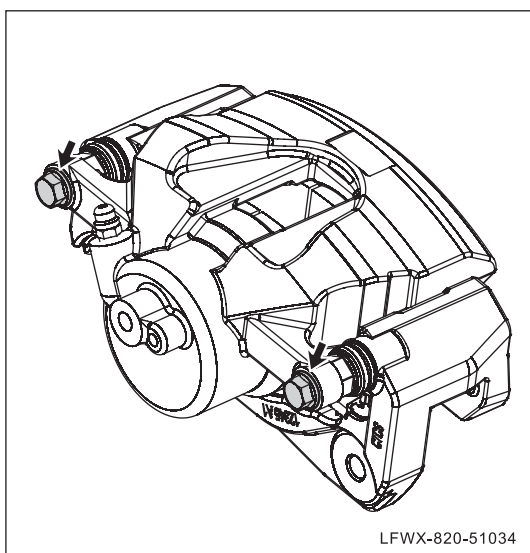
- (b) Install sliding pin ① of front brake onto the bracket of front brake caliper.



- (c) Install brake pad onto mounting position on both sides of the bracket of brake caliper according to the mark made during dismantling.

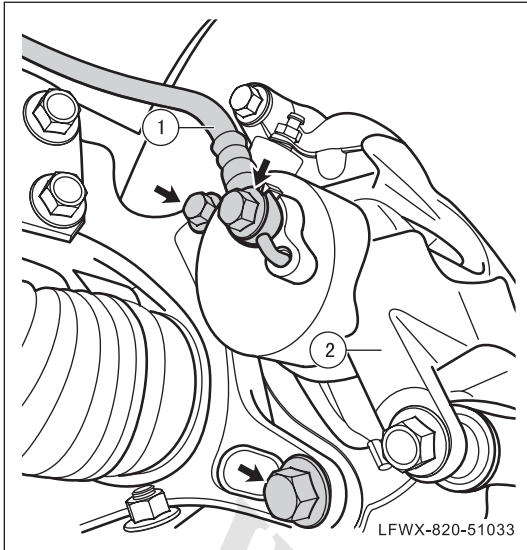
△ HINT:

If brake piston stretches out during repairing, install it onto mounting position by brake piston reset tool.



- (d) Install front brake caliper onto the bracket of brake caliper, and install and tighten fixing bolt.

Torque: 30N•m - 36N•m



- (e) Install front brake caliper with bracket assembly ② onto the steering knuckle, and install and tighten fixing bolt.

Torque: 80N•m - 100N•m

- (f) Install front brake hose ① onto front brake, and install and tighten hollow bolt and sealing ring.

Torque: 35N•m~40N•m

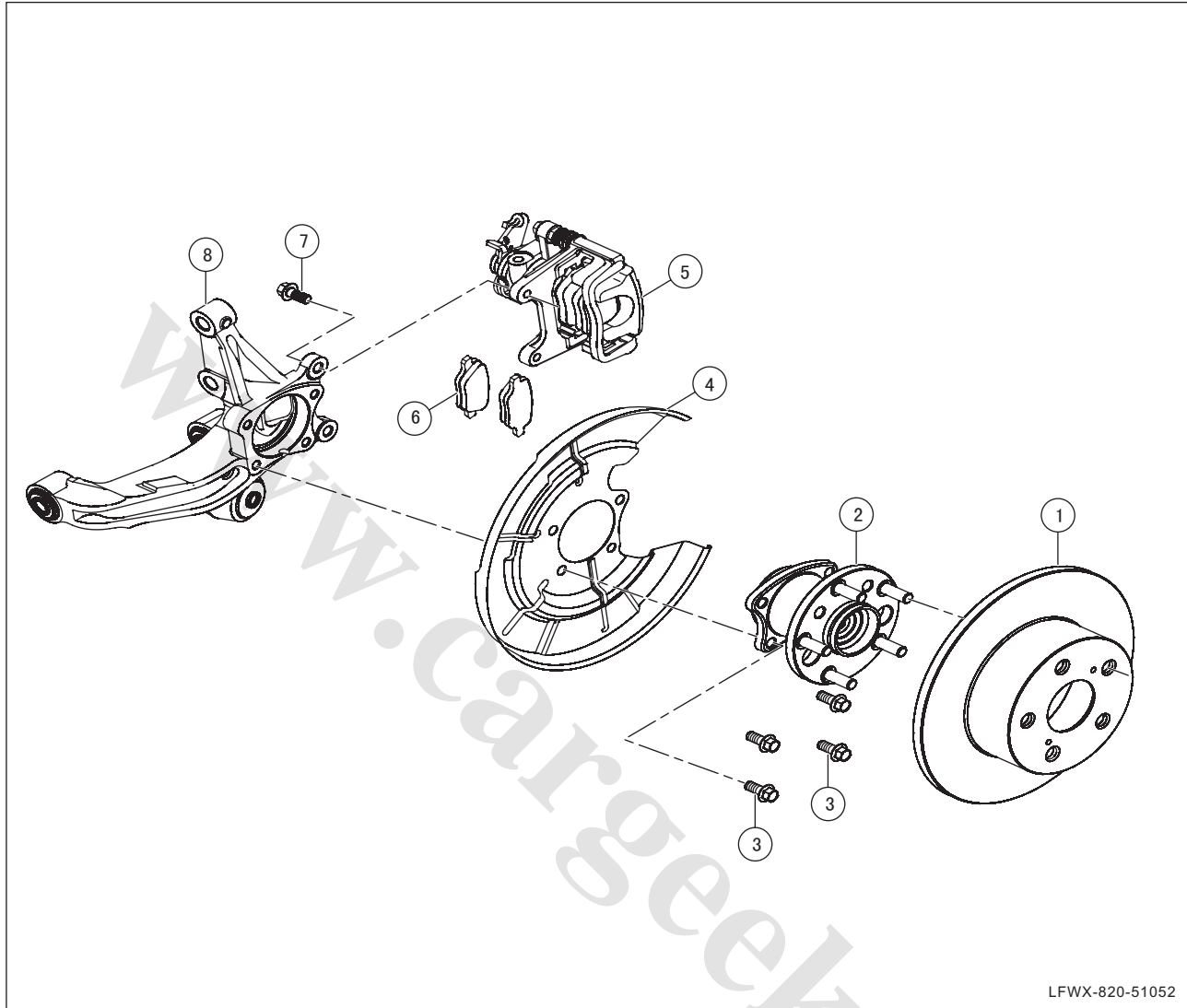
- (g) Install the front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)  
(h) Fill brake fluid, and exhaust air from the brake system.

## 5. Inspection

- (a) Make a road test to inspect whether brake system has good performance.

## Rear Brake

### Components



1	Brake disc
2	Wheel hub components
3	Bolt
4	Dustproof plate of brake

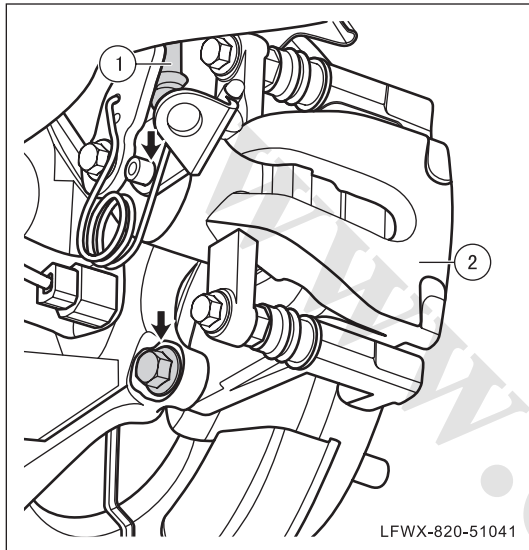
5	Brake caliper
6	Brake pad
7	Bolt
8	Steering knuckle



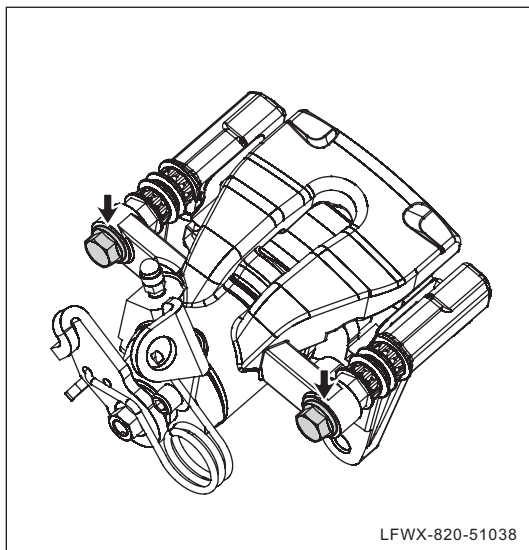
## Overhaul

### 1. Remove rear caliper

- (a). Discharge brake fluid. (See 51 - Service Brake, Brake Fluid, Drainage)
- (b). Remove the rear wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (c). Take down the parking brake cable from the rear brake. (see 52 - Parking Brake, Parking Brake Cable, Replacement)



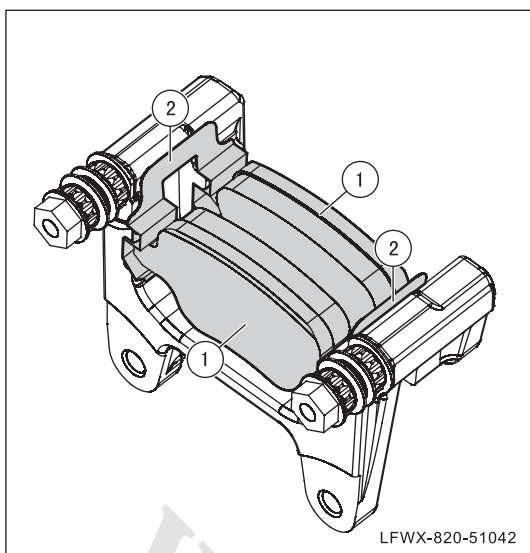
- (d). Remove the hollow bolt of rear brake hose ① and remove sealing ring.
- (e). Remove fixing bolt of rear brake caliper with bracket assembly ② and remove rear brake caliper with bracket assembly ② .



- (f). Remove fixing bolt of rear brake caliper and remove rear brake caliper.

△ HINT:

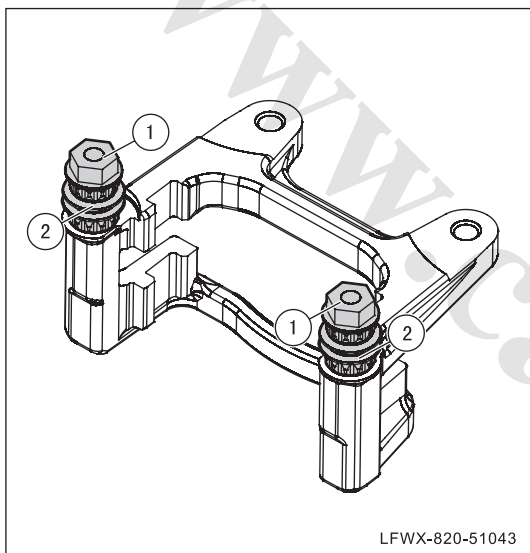
When dismantling, fix the sliding pin of rear brake caliper by using a wrench, to facilitate fixing bolt of brake caliper.



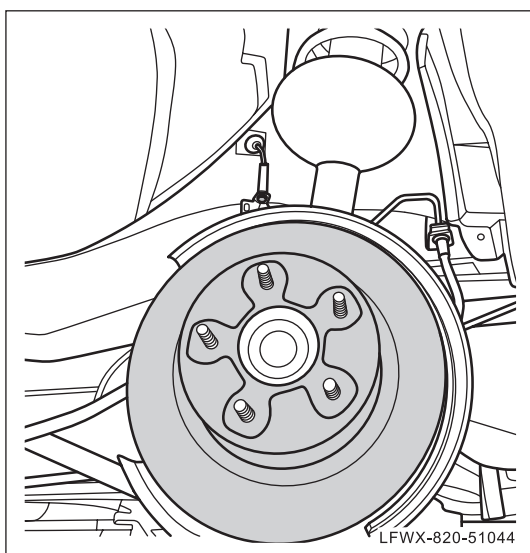
- (g) Remove brake pad ① and two clamp holder blocks ② from brake caliper bracket.

△ HINT:

- If you want to continue brake pad without replacement, please make assembly marks on it for subsequent installation when dismantling it. Otherwise, the brake effect is not desirable.
- Measure the thickness of brake pad. If the measured value exceeds the limit abrasion value, replace it.

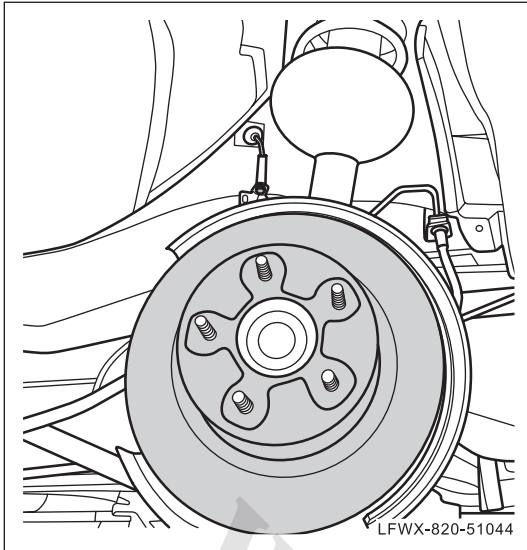


- (h). Take out the sliding pin from the brake caliper bracket.
- (i) Remove dust cover ② of sliding pin from the rear brake caliper bracket.



## 2. Remove the rear brake disc

- (a) Remove rear brake disc from rear wheel hub.

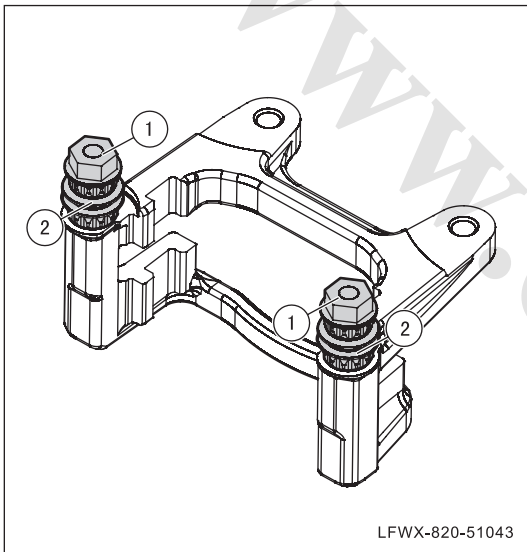


### 3. Install rear brake disc.

- (a) Install the rear brake disc onto the rear wheel hub.

**Note:**

No oil dirt is allowed to stay on the contact surface between the brake disc and friction plate. If has, be sure to clean it off.



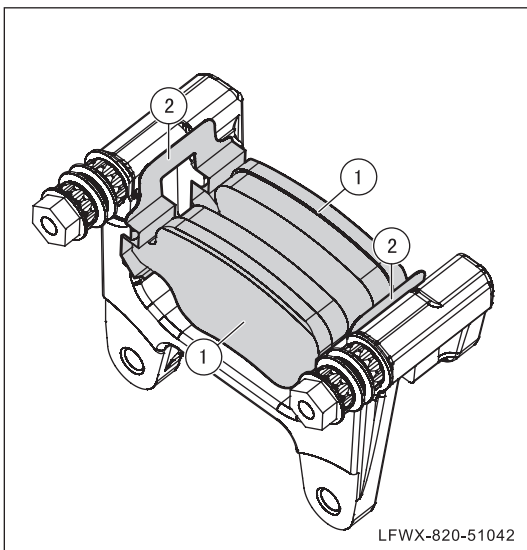
### 4. Install rear caliper.

- (a) Install dust cover ② of sliding pin onto the bracket of rear brake caliper.

△ HINT:

Before installing, apply a layer of grease onto the dust cover of sliding pin.

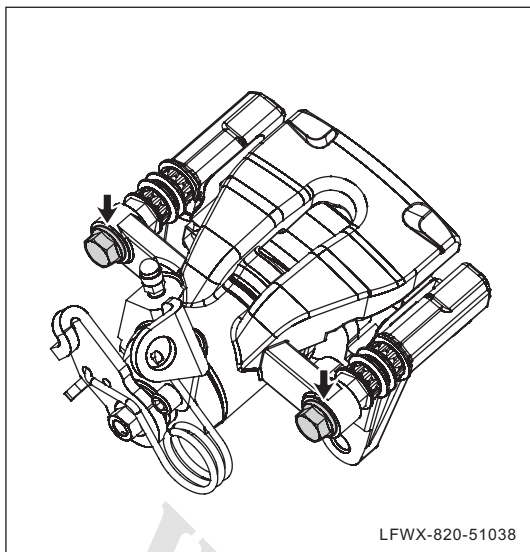
- (b) Install sliding pin ① of rear brake caliper onto the rear brake caliper bracket.



- (c) Install brake pad ① and two clamp holder blocks ② onto mounting position according to marks made during dismantling.

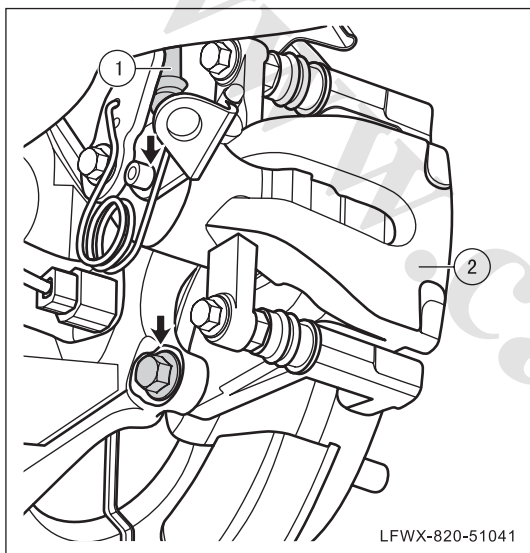
△ HINT:

If brake piston stretches out during repairing, install it onto mounting position by brake piston reset tool.



- (d) Install rear brake caliper onto the brake caliper bracket, and install and tighten fixing bolt.

Torque: 30N•m - 36N•m



- (e) Install rear brake caliper with bracket assembly ② onto steering knuckle, and install and tighten fixing bolt.

Torque: 80N•m - 100N•m

- (f) Install rear brake hose ① onto rear brake, and install and tighten hollow bolt and sealing ring.

Torque: 35N•m - 45N•m

- (g) Install rear wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

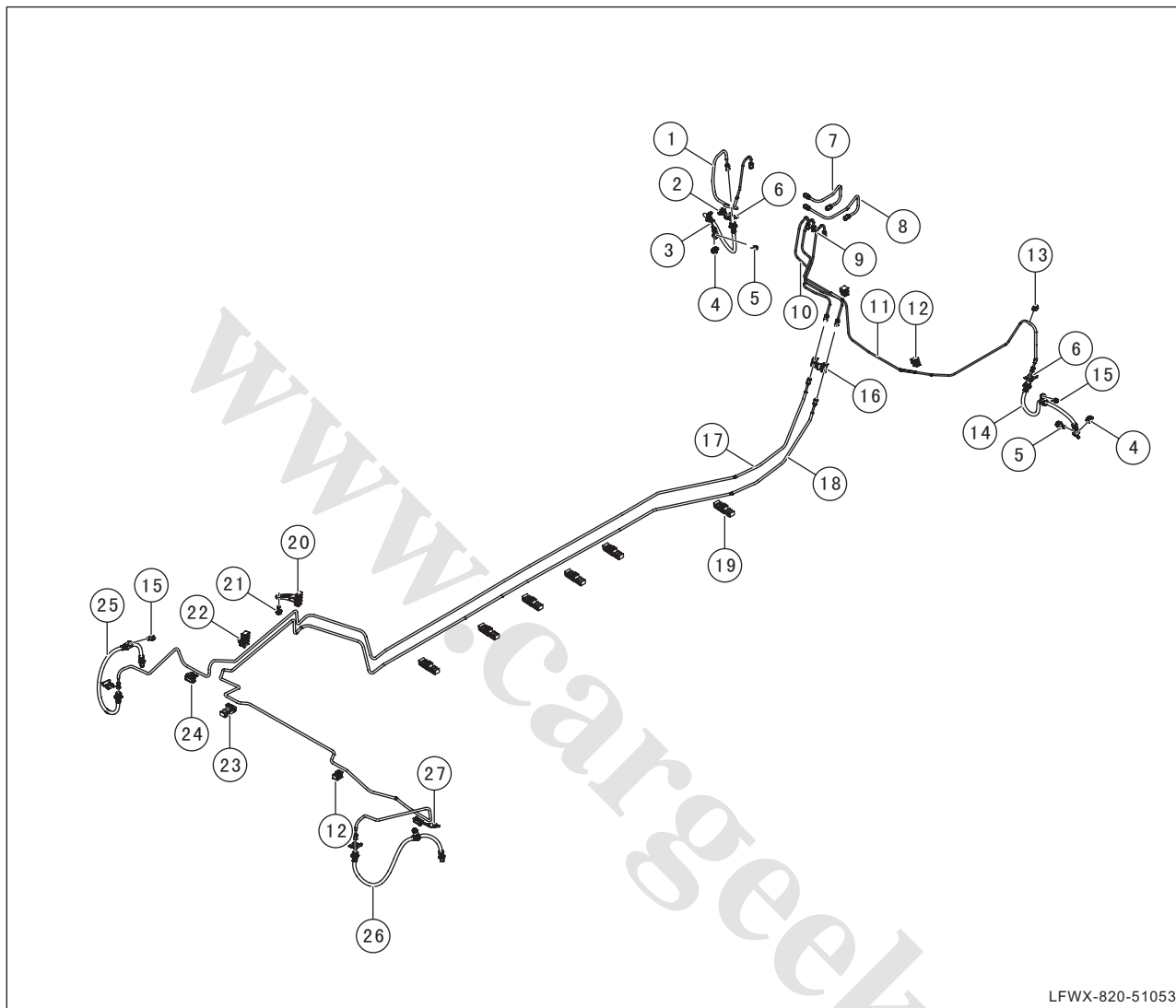
- (h) Fill brake fluid, and exhaust air from the brake system.

## 5. Inspection

- (a) Make a road test to inspect whether brake system has good performance.

# Braking Pipeline

## Component (I)

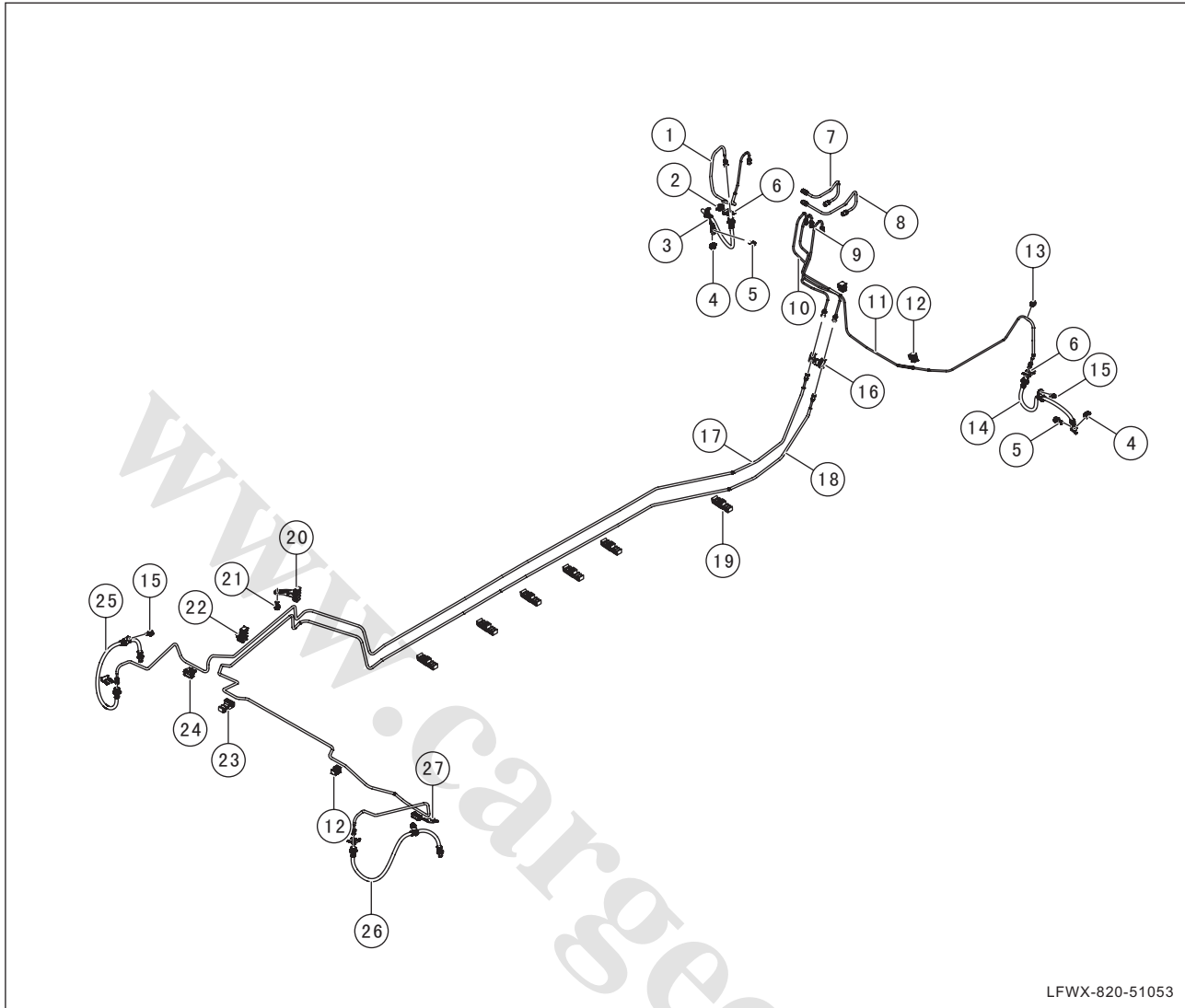


LFWX-820-51053

1	Front left brake pipe
2	Single clamp
3	Front left brake hose
4	Washer
5	Oil pipe bolt
6	E-shaped card
7	Oil outlet pipe of the second chamber of master cylinder
8	Oil outlet pipe of the first chamber of master cylinder
9	Rear right brake pipe I
10	Rear left brake pipe I
11	Brake pipe, right front

12	Single clamp
13	Rubber ring
14	Front right brake hose
15	Bolt
16	Two-way valve components
17	Rear left brake hard pipe II
18	Rear right brake hard pipe II
19	Five-hole pipe clip
20	Four-hole pipe clip
21	Bolt
22	Four-hole pipe clip

## Component (II)



LFWX-820-51053

23	Three clamp
24	Single clamp
25	Rear left brake hose

26	Rear right brake hose
27	Single clamp

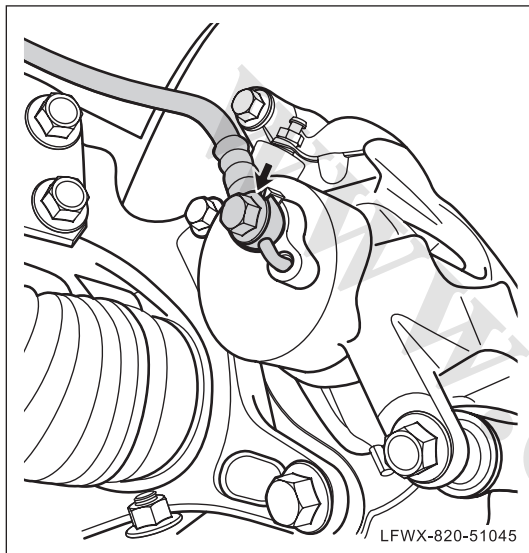
## Replacement

△ HINT:

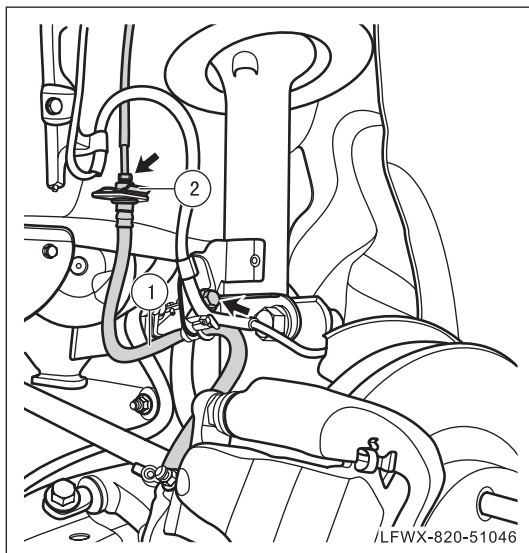
Replacement of pipes of brake system is basically the same. This section will only introduce the replacement of front brake oil pipe as an example.

### 1. Remove the front brake hose

- (a). Discharge brake fluid. (See 51 - Service Brake, Brake Fluid, Drainage)
- (b) Remove front wheels. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



- (c) Remove hollow bolt of front brake hose and remove sealing ring.



- (d) Remove fixing bolt of bracket ① of front brake hose.
- (e) Remove joint nut of front brake hose ①, unplug E-clip ②, and remove front brake hose ①.

## 2. Install front brake hose

- (a) Make the front brake hose go through the fixing bracket of body, and install E-clip of hose onto mounting position.
- (b) Tighten joint nut of front brake hose by using an oil pipe wrench.
- (c) Install and tighten fixing bolt of bracket of front brake hose.

Torque: 20N•m - 26N•m

- (d) Install front brake hose onto front brake, install and tighten hollow bolt and sealing ring.

Torque: 35N•m - 45N•m

- (e) Install the front wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)
- (f) Fill brake fluid, and exhaust air from the brake system.

## 3. Inspection

- (a) Make a road test to inspect whether brake system has good performance.

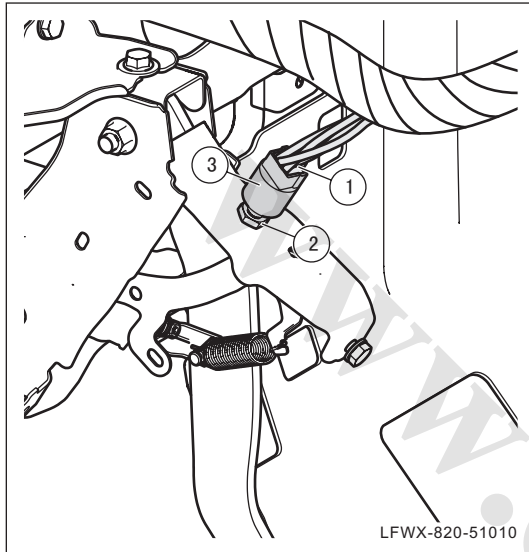


## Brake Switch

### Replacement

#### 1. Remove brake switch

- (a) Remove left lower panel of dashboard. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)



- (b). Disconnect wire harness connector ① from brake pedal switch.
- (c) Unscrew the brake pedal switch locking nut ② .
- (d). Remove the brake pedal switch ③ .

#### 2. Install brake switch

- (a) Install brake pedal switch onto mounting position.
- (b). Tighten the brake pedal switch lock nut.  
Torque: 20N•m - 26N•m
- (c) Connect wire harness connector of brake pedal switch.
- (d) Adjust the clearance of brake switch. (See 51 - Service Brake, Brake Pedal, Adjustment)
- (e) Install dashboard left lower panel. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)



## Brake Fluid Level Switch

### Replacement

△ HINT:

Brake fluid switch are designed together with brake fluid tank. For replacement, refer to the brake master pump. (see 51 - Service Brake, Brake Master Cylinder, Replacement)

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## 52-Parking Brake

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# Parking Brake

## System description

### 1. Function

Parking brake system allows the vehicle parking safely in a place for a long time and makes it convenient for the driver to start the vehicle on the ramp. If the service brake system in driving fails, the parking brake can be used for emergency brake.

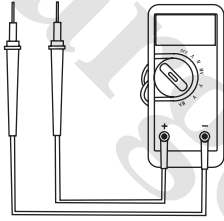
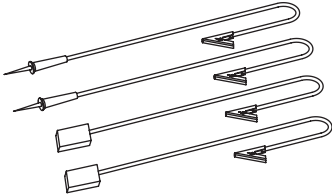
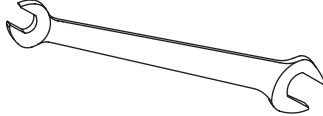
### 2. Components

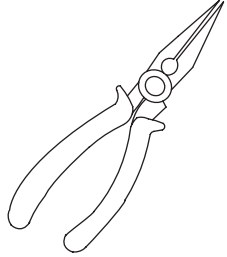
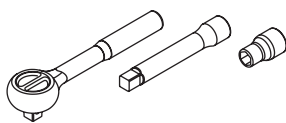
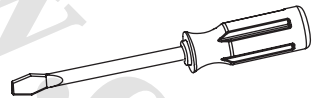
Parking brake system consists of parking brake mechanism, parking brake cable and brake, etc.

### 3. Principle

In the use of the parking brake, pull parking brake mechanism to drive the parking brake cable so as to make the brake have the effect of parking brake.

## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Wiring set		Testing circuits
3	Open-end wrench		Adjust parking brake cable

S/N	Tools	Outline diagram	Description
4	Nipper plier		Remove E-clip of parking brake cable
5	Fast wrench and sleeve subassembly		Used for removing and installing the fixing bolts
6	Screwdriver		Remove the fixing screws

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolt of parking brake control mechanism	6~12
Fixing bolt of parking brake cable	6~12

## Precautions

### 1. Precautions before repair

- (a) Inspect and adjust parking brake under normal brake condition.
- (b) Before checking the parking brake system, stop the vehicle on level ground and secure the wheels with triangle wood blocks.

### 2. Precautions for maintenance

- (a) Be careful to replace any part. Use of incorrect part could affect the parking brake performance and cause danger.

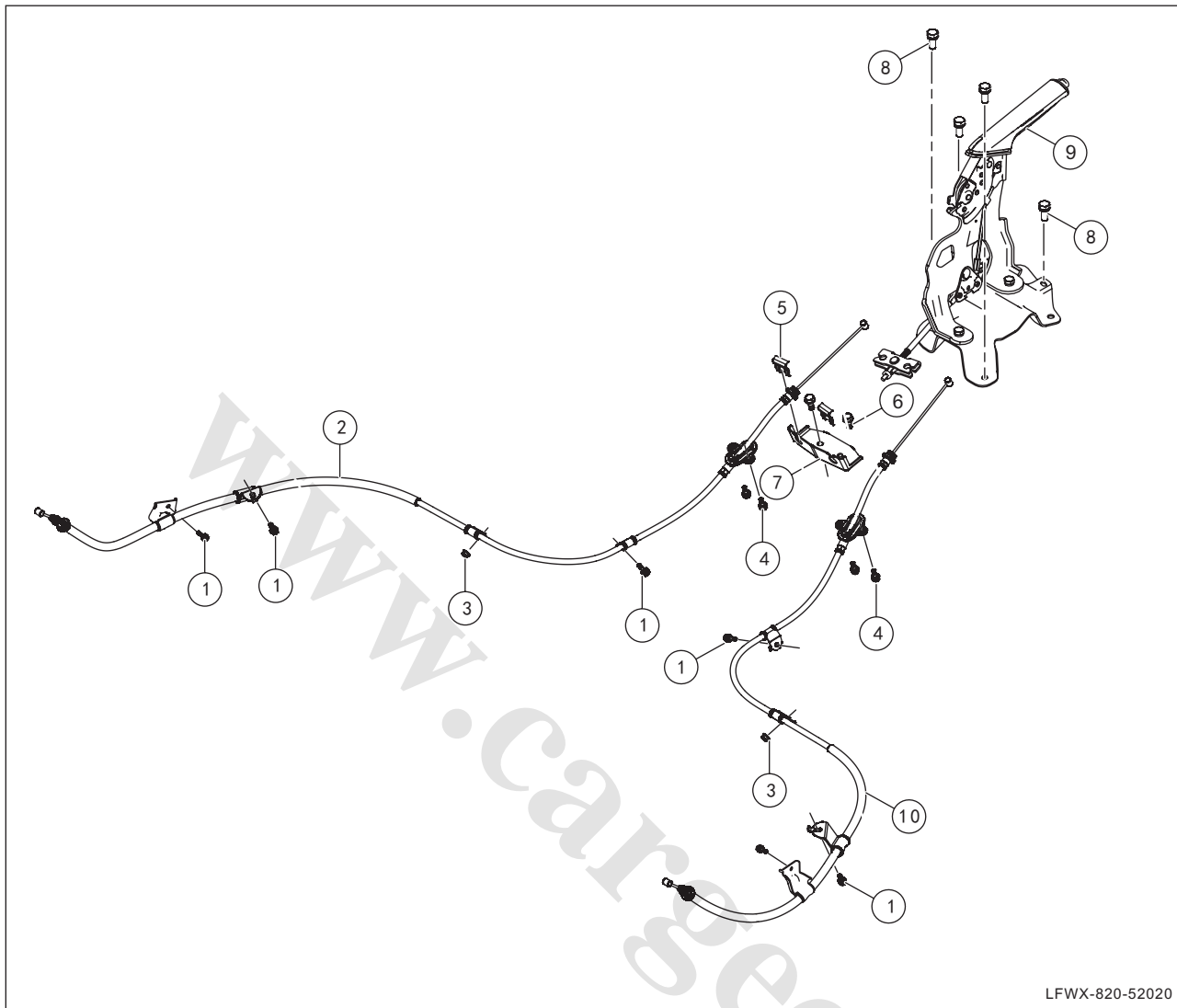
- (b) Removed snap-fit and cable tie should not be used again.
- (c) Be sure to have the parking brake performance tested after the parking brake system maintained and ensure it functions safely and reliably.

### 3. Other precautions

- (a) The parking brake cannot replace service brake and it can be used to decelerate only in case of emergency in driving.
- (b) Parking brake cable has plastic jacket, therefore, it is unnecessary to carry out regular lubrication.
- (c) Check it regularly; once each 10,000km.
  - Check the function of the parking brake.
  - Check the travel of the parking brake lever.
  - Check the connections for looseness.
  - Check that the parking brake system operates normally.



## Components



LFWX-820-52020

1	Bolt
2	Rear left parking brake cable
3	Nut
4	Bolt
5	E-shaped card

6	Bolt
7	Bracket of parking brake cable
8	Bolt
9	Parking brake control mechanism
10	Rear right parking brake cable

## General Check

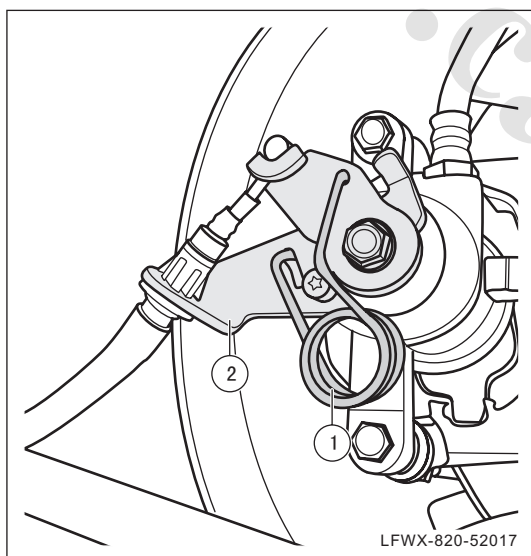
### Check the system

#### 1. Check system components

- (a). Check system for obvious mechanical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.
- (d). Check whether parking brake cable is loose, damaged or sticking. If yes, replace it.

#### 2. Check parking brake indicator lamp switch

- (a) Check whether parking brake indicator lamp switch works normally. If no, overhaul it.
  - When pulling up the parking brake mechanism, and the parking brake indicator should illuminate.
  - When lowering the parking brake mechanism, the parking brake indicator should go out.



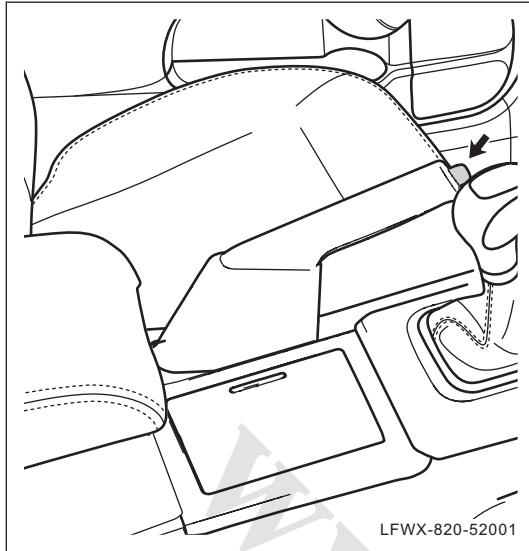
#### 3. Check the parking brake return spring

- (a) Check whether return spring ① of parking brake is ineffective. If yes, replace it.
- (b) Check whether the bracket ② of parking brake cable is loose or deformed. If yes, replace it.

#### 4. Check the working condition of system

- (a) With brake at normal condition, travel the car to a slope with grade of about 20%, step the brake pedal and pull up parking brake rod to stop the car on the slope.
- (b) Slowly rise up brake pedal, the car should not slide down within at least 5min. If the car slides down, it indicates that the parking brake has fault and should be inspected and repaired according to the following diagnosis step.

## Check parking brake control mechanism



### 1. Check the button of parking brake control mechanism

- (a) Check whether the button of parking brake control mechanism is flexible. If it can return, replace parking brake control mechanism.

### 2. Check the pawl of parking brake control mechanism.

- (a) Check whether the pawl of parking brake control mechanism is worn. If yes, replace parking brake control mechanism.

### 3. Check the stroke of parking brake lever

- (a) Pull up parking brake lever with 100N force to ensure that the dent is within the specified range.

**Standard value: 5-7 teeth**

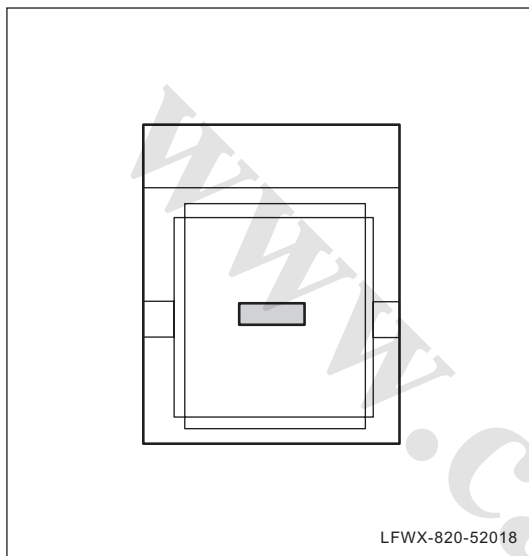
△ HINT:

Each time passing one tooth, you may hear "clatter" sound; you may listen and calculate times of clatter sound of dent for inspection.

## Check the parking brake switch

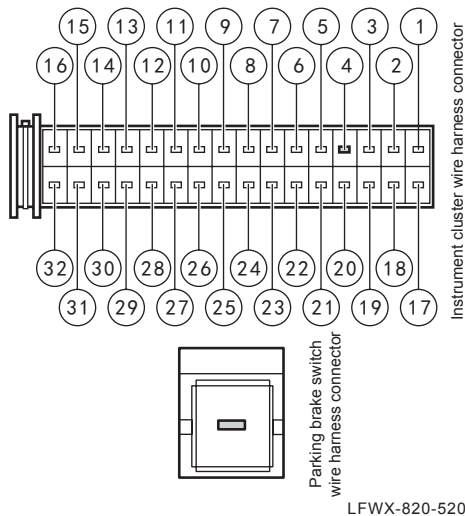
### 1. Check the working condition of parking brake switch

- (a) Check whether parking brake switch works normally. If no, replace it.
- When turning up parking brake control mechanism, parking brake switch should be turned on.
  - When turning down parking brake control mechanism, parking brake switch should be turned off.



### 2. Check signal cable of parking brake switch

- (a) Turn power supply to "LOCK" position, and disconnect wire harness connector of instrument cluster and wire harness connector of parking brake switch.
- (b) Use a digital multimeter resistance scale to measure whether the wire harness terminal of parking brake switch and body grounding are conducted. If yes, it indicates that there is short-circuit, and relevant wire harness should be inspected and repaired according to wiring diagram.
- (c) Use a digital multimeter resistance scale to measure whether the wire harness terminal of parking brake switch and wire harness connector No. 4 terminal of instrument cluster are conducted. If no, relevant wire harness should be inspected and repaired according to wiring diagram.



## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Parking brake doesn't work normally.	1. Parking brake lever (the stroke is incorrect)	See 52 - Parking Brake, Diagnosis, Fault Diagnosis (1. Parking brake performance is poor)
	2. Front section of cable (fault)	
	3. Park brake cable (loose, damage, sticking)	
	4. Parking brake cable bracket (deformed and loosened)	
	5. Parking brake return spring (aged and failed)	
	6. Rear brake pad (worn)	
	7. Rear brake caliper (stuck)	
Parking brake is dragged	1. Parking brake lever (stroke is too small)	See 52 - Parking Brake, Diagnosis, Fault Diagnosis (2. Parking brake is dragged)
	2. Park brake cable (loose, damage, sticking)	
	3. Parking brake cable bracket (deformed and loosened)	
	4. Parking brake return spring (aged and failed)	
	5. Rear brake pad (incorrectly installed)	
	6. Rear brake caliper (stuck)	
Parking brake indicator stays constantly bright	1. Parking brake switch (faulty)	See 52 - Parking Brake, Diagnosis, Fault Diagnosis (3. Parking brake indicator stays constantly bright)
	2. Wire harness (short circuit)	
	3. Instrument cluster (faulty)	
Under parking condition, power supply is located "ON" position; parking indicator lamp doesn't light up.	1. Instrument fuse (fusion)	See 52 - Parking Brake, Diagnosis, Fault Diagnosis (4. Under parking brake, power supply is located "ON" position; parking indicator lamp doesn't light up.)
	2. Wire harness (faulty)	
	3. Instrument cluster (damaged)	
	4. Parking brake switch (faulty)	

## Fault diagnosis

### 1. Parking brake performance is poor

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of parking brake (See 52 - General Check of Parking Brake, Check of System)	Diagnosis end.	Parking brake doesn't work normally.	Go to Step 1
1	Check the stroke of parking brake lever	Normal	Faulty	Instruction
	Check whether the travel of parking brake rod is normal (See 52 - General Check of Parking Brake, Check of Parking Brake Control Mechanism)	Go to Step 2	The stroke is incorrect	Adjustment (See - 52 Parking Brake Control Mechanism for Parking Brake, Adjustment)
2	Check parking brake cable	Normal	Faulty	Instruction
	Check the working condition of parking brake cable (See 52 - General Check of Parking Brake, Check of System)	Go to Step 3	The cable is loosened, damaged or stuck	Replacement (see 52 - Parking Brake, Parking Brake Cable, Replacement)
3	Check the front section of parking brake cable	Normal	Faulty	Instruction
	Check the working condition of front section of parking brake cable (See 52 - General Check of Parking Brake, Check of System)	Go to Step 4	The cable is loosened or ruptured	Replacement (see 52 - Parking Brake, Parking Brake Cable, Replacement)
4	Check parking brake return spring and cable bracket	Normal	Faulty	Instruction
	Check the working condition of return spring of parking brake and cable brake (See 52 - General Check of Parking Brake, Check of System)	Go to Step 5	<ul style="list-style-type: none"> <li>Return spring fails</li> <li>The cable bracket is loosened and deformed</li> </ul>	<ul style="list-style-type: none"> <li>Replace (See 52 - Return Spring of Parking Brake, Replacement)</li> <li>Correct cable bracket. If necessary, replace rear brake caliper assembly.</li> </ul> <p>Hint: The unit comes with integral cable bracket and rear brake</p>
5	Check rear brake pad	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the abrasion condition of rear brake pad (See 51 - General Check of Parking Brake, Check of Brake Pad and Brake Disc)	Go to Step 6	Brake pad is worn seriously.	Replace (See 51 - Parking Brake, Rear Brake Pad, Replacement)
6	Check the rear brake caliper	Normal	Faulty	Instruction
	Check the working condition of rear caliper (see 51 - Service Brake, Front Brake, Overhaul) Hint: Overhauling methods of rear brake caliper are the same as those of front brake.	Go to Step 7	The brake piston in the brake caliper is stuck	Replace (See 51 - Rear Brake Pad for Parking Brake, Replacement)
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Parking brake is dragged

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of parking brake (See 52 - General Check of Parking Brake, Check of System)	Diagnosis end.	Parking brake is dragged	Go to Step 1
1	Check the stroke of parking brake lever	Normal	Faulty	Instruction
	Check whether the travel of parking brake rod is normal (See 52 - General Check of Parking Brake, Check of Parking Brake Control Mechanism)	Go to Step 2	The stroke is too small	Adjustment (See - 52 Parking Brake Control Mechanism for Parking Brake, Adjustment)
2	Check parking brake cable	Normal	Faulty	Instruction
	Check the working condition of parking brake cable (See 52 - General Check of Parking Brake, Check of System)	Go to Step 3	The cable is loosened, damaged or stuck	Replacement (see 52 - Parking Brake, Parking Brake Cable, Replacement)
3	Check parking brake return spring and cable bracket	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of return spring of parking brake and cable brake (See 52 - General Check of Parking Brake, Check of System)	Go to Step 4	<ul style="list-style-type: none"> <li>Return spring fails</li> <li>The cable bracket is loosened and deformed</li> </ul>	<ul style="list-style-type: none"> <li>Replace (See 52 - Return Spring of Parking Brake, Replacement)</li> <li>Correct cable bracket. If necessary, replace rear brake caliper assembly.</li> </ul> <p>Hint: The unit comes with integral cable bracket and rear brake</p>
4	Check rear brake pad	Normal	Faulty	Instruction
	Check the installation condition of rear brake pad (See 51 - General Check of Parking Brake, Inspection of Brake Pad and Brake Disc)	Go to Step 5	Brake pad is installed incorrectly.	Re-installation (See 51 - Parking Brake, Rear Brake Pad, Replacement)
5	Check the rear brake caliper	Normal	Faulty	Instruction
	Check the working condition of rear caliper (see 51 - Service Brake, Front Brake, Overhaul) Hint: Overhauling methods of rear brake caliper are the same as those of front brake.	Go to Step 6	The brake piston in the brake caliper is stuck	Replacement (See 51 - Parking Brake, Rear Brake Pad, Replacement)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Parking brake indicator stays constantly bright

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Release parking brake, and inspect parking indicator lamp.	Diagnosis end.	Parking brake indicator stays constantly bright	Go to Step 1



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check the parking brake switch	Normal	Faulty	Instruction
	Check the working condition of parking brake switch (See 52 - General Check of Parking Brake, Check of System)	Go to Step 2	Parking brake switch doesn't work normally.	Replace (See 52 - Parking Brake Switch for Parking Brake, Replacement)
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether the signal circuit of parking brake switch has short-circuit (See 52 - General Check of Parking Brake, Check of Parking Brake Switch)	Go to Step 3	Short circuit	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. Under parking brake, power supply is located "ON" position; parking indicator lamp doesn't light up.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn power supply to "ON" position and set parking brake, and inspect the working condition of parking indicator lamp.	Diagnosis end.	Parking indicator lamp doesn't light up.	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether instrument fuse is damaged (See 73 - General Check of Instrument/ screen, Check of System)	Go to Step 3	FS33, FS34 fuses are blown	Go to Step 2
2	Check FS33 and FS34 circuit	Normal	Faulty	Instruction
	Check working condition of FS33 and FS34 circuit	Go to Step 3	The circuit is short	Overhaul relevant wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction

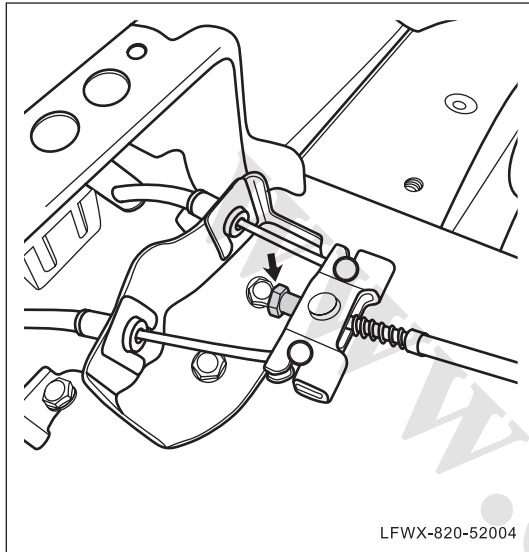
Steps	Inspection item	Inspection result		
	Check whether power supply cable of instrument cluster is conducted (See 73 - General Check of Instrument/ screen, Check of Instrument Cluster)	Go to Step 5	No continuity	Go to Step 4
4	Check the wire harness	Normal	Faulty	Instruction
	According to relevant contents of wiring diagram, measure whether circuit between the instrument cluster and fuse is conducted	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether the grounding circuit of instrument cluster is conducted (See 73 - General Check of Instrument/ screen, Check of Instrument Cluster)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal circuit of parking brake switch is broken (See 52 - General Check of Parking Brake, Check of Parking Brake Switch)	Go to Step 7	open circuit	Overhaul relevant wire harness according to wiring diagram.
7	Check the parking brake switch	Normal	Faulty	Instruction
	Check the working condition of parking brake switch (See 52 - General Check of Parking Brake, Check of System)	Go to Step 8	Parking brake switch doesn't work normally.	Replacement (See 52 - Parking Brake Switch for Parking Brake, Replacement)
8	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Parking Brake Control Mechanism

### Adjustment

#### 1. Adjust parking brake control mechanism

- (a). Remove dashboard assembly. (See 84 - Dashboard and Console, Console, Replacement)



- (b) Adjust the adjusting nut of brake cable by using an open-end wrench.

- (c). After adjustment, pull up the parking brake lever with force of 100N in direction vertical to the lever; now 5-7 teeth should be pulled up. Otherwise it is required to adjust it again.

△ HINT:

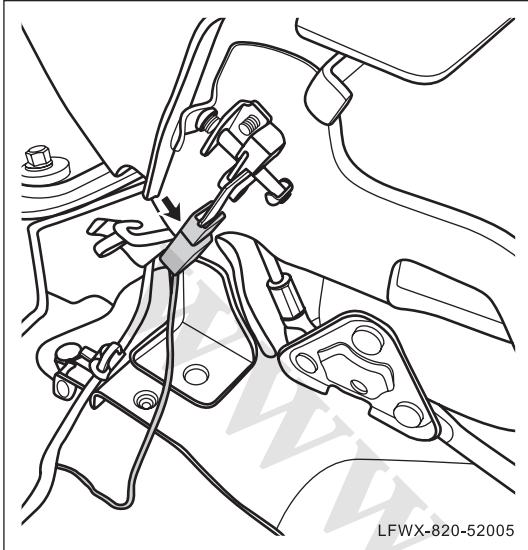
Each time passing one tooth, you may hear "clatter" sound; you may listen and calculate times of clatter sound of dent for inspection.

- (d). Install the console assembly. (See 84 - Dashboard and Console, Console, Replacement)

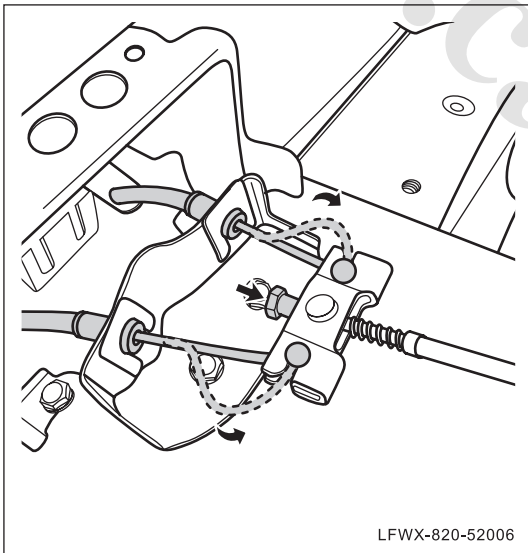
## Replacement

### 1. Remove parking brake control mechanism assembly

- (a). Remove dashboard assembly. (See 84 - Dashboard and Console, Console, Replacement)



- (b) Pull up parking brake rod, and disconnect wire harness connector of parking brake switch.



- (c). Place the parking brake lever to the lowest position.
- (d) Release the adjusting nut of brake cable.
- (e) Take the left and right cables of parking brake out of the balancer of parking brake control mechanism.

△ HINT:

Rotate cable 90° to the front opening section, and remove the cable.

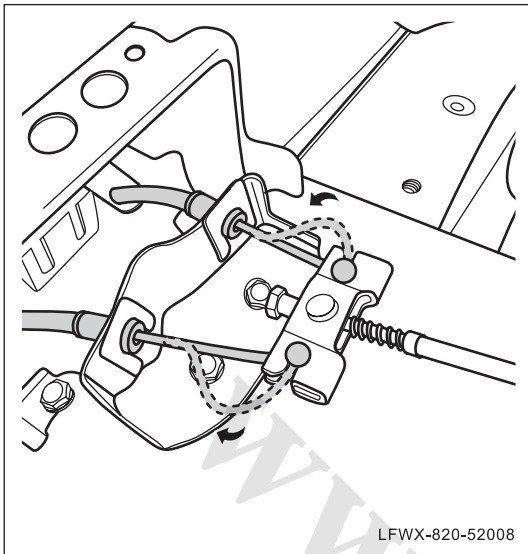
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- (f) Remove fixing bolt of parking brake control mechanism assembly, and remove parking brake control mechanism assembly.

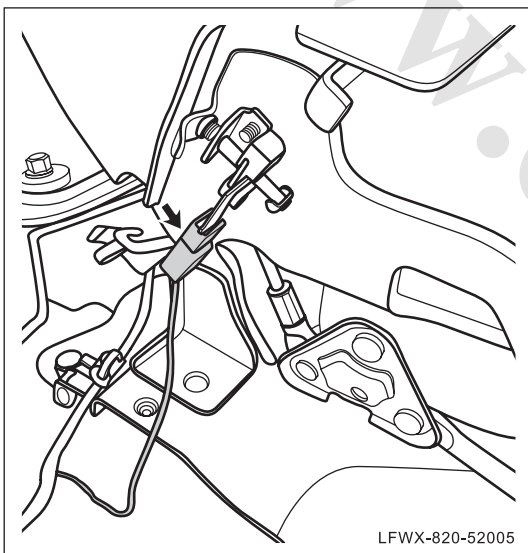
### 2. Install parking brake control mechanism assembly

- (a) Install parking brake control mechanism assembly onto mounting position, and install and tighten bolt.

**Torque: 6N•m - 12N•m**



- (b) Install left and right cables of parking brake onto the balancer of parking brake control mechanism.



- (c) Connect wire harness connector of parking brake switch.

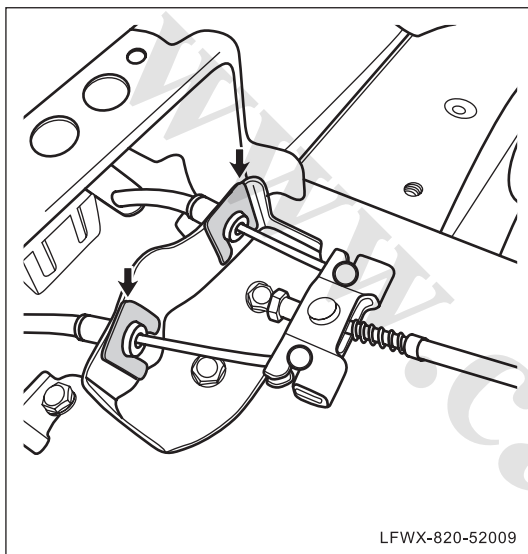
- (d) Adjust parking brake control mechanism. (See 52 - Parking Brake Control Mechanism for Parking Brake, Adjustment)
- (e). Install the console assembly. (See 84 - Dashboard and Console, Console, Replacement)

## Parking Brake Cable

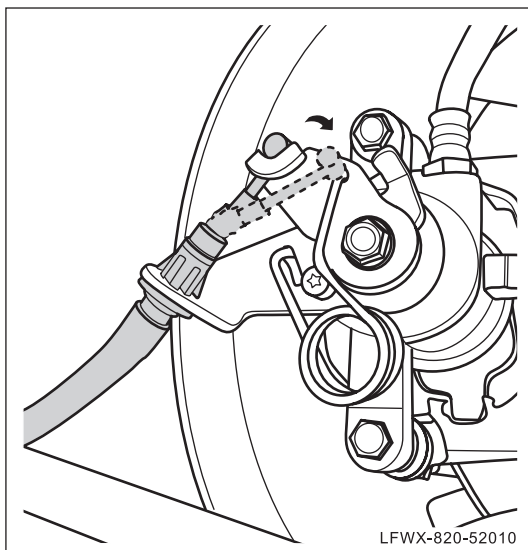
### Replacement

#### 1. Remove Parking Brake Cable

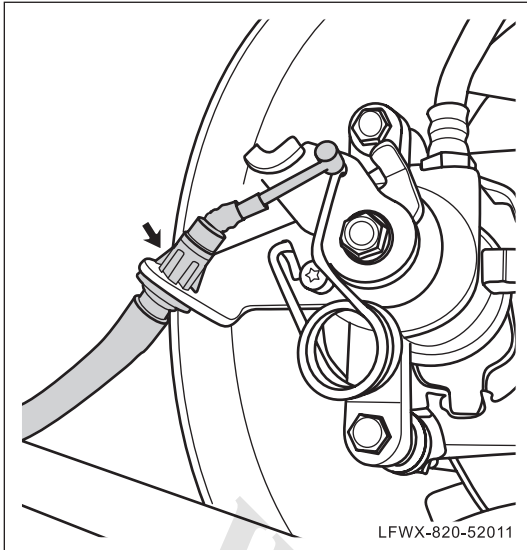
- (a). Remove console assembly. (See 84 - Dashboard and Console, Console, Replacement)
- (b). Disconnect the connection between the balancer of parking brake control mechanism and cable. (See 52 - Parking Brake Control Mechanism for Parking Brake, Replacement)



- (c). Remove E-clip of parking brake cable by using sharp-nose pliers, and take the parking brake cable out of the bracket.



- (d). Lift the vehicle
- (e). Remove the parking brake cable from the rear brake caliper.



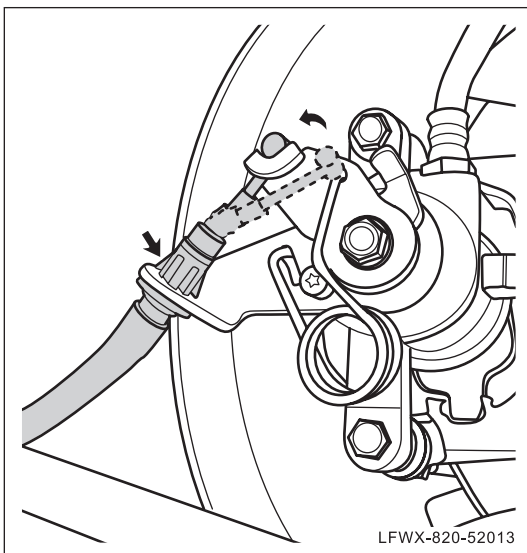
- (f). Press down the parking brake cable lock plate and pull out the parking brake cable from the bracket.

- (g) Remove fixing bolt of bracket and clip of rear parking brake cable assembly, and remove parking brake cable.

## 2. Install Parking Brake Cable

- (a) Make the cables of left and right parking brakes go through the mounting hole at the bottom of body, and install and tighten all fixing bolts of bracket and clip of cable assembly.

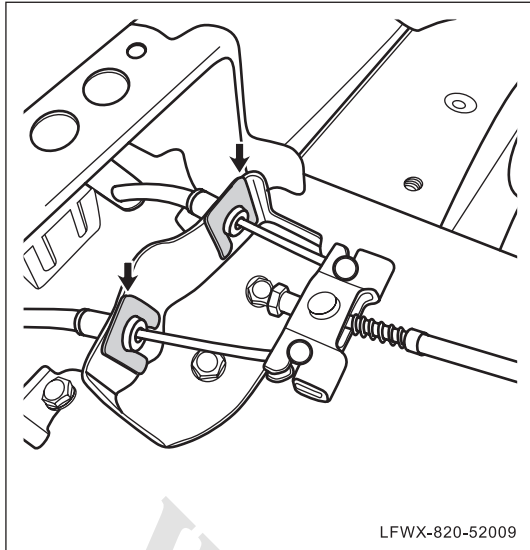
**Torque: 6N•m - 12N•m**



- (b). Pass the parking brake cable through the rear brake caliper bracket hole and install them onto the brake caliper.

△ HINT:

Confirm that the parking brake cable lock plate can not be detached from the bracket hole.



- (c) Install parking brake cable onto the bracket, and install E-clip.

- (d) Install parking brake cable onto the balancer of parking brake control mechanism. (See 52 - Parking Brake Control Mechanism for Parking Brake, Replacement)
- (e). Install the console assembly. (See 84 - Dashboard and Console, Console, Replacement)

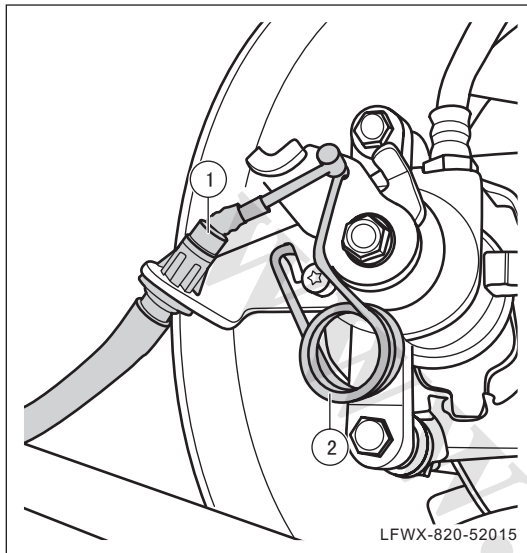


## Return Spring of Parking Brake

### Replacement

#### 1. Remove return spring of parking brake.

(a) Lift the vehicle



(b) Remove parking brake cable ① .

(c) Remove parking return spring ② by using sharp-nose pliers.

#### 2. Install return spring of parking brake

(a) Install return spring of parking brake by using sharp-nose pliers.

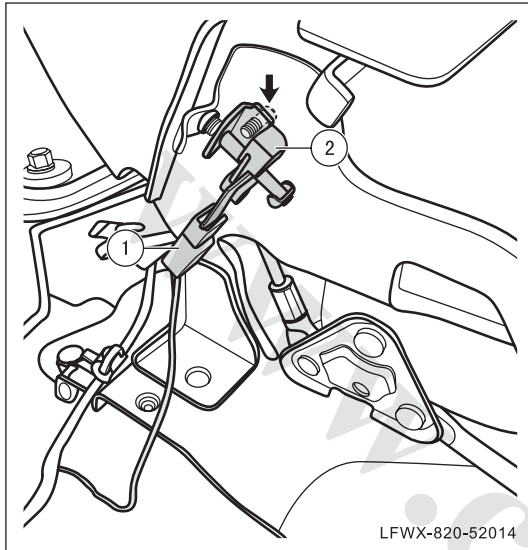
(b) Install parking brake cable onto mounting position.

## Parking Brake Switch

### Replacement

#### 1. Remove parking brake switch

- (a). Remove the console assembly. (See 84 - Dashboard and Console, Console, Replacement)



- (b) Pull up parking brake rod, and disconnect wire harness connector ① of parking brake lamp switch.
- (c) Remove fixing screw of parking brake switch ②, and remove parking brake switch ②.

#### 2. Install parking brake switch

- (a) Install parking brake switch ② onto parking brake control mechanism, and install and tighten fixing screw.
- (b) Connect wire harness connector ① of parking brake lamp switch.
- (c). Install the console assembly. (See 84 - Dashboard and Console, Console, Replacement)

## 53-Anti-lock Brake System (ABS)

<b>Anti-lock Brake System (ABS)</b> .....	<b>53-1</b>
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# Anti-lock Brake System (ABS)

## System description

### 1. Function

Anti-lock brake system has the following functions:

Anti-lock brake system can prevent the wheels from locking at the time of emergency brake, keep the vehicle stable and steering performance during braking and ensure safe driving.

### 2. Components

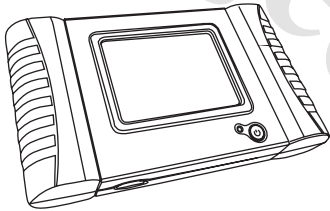
Anti-lock brake system mainly consists of ABS control unit, line and wheel speed sensor, etc.

### 3. Principle

If operating brake when car travels at speed of more than 15km/h, wheel speed sensor can detect the rotation speed of each wheel hub,

And then transmit signal to ECU. When the car is at locking condition and sliding rate is big, ECU will control brake to reduce brake torque of some or many wheels, to prevent wheel from locking or side sliding.

## Preparation

S/N	Tools	Outline diagram	Description
1	Diagnostic scanner		ABS fault diagnosis

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## Service data

### 1. Table of tightening torque

Item	N•m
Fixing nut of ABS control unit	20~25
Fixing bolt of probe of wheel speed sensor	15~20
Wheel speed sensor wire harness bracket fixing bolt	20~26

## Precautions

### 1. Precautions before repair

- (a) ABS shall be repaired by the skilled, well-trained technicians and replaced with the genuine parts.
- (b) Make sure that the service brake system works normally without fault before diagnosing ABS system.

### 2. Precautions for maintenance

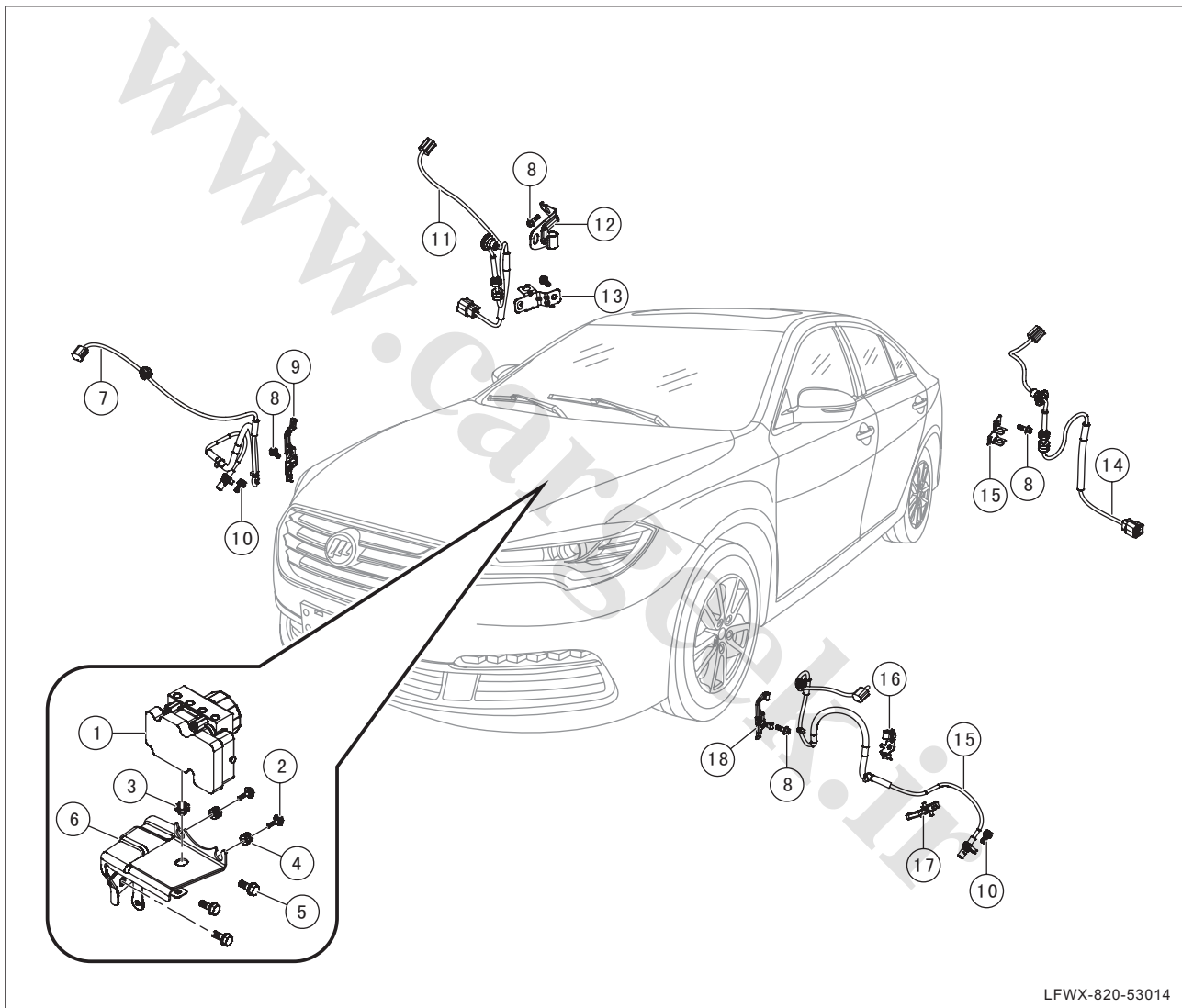
- (a). Before removing the ABS wire harness and the sensor wire harness, turn the ignition switch to OFF and disconnect the battery negative terminal.
- (b). Confirm that connectors are dry and clean; prevent any foreign matter from entering.
- (c). ABS wire harness connectors must be mounted vertically and horizontally to avoid damaging connectors.
- (d) When connecting ABS brake pipe, correctly install it according to the sign shown in ABS assembly. ABS control unit can't judge whether brake pipe is connected correctly. Wrong connection may cause serious accident.
  - MC1: Connect brake pipeline 1 of the brake master cylinder.
  - MC2: Connect brake pipeline 2 of the brake master cylinder.
  - FL: Connect brake pipeline of the front left wheel brake slave cylinder
  - FR: Connect brake pipeline of the front right wheel brake slave cylinder
  - RL: Connect brake pipeline of the rear left wheel brake slave cylinder
  - RR: Connect brake pipeline of the rear right wheel brake slave cylinder
- (e) ABS control unit can only be replaced as a whole. Don't detach or partly replace or interchange it. We don't give quality warrantee for detached ABS assembly. After being repaired, ABS system must be tested to ensure that all faults are eliminated.

### 3. Other precautions

- (a) ABS is an active safety system. Its main function is to make full use of ground adhesion to keep the car controllable and stable in running. But when traveling with speed exceeding physical limit or on wet and sliding road, ABS can't completely prevent sliding movement of vehicle.
- (b). When the vehicle is being electrified or the engine is being started, it may emit short time noise "buzz", which is sound of the ABS in self-test and is a normal phenomenon.
- (c). When ABS is working normally, sound comes from the following sources:
  - Action sound of the motor, solenoid valve and reflux pump in the ABS hydraulic unit.

- The brake pedal may generate sound in rebounding.
  - Sound of impacting between the suspension and the vehicle body due to emergency brake.
- (d) The following two cases indicate that ABS faults have been detected:
- Turn on the ignition switch, system self-test is completed, the ABS warning lamp illuminates.
  - ABS warning lamp stays constantly bright in driving the vehicle.

## Components



1	ABD controller assembly
2	Bolt
3	Bushing
4	Bushing

10	Bolt
11	ABS rear right wheel speed sensor assembly
12	Bracket
13	Bracket

5	Bolt	14	ABS rear left wheel speed sensor assembly
6	ABS bracket	15	Bracket
7	ABS front right wheel speed sensor assembly	16	Bracket
8	Teeth bolt	17	Damper fixing point of front left wheel speed sensor
9	Bracket	18	Bracket

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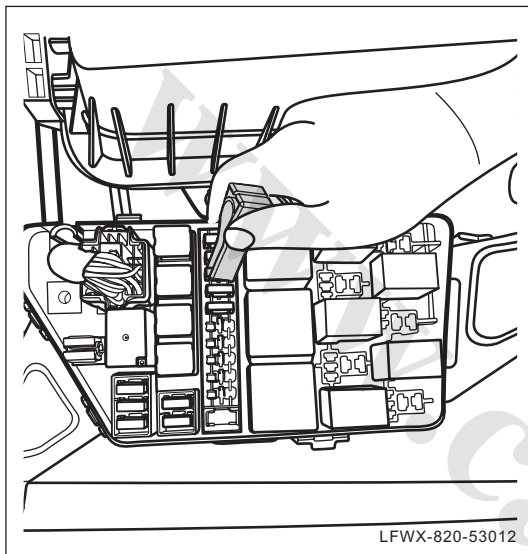


## General Check

### Check the system

#### 1. Check ABS control unit and brake pipe

- (a) Check ABS control unit and brake pipelines and connectors for leakage
- (b) Check whether the fixing bolt of ABS assembly and ABS bracket is loose.
- (c) Check whether the plastic washer on ABS bracket is missing or damaged.

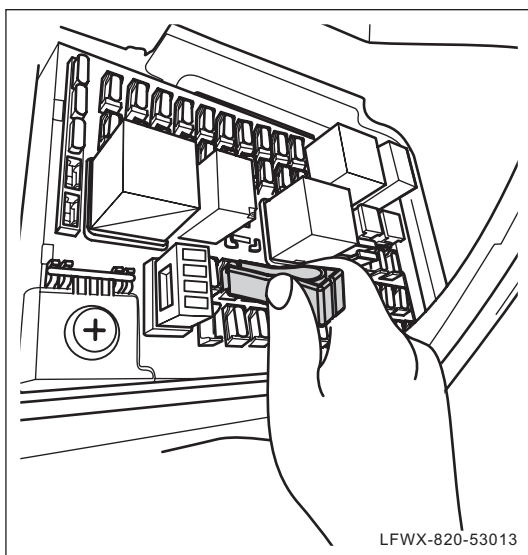


#### 2. Check the fuse

- (a) Check whether fuse FS45 of ABS electromagnetic valve is blown. If yes, replace fuse with the same specifications.

△ HINT:

Fuse of ABS electromagnetic valve is located in fuse hose of engine hood.



- (b) Check whether fuse FS29 of ABS control unit is blown. If yes, replace fuse with same specifications.

△ HINT:

Fuse of ABS control unit is located in fuse box of driver's cab.

- (c) Check whether fuse SB01 of ABS pump motor is blown. If yes, replace fuse with the same specifications.

△ HINT:

Fuse of ABS pump motor is located in positive polar fuse box of battery.

### 3. Check ABS grounding wire

- (a) Check whether the ABS ground wire's grounding point is loosened, and whether grounding location is changed

△ HINT:

ABS grounding wire must have good air tightness performance to avoid losing function resulting from water and moisture ingress into the ABS ECU connectors from the hole of the wire harness due to siphonage.

### 4. Check the working condition of relevant wire harness of ABS system.

- (a) Check whether relevant wire harness and connector of ABS system are connected correctly or damaged or cut.
- (b) Check whether relevant wire harness of ABS system get near devices with high-voltage or big current, such as high-voltage or parts, electric alternator and motor, after-sales installed stereo amplifier, etc.

#### ⓘ Note:

- **Devices with high voltage or big current might cause circuit to generate induced noise, consequently interfering with the normal working of the circuit.**
- **ABS parts are very sensitive to electromagnetic interference. If an intermittent fault is in doubt, check if after-sale optional anti-theft device, lamps and mobile telephone cause interference to it.**

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
ABS indicator lamp/ brake malfunction indicator lamp doesn't light up.	1. ABS fuse FS26 (blown)	See 53 - Anti-lock Brake System, Diagnosis of ABS, Fault Diagnosis (1. ABS indicator lamp/ brake malfunction indicator lamp doesn't light up)
	2. ABS indicator lamp circuit (short-circuit or open-circuit)	
	3. Instrument cluster (damaged)	
	4. ABS control unit (damaged)	
ABS indicator lamp/ brake malfunction indi- cator lamp constantly lights up.	1. ABS indicator lamp circuit (short-circuit or open-circuit)	See 53 - Anti-lock Brake System, Diagno- sis, Fault Diagnosis (2. ABS indicator lamp constantly lights up)
	2. Brake fluid (insufficient)	
	3. Instrument cluster (damaged)	
	4. ABS control unit (damaged)	
ABS does not work	1. Check whether the system outputs DTC	-
	2. Check the service brake sys- tem	See 51 - Anti-lock Brake System, Diagno- sis, Fault Diagnosis
	3. ABS control unit (damaged)	Replacement

### DTC list

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
C190004	Too high voltage in ECU power supply	1. Battery voltage (too high) 2. ECU is damaged	See 53 - Anti-lock Brake System, Diag- nosis, DTC Diagnosis)
C190104	Too low voltage in ECU power supply	1. Battery voltage (too low) 2. ECU is damaged	(3. C190004, C190104- power sup- ply voltage is high, low)

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
C100004	ECU has fault (hardware, microprocessor error)	1. ECU is damaged	See 53 - Anti-lock Brake System, Diagnosis, DTC Diagnosis) (4.C100004, C101008- ECU has internal fault)
C101008	ECU has fault (software error)	1. ABS control unit	
C006B06	ABS/ ESP isn't controlled rationally (control time is too long)	1. Continuous brake on icy ground 2. Wheel speed difference is too large	See 53 - Anti-lock Brake System, Diagnosis, DTC Diagnosis) 5. C006B - Unreasonable ABS control
C002004	Reflux pump electric motor failure	1. Pump motor bad grounding 2. Over-heating protection of system 3. The power supply of pump motor is abnormal (fuse and external relay) 4. Pump motor relay fault 5. Pump motor failed	See 53 - Anti-lock Brake System, Diagnosis, DTC Diagnosis) (6. C002004 - Pump motor failed)



Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
C003200	Front left wheel speed sensor circuit fault: open-circuit	<ol style="list-style-type: none"> <li>1. The wheel speed sensor circuit is disconnected, and the connector is loose and ruptured</li> <li>2. Wheel speed sensor signal wire is short circuit to power supply</li> <li>3. Wheel speed sensor power supply wire is short-circuited to ground;</li> <li>4. Reversed connection of wheel speed sensor signal wire and power lead</li> <li>5. Non- installation of gear ring, teeth missed, foreign matter in gear ring, demagnetization and eccentric gear ring</li> <li>6. An excessive air gap appears between the sensor and the gear ring.</li> <li>7. The wheel speed sensor is interfered by external magnetic fields (wheel or axle is not demagnetized)</li> <li>8. Wheel speed sensor body fault</li> <li>9. Wrong number of teeth in gear ring</li> <li>10. tyre size is out of specified range</li> <li>11. ECU is damaged</li> </ol>	See 53 - Anti-lock Brake System, Diagnosis, DTC Diagnosis) (7.C003200, C00A000, C00A100, C00A900, C003500, C00A200, C00A300, C00AA00, C003800, C00A400, C00A500, C00AB00, C003B00, C00A600, C00A700, C00AC00, C109904 - wheel speed sensor circuit has fault)
C00A000	Front left wheel speed sensor circuit fault: short-circuited to ground		
C00A100	Front left wheel speed sensor circuit fault: short-circuited to power supply		
C00A900	Front left wheel speed sensor fault: fault cause is impossible to be detected		
C003500	Front right wheel speed sensor circuit fault: open-circuit		
C00A200	Front right wheel speed sensor circuit fault: short-circuited to ground		
C00A300	Front right wheel speed sensor circuit fault: short-circuited to power supply		
C00AA00	Front right wheel speed sensor fault: the cause is impossible to be detected		
C003800	Rear left wheel speed sensor circuit fault: open-circuit		
C00A400	Rear left wheel speed sensor circuit fault: short-circuited to ground		
C00A500	Rear left wheel speed sensor circuit fault: short-circuited to power supply		
C00AB00	Rear left wheel speed sensor fault: the cause is impossible to be detected		
C003B00	Rear right wheel speed sensor circuit fault: open-circuit		
C00A600	Rear right wheel speed sensor circuit fault: short-circuited to ground		
C00A700	Rear right wheel speed sensor circuit fault: short-circuited to power supply		
C00AC00	Rear right wheel speed sensor fault: the cause is impossible to be detected		
C109904	Wheel speed sensor group failure (wheel speed sensor interchangeable, each wheel speed difference is too large, several wheel speed sensors malfunction)		

Fault code (DTC)	Description of DTCs	Possible causes	Recommended action
C001004	Front left fluid inlet valve is defective	<ol style="list-style-type: none"> <li>1. The solenoid valve is short circuit to power supply or to ground, and its circuit is open circuit</li> <li>2. Fuse fault</li> <li>3. Over-heating protection of system</li> <li>4. ABS is damaged</li> </ol>	See 53 - Anti-lock Brake System, Diagnosis, DTC Diagnosis) (8.C001004, C001104, C001404, C001504, C001804, C001904, C001C04, C001D04, C109504, C007208 - electromagnetic valve and valve group relay has fault)
C001104	Front left fluid outlet valve is defective		
C001404	Front right fluid inlet valve is defective		
C001504	Front right fluid outlet valve is defective		
C001804	Rear left fluid inlet valve is defective		
C001904	Rear left fluid outlet valve is defective		
C001C04	Rear right fluid inlet valve is defective		
C001D04	Rear right fluid outlet valve is defective		
C109504	Valve relay is defective		
C007208	Valve module fault (overheating protection, invalid signal, hardware damaged)		

## Fault diagnosis

### 1. ABS indicator lamp/ brake malfunction indicator lamp doesn't light up

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn ignition switch to "ON" position and check the indicator on instrument cluster for self-test	Diagnosis end.	When the indicator lamp of instrument cluster carries out self-inspection, ABS indicator lamp doesn't light up.	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS33, FS34 of instrument cluster of central control box in driver's cab are blown.	Go to Step 3	Too much current in the power circuit (short circuit or overload)	Replace the fuse with the same specification. Goto Step 2 in case of the fuse is blown again
2	Check instrument cluster power circuit	Normal	Faulty	Instruction
	Disconnect the negative cable of battery, and check the resistance between instrument cluster circuit and the grounding	Go to Step 3	There is short circuit in the power circuit or in the instrument cluster if the resistance is too small	Gradually troubleshoot to identify the short circuit point, and then replace the fuse with the same specification
3	Check the power supply voltage of instrument cluster.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the instrument cluster connector I07</li> <li>Turn power supply to "ON", and respectively inspect the voltage between terminal No.1 and No.17 of I07 and grounding connection.</li> </ul> Voltage: 9~13V	Go to Step 4	It indicates that there is open circuit in the wire harness, if the voltage is out of the specified range	Check the circuit between fuse of instrument wire harness and instrument cluster.
4	Check instrument cluster grounding circuit	Normal	Faulty	Instruction

	Check the resistance between terminal No.2 and No.18 of connector I07 of instrument cluster and grounding connection. Resistance: < 2 Ω	Go to Step 5	The circuit has open circuit point	Check the circuit between instrument wire harness I07 and grounding point G21 and G22.
5	Check the voltage in ABS ECU power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect ABS ECU connector U31</li> <li>Turn power supply to "ON" position, and inspect the voltage between terminal No.1, No.25, No.28 of U31 and grounding connection.</li> </ul> Voltage: 9~13V	Go to Step 6	If the voltage isn't in rational range, It indicates that the fuse is blown or wire harness has open-circuit.	Check fuse or measure the circuit between fuse and ABS ECU.
6	Check the grounding circuit of ABS ECU	Normal	Faulty	Instruction
	Check the resistance between the No. 13, 38 terminal of ABS ECU connector U31 and the grounding Resistance: < 2 Ω	Go to Step 7	The circuit has open circuit point	Overhaul the circuit between wire terminal No.13 and No.38 of wire harness U31 of front compartment and grounding point G13.
7	Check the communication circuit between ABS and instrument cluster.	Normal	Faulty	Instruction
	Connect diagnostic scanner to inspect whether the system has CAN communication fault.	Go to Step 8	CAN communication fault between ABS and instrument cluster	Overhaul CAN circuit between instrument cluster and ABS ECU or replace control module.
8	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Replace the instrument cluster	Fault still exists	Go to Step 9
9	Replacement and check	Normal	Faulty	Instruction



	Replace the ABS control unit with the same model, and check if the fault is eliminated	Replace the ABS actuator assembly	Fault still exists	Search the cause from other fault symptoms
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## 2. ABS indicator lamp/ brake malfunction indicator lamp constantly lights up.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn ignition switch to "ON" position and check if the indicator on instrument cluster is lit correctly	Diagnosis end.	ABS indicator light stays constantly bright.	Go to Step 1
1	Inspection of diagnostic scanner	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 2	With DTC output	Maintain it according to the tip of DTC
2	Check the voltage in ABS ECU power supply	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect ABS ECU connector U31</li> <li>Turn power supply to "ON" position, and inspect the voltage between terminal No.1, No.25, No.28 of U31 and grounding connection.</li> </ul> Voltage: 9~13V	Go to Step 3	It indicates that there is open circuit in the wire harness, if the voltage is out of the specified range	Check the circuit between the fuse and ABS ECU
3	Check the grounding circuit of ABS ECU	Normal	Faulty	Instruction
	Check the resistance between the No. 13, 38 terminal of ABS ECU connector U31 and the grounding Resistance: $< 2 \Omega$	Go to Step 4	The circuit has open circuit point	Overhaul the circuit between wire harness I09 of instrument and grounding point G15.
4	Check brake fluid	Normal	Faulty	Instruction
	Check if brake fluid is sufficient	Go to Step 5	Insufficient brake fluid	Refill brake fluid

5	Check the brake fluid level switch	Normal	Faulty	Instruction
	Check brake fluid level switch for damage	Go to Step 6	Brake fluid level switch is damaged	Replace brake fluid level switch
6	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, and check if the fault is eliminated	Replace the ABS actuator assembly	Fault still exists	Go to Step 7
7	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Replace the instrument cluster	Fault still exists	Search the cause from other fault symptoms

### 3. C190004,C190104 - power supply voltage is high, low.

The setting conditions of DTC:

1. In the beginning when the vehicle is being electrified, voltage is below 4.5V.
2. Ignition switch is in the "ON" position, and voltage is lower than 7.7V or higher than 16.8V.
3. Vehicle speed higher than 6km/h, and voltage is 7.7 - 9.2V.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Whether general inspection is carried out?	Go to Step 1	Carry out general inspection	
1	Check the battery voltage	Normal	Faulty	Instruction
	Disconnect connector of ABS control unit and inspect the voltage between terminal No.1 and No.25 of wire harness connector U31 of front compartment and grounding connection. Voltage: 9V - 13V	Go to Step 2	The detection value is out of the specified range	The abnormal voltage indicates that there is open circuit in the power circuit of ABS control unit. Check and fix the circuit between the connectors of ABS control unit and fuse
2	Check ignition switch power supply	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Disconnect connectors of ABS control unit, start the engine making it run idle, and then check the voltage between terminal 28 of wire harness connector U31 in the front compartment and the grounding Voltage: 13V - 15V	Go to Step 3	Too high voltage indicates the alternator has fault	Overhaul the circuit of alternator voltage adjuster
3	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, and check if the ABS works normally	Replace ABS control unit	Fault still exists	Search the cause from other fault symptoms

#### 4. C100004,C101008 - ECU internal fault

The setting conditions of DTC:

1. ECU power supply has fault
2. ECU is damaged

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Whether general inspection is carried out?	Go to Step 1	Carry out general inspection	
1	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, and check if the ABS works normally	Replace ABS control unit	Fault still exists	Search the cause from other fault symptoms
2	Verification and check	Normal	Faulty	Instruction
	Eliminate detected fault and test if the fault is eliminated	Diagnosis end.		

#### 5. C006B06- ABS/ESP irrational control

The setting conditions of DTC:

1. ABS connects with the continuous working instructions (greater than 1min)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Whether general inspection is carried out?	Go to Step 1	Carry out general inspection	
1	Check wheel speed sensor and gear ring	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Is the wheel speed sensor mounted correct</li> <li>Were signal gears scratched or did they absorb scrap metal or external objects?</li> </ul>	The installation of wheel speed sensor is wrong or the signal gears have fault	Go to Step 2	Troubleshooting
2	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, and check if the ABS works normally	Replace ABS control unit	Fault still exists	Search the cause from other fault symptoms

## 6. C002004 - Pump motor failed

The setting conditions of DTC:

- Pump motor works overload, with excessive high temperature; (Overheating protection)
- After reflux pump motor relay works 60ms, the reflux pump monitor can not detect voltage signal yet.
- The reflux pump motor relay does not work, the reflux pump monitor detects voltage for above 2.5s.
- The reflux pump motor relay stops working; the reflux pump monitor detects that voltage does not drop.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Fault location	Normal	Faulty	Instruction
	Eliminate DTC, keep the car cool for 5min, and check whether fault is eliminated.	Diagnosis end.	Go to Step 1	
1	Preliminary inspection	Normal	Faulty	Instruction
	Whether general inspection is carried out?	Go to Step 2	Carry out general inspection	
2	Inspect circuit.	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>• Check whether fuse SB01 of positive polar fuse box of battery is blown.</li> <li>• Check if connectors, wire harness and grounding wire are open-circuited or short circuited.</li> <li>• Check if voltage in the pump motor power supply connector pin (terminal 1 of U31) is battery voltage</li> </ul>	Go to Step 3	The circuit is open circuit, and/or short circuit	Check and fix the circuit between the connectors of ABS control unit and fuse
3	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, make cross-validation to ABS assembly and check if the ABS works normally	Replace ABS control unit	Fault still exists	Search the cause from other fault symptoms
4	Verification and check	Normal	Faulty	Instruction
	Eliminate detected fault and test if the fault is eliminated Hint: When turning power supply from "OFF" to "ON" position and accelerating speed to 60km/h and park the car. Re-diagnose and check whether fault recurs.	Diagnosis end.		

**7. C003200,C00A000,C00A100,C00A900,C003500,C00A200,C00A300,C00AA00, C003800, C00A400,C00A500,C00AB00,C003B00,C00A600,C00A700, C00AC00,C109904 - wheel speed sensor circuit fault**

The setting conditions of DTC:

1. ECU detects that the wheel speed sensor signal wire is short-circuited to ground.
2. Wheel speed sensor circuit is open-circuited.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Fault location	Normal	Faulty	Instruction
	Stop the car and keep this status it for 5 min; Check if the failure is eliminated	Diagnosis end.	Go to Step 1	
1	Preliminary inspection	Normal	Faulty	Instruction
	Whether general inspection is carried out?	Go to Step 2	Carry out general inspection	
2	Inspect circuit.	Normal	Faulty	Instruction
	Check if all wheel speed sensor connectors works normally, and check if wheel speed sensor circuit is open-circuited and short-circuited.	Go to Step 3	The circuit is open circuit, and/or short circuit	Overhaul the circuit between connector of ABS control unit and wheel speed sensor.
3	Check wheel speed sensor and gear ring	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check the clearance between wheel speed sensor and gear ring.</li> <li>Check if gear ring is contaminated and has foreign matter; or that teeth are missed.</li> <li>Check if number of teeth in gear ring is correct.</li> </ul>	Go to Step 4	Check if it is normal	Eliminated the corresponding faults, and replace the corresponding parts
4	Check the data flow	Normal	Faulty	Instruction
	Lift the vehicle by a lifter and rotate wheels. Observe by data flow from diagnostic scanner, that the wheel speed sensor signal output conforms to the wheel speed	Go to Step 5	Wheel speed sensor is fault	Go to Step 5
5	Check the wheel speed sensor	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect wheel speed sensor connector. Connect 12V power supply cable between two pins of wheel speed sensor connector and connect ammeter in series. Connect the positive pole of power supply to pin 2; while negative pole of power supply to pin 1.</li> <li>Slowly turn the wheel and observe whether the number displayed in the ammeter is in the vicinity of approximately 7mA and 14mA</li> </ul>	Go to Step 6	Wheel speed sensor is damaged	Replace the wheel speed sensor
6	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, and check if the ABS works normally	Replace ABS control unit	Fault still exists	Search the cause from other fault symptoms
7	Verification and check	Normal	Faulty	Instruction
	Eliminate detected fault and test if the fault is eliminated	Diagnosis end.		

**Note:**

- For wheel speed sensor signal fault, after elimination, it is necessary to start the vehicle and accelerate speed to about 30km/h, and then the ABS warning lamp will go off.
  - Wheel speed sensor supply voltage to the ECU cannot be measured; as long as open circuit exists in the wheel speed sensor circuit, ECU automatically stops power supply and then provides electricity when the next ignition self-test is finished.
8. C001004,C001104,C001404,C001504,C001804,C001904,C001C04,C001D04,C109504,C007208 - solenoid valve and group valve relay fault

The setting conditions of DTC:

1. Power supply of valve is abnormal. (Power supply is short-circuited to ground or

open-circuited to grounding wire)

2. The temperature of solenoid valve is too high. (Overheating protection)
3. More than 5 solenoid valves are short-circuited. (Fuse FS45 is blown)
4. Do action test of corresponding solenoid valve, but no response occurs;
5. Solenoid valve failure.
6. Group valve relay is defective

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Fault location	Normal	Faulty	Instruction
	Eliminate DTC, keep the car cool for 5min, and check whether fault is eliminated.	Diagnosis end.	Go to Step 1	
1	Preliminary inspection	Normal	Faulty	Instruction
	Whether general inspection is carried out?	Go to Step 2	Carry out general inspection	
2	Inspect circuit.	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>• Check whether fuse FS45 of central control box of engine compartment is blown.</li> <li>• Check if wire harness connectors, wire harness and grounding wire are open-circuited or short circuited.</li> <li>• Check if voltage in the solenoid valve power supply connector pin (No. 25 terminal of U31) is battery voltage;</li> </ul>	Go to Step 3	The circuit is open circuit, and/or short circuit	Check and fix the circuit between the connectors of ABS control unit and fuse
3	Replacement and check	Normal	Faulty	Instruction
	Replace the ABS control unit with the same model, make cross-validation to ABS assembly and check if the ABS works normally	Replace ABS control unit	Fault still exists	Search the cause from other fault symptoms
4	Verification and check	Normal	Faulty	Instruction



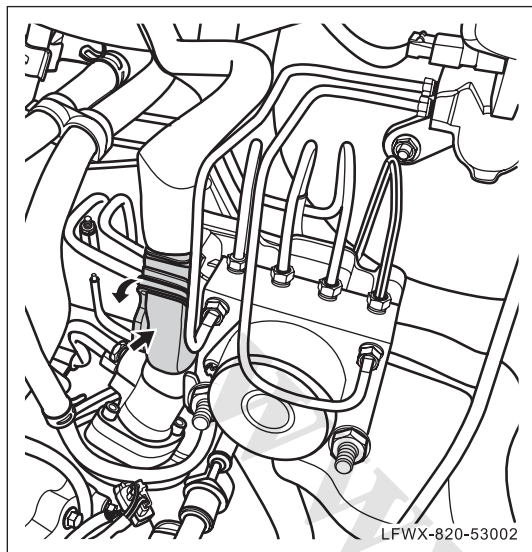


Steps	Inspection item	Inspection result		
	Eliminate detected fault and test if the fault is eliminated Hint: Stop the car after accelerating it above 30km/h, and confirm that this fault occurs again	Diagnosis end.		

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## ABS Control Unit

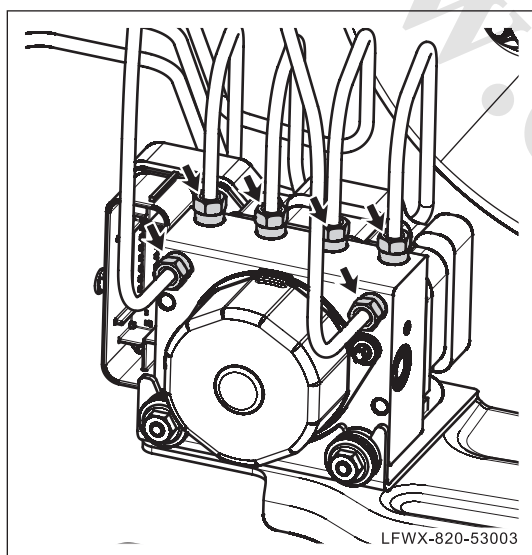
### Replacement



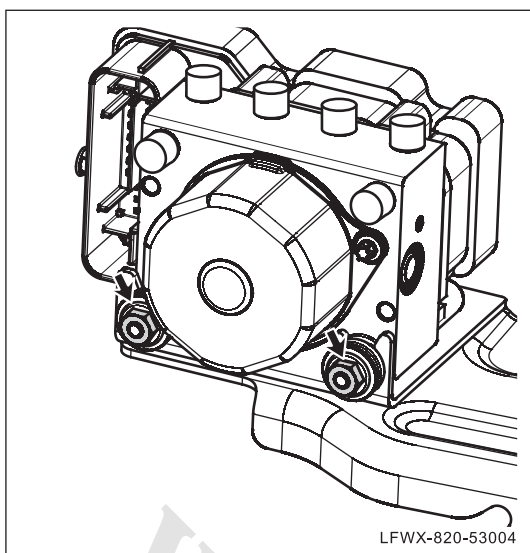
1. Remove the ABS control unit
  - (a) Turn power supply to "LOCK" position, and disconnect the connector of ABS control unit.

△ HINT:

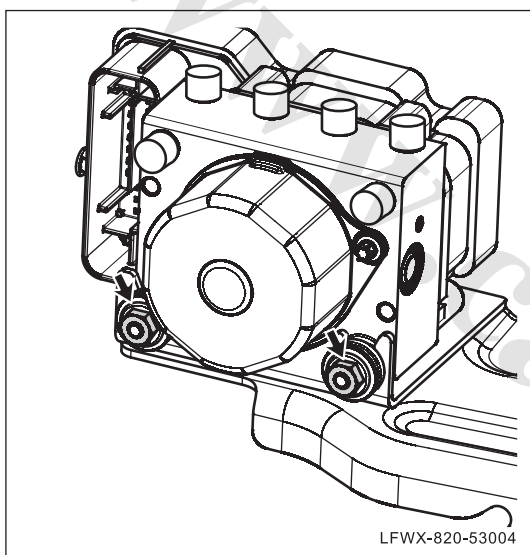
Turn up the ABS control unit wire harness connector snap-fit and then unplug the ABS control unit wire harness connector.



- (c) Remove the brake pipeline and then block the thread hole and the oil hole of the brake pipelines of the ABS assembly by a stopper.



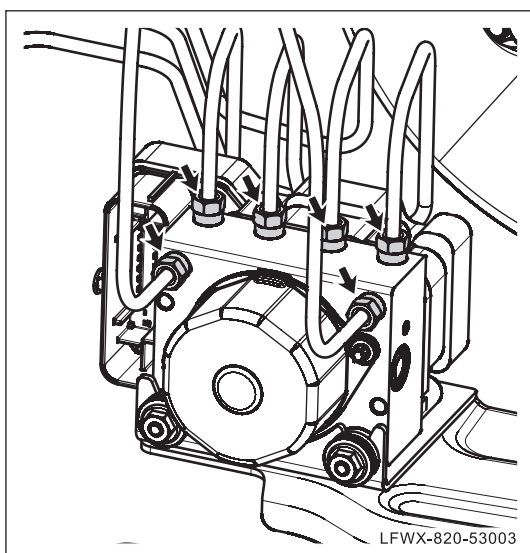
- (d) Remove fixing nuts of ABS control unit on the mounting bracket and then take out the ABS control unit.



2. Install ABS control unit

- (a) Install ABS control unit onto the mounting bracket, and then mount & tighten fixing nuts.

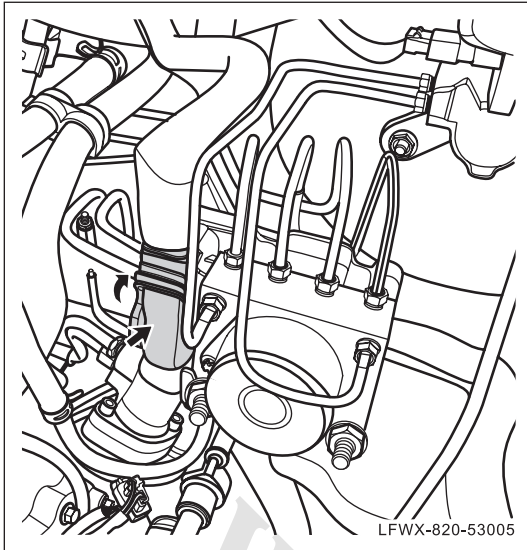
Torque: 20N•m - 25N•m



- (b). Install brake oil pipe.

△ HINT:

Remove the thread hole of the ABS control unit and the oil hole plug of the brake pipeline before installation, and then install corresponding pipeline into the ABS control unit holes.



- (c) Install wire harness connector of ABS control unit.

## Wheel Speed Sensor

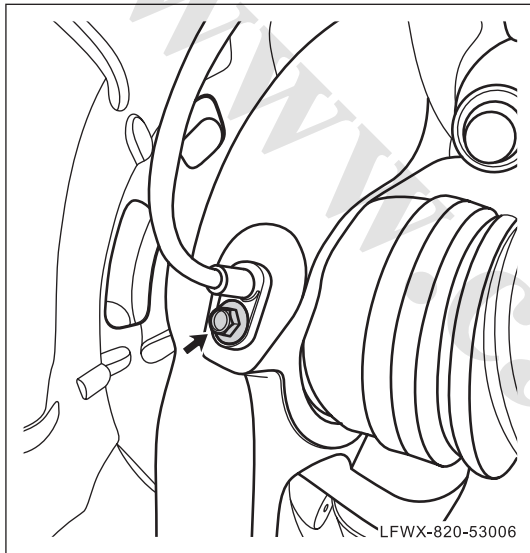
### Replacement

#### 1. Remove the front wheel speed sensor

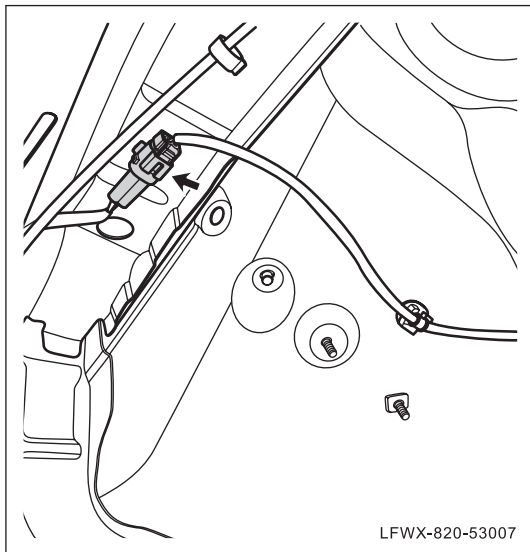
△ HINT:

Replacement of left and right wheel speed sensors is basically the same. This section will only introduce the replacement of front left wheel speed sensor as an example.

- (a) Remove front left wheel.
- (b) Remove front left mudguard strip. (See 81 - Trim Mudguard and Rubber Strip, Replacement)



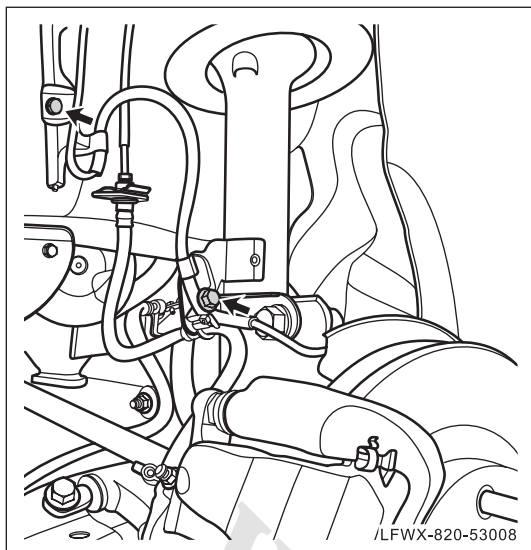
- (c) Remove fixing bolt of wheel speed sensor probe, and unplug wheel speed sensor probe.



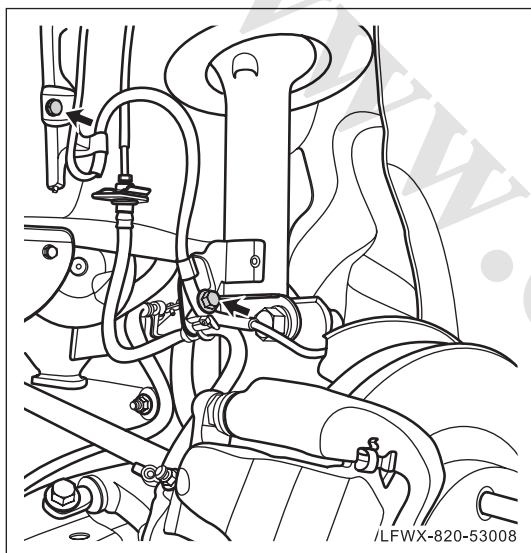
- (d) Disconnect wheel speed sensor wire harness connector.

**Note:**

Please don't drag the wire harness of wheel speed sensor with hard force, to avoid damage of wire harness.

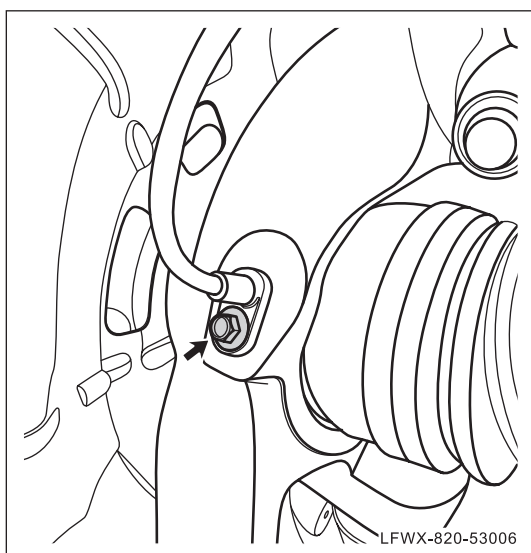


- (e) Remove fixing bolt of bracket of wire harness of wheel speed sensor, and remove the wire harness of wheel speed sensor.



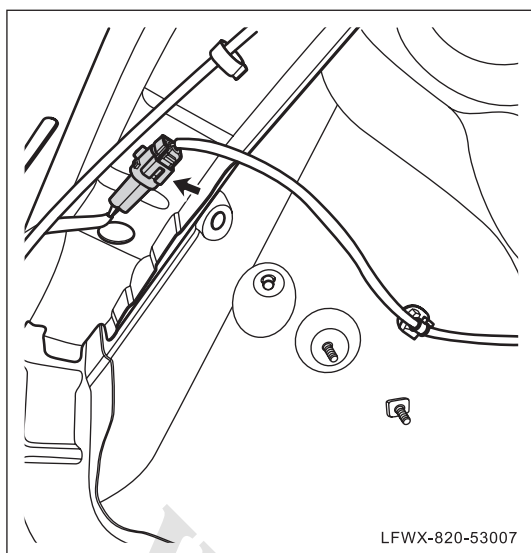
- 2. Install the front wheel speed sensor
  - (a) Install the bracket of wire harness of wheel speed sensor onto the front suspension and body, and install and tighten fixing bolt.

Torque: 20N•m - 26N•m



- (b) Install the probe of wheel speed sensor, and install and tighten fixing bolt.

Torque: 15N•m-20N•m



- (c) Connect wire harness connector of wheel speed sensor.

- (d) Install front left mudguard strip. (See 81 - Trim Mudguard and Rubber Strip, Replacement)

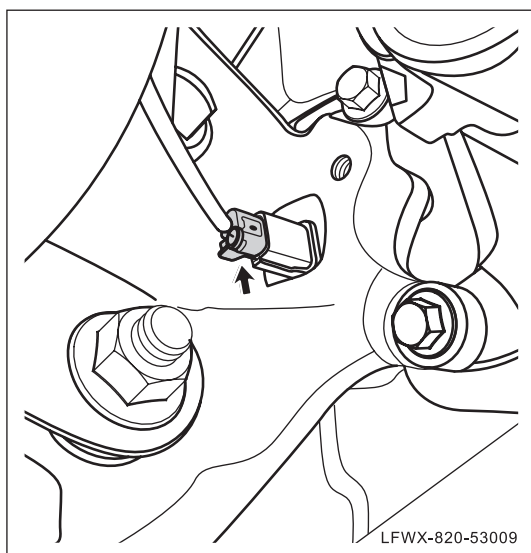
- (e) Install front left wheel.

### 3. Remove the rear wheel speed sensor

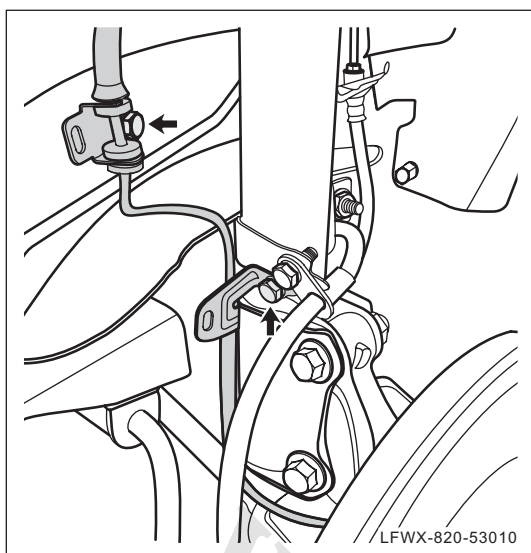
△ HINT:

Replacement of left and rear right wheel speed sensor is basically the same. This section will only introduce the replacement of rear left wheel speed sensor as an example.

- (a) Remove rear left wheel.

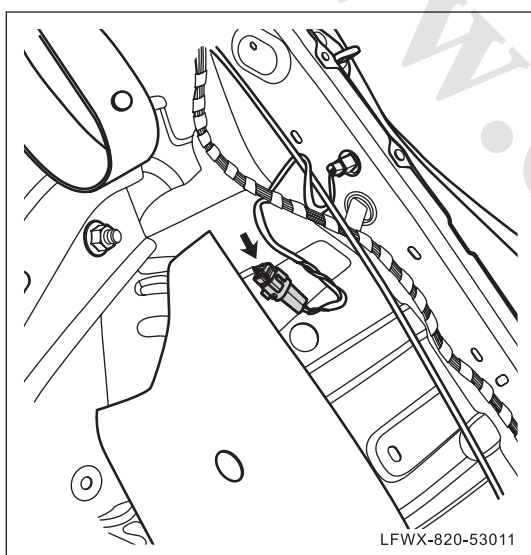


- (b) Disconnect connector of wheel speed sensor probe.

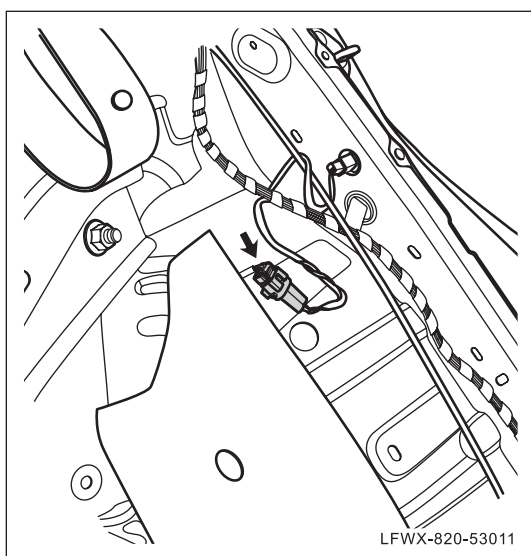


- (c) Remove fixing bolt of bracket of wire harness of wheel speed sensor.

- (d) Remove rear row seat backrest. (See 83 - Seat and Belt, Rear Row Seat Backrest, Replacement)

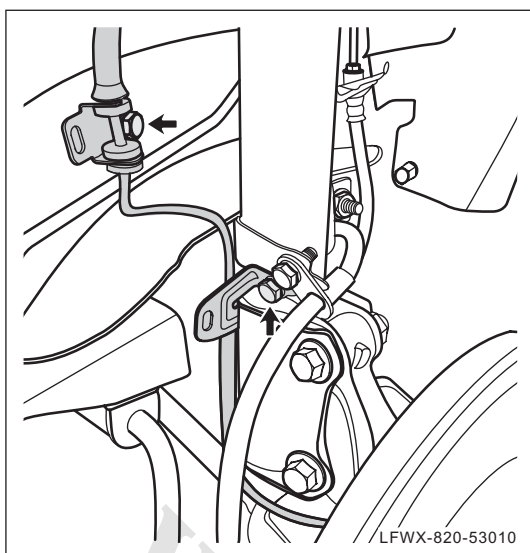


- (e) Disconnect wire harness connector of wheel speed sensor, and remove the wire harness of wheel speed sensor from the body.



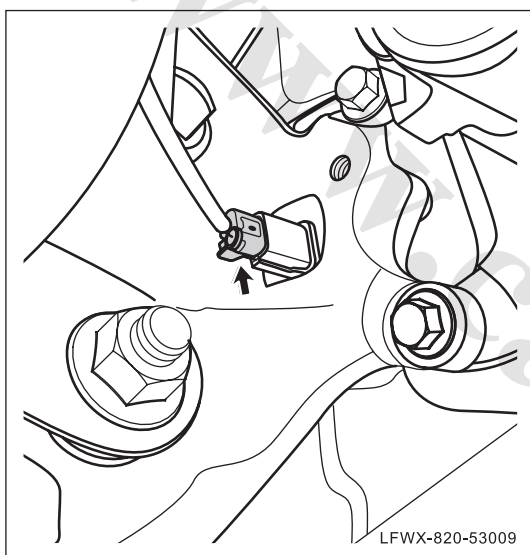
- 4. Install the rear wheel speed sensor
  - (a) Install wire harness of wheel speed sensor from the bottom of body, and connect wire harness connector of wheel speed sensor.





- (b) Install bracket of wire harness of wheel speed sensor, and install and tighten fixing bolt.

Torque: 20N•m - 26N•m



- (c) Connect connector of wheel speed sensor probe.

- (d) Install rear left wheel.

- (e) Install rear row seat backrest. (See 83 - Seat and Belt, Rear Row Seat Backrest, Replacement)



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## 72 –Supplemental Restraint System (SRS)

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# Supplemental Restraint System

## System description

### 1. Function

Functions of SRS:

Airbags provide protection for the driver and passengers during emergency, and help to reduce injuries of the driver and passengers.

### 2. Components

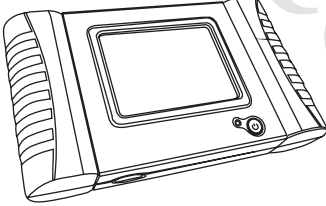
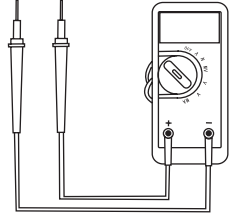
SRS mainly consists of driver airbag, front passenger airbag, SRS clock spring, SRS wire harness, SRS ECU, side airbag, side air curtain, impact sensor, etc.

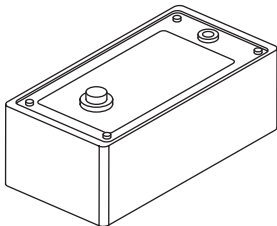
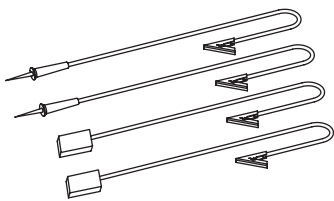
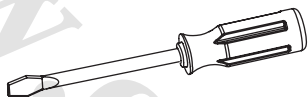
### 3. Working principle

When car has a front collision accident, impact sensor can produce impact signal. When SRS ECU detects this impact signal, it will analyze it and judge whether ignition is required. Once ignition is required, it will immediately send ignition pulse to ignite ignition pipe inside each airbag module. The ignition pipe will also ignite air generating drug inside each airbag module so that large amount of gas will be produced to expand airbag to absorb impact on passengers and driver due to impact accident, so as to protect driver and passengers from being injured or less injured.

## Preparation

72

S/N	Tools	Outline diagram	Description
1	Diagnostic scanner		Diagnosing fault of airbag system
2	Digital multimeter		Measuring voltage and resistance

S/N	Tools	Outline diagram	Description
3	Detonating tool of airbag		Detonating airbag
4	Wiring components		Testing circuits
5	Screwdriver		Remove the fixing screws

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolt of SRS ECU	6~10

## Precautions

### 1. Precautions before repair

- Confirm that ignition switch is turned to LOCK and the battery positive and negative cables are disconnected for more than 90s, and then conduct the operation (safety protection system is provided with backup power. Therefore, if operation is conducted within 90s after the battery positive and negative cables are disconnected, airbags may expand suddenly).
- Because it is difficult to confirm the fault of airbag, diagnostic trouble code (DTC) is regarded as the most important information source for troubleshooting. When troubleshooting is conducted for airbag, check diagnostic trouble code (DTC) before disconnecting the battery.

- (c) If the airbag assembly does not deploy in vehicle collision, check the horn button assembly and the airbag electronic control module (SRS ECU).
- (d) If airbag electronic control unit(SRS ECU) may be impacted during the course of maintenance, you must disconnect airbag electronic control unit (SRS ECU)connector.
- (e) After negative cable of battery is disconnected, memory of audio entertainment system will be cleared. Before maintenance, all necessary data shall be recorded. After maintenance, reset audio system and adjust electronic clock. Do not try to use backup power on other vehicles to avoid data in system memory from losing. Backup power will charge airbag, which will make airbag expand suddenly during the course of maintenance.

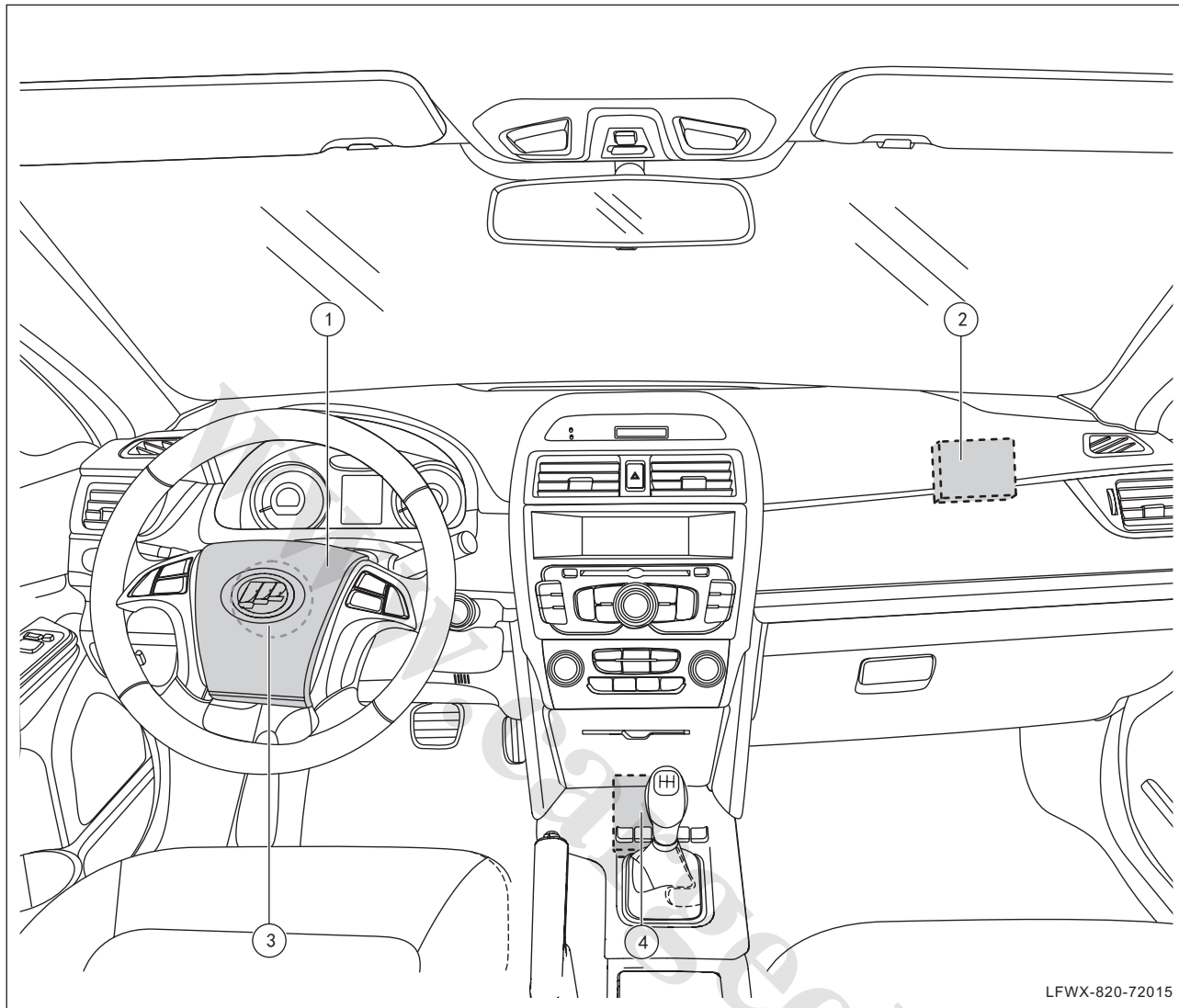
## 2. Cautions in repair

- (a) The airbag system components cannot be reused.
- (b) Check system circuit fault with a high resistance digital multimeter.
- (c) It is strictly forbidden to decompose or repair SRS modules or SRS ECU for the purpose of reuse or other reason.
- (d) If baking finish may bring an effect due to overheating (above 93 ° C), you must remove SRS ECU, airbag module and clock spring and other parts, then put them away.
- (e) During the course of maintaining airbags, airbag modules shall be installed on vehicles after being taken out of the container. If it is required to stop working, airbag modules shall be placed into the container. It is not allowed to keep airbag modules unattended. When storing removed airbag modules, keep the airbag expanding and the surface upwards.
- (f) Never place the airbag assembly in a hot environment or an open flame.
- (g) After the maintenance is finished, do not connect the airbag module to power supply right now. Do electrical inspection first, and connect it to the power supply if no fault is found.

## 3. Precautions after repair

- (a) There should be no any person in the vehicle when connecting the airbag system to the power supply.
- (b) After maintenance, check if the SRS warning lamp is normal.
- (c) The service life of the airbag is limited. For expiration of service life, the airbag module and label must be replaced.

## Components

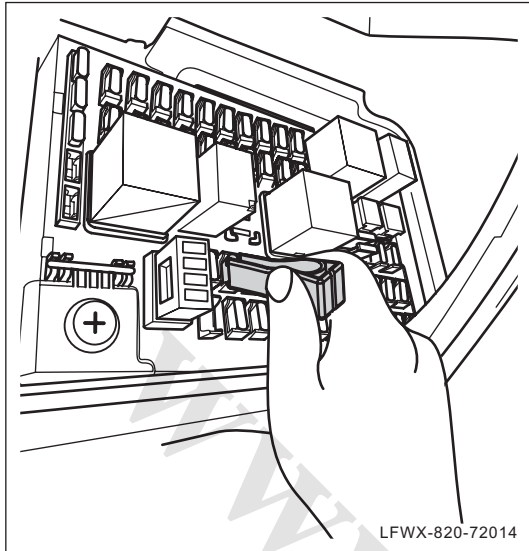


1	Driver airbag	3	Clock spring
2	Front passenger airbag	4	SRS ECU



## General Check

### Check the system



#### 1. Check the fuse

- (a) Check whether fuse FS30 of airbag is blown. If yes, replace it with the one having same specifications.

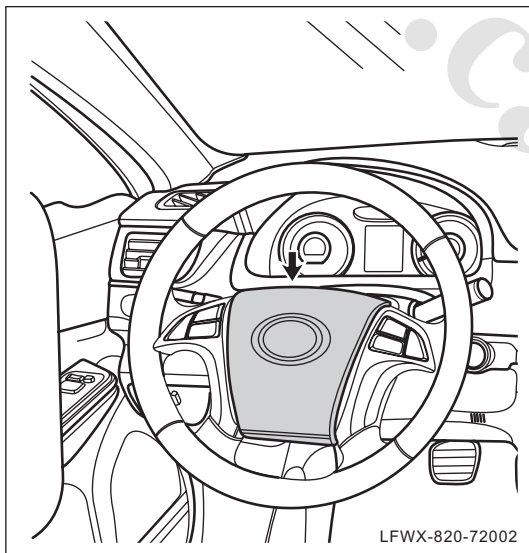
△ HINT:

Fuse of airbag is located in fuse box of driver's cab.

Check the driver airbag

#### 1. Check the driver airbag

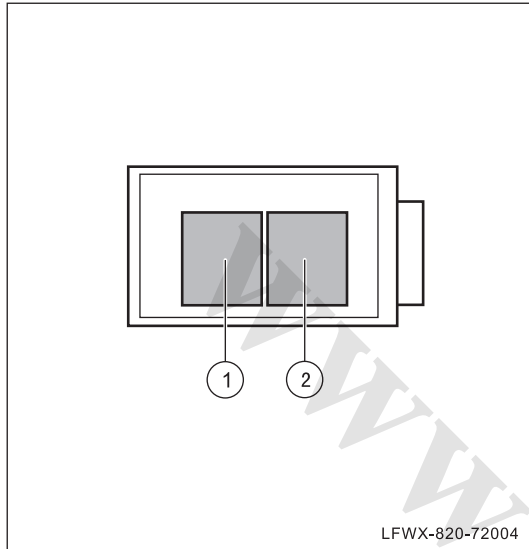
- (a) Identification mark of airbag is letters of "AIRBAG" marked on the pad plate of steering wheel.
- (b) Conduct visual inspection to the surface, cutting opening of gap, minor crack of driver safety airbag, to inspect whether they are damaged or have obvious discolor.



## Check the clock spring.

### 1. Check clock spring

- (a) Unplug airbag fuse FS30 in fuse box of dashboard.
- (b) Disconnect the connector connecting clock spring and driver airbag.



- (c) Use a digital multimeter to measure the resistance between pin No.1 and No.2 of clock spring connector.

**Resistance:**  $< 1 \Omega$

- (d) Slightly rotate clock spring for 1~2 circles, and measure the resistance between pin No.1 and No.2.

**Resistance:**  $< 1 \Omega$

△ HINT:

If the resistance doesn't meet requirement, replace clock spring.

**Note:**

It is strictly forbidden to use a digital multimeter to measure the resistance of drive airbag, to prevent airbag from being detonated incorrectly.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
The diagnostic scanner cannot communicate with the airbag system	1. Diagnostic interface fuse (burned)	See 72 - Safety Device Diagnosis, Fault Diagnosis (1. The diagnostic scanner cannot communicate with the airbag system)
	2. Wire harness (short circuit or open-circuit)	
	3. SRS ECU (damaged)	
Airbag fault indicator lamp is not lit	1. CAN communication circuit (open-circuit or short-circuit)	See 72 - Safety Device Diagnosis, Fault Diagnosis (2. The airbag fault indicator lamp does not come on)
	2. SRS ECU (damaged)	
	3. Instrument cluster (damaged)	
Airbag fault indicator lamp is usually on	1. CAN communication circuit (open-circuit or short-circuit)	See 72 - Safety Device Diagnosis, Fault Diagnosis (3. The airbag fault indicator lamp remains on)
	2. SRS ECU (damaged)	
	3. Instrument cluster (damaged)	
Check the SRS ECU for internal fault	1. SRS ECU (damaged)	See 72 - Safety Device Diagnosis, DTC Diagnosis (4. The SRS ECU internal fault)
Power supply circuit fault	1. Battery voltage (too low)	See 72 - SRS - Diagnosis, Fault Diagnosis (5. Power supply circuit fault)
	2. Alternator (damaged)	
Driver airbag circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (6. The driver airbag circuit fault)
	2. Driver airbag (damaged)	
	3. SRS ECU (damaged)	
The front passenger airbag circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (7. Front passenger airbag circuit fault)
	2. Front passenger airbag (damaged)	
	3. SRS ECU (damaged)	
The driver pretensioning seat belt circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (8. Driver pretensioning seat belt circuit fault)
	2. Driver seat belt tensioner (damaged)	
	3. SRS ECU (damaged)	

Symptom	Suspected area	Recommended action
The front passenger pretensioning seat belt circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (9. The front passenger pretensioning seat belt circuit fault)
	2. Front passenger seat belt tensioner (damaged)	
	3. SRS ECU (damaged)	
Left airbag circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (10. The left side airbag circuit fault)
	2. Driver side airbag (damaged)	
	3. SRS ECU (damaged)	
Right airbag circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (11. The right side airbag circuit fault)
	2. Front passenger side airbag (damaged)	
	3. SRS ECU (damaged)	
Left side curtain airbag circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (12. The left side curtain airbag circuit fault)
	2. Left side curtain airbag (damaged)	
	3. SRS ECU (damaged)	
Right side curtain airbag circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (13. The right side curtain airbag circuit fault)
	2. Right side curtain airbag (damaged)	
	3. SRS ECU (damaged)	
Left side impact sensor circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (14. The left side impact sensor circuit fault)
	2. Left side impact sensor (damaged)	
	3. SRS ECU (damaged)	
Right side impact sensor circuit fault	1. Wire harness (short circuit or open-circuit)	See 72 - Safety Device Diagnosis, DTC Diagnosis (15. The left side impact sensor circuit fault)
	2. Right side impact sensor (damaged)	
	3. SRS ECU (damaged)	
SRS configuration fault	1. SRS ECU (installed incorrectly or mismatched models)	See 72 - Safety Device Diagnosis, DTC Diagnosis (16. The airbag system configuration fault)
	2. Sensor or actuator (incorrect models)	

Symptom	Suspected area	Recommended action
CAN communication fault	1. CAN communication wire harness (short-circuit or open-circuit)	See 72 – SRS – Diagnosis, Fault Diagnosis (17. CAN communication fault)
	2. SRS ECU (damaged)	
	3. Instrument cluster (damaged)	

## Fault diagnosis

### 1. The diagnostic scanner cannot communicate with the airbag system

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Connect diagnostic scanner, check whether it can enter the airbag system, and then read the DTC and data flow	Diagnosis end.	The diagnostic scanner cannot communicate with the airbag system	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether the passenger compartment fuse box fuse FS17, FS19 is blown.	Go to Step 2	The fuse line faulty or the fuse blown	Check and repair the fuse line, and replace the fuse with rated capacity
2	Check the diagnostic interface connector	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the diagnostic interface connector and terminals are in good conditions</li> <li>Turn the ignition switch to the "ON" position.</li> <li>Check respectively the voltage between the terminal 8 &amp; 16 of the I17 of the diagnostic interface connector and the grounding with a multimeter</li> </ul> <b>Voltage: 9~13V</b>	Go to Step 3	The wire has an open-circuit point	Repair the line fault between the diagnostic interface and the compartment fuse box
3	Check the voltage of the airbag diagnosis communication line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn the ignition switch to the "ON" position.</li> <li>Measure the voltage between the terminal 6 of the diagnostic interface I17 and the grounding</li> </ul> <b>Voltage: 2.5~5V</b> <ul style="list-style-type: none"> <li>Measure the voltage between the terminal 14 of the diagnostic interface I17 and the grounding</li> </ul> <b>Voltage: 0~2.5V</b>	Go to Step 6	The voltage or resistance is not in a reasonable range	Go to Step 4

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
4	Check SRS ECU			
	<ul style="list-style-type: none"> <li>Turn the ignition switch to the "LOCK" position, and disconnect the SRS ECU wire harness connector</li> <li>Turn the ignition switch to the "ON" position, and measure the voltage between the terminal 10 of the SRS ECU connector S03 and the body grounding</li> </ul> <b>Voltage: 9~13V</b> <ul style="list-style-type: none"> <li>Measure the resistance between the terminal 20 of the SRS ECU wire harness connector S03 and the body grounding point</li> </ul> <b>Resistance: <math>\leq 2\Omega</math></b>	Go to Step 5	The wire has an open-circuit point	Repair the SRS ECU power and the grounding circuit
5	Check the airbag diagnosis communication line			
	Check whether terminal No.1 and No.11 of connector S03 of SRS ECU and terminal No.27 and No.26 of diagnostic connector I07 are conducted.	Go to Step 6	The wire has an open-circuit point	Repair the faulty wire harness open-circuit point
6	Replacement and check			
	Replace the SRS ECU, and recheck whether it can read the SRS DTC with the diagnostic scanner	Replace SRS ECU	Fault still exists	Search the cause from other fault symptoms

**2. Airbag fault indicator lamp is not lit**

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn the ignition switch to the "ON" position, and check whether the instrument cluster airbag fault indicator lamp displays normally	The airbag fault indicator lamp goes off after self-test	The instrument cluster indicator lamp does not come on	<ul style="list-style-type: none"> <li>If the other indicator lamps on the instrument cluster does not come on, check the instrument cluster power and grounding lines</li> <li>If the only airbag fault indicator lamp does not come on, go to the 1st step</li> </ul>
1	Check airbag communication circuit	Normal	Faulty	Instruction
	Connect diagnostic scanner to inspect whether there is CAN communication DTCs between instrument cluster and airbag.	Go to Step 2	If no, it indicates that there is fault inside instrument cluster.	Replace the instrument cluster
2	Check the line between the SRS ECU and the instrument cluster	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect air SRS ECU connector.</li> <li>Check whether terminal No.1 and No.11 of SRS ECU connector S03 and terminal No.27 and No.26 of instrument cluster connector I07 are conducted.</li> </ul>	Go to Step 3	The SRS ECU, or the instrument cluster connector terminal or line has an open-circuit fault	Check and repair the connector, terminal or wire harness between the SRS ECU and the instrument cluster
3	Check SRS ECU power line and the grounding line	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect air SRS ECU connector.</li> <li>Turn the ignition switch to the "ON" position, and measure the voltage between the terminal 10 of the SRS ECU connector S03 and the body grounding</li> </ul> <b>Voltage: 9-13V</b> <ul style="list-style-type: none"> <li>Measure the resistance between the terminal 20 of the SRS ECU wire harness connector and the body grounding point</li> </ul> <b>Resistance: &lt; 2Ω</b>	Go to Step 4	The wire has an open-circuit point	Repair the SRS ECU power and the grounding circuit
4	Replacement and check	Normal	Faulty	Instruction
	Replace the SRS ECU, and check whether the airbag fault indicator lamp is normal	Replace SRS ECU	Fault still exists	Search the cause from other fault symptoms

### 3. Airbag fault indicator lamp is usually on

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Whether the airbag has exploded	Go to Step 1	The airbag exploded	Replace the airbag
1	Read the fault code	Normal	Faulty	Instruction
	Read the airbag system DTC with the diagnostic scanner, and measure whether there is a DTC output	Go to Step 2	With DTC output	Perform diagnosis according to the DTC tips
2	Check the SRS ECU connector	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Turn ignition switch to "OFF" position.</li> <li>Disconnect the negative cable of battery, and check whether the SRS ECU connector and terminal are connected normally</li> </ul>	Go to Step 3	The SRS ECU connector has a connection fault	Properly connect the SRS ECU connector and terminal
3	Check the instrument cluster	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace the instrument cluster, and confirm whether the airbag warning lamp works normally	Replace the instrument cluster	Fault still exists	Go to Step 4
4	Replacement and check	Normal	Faulty	Instruction
	Replace the SRS ECU, and confirm whether the airbag warning lamp works normally	Replace SRS ECU	Fault still exists	Search the cause from other fault symptoms

#### 4. Check the SRS ECU for internal fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Restart the engine to perform road test, reread the DTC, and check whether the DTC can be read</li> </ul>	The DTC does not exist	Go to Step 2	The fault is sporadic. Check whether the SRS ECU connector is loose or damaged, and whether the wire harness terminal is corroded
2	Replacement and check	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test. <ul style="list-style-type: none"> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 5. Power circuit failed

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector is loose or damaged, and whether the wire harness terminal is corroded
2	Check the alternator voltage	Normal	Faulty	Instruction
	Connect vehicle diagnostic scanner, read the alternator data flow under various conditions, and then confirm whether the alternator voltage is normal <b>Voltage: 13~15V</b>	Go to Step 3	The voltage is not within the normal range	Check and repair the alternator circuit
3	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test. <ul style="list-style-type: none"> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 6. Driver airbag circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the driver airbag connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the clock spring connector	Normal	Faulty	Instruction
	Disconnect the clock spring connector, check whether the SRS ECU and the clock spring connectors are loose or damaged, and whether the wire harness terminal is corroded	Go to Step 3	The connector and pin are abnormal	•Check connectors and pins
3	Check the clock spring line	Normal	Faulty	Instruction
	Measure whether the terminal 1 & 2 of the clock spring connector S01 and the terminal 6 & 16 of the SRS ECU connector are conducted	Go to Step 4	The wire between the clock spring and the SRS ECU has an open-circuit point	Repair the faulty wire
4	Check the clock spring.	Normal	Faulty	Instruction
	Check whether the wire in the clock spring works normally	Go to Step 5	The clock spring internal wire is faulty	Replacement of clock spring
5	Check the driver airbag	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Replace driver airbag</li> <li>Diagnose it again, read the DTC and check if there are DTCs &amp; fault symptoms</li> </ul>	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 7. The front passenger airbag circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the front passenger airbag connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the front passenger airbag line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect connector of SRS ECU and connector of driver airbag.</li> <li>Measure whether terminal No.4 and No.14 of SRS ECU connector S03 and terminal No.3 and No.2 of front passenger airbag connector S02 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the front passenger airbag and the SRS ECU is short-circuit or open-circuit	Repair the faulty wire
3	Check the front passenger airbag	Normal	Faulty	Instruction
	Replace the front passenger airbag, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace front passenger airbag	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 8. The driver pretensioning seat belt circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the driver pretensioning seat belt connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the driver pretensioning seat belt line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and driver pretension belt connector</li> <li>Measure whether terminal No.7 and No.17 of SRS ECU connector S03 and terminal No.2 and No.1 of driver pretension belt connector S11, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the driver pretensioning seat belt and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire

Steps	Inspection item	Inspection result		
3	Check the driver pretensioning seat belt	Normal	Faulty	Instruction
	Replace the driver pretensioning seat belt, perform re-diagnosis, read the DTC, and confirm existence of DTC and symptom.	Replace the driver pretensioning seat belt	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

### 9. The front passenger pretensioning seat belt circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the front passenger pretensioning seat belt connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the front passenger airbag line	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and front passenger pretension belt connector.</li> <li>Measure whether terminal No.5 and No.15 of SRS ECU connector S03 and terminal No.2 and No.1 of driver pretension belt connector S06 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the front passenger pretensioning seat belt and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire
3	Check the front passenger pretensioning seat belt	Normal	Faulty	Instruction
	Replace the front passenger pretensioning seat belt, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace the front passenger pretensioning seat belt	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

### 10.Driver side airbag circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test s	Airbag malfunction indicator lamp doesn' t go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the driver side airbag connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the driver side airbag line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and driver pre-tension belt connector.</li> <li>Measure whether terminal No.1 and No.9 of SRS ECU connector S04 and terminal No.2 and No.3 of driver airbag connector S09 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the driver side airbag and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire
3	Check the driver side airbag	Normal	Faulty	Instruction
	Replace the driver side airbag, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace the driver side airbag	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 11. Front passenger side airbag circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and front passenger side airbag connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the front passenger side airbag line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and front passenger airbag connector.</li> <li>Measure whether terminal No.2 and No.10 of SRS ECU connector S04 and terminal No.2 and No.3 of front passenger airbag connector S08 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the front passenger side airbag and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire
3	Check the front passenger side airbag	Normal	Faulty	Instruction
	Replace the front passenger side airbag, perform re-diagnosis, read the DTC, and confirm existence of DTC and symptom	Replace the front passenger side airbag	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 12. Left side curtain airbag circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the left side curtain airbag connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the left side curtain airbag wiring	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and left air curtain connector</li> <li>Measure whether terminal No.3 and No.11 of SRS ECU connector S04 and terminal No.2 and No.1 of left air curtain connector S12 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the left side curtain airbag and the SRS ECU is open-circuit or short-circuit.	Repair the faulty wire
3	Check the left side curtain airbag	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace the left side curtain airbag assembly, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace the left side curtain airbag assembly	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

### 13.Right side curtain airbag circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the right side curtain airbag assembly connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the right side curtain airbag assembly wiring	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and right air curtain assembly connector.</li> <li>Measure whether terminal No.4 and No.12 of SRS ECU connector S04 and terminal No.2 and No.1 of left air curtain connector S11 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the right side curtain airbag assembly and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire
3	Check the right side curtain airbag assembly	Normal	Faulty	Instruction
	Replace the right side curtain airbag assembly, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace the right side curtain airbag assembly	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

#### 14. Left side impact sensor circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the left side impact sensor connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the left side impact sensor wiring	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and left impact sensor connector.</li> <li>Measure whether terminal No.2 and No.12 of SRS ECU connector S03 and terminal No.2 and No.1 of left impact sensor connector S10 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the left side impact sensor and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire
3	Check the left side impact sensor	Normal	Faulty	Instruction
	Replace the left side impact sensor, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace the left side impact sensor	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

## 15.Right side impact sensor circuit fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the SRS ECU connector and the right side impact sensor connector are loose or damaged, and whether the wire harness terminal is corroded
2	Check the right side impact sensor line	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect SRS ECU connector and right impact sensor connector.</li> <li>Measure whether terminal No.3 and No.13 of SRS ECU connector S03 and terminal No.2 and No.1 of right impact sensor connector S05 are conducted, and inspect whether they have short-circuit to grounding connection.</li> </ul>	Go to Step 3	The wire between the right side impact sensor and the SRS ECU is open-circuit or short-circuit	Repair the faulty wire
3	Check the right side impact sensor	Normal	Faulty	Instruction
	Replace the right side impact sensor, perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace the right side impact sensor	With DTC and fault symptom	Go to Step 4
4	Check SRS ECU	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms

### 16. Airbag system configuration error

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether the connectors of the relevant electrical components are loose or damaged, and whether the wire harness terminal is corroded
2	Check the electrical components	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Check whether the components related with DTC are the original accessories</li> <li>Read the diagnostic data flow, and check whether the electrical components match the vehicle</li> </ul>	Go to Step 3	The electrical components are not original accessories or the components do not match the SRS ECU	Replace the accessories or re-match the airbag
3	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Search the cause from other symptoms



## 17.CAN communication fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn off ignition switch and turn on it after 30s, and inspect the condition of airbag malfunction indicator lamp.	The airbag fault indicator lamp goes off after self-test	Airbag malfunction indicator lamp doesn't go out	Go to Step 1
1	Read the fault code	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Connect the vehicle diagnostic scanner, read and clear the DTC</li> <li>Reread the DTC, and check whether the DTC can be read</li> </ul>	The fault is sporadic	If there is a DTC, go to Step 2	The fault is sporadic. Check whether connectors of relevant control units (instrument cluster, FBCM) are loose, damaged, or wire harness terminal is corroded.
2	Check wire harness of CAN communication	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>Disconnect the SRS ECU connector and the instrument cluster connector</li> <li>Use a digital multimeter to inspect whether terminal No.1 and No.11 of SRS ECU connector S03 and terminal No.27 and No.26 of instrument cluster connector I07 are conducted, and inspect whether they have short-circuit to grounding connection, incorrect wire harness winding (twisted pair).</li> </ul>	Go to Step 3	Wire harness has fault	Eliminate wire harness fault
3	Check SRS ECU	Normal	Faulty	Instruction
	Replace the SRS ECU, and perform road test; perform re-diagnosis, read the DTC, and confirm the existence of DTC and symptom.	Replace SRS ECU	Fault still exists	Check whether relevant control system (instrument cluster, FBCM, ECM, etc.) has relevant communication DTCs, and eliminate them.

## SRS ECU

### Replacement

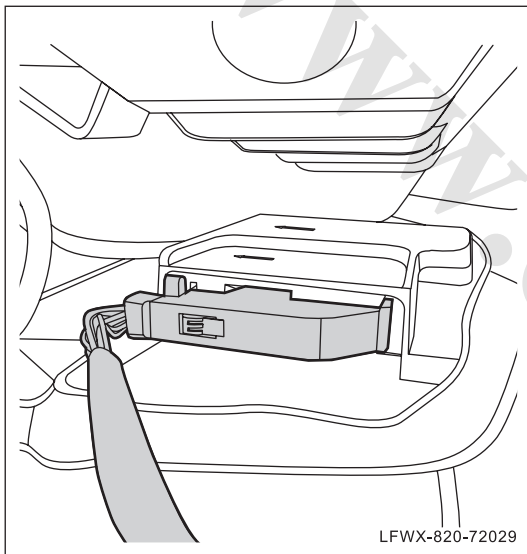
#### 1. Remove driver airbag assembly

- (a) Turn power supply of the system to “LOCK” position, and disconnect positive and negative cables of battery.

△ HINT:

After disconnecting the positive and negative cable of battery, wait for at least 90s and conduct the following operations.

- (b). Remove the console assembly. (See 84 - Dashboard and Console, Console, Replacement)



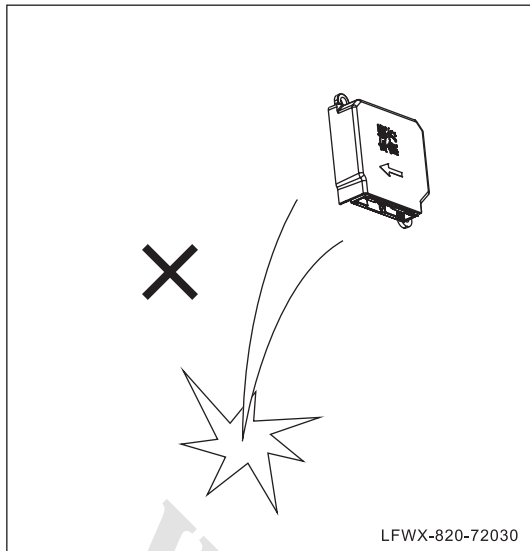
- (c). Disconnect air SRS ECU connector.  
(d) Disconnect fixing bolt of SRS ECU, and remove SRS ECU.

#### 2. Install the driver airbag assembly

- (a). Place the ECU in the installation position.

△ HINT:

- There must be no foreign matter on the mounting surface of ECU to ensure that ECU can be laid in level condition.
- Ensure that the arrow direction on the ECU label is the front of the vehicle, and align the three mounting holes of the ECU with the mounting holes on the ECU bracket.



**Note:**

Handle SRS ECU with care to avoid airbag ECU from falling off. If airbag ECU falls off, and replace a new ECU and it is prohibited to install the damaged ECU to vehicle.

(b). Install fixing bolts of SRS ECU.

**Torque: 6N•m - 10N•m**

(c). Connect SRS ECU connector.

△ HINT:

Make sure all related connectors are fixed and all wire harness is not damaged.

(d). Install the console assembly. (See 84 - Dashboard and Console, Console, Replacement)

(e). Install the battery positive and negative electrode cable.

## Driver Airbag

### Replacement

**Note:**

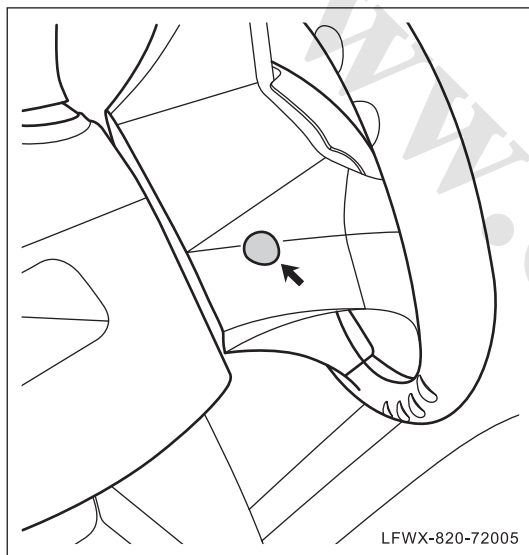
Before operating SRS system, please carefully read “72 – SRS, precautions”

#### 1. Remove driver airbag assembly

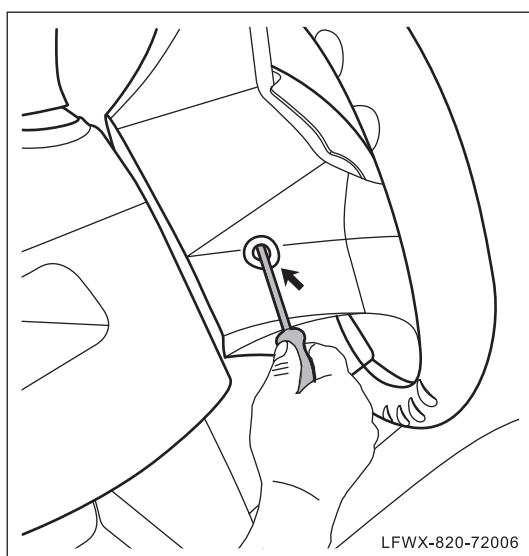
- (a) Turn power supply of the system to “LOCK” position, and disconnect positive and negative cables of battery.

**HINT:**

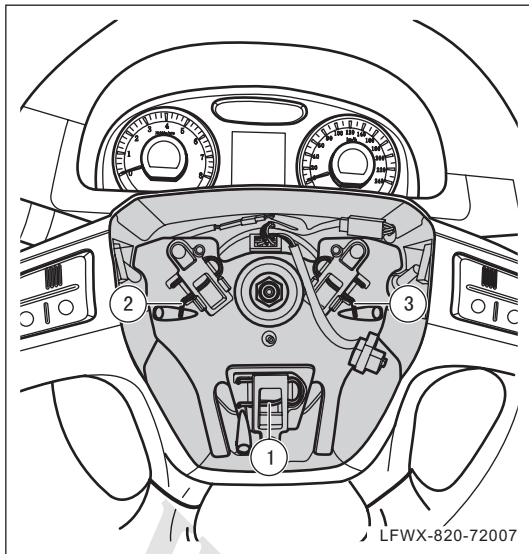
After disconnecting the positive and negative cable of battery, wait for at least 90s and conduct the following operations.



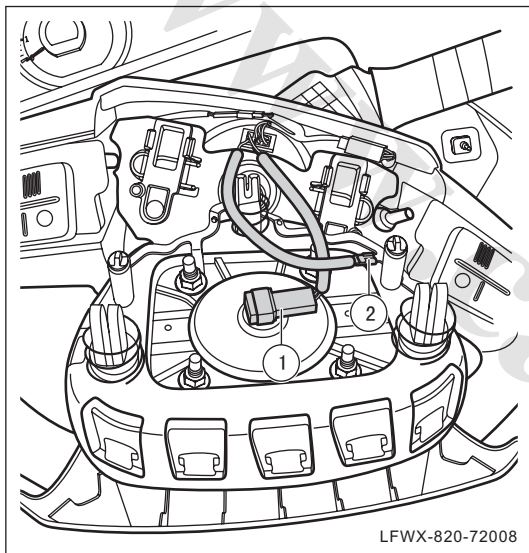
- (b) Remove plug of dismantle hole of airbag.



- (c). Extend into driver airbag assembly dismantling hole and push fixing clip with air-bag remover.



- Open fixing clip ① of driver airbag.
- Open fixing clip ② of driver airbag.
- Open fixing clip ③ of driver airbag.



- (d) Turn over fixing clip ① of driver airbag.

△ HINT:

Slowly turn over driver airbag assembly, to avoid damaging wire harness of airbag and wire harness of horn switch.

- (e) Disconnect wire harness connector ① of driver airbag and wire harness connector ② of horn switch.

**Note:**

**Do not pull wire harness to avoid being broken.**

- (f) Take out driver airbag and place it safely.

## 2. Install driver airbag

- (a) Take a new driver airbag assembly.

**Note:**

**If a new airbag assembly is handled improperly, it may deploy suddenly, which leads to serious damage. Therefore, when handling the module, the module front side shall face the body front to reduce possible hurt.**

- (b) Connector wire harness connector of driver airbag and wire harness connector of horn switch.
- (c) Install driver airbag assembly onto mounting position.

△ HINT:

Make sure airbag is completely installed in place. After installation, check if airbag and steering wheel interface coincide. If they do not coincide, it is necessary to reinstall it.

(d). Connect battery positive and negative cables.

### 3. Inspection

(a) Use a diagnostic scanner to inspect SRS.

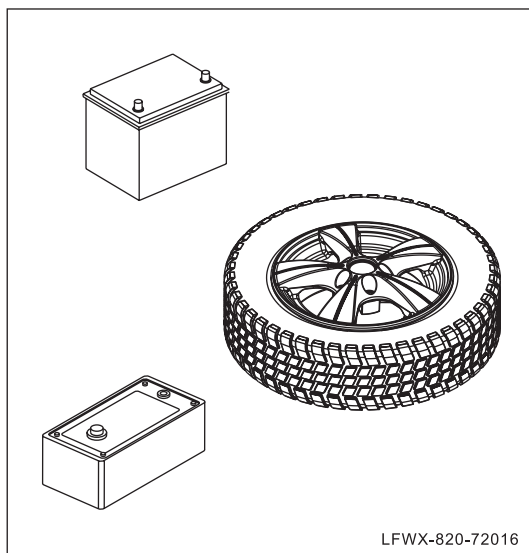
## Disposal

△ HINT:

When one vehicle is discarded or driver airbag module is disposed, it is necessary to detonate driver airbag to avoid the waste driver airbag from explosion in special circumstances. Deal with the explosion according to the following procedures. If the waste driver airbag cannot be detonated in accidents, contact with service station authorized by LIFAN.

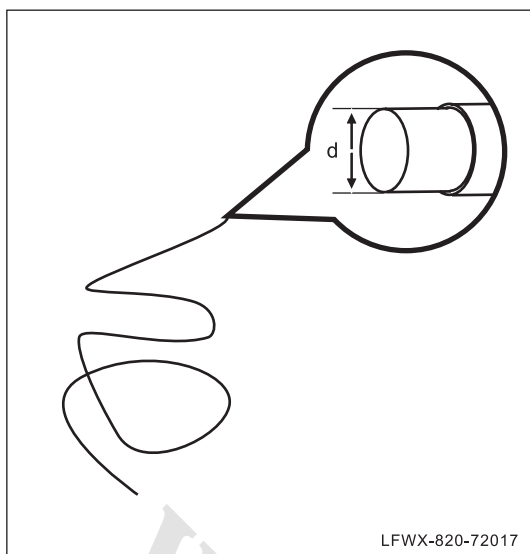
### ▲ WARNING:

- **Do not discard driver airbag module that is not detonated.**
- **When detonating airbags, a great explosion sound will occur. It is suggested to detonate airbag in the open air or detonate it where it will not affect residents nearby.**
- **When detonating airbags, detonating tool specified by LIFAN shall be used. The operation shall be done in a place far away from electrical interference.**
- **When detonating airbags, the operator shall keep 10m from airbags.**
- **After the airbag is detonated, airbags will become hot. Do not touch it within 30min to avoid scalds.**
- **When handling detonated airbags, it is necessary to wear gloves and glasses.**
- **Do not spray water on detonated airbag assembly.**
- **It is necessary to wash hands after operation.**



### 1. Preparation

- (a). Prepare special tools for detonating airbag.
- (b). Prepare one battery as power supply for detonating airbag.
- (c). Prepare one waste wheel with one steel rim and some waste tires (without steel rims) or hard carton and heavy objects.



- (d). Prepare some waste wire harness for vehicle maintenance.

△ HINT:

The diameter "d" of bare wire harness shall be larger than 1.3mm, i.e., sectional area of bare wire harness is larger than  $1.25\text{mm}^2$ .

▲ **WARNING:**

**If wire harness for binding driver airbag is too thin or unreliable, it may be broken when airbag deploys. It is very dangerous. Therefore, selected wire harness or equivalent shall be reliable.**

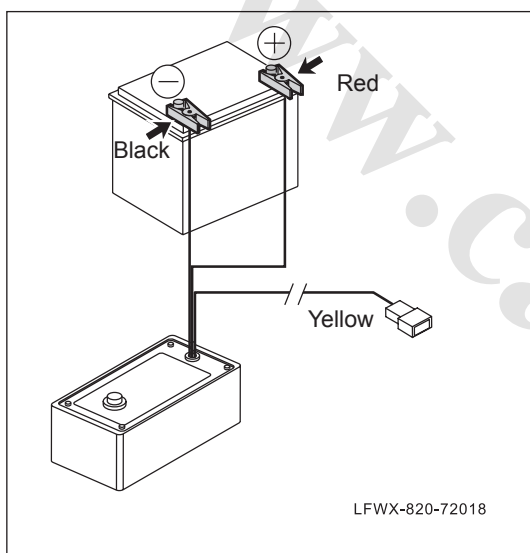
- (e). Select a spacious and appropriate space.

## 2. Preparation

- (a). Connect the special tool for detonating airbag to the battery.

△ HINT:

Connect red clip of special tool for detonating airbag to the battery positive electrode and black clip to the battery negative electrode. Do not connect yellow wire. It is used to connect airbag module.

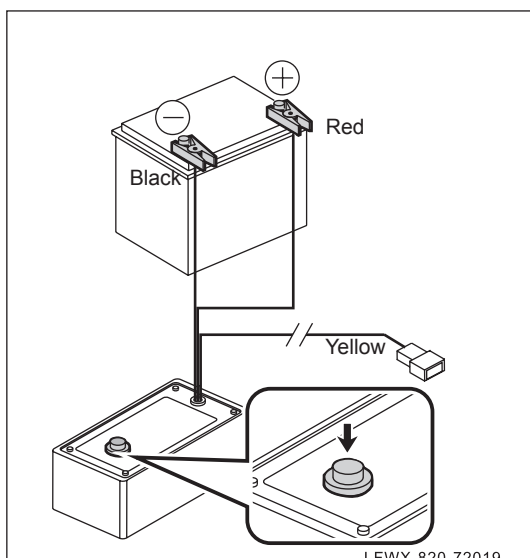


- (b). Press activating switch of special tools for detonating airbag and check if switching diode light is lit.

▲ **WARNING:**

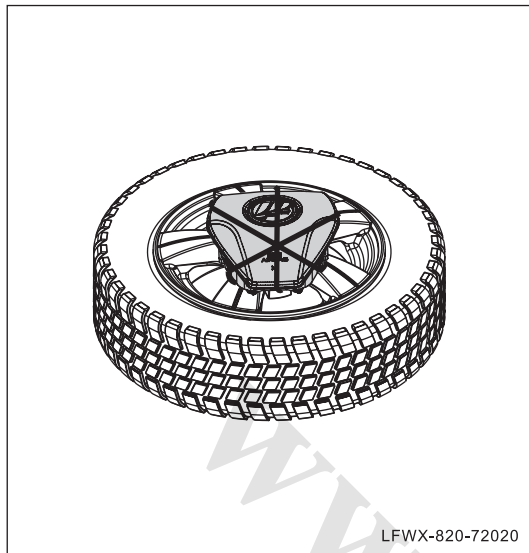
**If diode light is not lit, it means special tool for detonating airbag may have a fault. Therefore, it cannot be used.**

- (c). Disconnect special tools for detonating airbag from the battery.



### 3. Fasten driver airbag module

(a). Connect driver airbag wire harness to driver airbag module.



(b). Fasten driver airbag on prepared wheel with wire harness.

△ HINT:

When driver airbag deploys, it will damage the wheel. Therefore, it requires waste wheels.

▲ **WARNING:**

- **Make sure wire harness is reliable and fastened. If airbag module expands and wire harness is broken, airbag module will bounce, which is very dangerous.**
- **Make sure driver airbag surface is bound upwards. If the metal surface is upwards, wire harness will be broken when airbag expands. As a result, driver airbag flies to the sky, which is very dangerous.**

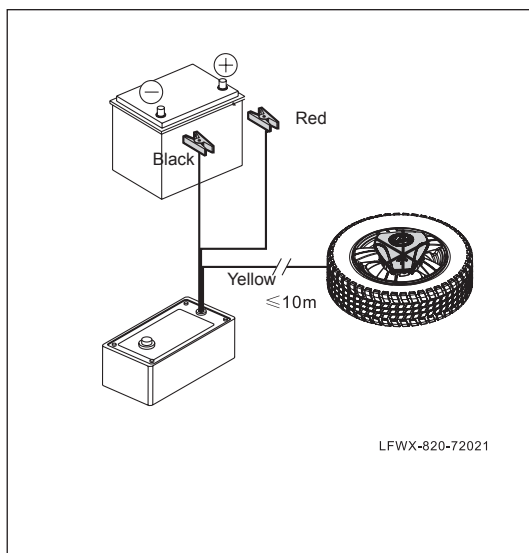
### 4. Connect special tools for detonating airbag.

(a). Connect driver airbag wire harness to yellow connector of special tool for detonating airbag.

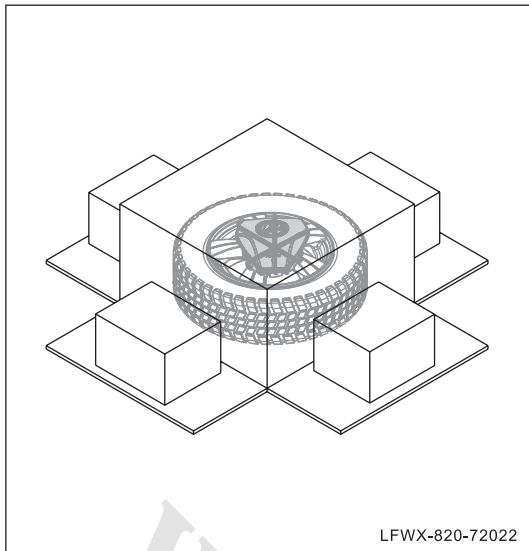
△ HINT:

In order to avoid damaging connector and wire harness of special tool for detonating airbag, do not lock the secondary lock of double interlocking. At the same time, make sure the line inside the tire is a little bit loose. Double interlocking and loose wire harness can ensure that the wire harness connector can be disconnected in time to protect wire harness of special tool for detonating airbag when airbag deploys, although the vibration is very high.

(b). Move special tools for detonating airbag beyond 10m from bounded airbag.





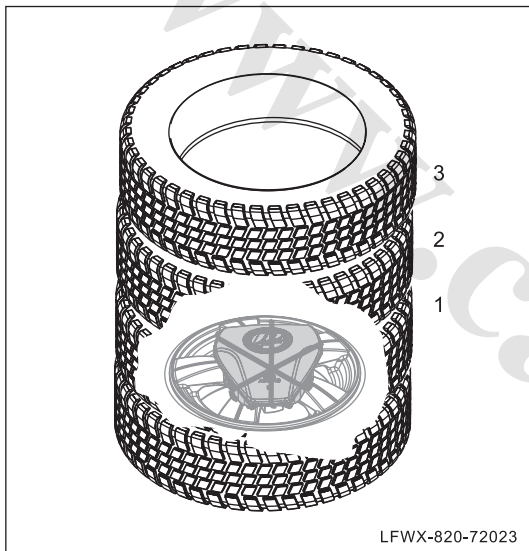


## 5. Cover and handle bounded airbag module

- (a). Cover bounded airbag module with hard carton or waste tire.

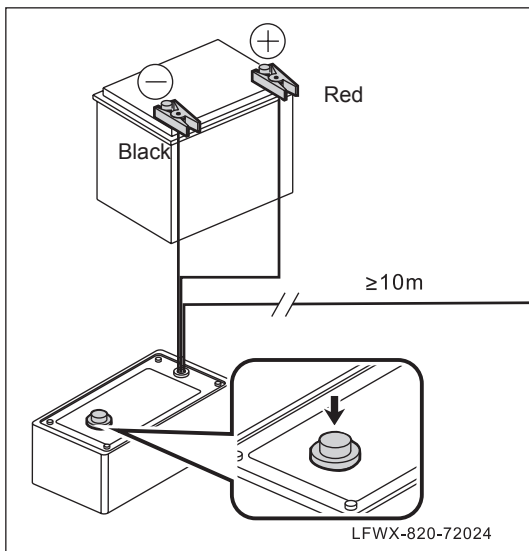
- Covering method of hard carton:

Use a hard carton that is larger than the wheel to cover bound airbag module, and place heavy objects that are larger than 190kg around the hard carton. As shown in the figure.



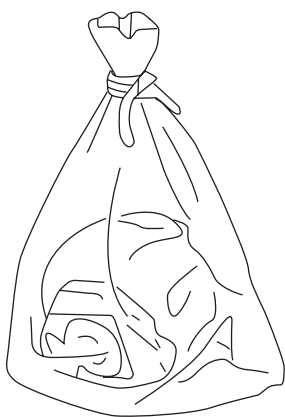
- Tire covering method:

Use 3 or more waste tires without rim to cover the bound safety airbag module, as shown in the figure below. As shown in the figure.



## 6. Detonate airbag module

- (a). Connect red and black clips of special tool of detonating airbag to the battery positive and negative electrodes, respectively.
- (b). Ensure that no one or animal is standing within 10m around the bundled airbag.
- (c). Press detonation switch and detonate airbag.



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## 7. Dispose driver airbag module

- (a). Remove driver airbag module from steel ring.
- (b). Put driver airbag into plastic bag and seal it, and dispose driver airbag module as disposal of waste parts.

### ▲ WARNING:

- **After the airbag is detonated, airbags will become hot. Do not touch it within 30min to avoid scalds.**
- **When handling detonated airbags, it is necessary to wear gloves and glasses.**
- **Do not spray water on detonated airbag assembly.**
- **It is necessary to wash hands after operation.**

## Front Passenger Airbag

### Replacement

**ⓘ Note:**

**Before operating SRS system, please carefully read “72 – SRS, precautions”**

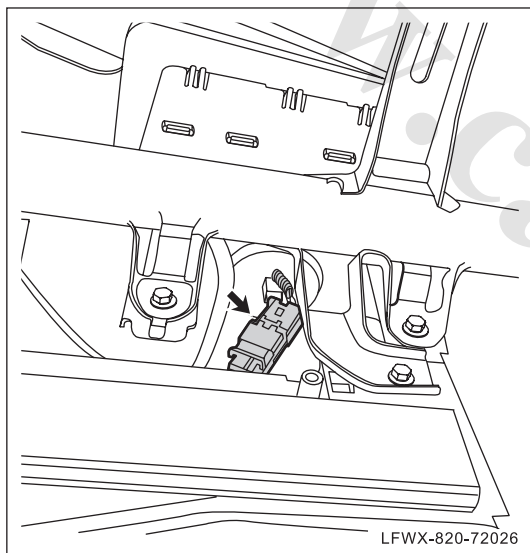
#### 1. Remove front passenger airbag assembly

- (a) Turn power supply of the system to “LOCK” position, and disconnect positive and negative cables of battery.

△ HINT:

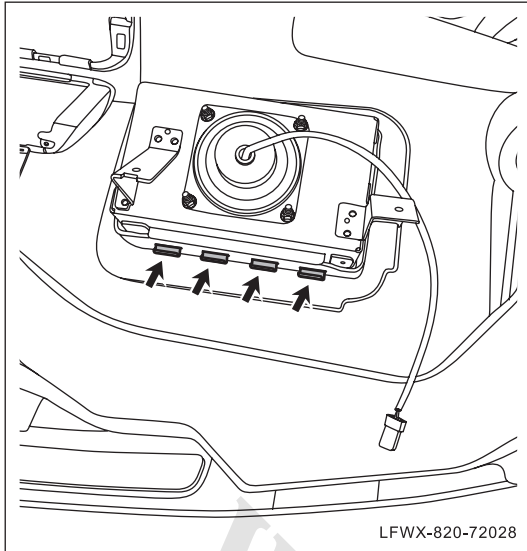
After disconnecting the positive and negative cable of battery, wait for at least 90s and conduct the following operations.

- (b) Remove dashboard glove box assembly. (See 84 – Dashboard/Console – Dashboard Glove Box, Replacement)



- (c). Disconnect front passenger airbag connector.

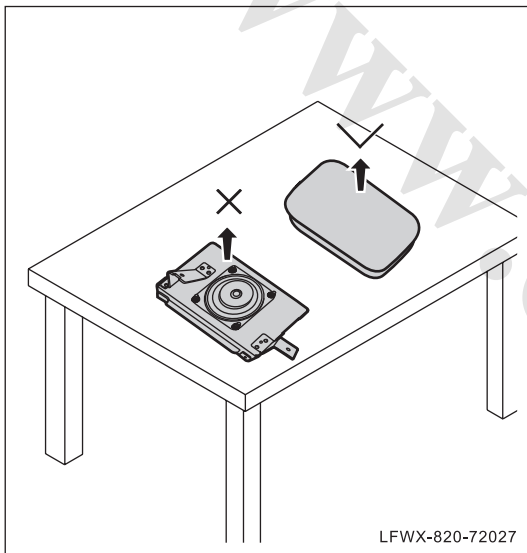
- (d). Remove dashboard upper panel. (See 84 - Dashboard and Console, Dashboard Upper Panel, Replacement)



- (e). Unclench the connecting tongue between the front passenger airbag module and the dashboard.

**▲ WARNING:**

When placing airbag module, it is dangerous to keep the face downwards. If airbag expands, the module movement will cause serious hurt. Therefore, it is placed with the face upwards.



- (f). Remove passenger airbag module assembly and place it safely.

**▲ WARNING:**

Do not disassemble the front passenger airbag module.

## 2. Install the front passenger airbag assembly

- (a) Take a new front passenger airbag assembly.

**ⓘ Note:**

If a new airbag assembly is handled improperly, it may deploy suddenly, which leads to serious damage. Therefore, when handling the module, the module front side shall face the body front to reduce possible hurt.

- (b). Install new front passenger airbag to the dashboard.

**ⓘ Note:**

After installation, check carefully if it is installed in place.

- (c) Install dashboard upper panel. (See 84 - Dashboard and Console, Dashboard Upper Panel, Replacement)
- (d). Connect front passenger airbag connector.

**Note:**

**Do not pull SRS wire harness forcedly.**

- (e) Install dashboard glove box assembly. (See 84 – Dashboard/Console – Dashboard Glove Box, Replacement)

**Disposal**

△ HINT:

(See 72 - Supplementary Safety Device, Driver Airbag, Disposal Process)

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# Clock Spring

## Replacement

### 1. Removal of clock spring

- (a) Turn power supply of the system to “LOCK” position, and disconnect positive and negative cables of battery.

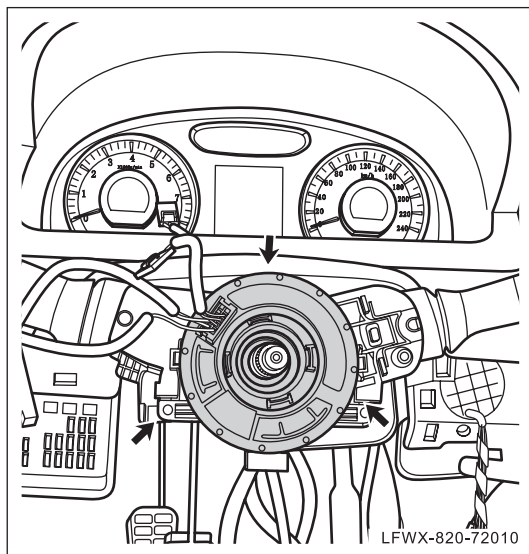
△ HINT:

After disconnecting the positive and negative cable of battery, wait for at least 90s and conduct the following operations.

- (b) Remove steering wheel. (See 61 – Steering Wheel of Hydraulic Steering System, Replacement)



- (c) Remove fixing screw of protective sleeve of steering shaft, and remove upper and lower protective sleeves of steering shaft.

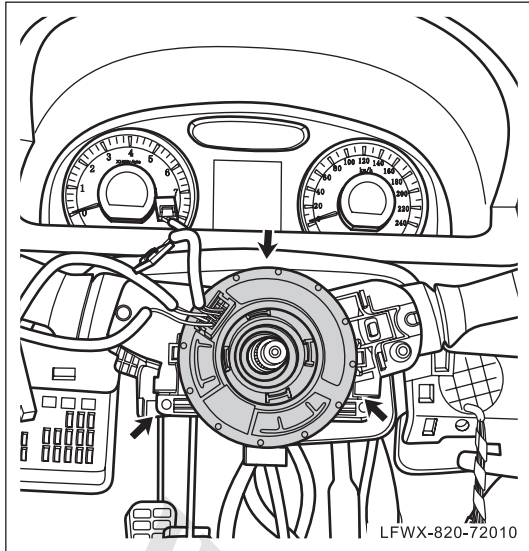


- (d) Disconnect wire harness connector of clock spring.
- (e) Pry the pawl of clock spring, and remove clock spring.

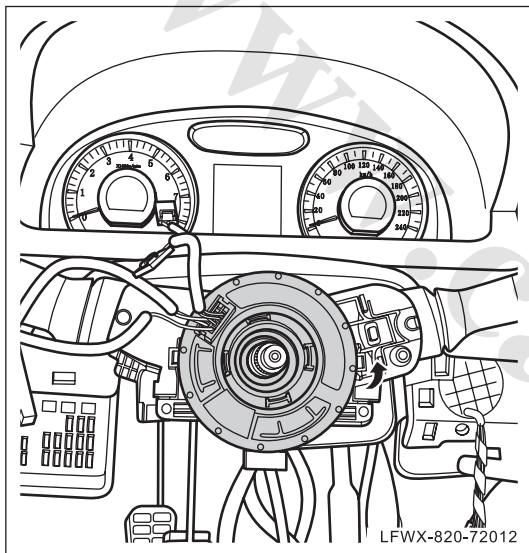
△ HINT:

If clock spring is required to be used continuously, it is required to make a mark on clock spring or tighten it with adhesive tape.

## Clock Spring

**2. Installation of clock spring**

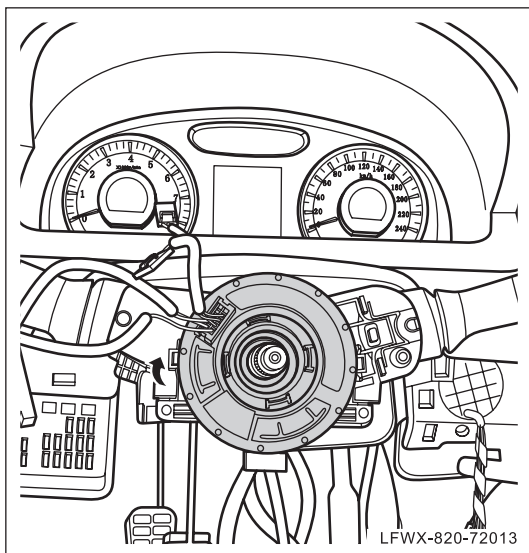
- (a) Check whether the front wheel is towards the front right direction.
- (b) Install clock spring, and place fixing clip to proper position.



## △ HINT:

If clock spring needs to be centered, follow the methods below.

- Rotate clock spring counterclockwise to limit position (don't use hard force).



- (d). Then rotate the clock by 2.5 turns clockwise and align with marks.

- (c) Connect wire harness connector of clock spring.



- (d) Install upper and lower protective sleeves of steering shaft to mounting position, and install and tighten fixing screw.

- (e) Install steering wheel. (See 61 – Steering Wheel of Hydraulic Steering System, Replacement)

### 3. Inspection

- (a) Check driver airbag assembly.  
(b) Use a diagnostic scanner to inspect SRS.



## 73 – Driver Information System

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# Instrument/Display

## System description

### 1. Function

Instrument cluster has the following functions:

It can provide driver with necessary information including traveling parameter, fault, and mileage. It is an essential part of the car. The correctness and reliability of traveling parameters are directly crucial to traveling safety.

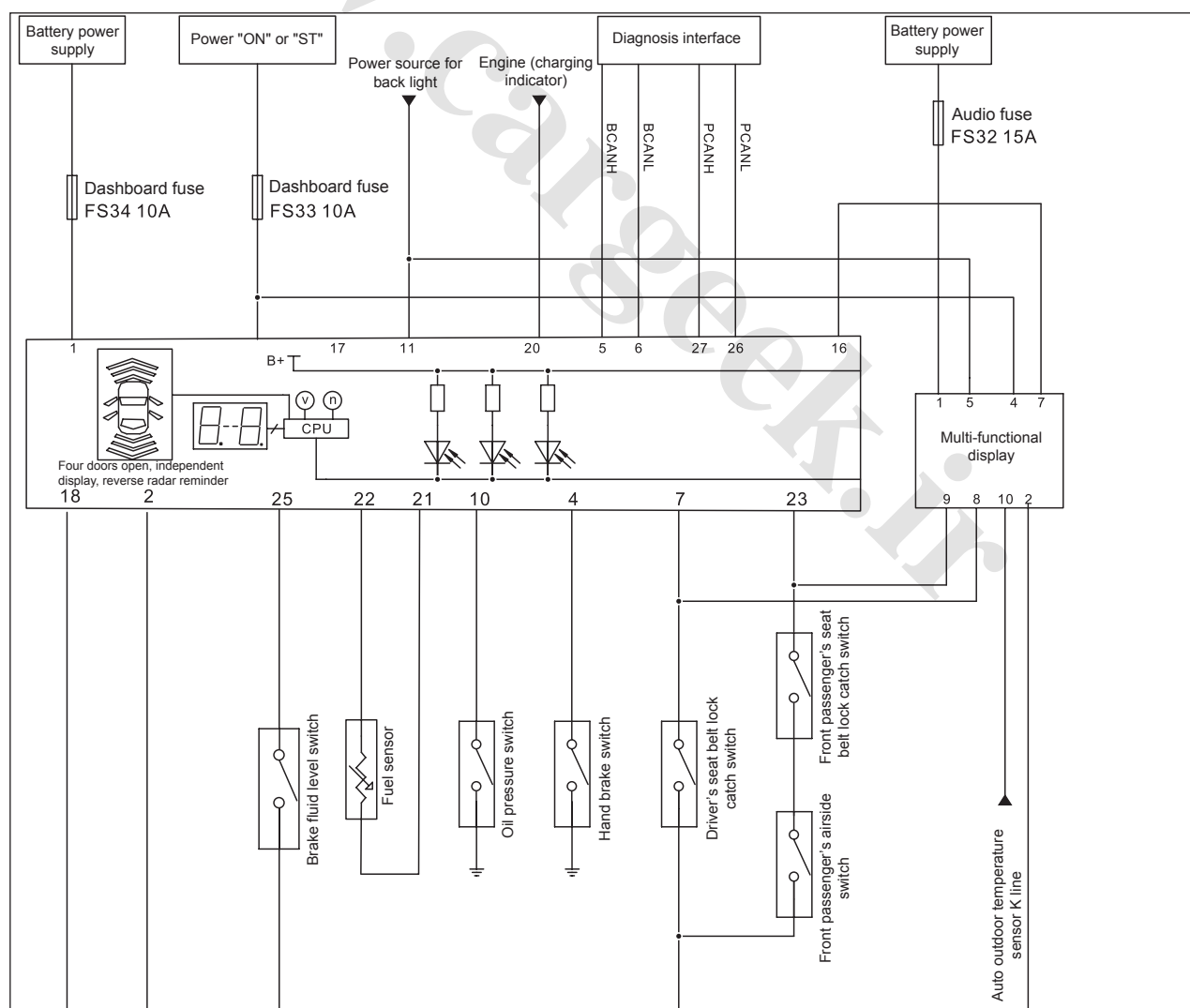
Instrument cluster has the following functions:

It can provide warning or tips for driver.

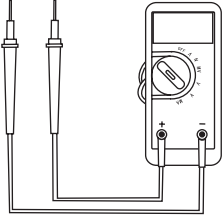
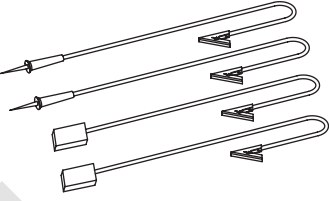
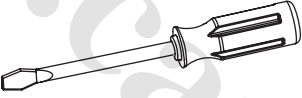
### 2. Components

Driver information system mainly consists of instrument cluster, multifunctional display, and wire harness, etc.

### 3. Principle



## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Wiring set		Testing circuits
3	Screwdriver		Remove the fixing screws

## Precautions

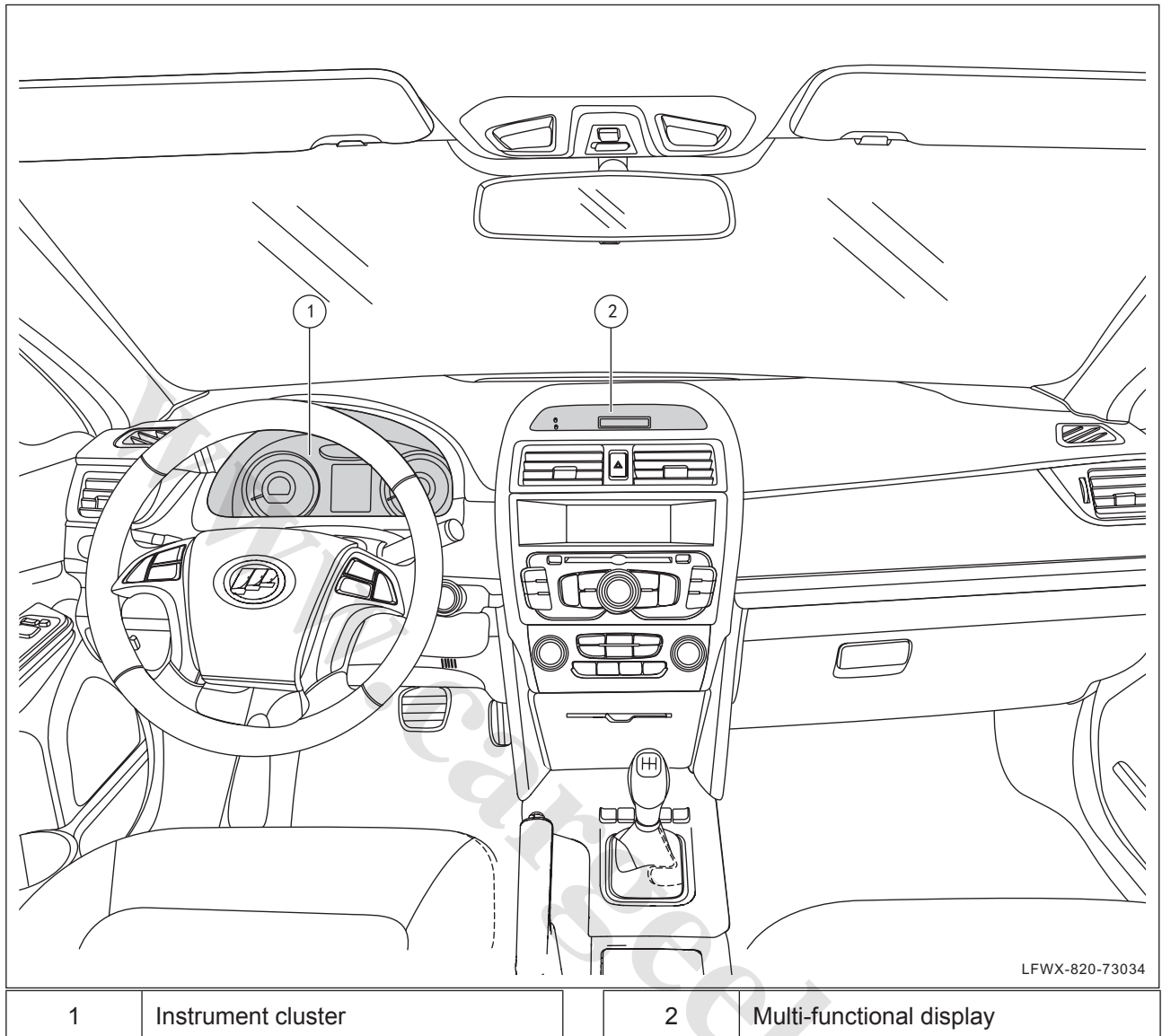
### 1. Cautions in repair

- (a) Instrument cluster and multifunctional display are assembly parts. Therefore, it is strictly forbidden to decompose it for repair. If there is any fault on them, directly replace them.

### 2. Precautions after repair

- (a) After installation of assembly parts, inspect their working condition.

## Components



## General Check

### Check the system

#### 1. Check the working condition of system

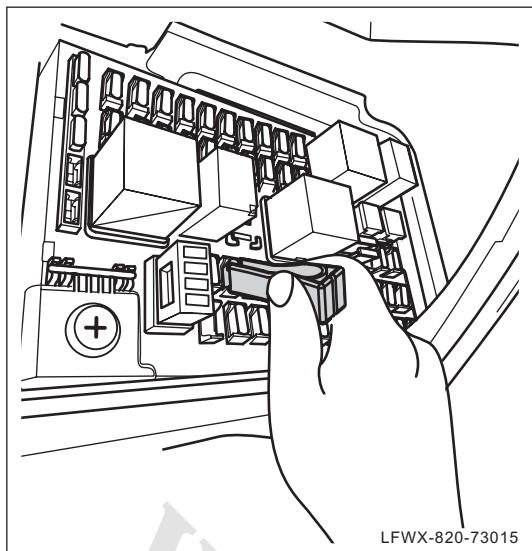
- (a) Turn power supply to “ON” position and inspect whether instrument cluster works normally. If no, overhaul it according to the following diagnosis steps.
- (b) Check whether instrument shows correct information. If no, overhaul it according to the following diagnosis steps.
- (c) Turn power supply to “ON” position, don’t start the engine, and inspect whether each indicator lamp works normally. If no, overhaul it according to following diagnosis steps.
- (d) Turn power supply to “ON” position and inspect whether multifunctional display works normally. If no, overhaul it according to the following diagnosis steps.

#### 2. Check system components

- (a). Check system for obvious mechanical or electrical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 3. Check wire harness

- (a). Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b). Check system wire harness for crack or damage. If any, fix it.



#### 4. Check the fuse

(a) Check whether fuse FS33, FS34 of instrument are blown. If yes, replace them with a new one having the same specifications.

△ HINT:

Instrument fuse is located in fuse box of driver's cab.

(b) Check whether fuse FS31 and FS32 of multifunctional display are blown. If yes, replace them with a new one having the same specifications.

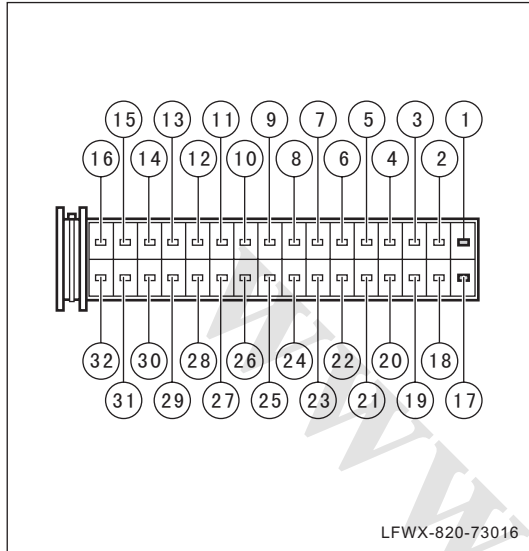
△ HINT:

Fuse of multifunctional display is located in fuse box of driver's cab.

## Check the instrument cluster

### 1. Check the working condition of instrument cluster

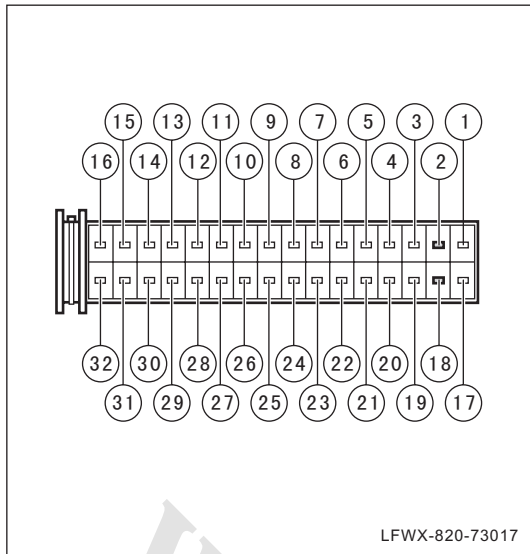
(a) Check whether the instrument surface is damaged. If yes, replace instrument cluster assembly.



### 2. Check power supply cable of instrument cluster

- (a) Turn power supply to “LOCK” position, and disconnect wire harness connector of instrument cluster.
- (b) Turn power supply to “ON” position, and use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of instrument cluster and body grounding connection. If this voltage is 0, overhaul relevant wire harness according to circuit book.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.17 of wire harness connector of instrument cluster and body grounding connection. If this voltage is 0, overhaul relevant wire harness according to circuit book.

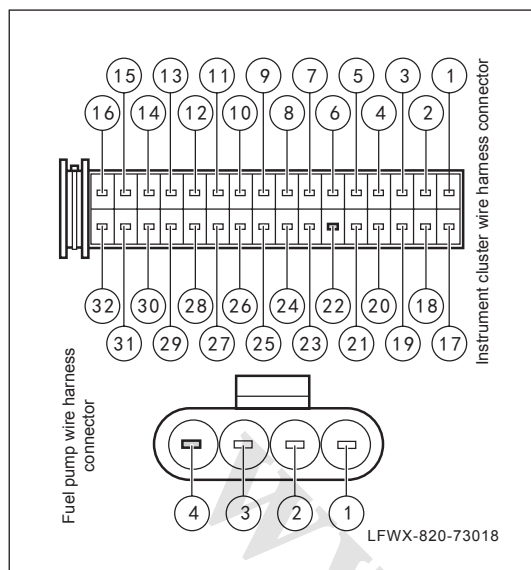




### 3. Check the grounding cable of instrument cluster

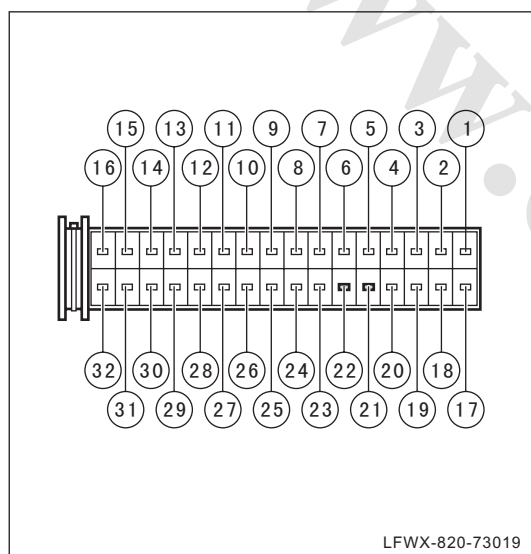
- (a) Turn power supply to "LOCK" position, and disconnect wire harness connector of instrument cluster.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of instrument cluster and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.18 of wire harness connector of instrument cluster and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check wire harness of oil level sensor



### 1. Check signal cable of oil level sensor

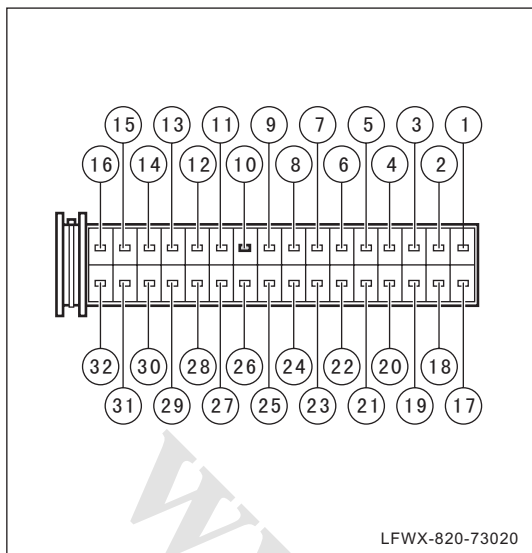
- (a) Turn power supply to "LOCK" position, and disconnect wire harness connector of instrument cluster and wire harness connector of fuel pump.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.22 of wire harness connector of instrument cluster and terminal No.4 of wire harness connector of fuel pump are conducted. If no, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of oil level sensor

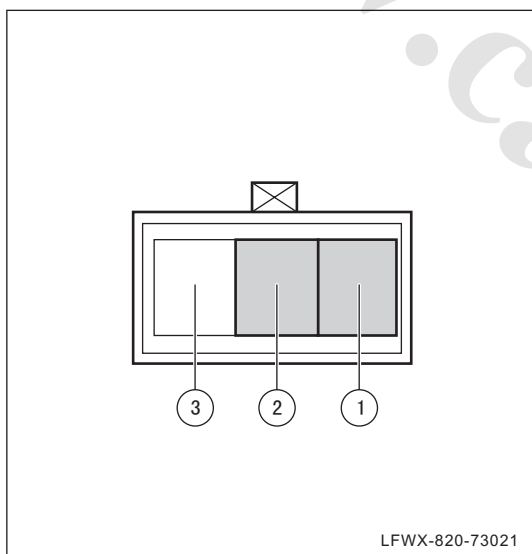
- (a) Turn power supply to "LOCK" position, and disconnect wire harness connector of instrument cluster.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.22 and No.21 of wire harness connector of instrument cluster are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check wire harness of engine oil pressure switch

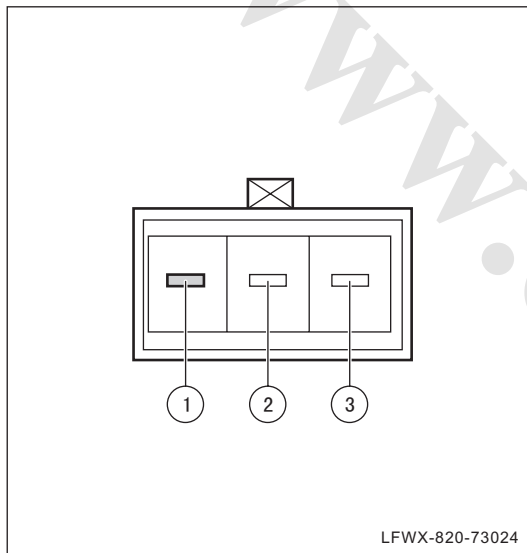
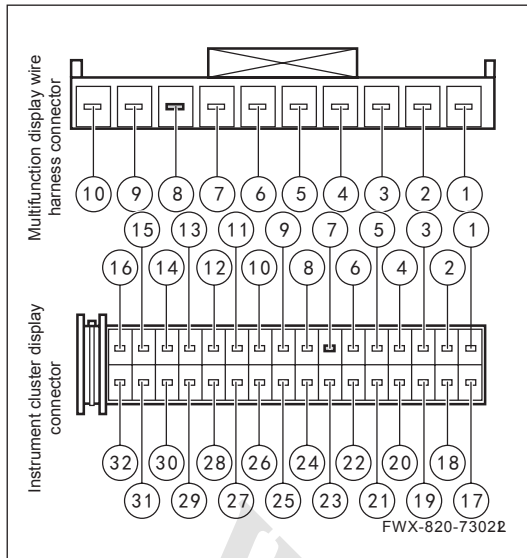


1. **Check signal cable of engine oil pressure switch**
  - (a) Turn power supply to “LOCK” position, and disconnect wire harness connector of instrument cluster.
  - (b) Use a digital multimeter resistance scale to inspect whether terminal No.10 of wire harness connector of instrument cluster and wire harness terminal of engine oil pressure sensor are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check driver's seat belt switch



1. **Check the working condition of driver's seat belt switch**
  - (a) Turn power supply to “LOCK” position and disconnect wire harness connector of driver's seat belt switch.
  - (b) Insert the belt lock latch into lock catch, and use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of driver's seat belt switch are conducted. If no, replace seat belt switch.
  - (c) Take the lock latch out of lock catch, and use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of driver's seat belt switch are conducted. If yes, replace seat belt switch.



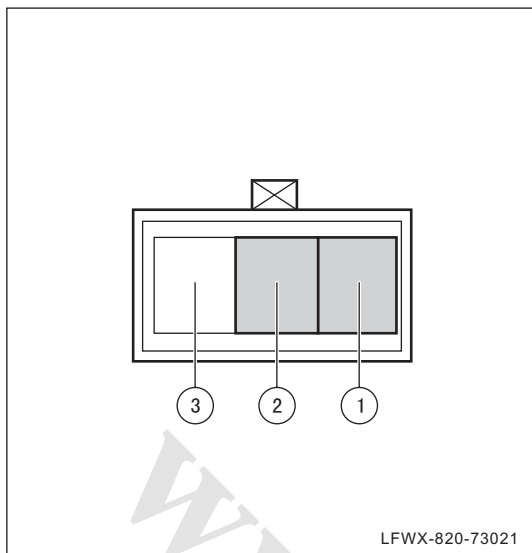
## 2. Check signal cable of driver's seat belt switch

- Turn power supply to "LOCK" position and disconnect wire harness connector of multifunctional display and wire harness connector of instrument cluster.
- Use a digital multimeter resistance scale to inspect whether terminal No.7 of wire harness connector of instrument cluster and terminal No.8 of wire harness connector of multifunctional display are conducted. If no, overhaul relevant wire harness according to circuit book.

## 3. Check grounding wire of driver's seat belt

- Turn power supply to "LOCK" position and disconnect wire harness connector of driver's seat belt switch.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of driver's seat belt switch and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check the front passenger seat belt switch

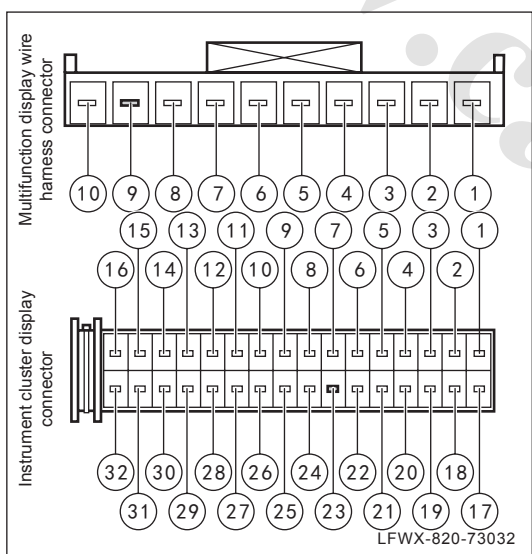


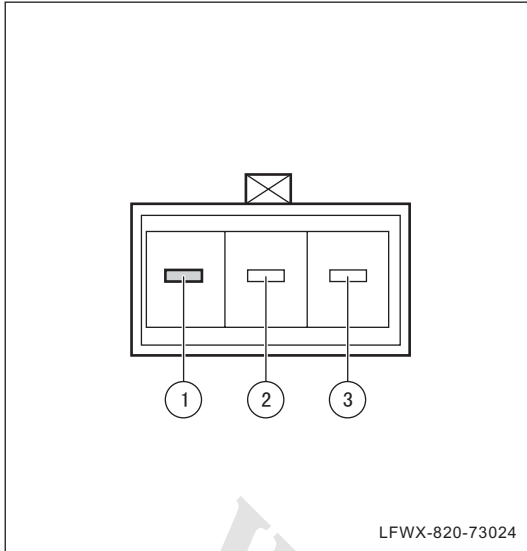
### 1. Check the working condition of front passenger's seat belt switch

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front passenger's seat belt switch.
- (b) Insert the belt lock latch into lock catch, and use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of front passenger's seat belt switch are conducted. If no, replace seat belt switch.
- (c) Take the lock latch out of lock catch, and use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of front passenger's seat belt switch are conducted. If yes, replace seat belt switch.

### 2. Check signal cable of front passenger's seat belt switch

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of multifunctional display and wire harness connector of instrument cluster.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.23 of wire harness connector of instrument cluster and terminal No.9 of wire harness connector of multifunctional display are conducted. If no, overhaul relevant wire harness according to circuit book.

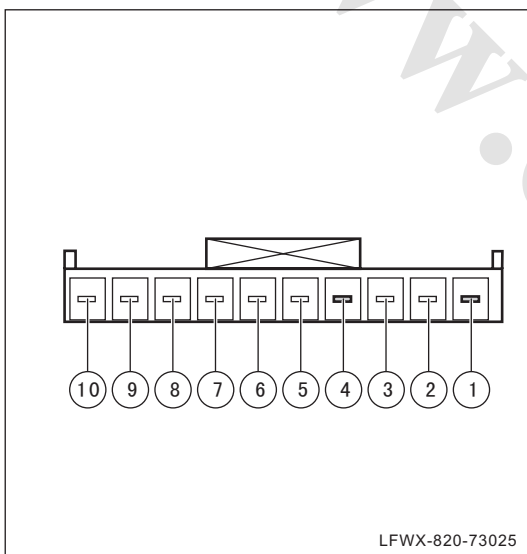




### 3. Check grounding wire of front passenger's seat belt

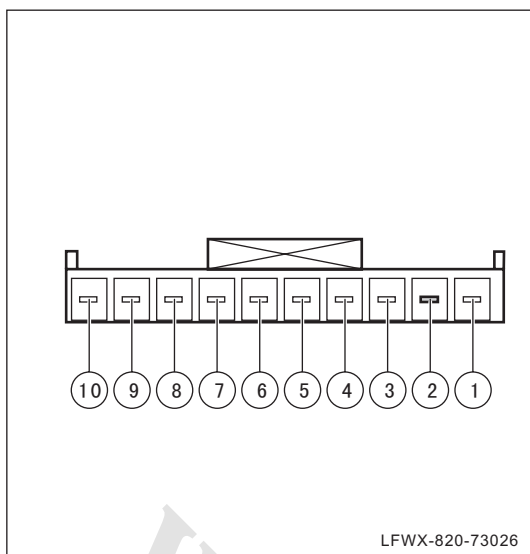
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front passenger's seat belt switch.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front passenger's seat belt switch and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check multifunctional display



### 1. Check power supply cable of multifunctional display

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of multifunctional display.
- (b) Turn power supply to "ON" position.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of multifunctional display and body grounding connection. If this voltage is 0, overhaul relevant wire harness according to circuit book.
- (d) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.4 of wire harness connector of multifunctional display and body grounding connection. If this voltage is 0, overhaul relevant wire harness according to circuit book.



## 2. Check grounding wire of multifunctional display

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of multifunctional display.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of multifunctional display and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
The whole instrument cluster doesn't work	1. Fuse (blown)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (1. The whole instrument cluster doesn't work)
	2. Wire harness (faulty)	
	3. Instrument cluster (damaged)	
Speedometer malfunction	1. CAN communication system (fault)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (2. Speedometer fault)
	2. Instrument cluster (damaged)	
Fault of the tachometer	1. CAN communication system (fault)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (3. Tachometer fault)
	2. Instrument cluster (damaged)	
Fuel volume is displayed incorrectly or warning lamp for low fuel level doesn't light up.	1. Wire harness (faulty)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (4. Fuel volume is displayed incorrectly or warning lamp for low fuel doesn't light up. Speedometer fault)
	2. Fuel level sensor (damaged)	
	3. Instrument cluster (damaged)	
When engine oil pressure is low, warning lamp for low engine oil pressure doesn't light up.	1. Engine oil pressure sensor (damaged)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (5. When engine oil pressure is low, warning lamp for low engine oil pressure doesn't light up.)
	2. Wire harness (faulty)	
	3. Instrument cluster (damaged)	
Driver's seat belt reminder is not lit/stays on	1. Driver's seat belt switch (damaged)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (6. Driver's seat belt reminder indicator lamp doesn't light up or constantly lights up.)
	2. Wire harness (faulty)	
	3. Multifunction display screen (damaged)	
Front passenger's seat belt reminder is not lit/stays on	1. Front passenger's seat belt switch (damaged)	See 73 – Instrument/ display, Diagnosis, Fault Diagnosis (7. Front passenger's seat belt reminder indicator lamp doesn't light up or constantly lights up.)
	2. Wire harness (faulty)	
	3. Multifunction display screen (damaged)	
Multifunctional display doesn't work	1. Fuse (blown)	See 73 – Instrument/display, Diagnosis, Fault Diagnosis (8. Multifunctional display doesn't work.)
	2. Wire harness (faulty)	
	3. Multifunction display screen (damaged)	



## Fault diagnosis

### 1. The whole instrument cluster doesn't work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether instrument cluster works normally (See 73 – General Check of Instrument/display, Check of System)	Diagnosis end.	The instrument cluster does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether instrument fuse is damaged (See 73 - General Check of Instrument/screen, Check of System)	Go to Step 3	FS33, FS34 fuses are blown	Go to Step 2
2	Check FS33 and FS34 circuit	Normal	Faulty	Instruction
	Check working condition of FS33 and FS34 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of instrument cluster is conducted (See 73 - General Check of Instrument/screen, Check of Instrument Cluster)	Go to Step 5	No continuity	Go to Step 4
4	Check the wire harness	Normal	Faulty	Instruction
	According to relevant contents of wiring diagram, measure whether circuit between the instrument cluster and fuse is conducted	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the grounding circuit of instrument cluster is conducted (See 73 - General Check of Instrument/screen, Check of Instrument Cluster)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Speedometer fault

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether instrument cluster works normally (See 73 – General Check of Instrument/ display, Check of System)	Diagnosis end.	Speedometer malfunction	Go to Step 1
1	Check CAN communication signal cable	Normal	Faulty	Instruction
	Check the PCAN communication cable between instrument cluster and ABS ECU.	Go to Step 2	Open circuit	Overhaul CAN communication cable
2	Read CAN DTCs.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 3	DTC about CAN communication cable is output.	Maintain it according to the tip of DTC
3	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Tachometer fault

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether instrument cluster works normally (See 73 – General Check of Instrument/ display, Check of System)	Diagnosis end.	Tachometer has fault	Go to Step 1
1	Check CAN communication signal cable	Normal	Faulty	Instruction
	Check the BCAN communication cable between instrument cluster and engine ECM.	Go to Step 2	Open circuit	Overhaul CAN communication cable
2	Read CAN DTCs.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 3	DTC about CAN communication cable is output.	Maintain it according to the tip of DTC
3	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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### 4. Fuel volume is displayed incorrectly or warning lamp for low fuel level doesn't light up.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether instrument cluster works normally (See 73 – General Check of Instrument/ display, Check of System)	Diagnosis end.	<ul style="list-style-type: none"> <li>Fuel volume is displayed incorrectly.</li> <li>Warning lamp for low fuel level doesn't light up.</li> </ul>	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
	Check whether oil level sensor circuit is conducted (See 73 – General Check of Instrument/ display, Check of Wire Harness of Oil Level Sensor)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding circuit of oil level sensor is conducted (See 73 – General Check of Instrument/ display, Check of Wire Harness of Oil Level Sensor)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the oil level sensor	Normal	Faulty	Instruction
	Check the working condition oil level sensor (See 13 – General Check of Fuel System, Check of Oil Level Sensor)	Go to Step 4	Oil level sensor is damage	Replacement (See 13- Fuel System Fuel Pump, Replacement)
4	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 5. When engine oil pressure is low, engine oil pressure warning lamp doesn't light up.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn power supply to "ON" position, don't start engine, and inspect whether engine oil pressure indicator lamp lights up.	Diagnosis end.	When engine oil pressure is low, engine oil pressure warning lamp doesn't light up.	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether signal circuit of engine oil pressure switch is conducted (See 73 – General Check of Instrument/ display, Check of Wire Harness of Engine Oil Pressure Switch)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Replacement and check	Normal	Faulty	Instruction
	Replace engine oil pressure sensor with the one having the same specification, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 3
3	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 6. Driver's seat belt reminder is not lit/stays on

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Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the multifunctional display works normally (See 73 – General Check of Instrument/ display, Check of System)	Diagnosis end.	Driver's seat belt reminder is not lit Driver's seat belt reminder stays on	Go to Step 1
1	Check driver's seat belt switch	Normal	Faulty	Instruction
	Check whether driver's seat belt switch is in good condition (See 73 – General Check of Instrument/ display, Check of Driver's Seat belt Switch)	Go to Step 2	Seat belt switch is damaged.	Replace (See 83 – Seat and Seat Belt – Seat Belt Switch, Replacement)
2	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether signal circuit of driver's seat belt switch is conducted (See 73 – General Check of Instrument/ display, Check of Driver's Seat Belt Switch)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding circuit of driver's seat belt switch is conducted (See 73 – General Check of Instrument/ display, Check of Driver's Seat Belt Switch)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Replacement and check	Normal	Faulty	Instruction
	Replace multifunctional display with the one having the same specification, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 7. Front passenger's seat belt reminder is not lit/stays on

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the multifunctional display works normally (See 73 – General Check of Instrument/ display, Check of System)	Diagnosis end.	<ul style="list-style-type: none"> <li>•Front passenger's seat belt reminder is not lit</li> <li>•Front passenger's seat belt reminder stays on</li> </ul>	Go to Step 1
1	Check the front passenger seat belt switch	Normal	Faulty	Instruction
	Check whether driver's seat belt switch is in good condition (See 73 – General Check of Instrument/ display, Check of Front Passenger's Seat Belt Switch)	Go to Step 2	Seat belt switch is damaged.	Replace (See 83 – Seat and Seat Belt, Seat Belt Switch, Replacement)
2	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether signal circuit of front passenger's seat belt switch is conducted (See 73 – General Check of Instrument/ display, Check of Front passenger's Seat Belt Switch)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding circuit of front passenger's seat belt switch is conducted (See 73 – General Check of Instrument/ display, Check of Front passenger's Seat Belt Switch)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Replacement and check	Normal	Faulty	Instruction
	Replace multifunctional display with the one having the same specification, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 8. Multifunctional display doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the multifunctional display works normally (See 73 – General Check of Instrument/ display, Check of System)	Diagnosis end.	Multifunctional display doesn't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of multifunctional display is damaged (See 73 – General Check of Instrument/ display, Check of System)	Go to Step 3	Fuse FS31, FS32 are blown	Go to Step 2
2	Check the circuit of FS31 and FS32	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check working condition of FS31 and FS32 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check power supply voltage of wire harness of multifunctional display (See 73 –General Check of Instrument/display, Check of Multifunctional Display)	Go to Step 4	No voltage	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding circuit of wire harness of multifunctional display is conducted (See 73 – General Check of Instrument/display, Check of Multifunctional Display)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Replacement and check	Normal	Faulty	Instruction
	Replace multifunctional display with the one having the same specification, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

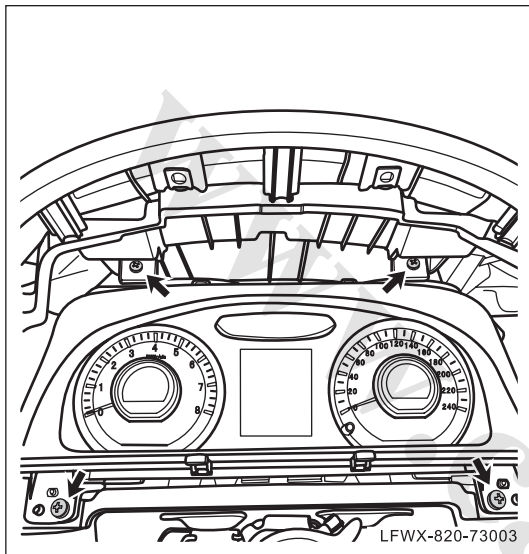


# Instrument Cluster

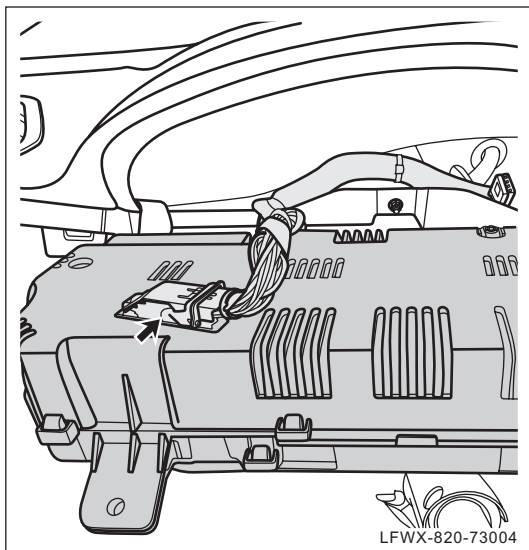
## Replacement

### 1. Removal of instrument cluster assembly

- (a) Turn power supply to "LOCK" position.
- (b) Remove instrument cluster cowl. (See 84 - Dashboard and Console, Instrument Cluster Cowl, Replacement)



- (c) Remove fixing screw of instrument cluster assembly.



- (d) Take instrument cluster assembly out a little distance, turn over instrument cluster assembly, and disconnect wire harness connector of instrument cluster assembly.

△ HINT:

Uncover the lock rod of wire harness connector of instrument cluster, and unplug wire harness connector of instrument cluster assembly.

- (e) Take out instrument cluster assembly.

## 2. Installation of instrument cluster assembly

- (a) Connect wire harness connector of instrument cluster assembly.

△ HINT:

After installing wire harness connector of instrument cluster assembly, lock the lock rod of wire harness connector of instrument cluster in good condition, to avoid the connector from falling off.

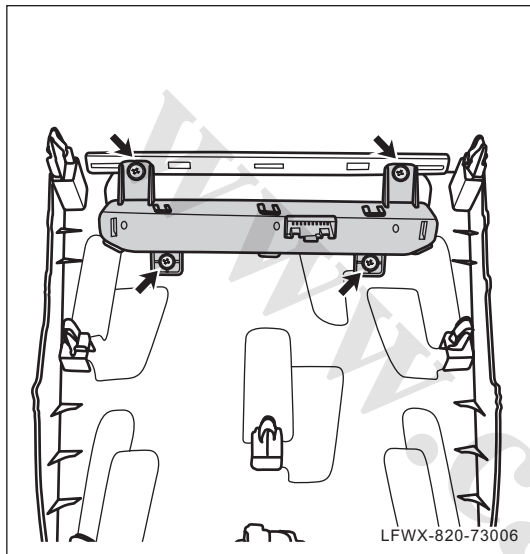
- (b) Turn over instrument cluster assembly, and put it onto mounting position.
- (c) Install and tighten fixing screw of instrument cluster assembly.
- (d). Install instrument cluster cowl. (See 84 - Dashboard and Console, Instrument Cluster Cowl, Replacement)

## Multi-functional Display

### Replacement

#### 1. Removal of multifunction display screen

- (a) Turn power supply to “LOCK “position.
- (b) Remove cover plate of multifunctional display. (See 84 –Instrument/console – Cover Plate of Multifunctional Display, Replacement)



- (c). Remove fixing screws of multifunction display screen and take out multifunction display screen.

#### 2. Installation of multifunction display screen

- (a) Install multifunctional display onto the cover plate of multifunctional display, and install and tighten fixing screw.
- (b) Install cover plate of multifunctional display. (See 84 –Instrument/console – Cover Plate of Multifunctional Display, Replacement)

# Reverse Radar System

## System description

### 1. Function

Reverse light switch has the following functions:

Provide reversing signal for body BCM.

Reverse radar probe has the following functions:

It can remind driver of surrounding barriers in voice form, solve problem for driver about detection in front and rear, left and right sides during parking and starting car, help driver to overcome blind area and vague sight, and improve driving safety.

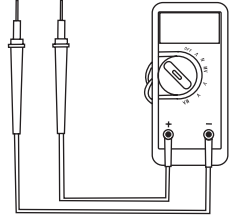
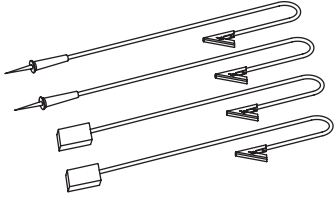

### 2. Components

Reverse radar system mainly consists of reverse radar probe, reverse radar buzzer (integrated into instrument cluster), and reverse light switch, etc.

### 3. Principle

Reverse radar system can calculate the distance between the rear of the car and the barrier by using reverse radar probe installed on rear bumper. Sensor can send and receive ultrasonic wave. Electronic system can calculate the distance between the rear of the car and barrier by using the sent and reflected ultrasonic wave. If the rear of the car gets near the barrier, the system will send intermittent warning sound to the driver. The shorter the distance between the rear of the car and barrier, the shorter the interval of warning sound is. When the rear of car gets very near the barrier, the system will send continuous warning sound. If at this moment the car continues to get near the barrier, the system won't detect the barrier at the rear of the car.

## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Wiring set		Testing circuits
3	Testing bar		Assist with testing reverse radar-detected distance

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## Service data

### 1. Table of tightening torque

Item	N•m
Reverse light switch	44~49

## Precautions

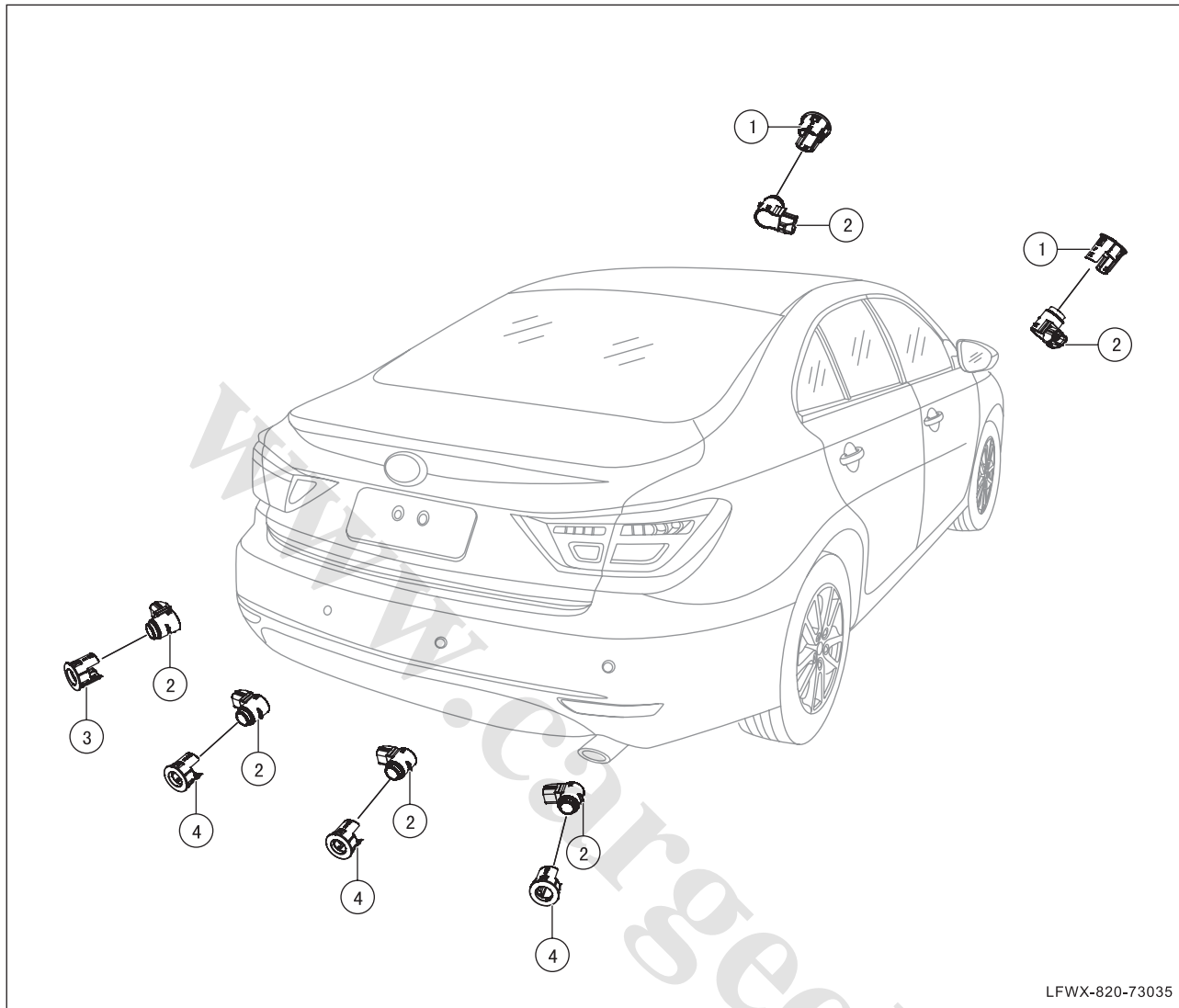
### 1. Cautions in repair

- (a) All parts of reverse radar system are assembly parts which can't be decomposed for repair. If there is any fault, directly replace the assembly.

### 2. Precautions after repair

- (a) After installation of assembly parts, inspect their working condition.

## Components



LFWX-820-73035

1	Anti-collision radar bracket
2	Anti-collision radar sensor

3	Anti-collision radar bracket
4	Anti-collision radar bracket

## General Check

### Check the system

#### 1. Visually inspect the reverse radar probe

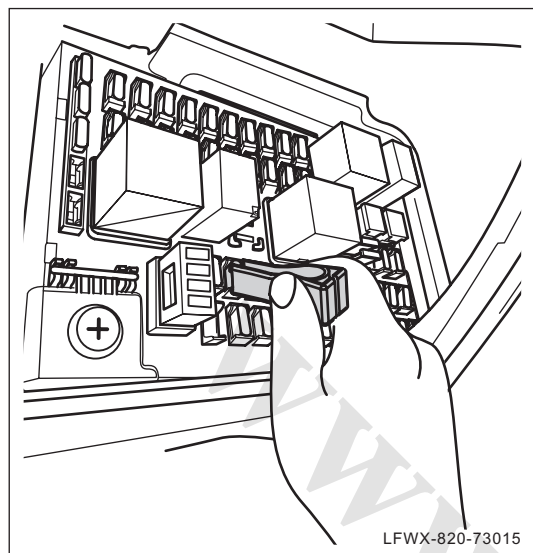
- (a) Check the connecting condition of connectors and wire harnesses of instrument cluster, reverse radar probe. If the connection is loose, re-connect them.
- (b) Reverse radar system may work abnormally under the following conditions:
  - Sensor is covered by mud or snow (detection function can recover after cleaning)
  - Sensor is icy.

#### △ HINT:

- On extremely cold weather, if the instrument cluster sends warning sound, reverse radar system can't work normally, and radar probe can't detect barriers.
  - If reverse radar system has fault, first visually inspect radar probe. If radar probe has no impurities but fault still exists, radar probe may have fault.
- (c) The detection range of reverse radar is affected by the following conditions:
    - Sensor is covered by mud or snow
    - Vehicles in extremely hot or cold areas.
    - Under some conditions, the detection result may be wrong:
      - ① When the car travels on uneven road, or road having many barriers or deep jungle.
      - ② The car gets near big noise or ultrasonic wave source.
      - ③ Heavy rain or sensor contacts with water (splashed).
      - ④ The car tilts sharply.
      - ⑤ The car is installed with protective rod or antenna.
      - ⑥ Vehicle moving toward high curbs or corners of outshoots.
      - ⑦ The car is in a house with smooth wall surface and big vertical angle, such as garage.
    - Reverse radar system may be unable to detect some objects, such as:
      - ① Some fine objects such as line and rope.
      - ② Some material absorbing ultrasonic wave, such as cotton and snow.
      - ③ Objects with sharp edge.
      - ④ Short objects.
      - ⑤ Projection objects.

## 2. Check the working condition of system

- (a) Turn power supply to “ON” position, place a barrier within 150cm from the rear of the car, shift gear to “R” speed, and inspect whether reverse radar system works normally. If no, overhaul it according to the following diagnosis steps.



## 3. Check the fuse

- (a) Check whether RBCM fuse FS22 is blown. If yes, replace fuse with the one having the same specification.

△ HINT:

RBCM fuse is located in fuse box of driver's cab.



## Check reverse radar probe

### 1. Check the detection range of reverse radar probe

(a) Turn power supply to “ON” position.

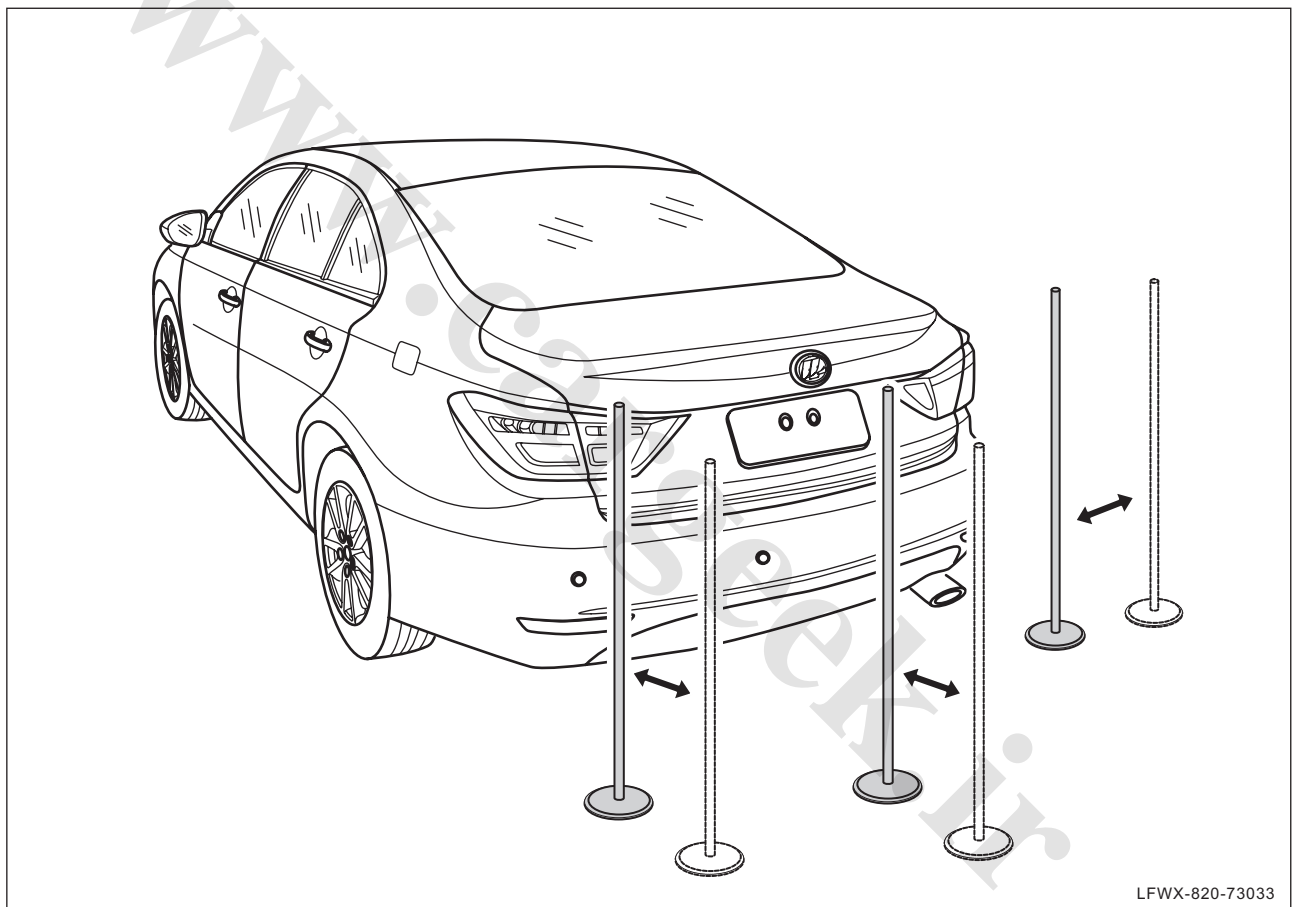
△ HINT:

Before inspecting, pull up parking brake handle to prevent car from moving.

(b) Shift gear to “R” speed to make the reverse radar work.

(c) Move a detection rod with diameter of 75mm around the radar probe to measure its detection range.

(d) Measure the detection range of reverse radar.

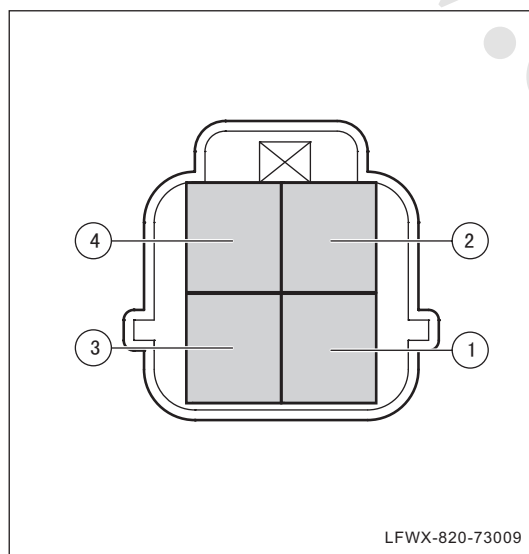


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△ HINT:

When making detection, keep the detection rod and radar probe at the same horizontal level or vertical level as much as possible. Detection range depends on measuring methods and type of barriers (for example, wall)

Detection range of radar probe		Beeper sound
Rear left, rear right reverse radar	$S > 0.5\text{m}$	Buzzer doesn't send sound, and reverse radar is shown in LCD: three layers don't light up.
	$0.4\text{m} < S \leq 0.5\text{m}$	Buzzer sends sound: at interval of 0.6s, and reverse radar is shown in LCD: only the outer layer lights up.
	$0.2\text{m} < S \leq 0.4\text{m}$	Buzzer sends sound: at interval of 0.3s, and reverse radar is shown in LCD: the outer and intermediate layers light up.
	$S \leq 0.2\text{m}$	Buzzer sends sound: no interval, and reverse radar is shown in LCD: the outer and intermediate layers light up.
Rear left middle, rear right middle reverse radars	$S > 1.5\text{m}$	Buzzer doesn't send sound, and reverse radar is shown in LCD: three layers don't light up.
	$1\text{m} < S \leq 1.5\text{m}$	Buzzer sends sound: at interval of 0.6s, and reverse radar is shown in LCD: only the outer layer lights up.
	$0.5\text{m} < S \leq 1\text{m}$	Buzzer sends sound: at interval of 0.3s, and reverse radar is shown in LCD: the outer and intermediate layers light up.
	$S \leq 0.5\text{m}$	Buzzer sends sound: no interval, and reverse radar is shown in LCD: the outer and intermediate layers light up.

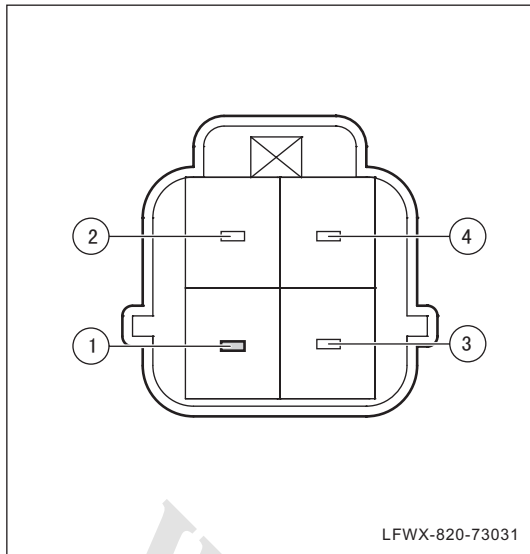


## 2. Check the working condition of reverse radar probe

### △ HINT:

Take left reverse radar probe as an example.

- (a) Turn power supply to "LOCK" position, and disconnect the wire harness connector of reverse radar probe.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.3 of reverse radar probe are conducted. If no, replace reverse radar probe.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.4 of reverse radar probe are conducted. If no, replace reverse radar probe.
- (d) Use an oscilloscope to measure whether there is square wave signal on terminal No.2 of reverse radar probe. If no, replace reverse radar probe.



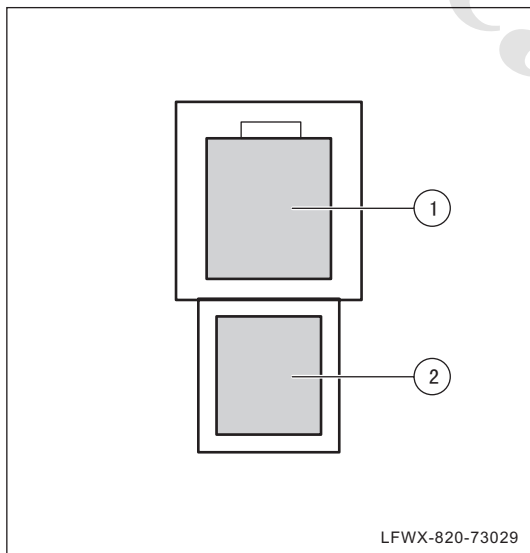
### 3. Check signal cable of reverse radar probe

△ HINT:

Take left reverse radar probe as an example.

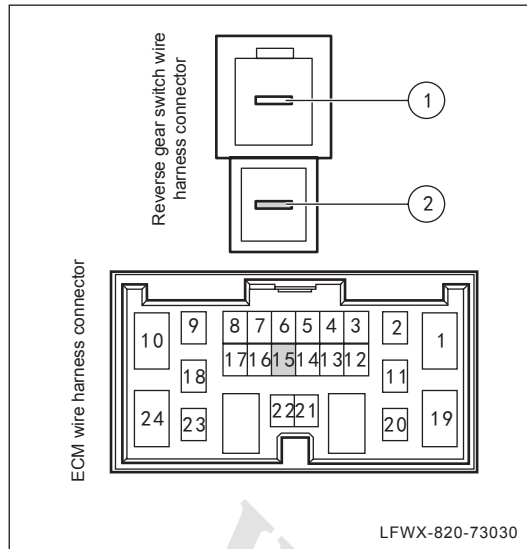
- (a) Turn power supply to “LOCK” position, and disconnect the wire harness connector of reverse radar probe.
- (b) Turn power supply to “ON” position and shift gear to “R” position.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of reverse radar probe and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

### Check the reverse light switch.



### 1. Check the working condition of reverse light switch

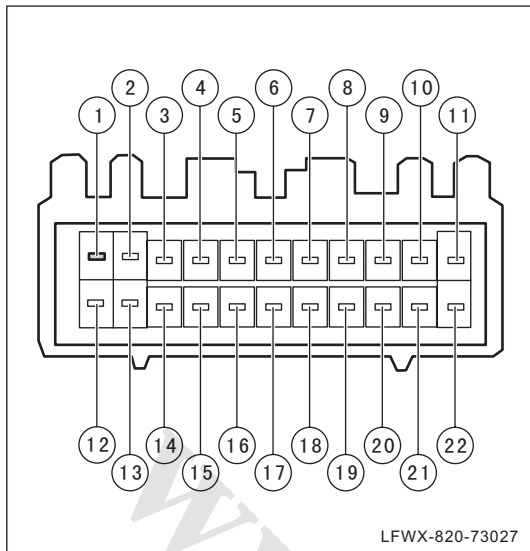
- (a) Turn power supply to “LOCK” position, and disconnect wire harness connector of reverse light switch.
- (b) Turn power supply to “ON” position and shift gear to “R” position.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of reverse light switch are conducted. If no, replace reverse light switch.



## 2. Check signal cable of reverse light switch

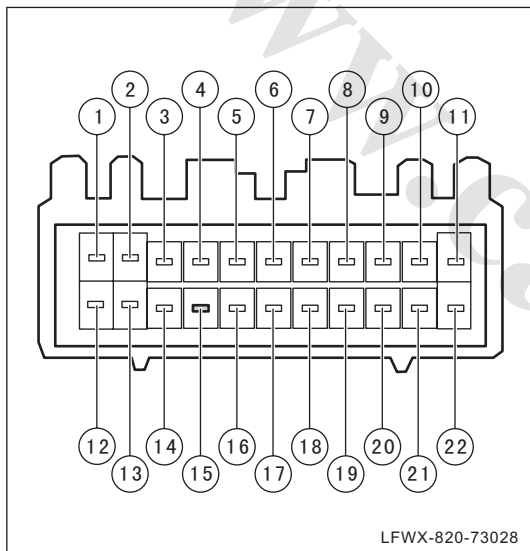
- (a) Turn power supply to “LOCK” position, and disconnect wire harness connector of reverse light switch and wire harness connector of engine ECM.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of reverse light switch and No.15 of wire harness connector of ECM are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check RBCM



### 1. Check power supply cable of RBCM

- Turn power supply to “LOCK” position and disconnect wire harness connector of RBCM.
- Turn power supply to “ON” position and shift gear to “R” position.
- Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of RBCM and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of RBCM

- Turn power supply to “LOCK” position and disconnect wire harness connector of RBCM.
- Use a digital multimeter resistance scale to inspect whether terminal No.15 of wire harness connector of RBCM and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Reverse radar buzzer doesn't send sound	1. Reverse light switch (fault)	See 73 – Diagnosis of Reverse Radar System, Fault Diagnosis (1. Reverse radar system doesn't work)
	2. Wire harness (short circuit or open-circuit)	
	3. RBCM (damaged)	
	4. Signal cable of CAN communication (open-circuit)	
	5 Instrument cluster (faulty)	

### Fault diagnosis

#### 1. Reverse radar buzzer doesn't send sound

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction method
	Check whether reverse radar system works normally (See 73 – General inspection of reverse radar system, inspection of system)	Diagnosis end.	Reverse radar buzzer doesn't send sound	Go to Step 1
1	Check reverse light	Normal	Faulty	Instruction method
	Turn power supply to "ON" position, shift gear to "R" speed, and inspect whether reverse light lights up.	Go to Step 2	Reverse light is not lighted up	See 75 – Diagnosis of Lighting System, Fault Diagnosis
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of RBCM is conducted (See 73 – General Check of Reverse Radar System, Check of RBCM)	Go to Step 4	No continuity	Go to Step 3
3	Check the wire harness	Normal	Faulty	Instruction

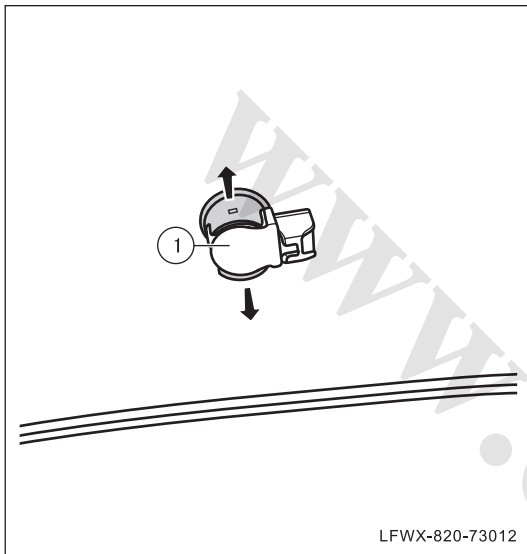
Steps	Inspection item	Inspection result		
	Check whether the circuit between RBCM and fuse is conducted according to circuit book.	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether the grounding circuit of RBCM is conducted (See 73 – General Check of Reverse Radar System, Check of RBCM)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check CAN communication signal cable	Normal	Faulty	Instruction
	Check the BCAN communication cable between instrument cluster and RBCM according to circuit book.	Go to Step 6	Open circuit	Overhaul CAN communication cable
6	Read CAN DTCs.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 7	DTC about CAN communication cable is output.	Maintain it according to the tip of DTC
7	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 8
8	Replacement and check	Normal	Faulty	Instruction
	Replace the instrument cluster with the same model, and check if the fault is eliminated	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Reverse Radar Probe

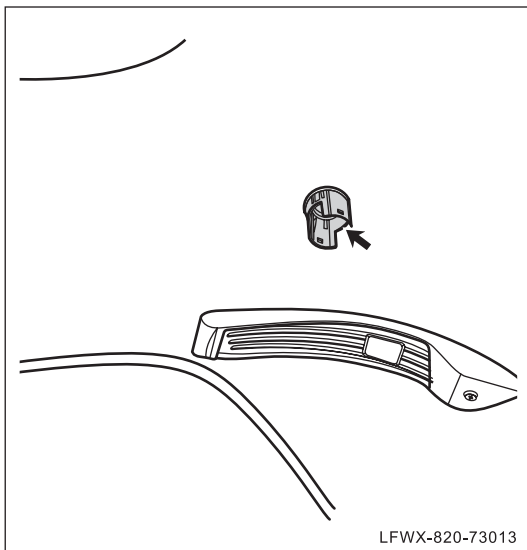
### Replacement

#### 1. Remove reverse radar probe

- (a) Turn power supply to "LOCK" position.
- (b). Remove the rear bumper. (See 81 - Interiors and Exteriors, Rear Bumper, Replacement).



- (c) Pry the clip of bracket of reverse radar probe.
- (d) Remove reverse radar probe ①



- (e) Remove the bracket of reverse radar probe.

△ HINT:

Press the clip of bracket of reverse radar probe and push the bracket of reverse radar probe out.



## 2. Install reverse radar probe

- (a) Install the bracket of reverse radar probe from the outside of rear bumper onto mounting position, and make sure that the clip is locked well.
- (b) Install reverse radar probe onto the bracket of reverse radar probe.

△ HINT:

If it is installed well, a clean “clip” sound is produced.

- (c) Install rear bumper (See 81 - Interiors and Exteriors, Rear Bumper, Replacement).

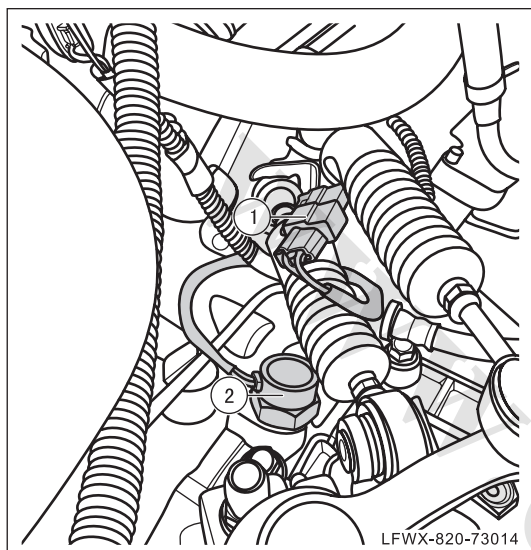
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## Reverse Light Switch

### Replacement

#### 1. Removal of reversing switch

- (a) Turn power supply to “LOCK “position.
- (b) Remove the air filter. (See 15 - Intake / exhaust system, Air filter, Replacement)



- (c) Disconnect wire harness connector ① of reverse light switch.
- (d) Remove reversing switch ② .

#### 2. Install reverse light switch

- (a) Install reverse light switch onto mounting position and tighten it.

**Torque: 44N•m- 49N•m**

- (b). Connect the reverse light switch wire harness connector.
- (c) Install air filter. (See 15 - Intake / exhaust system, Air filter, Replacement)

# 74-Audio Entertainment System

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## Audio System

### System description

#### 1. Function

Audio entertainment system has the following functions:

It will makes the vehicle to receive AM/FM broadcasting and play CD & MP3. And it also controls the playing information and volume for entertainment.

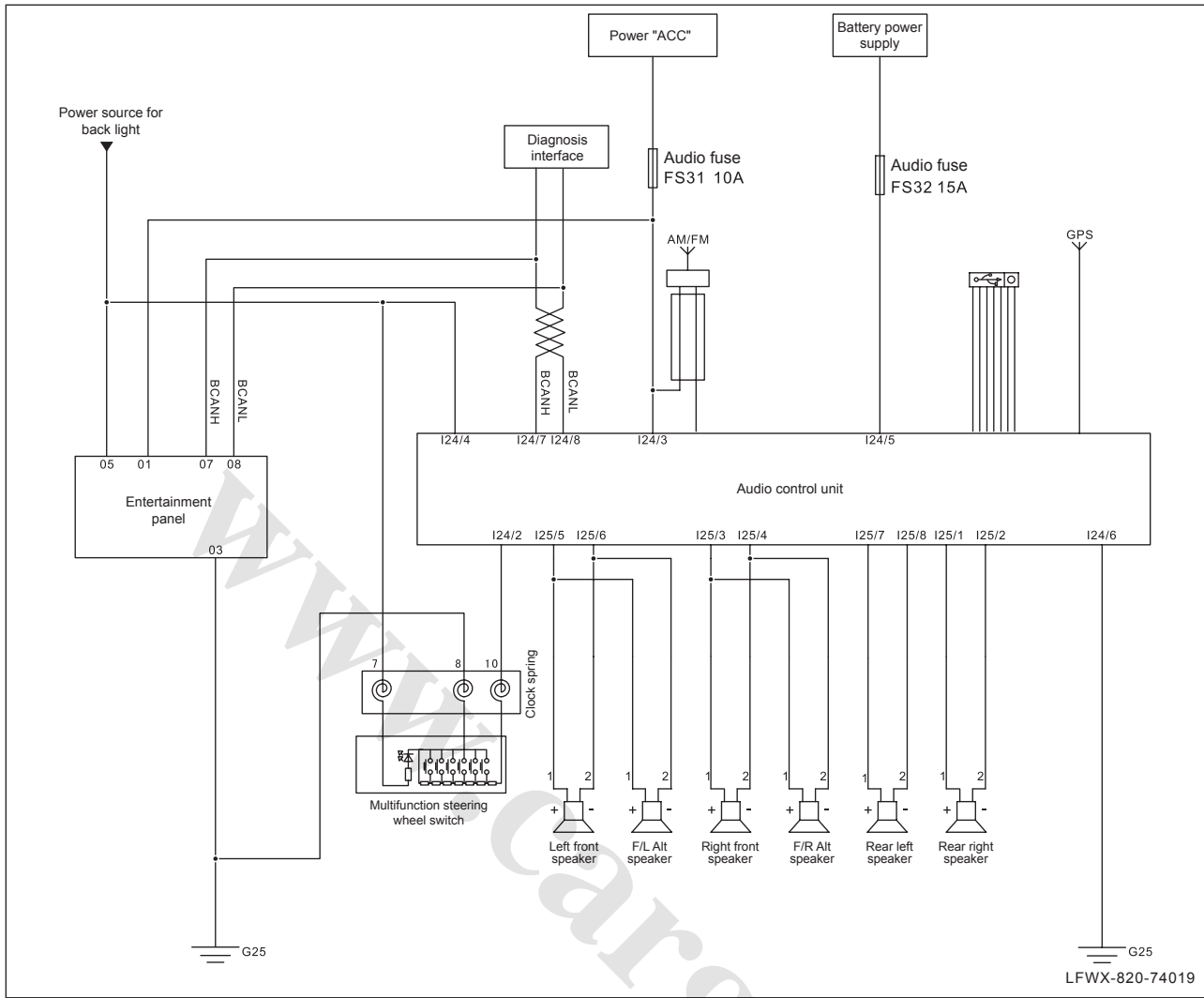
All the items on the instrument cluster related to sound alarm function are provided signal by the instrument, dealt by the radio/CD player, and then send out by the speaker, such as door open, seat belt unfastened (showed on the multifunction display screen), clearance lamp hasn't been turned off, reverse radar warning, etc.

#### 2. Components

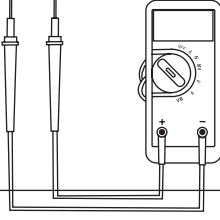
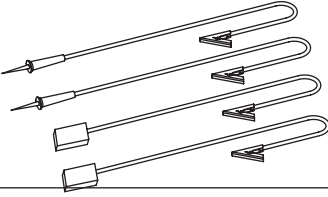
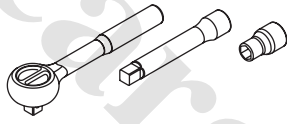
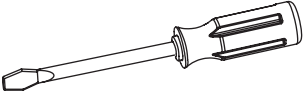
Audio entertainment system mainly consists of CD player, speaker, antenna, antenna amplifier and USB data cable, etc.

#### 3. Principle

The radio/CD player receives signal and AM/FM broadcast through the outside mounted antenna; it plays CD through the CD player; meantime, the radio/CD player combines the functions of MP3 that it can connect movable device through the USB port to play the audio files inside and connect outside mounted audio device through the AUX port.



## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Wiring components		Testing circuits
3	Fast wrench and sleeve subassembly		Used for removing and installing the fixing bolts
4	Screwdriver		Remove the fixing screws

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolts of rear-mounted speaker	6~10
Fixing bolts of antenna amplifier	6~10

## Precautions

### 1. Precautions before repair

- (a) The AM/FM station data stored in the Radio/CD Player will be erased when the negative cable of battery is disconnected.

△ HINT:

Record down those data before disconnecting the negative cable of battery if necessary, and reset them after the negative cable is connected.

- (b) When removing and installing radio/CD player, the CDs must be taken out of the Radio/CD Player.

△ HINT:

If CD is stuck in Radio/CD Player and cannot be taken out, do not take it out forcedly and then drive the vehicle to our service station.

### 2. Cautions in repair

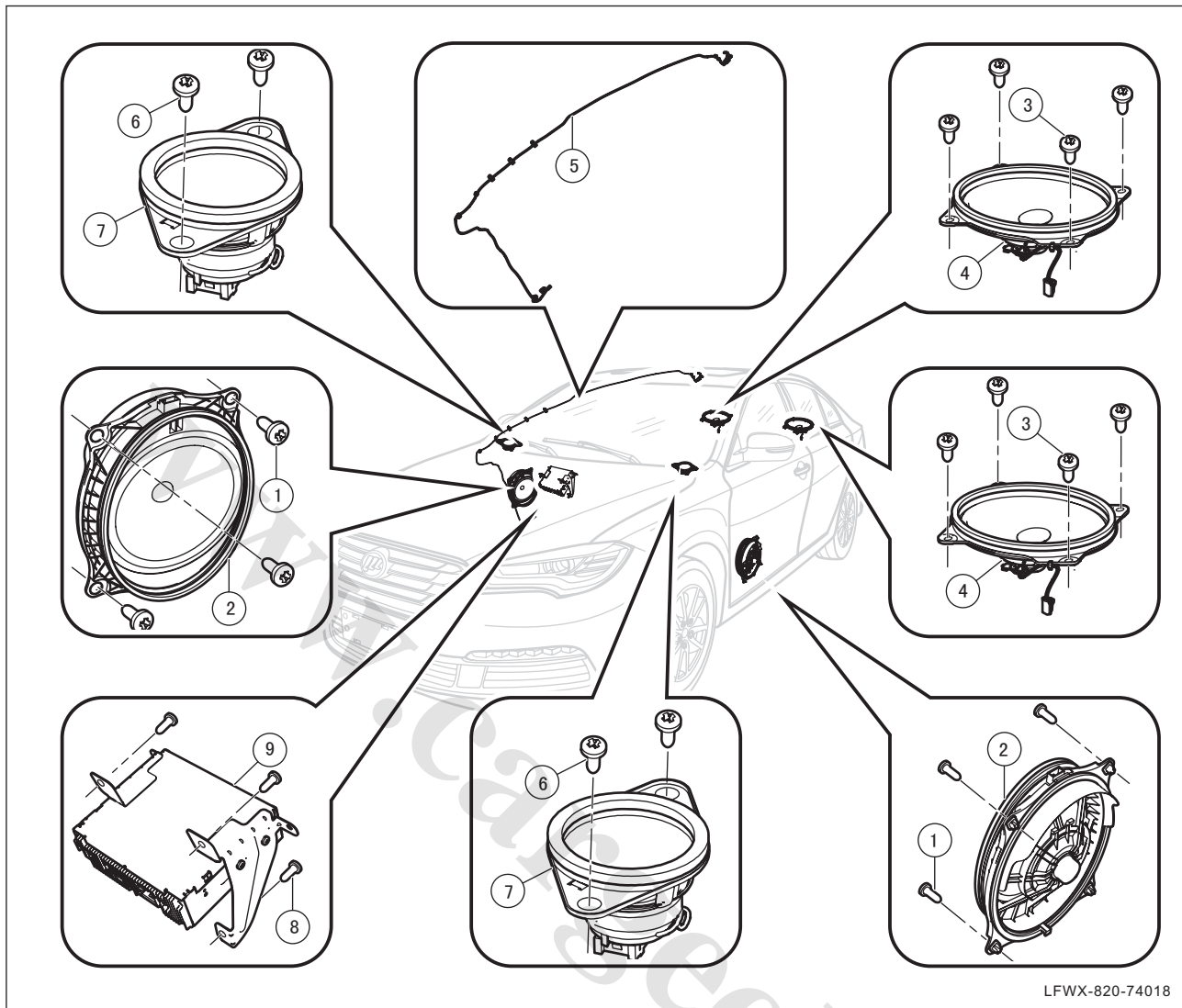
- (a) Don't touch the tapered paper cone.
- (b) While installing antenna assembly, it is necessary to ensure firm grounding connection.

△ HINT:

Bad connection of antenna grounding will cause noise and weaken the receiving signal when receiving broadcast information



## Components



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1	Screw
2	Front-mounted speaker
3	Screw
4	Rear-mounted speaker
5	Antenna

6	Screw
7	Alt speaker
8	Screw
9	CD player

## General Check

### Check the system

#### 1. Check the working condition of system

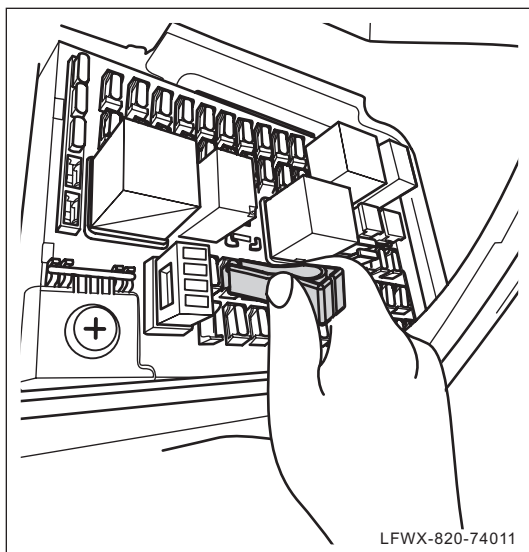
- (a) Turn power supply to “ON” position, press power key, and inspect whether audio system can be turned on normally. If no, overhaul it according to the follow diagnosis steps.
- (b) Turn power supply to “ON” position, insert the CD into CD player, and inspect whether CD player can play CD. If no, overhaul it according to the following diagnosis steps.
- (c) Play CD and check its tone quality. If CD has staccato or bad tone effect, overhaul it according to the following diagnosis steps.

#### 2. Check system components

- (a). Check system for obvious mechanical or electrical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 3. Check wire harness

- (a). Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b). Check system wire harness for crack or damage. If any, fix it.



#### 4. Check the fuse

- (a) Check whether fuse FS31, FS32 of audio system are blown. If yes, replace fuses with the ones having the same specifications.

△ HINT:

Fuse of audio system is located in fuse box in driver's cab.

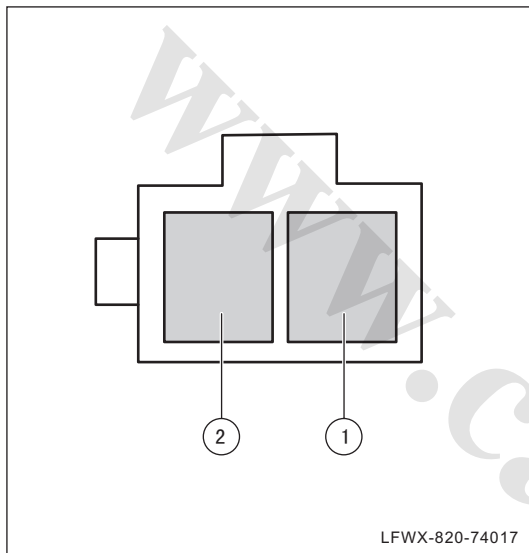
## Check speaker

△ HINT:

Alt speaker, front speaker and rear speaker have the same inspection methods. This section will only introduce the inspection of alt speaker as an example.

### 1. Check the working condition of speaker

- (a) Check whether the speaker is installed correctly. If no, correctly re-install it.
- (b) Check whether the tapered paper cone of speaker is damaged. If yes, replace speaker.



- (c) Turn power supply to “LOCK” position, and disconnect wire harness connector of alt speaker.
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of alt speaker are conducted. If no, replace alt speaker.

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## Check antenna

### 1. Check the working condition of antenna

- (a) Disconnect antenna feeder plug. (See 74 - Audio System, Radio/CD Player, Replacement)
- (b) Use a digital multimeter resistance scale to measure the resistance between antenna feeder plug and body grounding connection.

Resistance value: Infinity

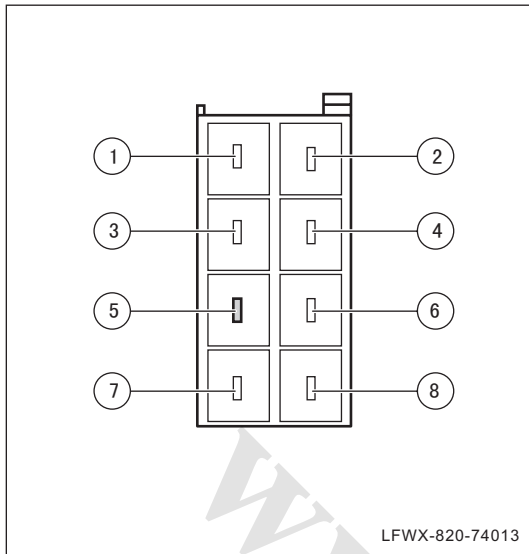
△ HINT:

If it does not conform to the above requirements, it means there is short circuit in the antenna feeder line or antenna, replace the antenna feeder line or antenna assembly.

#### ⓘ Note:

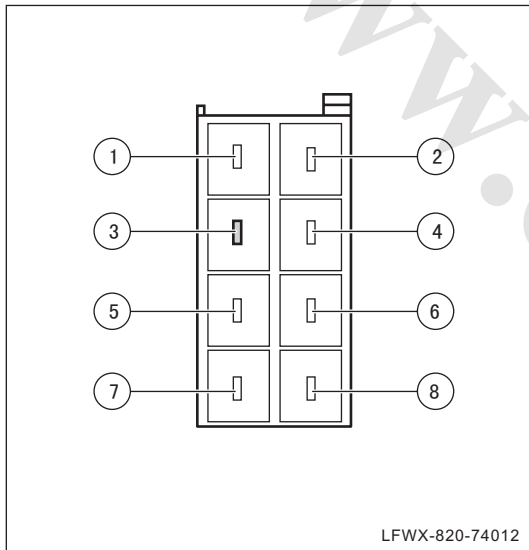
- When measuring, the digital multimeter pointer needs to contact the metal part of the antenna end.

## Check Radio/CD Player

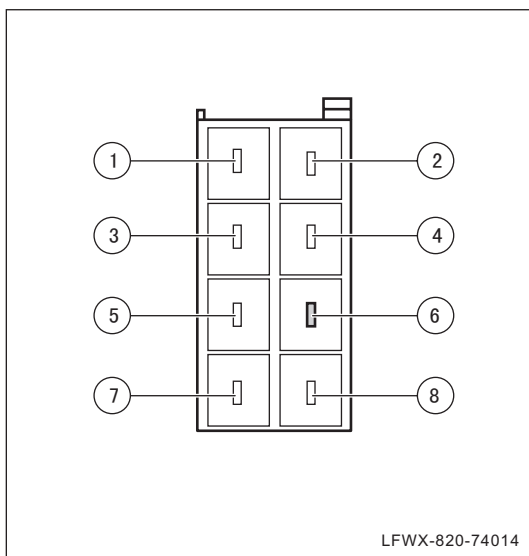


### 1. Check the power supply voltage of CD player

- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of CD player.
- (b) Turn power supply to “ON” position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.5 of wire harness connector of CD player and body grounding connection. If the voltage is 0, overhaul it according to circuit book.

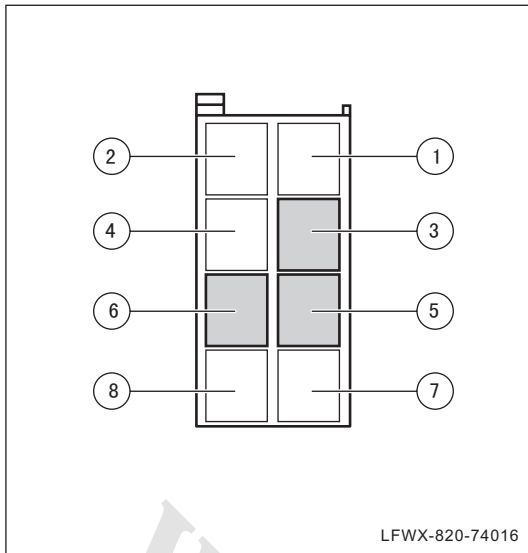


- (c) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.3 of wire harness connector of CD player and body grounding connection. If the voltage is 0, overhaul it according to circuit book.



### 2. Check the grounding circuit of CD player

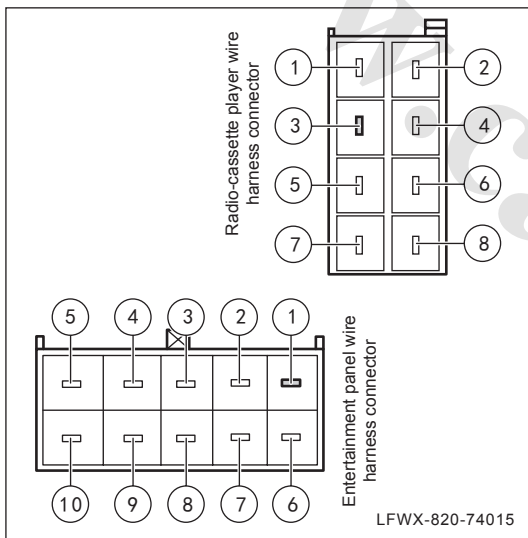
- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of CD player.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.6 of wire harness connector of CD player and body grounding connection are conducted. If no, overhaul it according to circuit book.



### 3. Check the working condition of CD player

- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of CD player.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.6 of CD player are conducted. If no, replace CD player.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.6 of CD player are conducted. If no, replace CD player.

## Check audio system switch



### 1. Check the circuit of audio system switch

- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of CD player and wire harness connector of entertainment panel.
- (b) Turn power supply to “ON” position.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.3 of wire harness connector of CD player and terminal No.1 of wire harness connector of entertainment panel (audio system switch) are conducted. If no, overhaul it according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Press the power switch but the radio/CD player has no reaction	1. Fuse (blown)	See 73 – Diagnosis of Audio Entertainment System, Fault Diagnosis (1. Press power switch, but CD player can't be turned on)
	2. Wire harness (short circuit or open-circuit)	
	3. CD player (fault)	
Abnormal noise appears	1. CD player (installed incorrectly)	See 74 – Diagnosis of Audio Entertainment System, Fault Diagnosis (2. Abnormal sound appears)
	2. Wire harness (short circuit or open-circuit)	
	3. CD player (fault)	
Radio broadcasting cannot be received or received poorly	1. Wire harness (short circuit or open-circuit)	See 74 – Diagnosis of Audio Entertainment System, Fault Diagnosis (3. The radio broadcasting can't be received or received badly)
	2. CD player (fault)	
CD cannot be inserted or pop up after inserting.	1. CD (can't be identified or damaged)	See 74 – Diagnosis of Audio Entertainment System, Fault Diagnosis (4. CD can't be inserted or immediately popped out after being inserted)
	2. CD player (fault)	
CD skipping and poor sound quality	1. CD (damaged)	See 74 – Diagnosis of Audio Entertainment System, Fault Diagnosis (5. CD has staccato or undesirable tone)
	2. CD player (fault)	

### Fault diagnosis

#### 1. Press the power switch but the radio/CD player has no reaction

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether CD player is turned on (See 74 – General Check of Audio Entertainment System, Check of System)	Diagnosis end.	If the radio/CD player can only be started up after pressing the power button for a long time, then the button is in poor connection. And this fault can only be eliminated completely after replace the radio/CD play assembly	Go to Step 1

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of audio system is blown (See 74 – General Check of Audio Entertainment System, Check of System)	Go to Step 3	FS31 and FS32 fuse are blown	Go to Step 2
2	Check FS31 and FS32 Circuits	Normal	Faulty	Instruction
	Check working condition of FS31 and FS32 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of CD player is conducted (See 74 – General Check of Audio Entertainment System, Check of CD Player)	Go to Step 5	No continuity	Go to Step 4
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether the circuit between the host of audio system and fuse is conducted according to circuit book.	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding circuit of CD player is conducted (See 74 – General Check of Audio Entertainment System, Check of CD Player)	Go to Step 6	No continuity	Overhaul wire harness according to circuit book.
6	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether circuit between audio system switch and CD player is conducted (See 74 – General Check of Audio Entertainment System, Check of Audio System Switch)	Go to Step 7	No continuity	Overhaul wire harness according to circuit book.
7	Replacement and check	Normal	Faulty	Instruction
	Replace CD player with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Abnormal noise appears

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Find out the part that noise coming from and the time, and check whether the ambient environment has the following interference sources: <ul style="list-style-type: none"> <li>Electrical appliance of high power nearby</li> <li>Strong magnetic field or strong electric field, etc.</li> </ul>	Diagnosis end.	In an environment without external interference, the problem must come from the components of the radio/CD player if noise still exists	Go to Step 1
1	Check the speaker of the radio/CD player	Normal	Faulty	Instruction
	Check the working condition of speaker (See 74 – General Check of Audio Entertainment System, Check of Speaker)	Go to Step 2	<ul style="list-style-type: none"> <li>The speaker is installed incorrectly</li> <li>There is foreign matter in the speaker</li> <li>The speaker cone is damaged</li> </ul>	<ul style="list-style-type: none"> <li>Reinstall them.</li> <li>Clean off the foreign matter in the speaker</li> <li>Replace the speaker</li> </ul>
2	Check the wire harness	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check CD player antenna and antenna shielded wire of CD player antenna (See 74 – General Check of Audio Entertainment System, Check of Antenna)	Go to Step 3	The antenna or the shield wire is short circuit	Both short circuit of antenna and shield wire might cause the signal received by the radio/ CD player to be interfered. At this moment, replace the antenna, check the shield wire grounding point or check the connection of the antenna and the radio/CD player
3	Replacement and check	Normal	Faulty	Instruction
	Replace CD player with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Radio broadcast cannot be received or received poorly

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	After confirming that there is no strong magnetic field interference surrounded, check the automatic station searching function of the radio/ CD player	Diagnosis end.	It can't receive or has bad receiving effect (it is normal that the CD player can't receive signal among high buildings, mountains, sealing space, or near big-power electrical equipment)	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of CD player is conducted (See 74 – General Check of Audio Entertainment System, Check of CD Player)	Go to Step 3	No continuity	Go to Step 2
2	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the circuit between the host of audio system and fuse is conducted according to circuit book.	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding circuit of CD player is conducted (See 74 – General Check of Audio Entertainment System, Check of CD Player)	Go to Step 4	No continuity	Overhaul wire harness according to circuit book.
4	Check the wire harness	Normal	Faulty	Instruction
	Check CD player antenna and antenna shielded wire of CD player antenna (See 74 – General Check of Audio Entertainment System, Check of Antenna)	Go to Step 5	The antenna or the shield wire is short circuit	Both short circuit of antenna and shield wire might cause the signal received by the radio/CD player to be interfered. At this moment, replace the antenna, check the shield wire grounding point or check the connection of the antenna and the radio/CD player
5	Replacement and check	Normal	Faulty	Instruction
	Replace CD player with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. CD cannot be inserted or pops up after inserting.

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether CD is inserted into CD player (See 74 – General Check of Audio Entertainment System, Check of System)	Diagnosis end.	CD cannot be inserted or pop up after inserting.	Go to Step 1
1	Check CD	Normal	Faulty	Instruction
	Check the surface of CD, use a soft cloth to wipe CD, and re-insert it.	Diagnosis end.	CD cannot be inserted or pop up after inserting.	Go to Step 2
2	Replacement and check	Normal	Faulty	Instruction
	Replace it with another CD, and inspect whether CD can be inserted into CD player.	Diagnosis end.	CD cannot be inserted or pop up after inserting.	Go to Step 3
3	Replacement and check	Normal	Faulty	Instruction
	Replace CD player with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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#### 5. CD skipping and poor sound quality

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the tone effect of CD (See 74 – General Check of Audio Entertainment System, Check of System)	Diagnosis end.	CD skipping or poor sound quality	Go to Step 1
1	Check CD	Normal	Faulty	Instruction

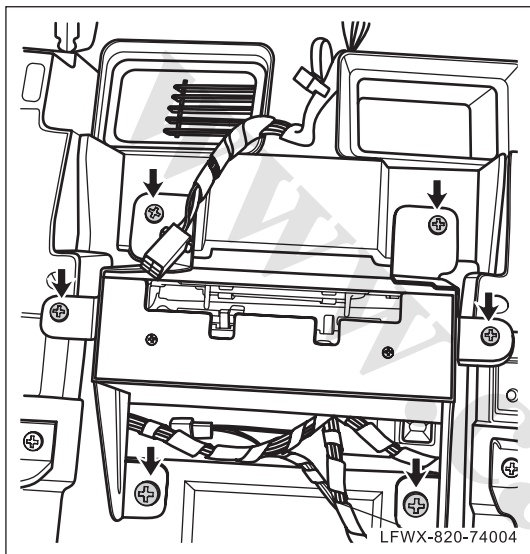
Steps	Inspection item	Inspection result		
	Check whether CD is inserted into CD player correctly.	Go to Step 2	The CD is not inserted correctly	Insert the CD correct
2	Check CD	Normal	Faulty	Instruction
	Check whether the surface of CD has stains or damage.	Go to Step 3	<ul style="list-style-type: none"> <li>• CD has stains.</li> <li>• CD is damaged.</li> </ul>	<ul style="list-style-type: none"> <li>• Clean CD.</li> <li>• Replace CD.</li> </ul>
3	Replacement and check	Normal	Faulty	Instruction
	Put CD into another CD player having the same model, and inspect tone effect.	Replace CD player, and proceed with step 4.	CD skipping or poor sound quality	Replace CD.
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## CD Player

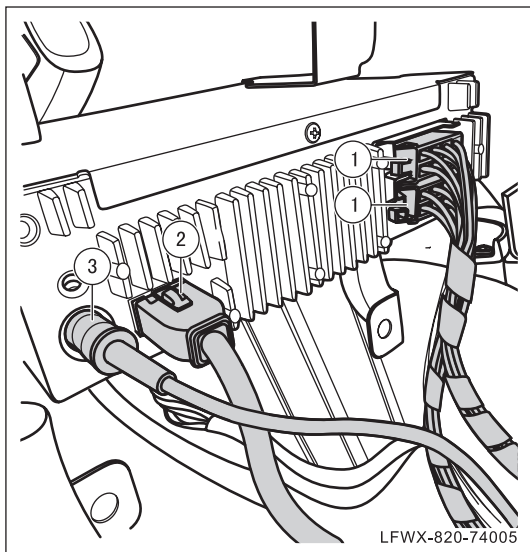
### Replacement

#### 1. Remove CD player assembly

- (a) Turn power supply to "LOCK" position.
- (b) Disconnect central control switch component of central control panel. (See 84 – Instrument/ console - Central Control Switch Component of Central Control Panel, Replacement)



- (c) Remove fixing screw of CD player assembly.



- (d) Take the CD player assembly out a little distance.
- (e) Disconnect CD player assembly connector ①, USB plug ② and antenna feeder plug ③.
- (f) Take out CD player assembly.

## 2. Install CD player.

- (a) Connect CD player assembly connector, USB plug and antenna feeder plug.
- (b) Push CD player assembly into mounting position, and install and tighten fixing screw.
- (b) Install central control switch component of central control panel. (See 84 – Instrument/ console - Central Control Switch Component of Central Control Panel, Replacement)

## 3. Inspection

- (a) Turn on audio entertainment system, inspect whether CD player works normally.

## Alt Speaker

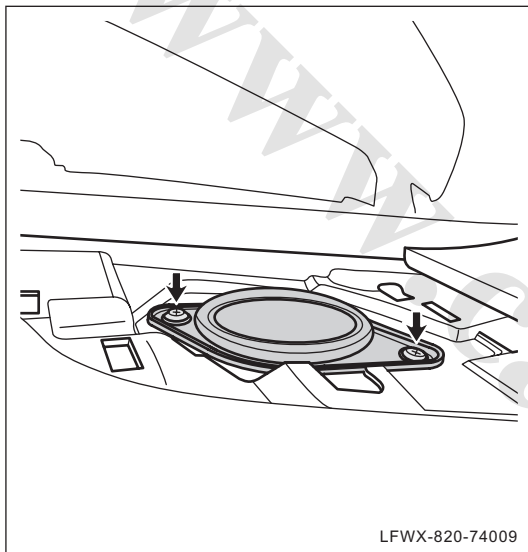
### Replacement

△ HINT:

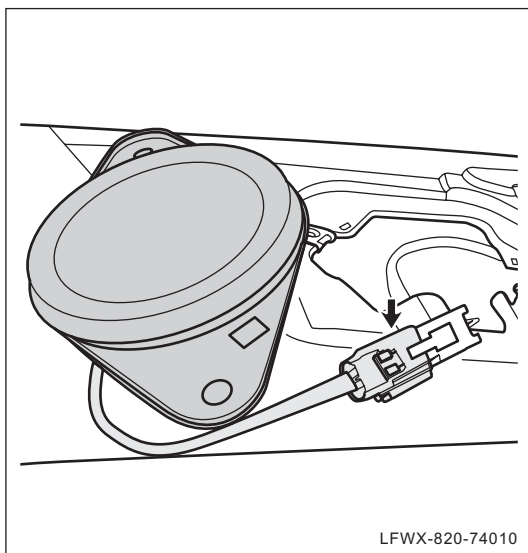
Replacement of left and right alt speakers is basically the same. This section will only introduce left alt speaker as an example.

#### 1. Remove alt speaker

- (a) Turn power supply to “LOCK “position.
- (b) Remove cover plate of alt speaker. (See 84 –Instrument/ console – Cover Plate of Alt Speaker, Replacement)



- (c) Remove fixing screw of alt speaker, and take out alt speaker.



- (d) Disconnect wire harness connector of alt speaker, and remove alt speaker.

## 2. Install alt speaker

- (a) Connect wire harness connector of alt speaker.
- (b) Install alt speaker onto mounting position, and install and tighten fixing screw.
- (c) Install cover plate of alt speaker. (See 84 –Instrument/ console – Cover Plate of Alt Speaker, Replacement)

## 3. Inspection

- (a) Turn on audio entertainment system, and inspect whether alt speaker works normally.



## Front-mounted Speaker

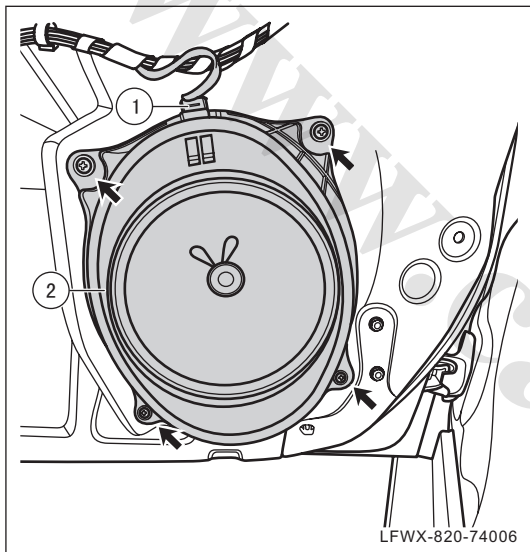
### Replacement

△ HINT:

Replacement of left and front right speakers is basically the same. This section will only introduce the replacement of front left speaker as an example.

#### 1. Remove front speaker

- (a) Turn power supply to “LOCK “position.
- (b) Remove the front door inside guard board. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)



- (c) Disconnect wire harness connector ① of front speaker, and dismantle fixing screw of front speaker.

- (d) Remove front speaker ② .

#### ⓘ Note:

**Avoid touching the speaker tapered cone.**

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#### 2. Install front speaker

- (a) Install front speaker onto mounting position, and install and tighten fixing screw.
- (b) Connect wire harness connector of front speaker.

△ HINT:

When connecting connector, if it is installed well, a clean “clip” sound is produced.

- (c). Install front door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)

#### 3. Inspection

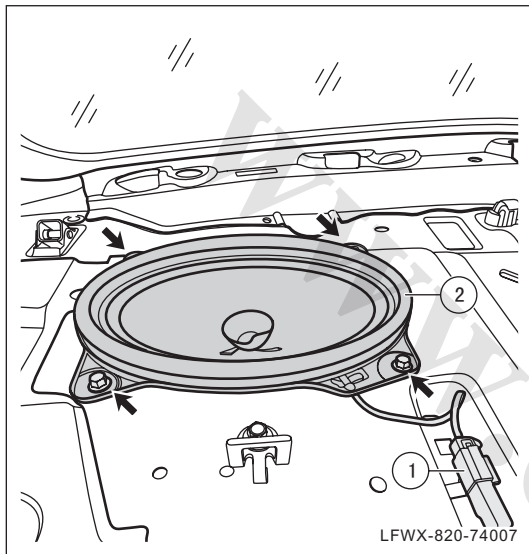
- (a) Turn on audio entertainment system, and inspect whether front-mounted speaker works normally.

## Rear-mounted Speaker

### Replacement

#### 1. Remove rear speaker

- (a) Turn power supply to “LOCK” position.
- (b) Remove rear shelf panel. (See 81 –Interiors and Exteriors Rear Shelf Panel, Replacement)



- (c) Disconnect wire harness connector ① of rear speaker.
- (d) Remove fixing bolt of rear speaker ②, and remove rear speaker ②.

**Note:**

**Avoid touching the speaker tapered cone.**

#### 2. Install rear speaker

- (a) Install rear speaker onto mounting position, and install and tighten fixing bolt.

**Torque: 6N•m - 10N•m**

- (b) Connect wire harness connector of rear speaker.

△ HINT:

When connecting connector, if it is installed well, a clean “clip” sound is produced.

- (c) Install rear shelf panel. (See 81 –Interiors and Exteriors Rear Shelf Panel, Replacement)

#### 3. Inspection

- (a) Turn on audio entertainment system, and inspect whether rear-mounted speaker works normally.



## Antenna Feeder Line

### Replacement

△ HINT:

See 74 – Audio Entertainment System – Antenna Amplifier, Replacement.

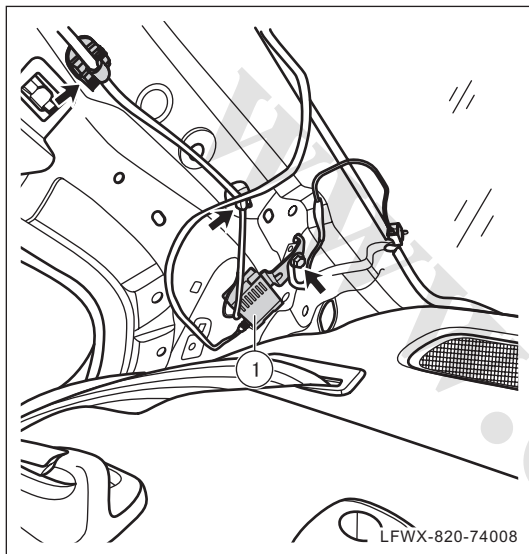
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## Antenna Amplifier

### Replacement

#### 1. Remove antenna amplifier.

- (a) Turn power supply to “LOCK “position.
- (b) Remove ceiling. (See 81 – Interiors and Exteriors Roof, Replacement)
- (c) Remove CD player. (See 74 - Audio System, Radio/CD Player, Replacement)



- (d) Remove all clips and bandages on wire harness of antenna amplifier.
- (e) Remove fixing bolt of antenna amplifier ① and remove antenna amplifier ① .

#### 2. Install antenna amplifier

- (a) Install antenna amplifier onto mounting position, and install and tighten fixing bolt.

**Torque: 6N•m - 10N•m**

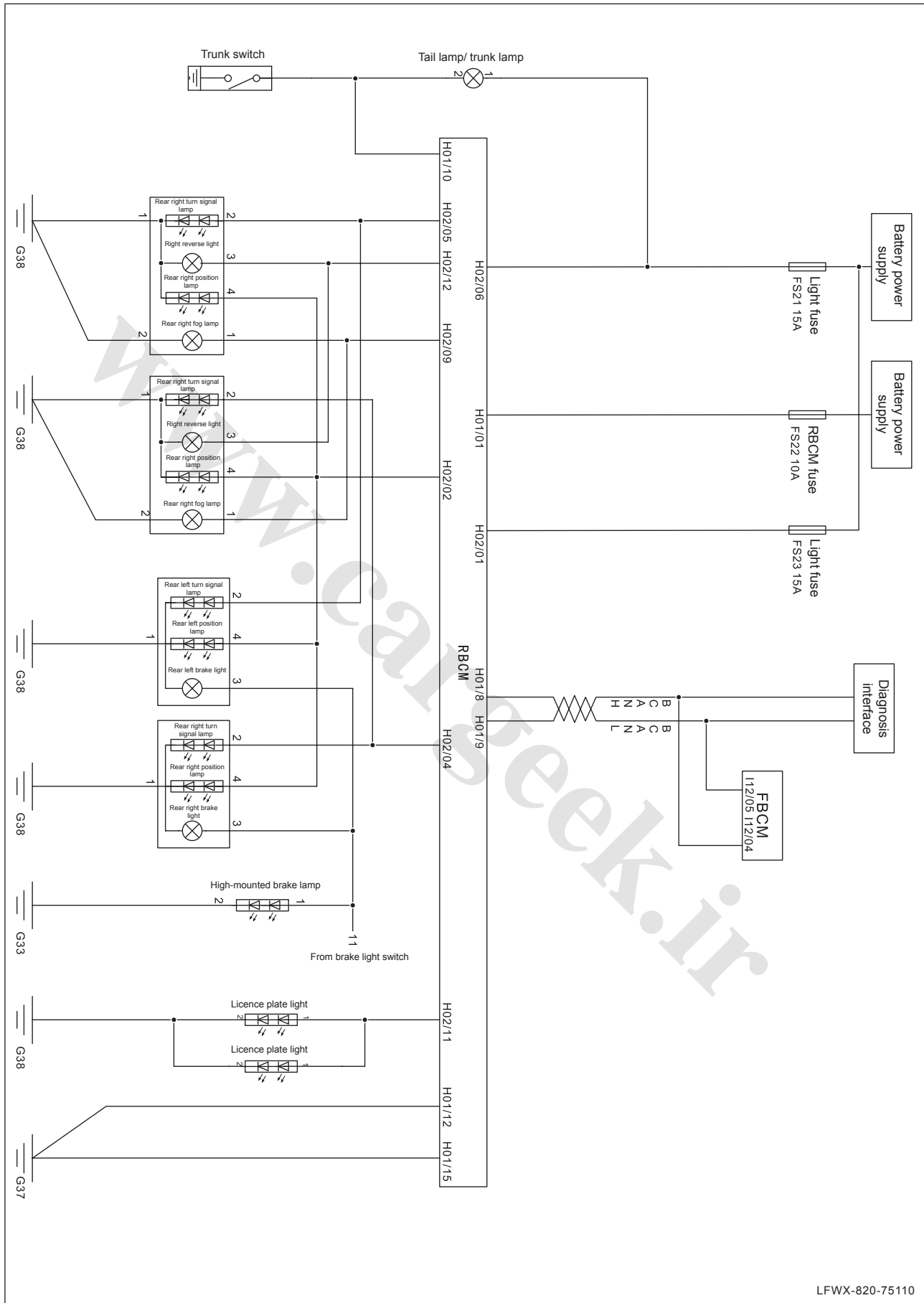
- (b) Arrange wire harness of antenna amplifier, and fix it with clips and bandages.
- (c) Install CD player. (See 74 - Audio System, Radio/CD Player, Replacement)
- (d) Install ceiling. (See 81 – Interiors and Exteriors Roof, Replacement)

## 75 – Lighting System

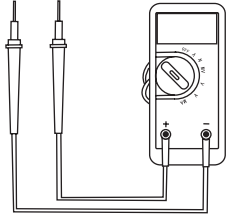
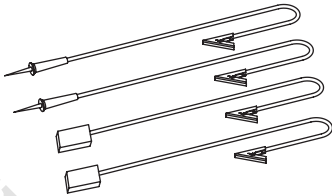
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### 4. Principles (rear light control)



## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Used for measuring voltage or resistance.
2	Wiring set		Assist to measure voltage or resistance

## Service data

### 1. Table of tightening torque

Item	N•m
Front combination lamp assembly fixing bolt	20~25
Fixing nut of rear combination light I	8~10
Fixing nut of rear combination light II	8~10
Fixing bolt of front ceiling light switch assembly	5~6
Fixing bolt of rear ceiling light switch assembly	5~6

## Precautions

### 1. Precautions for maintenance

- (a) When using battery during inspection, please don't let negative and positive probes of tester get too close. Otherwise, it may cause short-circuit.
- (b) When measuring the circuit voltage, turn ignition switch to "ON" position.
- (c) Be careful to operate halogen lamps. Because very high pressure exists inside the bulb, falling, collision or damage of bulbs may cause explosion or crash.
- (d) Be sure to replace bulbs with same wattage.
- (e) Always mount the light holder securely after replacing the bulb. Gaps around the light holder may cause fuzzy light cap and water ingress into the light chamber.



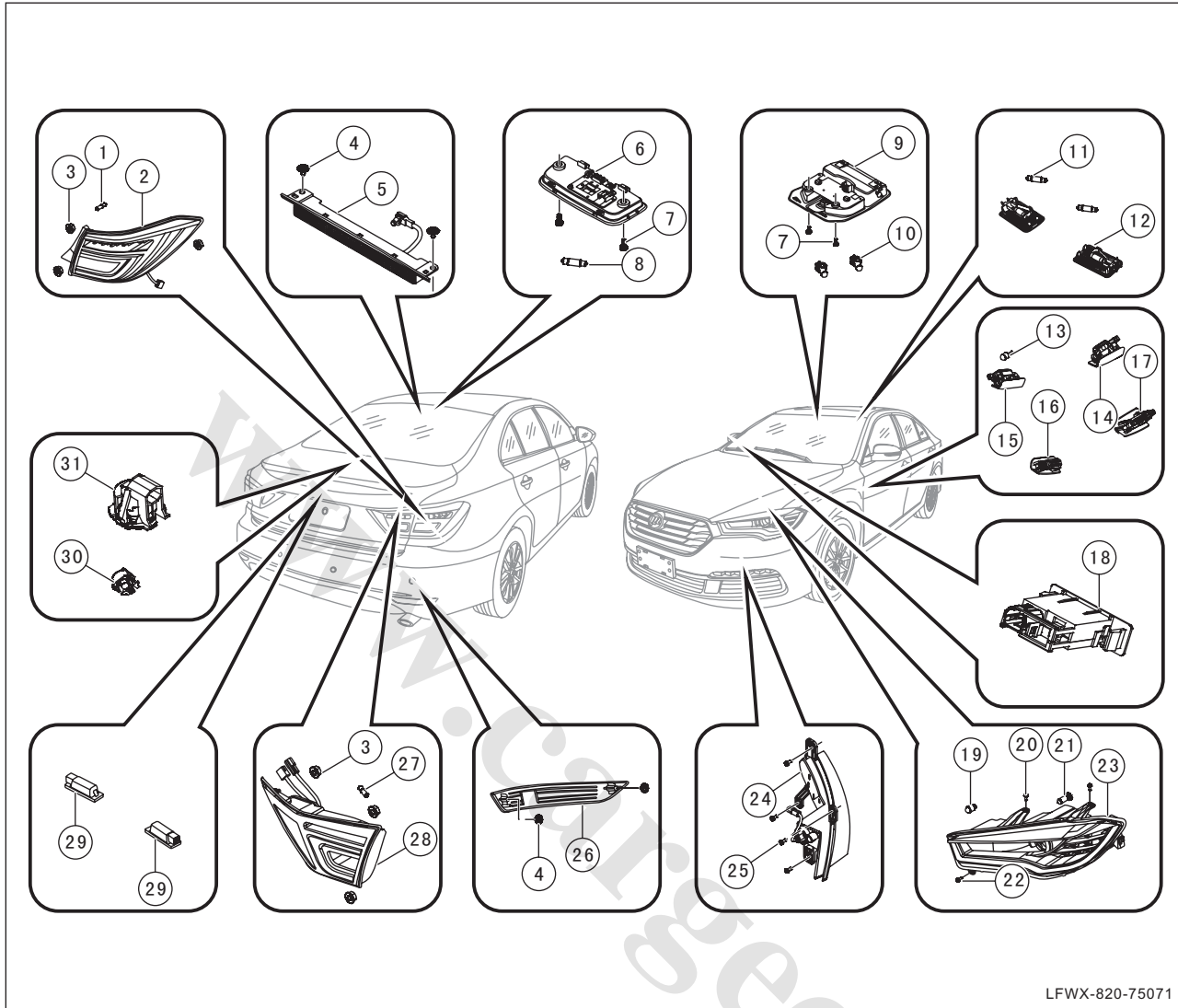
- (f) If only one lamp doesn't work, please overhaul poor connection or open-circuit fault of power supply or grounding connection before replacing a new bulb.

## 2. Other precautions

- (a) Always have a backup bulb.
- (b) When replacing the bulb, if you lay aside the bulb removed from the vehicle for a long time, the light shield will be polluted by dust or moisture. It may cause bulb having bad lighting effect or early damage. When installing bulb, please use a soft cloth to clean the surface of the bulb.

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## Component (I)



LFWX-820-75071

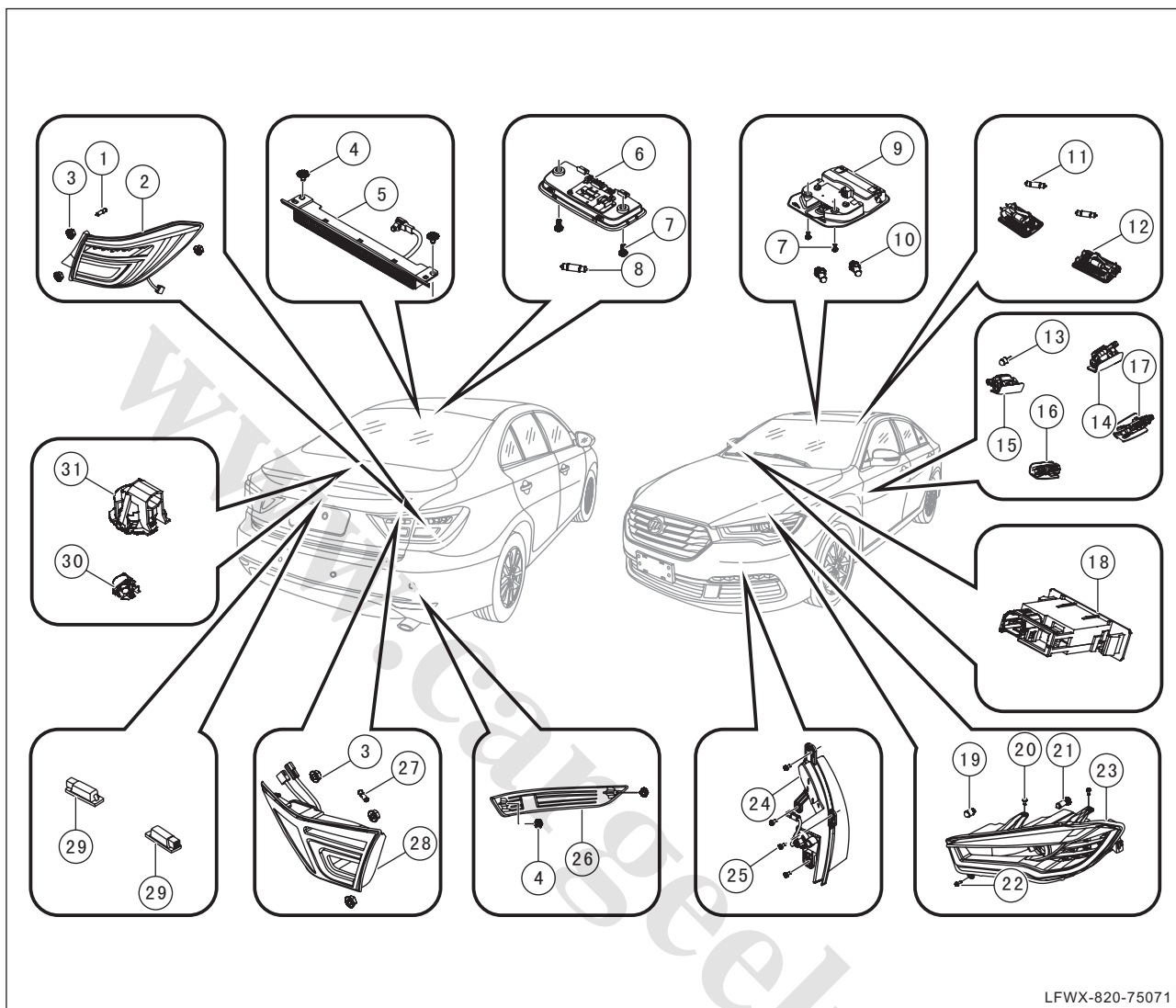
1	Bulb
2	Rear right combination light II
3	Nut
4	Screw
5	High-mounted brake lamp
6	Rear ceiling light
7	Bolt
8	Bulb
9	Front ceiling light
10	Bulb
11	Bulb
12	Makeup light assembly

14	Rear right door light assembly
15	Front right door light assembly
16	Front left door light assembly
17	Rear left door light assembly
18	Glove box light assembly
19	Bulb
20	Bolt
21	Bulb
22	Bolt
23	Left front combination lamp assembly
24	Left daytime running light assembly
25	Screw

13	Bulb
----	------

26	Rear right reflex reflector assembly
----	--------------------------------------

### Component (II)



LFWX-820-75071

27	Bulb
28	Rear right combination light I
29	Licence plate light assembly

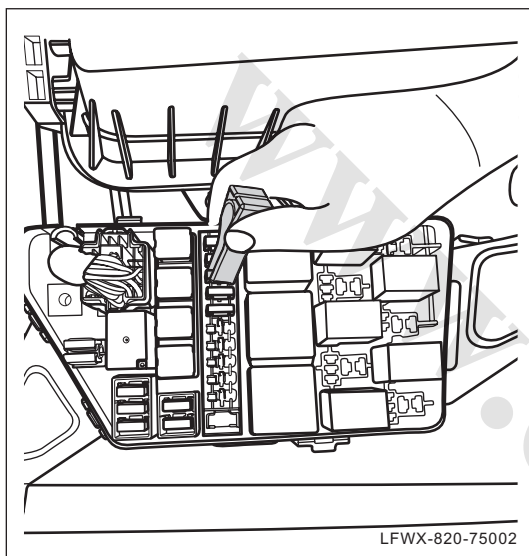
30	Bulb
31	Trunk light

## General Check

### Check the system

#### 1. Check the working conditions of system parts and relevant wire harness.

- (a) Check system parts easy to be touched or visible, to find out whether there is obvious damage or potential fault.
- (b) Check whether relevant wire harness connector is damaged, has poor connection, aging or loose conditions.

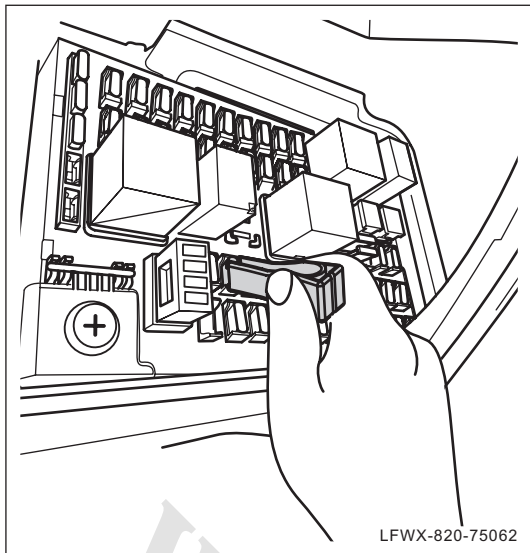


#### 2. Check the fuse

- (a) Check whether high/low fuse FS20 is blown. If yes, replace fuse with the one having the same specification.

△ HINT:

Fuse of high/low beam light is located in fuse box in engine compartment.



- (b) Check whether fuse FS17 of turn signal lamp is blown. If yes, replace fuse with the new one having the same specifications.

△ HINT:

Fuse of turn signal lamp is located in fuse box in driver's cab.

- (c) Check whether fuses FS21 and FS23 of tail lamp are blown. If yes, replace the fuse with a new one having the same specifications.

△ HINT:

Fuse of tail lamp is located in fuse box in driver's cab.

- (d) Check whether fuse FS19 is blown. If yes, replace fuse with a new one having the same specifications.

△ HINT:

Fuse FS19 is located in fuse box in driver's cab.

- (e) Check whether fuse FS13 of ceiling light is blown. If yes, replace fuse with a new one having the same specifications.

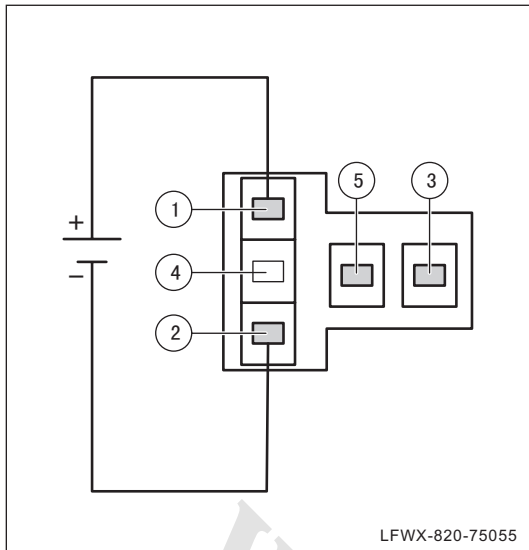
△ HINT:

Fuse FS13 of ceiling light is located in fuse box in driver's cab.

- (f) Check whether fuse FS24 of front left door lamp, fuse FS26 of front right door lamp, fuse FS27 of rear left door lamp and fuse FS28 of rear right door lamp are blown. If yes, replace them with new ones having the same specifications.

△ HINT:

Fuse FS13 of ceiling light is located in fuse box in driver's cab.

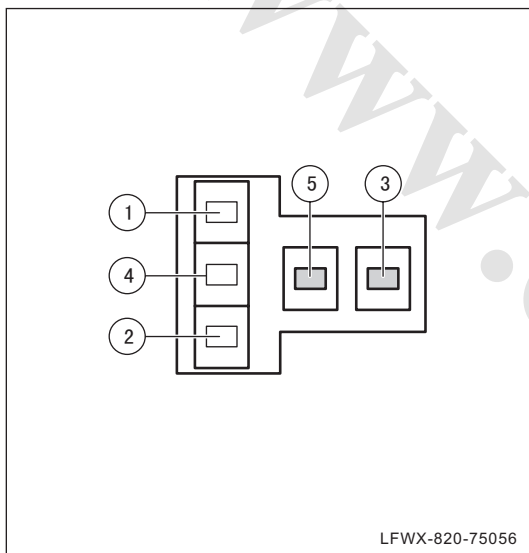


### 3. Check relay

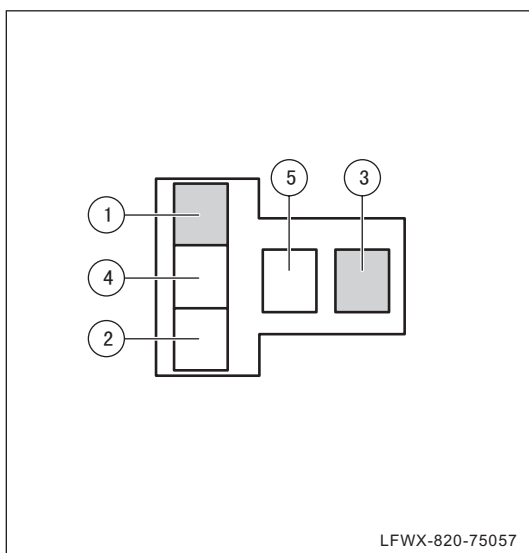
- (a) Unplug relay K13 of high/low beam lamp and connect power supply as shown in figure. Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.5 of relay are conducted. If no, replace relay with a new one having the same specifications.

△ HINT:

Relay of high/low beam light is located in fuse box in engine compartment.



- (b) Unplug relay K13 of high/low beam lamp. Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.5 of relay are conducted. If yes, replace relay with a new one having the same specifications.



### 4. Check voltage of power supply of relay

- (a) Unplug relay K13 of high/low beam lamp. Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to circuit book.

## Inspection of function

### 1. Check light switch

(a). Stop the vehicle in a safe place and use parking brake.

**Note:**

**When checking the lighting system, make sure that the battery voltage is not less than 12V.**

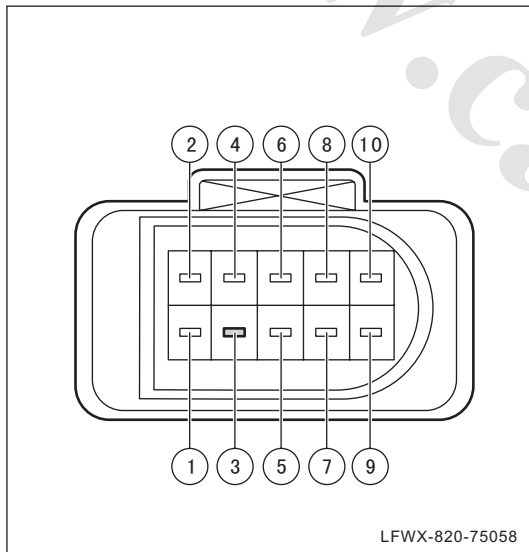
(b) Turn power supply to "ON" position.

(c) Turn on all lamp switches of the lighting system in turn, and check all lamps of the lighting system. Phenomenon: Lamps will illuminate or go out due to switch control.

**HINT:**

For detailed procedures of using switches and turning on/off lamps, refer to Owner' Manual for LIFAN.

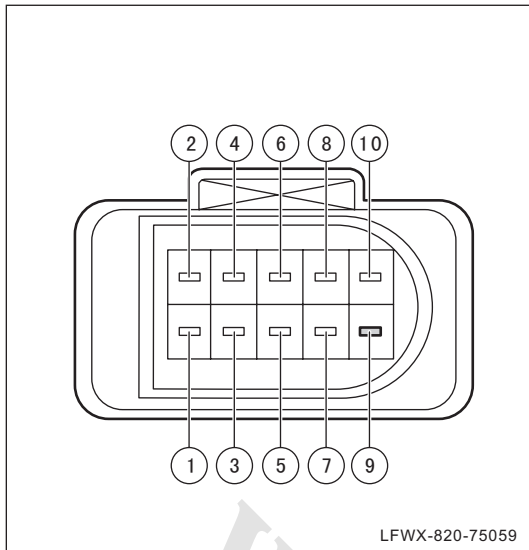
### Check high/low beam light



#### 1. Check power supply cable of high-low beam light.

(a) Turn power supply to "LOCK" position and disconnect wire harness connector of front combination light.

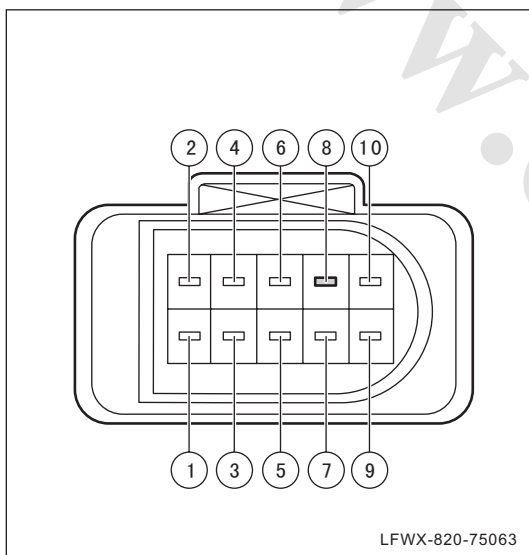
(b) Turn power supply to "ON" position and turn on low beam light. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.3 of wire harness connector of combination light and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



## 2. Check grounding wire of high/low beam light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front combination light.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.9 of wire harness connector of front combination light and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

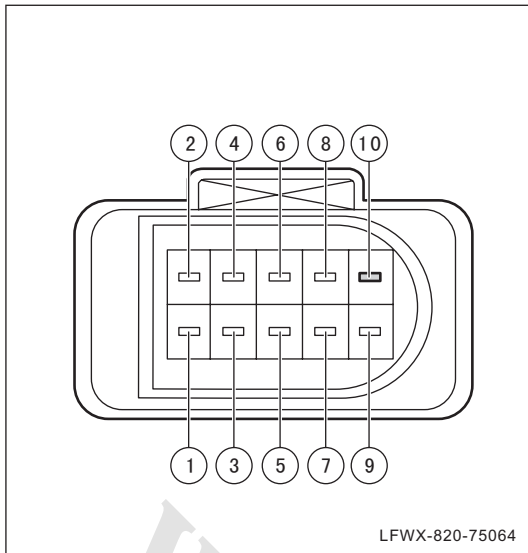
## Check turn signal lamp



### 1. Check power supply cable of front turn signal lamp

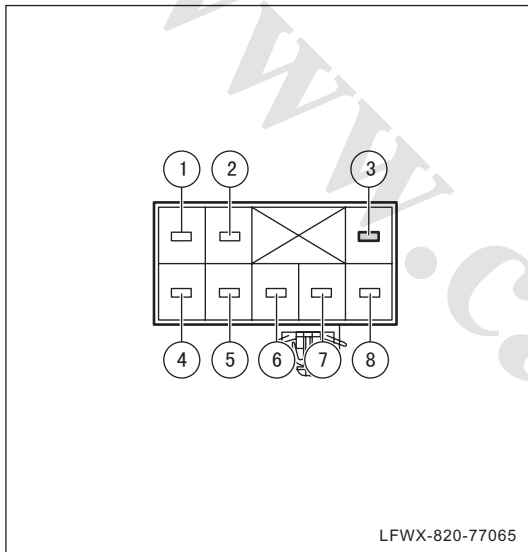
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front combination light.
- (b) Turn power supply to "ON" position and turn on front signal lamp. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.8 of wire harness connector of combination light and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.





**2. Check grounding wire of front turn signal lamp**

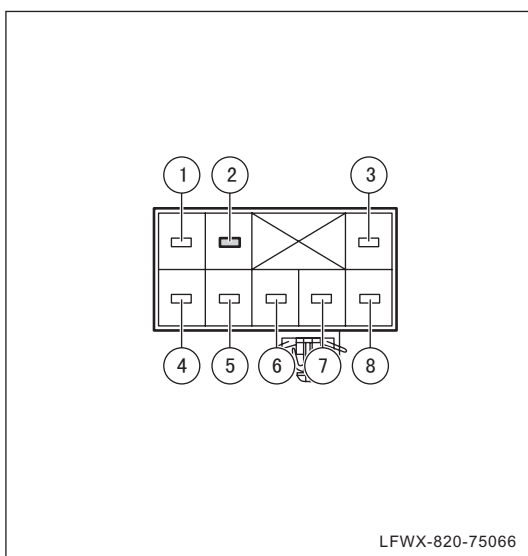
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front combination light.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.9 of wire harness connector of front combination light and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.



**3. Check power supply cable of side turn signal lamp**

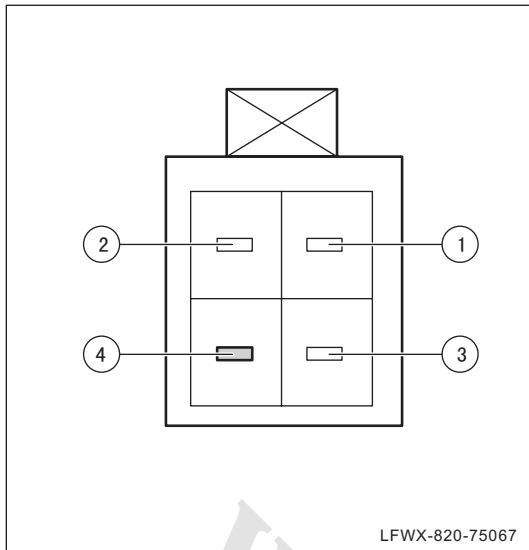
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of electric rearview mirror.
- (b) Turn power supply to "ON" position and turn on turn signal lamp. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.3 of wire harness connector of electric rearview mirror and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

75



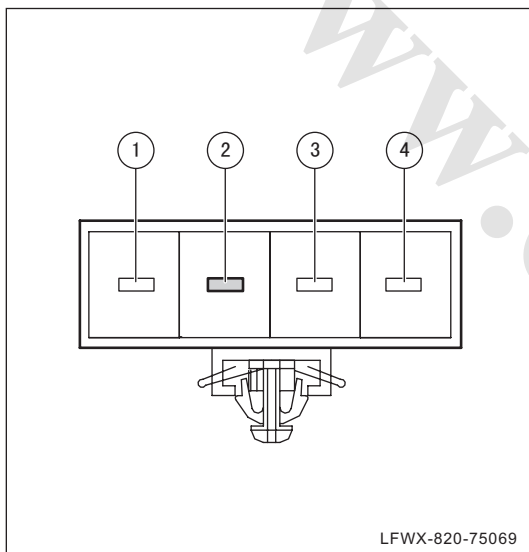
**4. Check grounding wire of side turn signal lamp**

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of electric rearview mirror.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of electric rearview mirror and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

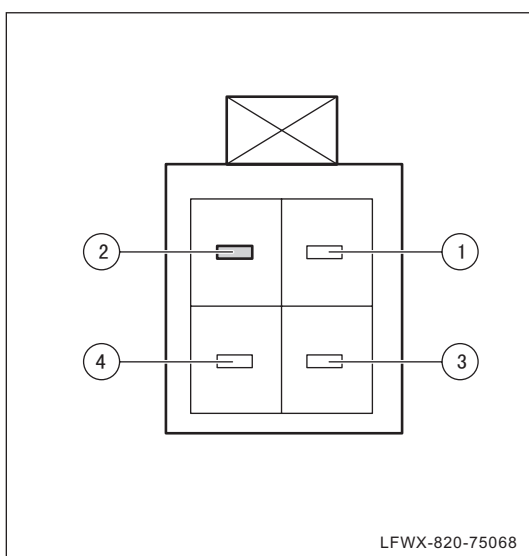


### 5. Check power supply cable of rear turn signal lamp

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light (body).
- (b) Turn power supply to "ON" position and turn on turn signal lamp. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.4 of wire harness connector of rear combination light (body) and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

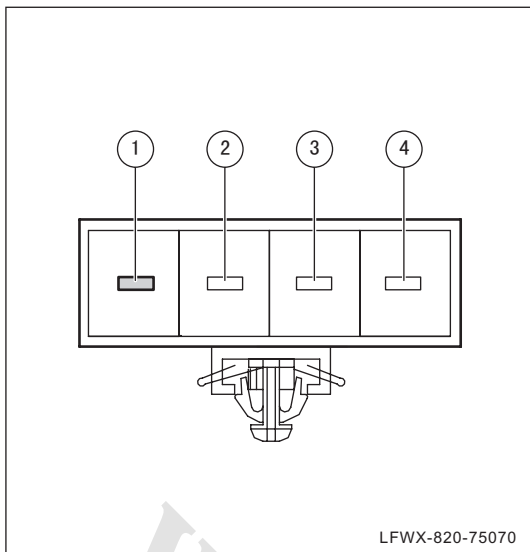


- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light (trunk).
- (b) Turn power supply to "ON" position and turn on turn signal lamp. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of wire harness connector of rear combination light (trunk) and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



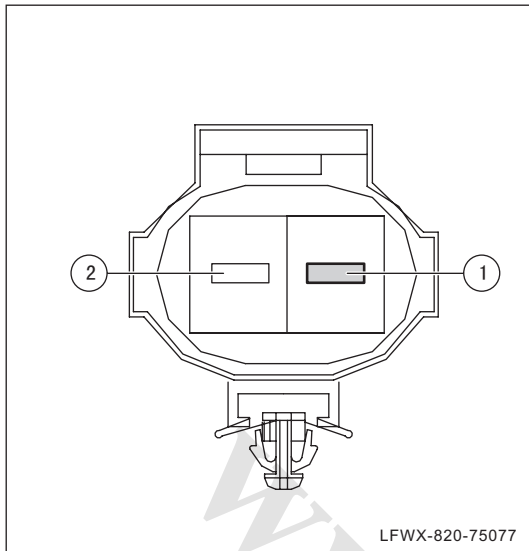
### 6. Check grounding wire of rear turn signal lamp

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light (body).
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of rear combination light (body) and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.



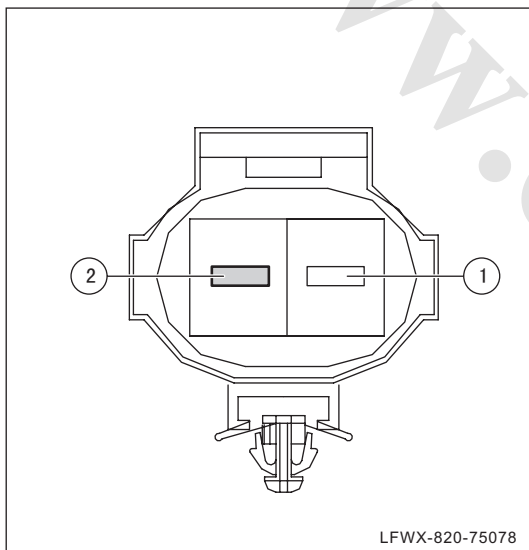
- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of rear combination light (trunk).
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of rear combination light (trunk) and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Check rear fog lamp



### 1. Check power supply cable of rear fog lamp

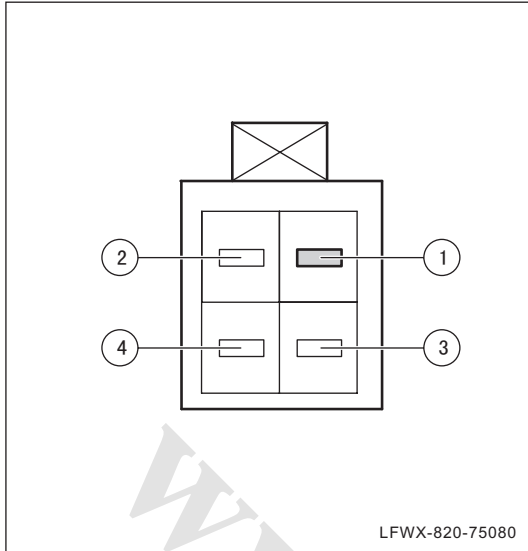
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear fog lamp.
- (b) Turn power supply to "ON" position and turn on rear fog lamp.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of rear fog lamp and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of rear fog lamp

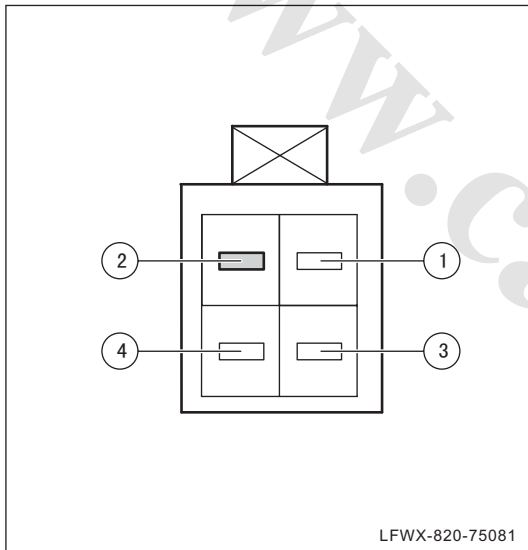
- (a) Disconnect wire harness connector of rear fog lamp.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of rear fog lamp and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Check brake lamp



### 1. Check power supply of brake lamp

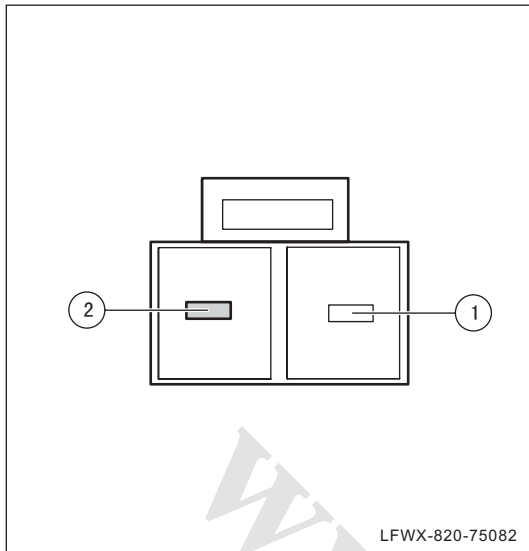
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light (body).
- (b) Turn power supply to "ON" position and step brake pedal.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of brake lamp and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of brake lamp

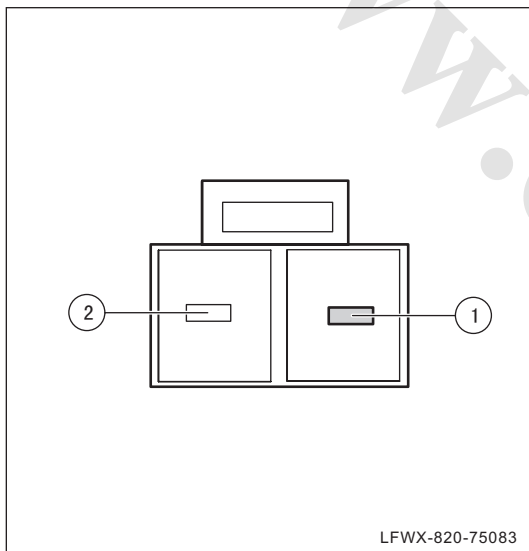
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light (body).
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of brake lamp and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Check high-mounted brake lamp



### 1. Check power supply of brake lamp

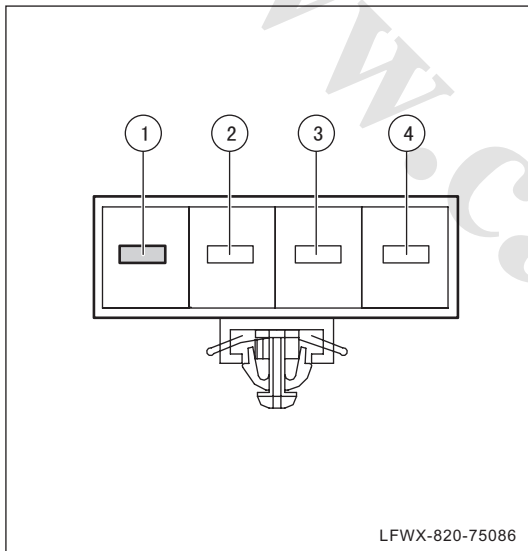
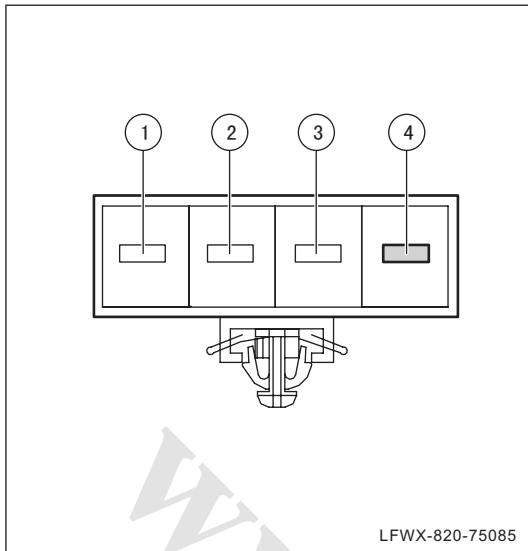
- (a) Turn power supply to "LOCK" position and disconnect high-mounted wire harness connector.
- (b) Turn power supply to "ON" position and step brake pedal.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of high-mounted wire harness connector and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of brake lamp

- (a) Turn power supply to "LOCK" position and disconnect high-mounted wire harness connector.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of high mounted brake lamp and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Check reverse light



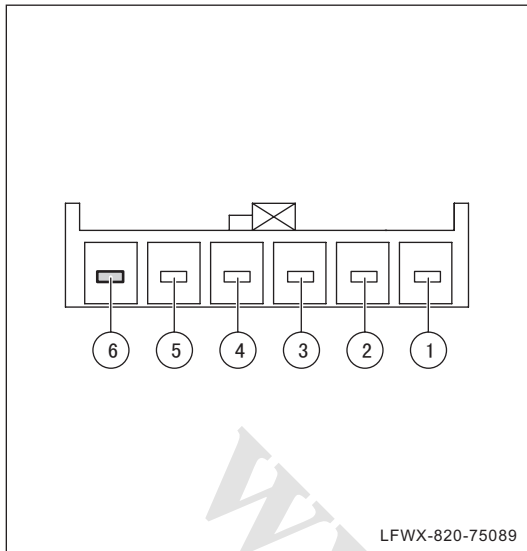
### 1. Check power supply cable of reverse light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light.
- (b) Turn power supply to "ON" position and shift gear to "R" speed.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.4 of wire harness connector of reverse light and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

### 2. Check grounding wire of reverse light

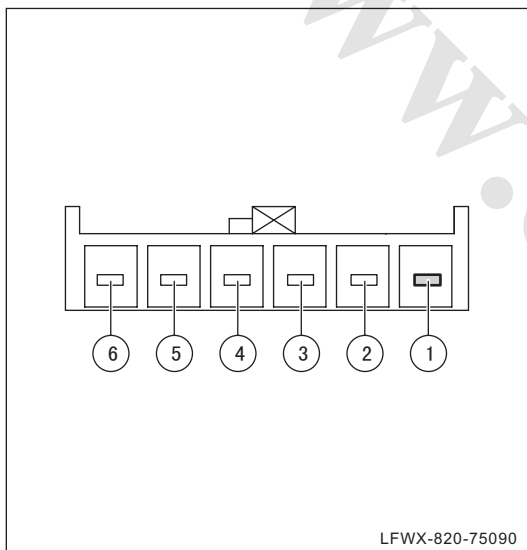
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear combination light.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of reverse light and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Check front ceiling light



### 1. Check power supply cable of front ceiling light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front ceiling light.
- (b) Turn power supply to "ON" position. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.6 of wire harness connector of front ceiling light and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

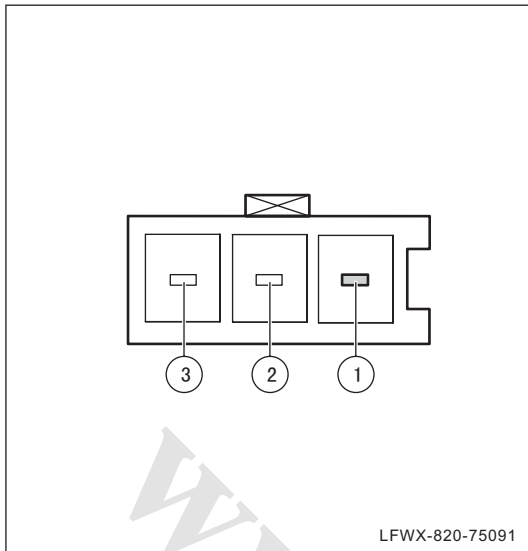


### 2. Check grounding wire of front ceiling light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front ceiling light.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front ceiling light and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

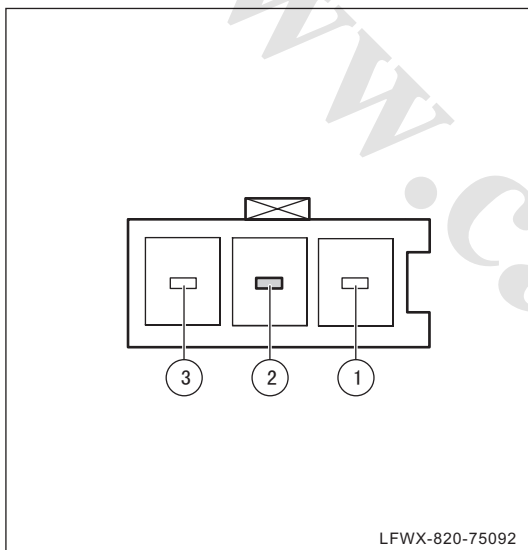


## Check rear ceiling light



### 1. Check power supply cable of rear ceiling light

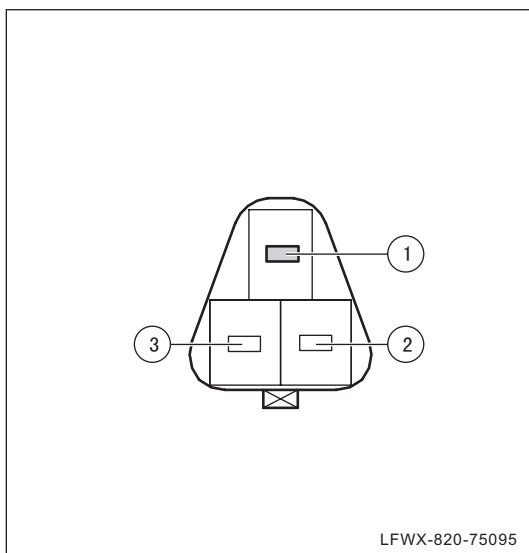
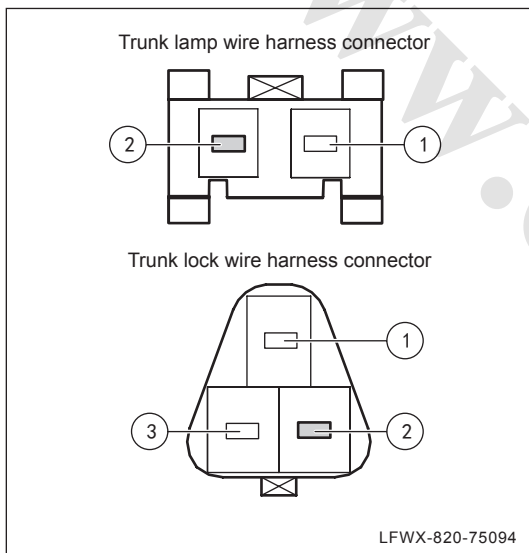
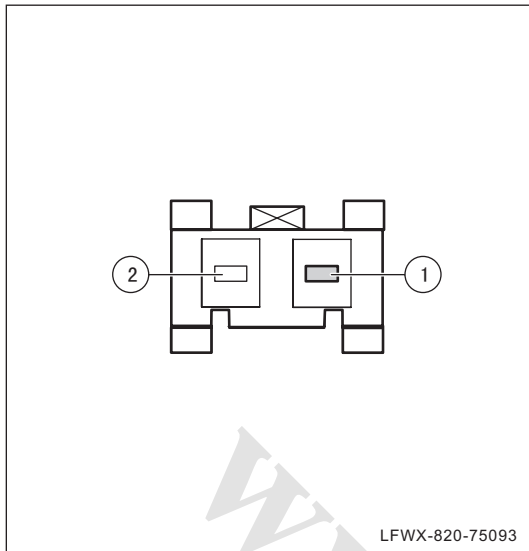
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear ceiling light.
- (b) Turn power supply to "ON" position. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of rear ceiling light and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of rear ceiling light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of rear ceiling light.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of rear ceiling light and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Check trunk light



### 1. Check power supply cable of trunk light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of trunk light.
- (b) Turn power supply to "ON" position. Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of trunk light and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

### 2. Check signal cable of trunk light

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of trunk light and trunk lid lock.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of trunk light and terminal No.2 of wire harness of trunk lid lock are connected. If no, overhaul relevant wire harness according to circuit book.

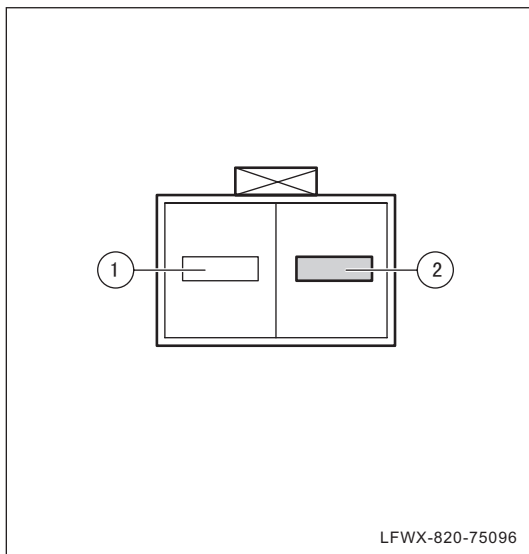
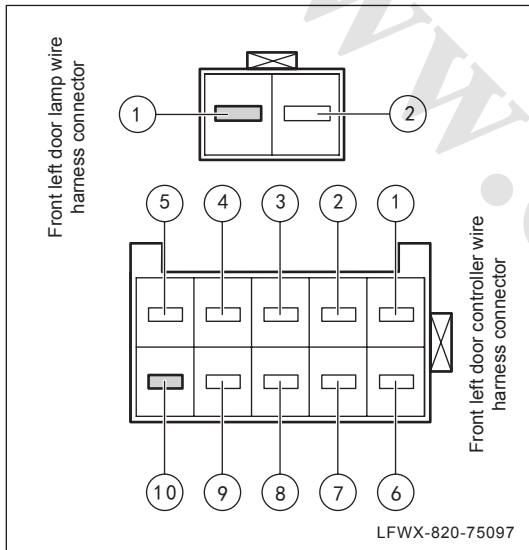
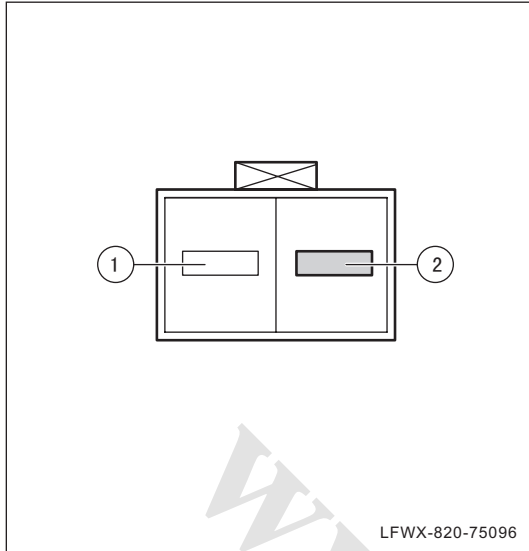
### 3. Check grounding wire of trunk lid lock

- (a) Disconnect wire harness connector of trunk lid lock.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of trunk lid lock and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.



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## Check door lamp



### 1. Check front left door lamp

#### (a) Check power supply cable of front left door lamp.

- Disconnect wire harness connector of front left door lamp.
- Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of wire harness connector of front right door lamp and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

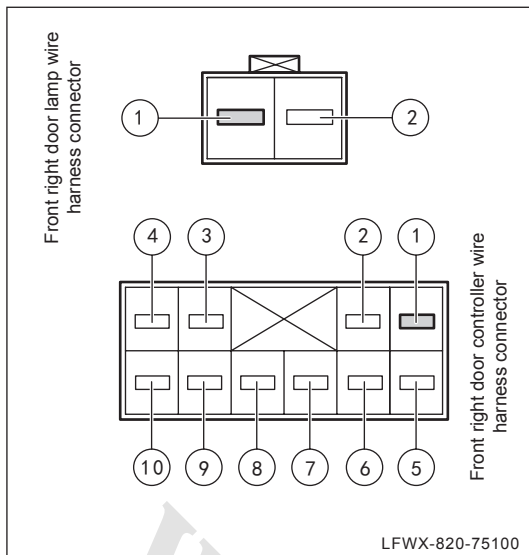
#### (b) Check control cable of front left door lamp.

- Disconnect wire harness connector of front left door lamp and controller of front left door lamp.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front left door lamp and terminal No.10 of wire harness connector of controller of front left door lamp are connected. If no, overhaul relevant wire harness according to circuit book.

### 2. Check front right door lamp

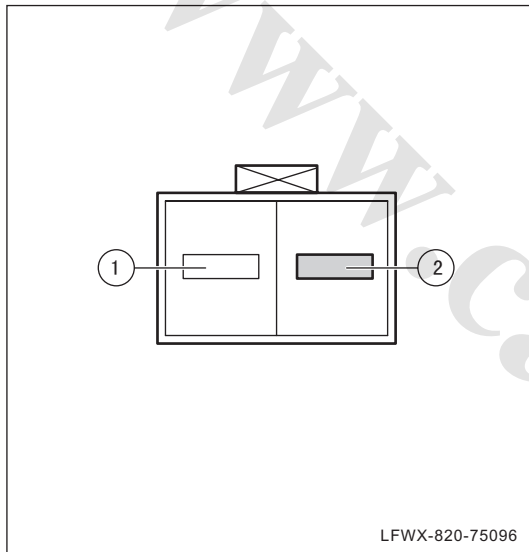
#### (a) Check power supply cable of front right door lamp.

- Disconnect wire harness connector of front right door lamp.
- Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of wire harness connector of front right door lamp and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



(b) Check control wire of front right door lamp.

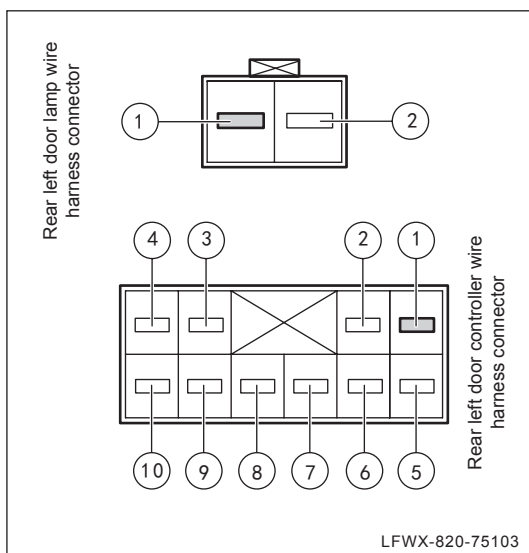
- Disconnect wire harness connector of front right door lamp and controller of front right door lamp.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front right door lamp and terminal No.1 of wire harness connector of controller of front right door lamp are connected. If no, overhaul relevant wire harness according to circuit book.



### 3. Check rear left door lamp

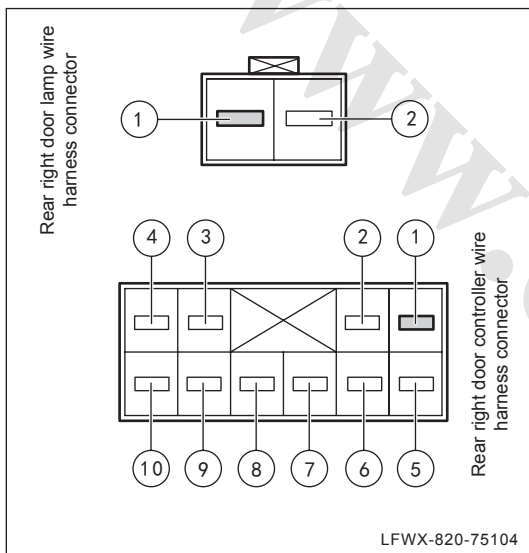
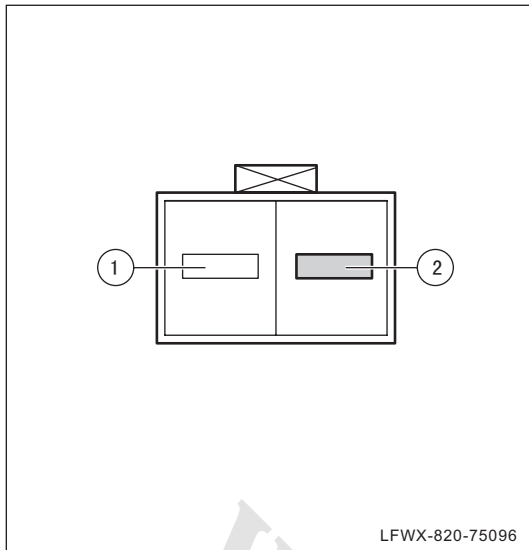
(a) Check power supply cable of rear left door lamp.

- Disconnect wire harness connector of rear left door lamp.
- Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of wire harness connector of rear right door lamp and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



(b) Check control wire of rear left door lamp.

- Disconnect wire harness connector of rear left door lamp and controller of rear left door lamp.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of rear left door lamp and terminal No.1 of wire harness connector of controller of rear left door lamp are connected. If no, overhaul relevant wire harness according to circuit book.



#### 4. Check rear right door lamp

##### (a) Check power supply cable of rear right door lamp.

- Disconnect wire harness connector of rear right door lamp.
- Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of wire harness connector of rear right door lamp and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

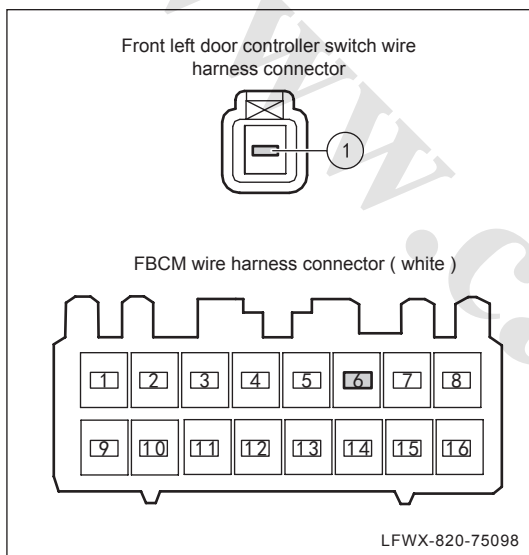
##### (b) Check control wire of rear right door lamp.

- Disconnect wire harness connector of rear right door lamp and controller of rear right door lamp.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of rear right door lamp and terminal No.1 of wire harness connector of controller of rear right door lamp are connected. If no, overhaul relevant wire harness according to circuit book.

## Check door switch

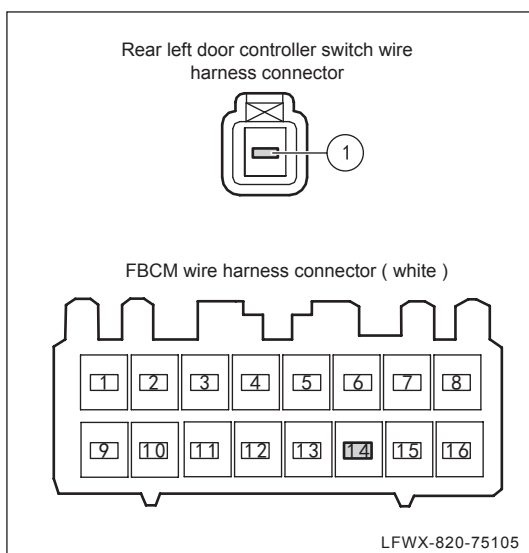
### 1. Check front left door switch

- (a) Check signal cable of front left door switch.
- Disconnect wire harness connector of front left door switch and FBCM.
  - Use a digital multimeter resistance scale to inspect whether terminal of wire harness connector of front left door switch and terminal No.6 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.



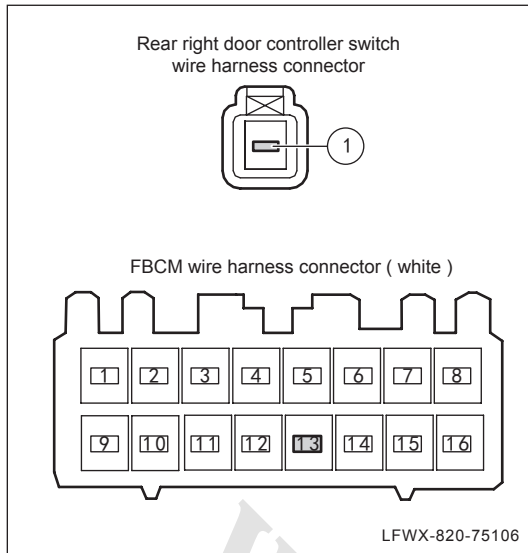
### 2. Check front right door switch

- (a) Check signal cable of front right door switch.
- Disconnect wire harness connector of front right door switch and FBCM.
  - Use a digital multimeter resistance scale to inspect whether terminal of wire harness connector of front right door switch and terminal No.5 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.



### 3. Check rear left door switch

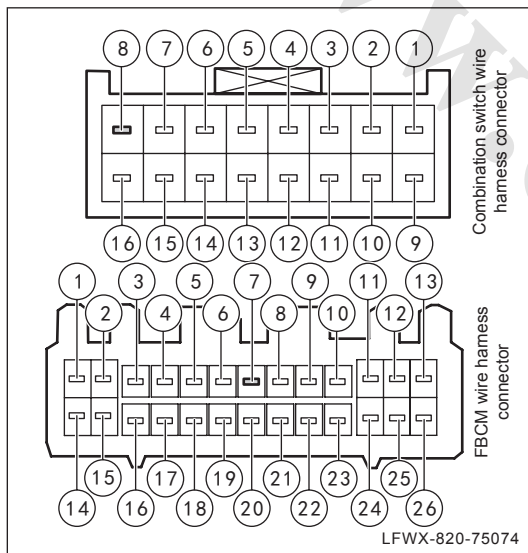
- (a) Check signal cable of rear left door switch.
- Disconnect wire harness connector of rear left door switch and FBCM.
  - Use a digital multimeter resistance scale to inspect whether terminal of wire harness connector of rear left door switch and terminal No.14 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.



#### 4. Check rear right door switch

- (a) Check signal cable of rear right door switch.
- Disconnect wire harness connector of rear right door switch and FBCM.
  - Use a digital multimeter resistance scale to inspect whether terminal of wire harness connector of rear right door switch and terminal No.13 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.

### Check the light combination switch

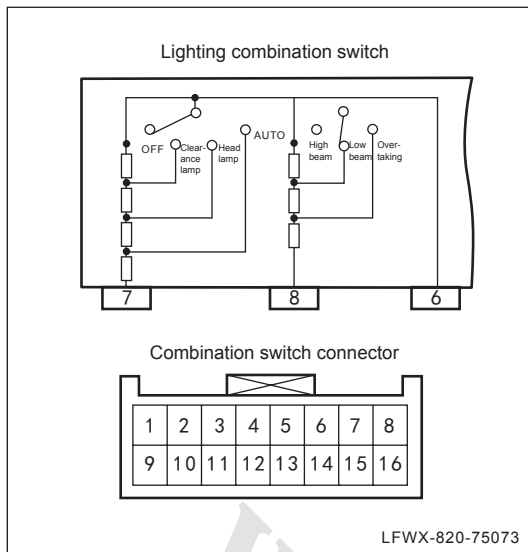


#### 1. Check signal cable of high/ low beam light on combination switch

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of combination switch and FBCM.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.8 of wire harness connector of combination switch and terminal No.7 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.







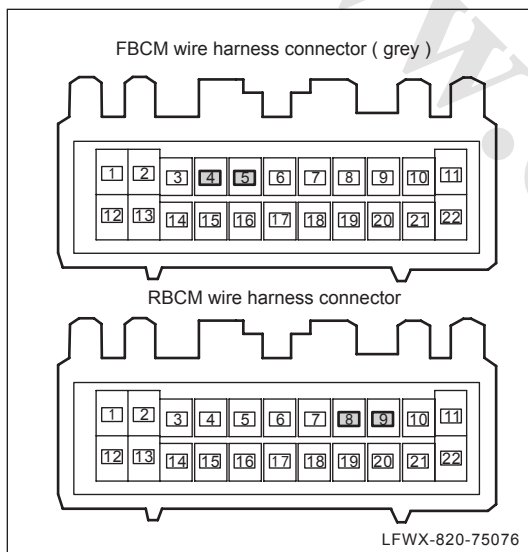
## 5. Check the working condition of light combination switch

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of combination switch.
- (b). As illustrated in the left figure, check the continuity between each terminal of combination switch with digital multimeter

△ HINT:

Under some light combination switch condition, if relevant terminals are not conducted, replace combination switch.

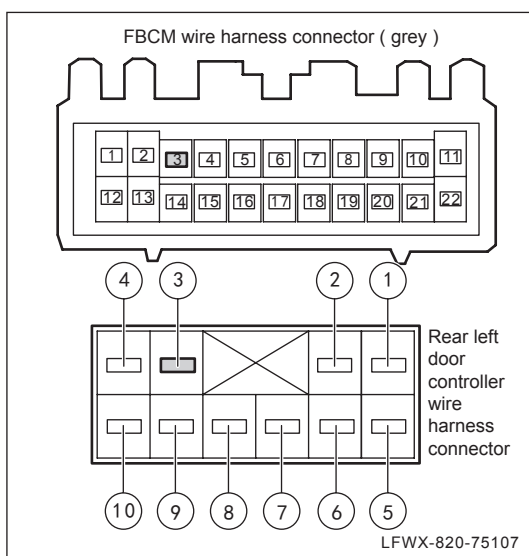
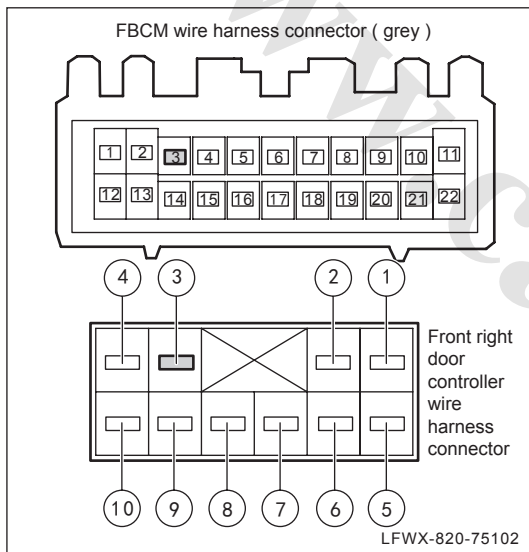
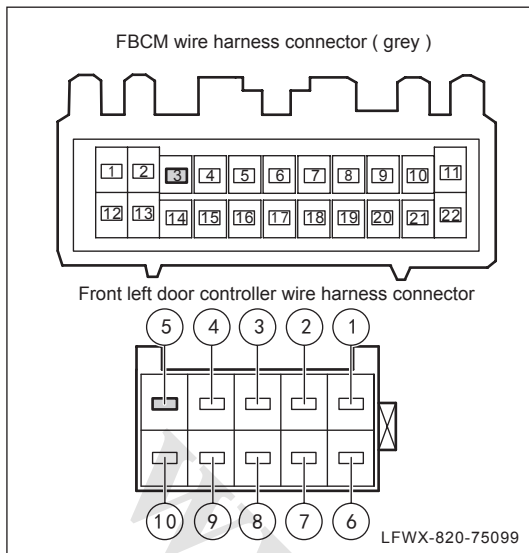
## Check BCAN-L and BCAN-H cable



### 1. Check the cable of BCAN-L and BCAN-H between FBCM and RBCM.

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of RBCM and FBCM.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of FBCM and terminal No.9 of wire harness connector of RBCM are connected. If no, overhaul relevant wire harness according to circuit book.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of FBCM and terminal No.9 of wire harness connector of RBCM are connected. If no, overhaul relevant wire harness according to circuit book.

## Check signal cable of LIN communication



### 1. Check signal cable of LIN communication between front left door controller and FBCM.

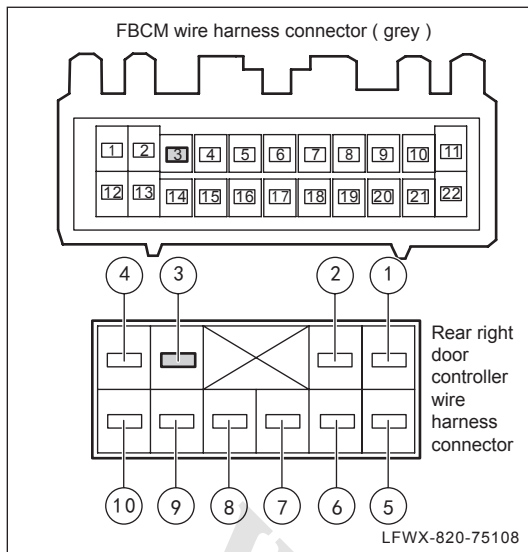
- Turn power supply to "LOCK" and disconnect wire harness connector of front left door controller and FBCM.
- Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of front left door controller and terminal No.3 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.

### 2. Check signal cable of LIN communication between front right door controller and FBCM.

- Turn power supply to "LOCK" and disconnect wire harness connector of front right door controller and FBCM.
- Use a digital multimeter resistance scale to inspect whether terminal No.3 of wire harness connector of front right door controller and terminal No.3 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.

### 3. Check signal cable of LIN communication between rear left door controller and FBCM.

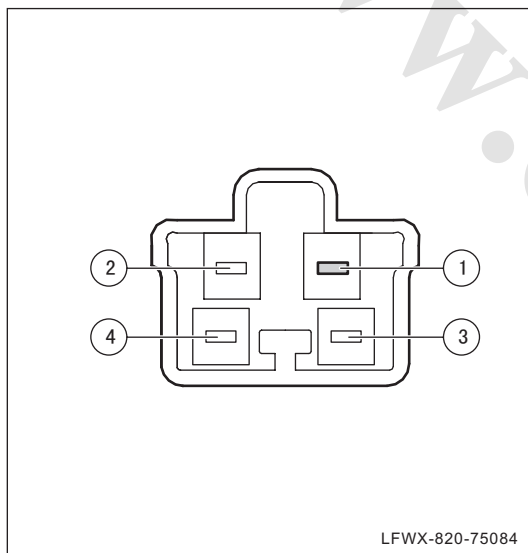
- Turn power supply to "LOCK" and disconnect wire harness connector of rear left door controller and FBCM.
- Use a digital multimeter resistance scale to inspect whether terminal No.3 of wire harness connector of rear left door controller and terminal No.3 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.



### 3. Check signal cable of LIN communication between rear right door controller and FBCM.

- Turn power supply to "LOCK" and disconnect wire harness connector of rear right door controller and FBCM.
- Use a digital multimeter resistance scale to inspect whether terminal No.3 of wire harness connector of rear right door controller and terminal No.3 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.

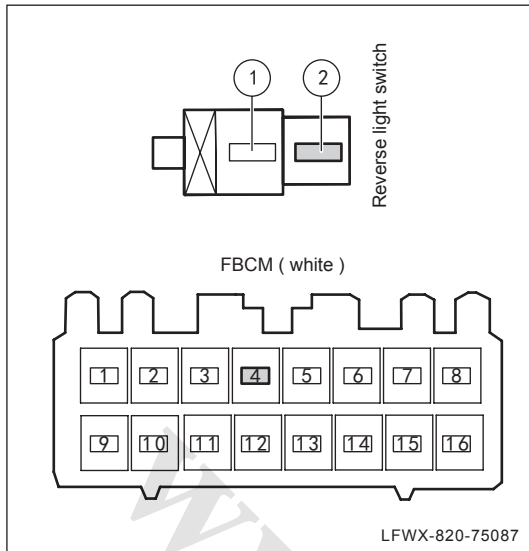
## Check the brake switch



### 1. Check the brake switch power wire

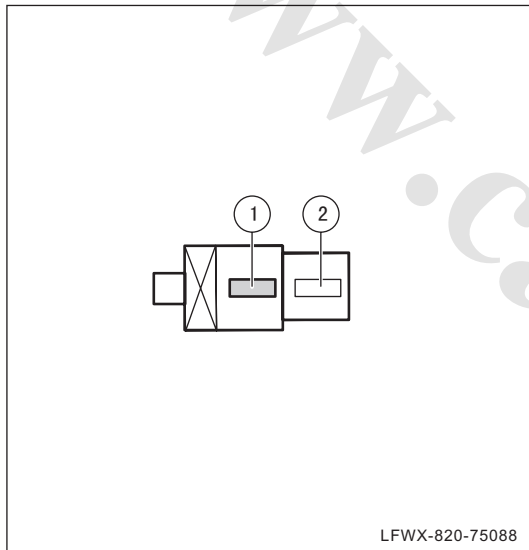
- Turn the power supply to "LOCK" position, and disconnect the wire harness connector of brake fluid level switch.
- Turn power supply to "ON" position and use a digital multimeter voltage scale to measure whether there is voltage between terminal No.1 of wire harness connector of brake switch and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

## Inspect reversing switch.



### 1. Check signal cable of reverse light switch

- (a) Turn power supply to "LOCK" and disconnect wire harness connector of reverse light switch and FBCM.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of reverse light switch and terminal No.4 of wire harness connector of FBCM are connected. If no, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of reverse light switch

- (a) Turn power supply to "LOCK" and disconnect wire harness of reverse light switch and FBCM.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of reverse light switch and body grounding connection are connected. If no, overhaul relevant wire harness according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
High/low beam lights on both sides don't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (1. High/low beam lights on both sides don't work)
	2. Relay (damaged)	
	3. Bulb (damaged)	
	4. Wire harness (faulty)	
	5. Light combination switch (damaged)	
High/low beam light on one side doesn't work	1. Bulb (damaged)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (2. High/low beam light on one side doesn't work)
	2. Wire harness (faulty)	
Front turn signal lamp and side turn signal lamp don't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (3. Front turn signal lamp and side turn signal lamp don't work.)
	2. Wire harness (faulty)	
	3. FBCM (damaged)	
Rear turn signal lamp doesn't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (4. Rear turn signal lamp doesn't work.)
	2. Bulb (damaged)	
	3. RBCM (faulty)	
All turn signal lamps don't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (5. All turn signal lamps don't work)
	2. Wire harness (faulty)	
	3. Light combination switch (damaged)	
	4. FBCM (faulty)	
	5. RBCM (faulty)	
Rear fog lamp on one side doesn't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (6. Rear fog lamp on one side doesn't work)
	2. Bulb (damaged)	
Rear fog lamps on both sides don't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (7. Rear fog lamps on both sides don't work)
	2. Bulb (damaged)	
	3. Light combination switch (damaged)	
	4. FBCM (faulty)	
	5. RBCM (faulty)	

Symptom	Suspected area	Recommended action
Brake lamp on one side doesn't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (8. Brake lamp on one side doesn't work.)
	2. Bulb (damaged)	
Brake lamps on both sides don't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (9. Brake lamps on both sides don't work.)
	2. Bulb (damaged)	
high-mounted brake lamp doesn't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (10. high-mounted brake lamp doesn't work.)
	2. Bulb (damaged)	
All brake lamps don't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (11. All brake lamps don't work.)
	2. Wire harness (faulty)	
	3. Brake switch (damaged)	
Reverse light on one side doesn't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (12. Reverse light on one side doesn't work.)
	2. Bulb (damaged)	
Reverse lights on both sides don't work	1. Wire harness (faulty)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (13. Reverse light on both sides don't work)
	2. Bulb (damaged)	
	3. Reverse light switch (fault)	
	4. RBCM (faulty)	
Front ceiling light doesn't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (14. Front ceiling light doesn't work.)
	2. Wire harness (faulty)	
	3. Bulb (damaged)	
	4. Front ceiling light switch (damaged)	
Rear ceiling light doesn't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (15. Rear ceiling light doesn't work)
	2. Wire harness (faulty)	
	3. Bulb (damaged)	
	4. Rear ceiling light switch (damaged)	
Trunk light doesn't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (16. Trunk light doesn't work.)
	2. Wire harness (faulty)	
	3. Trunk lid lock (fault)	

Symptom	Suspected area	Recommended action
Front left door lamp doesn't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (17. Front left door lamp doesn't work.)
	2. Wire harness (faulty)	
	3. Door control switch (damaged)	
	4. Front left door controller (damaged)	
	5. FBCM (faulty)	
Front right door lamp doesn't work.	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (18. Front right door lamp doesn't work)
	2. Wire harness (faulty)	
	3. Door control switch (damaged)	
	4. Front right door controller is damaged	
	5. FBCM (faulty)	
Rear left door lamp doesn't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (19. Rear left door lamp doesn't work.)
	2. Wire harness (faulty)	
	3. Door control switch (damaged)	
	Rear left door controller (damaged)	
	5. FBCM (faulty)	
Rear right door lamp doesn't work	1. Fuse (blown)	See 75 – Diagnosis of Lighting System, Fault Diagnosis (20. Rear right door lamp doesn't work)
	2. Wire harness (faulty)	
	3. Door control switch (damaged)	
	4. Rear right door controller (damaged)	
	5. FBCM (faulty)	



## Fault diagnosis

### (1. High/low beam lights on both sides don't work)

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of high/low beam lights (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	High and low beam headlamps don't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of high/low beam light is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	FS20 fuse is blown	Go to Step 2
2	Check FS20 circuit	Normal	Faulty	Instruction
	Check working condition of FS20 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check relay	Normal	Faulty	Instruction
	Check whether relay of high/low beam light is damaged (See 75 – General Check of Lighting System, Check of System)	Go to Step 4	Relay (damaged)	Replace the relay with the same specification.
4	Replacement and check	Normal	Faulty	Instruction
	Replace bulb of high/low beam light with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 5
5	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of high/low beam light is conducted (See 75 – General Check of Lighting System, Check of High/low Beam Light)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of high/low beam light is conducted (See 75 – General Check of Lighting System, Check of High/low Beam Light)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of high/low beam light is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check the light combination switch	Normal	Faulty	Instruction
	Check the working condition of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 10	The light combination switch is damaged	Replace combination switch (See 75 – Lighting System Combination Switch, Replacement)
10	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. High/low beam light on one side doesn't work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of high/low beam lights (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	High/low beam lights on one or both sides don't work	Go to Step 1
1	Replacement and check	Normal	Faulty	Instruction
	Replace bulb of high/low beam light with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 2
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of high/low beam light is conducted (See 75 – General Check of Lighting System, Check of High/low Beam Light)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of high/low beam light is conducted (See 75 – General Check of Lighting System, Check of High/low Beam Light)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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### 3. Front turn signal lamp and side turn signal lamp don't work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of turn signal lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Front turn signal lamp and side turn signal lamp don't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of turn signal lamp is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	Fuse FS17 is blown	Go to Step 2
2	Check the FS17 circuit	Normal	Faulty	Instruction
	Check working condition of FS17 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front turn signal lamp is conducted (See 75 – General Check of Lighting System, Check of Turn Signal Lamp)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of front turn signal lamp is conducted (See 75 – General Check of Lighting System, Check of Turn Signal Lamp)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of front turn signal lamp is conducted (See 75 – General Check of Lighting System, Check of Turn Signal Lamp)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of side turn signal lamp is conducted (See 75 – General Check of Lighting System, Check of Turn Signal Lamp)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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#### 4. Rear turn signal lamp doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of turn signal lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Rear turn signal lamp doesn't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear turn signal lamp is conducted (See 75 – General Check of Lighting System, Check of Turn Signal Lamp)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear turn signal lamp is conducted (See 75 – General Check of Lighting System, Check of Turn Signal Lamp)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of RBCM is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear turn signal lamp is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check BCAN-L and BCAN-H cable	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether BCAN-L line and BCAN-H line between RBCM and FBCM are conducted (See 75 – General Check of Lighting System, Check of BCAN-L and BCAN-H)	Go to Step 6	No continuity	Check line of BCAN-L and BCAN-H.
6	Read DTCs.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 7	Output of DTCs about line of BCAN-L and BCAN-H.	Maintain it according to the tip of DTC
7	Replacement and check	Normal	Faulty	Instruction
	Replace rear combination light and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 8
8	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 5. All turn signal lamps don't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of turn signal lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	All turn signal lamps don't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of turn signal lamp is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	Fuse FS17 is blown	Go to Step 2
2	Check the FS17 circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check working condition of FS17 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of turn signal lamp of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the light combination switch	Normal	Faulty	Instruction
	Check the working condition of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 6	The light combination switch is damaged	Replace combination switch (See 75 – Lighting System Combination Switch, Replacement)
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of RBCM is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear turn signal lamp is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 10	No continuity	Overhaul relevant wire harness according to wiring diagram.
10	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 11
11	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 6. Rear fog lamp on one side doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of rear fog lamp (See 75 – General Check of Lighting System, Check of System)	Diagnosis end.	Rear fog lamp on one side doesn't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear fog lamp is conducted (See 75 – General Check of Lighting System, Check of Rear Fog Lamp)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear fog lamp is conducted (See 75 – General Check of Lighting System, Check of Rear Fog Lamp)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of rear fog lamp with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 7. Rear fog lamps on both sides don't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of rear fog lamp (See 75 – General Check of Lighting System, Check of System)	Diagnosis end.	Rear fog lamps on both sides don't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of rear fog lamp is conducted (See 75 – General Check of Lighting System, Check of Rear Fog Lamp)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear fog lamp is conducted (See 75 – General Check of Lighting System, Check of Rear Fog Lamp)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of rear fog lamp of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of rear fog lamp with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 6
6	Check the light combination switch	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of light combination switch is conducted (See 75 – General Check of Lighting System, Check of Light Combination Switch)	Go to Step 7	The light combination switch is damaged	Replace combination switch (See 75 – Lighting System Combination Switch, Replacement)
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of RBCM is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 10	No continuity	Overhaul relevant wire harness according to wiring diagram.
10	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear turn signal lamp is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 11	No continuity	Overhaul relevant wire harness according to wiring diagram.
11	Check BCAN-L and BCAN-H cable	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether BCAN-L line and BCAN-H line between RBCM and FBCM are conducted (See 75 – General Check of Lighting System, Check of BCAN-L and BCAN-H)	Go to Step 12	No continuity	Check line of BCAN-L and BCAN-H.
12	Read DTCs.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 13	Output of DTCs about line of BCAN-L and BCAN-H.	Maintain it according to the tip of DTC
13	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 14
14	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 8. Brake lamp on one side doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Brake lamp on one side doesn't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of brake lamp is conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.

Steps	Inspection item	Inspection result		
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of brake lamp is conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction
	Replace bulb with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 9. Brake lamps on both sides don't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Brake lamps on both sides don't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of brake lamp is conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of brake lamp is conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace bulb with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 10. high-mounted brake lamp doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	high-mounted brake lamp doesn't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of high-mounted brake lamp is conducted (See 75 – General Check of Lighting System, Check of High-mounted Brake Lamp)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of brake lamp is conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction
	Replace high-mounted brake lamp with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## 11. All brake lamps don't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of brake lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	All brake lamps don't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS17 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	Fuse FS17 is blown	Go to Step 2
2	Check the FS17 circuit	Normal	Faulty	Instruction
	Check working condition of FS17 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS19 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 5	Fuse FS19 is blown	Go to Step 4
4	Check the FS19 circuit	Normal	Faulty	Instruction
	Check working condition of FS19 circuit	Go to Step 5	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of brake switch is conducted (See 75 – General Check of Lighting System, Check of Brake Switch)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check whether power supply cable of high-mounted brake lamp is conducted (See 75 – General Check of Lighting System, Check of High-mounted Brake Lamp)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether the grounding wire of high-mounted brake lamp is conducted (See 75 – General Check of Lighting System, Check of High-mounted Brake Lamp)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cables of brake lamps on both sides are conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wires of brake lamps on both sides are conducted (See 75 – General Check of Lighting System, Check of Brake Lamp)	Go to Step 10	No continuity	Overhaul relevant wire harness according to wiring diagram.
10	Replacement and check	Normal	Faulty	Instruction
	Replace brake switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 12. Reverse light on one side doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of reverse light (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Reverse light on one side doesn't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of reverse light is conducted (See 75 – General Check of Lighting System, Check of Reverse Light)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of reverse light is conducted (See 75 – General Check of Lighting System, Check of Reverse Light)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of reverse light with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 13. Reverse light on both sides don't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of reverse light (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Reverse light on both sides don't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check whether power supply cable of RBCM is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear turn signal lamp is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of FBCM is conducted (See 78 - General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of reverse light is conducted (See 75 - General Check of Lighting System, Check of Reverse Light)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether grounding wire of reverse light is conducted (See 75 – General Check of Lighting System, Check of Reverse Light)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of reverse light switch is conducted (See 75 – General Check of Lighting System, Check of Reverse Light Switch)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of reverse light switch is conducted (See 75 – General Check of Lighting System, Check of Reverse Light Switch)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check BCAN-L and BCAN-H cable	Normal	Faulty	Instruction
	Check whether BCAN-L line and BCAN-H line between RBCM and FBCM are conducted (See 75 – General Check of Lighting System, Check of BCAN-L and BCAN-H)	Go to Step 10	No continuity	Check line of BCAN-L and BCAN-H.
10	Read DTCs.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 11	Output of DTCs about line of BCAN-L and BCAN-H.	Maintain it according to the tip of DTC
11	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of reverse light with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 12

Steps	Inspection item	Inspection result		
12	Replacement and check	Normal	Faulty	Instruction
	Replace revers light switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 13
13	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 14
14	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 14. Front ceiling light doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of front ceiling light (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Front ceiling light doesn't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS13 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	Fuse FS13 is blown	Go to Step 2
2	Check the FS13 circuit	Normal	Faulty	Instruction
	Check working condition of FS13 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front ceiling light is conducted (See 75 – General Check of Lighting System, Check of Front Ceiling Light)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of front ceiling light is conducted (See 75 – General Check of Lighting System, Check of Front Ceiling Light)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of front ceiling light with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 6
6	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of front ceiling light switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 15. Rear ceiling light doesn't work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of rear ceiling light (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Rear ceiling light doesn't work	Go to Step 1



Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS13 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	Fuse FS13 is blown	Go to Step 2
2	Check the FS13 circuit	Normal	Faulty	Instruction
	Check working condition of FS13 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check power supply cable of rear ceiling light (See 75 – General Check of Lighting System, Check of Rear Ceiling Light)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear ceiling light is conducted (See 75 – General Check of Lighting System, Check of Rear Ceiling Light)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of rear ceiling light with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 6
6	Replacement and check	Normal	Faulty	Instruction
	Replace the bulb of rear ceiling light switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms



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**16. Trunk light doesn't work**

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of trunk light (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Trunk light doesn't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS21 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	FS21 fuse is blown	Go to Step 2
2	Check FS21 circuit	Normal	Faulty	Instruction
	Check working condition of FS21 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of trunk light is conducted (See 75 – General Check of Lighting System, Check of Trunk Light)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether trunk signal cable is conducted (See 75 – General Check of Lighting System, Check of Trunk Light)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of trunk lid lock is conducted (See 75 – General Check of Lighting System, Check of Trunk Light)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.

Steps	Inspection item	Inspection result		
6	Check trunk lid lock	Normal	Faulty	Instruction
	Check the working condition of trunk lid lock	Go to Step 7	Trunk lid lock is damaged.	Replace (See 82 – Door/ compartment/ door lock– trunk lid lock, Replacement)
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 17. Front left door lamp don't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of front left door lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Front left door lamp doesn't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS24 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	FS24 fuse is blown	Go to Step 2
2	Check FS24 circuit	Normal	Faulty	Instruction
	Check working condition of FS24 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front left door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether control wire of front left door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front left door switch is conducted (See 75 – General Check of Lighting System, Check of Door Switch)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Replacement and check	Normal	Faulty	Instruction
	Replace door switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 7
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front left door controller is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	(See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check the front left door controller	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	(See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 10	Front left door controller (damaged)	(See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)
10	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 11	No continuity	Overhaul relevant wire harness according to wiring diagram.
11	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 12	No continuity	Overhaul relevant wire harness according to wiring diagram.
12	Check signal cable of LIN communication	Normal	Faulty	Instruction
	Check whether signal cable of LIN communication between front left door controller and FBCM is conducted (See 75 – General Check of Lighting System, Check of Signal Cable of LIN Communication)	Go to Step 13	No continuity	Check LIN communication line
13	Read DTCs about LIN.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 14	Output of DTCs about LIN communication line	Maintain it according to the tip of DTC
14	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 18. Front right door lamp doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of front right door lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Front right door lamp doesn't work.	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS26 is blown (See 75 – General Check of Lighting System, Check of System)	Go to Step 3	FS26 fuse is blown	Go to Step 2
2	Check FS26 circuit	Normal	Faulty	Instruction
	Check working condition of FS26 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front right door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether control wire of front right door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front right door switch is conducted (See 75- General Check of Lighting System, Check of door switch)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Replacement and check	Normal	Faulty	Instruction
	Replace door switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 7
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front right door controller is conducted (See 77- General Check of Electric Window, Check of Front Right Door Controller)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of front right door controller is conducted (See 77 – General Check of Electric Window, Check of Front Right Door Controller)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check front right door controller	Normal	Faulty	Instruction
	Check the working condition of front right door controller (See 77 – General Check of Electric Window, Check of Front Right Door Controller)	Go to Step 10	Front right door controller is damaged	(See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)
10	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 11	No continuity	Overhaul relevant wire harness according to wiring diagram.
11	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 12	No continuity	Overhaul relevant wire harness according to wiring diagram.
12	Check signal cable of LIN communication	Normal	Faulty	Instruction
	Check whether signal cable of LIN communication between front right door controller and FBCM is conducted (See 75 – General Check of Lighting System, Check of Signal Cable of LIN Communication)	Go to Step 13	No continuity	Check LIN communication line
13	Read DTCs about LIN.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 14	Output of DTCs about LIN communication line	Maintain it according to the tip of DTC
14	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

**19. Rear left door lamp doesn't work**

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of rear left door lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Rear left door lamp doesn't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse FS27 is blown (See 75 – General Check of Lighting System, General Check)	Go to Step 3	FS27 fuse is blown	Go to Step 2
2	Check FS27 circuit	Normal	Faulty	Instruction
	Check working condition of FS27 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear left door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether control wire of rear left door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear left door switch is conducted (See 75 – General Check of Lighting System, Check of Door Switch)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.



Steps	Inspection item	Inspection result		
6	Replacement and check	Normal	Faulty	Instruction
	Replace door switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 7
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear left door controller is conducted (See 77 – General Check of Electric Window, Check of Rear Left Door Controller)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear left door controller is conducted (See 77 – General Check of Electric Window, Check of Rear Left Door Controller)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check rear left door controller	Normal	Faulty	Instruction
	Check the working condition of rear left door controller (See 77 – General Check of Electric Window, Check of Rear Left Door Controller)	Go to Step 10	Rear left door controller is damaged.	Replace (See 78 – Central Door Lock and Immobilizer – Rear Door Controller, Replacement)
10	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 11	No continuity	Overhaul relevant wire harness according to wiring diagram.
11	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 12	No continuity	Overhaul relevant wire harness according to wiring diagram.
12	Check signal cable of LIN communication	Normal	Faulty	Instruction
	Check whether signal cable of LIN communication between rear left door controller and FBCM is conducted (See 75 – General Check of Lighting System, Check of Signal Cable of LIN Communication)	Go to Step 13	No continuity	Check LIN communication line
13	Read DTCs about LIN.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 14	Output of DTCs about LIN communication line	Maintain it according to the tip of DTC
14	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 20. Rear right door lamp doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of rear right door lamp (See 75 – General Check of Lighting System, Check of Functions)	Diagnosis end.	Rear right door lamp doesn't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether fuse FS28 is blown (See 75 – General Check of Lighting System, General Check)	Go to Step 3	FS28 fuse is blown	Go to Step 2
2	Check FS28 circuit	Normal	Faulty	Instruction
	Check working condition of FS28 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear right door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether control wire of rear right door lamp is conducted (See 75 – General Check of Lighting System, Check of Door Lamp)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear right door switch is conducted (See 75 – General Check of Lighting System, Check of Door Switch)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Replacement and check	Normal	Faulty	Instruction
	Replace door switch with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 7
7	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of rear right door controller is conducted (See 77 – General Check of Electric Window, Check of Rear Right Door Controller)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear right door controller is conducted (See 77 – General Check of Electric Window, Check of Rear Right Door Controller)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check rear right door controller	Normal	Faulty	Instruction
	Check the working condition of rear right door controller (See 77 – General Check of Electric Window, Check of Rear Right Door Controller)	Go to Step 10	Rear right door control unit is damaged	Replace (See 78 – Central Door Lock and Immobilizer – Rear Door Controller, Replacement)
10	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 11	No continuity	Overhaul relevant wire harness according to wiring diagram.
11	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of FBCM is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of FBCM)	Go to Step 12	No continuity	Overhaul relevant wire harness according to wiring diagram.
12	Check signal cable of LIN communication	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether signal cable of LIN communication between rear right door controller and FBCM is conducted (See 75 – General Check of Lighting System, Check of Signal Cable of LIN Communication)	Go to Step 13	No continuity	Check LIN communication line
13	Read DTCs about LIN.	Normal	Faulty	Instruction
	Connect the diagnostic scanner, and check whether it has DTC to output	Go to Step 14	Output of DTCs about LIN communication line	Maintain it according to the tip of DTC
14	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

# Front Combination Light

## Adjustment

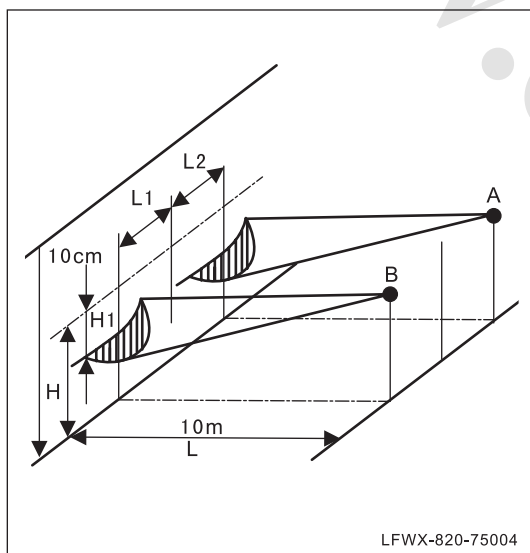
### 1. Before Adjustment

(a) Adjust the vehicle as follows.

- Make sure there is no deformation around front headlamp.
- Park the vehicle on level ground.
- Make sure the tyres are inflated with the specified pressures. (See 33 – General Check of Wheel and Tyre, Check of Tyre)
- The driver sits in the car (or with a weight of about 73kg), and the car is in no-load condition.

△ HINT:

No-load condition indicates that the fuel, engine coolant and lubricant are full, and the spare tyre, jack, tool set and floor mats are at the specified locations.



### 2. Inspection of illumination range of front headlamp

(a) Keep 10m between the surface of lens of front combination light and screen

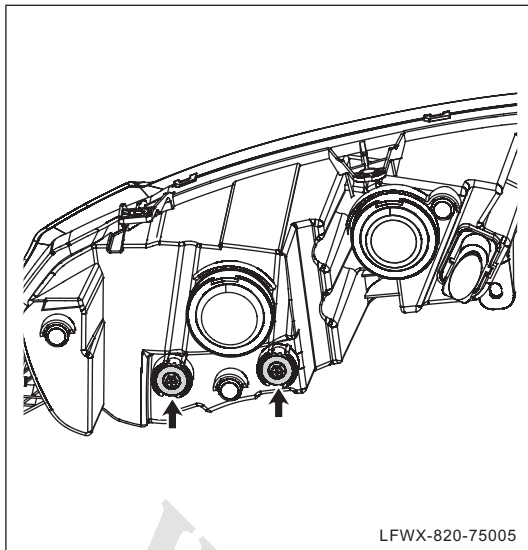
△ HINT:

The screen can be either curtain cloth or flat wall.

- (b) Start the engine.
- (c) Turn on front headlamp.
- (d) Check whether the lighting range of front combination light meets requirement shown in figure. If no, adjust the front combination light.

△ HINT:

A and B indicate the position of front headlamp respectively. H indicates the height of front headlamp. L1 and L2 indicate the distance between front headlamp center and the vehicle center respectively.



### 3. Adjust the lighting range of front combination light.

- (a) Open the engine hood.
- (b) Screw adjusting bolt and adjust the lighting range of front combination light to the specified range.

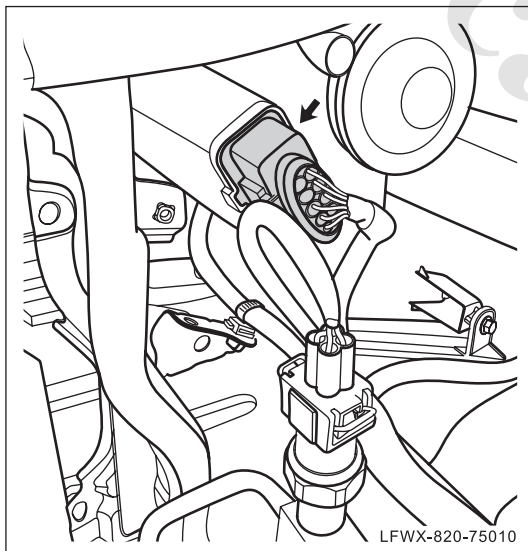
#### △ HINT:

The lighting height of front combination light can be adjusted by using the lighting height adjusting switch installed in driver's cab.

## Replacement

#### △ HINT:

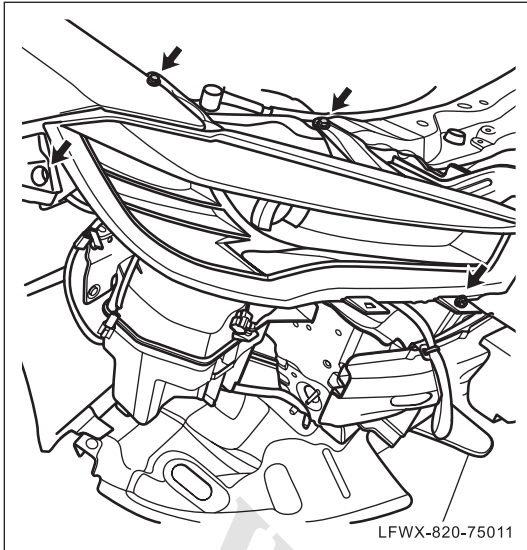
Replacement of left and right combination lights is basically the same. This section will only introduce the replacement of front right combination light as an example.



### 1. Replacement of front right headlamp assembly

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front right combination light.

- (b) Remove the front bumper assembly. (See 81- Interiors and Exteriors, Front Bumper, Replacement).



- (c) Remove fixing nut of front right combination light assembly, and remove front right combination light assembly.

- (d) Install front right combination light assembly onto mounting position, and install and tighten fixing bolt.

Torque: 20N•m - 25N•m

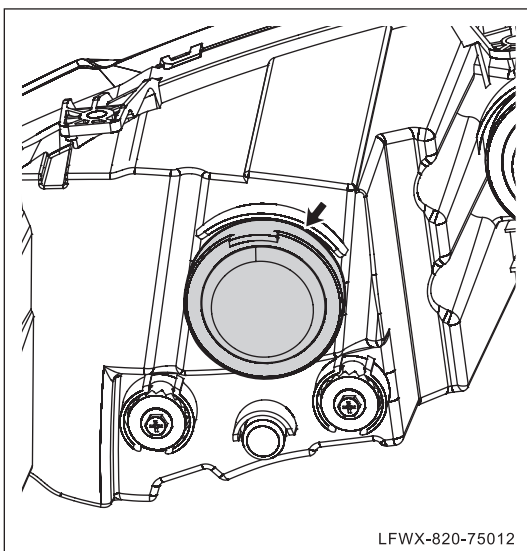
- (e). Install front bumper assembly. (See 81- Interiors and Exteriors, Front Bumper, Replacement).
- (f) Connect wire harness connector of front right combination light.

## 2. Inspection

- (a). Turn on the front combination lamp, to check whether it operates normally.

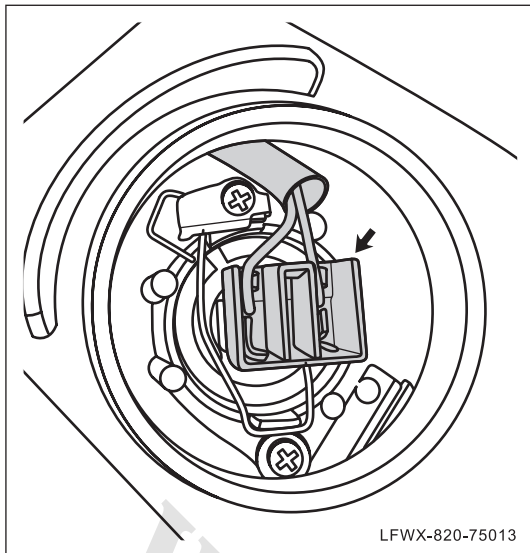
## 3. Replace bulb of low/high beam light

- (a). Remove front right combination lamp assembly. (See 75 - Lighting System, Front Combination Lamp, Replacement)

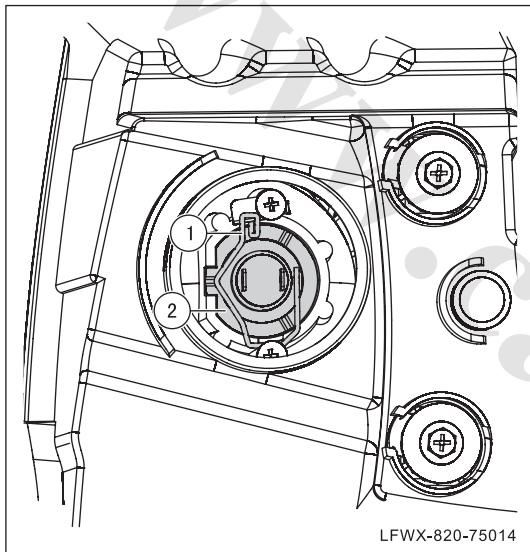


- (b) Remove rubber shade of low/high beam light.

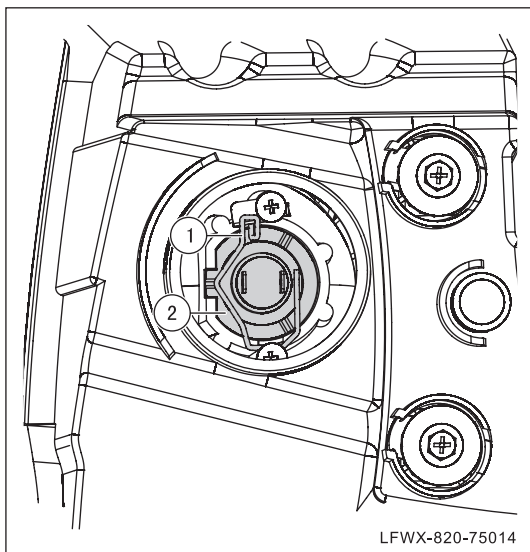




(c) Unplug low/high beam light holder.



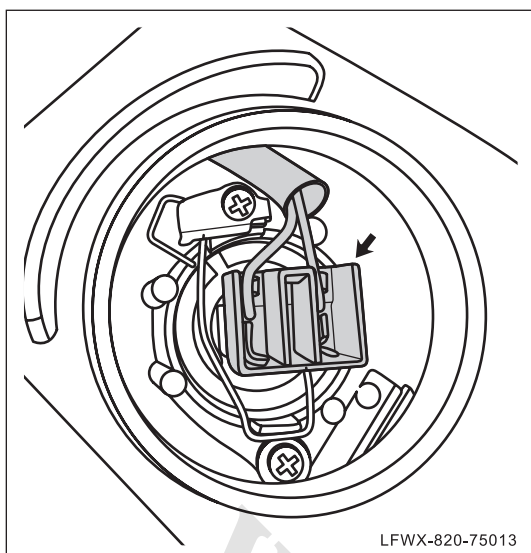
(d). Remove the low/high beam bulb ② by pushing the locking lever ① outward while pressing it downwards.



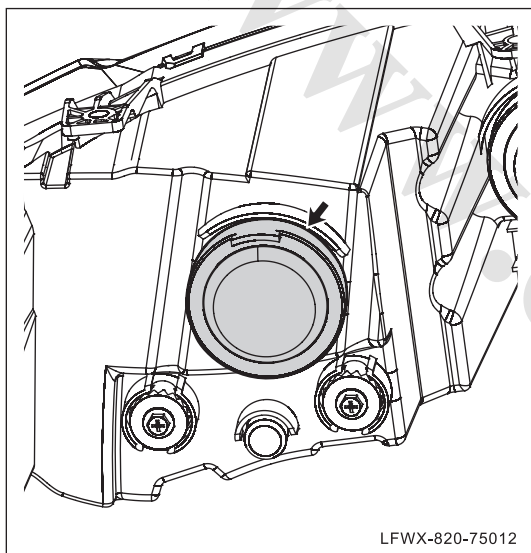
(e) Install low/high beam light bulb ② onto mounting hole, and press and push lock rod ① inward.

△ HINT:

When installing low/high beam light bulb, align the projection section with slot section.



(f) Install low/high beam light holder.

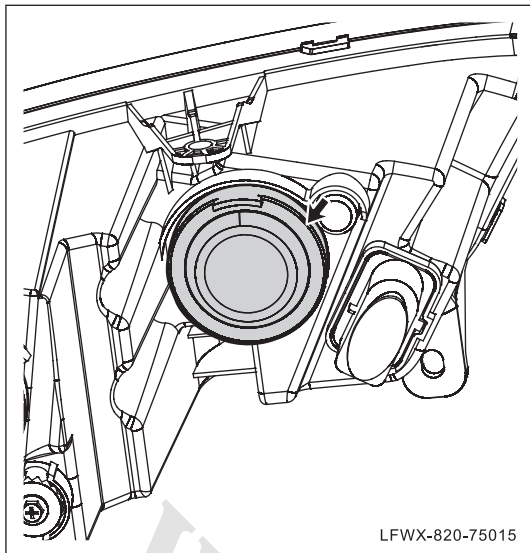


(g) Install rubber shade of low/high beam light

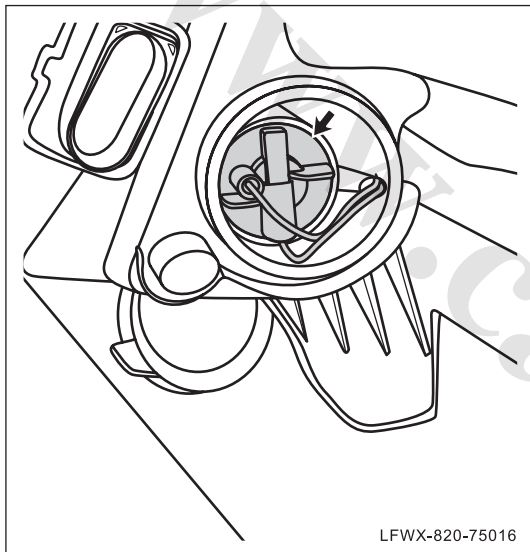
(h). Install front combination lamp assembly. (See 75 - Lighting System, Front Combination Lamp, Replacement)

#### 4. Replacement of bulb of turn signal lamp

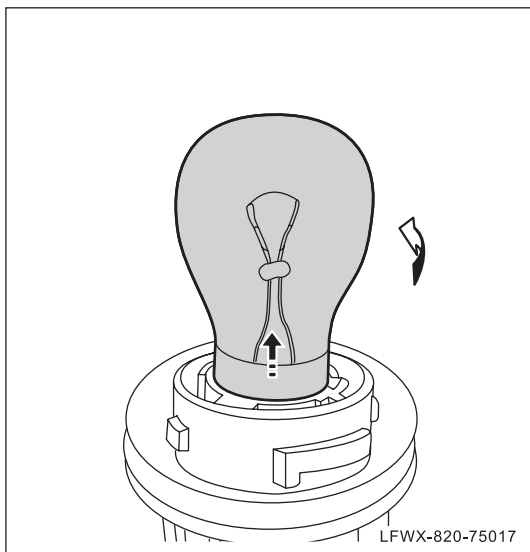
(a). Remove front right combination lamp assembly. (See 75 - Lighting System, Front Combination Lamp, Replacement)



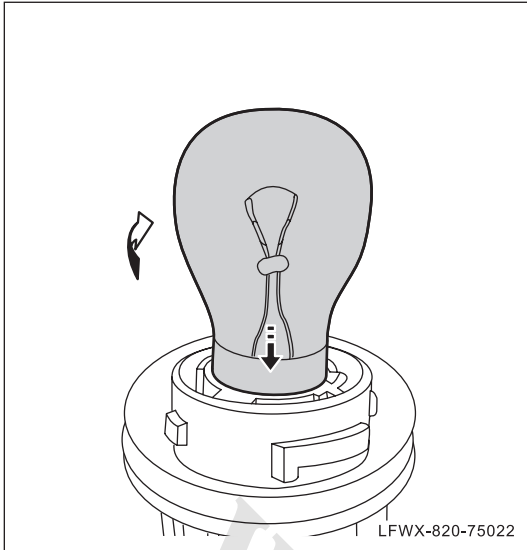
- (b) Remove rubber shade of turn signal lamp.



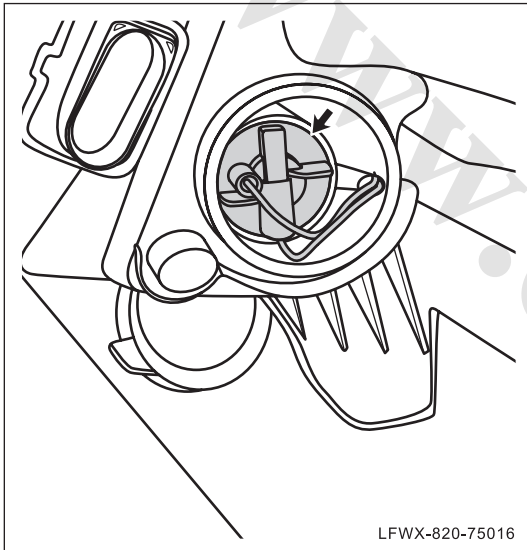
- (c) Press down the turn signal lamp hold and simultaneously rotate the holder counterclockwise and take out the turn signal lamp.



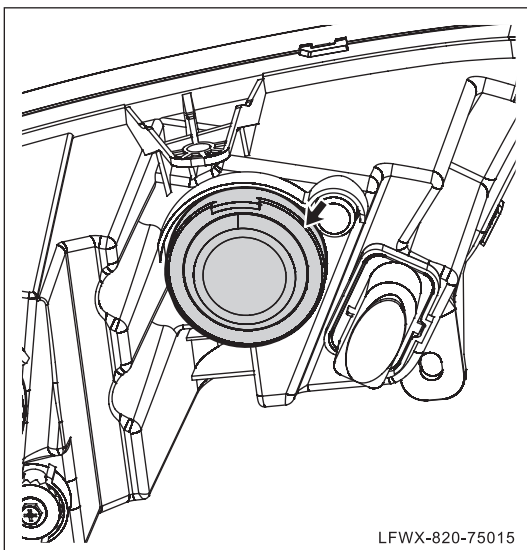
- (d) Rotate and then remove the turn signal lamp bulb.



- (e) Install turn signal lamp bulb onto mounting hole, and rotate and lock the turn signal lamp bulb.



- (f) Align slot of mounting hole and press turn signal lamp holder while rotating and locking holder.



- (g) Install rubber shade of turn signal lamp.

- (h). Install front right combination lamp assembly. (See 75 - Lighting System, Front Combination Lamp, Replacement)

## Rear Combination Light

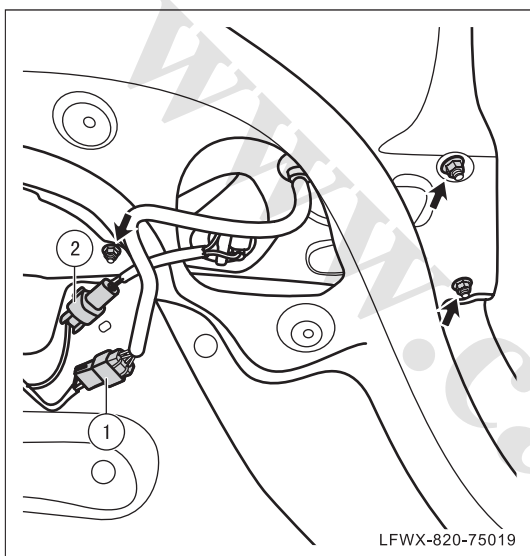
### Replacement

△ HINT:

Replacement of left and right combination lights is basically the same. This section will only introduce the replacement of rear combination light.

#### 1. Replace rear right combination light assembly I

- (a) Remove trunk lid panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)



- (b) Turn power supply to “LOCK” position and disconnect wire harness connector ① of rear right combination light assembly I and wire harness connector ② of rear fog lamp.
- (c) Remove fixing nut of rear right combination light assembly, and remove rear right combination light assembly.

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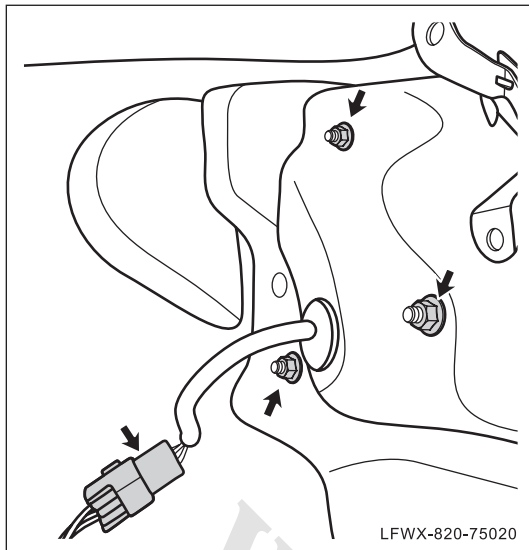
- (d) Install rear right combination light assembly I to mounting position, and install and tighten fixing nut.

Torque: 8N•m - 10N•m

- (e) Connect wire harness connection of rear right combination light assembly I and wire harness connector of rear fog lamp.
- (f) Install trunk lid trim panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)

#### 2. Replacement of rear headlamp assembly II

- (a) Remove right trim panel of trunk. (See 81 – Interiors and Exteriors – Left/right Trim Panel of Trunk Lid, Replacement)
- (b) Remove the rear bumper. (See 81 - Interiors and Exteriors, Rear Bumper, Replacement).



- (c) Turn power supply to "LOCK" position and disconnect wire harness connector of rear right combination light assembly II .
- (d) Remove fixing nut of rear right combination light assembly II and remove rear combination light assembly II .

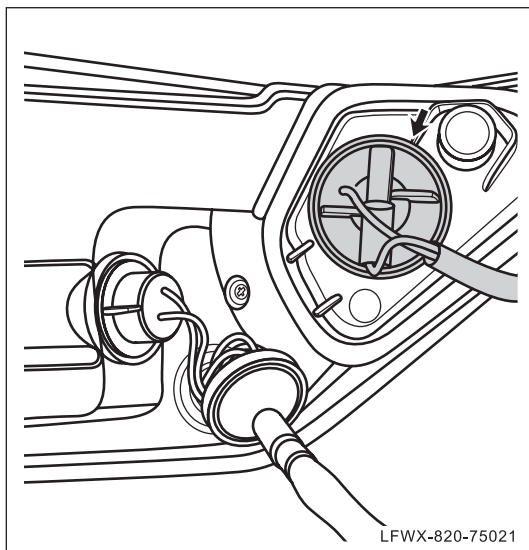
- (e) Install rear right combination light II onto mounting position, and install and tighten fixing nut.

Torque: 8N•m - 10N•m

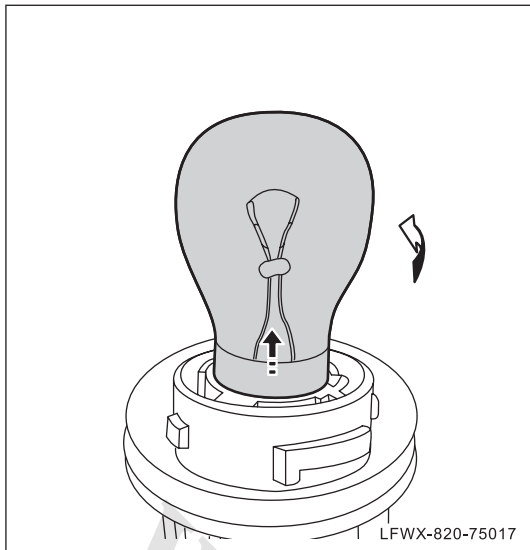
- (f) Connect wire harness connector of rear right combination light assembly II .
- (g). Install rear bumper (See 81 - Interiors and Exteriors, Rear Bumper, Replacement).
- (h) Install right trunk panel. (See 81 –Interiors and Exteriors – Left/right Trim Panel of Trunk Lid, Replacement)

### 3. Replacement of bulb of rear fog lamp

- (a). Remove the rear right combination lamp I assembly. (See 75 – Lighting System – Replacement of Rear Combination Light)



- (b) Press rear fog lamp holder while rotating the holder counterclockwise, and remove rear fog lamp.



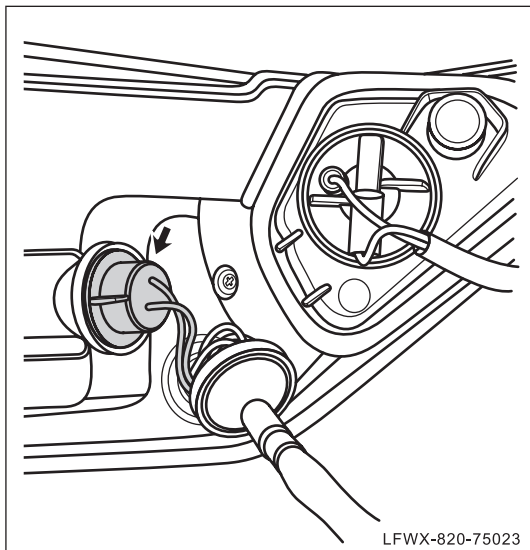
- (c). Rotate and then remove the rear fog light bulb.

- (d) Install rear fog lamp bulb onto mounting hole, and rotate and lock the bulb holder.
- (e) Align the slot of mounting hole and press rear fog lamp holder, meanwhile rotate rear fog lamp holder counterclockwise to install rear fog lamp.
- (f) Install rear right combination light I assembly. (See 75 – Lighting System – Replacement of Rear Combination Light)

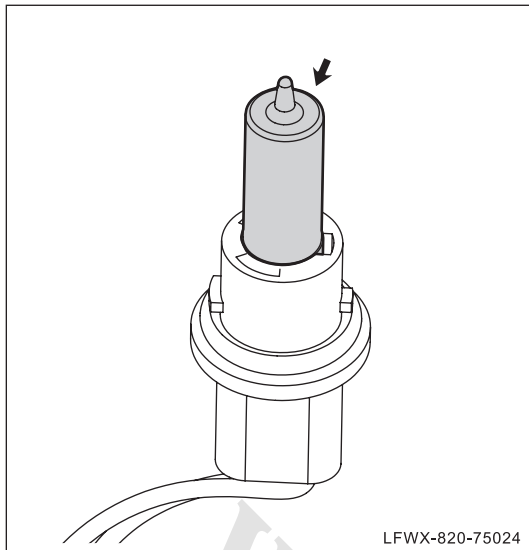
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#### 4. Replacement of bulb of reverse light

- (a). Remove the rear right combination lamp I assembly. (See 75 – Lighting System – Replacement of Rear Combination Light)



- (b) Press reverse light holder while rotating it counterclockwise, and remove reverse light.

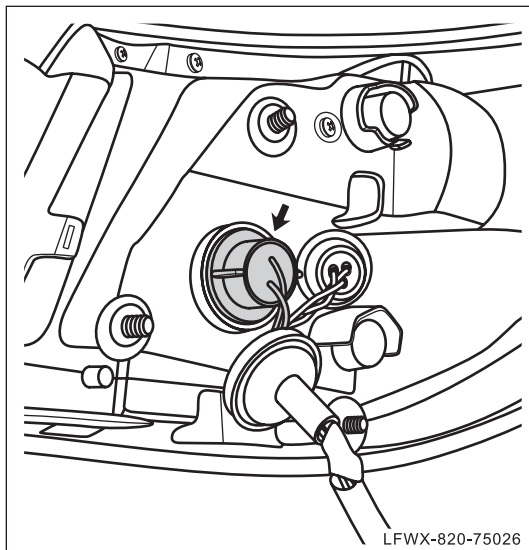


(c) Unplug reverse light bulb.

- (d) Install reverse light bulb onto the holder.
- (e) Align the slot of mounting hole and press reverse light holder, meanwhile rotate reverse light holder counterclockwise to install reverse light.
- (f) Install rear right combination light I assembly. (See 75 – Lighting System – Replacement of Rear Combination Light)

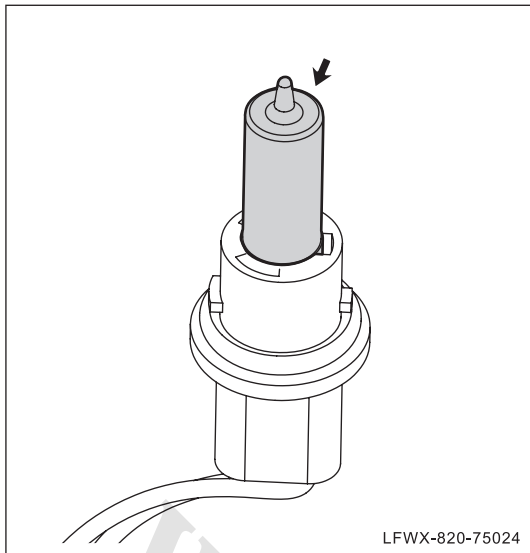
#### 5. Replace brake lamp bulb

- (a) Remove rear right combination light assembly II . (See 75 – Lighting System – Replacement of Rear Combination Light)



- (b) Press brake lamp holder, meanwhile rotate brake lamp holder counterclockwise to remove brake lamp.





(c) Unplug brake lamp bulb.

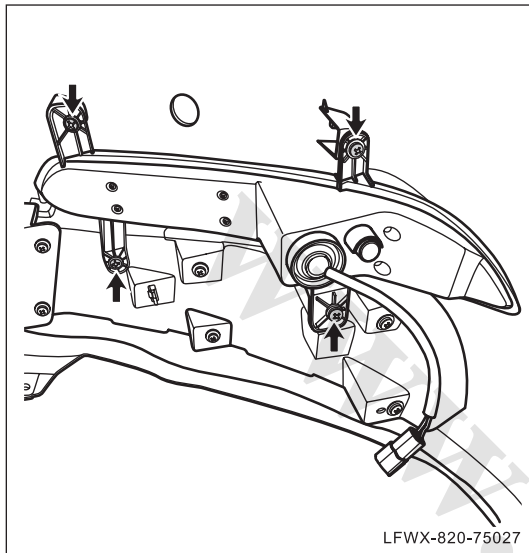
- (d) Install brake lamp bulb onto the holder.
- (e) Align the slot of mounting hole and press brake lamp holder, meanwhile rotate brake lamp holder counterclockwise to install brake lamp.
- (f) Install rear right combination light assembly II . (See 75 – Lighting System – Replacement of Rear Combination Light)

## Daytime Driving Light

### Replacement

#### 1. Removing the daytime running light

(a). Remove front bumper. (See 81- Interiors and Exteriors, Front Bumper, Replacement).



(b). Remove the daytime running light fixing screws, and remove the daytime running light assembly.

#### 2. Installing the daytime running light

(a). Install daytime running lamp assembly onto the front bumper, and install & tighten the fixing screws.

(b). Install front bumper. (See 81- Interiors and Exteriors, Front Bumper, Replacement).

## Side Turn Signal Lamp

### Replacement

△ HINT:

See 77 – Rearview Mirror – Power Rearview Mirror, Replacement

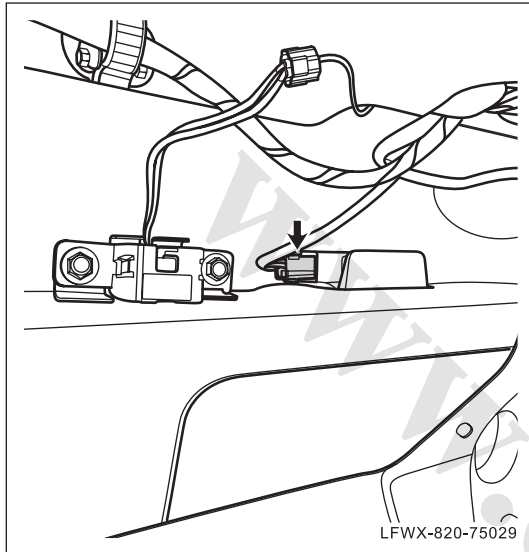
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## Rear Licence Plate Lamp

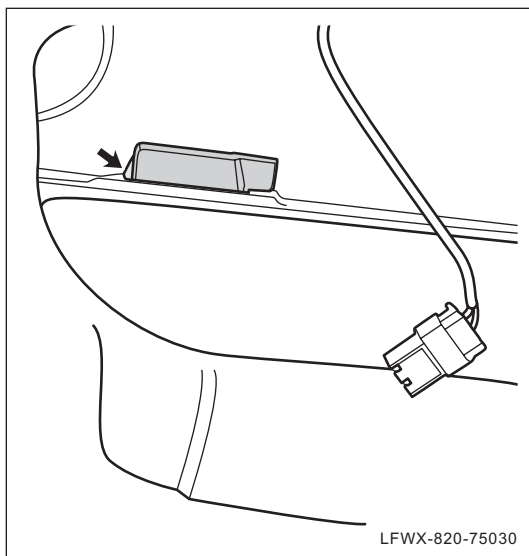
### Replacement

#### 1. Removing the rear licence plate light assembly

- (a) Remove trunk lid panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)



- (b) Turn power supply to “LOCK” position and disconnect wire harness connector of rear licence plate light.



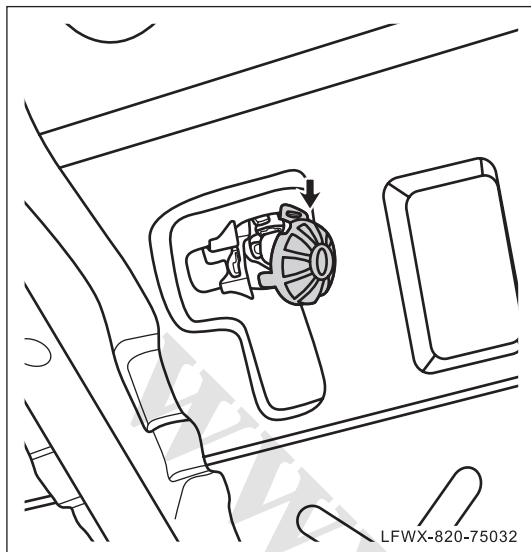
- (c) Press the clip tone of rear licence plate light, and remove rear licence plate light assembly.

#### 2. Install rear licence plate light assembly

- (a) Install rear licence plate light assembly onto trunk lid.
- (b). Connect the rear licence lamp wire harness connector.
- (c) Install trunk lid trim panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)

## Trunk Light

### Replacement



#### 1. Remove the bulb of trunk light.

- (a) Open trunk lid.
- (b) Open the trunk light cover.
- (c) Remove the trunk light bulb.

#### 2. Install trunk light bulb

- (a) Install trunk light bulb onto mounting position.
- (b) Close trunk light cover.
- (c) Close trunk lid.

## Courtesy Lamp

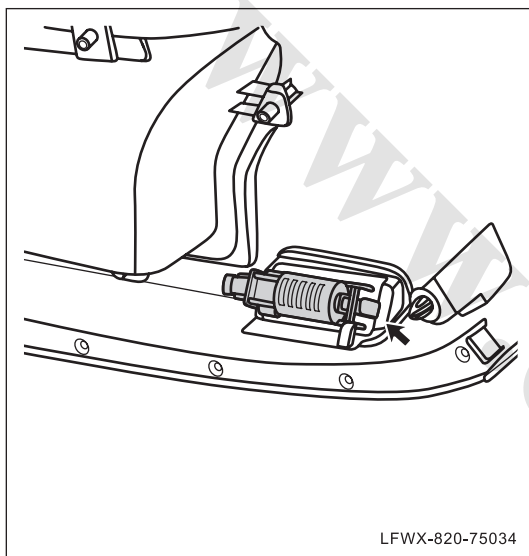
### Replacement

△ HINT:

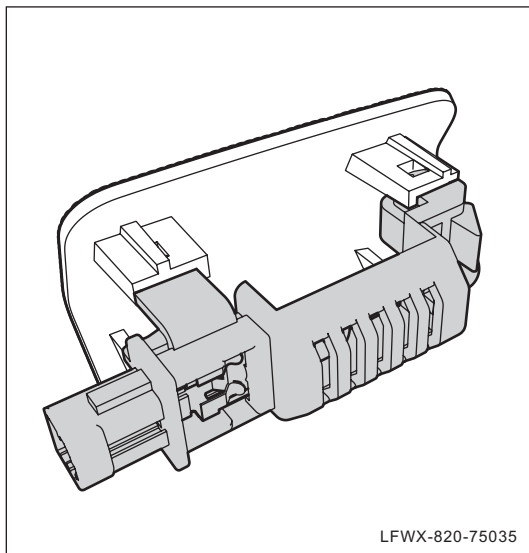
Replacement of front and rear door lamps is basically the same. This section will only introduce the replacement of front door lamp.

#### 1. Remove front door lamp

- (a) Remove the front door inside guard board. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)



- (b) Press the clip tone of front door lamp, and remove front door lamp.



- (c) Pry front door lamp shade.  
(d) Unplug front door lamp bulb.

#### 2. Install front door lamp

- (a) Install front door lamp bulb onto mounting position.  
(b) Install front door lamp shade.



- (c) Install front door lamp onto front door trim panel.
- (d). Install front door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)

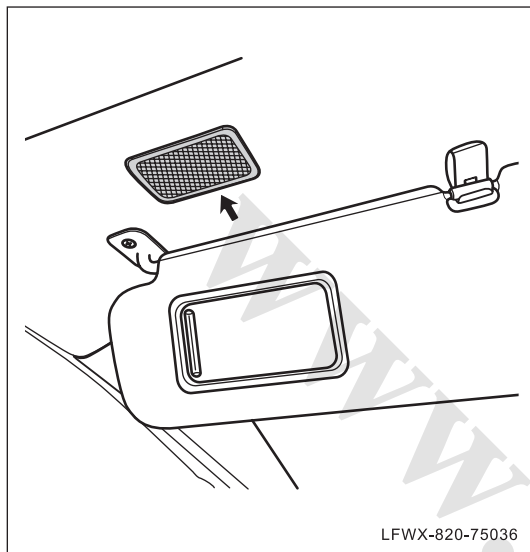
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## Makeup Mirror

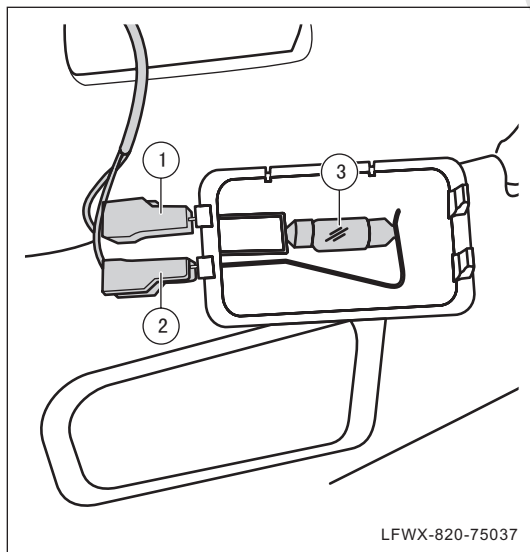
### Replacement

#### 1. Remove makeup lamp

(a) Turn power supply to "LOCK" position.



(b) Turn over sunvisor and pry makeup lamp assembly out by using a prying bar.



(c) Disconnect wire harness connector ① and ② of makeup lamp and remove makeup lamp bulb ③.

#### 2. Install makeup lamp.

(a) Install makeup lamp bulb onto mounting position.

(b) Connect wire harness connector of makeup lamp.

(c) Install makeup lamp assembly onto mounting position.

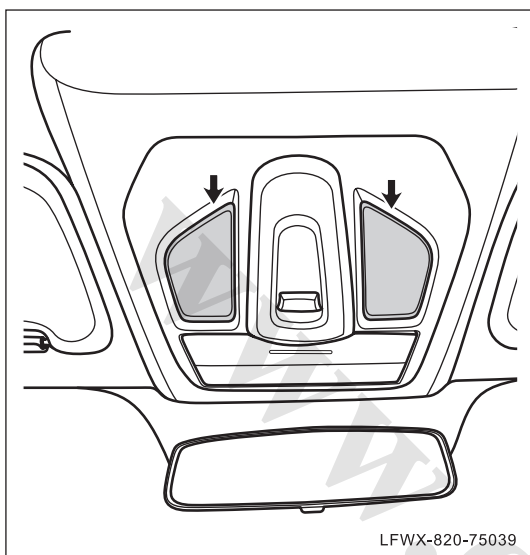


## Front Ceiling Light

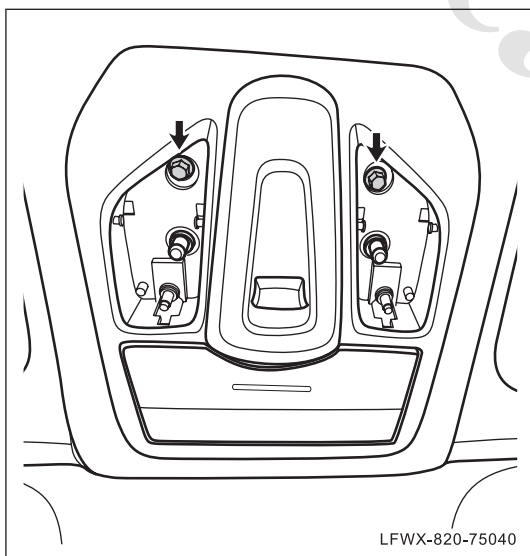
### Replacement

#### 1. Replace front ceiling light switch assembly.

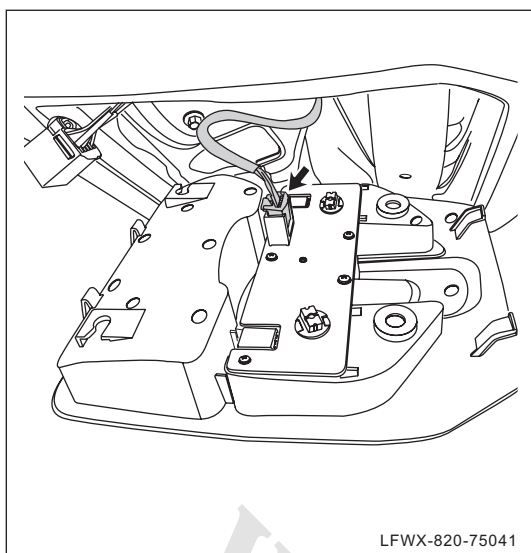
(a) Turn power supply to "LOCK" position.



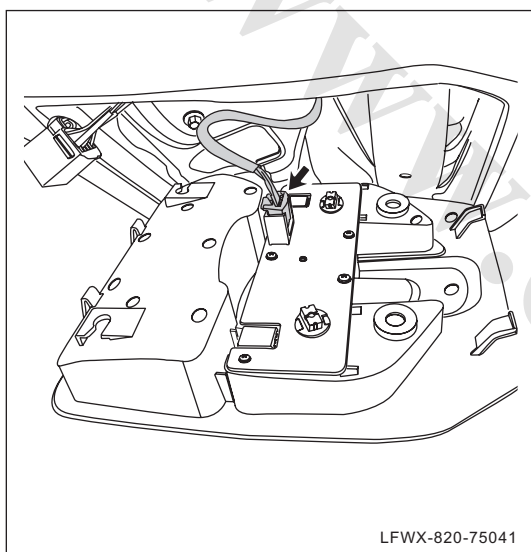
(b) Pry front ceiling light cover out by using a prying bar.



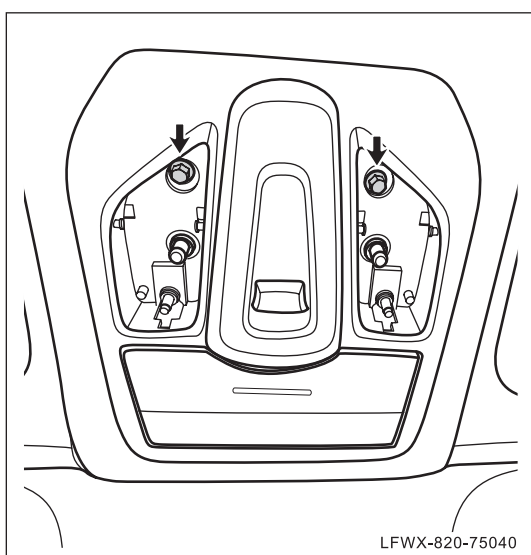
(c) Remove fixing bolt of front ceiling light switch assembly, and remove front ceiling light switch assembly.



- (d) Disconnect wire harness connector of front ceiling light, and remove front ceiling light switch assembly.

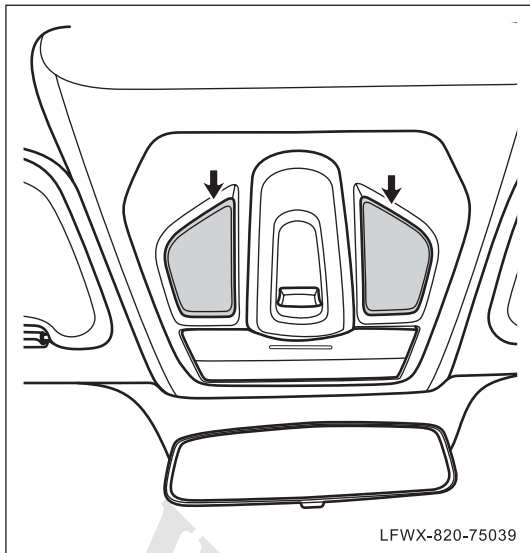


- (e) Connect wire harness connector of front ceiling light.



- (f) Install front ceiling light switch assembly onto mounting position, and install and tighten fixing bolt.

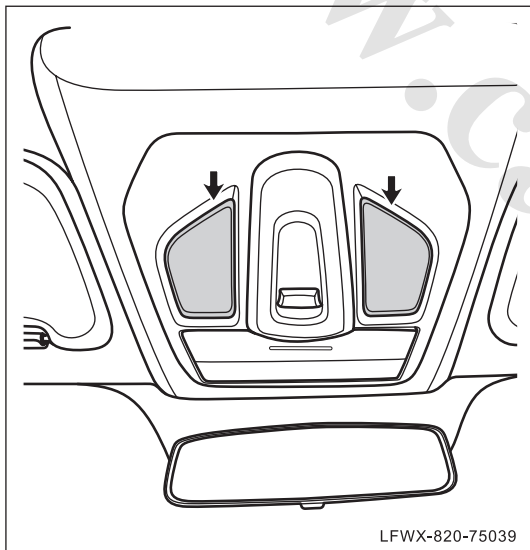
Torque: 5N•m - 6N•m



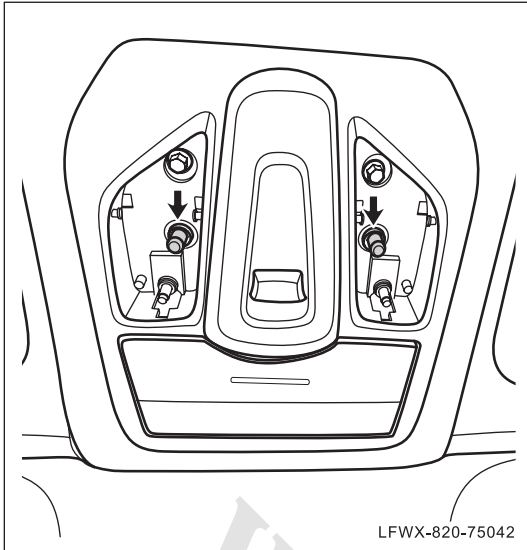
- (g) Install front door lamp shade onto mounting position.

## 2. Replacement of front ceiling light bulb

- (a) Turn power supply to "LOCK" position.



- (b) Pry front ceiling light cover out by using a prying bar.



(c). Take off the front ceiling light bulb.

- (d) Install front ceiling light bulb onto mounting position.
- (e) Install front door lamp shade onto mounting position.

## Rear Ceiling Light

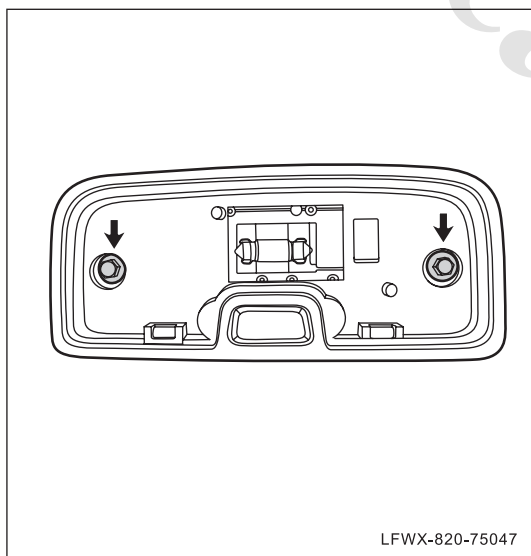
### Replacement

#### 1. Replace rear ceiling light switch assembly.

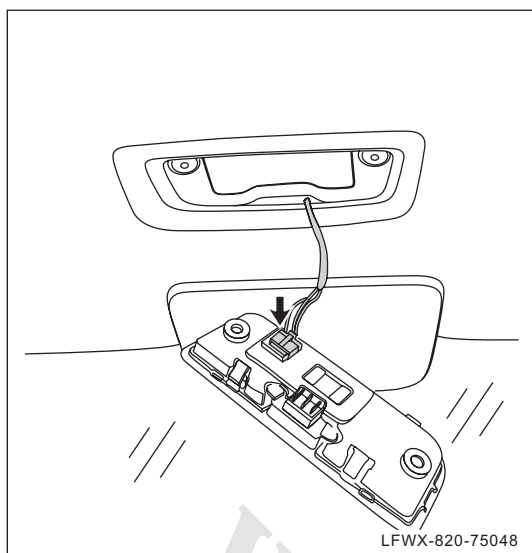
(a) Turn power supply to "LOCK" position.



(b) Pry rear ceiling light cover out by using a prying bar.



(c) Remove fixing bolt of rear ceiling light switch assembly, and take out rear ceiling light switch assembly.



- (d) Disconnect wire harness connector of rear ceiling light, and remove rear ceiling light switch assembly.

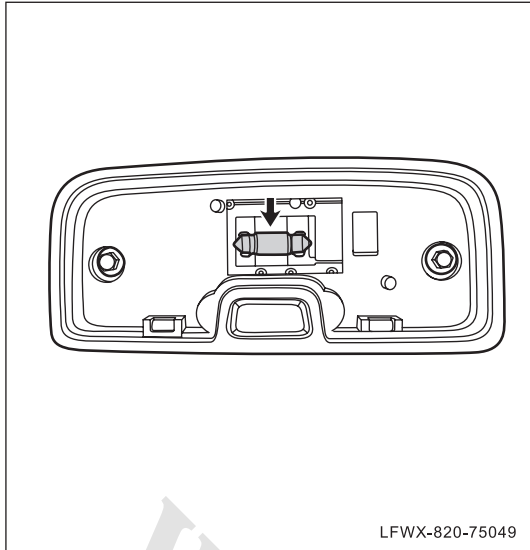
- (e) Connect wire harness connector of rear ceiling light.
- (f) Install rear ceiling light switch assembly onto mounting position, and install and tighten fixing bolt.
- Torque: 5N•m - 6N•m
- (g) Install rear ceiling light cover onto mounting position.

## 2. Replacement of rear ceiling light bulb

- (a) Turn power supply to "LOCK" position.



- (b) Pry rear ceiling light cover out by using a prying bar.



(c) Remove rear ceiling light bulb.

(d) Install rear ceiling light bulb onto mounting position.

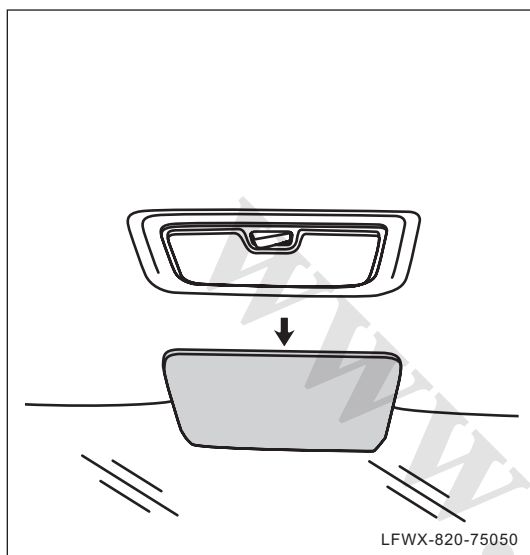
(e) Install rear ceiling light cover onto mounting position.

## High-mounted Brake Lamp

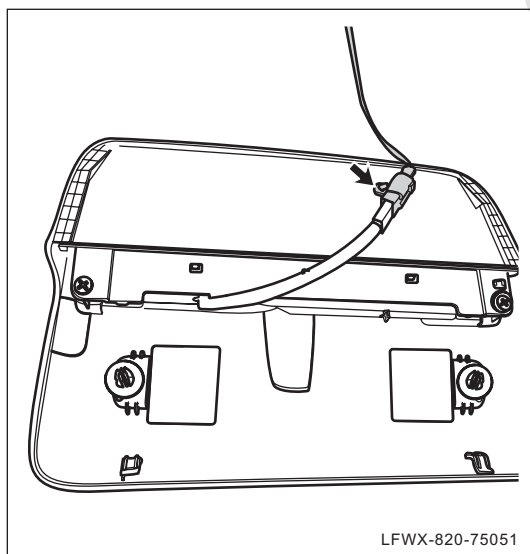
### Replacement

#### 1. Remove high-mounted brake lamp.

(a) Turn power supply to "LOCK" position.



(b) Pry cover plate of high-mounted brake lamp by using a prying bar.



(c) Disconnect wire harness connector of high-mounted brake lamp, and remove high-mounted brake lamp with cover plate assembly.





- (d). Remove the high-mounted brake lamp fixing screw, and remove the high-mounted brake lamp.

## 2. Install high-mounted brake lamp

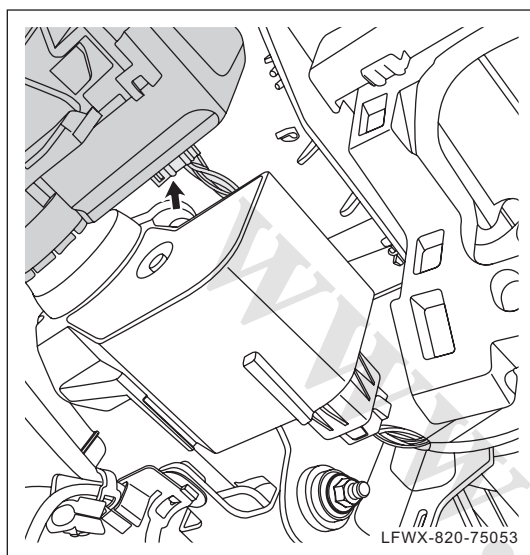
- (a) Install high-mounted brake lamp onto its cover plate, and install and tighten fixing screw.
- (b) Connect wire harness connector of high-mounted brake lamp.
- (c) Install high-mounted brake lamp with cover plate assembly onto mounting position.

## Combination Switch

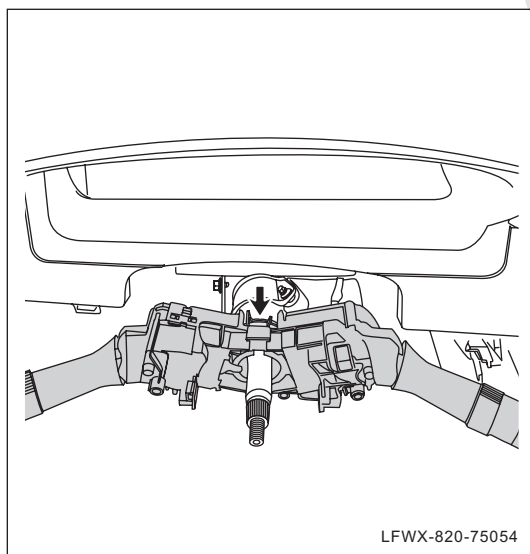
### Replacement

#### 1. Remove the combination switch

- (a) Remove clock spring. (See 72 – SRS – Clock Spring, Replacement)



- (b) Disconnect wire harness connector of combination switch.



- (c) Remove combination switch clamp, and take down the combination switch.

#### 2. Install the combination switch

- (a) Install combination switch and elastic clip onto mounting position.  
(b) Connect wire harness connector of combination switch.  
(c) Install clock spring. (See 72 – SRS – Clock Spring, Replacement)

## 76 – Wiper and Washer System

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## Wiper and Washer System

### System description

#### 1. Function

Wiper has the following functions:

On rainy or snowy days, when rain drip or snow sprays on the window glass, it may seriously affect driver's vision. Wiper can wipe water and snow from the glass, to improve driver's vision and driving safety.

Wiper speed can be adjusted based on degree of rain or amount, to ensure the driver's safety.

Washer has the following functions:

When the window glass is filled with dirt or dust, spray the washer fluid on window glass and use wiper to clean dust and dirt from the window glass and provide good vision of driver.

#### **Note:**

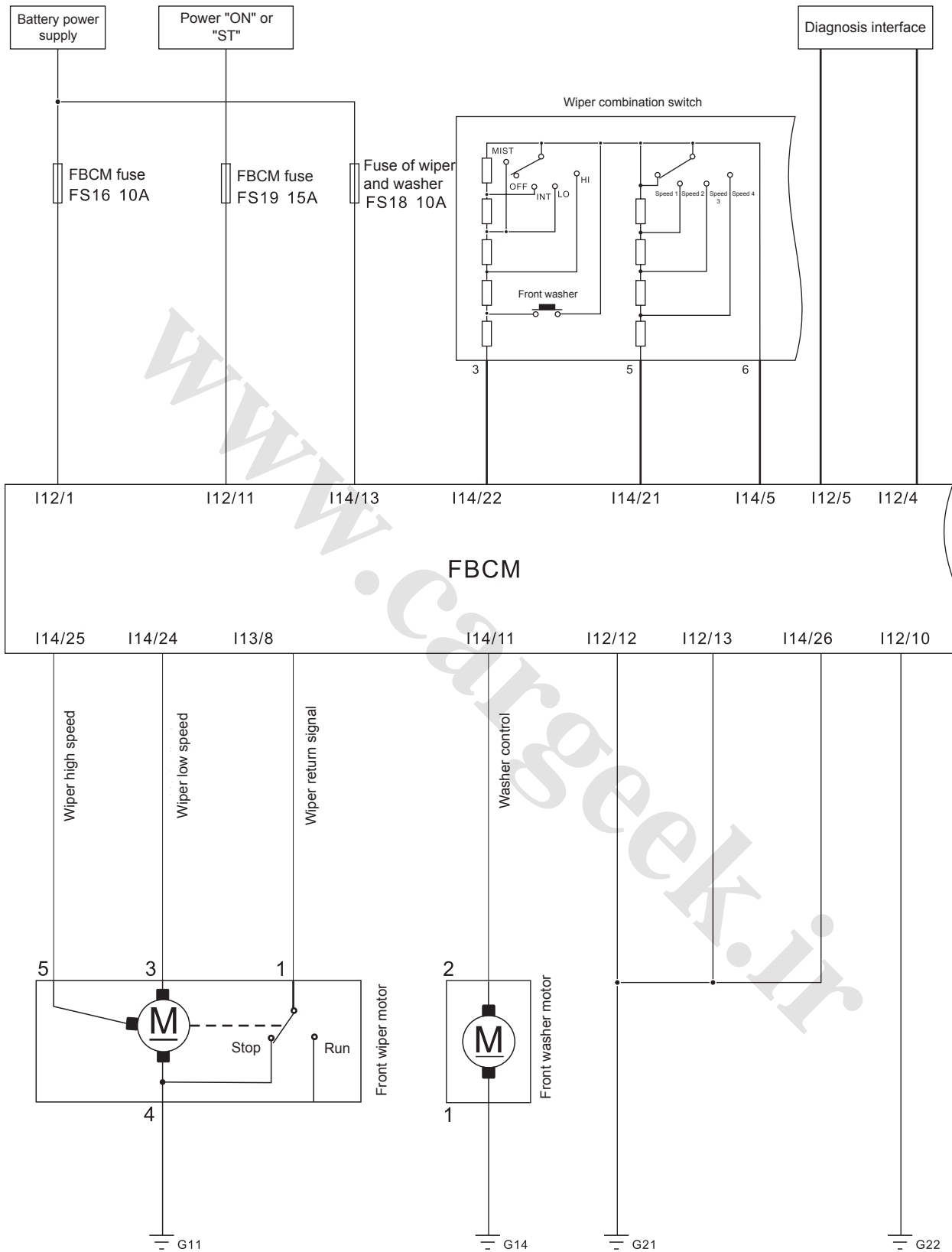
**In stormy days, rapid and huge raindrop falling on the windshield, it is difficult to remove the raindrop even in the event that the wiper moves fast, blocking the driver's view. To ensure driving safety, stop driving immediately.**

#### 2. Components

Wiper mainly consists of wiper motor, wiper linkage, wiper arm, wiper blade, etc.

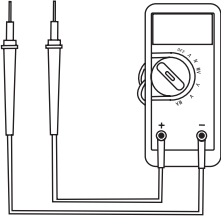
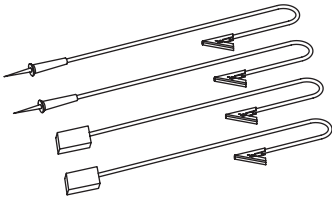
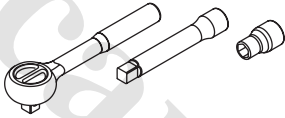
Washer mainly consists of washer motor, washer fluid reservoir, nozzle and spray hose, etc.

### 3. Principle



LFWX-820-76033

## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		For measuring the voltage, resistance, current and the circuit
2	Wiring set		Testing circuits
3	Fast wrench and sleeve sub-assembly		Used for removing and installing the fixing bolts

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## Service data

### 1. Technical specifications table

Specification of washer fluid	NFC-60
Filling amount of washer fluid	5.5L

### 2. Table of tightening torque

Fixing bolt of washer fluid reservoir.	8~12
Fixing nut of wiper arm assembly	20~26
Fixing bolts of wiper motor	8~12
Fixing nut of wiper linkage swing arm	8~12
Fixing bolt of wiper linkage mechanism and motor assembly	8~12

## Precautions

### 1. Cautions in repair

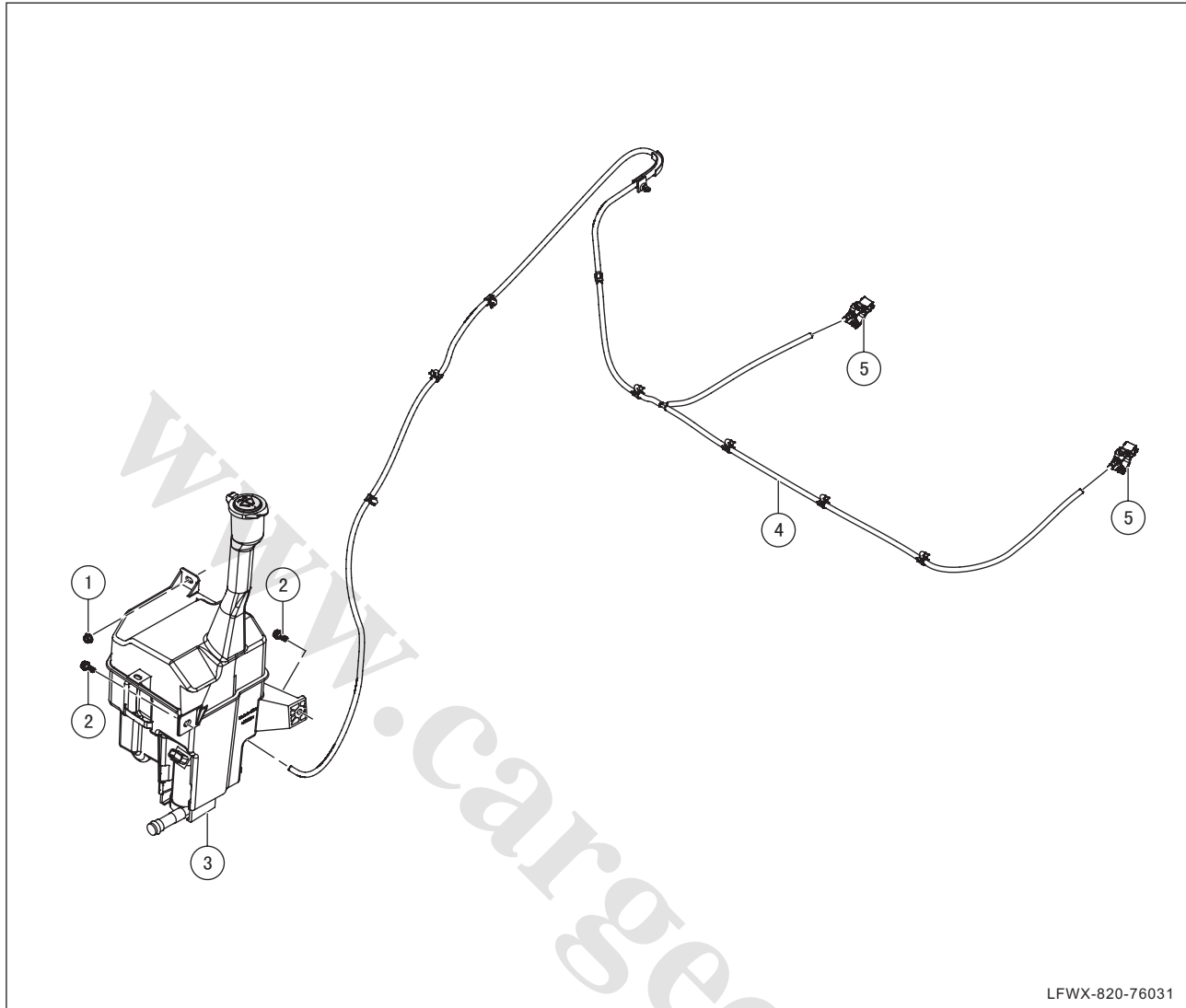
- (a). Before disconnecting the connector, remove the battery negative electrode and wait for at least 1min. Otherwise, it may cause personal injury.
- (b). The spray hose should be securely fixed. It is strictly prohibited to randomly move the spray hose. When washing your vehicle, do not aim the water jet at the spray hose joint for a long duration. This helps prevent corrosion and ages.

### 2. Other precautions

- (a). During the course of using, if the wiper is blocked unexpectedly, shut off the power immediately to prevent wiper motor from being burnt out.
- (b). In the process of using, wiper blade shall keep close to the window glass, without any clearance. Otherwise, the wiper cannot clean the glass.
- (c). In the course of using, it is forbidden to wipe the glass off in a dry state. If you touch the wiper switch carelessly, turn it off immediately. Pay attention to maintain and clean windshield and wiper to prevent dust accumulation.
- (d). The washer may not operate for a long duration. The duration of each operation should not exceed 5 seconds. Every time, the wiper pauses for at least 10s. It is forbidden to turn on washer motor without washer fluid.
- (e). In chilly regions, be sure to use the corresponding washer fluid.
- (f). Do not use engine antifreeze or another fluid as a substitute, to avoid damaging the window glass or vehicle body paint.
- (g). As washer fluid is easy-consumable, check it regularly (two weeks or one month). If insufficient, refill washer fluid.



## Components (washer)

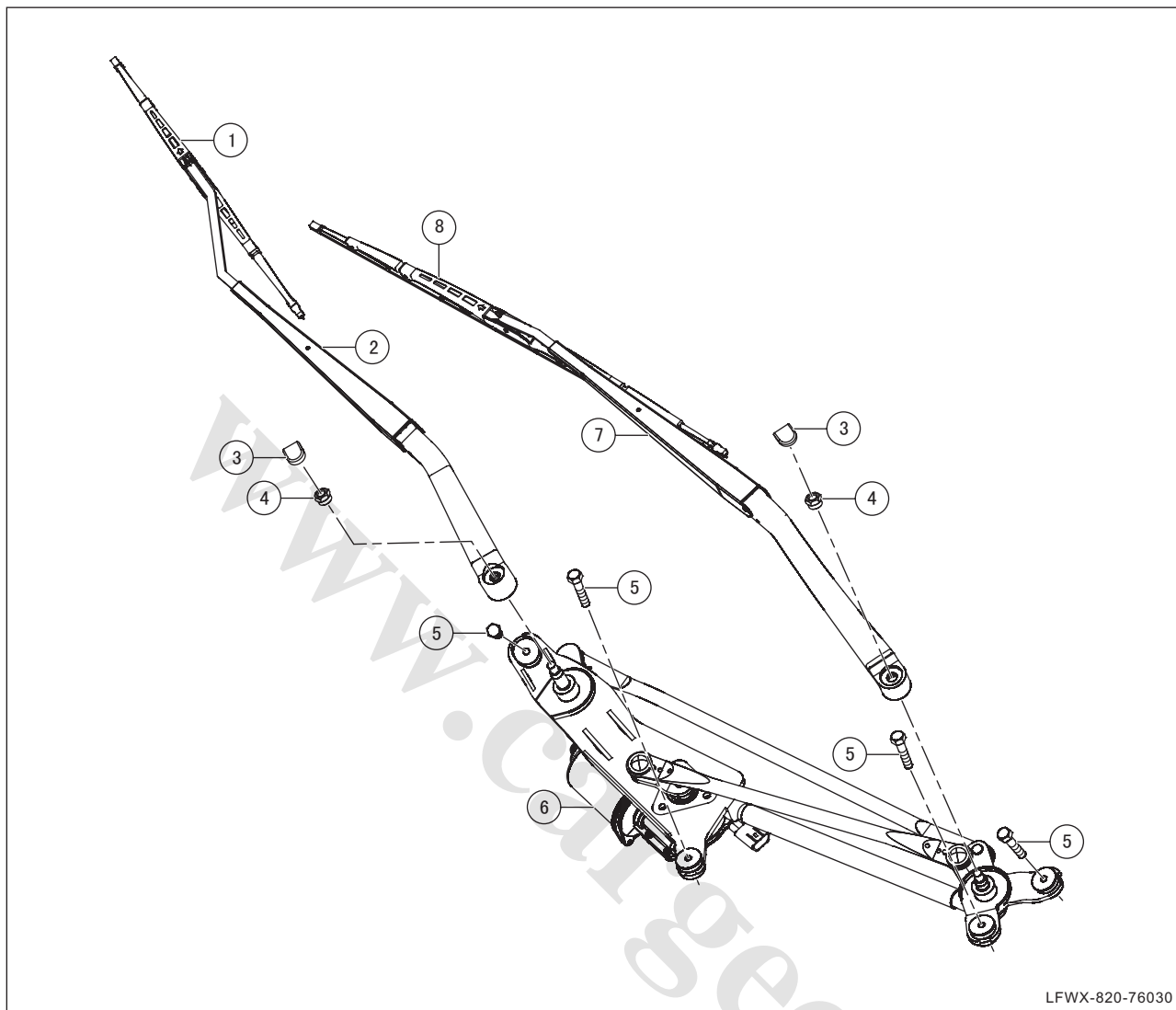


LFWX-820-76031

1	Nut
2	Bolt
3	Washer fluid reservoir assembly

4	Washer hose
5	Nozzle

## Components (wiper)



LFWX-820-76030

1	Right wiper blade
2	Right wiper arm
3	Wiper arm pivot cover
4	Nut

5	Bolt
6	wiper linkage mechanism and motor assembly
7	Left wiper arm
8	Left wiper blade

## General Check

### Check the system

#### 1. Check the working condition of wiper and washer system.

- (a) Turn power supply to "ON" position and trigger wiper switch, and observe whether the system works normally. If no, overhaul it according to the following diagnosis steps.
- (b) Turn power supply to "ON" position, trigger wiper switch, shift gear to low speed scale, and observe whether the system works normally. If no, overhaul it according to the following diagnosis steps.
- (c) Turn power supply to "ON" position, trigger wiper switch, shift gear to high speed scale, and observe whether the system works normally. If no, overhaul it according to the following diagnosis steps.
- (d) Turn power supply to "ON" position, trigger wiper switch, shift gear to intermittent speed scale, and observe whether the system works normally. If no, overhaul it according to the following diagnosis steps.
- (d) Turn power supply to "ON" position, trigger wiper switch, and inspect whether the wiper has good wiping effect. If no, overhaul it according to the following diagnosis steps.
- (f) Turn power supply to "ON" position, trigger wiper switch, and inspect whether washer fluid sprays normally. If no, overhaul it according to the following diagnosis steps.

#### 2. Check system components

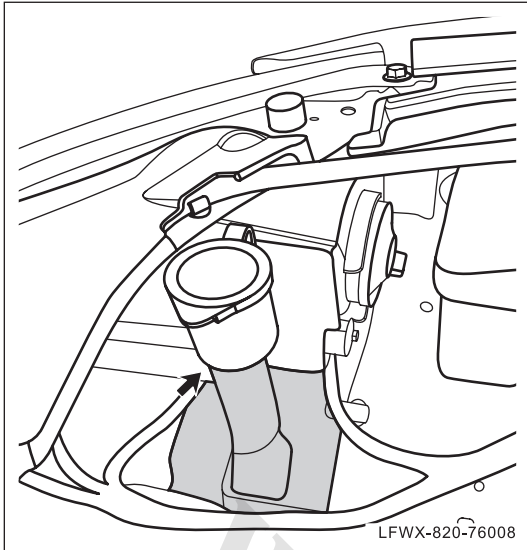
- (a). Check system for obvious mechanical or electrical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 3. Check wire harness

- (a). Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b). Check system wire harness for crack or damage. If any, fix it.

#### 4. Check washer fluid

- (a) Check whether washer fluid meets standard. If no, replace it. Specification: NFC-60  
Filling amount: 5.5L



(b). Check if washer fluid is sufficient.

△ HINT:

- As washer fluid is easy-consumable, check it regularly (two weeks or one month). If insufficient, refill washer fluid.
- Washer fluid can prevent the nozzle, fluid reservoir and connecting hose from freezing.
- In warm weather, it is also necessary to refill washer fluid. Strong washing capacity can help remove the wax and oil residues from the windshield.
- Make sure the washing device of windshield will not freeze in the lowest temperature of approximately  $-25^{\circ}\text{C}$  (in certain area with extreme weather, the temperature is approximately  $-35^{\circ}\text{C}$  ).
- Open the filling cap and refill the washer fluid to visual area below diameter bend. Do not refill too much!

## 5. Check washer water pipe

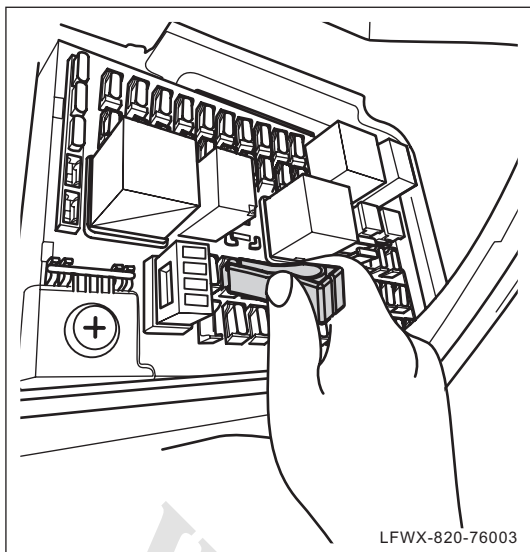
- (a) Check whether washer water pipe is loose, broken or ageing. If yes, replace washer water pipe.

## 6. Check washer nozzle

- (a) Check whether washer nozzle sprays fluid in a wrong direction. If yes, re-install washer nozzle.
- (b) Check whether washer nozzle is blocked. If yes, dredge it.

## 7. Check washer fluid reservoir

- (a) Check whether washer fluid reservoir has cracks, damage or ageing. If yes, replace it.

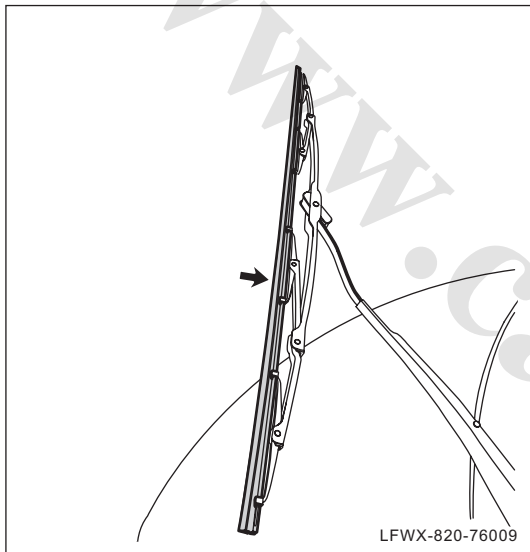


### 8. Check the fuse

- (a) Check whether fuse FS38 of wiper and washer is blown. If yes, replace it with a new one having the same specifications.

△ HINT:

Fuse of wiper and washer is located in fuse box in driver's cab.



### 9. Check the wiper blade

- (a). Check the wiper blade strip for aging, cut, deformation, wear, etc., and replace with new ones if necessary.

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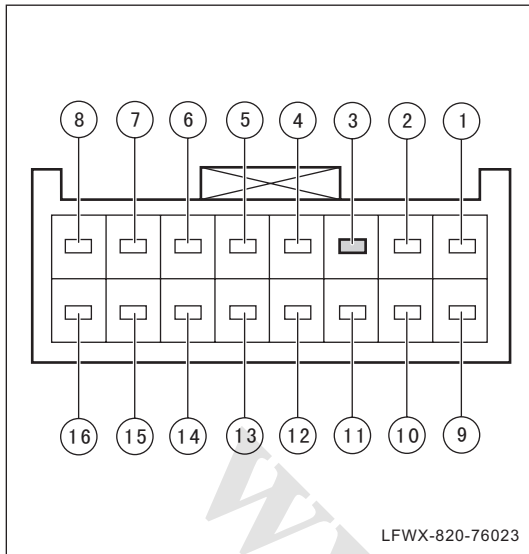
### 10. Check wiper arm

- (a) Check whether wiper arm is installed correctly. If no, re-install it.  
 (b) Check whether the elasticity of wiper arm spring is in good condition. If no, replace it.

### 11. Check the wiper linkage mechanism

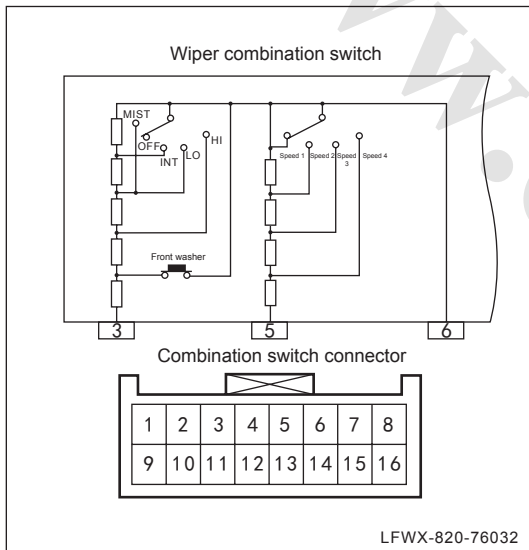
- (a) Check whether wiper mechanism is deformed or damaged. If yes, replace it.  
 (b) Check whether wiper linkage mechanism has rusting or insufficient lubrication condition. If yes, apply grease on its moving section.

## Check wiper and washer switch



### 1. Check power supply cable of wiper and washer switch

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of combination switch.
- (b) Turn power supply to "ON" position.
- (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.3 of wire harness connector of combination switch and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book



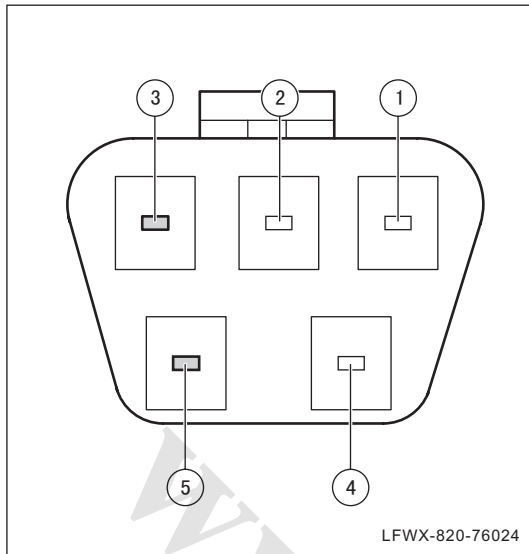
### 2. Check the working condition of wiper and washer switch

- (a) Disconnect wire harness connector of combination switch.
- (b). As illustrated in the left figure, check the continuity between each terminal of combination switch with digital multimeter

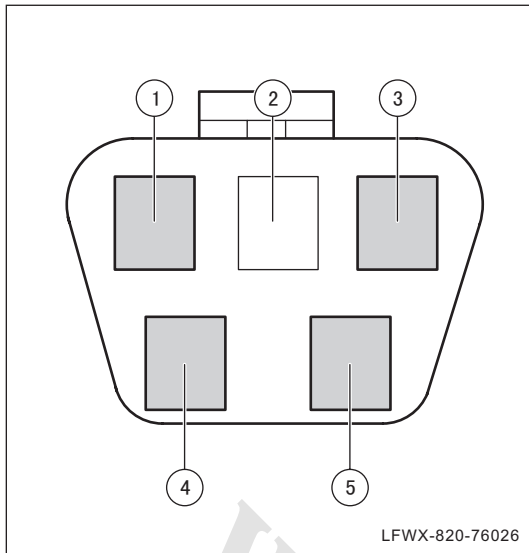
△ HINT:

Keep wiper switch under relevant condition. If terminals aren't conducted, replace combination switch.

## Check wiper motor



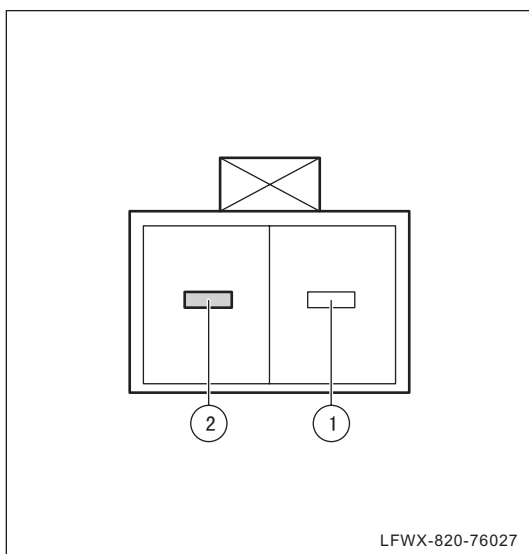
1. **Check power supply cable of wiper motor**
  - (a) Turn power supply to "LOCK" position and disconnect wire harness connector of wiper motor.
  - (b) Turn power supply to "ON" position, and trigger wiper switch to low speed scale.
  - (c) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.3 of wire harness connector of wiper motor and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book
  - (d) Turn power supply to "ON" position, and trigger wiper switch to high speed scale.
  - (e) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.3 of wire harness connector of wiper motor and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book



## 2. Check the working condition of wiper motor

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of wiper motor.
  - (b) Check the working condition of wiper motor intermittent scale.
    - Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.4 of wiper motor are conducted. If no, replace wiper motor.
  - (c) Check the working condition of wiper motor low speed scale.
    - Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.4 of wiper motor are conducted. If no, replace wiper motor.
  - (d) Check the working condition of wiper motor high speed scale.
    - Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.4 of wiper motor are conducted. If no, replace wiper motor.

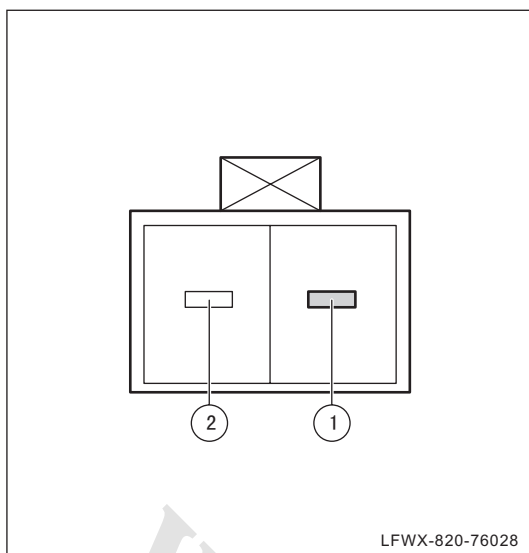
## Check Washer Motor



## 1. Check power supply cable of washer motor

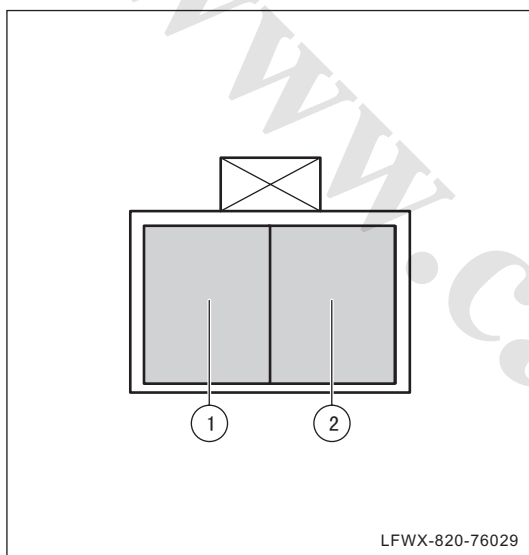
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of washer motor.
- (b) Turn power supply to "ON" position and turn on washer switch.
- (e) Use a digital multimeter voltage scale to measure whether there is voltage between terminal No.2 of wire harness connector of washer motor and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book





## 2. Check grounding wire of washer motor

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of washer motor.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of washer motor and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.



## 3. Check the working condition of washer motor

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of washer motor.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of washer motor are conducted. If no, replace washer motor.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Wiper and washer system does not operate	1. Battery (insufficient voltage)	See 76 - Wiper and Washer System, Diagnosis, Fault Diagnosis (1. the complete wiper and washer system does not operate)
	2. Fuse (blown)	
	3. Wire harness (short circuit or open-circuit)	
	4. Wiper motor (fault)	
	5. Wiper switch (fault)	
	6. FBCM (faulty)	
Wiper doesn't work at low speed scale.	1. Wiper motor (fault)	See 76 – Diagnosis of Wiper and Washer System, Fault Diagnosis (2. Wiper doesn't work at low speed scale)
	2. Wiper switch (fault)	
	3. Wire harness (short circuit or open-circuit)	
	4. FBCM (faulty)	
Wiper doesn't work at high speed scale	1. Wiper motor (fault)	See 76 – Diagnosis of Wiper and Washer System, Fault Diagnosis (3. Wiper doesn't work at high speed scale)
	2. Wiper switch (fault)	
	3. Wire harness (short circuit or open-circuit)	
	4. FBCM (faulty)	
Wiper doesn't work at intermittent scale	1. Wiper motor (fault)	See 76 – Diagnosis of Wiper and Washer System, Fault Diagnosis (4. Wiper doesn't work at intermittent speed)
	2. Wiper switch (fault)	
	3. Wire harness (short circuit or open-circuit)	
	4. FBCM (faulty)	
Wiping result is poor	1. Washer fluid (unqualified)	See 76 – Diagnosis of Wiper and Washer System, Fault Diagnosis (5. Wiper has bad performance)
	2. Wiper brush (damaged)	
	3. Wiper arm (incorrect installation or ineffective spring)	
	4. Windshield (with oil stain or wax)	
	5. Wiper linkage mechanism (deformed or damaged)	

Symptom	Suspected area	Recommended action
Wiper produces abnormal sound	1. Washer fluid (unqualified)	See 76 - Wiper and Washer System, Diagnosis, Fault Diagnosis (6. Abnormal noise of wiper)
	2. Wiper brush (damaged)	
	3. Wiper arm (incorrect installation or ineffective spring)	
	4. Windshield (oil stain, wax or crack, damage)	
	5. Wiper linkage mechanism (rusting or insufficient lubrication)	
Washer fluid is not injected or injected weakly	1. Washer fluid (insufficient)	See 76 – Diagnosis of Wiper and Washer System, Fault Diagnosis (7. Washer fluid doesn't spray or no spraying force)
	2. Washer nozzle (blocked)	
	3. Washer motor (fault)	
Washer doesn't work	1. Washer fluid (insufficient)	See 76 – Diagnosis of Wiper and Washer System, Fault Diagnosis (8. Washer doesn't work)
	2. Washer nozzle (blocked)	
	3. Washer switch (fault)	
	4. Wire harness (short circuit or open-circuit)	
	5. Washer motor (fault)	
	6. FBCM (faulty)	

## Fault diagnosis

### 1. The whole wiper and washer system does not work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether wiper and washer system works normally (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	The system does not work	Go to Step 1
1	Check the battery	Normal	Faulty	Instruction
	Use a digital multimeter to inspect battery voltage (See 19 – General Check of Battery, Check of Battery)	Go to Step 2	Battery voltage is insufficient	Charge or replace battery (See 19 – Battery, Replacement)
2	Check fuse	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether fuse of wiper and washer is blown (See 76 – General Check of Wiper and Washer System, Check of System)	Go to Step 4	Fuse FS38 is blown	Go to Step 3
3	Check FS38 circuit	Normal	Faulty	Instruction
	Check working condition of FS38 circuit	Replace the fuse with the same specification.	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of wiper motor is conducted (See 76 – General Check of Wiper and Washer System, Check of Wiper Motor)	Go to Step 5	No continuity	Overhaul wire harness according to circuit book.
5	Check wiper motor	Normal	Faulty	Instruction
	Check whether wiper motor is damaged (See 76 – General Check of Wiper and Washer System, Check of Wiper Motor)	Go to Step 6	Wiper motor is damaged	Replace (See 76 – Wiper and Washer System – Wiper Linkage Mechanism and Motor Assembly, Replacement)
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of wiper switch is conducted (See 76 – General Check of Wiper and Washer System, Check of Wiper Switch)	Go to Step 7	No continuity	Overhaul wire harness according to circuit book.
7	Check wiper switch	Normal	Faulty	Instruction
	Check whether wiper switch is damaged (See 76 – General Check of Wiper and Washer System, Check of Wiper and Washer Switch)	Go to Step 8	Wiper switch is damaged	Replace (See 75 – Lighting System Combination Switch, Replacement)
8	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the circuit between wiper switch and wiper motor is conducted according to circuit book.	Go to Step 9	No continuity	Overhaul wire harness according to circuit book.
9	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Wiper doesn't work at low speed scale

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of wiper and washer system (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	Wiper doesn't work at low speed scale.	Go to Step 1
1	Check wiper motor	Normal	Faulty	Instruction
	Check the working condition of wiper motor at low speed scale (See 76 - Inspection of Wiper and Washer System, Check of System)	Go to Step 2	Wiper motor is damaged	Replace (See 76 – Wiper and Washer System – Wiper Linkage Mechanism and Motor Assembly, Replacement)
2	Check wiper switch	Normal	Faulty	Instruction
	Check whether wiper switch is damaged (See 76 – General Check of Wiper and Washer System, Check of Wiper and Washer Switch)	Go to Step 3	Wiper switch is damaged	Replace (See 75 – Lighting System Combination Switch, Replacement)
3	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the circuit between wiper switch and wiper motor is conducted according to circuit book.	Go to Step 4	No continuity	Overhaul wire harness according to circuit book.
4	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Wiper doesn't work at high speed scale

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of wiper and washer system (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	Wiper doesn't work at high speed scale	Go to Step 1
1	Check wiper motor	Normal	Faulty	Instruction
	Check the working condition of wiper motor at high speed scale (See 76 - Inspection of Wiper and Washer System, Check of System)	Go to Step 2	Wiper motor is damaged	Replace (See 76 – Wiper and Washer System – Wiper Linkage Mechanism and Motor Assembly, Replacement)
2	Check wiper switch	Normal	Faulty	Instruction
	Check whether wiper switch is damaged (See 76 – General Check of Wiper and Washer System, Check of Wiper and Washer Switch)	Go to Step 3	Wiper switch is damaged	Replace (See 75 – Lighting System Combination Switch, Replacement)
3	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the circuit between wiper switch and wiper motor is conducted according to circuit book.	Go to Step 4	No continuity	Overhaul wire harness according to circuit book.
4	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. Wiper doesn't work at intermittent scale

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of wiper and washer system (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	Wiper doesn't work at intermittent scale	Go to Step 1
1	Check wiper motor	Normal	Faulty	Instruction
	Check the working condition of wiper motor at intermittent scale (See 76 - Inspection of Wiper and Washer System, Check of System)	Go to Step 2	Wiper motor is damaged	Replace (See 76 – Wiper and Washer System – Wiper Linkage Mechanism and Motor Assembly, Replacement)
2	Check wiper switch	Normal	Faulty	Instruction
	Check whether wiper switch is damaged (See 76 – General Check of Wiper and Washer System, Check of Wiper and Washer Switch)	Go to Step 3	Wiper switch is damaged	Replace (See 75 – Lighting System Combination Switch, Replacement)
3	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether the circuit between wiper switch and wiper motor is conducted according to circuit book.	Go to Step 4	No continuity	Overhaul wire harness according to circuit book.
4	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 5. Wiper has bad performance

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check wiper performance (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	Wiping result is poor	Go to Step 1
1	Check washer fluid	Normal	Faulty	Instruction
	Check whether washer fluid meets standard (See 76 – General Check of Wiper and Washer System, Check of System)	Go to Step 2	Not conform to the standard	Replacement
2	Check wiper brush	Normal	Faulty	Instruction
	Check the working condition of wiper brush (See 76 – General Check of Wiper and Washer System, Check of Wiper Brush)	Go to Step 3	Wiper brush is damaged	Replace (See 76 – Wiper and Washer System – Wiper Brush, Replacement)
3	Check wiper arm	Normal	Faulty	Instruction
	Check the working condition of wiper arm (See 76 – General Check of Wiper and Washer, Check of Wiper Arm)	Go to Step 4	Wiper arm has incorrect installation or ineffective spring	Replace (See 76 – Wiper and Washer System – Wiper Brush, Replacement)
4	Check windshield	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check if the wind-shield has oil stain or wax.	Go to Step 5	Window glass has oil stain or wax	Remove wax and oil stain
5	Check the wiper linkage mechanism	Normal	Faulty	Instruction
	Check the working condition of wiper linkage mechanism (See 76 – General Check of Wiper and Washer System, Check of Wiper Linkage Mechanism)	Go to Step 6	Wiper mechanism is deformed or damaged.	Replace (See 76 – Wiper and Washer System – Wiper Linkage Mechanism and Motor Assembly, Replacement)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 6. Wiper produces abnormal sound.

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Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether wiper produces abnormal sound during working.	Diagnosis end.	Abnormal noise	Go to Step 1
1	Check washer fluid	Normal	Faulty	Instruction
	Check whether washer fluid meets standard.	Go to Step 2	Not conform to the standard	Replacement
2	Check wiper brush	Normal	Faulty	Instruction
	Check the working condition of wiper brush (See 76 – General Check of Wiper and Washer System, Check of Wiper Brush)	Go to Step 3	Wiper brush is damaged	Replace (See 76 – Wiper and Washer System – Wiper Brush, Replacement)
3	Check wiper arm	Normal	Faulty	Instruction
	Check the working condition of wiper arm (See 76 – General Check of Wiper and Washer, Check of Wiper Arm)	Go to Step 4	Wiper arm has incorrect installation or ineffective spring	Replace (See 76 – Wiper and Washer System – Wiper Brush, Replacement)

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Steps	Inspection item	Inspection result		
4	Check windshield	Normal	Faulty	Instruction
	<ul style="list-style-type: none"> <li>•Check whether windshield is clean.</li> <li>•Check whether windshield has cracks or damage.</li> </ul>	Go to Step 5	<ul style="list-style-type: none"> <li>• Window glass has oil stain or wax</li> <li>• Windshield has cracks or damage</li> </ul>	<ul style="list-style-type: none"> <li>• Remove wax and oil stain</li> <li>• Replacement</li> </ul>
5	Check the wiper linkage mechanism	Normal	Faulty	Instruction
	Check the working condition of wiper linkage mechanism (See 76 – General Check of Wiper and Washer System, Check of Wiper Linkage Mechanism)	Go to Step 6	Wiper linkage has rusting or insufficient lubrication.	Apply grease at connections.
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 7. Washer fluid is not injected or injected weakly

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of wiper and washer system (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	Nozzle has no force to spray fluid or don't spray fluid.	Go to Step 1
1	Check washer fluid	Normal	Faulty	Instruction
	Check whether washer fluid in reservoir is sufficient (See 76 – General Check of Wiper and Washer System, Check of Washer Fluid)	Go to Step 2	Washer fluid is insufficient.	Filling
2	Check washer nozzle	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether washer nozzle is blocked (See 76 – General Check of Wiper and Washer System, Check of System)	Go to Step 3	Washer nozzle is blocked.	Dredge washer nozzle
3	Check Washer Motor	Normal	Faulty	Instruction
	Check whether washer motor is damaged (See 76 – General Check of Wiper and Washer System, Check of Washer Motor)	Diagnosis end.	Washer motor is damaged	Replace (See 76 – Wiper and Washer System – Washer Motor, Replacement)
4	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 8. Washer doesn't work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of washer (See 76 – General Check of Wiper and Washer System, Check of System)	Diagnosis end.	Washer doesn't work	Go to Step 1
1	Check washer fluid	Normal	Faulty	Instruction
	Check whether washer fluid in reservoir is sufficient (See 76 – General Check of Wiper and Washer System, Check of Washer Fluid)	Go to Step 2	Washer fluid is insufficient.	Filling
2	Check washer nozzle	Normal	Faulty	Instruction
	Check whether washer nozzle is blocked (See 76 – General Check of Wiper and Washer System, Check of System)	Go to Step 3	Washer nozzle is blocked.	Dredge washer nozzle
3	Check washer switch	Normal	Faulty	Instruction

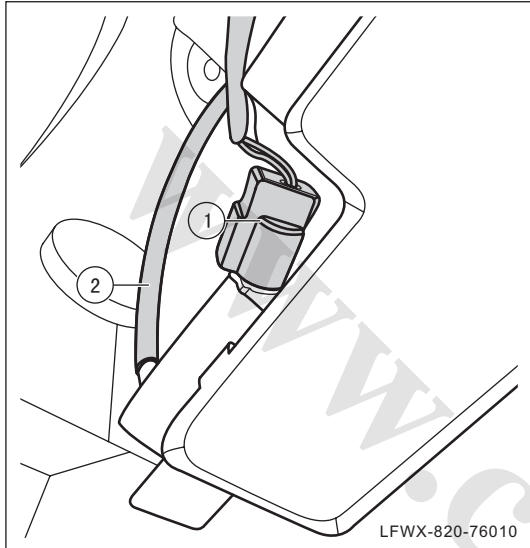
Steps	Inspection item	Inspection result		
	Check whether washer switch is damaged (See 76 – General Check of Wiper and Washer System, Check of Wiper and Washer Switch)	Go to Step 4	Wiper switch is damaged	Replace (See 75 – Lighting System Combination Switch, Replacement)
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply motor of washer motor is conducted (See 76 – General Check of Wiper and Washer System, Check of Washer Motor)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of washer motor is conducted (See 76 – General Check of Wiper and Washer System, Check of Washer Motor)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check Washer Motor	Normal	Faulty	Instruction
	Check whether washer motor is damaged (See 76 – General Check of Wiper and Washer System, Check of Washer Motor)	Go to Step 7	Washer motor is damaged	Replace (See 76 – Wiper and Washer System – Washer Motor, Replacement)
7	Replacement and check	Normal	Faulty	Instruction
	Replace FBCM with a new one having the same model, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Washer Fluid Reservoir with Motor Assembly

### Replacement

#### 1. Remove washer fluid reservoir with motor assembly

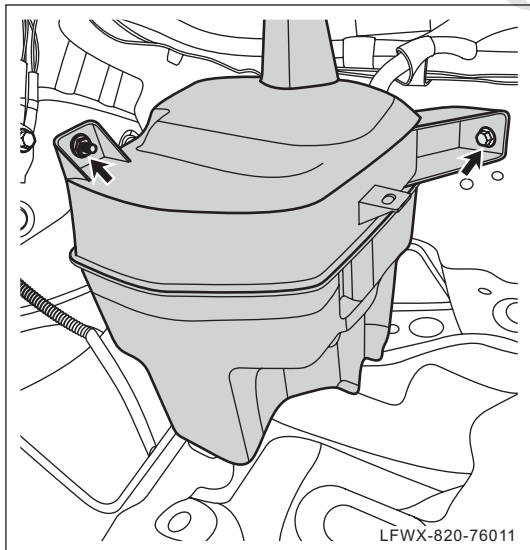
- (a) Turn power supply to "LOCK" position.
- (b) Remove front bumper. (See 81- Interiors and Exteriors, Front Bumper, Replacement).



- (c) Disconnect wire harness connector ① of washer motor.
- (d) Pull down water outlet pipe ② of washer motor.

△ HINT:

Place a container under the washer fluid reservoir to receive washer fluid.



- (e) Remove fixing bolt of washer fluid reservoir with motor assembly, and remove washer fluid with motor assembly.

△ HINT:

First remove the wire harness clip from washer fluid reservoir with motor assembly.

#### 2. Install Washer Fluid Reservoir with Motor Assembly

- (a) Install washer fluid reservoir with motor assembly onto mounting position, and install and tighten fixing bolt.

Torque: 8N•m-12N•m

- (b) Install water outlet pipe of washer motor.



- (c) Connect wire harness connector of washer motor.
- (d) Install front bumper. (See 81- Interiors and Exteriors, Front Bumper, Replacement).
- (e) Fill washer fluid.

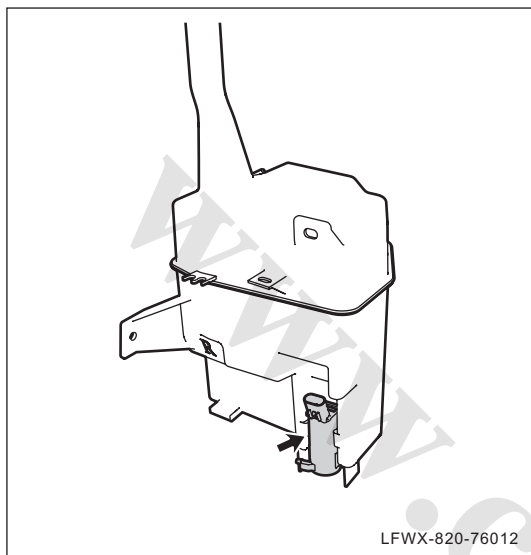
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## Washer Motor

### Replacement

#### 1. Remove washer motor

- (a) Remove washer fluid reservoir with motor assembly. (See 76 – Wiper and Washer System – Washer Fluid Reservoir with Motor Assembly, Replacement)



- (b) Unplug washer motor from washer fluid reservoir.

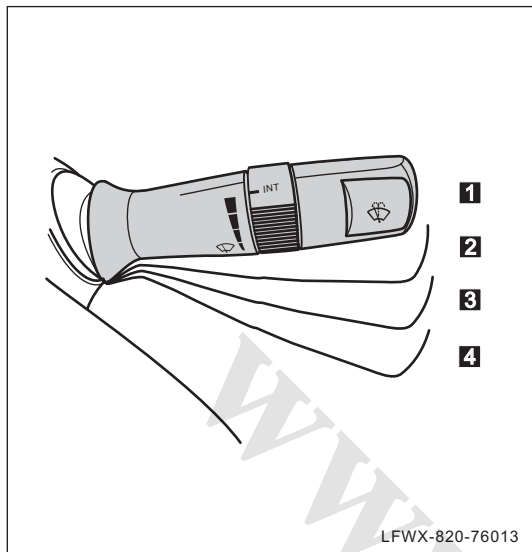
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#### 2. Install washer motor

- (a) Install washer motor onto washer fluid reservoir.
- (b) Install washer fluid reservoir with motor assembly. (See 76 – Wiper and Washer System – Washer Fluid Reservoir with Motor Assembly, Replacement)

## Wiper Arm Assembly

### Replacement



#### 1. Remove wiper arm assembly

- (a) Turn on wiper switch to swing the wiper arm assembly.

**Note:**

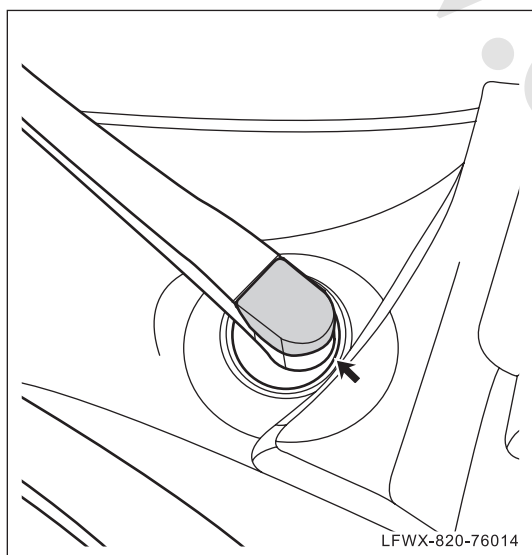
Do not turn on wiper switch when windshield assembly is dry to avoid damaging windshield assembly.

- (b). Turn wiper switch to OFF position to make wiper arm assembly reset automatically.

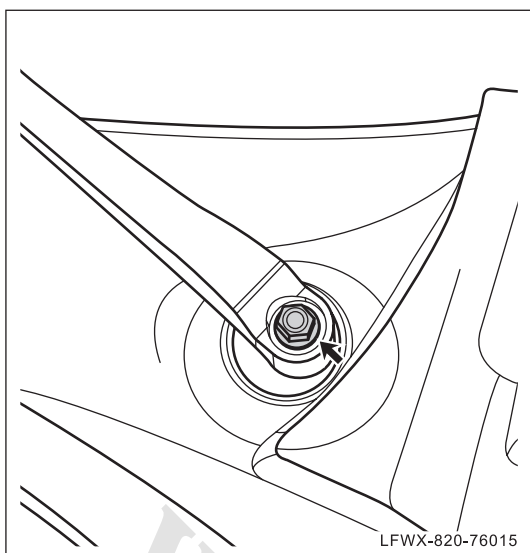
**HINT:**

No.1 is OFF scale; No.2 is INT scale; No.3 is LO scale; No.4 is HI scale.

- (c) Remove pivot cover of wiper arm.





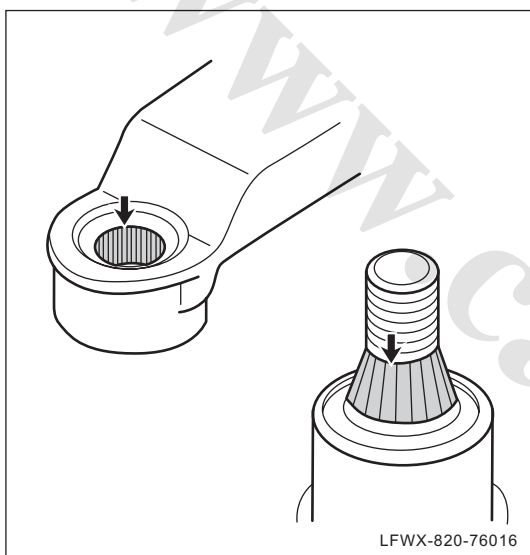


(d) Remove fixing nut of wiper arm assembly.

(e) Take out the wiper arm assembly.

△ HINT:

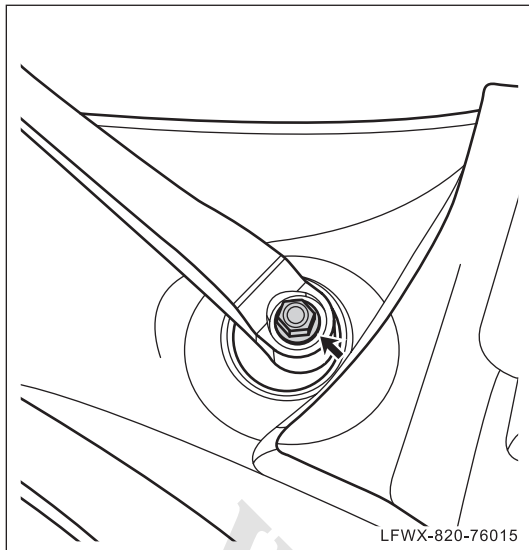
Turn up wiper arm assembly. Shake wiper arm assembly to remove it.



## 2. Install wiper arm assembly

(a) Using a round file or similar tool, clean the splined hole of the wiper arm.

(b) Clean wiper rotation spline by using as wire brush.



(c). Place wiper arm assembly in the installation place.

△ HINT:

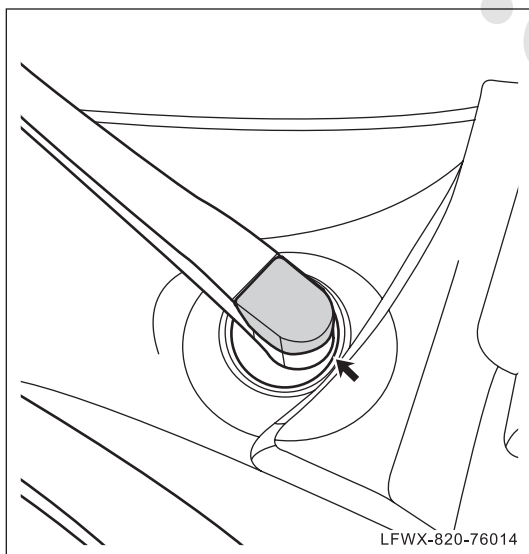
- Wiper arm assembly shall be located at lower edge of front windshield assembly.
- Turn up front wiper arm assembly and put it on proper position.

(d). Install and tighten fixing nuts of wiper arm assembly.

Torque: 20N•m - 26N•m

△ HINT:

- After installation, turn down wiper arm assembly.
- Confirm that wiper arm assembly is located at lower edge of front windshield assembly.



(e) Install wiper arm pivot cover.

### 3. Inspection

(a). Check wiper arm assembly for Automatic return.

- Turn on wiper switch to swing wiper arm assembly.

#### ⓘ Note:

**Do not turn on wiper switch when windshield assembly is dry to avoid damaging windshield assembly.**

- Turn off wiper switch to return wiper arm assembly.

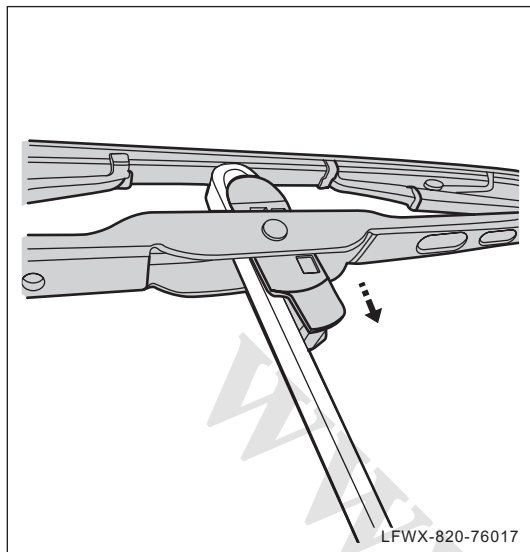


- Check if the wiper assembly is located at lower edge of front windshield assembly.

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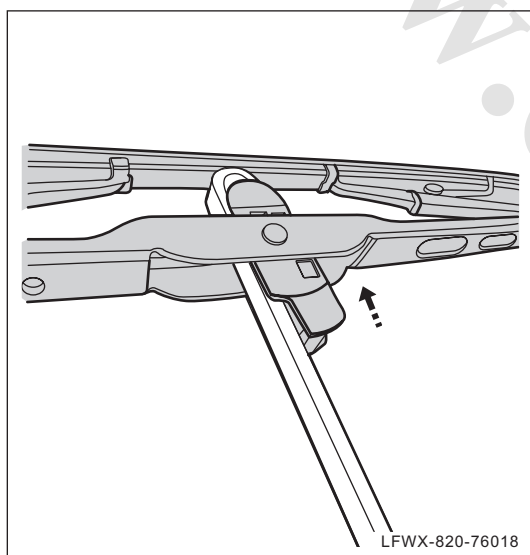
## Wiper Blade

### Replacement



#### 1. Remove Wiper Blade

- (a) Turn over wiper arm assembly.
- (b). Rotate the wiper blade, push out the wiper brush connecting part, and remove the wiper blade.



#### 2. Install Wiper Blade

- (a). Install wiper blade

△ HINT:

If you hear a click, it indicates the wiper blade assembly is installed in place.

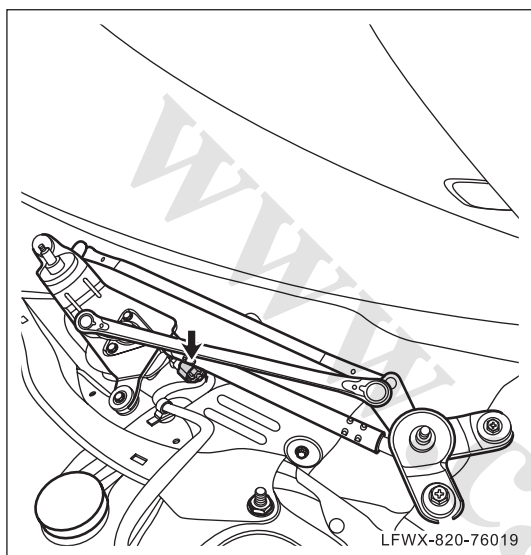
- (b) Turn over wiper brush, and turn down wiper arm assembly.

## wiper Linkage Mechanism and Motor Assembly

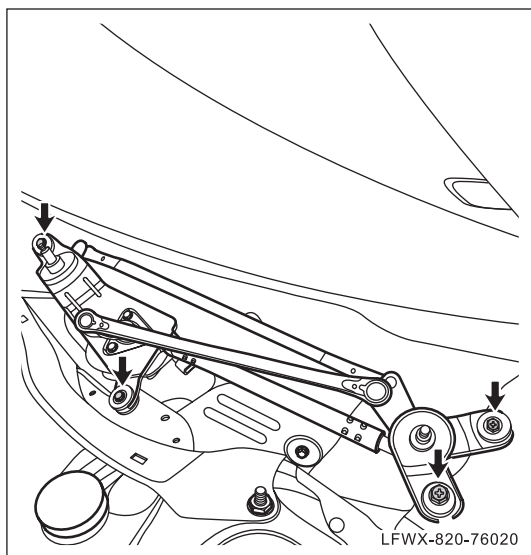
### Replacement

#### 1. Remove the wiper linkage mechanism and motor assembly

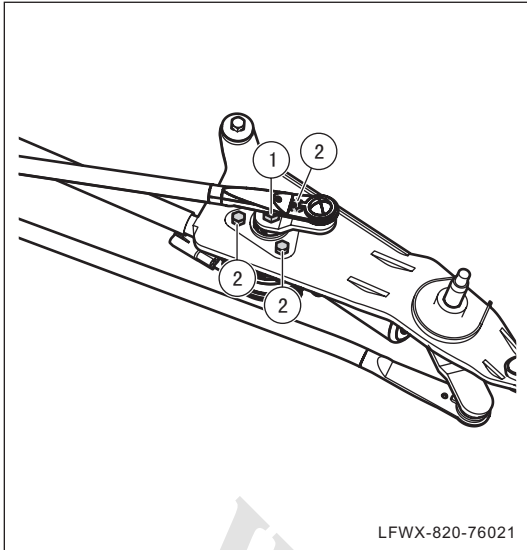
- (a) Turn power supply to "LOCK" position.
- (b) Remove windshield cover plate (See 81 – Interiors and Exteriors Windshield Cover Plate, Replacement)



- (c). Disconnect wiper motor wire harness connector.



- (d). Remove the fixing bolts of wiper linkage mechanism and motor assembly and take down the wiper linkage mechanism and motor assembly.



## 2. Disassemble the wiper linkage mechanism and motor assembly

- (a) Remove fixing nut ① of linkage swing arm.

△ HINT:

When dismantling, pay attention to fix wiper linkage to avoid swing arm rotation affecting dismantling.

- (b) Remove the wiper motor fixing bolt ② .  
Remove the wiper motor assembly.

## 3. Assemble wiper connecting rod mechanism and motor assembly

- (a) Install wiper motor onto the linkage bracket, and install and tighten fixing bolt.

Torque: 8N•m-12N•m

- (b) Install and tighten fixing nut of linkage swing arm.

Torque: 8N•m-12N•m

## 4. Install wiper linkage mechanism and motor assembly

- (a). Install wiper linkage mechanism and motor assembly to the installation position.

△ HINT:

Install the locating block of wiper linkage mechanism and motor assembly in place when installing

- (b). Install and tighten the fixing bolts of wiper linkage mechanism and motor assembly.

Torque: 8N•m-12N•m

- (c). Connect wiper motor assembly wire harness connector.

### ⓘ Note:

**When connecting the connector, if you hear click sound clearly, it indicates that the connector is connected in place.**

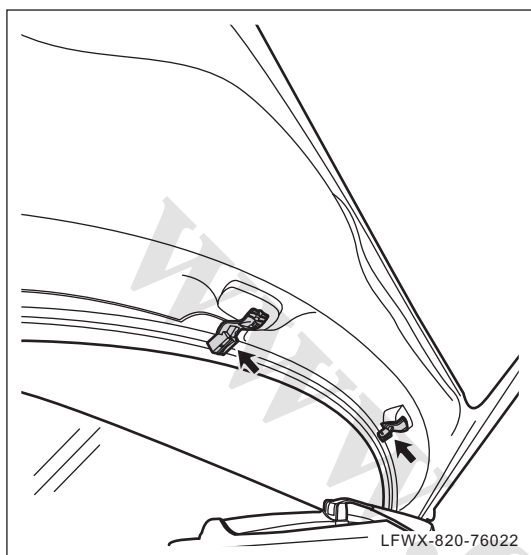
- (d) Install windshield cover plate (See 81 – Interiors and Exteriors Windshield Cover Plate, Replacement)

## Nozzle

### Replacement

#### 1. Remove nozzle

- (a) Open the engine hood.



- (b) Pry nozzle.

- (c) Pull out the washer hose and take out the nozzle.

**Note:**

After removing hole, fix hose to avoid hose falling down onto windshield cover plate.

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#### 2. Install nozzle

- (a) Connect wiper hose onto nozzle.

- (b) Install nozzle onto mounting position.

**HINT:**

Press washer nozzle into installation slot directly. When you hear the clack sound, it means washer nozzle is installed in place.

## 77 – Glass/Window/Rearview Mirror/Horn/ Cigarette lighter

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## Power Window

### System description

#### 1. Function

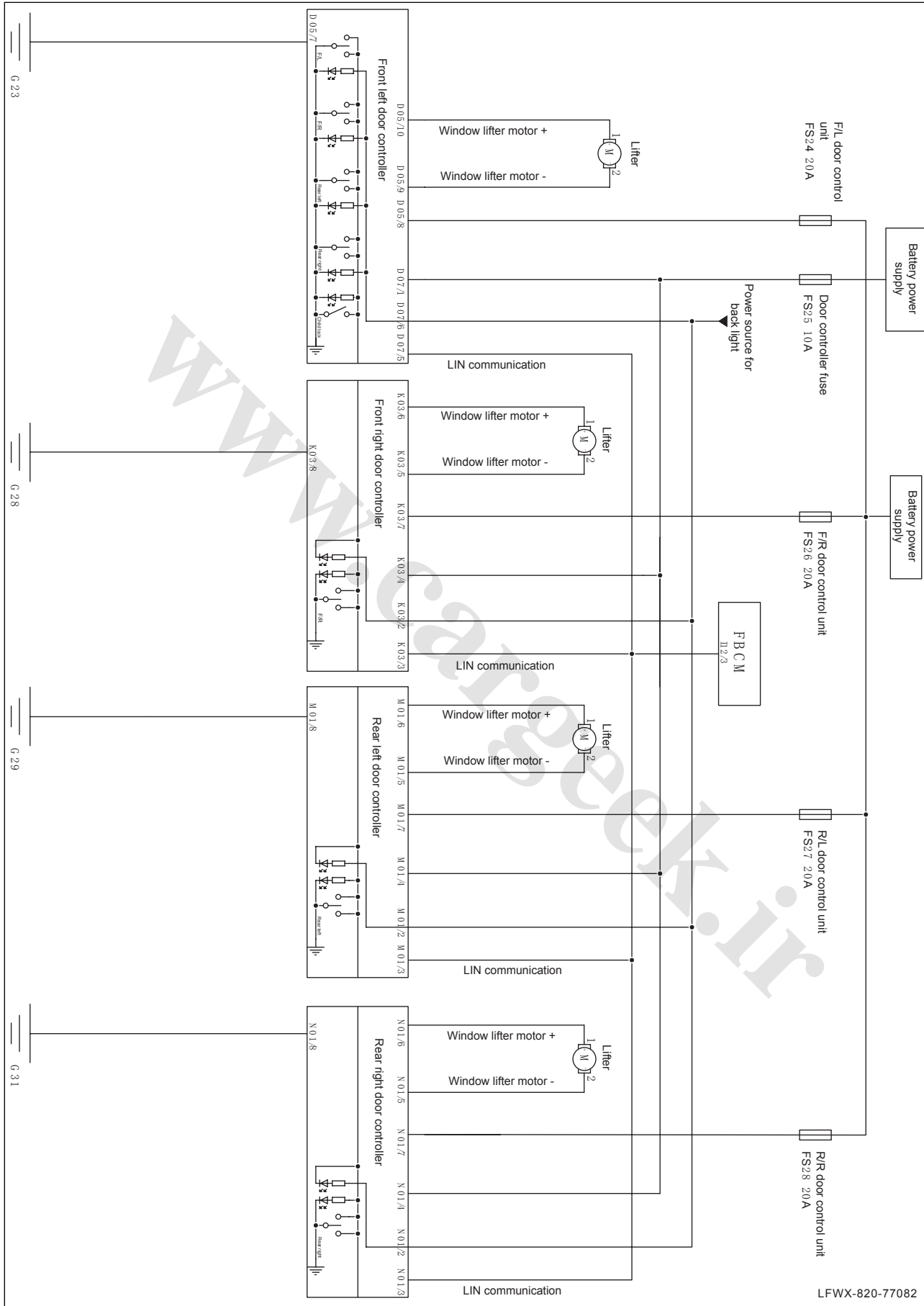
To facilitate use for driver and passengers, this car is equipped with electric window, which means using electric motor to drive lifter to move up and down.

#### 2. Components

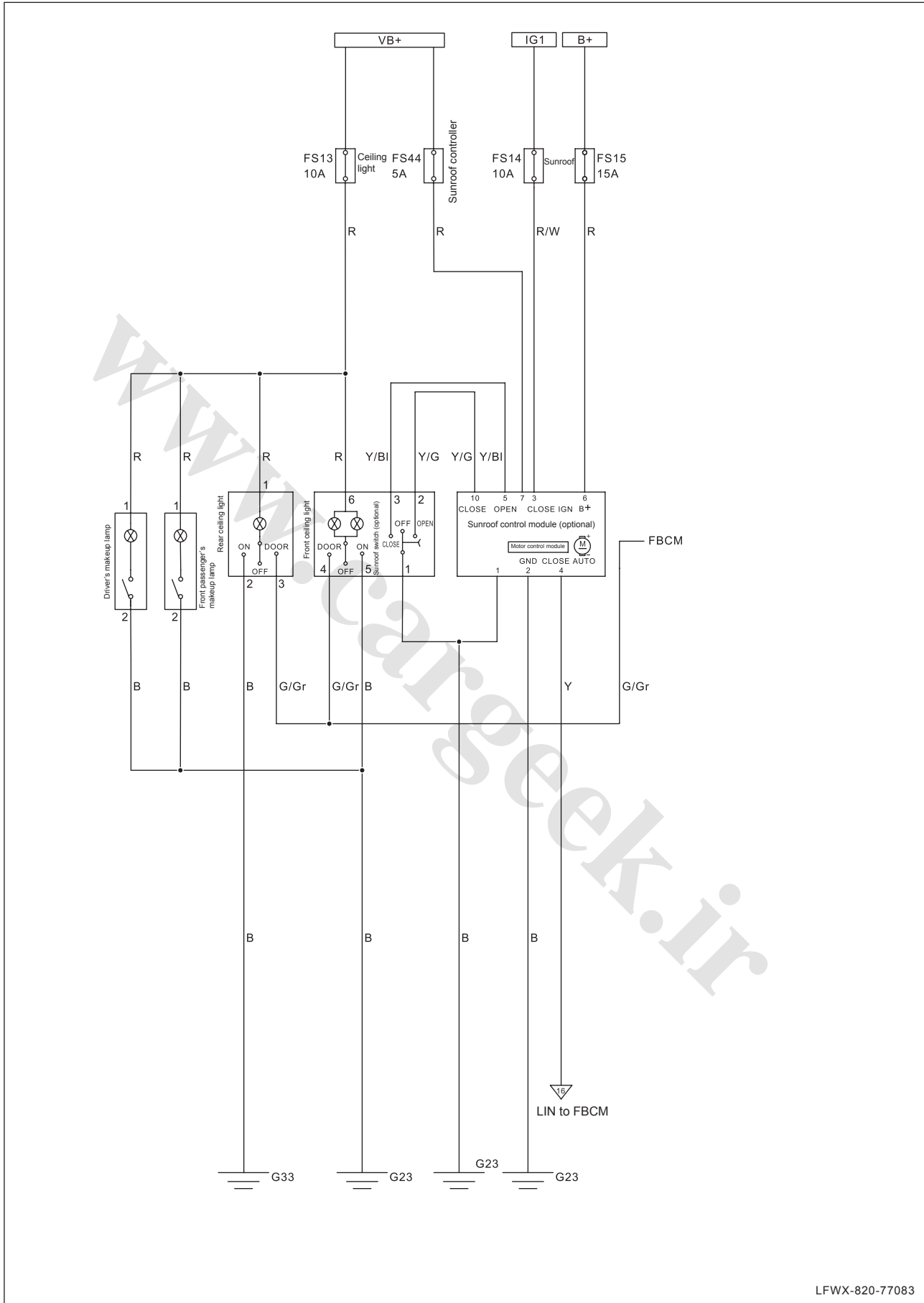
The power window mainly consists of a window regulator, motor, guide rail and control circuits, etc.

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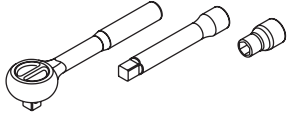
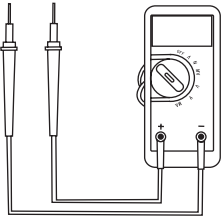
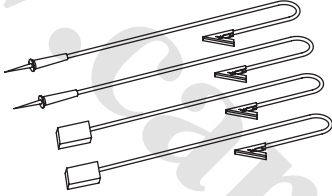
### 3. Principles (power window)



### 4. Principles (ceiling light, sunroof)



## Preparation

S/N	Tools	Outline diagram	Description
1	Quick wrench, extension rod and sleeve		Used for removing fixing bolts and nuts
2	Digital multimeter		Used for measuring voltage or resistance.
3	Wiring set		Assist to measure voltage or resistance

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolt of right glass run rail of front power window	10~12
Fixing bolt of front power window lifter	10~12
Fixing bolt of front window glass	10~12
Fixing bolt of left glass run rail of front power window	10~12
Fixing bolt of rear power window lifter	10~12
Fixing bolt of glass run rail of rear power window	10~12
Fixing bolt of bracket of sunroof	10~12

## Precautions

### 1. Precautions for maintenance

- (a) If it is required to open the door for removal during maintenance, support the door with a rod.
- (b) Do not use a sharp tool to remove any trim panel or other vulnerable parts.

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## General Check

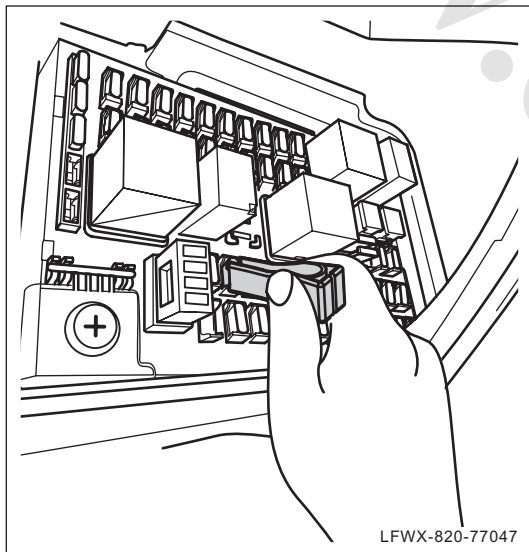
### Check the system

#### 1. Check the working condition of power window

- (a) Turn power supply to "ON" position, toggle UP/DOWN window switch, and inspect the working condition of power window. If the window doesn't work, overhaul it according to the following diagnosis steps.

#### 2. Check working condition of sunroof

- (a). Check the sealing condition and corrosion and damage condition of the sunroof.
- (b). Open and close the sunroof to check the sunroof functions.
- (c). Clean the guide rail of the sunroof and apply lubrication grease to the guide rail if necessary.
- (d) Check the working condition of sunroof, and pay attention to possible friction residues.



#### 3. Check the fuse

- (a) Check whether fuse FS25 of door controller is blown. If yes, replace it with a new one having the same specifications.

△ HINT:

Fuse of door controller is located in fuse box in driver's cab.

- (b) Check whether fuse FS24 of front left door lamp is blown. If yes, replace fuse with a new one having the same specifications.

△ HINT:

Fuse of front left door lamp is located in fuse box in driver's cab.

- (c) Check whether fuse FS26 of front right door lamp is blown. If yes, replace it with a new one having the same specifications.

△ HINT:

Fuse of front right door lamp is located ins fuse box in driver's cab.

- (d) Check whether fuse FS27 of rear left door lamp is blown. If yes, replace it with a new one having the same specifications.

△ HINT:

Fuse of rear left door lamp is located ins fuse box in driver's cab.

- (e) Check whether fuse FS28 of rear right door lamp is blown. If yes, replace it with a new one having the same specifications.

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△ HINT:

Fuse of rear right door lamp is located ins fuse box in driver's cab.

- (f) Check whether fuse FS15 of sunroof motor is blown. If yes, replace it with a new one having the same specifications.

△ HINT:

Fuse of sunroof motor is located ins fuse box in driver's cab.

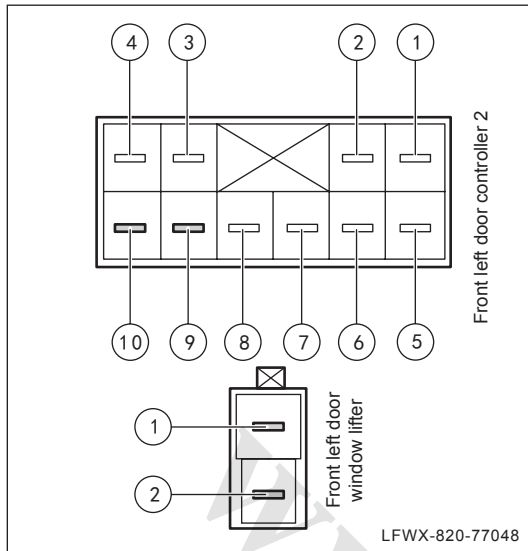
- (f) Check whether fuse FS14 of sunroof IG1 is blown. If yes, replace it with a new one having the same specifications.

△ HINT:

Fuse of sunroof IG1 is located ins fuse box in driver's cab.



## Check front left door window lifter

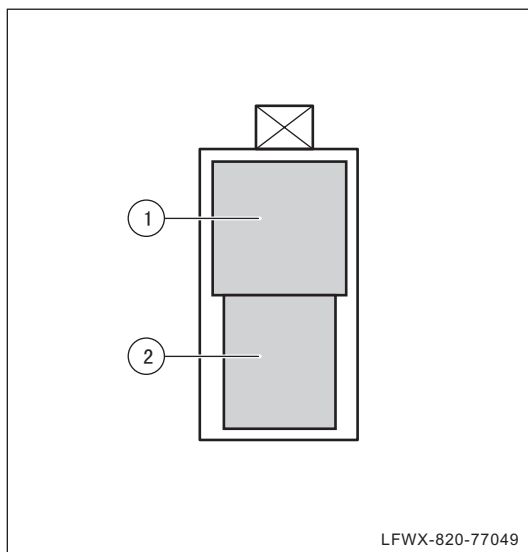


### 1. Check control wire of front left door window lifter

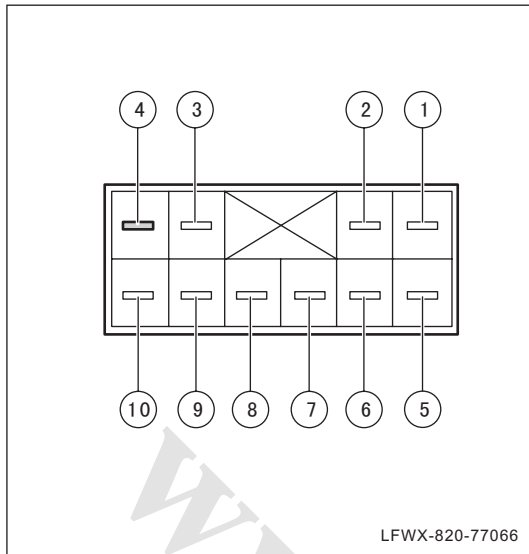
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front left door controller 2.
- (b) Disconnect wire harness connector of front left door window lifter.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front left door window lifter and terminal No.10 of wire harness connector of front left door controller are conducted. If no, overhaul relevant wire harness according to circuit book.
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front left door window lifter and terminal No.10 of wire harness connector of front left door controller are conducted. If no, overhaul relevant wire harness according to circuit book.

### 2. Check the working condition of front left door window lifter

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front left door window lifter.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of front left door window lifter are conducted. If no, replace it.

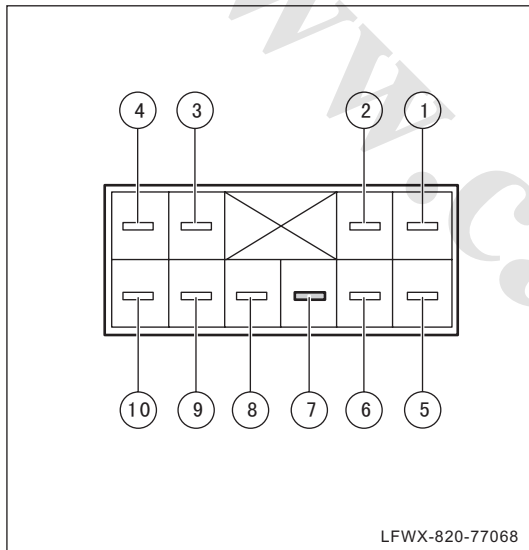


## Check front right door controller



### 1. Check power supply cable of front right door controller

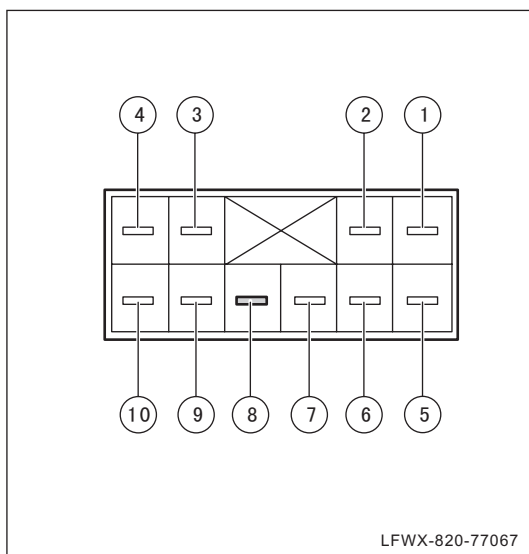
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front right door controller.
- (b) Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.4 of wire harness connector of front right door controller and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check power supply cable of front right door armrest switch.

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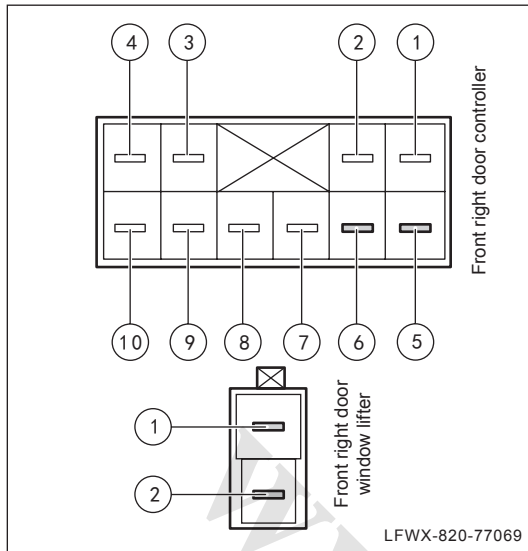
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front right door controller.
- (b) Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.7 of wire harness connector of rear left door controller and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.



### 3. Check circuit of front right door armrest switch.

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front right door controller.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.8 of wire harness connector of front right door controller and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check front right door window lifter

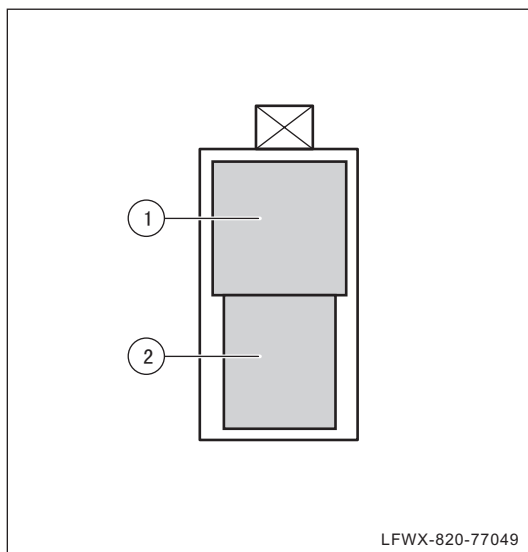


### 1. Check control wire of front right door window lifter.

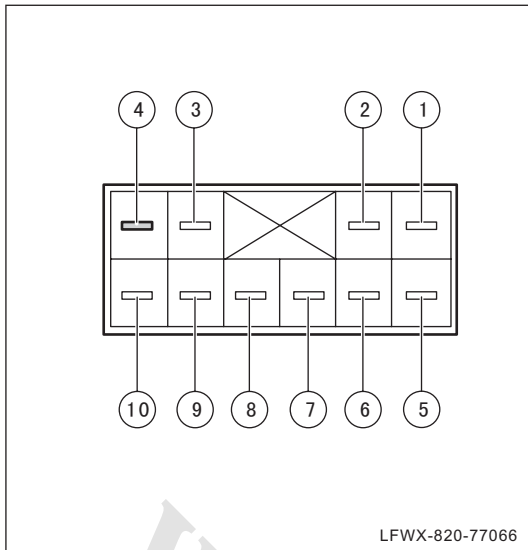
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front right door controller.
- (b) Disconnect wire harness connector of front right door window lifter.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of front right door window lifter and terminal No.6 of wire harness connector of front right door controller are conducted. If no, overhaul relevant wire harness according to circuit book.
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of front right door window lifter and terminal No.5 of wire harness connector of front right door controller are conducted. If no, overhaul relevant wire harness according to circuit book.

### 2. Check the working condition of front right door window lifter

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front right door controller.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of front right door window lifter are conducted. If no, replace it.

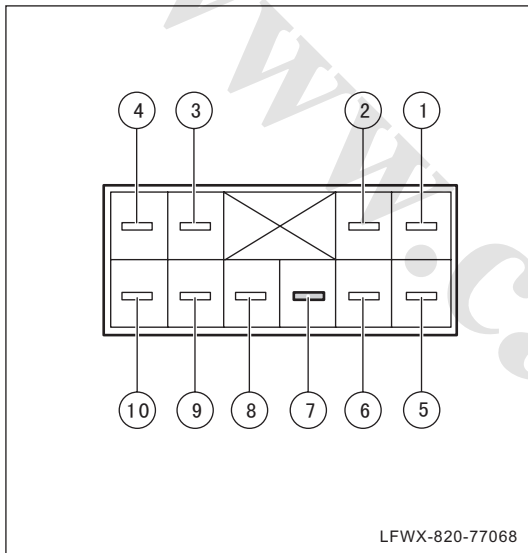


## Check rear left door controller



### 1. Check power supply cable of rear left door controller

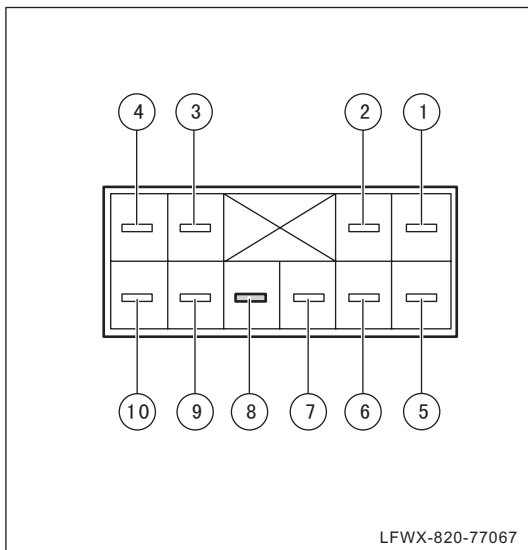
- Turn power supply to "LOCK" position and disconnect wire harness connector of rear left door controller.
- Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.4 of wire harness connector of rear left door controller and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check power supply cable of rear left door armrest

- Turn power supply to "LOCK" position and disconnect wire harness connector of rear left door controller.
- Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.4 of wire harness connector of rear left door controller and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.

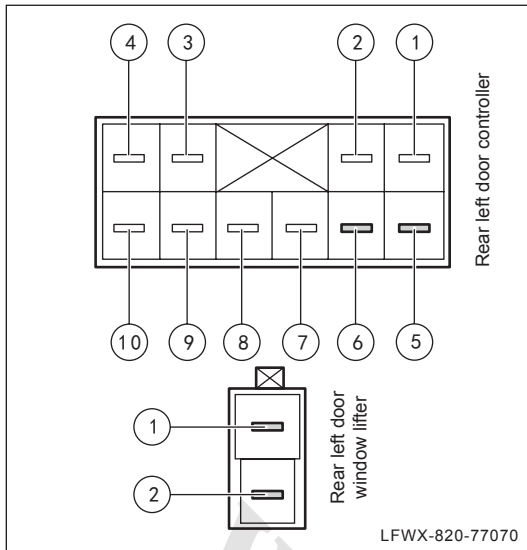
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### 3. Check grounding wire of rear left door armrest

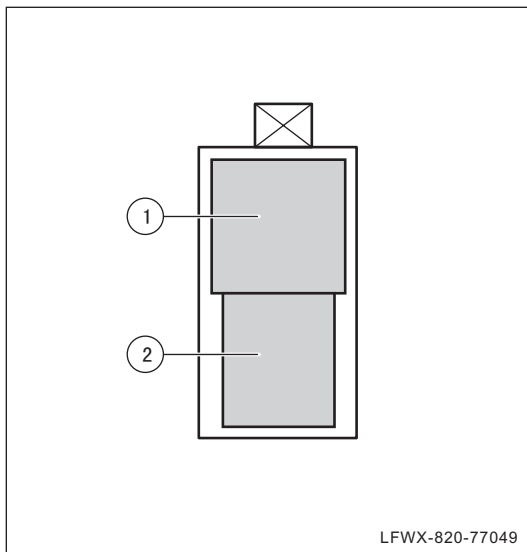
- Turn power supply to "LOCK" position and disconnect wire harness connector of rear left door controller.
- Use a digital multimeter resistance scale to inspect whether terminal No.8 of wire harness connector of rear left door controller and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check rear left door window lifter



### 1. Check control wire of rear left door window lifter switch

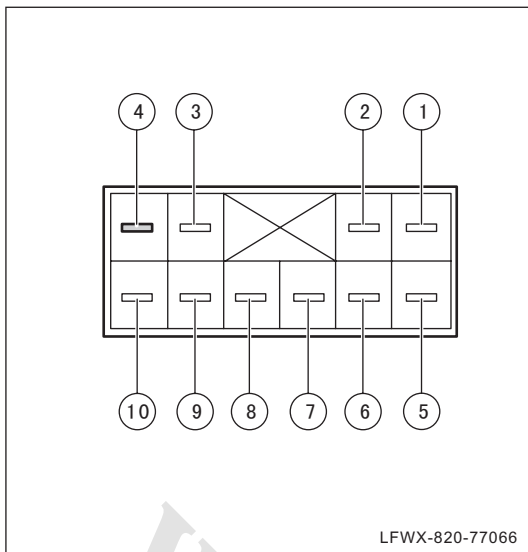
- Turn power supply to "LOCK" position and disconnect wire harness connector of rear left door controller.
- Disconnect wire harness connector of rear left door window lifter.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of rear left door window lifter and terminal No.6 of wire harness connector of rear left door controller are conducted. If no, overhaul relevant wire harness according to circuit book.
- Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of rear left door window lifter and terminal No.5 of wire harness connector of rear left door controller are conducted. If no, overhaul relevant wire harness according to circuit book.



### 2. Check the working condition of rear left door window lifter

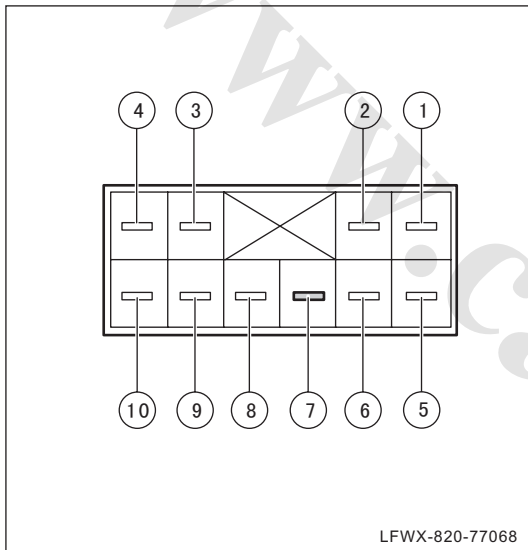
- Turn power supply to "LOCK" position and disconnect wire harness connector of rear left door window lifter.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of rear left door window lifter are conducted. If no, replace it.

## Check rear right door controller



### 1. Check power supply cable of rear right door controller

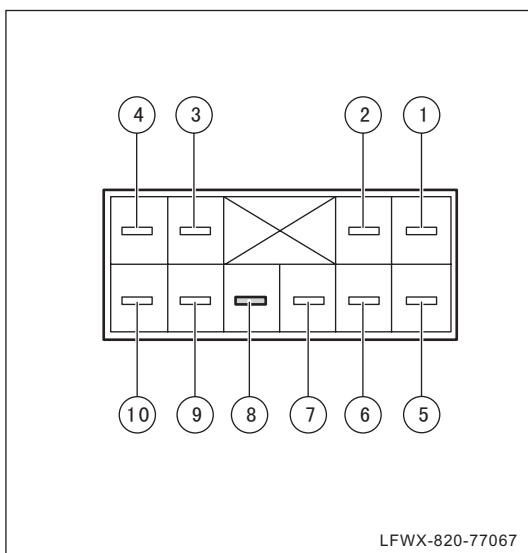
- Turn power supply to "LOCK" position and disconnect wire harness connector of rear right door controller.
- Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.4 of wire harness connector of rear left door controller and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check power supply cable of rear right door armrest switch

- Turn power supply to "LOCK" position and disconnect wire harness connector of rear right door controller.
- Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.4 of wire harness connector of rear left door controller and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.

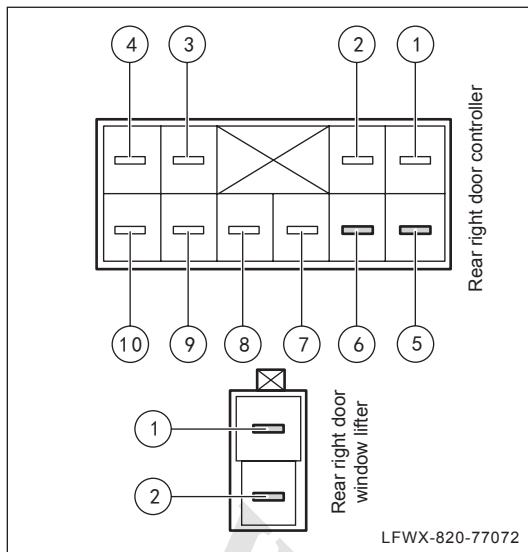
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### 3. Check grounding wire of rear right door armrest switch

- Turn power supply to "LOCK" position and disconnect wire harness connector of rear right door controller.
- Use a digital multimeter resistance scale to inspect whether terminal No.8 of wire harness connector of rear right door controller and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check rear right door window lifter

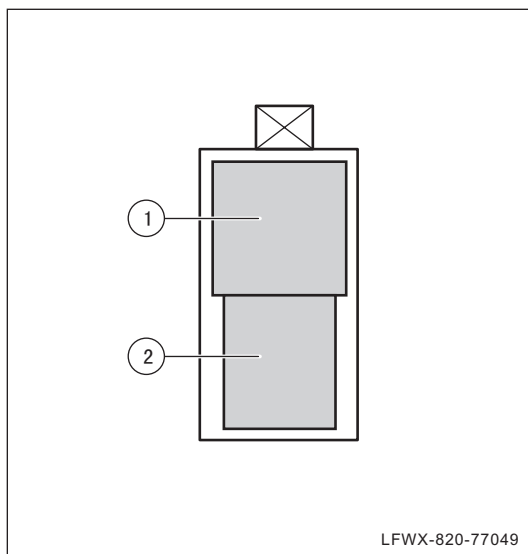


### 1. Check control wire of rear right door window lifter switch

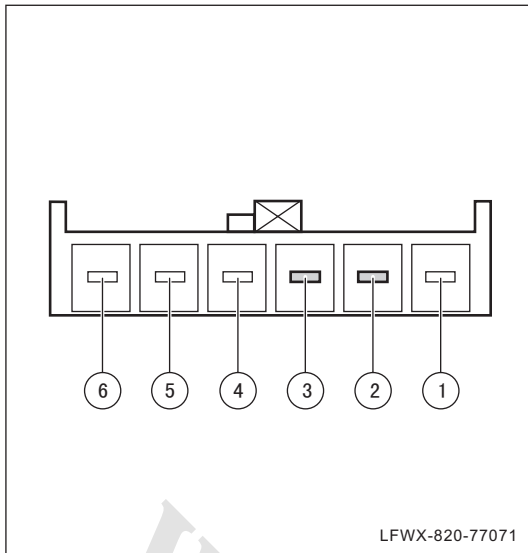
- Turn power supply to "LOCK" position and disconnect wire harness connector of rear right door controller.
- Disconnect wire harness connector of rear right door window lifter.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of rear right door window lifter and terminal No.6 of wire harness connector of rear right door controller are conducted. If no, overhaul relevant wire harness according to circuit book.
- Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of rear right door window lifter and terminal No.5 of wire harness connector of rear right door controller are conducted. If no, overhaul relevant wire harness according to circuit book.

### 2. Check the working condition of rear right door window lifter

- Turn power supply to "LOCK" position and disconnect wire harness connector of rear right door window lifter.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of rear right door window lifter are conducted. If no, replace it.

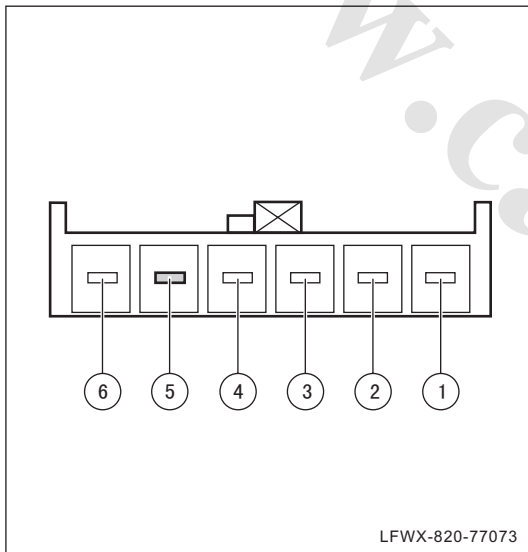


## Check sunroof switch



### 1. Check signal cable of sunroof switch

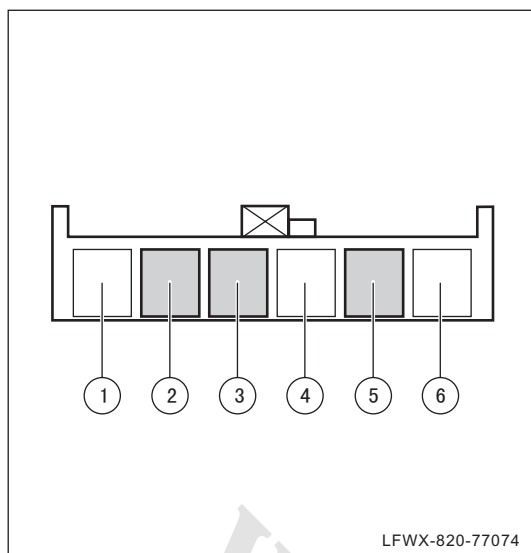
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of sunroof switch.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of sunroof switch and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.3 of wire harness connector of sunroof switch and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.



### 2. Check grounding wire of sunroof switch

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of sunroof switch.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of sunroof switch and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

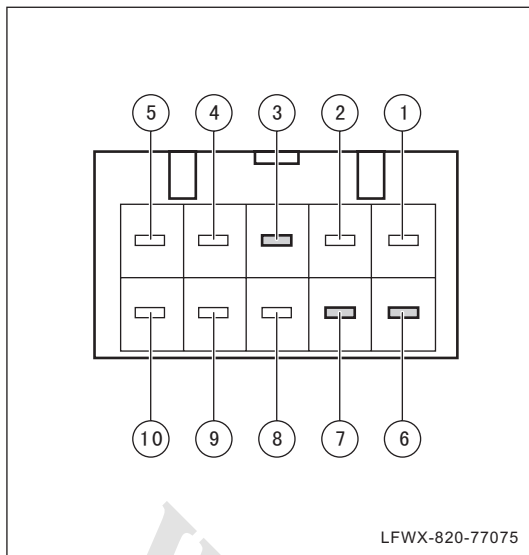




### 3. Check the working condition of sunroof switch

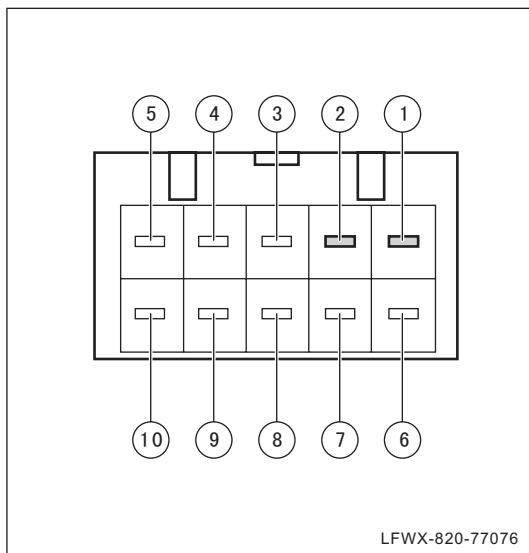
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of sunroof switch.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 and No.5 of wire harness connector of sunroof switch are conducted. If no, replace sunroof switch.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.5 of wire harness connector of sunroof switch are conducted. If no, replace sunroof switch.

### Check the sunroof motor



## 1. Check power supply cable of sunroof motor

- Turn power supply to "LOCK" position and disconnect wire harness connector of sunroof motor.
- Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.6 of wire harness connector of sunroof motor and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.
- Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.3 of wire harness connector of sunroof motor and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.
- Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.7 of wire harness connector of sunroof motor and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.



## 2. Check grounding wire of sunroof motor

- Turn power supply to "LOCK" position and disconnect wire harness connector of sunroof motor.
- Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of sunroof motor and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.
- Use a digital multimeter resistance scale to inspect whether terminal No. 2 of wire harness connector of sunroof motor and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
All power windows do not work	1. Fuse (blown)	See 77 – Diagnosis glass/ window/ rearview mirror/ horn / cigarette lighter, Fault Diagnosis (1. All power windows do not work)
	2. Wire harness (short circuit or open-circuit)	
	3. Front left door controller (fault)	
Front left door power window does not work	1. Fuse (blown)	See 77 – Diagnosis glass/ window/ rearview mirror/ horn / cigarette lighter, Fault Diagnosis (2. Front left door power window does not work)
	2. Wire harness (short circuit or open-circuit)	
	3. Front right door window lifter (fault)	
Front right door power window does not work	1. Fuse (blown)	See 77 – Diagnosis glass/ window/ rearview mirror/ horn / cigarette lighter, Fault Diagnosis (3. Front right door power window does not work)
	2. Wire harness (short circuit or open-circuit)	
	3. Front right door window lifter (fault)	
	4. Front right door controller (fault)	
Rear left door power window does not work	1. Fuse (blown)	See 77 – Diagnosis glass/ window/ rearview mirror/ horn / cigarette lighter, Fault Diagnosis (4. The rear left door power window does not work)
	2. Wire harness (short circuit or open circuit)	
	3. Rear left door window lifter (fault)	
	4. Rear left door controller (fault)	
Rear right door power window does not work	1. Fuse (blown)	See 77 – Diagnosis glass/ window/ rearview mirror/ horn / cigarette lighter, Fault Diagnosis (5. Rear right door power window does not work)
	2. Wire harness (short circuit or open circuit)	
	3. Rear right door window lifter (fault)	
	4. Rear right door controller (fault)	

Symptom	Suspected area	Recommended action
Sunroof does not work	1. Fuse (blown)	See 77 – Diagnosis glass/ window/ rearview mirror/ horn / cigarette lighter, Fault Diagnosis 6. Sunroof does not work
	2. Wire harness (short circuit or open circuit)	
	3. Sunroof switch (fault)	
	4. Sunroof motor (fault)	

## Fault diagnosis

### 1. All power windows do not work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power window (See 77 – General Check of Power Window, Check of System)	Diagnosis end.	All door windows don't work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of door controller is blown (See 77 – General Check of Power Window, Check of System)	Go to Step 3	FS25 fuse is blown	Go to Step 2
2	Check FS25 circuit	Normal	Faulty	Instruction
	Check working condition of FS25 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front left door controller is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction

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	Check whether grounding wire of front left door controller is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Replacement and check	Normal	Faulty	Instruction
	Replace front left door controller with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Front left door power window does not work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power window (See 77 – General Check of Power Window, Check of System)	Diagnosis end.	Front left door power window does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of front left door lamp is blown (See 77 – General Check of Power Window, Check of System)	Go to Step 3	FS24 fuse is blown	Go to Step 2
2	Check FS24 circuit	Normal	Faulty	Instruction
	Check working condition of FS24 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction

	Check whether power supply cable of front left door armrest switch is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of front left door armrest switch is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether control wire of front left door window lifter switch is conducted (See 77 – General Check of Power Window, Check of Front Left Door Window Lifter)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check front left door window lifter	Normal	Faulty	Instruction
	Check whether front left door window lifter is damaged (See 77 – General Check of Power Window, Check of Front Left Door Window Lifter)	Go to Step 7	Front left door window lifter is damaged.	Replace (See 77 – Power Window –Front Power Window, Replacement)
7	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 3. Front right door power window does not work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power window (See 77 – General Check of Power Window, Check of System)	Diagnosis end.	Front right door power window does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of front right door lamp is blown (See 77 – General Check of Power Window, Check of System)	Go to Step 3	FS26 fuse is blown	Go to Step 2
2	Check FS26 circuit	Normal	Faulty	Instruction
	Check working condition of FS26 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front right door controller is conducted (See 77- General Check of Electric Window, Check of Front Right Door Controller)	Go to Step 4	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front right door armrest switch is conducted (See 77 – General Check of Power Window, Check of Front Right Door Controller)	Go to Step 5	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
5	Check the wire harness	Normal	Faulty	Instruction

	Check whether grounding wire of front right door arm-rest switch is conducted (See 77 – General Check of Power Window, Check of Front Right Door Controller)	Go to Step 6	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether control wire of front right door window lifter switch is conducted (See 77 – General Check of Power Window, Check of Front Right Door Window Lifter)	Go to Step 7	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
7	Check front right door window lifter	Normal	Faulty	Instruction
	Check whether front right door window lifter is damaged (See 77 – General Check of Power Window, Check of Front Right Door Window Lifter)	Go to Step 8	Front right door window lifter is damaged	Replace (See 77 – Power Window –Front Power Window, Replacement)
8	Replacement and check	Normal	Faulty	Instruction
	Replace front right door controller with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

#### 4. The rear left door power window does not work

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power window (See 77 – General Check of Power Window, Check of System)	Diagnosis end.	Rear left door power window does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction



	Check whether fuse of rear left door lamp is blown (See 77 – General Check of Power Window, Check of System)	Go to Step 3	FS27 fuse is blown	Go to Step 2
2	Check FS27 circuit	Normal	Faulty	Instruction
	Check working condition of FS27 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear left door controller is conducted (See 77 – General Check of Electric Window, Check of Rear Left Door Controller)	Go to Step 4	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear left door armrest switch is conducted (See 77 – General Check of Power Window, Check of Rear Left Door Controller)	Go to Step 5	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear left door armrest switch is conducted (See 77 – General Check of Power Window, Check of Rear Left Door Controller)	Go to Step 6	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
6	Check the wire harness	Normal	Faulty	Instruction

	Check whether control wire of rear left door window lifter switch is conducted (See 77 – General Check of Power Window, Check of Rear Left Door Window Lifter)	Go to Step 7	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
7	Check rear left door window lifter	Normal	Faulty	Instruction
	Check whether rear left door window lifter is damaged (See 77 – General Check of Power Window, Check of Rear Left Door Window Lifter)	Go to Step 8	Rear left door window lifter is damaged	Replace (See 77 – Power Window – Rear Power Window, Replacement)
8	Replacement and check	Normal	Faulty	Instruction
	Replace rear left door controller with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

### 5. Rear right door power window does not work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power window (See 77 – General Check of Power Window, Check of System)	Diagnosis end.	Rear right door power window does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of rear right door lamp is blown (See 77 – General Check of Power Window, Check of System)	Go to Step 3	FS28 fuse is blown	Go to Step 2
2	Check FS28 circuit	Normal	Faulty	Instruction

	Check working condition of FS28 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear right door controller is conducted (See 77 – General Check of Electric Window, Check of Rear Right Door Controller)	Go to Step 4	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of rear right door armrest switch is conducted (See 77 – General Check of Power Window, Check of Rear Right Door Controller)	Go to Step 5	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of rear right door armrest switch is conducted (See 77 – General Check of Power Window, Check of Rear Right Door Controller)	Go to Step 6	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether control wire of left right door window lifter switch is conducted (See 77 – General Check of Power Window, Check of Rear Right Door Window Lifter)	Go to Step 7	No continuity	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
7	Check rear right door window lifter	Normal	Faulty	Instruction



	Check whether rear right door window lifter is damaged (See 77 – General Check of Power Window, Check of Rear Right Door Window Lifter)	Go to Step 8	Rear right door window lifter is damaged.	Replace (See 77 – Power Window – Rear Power Window, Replacement)
8	Replacement and check	Normal	Faulty	Instruction
	Replace rear right door controller with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 6. Sunroof does not work

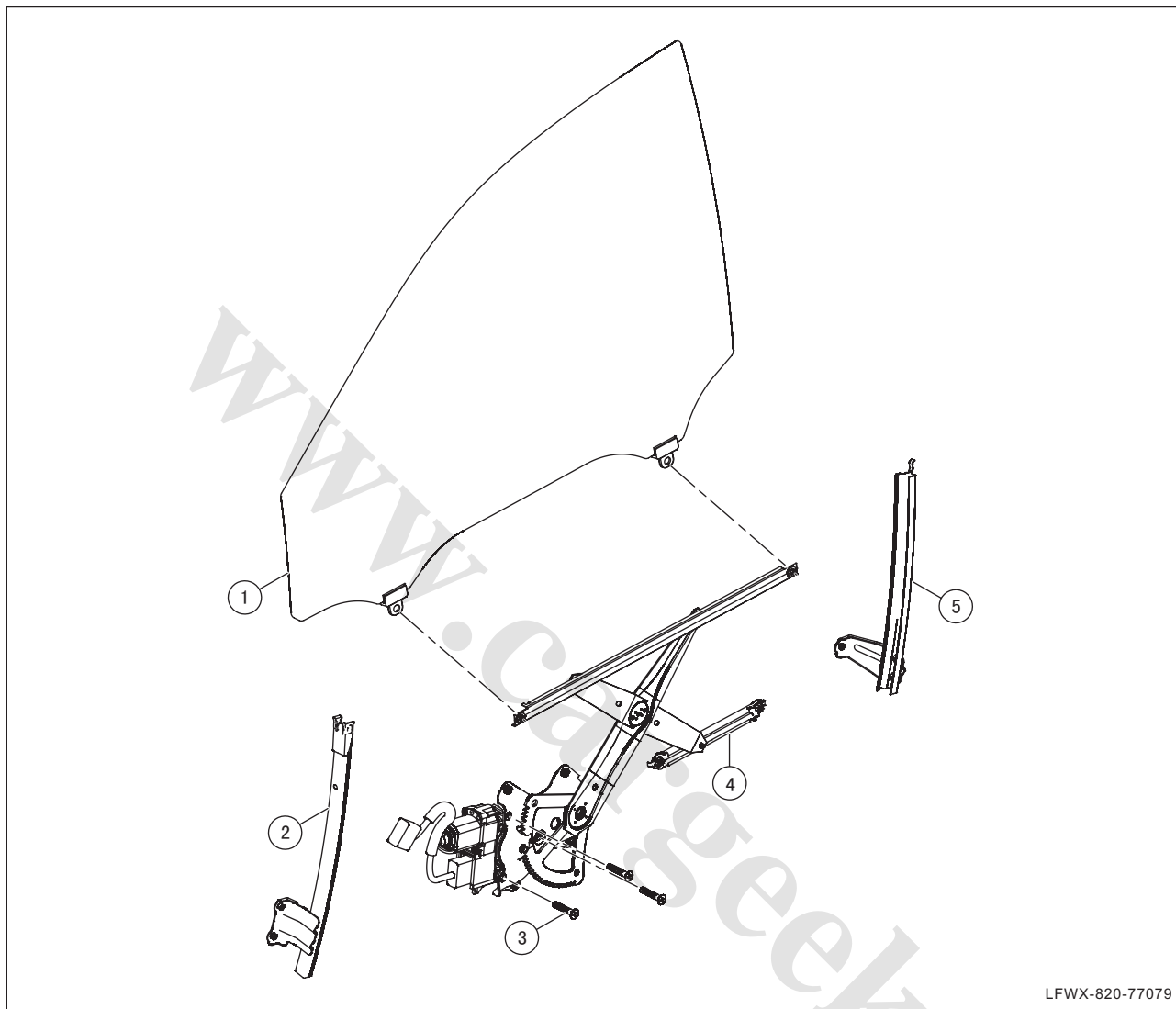
Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether the working condition of sunroof (See 77 – General Check of Power Window, Check of System)	Diagnosis end.	Sunroof does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of sunroof motor is blown (See 77 – General Check of Power Window, Check of System)	Go to Step 3	Fuse FS15, FS14 and FS44 are blown	Go to Step 2
2	Check the circuit of FS15, FS14 and FS44	Normal	Faulty	Instruction
	Check the working condition of FS15, FS14 and FS44	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of sunroof switch is conducted (See 77 – General Check of Power Window, Check of System)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of sunroof switch is conducted (See 77 – General Check of Power Window, Check of System)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check sunroof switch	Normal	Faulty	Instruction
	Check whether sunroof switch is damaged (See 77 – General Check of Power Window, Check of System)	Go to Step 6	Sunroof switch is damaged.	Replace (See 75 – Lighting System – Front Ceiling Light Switch, Replacement)



6	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of sunroof motor is conducted (See 77 – General Check of Power Window, Check of Sunroof Motor)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of sunroof motor is conducted (See 77 – General Check of Power Window, Check of Sunroof Motor)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Replacement and check	Normal	Faulty	Instruction
	Replace sunroof motor with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

# Front Power Window

## Components



1	Left front door glass
2	Front run rail of front left door window glass
3	Bolt

4	Left front door glass regulator assembly
5	Rear run rail of front left door window glass

## Replacement

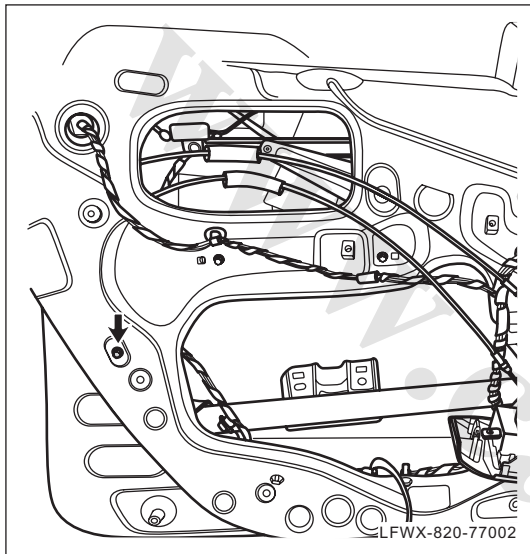
△ HINT:

Replacement of left, front right power window is basically the same. This section will only introduce the replacement of front left power window as an example.

### 1. Remove front left power window

(a). Remove front left door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)

(b). Remove front door rainproof curtain.

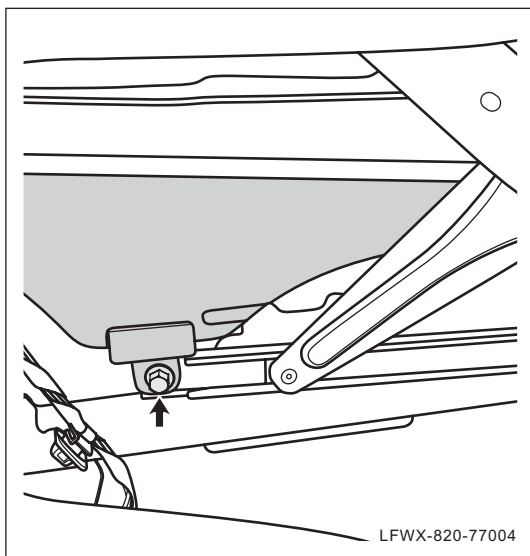


(c). Remove fixing bolt of front glass run rail, and remove front glass run rail.

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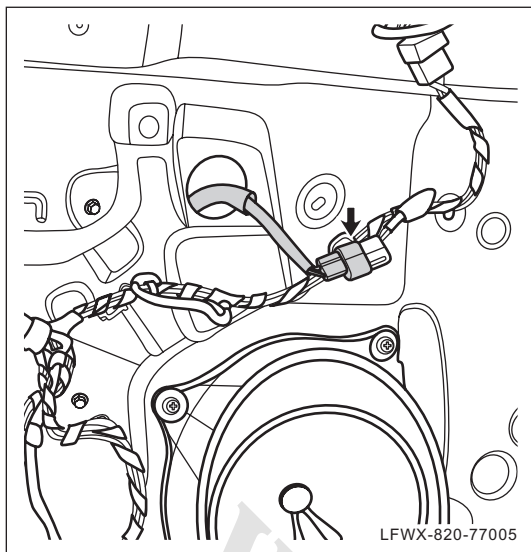
(d). Lift and lower the glass to the appropriate position by external power supply.

(e). Remove front speaker. (See 74 – Audio Entertainment System – Front Speaker, Replacement)

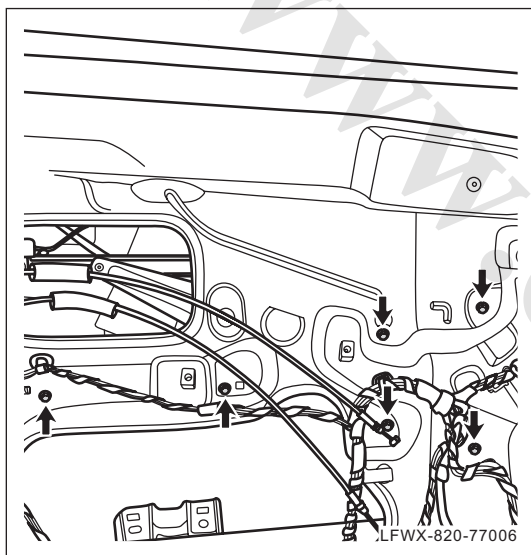


(f). Remove bolt connecting door glass and lifter, and rotate and take out door glass.

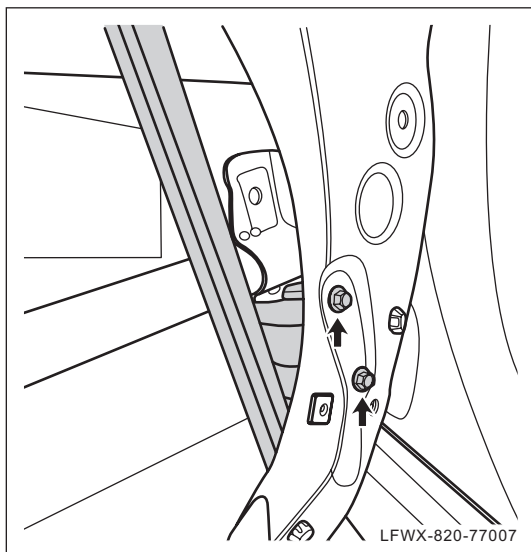




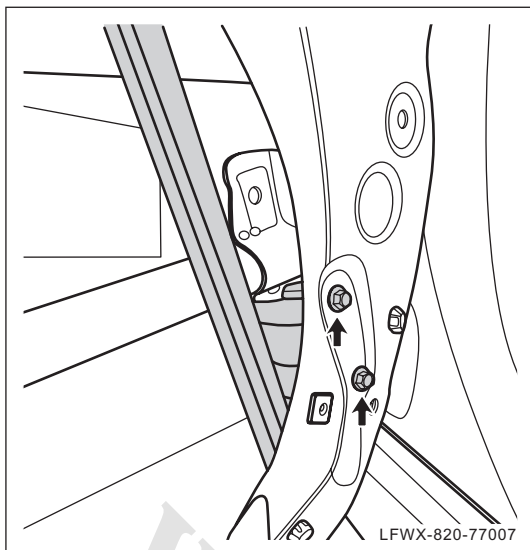
- (g). Disconnect window lifting motor wire harness connectors.



- (h). Remove fixing bolts of window regulator motor, and take out the window regulator assembly.



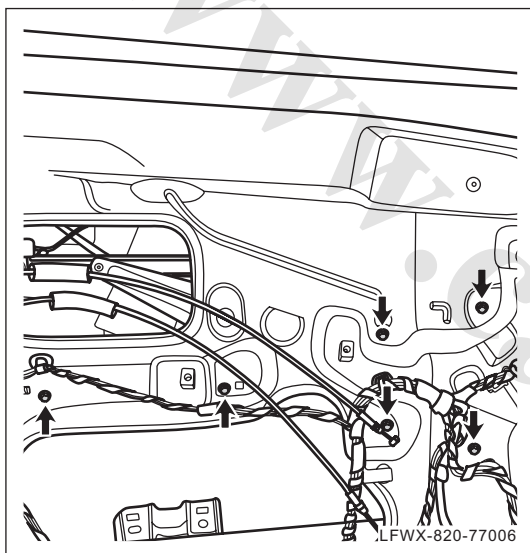
- (i). Remove fixing bolt of rear glass run rail, and remove rear glass run rail.



## 2. Install front power window

- (a) Install rear glass run rail onto mounting position, and install and tighten fixing bolt.

**Torque: 10N•m-12N•m**

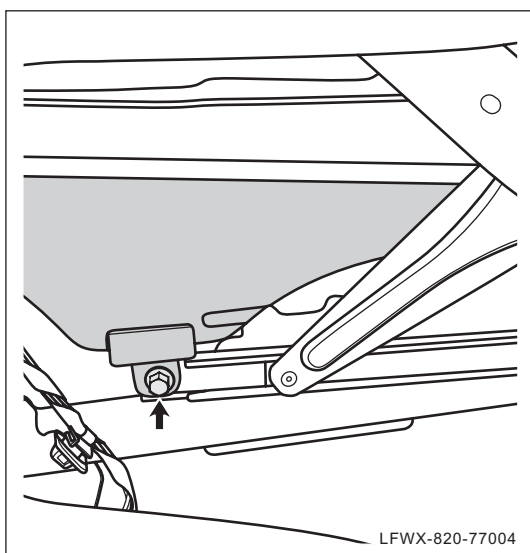


- (b) Install window lifter assembly onto mounting position, and install and tighten fixing bolt.

**Torque: 10N•m-12N•m**

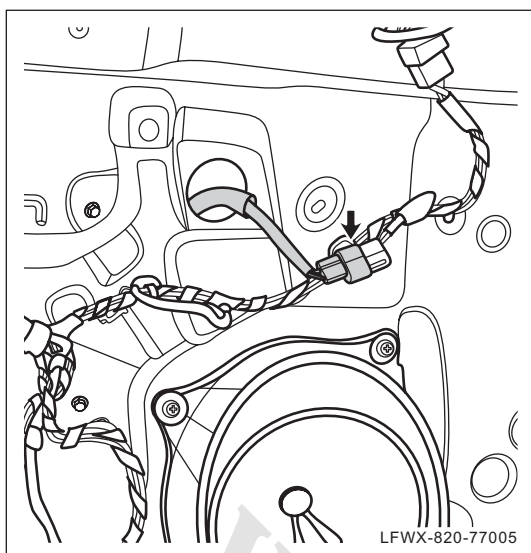
### △ HINT:

Temporarily don't tighten fixing bolt of window lifter. Connect an external battery to make the window lift work. After the glass lifts up and down freely, tighten fixing bolt of window lifter.



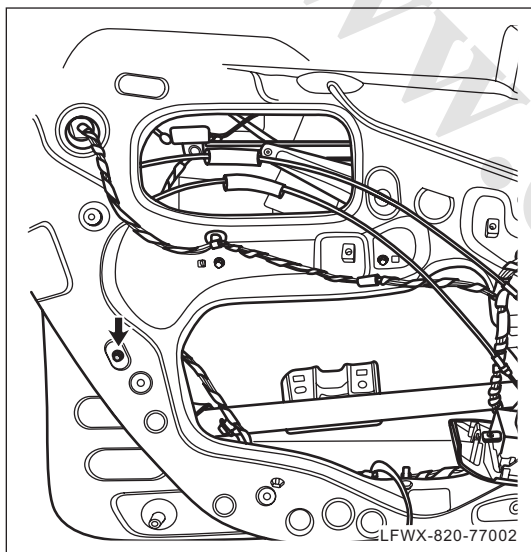
- (c) Install front door window glass onto mounting position, and install and tighten fixing bolt.

**Torque: 10N•m-12N•m**



- (d). Connect window regulator motor wire harness connector.

- (e). Lift window glass to the highest point by external power supply.



- (f) Install front glass run rail onto mounting position, and install and tighten fixing bolt.

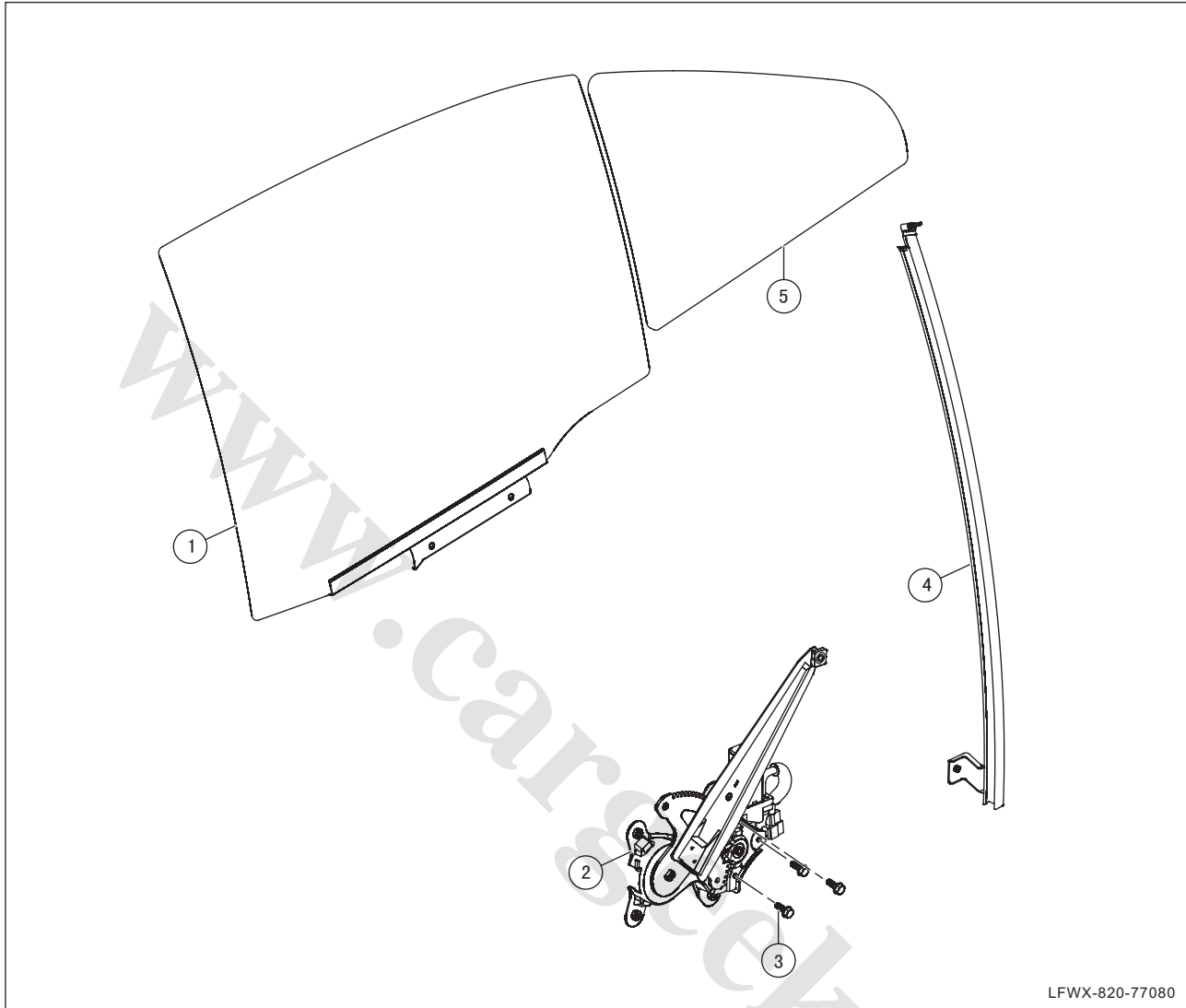
**Torque: 10N•m-12N•m**

- (g). Attach door rain curtain.

- (h). Install the front door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)

# Rear Power Window

## Components



77

1	Left rear door glass
2	Left rear door window regulator assembly
3	Bolt

4	Rear run rail of rear left door glass
5	Quarter glass of left rear door

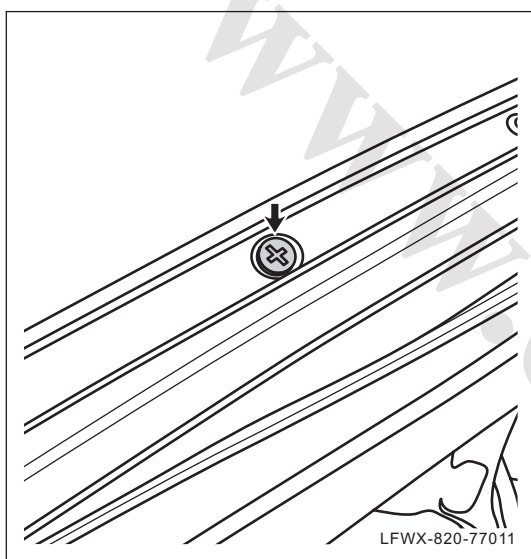
## Replacement

△ HINT:

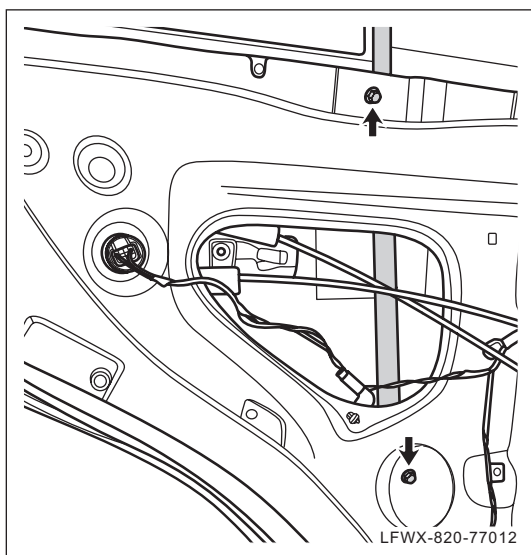
Replacement of left, rear right power windows is basically the same. This section will only introduce replacement of rear left power window.

### 1. Remove rear left power window

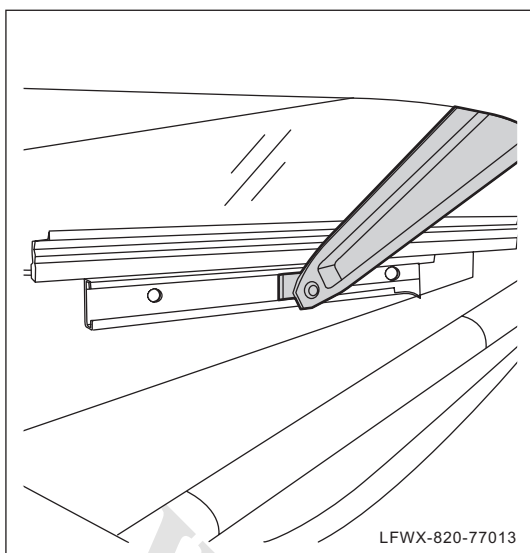
- (a) Remove rear left door trim panel. (See 81 - Interiors and Exteriors, Rear Door Interior Guard Panel, Replacement)
- (b) Remove rear left door rainproof curtain.
- (c) Lift and lower the glass to the appropriate position by external power supply.



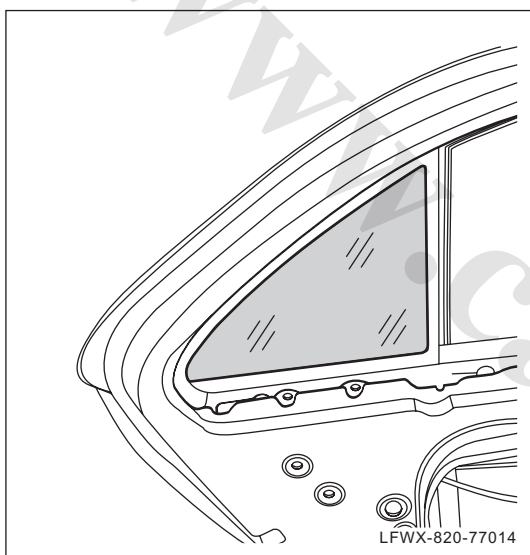
- (d) Remove upper fixing screw of rear run rail of rear left door glass.



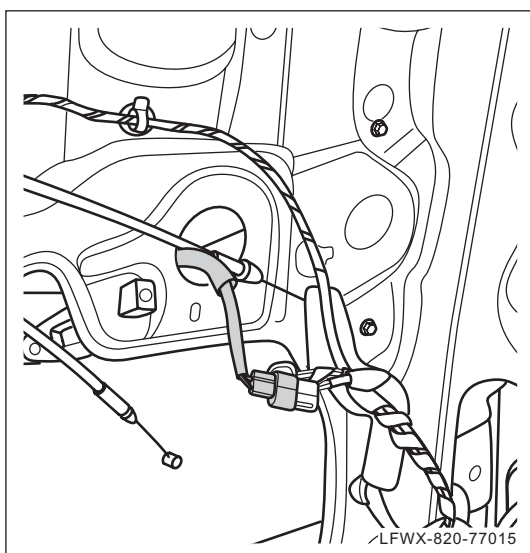
- (e) Remove lower fixing bolt of rear run rail of rear left door glass.



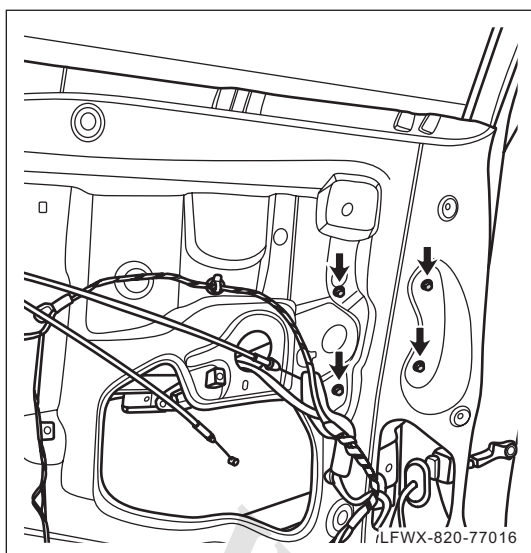
- (f). Rotate the glass and disengage the glass run and window lifter, then take out the glass.



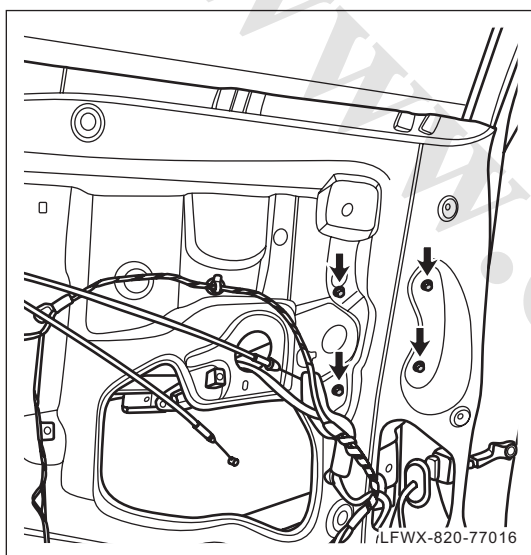
- (g). Take out glass guide rail, remove rear door quarter glass and quarter glass seal.



- (h). Disconnect window lifting motor wire harness connectors.



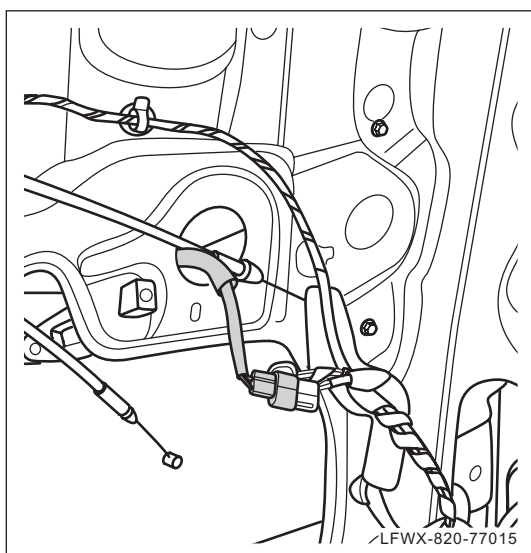
- (i). Remove fixing bolts of window regulator motor, and take out the window regulator assembly.



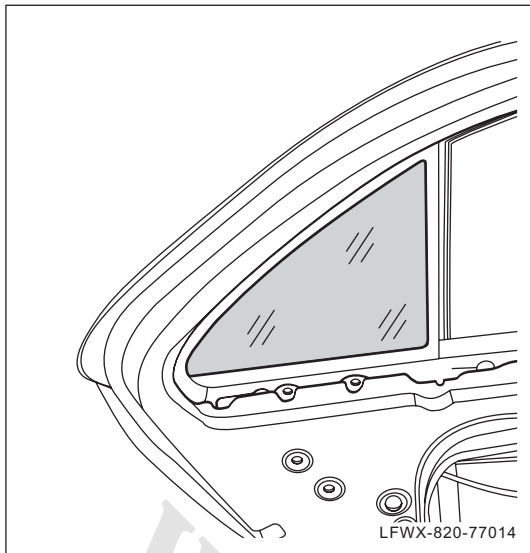
## 2. Install rear power window

- (a) Install window lifter assembly onto mounting position, and install and tighten fixing bolt.

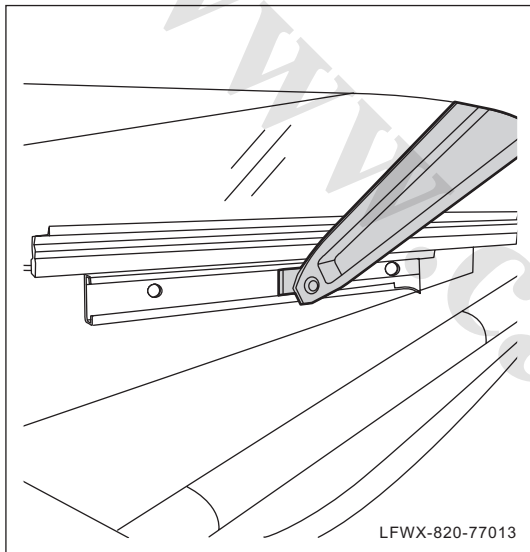
**Torque: 10N•m-12N•m**



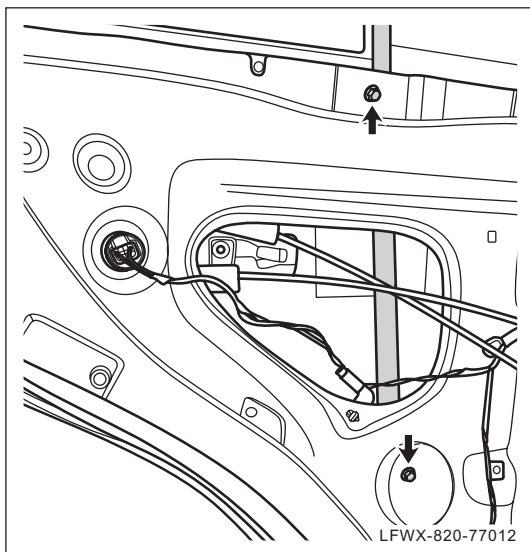
- (b). Connect window regulator motor wire harness connector.



- (c). Install quarter glass seal of rear door and rear door quarter glass.
- (d). Place glass guide rail to mounting position.



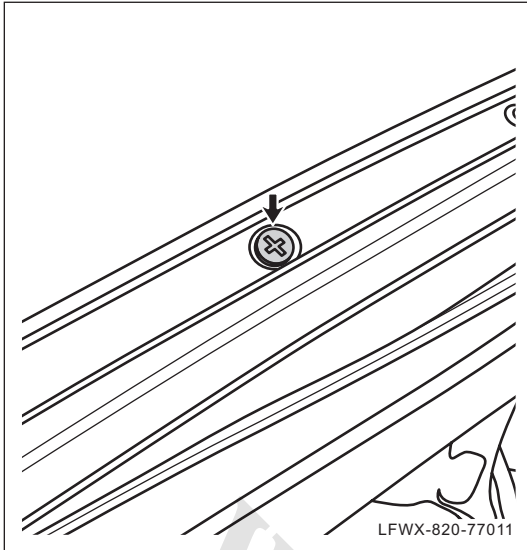
- (e). Rotate the glass, and install window lifter sliding block into glass sliding groove.



- (f). Install and tighten lower fixing bolt of glass run rail.

**Torque: 10N•m-12N•m**



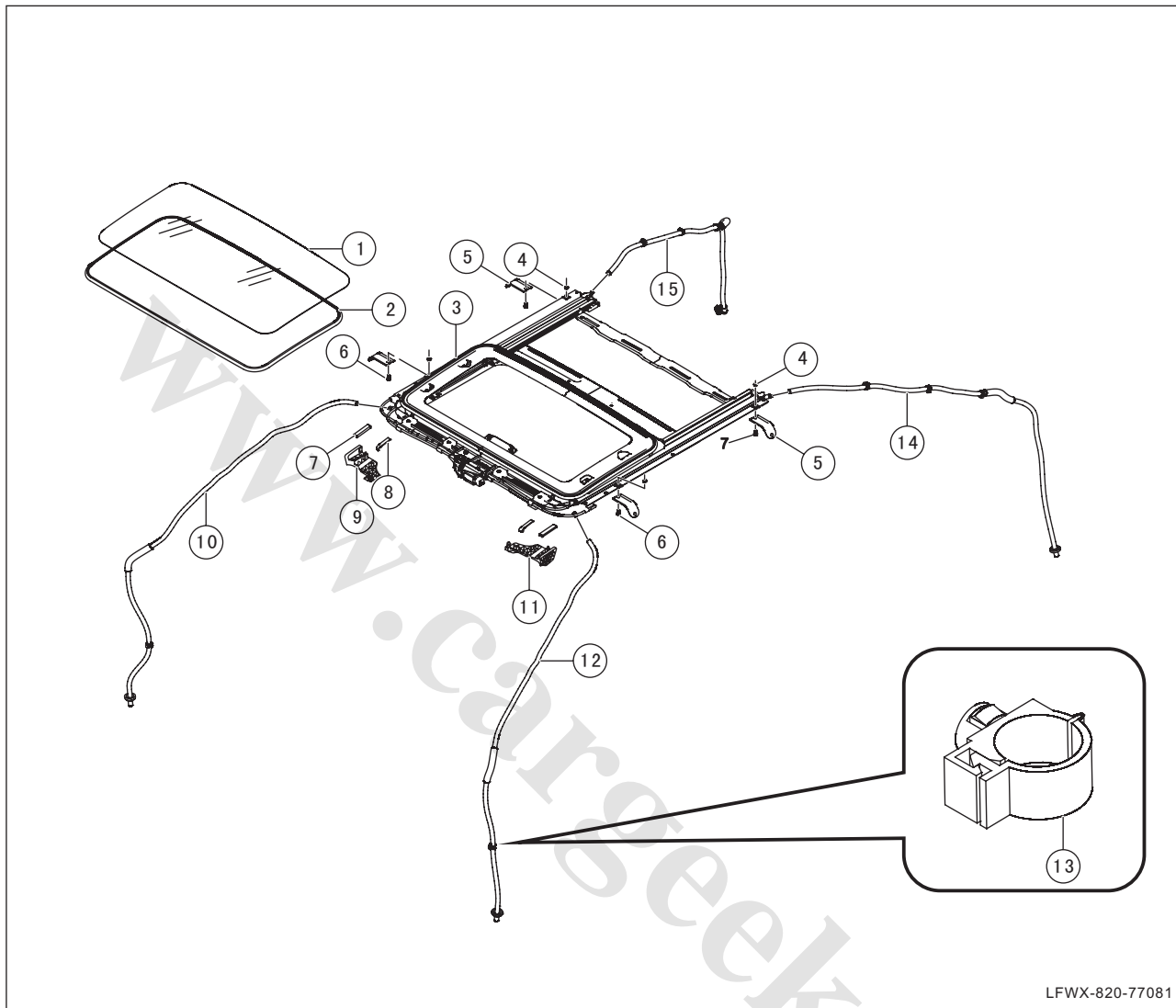


- (g) Install and tighten upper fixing screw of door run rail.

- (h). Install rear door rain-proof curtain.
- (i). Install the rear door trim panel. (See 81 - Interiors and Exteriors, Rear Door Trim Panel, Replacement)

# Sunroof Assembly

## Components



LFWX-820-77081

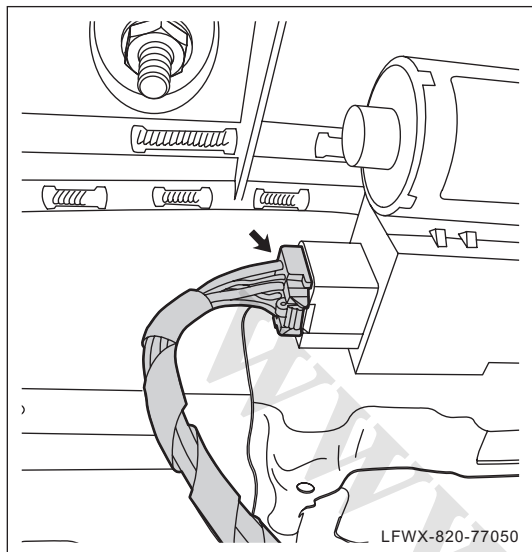
1	Sunroof glass
2	Glass sealing strip
3	Sunroof
4	Nut
5	Bracket
6	Bolt
7	Sponge block
8	Sponge block

9	Sunroof trim panel
10	Front right drainage pipe of sunroof
11	Sunroof trim panel
12	Front left drainage pipe of sunroof
13	Clamps
14	Rear left drainage pipe of sunroof
15	Rear right drainage pipe of sunroof

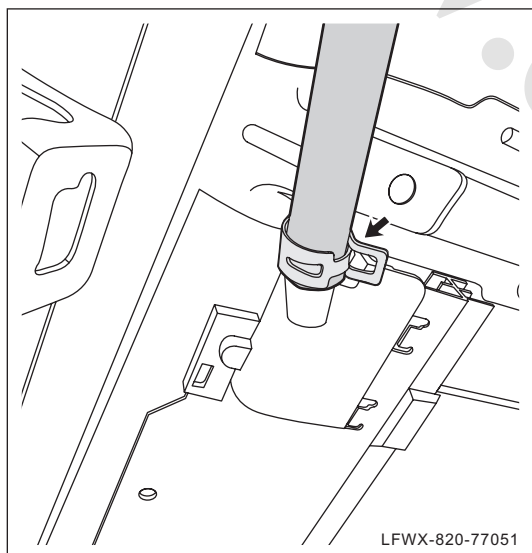
## Replacement

### 1. Remove sunroof assembly

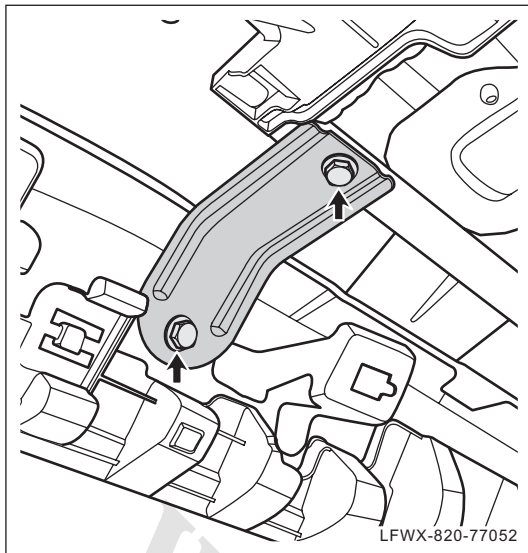
(a) Remove the roof. (See 81 – Interiors and Exteriors Roof, Replacement)



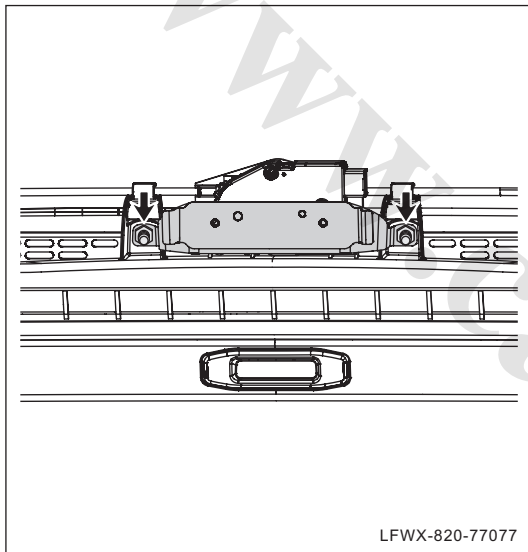
(b) Disconnect wire harness connector of sunroof motor.



(c) Remove the fixing clamps of sunroof front and rear drain pipes and pull off the drain pipes.

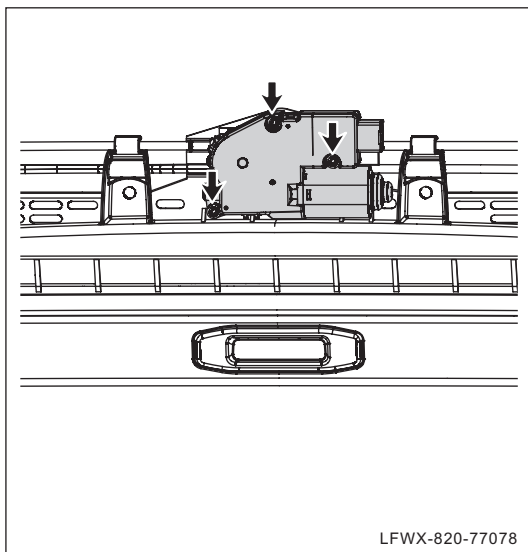


- (d) Remove fixing bolt of sunroof bracket, and remove sunroof.



- (e) Remove fixing nut of mounting bracket of front ceiling light, and remove mounting bracket of front ceiling light.

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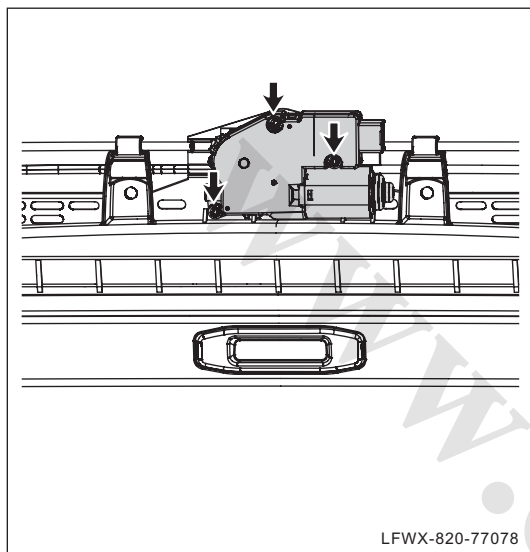
- (f). Remove the fixing screws of the sunroof motor. Remove the sunroof motor assembly.

## 2. Remove sunroof glass

- (a). Open the sunroof sunvisor by sliding.
- (b). Remove the fixing screws of the sunroof glass. Remove the sunroof glass.

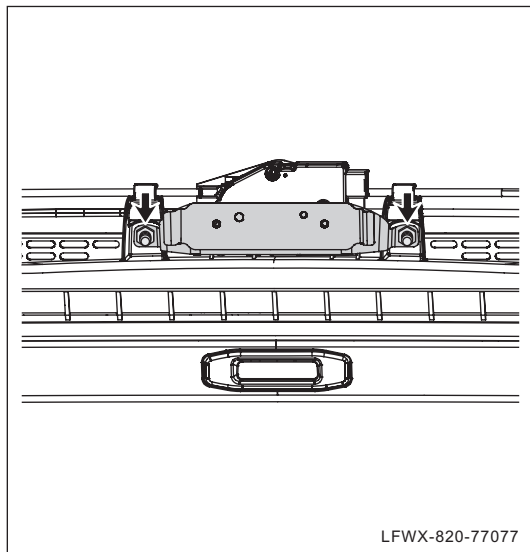
## 3. Install sunroof glass

- (a). Install the sunroof glass in the sunroof slide way and install the fixing screws and tighten them.

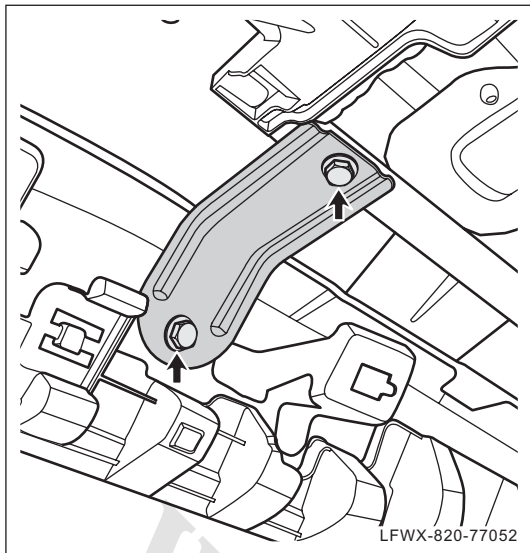


## 4. Install sunroof assembly

- (a) Install sunroof motor onto mounting position, and install and tighten fixing screw.

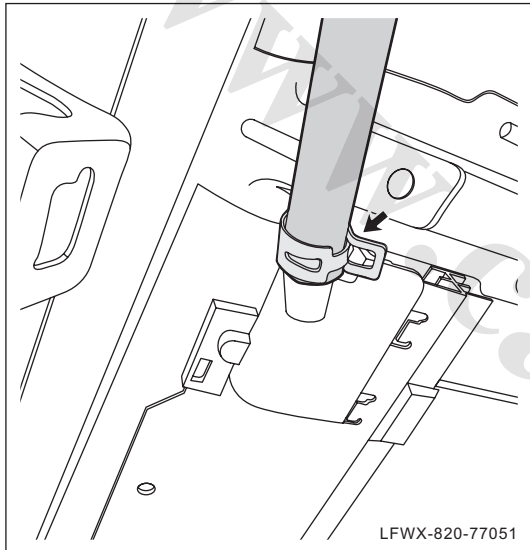


- (b) Install mounting bracket of front ceiling light onto mounting position, and install and tighten fixing nut.

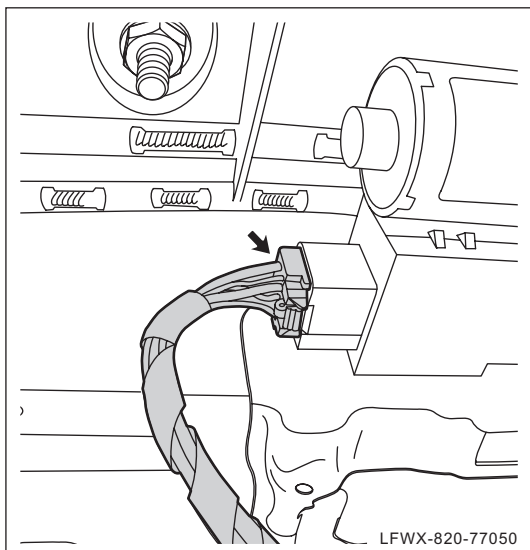


- (c) Install sunroof assembly onto mounting position, and install and tighten fixing bolt of sunroof bracket.

**Torque: 10N•m-12N•m**



- (d) Install front and rear water pipe and clip onto their mounting positions.



- (e) Connect wire harness connector of sunroof motor.

- (f) Install the roof. (See 81 – Interiors and Exteriors Roof, Replacement)

## Windshield Glass

### Replacement

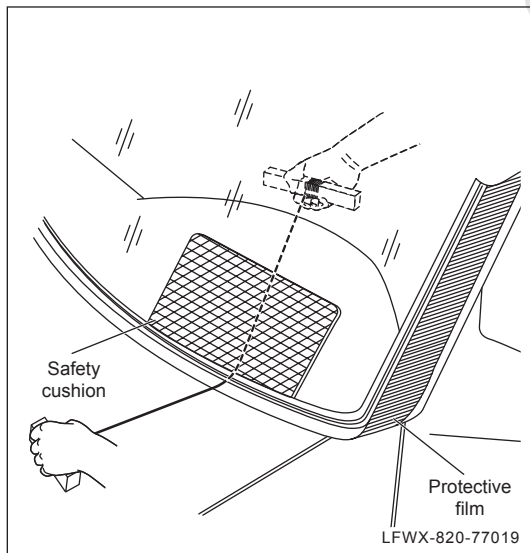
#### 1. Remove the windshield glass

- (a). Remove A pillar upper trim panel (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)
- (b). Remove the interior rearview mirror.
- (c). Remove windshield cover plate (See 81 – Interiors and Exteriors Windshield Cover Plate, Replacement)
- (d). Cover defroster port.

#### ⓘ Note:

**If glass fragment falls into defroster port, it may be blown into passenger room when the defroster works. As a result, it may hurt passengers. Therefore, it is necessary to cover defroster port to prevent glass fragment from going into the outlet.**

- (e). Remove front windshield sealing strip.
- (f). Make an awl to pass through front windshield glass sealant.



- (g). Insert the thin steel wire through the gap between vehicle body and windshield glass, and tie wood blocks or similar objects on both ends of thin steel wire used as handle.
- (h). Pull thin steel wire along the glass edge to cut off windshield glass sealant.

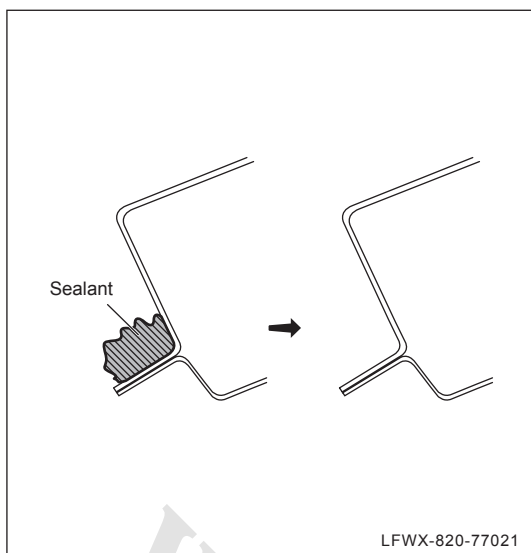
#### △ HINT:

- It is difficult for a single person to complete it. An assistant is required.
- Before pulling thin steel wire, it is necessary to attach protective film on the body surface around windshield glass. At the same time, safety pad is placed on the dashboard to prevent body surface and dashboard from being scratched.

- (i). Use a sucker to remove windshield glass.

#### △ HINT:

It is difficult for a single person to complete it. An assistant is required.

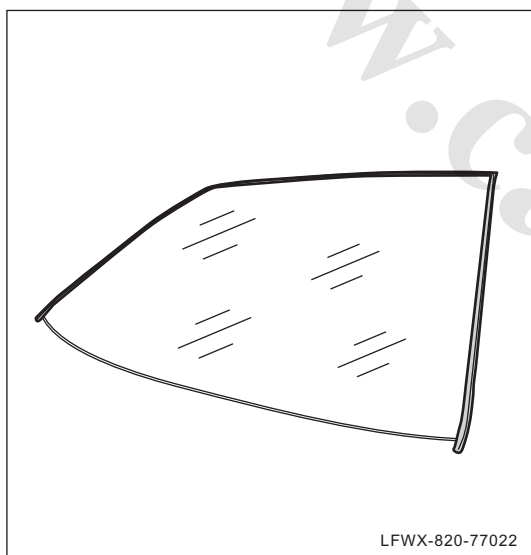


## 2. Install the windshield glass

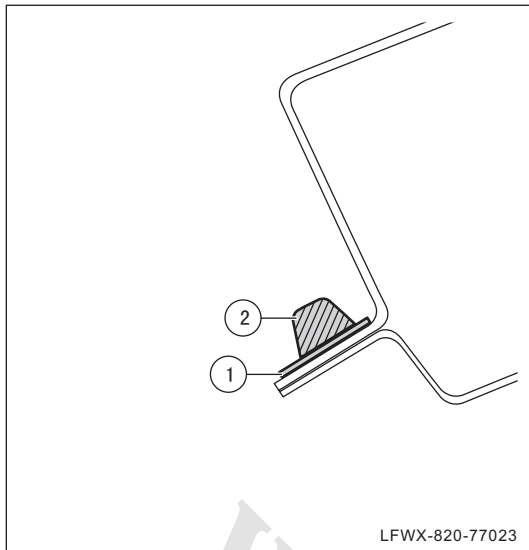
- (a) Use a cutter to shovel adhesive on contact surface between body and front windshield, and use a clean cloth with cleaning agent to clean the contact surface between body and front windshield.
- (b). Control heat gun temperature at 25 ° C, and remove the moisture on the contact surface between the body and windshield glass.

### ⓘ Note:

- Remove the moisture on adhesive surface to keep the adhesive effect.
  - Do not contact the cleaned surface to keep the adhesive effect.
- (c) Install front windshield sealant onto the front windshield glass.







- (d) Paint primer ① on the exposed positions of body and edges of front windshield by using a brush.

△ HINT:

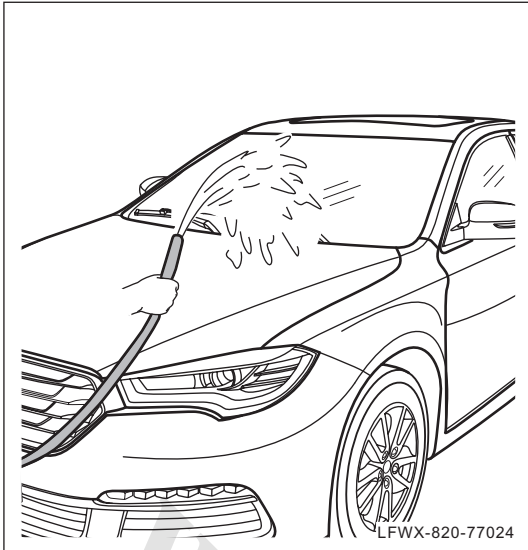
If other areas are applied by priming paint unexpectedly, wipe it off immediately to prevent it from solidifying.

- (e) Apply a layer of adhesive ② on the mounting contact surface of front windshield.

ⓘ Note:

- When using the adhesive, open the doors. The closed doors will increase the pressure inside the vehicle so that influences the adhesive effect.
- Install the windshield glass on vehicle within 10min. Otherwise, adhesive capacity of glass adhesive will be influenced.

- (f) Install front windshield onto mounting position by using a suction cup.
- (g). Press along the edge of windshield glass slightly to make sure windshield glass is installed properly without clearance.
- (h) Install windshield cover plate (See 81 – Interiors and Exteriors Windshield Cover Plate, Replacement)
- (i). Install the interior rearview mirror.
- (j). Install A pillar upper trim panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)



### 3. Rainfall test

① **Note:**

After windshield glass is installed, do not make rainfall test at once. It is necessary to wait for 3 - 4h (room temperature 20° C).

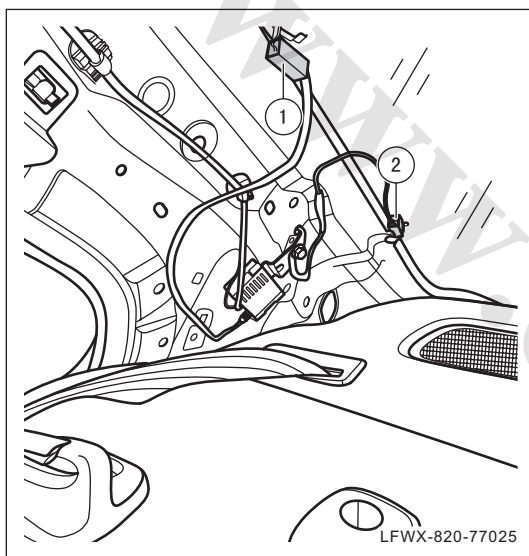
- (a). Make rainfall test, and then seal leaking positions by sealant.

## Rear Windshield

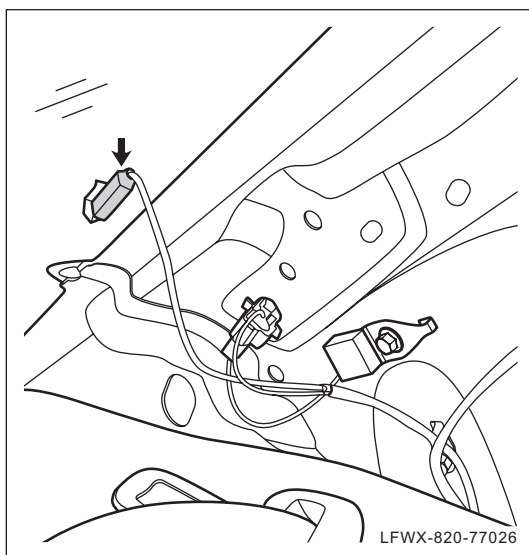
### Replacement

#### 1. Remove rear windshield

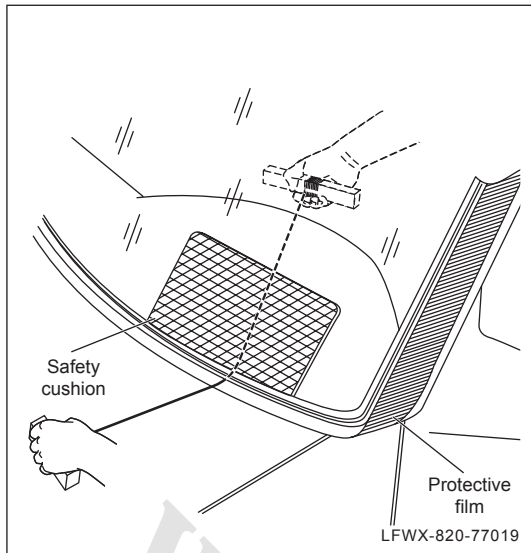
- (a) Remove C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)
- (b) Remove rear shelf panel. (See 81 –Interiors and Exteriors Rear Shelf Panel, Replacement)
- (c) Remove high-mounted brake lamp. (See 75 –Lighting System – High-mounted Brake Lamp, Replacement)



- (d) Disconnect wire harness connector ① of right antenna amplifier and negative connector ② of rear windshield defroster.



- (e) Disconnect positive connector of rear left windshield defroster.



- (f). Insert the thin steel wire through the gap between vehicle body and tail door windshield glass, and tie wood blocks or similar objects can be tied on both ends of thin steel wire used as handle.
- (g) Slide fine wire rope along the edge of glass to cut the sealant of rear windshield.

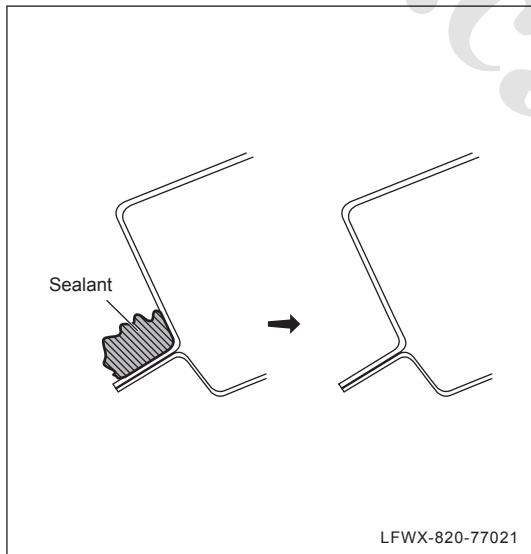
△ HINT:

- It is difficult for a single person to complete it. An assistant is required.
- Before sliding rope, post protective film on the surface of body around the rear windshield.

- (h). Use a sucker to remove rear windshield.

△ HINT:

It is difficult for a single person to complete it. An assistant is required.



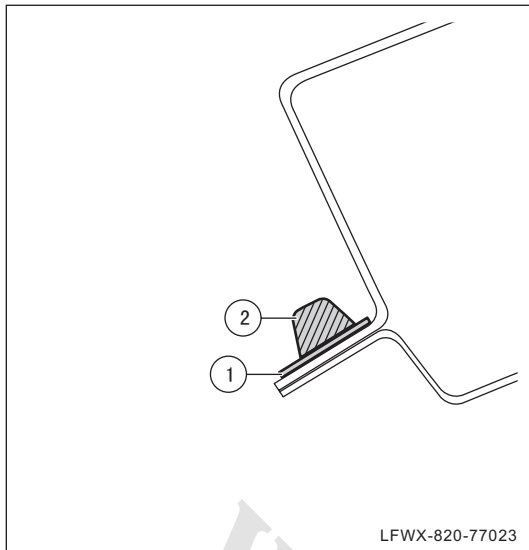
## 2. Install rear windshield

- (a) Use a cutter to shovel adhesive on contact surface between body and rear windshield, and use a clean cloth with cleaning agent to clean the contact surface between body and rear windshield.
- (b). Control heat gun temperature at 25 ° C, and remove the moisture on the contact surface between the body and windshield glass.

ⓘ Note:

- **Remove the moisture on adhesive surface to keep the adhesive effect.**
- **Do not contact the cleaned surface to keep the adhesive effect.**

- (c) Install rear windshield sealing strip onto rear windshield.



- (d) Paint primer ① on the exposed positions of body and edges of rear windshield by using a brush.

△ HINT:

If other areas are applied by priming paint unexpectedly, wipe it off immediately to prevent it from solidifying.

- (e) Apply adhesive on the mounting contact surface of rear windshield.

ⓘ Note:

- **When using the adhesive, open the doors. The closed doors will increase the pressure inside the vehicle so that influences the adhesive effect.**
- **Install the windshield glass on vehicle within 10min. Otherwise, adhesive capacity of glass adhesive will be influenced.**

- (f) Install rear windshield onto mounting position by using a suction cup.
- (g). Press along the edge of rear windshield slightly to make sure rear windshield is installed properly without clearance.
- (h) Install high-mounted brake lamp . (See 75 –Lighting System – High-mounted Brake Lamp, Replacement)
- (i) Install rear shelf panel (See 81 –Interiors and Exteriors Rear Shelf Panel, Replacement)
- (j) Install C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)

### 3. Rainfall test

ⓘ Note:

**After rear windshield is installed, do not make rainfall test at once. It is necessary to wait for 3 - 4h (room temperature 20° C).**

- (a). Make rainfall test, and then seal leaking positions by sealant.

## Rearview Mirror

### System description

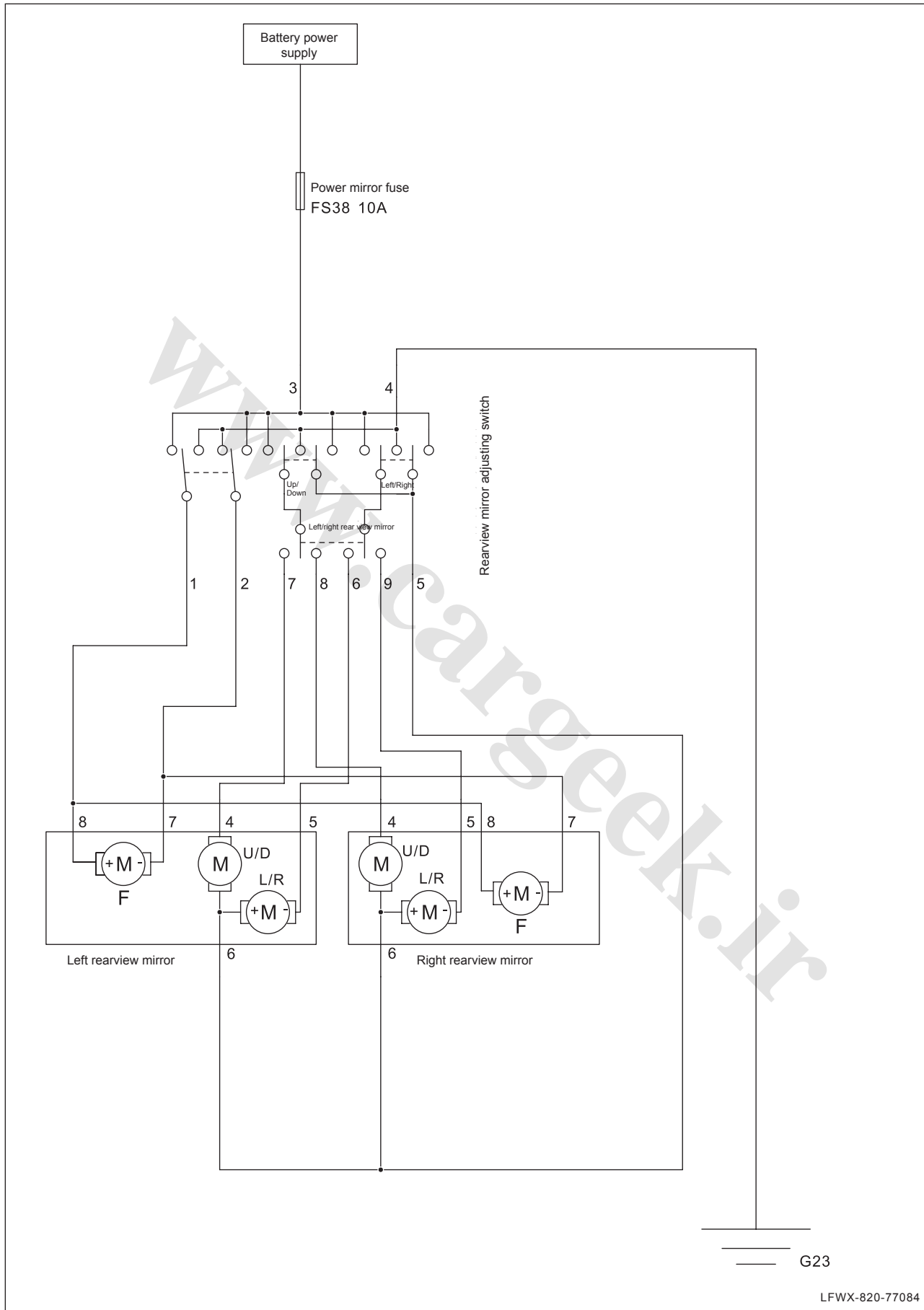
#### 1. Function

For the convenience of drivers, power rearview mirrors have been installed on the vehicle. Drivers can adjust the angle of the left and right rearview mirrors easily through adjusting the regulator switch.

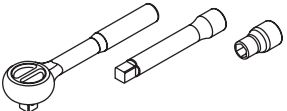
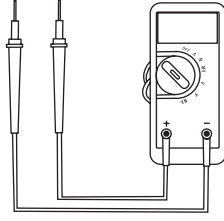
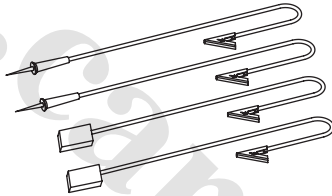
#### 2. Components

The rearview mirror mainly consists of an adjustment switch, a motor, a drive and a actuator, etc.

### 3. Principles (power rearview mirror)



## Preparation

S/N	Tools	Outline diagram	Description
1	Quick wrench, extension rod and sleeve		Remove fixing bolts and nuts
2	Digital multimeter		Used for measuring voltage or resistance.
3	Wiring set		Assist to measure voltage or resistance

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## Service data

### 1. Table of tightening torque

Item	N•m
Fixing nut of power rearview mirror	10~12

## Precautions

### 1. Precautions for maintenance

- (a) If it is required to open the door for removal during maintenance, support the door with a rod.
- (b) Do not use a sharp tool to remove any trim panel or other vulnerable parts.

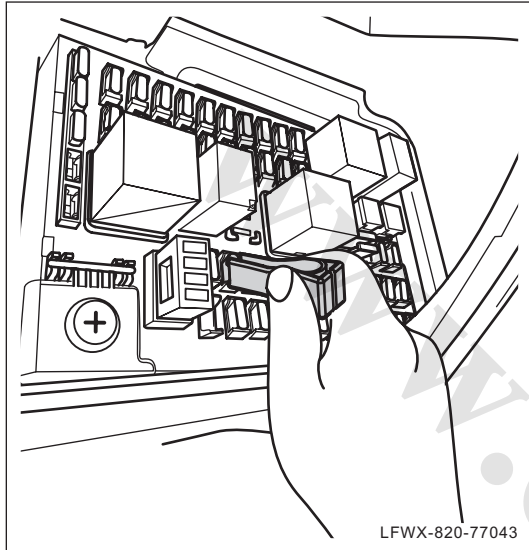


## General Check

### Check the system

#### 1. Check the working condition of power rearview mirror.

- (a) Turn power supply of system to “ACC” position, trigger power rearview mirror switch, and inspect whether power rearview mirror works normally. If no, overhaul it according to the following diagnosis steps.



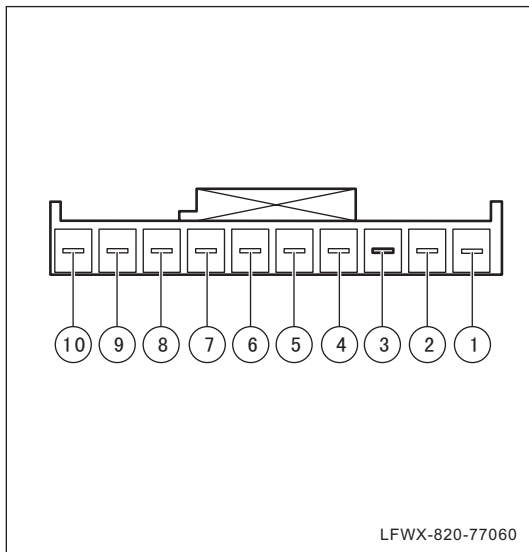
#### 2. Check the fuse

- (a) Check whether fuse FS38 of power rearview mirror is blown. If no, replace fuse with a new one having the same specifications.

△ HINT:

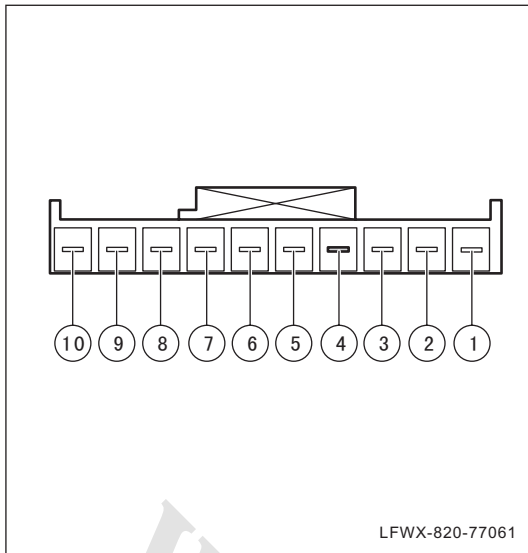
Fuse of power rearview mirror is located in fuse box in driver's cab.

### Check power rearview mirror switch



#### 1. Check power supply cable of power rearview mirror switch.

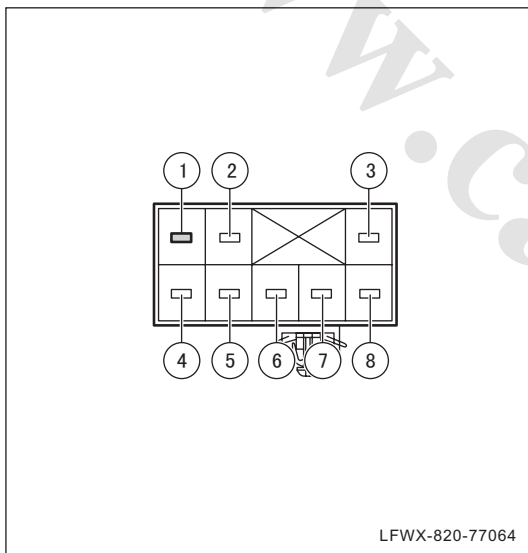
- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of power rearview mirror switch.
- (b) Turn power supply to “ACC” position and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.3 of wire harness connector of power rearview mirror switch and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



**2. Check grounding wire of power rearview mirror switch**

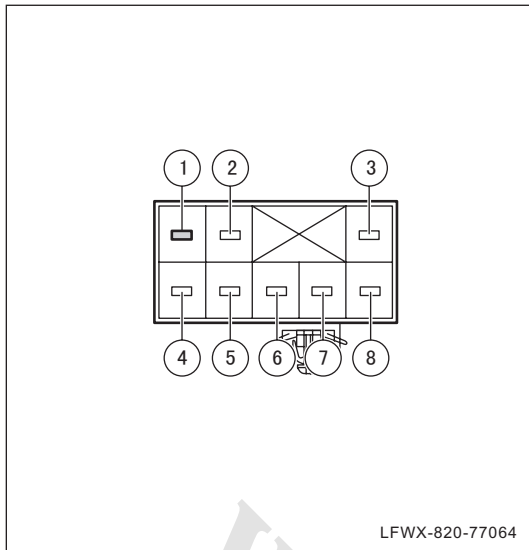
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of power rearview mirror switch.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.4 of wire harness connector of power rearview mirror switch and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

**Check power rearview mirror**



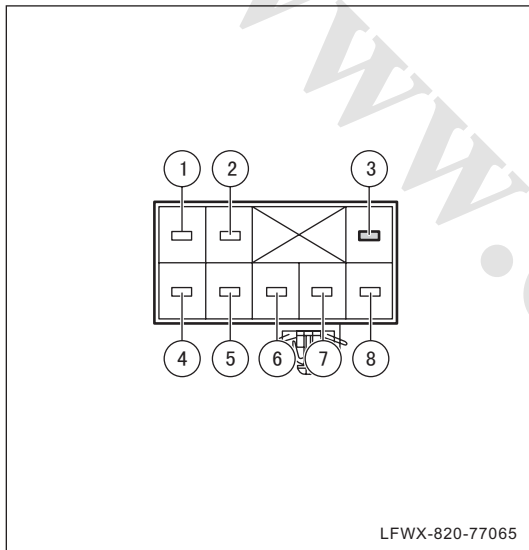
**1. Check power supply cable of left power rearview mirror**

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of left power rearview mirror.
- (b) Turn power supply to "ACC" position and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of wire harness connector of left power rearview mirror and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



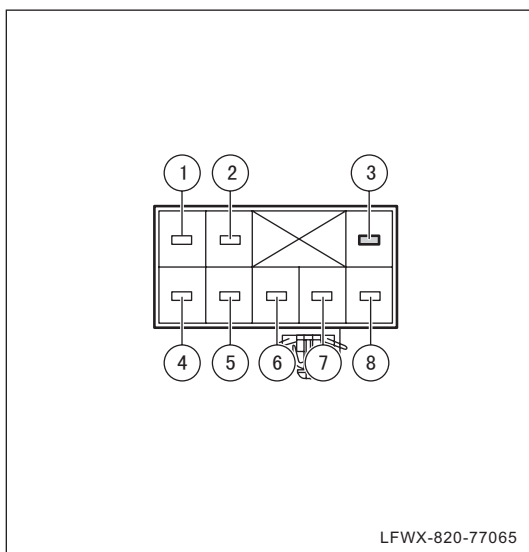
## 2. Check power supply cable of right power rearview mirror

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of right power rearview mirror.
- (b) Turn power supply to "ACC" position and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of wire harness connector of right power rearview mirror and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



## 3. Check grounding wire of left power rearview mirror.

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of left power rearview mirror.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of left power rearview mirror and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

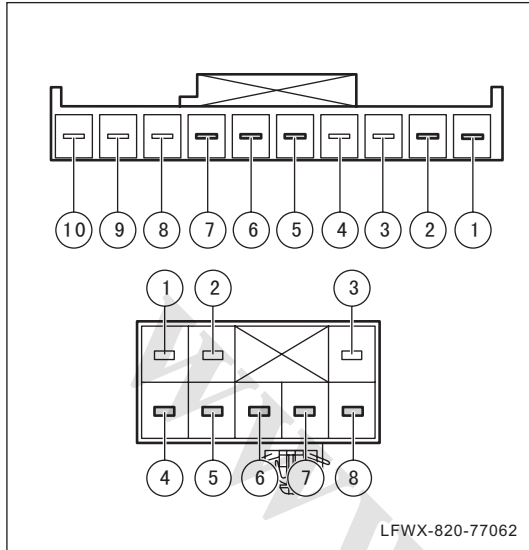


## 4. Check grounding wire of right power rearview mirror

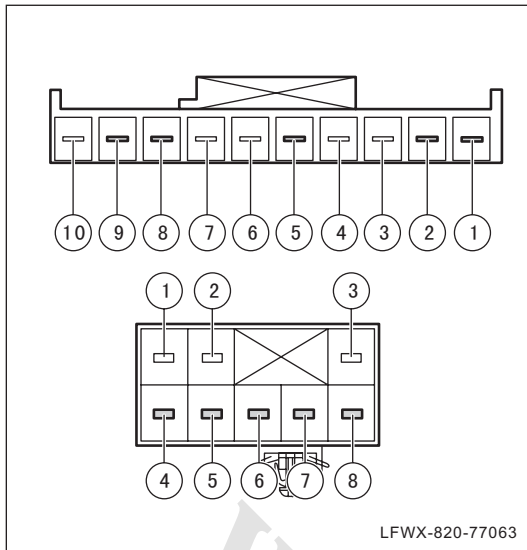
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of right power rearview mirror.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of right power rearview mirror and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## 5. Check signal cable of left power rearview mirror

- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of power rearview mirror switch and wire harness connector of left power rearview mirror.



- (b) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of power rearview mirror switch and terminal No.7 of wire harness connector of left power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of power rearview mirror switch and terminal No.8 of wire harness connector of left power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.7 of wire harness connector of power rearview mirror switch and terminal No.4 of wire harness connector of left power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (e) Use a digital multimeter resistance scale to inspect whether terminal No.6 of wire harness connector of power rearview mirror switch and terminal No.5 of wire harness connector of left power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (f) Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of power rearview mirror switch and terminal No.6 of wire harness connector of left power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.



## 6. Check signal cable of right power rearview mirror

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of power rearview mirror switch and wire harness connector of right power rearview mirror.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.8 of wire harness connector of power rearview mirror switch and terminal No.4 of wire harness connector of right power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (c) Use a digital multimeter resistance scale to inspect whether terminal No.9 of wire harness connector of power rearview mirror switch and terminal No.5 of wire harness connector of right power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (d) Use a digital multimeter resistance scale to inspect whether terminal No.2 of wire harness connector of power rearview mirror switch and terminal No.7 of wire harness connector of right power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (e) Use a digital multimeter resistance scale to inspect whether terminal No.1 of wire harness connector of power rearview mirror switch and terminal No.8 of wire harness connector of right power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.
- (f) Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of power rearview mirror switch and terminal No.6 of wire harness connector of right power rearview mirror are conducted. If no, overhaul relevant wire harness according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Neither of power rearview mirrors on both sides works	1. Fuse (blown)	See 77 – Diagnosis of Rearview Mirror, Fault Diagnosis (1. Neither of power rearview mirrors on both sides works)
	2. Wire harness (short circuit or open circuit)	
	3. Power rearview mirror switch (fault)	
	4. Power rearview mirror (fault)	
Power rearview mirror on one side doesn't work	1. Wire harness (short circuit or open circuit)	See 77 – Diagnosis of Rearview Mirror, Fault Diagnosis (1. Power rearview mirror on one side doesn't work)
	2. Power rearview mirror switch (fault)	
	3. Power rearview mirror (fault)	

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### Fault diagnosis

#### 1. Neither of power rearview mirrors on both sides works

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power rearview mirror (See 77 – General Check of Rearview Mirror, Check of System)	Diagnosis end.	Neither of power rearview mirrors on both sides works	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of power rearview mirror is blown (See 77 – General Check of Rearview Mirror, Check of System)	Go to Step 3	Fuse FS38 is blown	Go to Step 2
2	Check FS38 circuit	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check working condition of FS38 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of power rearview mirror switch is conducted (See 77 – General Check of Rearview Mirror, Check of Power Rearview Mirror Switch)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of power rearview mirror switch is conducted (See 77 – General Check of Rearview Mirror, Check of Power Rearview Mirror Switch)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply wire of power rearview mirror (See 77 – General Check of Rearview Mirror, Check of Power Rearview Mirror)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply wire of power rearview mirror (See 77 – General Check of Rearview Mirror, Check of Power Rearview Mirror)	Go to Step 7	No continuity	Overhaul relevant wire harness according to wiring diagram.
7	Replacement and check	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Replace power rear-view mirror switch with a new one having same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 8
8	Replacement and check	Normal	Faulty	Instruction
	Replace power rear-view mirror with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Power rearview mirror on one side doesn't work

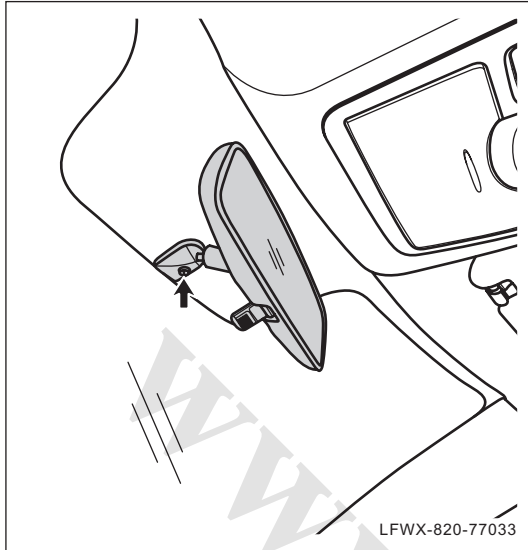
Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check the working condition of power rearview mirror (See 77 – General Check of Rearview Mirror, Check of System)	Diagnosis end.	Power rearview mirror on one side doesn't work	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply wire of power rearview mirror (See 77 – General Check of Rearview Mirror, Check of Power Rearview Mirror)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply wire of power rearview mirror (See 77 – General Check of Rearview Mirror, Check of Power Rearview Mirror)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Replacement and check	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Replace power rear-view mirror switch with a new one having same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Go to Step 4
4	Replacement and check	Normal	Faulty	Instruction
	Replace power rear-view mirror with a new one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Interior Rearview Mirror

### Replacement



1. Remove interior rearview mirror assembly
  - (a). Remove the interior rearview mirror assembly fixing screw and take out the interior rearview mirror assembly.

### 2. Install interior rearview mirror

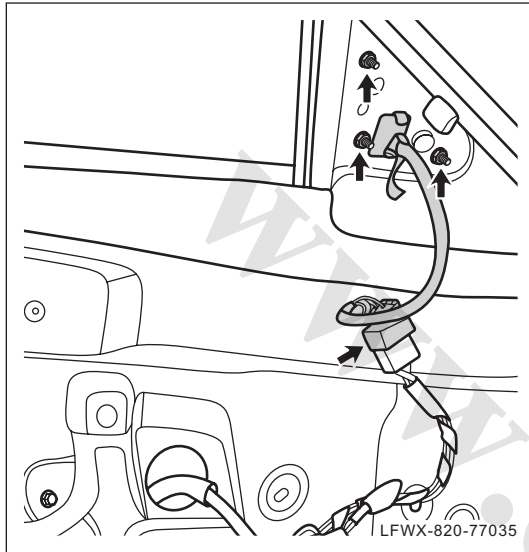
- (a) Install interior rearview mirror assembly onto mounting position, and install and tighten fixing screw.

## Power Rearview Mirror

### Replacement

#### 1. Remove power rearview mirror

- (a) Remove the front door inside guard board. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)



- (b) Disconnect wire harness connector of power rearview mirror.
- (c) Remove fixing nut of power rearview mirror, and remove power rearview mirror.

#### 2. Install power rearview mirror

- (a) Install power rearview mirror onto mounting position, and install and tighten fixing nut.  
**Torque: 10N•m-12N•m**
- (b) Connect wire harness connector of power rearview mirror.
- (c) Install front door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)

#### 3. Inspection

- (a) Check the working condition of power rearview mirror. (See 77 – General Check of Rearview Mirror, Check of System)

## Window Lifter Switch and Exterior Rearview Mirror Switch

△ HINT:

Replacement of front and rear window lifter switch is basically the same. This section will only introduce the replacement of front left door as an example.

### Replacement

△ HINT:

See 78 –Central Door Lock and Immobilizer, Front Door Controller (Front Door Armrest and Window Lifter Switch Assembly), Replacement.

# Horn System

## System description

### 1. Function

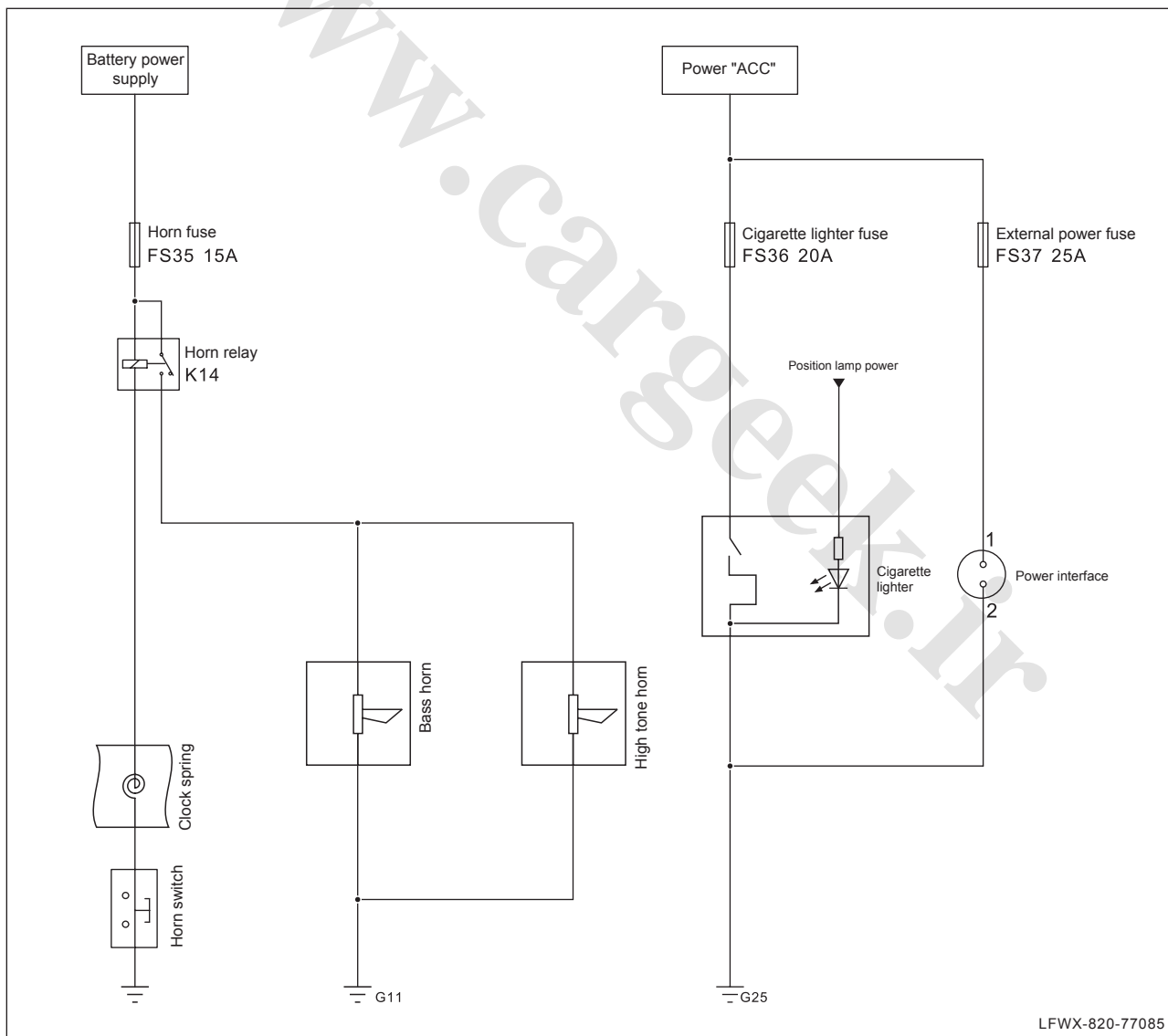
Horn system can remind pedestrians and other vehicles to pay attention to safety to avoid traffic accidents.

### 2. Components

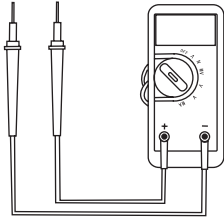
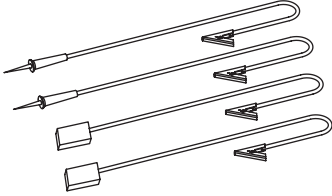
Horn system consists of alt, bass horn, horn switch, relay, fuse, etc.

### 3. Principle

Driver presses the horn switch when necessary, and then horn relay switches on the horn circuit and the horn sounds.



## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance
2	Wiring set		Testing circuits

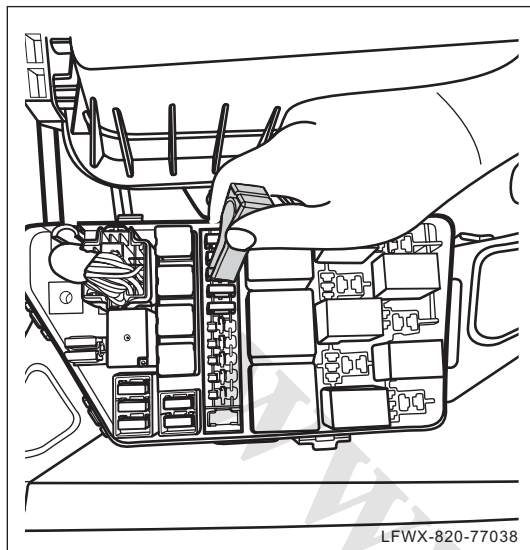
## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolts of alt horn and bass horn	20~25

## General Check

### Check the system

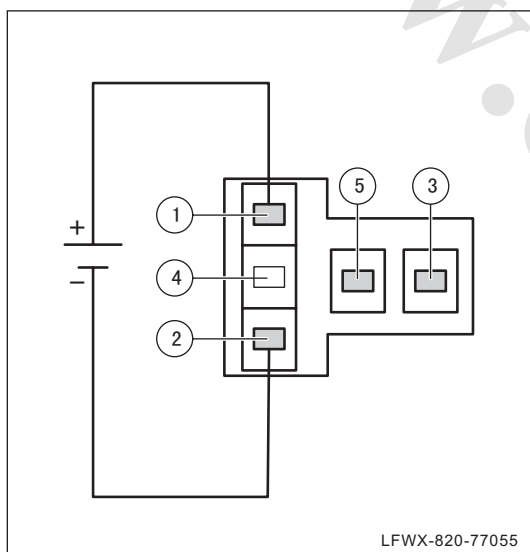


#### 1. Check the fuse

- (a) Check whether fuse FS35 of horn is blown. If yes, replace fuse with a new one having the same specifications.

△ HINT:

Horn fuse is located in fuse box in driver's cab.

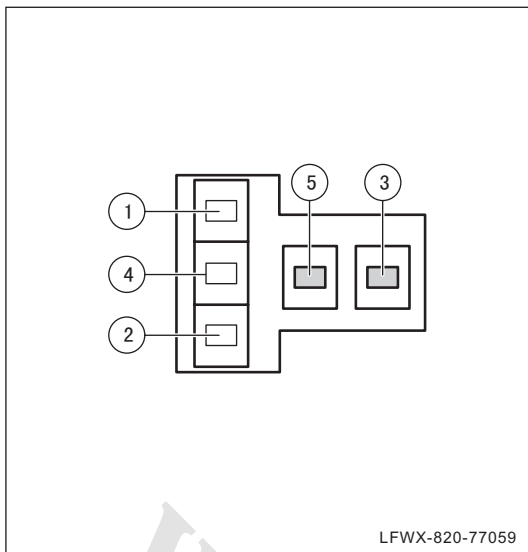


#### 2. Check relay

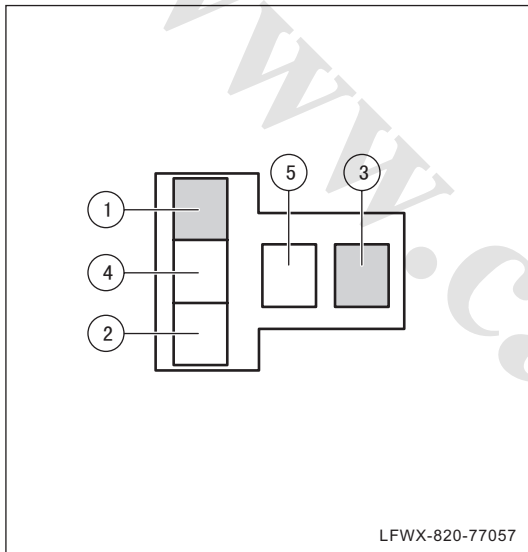
- (a) Unplug horn relay K14, and connect power supply as shown in figure. Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.5 of relay are conducted. If no, replace relay with a new one having the same specifications.

△ HINT:

Horn relay is located in fuse box in driver's cab.



- (a) Unplug horn relay K14, and connect power supply as shown in figure. Use a digital multimeter resistance scale to inspect whether terminal No.3 and No.5 of relay are conducted. If no, replace relay with a new one having the same specifications.



### 3. Check power supply cable of relay

- (a) Unplug horn relay K14, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to circuit book.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of mounting slot of relay and body grounding connection. If the voltage is 0, overhaul relevant wire harness connector according to circuit book.

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## Inspection of function

### 1. Check the working condition of horn system

- (a) Park the vehicle stably, apply the parking brake and open the lower the window glass.
- (b). Click the horn switch and listen the sound from the horn. Symptom: Intermittent beeps.
- (c). Press the horn switch long and listen the sound from the horn. Symptom: Continuous beeps

△ HINT:

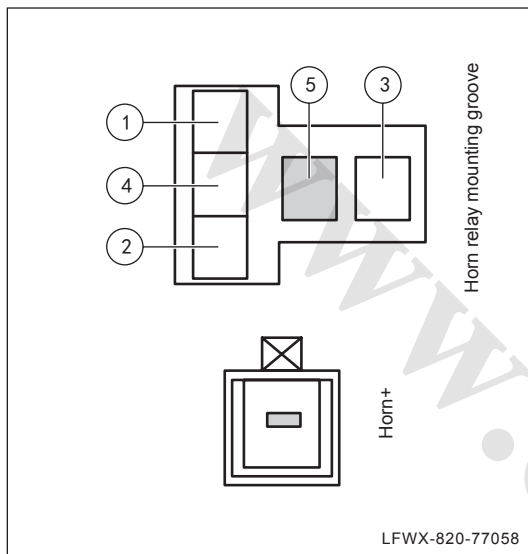
If sound is abnormal, please eliminate this fault according to fault diagnosis steps.



## Check alt and bass horns

### 1. Check the working condition of horn

- (a) Disconnect wire harness connector of horn.
- (b) Use a digital multimeter resistance scale to inspect whether two terminals of horn are conducted. If no, replace horn.
- (c) Exert 12V battery voltage between two terminals of horn. The horn should produce sound. If no, replace horn.



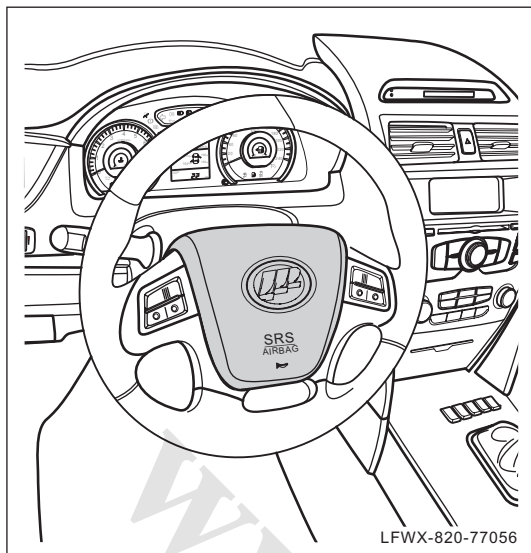
### 2. Check power supply cable of horn

- (a) Disconnect wire harness connector of horn.
- (b) Unplug horn relay.
- (c) Use a digital multimeter resistance scale to inspect whether power supply terminal of wire harness connector of horn and terminal No.5 of mounting slot of relay are connected. If no, overhaul relevant wire harness according to circuit book.

### 3. Check grounding wire of horn

- (a) Disconnect wire harness connector of horn.
- (b) Use a digital multimeter resistance scale to inspect whether grounding wire terminal of wire harness connector of horn and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.

## Horn switch



### 1. Check the working condition of horn switch

- (a) Press horn switch and hold it.
- (b) Slowly release horn switch, and the operator should feel resistance.

#### △ HINT:

The horn switch made of copper plate, which is riveted to the driver airbag is difficult to be corrupted or damaged. If horn switch doesn't take any effect, it may be caused by damage of clock spring. Therefore the inspection of horn mainly lies in inspecting whether clock spring is damaged.

- (c) Check whether the contact point of horn switch has good condition. If no, repair or replace the switch.

#### △ HINT:

If the contact point has dirt, remove the dirt.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Horn does not sound	1. Fuse (blown)	See 77 – Diagnosis of Horn System, Fault Diagnosis 1. Horn does not sound
	2. Relay (damaged)	
	3. Horn switch (fault)	
	4. Clock spring (fault)	
	5. Horn (damaged)	
	6. Wire harness (short circuit or open circuit)	
Horn stays on	1. Relay (damaged)	See 77 – Diagnosis of horn system, fault diagnosis (2. Horn always sounds)
	2. Horn switch (fault)	
	3. Clock spring (fault)	
	4. Wire harness (short circuit)	

### Fault diagnosis

#### 1. Horn does not sound

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Press horn switch for a long time to inspect whether horn produces sound (See 77 –General Check of Horn System, Check of Functions)	Diagnosis end.	Horn does not sound	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether horn fuse is blown (See 77 –General Check of Horn System, Check of System)	Go to Step 3	Fuse FS35 is blown	Go to Step 2
2	Check FS35 circuit	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check working condition of FS35 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check relay	Normal	Faulty	Instruction
	Check whether horn relay is damaged (See 77 –General Check of Horn System, Check of System)	Go to Step 4	Relay (damaged)	Replace the relay with the same specification.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether horn relay is damaged (See 77 –General Check of Horn System, Check of System)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Check Horn Switch	Normal	Faulty	Instruction
	Check whether contact point of horn switch is normal (See 77 –General Check of Horn System, Check of Horn Switch)	Go to Step 6	Horn contact is dirty and bent, etc.	Repair or replace (See 77 – Horn System – Horn Switch, Replacement)
6	Check the clock spring.	Normal	Faulty	Instruction
	Check the working condition of clock spring (See 72 – General Check of SRS, Check of Clock Spring)	Go to Step 7	Clock spring is damaged	Replace (See 72 – SRS – Clock Spring, Replacement)
7	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of horn is conducted (See 77 – General Inspection of Horn System, Check of Alt and Bass Horn)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether grounding wire of horn is conducted (See 77 – General Check of Horn System, Check of Alt and Bass Horns)	Go to Step 9	No continuity	Overhaul relevant wire harness according to wiring diagram.
9	Check horn	Normal	Faulty	Instruction
	Check whether horn is damaged (See 77 – General Check of Horn System, Check of Alt and Bass Horns)	Go to Step 10	Horn is damaged	Replace (See 77 – Horn System – Horn Switch, Replacement)
10	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Horn always sounds

Steps	Inspection item	Inspection result		
1	Check relay	Normal	Faulty	Instruction
	Check whether horn relay is damaged (See 77 –General Check of Horn System, Check of System)	Go to Step 2	Relay (damaged)	Replace the relay with the same specification.
2	Check Horn Switch	Normal	Faulty	Instruction
	Check whether contact point of horn switch is normal (See 77 –General Check of Horn System, Check of Horn Switch)	Go to Step 3	Contact point of horn constantly contacts	Repair or replace (See 77 – Horn System – Horn Switch, Replacement)
3	Check the clock spring.	Normal	Faulty	Instruction
	Check the working condition of clock spring (See 72 – General Check of SRS, Check of Clock Spring)	Go to Step 4	Clock spring is damaged	Replace (See 72 – SRS – Clock Spring, Replacement)
4	Verification and check	Normal	Faulty	Instruction

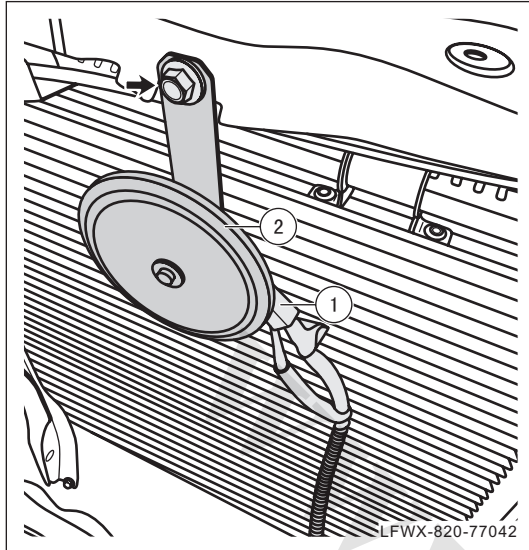


Steps	Inspection item	Inspection result		
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## Compound Horn

### Replacement



#### 1. Remove the alt and bass horn

- (a) Disconnect wire harness connector of horn ① .
- (b) Remove fixing bolt of horn ② , and remove horn ② .

#### 2. Mount the alt and bass horn

- (a) Install horn onto mounting position, and install and tighten fixing bolt.

**Torque: 20N·m - 25N·m**

- (b) Connect wire harness connector of horn.

#### ⓘ Note:

When connecting connector, if it is installed well, a clean “clip” sound is produced.

#### 3. Inspection

- (a) Press horn switch to inspect whether horn works normally. If no, overhaul it.

## Horn Switch

### Replacement

△ HINT:

See 72 - Supplementary Safety Protection Device, Driver Airbag, Replacement

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## Cigarette Lighter

### System description

#### 1. Function

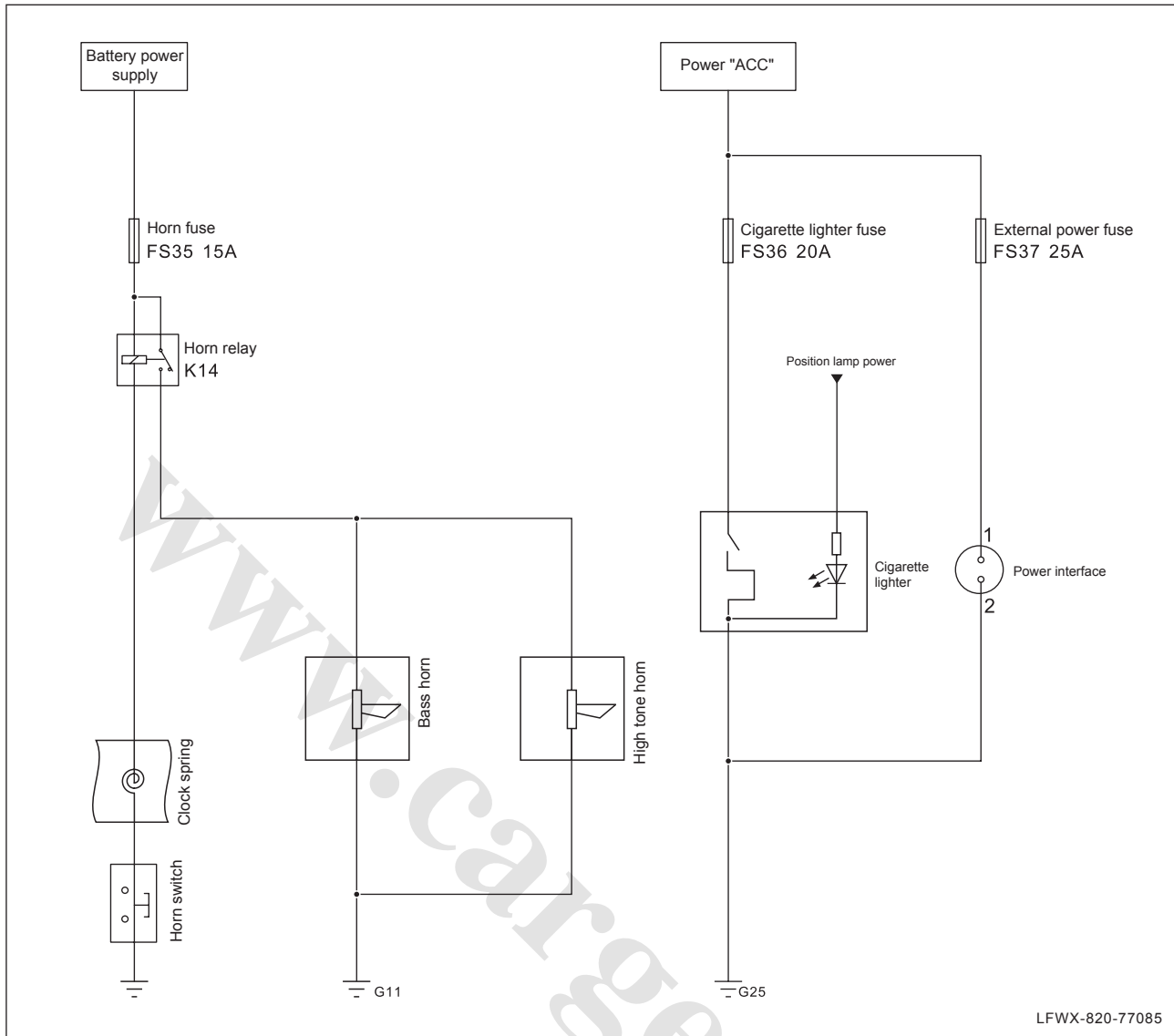
Except for lighting cigarette, auto cigarette lighter can be equipped with a on-board inverter, which can convert the 12V DC to AC power supply of 220V/50Hz for common electric appliance application.

#### 2. Components

Cigarette lighter mainly consists of case, positioning seat, resistance wire, mica, resistance tray, spring, spring cover and knob, etc.

#### 3. Principle

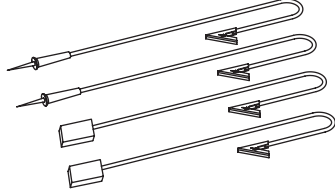
Cigarette lighter is heated through resistance; when the lighter is pressed into, a circle metal and inner wall outside the lighter contact to form a circuit. For the tapered inlet expands with heat and contracts with cold, the cigarette lighter ejects after energization heating.



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### Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measuring voltage and resistance

S/N	Tools	Outline diagram	Description
2	Wiring set		Testing circuits

## Precautions

### 1. Precautions for maintenance

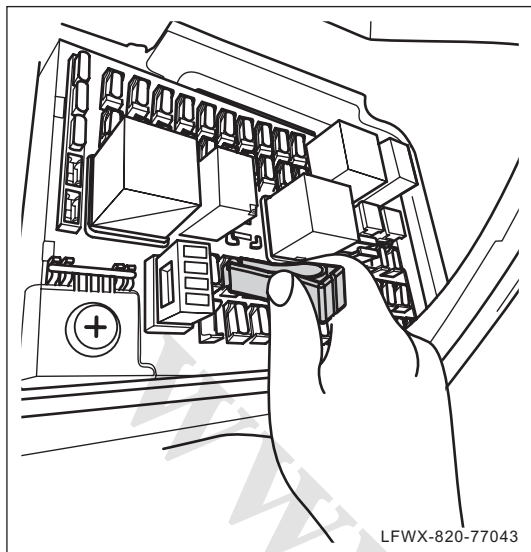
- (a) Power supply voltage of cigarette lighter is 12V which is the same as battery voltage. Cigarette lighter has a separate power supply cable which can't be shared by other circuits. Therefore, it has its own fuse.

### 2. Other precautions

- (a) Correct operation method is to insert and pull out vertically with mounting surface of the cigarette lighter. Do not shake the lighter, otherwise, looseness, short-circuit, fuse blow and external equipment will be caused.
- (b) If the cigarette lighter can not be plugged back to socket, fire may be caused.
- (c) Being used for a long time, repeated pulling out and inserting will cause looseness of snap ring, which makes the lighter not determine position after being depressed and heat the heating elements.
- (d) Repeated pulling out and inserting and unreasonable application will cause short-circuit and damage fuse.

## General Check

### Check the system



#### 1. Check the fuse

- (a) Check whether fuse FS36 of cigarette lighter is blown. If yes, replace fuse with a new one having the same specifications.

△ HINT:

Fuse of cigarette lighter is located in fuse box of driver's cab.

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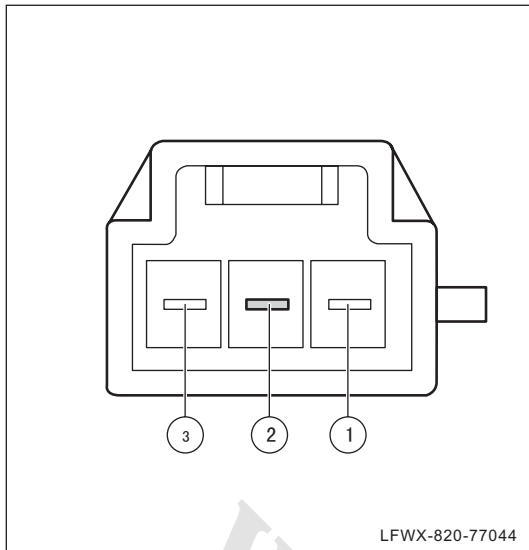
### Inspect cigarette lighter.

#### 1. Check the working condition of cigarette lighter

- (a) Turn power supply to "ACC" position.
- (b) Turn on position lamp, and inspect whether the backlight of cigarette lighter lights up.
- (c) Press cigarette lighter to confirm whether cigarette lighter can be pressed normally and popped up after heating. If no, inspect whether snap ring is damaged.

△ HINT:

If the snap ring of cigarette lighter is damaged, replace cigarette lighter assembly.

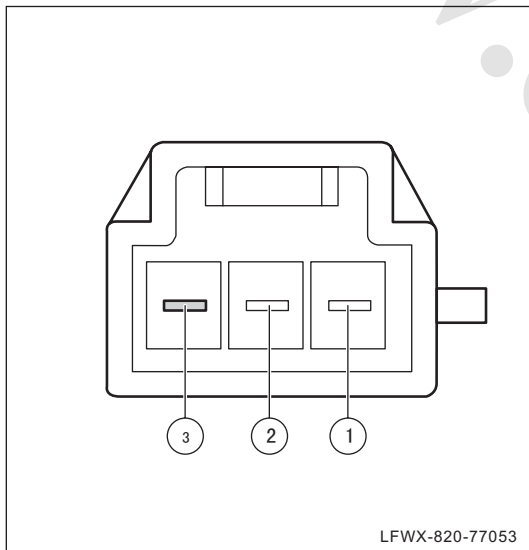


## 2. Check power supply cable of cigarette lighter

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of cigarette lighter.
- (b) Turn power supply to "ACC" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.2 of wire harness connector of cigarette lighter and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

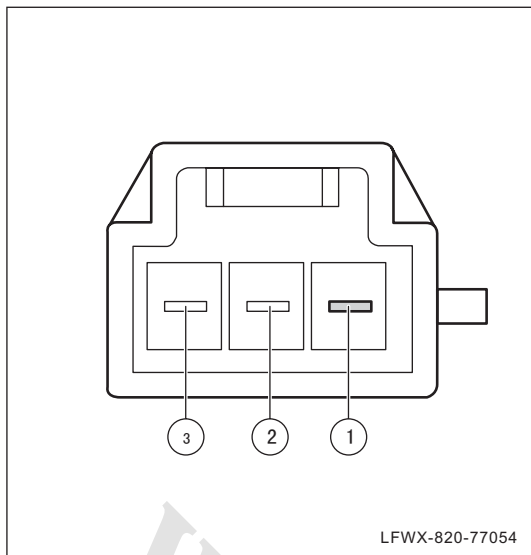
△ HINT:

If the voltage is normal but the cigarette lighter does not operate, just replace the cigarette lighter.



## 3. Check grounding wire of cigarette lighter

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of cigarette lighter.
- (b) Use a digital multimeter resistance scale to inspect whether there is voltage between terminal No.3 of wire harness connector of cigarette lighter and body grounding connection. If no, overhaul relevant wire harness according circuit book.



**4. Check power supply cable of back-ground light of cigarette lighter**

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of cigarette lighter.
- (b) Turn power supply to "ACC" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of wire harness connector of cigarette lighter and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Cigarette lighter does not work	1. Fuse (blown)	See 77 - Cigarette Lighter, Diagnosis, Fault Diagnosis (1. Cigarette lighter does not work)
	2. Wire harness (short circuit or open circuit)	
	3. Cigarette lighter (fault)	
Illuminating lamps of cigarette lighter do not work	1. Wire harness (short circuit or open circuit)	See 77 - Cigarette Lighter, Diagnosis, Fault Diagnosis (2. Background light of cigarette lighter doesn't light up)
	2. Cigarette lighter (fault)	

### Fault diagnosis

#### 1. Cigarette lighter does not work

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether cigarette lighter works normally (See 77 – General Check of Cigarette Lighter, Check of Cigarette Lighter)	Diagnosis end.	Cigarette lighter does not work	Go to Step 1
1	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of cigarette lighter is blown (See 77 – General Check of Cigarette Lighter, Check of System)	Go to Step 3	Fuse FS36 is blown	Go to Step 2
2	Check FS36 circuit	Normal	Faulty	Instruction
	Check working condition of FS36 circuit	Go to Step 3	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
3	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of cigarette lighter is conducted (See 77 – General Check of Cigarette Lighter, Check of Cigarette Lighter)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check the wire harness	Normal	Faulty	Instruction
	Check whether grounding wire of cigarette lighter is conducted (See 77 – General Check of Cigarette Lighter, Check of Cigarette Lighter)	Go to Step 5	No continuity	Overhaul relevant wire harness according to wiring diagram.
5	Replacement and check	Normal	Faulty	Instruction
	Replace cigarette lighter with a new one having the same specifications and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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## 2. Background light of cigarette lighter doesn't light up)

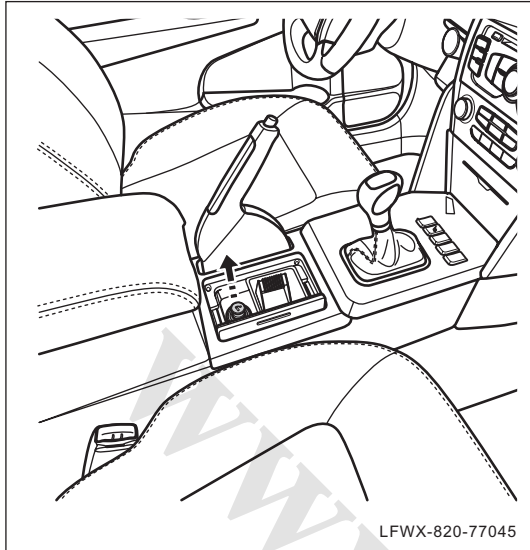
Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Turn on position lamp and inspect whether backlight of cigarette lighter lights up (See 77 – General Check of Cigarette Lighter, Check of Cigarette Lighter)	Diagnosis end.	Backlight doesn't light up.	Go to Step 1
1	Check the wire harness	Normal	Faulty	Instruction



Steps	Inspection item	Inspection result		
	Check whether power supply cable of backlight of cigarette lighter is conducted (See 77 – General Check of Cigarette Lighter, Check of Cigarette Light)	Go to Step 2	No continuity	Overhaul relevant wire harness according to wiring diagram.
2	Replacement and check	Normal	Faulty	Instruction
	Replace cigarette lighter with a new one having the same specifications and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Cigarette Lighter

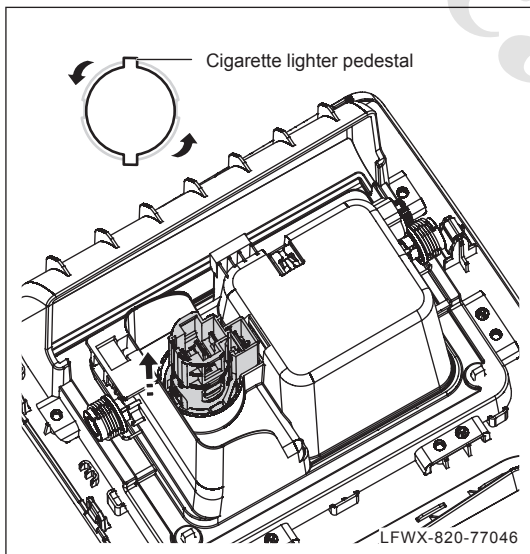
### Replacement



#### 1. Remove the cigarette lighter assembly

- (a) Open cover plate of middle ashtray of console, and remove cigarette lighter.

- (b) Remove parking brake panel of console. (See 84 - Dashboard/Console, Instrument Panel, Replacement)



- (c) Rotate cigarette lighter holder, align claws of cigarette lighter holder with slot of parking brake panel, and remove cigarette lighter holder.

#### **Note:**

**Don't pull out the cigarette lighter forcibly.**

#### 2. Mount the cigarette lighter assembly

- (a) Install cigarette lighter holder onto parking brake panel.
- (b) Install parking brake panel of console. (See 84 - Dashboard/Console, Console, Replacement)
- (c) Open cover plate of middle ashtray of console, and install cigarette lighter.

#### 3. Inspection

- (a) Check the working condition of cigarette lighter.

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## See 78 –Central Door Lock and Immobilizer

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## Central Door Lock and Immobilizer

### System description

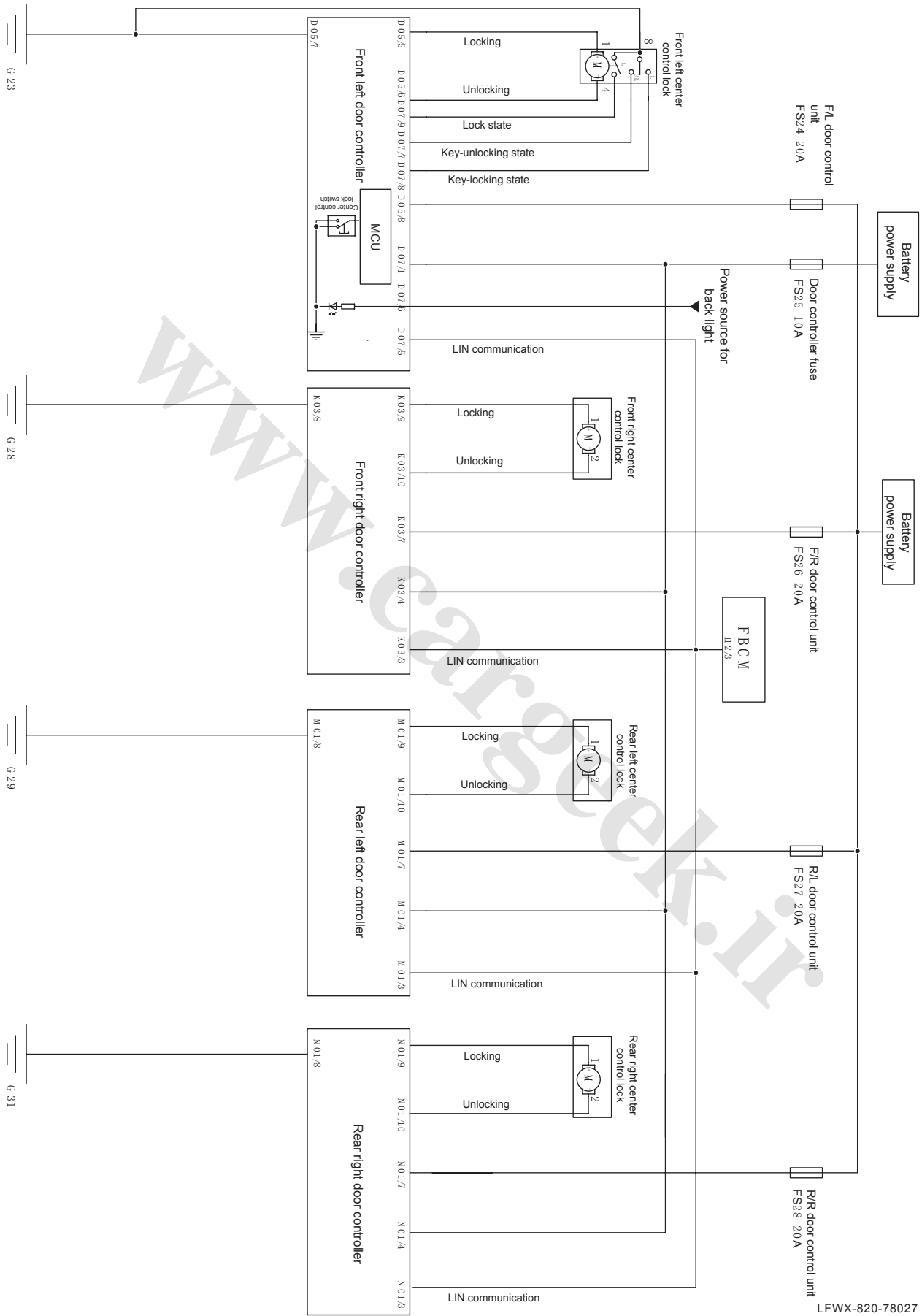
#### 1. Function

Central door lock of the car is also called central controlled door lock. It is designed to provide convenience of use and driving safety. Immobilizer system is designed to send warning when someone forces to open the door, trunk lid or engine hood.

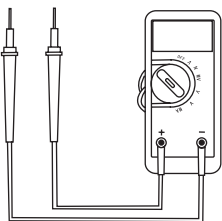
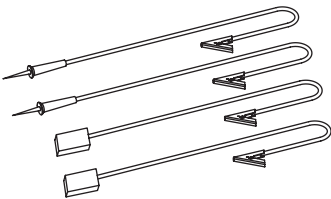
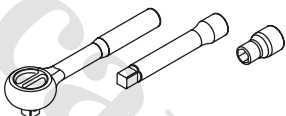
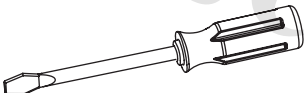
#### 2. Components

Central door lock mainly consists of front door lock, rear door lock, front door controller and rear door controller, etc. Immobilizer system mainly consists of smart key, PEPS control module, front body control module (FBCM), rear body control module (RBCM), front door signal switch, rear door signal switch, engine hood switch, micro-switch of trunk and immobilizer, etc.

### 3. Principle



## Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Measure voltage and resistance
2	Wiring set		Testing circuits
3	Quick wrench		Remove fixing bolt and inspect circuit
4	Screwdriver		Remove the fixing screws

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## Service data

### 1. Table of tightening torque

Item	N•m
Fixing nut of front body control module	8~12
Fixing nut of rear body control module	8~12
Fixing bolt of microswitch of trunk	8~12
Fixing bolt of immobilizer	8~12

78-3



## Precautions

### 1. Precautions before repair

- (a) Whether engine operates or not, as long as the ignition switch is on, never plug any element of system, such as: any battery cables, connectors of system components, etc.

### 2. Precautions for maintenance

- (a) Before dismantling or installing any electric device or electric terminals which are easy to be contacted by tools or equipment, first disconnect negative battery cable to prevent worker being injured or car be damaged.
- (b) When disconnect system part connector, please don't draw any wire harness, to prevent damaging it.

## General Check

### Check the system

#### 1. Check the working condition of system

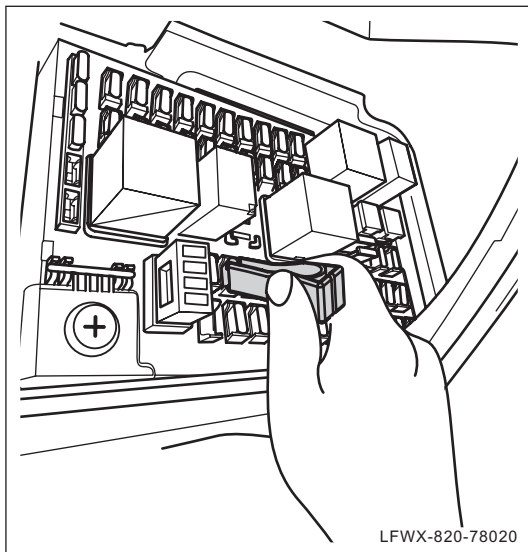
- (a) Check whether mechanical key/ central lock switch can lock all central control doors. If no, overhaul it according to the following diagnosis steps.
- (b) Check whether mechanical key/ central lock switch can unlock all central control doors. If no, overhaul it according to the following diagnosis steps.
- (c) Check whether the start switch on smart key can open trunk. If no, overhaul it according to the following diagnosis steps.

#### 2. Check system components

- (a). Check system for obvious mechanical or electrical damage. If any, repair it.
- (b). Check system for obvious collision and deformation. If any, repair it.
- (c). Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 3. Check wire harness

- (a). Check system wire harness connector for secure and reliable installation. If any, re-install it.
- (b). Check system wire harness for crack or damage. If any, fix it.



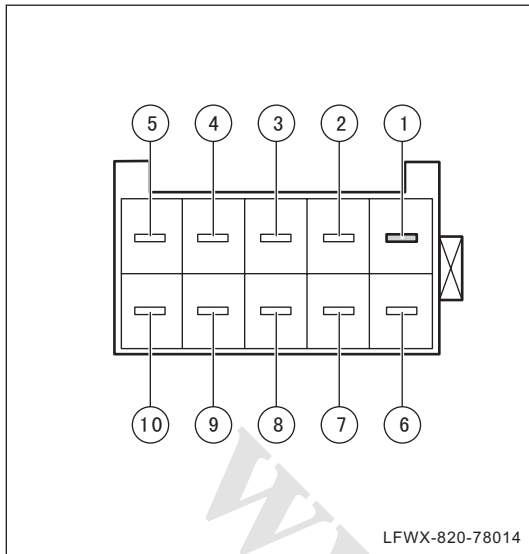
#### 4. Check the fuse

- (a) Check whether fuse FS52 for auto opening of trunk is blown. If yes, replace it with a new one having the same specifications

△ HINT:

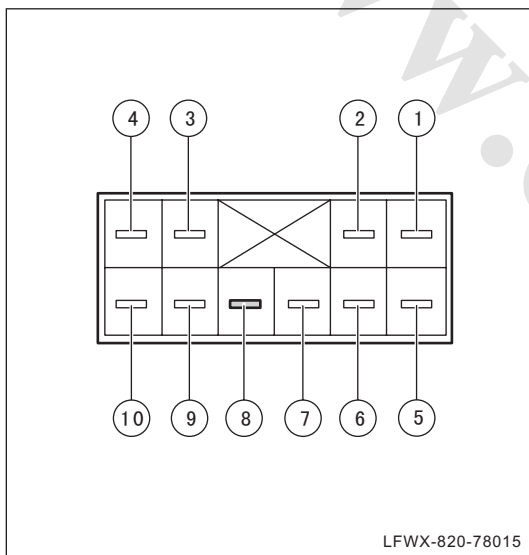
Fuse for auto opening of trunk is located in fuse box in driver's cab.

## Check the front left door controller

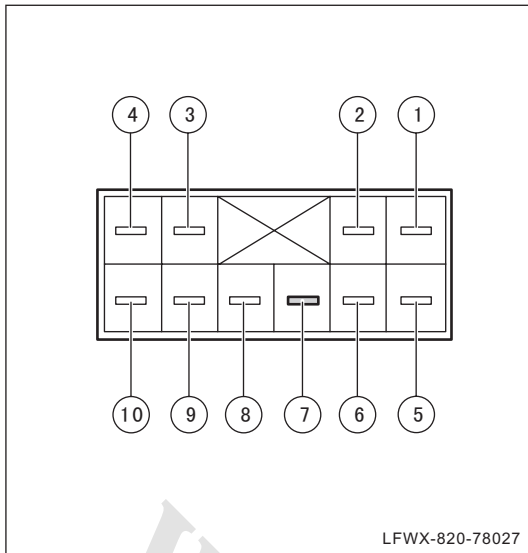


### 1. Check whether power supply cable of front left door controller

- (a) Turn power supply to "LOCK" position and disconnect wire harness connectors of front left door controller 2 and front left door controller 1.
- (b) Turn power supply to "ON" position, and use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.1 of wire harness connector of front left door controller1 and body grounding connection. If voltage is 0, overhaul relevant wire harness according to circuit book.

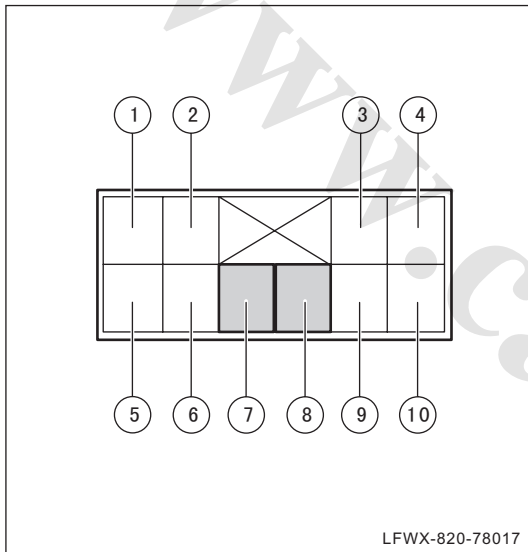


- (c) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.8 of wire harness connector of front left door controller 2 and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



## 2. Check grounding cable of front left door controller

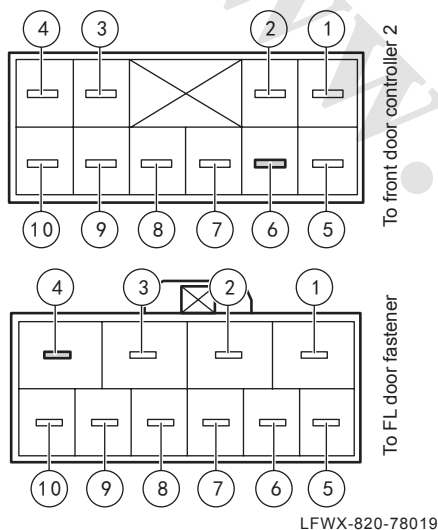
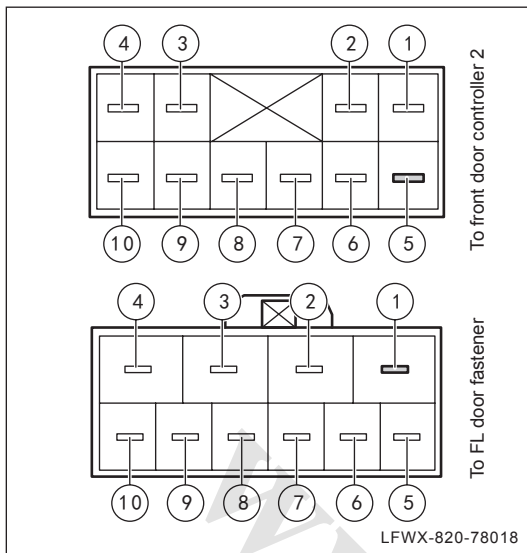
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front left door controller 2.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.7 of wire harness connector of front left door controller 2 and body grounding connection are conducted. If no, overhaul relevant wire harness according to circuit book.



## 3. Check the working condition of front left door controller

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front left door controller 2.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.7 and No.8 of wire harness connector of front left door controller 2 are conducted. If no, overhaul relevant wire harness according to circuit book.

## Check front left door lock



### 1. Check locking signal cable of front left door lock

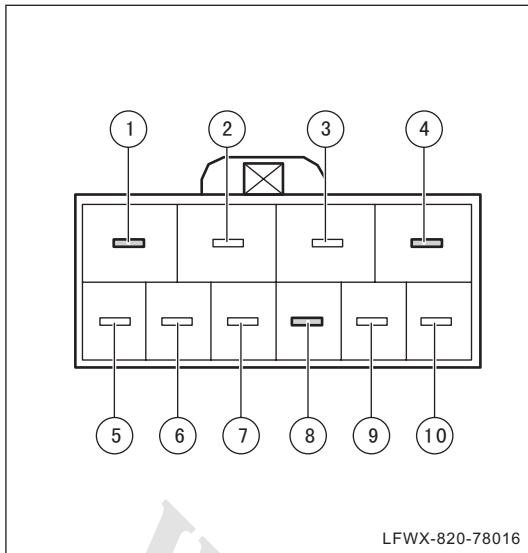
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front left door lock and front left door controller 2.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.5 of wire harness connector of front left door controller 2 and terminal No.1 of wire harness connector of front left door lock. If no, overhaul relevant wire harness according to circuit book.

### 2. Check unlocking signal wire of front left door lock

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of front left door lock and front left door controller 2.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.6 of wire harness connector of front left door controller 2 and terminal No.4 of wire harness connector of front left door lock. If no, overhaul relevant wire harness according to circuit book.

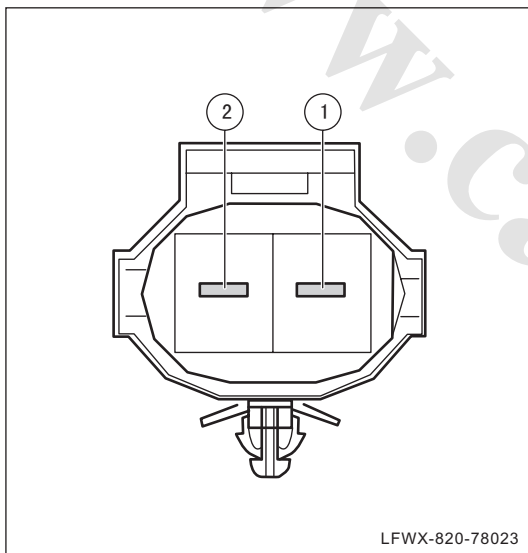
### 3. Check the working condition of front left door lock

- (a) Remove front left door lock. (See 82 – Door/ compartment/ door lock– trunk lid lock, Replacement)



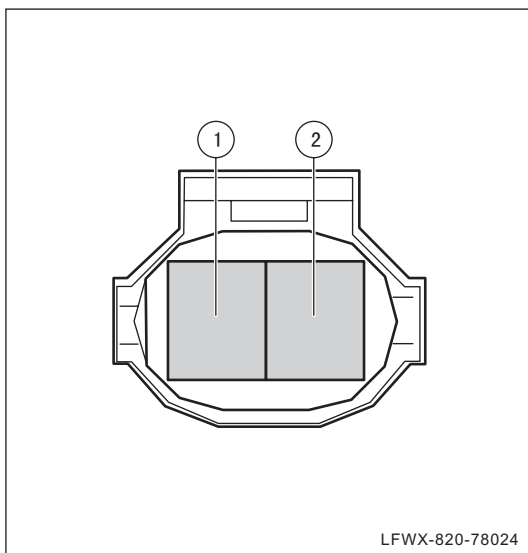
- (b) Simulate locking action of mechanical key and use a digital multimeter resistance scale to inspect whether terminal No.1 and No.8 of front left door lock are conducted. If no, replace front left door lock.
- (c) Simulate locking action of mechanical key and use a digital multimeter resistance scale to inspect whether terminal No.4 and No.8 of front left door lock are conducted. If no, replace front left door lock.

## Check microswitch of trunk



### 1. Check signal cable of microswitch of trunk

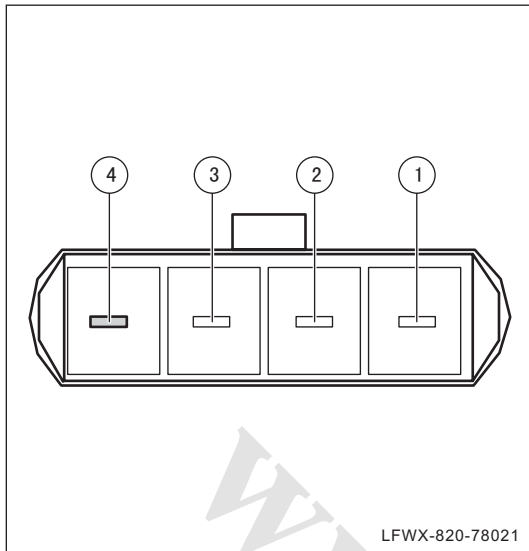
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of microswitch of trunk.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of wire harness connector of microswitch of trunk are conducted. If no, overhaul relevant wire harness according to circuit book.



### 2. Check the working condition of micro-switch of trunk

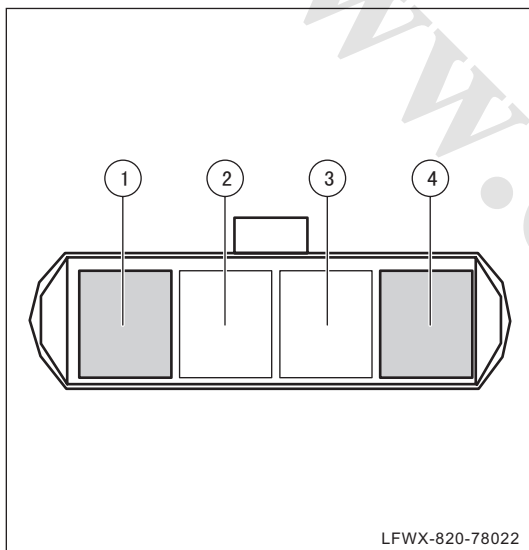
- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of microswitch of trunk.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.2 of microswitch 1 of trunk are conducted. If no, replace microswitch of trunk.

## Check auto opening trunk module



### 1. Check power supply cable of auto opening trunk module

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of auto opening trunk module.
- (b) Use a digital multimeter voltage scale to inspect whether there is voltage between terminal No.9 of wire harness connector of auto opening trunk module and body grounding connection. If the voltage is 0, overhaul relevant wire harness according to circuit book.



### 2. Check the working condition of auto opening trunk module

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of auto opening trunk module.
- (b) Use a digital multimeter resistance scale to inspect whether terminal No.1 and No.4 of auto opening trunk module are conducted. If no, replace microswitch of trunk.

## Check FBCM

### 1. Check power supply cable of FBCM

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of RBCM.
- (b) Turn power supply to "ON" position and use a digital multimeter voltage scale to inspect whether FBCM power supply cable is conducted. If no, overhaul relevant wire harness according to circuit book.

### 2. Check grounding wire of FBCM

- (a) Turn power supply to "LOCK" position and disconnect wire harness connector of FBCM.

- (b) Use a digital multimeter resistance scale to inspect whether FBCM grounding wire is conducted. If no, overhaul relevant wire harness according to circuit book.

## Inspect RBCM.

### 1. Check power supply cable of FBCM

- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of RBCM.
- (b) Turn power supply to “ON” position and use a digital multimeter voltage scale to inspect whether RBCM power supply cable is conducted. If no, overhaul relevant wire harness according to circuit book.

### 2. Check grounding wire of RBCM

- (a) Turn power supply to “LOCK” position and disconnect wire harness connector of RBCM.
- (b) Use a digital multimeter resistance scale to inspect whether RBCM grounding wire is conducted. If no, overhaul relevant wire harness according to circuit book.



## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

Symptom	Suspected area	Recommended action
Mechanical key/ central control lock switch can't lock all central control door locks	1. Wire harness (open circuit)	See 78 – Diagnosis of central door lock and immobilizer, fault diagnosis) (1. Mechanical key/ central control lock switch can't lock all central control door locks)
	2. Front left door lock (fault)	
	3. Front left door controller (fault)	
Mechanical key/ central control lock switch can't unlock all central control door locks	1. Wire harness (open circuit)	See 78 – Diagnosis of central door lock and immobilizer, fault diagnosis) (2. Mechanical key/ central control lock switch can't unlock all central control door locks)
	2. Front left door lock (fault)	
	3. Front left door controller (fault)	
Trunk can't be opened	1. Trunk lid lock (fault)	See 78 – Diagnosis of central door lock and immobilizer, fault diagnosis) (3. Trunk can't be opened)
	2. Fuse (blown)	
	3. Wire harness (open circuit)	
	4. Microswitch of trunk (fault)	
	5. Auto opening trunk module (fault)	
	6. RBCM (faulty)	

### Fault diagnosis

#### 1. Mechanical key/ central control lock switch can't lock all central control door locks

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether mechanical key/ central control lock switch can lock all central control locks (See 78 – General Check of Central Door Lock and Immobilizer, Check of System)	Diagnosis end.	Mechanical key/ central control lock switch can't lock all central control door locks	Go to Step 1
1	Check the working condition when using smart key	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Use smart key to lock all central control locks	Go to Step 2	Smart key can't lock all central control locks.	Confirm whether immobilizer system works normally.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front left door controller is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether locking signal cable of front left door lock is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Inspection of Front Left Door Lock)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check front left door lock	Normal	Faulty	Instruction
	Check the working condition of front left door lock (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Lock)	Go to Step 5	Front left door lock is damaged	Replace front left door lock (See 82 – Door/compartment/ door lock–Front door lock, Replacement)
5	Check the front left door controller	Normal	Faulty	Instruction
	(See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 6	Front left door controller (damaged)	Replace front left door controller (See 78 – General Check of Central Door Lock and Immobilizer, Replacement)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## 2. Mechanical key/ central control lock switch can't unlock all central control door locks

Steps	Inspection item	Inspection result		
		Normal	Faulty	Instruction
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether mechanical key/ central control lock switch can unlock all central control door locks (See 78 – General Check of Central Door Lock and Immobilizer, Check of System)	Diagnosis end.	Mechanical key/ central control door lock switch can't unlock all central control door locks.	Go to Step 1
1	Check the working condition when using smart key	Normal	Faulty	Instruction
	Use smart key to unlock all central control locks	Go to Step 2	Smart key can't unlock all central control locks.	Confirm whether immobilizer system works normally.
2	Check the wire harness	Normal	Faulty	Instruction
	Check whether power supply cable of front left door controller is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 3	No continuity	Overhaul relevant wire harness according to wiring diagram.
3	Check the wire harness	Normal	Faulty	Instruction
	Check whether unlocking signal cable of front left door lock is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Lock)	Go to Step 4	No continuity	Overhaul relevant wire harness according to wiring diagram.
4	Check front left door lock	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition of front left door lock (See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Lock)	Go to Step 5	Front left door lock is damaged	Replace front left door lock (See 82 – Door/ compartment/ door lock–Front door lock, Replacement)
5	Check the front left door controller	Normal	Faulty	Instruction
	(See 78 – General Check of Central Door Lock and Immobilizer, Check of Front Left Door Controller)	Go to Step 6	Front left door controller (damaged)	Replace front left door controller (See 78 – General Check of Central Door Lock and Immobilizer, Replacement)
6	Verification and check	Normal	Faulty	Instruction
	After installing the system again, check whether the fault is eliminated.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

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### 3. Trunk can't be opened

Steps	Inspection item	Inspection result		
0	Preliminary inspection	Normal	Faulty	Instruction
	Check whether trunk can be opened by using the start switch on smart key (See 78 – General Check of Central Door Lock and Immobilizer, Check of System)	Diagnosis end.	Trunk can't be opened	Go to Step 1
1	Check whether trunk can be opened by hands manually.	Normal	Faulty	Instruction
	Check whether trunk can be opened by hands normally.	Go to Step 2	It can't be opened	Replace trunk lid lock (See 82 – Door/ compartment/door lock – Trunk lid lock, Replacement)
2	Check microswitch of trunk	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check the working condition when using smart key to open trunk	Confirm whether immobilizer system works normally.	Trunk can't be opened	Go to Step 3
3	Check fuse	Normal	Faulty	Instruction
	Check whether fuse of auto opening trunk module is blown (See 78 – General Check of Central Door Lock and Immobilizer, Check of System)	Go to Step 5	Fuse FS52 is blown	Go to Step 4
4	Check the FS52 circuit	Normal	Faulty	Instruction
	Check the working condition of FS52	Go to Step 5	The circuit is short	Overhaul wire harness according to circuit book, and replace fuse with a new one having the same specifications.
5	Check the wire harness	Normal	Faulty	Instruction
	Check whether signal cable of microswitch of trunk is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Microswitch of Trunk)	Go to Step 6	No continuity	Overhaul relevant wire harness according to wiring diagram.
6	Check microswitch of trunk	Normal	Faulty	Instruction
	Check the working condition of microswitch of trunk (See 78 – General Check of Central Door Lock and Immobilizer, Check of Microswitch of Trunk)	Go to Step 7	Microswitch of trunk is damaged	Replace (See 78 – Central Door Lock and Immobilizer – Microswitch of Trunk, Replacement)
7	Check the wire harness	Normal	Faulty	Instruction

Steps	Inspection item	Inspection result		
	Check whether power supply cable of auto opening trunk module is conducted (See 78 – General Check of Central Door Lock and Immobilizer, Check of Auto Opening Trunk Module)	Go to Step 8	No continuity	Overhaul relevant wire harness according to wiring diagram.
8	Check auto opening trunk module	Normal	Faulty	Instruction
	Check the working condition of auto opening trunk module (See 78 – General Check of Central Door Lock and Immobilizer, Check of Auto Opening Trunk Module)	Go to Step 9	Auto opening trunk module is damaged	Replace (See 78 – Central Door Lock and Immobilizer – Auto Opening Trunk Module, Replacement)
9	Replacement and check	Normal	Faulty	Instruction
	Replace RBCM with the one having the same specifications, and inspect whether fault disappears.	Diagnosis end.	Fault still exists	Search the cause from other fault symptoms

## Front Door Lock

### Replacement

△ HINT:

See 82 – Door/ Compartment/Door Lock – Front Door Lock, Replacement)

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## Rear Door Lock

### Replacement

△ HINT:

See 82 - Door/Compartment/Door Lock – Rear Door Lock, Replacement)

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## Trunk Lid Lock

### Replacement

△ HINT:

See 82 - Door/ compartment/door lock – Trunk Lid Lock, Replacement)

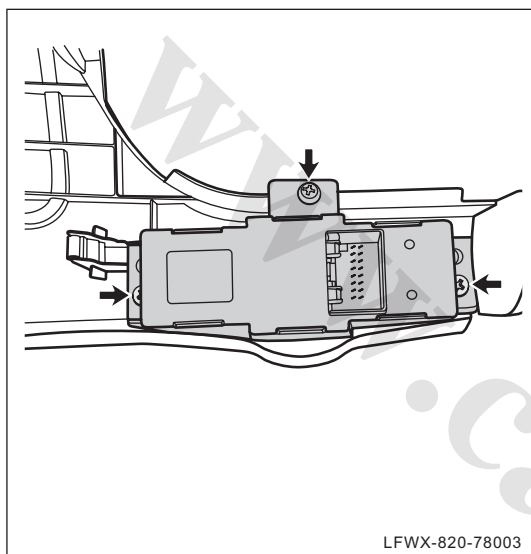
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## Opening Switch of Trunk (Dashboard Switch Components)

### Replacement

#### 1. Remove opening switch of trunk

- (a) Turn power supply to "LOCK" position.
- (b). Remove instrument cluster cowl. (See 84 - Dashboard and Console, Instrument Cluster Cowl, Replacement)



- (c) Remove fixing screw of dashboard switch components, and remove dashboard switch components.

#### 2. Install opening switch of trunk

- (a) Install dashboard switch components onto instrument cluster housing, and install and tighten fixing screw.
- (b). Install instrument cluster cowl. (See 84 - Dashboard and Console, Instrument Cluster Cowl, Replacement)



## Front Door Controller (Front Door Armrest and Window Lifter Switch Assembly)

### Replacement

△ HINT:

See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement

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## Rear Door Controller

### Replacement

△ HINT:

Replacement of rear door controller and right door controller is basically the same. For details, See 78 –Central door lock and immobilizer – front door controller, replacement)

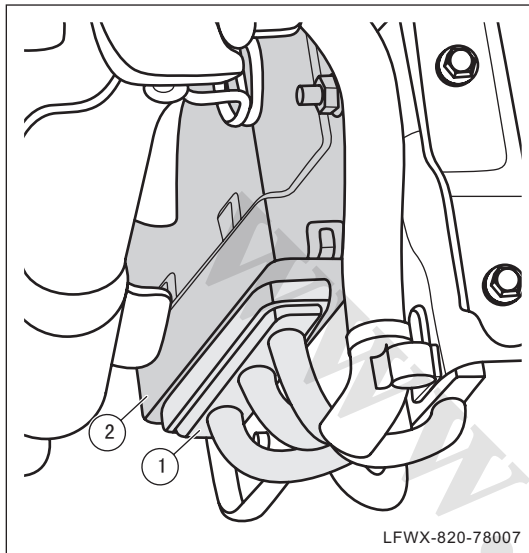
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## Front Body Control Module (FBCM)

### Replacement

#### 1. Remove front body control module

(a). Remove dashboard. (See 84 - Dashboard/Console, Instrument Panel, Replacement)



(b) Disconnect wire harness connector ① of front body control module.

(c) Remove fixing nut ② of front body control module, and remove front body control module ② .

#### 2. Install front body control module

(a) Install front body control module onto mounting position, and install and tighten fixing nut.

**Torque: 8N•m-12N•m**

(b) Connect wire harness connector of front body control module.

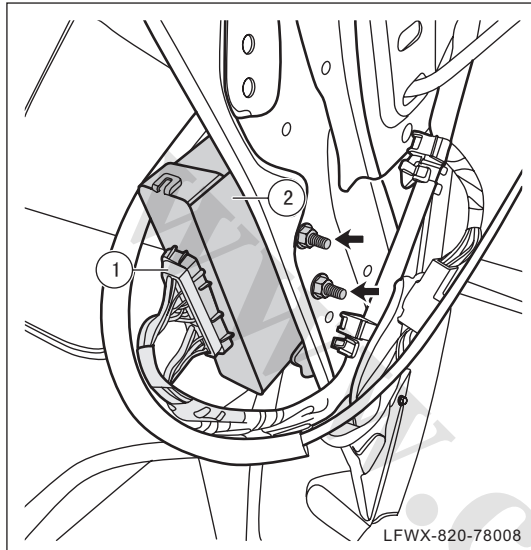
(c). Install dashboard. (See 84 - Dashboard/Console, Instrument Panel, Replacement)

## Rear Body Control Module (RBCM)

### Replacement

#### 1. Remove rear body control module

- (a) Remove trunk left panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)



- (b) Disconnect wire harness connector ① of rear body control module.

- (c) Remove fixing nut of rear body control module ②, and remove rear body control module ②.

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#### 2. Install rear body control module

- (a) Install rear body control module onto mounting position, and install and tighten fixing nut.

**Torque: 8N•m-12N•m**

- (b) Connect wire harness connector of rear body control module.
- (c) Install trunk left panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)

## PEPS Control Module

### Replacement

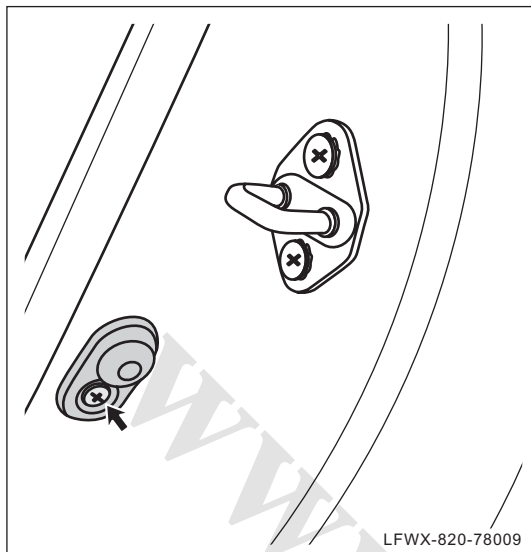
△ HINT:

See 19 – PEPS Button System –PEPS Button of ECU Module, Replacement)

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## Front Door Signal Switch

### Replacement



#### 1. Remove front door signal switch

- (a) Open front door.
- (b) Remove fixing nut of front door signal switch, and take out front door signal switch.
- (c) Disconnect connector of front door signal switch, and remove front door signal switch.

#### 2. Install front door signal switch

- (a) Connect connector of front door signal switch.
- (b) Install front door signal switch onto mounting position, and install and tighten fixing screw.
- (c) Close front door.



## Rear Door Signal Switch

### Replacement

△ HINT:

Replacement of front and rear door signal switches is basically the same. For details, See 78 –Central Door Lock and Immobilizer – Front Door Signal Switch, Replacement)

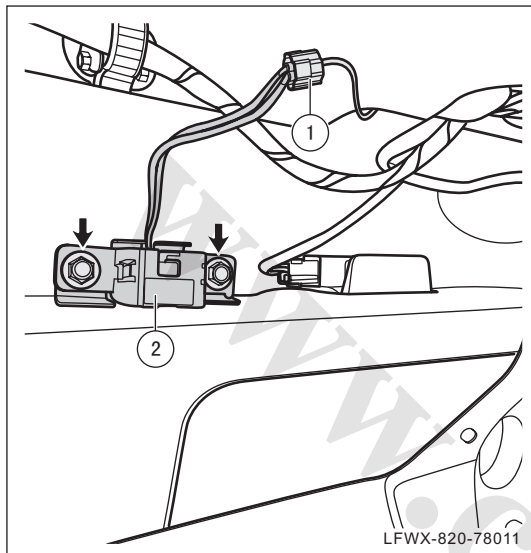
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## Trunk Microswitch

### Replacement

#### 1. Remove microswitch of trunk

- (a) Remove trunk lid panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)



- (b) Disconnect wire harness connector ① of microswitch of trunk.
- (c) Remove fixing bolt of microswitch of trunk, and remove microswitch ② of trunk.

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#### 2. Install microswitch of trunk

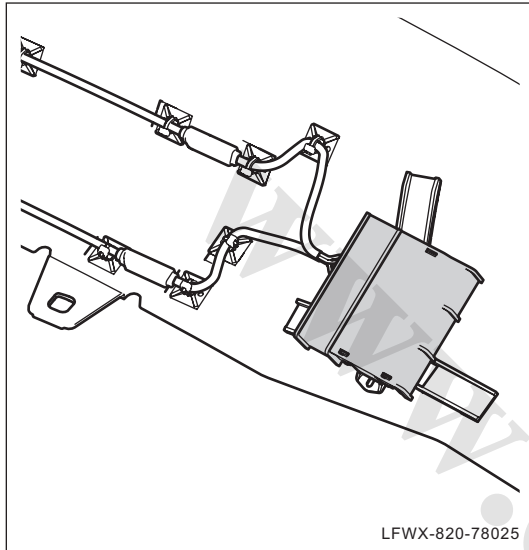
- (a) Install microswitch of trunk onto mounting position, and install and tighten fixing bolt. Torque: 8N•m-12N•m
- (b) Connect wire harness connector of microswitch of trunk.
- (c) Install trunk lid trim panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)

# Auto Opening Trunk Module

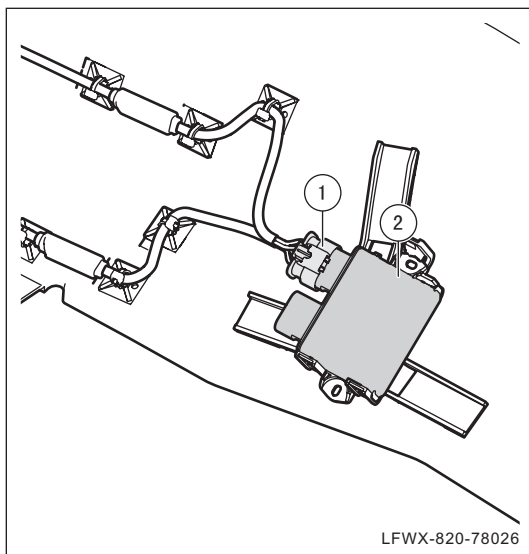
## Replacement

### 1. Remove auto opening trunk module

- (a). Remove the rear bumper. (See 81 - Interiors and Exteriors, Rear Bumper, Replacement).



- (b) Remove housing of auto opening trunk module.



- (c) Disconnect wire harness connector ① of auto opening trunk module.
- (d) Remove auto opening trunk module ② .

### 2. Install auto opening trunk module

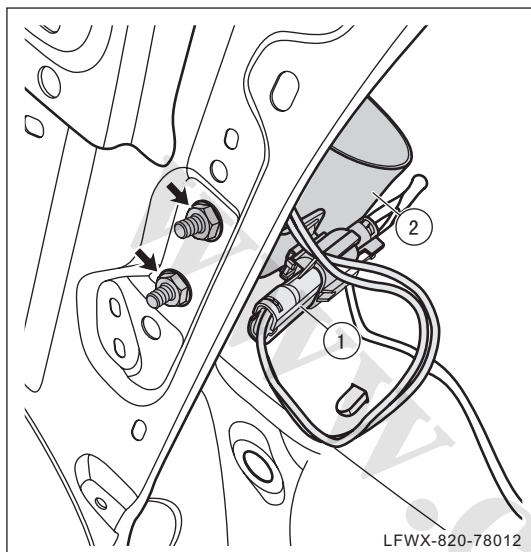
- (a) Install auto opening trunk module onto mounting position.
- (b) Connect wire harness connector of auto start trunk module.
- (c) Install the housing of auto opening trunk module.
- (d). Install rear bumper (See 81 - Interiors and Exteriors, Rear Bumper, Replacement).

## Anti-theft Alarm

### Replacement

#### 1. Remove immobilizer

- (a) Remove right trim panel of trunk. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)



- (b) Disconnect wire harness connector ① of immobilizer.
- (c) Remove fixing nut of immobilizer ② , and remove immobilizer ② .

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#### 2. Install immobilizer

- (a) Install immobilizer onto mounting position, and install and tighten fixing nut.  
**Torque: 8N•m-12N•m**
- (b) Connect wire harness connector of immobilizer.
- (c) Install right trunk panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)



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## 81- Interiors and Exteriors

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## Interiors and Exteriors

### System description

#### 1. Components

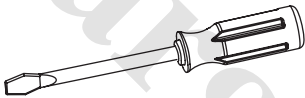
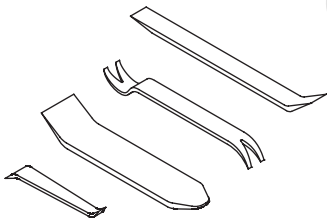
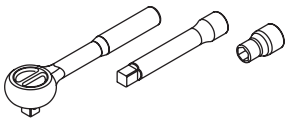
Interior and exterior trimming mainly consists of the interior trimming and the exterior trimming.

Interior trim mainly includes: sunvisor, front doorsill panel, rear doorsill panel, A pillar panel, B pillar panel, C pillar panel, front door panel, rear door panel, rear rack, roof handle, roof, carpet, trunk lid panel, trunk left/right panel, spare tyre cover plate, rear row seat trim panel and rear skirt plate panel, etc..

Exterior trim mainly includes: trunk lid trim strip, windshield cover plate, front grille, front bumper, rear bumper, panel under engine, side panel of engine, engine hood, heat insulation pad of engine hood, top cross member panel of tank, mudguard and mudguard skin, seal strip and sealing element, and logo, etc.

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### Preparation

S/N	Tools	Outline diagram	Description
1	Screwdriver		Remove the fixing screws Remove the trims
2	Interior trimming crow plate		Remove the trims and snap-fit
3	Quick wrench		Used for removing and installing the fixing bolts



## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolts of A pillar lower panel	8~10
Fixing bolt of lower bracket of driver seat belt	65~85
Fixing bolts of B pillar upper panel	8~10
Fixing bolts of lower bracket for rear row seat belt	65~85
Front bumper upper fixing bolts	10~12
Front bumper lower fixing bolts	10~12
Fixing nuts of engine hood	10~12
Fender fixing bolts	10~12

## Precautions

### 1. Precautions before repair

- (a) Before maintenance, cover the protective sleeve on seat and steering wheel.
- (b) Whether engine operates or not, as long as the ignition switch is on, never plug any element of system, such as: any battery cables, connectors of system components, etc.

### 2. Precautions for maintenance

- (a) Before dismantling or installing any electric device or electric terminals which are easy to be contacted by tools or equipment, first disconnect negative battery cable to prevent worker being injured or car be damaged.
- (b) When disconnect system part connector, please don't draw any wire harness, to prevent damaging it.
- (c) To disassemble interiors and exteriors system components, it is suggested to use special tool, if none, flat-blade screwdriver is alternative.

#### **Note:**

**Make sure to wrap the head of the flathead screwdriver with the adhesive tape to prevent scratching the trim pieces.**

- (d) When disassembling interiors and exteriors system components, if it is difficult to disassemble components, do not take down forcibly. Check if any snap-fit or screw is left, and then carry out the operation.

### 3. Other precautions

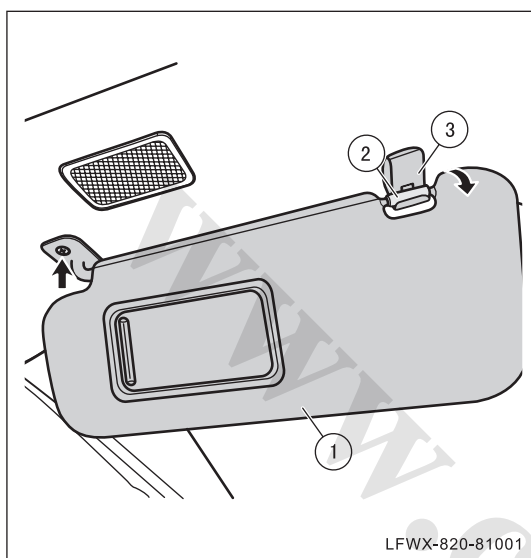
- (a) Avoid oil or chemicals coming into contact with interiors and exteriors components. Otherwise, the trims will be corroded.

## Sunvisor

### Replacement

△ HINT:

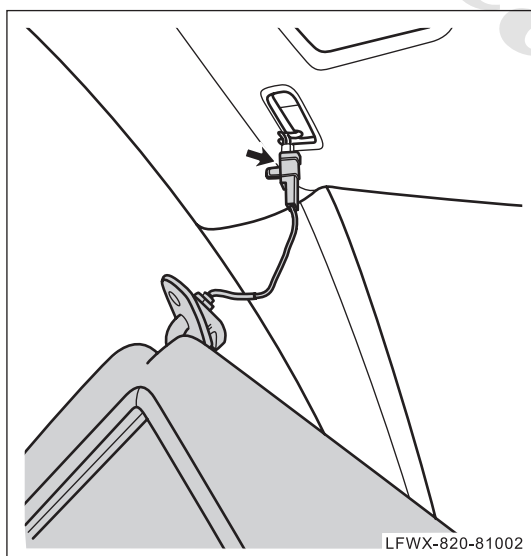
Replacement methods of left and right sunvisor are basically the same, and this section only takes the left side sunvisor as example.



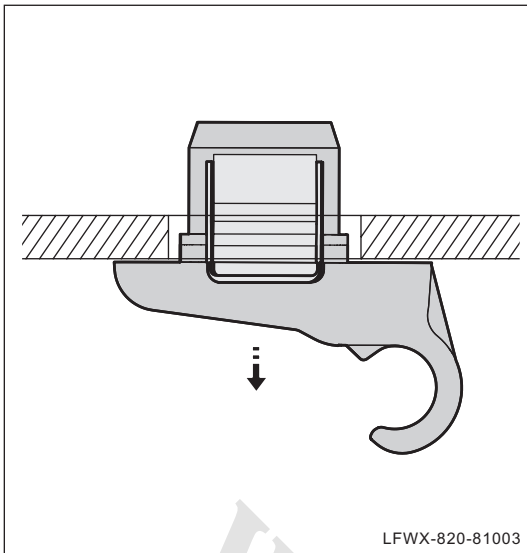
#### 1. Remove sunvisor

- (a) Open sunvisor ① , take down sunvisor part ② from mounting bracket ③ .
- (b) Remove the fixing screws of sunvisor ① , slowly let sunvisor ① separate from installation position.

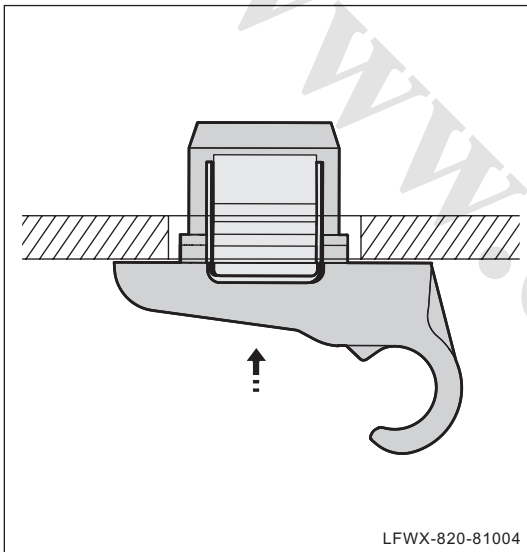
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- (c) Disconnect wire harness connector of makeup lamp switch and take down sunvisor.

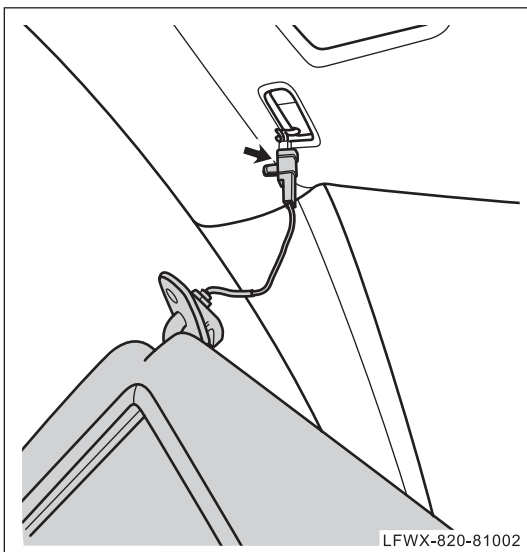


- (d) Use trim prying plate to pry sunvisor pot-hook.

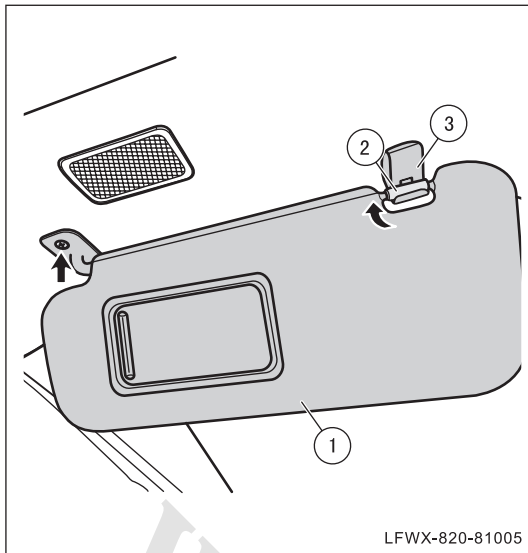


## 2. Install sunvisor.

- (a) Install sunvisor pothook into mounting holes.



- (b) Connect the wire harness connector of makeup lamp switch.



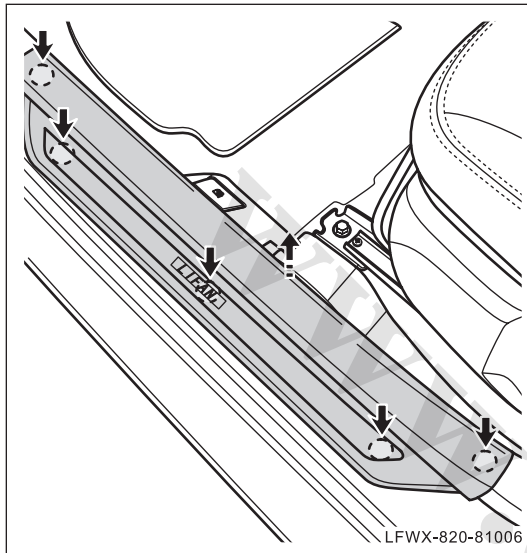
- (c). Install the sunvisor to the installation position, and install and tighten fastening bolts.
- (d). Install sunvisor part ② onto mounting bracket ③ .

## Front Doorsill Trim Panel

### Replacement

△ HINT:

Replacement methods of left and front right doorsill panel is basically the same, and this section only takes the front left doorsill panel as an example.



#### 1. Remove front doorsill trim panel

- (a) Use trim prying plate to pry snap-fits of front doorsill panel, and take down front doorsill panel.

#### 2. Install front doorsill trim panel

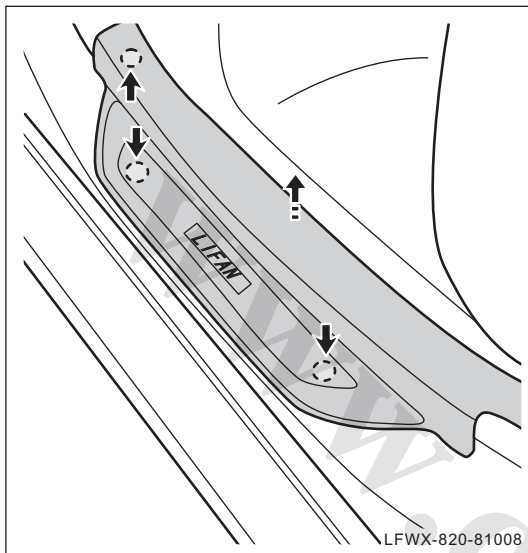
- (a) Install snap-fits onto front doorsill panel.
- (b) Install the front doorsill panel onto the front doorsill panel, align the snap-fits of front doorsill panel to the mounting holes, press down snap-fits position hard, and make sure that the front doorsill panel is installed in place.

## Rear Doorsill Trim Panel

### Replacement

△ HINT:

Replacement methods of left and rear right doorsill panel is basically the same, and this section only takes the rear left doorsill panel as an example.



#### 1. Remove rear doorsill trim panel

- (a) Use trim prying plate to pry snap-fits of rear doorsill panel, and take down rear doorsill panel.

81

#### 2. Install rear doorsill trim panel

- (a) Install snap-fits onto rear doorsill panel.
- (b) Install rear doorsill panel onto rear doorsill, align the snap-fits of rear doorsill panel to the mounting holes, press down snap-fits position hard, and make sure that the rear doorsill panel is installed in place.

## A Pillar Trim Panel

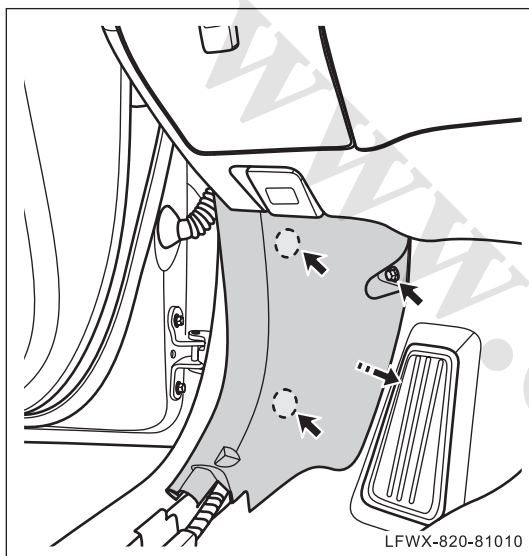
### Replacement

△ HINT:

Replacement methods of left and right A pillar panel is basically the same, and this section only takes the left side A pillar panel as an example.

#### 1. Remove A pillar lower trim panel

- (a). Remove front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)



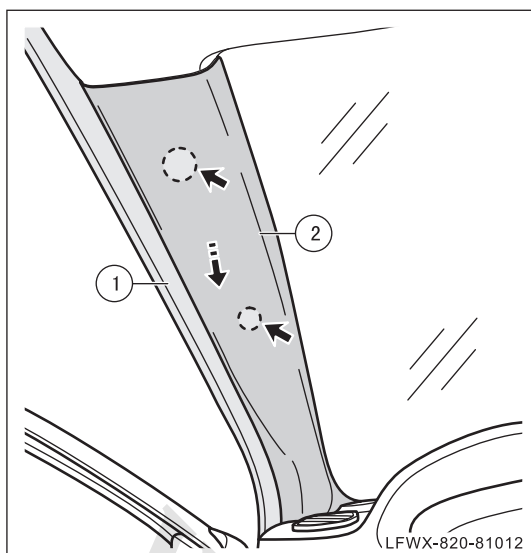
- (b) Remove fixing bolts of A pillar lower panel
- (c) Use trim prying plate to pry snap-fits on A pillar lower panel, and take down A pillar lower panel.

#### 2. Install A pillar lower panel

- (a) Install snap-fits onto A pillar lower panel.
- (b) Install A pillar lower panel to installation place, align the snap-fits of A pillar lower panel to the mounting holes, press down snap-fits position hard, and make sure that A pillar lower panel is installed in place.
- (c) Install fixing bolts of A pillar lower panel and fasten them.

**Torque: 8N•m - 10N•m**

- (d). Install front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)



### 3. Remove A pillar upper trim panel

- (a). Remove front door weatherstrips ① near A pillar upper panel.
- (b). Use trim prying plate to pry snap-fits on A pillar upper panel, and take down A pillar upper panel ② .

### 4. Install A pillar upper trim panel

- (a) Install snap-fits onto A pillar upper panel.
- (b) Install A pillar upper panel to installation place, align the snap-fits of A pillar upper panel to the mounting holes, press down snap-fits position hard, and make sure that A pillar upper panel is installed in place.
- (c) Install front door weatherstrip near A pillar upper panel.



## B Pillar Trim Panel

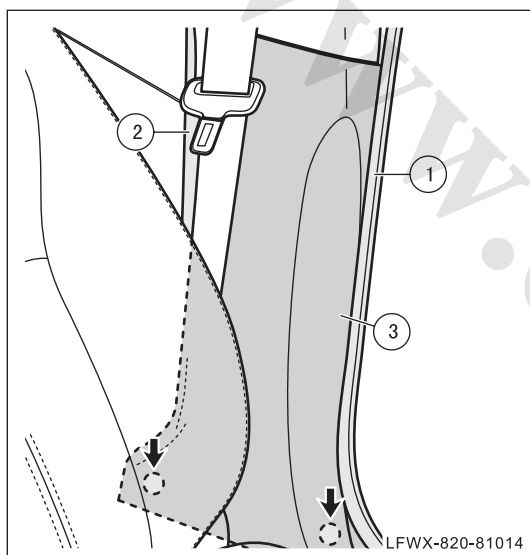
### Replacement

△ HINT:

Replacement methods of left and right B pillar panel is basically the same, and this section only takes the left side B pillar panel as an example.

#### 1. Remove B pillar lower trim panel

- (a). Remove front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)
- (b). Remove rear doorsill panel. (See 81 - Interiors and Exteriors, Rear Doorsill Guard Panel, Replacement)



- (c). Remove front door weatherstrip ① and rear door weatherstrip ② near B pillar lower panel.
- (d). Use trim prying plate to pry snap-fits on B pillar lower panel, and take down B pillar lower panel ③ .

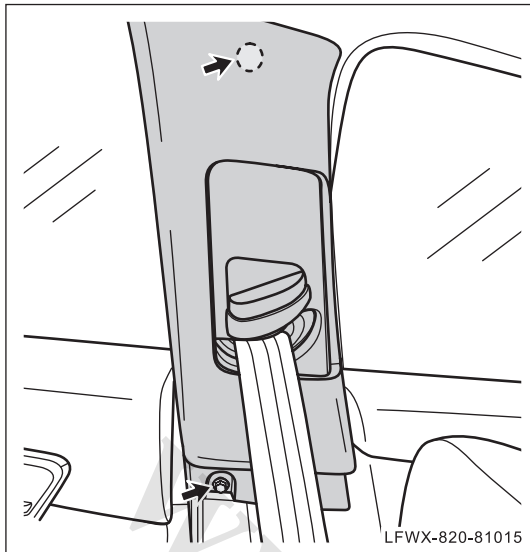
#### 2. Install B pillar lower trim panel

- (a). Install snap-fits onto B pillar lower panel.
- (b). Install B pillar lower panel onto B pillar, align the snap-fits of B pillar lower panel to the mounting holes, press down snap-fits position hard, and make sure that B pillar lower panel is installed in place.
- (c). Install front door weatherstrip and rear door weatherstrip near B pillar lower panel.
- (d). Installation of rear doorsill trim panel. (See 81 - Interiors and Exteriors, Rear Doorsill Guard Panel, Replacement)
- (e). Install front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)

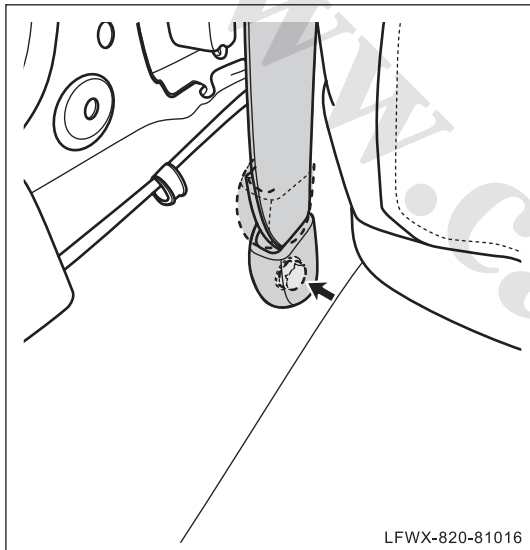
#### 3. Remove B pillar upper trim panel

- (a). Remove the B pillar lower trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar

## Trim Panel, Replacement)



- (b) Remove the fixing bolts of B pillar upper panel.
- (c) Use trim prying plate to pry snap-fits on B pillar upper panel, and take down B pillar upper panel.



- (d) Remove the fixing bolts of lower bracket of driver seat belt. Extract seat belt from B pillar upper panel, and take down B pillar upper panel.

81

**4. Install B pillar upper trim panel**

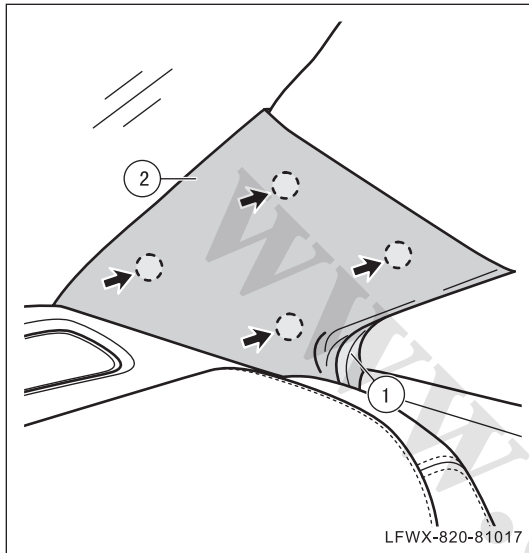
- (a) Let driver's seat belt pass through B pillar upper panel.
- (b) Install fixing bolts of upper bracket for driver seat belt and tighten them. Torque: 65N•m - 85N•m
- (c) Install snap-fits onto B pillar upper panel.
- (d) Install B pillar upper panel onto B pillar, align the snap-fits of B pillar upper panel to the mounting holes, press down snap-fits position hard, and make sure that B pillar upper panel is installed in place.
- (e) Install fixing bolts of B pillar upper panel and fasten them. Torque: 8N•m - 10N•m
- (f) Install B pillar lower trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)

## C Pillar Trim Panel

### Replacement

△ HINT:

Replacement methods of left and right C pillar panel is basically the same, and this section only takes the left side C pillar panel as an example.



#### 1. Remove C pillar panel

- (a) Remove rear door weatherstrip ① near C pillar panel.
- (b) Use trim prying plate to pry snap-fits on C pillar panel, and take down C pillar panel ②.

#### 2. Install C pillar trim panel

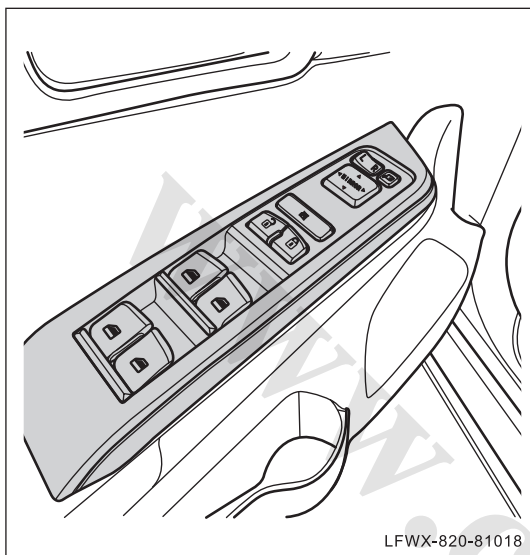
- (a) Install snap-fits onto C pillar panel.
- (d) Install C pillar panel onto C pillar, align the snap-fits of C pillar panel to the mounting holes, press down snap-fits position hard, and make sure that C pillar panel is installed in place.
- (c). Install rear door weatherstrips near C pillar trim panel.

## Front Door Inner Panel

### Replacement

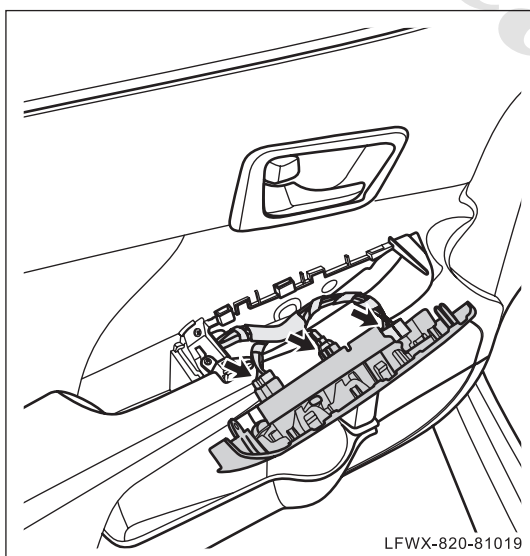
△ HINT:

Replacement methods of left and front right door panel is basically the same, and this section only takes the front left door panel as an example.

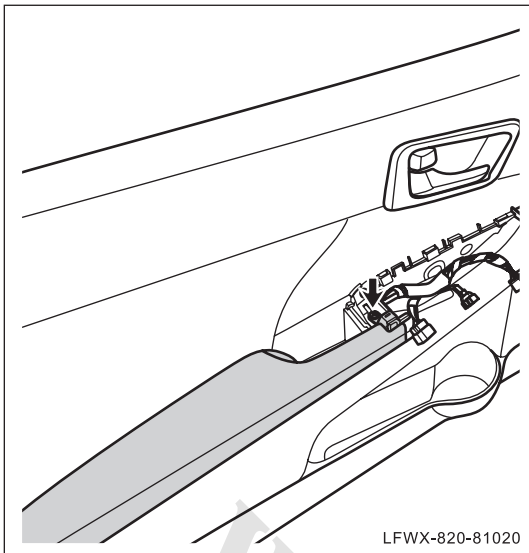


#### 1. Remove front door inner panel

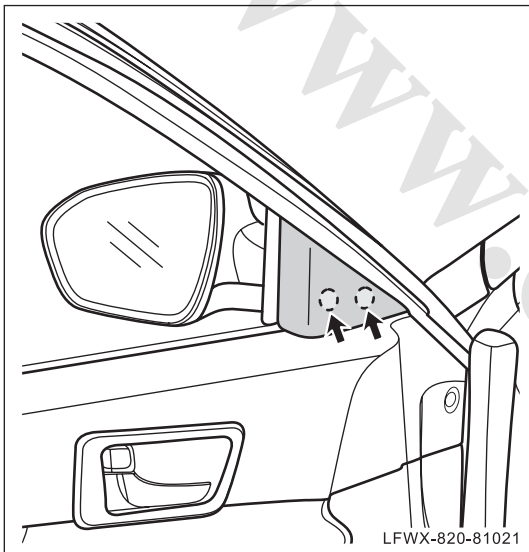
- (a) Use trim prying plate to pry front door armrest and window lifter switch assembly.



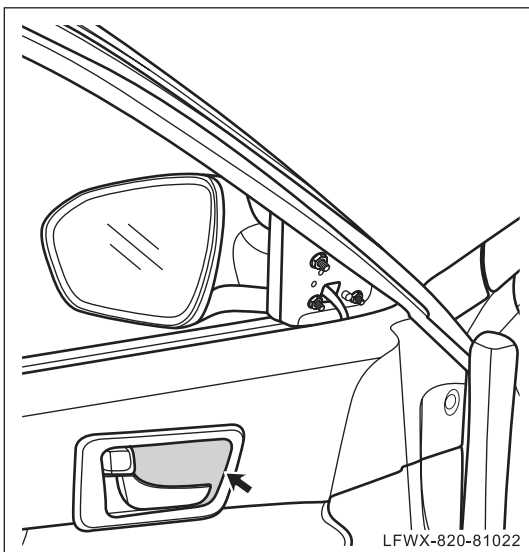
- (b) Disconnect every connector and take down front door armrest and window lifter switch assembly.



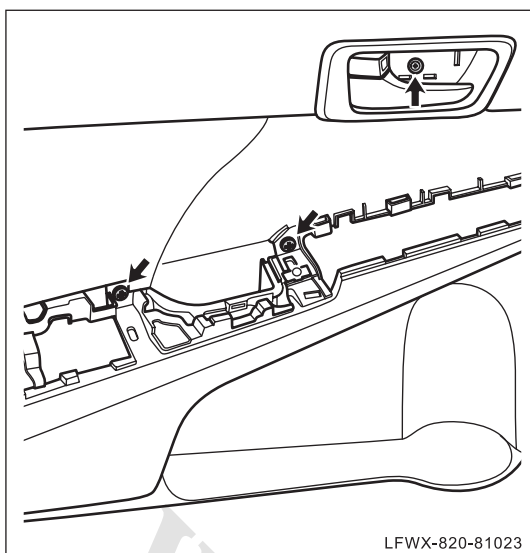
- (c) Remove the fixing screws of front door armrest. Use trim prying plate to pry front door armrest.



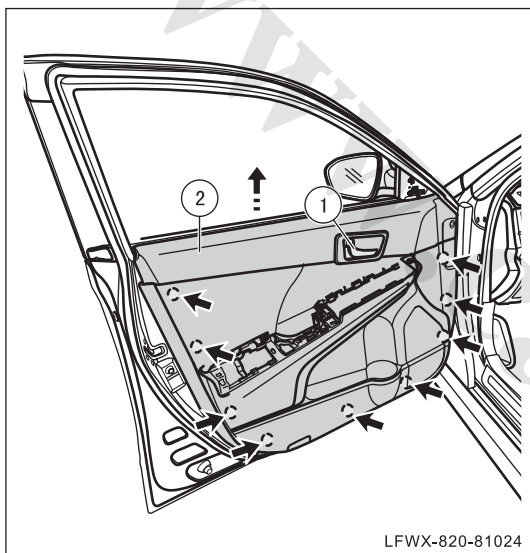
- (d) Use trim prying plate to pry snap-fits of triangle panel of front door and take down triangle panel of front door.



- (e) Remove front door inside handle panel.

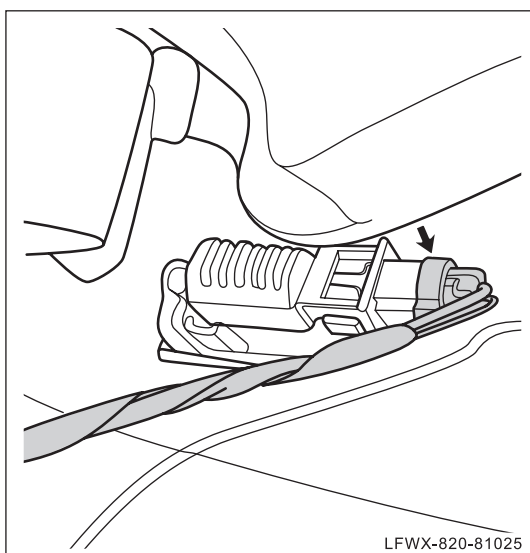


- (f) Remove the fixing screws of front door inside handle.
- (g) Remove front door inner panel fixing screws.

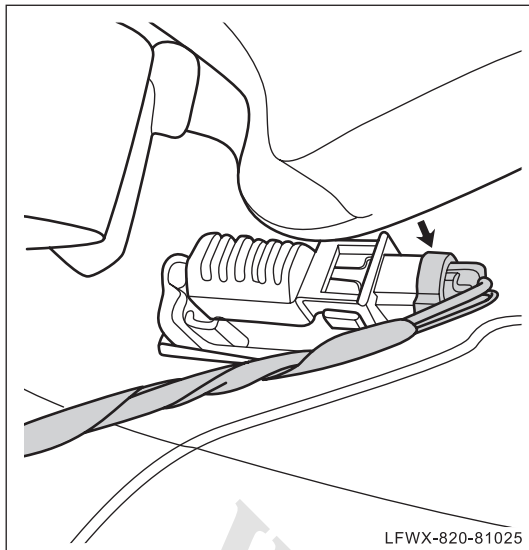


- (h) Push out front door inside handle ① from installation position.
- (i) Use trim prying plate to pry snap-fits of front door panel ② .
- (j) Take out front door panel ② upward.

81

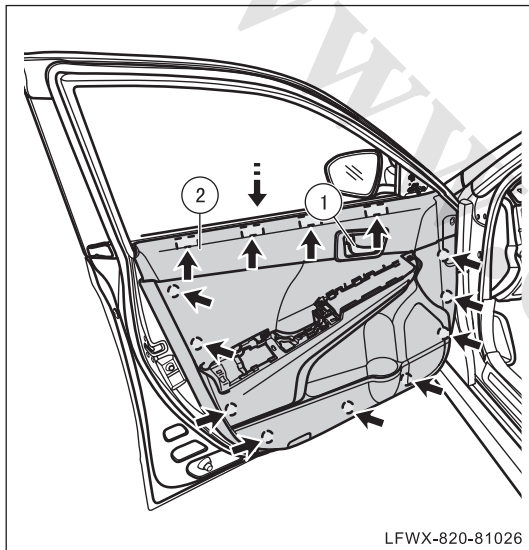


- (k) Disconnect wire harness connector of front door lamp and take down front door panel.

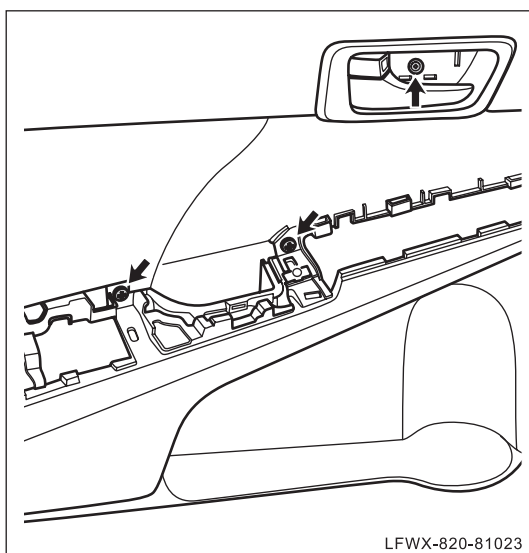


## 2. Install front door inner panel

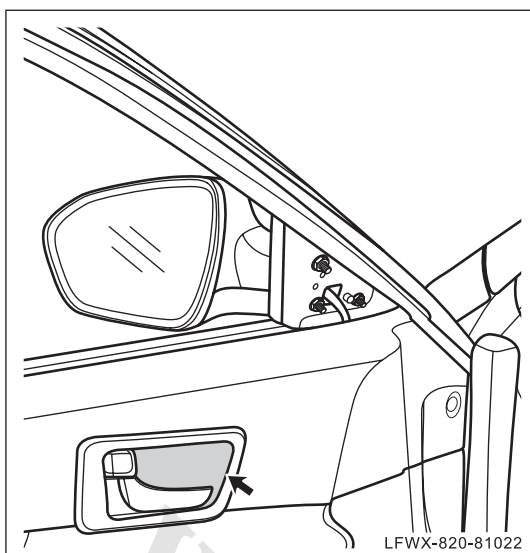
- (a) Install snap-fits of front door onto front door panel.
- (b) Move the front door panel close to door installation position and connect the wire harness connector of front door lamp.



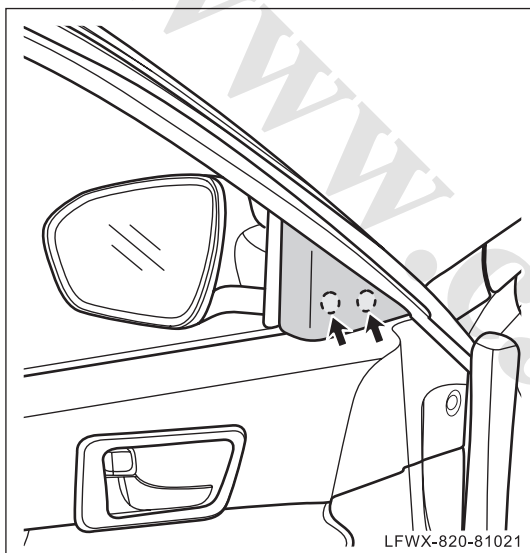
- (c) Install inside handle ① of front door to installation position.
- (d) Install front door panel ② to installation position downward, and make sure that all metal clips are installed in place.
- (e) Align the snap-fits of front door panel to the mounting holes, press down snap-fits position hard, and make sure that front door panel ② is installed in place.



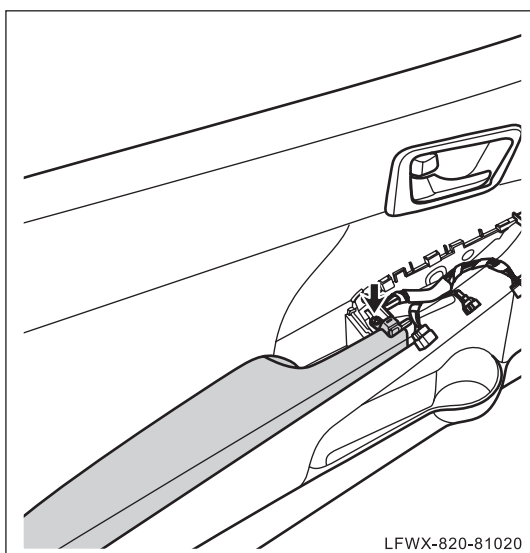
- (f) Install fixing screws of front door inside handle and fasten them.
- (g) Install the fixing screws of front door panel and fasten them.



- (h) Install the inside handle panel of front door.

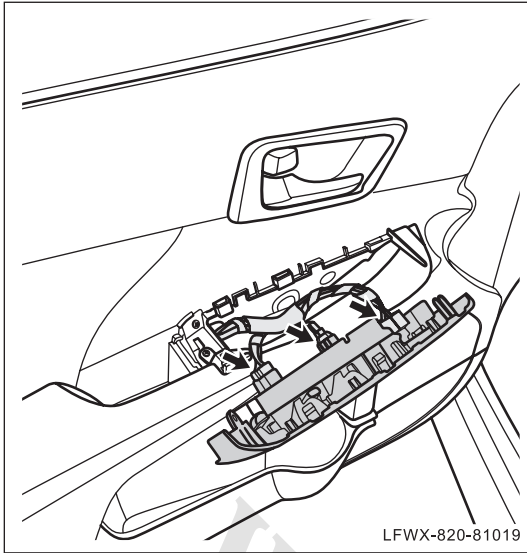


- (i) Install triangle panel of front door to installation position, align the snap-fits of triangle panel to the mounting holes, press down snap-fits position hard, and make sure that triangle panel of front door is installed in place.

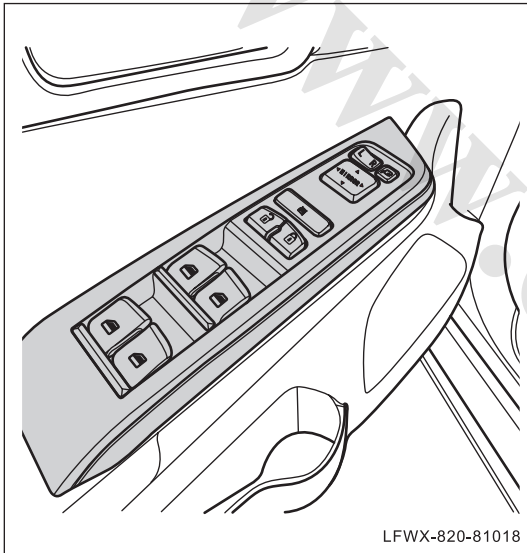


- (j) Install front door armrest to installation position, mount fixing screws and fasten them.





- (k) Connect front door armrest and connector of window lifter switch assembly.



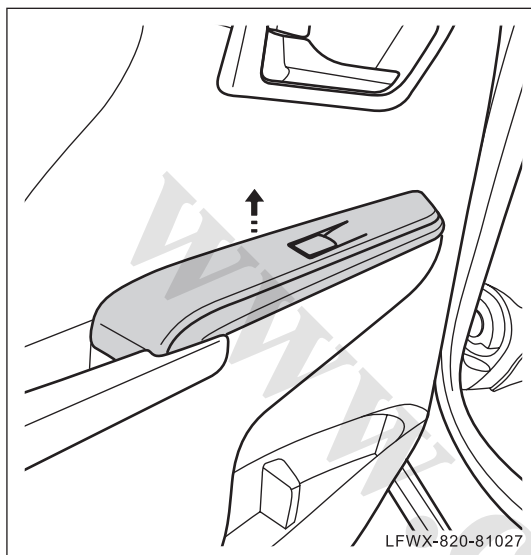
- (l) Install front door armrest and window lifter switch assembly to installation position.

## Rear Door Inner Panel

### Replacement

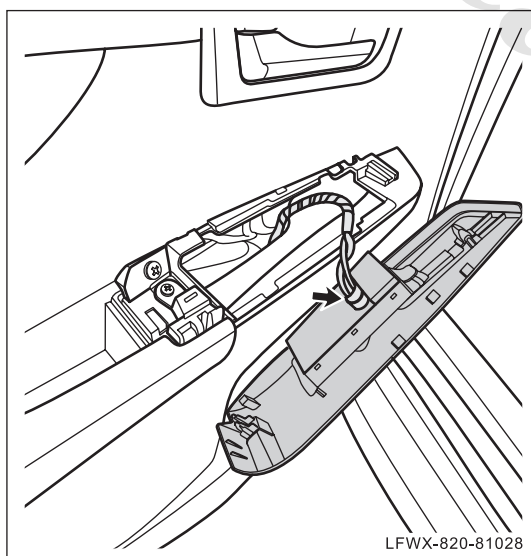
△ HINT:

Replacement methods of left and rear right door panel is basically the same, and this section only takes the left side rear door panel as an example.

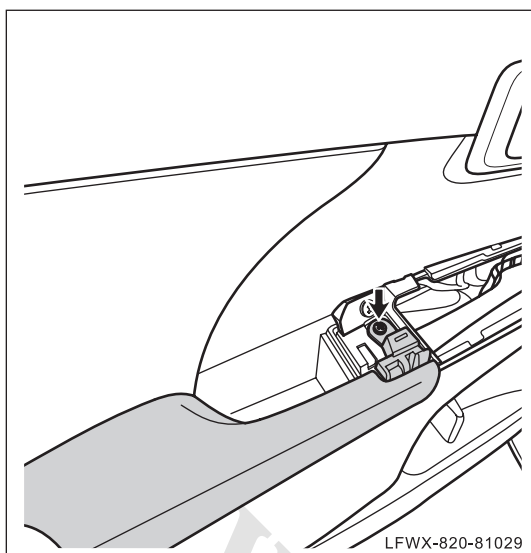


#### 1. Remove rear door panel

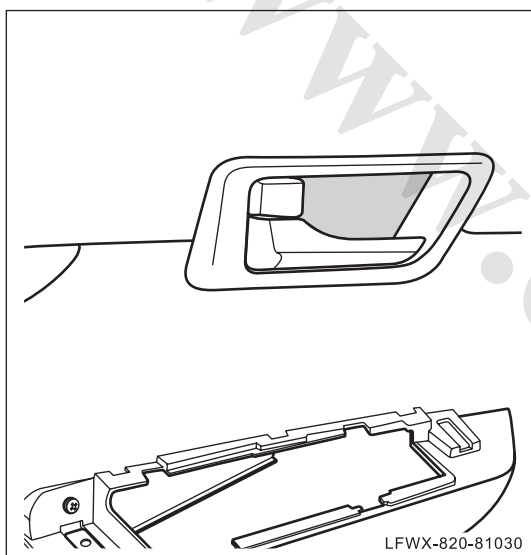
- (a) Use trim prying plate to pry rear door armrest and window lifter switch assembly.



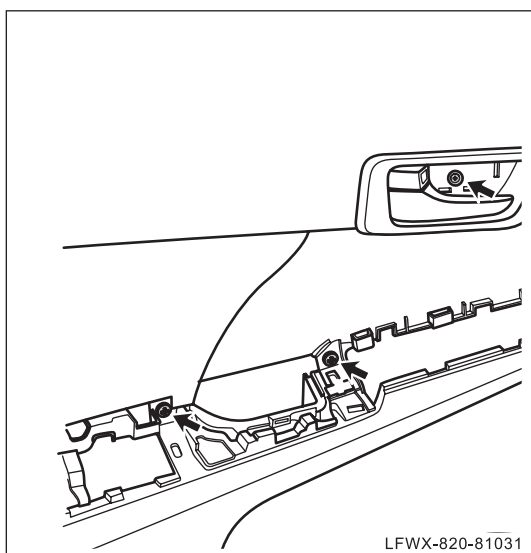
- (b) Disconnect connector and take down rear door armrest and window lifter switch assembly.



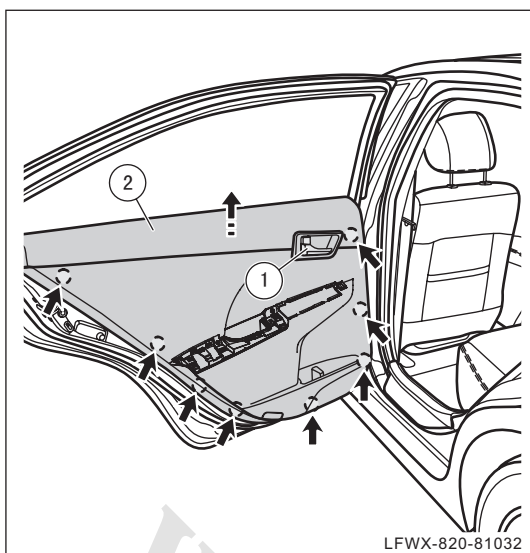
- (c) Remove fixing screws of rear door armrest and use trim prying plate to pry rear door armrest.



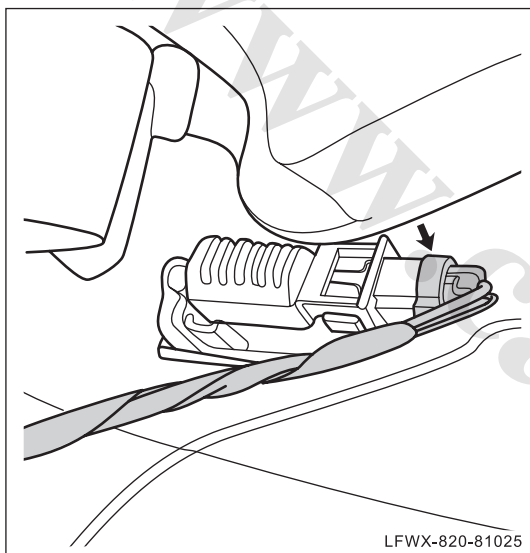
- (d) Remove rear door inside handle panel.



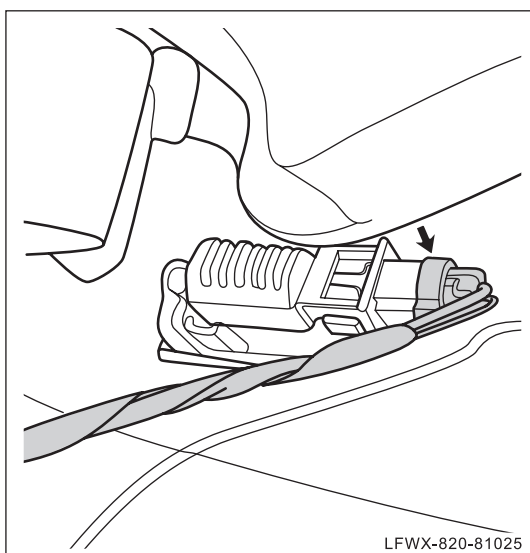
- (e) Remove the fixing screws of rear door inside handle.
- (f) Remove rear door trim panel fastening screws.



- (g) Push out rear door inside handle ① from installation position.
- (h) Use trim prying plate to pry snap-fits of rear door panel.
- (i) Take out rear door panel ② upward.

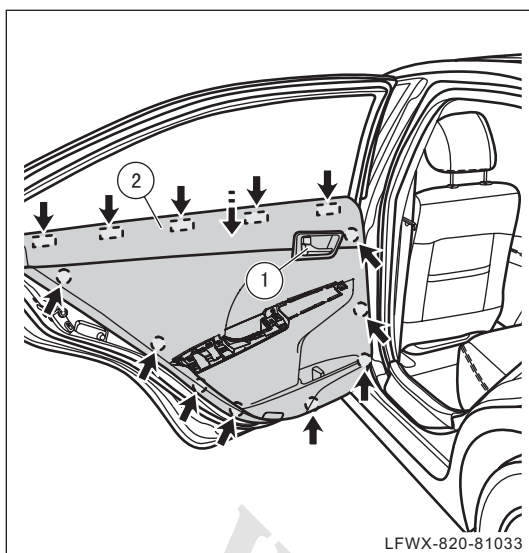


- (j) Disconnect the wire harness connector of rear door lamp and take down rear door panel.

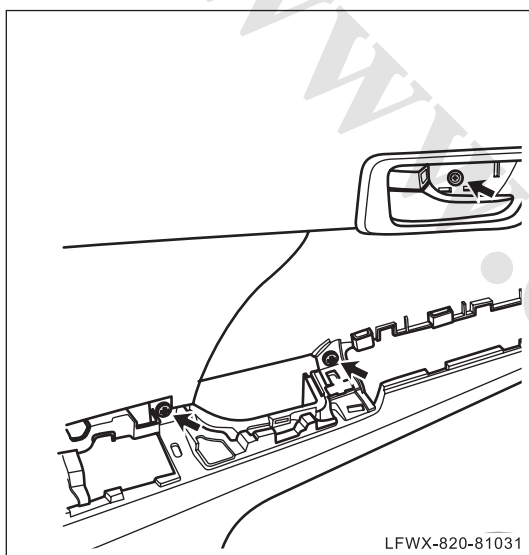


## 2. Install rear door panel

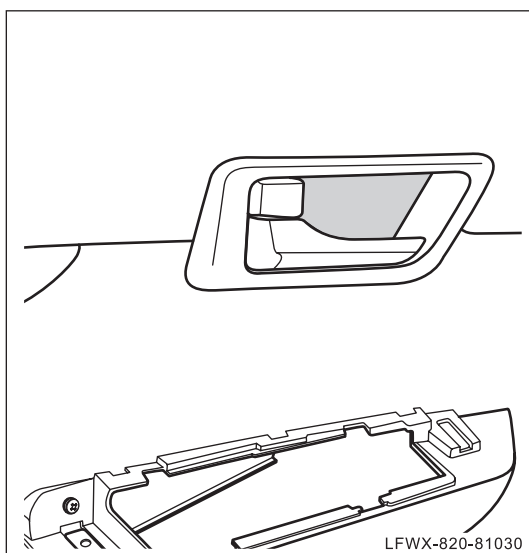
- (a) Install snap-fits of rear door onto rear door panel.
- (b) Move the rear door panel close to door installation position and connect the wire harness connector of rear door lamp.



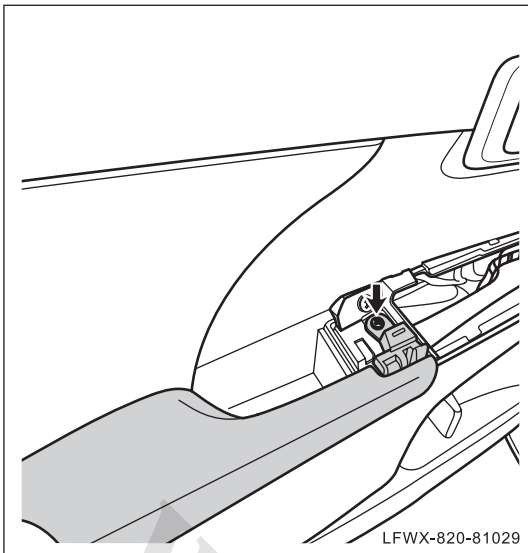
- (c) Install rear door inside handle ① to installation position.
- (d) Install rear door panel ② to installation position downward and make sure that all metal clips are installed in place.
- (e) Align the snap-fits of rear door panel to the mounting holes, press down snap-fits position hard, and make sure that rear door panel ② is installed in place.



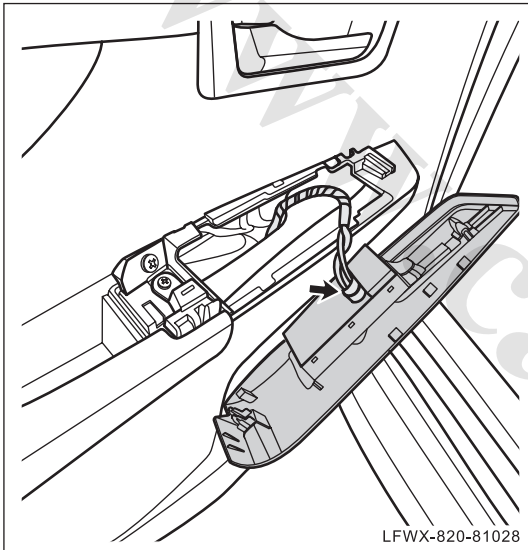
- (f) Install the fixing screws of rear door inside handle and fasten them.
- (g) Install the fixing screws of rear door panel and fasten them.



- (h) Install rear door inside handle panel.

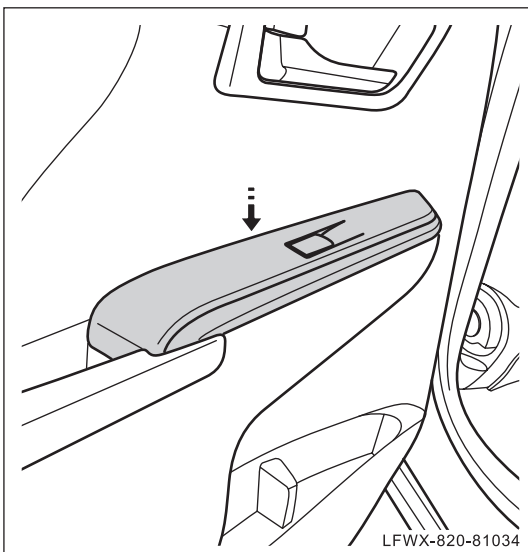


- (i) Install rear door armrest to installation position, mount fixing screws and fasten them.



- (j) Connect connector of rear door armrest and window lifter switch assembly.

81



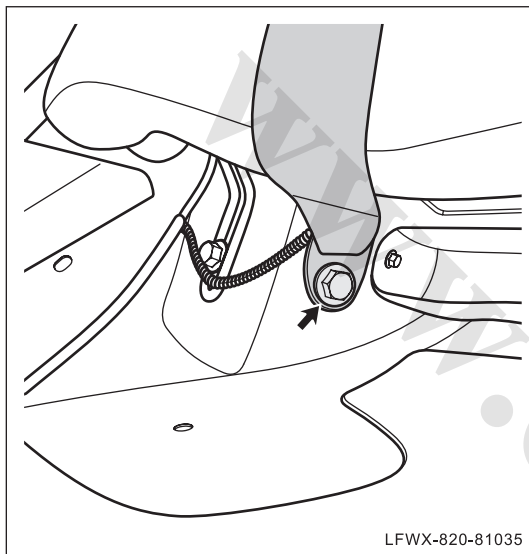
- (k) Install rear door armrest and window lifter switch assembly to installation position.

## Rear Shelf Panel

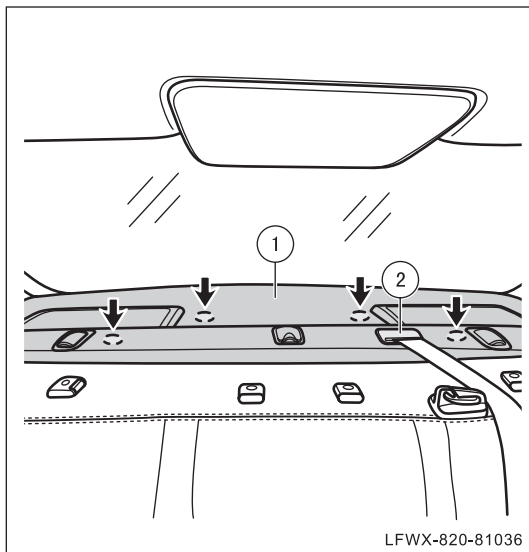
### Replacement

#### 1. Remove rear shelf panel

- (a) Remove C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)
- (b). Remove rear seat cushion. ( See 83- Seat and Seat Belt, rear row Seat Cushion, Replacement )



- (c). Remove fixing bolts of lower bracket of rear row seat belt.



- (d) Use trim prying plate to pry snap-fits of rear shelf panel and take down shelf panel ① slowly.
- (e) Use trim prying plate to pry hole cover ② of shelf panel seat belt and let seat belt pass through shelf panel seat belt installation hole.
- (f) Take out shelf panel ① .

#### 2. Install rear shelf panel

- (a) Install the snap-fits of rear shelf panel onto rear shelf panel.
- (b) Let seat belt pass through rear shelf panel seat belt installation hole and install hole cover of shelf panel seat belt.

- (c) Install rear shelf panel to installation position, align the snap-fits of rear shelf panel to the mounting holes, press down snap-fits position hard, and make sure that rear shelf panel is installed in place.
- (d) Install lower supporting bracket of rear row seat belt to installation position, mount fixing bolts and fasten them.

**Torque: 65N•m - 85N•m**

- (e) Install rear seat cushion. ( See 83- Seat and Seat Belt, rear row Seat Cushion, Replacement )
- (f) Install C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)

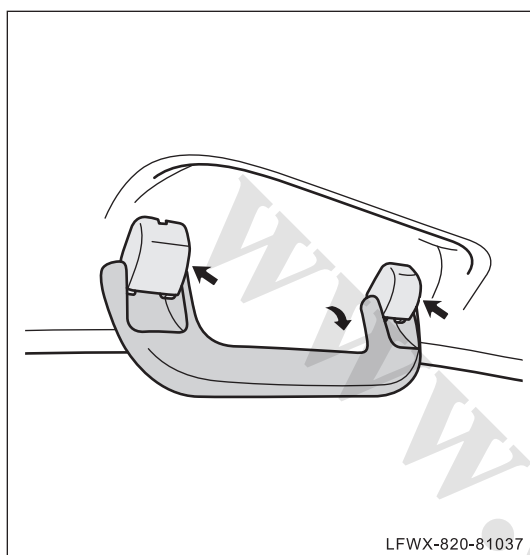


## Roof Handle

### Replacement

△ HINT:

Replacement methods of front and rear roof handle are basically the same, and this section only takes the rear left roof handle as an example.

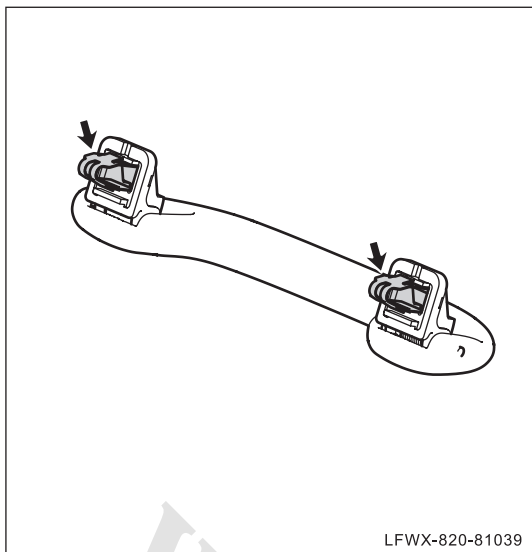


#### 1. Remove roof handle

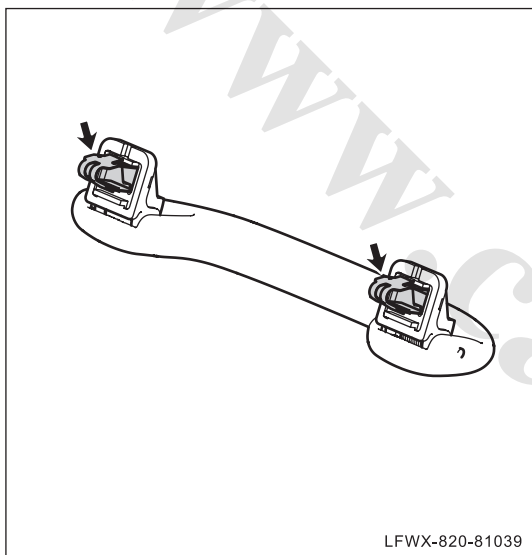
- (a) Turn over roof handle.
- (b) Use trim prying plate to pry fixing snap-fit protective cover of roof handle.



- (c). Take out assist grip.



(d). Take out assist grip piece.



## 2. Install roof handle

(a). Install fixed piece of assist grip to assist grip.



(b). Install assist grip to mounting position to install fixed snap-fits in place.



- (c) Install fixing snap-fit protective cover of roof handle.

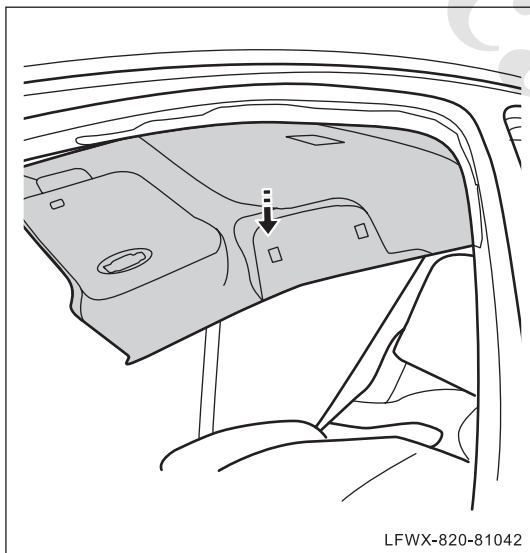
## Ceiling

### Replacement

#### 1. Remove roof handle

- (a). Remove the sunvisor. (See 81 - Interiors and Exteriors, Sunvisor, Replacement)
- (b). Remove roof handle. ( See 81- Interiors and Exteriors, Roof Handle, Replacement )
- (c). Remove front room lamp. ( See 75- Lighting System, Front Room Lamp, Replacement )
- (d). Remove rear room lamp. ( See 75-Lighting system, Rear Room Lamp, Replacement )
- (e). Remove A pillar upper trim panel (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)
- (f). Remove B pillar upper trim panel (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)
- (g). Remove C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)

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- (h) Remove roof fixing snap-fits and take out roof with the help of assistant.

#### 2. Install roof

- (a) Install roof onto car top and mount roof fixing snap-fits.

#### **Note:**

**Before installation of roof fixing snap-fits, be sure that lamp wire harness is sorted out to avoid it being pressed on roof face.**

- (b) Install C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)

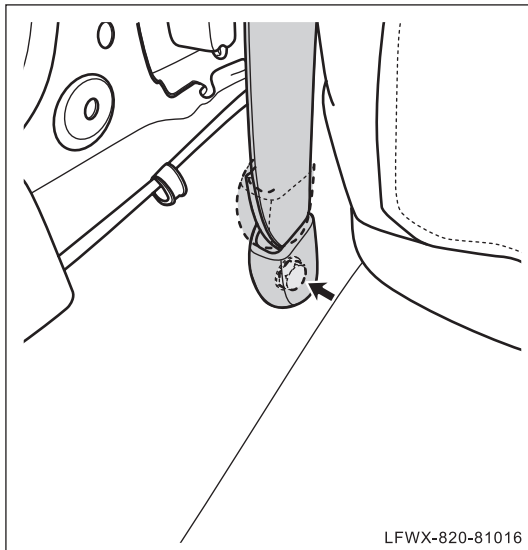
- (c). Install B pillar upper trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)
- (d). Install A pillar upper trim panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)
- (e). Install rear room lamp. ( See 75-Lighting system, Rear Room Lamp, Replacement )
- (f). Install front room lamp. ( See 75- Lighting System, Front Room Lamp, Replacement )
- (g). Install roof handle. ( See 81- Interiors and Exteriors, Roof Handle, Replacement )
- (h). Install the sunvisor. (See 81 - Interiors and Exteriors, Sunvisor, Replacement)

## Floor Carpet

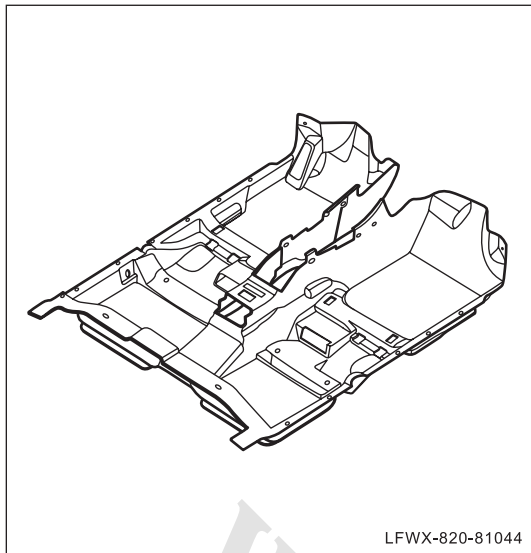
### Replacement

#### 1. Remove floor carpet

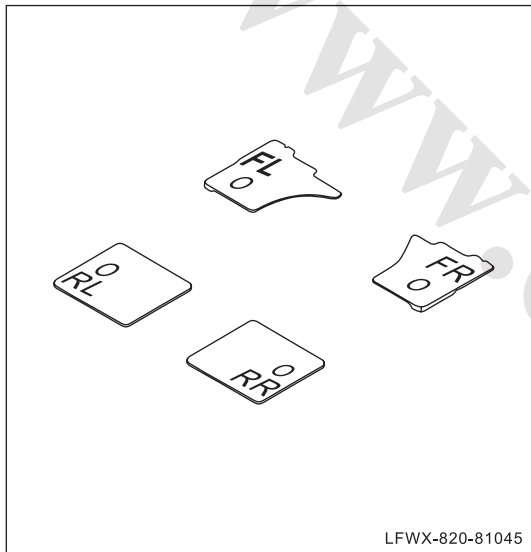
- (a). Remove the console. (See 84 - Dashboard/Console, Console, Replacement)
- (b). Remove front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)
- (c). Remove rear doorsill panel. (See 81 - Interiors and Exteriors, Rear Doorsill Guard Panel, Replacement)
- (d). Remove A pillar lower trim panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)
- (e). Remove the B pillar lower trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)
- (f). Remove C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)
- (g). Remove front row seat. ( See 83-Seat and Seat Belt, Front Tow Seat, Replacement )
- (h). Remove rear seat cushion. ( See 83- Seat and Seat Belt, rear row Seat Cushion, Replacement )



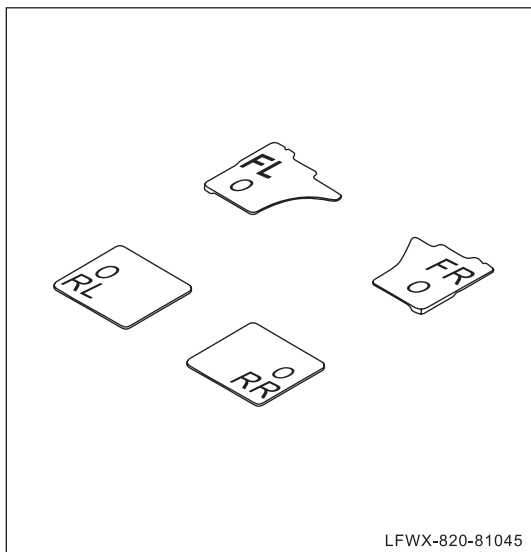
- (i) Remove fixing bolts of lower bracket of front row seat belt



(j). Raise and take out the floor carpet.



(k) Take out every damper in floor carpet pedal area.



## 2. Install the floor carpet

(a) Install every damper in floor carpet pedal area to installation position.

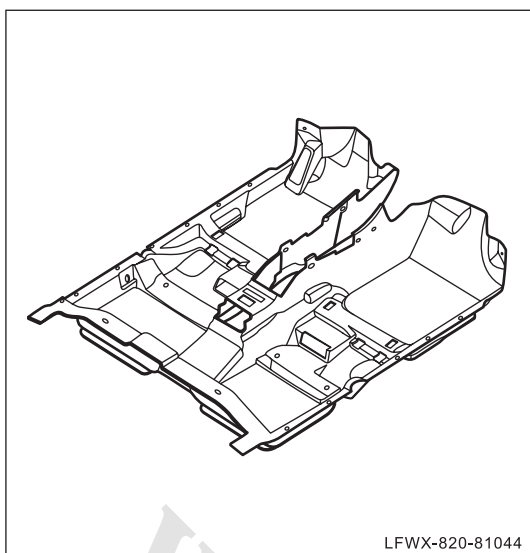
△ HINT:

FL: Front left

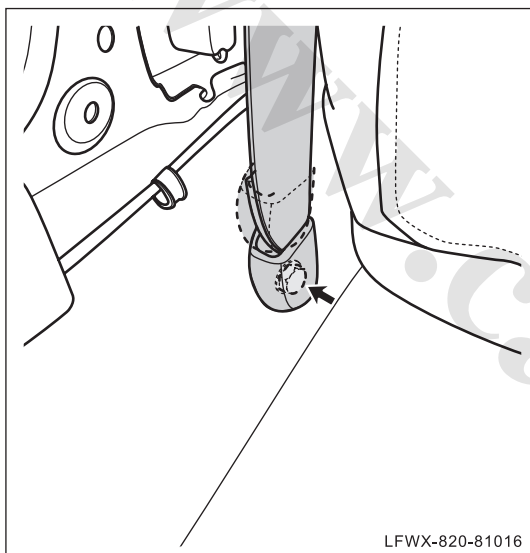
FR: Front right

RL: Rear left

RR: Right rear



(b) Install floor carpet onto vehicle ground.



(d) Install lower bracket of front row seat belt to installation position, mount fixing bolts and fasten them.

**Torque: 65N·m~85N·m**

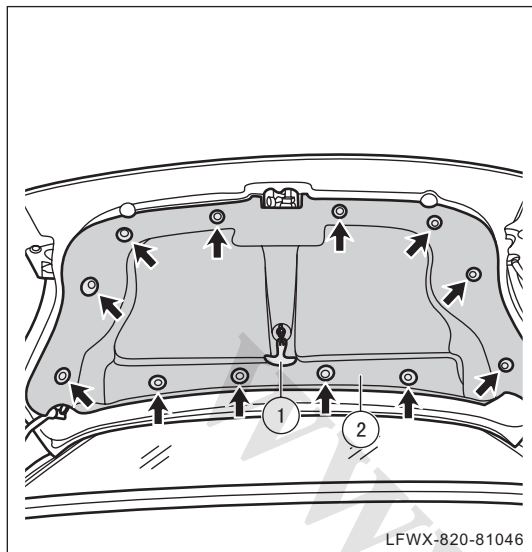
**81**

- (d). Install rear seat cushion. ( See 83- Seat and Seat Belt, rear row Seat Cushion, Replacement )
- (e) Install front row seat. ( See 83-Seat and Seat Belt, Front Tow Seat, Replacement )
- (f) Install C pillar panel. (See 81 - Interiors and Exteriors, C Pillar Trim Panel, Replacement)
- (g). Install B pillar lower trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)
- (h). Install A pillar lower trim panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)
- (i). Install front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)
- (j). Installation of rear doorsill trim panel. (See 81 - Interiors and Exteriors, Rear Doorsill Guard Panel, Replacement)
- (k). Install the console (See 84 - Dashboard/Console, Console, Replacement)



## Trunk Lid Interior Trim Panel

### Replacement



#### 1. Remove trunk lid panel

- (a) Open trunk lid.
- (b) Remove trunk lid handle ① .
- (c) Use trim prying plate to pry snap-fits of trunk lid panel ② and take down trunk lid panel ② .

#### 2. Install trunk lid panel

- (a) Install trunk lid panel onto trunk lid and install snap-fits of trunk lid panel.
- (b) Install trunk lid handle.
- (c) Close trunk lid.

## Trunk Left/Right Panel

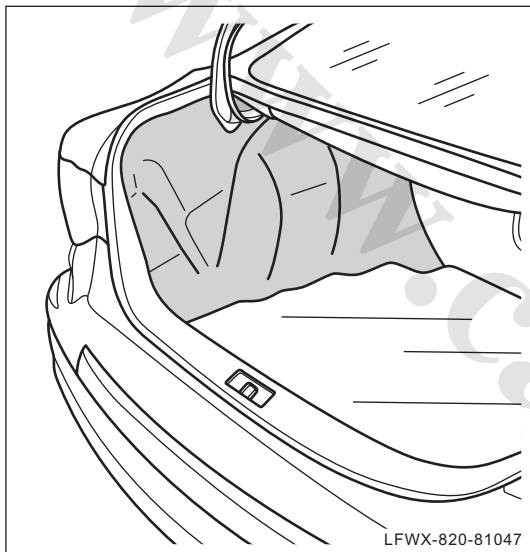
### Replacement

△ HINT:

Replacement methods of left and right panel of trunk are basically the same, and this section only takes the left panel as an example.

#### 1. Remove trunk left panel

- (a) Open trunk lid.
- (b) Remove rear skirt plate panel. (See 81-Interiors and Exteriors, Rear Apron Guard Panel, Replacement)



- (c) Use trim prying plate to disassemble the fixing snap-fits of trunk left panel and take down trunk left panel.

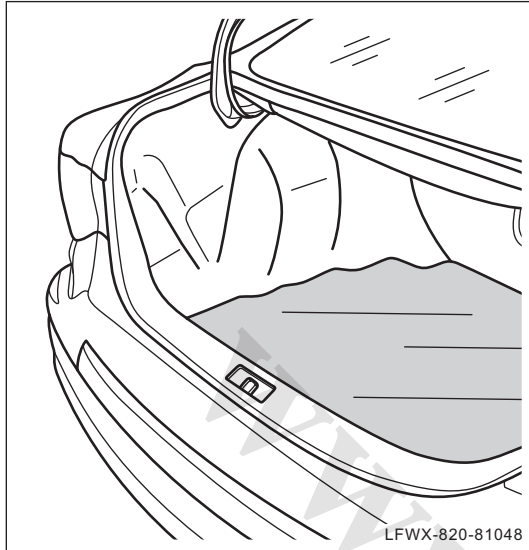
**81**

#### 2. Install trunk left panel

- (a) Install trunk left panel to installation position and install the fixing snap-fits of trunk left panel.
- (b) Install rear skirt plate panel. (See 81-Interiors and Exteriors, Rear Apron Guard Panel, Replacement)
- (c) Close trunk lid.

## Spare Tyre Cover

### Replacement



#### 1. Remove spare tyre cover

- (a) Open trunk lid.
- (b) Take out spare tyre cover.

#### 2. Install spare tyre cover

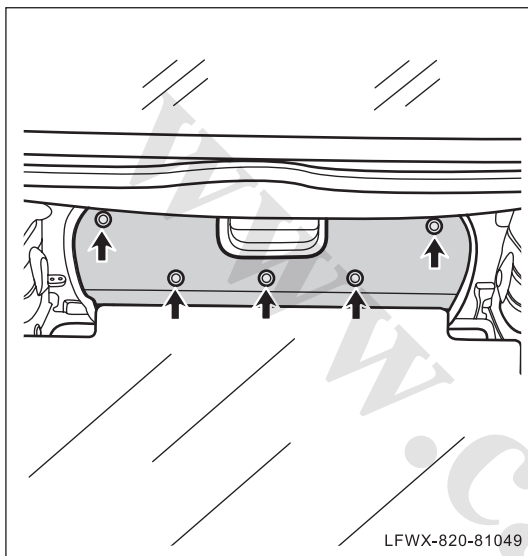
- (a) Install spare tyre cover to installation position.
- (b) Close trunk lid.

## Rear Row Seat Panel

### Replacement

#### 1. Remove rear row seat panel.

- (a) Open trunk lid.
- (b) Remove trunk left/right panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)



- (c) Use trim prying plate to disassemble the fixing snap-fits of rear row seat panel and take out rear row seat panel.

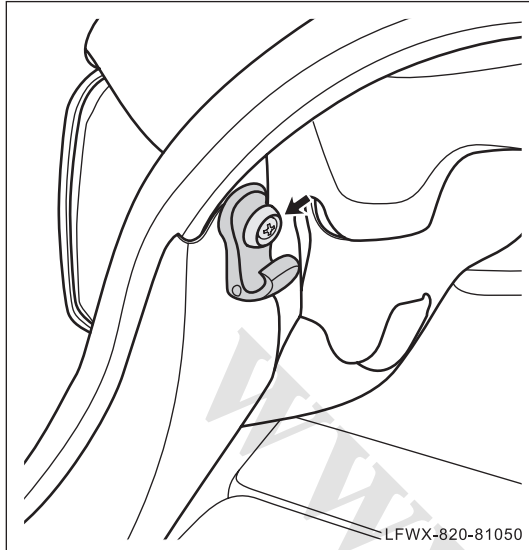
81

#### 2. Install rear row seat panel

- (a) Install rear row seat panel to installation position and install the fixing snap-fits of panel.
- (b) Install trunk left/right panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)
- (c) Close trunk lid.

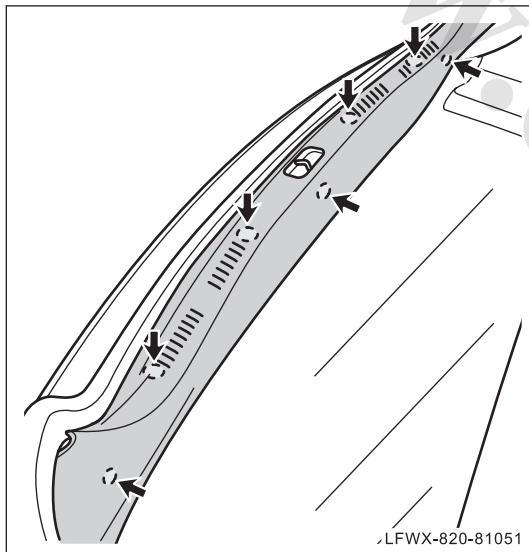
## Rear Apron Plate Trim Panel

### Replacement



#### 1. Remove rear apron plate trim panel

- (a) Open trunk lid.
- (b) Remove the pothooks of rear skirt plate panel.



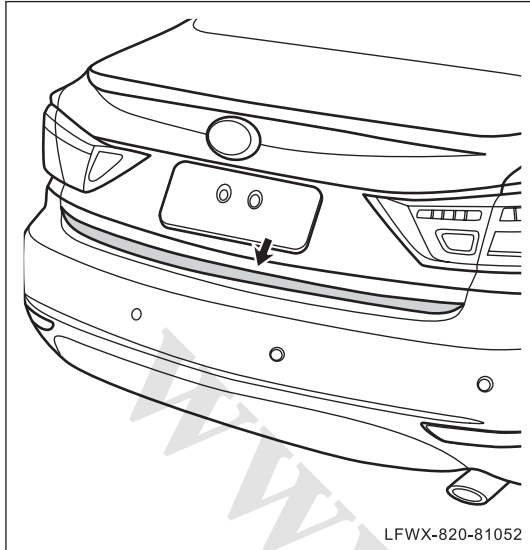
- (c) Use trim prying plate to pry snap-fits of rear skirt plate panel and take out rear skirt plate panel.

#### 2. Remove rear apron plate trim panel

- (a) Install the snap-fits of rear skirt plate panel onto rear skirt plate panel.
- (b) Install rear skirt plate panel to installation position, align the snap-fits of rear skirt plate panel to the mounting holes, press down snap-fits position hard, and make sure that rear skirt plate panel is installed in place.
- (c) Install the pothooks of rear skirt plate panel.
- (d) Close trunk lid.

## Trunk Lid Trim Strip

### Replacement



#### 1. Remove trunk lid trim strip

- (a) Use trim prying plate to disassemble trunk lid trim strip and take it down.

81

#### 2. Install trunk lid trim strip

- (a) Stick adhesive glue on trunk lid trim strip.

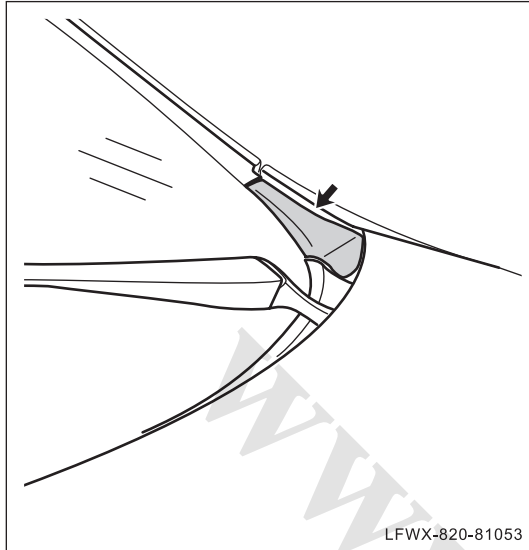
△ HINT:

Before installation of trunk lid trim strip, it is suggested to remove adhesive glue remained on trunk lid.

- (b) Install trunk lid trim strip onto trunk lid, press it down hard, and make sure that trunk lid trim strip is installed firmly.

## Windshield Cover Plate

### Replacement

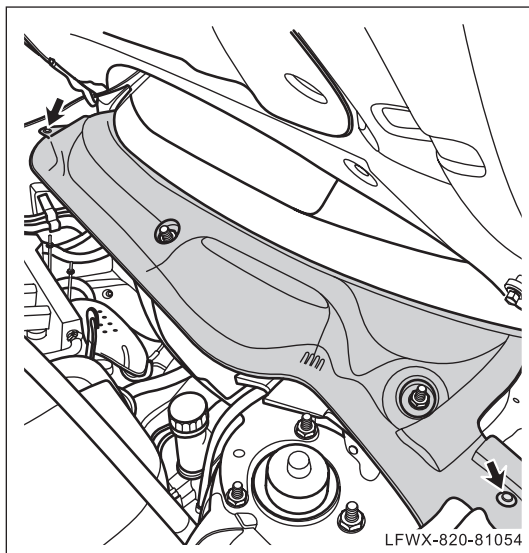


#### 1. Remove windshield cover plate

- (a) Use trim prying plate to disassemble panel on both sides of windshield cover plate.

- (b). Remove front wiper arm assembly. (See 76 Wiper and Washer System, Wiper Arm Assembly, Replacement)

- (c) Remove engine compartment cover rear seal strip. ( See 81- Interiors and Exteriors, Seal Strip and Sealing Element, Engine Compartment Cover Rear Seal Strip )



- (a) Use trim prying plate to disassemble snap-fits on both sides of windshield cover plate and take down windshield cover plate.

#### 2. Install windshield cover plate

- (a) Install windshield cover plate to installation position, and install snap-fits on both sides of windshield cover plate.

- (b) Install engine compartment cover rear seal strip. ( See 81- Interiors and Exteriors, Seal Strip and Sealing Element, Engine Compartment Cover Rear Seal Strip )



- (c). Install wiper arm assembly (See 76 Wiper and Washer System, Wiper Arm Assembly, Replacement)
- (d). Install panel on both sides of windshield cover plate.

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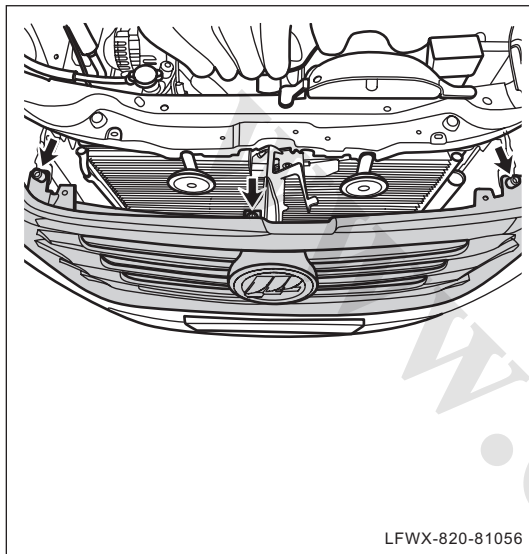


## Front Grilles

### Replacement

#### 1. Remove front grille

- (a) Open the engine hood.
- (b) Remove upper cross beam trim panel of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



- (c) Remove the fixing bolts and snap-fits of front grille, and take down front grille.

#### 2. Install front grille

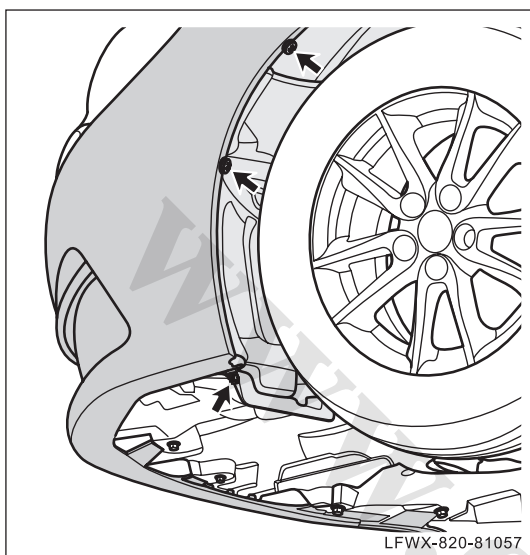
- (a) Install front grille to installation position and mount fixing bolts and snap-fits.
- (b) Install top cross member panel of tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)
- (c) Close engine compartment cover

## Front Bumper

### Replacement

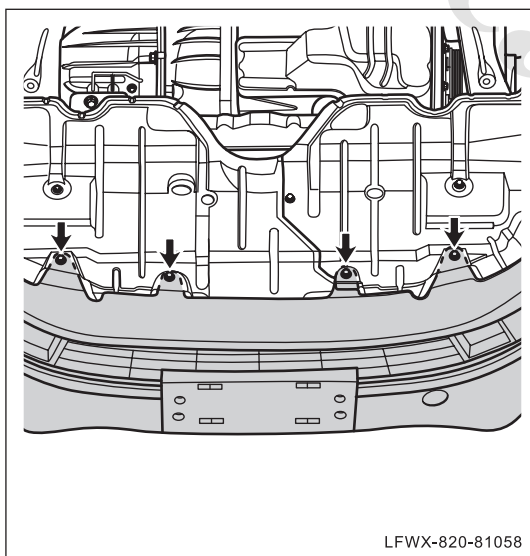
#### 1. Remove Front Bumper

(a) Remove front grille. (See 81 – Front Grille of Trim, Replacement)

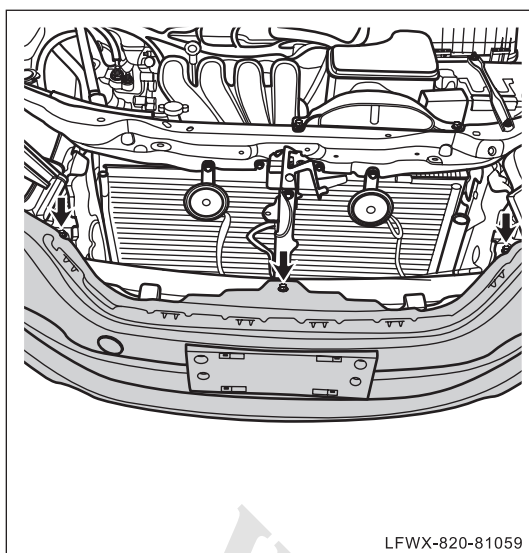


(b) Remove fixing screws and snap-fits for connecting left/ front right mudguard/mud-guard skin and front bumper.

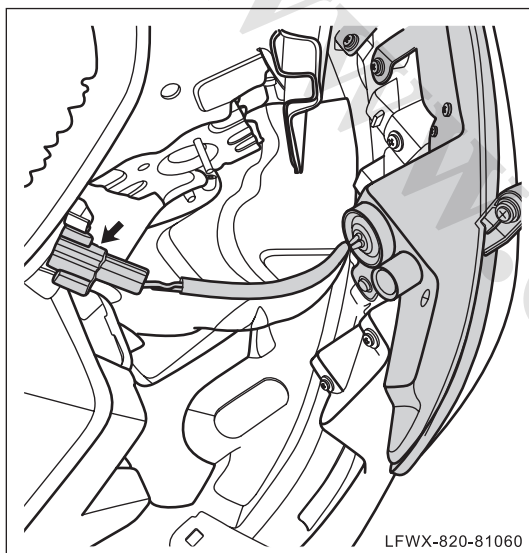
81



(c) Remove lower fixing bolts of front bumper.



(d) Remove upper fixing bolts of front bumper.

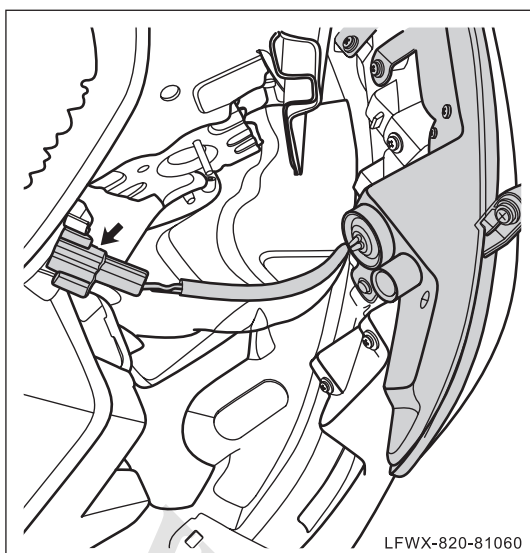


(e). Open the front bumper gently, and disconnect wire harness connectors of L/R daytime running lamps to take down the front bumper.

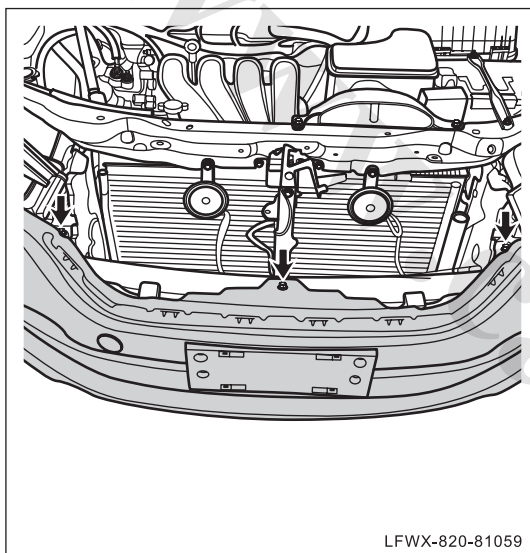
(f) Remove left/right daytime running lights. ( See 75-Lighting System, Daytime Driving Lights, Replacement )

## 2. Install front bumper.

(a) Install left/right daytime running lights onto front bumper. ( See 75-Lighting System, Daytime Driving Lights, Replacement )

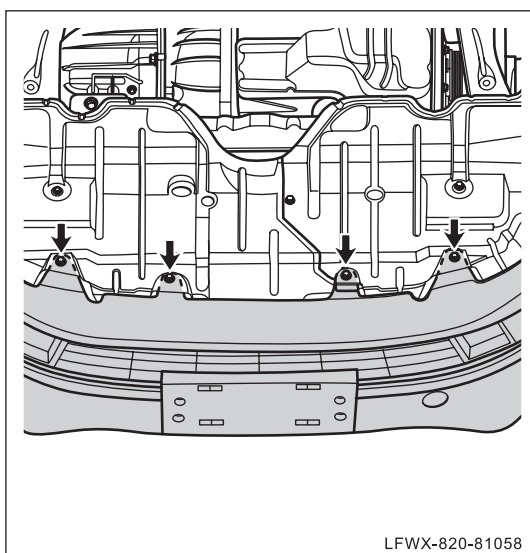


- (b) Connect wire harness connector of left/right daytime running lights and install front bumper to installation position.



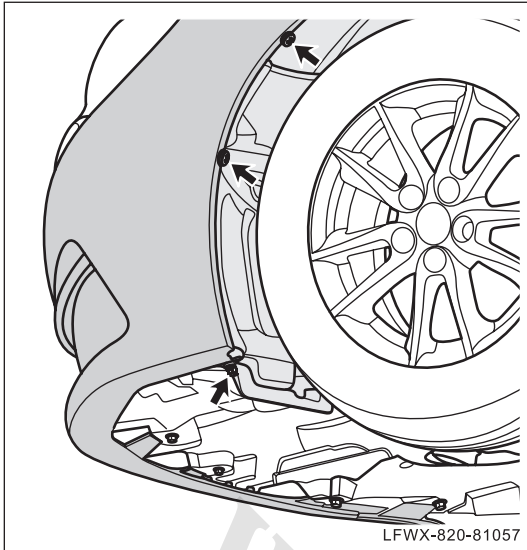
- (c). Install fixing bolts of front bumper and tighten them.

**Torque: 10N•m-12N•m**



- (d). Install lower fixing bolts of front bumper and tighten them.

**Torque: 10N•m-12N•m**

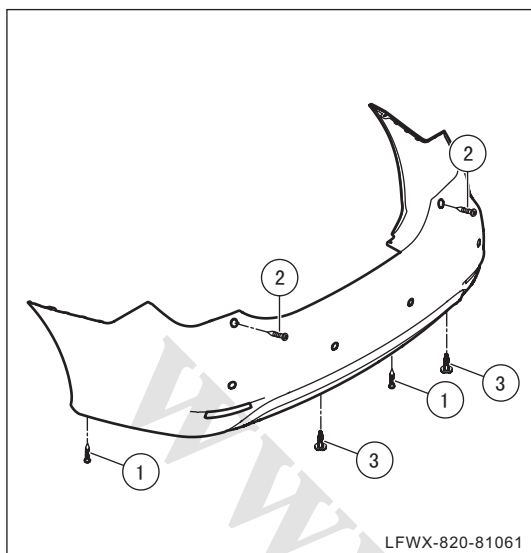


- (e) Install the fixing screws and snap-fits for connecting left/ front right mudguard/mud skin and front bumper.

- (f) Install front grille. (See 81 – Front Grille of Trim, Replacement)

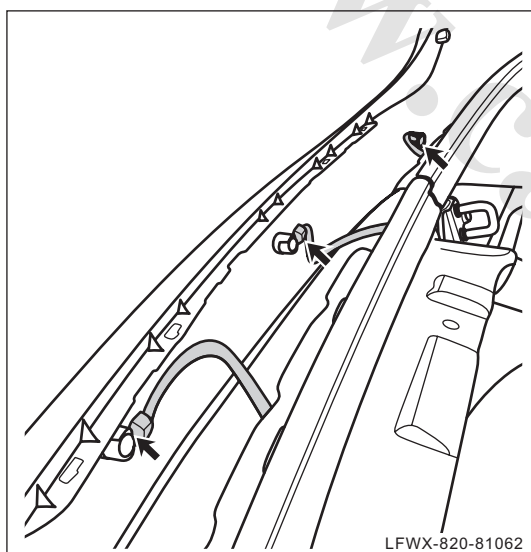
## Rear Bumper

### Replacement

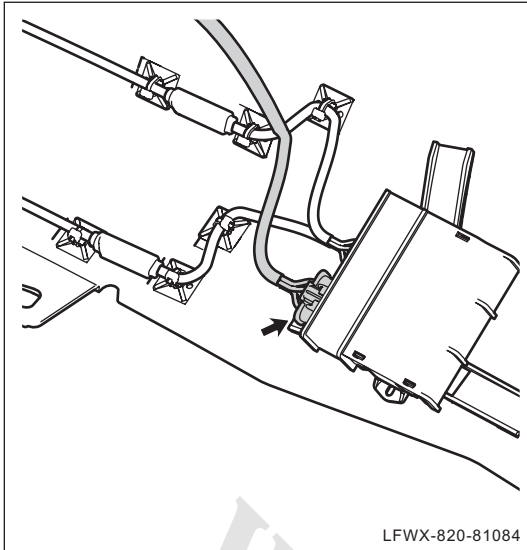


#### 1. Remove the rear bumper

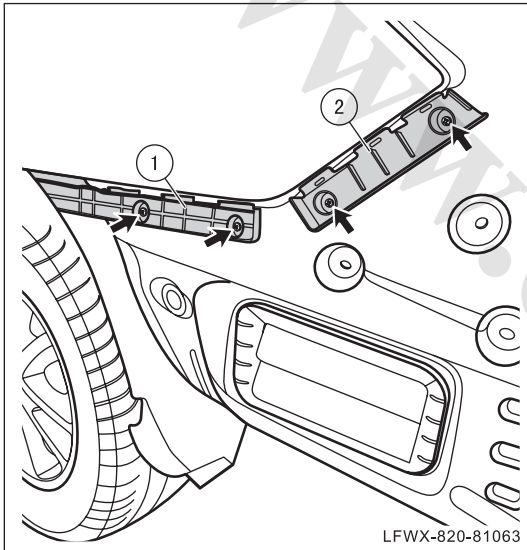
- (a) Disassemble the fixing screws ① for connecting left/ rear right mudguard skin and rear bumper.
- (b) Remove the fixing screws ② and snap-fits ③ of rear bumper.



- (c) Slightly pry rear bumper, disconnect wire harness connector of reverse radar probe and take down rear bumper.



- (d) Disconnect wire harness connector of auto start trunk module.



- (e) Remove the fixing screws of rear bumper left mounting bracket ① and take down rear bumper left mounting bracket ① .
- (f) Remove the fixing screws of rear bumper left mounting bracket ② and take down rear bumper left mounting bracket ② .
- (g) Remove rear bumper right mounting bracket.

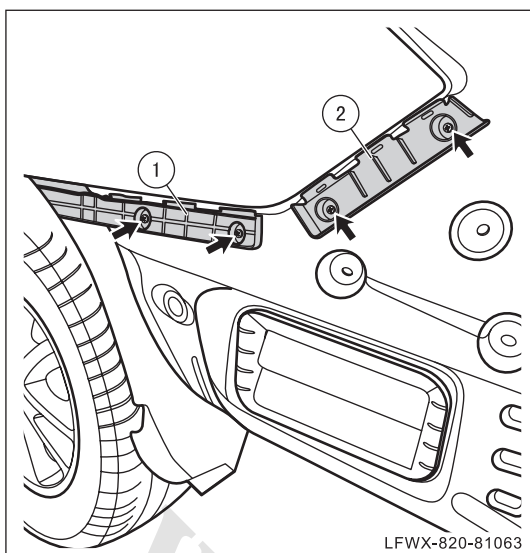
△ HINT:

Disassembling methods of left and right mounting bracket of rear bumper are basically the same.

- (h). Remove reverse radar probe. ( See 73-Driver Information System, Reverse Radar Probe, Replacement )

## 2. Install rear bumper

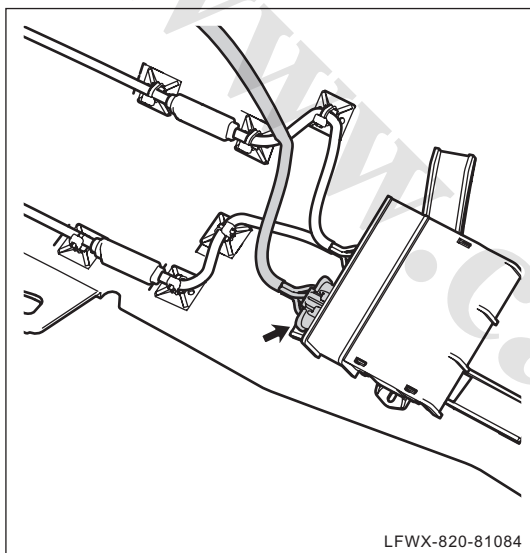
- (a). Install reversing radar probe. ( See 73-Driver Information System, Reverse Radar Probe, Replacement )



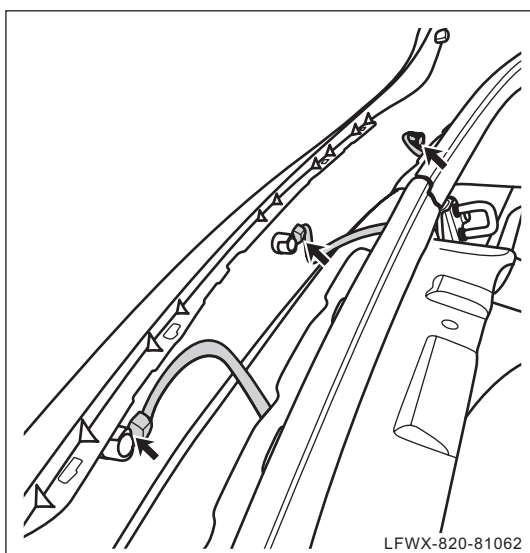
- (b) Install rear bumper left mounting bracket ① onto body, mount fixing screws and fasten them.
- (c) Install rear bumper left mounting bracket ② onto body, mount fixing screws and fasten them.
- (d) Install rear bumper right mounting bracket.

△ HINT:

Installation methods of left and right mounting bracket of rear bumper are basically the same.

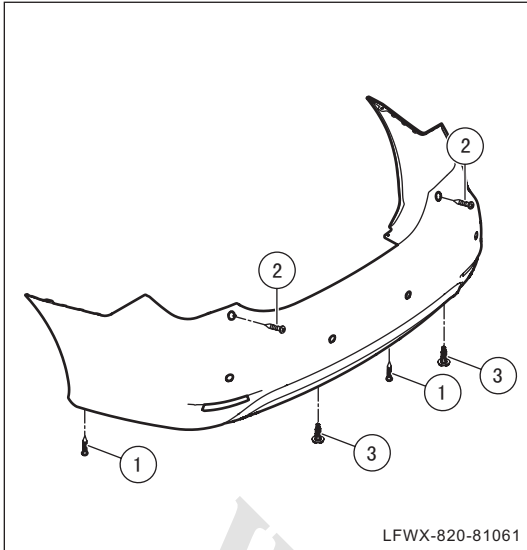


- (e) Connect wire harness connector of auto start trunk module.



- (f) Connect wire harness connector of reverse radar probe and install rear bumper to installation position.





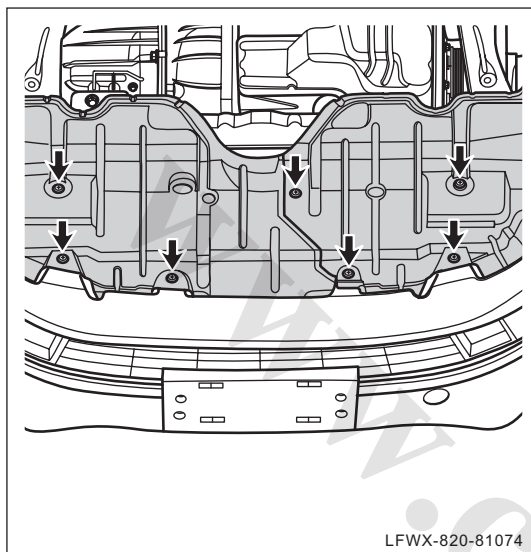
- (g) Install the fixing screw ② and snap-fit ③ of rear bumper.
- (h) Install the fixing screw ① for connecting left/ rear right mudguard skin and rear bumper.

## Engine Lower Trim Panel

### Replacement

#### 1. Remove engine lower panel

- (a) Remove front mudguard. ( See 81- Interiors and Exteriors, Mudguard and Mudguard Skin, Replacement )



- (b) Remove the snap-fits of engine left/right lower panel and take down engine left/right lower panel.

#### 2. Install engine lower panel

- (a) Install engine left/right lower panel to installation position and mount fixing snap-fits.
- (b) Install front mudguard. ( See 81- Interiors and Exteriors, Mudguard and Mudguard Skin, Replacement )

## Engine Side Panel

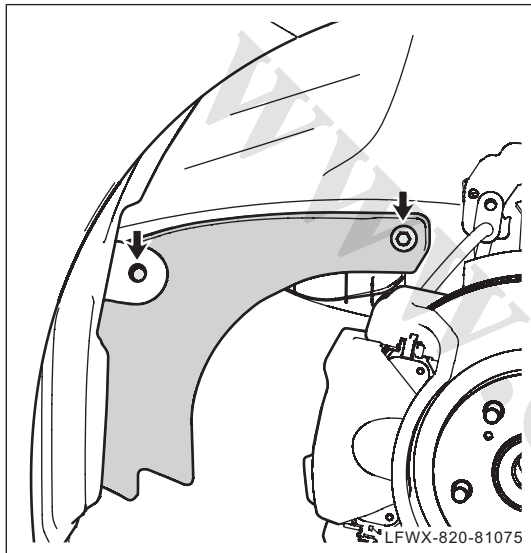
### Replacement

△ HINT:

Replacement methods of engine left and right side panel are basically the same, and this section only takes the left side panel as an example.

#### 1. Remove engine left side panel

(a) Remove front left wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



(b) Remove the fixing bolts of engine left side panel, and take down engine left side panel.

#### 2. Install engine left side panel

(a) Install engine left side panel to installation position, mount fixing bolts and fasten them.

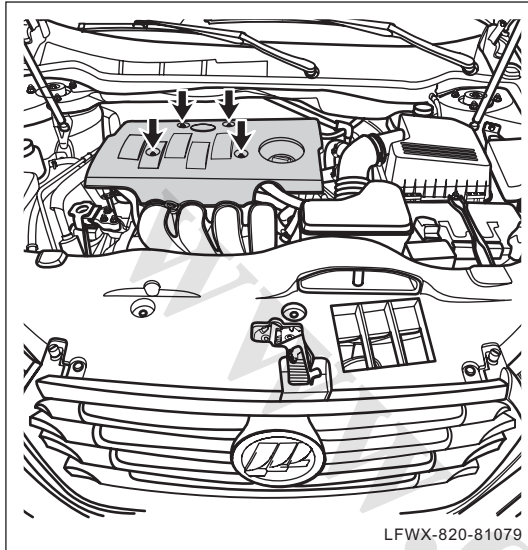
(b) Install front left wheel. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

## Engine Trim Cover

### Replacement

#### 1. Remove engine hood

(a) Open the engine hood.



(b) Remove the hold-down nuts of engine hood, take down engine hood.

81

#### 2. Install engine hood

(a) Install engine hood to installation position, mount fixing nuts and fasten them.

**Torque: 10N•m-12N•m**

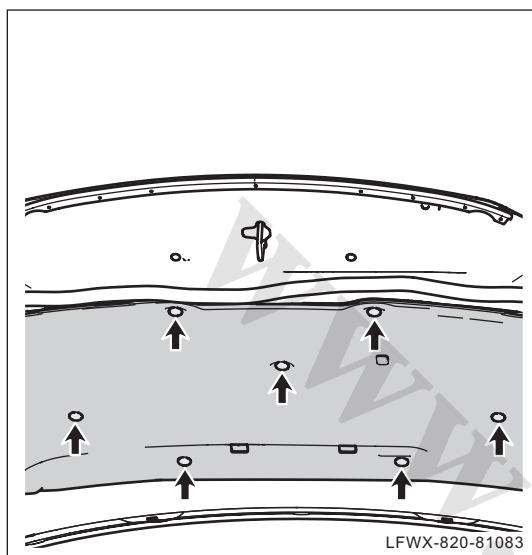
(b) Close engine compartment cover

## Engine Hood Heating Insulation Pad

### Replacement

#### 1. Remove engine hood heat insulation pad

(a) Open the engine hood.



(b) Use trim prying plate to pry snap-fits of engine hood heat insulation pad and take down engine hood heat insulation pad.

#### 2. Install engine hood heat insulation pad

(a) Install engine hood heat insulation pad to installation position and install the snap-fits of engine hood heat insulation pad.

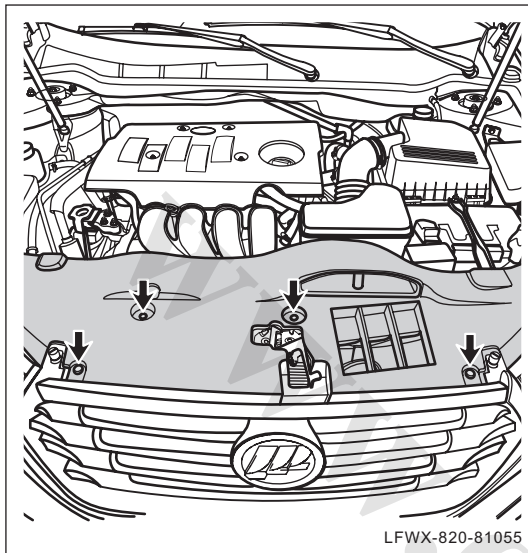
(b) Close engine compartment cover

## Upper Crossmember Trim Panel of Water Tank

### Replacement

#### 1. Remove tank top cross member panel

(a) Open the engine hood.



(b) Use trim prying plate to pry snap-fits of tank top cross member panel and take down tank top cross member panel.

81

#### 2. Install tank top cross member panel

(a) Install tank top cross member panel to installation position and install snap-fits of tank top cross member panel.

(b) Close engine compartment cover

## Fender

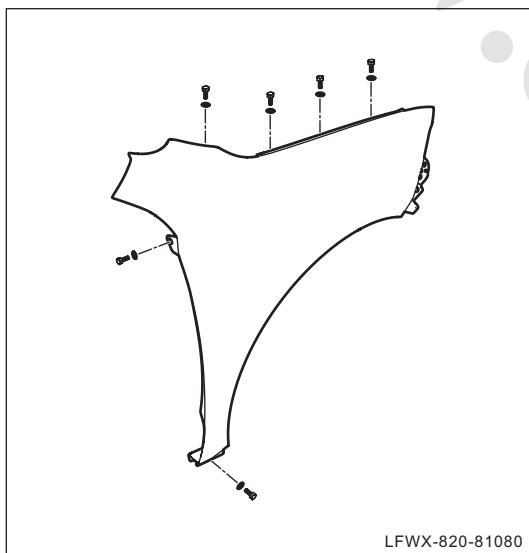
### Replacement

△ HINT:

Replacement methods of left and right fender are basically the same, and this section only takes the right side fender as an example.

#### 1. Remove fender

- (a) Remove front right combination light. (See 75 - Lighting System, Front Combination Lamp, Replacement)
- (b) Remove front right mudguard skin. ( See 81- Interiors and Exteriors, Mudguard and Mudguard Skin, Replacement )
- (c) Remove right fender trimming element. ( See 81- Interiors and Exteriors, Fender Trimming Element, Replacement )
- (d) Remove right body side doorsill lower panel assembly. ( See 81- Interiors and Exteriors, Body Side Doorsill Lower Panel Assembly, Replacement )



- (e). Remove fixing bolts of the fender, and take down the fender.

#### 2. Install fender

- (a). Install the fender onto the vehicle body, and then mount & tighten the fixing bolts.

**Torque: 10N•m-12N•m**

- (b) Install right body side doorsill lower panel assembly. ( See 81- Interiors and Exteriors, Body Side Doorsill Lower Panel Assembly, Replacement )
- (c) Install right fender trimming element. ( See 81- Interiors and Exteriors, Fender Trimming Element, Replacement )
- (d) Install front right mudguard skin. ( See 81- Interiors and Exteriors, Mudguard and



Mudguard Skin, Replacement )

- (e) Install front right combination light. (See 75 - Lighting System, Front Combination Lamp, Replacement)

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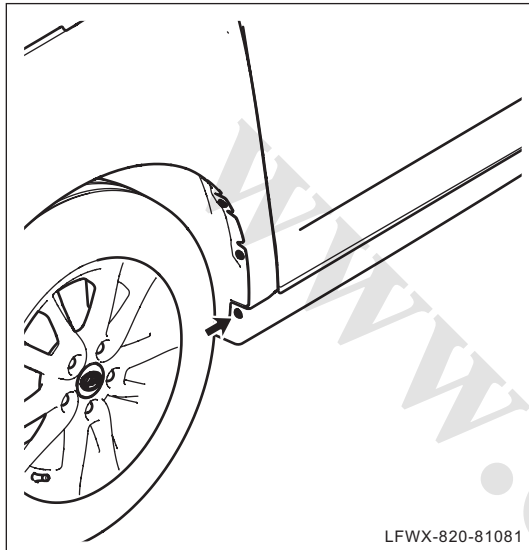
## Body Side Doorsill Lower Panel

△ HINT:

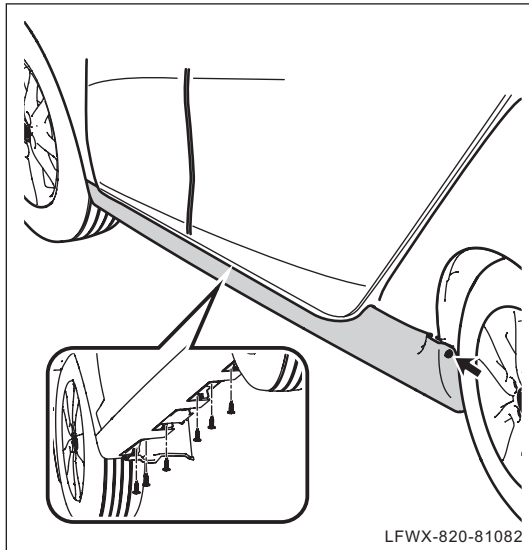
Replacement methods of left and right body side doorsill lower panel are basically the same, and this section only takes the left body side doorsill lower panel as an example.

### 1. Remove body side doorsill lower panel

(a) Lift the vehicle



(b) Remove front fixing screws of body side doorsill lower panel



(c) Remove bottom snap-fits and rear fixing screws of body side doorsill lower panel and take down body side doorsill lower panel

### 2. Install body side doorsill lower panel

(a) Install body side doorsill lower panel to installation position, align the snap-fits of body side doorsill lower panel to the mounting holes, press down snap-fits position hard, and make sure that body side doorsill lower panel is installed in place.

**Note:**

**Installation of body side doorsill lower panel should be carried out under the help of assistant.**

- (b) Install rear fixing screws of body side doorsill lower panel and fasten them.
- (c) Install front fixing screws of body side doorsill lower panel and fasten them.

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## Mudguard and Mudguard Skin

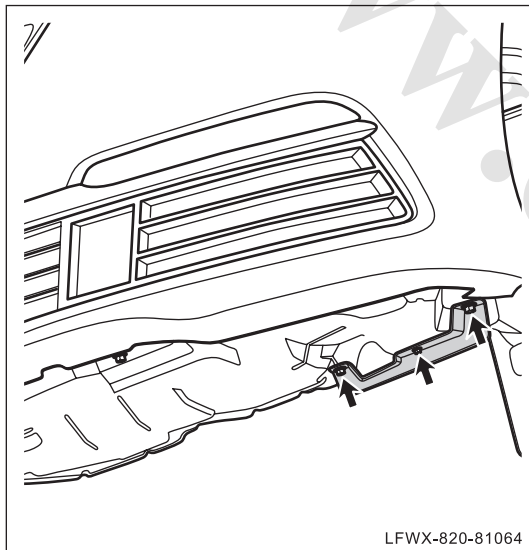
### Replacement

△ HINT:

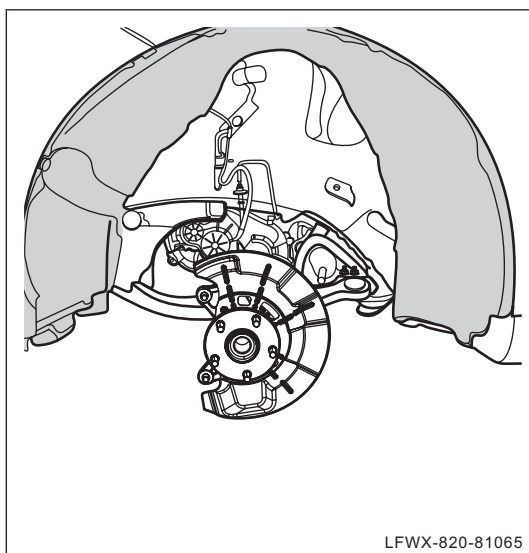
- Replacement methods of left and front right mudguard and mudguard skin are basically the same, and this section only takes the front left mudguard and mudguard skin as an example.
- Replacement methods of left and rear right mudguard and mudguard skin are basically the same, and this section only takes the rear left mudguard and mudguard skin as an example.

#### 1. Remove front mudguard and mudguard skin

- (a) Remove front tyre assembly. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



- (b) Remove the fixing screws of front mudguard and take down front mudguard.



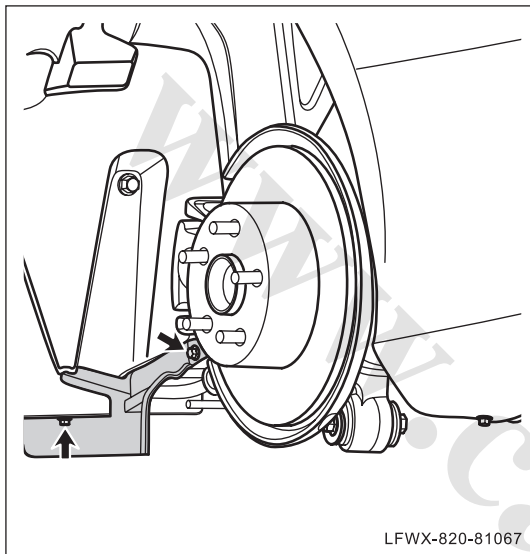
- (c) Remove the fixing screws and snap-fits of front mudguard skin and take down front mudguard skin.

## 2. Install front mudguard and mudguard skin

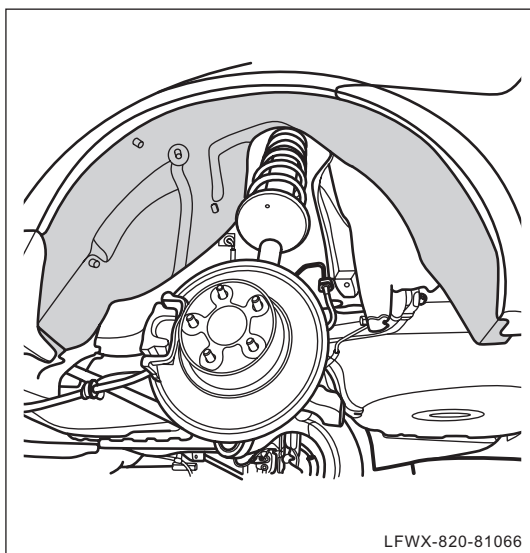
- Install front mudguard skin onto vehicle body and mount fixing screws and snap-fits.
- Install front mudguard to installation position, mount fixing screws and fasten them.
- Install front tyre assembly. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

## 3. Remove rear mudguard and mudguard skin

- Remove rear tyre assembly. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)



- Remove the fixing screws of rear mudguard and take down rear mudguard.



- Remove the fixing screws and snap-fits of rear mudguard skin and take down rear mudguard skin.

## 4. Install rear mudguard and mudguard skin

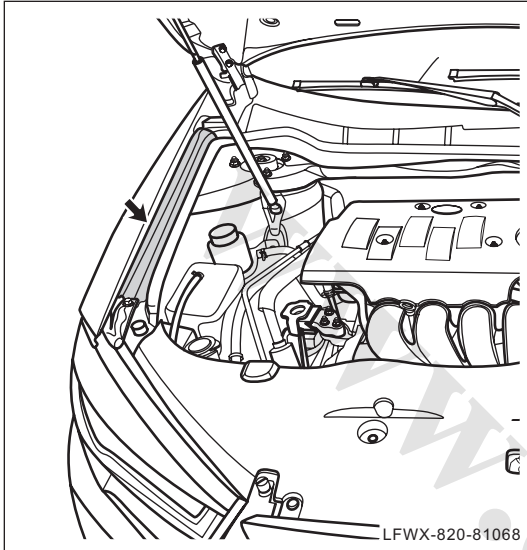
- Install rear mudguard skin onto vehicle body and mount fixing screws and snap-fits.
- Install rear mudguard to installation position, mount fixing screws and fasten them.
- Install rear tyre assembly. (See 33 - Wheel and Tyre, Wheel Assembly, Replacement)

## Seal Strip and Sealing Element

### Fender adhesive tape

△ HINT:

Replacement methods of left and right fender adhesive tape are basically the same, and this section only takes the right side fender adhesive tape as an example.



#### 1. Disassemble fender adhesive tape

- (a) Use trim prying plate to pry the clips of fender adhesive tape and take down fender adhesive tape.

#### 2. Install fender adhesive tape

- (a) Install fender adhesive tape to installation position, and align the clips of fender adhesive tape to the mounting holes.

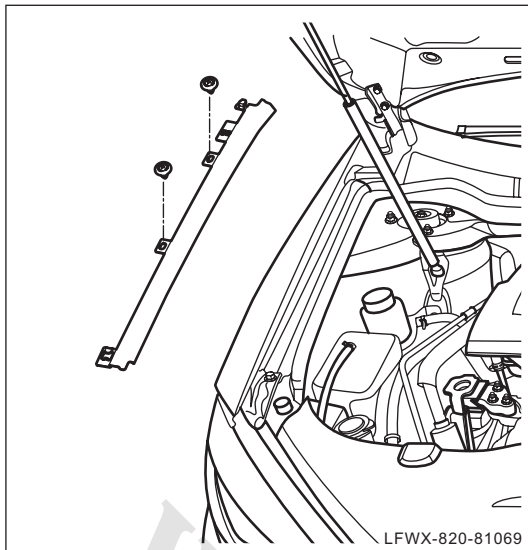
### Fender trimming element

△ HINT:

Replacement methods of left and right fender trimming element are basically the same, and this section only takes the right fender trimming element as an example.

#### 1. Remove fender trimming element

- (a) Remove fender adhesive tape. ( See 81- Interiors and Exteriors, Seal Strip and Sealing Element, Fender Adhesive Tape )



- (b) Use trim prying plate to pry the snap-fits of fender trimming element and take down fender trimming element.

## 2. Install fender trimming element

- (a) Install fender trimming element to installation position, and mount the snap-fits of fender trimming element.
- (b) Install fender adhesive tape. ( See 81- Interiors and Exteriors, Seal Strip and Sealing Element, Fender Adhesive Tape )

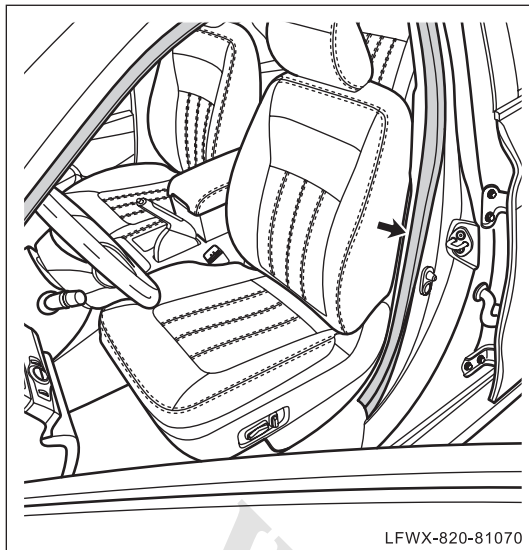
## Door weatherstrip

△ HINT:

Replacement methods of front left and front right door weatherstrip are basically the same with that of rear left and rear right door weatherstrip, and this section only takes front left door as an example.

### 1. Remove front left door weatherstrip

- (a) Remove front left doorsill panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)



- (b) Remove door weatherstrip and take it down.

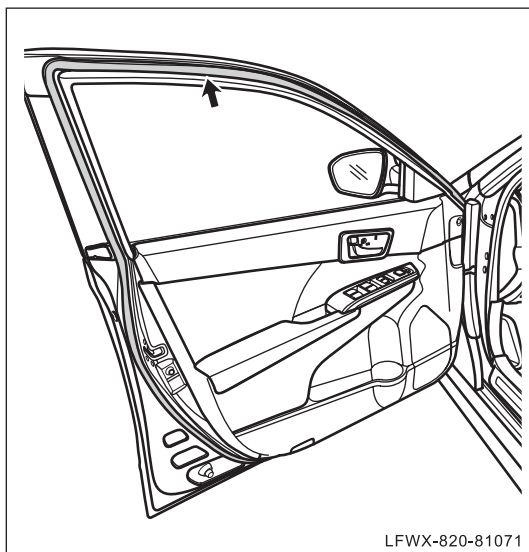
## 2. Install front left door weatherstrip

- (a) Install front left door weatherstrip to installation position, use rubber hammer to knock front left door weatherstrip lightly, and make sure that front left door weatherstrip is installed in place.
- (b) Install front left doorsill panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)

## Door weatherstrip

△ HINT:

Replacement methods of front left/front right and rear left/rear right door weatherstrip are basically the same, and this section only takes the front left door as an example.



### 1. Remove door weatherstrip

- (a) Remove door weatherstrip and take it down.

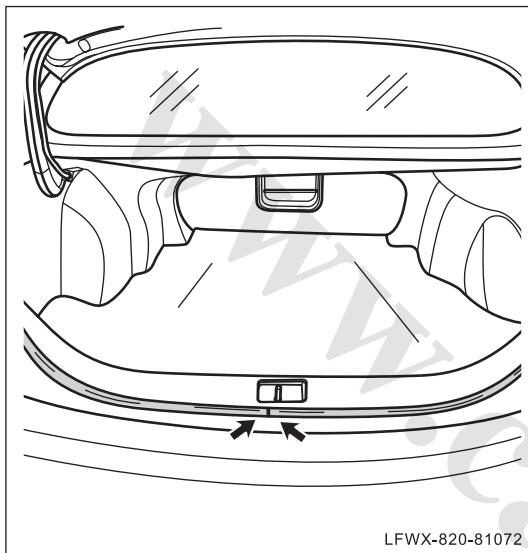
## 2. Install door weatherstrip

- (a) Install door weatherstrip and embed weatherstrip into fixing groove of door weatherstrip

## Trunk weather strip

### 1. Remove trunk weatherstrip

- (a) Remove trunk rear skirt plate panel. (See 81-Interiors and Exteriors, Rear Apron Guard Panel, Replacement)



- (b) Remove trunk weatherstrip and take it down.

81

### 2. Install trunk weatherstrip

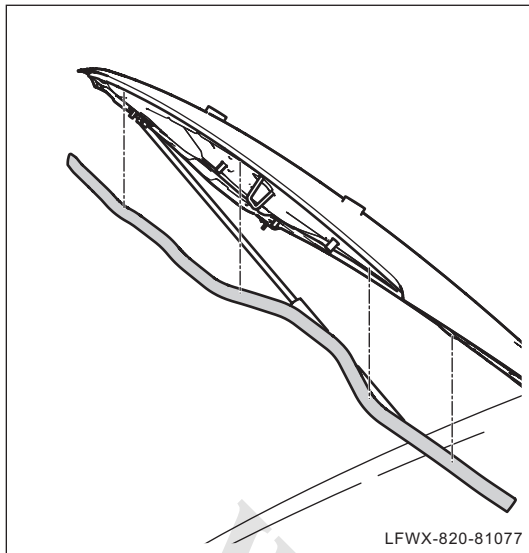
- (a) Install trunk weatherstrip to installation position, use rubber hammer to knock weatherstrip lightly, and make sure that trunk weatherstrip is installed in place.
- (b) Install trunk rear skirt plate panel. (See 81-Interiors and Exteriors, Rear Apron Guard Panel, Replacement)

## Engine compartment cover front seal strip

### 1. Disassemble engine compartment cover front seal strip

- (a) Open the engine hood.



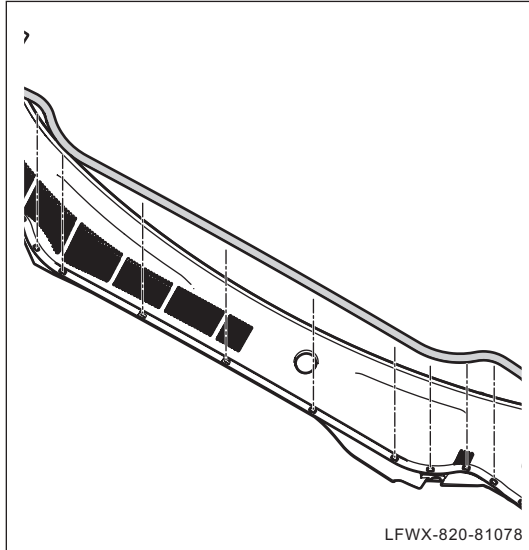


- (b) Use trim prying plate to pry the clips of engine compartment cover front seal strip, and take down engine compartment cover front seal strip.

## 2. Install engine compartment cover front seal strip

- (a) Install engine compartment cover front seal strip to installation position, and align the clips of engine compartment cover front seal strip to the mounting holes.
- (b) Close engine compartment cover

## Engine compartment cover rear seal strip



1. Remove front compartment cover rear seal strip
- (a) Use trim prying plate to pry clips of engine front compartment cover rear seal strip, and take down front compartment cover rear seal strip.

## 2. Install front compartment cover rear seal strip

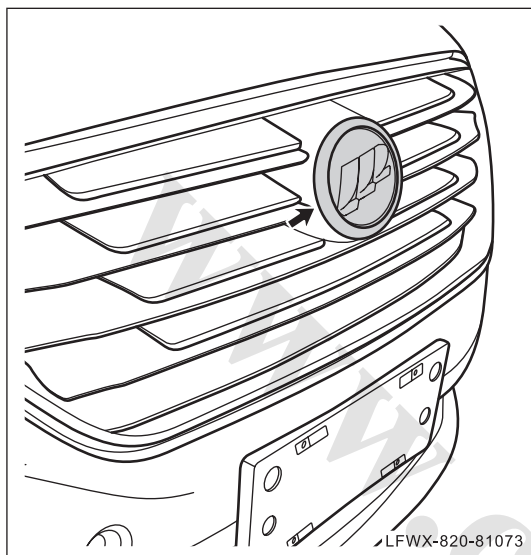
- (a) Install engine front compartment cover rear seal strip to installation position, align the clips of front compartment cover rear seal strip to the mounting holes.

## Logo

### Replacement

△ HINT:

Replacement methods of front and rear logo are basically the same, and this section only takes the front logo as an example.



#### 1. Remove front logo

- (a) Use flat-blade screwdriver to disassemble front logo.

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#### 2. Install front logo

- (a) Install front logo to installation position, press down front logo hard, and make sure that front logo is installed firmly.

△ HINT:

Before installation of front logo, it is suggested to remove adhesive glue remained on installation position of front logo.



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## 82- Vehicle Door/Engine Compartment Door/Lock

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## Vehicle Door/Engine Compartment Door/Lock

### System description

#### 1. Function

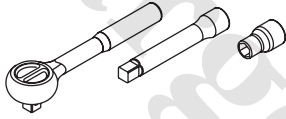
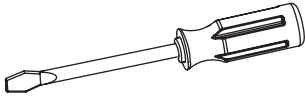
Vehicle door, compartment door and lock are important components of vehicle body. Vehicle door, compartment door and lock form a safe enclosed space during vehicle travels.

#### 2. Components

Vehicle door mainly includes: front vehicle door, rear vehicle door and vehicle door hinge and stopper, etc., vehicle door connects with vehicle body by hinge and is locked-up by lock and lock catch. Engine compartment door mainly includes: engine compartment cover, trunk lid, engine oil filler cap and respective hinge, etc.; compartment door connects with vehicle body by respective hinge and is locked-up by respective lock.

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### Preparation

S/N	Tools	Outline diagram	Description
1	Quick wrench		Used for removing and installing the fixing bolts
2	Screwdriver		Remove the fixing screws

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolts for connecting upper/lower hinge of vehicle door and vehicle body	30~36
Fixing bolts for connecting upper/lower hinge of vehicle door and vehicle door	30~36
Fixing bolt of door check and the body	30~36
Fixing bolt of door check and the door	30~36
Fixing bolts for connecting engine compartment cover and engine compartment cover hinge	30~36
Fixing bolts for connecting trunk lid and trunk lid hinge	30~36
Fixing bolt of fuel filler cap	8~12
Fixing bolts of engine compartment cover	10~12
Fixing bolts of trunk lid lock	10~12

## Precautions

### 1. Precautions before repair

- (a) Whether engine operates or not, as long as the ignition switch is on, never plug any element of system, such as: any battery cables, connectors of system components, etc.

### 2. Precautions for maintenance

- (a) Before dismantling or installing any electric device or electric terminals which are easy to be contacted by tools or equipment, first disconnect negative battery cable to prevent worker being injured or car be damaged.
- (b) When disconnect system part connector, please don't draw any wire harness, to prevent damaging it.

## General check

### Check the system

#### 1. Check system components

- Check system for obvious mechanical or electrical damage. If any, repair it.
- Check system for obvious collision and deformation. If any, repair it.
- Check system fasteners (bolt or nut) for looseness. If any, re-tighten it.

#### 2. Check wire harness

- Check system wire harness connector for secure and reliable installation. If any, re-install it.
- Check system wire harness for crack or damage. If any, fix it.

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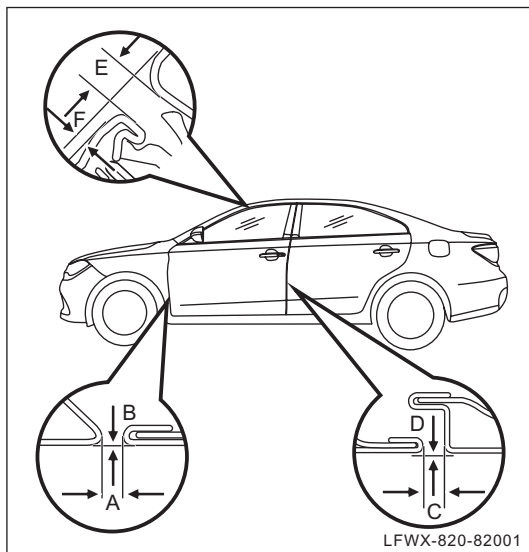
### Check the door

#### 1. Check working condition of vehicle door

- Close all vehicle doors, open and close single door, hear attentively the sound of opening/closing door to judge the leakproofness of vehicle driver's room.

△ HINT:

If the sound of opening/closing door is sharp, this indicates that the leakproofness of vehicle is bad; if the sound of opening/closing door is muffled, this indicates that the leakproofness of vehicle is good.



- Close vehicle door and check every clearance value of front vehicle door; if it doesn't meet the requirements, adjust it.

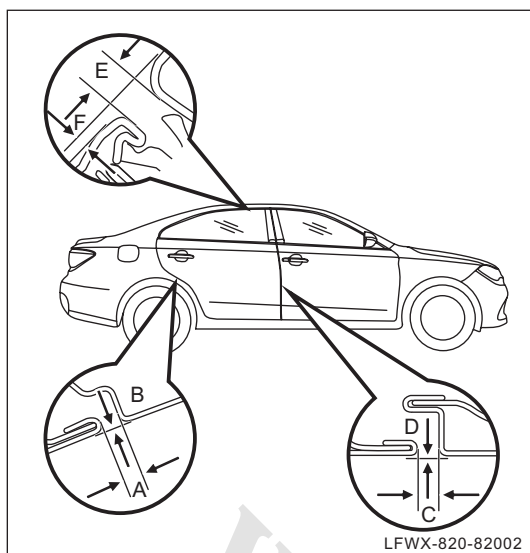
**Standard value:**

**2.7-5.7mm(A), less than 1.5mm(B)**

**2.7-5.7mm(C), less than 1.5mm(D)**

**3.3~6.3mm(E)、 0.9~3.9mm(F)**





- (c) Check every clearance value of rear vehicle door; if it doesn't meet the requirements, adjust it.

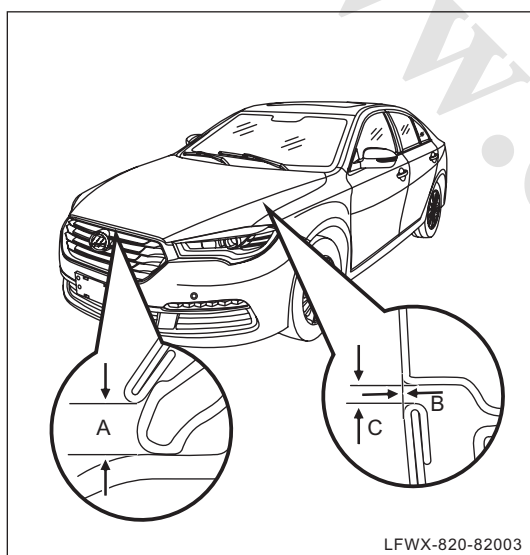
**Standard value:**

**2.7-5.7mm(A), less than 1.5mm(B)**

**2.7-5.7mm(C), less than 1.5mm(D)**

**3.3~6.3mm(E), 0~3mm(F)**

### Check compartment door



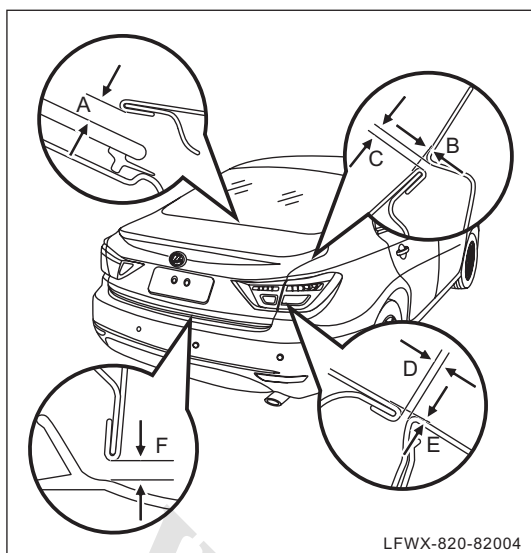
- 1. Check working condition of engine compartment cover**

- (a) Check every clearance value of engine compartment cover, if it doesn't meet the requirements, adjust it.

**Standard value:**

**2.3-5.7mm(A), less than 1.6mm(B)**

**2.0~5.0mm(C)**



## 2. Check working condition of trunk lid

- (a) Check every clearance value of trunk lid; if it doesn't meet the requirements, adjust it.

### Standard value:

5-5.7mm(A), less than 1.5mm(B)

2.0~5.0mm(C)、 2.0~5.0mm(D)

Less than 1.5mm(E), 3.8-7.8mm(F)

## Check vehicle door lock

### △ HINT:

Checking methods of each vehicle door are basically the same, and this section only takes the front left vehicle door as an example.

### 1. Check working condition of front left vehicle door lock

- (a) Enter cab, lock or open front left vehicle door, check whether door lock works normally, and if front left door can't be locked or opened, check whether lock-up cable, inside cable or lock is damaged.
- (b) Close vehicle door, use mechanical key to lock or open the vehicle door, check if door lock works normally, and if it can't be locked or opened, check whether door lock cylinder or lock malfunctions.

## Check engine compartment cover lock

### 1. Check working condition of engine compartment cover lock

- (a) Close engine compartment cover, check if engine compartment cover lock works normally by engine compartment cover handle, if engine compartment cover can't be opened, check if engine compartment cover open cable or lock malfunctions.

## Check the fuel filler cap

### 1. Check working condition of engine oil filler cap

- (a) Close engine oil filler cap, check if engine oil filler cap works normally by engine oil filler cap opener, if engine oil filler cap can't be opened, check if engine oil filler cap open cable or locking dog malfunctions.

## Diagnosis

### Fault symptom table

△ HINT:

See 78- Center Control Door Lock and Anti-theft Diagnosis of Vehicle Body, Fault Phenomenon Table.

### Fault diagnosis

△ HINT:

See 78 – Diagnosis of Central Door Lock and Immobilizer, Fault Diagnosis)

## Front Door Assembly

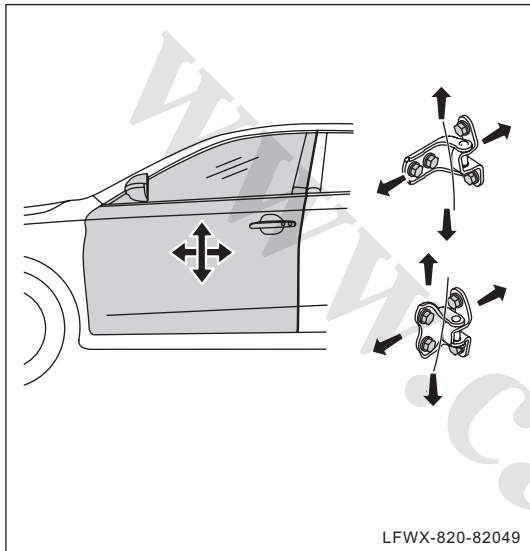
### Adjustment

△ HINT:

Adjustment methods of left and front right vehicle door are basically the same, and this section only takes the front left vehicle door as an example.

#### 1. Adjust front left door

(a) Remove fender. (See 81 - Interiors and Exteriors, Fender, Replacement)



(b). Loosen fixing bolts of upper /lower hinges for front left door and the body and door, and adjust front left door.

(c). After adjusting, tighten fixing bolts of upper /lower hinges of front left door and the body and door.

**Torque: 30N•m - 36N•m**

**ⓘ Note:**

**Check if there is bump phenomenon in the process of installation and if bolts /nuts are installed in place and for screw looseness, etc..**

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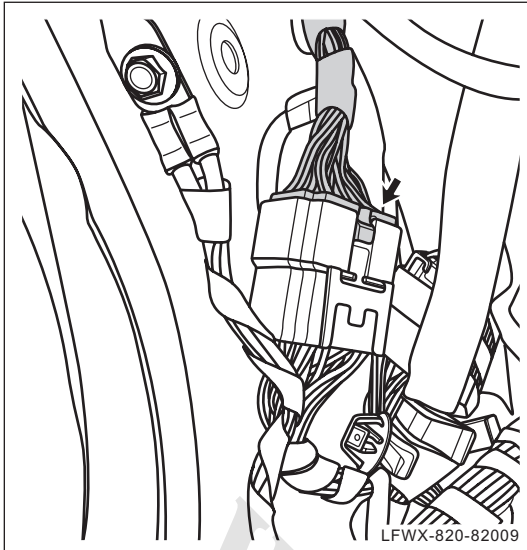
### Replacement

△ HINT:

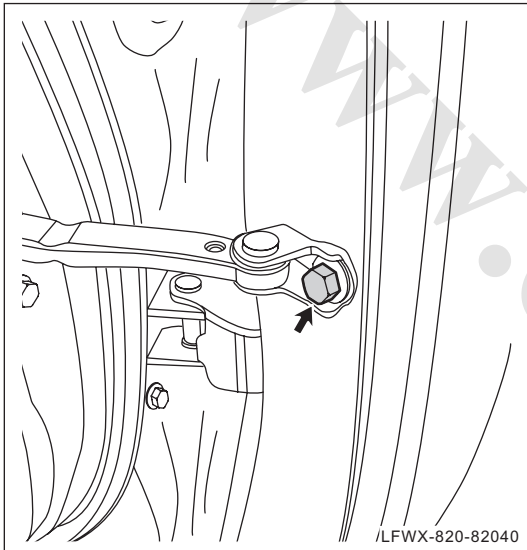
Replacement methods of left and front right vehicle door are basically the same, and this section only takes the front left vehicle door as an example.

#### 1. Remove front left door assembly

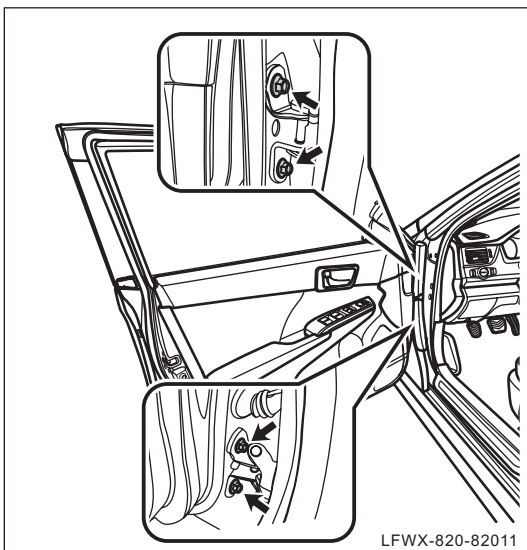
(a). Remove A pillar lower trim panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)



- (b). Disconnect wire harness connector of front left door.



- (c). Remove fixing bolts of front left door check and the body.



- (d). Remove fixing bolts for upper and lower hinge of front left door and front left door.

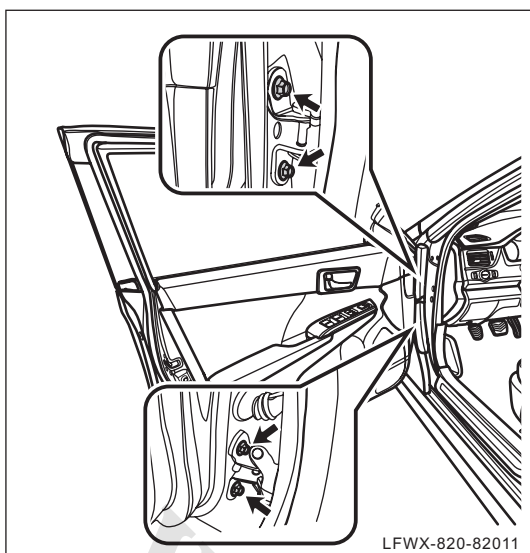
△ HINT:

When dismantling, it is necessary to make marks on matching surface of front left door hinge and front left door for easy installation in the future.

ⓘ Note:

**When operating, an assistant is required to fix front left door, or use lifting tools to fix front left door to prevent front left door from falling or shaking when dismantling.**

- (e). Remove front left door.



## 2. Install front left door assembly

- (a). Install and tighten fixing bolts for upper / lower hinges of front left door and front left door.

**Torque: 30N•m - 36N•m**

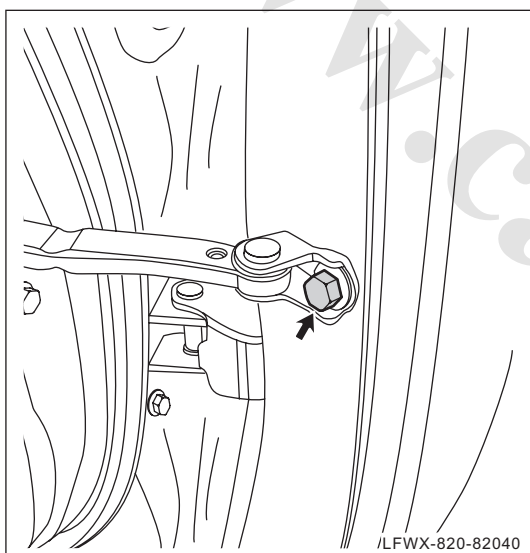
△ HINT:

When installing front left door, align the marks to install it.

📌 **Note:**

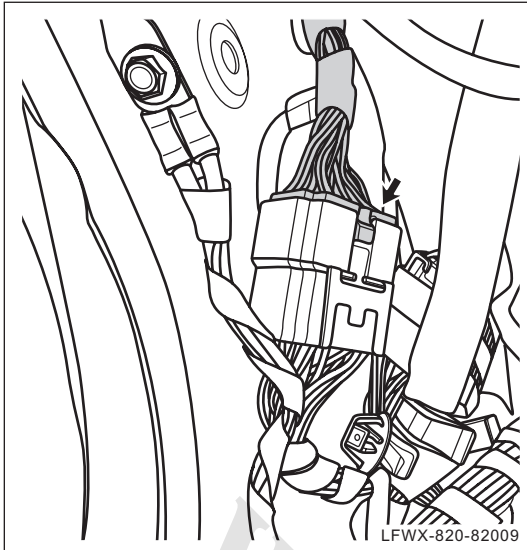
It is difficult for a single person to complete it. An assistant is required to fix front left door, or use lifting tools to fix front left door to prevent front left door from falling or shaking when installing.

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- (b). Install fixing bolts of front left door check and the body, and tighten them.

**Torque: 30N•m - 36N•m**



- (c) Connect the wire harness connector of front left vehicle door.

- (d). Install A pillar lower trim panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)

## Rear Door Assembly

### Adjustment

△ HINT:

Adjustment method of front/rear vehicle door is basically the same, See 82- Vehicle door/ Engine compartment door/Lock, Front vehicle door assembly, Adjustment .

### Replacement

△ HINT:

Replacement method of front/rear vehicle door is basically the same, See 82- Vehicle door/ Engine compartment door/Lock, Front vehicle door assembly, Replacement.



## Door Hinge and Check

### Replacement

△ HINT:

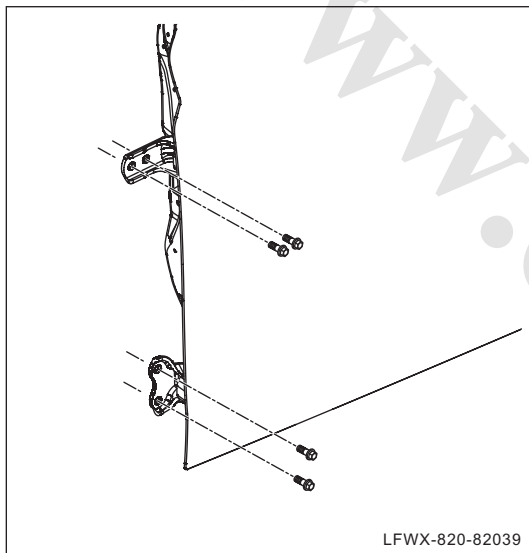
Replacement methods of every vehicle door hinge and stopper are basically the same, and this section only takes the front left vehicle door as an example.

#### 1. Remove front left door hinge

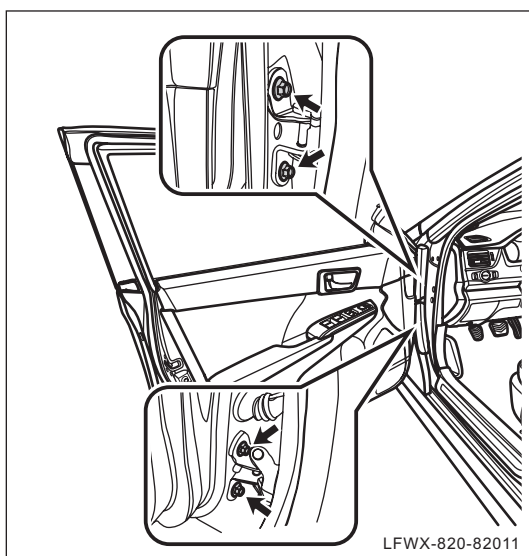
**Note:**

In order to avoid relocating doors, do not dismantle two door hinges at the same time. It is better to dismantle the doors one by one.

(a) Remove left fender. (See 81 - Interiors and Exteriors, Fender, Replacement)



(b). Remove fixing bolts of hinge of front left door and the body.



(c). Remove fixing bolts for hinge of front left door and front left door.

△ HINT:

When dismantling, it is necessary to make marks on matching surface of front left door hinge and front left door for easy installation in the future.

(d). Remove hinge of front left door.

## 2. Install front left door hinge

- (a) Install front left vehicle door hinge onto vehicle door, mount the fixing screws of hinge and fasten them.

**Torque: 30N•m - 36N•m**

△ HINT:

When installing hinge of front left door, align marks made at the time of dismantling.

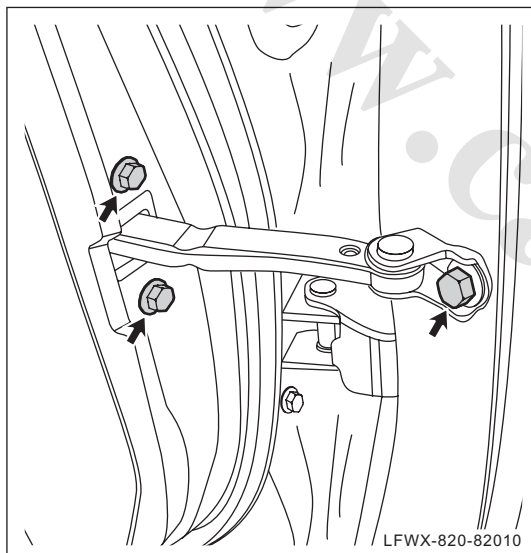
- (b). Install fixing bolts between hinge of front left door and the body, and tighten them.

**Torque: 30N•m - 36N•m**

- (c) Install left fender. (See 81 - Interiors and Exteriors, Fender, Replacement)

## 3. Remove front left door check

- (a). Remove front left door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)



- (b). Remove fixing bolts of front left door check and the body.

- (c). Remove fixing bolts of front left door check and front left door to remove front left door check.

## 4. Install front left door check

- (a) Install front left vehicle door stopper to installation position, mount the fixing bolts for connecting stopper and front left vehicle door, and fasten them.

**Torque: 30N•m - 36N•m**

- (b). Install fixing bolts of front left door check and the body, and tighten them.

**Torque: 30N•m - 36N•m**

- (c). Install the left front door inside guard board. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)

## Door Lock Buckle

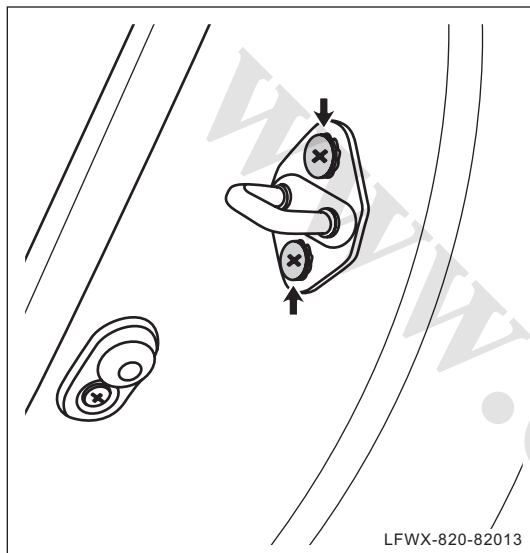
### Adjustment

△ HINT:

Adjustment methods of every vehicle door lock catch are basically the same, and this section only takes the front left vehicle door as an example.

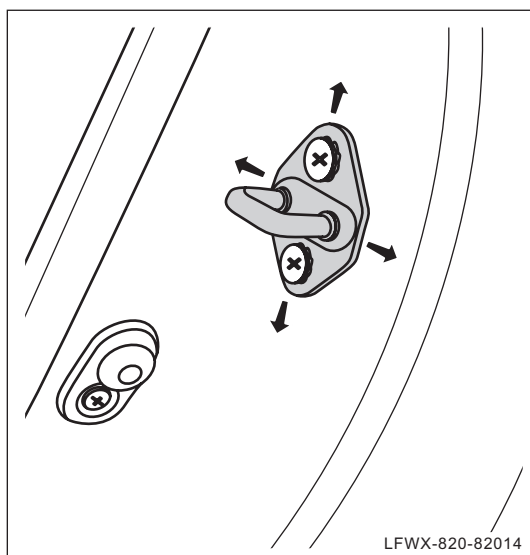
❗ **Note:**

**Before adjusting lock buckle, the door shall be located properly.**



#### 1. Adjust the front left door lock buckle

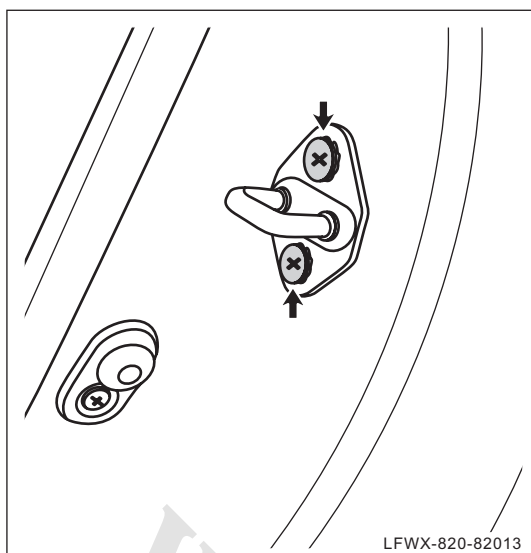
(a) Unscrew the fixing screws of front left vehicle door lock catch.



(b) Use rubber hammer to knock front left vehicle door lock catch, conduct upward/downward, left/right adjustment as needed.

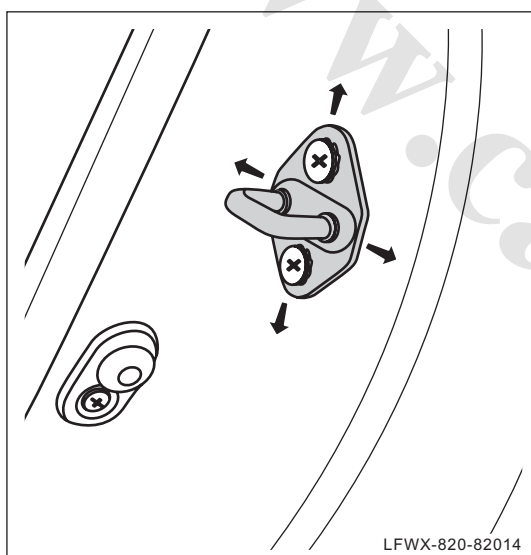
△ HINT:

- Adjust left & right to change the clearance between the door and vehicle body.
- Adjust up & down to accommodate the conditions that the door can not be locked.



- (c). Tighten the bolts of front left door lock buckle.

## Replacement



### 1. Install the front left door lock buckle

- (a) Remove the fixing screws of front left vehicle door lock catch, and take down front left vehicle door lock catch.

### 2. Install the front left door lock buckle.

- (a) Install front left vehicle door lock catch to installation position, mount fixing screws and pre-tighten them.
- (b) Adjust installation position of front left vehicle door lock catch, fasten fixing screws of front left vehicle door lock catch.

## Door Outside Handle

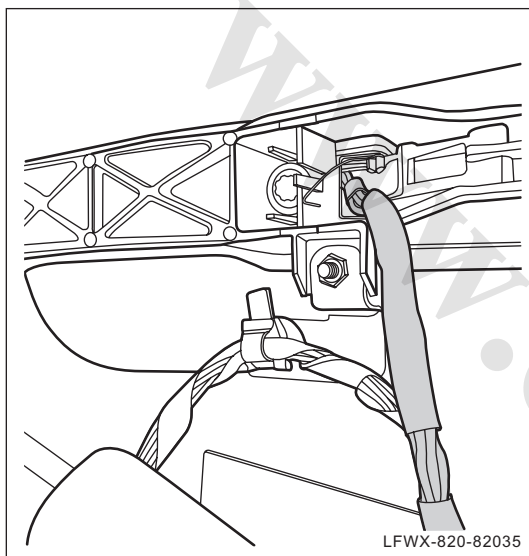
### Replacement

△ HINT:

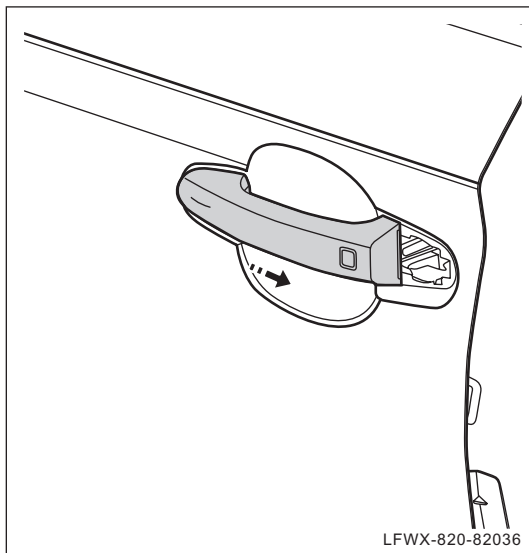
Replacement methods of every vehicle door outside handle are basically the same, and this section only takes the front left vehicle door as an example.

#### 1. Remove front left vehicle door outside handle

- (a) Remove front left vehicle door lock cylinder. ( See 82- Vehicle Door/ Compartment Door/Lock, Front left Vehicle Door Lock Cylinder, Replacement)



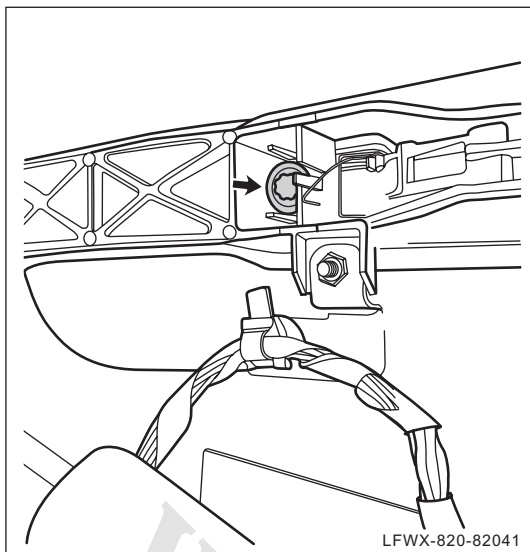
- (b) Disconnect the wire harness connector of front left door anti-theft antenna.



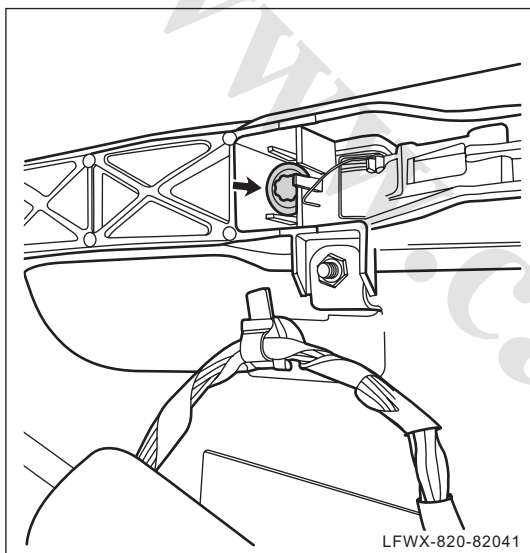
- (c) Take down front left vehicle door outside handle and gasket.

△ HINT:

Push front left vehicle door outside handle toward lock cylinder, and then take down vehicle door outside handle.

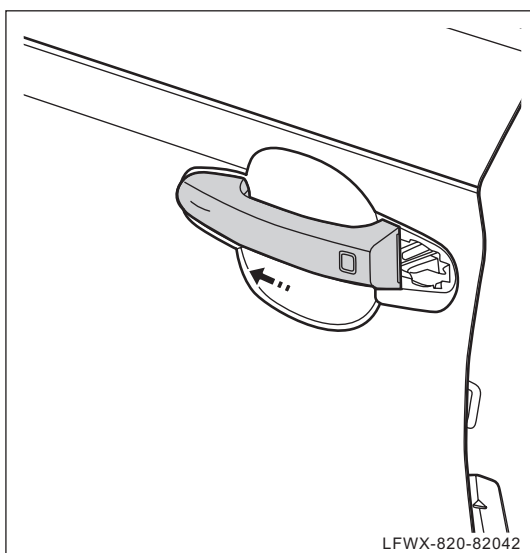


- (d) Remove the fixing screws of pedestal base of front left vehicle door outside handle pedestal base, and then take down pedestal base of front left vehicle door outside handle.



## 2. Install front left vehicle door outside handle

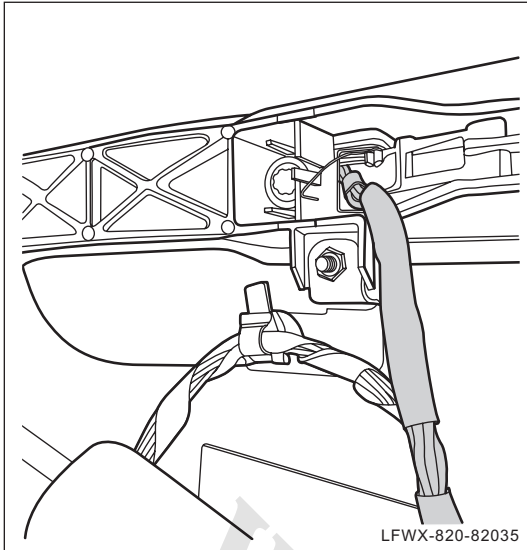
- (a) Install pedestal base of front left vehicle door outside handle to installation position, mount fixing screws and fasten them.



- (b) Install gasket of front left vehicle door outside handle.
- (c) Let front left vehicle door outside handle inward to pass through installation hole, then pull it forward, and install it onto the pedestal base of front left vehicle door outside handle.

### △ HINT:

Pull front left vehicle door outside handle outward, check if front left vehicle door outside handle is installed in place by visual inspection, and if not, re-install again.



- (d) Connect the wire harness connector of anti-theft antenna of front left vehicle door.

- (e) Install front left vehicle door lock cylinder. ( See 82- Vehicle Door/ Compartment Door/ Lock, Front left Vehicle Door Lock Cylinder, Replacement)

## Door Inside Handle

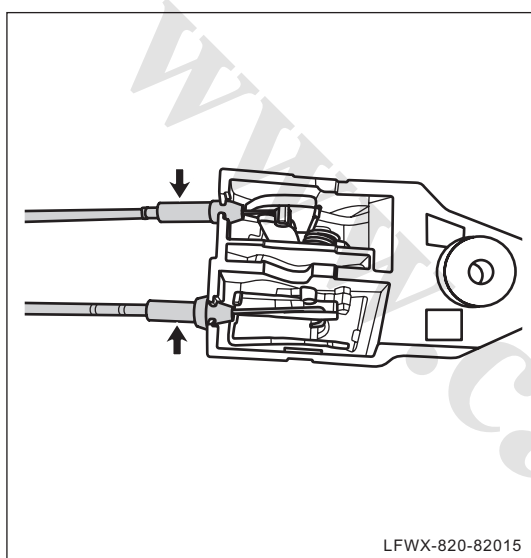
### Replacement

△ HINT:

Replacement methods of every vehicle door inside handle are basically the same, and this section only takes the front left vehicle door as an example.

#### 1. Remove front left vehicle door inside handle

- (a). Remove front left door trim panel. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)



- (b) Take out inside cable and lock-up cable and take down inside handle.

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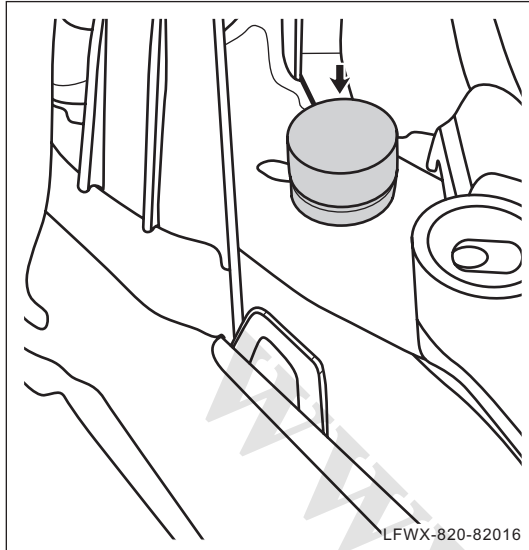
#### 2. Install front left vehicle door inside handle

- (a) Install inside cable and lock-up cable onto vehicle door inside handle.
- (b). Install the left front door inside guard board. (See 81- Interiors and Exteriors, Front Door Interior Trim Panel, Replacement)



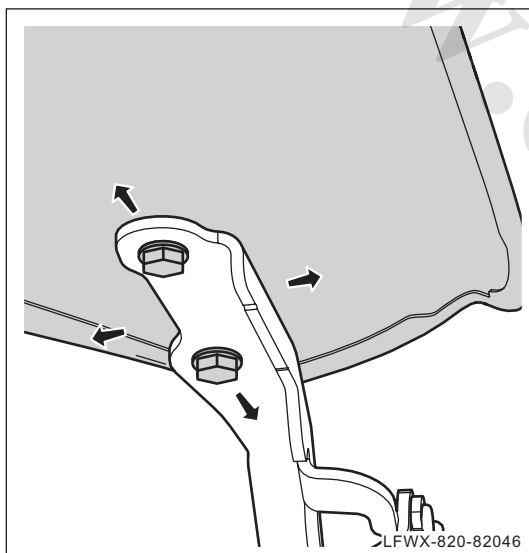
## Engine Hood

### Adjustment



#### 1. Adjust working condition of engine compartment cover

- (a) Open the engine hood.
- (b) Rotate 2 engine compartment cover rubber bolts, adjust rubber bolts position upward/downward, and thus adjustment of engine compartment cover can be realized in height direction.



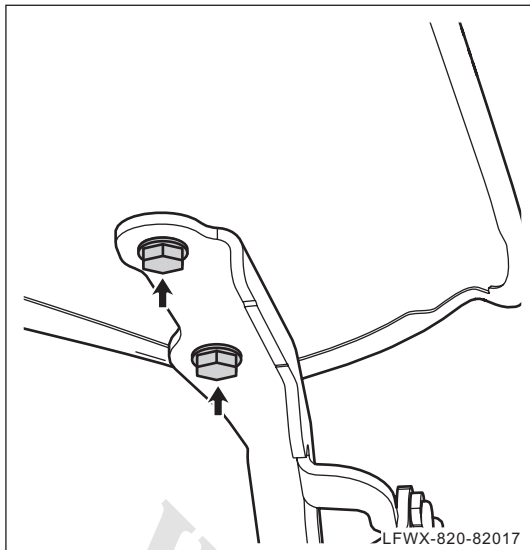
- (c) Adjust installation position of hinge fixing bolts on engine compartment cover side, and forward/backward adjustment of engine compartment cover can be realized.

- (d) Close engine compartment cover

### Replacement

#### 1. Remove engine compartment cover

- (a) Open engine compartment cover and use lifting tool to lift up engine compartment cover.
- (b) Disconnect upper part connection of supporting rod of engine compartment cover ( See 82- Vehicle Door/ Compartment door/Lock, Supporting Rod of Engine Compartment Cover, Replacement)



- (c) Remove fixing bolts for connecting engine compartment cover and compartment cover hinge, and take down engine compartment cover.

**Note:**

It is difficult to accomplish this operation by single person, and it is suggested to accomplish this operation under the help of assistant.

## 2. Install engine compartment cover

- (a) Use lifting tool to install engine compartment cover to installation position, mount the fixing bolts for connecting engine compartment cover and engine compartment cover hinge, and fasten them.

**Torque: 30N•m - 36N•m**

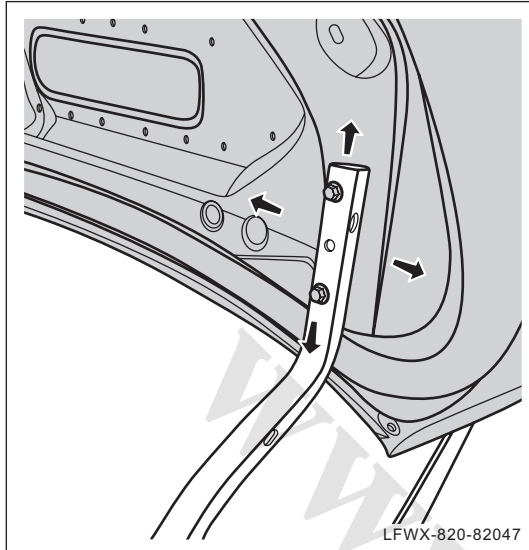
**Note:**

It is difficult to accomplish this operation by single person, and it is suggested to accomplish this operation under the help of assistant.

- (b) Install supporting rod upper part of engine compartment cover onto engine compartment cover. ( See 82- Vehicle Door/ Compartment door/Lock, Supporting Rod of Engine Compartment Cover, Replacement)
- (c) Close engine compartment cover

## Trunk Lid

### Adjustment

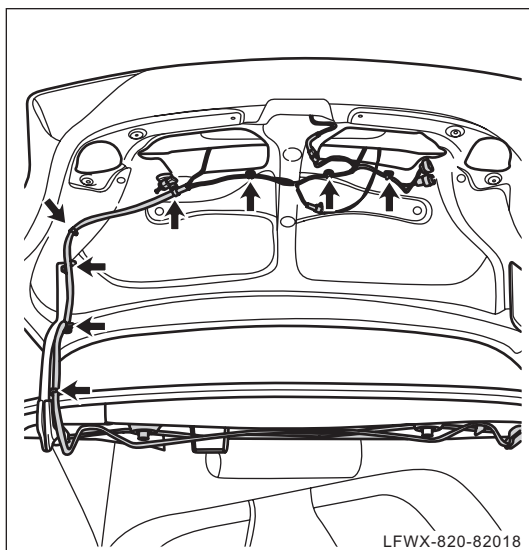


1. **Adjust working condition of trunk lid**
  - (a) Open trunk lid.
  - (b) Adjust installation position of hinge fixing bolts on trunk lid side, and forward/backward adjustment of engine compartment cover can be realized.
  - (c) After adjustment, close trunk lid.

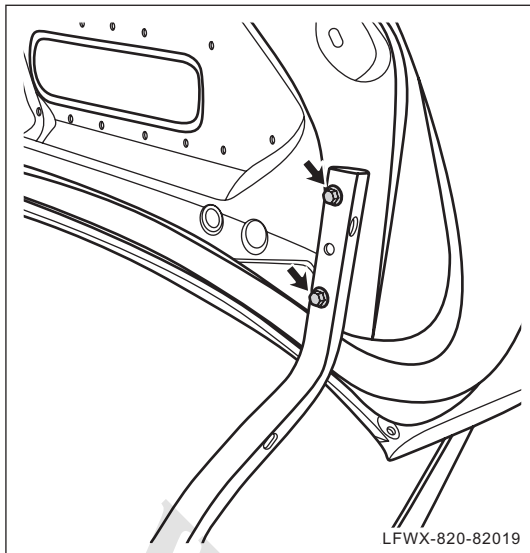
### Replacement

#### 1. Remove trunk lid

- (a) Remove trunk lid panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)
- (b) Remove left/rear right combination light . ( See 75- Lighting System, Rear Combination Light, Replacement )
- (c) Remove left/right licence plate lamp. ( See 75- Lighting System, Licence Plate Lamp, Replacement )
- (d) Remove trunk lid lock. ( See 82- Vehicle Door/ Compartment Door/Lock, Trunk Lid Lock, Replacement )



- (e) Remove the snap-fits of the wire harness of rear vehicle body and take down the wire harness of rear vehicle body from trunk lid.



- (f) Use lifting tool to lift up trunk lid, disassemble the fixing bolts for connecting trunk lid and trunk lid hinge and take down trunk lid.

**Note:**

**It is difficult to accomplish this operation by single person, and it is suggested to accomplish this operation under the help of assistant.**

## 2. Install trunk lid

- (a) Use lifting tool to install trunk lid to installation position, install the fixing bolts for connecting trunk lid and trunk lid hinge, and fasten them. Torque: 30N•m - 36N•m

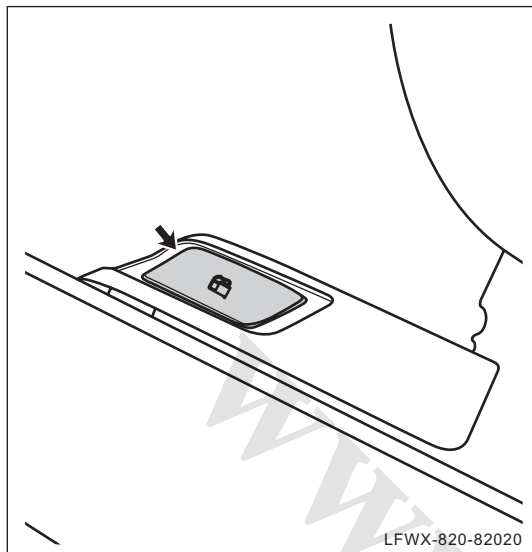
**Note:**

**It is difficult to accomplish this operation by single person, and it is suggested to accomplish this operation under the help of assistant.**

- (b) Install wire harness of rear vehicle body onto trunk lid.
- (c) Install trunk lid lock. ( See 82- Vehicle Door/ Compartment Door/Lock, Trunk Lid Lock, Replacement )
- (d) Install left/right licence plate lamp. ( See 75- Lighting System, Licence Plate Lamp, Replacement )
- (e) Install left/rear right combination light . ( See 75- Lighting System, Rear Combination Light, Replacement )
- (f) Install trunk lid trim panel. (See 81 – Interiors and Exteriors – Trunk Lid Trim Panel, Replacement)

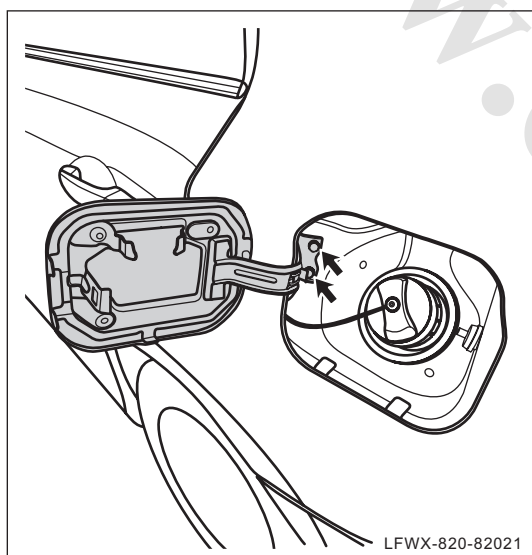
## Fuel Filler Cap

### Replacement



#### 1. Remove fuel filler cap

- (a). Pull fuel filler cap opener to open the fuel filler cap.



- (b). Remove fixing bolts of fuel filler cap, and take down fuel filler cap.

#### 2. Install fuel filler cap

- (a). Install fuel filler cap on fuel filler, and mount & tighten the fixing bolts.

**Torque: 8N•m-12N•m**

- (b) Close the fuel filler cap.

## Front Door Lock

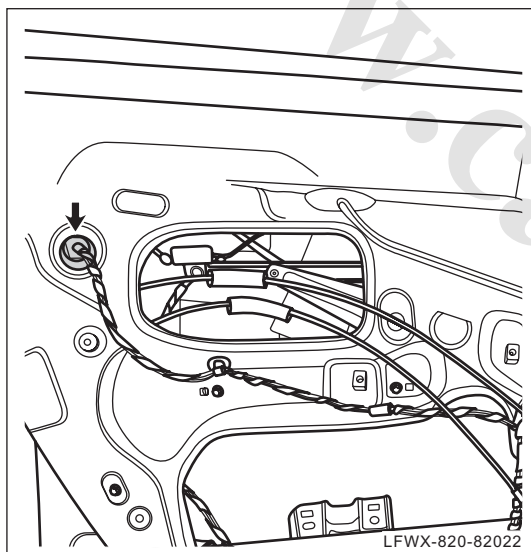
### Replacement

△ HINT:

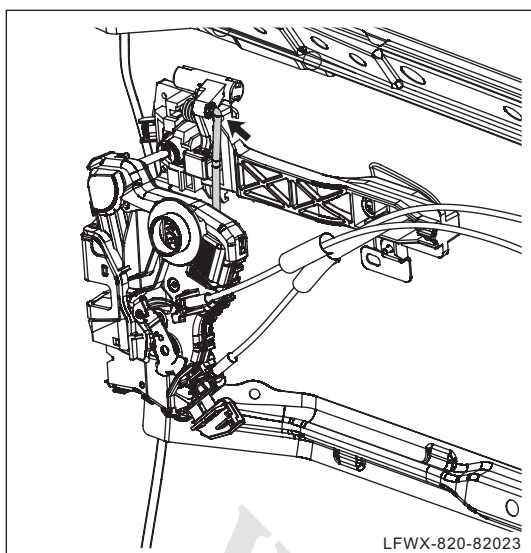
Replacement methods of left/front right vehicle door lock are basically the same, and this section only takes the front left vehicle door lock as an example.

#### 1. Remove front left vehicle door lock

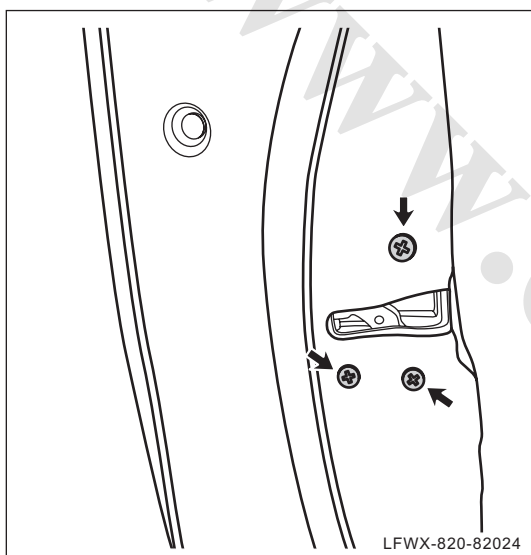
- (a). Disconnect negative cable of battery.
- (b). Remove front left vehicle door panel. ( See 81- Interiors and Exteriors, Front Vehicle Door Panel, Replacement )
- (c). Remove front left vehicle door inside handle. ( See 82- Vehicle Door/ Compartment Door/Lock, Vehicle Door Inside Handle, Replacement)
- (d). Slowly take down rain-proof curtain of front left vehicle door.



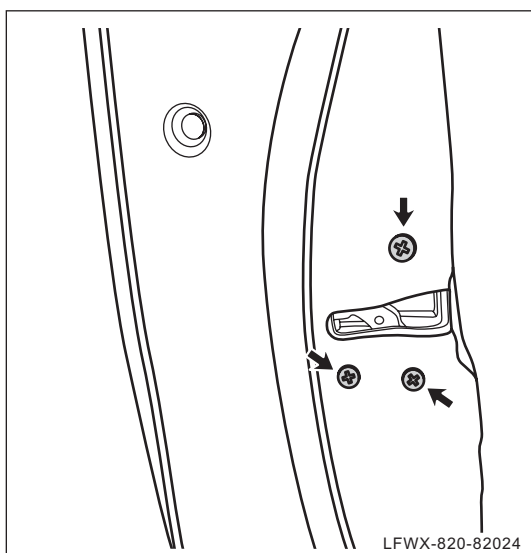
- (e). Disconnect connector of locking mechanism assembly of front left vehicle door



- (f) Disconnect connection between outside tie rod and lock of front left vehicle door.

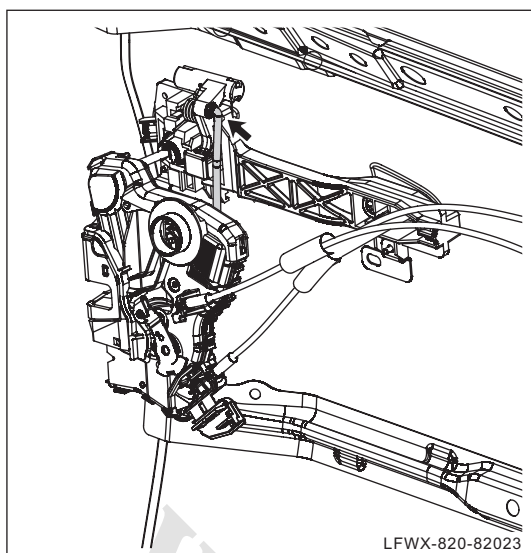


- (g) Remove the fixing screws of front left vehicle door lock and take down front left vehicle door lock.

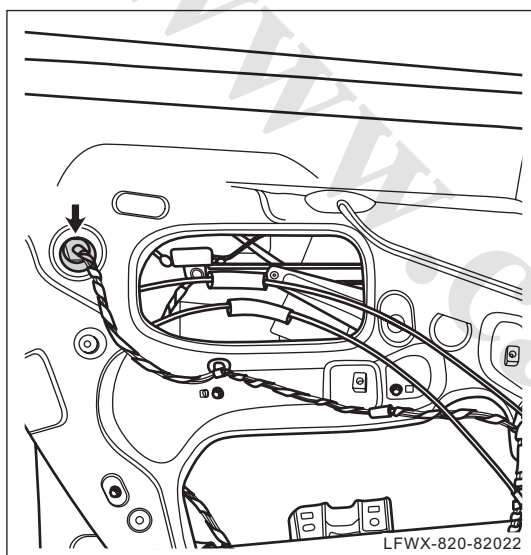


## 2. Install front left vehicle door lock cylinder

- (a). Place the front left door lock onto the installation position and mount and tighten the set screws.



- (b) Install outside tie rod of front left vehicle door.



- (c) Connect connector of locking mechanism assembly of front left vehicle door.

- (d) Install front left door trim seal.
- (e) Install front left vehicle door inside handle. ( See 82- Vehicle Door/ Compartment Door/Lock, Vehicle Door Inside Handle, Replacement)
- (f) Install front left vehicle door panel. ( See 81- Interiors and Exteriors, Front Vehicle Door Panel, Replacement )
- (g). Connect the negative cable of battery.



## Rear Door Lock

### Replacement

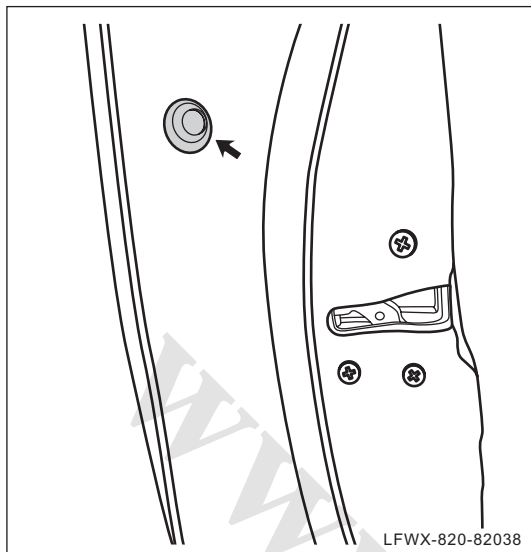
△ HINT:

Replacement methods of front/rear vehicle door lock are basically the same. See 82- Vehicle Door/ Compartment Door/Lock, Front Vehicle Door Lock, Replacement)

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## Front Left Door Lock Cylinder

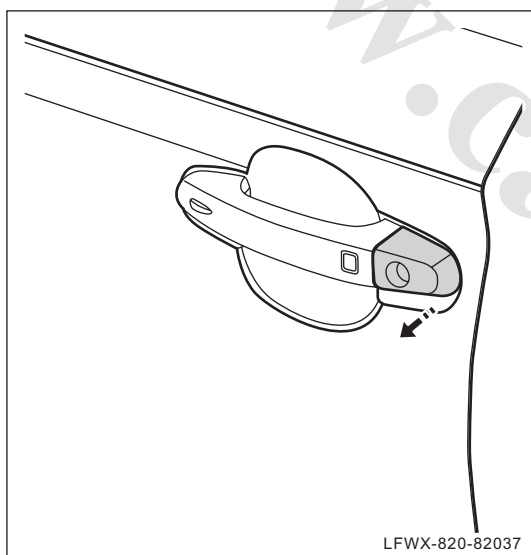
### Replacement



#### 1. Remove front left vehicle door lock cylinder

- (a). Pry the cover, and remove fixing screws of front left door lock cylinder.

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- (b). Take out outside handle cap and lock cylinder of front left vehicle door.

#### 2. Install front left vehicle door lock cylinder

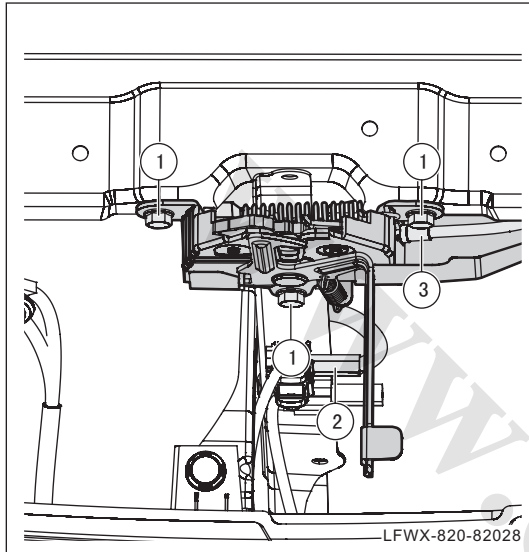
- (a). Install lock cylinder and outside handle cap of front left vehicle door to installation position.
- (b). Mount the fixing screws of lock cylinder of front left vehicle door and fasten them and then install protecting cover.

## Engine Compartment Cover Lock

### Replacement

#### 1. Remove engine compartment cover lock

- (a) Remove upper cross beam trim panel of water tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)



- (b) Remove the fixing bolts ① of engine compartment cover lock.
- (c) Disconnect connector ② of engine compartment cover switch.
- (d) Disconnect cable ③ of engine compartment cover lock.
- (e) Take down engine compartment cover lock.

#### 2. Install engine compartment cover lock

- (a) Install engine compartment cover lock cable onto engine compartment cover lock.
- (b) Install engine compartment cover lock to installation position, mount fixing bolts and fasten them.

**Torque: 10N•m-12N•m**

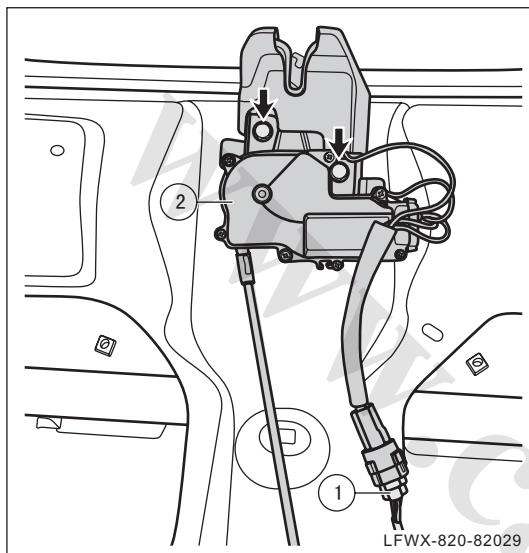
- (c) Connect connector of engine compartment cover switch.
- (d) Install top cross member panel of tank. (See 81 - Interiors and Exteriors - Upper Cross Beam Trim Panel of Water Tank, Replacement)

## Trunk Lid Lock

### Replacement

#### 1. Remove trunk lid lock

- (a). Disconnect negative cable of battery.
- (b). Remove trunk lid panel. ( See 81- Interiors and Exteriors, Trunk Panel, Replacement )



- (c). Disconnect wire harness connector ① of trunk lid lock.
- (d). Remove fixing screws of trunk lid and take down trunk lid lock ② .

82

#### 2. Install trunk lid lock

- (a). Install trunk lid lock to installation position, mount fixing bolts and fasten them.

**Torque: 10N•m-12N•m**

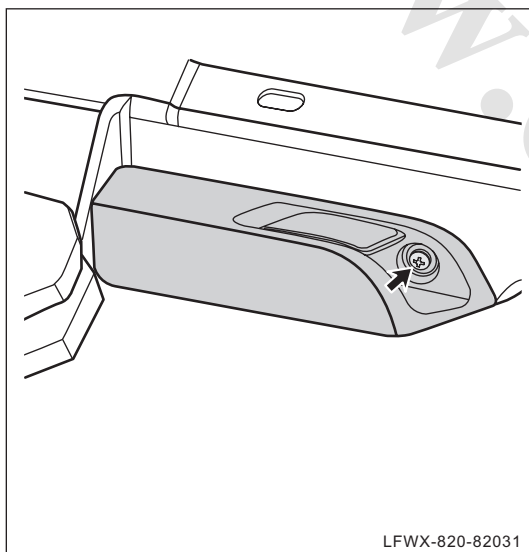
- (b). Connect wire harness connector of trunk lid to trunk lid lock.
- (c). Install trunk lid trim panel. ( See 81- Interiors and Exteriors, Trunk Panel, Replacement )
- (d). Connect the negative cable of battery.

## Fuel Filler Cable

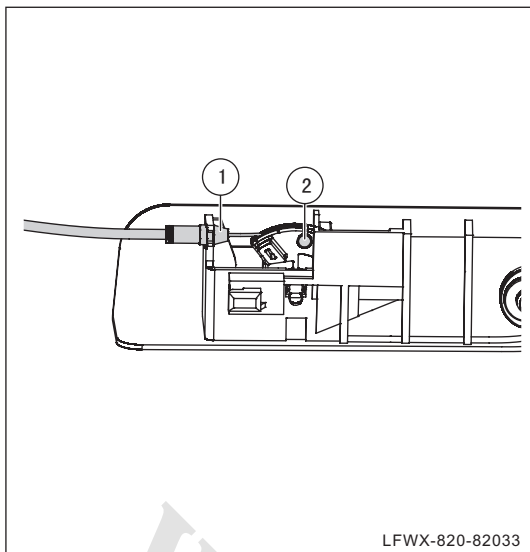
### Replacement

#### 1. Removal of fuel filler cable

- (a). Remove front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)
- (b). Remove the B pillar lower trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)
- (c). Remove rear doorsill panel. (See 81 - Interiors and Exteriors, Rear Doorsill Guard Panel, Replacement)
- (d). Remove rear row seat backrest. (See 83 - Seat and belt and rear row seat backrest, replacement)
- (e). Remove trunk left panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)

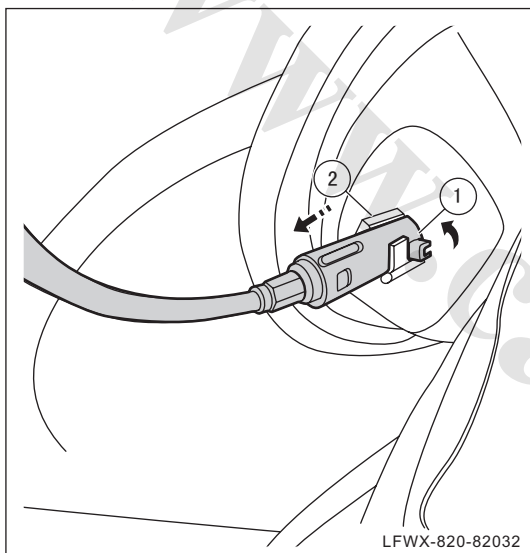


- (f). Remove fixing screws of engine oil filler cap opener and take out engine oil filler cap opener.



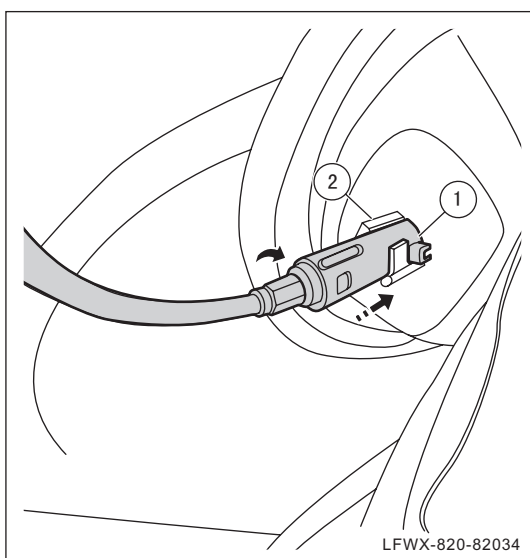
(g) Disconnect connection between cable and engine oil filler cap opener.

- Take out the cable part ① from the groove, then rotate the cable part ① to align with the notch of opener part ② and remove the cable.



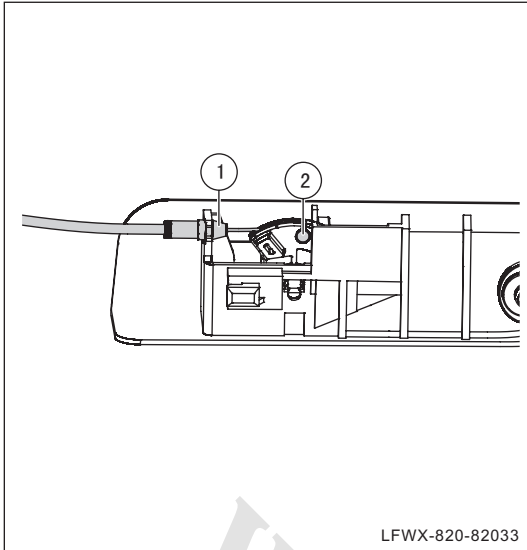
(h) Rotate the cable tongue ① to the opening of clamp ② and pull out the cable outward.

(i) Pry fixing snap-fits of cable and take out cable.



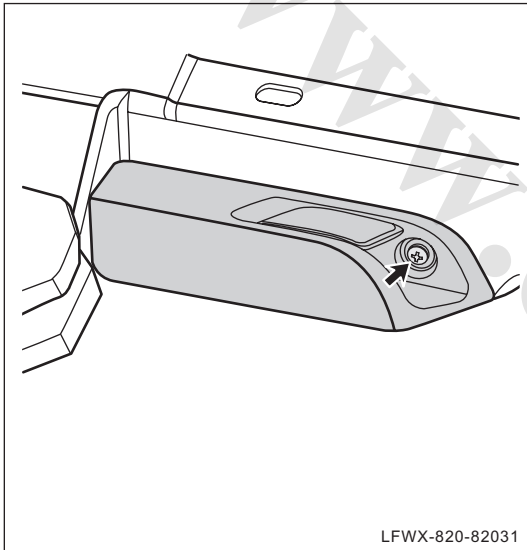
## 2. Installation of fuel filler cable

(a) Rotate the cable tongue ① to the opening of clamp ② and install the cable in installation place.



(b) Install cable onto engine oil filler cap opener.

- Firstly align cable part ① to gap of engine oil filler cap opener part ②, install it into engine oil filler cap opener part ②, then rotate cable to install cable part ① into slot.



(c) Install engine oil filler cap opener to installation position, mount fixing screws and fasten them.

- (d) Install trunk left panel. (See 81 –Interiors and Exteriors – Left/right Trunk Trim Panel, Replacement)
- (e) Install rear row seat backrest. (See 83 - Seat and belt and rear row seat backrest, replacement)
- (f). Installation of rear doorsill trim panel. (See 81 - Interiors and Exteriors, Rear Doorsill Guard Panel, Replacement)
- (g). Install B pillar lower trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)
- (h). Install front doorsill trim panel. (See 81-Interiors and Exteriors, Front Doorsill Trim Panel, Replacement)

## Engine Compartment Cover Supporting Rod

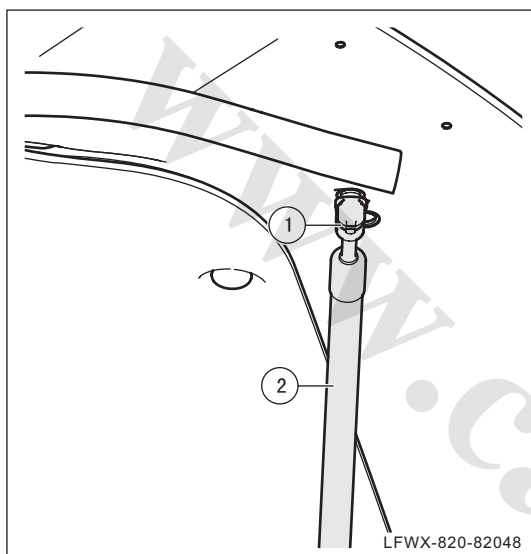
### Replacement

#### 1. Remove engine compartment cover supporting rod

##### Note:

During replacement, use other supporting equipment to support engine compartment cover.

(a) Open the engine hood.



(b) Remove clamps on both ends of engine compartment cover supporting rod and take down engine compartment cover supporting rod.

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#### 2. Install engine compartment cover supporting rod

(a) Install engine compartment cover supporting rod to installation position and install clamps on both ends of engine compartment cover supporting rod.

(b) Close engine compartment cover





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## 83-Seat and Seat Belt

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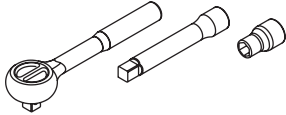
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## Seat

### System description

1. Adjust seat position according to different posture and habit of driver and passenger so as to reach most comfortable state.
2. Seats mainly consists of driver's seat, front passenger's seat and rear row seat.

### Preparation

S/N	Tools	Outline diagram	Description
1	Quick wrench		Disassemble bolts

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### Service data

#### 1. Table of tightening torque

Item	N•m
Fixing bolts of front row seat front part	45~55
Fixing bolts of front row seat rear part	45~55
Fixing bolt of rear seat backrest	45~55

### Precautions

#### 1. Cautions in repair

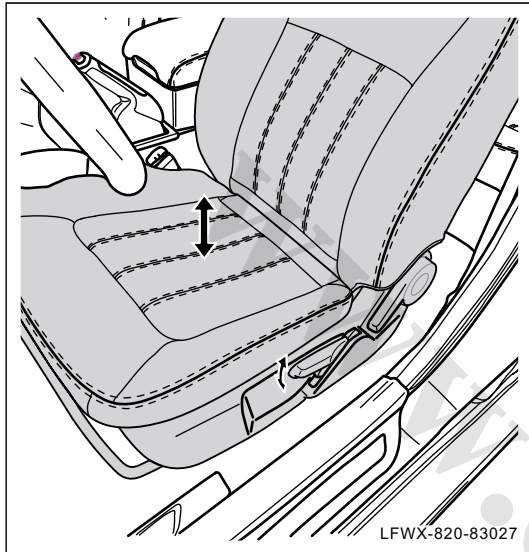
- (a) When removing the seats, do not place the tool on them to prevent the seats from being contaminated by oil stain.
- (b) The fixing bolts removed should be placed together in case of being lost.
- (c) When taking out or installing seat, prevent the seat bracket from clashing other interior parts and the vehicle body.

## General Check

### Check seat

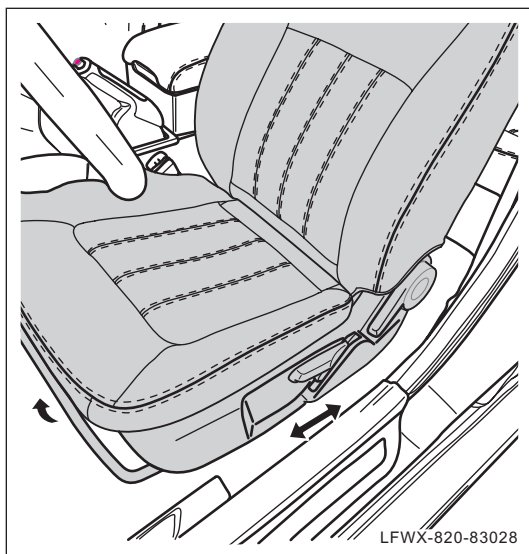
#### 1. Check working condition of headrest

- (a) Adjust all headrests, check if it is flexible and if headrest can't be adjusted or is difficult to be adjusted, then replace guiding element of headrest.



#### 2. Check working condition of front row seat

- (a) Repeatedly upward lift or downward press handle of front row seat, and if front row seat height can't be adjusted or is difficult to be adjusted, then replace seat.



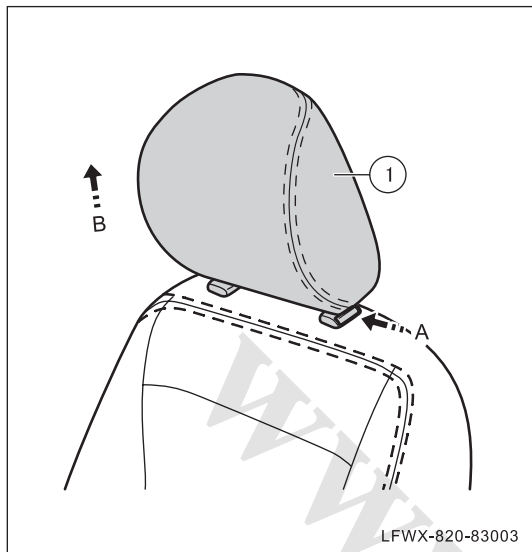
- (b) Hold middle of position adjustment rod of seat and lift upward with big force, slide seat by using body pressure slightly, and if seat can't be adjusted or is difficult to be adjusted back and forth, then replace seat.



- (c) Lift angle adjustment handle upward with big force, and if seat backrest can't be adjusted or is difficult to be adjusted back and forth, then replace seat.

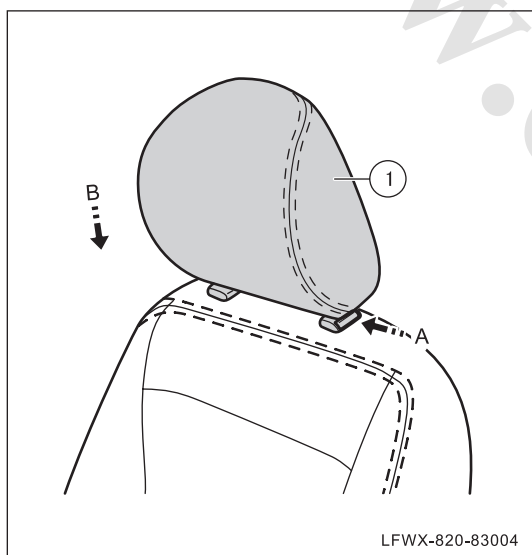
## Front Seat Headrest

### Replacement



#### 1. Remove front row headrest

- (a) Press headrest lock-up release button in A arrow direction.
- (b) Remove rear row headrest ① in B arrow direction.



#### 2. Install front row headrest

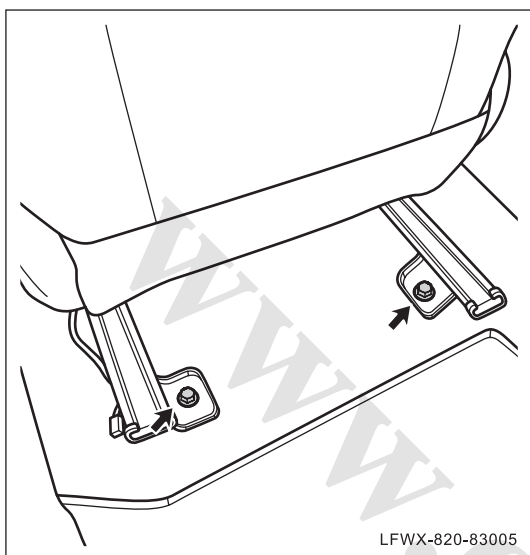
- (a) Press headrest lock-up release button in A arrow direction.
- (b) Install front row headrest ① in B arrow direction.

## Front Row Seats

### Replacement

#### 1. Remove front row seat

(a) Turn power supply to “OFF “position.

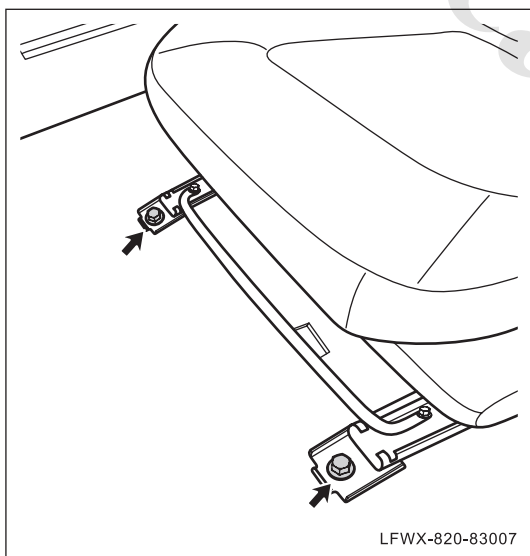


(b) Adjust front row seat to extreme position forward.

(c) Remove front row seat rear foot cover.

(d) Remove the fixing bolts of front row seat rear part.

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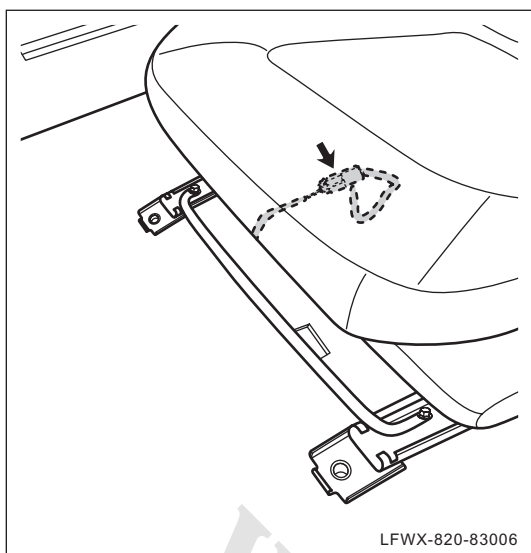


(e) Move front row seat to extreme position backward and adjust seat cushion to highest position.

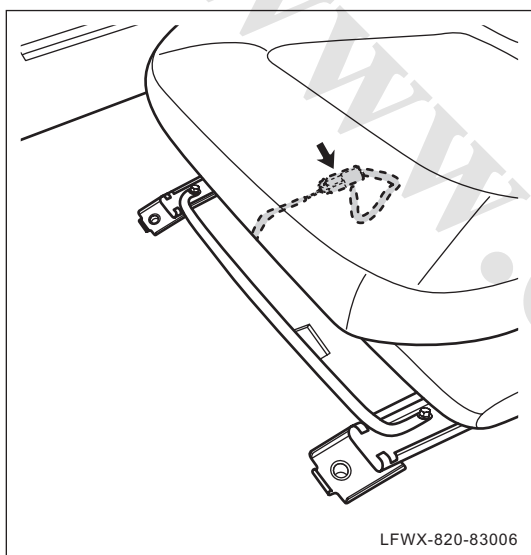
(f) Remove front row seat front foot cover.

(g) Remove fixing bolts of front row seat front part.



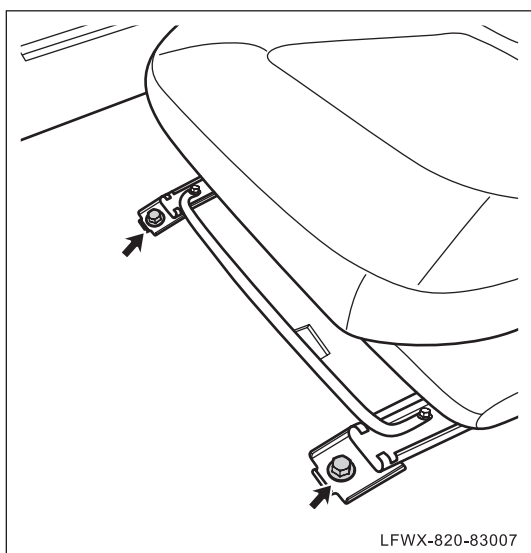


- (h) Disconnect front row seat wire harness connector and take out front row seat.



## 2. Install front row seat

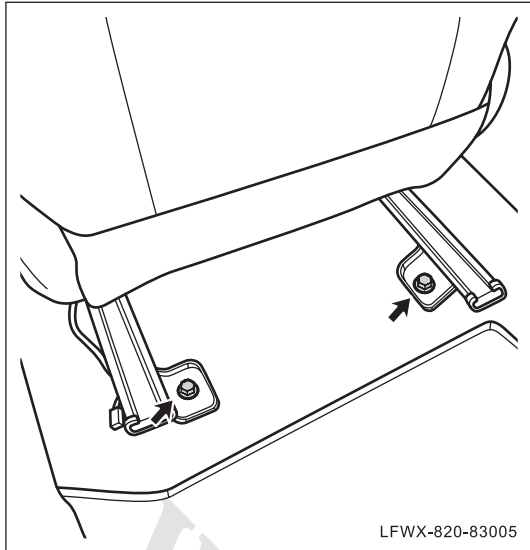
- (a) Install front row seat to installation position.  
(b) Connect front row seat wire harness connector.



- (c) Move front row seat backward to extreme position and adjust seat cushion to highest position.  
(d) Install fixing bolts of front row seat front part and fasten them.

**Torque: 45N.m - 55N.m**

- (e) Install front row seat front foot cover.



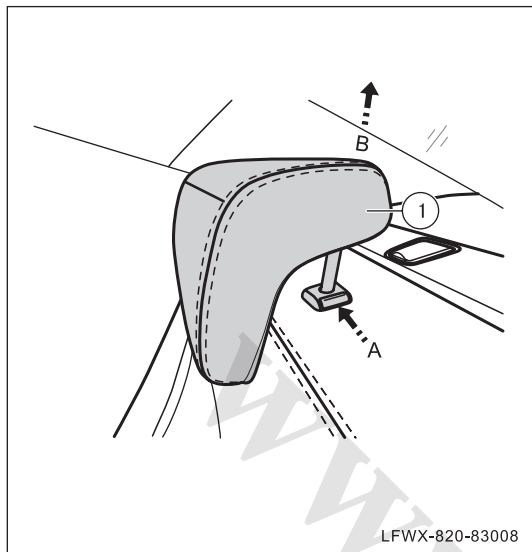
- (f) Adjust front row seat to extreme position forward.
- (g) Install fixing bolts of front row seat rear part and fasten them.

**Torque: 45N.m - 55N.m**

- (h) Install front row seat rear foot cover.

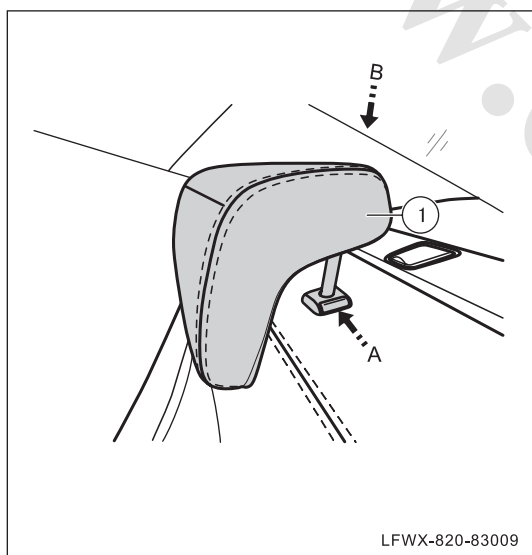
## Rear Seat Headrest

### Replacement



#### 1. Remove rear row headrest

- (a) Press headrest lock-up button in A arrow direction.
- (b) Remove rear row headrest ① in B arrow direction.

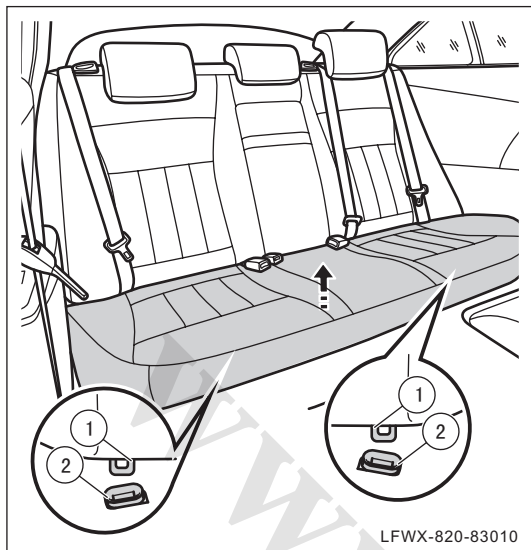


#### 2. Install rear row headrest

- (a) Press headrest lock-up button in A arrow direction.
- (b) Install rear row headrest ① in B arrow direction.

## Rear Row Seat Cushion

### Replacement



#### 1. Remove rear row seat cushion

- (a) Lift rear row seat cushion in arrow direction until fixing pin ① of rear row seat cushion and fixing clip ② of rear row seat cushion are disconnected.
- (b) Take down rear row seat cushion

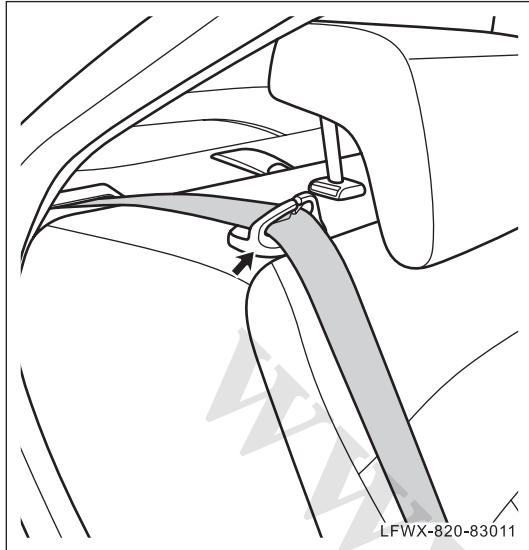
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#### 2. Install rear row seat cushion

- (a) Install rear row seat cushion to installation position.
- (b) Align fixing pin of rear row seat cushion to fixing clip of rear row seat cushion, and press rear row seat cushion downward.

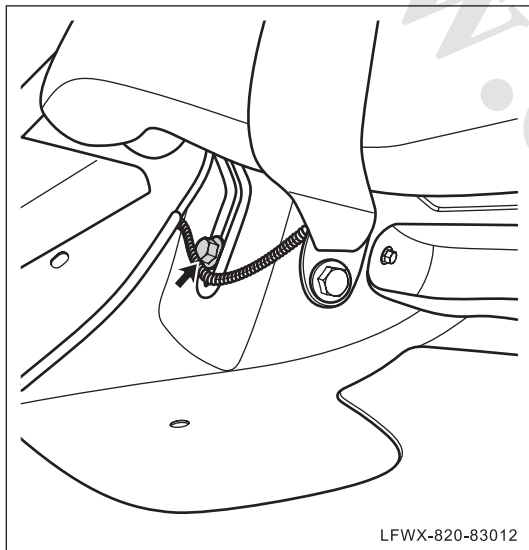
## Rear Row Seat Backrest

### Replacement



#### 1. Remove rear row seat backrest

- (a) Remove rear row seat cushion ( See 83-Seat and Seat Belt, Seat Cushion, Replacement )
- (b) Take down rear row seat belt from guider of rear row seat belt.



- (c) Remove fixing bolts of rear row seat backrest assembly.
- (d) Disconnect fixing pin and fixing clip of rear row seat backrest assembly upward.
- (e) Take out rear row seat backrest assembly.

#### 2. Install rear row seat backrest assembly

- (a) Install rear row seat backrest assembly to installation position.
- (b) Align fixing pins of rear row seat backrest assembly to fixing clips, and press rear row seat backrest assembly downward.

△ HINT:

Make sure that rear row seat backrest assembly is installed in place.

- (c) Mount fixing bolts of rear row seat backrest assembly and fasten them.

**Torque: 45N.m - 55N.m**



- (d) Install seat belt of rear row seat into belt guider.
- (e) Install rear row seat cushion.

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## Seat Belt

### System description

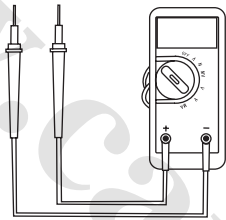
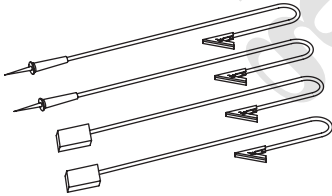
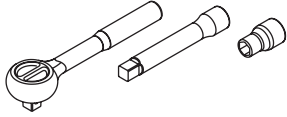
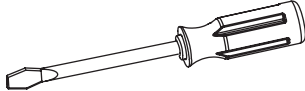
#### 1. Function

Seat belt is the equipment used for preventing serious injury of passenger and driver when vehicle body is under violent strike.

#### 2. Components

Seat belt mainly consists of driver's seat belt, front passenger's seat belt seat belt buckle and rear row seat belt.

### Preparation

S/N	Tools	Outline diagram	Description
1	Digital multimeter		Used for measuring voltage or resistance.
2	Wiring set		Assist to measure voltage or resistance
3	Quick wrench		Used for removing and installing the fixing bolts
4	Screwdriver		Remove the fixing screws

## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolts of height regulator of front row seat belt	65~85
front row seat belt retractor fixing bolts	10 (upward);65-85(downward)
Fixing bolts of guide ring of front row seat belt	65~85
Fixing bolts of lower bracket of front row seat belt	65~85
Fixing bolts of front row seat belt buckle	65~85
rear row seat belt retractor fixing bolts	65~85
Fixing bolts of buckle of rear row seat belt	65~85

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## Precautions

### 1. Precautions before repair

- (a) All check/disassembly/installation/ maintenance work can only be carried out by specially trained person.

### 2. Cautions in repair

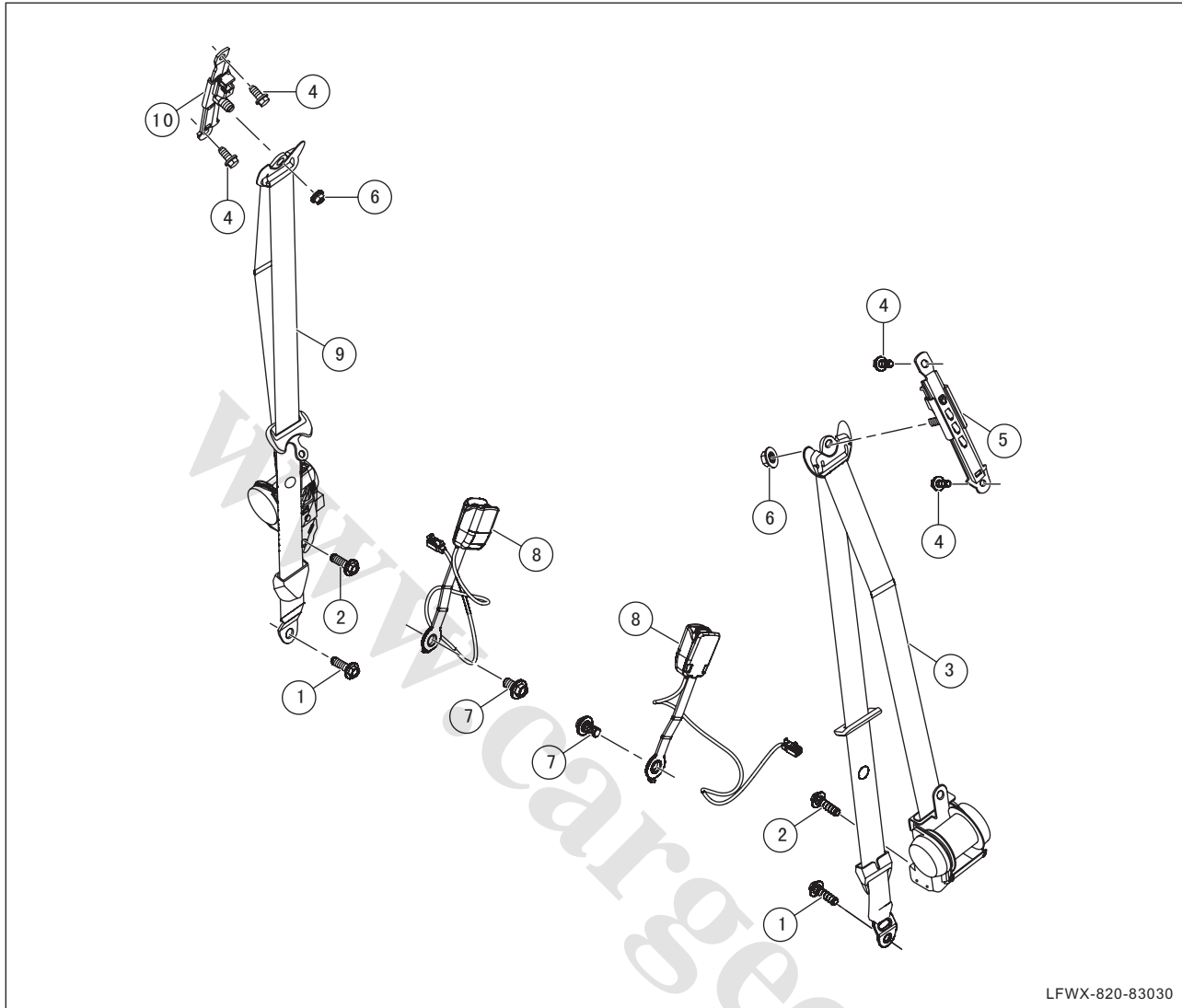
- (a) Don't insert foreign matter into seat belt buckle and don't modify or take down seat belt.
- (b) When a seat belt is dirty, use neutral detergent to wash it. Do not use corrosive, dye or dry cleaning agent. Otherwise, they will affect seat belt strength seriously.

### 3. Other precautions

- (a) If seat belt is damaged, split seams or buckle acts abnormally, replace seat belt at once.
- (b) If any collision occurs and seat belt bears a certain impact force, even if seat belt is not damaged, it is also necessary to replace it immediately.
- (c) If seat belt is damaged, split seams or loose and deformed due to chemical action and sunlight, \ replace seat belt.
- (d) If metal connecting part of seat belt is bent, deformed or corrosive, the seat belt shall be replaced.
- (e) Performance requirements of retractor: at mounting angle, it shall be retracted freely and automatically.
- (f) Performance requirements of padlock: inserting locking dog and unlocking shall be obviously in place. Buckle shall not open by itself. The assembly shall not be invalid.



## Component (I)

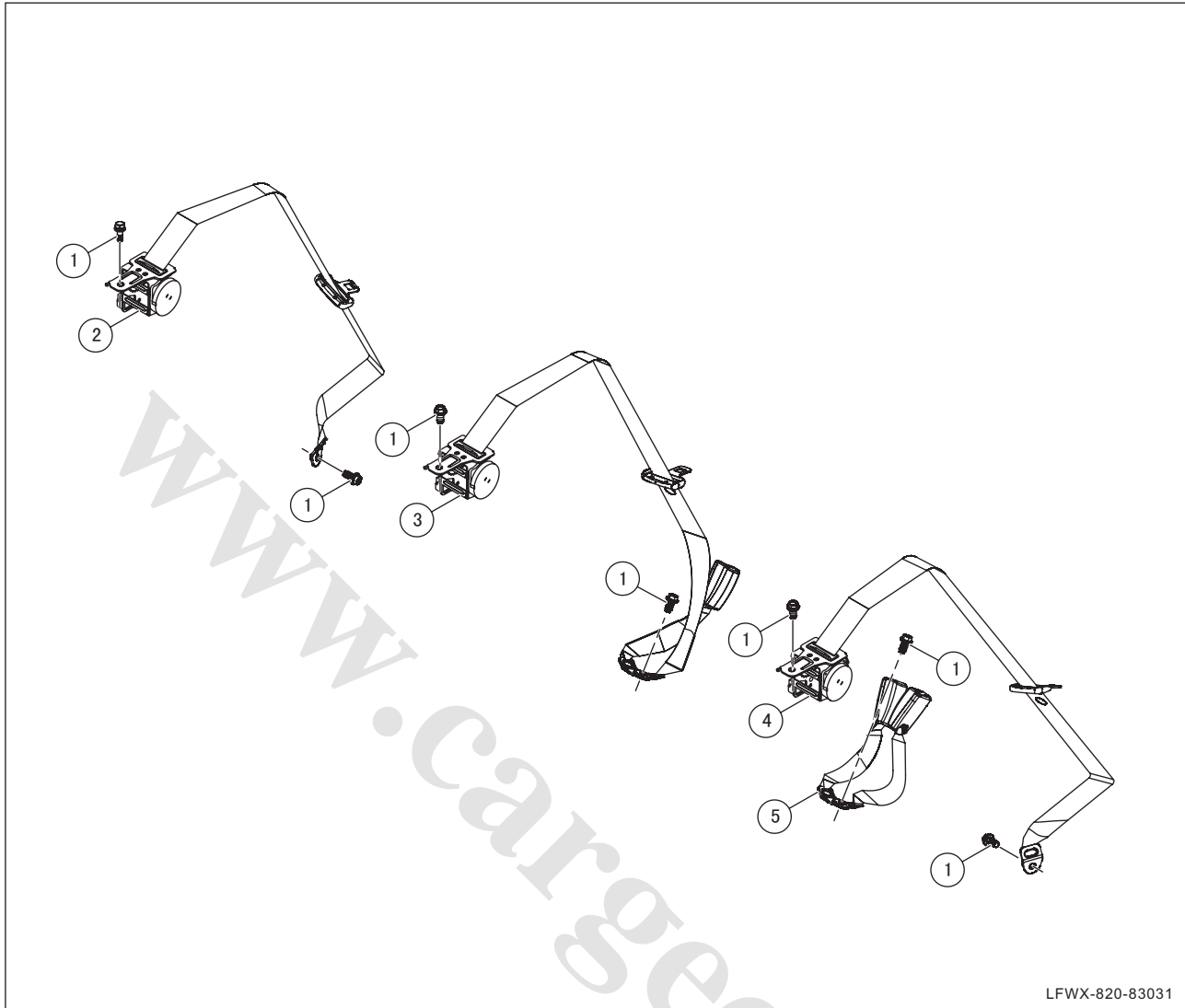


LFWX-820-83030

1	Bolt
2	Bolt
3	Front right seat belt retractor
4	Bolt
5	Front right height regulator

6	Nut
7	Bolt
8	Front seat belt buckle
9	Front left seat belt retractor
10	Front left height regulator

## Component (II)



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1	Bolt
2	Rear left seat belt retractor
3	Rear row buckle and retractor assembly

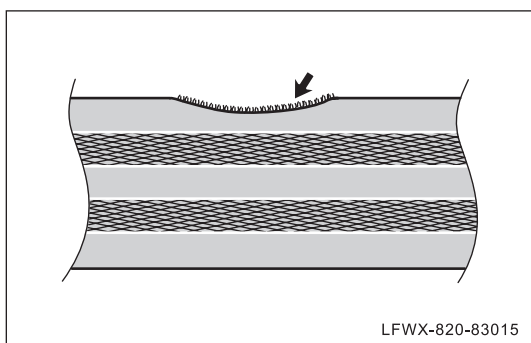
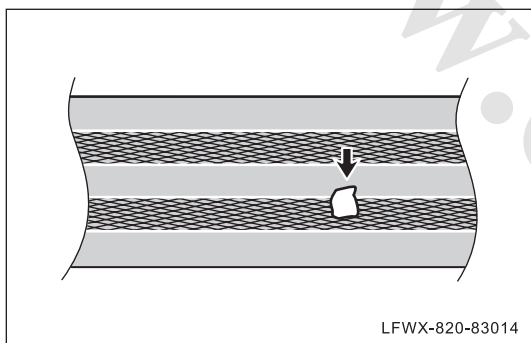
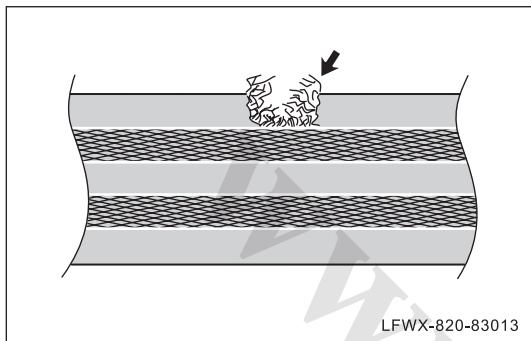
4	Rear right seat belt retractor
5	Rear row double buckle assembly

## General Check

### Check seat belt

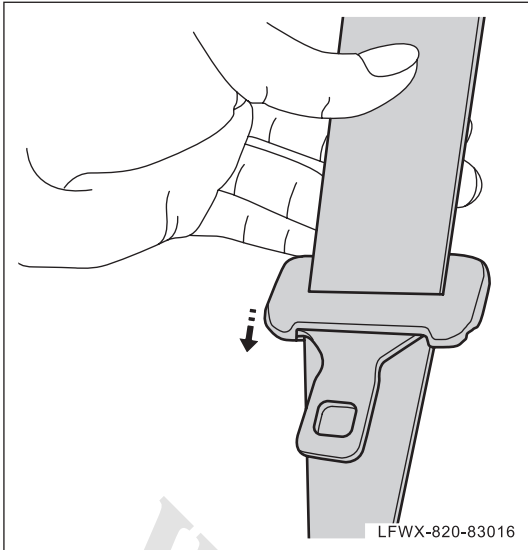
#### 1. Right working condition of seat belt

- (a) Pull out seat belt completely from seat belt automatic retractor
- (b) Check if seat belt is dirty and use neutral washing agent to clean it.



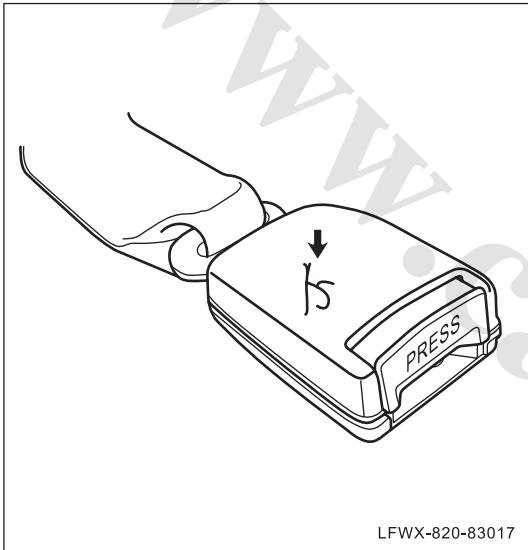
- (c) Check seat belt for below damage and replace it if any.

- Seat belt is broken, ripped or scratched.
- Fabric coil of seat belt is ripped.
- There is sign burnt by cigarette.
- One side of seat belt is transformed or seat belt edge has a wave shape.



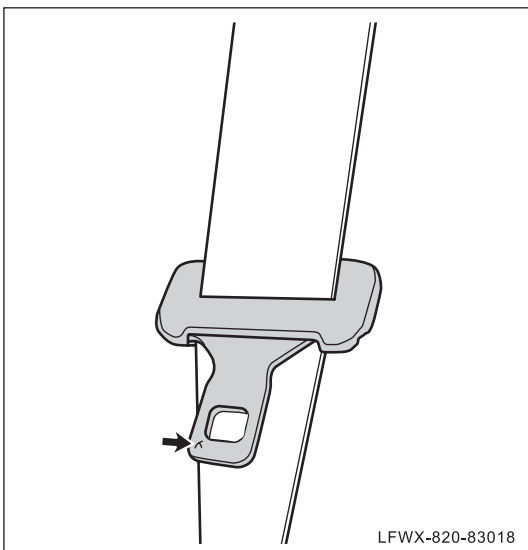
## 2. Check seat belt lock

- (a) Pull seat belt downward, check if retractor is locked up flexibly, and if not, then replace it.



## 3. Check seat belt buckle and lock latch

- (a) Check if housing of seat belt buckle is deformed, fell off or ripped, and if any, replace it.



- (b) Check if lock latch is deformed, or ripped, and if any, replace it.
- (c) Insert lock latch into buckle to check if lock latch can be locked up and by repeat check ( above 5 times ), if it can't be locked up in buckle for one time, replace it.

## Diagnosis

### Fault symptom table

The following table will help you to locate the fault information needed.

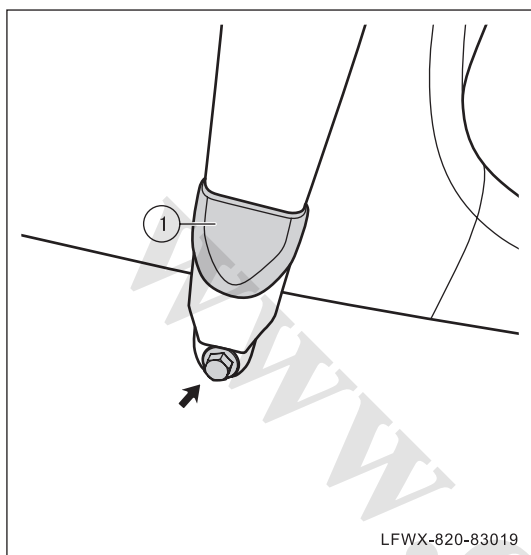
Symptom	Suspected area	Recommended action
Seat belt cannot be pulled out	1. Seat belt retractor assembly (damaged)	Replace the seat belt assembly
Seat belt cannot retract automatically	1. Seat belt retractor assembly (damaged)	Replace the seat belt assembly
It is difficult to engage the seat belt buckle	1. Seat belt buckle (damaged)	Replace the seat belt assembly
The seat belt buckle cannot be released after engagement	1. Seat belt buckle (damaged)	Replace the seat belt assembly
Seat belt cannot be locked immediately after being pulled beyond specified length	1. Seat belt retractor assembly (damaged)	Replace the seat belt assembly

## Front Row Seat Belt

### Replacement

#### 1. Remove front row seat belt assembly

(a) Adjust front row seat to extreme position forward.

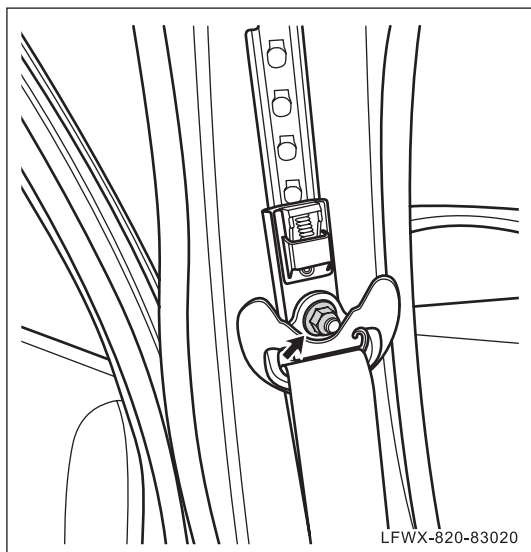


(b) Remove fixing bolts shield ① of lower bracket of front row seat belt

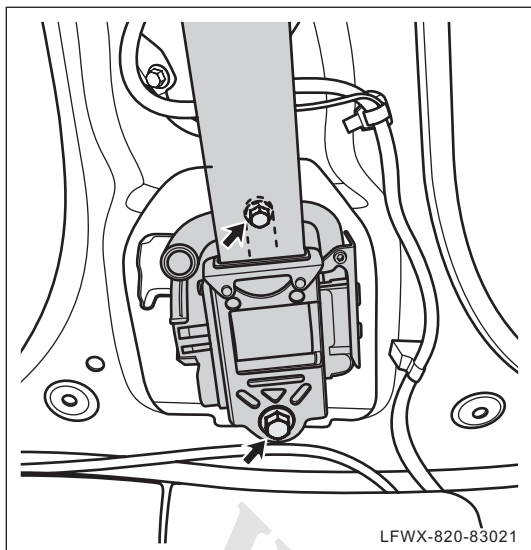
(c) Remove fixing bolts of lower bracket of front row seat belt

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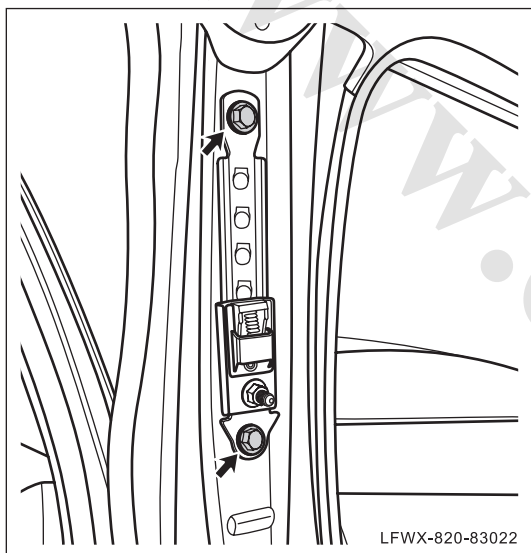
(d). Remove B pillar trim panel. (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)



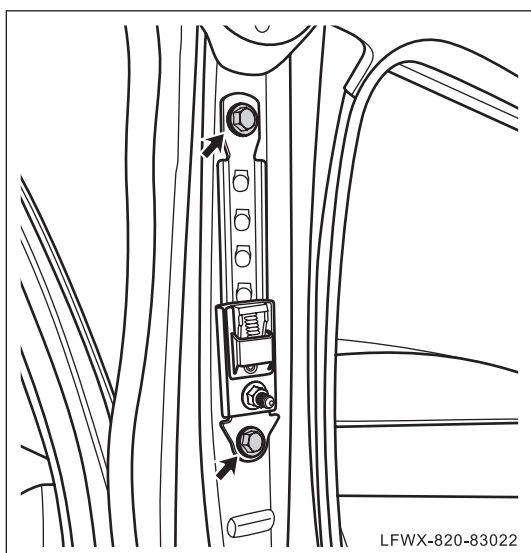
(e) Remove fixing nuts of guide ring of front row seat belt and take down front row seat belt guide ring.



- (f) Remove fixing bolts of retractor of front row seat belt and take down front row belt retractor assembly.



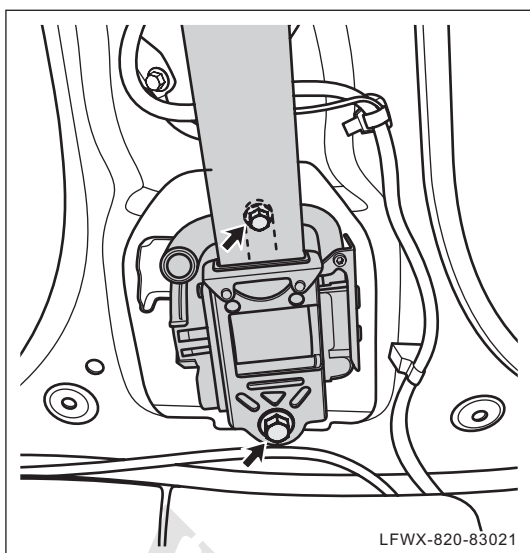
- (g) Remove fixing bolts of height regulator of front row seat belt and take down belt height regulator.



## 2. Install front row seat belt assembly

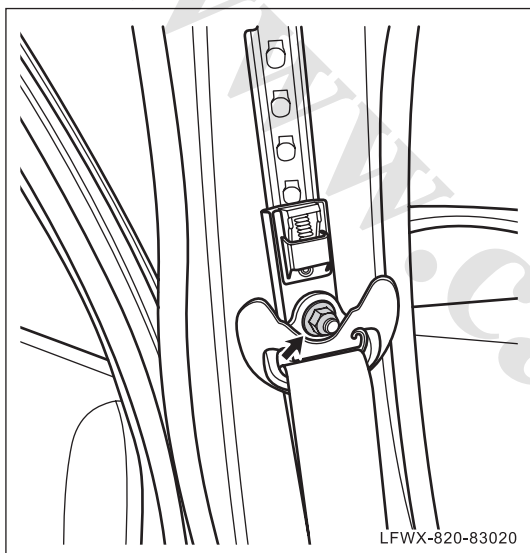
- (a) Install front row seat belt height regulator to installation position, mount fixing bolts and fasten them.

**Torque: 65N•m - 85N•m**



- (b) Install front row seat belt retractor to installation position, mount fixing bolts and fasten them.

**Torque: 10N•m(upper);65N•m85N•m(lower)**

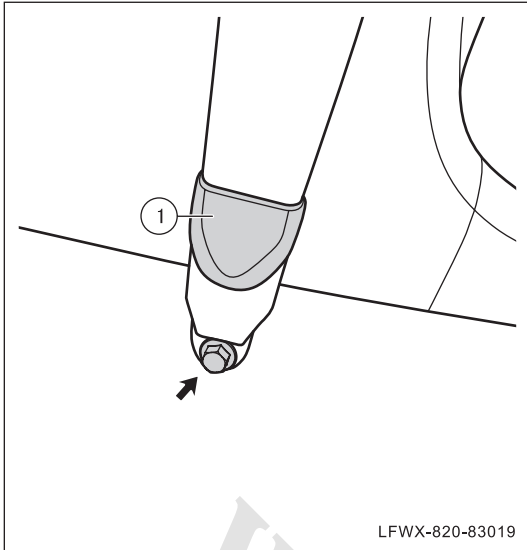


- (c) Install front row seat belt guide ring to installation position, mount fixing nuts and fasten them.

**Torque: 65N•m - 85N•m**

- (d) Install B pillar panel (Refer to 81 - Interiors and Exteriors, B Pillar Trim Panel, Replacement)





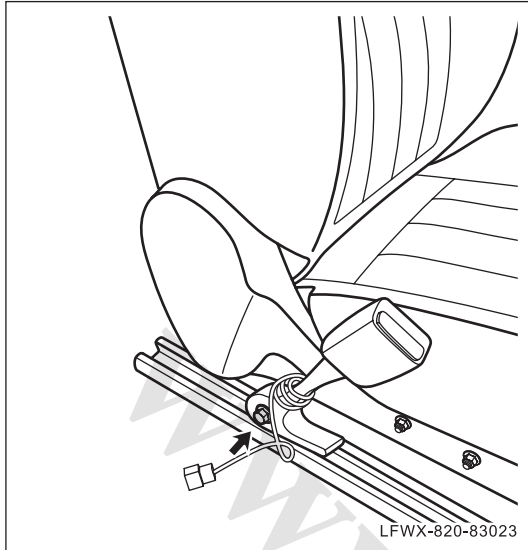
- (e). Install and tighten front row seat belt lower bracket fixing bolts.

**Torque: 65N•m - 85N•m**

- (f) Install fixing bolts shield ① of lower bracket of front row seat belt.
- (g) Adjust front row seat to suitable position

## Front Seat Belt Buckle

### Replacement



#### 1. Removal of front row seat belt buckle

- (a). Remove the front seat belt buckle fixing bolts, and take down the front seat belt buckle.

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#### 2. Installation of front row seat belt buckle

- (a) Install front row belt buckle to installation position, mount fixing bolts and fasten them.

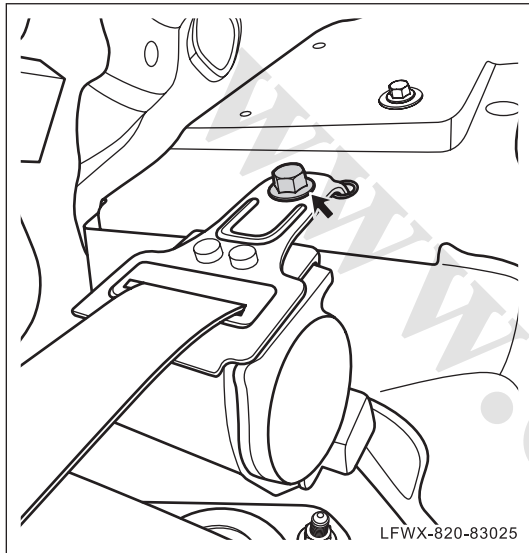
**Torque: 65N•m - 85N•m**

## Rear Row Seat Belt

### Replacement

#### 1. Remove rear row seat belt

- (a) Remove rear row seat cushion ( See 83- Seat and Seat Belt, Rear Row Seat Cushion, Replacement )
- (b) Remove rear shelf panel. (See 81 –Interiors and Exteriors Rear Shelf Panel, Replacement)



- (c) Remove fixing bolts of retractor of rear row seat belt and take down rear row seat belt retractor assembly.

#### 2. Install rear row seat belt

- (a) Install rear row belt retractor assembly to installation position, mount fixing bolts and fasten them.

**Torque: 65N•m - 85N•m**

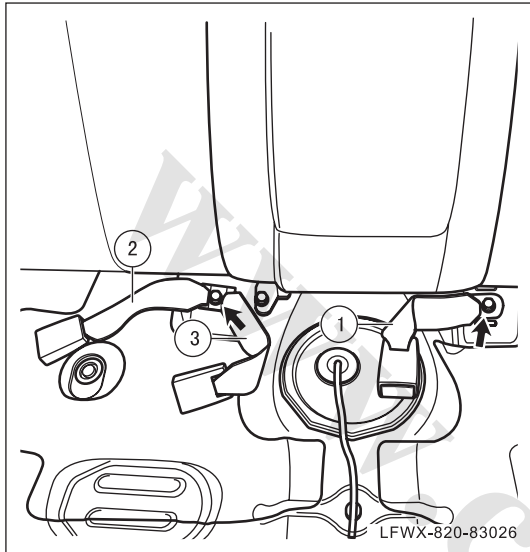
- (b) Install rear shelf panel (See 81 –Interiors and Exteriors Rear Shelf Panel, Replacement)
- (c) Install rear row seat cushion. ( See 83- Seat and Seat Belt, Rear Row Seat Cushion, Replacement )

## Rear Seat Belt Buckle

### Replacement

#### 1. Remove the rear seat belt buckle

- (a) Remove rear row seat cushion ( See 83- Seat and Seat Belt, Rear Row Seat Cushion, Replacement )



- (b). Remove fixing bolt of rear seat belt buckle.
- (c) Take down seat belt buckle ① of rear row left seat belt, buckle ② of rear row right seat belt, buckle ③ of rear row middle seat belt.

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#### 2. Install rear row seat belt buckle

- (a) Install rear row left seat belt buckle, rear row right seat belt buckle, rear row middle seat belt buckle to installation position.
- (b) Mount fixing bolts of rear row seat belt buckles and fasten them.

**Torque: 65N•m - 85N•m**

- (c) Install rear row seat cushion. ( See 83- Seat and Seat Belt, Rear Row Seat Cushion, Replacement )



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## 84- Dashboard/Console

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Replacement .....84-21	

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## Dashboard/Console

### System description

#### △ HINT:

Lifan 820 series models include LF7186, LF7240, LF7240B with two types of engine (LFB479Q and LF489Q) and 5MT manual transmission or 6AT automatic transmission. Dashboard, console are different according to engine and transmission, but inspection and repair methods are basically the same, and this section takes LF7186 model which is equipped with LFB479Q engine and 5MT as an example.

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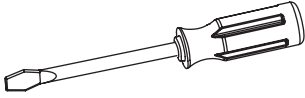
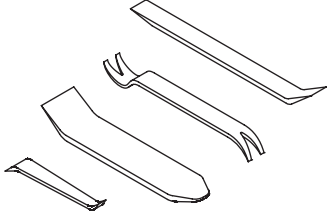
#### 1. Components

Dashboard and console are carriers of information display and control function, providing good operation environment and visual enjoyment for driver.

Dashboard mainly consists of dashboard left/right speaker cover plate, dashboard left/right panel, switch panel, left/right side air vent, dashboard left trim strip, one key start panel, dashboard left lower panel, instrument cluster cover, dashboard glove box lower baffle, dashboard glove box, dashboard right trim strip, dashboard left/right middle panel trim, dashboard left/right middle panel, center control glove box, center air vent, air conditioning/ radio-cassette player control panel, multifunction display cover plate and dashboard upper panel, etc..

Console mainly consists of console gear shift panel, console hand brake panel, console main body, etc..

### Preparation

S/N	Tools	Outline diagram	Description
1	Screwdriver		Remove the fixing screws Remove the trims
2	Interior trimming crow plate		Remove the trims and snap-fit



## Service data

### 1. Table of tightening torque

Item	N•m
Fixing bolt of console	8~12

## Precautions

### 1. Precautions before repair

- (a) Before maintenance, cover the protective sleeve on seat and steering wheel.
- (b) Whether engine operates or not, as long as the ignition switch is on, never plug any element of system, such as: any battery cables, connectors of system components, etc.

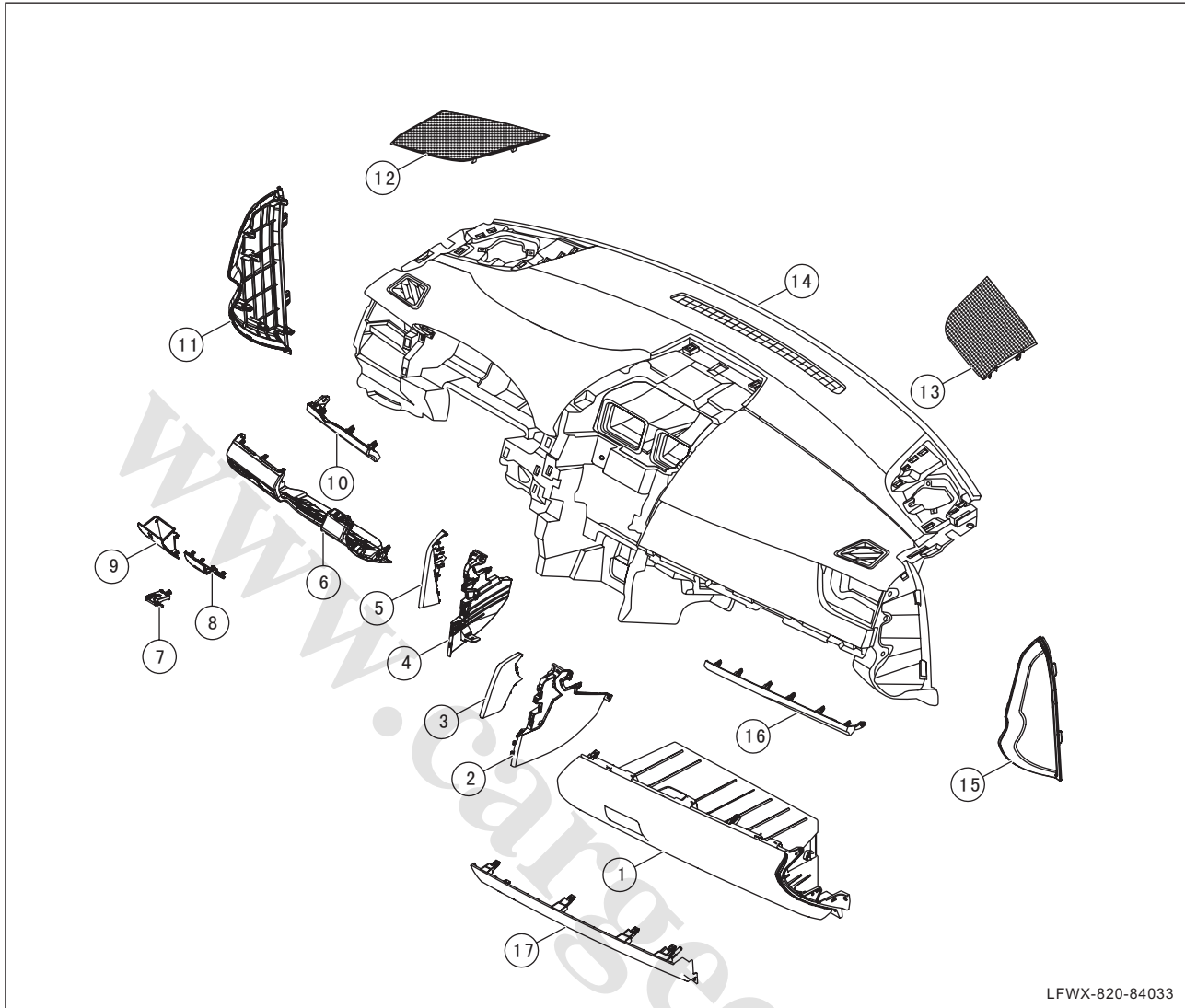
### 2. Precautions for maintenance

- (a) Before dismantling or installing any electric device or electric terminals which are easy to be contacted by tools or equipment, first disconnect negative battery cable to prevent worker being injured or car be damaged.
- (b) When disconnect system part connector, please don't draw any wire harness, to prevent damaging it.

### 3. Other precautions

- (a) Avoid oil or chemicals coming into contact with dashboard, console. Otherwise corrosion will occur.

## Component (I)

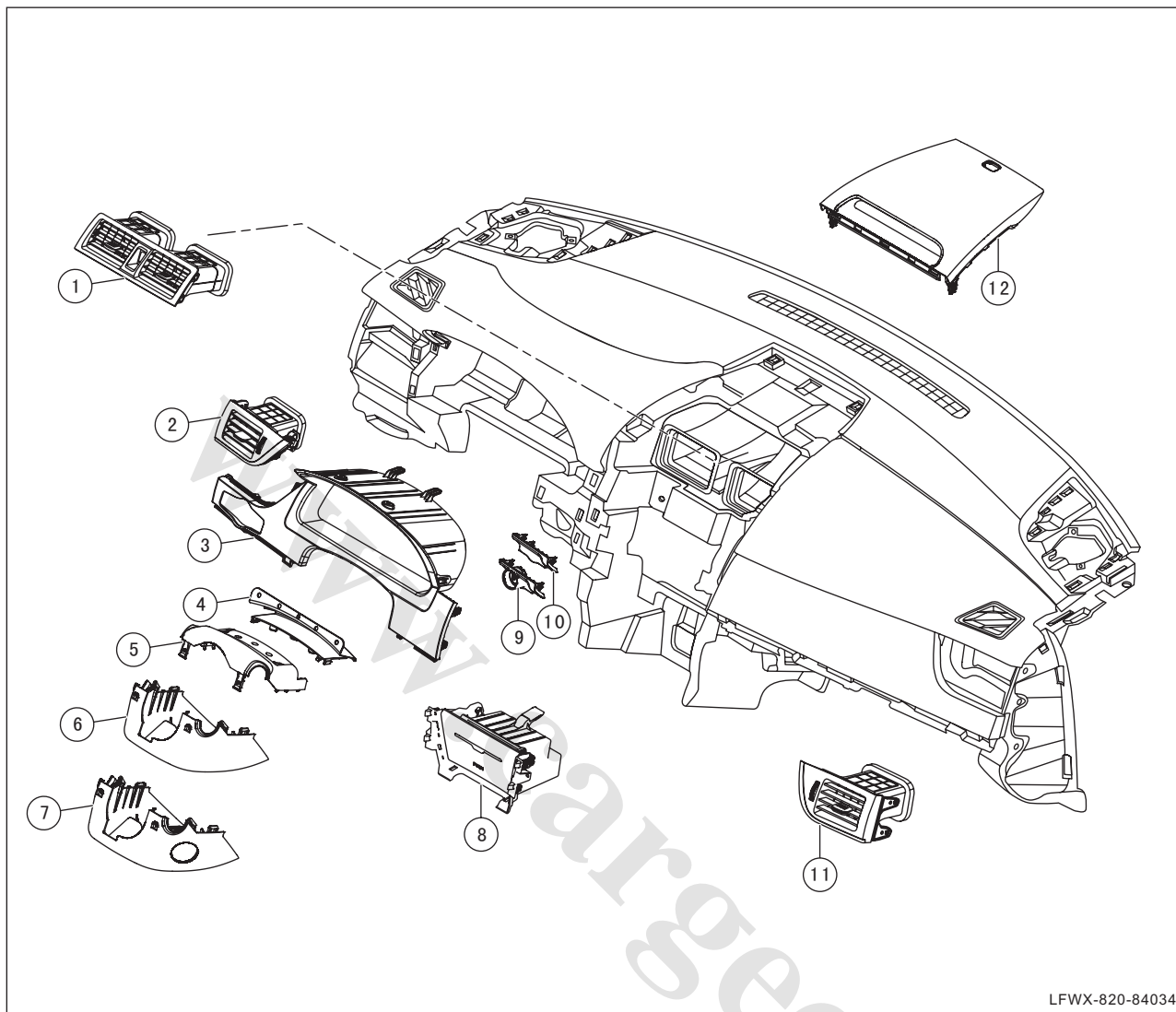


LFWX-820-84033

1	Glove box
2	Dashboard right middle panel
3	Dashboard right middle panel trim
4	Dashboard left middle panel
5	Dashboard left middle panel trim
6	Lower left panel of the dashboard
7	Front compartment cover open handle
8	Electrical box maintenance cover plate
9	Driver's glove box

10	Dashboard left trim strip
11	Dashboard left panel
12	Dashboard left speaker cover plate
13	Dashboard right speaker cover plate
14	Dashboard upper panel
15	Dashboard right panel
16	Dashboard right trim strips
17	Dashboard glove box lower baffle

## Component (II)



LFWX-820-84034

1	Central air vent
2	Dashboard left air vent
3	Instrument cluster cowl
4	Dust cover
5	Upper shield of steering column
6	Steering column lower shield (PEPS vehicle)

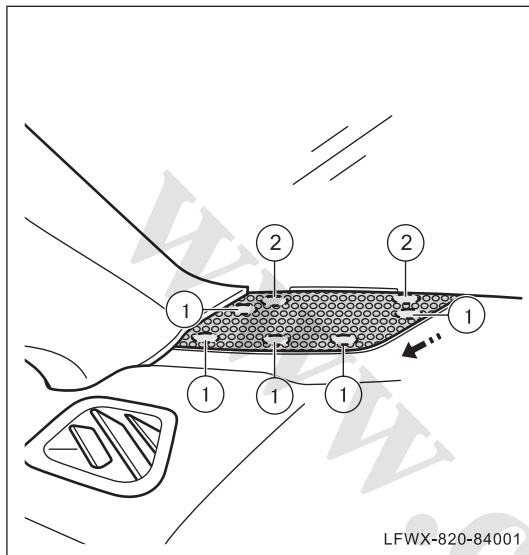
7	Steering column lower shield ( non PEPS vehicle )
8	Central control glove box
9	PEPS switch panel (PEPS vehicle )
10	Ignition switch panel ( non PEPS)
11	Dashboard right air vent
12	Multifunction display cover plate

## Alt Speaker Cover Plate

### Replacement

△ HINT:

Replacement methods of left and right alt speaker cover plate are basically the same, and this section only takes the left Alt speaker cover plate as an example.



#### 1. Remove alt speaker cover plate

- (a) Use trim prying plate to pry snap-fits ① of alt speaker cover plate, push alt speaker cover plate backward, let fixing clips ② of speaker cover plate separate from installation position and take down alt speaker cover plate.

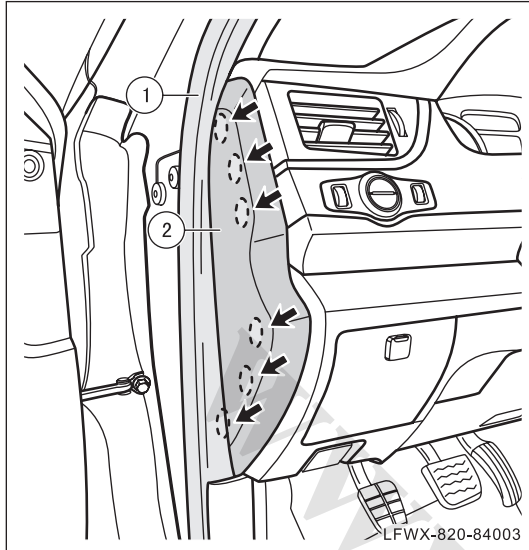
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#### 2. Install alt speaker cover plate

- (a) Install alt speaker cover plate to installation place.
- Firstly have fixing clips of alt speaker cover plate stuck onto dashboard.
  - Secondly align snap-fits of alt speaker cover plate to mounting hole, press down snap-fits position hard, and make sure that alt speaker cover plate is installed in place.

## Dashboard Left panel

### Replacement



#### 1. Remove dashboard left panel

- (a) Remove door weatherstrip ① near dashboard left panel.
- (b) Use trim prying plate to pry snap-fits of dashboard left panel and take down dashboard left panel ② .

#### 2. Install dashboard left panel

- (a) Install dashboard left panel to installation place, align snap-fits of dashboard left panel to mounting hole, press down snap-fits position hard and make sure that dashboard left panel is installed in place.
- (b) Install door weatherstrip near dashboard left panel.



## Dashboard Right Panel

### Replacement

△ HINT:

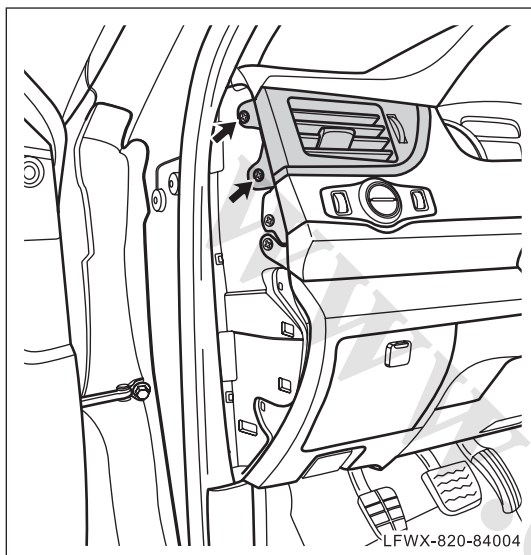
Replacement methods of dashboard left/right panel are basically the same, and see 84-Dashboard/Console, Dashboard Left Panel, Replacement.

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## Dashboard Left Air Vent

### Replacement

1. Remove dashboard left air vent
  - (a) Remove dashboard left panel ( See 84- Dashboard/Console, Dashboard Left Panel, Replacement )



- (b) Remove fixing screws of dashboard left air vent and take down left air vent.

2. Install dashboard left air vent
  - (a) Install dashboard left air vent to installation position, mount fixing screws and fasten them.
  - (b) Install dashboard left panel. ( See 84- Dashboard/Console, Dashboard Left Panel, Replacement )

## Dashboard Right Air Vent

### Replacement

△ HINT:

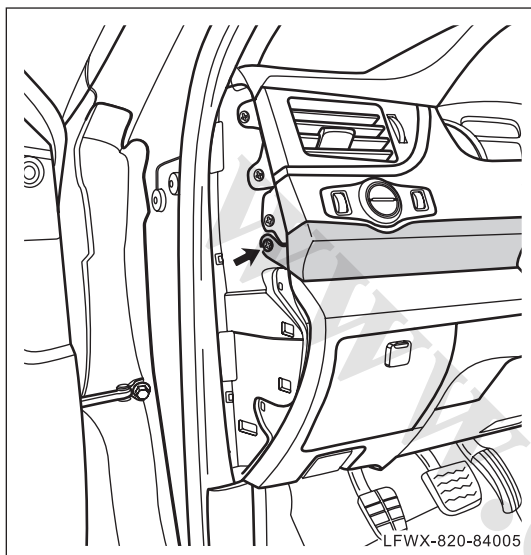
Replacement methods of dashboard left and right air vent are basically the same, and see 84- Dashboard/Console, Dashboard left Air Vent, Replacement.



## Dashboard Left Trim Strip

### Replacement

1. Remove dashboard left trim strip
  - (a) Remove dashboard left panel ( See 84- Dashboard/Console, Dashboard Left Panel, Replacement )

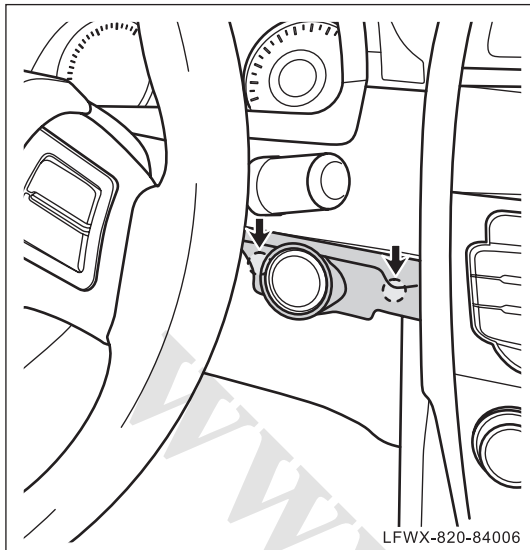


- (b) Remove fixing screws of dashboard left trim strip and take down dashboard left trim strip.

2. Install dashboard left trim strip
  - (a) Install dashboard left trim strip to installation position, mount fixing screws and fasten them.
  - (b) Install dashboard left panel. ( See 84- Dashboard/Console, Dashboard Left Panel, Replacement )

## PEPS Panel

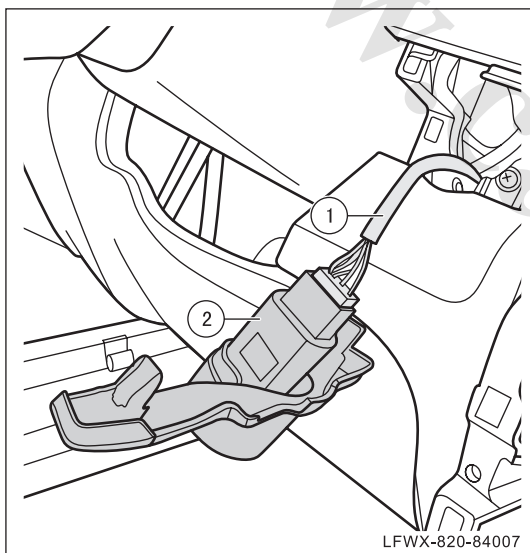
### Replacement



#### 1. Remove PEPS panel

- (a) Use trim prying plate to pry snap-fits of PEPS panel and take out PEPS panel.

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- (b) Disconnect wire harness connector ① of PEPS switch and take down PEPS panel ②.

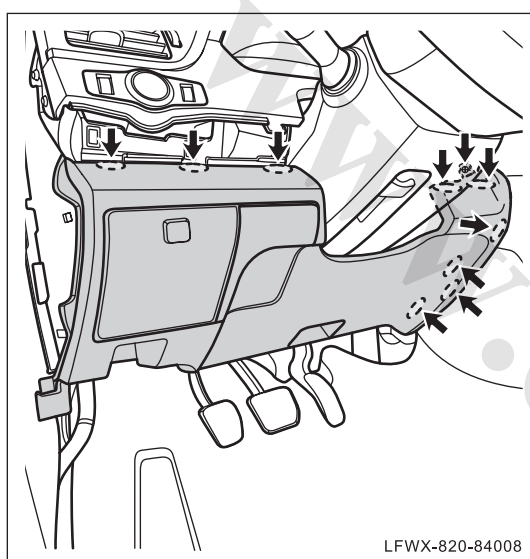
#### 2. Install PEPS panel

- (a) Connect wire harness connector of PEPS switch to PEPS panel.
- (b) Install PEPS panel to installation place, align snap-fits of PEPS panel to mounting hole, press down snap-fits position hard, and make sure that PEPS panel is installed in place.

## Lower Left Panel of Dashboard

### Replacement

1. Remove dashboard lower panel
  - (a) Remove front compartment cover open handle ( See 82- Vehicle Door/ Compartment Door/Lock, Front Compartment Cover Open Handle, Replacement )
  - (b) Remove dashboard left trim strip ( See 84- Dashboard/Console, Dashboard Left Trim Strip, Replacement )
  - (c) Remove PEPS panel. (See 84 - Dashboard/Console, PEPS Panel, Replacement)



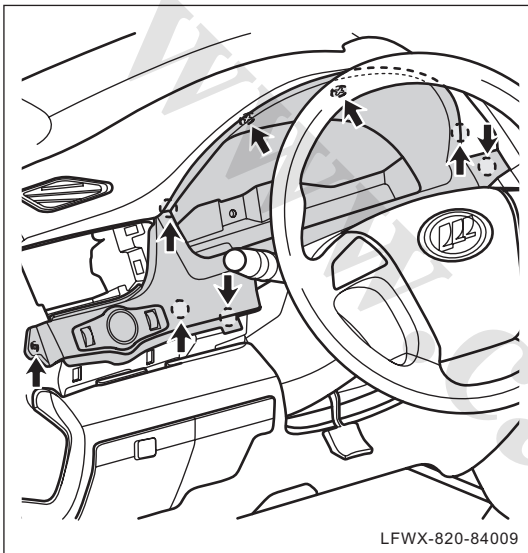
- (d) Remove fixing screws of dashboard left lower panel.
- (e) Use trim prying plate to pry snap-fits of dashboard left lower panel, let dashboard left lower panel separate from installation position.

2. Install dashboard left lower panel
  - (a) ) Install dashboard left lower panel to installation place, align snap-fits of dashboard left lower panel to mounting hole, press down snap-fits position hard, and make sure that dashboard left lower panel is installed in place.
  - (b) Mount fixing screws of dashboard left lower panel and fasten them.
  - (c) Install PEPS panel. (See 84 - Dashboard/Console, PEPS Panel, Replacement)
  - (d) Install dashboard left trim strip. ( See 84- Dashboard/Console, Dashboard Left Trim Strip, Replacement )
  - (e) Install front compartment cover open handle. ( See 82- Vehicle Door/ Compartment Door/Lock, Front Compartment Cover Open Handle, Replacement )

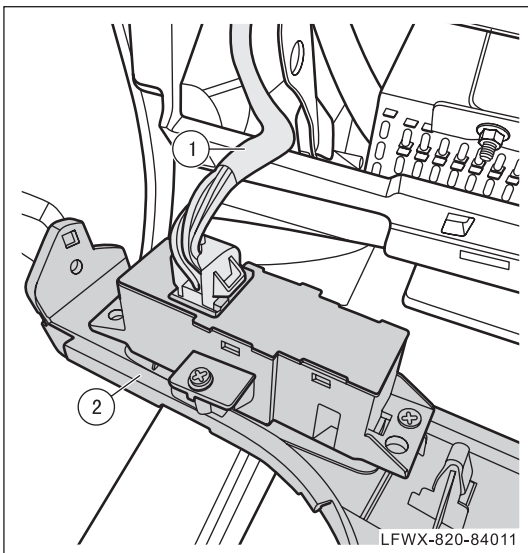
## Instrument Cluster Cowl

### Replacement

1. Remove instrument cluster cowl
  - (a) Remove dashboard left air vent. ( See 82- Vehicle Door/ Compartment door/Lock, Dashboard Left Air Vent, Replacement )
  - (b) Remove dashboard left trim strip ( See 84- Dashboard/Console, Dashboard Left Trim Strip, Replacement )
  - (c) Remove PEPS panel. (See 84 - Dashboard/Console, PEPS Panel, Replacement)



- (d) Remove instrument cluster hood fixing screws.
- (e) Use trim prying plate to pry snap-fits of instrument cluster cover and take out instrument cluster cover.



- (f) Disconnect wire harness connector ① of dashboard switch assy. and take down instrument cluster cover ② .

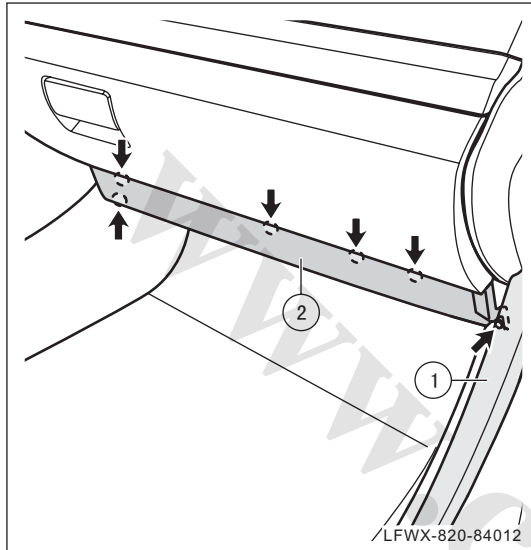
2. Install instrument cluster cowl
  - (a) Connect wire harness connector of dashboard switch assy. to instrument cluster cover.

- (b) Install instrument cluster cover to installation place, align snap-fits of combination instrument cover to mounting hole, press down snap-fits position hard, and make sure that instrument cluster cover is installed in place.
- (c) Mount fixing screws of instrument cluster cover and fasten them.
- (d) Install PEPS panel. (See 84 - Dashboard/Console, PEPS Panel, Replacement)
- (e) Install dashboard left trim strip. ( See 84- Dashboard/Console, Dashboard Left Trim Strip, Replacement )
- (f) Install dashboard left side air vent. ( See 82- Vehicle Door/ Compartment door/Lock, Dashboard Left Air Vent, Replacement )

## Dashboard Glove Box Lower Baffle

### Replacement

1. Remove dashboard glove box lower baffle
  - (a) Remove right A pillar lower panel. (See 81 - Interiors and Exteriors, A Pillar Trim Panel, Replacement)



- (b) Remove door weatherstrip ① near dashboard glove box lower baffle.
- (c) Remove fixing screws of dashboard glove box lower baffle.
- (d) Use trim prying plate to pry dashboard glove box lower baffle and take down dashboard glove box lower baffle ②.

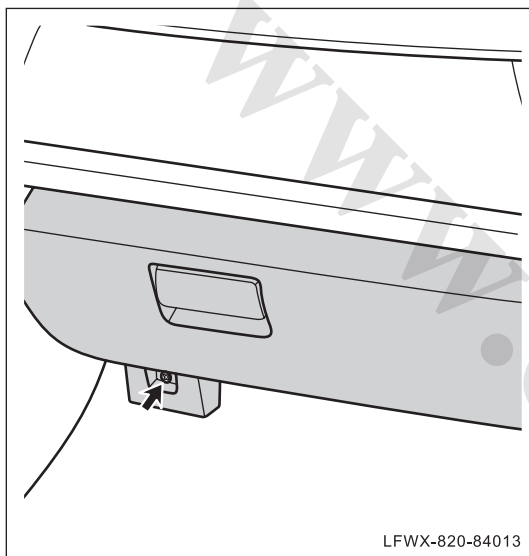
84

2. Install dashboard glove box lower baffle
  - (a) Install dashboard glove box lower baffle to installation place, align snap-fits of dashboard glove box lower baffle to mounting hole, press down snap-fits position hard, and make sure that dashboard glove box lower baffle is installed in place.
  - (b) Mount fixing screws of dashboard glove box lower baffle and fasten them.
  - (c) Install door weatherstrip near dashboard glove box lower baffle.

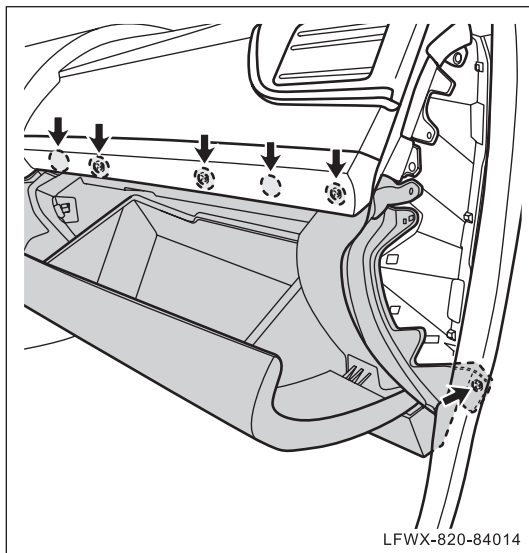
## Dashboard Glove Box

### Replacement

1. Remove dashboard glove box
  - (a) Remove dashboard right panel. ( See 84- dashboard/Console, Dashboard Right Panel, Replacement )
  - (b) Remove dashboard glove box lower baffle. ( See 84- Dashboard/Console, Dashboard Glove Box Lower Baffle, Replacement )
  - (c) Remove glove box lamp.



- (d) Remove fixing screws under glove box.



- (e) Open glove box and disassemble fixing screws of glove box.
- (f) Use trim prying plate to pry snap-fits of dashboard glove box and take down dashboard glove box.

2. Install dashboard glove box

- (a) Install dashboard glove box to installation place, align snap-fits of dashboard glove box to mounting hole, press down snap-fits position hard, and make sure that dash-



- board glove box is installed in place.
- (b) Close dashboard glove box.
  - (c) Mount fixing screws of dashboard glove box and fasten them.
  - (d) Install glove box lamp.
  - (e) Install dashboard glove box lower baffle. ( See 84- Dashboard/Console, Dashboard Glove Box Lower Baffle, Replacement )
  - (f) Install dashboard right panel. ( See 84- dashboard/Console, Dashboard Right Panel, Replacement )

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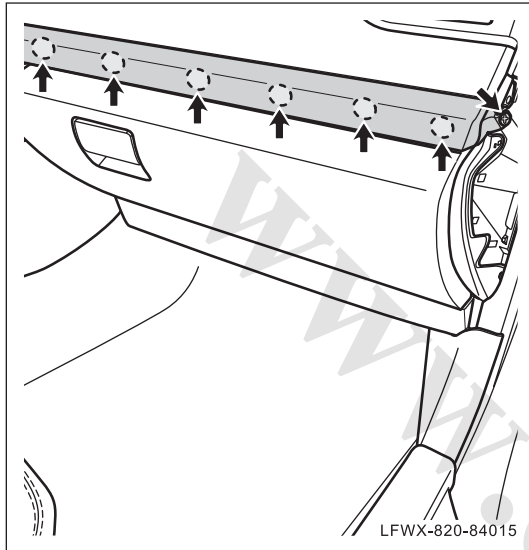


## Dashboard Right Trim Strips

### Replacement

#### 1. Remove dashboard right trim strip

- (a) Remove dashboard right panel. ( See 84- dashboard/Console, Dashboard Right Panel, Replacement )



- (b) Remove fixing screws of dashboard right trim strip.

- (c) Use trim prying plate to pry snap-fits of dashboard right trim strip and take down dashboard right trim strip.

#### 2. Install dashboard right trim strip

- (a) Install dashboard right trim strip to installation place, align snap-fits of dashboard right trim strip to mounting hole, press down snap-fits position hard, and make sure that dashboard right trim strip is installed in place.

- (b) Mount fixing screws of dashboard right trim strip and fasten them.

- (c) Install dashboard right panel. ( See 84- dashboard/Console, Dashboard Right Panel, Replacement )

## Dashboard Left Middle Panel Trim

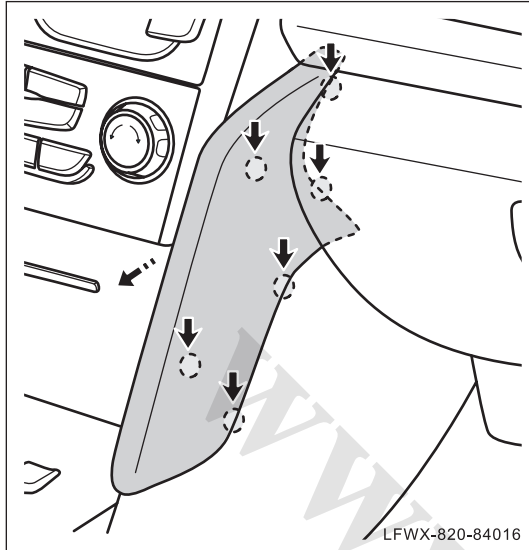
### Replacement

△ HINT:

Replacement methods of dashboard left and right middle panel trim are basically the same, and see 84- Dashboard/Console, Dashboard Right Middle panel Trim, Replacement.

## Dashboard Right Middle Panel Trim

### Replacement



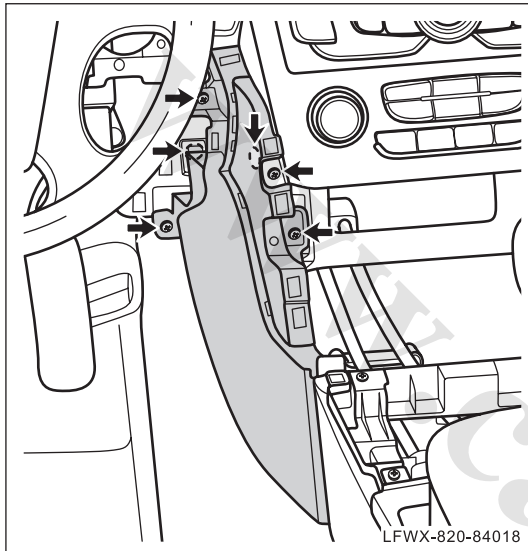
1. **Remove dashboard right middle panel trim**
  - (a) Use trim prying plate to pry snap-fits of dashboard right middle panel trim and take down dashboard right middle panel trim.

2. **Install dashboard right middle panel trim**
  - (a) Install dashboard right middle panel trim to installation place, align snap-fits of dashboard right middle panel trim to mounting hole, press down snap-fits position hard, and make sure that dashboard right middle panel trim is installed in place.

## Dashboard Left Middle Panel

### Replacement

1. Disassemble dashboard left middle panel
  - (a) Remove left lower panel of dashboard. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)
  - (b) Remove center control glove box. ( See 84- Dashboard/Console, Center Control Glove box, Replacement )



- (c) Remove fixing screws of dashboard left middle panel.
- (d) Use trim prying plate to pry snap-fits of dashboard left middle panel and take down dashboard left middle panel.

2. Install dashboard left middle panel
  - (a) Install dashboard left middle panel to installation place, align snap-fits of dashboard left middle panel to mounting hole, press down snap-fits position hard and make sure that dashboard left middle panel is installed in place.
  - (b) Mount fixing screws of dashboard left middle panel and fasten them.
  - (c) Install center control glove box. ( See 84- Dashboard/Console, Center Control Glove box, Replacement )
  - (d) Install dashboard left lower panel. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)

## Dashboard Right Middle Panel

### Replacement

△ HINT:

Replacement methods of dashboard left and right middle panel are basically the same and see 84- Dashboard/Console, Dashboard Left Middle Panel, Replacement.

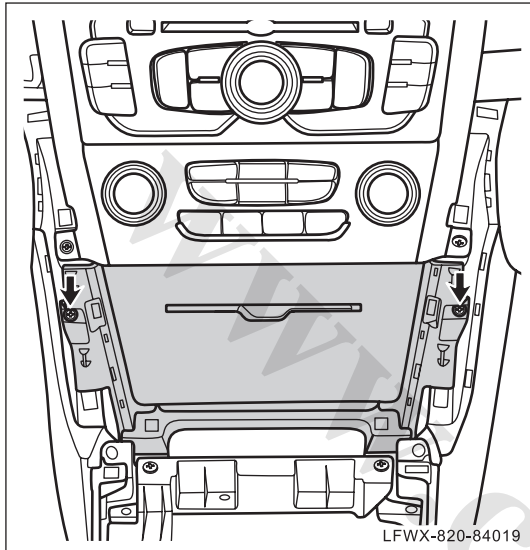
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## Central Control Glove Box

### Replacement

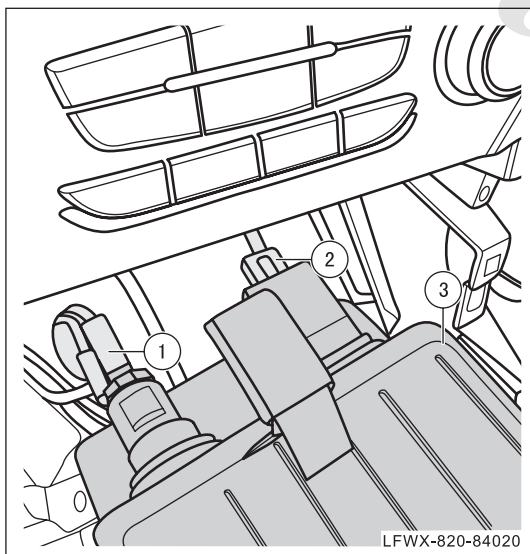
#### 1. Remove center control glove box

- (a) Remove dashboard gear shift panel assembly. ( See 84- Dashboard/Console, Dashboard Gear Shift Panel Assembly , Replacement )



- (b) Remove fixing screws of center control glove box and take out center control glove box.

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- (c) Disconnect connector ① of external power and AUX/USB data cable ② and take down center control glove box ③ .

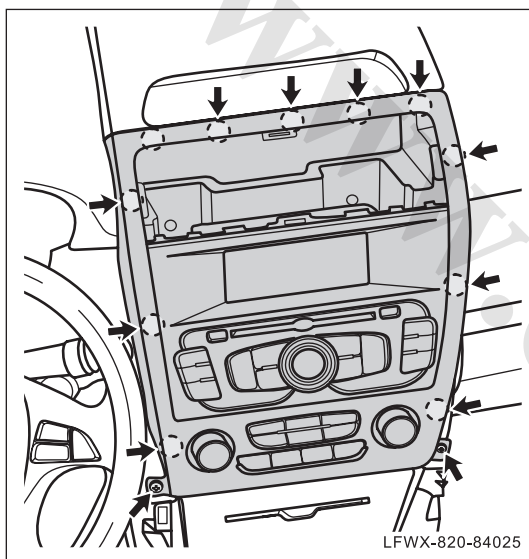
#### 2. Install center control glove box

- (a) Connect connector of external power and AUX/USB data cable onto center control glove box.
- (b) Install center control glove box to installation place, mount fixing screws and fasten them.
- (c) Install console gear shift panel assembly. ( See 84- Dashboard/Console, Dashboard Gear Shift Panel Assembly , Replacement )

## Center Plate Center Control Switches Assy.

### Replacement

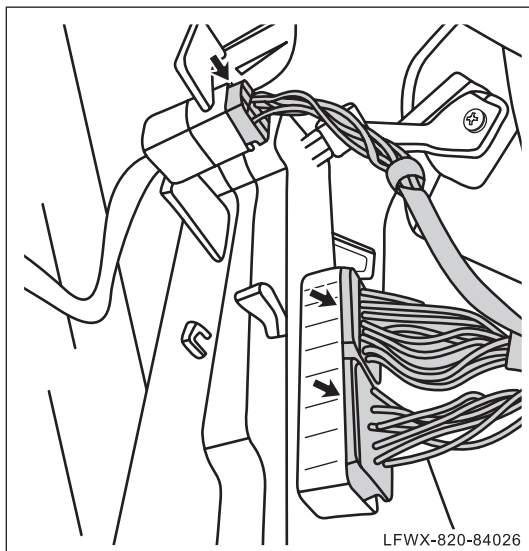
1. Remove center control panel centralized control switch assy.
  - (a) Remove dashboard left middle panel trim. ( See 84- Dashboard/Console, Dashboard Left Middle Panel Trim, Replacement )
  - (b) Remove dashboard right middle panel trim. ( See 84- Dashboard/Console, Dashboard Right Middle Panel Trim, Replacement )
  - (c) Remove dashboard middle air outlet assembly. ( See 84- Dashboard/Console, Dashboard Middle Air Vent Assembly, Replacement )



- (d) Remove fixing screws of center control panel centralized control switch assy..
- (e) Use trim prying plate to pry snap-fits of center control panel centralized control switch assy. and take down center control panel centralized control switch assy..

#### **Note:**

**Slowly let center control panel centralized control switch assy. separate from installation position, and never pull wire harness of center control panel centralized control switches assy. to avoid wire harness damage.**



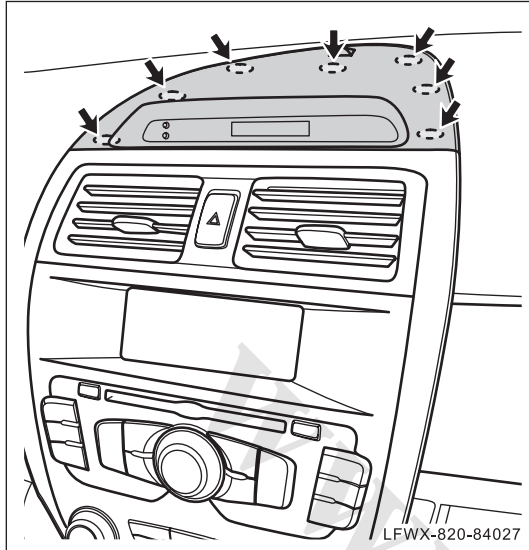
- (f) Disconnect wire harness connector of center control panel centralized control switch assy. and take out center control panel centralized control switch assy..

2. Install center control panel centralized control switch assy.
  - (a) Connect wire harness connector of center control panel centralized control switch assy. to center control panel centralized control switch assy.
  - (b) Install center control panel centralized control switch assy. to installation place, align snap-fits of center control panel centralized control switch assy. to mounting hole, press down snap-fits position hard, and make sure that center control panel centralized control switch assy. is installed in place.
  - (c) Mount fixing screws of center control panel centralized control switch assy. and fasten them.
  - (d) Install dashboard middle air vent assembly. ( See 84- Dashboard/Console, Dashboard Middle Air Vent Assembly, Replacement )
  - (e) Install dashboard right middle panel trim. ( See 84- Dashboard/Console, Dashboard Right Middle Panel Trim, Replacement )
  - (f) Install dashboard left middle panel trim. ( See 84- Dashboard/Console, Dashboard Left Middle Panel Trim, Replacement )



## Multifunction Display Cover Plate

### Replacement

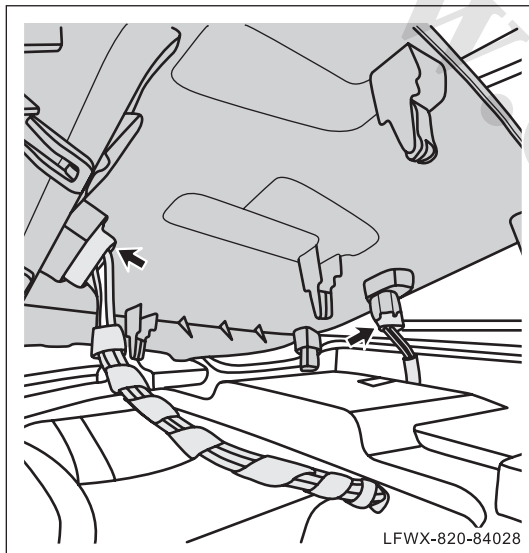


#### 1. Remove multifunction display cover plate

- (a) Use trim prying plate to pry snap-fits of multifunction display cover plate and take out multifunction display cover plate.

#### ⓘ Note:

**Slowly let multifunction display cover plate separate from installation position, and never pull wire harness of multifunction display cover plate to avoid wire harness damage.**



- (b) Disconnect wire harness connector of ambient light sensor.
- (c) Disconnect wire harness connector of multifunction display and take down multifunction display cover plate.

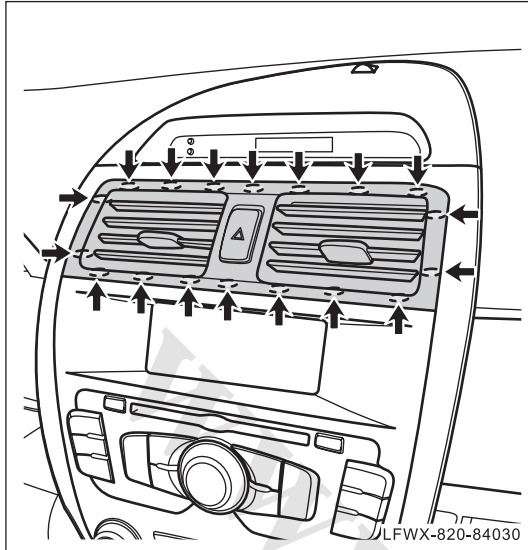
- (d) Remove multifunction display. ( See 73-Driver Information System, Multifunction Display, Replacement )

#### 2. Install multifunction display cover plate.

- (a) Install multifunction display onto multifunction display cover plate. ( See 73-Driver Information System, Multifunction Display, Replacement )
- (b) Connect wire harness connector of environment light sensor to environment light sensor.
- (c) Connect wire harness connector of multifunction display onto multifunction display.
- (d) Install multifunction display cover plate to installation place, align snap-fits of multifunction display cover plate to mounting hole, press down snap-fits position hard, and make sure that multifunction display cover plate is installed in place.

## Dashboard Middle Air Vent Assembly

### Replacement

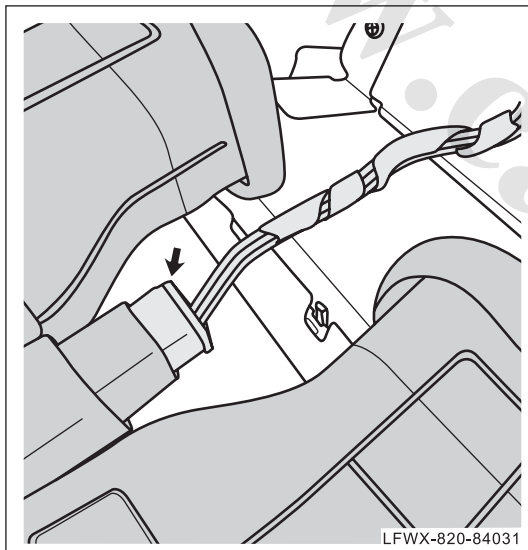


#### 1. Remove dashboard middle air vent assembly

- (a) Use trim prying plate to pry snap-fits of dashboard middle air vent assembly and take out dashboard middle air vent assembly.

#### ⓘ Note:

Slowly let dashboard middle air vent separate from installation position, and never pull wire harness to avoid wire harness damage.



- (b) Disconnect wire harness connector of risk alarm lamp, and take down dashboard middle air vent assembly.

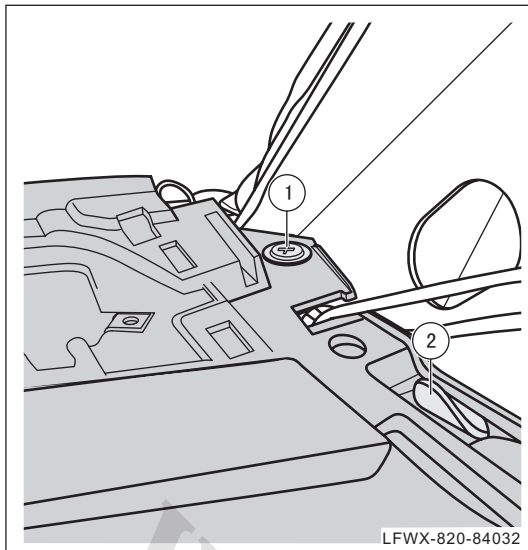
#### 2. Install dashboard middle air vent assembly

- (a) Connect wire harness connector of risk alarm lamp switch to risk alarm lamp switch.
- (b) Install dashboard middle air vent assembly to installation place, align snap-fits of dashboard middle air vent assembly to mounting hole, press down snap-fits position hard, and make sure that dashboard middle air vent assembly is installed in place.

## Dashboard Upper Panel

### Replacement

1. Remove dashboard upper panel
  - (a) Remove alt speaker. ( See 74- Audio Entertainment System, Alt Speaker, Replacement )
  - (b) Remove dashboard left air vent. ( See 84- Dashboard/Console, Dashboard Left Air Vent, Replacement )
  - (c) Remove dashboard right air vent. ( See 84- Dashboard/Console, Dashboard Right Air Vent, Replacement )
  - (d) Remove left lower panel of dashboard. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)
  - (e). Remove instrument cluster cowl. (See 84 - Dashboard and Console, Instrument Cluster Cowl, Replacement)
  - (f). Remove dashboard glove box. (See 84 – Dashboard/ Console – Glove Box of Dashboard, Replacement)
  - (g) Remove dashboard right trim strip. ( See 84- Dashboard/Console, Dashboard Right Trim Strip, Replacement )
  - (h) Remove dashboard left middle panel ( See 84- Dashboard/Console, Dashboard Left Middle Panel, Replacement )
  - (i) Remove dashboard right middle panel. ( See 84- Dashboard/Console, Dashboard Right Middle Panel, Replacement )
  - (j) Remove center control panel centralized control switch assy. ( See 84- Dashboard/ Console, Center Control Panel Centralized Control Switch Assy., Replacement )
  - (k) Remove multifunction display cover plate upper cover. ( See 84-Dashboard/Console, Multifunction Display, Replacement )
  - (l) Remove front passenger airbag.



(m) Remove snap-fits ① of dashboard upper panel

△ HINT:

The snap-fits position of dashboard upper panel is bilaterally symmetrical.

(n) Slowly let dashboard upper panel separate from bracket ② and take down dashboard panel.

△ HINT:

The bracket position of dashboard upper panel is bilaterally symmetrical.

**Note:**

- Take down dashboard upper panel under the help of assistant.
- Slowly take down dashboard upper panel and avoid damage of antenna.

2. Install dashboard upper panel

(a) Install dashboard upper panel to installation position, and let dashboard upper panel be located on bracket

**Note:**

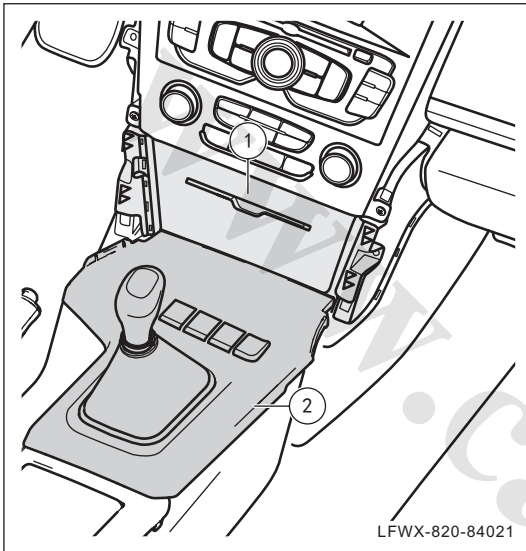
- Install dashboard upper panel under the help of assistant.
  - Slowly install dashboard upper panel and avoid damage of antenna.
- (b) Install snap-fits of dashboard upper panel.
- (c) Install front passenger airbag.
- (d) Install multifunction display cover plate upper cover. ( See 84-Dashboard/Console, Multifunction Display, Replacement )
- (e) Install center control centralized control switch assy. ( See 84- Dashboard/Console, Center Control Panel Centralized Control Switch Assy., Replacement )
- (f) Install dashboard right middle panel. ( See 84- Dashboard/Console, Dashboard Right Middle Panel, Replacement )
- (g) Install dashboard left middle panel. ( See 84- Dashboard/Console, Dashboard Left Middle Panel, Replacement )
- (h) Install dashboard right trim strip. ( See 84- Dashboard/Console, Dashboard Right Trim Strip, Replacement )

- (i). Install dashboard glove box. (See 84 – Dashboard/ Console – Glove Box of Dashboard, Replacement)
- (j) Install instrument cluster cowl. (See 84 - Dashboard and Console, Instrument Cluster Cowl, Replacement)
- (k) Install dashboard left lower panel. (See 84 – Dashboard/ console - Left Lower Trim Panel of Dashboard, Replacement)
- (l) Install dashboard right side air vent. ( See 84- Dashboard/Console, Dashboard Right Air Vent, Replacement )
- (m) Install dashboard left side air vent. ( See 84- Dashboard/Console, Dashboard Left Air Vent, Replacement )
- (n) Install alt speaker. ( See 74- Audio Entertainment System, Alt Speaker, Replacement )

## Console

### Replacement

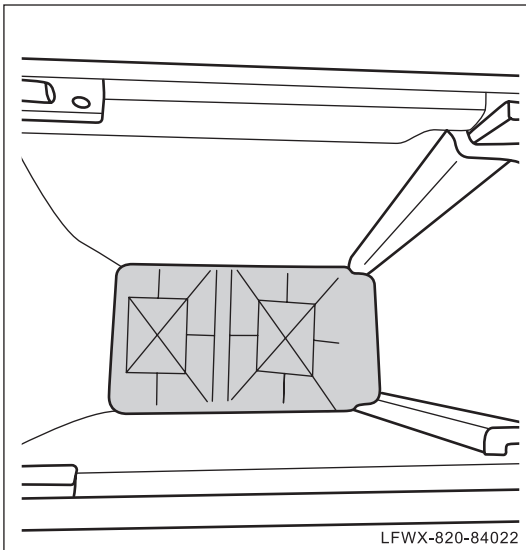
1. Remove console
  - (a) Remove dashboard left middle panel trim. ( See 84- Dashboard/Console, Dashboard Left Middle Panel Trim, Replacement )
  - (b) Remove dashboard right middle panel trim. ( See 84- Dashboard/Console, Dashboard Right Middle Panel Trim, Replacement )



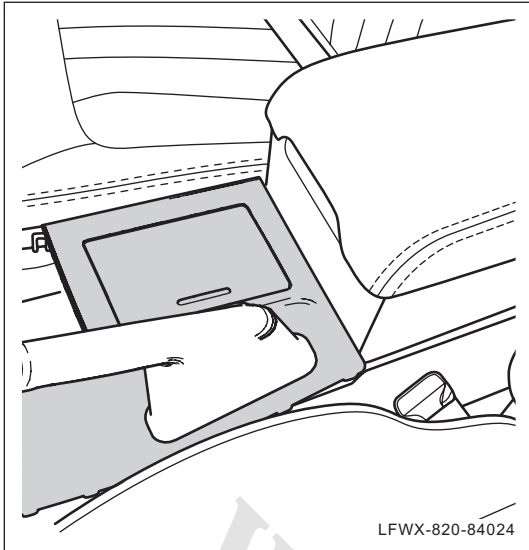
- (c) Open center control glove box ①.
- (d) Use trim prying plate to pry snap-fits of console gear shift panel and take down console gear shift panel ② .

△ HINT:

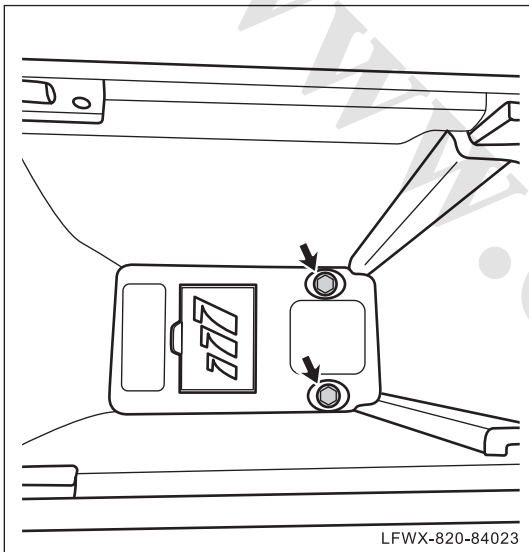
After disassembling, take down shift lever knob from gear shift panel.



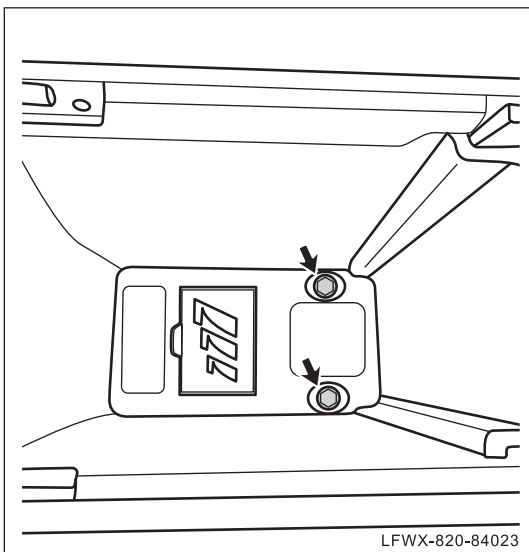
- (e) Open console armrest cover plate and take out trim pad.



- (f) Use trim prying plate to pry snap-fits of console hand brake panel and take down console parking brake panel.



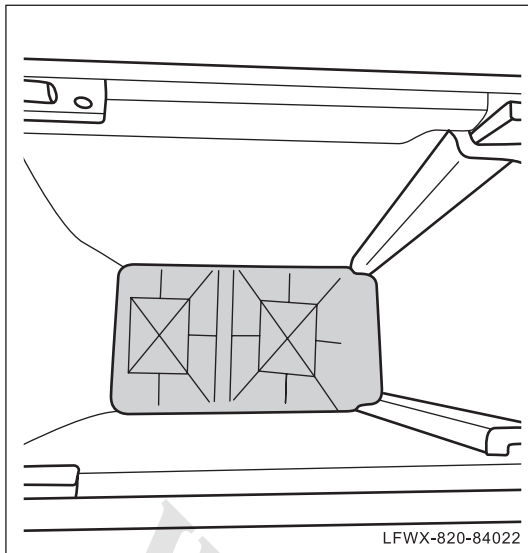
- (g) Remove fixing bolts and screws of console and take down console.



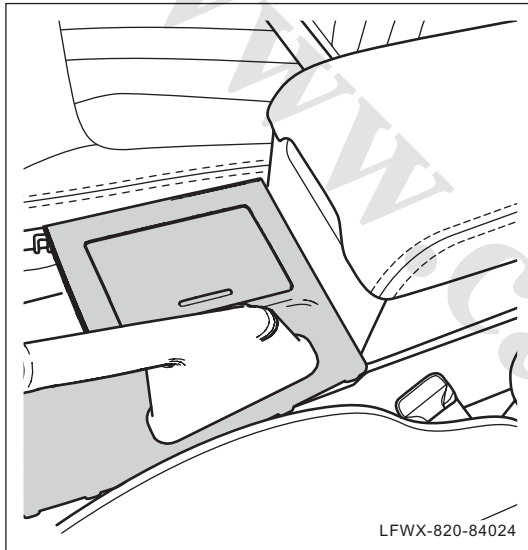
## 2. Install console

- (a) Install console to installation position, mount fixing screws and fasten them.

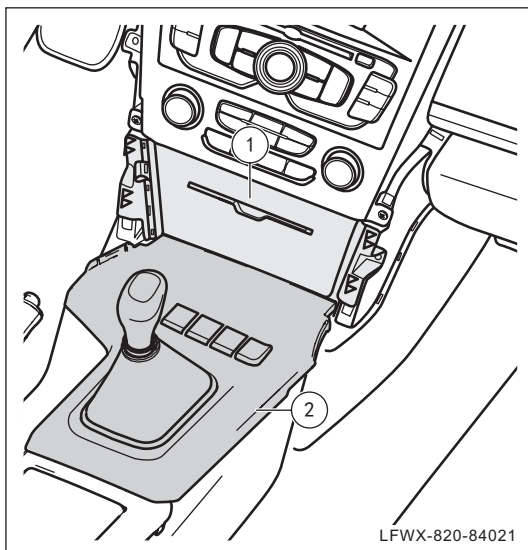
**Torque: 8N•m-12N•m (bolt)**



(b) Install trim pad.



(c) Install the console hand brake panel to installation position, align the snap-fits of console hand brake panel to the mounting holes, press down snap-fits position hard, and make sure that console hand brake panel is installed in place.



(d) Open center control glove box ①.

(e) Install console gear shift panel ② to installation position, align the snap-fits of console gear shift panel to the mounting holes, press down snap-fits position hard, and make sure that console gear shift panel is installed in place.

△ HINT:

Before installation, install shift lever knob onto gear shift panel.



- (f) Install dashboard right middle panel trim. ( See 84- Dashboard/Console, Dashboard Right Middle Panel Trim, Replacement )
- (g) Remove dashboard left middle panel trim. ( See 84- Dashboard/Console, Dashboard Left Middle Panel Trim, Replacement )

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