



# H330-H320

- **A/T repair manual  
Diagnostics\_Guideline\_for\_4F16**

H320H330RM2B/1/1

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## Diagnostics Guideline

<b>Date of release</b>	<b>2010-02-22</b>
<b>Version</b>	<b>1.0</b>
<b>Customer</b>	<b>Brilliance Auto</b>
<b>Vehicle</b>	<b>A1 / A2</b>
<b>A/T</b>	<b>4F16</b>

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### VERSION LIST

Version	Date	Author	Description
1.0	2010-02-22	C.S.WOO	Release



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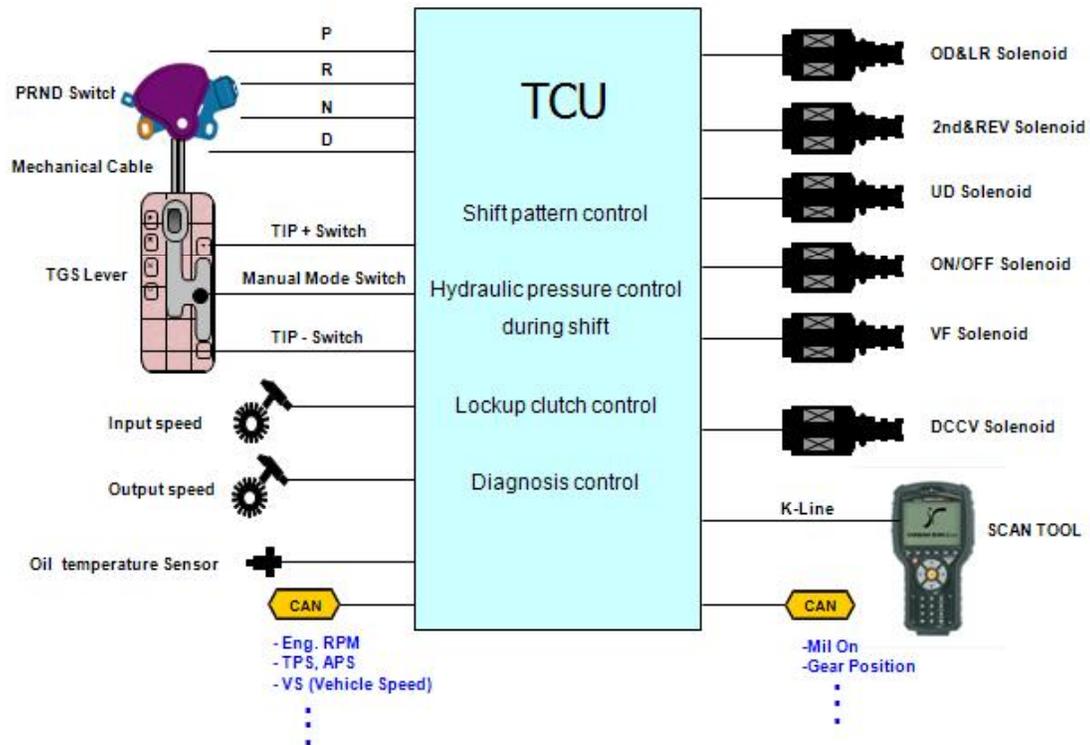
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1 Electronic Control System Block Diagram



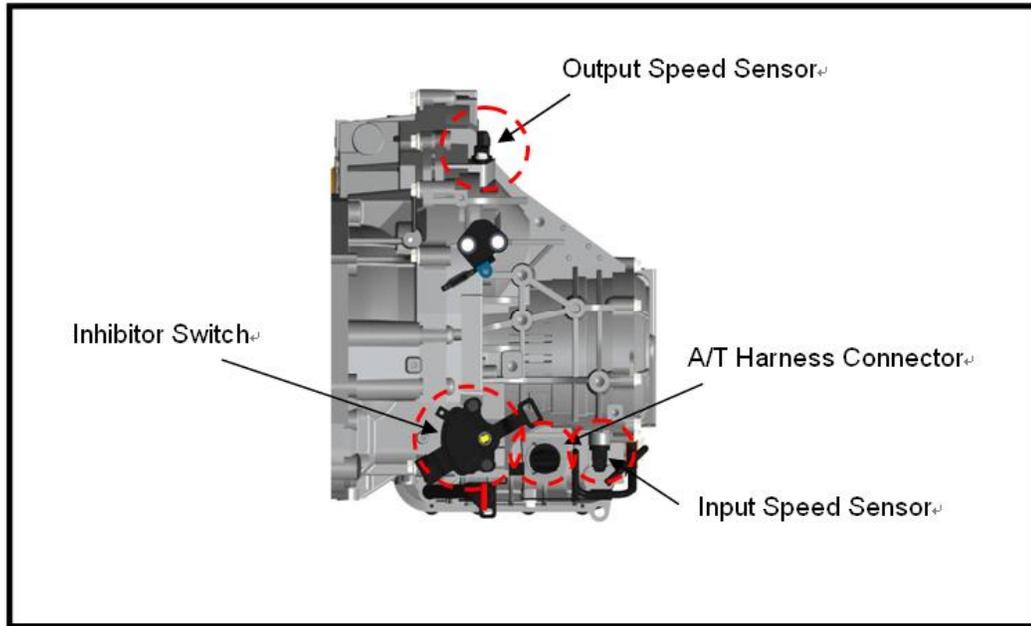
- Abbreviation

- LR : Low & Reverse
- OD : Over Drive
- 2<sup>nd</sup>&REV : Second & Reverse
- UD : Under Drive
- VB : Battery voltage
- DCCV : Damper Clutch Control Valve
- TGS : Transmission Gear Select

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### 2 Electronic Control Location



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### 3 Operating Components and Function

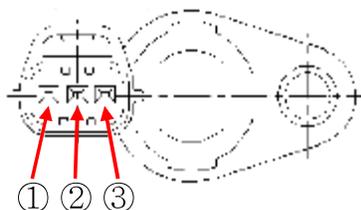
Sensor ( Switch)	Function
Input Speed Sensor	Detect input shaft speed
Output Speed Sensor	Detect output shaft speed
Inhibitor Switch	Select lever position by contact switch
Manual Mode Switch	Select manual mode
Up Shift Switch	Operate up shift signal
Down Shift Switch	Operate down shift signal

#### 3.1 Sensors

Input shaft & Output shaft speed sensor

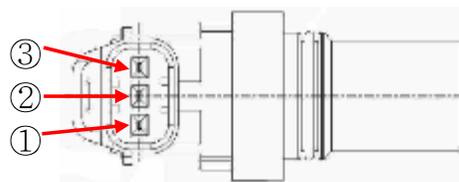
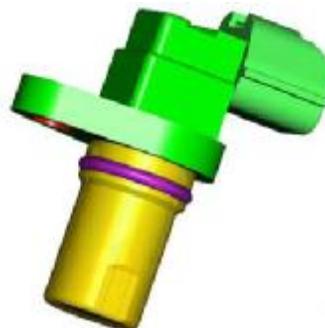
- Type : Hall sensor
- Current consumption : 22 mA (Max)

**Output Speed Sensor**



- ① : GND  
 ② : Sensor Signal  
 ③ : V\_IG1

**Input Speed Sensor**



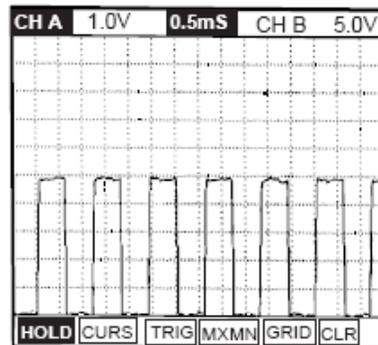
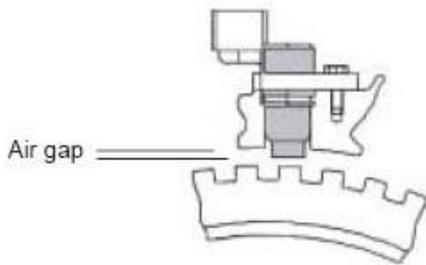
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Hall type sensor specification

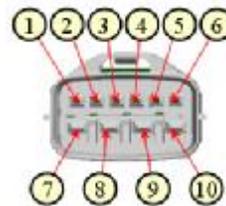
Air Gap (mm)	Input Speed Sensor	1.3
	Output Speed Sensor	0.85
Coil Resistance	Input Speed Sensor	Over 1M $\Omega$
	Output Speed Sensor	Over 1M $\Omega$
Peak-Peak Voltage	High	4.8 V
	Low	0.8 V

Sensor positioning & waveform



3.2 Inhibitor Switch

- Type : Rotary contact type
- Range of temperature : -40 °C ~ 145 °C



Inhibitor switch – Continuity check

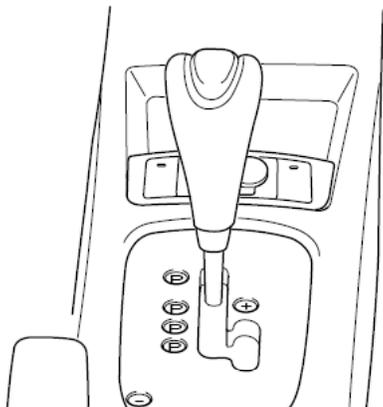
Range	Terminal Number									
	①	⑥	②	⑤	③	④	⑧	⑦	⑨	⑩
P	○						○		○	○
R							○	○		
N		○					○		○	○
D			○				○			

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### 3.3 Manual mode



Manual mode allows the manual up-shift and downshift with the accelerator pedal is depressed. The prompt response and shift would be obtained due to the continuous shifting without cutting of driving power. The shifting time is also decreased about 0.1sec during up-shift, 0.2sec during down shift. As the selector lever is pushed upward or downward one time, the gear is up shifted or downshifted by one gear.

#### Signal of Manual mode switch

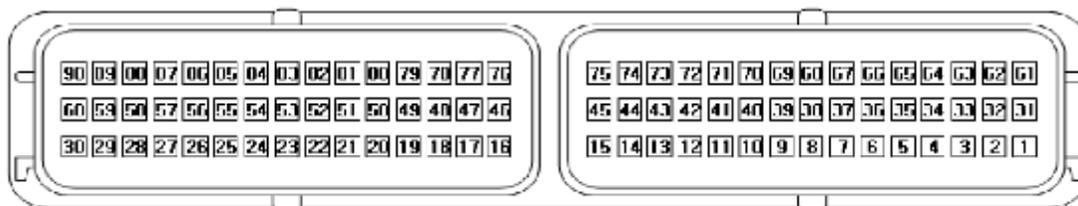
Items	Manual Mode Switch	Up Switch	Down Switch
D range selection	OFF	OFF	OFF
Manual mode selection	ON	OFF	OFF
Up shift selection	ON	ON	OFF
Down shift selection	ON	OFF	ON

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### 3.4 TCU PIN Description



No.	Name	Description
A 2	GND1	Power Stage Ground
A 3	GND2	Power Stage Ground
A14	ATF_GND	ATF ground
A15	ATF	Oil Temperature Sensor
B16	WINTER_SW	Winter Switch
B18	PG_A_GND	PG-A Ground
B19	PG_B_GND	PG-B Ground
B20	R-SW	Inhibitor Switch R
B24	GND3	Power Stage Ground
B25	GND4	Power Stage Ground
B29	V_IGK	Battery Voltage After IG Key
B30	VBD	Direct Battery Voltage supply
A31	VFS	Variable Force Solenoid (VFS)
A35	VS_OUT	Vehicle Speed Output
A36	PCSV-C(UD)	Solenoid Valve UD
B46	PG_B	Output Speed PG-B
B48	UP SHIFT	Inhibitor Switch (Up Shift Switch)
B49	D-SW	Inhibitor Switch D
B56	DIAG_DL	K-Line (KWP 2000)
A61	V_SOL_IN1	Battery Voltage for HSD Power
A62	V_SOL_IN2	Battery Voltage for HSD Power
A64	TRIP_COM	Trip Computer
A65	PCSV-B(2nd&REV)	Solenoid Valve 2 <sup>nd</sup> &REV
A66	PCSV-D(DCCV)	Solenoid Valve DCCV
A67	ON/OFF SOL.	Solenoid Valve On/Off
A70	PCSV-A(OD&LR)	Solenoid Valve OD&LR
A72	V_SOL1	Battery voltage After HSD for solenoids Power Supply
A73	V_SOL2	Battery voltage After HSD for solenoids Power Supply
A74	V_VFS	Battery voltage After HSD for VFS Power Supply
B76	PG_A	Input Speed PG-A
B77	DOWN SHIFT	Inhibitor Switch (Down Shift Switch)
B78	MANUAL MODE	Inhibitor Switch (Manual Mode Switch)
B79	N-SW	Inhibitor Switch N
B81	P-SW	Inhibitor Switch P
B87	CAN_L_IN	Controller Area Network
B88	CAN_H_IN	Controller Area Network

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### 4 TROUBLE SHOOTING

#### 4.1 DIAGNOSTIC TROUBLE CODES (INSPECTION PROCEDURE)

##### Check the Diagnostic Trouble Code

1. Turn the ignition switch to OFF.
2. Connect the scan tool to the DLC connector for diagnosis.
3. Turn the ignition switch to ON.
4. Check the diagnostic trouble codes using the scan tool.
5. Read the output diagnostic trouble codes. Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following pages.
6. Delete the diagnostic trouble code.
7. Disconnect the scan tool.

##### NOTE

DTC cleaning should only be done with the scan tool.

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### 4.2 DTC list

DTC	DTC Description	Remark
P0707	Inhibitor switch short to ground or open	
P0708	Inhibitor switch short to battery or short between switches	
P0712	Oil temperature sensor short to ground	
P0713	Oil temperature sensor open or short to battery	
P0717	Turbine speed sensor no signal	
P0722	Transmission output speed sensor no signal	
P0731	1st speed asynchronous synchronous error	
P0732	2nd speed asynchronous synchronous error	
P0733	3rd speed asynchronous synchronous error	
P0734	4th speed asynchronous synchronous error	
P0741	Damper clutch abnormal	
P0743	DCCV solenoid short to battery or open or short to ground	
P0748	VFS short to battery or open or short to ground	
P0750	OD&LR solenoid short to battery or open or short to ground	
P0755	UD solenoid short to battery short to battery or open or short to ground	
P0760	2ND&REV solenoid short to battery or open or short to ground	
P0765	On/Off solenoid short to battery or open or short to ground	
P0880	TCM power signal error: short to ground or open	
U0001	CAN BUS OFF	
U0100	No ID from ECU	

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### 5 DIAGNOSTIC TROUBLE CODE DESCRIPTION

#### 5.1 Inhibitor switch short to ground or open (P0707)

##### GENERAL DESCRIPTION

The inhibitor switch sends the shift lever position information to the TCU using a 12V (battery voltage) signal. When the shift lever is in the D (Drive) position the output signal of range switch is 12V and in all other positions the voltage is 0V. The TCU judges the shift lever position by reading all signals, for the range switch, simultaneously.

##### DTC DESCRIPTION

The TCU sets this code when the inhibitor switch has no output signal for more than 30 seconds.

##### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
DTC strategy	Check for no signal	- Open or short in circuit - Faulty inhibitor switch - Faulty TCU
Enable conditions	- Engine Speed $\geq$ 400 rpm - Vi $\geq$ 10 V	
Threshold value	No signal detected	
Diagnostic time	More than 30 sec	

##### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "Inhibitor switch" parameter on the scan tool.
4. Move TGS lever from "P" range to "D" range.
5. Does "Inhibitor switch" follow the reference data?

##### YES

► Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

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**NO**

- ▶ Go to "Terminal & connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

- ▶ Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Go to "Power supply circuit inspection" procedure.

### POWER SUPPLY CIRCUIT INSPECTION

1. Check power to inhibitor switch.
  - 1) Disconnect "Inhibitor switch" connector.
  - 2) Ignition "ON" & engine "OFF".
  - 3) Measure voltage between terminal "8" of the harness connector and chassis ground.
    - ▷ Specification : approx. VB
  - 4) Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check the Fuse is OK or not.
- ▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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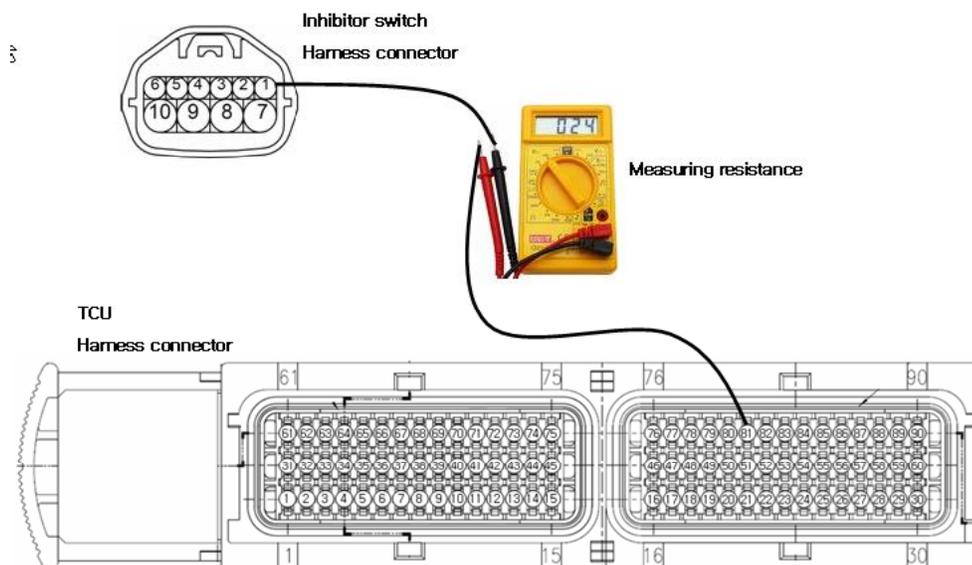
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### SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect "Inhibitor Switch" and "TCU" connector.
3. Measure resistance between each terminal of the harness connector and TCU harness connector as below.

PIN No. of "Inhibitor switch"	No. 1	No. 2	No. 6	No. 7
PIN No. of "TCM" harness	No. 81	No. 49	No. 79	No. 20
Specification	0 $\Omega$	0 $\Omega$	0 $\Omega$	0 $\Omega$



4. Is resistance within specifications?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for Open in harness. Repair as necessary and go to "verification of vehicle repair" procedure.

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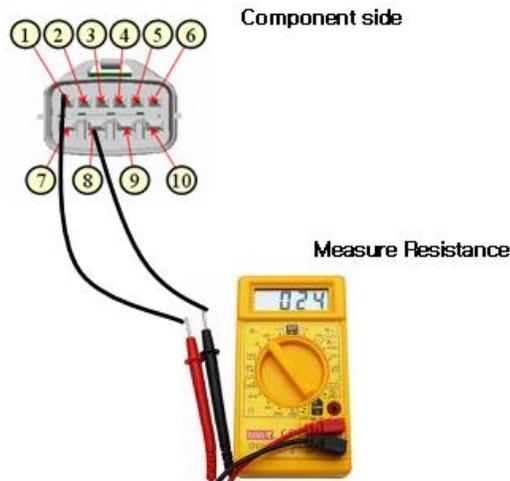
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### COMPONENT INSPECTION

1. Ignition "OFF".
2. Remove "Inhibitor switch".
3. Measure the resistance between each terminal of the sensor.  
(Refer 3.2 for Inhibitor switch continuity check table.)

▷ Specification : approx. 0 Ω (at each range)



4. Is resistance within specification?

**YES**

- ▶ Substitute with a known-good TCU and check for proper operation. If the problem is corrected, replace TCU as necessary and then go to "Verification of vehicle repair" procedure

**NO**

- ▶ Replace "Inhibitor switch" as necessary and go to "Verification of vehicle repair" procedure.

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### VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and Clear DTC.
2. Operate the vehicle within DTC enable conditions in general information.
3. Are any DTC present?

#### YES

- ▶ Go to the applicable trouble shooting procedure.

#### NO

- ▶ System performing to specification at this time.

## 5.2 Inhibitor switch short to battery or short between switches (P0708)

### GENERAL DESCRIPTION

Refer to DTC P0707

### DTC DESCRIPTION

The TCU sets this code when the inhibitor switch outputs multiple signal for more than 10 seconds.

### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
DTC strategy	Check for multiple signal	- Open or short in circuit - Faulty inhibitor switch - Faulty TCU
Enable conditions	$V_i \geq 10\text{ V}$	
Threshold value	Multiple signal detected	
Diagnostic time	More than 10 sec	

### MONITOR SCANTOOL DATA

Refer to DTC P0707

### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0707

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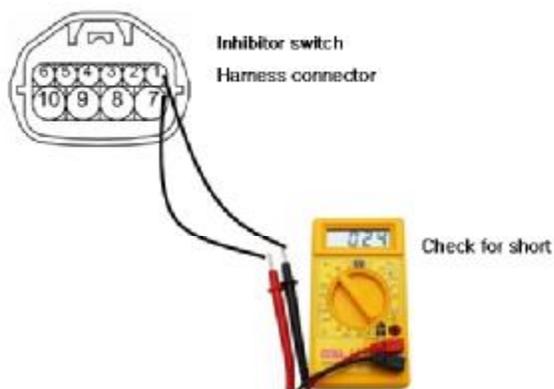
### POWER SUPPLY CIRCUIT INSPECTION

Refer to DTC P0707

### SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect "Inhibitor Switch" and "TCU" connector.
3. Measure resistance between each terminal of the harness to check for Short.

▷ Specification : Infinite



4. Is resistance within specification?

**YES**

▶ Go to "Component inspection" procedure.

**NO**

▶ Check for Short circuit in harness. Repair as necessary and go to "verification of vehicle repair" procedure.

### COMPONENT INSPECTION

Refer to DTC P0707

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707

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### 5.3 Oil temperature sensor short to ground (P0712)

#### GENERAL DESCRIPTION

The automatic transmission fluid(ATF) temperature sensor uses a thermistor whose resistance changes according to the temperature changes. The TCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic transmission fluid(ATF) temperature provides very important data for the TCU control of the Torque Converter Clutch, and is also used for many other purposes.

#### DTC DESCRIPTION

This DTC code is set when the ATF temperature output voltage is lower than a value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The TCU regards the ATF temperature as fixed at a value of 80 °C(176 °F).

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check for ground short	- Sensor signal circuit is short to ground - Faulty sensor - Faulty TCU
<b>Enable conditions</b>	$V_i \geq 10\text{ V}$	
<b>Threshold value</b>	Voltage < 0.1 V	
<b>Diagnostic time</b>	More than 1 sec	
<b>Fail safe</b>	<ul style="list-style-type: none"> <li>- Prohibit Intelligent shift and Learning control.</li> <li>- Fluid temperature is regarded as 80 °C</li> <li>- Stop the line pressure control unit IG-OFF.</li> </ul>	

#### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "ATF sensor" parameter on the scan tool.

▷ Specification : Increasing Gradually

4. Does "ATF sensor" follow the specification?

**YES**

► Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

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**NO**

- ▶ Go to "Terminal & connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

- ▶ Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Go to "Signal circuit inspection" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "ATF sensor" connector.
3. Measure the voltage between ATF(+) terminal and chassis ground.

- ▷ Specification : Approx. 5 V



4P16

Solenoid Valve  
 Harness side connector

	T/M CIRCUIT
①	PCSV-A(ODMLR)
②	PCSV-R(=+REF)
③	ON/OFF SOL
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-D(OR)
⑨	VTS(+)
⑩	VFS(-)

4. Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for Short circuit in harness. Repair as necessary and go to "verification of vehicle repair" procedure.

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### COMPONENT INSPECTION

1. Check "ATF sensor"
  - 1) Ignition "OFF".
  - 2) Disconnect the "ATF sensor" connector.
  - 3) Measure the resistance between ATF(+) terminal and ATF(-) terminal of the ATF sensor.

▷ Specification : Refer to "Reference data"

#### [REFERENCE DATA]

Temperature [°C(°F)]	Resistance[kΩ ]	Temperature [°C(°F)]	Resistance[kΩ ]
-40(-40)	Approx. 139.5	80(176)	Approx. 1.08
-20(-4)	Approx. 47.7	100(212)	Approx. 0.63
0(32)	Approx. 18.6	120(248)	Approx. 0.38
20(68)	Approx. 8.1	140(284)	Approx. 0.25
40(104)	Approx. 3.8	160(320)	Approx. 0.16
60(140)	Approx. 1.98	-	-

- 4) Is resistance within specifications?

**YES**

▶ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Replace "ATF sensor" as necessary and Go to "Verification Vehicle Repair" procedure.  
 ※ ATF sensor is in the 8p connector of main harness(inside A/T).

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707

#### 5.4 Oil temperature sensor open or short to battery (P0713)

#### GENERAL DESCRIPTION

Refer to DTC P0712

#### DTC DESCRIPTION

This DTC code is set when the ATF temperature output voltage is higher than a value generated by thermistor resistance, in a normal operating range, for an extended period of time. The TCU regards the ATF temperature as fixed at a value of 80 C(176 F).

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### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check voltage range	<ul style="list-style-type: none"> <li>- Open in circuit</li> <li>- Faulty sensor</li> <li>- Faulty TCU</li> </ul>
<b>Enable conditions</b>	- $V_i \geq 10\text{ V}$	
<b>Threshold value</b>	Voltage > 4.9 V	
<b>Diagnostic time</b>	More than 1 sec	
<b>Fail safe</b>	<ul style="list-style-type: none"> <li>- Prohibit Intelligent shift and Learning control.</li> <li>- Fluid temperature is regarded as 80 °C</li> <li>- Stop the line pressure control until IG-OFF.</li> </ul>	

### MONITOR SCANTOOL DATA

Refer to DTC P0712

### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0712

### SIGNAL CIRCUIT INSPECTION

Refer to DTC P0712

### COMPONENT INSPECTION

Refer to DTC P0712

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0712

## 5.5 Turbine speed sensor no signal (P0717)

### GENERAL DESCRIPTION

The input(turbine) speed sensor outputs pulse-signals according to the revolutions of the input shaft of the transmission. The TCU determines the input shaft speed by counting the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

### DTC DESCRIPTION

The TCU sets this code if an output pulse-signal is not detected, from the input speed sensor, when the vehicle is running faster than 30 Km/h. The Fail-Safe function will be set by the TCU if this code is detected.

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### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Speed rationality check	- Signal circuit is open or short - Sensor power circuit is open - Sensor ground circuit is open - Faulty turbine speed sensor - Faulty TCU
<b>Enable conditions</b>	- D range - Engine RPM > 2600 rpm - Vehicle Speed ≥ 30 km/h - Vi > 10 V	
<b>Threshold value</b>	No signal	
<b>Diagnostic time</b>	More than 4 sec	
<b>Fail safe</b>	- Keep 2 <sup>nd</sup> /3 <sup>rd</sup> gear. - Stop the line pressure control until IG-OFF.	

### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "input(turbine) speed sensor" parameter on the scan tool.
4. Driving at speed of over 30 km/h.

▷ Specification : Increasing Gradually

5. Does "input(turbine) speed sensor" follow the specification?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

▶ Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

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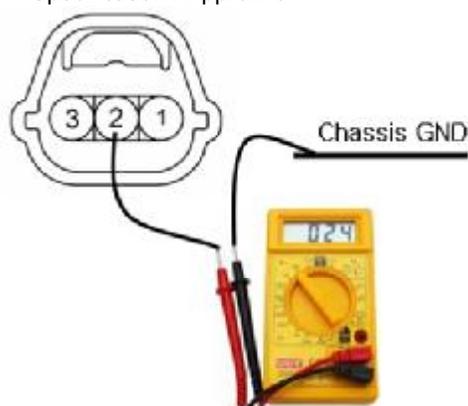
**NO**

- ▶ Go to "Signal circuit inspection" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "Input(turbine) speed sensor" connector.
3. Measure the voltage between sensor signal terminal of harness connector and chassis ground.

▷ Specification : Approx. 5 V



1. Sensor ground
2. Input(Turbine) speed signal
3. Power supply

4. Is voltage within specification?

**YES**

- ▶ Go to "Power supply circuit inspection" procedure.

**NO**

- ▶ Check for Short circuit in harness. Repair as necessary and go to "verification of vehicle repair" procedure.
- ▶ If signal circuit in harness is OK, Go to "Check TCU" of the "Component Inspection" procedure.

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### POWER SUPPLY CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "Input(turbine) speed sensor" connector.
3. Measure the voltage between power supply terminal of harness connector and chassis ground.

▷ Specification : Approx. VB



1. Sensor ground
2. Input(Turbine) speed signal
3. Power supply

4. Is voltage within specification?

**YES**

▶ Go to "Ground circuit inspection" procedure.

**NO**

▶ Check for Short circuit in harness. Repair as necessary and go to "verification of vehicle repair" procedure.

### GROUND CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "Input(turbine) speed sensor" connector.
3. Measure the resistance between sensor ground terminal of harness connector and chassis ground.

▷ Specification : Approx. 0 Ω

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1. Sensor ground
2. Input(Turbine) speed signal
3. Power supply

4. Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for Short circuit in harness. Repair as necessary and go to "verification of vehicle repair" procedure.
- ▶ If signal circuit in harness is OK, Go to "Check TCU" of the "Component Inspection" procedure.

### COMPONENT INSPECTION

1. Replace sensor component. Is it continued to operate abnormal?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace "Input(Turbine) speed sensor" as necessary and go to "Verification of vehicle repair" procedure.

2. Check TCU

- 1) Connect the "Scan tool".
- 2) Engine "ON".
- 3) Keep the manual control lever at N range. And keep the engine rpm at the idle rpm.
- 4) Check "Input(Turbine) speed" with scan tool. The rpm should be equal to engine rpm or little bit smaller than the engine rpm.
- 5) Change the manual control lever position from N to D while pressing the brake pedal not to move vehicle.
- 6) The "Input(Turbine) speed" should be 0(zero).

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7) Is the "Input speed" changed according to the above explanation?

### YES

▶ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

### NO

▶ Substitute with a known-good TCU and check for proper operation. If the problem is corrected, replace TCU as necessary and then go to "Verification of Vehicle Repair" procedure.

## VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

## 5.6 Transmission output speed sensor no signal (P0722)

### GENERAL DESCRIPTION

The Output Speed Sensor outputs pulse-signals according to the revolutions of the output shaft of the transmission.

### DTC DESCRIPTION

The TCU sets this code if the calculated value of the pulse-signal is noticeably different from the value calculated, when the vehicle is running faster than 30 km/h. The TCU will initiate the fail safe function if this code is detected.

### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Speed rationality check	- Signal circuit is open or short - Sensor power circuit is open - Sensor ground circuit is open - Faulty output speed sensor - Faulty TCU
<b>Enable conditions</b>	- D range - Engine RPM > 2600 rpm - Vehicle Speed ≥ 30 km/h - Vi > 10 V	
<b>Threshold value</b>	No signal	
<b>Diagnostic time</b>	More than 4 sec	
<b>Fail safe</b>	- Keep 2 <sup>nd</sup> /3 <sup>rd</sup> gear. - Stop the line pressure control until IG-OFF.	

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## Technical Customer Information

### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "output speed sensor" parameter on the scan tool.
4. Driving at speed of over 30 km/h.

▷ Specification : Increasing Gradually

5. Does "input(turbine) speed sensor" follow the specification?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0717

### SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "output speed sensor" connector.
3. Measure the voltage between sensor signal terminal of harness connector and chassis ground.

▷ Specification : Approx. 5 V



1. Sensor ground
2. Output speed signal
3. Power supply

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4. Is voltage within specification?

**YES**

▶ Go to “Power supply circuit inspection” procedure.

**NO**

▶ Check for Short circuit in harness. Repair as necessary and go to “verification of vehicle repair” procedure.

### POWER SUPPLY CIRCUIT INSPECTION

1. Ignition “ON” & Engine “OFF”.
2. Disconnect the “Output speed sensor” connector.
3. Measure the voltage between power supply terminal of harness connector and chassis ground.

▷ Specification : Approx. VB



1. Sensor ground
2. Output speed signal
3. Power supply

4. Is voltage within specification?

**YES**

▶ Go to “Ground circuit inspection” procedure.

**NO**

▶ Check for Short circuit in harness. Repair as necessary and go to “verification of vehicle repair” procedure.

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### GROUND CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "Output speed sensor" connector.
3. Measure the resistance between sensor ground terminal of harness connector and chassis ground.

▷ Specification : Approx. 0 Ω



1. Sensor ground
2. Output speed signal
3. Power supply

4. Is resistance within specification?

**YES**

▶ Go to "Component inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and go to "verification of vehicle repair" procedure.

### COMPONENT INSPECTION

1. Replace sensor component. Is it continued to operate abnormal?

**YES**

▶ Substitute with a known-good TCU and check for proper operation. If the problem is corrected, replace TCU as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Replace "Output speed sensor" as necessary and go to "Verification of vehicle repair" procedure

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## Technical Customer Information

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

#### 5.7 1st speed asynchronous synchronous error (P0731)

##### GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 1<sup>st</sup> gear ratio, while the transmission is engaged in the 1st gear.

##### DTC DESCRIPTION

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 1<sup>st</sup> gear ratio, while the transmission is engaged in 1st gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

##### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	1 <sup>st</sup> gear incorrect ratio	<ul style="list-style-type: none"> <li>- Faulty input speed sensor</li> <li>- Faulty output speed sensor</li> <li>- Faulty UD clutch or LR brake or One-way clutch</li> </ul>
<b>Enable conditions</b>	<ul style="list-style-type: none"> <li>- Battery voltage <math>\geq 10</math> V</li> <li>- ATF temperature <math>\geq -23</math> °C</li> <li>- After 2sec is passed from shift finish of shift to 1<sup>st</sup> gear</li> <li>- Engine RPM <math>\geq 450</math> rpm</li> <li>- T/M Output RPM <math>\geq 350</math> rpm</li> <li>- Turbine RPM <math>\neq 0</math> rpm</li> <li>- Inhibitor switch is normal</li> <li>- After 2sec is passed from IG ON</li> </ul>	
<b>Threshold value</b>	$Nt - Nt1 \geq 200$ rpm	
<b>Diagnostic time</b>	More than 1sec 4times	
<b>Fail safe</b>	<ul style="list-style-type: none"> <li>- Locked into 3<sup>rd</sup> gear.</li> <li>- Stop the line pressure control until IG-OFF.</li> </ul>	

Nt : Input(Turbine) rpm

Nt1 : Output rpm \* Gear ratio of 1st gear

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## Technical Customer Information

### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "Engine speed, Input speed, Output speed sensor, Gear position" parameter on the scan tool.
4. Perform the "Stall test" with gear position "1".

▷ Specification : 2000 ~ 2700 engine rpm

#### Stall test procedure in D1 and reason

##### Procedure

1. Warm up the engine.
2. After positioning the select lever in "D", depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.  
\* The slippage of 1st gear operating parts can be detected by stall test in D range.

##### Reason for stall test

1. If there is no mechanical defaults in A/T. Every slippage occur in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 1<sup>st</sup> gear operating part has faults, input speed revolution will be out.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Re-measuring is required.

#### Operating Element of Each Shifting Range

	UD/C	OD/C	REV/C	2-4B	LR/B	OWC
P					●	
R			●		●	
N					●	
D1	●				●	●
D2	●			●		
D3	●	●				
D4		●		●		

5. Is "Stall test" within specification?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Go to "Component inspection" procedure.

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### CAUTION

- ✚ Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- ✚ Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 80~100 C
  - Engine coolant temperature : 80~100 C
- ✚ Chock both rear wheel(left and right).
- ✚ Pull the parking brake lever on with the brake pedal fully depressed.
- ✚ The throttle should not be left fully open for more than eight second.
- ✚ If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

### SIGNAL CIRCUIT INSPECTION

1. Connect Scan tool.
2. Engine "ON".
3. Monitor the "Input & Output speed sensor" parameter on the scan tool.
4. Accelerate the Engine speed until about 2000 rpm in the 1<sup>st</sup> gear.
  - ▷ Specification :  $\text{Input Speed} - (\text{Output Speed} * 1^{\text{st}} \text{ Gear ratio}) \leq 200 \text{ rpm}$
5. Are "Input & Output speed sensor" within specification?

#### YES

- ▶ Go to "Component Inspection" procedure.

#### NO

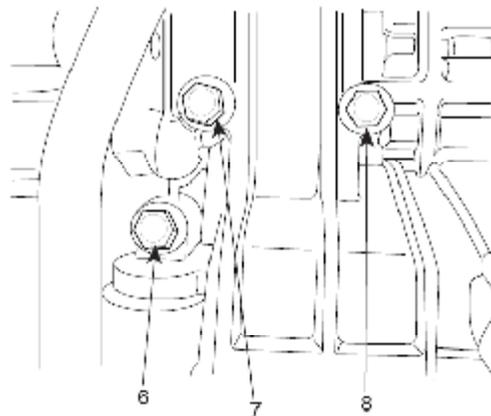
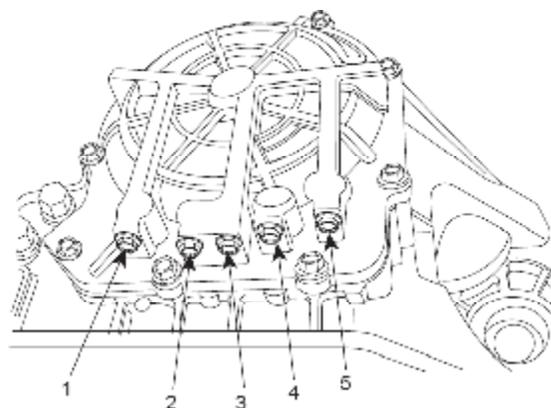
- ▶ Check for electrical noise of circuit in Input & Output speed sensor or Replace Input & Output Speed Sensor. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

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### COMPONENT INSPECTION



1. LUB Pressure port  
 2. RED Pressure port  
 3. OD Pressure port

4. 2-4 Pressure port  
 5. REV Pressure port  
 6. DA Pressure port

7. UD Pressure port  
 8. LR Pressure port

1. Connect oil pressure gauge to "UD" and "L/R" port.
2. Engine "ON".
3. Drive a car with gear position 1 in "Manual mode".
4. Compare it with reference data as below.

#### ▷ Specification

Measurement condition			Reference hydraulic pressure (Kgf/cm <sup>2</sup> )				
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure
R	Reverse	2,500	-	17.1 (± 0.8)	-	-17.1 (± 0.8)	-
D (Manual mode)	1 <sup>st</sup> gear	2,500	10.5 (± 0.2)	-	-	10.5 (± 0.2)	-
	2 <sup>nd</sup> gear	2,500	10.5 (± 0.2)	-	-	-	10.5 (± 0.2)
	3 <sup>rd</sup> gear	2,500	10.5 (± 0.2)	-	10.5 (± 0.2)	-	-
	4 <sup>th</sup> gear	2,500	-	-	10.5 (± 0.2)	--	10.5 (± 0.2)

※ The values are subject to change according to vehicle model or condition.

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5. Is oil pressure value within specifications?

**YES**

▶ Go to “Verification of Vehicle Repair” procedure.

**NO**

▶ Replace “A/T” as necessary and go to “Verification of vehicle repair” procedure

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

### 5.8 2nd speed asynchronous synchronous error (P0732)

#### GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 2nd gear ratio, while the transmission is engaged in the 2nd gear.

#### DTC DESCRIPTION

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 2nd gear ratio, while the transmission is engaged in 2nd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	2nd gear incorrect ratio	- Faulty input speed sensor - Faulty output speed sensor - Faulty UD clutch or 2-4 brake
<b>Enable conditions</b>	- Battery voltage $\geq 10$ V - ATF temperature $\geq -23$ °C - After 2sec is passed from shift finish of shift to 2nd gear - Engine RPM $\geq 450$ rpm - T/M Output RPM $\geq 500$ rpm - Turbine RPM $\neq 0$ rpm - Inhibitor switch is normal - After 2sec is passed from IG ON	
<b>Threshold value</b>	$Nt - Nt2 \geq 200$ rpm	
<b>Diagnostic time</b>	More than 1sec 4times	
<b>Fail safe</b>	- Locked into 3 <sup>rd</sup> gear. - Stop the line pressure control until IG-OFF.	

Nt : Input(Turbine) rpm

Nt2 : Output rpm \* Gear ratio of 2nd gear

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## Technical Customer Information

### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "Engine speed, Input speed, Output speed sensor, Gear position" parameter on the scan tool.
4. Perform the "Stall test" with gear position "2".

▷ Specification : 2000 ~ 2700 engine rpm

#### Stall test procedure in D2 and reason

##### Procedure

1. Warm up the engine.
2. After positioning the select lever in "D", depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.  
\* The slippage of 2<sup>nd</sup> gear operating part can be detected by stall test in D2.

##### Reason for stall test

1. If there is no mechanical defaults in A/T. Every slippage occur in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 2<sup>nd</sup> gear operating part has faults, input speed revolution will be out.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Re-measuring is required.

#### Operating Element of Each Shifting Range

	UD/C	OD/C	REV/C	2-4B	LR/B	OWC
P					●	
R			●		●	
N					●	
D1	●				●	●
D2	●			●		
D3	●	●				
D4		●		●		

5. Is "Stall test" within specification?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Go to "Component inspection" procedure.

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### CAUTION

- ✚ Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- ✚ Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 80~100 C
  - Engine coolant temperature : 80~100 C
- ✚ Chock both rear wheel(left and right).
- ✚ Pull the parking brake lever on with the brake pedal fully depressed.
- ✚ The throttle should not be left fully open for more than eight second.
- ✚ If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

### SIGNAL CIRCUIT INSPECTION

1. Connect Scan tool.
2. Engine "ON".
3. Monitor the "Input & Output speed sensor" parameter on the scan tool.
4. Accelerate the Engine speed until about 2000 rpm in the 2nd gear.
  - ▷ Specification :  $\text{Input Speed} - (\text{Output Speed} * 2^{\text{nd}} \text{ Gear ratio}) \leq 200 \text{ rpm}$
5. Are "Input & Output speed sensor" within specification?

#### YES

- ▶ Go to "Component Inspection" procedure.

#### NO

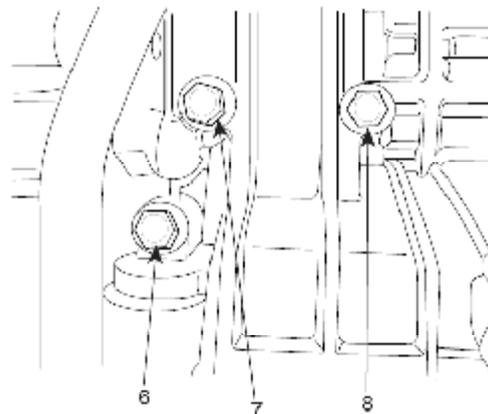
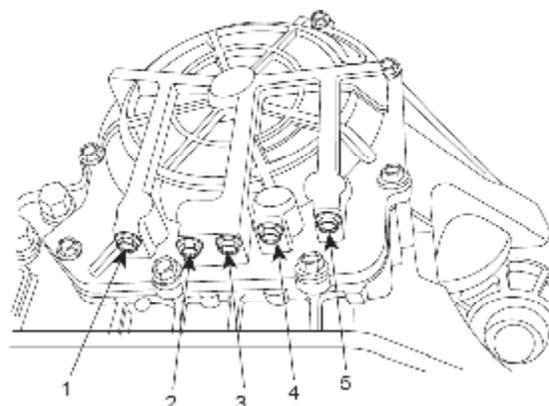
- ▶ Check for electrical noise of circuit in Input & Output speed sensor or Replace Input & Output Speed Sensor. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

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### COMPONENT INSPECTION



1. LUB Pressure port  
 2. RED Pressure port  
 3. OD Pressure port

4. 2-4 Pressure port  
 5. REV Pressure port  
 6. DA Pressure port

7. UD Pressure port  
 8. LR Pressure port

1. Connect oil pressure gauge to "UD" and "2-4/B" port.
2. Engine "ON".
3. Drive a car with gear position 2 in "Manual mode".
4. Compare it with reference data as below.

#### ▷ Specification

Measurement condition			Reference hydraulic pressure (Kgf/cm <sup>2</sup> )				
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure
R	Reverse	2,500	-	17.1 (± 0.8)	-	17.1 (± 0.8)	-
D (Manual mode)	1 <sup>st</sup> gear	2,500	10.5 (± 0.2)	-	-	10.5 (± 0.2)	-
	2 <sup>nd</sup> gear	2,500	10.5 (± 0.2)	-	-	-	10.5 (± 0.2)
	3 <sup>rd</sup> gear	2,500	10.5 (± 0.2)	-	10.5 (± 0.2)	-	-
	4 <sup>th</sup> gear	2,500	-	-	10.5 (± 0.2)	--	10.5 (± 0.2)

※ The values are subject to change according to vehicle model or condition.

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5. Is oil pressure value within specifications?

**YES**

▶ Go to “Verification of Vehicle Repair” procedure.

**NO**

▶ Replace “A/T” as necessary and go to “Verification of vehicle repair” procedure

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

### 5.9 3rd speed asynchronous synchronous error (P0733)

#### GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 3rd gear ratio, while the transmission is engaged in the 3rd gear.

#### DTC DESCRIPTION

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 3rd gear ratio, while the transmission is engaged in 3rd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	3rd gear incorrect ratio	- Faulty input speed sensor - Faulty output speed sensor - Faulty UD clutch or OD clutch
<b>Enable conditions</b>	- Battery voltage $\geq 10$ V - ATF temperature $\geq -23$ °C - After 2sec is passed from shift finish of shift to 3rd gear - Engine RPM $\geq 450$ rpm - T/M Output RPM $\geq 900$ rpm - Turbine RPM $\neq 0$ rpm - Inhibitor switch is normal - After 2sec is passed from IG ON	
<b>Threshold value</b>	$N_t - N_{t3} \geq 200$ rpm	
<b>Diagnostic time</b>	More than 1sec 4times	
<b>Fail safe</b>	- Locked into 3 <sup>rd</sup> gear. - Stop the line pressure control until IG-OFF.	

$N_t$  : Input(Turbine) rpm

$N_{t3}$  : Output rpm \* Gear ratio of 3rd gear

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "Engine speed, Input speed, Output speed sensor, Gear position" parameter on the scan tool.
4. Perform the "Stall test" with gear position "3".

▷ Specification : 2000 ~ 2700 engine rpm

#### Stall test procedure in D3 and reason

##### Procedure

1. Warm up the engine.
2. After positioning the select lever in "D", depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.  
\* The slippage of 3rd gear operating parts can be detected by stall test in D range.

##### Reason for stall test

1. If there is no mechanical defaults in A/T. Every slippage occur in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 3rd gear operating part has faults, input speed revolution will be out.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Re-measuring is required.

#### Operating Element of Each Shifting Range

	UD/C	OD/C	REV/C	2-4B	LR/B	OWC
P					●	
R			●		●	
N					●	
D1	●				●	●
D2	●			●		
D3	●	●				
D4		●		●		

5. Is "Stall test" within specification?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Go to "Component inspection" procedure.

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### CAUTION

- ✚ Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- ✚ Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 80~100 C
  - Engine coolant temperature : 80~100 C
- ✚ Chock both rear wheel(left and right).
- ✚ Pull the parking brake lever on with the brake pedal fully depressed.
- ✚ The throttle should not be left fully open for more than eight second.
- ✚ If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

### SIGNAL CIRCUIT INSPECTION

1. Connect Scan tool.
2. Engine "ON".
3. Monitor the "Input & Output speed sensor" parameter on the scan tool.
4. Accelerate the Engine speed until about 2000 rpm in the 3rd gear.
  - ▷ Specification :  $\text{Input Speed} - (\text{Output Speed} * 3^{\text{rd}} \text{ Gear ratio}) \leq 200 \text{ rpm}$
5. Are "Input & Output speed sensor" within specification?

#### YES

- ▶ Go to "Component Inspection" procedure.

#### NO

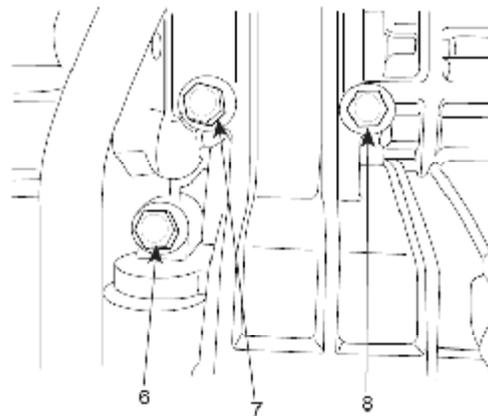
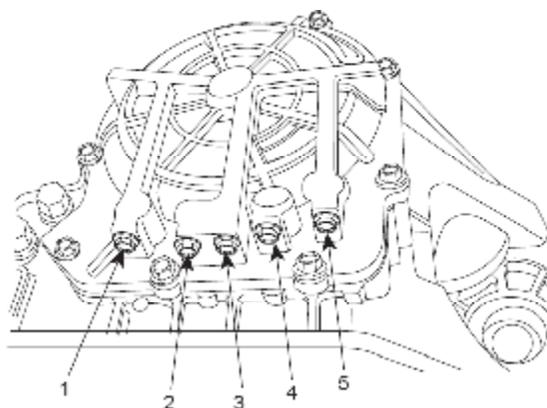
- ▶ Check for electrical noise of circuit in Input & Output speed sensor or Replace Input & Output Speed Sensor. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

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### COMPONENT INSPECTION



1. LUB Pressure port  
 2. RED Pressure port  
 3. OD Pressure port

4. 2-4 Pressure port  
 5. REV Pressure port  
 6. DA Pressure port

7. UD Pressure port  
 8. LR Pressure port

1. Connect oil pressure gauge to "UD" and "OD" port.
2. Engine "ON".
3. Drive a car with gear position 3 in "Manual mode".
4. Compare it with reference data as below.

#### ▷ Specification

Measurement condition			Reference hydraulic pressure (Kgf/cm <sup>2</sup> )				
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure
R	Reverse	2,500	-	17.1 (± 0.8)	-	17.1 (± 0.8)	-
D (Manual mode)	1 <sup>st</sup> gear	2,500	10.5 (± 0.2)	-	-	10.5 (± 0.2)	-
	2 <sup>nd</sup> gear	2,500	10.5 (± 0.2)	-	-	-	10.5 (± 0.2)
	3 <sup>rd</sup> gear	2,500	10.5 (± 0.2)	-	10.5 (± 0.2)	-	-
	4 <sup>th</sup> gear	2,500	-	-	10.5 (± 0.2)	--	10.5 (± 0.2)

※ The values are subject to change according to vehicle model or condition.

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5. Is oil pressure value within specifications?

**YES**

▶ Go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Replace "A/T" as necessary and go to "Verification of vehicle repair" procedure

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

### 5.10 4th speed asynchronous synchronous error (P0734)

#### GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 4th gear ratio, while the transmission is engaged in the 4th gear.

#### DTC DESCRIPTION

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 4th gear ratio, while the transmission is engaged in 4th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	4th gear incorrect ratio	- Faulty input speed sensor - Faulty output speed sensor - Faulty OD clutch or 2-4 Brake
<b>Enable conditions</b>	- Battery voltage $\geq 10$ V - ATF temperature $\geq -23$ °C - After 2sec is passed from shift finish of shift to 4th gear - Engine RPM $\geq 450$ rpm - T/M Output RPM $\geq 900$ rpm - Turbine RPM $\neq 0$ rpm - Inhibitor switch is normal - After 2sec is passed from IG ON	
<b>Threshold value</b>	$N_t - N_{t4} \geq 200$ rpm	
<b>Diagnostic time</b>	More than 1sec 4times	
<b>Fail safe</b>	- Locked into 3 <sup>rd</sup> gear. - Stop the line pressure control until IG-OFF.	

$N_t$  : Input(Turbine) rpm

$N_{t4}$  : Output rpm \* Gear ratio of 4th gear

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "Engine speed, Input speed, Output speed sensor, Gear position" parameter on the scan tool.
4. Perform the "Stall test" with gear position "4".

▷ Specification : 2000 ~ 2700 engine rpm

#### Stall test procedure in D4 and reason

##### Procedure

1. Warm up the engine.
2. After positioning the select lever in "D", depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.  
\* The slippage of 4th gear operating parts can be detected by stall test in D range.

##### Reason for stall test

1. If there is no mechanical defaults in A/T. Every slippage occur in torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 4th gear operating part has faults, input speed revolution will be out.
4. If output speed revolution is output. It means that the foot brake force is not applied fully. Re-measuring is required.

#### Operating Element of Each Shifting Range

	UD/C	OD/C	REV/C	2-4B	LR/B	OWC
P					●	
R			●		●	
N					●	
D1	●				●	●
D2	●			●		
D3	●	●				
D4		●		●		

5. Is "Stall test" within specification?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Go to "Component inspection" procedure.

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### CAUTION

- ✚ Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- ✚ Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 80~100 C
  - Engine coolant temperature : 80~100 C
- ✚ Chock both rear wheel(left and right).
- ✚ Pull the parking brake lever on with the brake pedal fully depressed.
- ✚ The throttle should not be left fully open for more than eight second.
- ✚ If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

### SIGNAL CIRCUIT INSPECTION

1. Connect Scan tool.
2. Engine "ON".
3. Monitor the "Input & Output speed sensor" parameter on the scan tool.
4. Accelerate the Engine speed until about 2000 rpm in the 4th gear.
  - ▷ Specification :  $\text{Input Speed} - (\text{Output Speed} * \text{Gear ratio}) \leq 200 \text{ rpm}$
5. Are "Input & Output speed sensor" within specification?

#### YES

- ▶ Go to "Component Inspection" procedure.

#### NO

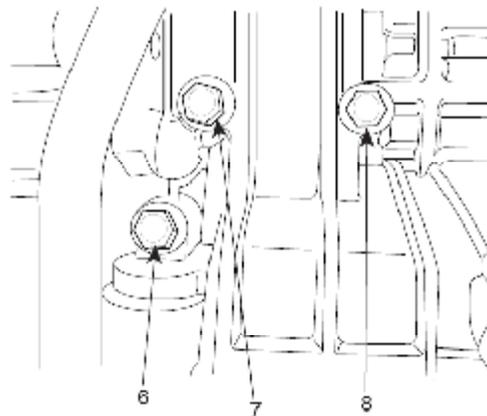
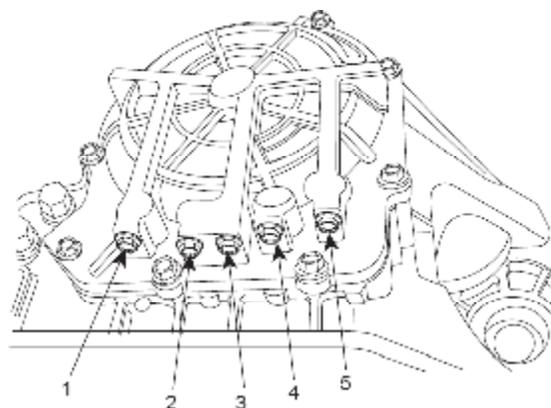
- ▶ Check for electrical noise of circuit in Input & Output speed sensor or Replace Input & Output Speed Sensor. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

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### COMPONENT INSPECTION



1. LUB Pressure port  
 2. RED Pressure port  
 3. OD Pressure port

4. 2-4 Pressure port  
 5. REV Pressure port  
 6. DA Pressure port

7. UD Pressure port  
 8. LR Pressure port

1. Connect oil pressure gauge to "OD" and "2-4/B" port.
2. Engine "ON".
3. Drive a car with gear position 4 in "Manual mode".
4. Compare it with reference data as below.

▷ Specification

Measurement condition			Reference hydraulic pressure (Kgf/cm <sup>2</sup> )				
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure
R	Reverse	2,500	-	17.1 (± 0.8)	-	17.1 (± 0.8)	-
D (Manual mode)	1 <sup>st</sup> gear	2,500	10.5 (± 0.2)	-	-	10.5 (± 0.2)	-
	2 <sup>nd</sup> gear	2,500	10.5 (± 0.2)	-	-	-	10.5 (± 0.2)
	3 <sup>rd</sup> gear	2,500	10.5 (± 0.2)	-	10.5 (± 0.2)	-	-
	4 <sup>th</sup> gear	2,500	-	-	10.5 (± 0.2)	--	10.5 (± 0.2)

※ The values are subject to change according to vehicle model or condition.

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5. Is oil pressure value within specifications?

**YES**

▶ Go to “Verification of Vehicle Repair” procedure.

**NO**

▶ Replace “A/T” as necessary and go to “Verification of vehicle repair” procedure

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

#### 5.11 Damper clutch abnormal (P0741)

##### GENERAL DESCRIPTION

The TCU controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by applying hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The TCU outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV, DCCV) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked.

##### DTC DESCRIPTION

The TCU increases the duty ratio to engage the Damper Clutch by monitoring slip rpm (difference value between engine speed and turbine speed). To decrease the slip of the Damper Clutch, the TCU increases the duty ratio by applying more hydraulic pressure. When slip rpm does not drop under some value with 100% duty ratio, the TCU determines that the Torque Converter Clutch is stuck OFF and sets this code.

##### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Stuck “OFF”	
<b>Enable conditions</b>	<ul style="list-style-type: none"> <li>- During the connect control</li> <li>- <math>16V &gt; VB \geq 10V</math></li> </ul>	<ul style="list-style-type: none"> <li>- Faulty damper clutch or oil pressure system</li> <li>- Faulty damper clutch solenoid valve</li> <li>- Faulty valve body</li> <li>- Faulty TCU</li> </ul>
<b>Threshold value</b>	Detect 2 times the Lock-up clutch control duty = 100% for 2sec.	
<b>Diagnostic time</b>	1 event	
<b>Fail safe</b>	Prohibit lockup control	

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Select "D range" and drive vehicle.
4. Monitor the "damper clutch duty" parameter on the scan tool.

▷ Specification : damper clutch sol. Duty > 30% (in condition damper clutch slip < 100 rpm)

5. Are damper clutch sol. duty and damper clutch slip within the specification?

#### **YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### **NO**

▶ Go to "Component inspection" procedure.

### COMPONENT INSPECTION

1. Check damper clutch solenoid valve.

- 1) Connect scan tool to data link connector(DLC).
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T solenoid valve actuator test and operate actuator test.
- 4) Is actuator testing performed normally?

#### **YES**

▶ Go to "Check oil pressure" as below.

#### **NO**

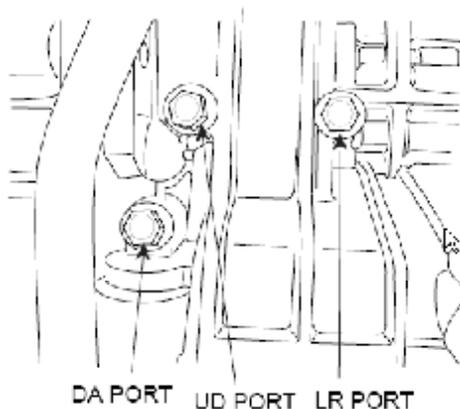
▶ Replace "damper clutch solenoid valve" as necessary and go to "Verification of vehicle repair" procedure.

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### 2. Check oil pressure



- 1) Connect oil pressure gauge to "DA" port.
- 2) Engine "ON".
- 3) After connecting scan tool and monitor the "damper clutch solenoid duty" parameter on the scan tool data list.
- 4) Operate vehicle with 3<sup>rd</sup> or 4<sup>th</sup> gear and operate the "damper clutch solenoid duty" more than 35%.

▷ Specification : Above 2.0~4.6kg/cm<sup>2</sup> (196~451kpa, 28.4~65.4psi) (Engine Speed : 2500rpm, damper clutch solenoid duty : 50%)

- 5) Is oil pressure value within specification?

**YES**

- ▶ Replace torque converter as necessary and go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Replace valve body as necessary and go to "Verification of vehicle repair" procedure.

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

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### 5.12 DCCV solenoid short to battery or open or short to ground (P0743)

#### GENERAL DESCRIPTION

Refer to DTC P0741.

#### DTC DESCRIPTION

The TCU checks the Damper Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the TCU judges that damper clutch solenoid valve circuit is malfunctioning and sets this code.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check voltage range	- Faulty damper clutch solenoid valve - Open or short in circuit - Faulty TCU
<b>Enable conditions</b>	- $16V > VB \geq 10V$ - In gear state(no gear shifting) 500msec is passed from turn on the relay.	
<b>Threshold value</b>	- Feedback voltage from damper clutch control solenoid $> VB-2V$ and DCC control duty is 100%(320msec). - Feedback voltage from damper clutch control solenoid $\leq 5.5V$ and DCC control duty is 0%(320msec).	
<b>Diagnostic time</b>	More than 320msec	
<b>Fail safe</b>	- Locked into 3 <sup>rd</sup> gear. - Stop the line pressure control until IG-OFF.	

#### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "Damper clutch solenoid valve" parameter on the scan tool.
4. Select "D range" and operate "Damper clutch solenoid duty" more than 35%.
5. Does "Damper clutch solenoid duty" follow the reference data?

#### YES

► Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### NO

► Go to "Terminal & Connector inspection" procedure.

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### TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

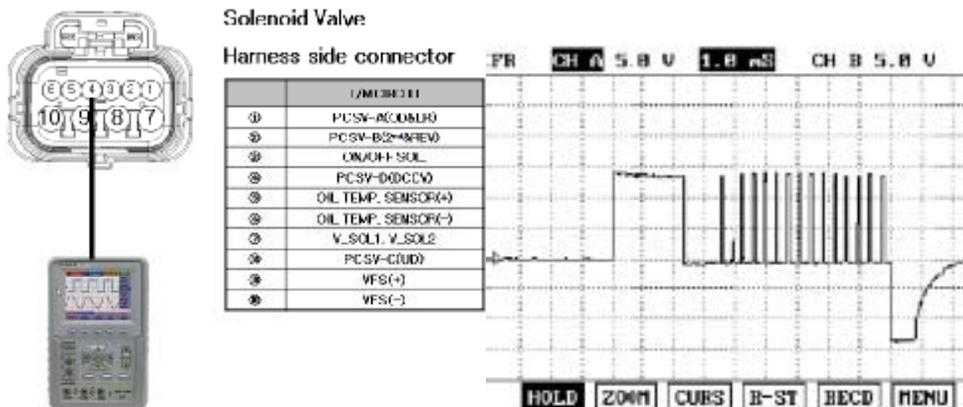
- ▶ Repair as necessary and then go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Go to "Power supply circuit inspection" procedure.

### POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate damper clutch.
3. Measure wave form between terminal "4" of the sensor harness connector and chassis ground.



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4. Is measured normally operating wave form?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

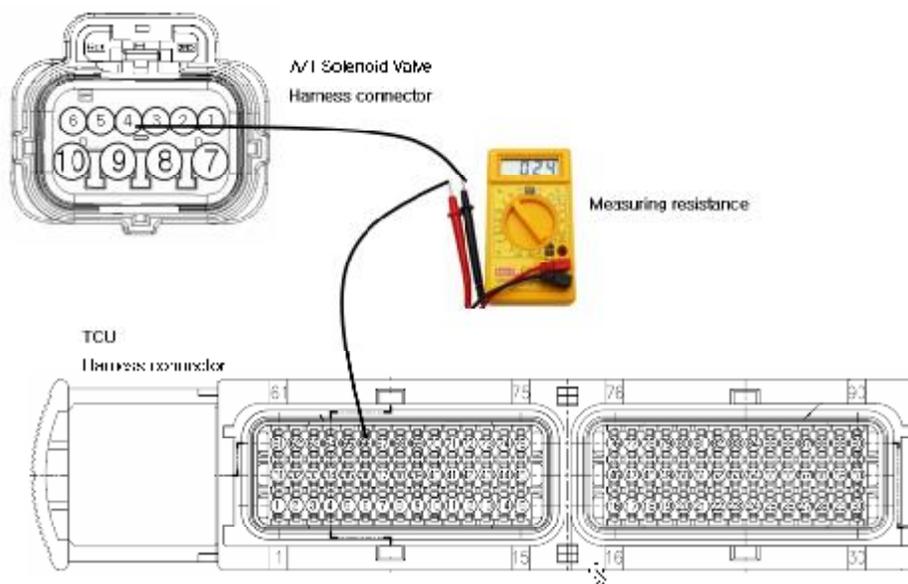
▶ Check for open in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.

- 1) Ignition "OFF".
- 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
- 3) Measure resistance between terminal "4" of the A/T solenoid valve harness connector and terminal "66" of the TCU harness connector.

▷ Specification : approx. 0Ω



4) Is resistance within specification?

**YES**

▶ Go to "Check signal circuit short inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

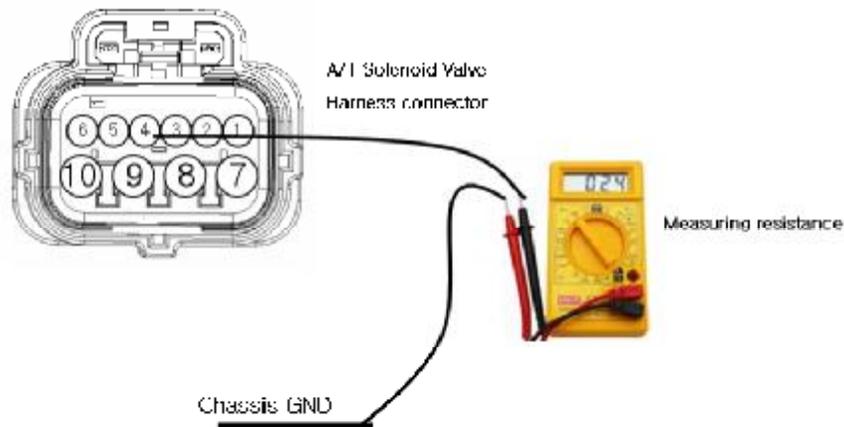
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2. Check signal circuit open inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "4" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : Infinite



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

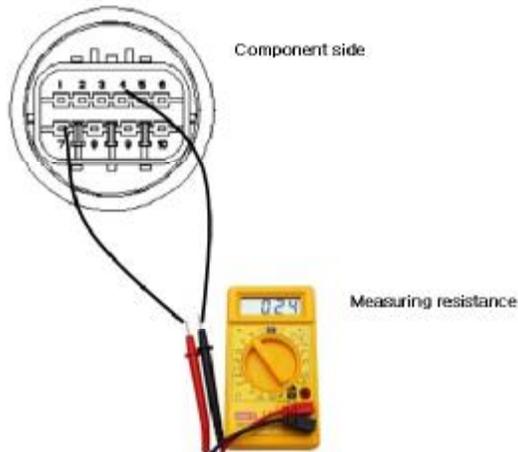
- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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### COMPONENT INSPECTION

1. Check signal circuit open inspection.
    - 1) Ignition "OFF".
    - 2) Disconnect "A/T solenoid valve" connector.
    - 3) Measure resistance between terminal "4" and terminal "7" of the A/T solenoid valve harness connector.
- ▷ Specification : approx.  $3.5 \pm 0.2 \Omega$  [25 °C]



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace damper clutch solenoid valve as necessary and go to "Verification of vehicle repair" procedure.

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2. Check TCU.
  - 1) Connect scan tool to data link connector(DLC).
  - 2) Ignition "ON" & Engine "OFF".
  - 3) Select A/T solenoid valve actuator test and operate actuator test.
  - 4) Is Actuator Testing performed normally?

**YES**

- ▶ Go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Replace TCU as necessary and go to "Verification of vehicle repair" procedure.

### ACTUATOR TEST CONDITION

- 1) Ignition switch "ON"
- 2) Inhibitor switch is normal
- 3) P range
- 4) Throttle 0%
- 5) Vehicle speed 0km/h
- 6) Engine RPM 0 rpm

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

### 5.13 VFS short to battery or open or short to ground (P0748)

#### GENERAL DESCRIPTION

Variable Faced Solenoid (Linear Solenoid) : With the duty control which uses higher frequency(600Hz), instead of the existing PWM type which adapts low frequency(60Hz) to control, spool valve can be controlled precisely.

In PWM control, the amount of oil flow is determined by the duration of "ON" signal among continuously repeated ON/OFF signals.

In VFS, the amount is decided by how widely spool valve open the passage of going through.

#### DTC DESCRIPTION

The TCU checks the VFS Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCU judges that the Low and Reverse control solenoid circuit is malfunctioning and sets this code.

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### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check feedback period	- Faulty Variable Forced solenoid valve - Open or short in circuit - Faulty TCU
<b>Enable conditions</b>	- $VB \geq 9V$ - $10\% < \text{output duty} \leq 90\%$	
<b>Threshold value</b>	Circuit open or short	
<b>Diagnostic time</b>	More than 320msec	
<b>Fail safe</b>	Stop the line pressure control unit IG-OFF.	

### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "VFS valve" parameter on the scan tool.
4. Shift gear at each position.
5. Does "VF solenoid duty" follow the reference data?

#### **YES**

► Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### **NO**

► Go to "Terminal & Connector inspection" procedure.

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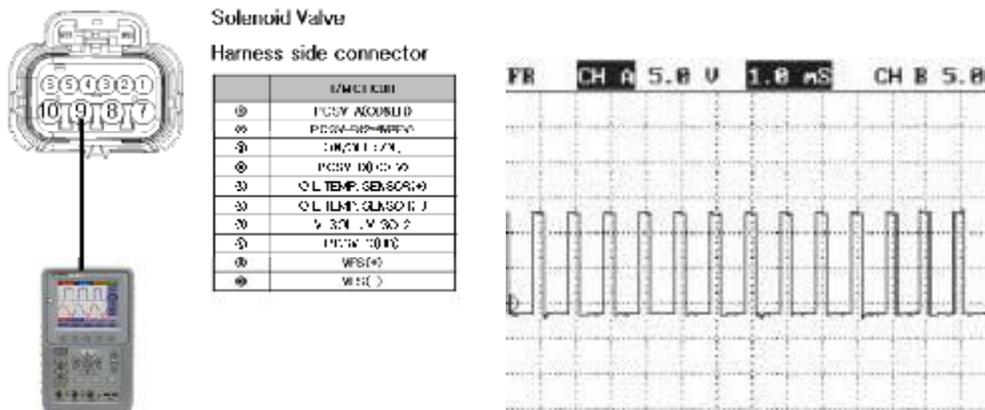
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### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0743.

### POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate VFS valve.
3. Measure wave form between terminal "9" of the sensor harness connector and chassis ground.



4. Is measured normally operating wave form?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check for open in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.

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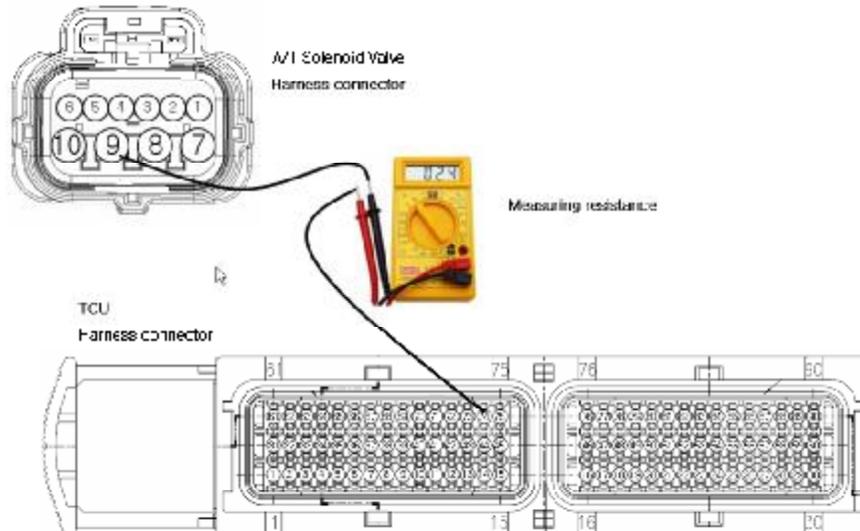
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### SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "9" of the A/T solenoid valve harness connector and terminal "74" of the TCU harness connector.

▷ Specification : approx.  $0\Omega$



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check signal circuit short inspection" procedure.

**NO**

- ▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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2. Check signal circuit short inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "9" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : Infinite



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Signal circuit ground inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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3. Check signal circuit ground inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "10" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : approx. 0Ω



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

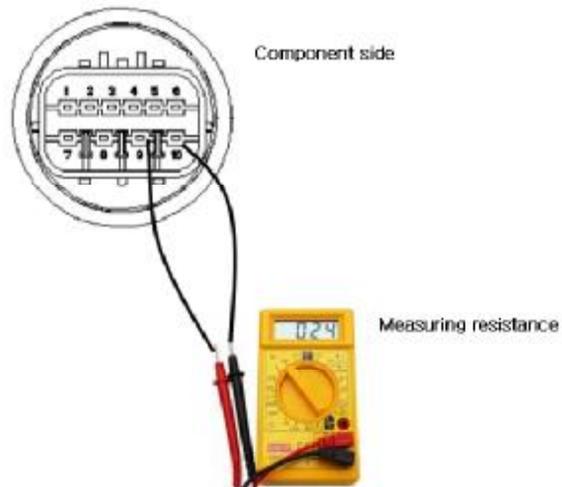
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### COMPONENT INSPECTION

1. Check solenoid valve.
    - 1) Ignition "OFF".
    - 2) Disconnect "A/T solenoid valve" connector.
    - 3) Measure resistance between terminal "9" and terminal "10" of the A/T solenoid valve harness connector.
- ▷ Specification : approx.  $3.5 \pm 0.2 \Omega$  [25 °C]



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace VFS as necessary and go to "Verification of vehicle repair" procedure.

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2. Check TCU.
  - 1) Connect scan tool to data link connector(DLC).
  - 2) Ignition "ON" & Engine "OFF".
  - 3) Select A/T solenoid valve actuator test and operate actuator test.
  - 4) Can you hear operating sound for "VFS valve" actuator testing function?

### **YES**

- ▶ Go to "Verification of vehicle repair" procedure.

### **NO**

- ▶ Replace TCU as necessary and go to "Verification of vehicle repair" procedure.

### **ACTUATOR TEST CONDITION**

- 1) Ignition switch "ON"
- 2) Inhibitor switch is normal
- 3) P range
- 4) Throttle 0%
- 5) Vehicle speed 0km/h
- 6) Engine RPM 0 rpm

### **VERIFICATION OF VEHICLE REPAIR**

Refer to DTC P0707.

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## Technical Customer Information

### 5.14 OD&LR solenoid short to battery or open or short to ground (P0750)

#### GENERAL DESCRIPTION

The Automatic transmission changes the gear position of the transmission by utilizing a combination of clutches and brakes, which are controlled by solenoid valves. 4F16 A/T consists of a: OD&LR, 2nd&REV, UD, and On/Off solenoid.

#### DTC DESCRIPTION

The TCU checks the Over Drive and Low and Reverse Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCU judges that the Over Drive and Low and Reverse control solenoid circuit is malfunctioning and sets this code.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check feedback period	- Faulty OD&LR solenoid valve - Open or short in circuit - Faulty TCU
<b>Enable conditions</b>	- $16\text{ V} > V_B \geq 10\text{ V}$ - In gear state(no gear shifting) 500msec is passed from turn on the relay	
<b>Threshold value</b>	- Feedback voltage from OD&LR control solenoid $> V_B - 2\text{V}$ and OD&LR control duty is 0% - Feedback voltage from OD&LR control solenoid $\leq 5.5\text{V}$ and OD&LR control duty is 100%	
<b>Diagnostic time</b>	More than 320msec	
<b>Fail safe</b>	- Locked into 3rd gear - Stop the line pressure control unit IG-OFF.	

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## Technical Customer Information

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "OD&LR solenoid valve" parameter on the scan tool.
4. Shift gear at each position.

▷ Specification : 2<sup>nd</sup> → 100%, 3<sup>rd</sup> → 0%

5. Does "OD&LR solenoid duty" follow the reference data?

#### **YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### **NO**

▶ Go to "Terminal & Component inspection" procedure.

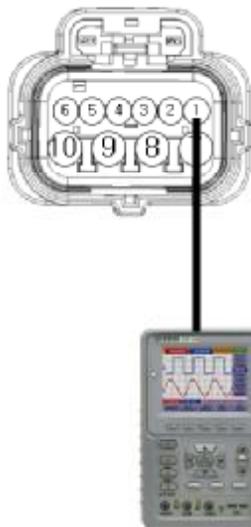
### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0743.

Technical Customer Information

POWER SUPPLY CIRCUIT INSPECTION

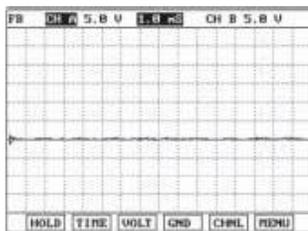
1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate OD&LR solenoid valve.
3. Measure wave form between terminal "1" of the sensor harness connector and chassis ground.



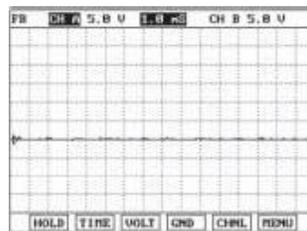
Solenoid Valve

Harness side connector

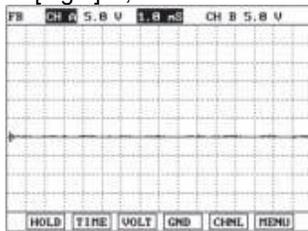
	T/MCIRCUIT
①	PCSV-A(OD&LR)
②	PCSV-B(2-REV)
③	ON/OFF SOL
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOLT, V_SOL2
⑧	PCSV-C(LUD)
⑨	VFS(+)
⑩	VFS(-)



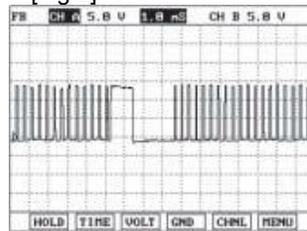
[Fig 1] P, N



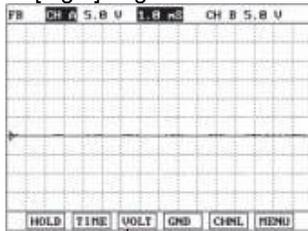
[Fig 2] R



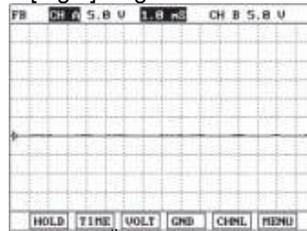
[Fig 3] 1<sup>st</sup> gear in D



[Fig 4] 2<sup>nd</sup> gear in D



[Fig 5] 3<sup>rd</sup> gear in D



[Fig 6] 4<sup>th</sup> gear in D

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4. Is measured normally operating wave form?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

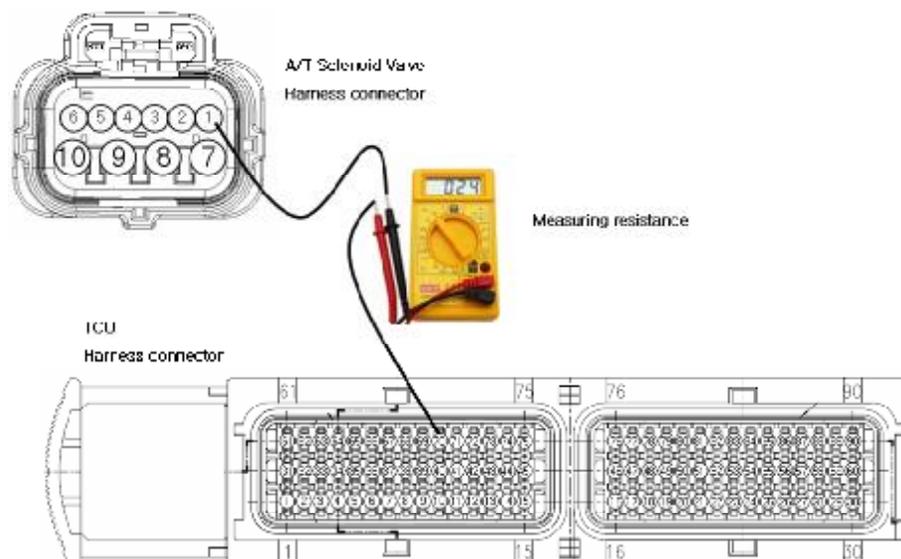
▶ Check for open in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.

- 1) Ignition "OFF".
- 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
- 3) Measure resistance between terminal "1" of the A/T solenoid valve harness connector and terminal "70" of the TCU harness connector.

▷ Specification : approx.  $0\Omega$



4) Is resistance within specification?

**YES**

▶ Go to "Check signal circuit short inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

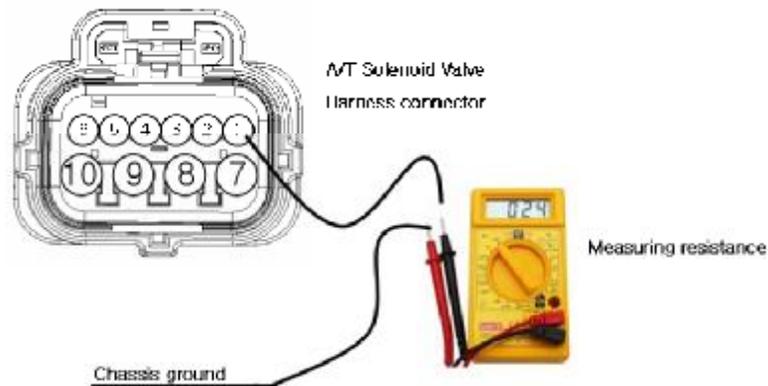
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## Technical Customer Information

2. Check signal circuit short inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "1" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : Infinite



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Signal circuit ground inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

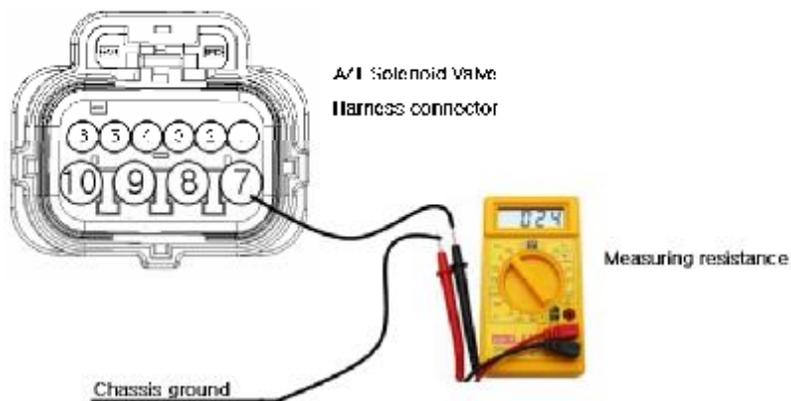
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3. Check signal circuit ground inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "7" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : approx. 0Ω



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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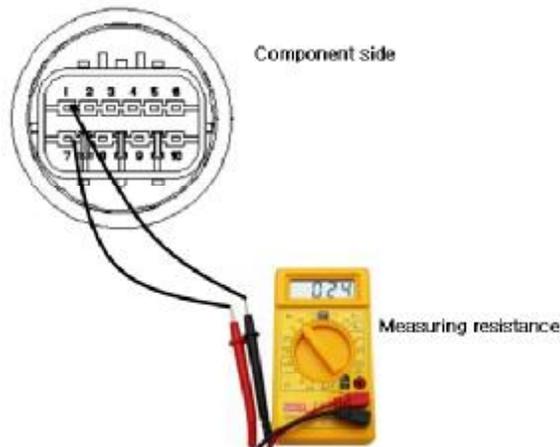
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## Technical Customer Information

### COMPONENT INSPECTION

1. Check solenoid valve.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector.
  - 3) Measure resistance between terminal "1" and terminal "7" of the A/T solenoid valve harness connector.

▷ Specification : approx.  $3.5 \pm 0.2 \Omega$  [25 °C]



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace OD&LR solenoid as necessary and go to "Verification of vehicle repair" procedure.

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## Technical Customer Information

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2. Check TCU.
  - 1) Connect scan tool to data link connector(DLC).
  - 2) Ignition "ON" & Engine "OFF".
  - 3) Select A/T solenoid valve actuator test and operate actuator test.
  - 4) Is Actuator testing performed normally?

**YES**

- ▶ Go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Replace TCU as necessary and go to "Verification of vehicle repair" procedure.

### ACTUATOR TEST CONDITION

- 1) Ignition switch "ON"
- 2) Inhibitor switch is normal
- 3) P range
- 4) Throttle 0%
- 5) Vehicle speed 0km/h
- 6) Engine RPM 0 rpm

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

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## Technical Customer Information

### 5.15 UD solenoid short to battery or open or short to ground (P0755)

#### GENERAL DESCRIPTION

Refer to DTC P0750.

#### DTC DESCRIPTION

The TCU checks the Under Drive Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected or low voltage is detected when high voltage is expected), the TCU judges that the UNDER DRIVE CLUTCH drive control solenoid circuit is malfunctioning and sets this code.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check voltage range	- Faulty UD solenoid valve - Open or short in circuit - Faulty TCU
<b>Enable conditions</b>	- $16\text{ V} > V_B \geq 10\text{ V}$ - In gear state(no gear shifting) 500msec is passed from turn on the relay	
<b>Threshold value</b>	- Feedback voltage from UD control solenoid $> V_B - 2\text{V}$ and UD control duty is 0% - Feedback voltage from UD control solenoid $\leq 5.5\text{V}$ and UD control duty is 100%	
<b>Diagnostic time</b>	More than 320msec	
<b>Fail safe</b>	- Locked into 3rd gear - Stop the line pressure control unit IG-OFF.	

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## Technical Customer Information

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "UD solenoid valve" parameter on the scan tool.
4. Shift gear at each position.

▷ Specification : 3<sup>rd</sup> → 0%, 4<sup>th</sup> → 100%

5. Does "UD solenoid duty" follow the reference data?

#### **YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### **NO**

▶ Go to "Terminal & Connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

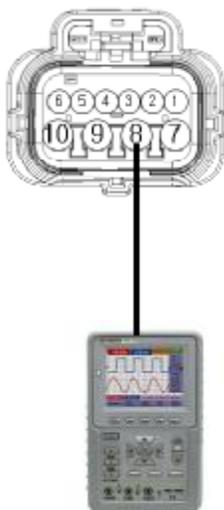
Refer to DTC P0743.

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POWER SUPPLY CIRCUIT INSPECTION

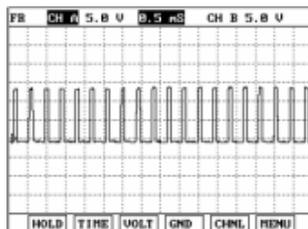
1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate UD solenoid valve.
3. Measure wave form between terminal "8" of the sensor harness connector and chassis ground.



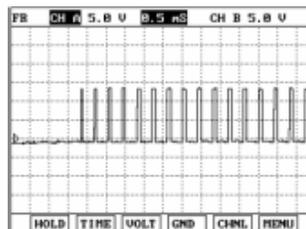
Solenoid Valve

Harness side connector

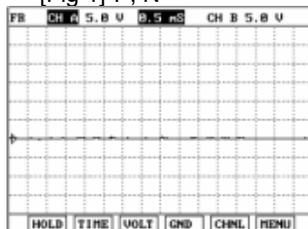
	T/W CIRCUIT
①	PCS-V-A(OD&LR)
②	PCS-V-R(2nd&3rd FV)
③	ON/OFF SOL.
④	PCS-V-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V SOL1, V SOL2
⑧	PCS-V-C(11D)
⑨	VFS(+)
⑩	VFS(-)



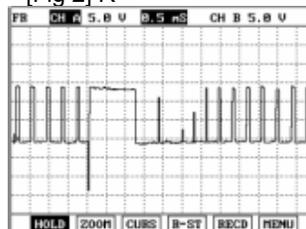
[Fig 1] P, N



[Fig 2] R



[Fig 3] 1<sup>st</sup> ~ 3<sup>rd</sup> gear in D



[Fig 4] 4<sup>th</sup> gear in D

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4. Is measured normally operating wave form?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

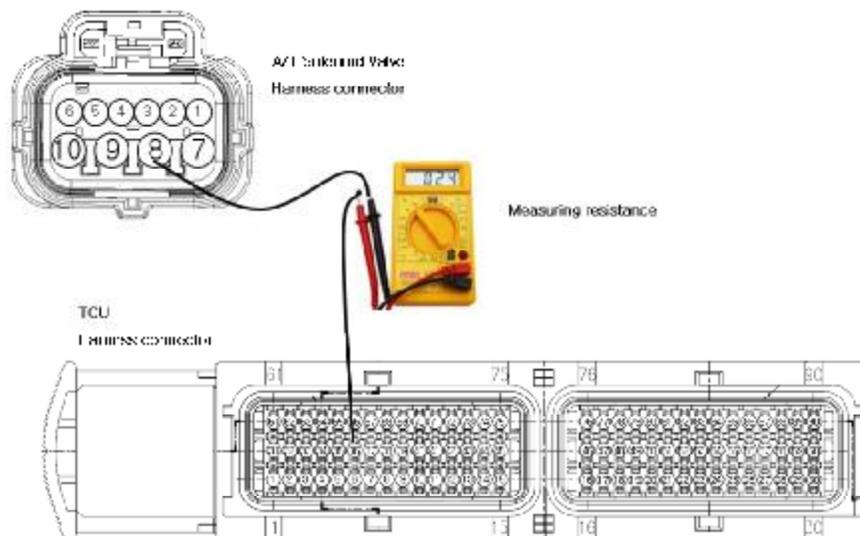
▶ Check for open in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.

- 1) Ignition "OFF".
- 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
- 3) Measure resistance between terminal "8" of the A/T solenoid valve harness connector and terminal "36" of the TCU harness connector.

▷ Specification : approx. 0Ω



4) Is resistance within specification?

**YES**

▶ Go to "Check signal circuit short inspection" procedure.

**NO**

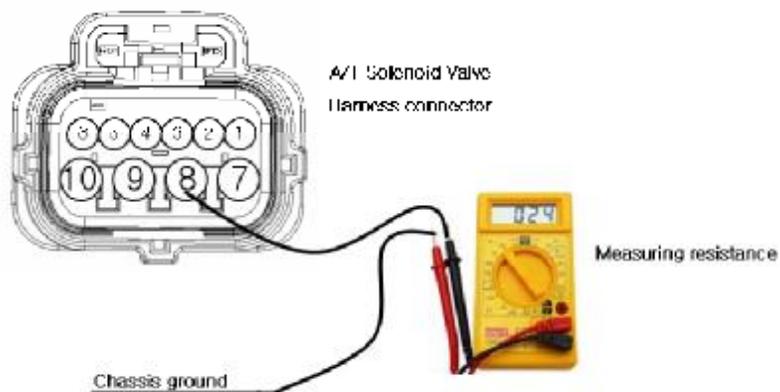
▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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## Technical Customer Information

2. Check signal circuit short inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "8" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : Infinite



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Signal circuit ground inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

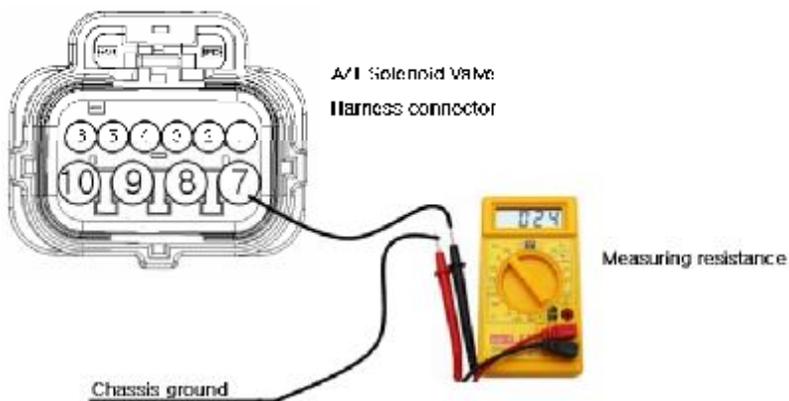
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## Technical Customer Information

3. Check signal circuit ground inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "7" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : approx. 0Ω



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

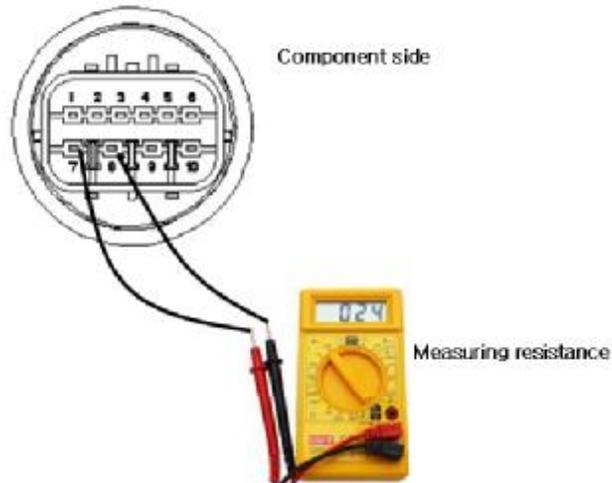
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## Technical Customer Information

### COMPONENT INSPECTION

1. Check solenoid valve.
    - 1) Ignition "OFF".
    - 2) Disconnect "A/T solenoid valve" connector.
    - 3) Measure resistance between terminal "7" and terminal "8" of the A/T solenoid valve harness connector.
- ▷ Specification : approx.  $3.5 \pm 0.2 \Omega$  [25 °C]



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace UD solenoid as necessary and go to "Verification of vehicle repair" procedure.

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## Technical Customer Information

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2. Check TCU.
  - 1) Connect scan tool to data link connector(DLC).
  - 2) Ignition "ON" & Engine "OFF".
  - 3) Select A/T solenoid valve actuator test and operate actuator test.
  - 4) Is Actuator testing performed normally?

### **YES**

- ▶ Go to "Verification of vehicle repair" procedure.

### **NO**

- ▶ Replace TCU as necessary and go to "Verification of vehicle repair" procedure.

### **ACTUATOR TEST CONDITION**

- 1) Ignition switch "ON"
- 2) Inhibitor switch is normal
- 3) P range
- 4) Throttle 0%
- 5) Vehicle speed 0km/h
- 6) Engine RPM 0 rpm

### **VERIFICATION OF VEHICLE REPAIR**

Refer to DTC P0707.

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## Technical Customer Information

### 5.16 2<sup>nd</sup>&REV solenoid short to battery or open or short to ground (P0760)

#### GENERAL DESCRIPTION

Refer to DTC P0750.

#### DTC DESCRIPTION

The TCU checks the 2nd brake and Reverse clutch drive control signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected or low voltage is detected when high voltage is expected) the TCU judges that 2nd brake and reverse clutch drive control solenoid circuit is malfunctioning and sets this code.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check voltage range	- Faulty 2nd&REV solenoid valve - Open or short in circuit - Faulty TCU
<b>Enable conditions</b>	<ul style="list-style-type: none"> <li>- <math>16\text{ V} &gt; V_B \geq 10\text{ V}</math></li> <li>- In gear state(no gear shifting) 500msec is passed from turn on the relay</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>- Feedback voltage from 2nd control solenoid <math>&gt; V_B - 2\text{V}</math> and 2nd control duty is 0%</li> <li>- Feedback voltage from 2nd control solenoid <math>\leq 5.5\text{V}</math> and 2nd control duty is 100%</li> </ul>	
<b>Diagnostic time</b>	More than 320msec	
<b>Fail safe</b>	<ul style="list-style-type: none"> <li>- Locked into 3rd gear</li> <li>- Stop the line pressure control unit IG-OFF.</li> </ul>	

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## Technical Customer Information

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "2nd&REV solenoid valve" parameter on the scan tool.
4. Shift gear at each position.

▷ Specification : 1<sup>st</sup> → 100%, 2<sup>nd</sup> → 0%

5. Does "2<sup>nd</sup>&REV solenoid duty" follow the reference data?

#### **YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### **NO**

▶ Go to "Terminal & Connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

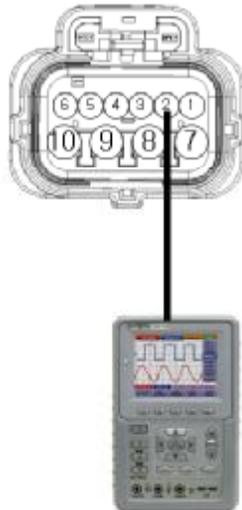
Refer to DTC P0743.

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Technical Customer Information

POWER SUPPLY CIRCUIT INSPECTION

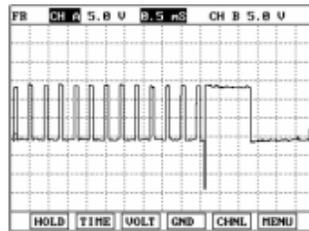
1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate 2<sup>nd</sup>&REV solenoid valve.
3. Measure wave form between terminal "2" of the sensor harness connector and chassis ground.



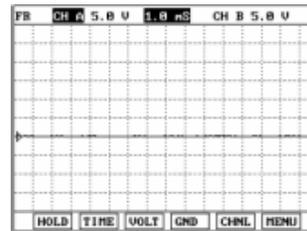
Solenoid Valve

Harness side connector

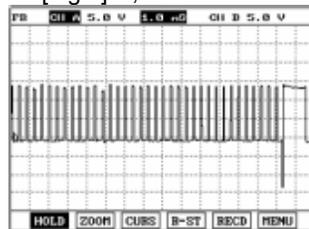
	T/M CIRCUIT
①	PCSV-A(CD&LR)
②	PCSV-B(2 <sup>nd</sup> &REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)



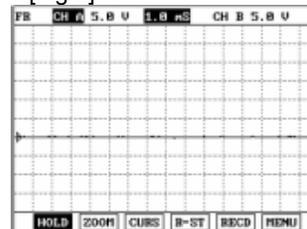
[Fig 1] P, N



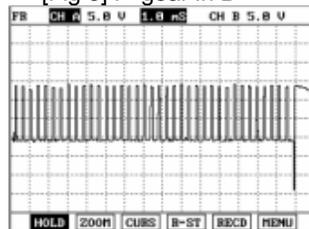
[Fig 2] R



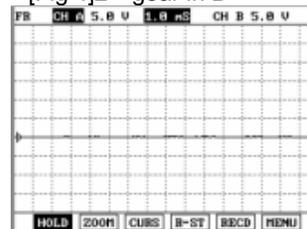
[Fig 3] 1<sup>st</sup> gear in D



[Fig 4] 2<sup>nd</sup> gear in D



[Fig 5] 3<sup>rd</sup> gear in D



[Fig 6] 4<sup>th</sup> gear in D

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## Technical Customer Information

4. Is measured normally operating waveform?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

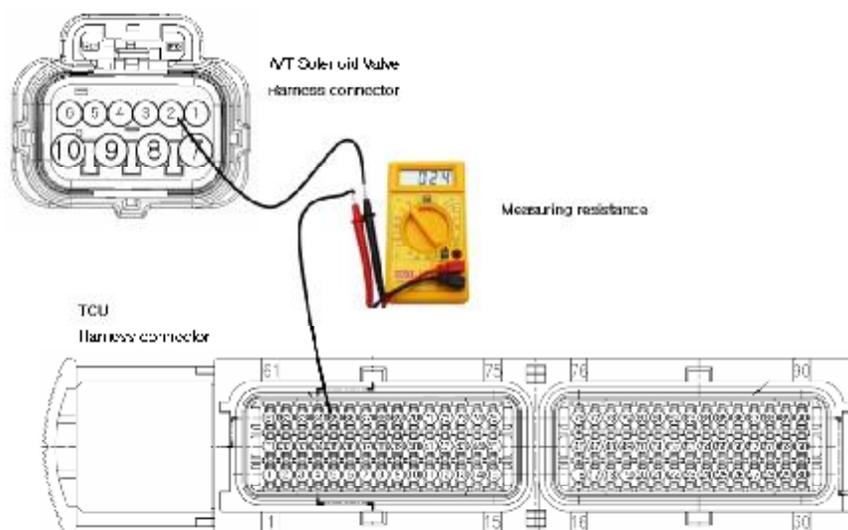
▶ Check for open in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.

- 1) Ignition "OFF".
- 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
- 3) Measure resistance between terminal "2" of the A/T solenoid valve harness connector and terminal "65" of the TCU harness connector.

▷ Specification : approx.  $0\Omega$



4) Is resistance within specification?

**YES**

▶ Go to "Check signal circuit short inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

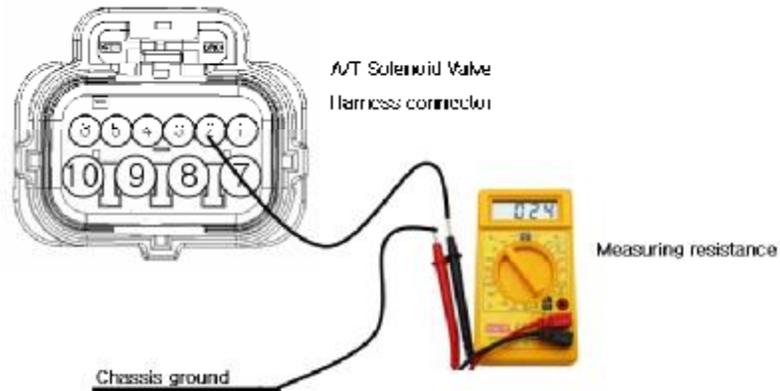
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2. Check signal circuit short inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "2" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : Infinite



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Signal circuit ground inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

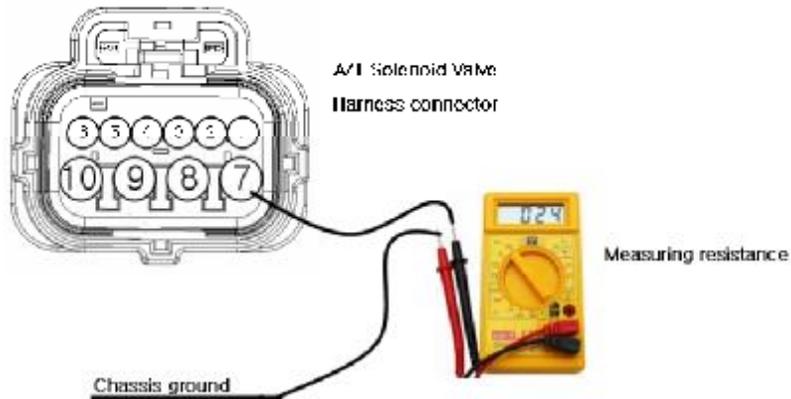
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## Technical Customer Information

3. Check signal circuit ground inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "7" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : approx. 0Ω



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

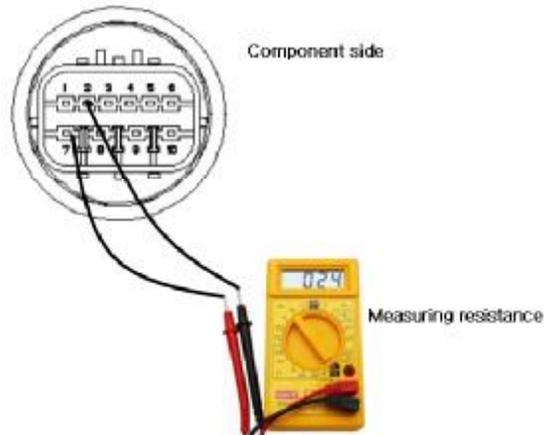
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## Technical Customer Information

### COMPONENT INSPECTION

1. Check solenoid valve.
    - 1) Ignition "OFF".
    - 2) Disconnect "A/T solenoid valve" connector.
    - 3) Measure resistance between terminal "2" and terminal "7" of the A/T solenoid valve harness connector.
- ▷ Specification : approx.  $3.5 \pm 0.2 \Omega$  [25 °C]



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace 2nd solenoid as necessary and go to "Verification of vehicle repair" procedure.

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## Technical Customer Information

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2. Check TCU.
  - 1) Connect scan tool to data link connector(DLC).
  - 2) Ignition "ON" & Engine "OFF".
  - 3) Select A/T solenoid valve actuator test and operate actuator test.
  - 4) Is Actuator testing performed normally?

**YES**

- ▶ Go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Replace TCU as necessary and go to "Verification of vehicle repair" procedure.

### ACTUATOR TEST CONDITION

- 1) Ignition switch "ON"
- 2) Inhibitor switch is normal
- 3) P range
- 4) Throttle 0%
- 5) Vehicle speed 0km/h
- 6) Engine RPM 0 rpm

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

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## Technical Customer Information

### 5.17 On/Off solenoid short to battery or open or short to ground (P0765)

#### GENERAL DESCRIPTION

Refer to DTC P0750.

#### DTC DESCRIPTION

The TCU checks the On/Off Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCU judges that the On/Off control solenoid circuit is malfunctioning and sets this code.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check voltage range	<ul style="list-style-type: none"> <li>- Faulty On/Off solenoid valve</li> <li>- Open or short in circuit</li> <li>- Faulty TCU</li> </ul>
<b>Enable conditions</b>	<ul style="list-style-type: none"> <li>- <math>16\text{ V} &gt; V_B \geq 10\text{ V}</math></li> <li>- In gear state(no gear shifting) 500msec is passed from turn on the relay</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>- Feedback voltage from On/Off control solenoid <math>&gt; V_B - 2\text{V}</math> and On/Off control duty is 0%</li> <li>- Feedback voltage from On/Off control solenoid <math>\leq 5.5\text{V}</math> and On/Off control duty is 100%</li> </ul>	
<b>Diagnostic time</b>	More than 320msec	
<b>Fail safe</b>	<ul style="list-style-type: none"> <li>- Locked into 3rd gear</li> <li>- Stop the line pressure control unit IG-OFF.</li> </ul>	

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## Technical Customer Information

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "On/Off solenoid valve" parameter on the scan tool.
4. Shift gear at each position.

▷ Specification : 1<sup>st</sup> → 100%, 2<sup>nd</sup> → 0%

5. Does "On/Off solenoid duty" follow the reference data?

#### **YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

#### **NO**

▶ Go to "Terminal & Connector inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0743.

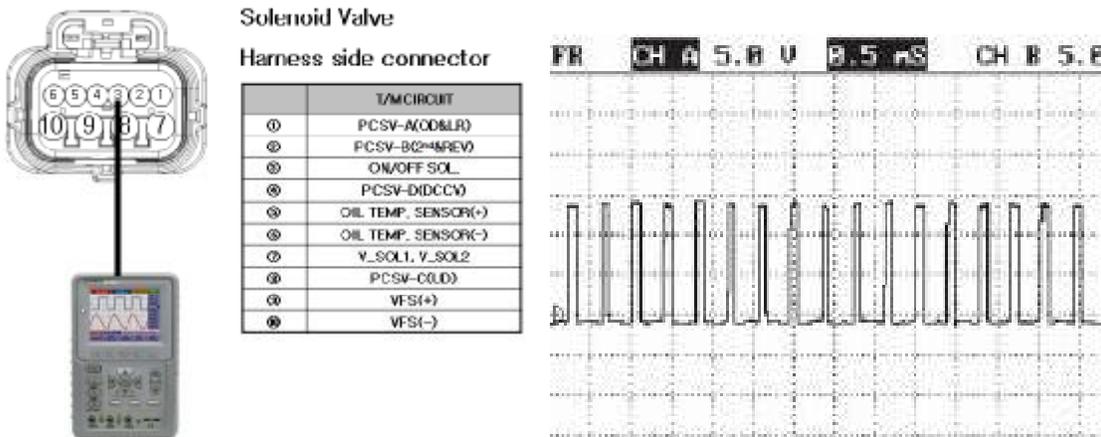
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## Technical Customer Information

### POWER SUPPLY CIRCUIT INSPECTION

1. Connect "A/T SOLENOID VALVE" connector and install device for measuring wave form.
2. Turn on the engine and operate On/Off solenoid valve.
3. Measure wave form between terminal "3" of the sensor harness connector and chassis ground.



4. Is measured normally operating waveform?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check for open in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.

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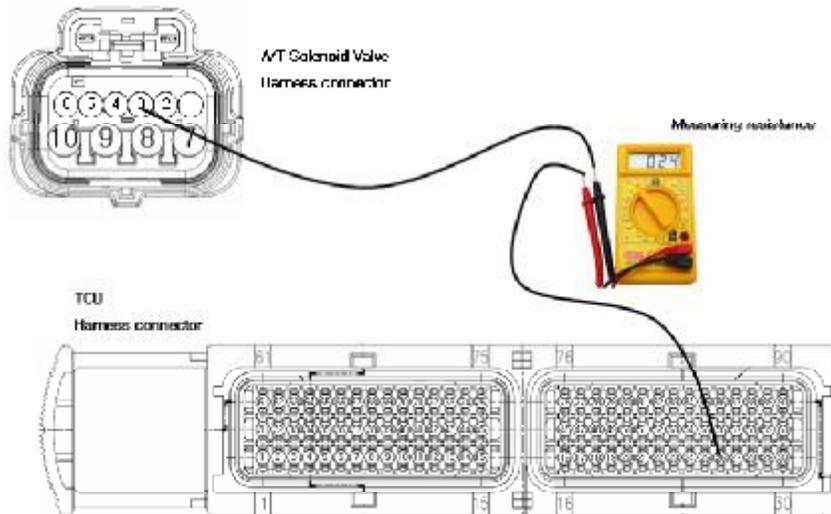
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## Technical Customer Information

### SIGNAL CIRCUIT INSPECTION

1. Check signal circuit open inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "3" of the A/T solenoid valve harness connector and terminal "26" of the TCU harness connector.

▷ Specification : approx. 0Ω



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check signal circuit short inspection" procedure.

**NO**

- ▶ Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

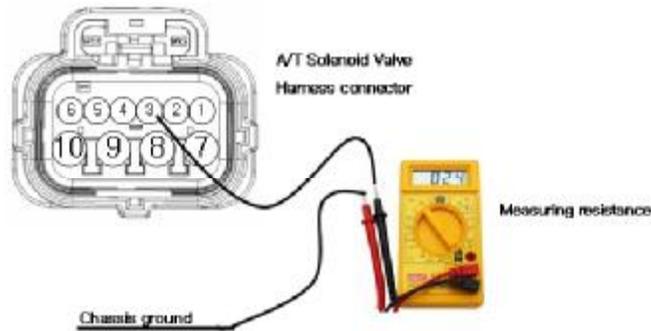
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## Technical Customer Information

2. Check signal circuit short inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "3" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : Infinite



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Signal circuit ground inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

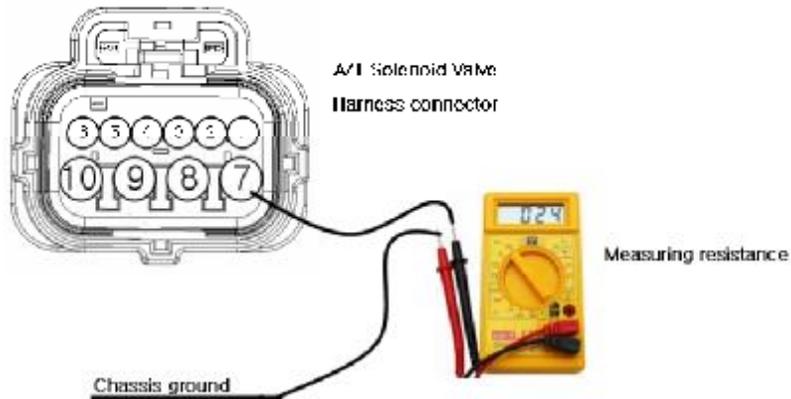
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## Technical Customer Information

3. Check signal circuit ground inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector and "TCU" connector.
  - 3) Measure resistance between terminal "7" of the A/T solenoid valve harness connector and chassis ground.

▷ Specification : approx. 0Ω



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

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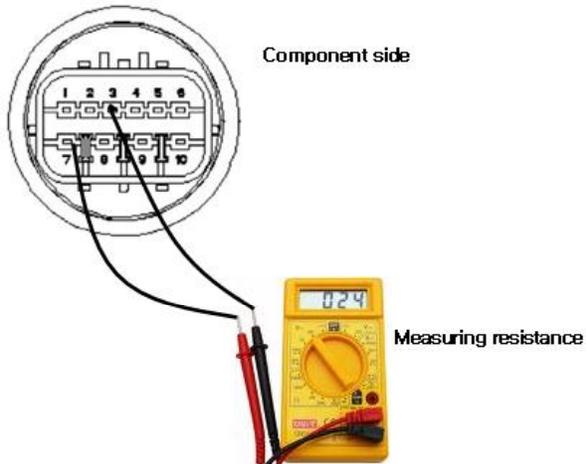
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## Technical Customer Information

### COMPONENT INSPECTION

1. Check solenoid valve.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T solenoid valve" connector.
  - 3) Measure resistance between terminal "3" and terminal "7" of the A/T solenoid valve harness connector.

▷ Specification : approx.  $3.5 \pm 0.2 \Omega$  [25 °C]



- 4) Is resistance within specification?

**YES**

- ▶ Go to "Check TCU" as below.

**NO**

- ▶ Replace On/Off solenoid as necessary and go to "Verification of vehicle repair" procedure.

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## Technical Customer Information

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2. Check TCU.
  - 1) Connect scan tool to data link connector(DLC).
  - 2) Ignition "ON" & Engine "OFF".
  - 3) Select A/T solenoid valve actuator test and operate actuator test.
  - 4) Is Actuator testing performed normally?

**YES**

- ▶ Go to "Verification of vehicle repair" procedure.

**NO**

- ▶ Replace TCU as necessary and go to "Verification of vehicle repair" procedure.

### ACTUATOR TEST CONDITION

- 1) Ignition switch "ON"
- 2) Inhibitor switch is normal
- 3) P range
- 4) Throttle 0%
- 5) Vehicle speed 0km/h
- 6) Engine RPM 0 rpm

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0707.

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## Technical Customer Information

### 5.18 TCM power signal error: short to ground or open (P0880)

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check voltage range	- Open or short in circuit - Faulty TCU
<b>Enable conditions</b>	- 22 V > VB > 9 V - Time after TCU turns on > 0.5sec	
<b>Threshold value</b>	VB < 7V or VB > 24.5V	
<b>Diagnostic time</b>	More than 100msec	
<b>Fail safe</b>	- Locked into 3rd gear - Stop the line pressure control unit IG-OFF.	

#### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "Voltage" parameter on the scan tool.

▷ Specification : approx. VB

4. Is voltage within specification?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

**NO**

▶ Go to "Terminal & Component inspection" procedure.

#### TERMINAL & CONNECTOR INSPECTION

Refer to DTC P0741.

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## Technical Customer Information

### 5.19 CAN BUS OFF (U0001)

#### GENERAL DESCRIPTION

The TCU can either receive data from the Engine Control Module or ABS control module, or it can send data to the ECM and ABSCM by using CAN communication. The CAN communication is one of the vehicle communications method, which is now widely used to transfer the vehicle data.

#### DTC DESCRIPTION

When the TCU can not read the data from the ECM through the CAN-BUS line, the TCU sets this code. CAN-BUS circuit malfunctioning or ECM can be a possible cause of this DTC.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check communication	- Open or short in CAN communication harness - Faulty TCU - Faulty ECM
<b>Enable conditions</b>	- $N_t \geq 1000$ rpm and 500 msec passed from IG "ON" - $V_i \geq 10$ V	
<b>Threshold value</b>	CAN message transfer error	
<b>Diagnostic time</b>	More than 1 sec	
<b>Fail safe</b>	- Intelligent shift is inhibited - Learning for oil pressure control is inhibited - ETR is inhibited - Lock up is inhibited. - Substitute CAN input value - Stop the line pressure control unit IG-OFF.	

#### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "CAN COMMUNICATION SERVICE DATA(ENGINE RPM, VEHICLE SPEED SENSOR, THROTTLE POSITION SENSOR)" parameter on the scan tool.
4. Compare it with reference data.
5. Does "CAN BUS LINE DATA" follow the reference data?

#### YES

- ▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. And go to Verification of Vehicle Repair procedure.

#### NO

- ▶ Go to "Terminal & Connector inspection" procedure.

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## Technical Customer Information

### TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

#### YES

- ▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. And go to Verification of Vehicle Repair procedure.

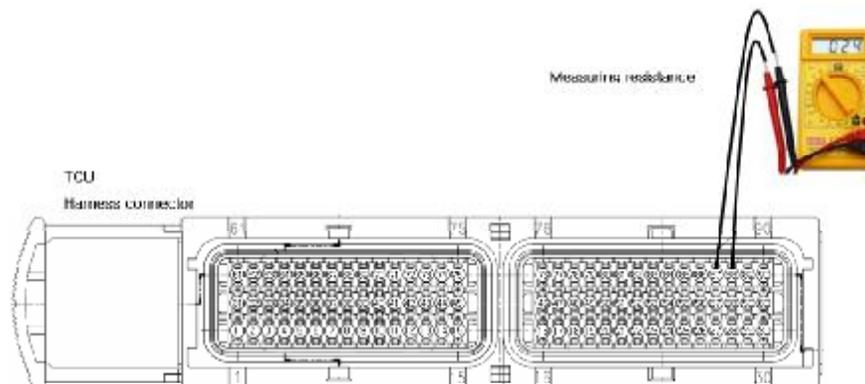
#### NO

- ▶ Go to "Signal Circuit Inspection" procedure.

### SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the TCU connector.
3. Measure resistance between terminal "87" and "88" of the TCU harness connector.

- ▷ Specification : approx. 0Ω



4. Is measured resistance within specification?

#### YES

- ▶ Substitute with a known-good TCU and check for proper operation. If the problem is corrected, replace TCU as necessary and then go to "Verification of Vehicle Repair" procedure.

#### NO

- ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage of ECM and then Repair or replace Resistance for CAN communication as necessary and go to "Verification Vehicle Repair" procedure.

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## Technical Customer Information

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0741.

### 5.20 No ID from ECU (U0010)

#### GENERAL DESCRIPTION

Refer to DTC U0001.

#### DTC DESCRIPTION

Refer to DTC U0001.

#### DTC DETECTING CONDITION

Item	Detecting Condition & Fail safe	Possible Cause
<b>DTC strategy</b>	Check communication	<ul style="list-style-type: none"> <li>- Open or short in CAN communication harness</li> <li>- Faulty TCU</li> <li>- Faulty ECM</li> </ul>
<b>Enable conditions</b>	<ul style="list-style-type: none"> <li>- <math>N_t \geq 1000</math> rpm and 500 msec passed from IG "ON"</li> <li>- <math>V_i \geq 10</math> V</li> </ul>	
<b>Threshold value</b>	No message from EMS	
<b>Diagnostic time</b>	More than 2 sec	
<b>Fail safe</b>	<ul style="list-style-type: none"> <li>- Intelligent shift is inhibited</li> <li>- Learning for oil pressure control is inhibited</li> <li>- ETR is inhibited</li> <li>- Lock up is inhibited.</li> <li>- Substitute CAN input value</li> <li>- Stop the line pressure control unit IG-OFF.</li> </ul>	

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## Technical Customer Information

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### MONITOR SCANTOOL DATA

1. Connect scan tool to data link connect(DLC).
2. Engine "ON".
3. Monitor the "CAN COMMUNICATION SERVICE DATA(ENGINE RPM, VEHICLE SPEED SENSOR, THROTTLE POSITION SENSOR)" parameter on the scan tool.
4. Compare it with reference data.
5. Does "CAN BUS LINE DATA" follow the reference data?

#### **YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCU connector or was repaired and TCU memory was not cleared. And go to Verification of Vehicle Repair procedure.

#### **NO**

▶ Substitute with a known-good TCM and check for proper operation. If the problem is corrected, replace TCU as necessary and then go to "Verification of Vehicle Repair" procedure.

### VERIFICATION OF VEHICLE REPAIR

Refer to DTC P0741.



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