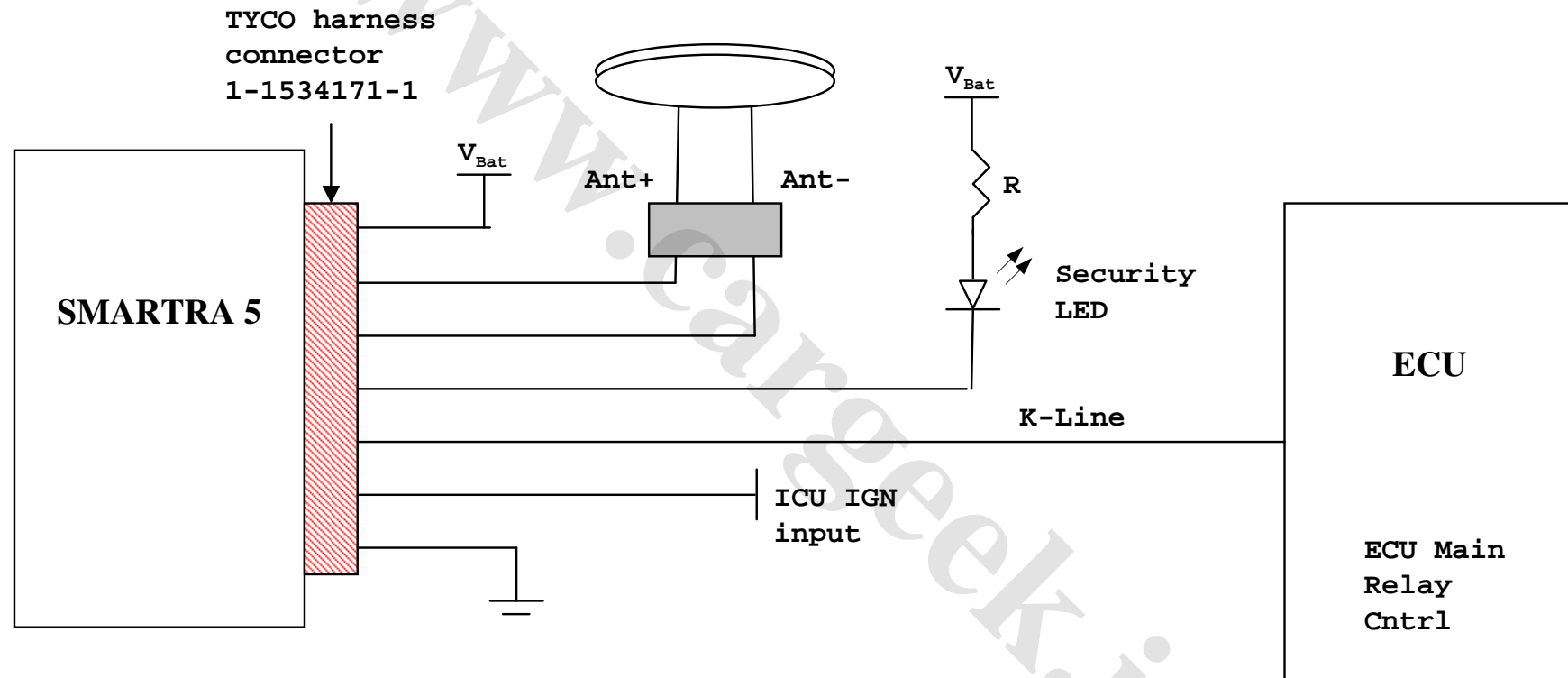


ICU / ECU System Overview

- SAIPA requires the immobiliser LED to flash at a different frequency depending on the immobiliser system state:
 - Virgin State: LED flashes at 2Hz (with IGN ON & IGN OFF)
 - 1st Key taught: LED flashes at 1Hz (with IGN ON & IGN OFF)
 - 2nd Key taught: LED flashes at 0.5Hz (with IGN ON)
 - Learnt state: LED flashes at 0.5Hz (with IGN OFF)
 - Error state: LED is always ON (with IGN ON & IGN OFF)
- ICU has complete control of LED (LED not connected to ECU)
- ICU will control the LED based on ECU command
- Immediately after receiving command from ECU, ICU will control LED at requested frequency (or ON/OFF)



ICU / ECU connection diagram



Immobiliser Control Unit

Twisted Pair (80cm max) , 50 turns/m

ANT 1

ANT 2

Transponder
Base Station
Front End

120mA Pk

EEPROM

Micro
Controller

Wake Circuit,
VREG with
Watchdog
Ignition
and Reset Circuit

KLINE
Transceiver

LED Low Side Driver

6.2mA max.

1.31 kOhm

Immobilizer Status
Indicator LED

ISO Pulse Protection
Diode
(Similar to 1N4004)

LED short circuit
protection Resistor

1.0 kOhm
0.5W

VBAT (KL30)

VBAT 13.5V (Typ.)

5A

200mA max

IGN SWITCH

5A

11mA max.

33k

1K47

IGNITION (KL15)

Central Load Dump
protection Diode
Located elsewhere in
Vehicle.
(Refer to Product Specs.)

0V

Ground (KL31)

Switched Vbat

33K

68pF

K-Line

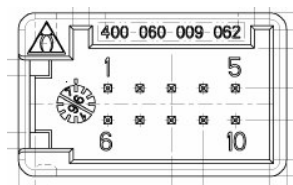
Baud rate = 4.8kbs

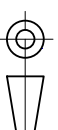
Engine
Management
System
(EMS)

510 Ohm

Capacitance contribution of EMS and looms
should comply with ISO 14230-1 specifications.

Connector Pinout



					SURF. TREATM.		SCALE NOT TO SCALE		PROJECT DV4725			
							MADE FROM					
					ISO E 	F005VC0351		DATE	NAME	DESCRIPTION SMARTRA 5 12V KLine Immobiliser Vehicle Wiring Diagram	PCB No.	
							DRAWN	29/10/2009	ENG22BR			
							CHCK.					Orig. DIN A3
							APPR.					PTL
							Original: RBAU <input type="checkbox"/> EGE1 <input type="checkbox"/> TEF23					
							ROBERT BOSCH (AUSTRALIA) PTY. LTD. A.C.N. 004 315 628			No.	F005VC0351	SHEET 1 OF 1
1	Revision - 1	ENG22BR	29/10/2008									
INDEX	ALTERATION No.	BY	VALID FROM	CHCK.						SUPERSEDED No.		VALID FROM

Sl. No.	P-Code	Group	Type	Meaning	Reason	Possible Checks or Corrections
1	Not used	WFS_ERR	NP	Immo is disabled	Not Applicable - Absent in production ECU	Not Applicable
2	Not used	WFS_ERR	SI	EMS virgin/Neutral	Not Applicable - No Pcode set in this condition	Not Applicable
3	P1622	WFS_ERR	MN	Auth. NOK, Key Learning process NOK	Incomplete authentication or teaching	Retry with correct key^
4	P1621	WFS_ERR	MX	Unknown Key	Usage of wrong key*	Retry with correct key^
5	Not used	SGEEW_ERR	NP	Not used	Not Applicable - Absent in production ECU	Not Applicable
6	Not used	SGEEW_ERR	SI	Not used	Not Applicable - Absent in production ECU	Not Applicable
7	P1626	SGEEW_ERR	MN	EEP: invalid write oper.	Internal to ECU - Error in EEPROM operation	Switch IGN off, wait until afterrun is complete, IGN On - Try again
8	P1625	SGEEW_ERR	MX	EEP: inconsistent data	Internal to ECU - Error in EEPROM storage	Switch IGN off, wait until afterrun is complete, IGN On - Try again
9	P1629	MSG_ERR	NP	Timeout from SMARTRA	SMARTRA disconnected from supply or Smartra not connected to ECU	Check for Smartra connections
10	P1628	MSG_ERR	SI	SMARTRA ERR 03H (invalid EMS request)	Wrong request to SMARTRA from ECU	Check for noise on communication interface between K-Line and CAN - Retry with IGN Off and On
11	P1628	MSG_ERR	MN	Wrong CS, invalid Smartra response	Noise in interface between SMARTRA and ECU	Check for noise on communication interface between K-Line and CAN - Retry with IGN Off and On
12	P1627	MSG_ERR	MX	SMARTRA ERR 01H (antenna)	Antenna not connected or not functioning correctly	Check for Antenna connections
13	P1630	SMTP_ERR	NP	SMARTRA ERR 04H (TP mode)	Wrong key usage* - Password mode invalid	IGN Off and On - try with correct key^
14	P1632	SMTP_ERR	SI	SMARTRA ERR 02H (ELP not OK)	Wrong key usage* - Authentication not matching	IGN Off and On - try with correct key^
15	P1631	SMTP_ERR	MN	SMARTRA ERR 02H (No TP)	Key does not have transponder or Transponder can not be read	IGN Off and On - try with correct key^
16	P1630	SMTP_ERR	MX	SMARTRA ERR 11..17H (programing)	Wrong key usage* - Remaining TRP programming errors	IGN Off and On - try with correct key^
17	P1635	WFSE2_ERR	NP	Wrong CHL, Tester	Random, Challenge pair not matching	Should not be present once tester SW is synchronized
18	P1634	WFSE2_ERR	SI	Wrong ACC, Tester	Access code not correct	Use correct access card
19	Not used	WFSE2_ERR	MN	AntiScan Running, Tester	Not Applicable - Absent in production ECU	Not Applicable
20	P1633	WFSE2_ERR	MX	Wrong Command, Tester	Invalid command related to Immobilizer	Should not be present once tester SW is synchronized
21	P1636	SMARTRA3_ERR	NP	Authentication fail - SMARTRA learnt different VSD	Wrong SMARTRA used	Retry with correct/paired SMARTRA
22	P1637	SMARTRA3_ERR	SI	Virgin/neutral SMARTRA at learnt EMS	SMARTRA is Virgin/Neutral while ECU is learnt	Neutralize ECU, SMARTRA and pair once again using XECM+NKEY
23	P1638	SMARTRA3_ERR	MN	SMARTRA Teach/Neutralize command fail	Communication error, SMARTRA is locked	Retry - IGN Off and On Retry teaching with correct SMARTRA
24	P1639	SMARTRA3_ERR	MX	LED Control Command Fail	Communication error	Retry - IGN Off and On

Notes:

Error reporting is based on order of priorities and occurrence

In a given driving cycle, only one error is reported, from an error group, depending on order of priority

In a given Error_group, reporting of errors is in NP->SI->MN->MX order

^In case of teaching, correct key implies a virgin key or a key already taught to this ECU

^In case of IGN On or Crank attempt, correct key implies a key already taught to this ECU

*Wrong key implies a key already learnt with a different secret, unpaired key

	Pre condition				Action/Command execution	After successful command			Comments
	Situation	ECU	Key1	Key2		ECU	Key1	Key2	
At Factory	EOL teaching	Virgin	Virgin	Virgin	Factory learning (CMD_FACT, CMD_NKEY)	Learnt	Learnt	Learnt	2 keys have been learnt and paired to EMS
At Factory	EOL teaching, only one key learnt and teaching could not continue but access card and Key1 are available	Learnt1	Learnt	Virgin	Factory learning (SIA_FACT, SIA_NKEY)	Learnt	Learnt	Learnt	Possible by reworking SIA_FACT (with learnt KEY1) and SIA_NKEY (virgin key) with the same access code
At Factory	EOL teaching - One key learnt	Learnt1	Learnt	Virgin	Crank attempt	Learnt	Learnt	Learnt	Not possible to crank
At Factory	EOL teaching - attempt to learn more than 2 keys	Learnt	X	X	Factory learning (SIA_FACT, SIA_NKEY)	Learnt	Learnt	Learnt	Not possible to learn more/different keys once EMS is learnt
At Factory / Aftersale	Learnt EMS, Key1 and access card available, Key2 damaged or lost	Learnt	Learnt	#Damaged	Add key in after-sale (SIA_OKEY, SIA_NKEY)	Learnt	Learnt	Learnt	New key (key3) is replaced as a learnt key
At Factory / Aftersale	Learnt EMS, Key2 and access card available, Key1 damaged or lost	Learnt	#Damaged	Learnt	Add key in after-sale (SIA_OKEY, SIA_NKEY)	Learnt	Learnt	Learnt	New key (key3) is replaced as a learnt key
At Factory / Aftersale	Learnt EMS and access card available both the keys are lost	Learnt	#Damaged	#Damaged	Neutralize ECM (SIA_NECM) and Replace ECM command (SIA_XECM, SIA_NKEY)	Learnt	Learnt	Learnt	Possible to learn 2 new keys to learnt EMS
At Factory / Aftersale	EMS Damaged, learnt keys and access card available	#Damaged	Learnt	Learnt	Replace of ECM with a new one (SIA_XECM, SIA_NKEY)	Learnt	Learnt	Learnt	Old learnt keys can be paired with new EMS, if access code is same as the previous
At Factory / Aftersale	EMS Damaged, learnt Key1 and access card available	#Damaged	Learnt	Virgin	Replace of ECM with a new one (SIA_XECM, SIA_NKEY)	Learnt	Learnt	Learnt	New EMS, one old learnt key and one new key pairing possible if access code is same as previous
At Factory / Aftersale	EMS Damaged, learnt Key2 and access card available	#Damaged	Virgin	Learnt	Replace of ECM with a new one (SIA_XECM, SIA_NKEY)	Learnt	Learnt	Learnt	New EMS, one old learnt key and one new key pairing possible if access code is same as previous
At Factory / Aftersale	EMS damaged and both the keys are also not available	#Damaged	Virgin	Virgin	Replace of ECM with a new one (SIA_XECM, SIA_NKEY)	Learnt	Learnt	Learnt	Virgin EMS and Keys can be paired
Theft Attempt	Not possible to teach a key paired to different EMS	Learnt	Learnt	LearntX	Any command	NC	NC	NC	Not possible to teach a key paired to another EMS
Theft Attempt	Not possible to teach a key paired to different EMS	Learnt	LearntX	Learnt	Any command	NC	NC	NC	Not possible to teach a key paired to another EMS
Theft Attempt	Not possible to teach/crank with a keys paired to different EMS	Learnt	LearntX	LearntX	Any command*, Crank attempt	NC	NC	NC	Not possible to teach/crank with keys paired to another EMS
Theft Attempt	Not possible to teach/crank with a keys paired to different EMS	LearntX	LearntY	LearntZ	Any command*, Crank attempt	NC	NC	NC	Not possible to teach/crank with invalid pairs
Normal Operation	Paired EMS started with key1	Learnt	Learnt	X	Crank attempt	NC	NC	NC	Possible to crank with one valid key
Normal Operation	Paired EMS started with key2	Learnt	X	Learnt	Crank attempt	NC	NC	NC	Possible to crank with one valid key

Note:

ICU is not paired to keys or the EMS

* - Applicable only if tester (having the immo teach functions+ algorithms) and the ACCESS code are not available to intruder

NC - No Change in the state of original EMS or Key

Learnt1 - 1 Key learnt

LearntX, LearntY, LearntZ - Paired to different EMS/KEYS

#Damaged - It is expected that a new ECM/Key in Virgin state will be used for pairing

X - Don't care

Refer to Bosch Immo Diagnostic Specs for more information