SANTAFE(DMA) > 2013 > G 2.4 GDI > Body Electrical System

Body Electrical System > General Information > General Information

General Troubleshooting Information

Before Troubleshooting

1. Check applicable fuses in the appropriate fuse/relay box.
2. Check the battery for damage, state of charge, and clean and tight connections.
   (Refer to Engine Electrical System - "Battery")

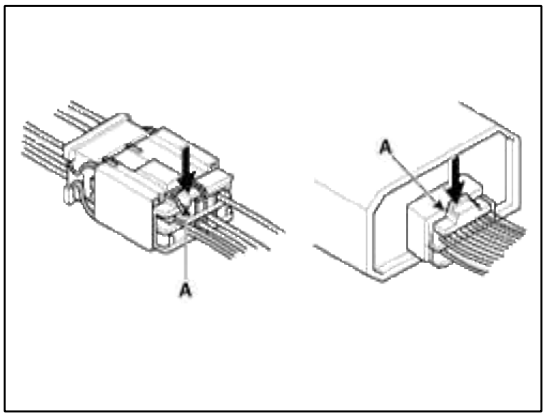
NOTE

- Do not quick-charge a battery unless the battery ground cable has been disconnected, otherwise you will damage the alternator diodes.
- Do not attempt to crank the engine with the battery ground cable loosely connected or you will severely damage the wiring.

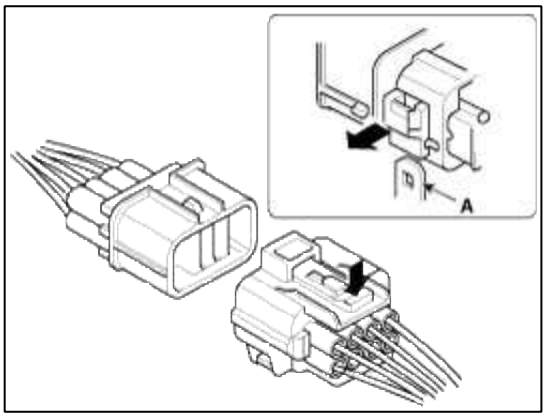
3. Check the alternator belt tension (D).

Handling Connectors

1. Make sure the connectors are clean and have no loose wire terminals.
2. Make sure multiple cavity connectors are packed with grease (except watertight connectors).
3. All connectors have push-down release type locks (A).

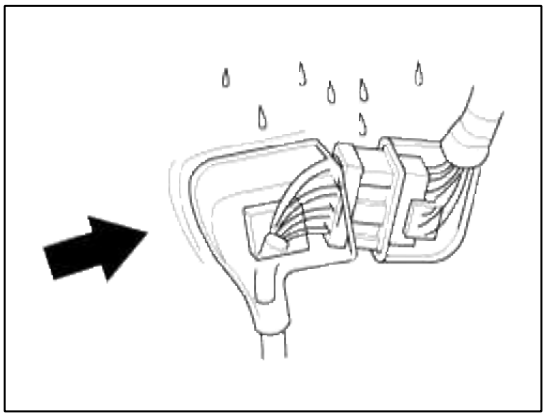


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

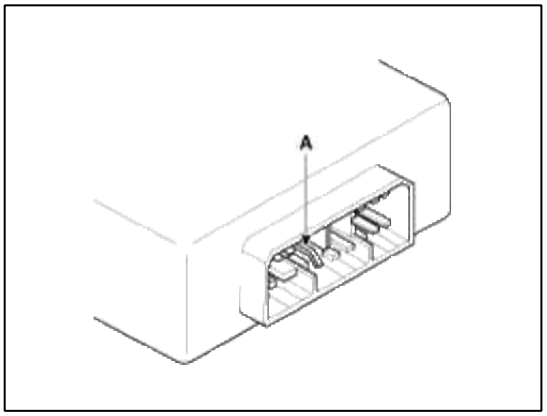


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.

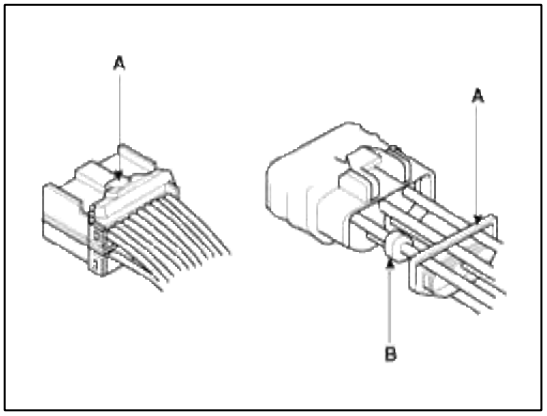
7. Always reinstall plastic covers.



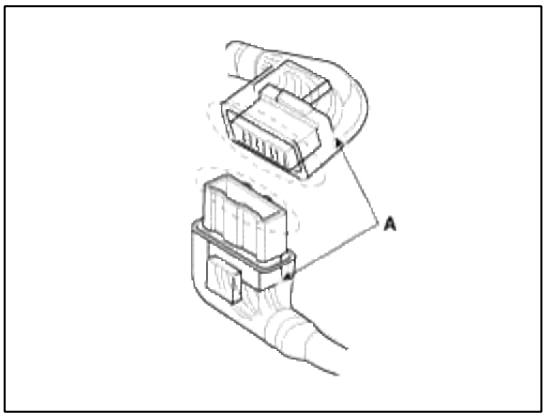
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



9. Check for loose retainer (A) and rubber seals (B).

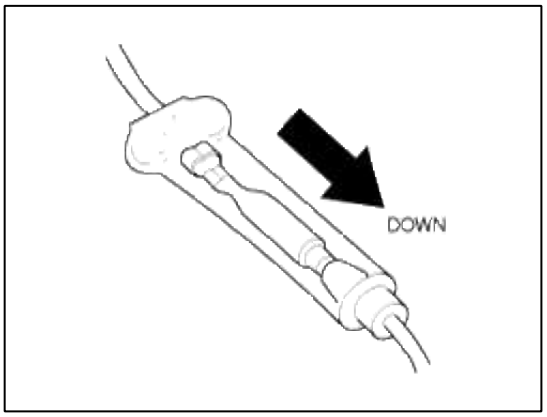


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



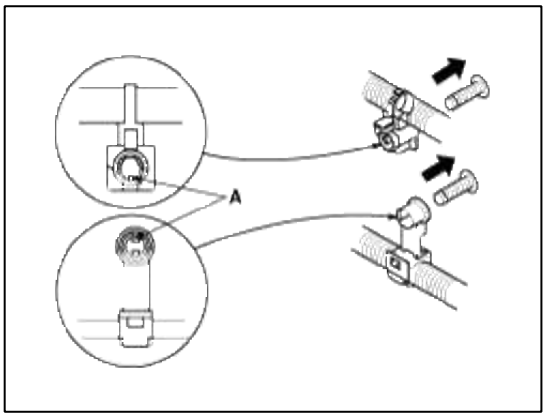
11. Insert the connector all the way and make sure it is securely locked.

12. Position wires so that the open end of the cover faces down.

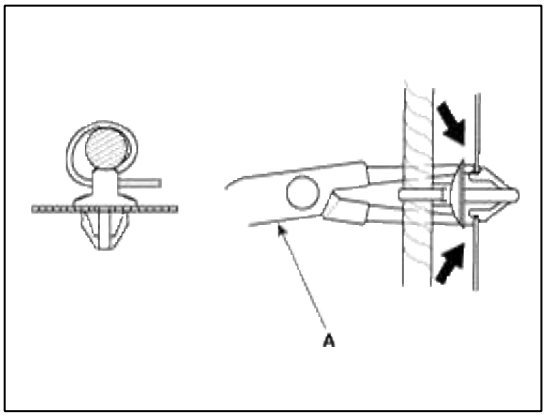


Handling Wires And Harnesses

1. Secure wires and wire harnesses to the frame with their respective wire ties at the designated locations.
2. Remove clips carefully; don't damage their locks (A).

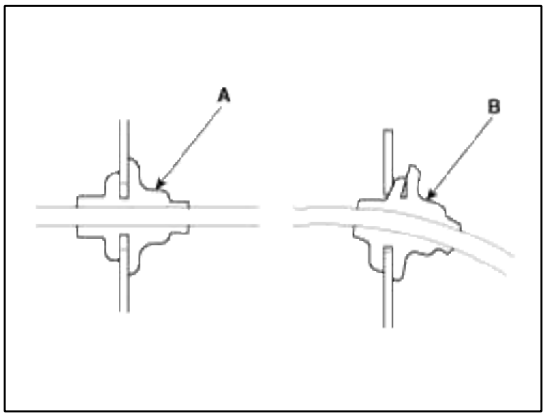


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



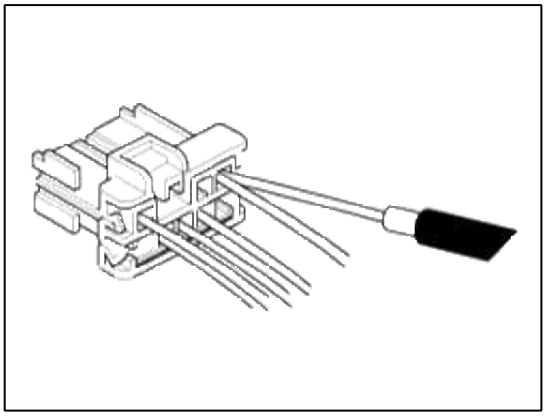
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.

6. Seat grommets in their grooves properly (A). Do not leave grommets distorted (B).

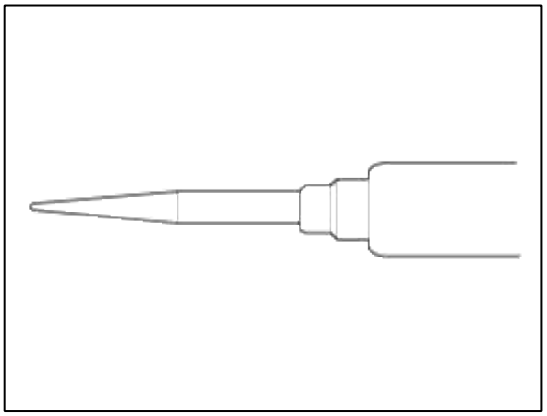


Testing And Repairs

1. Do not use wires or harnesses with broken insulation.
   Replace them or repair them by wrapping the break with electrical tape.
2. After installing parts, make sure that no wires are pinched under them.
3. When using electrical test equipment, follow the manufacturer's instructions and those described in this manual.
4. If possible, insert the remover tool from the wire side (except waterproof connector).



5. Use a probe with a tapered tip.
   Refer to the user's guide in the wiring repair kit (Pub No. : TRK 015.)



Five-step Troubleshooting

1. Verify the complaint
   Turn on all the components in the problem circuit to verify the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.
2. Analyze the schematic
   Look up the schematic for the problem circuit.
   Determine how the circuit is supposed to work by tracing the current paths from the power feed through the circuit components to ground. If several circuits fail at the same time, the fuse or ground is a likely cause.
   Based on the symptoms and your understanding of the circuit operation, identify one or more possible causes of the problem.

3. Isolate the problem by testing the circuit.
   Make circuit tests to check the diagnosis you made in step 2. Keep in mind that a logical, simple procedure is the key to efficient troubleshooting.
   Test for the most likely cause of failure first. Try to make tests at points that are easily accessible.
4. Fix the problem
   Once the specific problem is identified, make the repair. Be sure to use proper tools and safe procedures.
5. Make sure the circuit works
   Turn on all components in the repaired circuit in all modes to make sure you've fixed the entire problem. If the problem was a blown fuse, be sure to test all of the circuits on the fuse. Make sure no new problems turn up and the original problem does not recur.

Battery Reset

Description

When reconnecting the battery cable after disconnecting, recharging battery after discharged or installing the memory fuse located on the driver's side panel after removing, be sure to reset systems mentioned on the below table.
In addition, when replacing or reinstalling their fuses after removing, they should be reset according to the below table. Please refer to the below table when servicing.

System	Resetting
Auto up/down window	Whenever the battery is disconnected, discharged or the related fuse is replaced or reinstalled, reset the Auto up/down window system according to the procedure below. 1) Turn the ignition switch to the ON position. 2) Pull up the power window switch in order that the window can close completely, and then keep pulling up the power switch for about 1 second.
Panoramaroof	Whenever the battery is disconnected, discharged or the related fuse is replaced or reinstalled, the panoramaroof system must be reset according to the procedure below. 1) Turn the ignition key to the ON position and then close the panoramaroof completely. 2) Release the panoramaroof control lever. 3) Press and hold the CLOSE button for more than 10 seconds until the sunroof has moved slightly. 4) Release the panoramaroof control lever. 5) Press and hold the CLOSE button once again until the sunroof do as follows. • Tilt → Slide Open → Slide Close Then, release the lever. 6) Reset procedure of panorama system is finished.
Trip computer	When the battery is disconnected and reconnected, the set functions of the trip computer become initialized. So, you need to explain this information to the customer.
Clock	Whenever the battery terminals or related fuses are disconnected, you must reset the time in audio head unit. (Refer to Audio owner's manual)
Audio	When the battery is disconnected and reconnected, the customer's radio stations become initialized. So, you need to record the customer's radio stations prior to service, and after service, set the customer's radio stations into the audio.

Body Electrical System > Audio > Specifications

Specifications

Audio

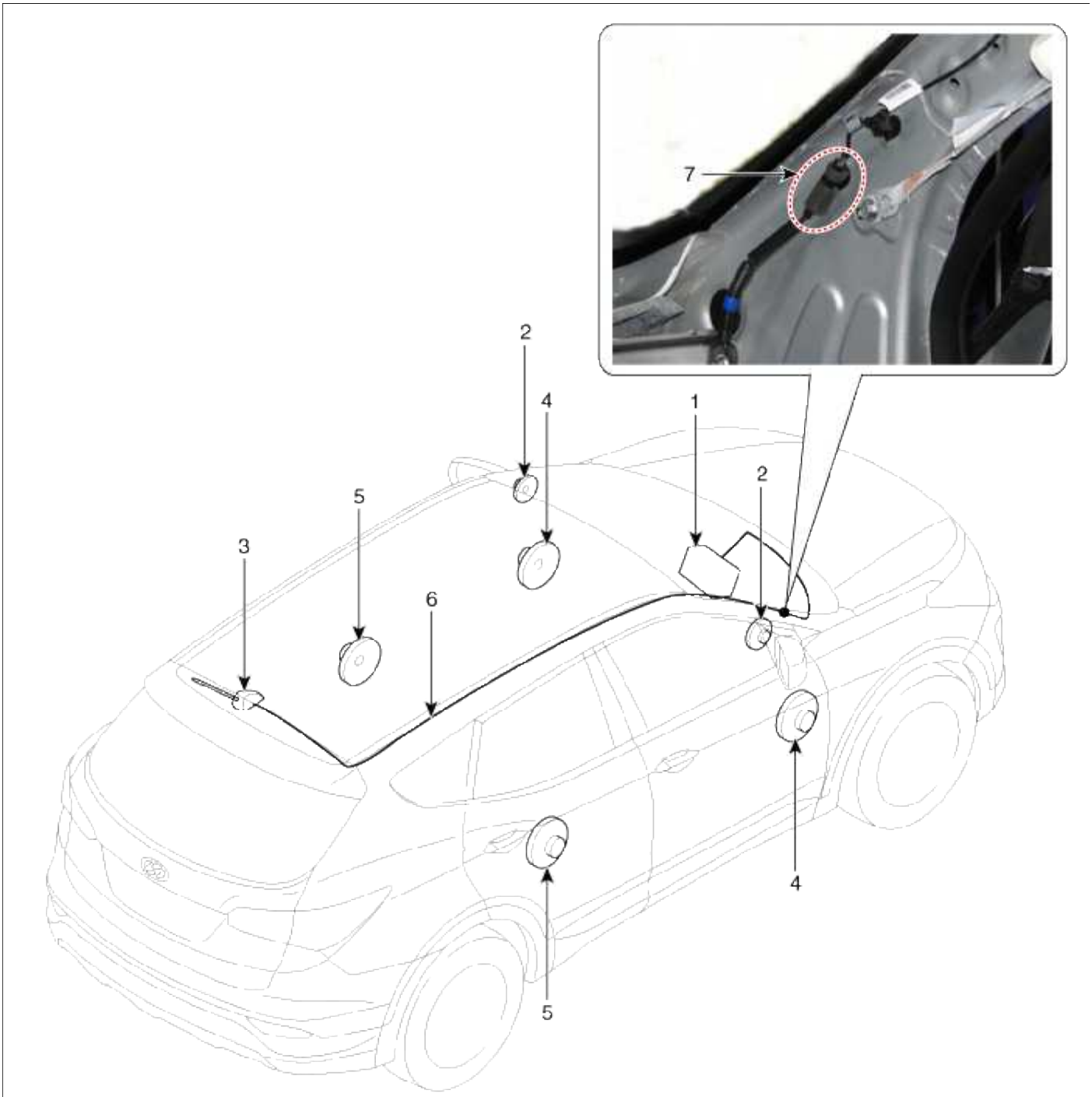
Item		Specification	
Model		RADIO/CD/MP3/SDARS (PA30A S)	RADIO/CD/MP3/SDARS (PA30B S)
Power supply		DC 14.4V	
Dark current		Max. 2mA (Head unit only)	
Antenna		80PF 75Ω	
Tuning type		PLL SYNTHESIZED TUNING	
Frequency range / Channel space	FM	87.5~107.9 MHz / 200KHz	
	AM	530~1710 KHz / 10KHz	

Speaker

Item		PA30A	PA30B
Input Power (W or V)	Front	20W (Max 40W)	
	Rear	20W (Max 40W)	
	Front Center	-	
	Front Tweeter	20W (Max 40W)	
	Surround	-	
	Sub woofer	-	
Speaker Impedance (Ω)	Front	4 ± 0.6	
	Rear	4 ± 0.6	
	Front Center	-	
	Front Tweeter	3.4 ± 0.5	
	Surround	-	
	Sub woofer	-	
Speaker Number		6	

Body Electrical System > Audio > Components and Components Location

Component Location



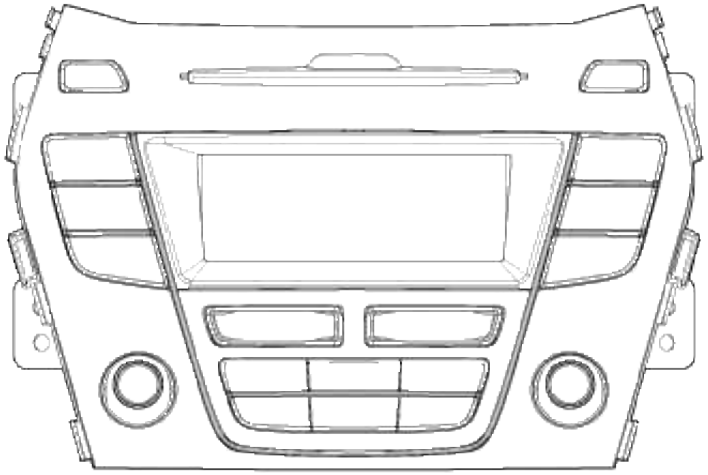
1. Audio unit 2. Tweeter speaker 3. Roof antenna (Radio+SDARS) 4. Front door speaker	5. Rear door speaker 6. Antenna feeder cable 7. Antenna cable connector

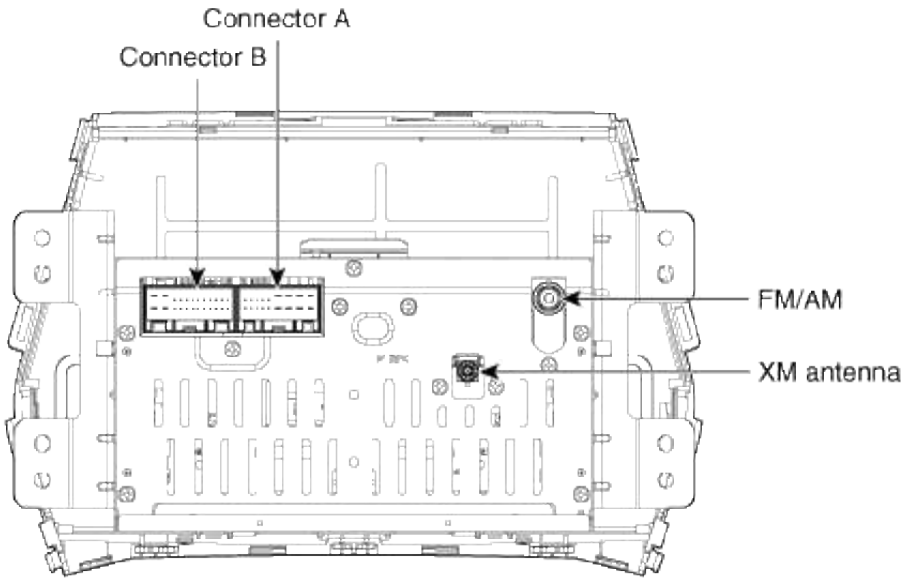
SDARS : Satellite Digital Audio Radio Service

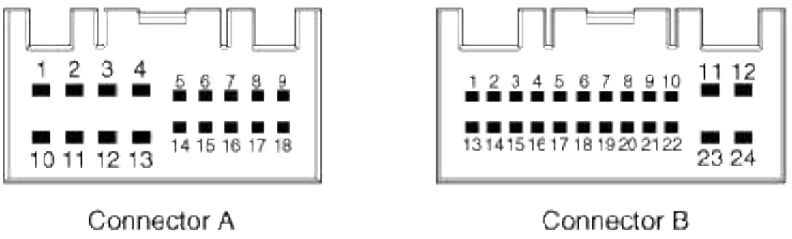
Body Electrical System > Audio > Audio Unit > Components and Components Location

Components

[RADIO/CD/MP3/SDARS(PA30A S)]



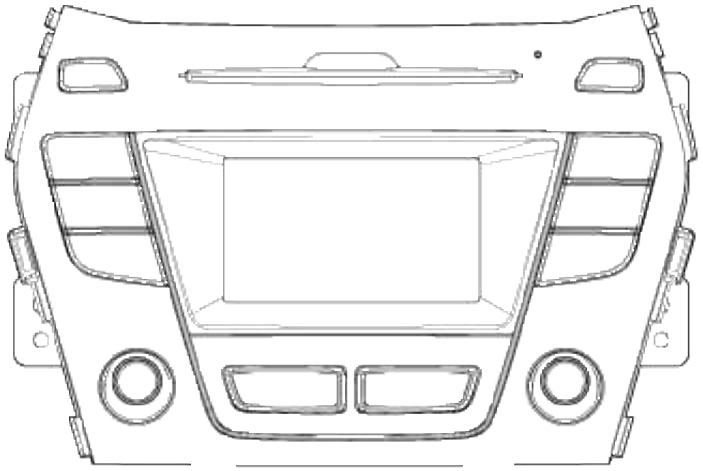


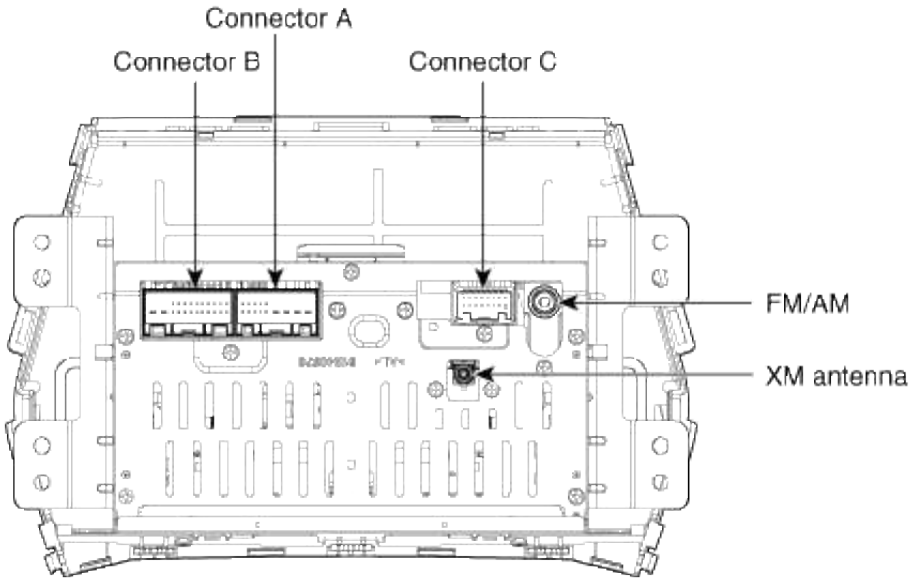


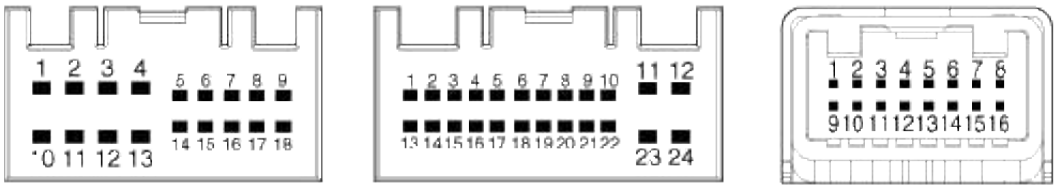
Connector Pin Information

No.	Connector A	Connector B
1	Rear left speaker (+)	CAN High
2	Front left speaker (+)	TMU Audio (+) (For USA)
3	Front right speaker (+)	-
4	Rear right speaker (+)	Steering wheel remote
5	-	-
6	-	USB D (+)
7	Ignition	USB/iPod VDD
8	Illumination (+)	AUX R IN
9	Detent	AUX GND
10	Rear left speaker (-)	Mic (+) B/T
11	Front left speaker (-)	ACC
12	Front right speaker (-)	B+
13	Rear right speaker (-)	CAN Low
14	-	TMU Audio (-) (For USA)
15	-	-
16	-	Speed
17	Illumination (-)	Remote GND
18	Remote antenna	USB D (-)
19		USB/iPod GND
20		AUX DETECT
21		AUX L IN
22		Mic (-) B/T
23		-
24		Power GND

[RADIO/CD/MP3/SDARS(PA30B S)]







Connector A Connector B Connector C

Connector Pin Information

No.	Connector A	Connector B	Connector C
1	Rear left speaker (+)	CAN High	-
2	Front left speaker (+)	TMU Audio (+) (For USA)	-
3	Front right speaker (+)	-	Camera ground
4	Rear right speaker (+)	Steering wheel remote	Camera video input
5	-	-	-
6	-	USB D (+)	-
7	Ignition	USB/iPod VDD	-
8	Illumination (+)	AUX R IN	-
9	Detent	AUX GND	-
10	Rear left speaker (-)	Mic (+) B/T	Camera battery (+)
11	Front left speaker (-)	ACC	Parking ground
12	Front right speaker (-)	B+	P detector
13	Rear right speaker (-)	CAN Low	-
14	-	TMU Audio (-) (For USA)	-
15	-	-	-
16	-	Speed	-
17	Illumination (-)	Remote GND	
18	Remote antenna	USB D (-)	
19		USB/iPod GND	
20		AUX DETECT	
21		AUX L IN	
22		Mic (-) B/T	
23		-	
24		Power GND	

Body Electrical System > Audio > Audio Unit > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.

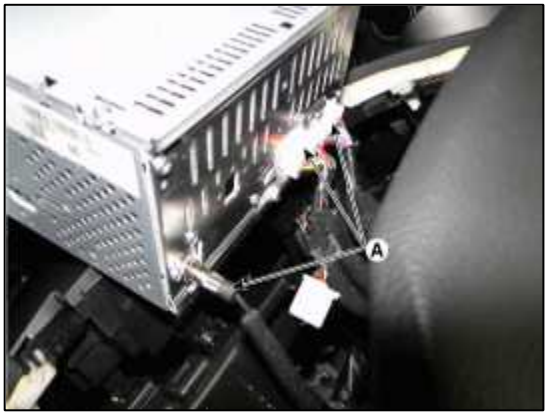
2. Remove the center air vent duct (A).



3. Seperate the audio head unit (A) from crash pad after loosening the screws (4EA).



4. Remove the audio head unit (A) after disconnecting the connectors and cable.



NOTE

When the compact disc is not ejected, do not remove it forcibly.

Installation

1. Connect the audio unit connectors and cable.
2. Install the audio head unit.
3. Install the center air vent duct.
4. Connect the negative (-) battery terminal.

NOTE

A. Make sure the connector are connected in properly.

B. Check the audio system.

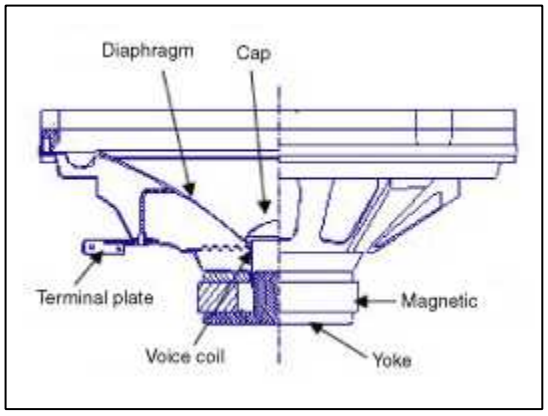
Body Electrical System > Audio > Speakers > Repair procedures

Inspection

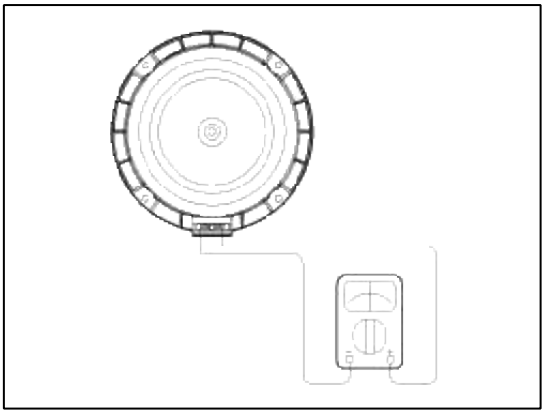
1. Troubleshooting for Speaker

(1) Basic inspection of speaker

Inspect the sound from speaker after verifying that the speaker mounting screws is removed and the wiring connector is connected precisely to remove vibration transmitted from body trims and surrounding parts.



(2) Case Troubleshooting

No.	Case	Inspection/Remedy
1	Trembling sound	1. Before replacing the speaker, inspect that the mounting screw is installed normally. 2. After re-installing the speaker, verify that no trembling sound is heard. 3. When hearing a trembling sound again, replace the speaker with new one.
2	Noise	1. Check if the wiring connector is connected normally. If not, reconnect the wiring connector. 2. In case of radio static, check if there is a noise from CD player. 3. When a noise is heard on turning radio and CD on, replace the speaker with new one. NOTE In case there is only radio static, this causes from poor radio reception. Thus the speaker needs no repair and replacement.
3	Poor working	Inspection of the wiring connection between the battery and the speaker 1. Before replacing the speaker, inspect the wiring and connections in the speaker circuit. 2. Check the supplying power to the speaker and the resistance, and then inspect the sound quality.  3. If the speaker works poorly, replace it with new one.

CAUTION

When handling the speaker :
- Dropping or rough handling of the speaker can cause damage.
- Be careful not to spill water or oil on the speaker.
- Caution when dealing with speaker because the diaphragm is paper and can be easily torn by impact and external force.
- Electrical mishandling of speakers is not covered by manufacturers warranty.

Removal

Front Speaker

1. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
2. Remove the front speaker (A) after loosening the screws (4EA).



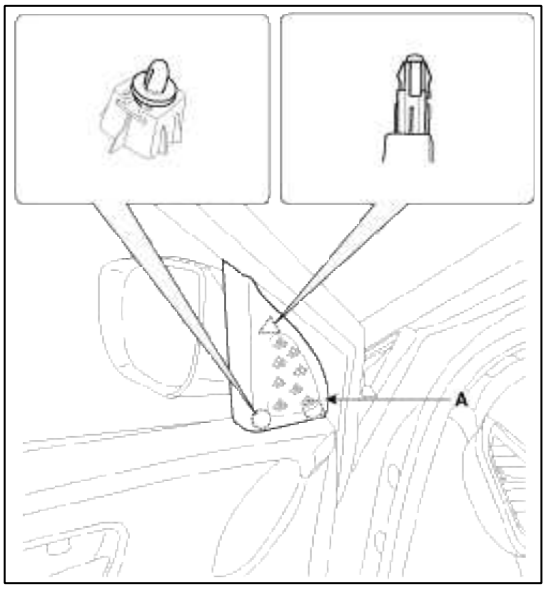
Rear Speaker

1. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear speaker (A) after loosening the screws (4EA).

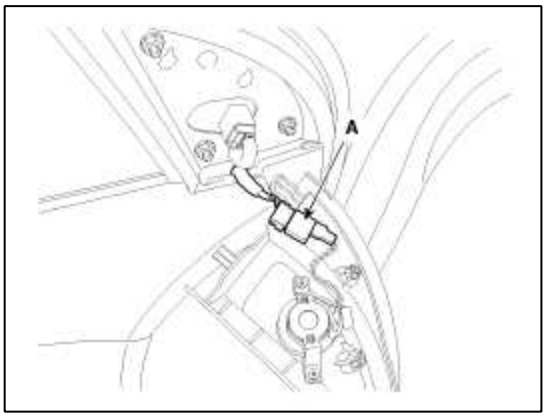


Tweeter Speaker (Front)

1. Using a screwdriver or remover, remove the front door quadrant inner cover (A).



2. Disconnect the tweeter speaker connector (A).



Installation

Front Speaker

1. Install the front speaker.
2. Install the front door trim.

Rear Speaker

1. Install the rear speaker.
2. Install the rear door trim.

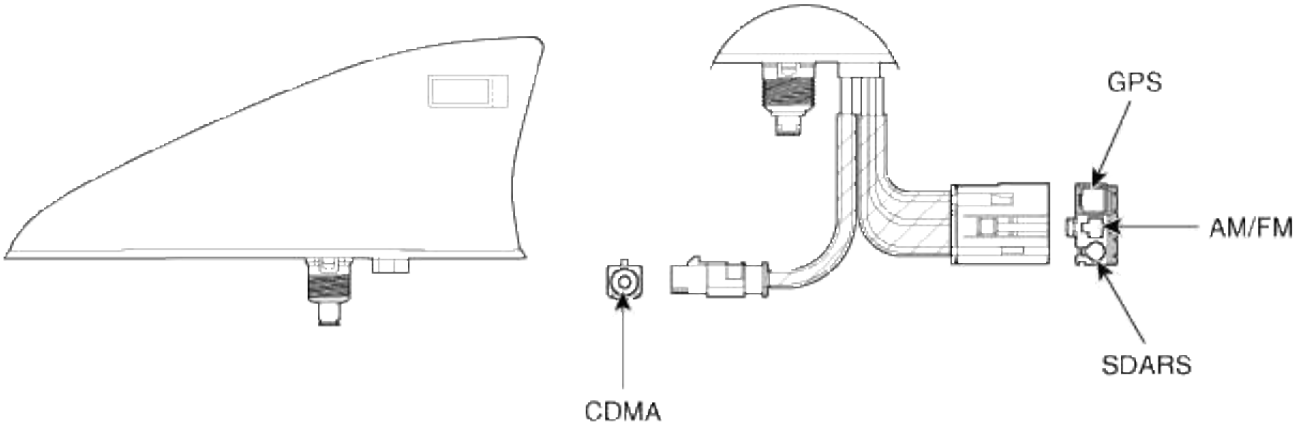
Tweeter Speaker (Front)

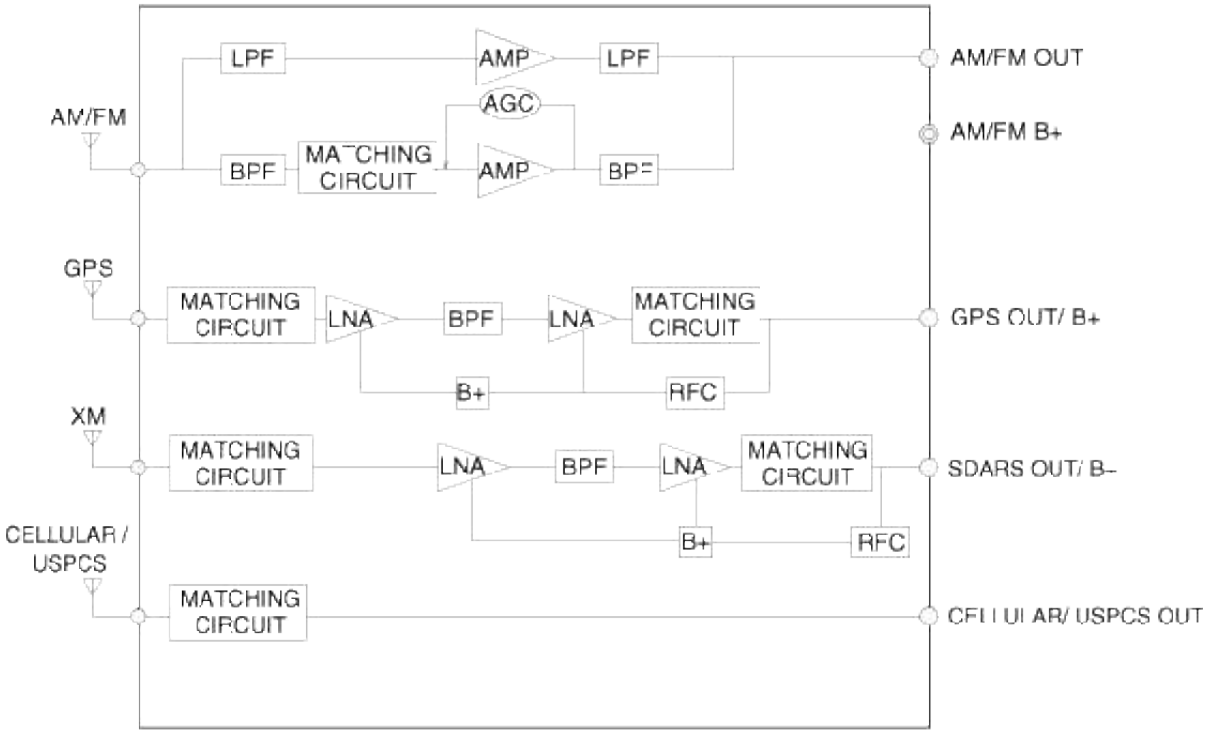
1. Connect the connector.
2. Install the tweeter speaker and front door quadrant inner cover

Body Electrical System > Audio > Antenna > Components and Components Location

Components

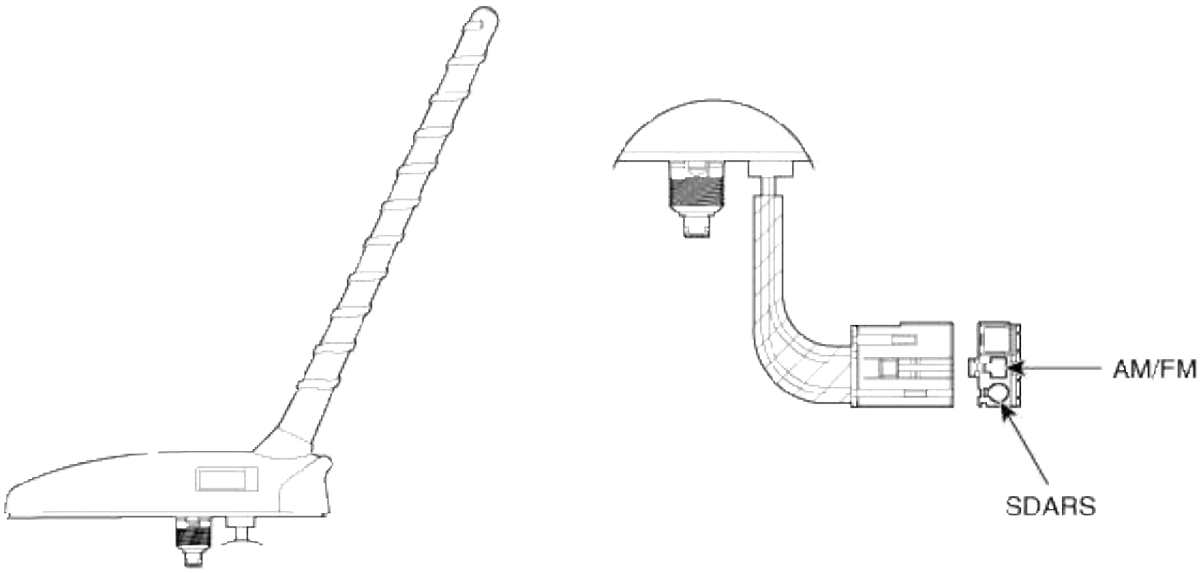
[RADIO+GPS+SDARS+CDMA]

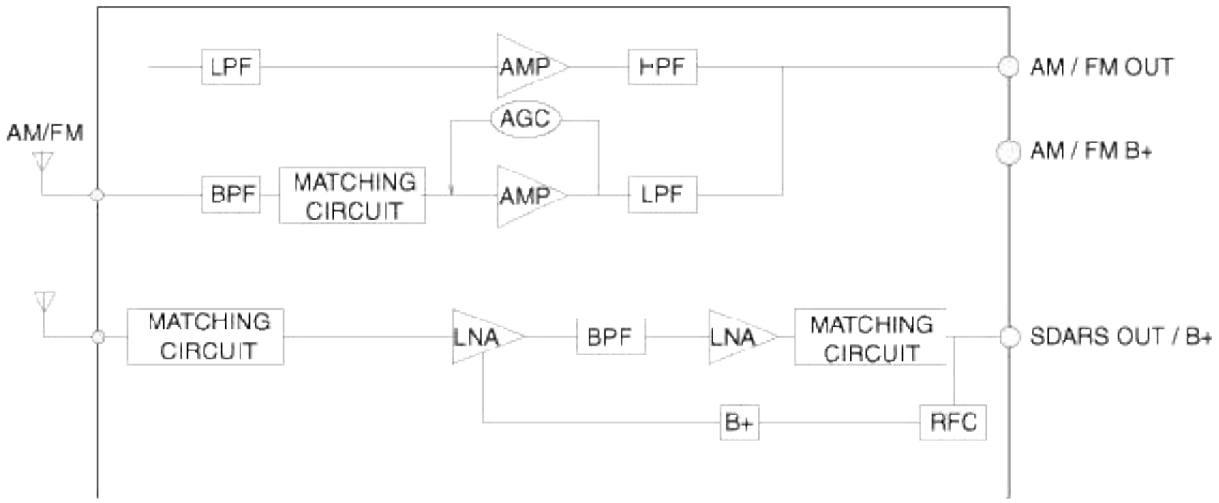




※ LNA : Low Noise Amplifier
BPF : Band Pass Filter
RFC : Radio Frequency Choke

[RADIO+SDARS(CANADA)]





※ LNA : Low Noise Amplifier
BPF : Band Pass Filter
RFC : Radio Frequency Choke

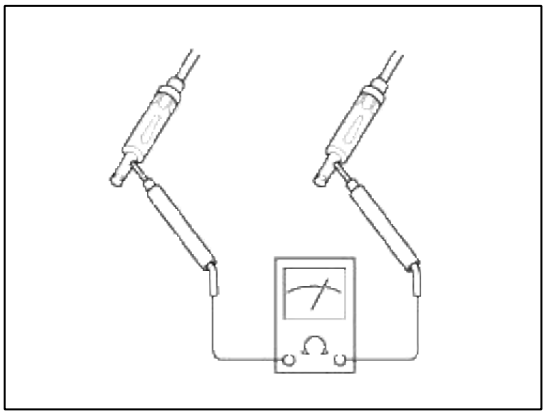
Body Electrical System > Audio > Antenna > Repair procedures

Inspection

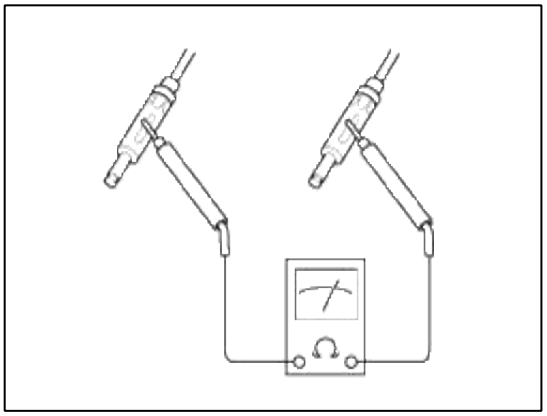
Antenna Cable

1. Remove the antenna jack from the audio unit and antenna.

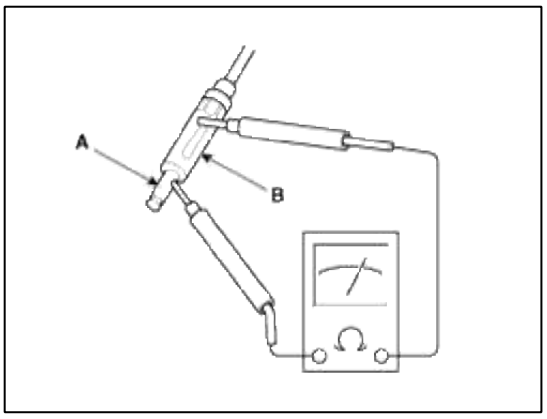
2. Check for continuity between the center poles of antenna cable.



3. Check for continuity between the outer poles of antenna cable. There should be continuity.



4. If there is no continuity, replace the antenna cable.
5. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.



6. If there is continuity, replace the antenna cable.

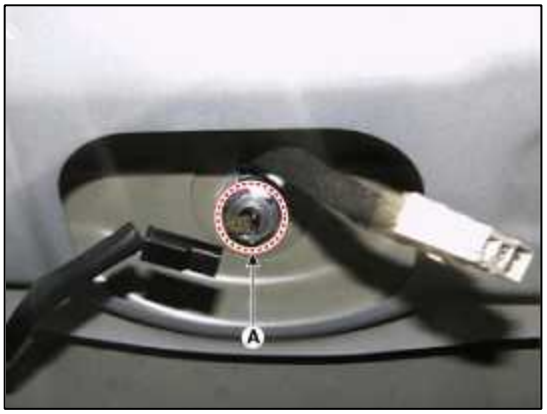
Removal

1. Remove the rear roof trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Roof Trim Assembly")

2. Disconnect the roof antenna connectors (A) from the roof antenna.



3. Remove the roof antenna (A) after removing a nut.



Installation

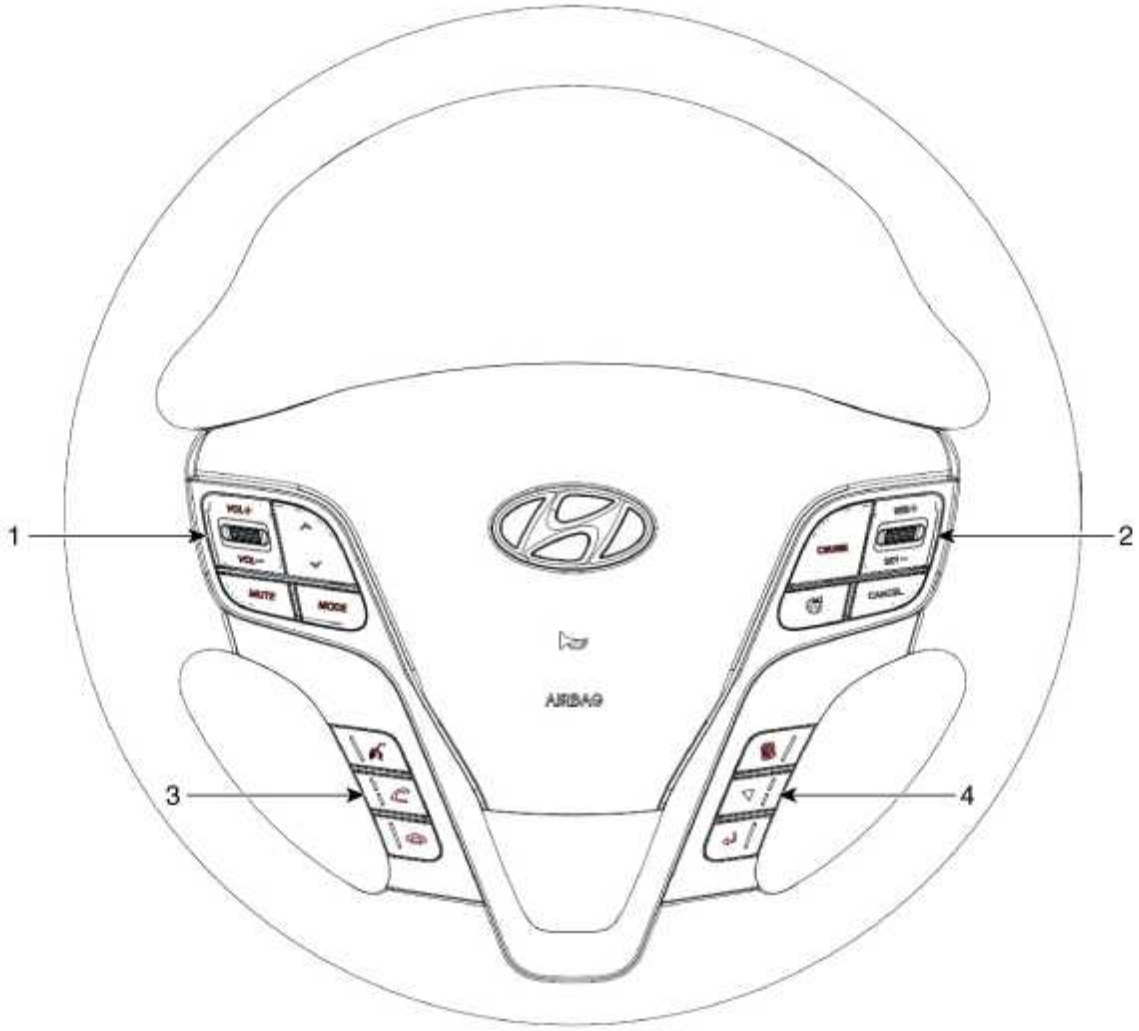
1. Connect the roof antenna connectors.
2. Install the rear roof trim.

NOTE

- Make sure that the cables and connectors are plugged in properly.
- Check the audio system.

Body Electrical System > Audio > Audio Remote Control > Components and Components Location

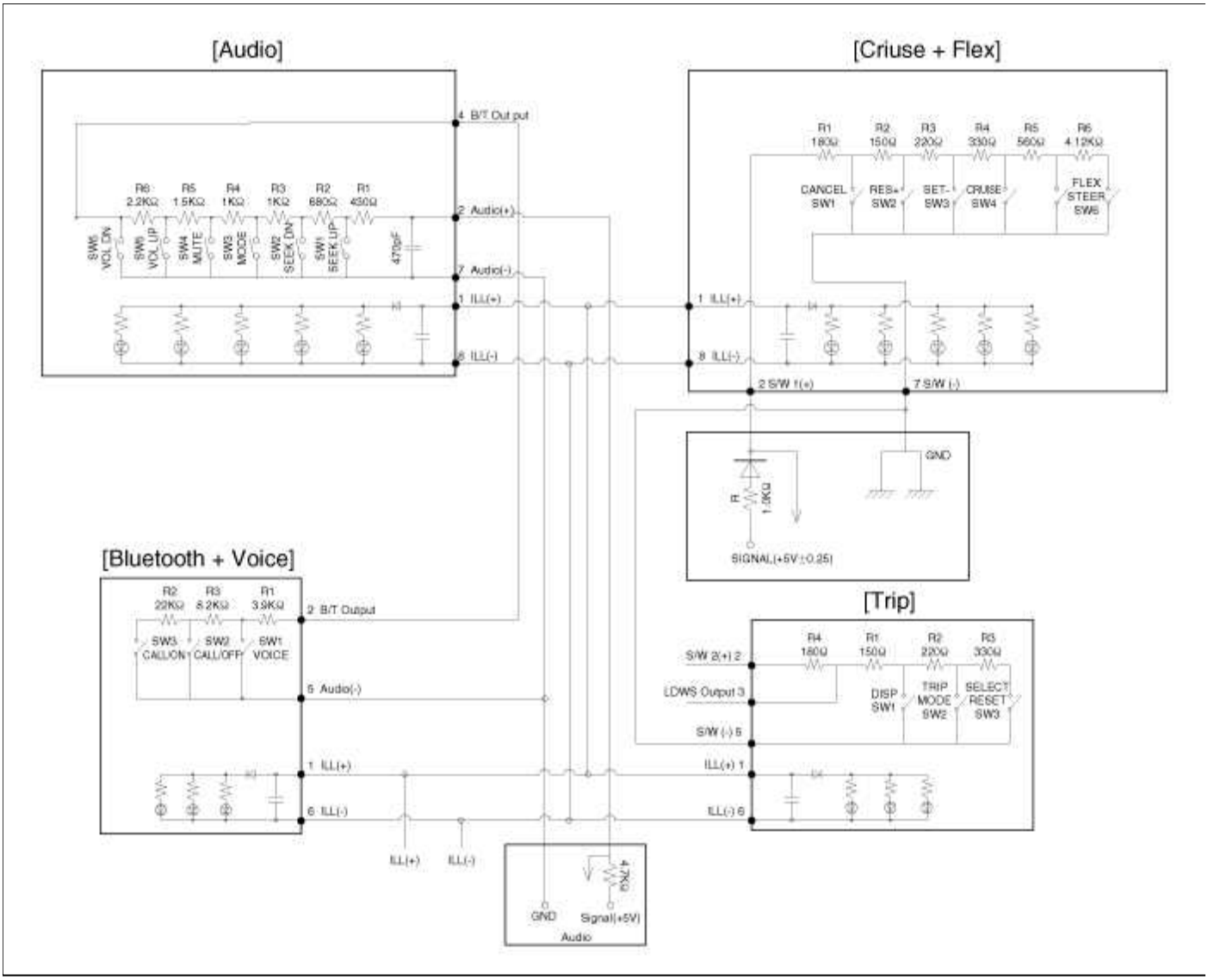
Components

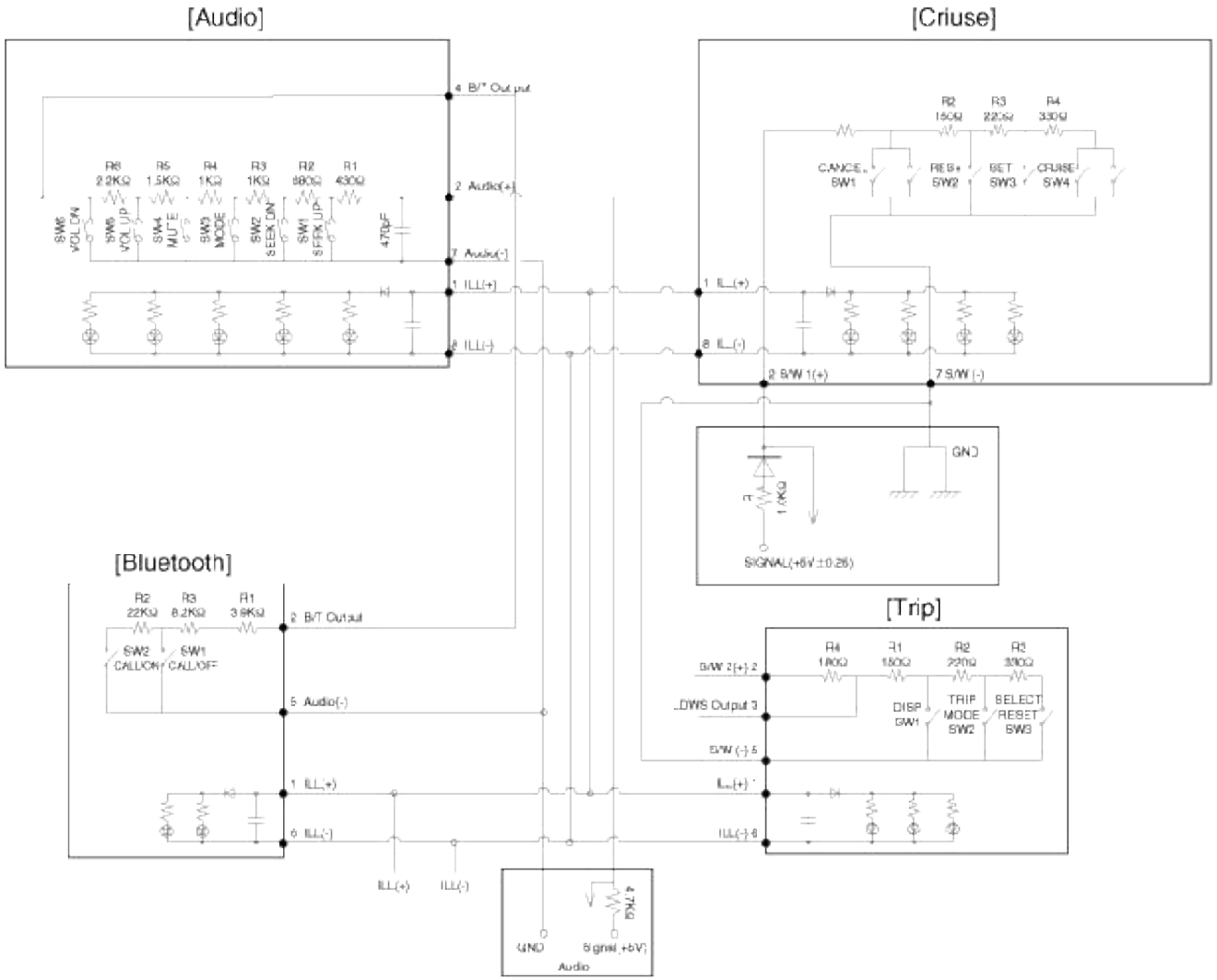


1. Remote control switch (LH) 2. Remote control switch (RH)	3. Bluetooth hands free switch 4. Trip switch

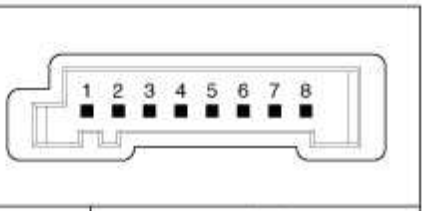
Body Electrical System > Audio > Audio Remote Control > Schematic Diagrams

Circuit Diagram


[Audio]
[Criuse + Flex]
[Bluetooth + Voice]
[Trip]
4 B/T Out put
2 Audio(+)
7 Audio(-)
1 ILL(+)
8 ILL(-)
R6 2.2KΩ
R5 1.5KΩ
R4 1KΩ
R3 1KΩ
R2 680Ω
R1 430Ω
SW6 VOL DN
SW5 VOL UP
SW4 MUTE
SW3 MODE
SW2 SEEK DN
SW1 SEEK UP
470pF
R1 180Ω
R2 150Ω
R3 220Ω
R4 330Ω
R5 560Ω
R6 4.12KΩ
CANCEL SW1
RES+ SW2
SET- SW3
CRUISE SW4
FLEX STEER SW6
2 S/W 1(+)
7 S/W (-)
GND
R
1.0KΩ
SIGNAL(+5V±0.25)
R2 22KΩ
R3 8.2KΩ
R1 3.9KΩ
SW3 CALL/ON
SW2 CALL/OFF
SW1 VOICE
2 B/T Output
5 Audio(-)
1 ILL(+)
6 ILL(-)
ILL(+)
ILL(-)
4.7KΩ
GND
Signal(+5V)
Audio
S/W 2(+) 2
LDWS Output 3
S/W (-) 5
ILL(+) 1
ILL(-) 6
R4 180Ω
R1 150Ω
R2 220Ω
R3 330Ω
DISP SW1
TRIP MODE SW2
SELECT RESET SW3

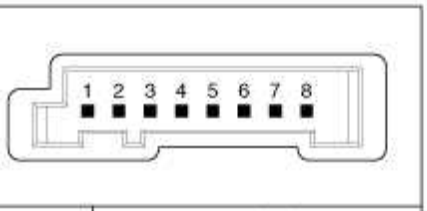

[Audio]
[Criuse]
[Bluetooth]
[Trip]
4 B/T Output
2 Audio(+)
7 Audio(-)
1 ILL(+)
8 ILL(-)
R6 2.2KΩ
R5 1.5KΩ
R4 1KΩ
R3 1KΩ
R2 880Ω
R1 430Ω
SW6 VOL DN
SW5 VOL UP
SW4 MUTE
SW3 MODE
SW2 SEEK DN
SW1 SEEK UP
470pF
R2 150Ω
R3 220Ω
R4 330Ω
CANCEL SW1
RES+ SW2
SET SW3
CRUISE SW4
1 IL_(+)
8 IL_(-)
2 S/W 1(+)
7 S/W (-)
GND
1.0KΩ
SIGNAL(+5V ±0.25)
R2 22KΩ
R3 8.2KΩ
R1 3.9KΩ
SW2 CALL/ON
SW1 CALL/OFF
2 B/T Output
5 Audio(-)
1 ILL(+)
6 ILL(-)
ILL(+)
ILL(-)
4.7KΩ
GND
Signal (+5V)
Audio
R4 180Ω
R1 150Ω
R2 220Ω
R3 330Ω
DISP SW1
TRIP MODE SW2
SELECT RESET SW3

[Audio]



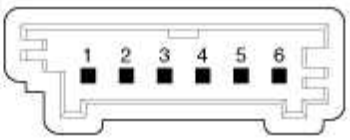
No.	Description
1	Illumination(+)
2	Audio(+)
3	-
4	Bluetooth input
5	-
6	-
7	Audio(-)
8	Illumination(-)

[Criuse + Flex]



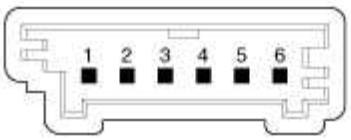
No.	Description
1	Illumination(+)
2	Switch1(+)
3	-
4	-
5	-
6	-
7	Switch(-)
8	Illumination(-)

[Bluetooth + Voice]



No.	Description
1	Illumination(+)
2	Bluetooth input
3	-
4	-
5	Audio(-)
6	Illumination(-)

[Trip]

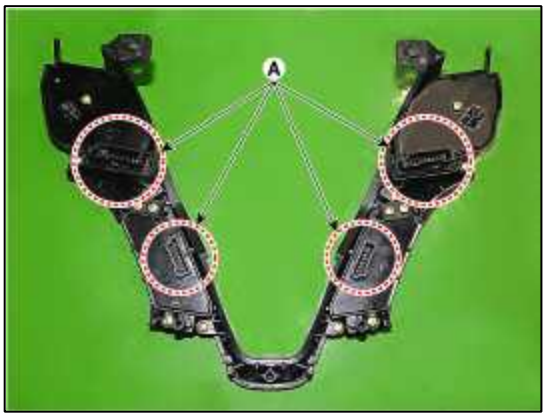


No.	Description
1	Illumination(+)
2	Switch2(+)
3	LDWS output
4	-
5	Switch(-)
6	Illumination(-)

Body Electrical System > Audio > Audio Remote Control > Repair procedures

Inspection

1. Check for resistance between terminals in each switch position.



[Audio]

Switch	Connector terminal	Resistance (± 5%)
SEEK up	2-7	430 Ω
SEEK down	2-7	1.11 kΩ
Mode	2-7	2.11 kΩ
Mute	2-7	3.11 kΩ
Volume up	2-7	4.61 kΩ
Volume down	2-7	6.81 kΩ

[Cruise + Flex]

Switch	Connector terminal	Resistance (± 5%)
CANCEL	2-7	180 Ω
RES +	2-7	330 Ω
SET -	2-7	550 Ω
Cruise ON/OFF	2-7	880 Ω
Limit	2-7	1.44 kΩ
Flex	2-7	5.56 kΩ

[Bluetooth + Voice]

Switch	Connector terminal	Resistance (± 5%)
Voice	2-5	3.9 kΩ
End	2-5	12.1 kΩ
Send	2-5	34.1 kΩ

[Trip]

Switch	Connector terminal	Resistance (± 5%)
Group	2-5	330 Ω
Trip	2-5	550 Ω
Select/Reset	2-5	880 Ω

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")

3. Remove the steering wheel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Steering System - "Steering Column and Shaft")
4. Remove the steering wheel cover (A) after loosening the screws.

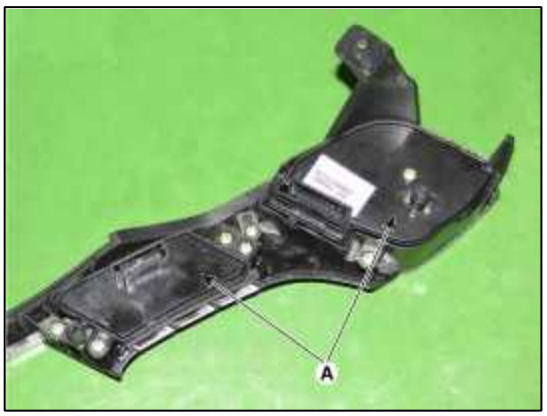




5. Loosen the screws after disconnecting the steering wheel remote control switch connector (A).



6. Remove the remote control switchs (A).



Installation

1. Install the remote control switch on the steering wheel.
2. Install the steering wheel.
3. Reconnect the remote control switch connector and airbag connectors.

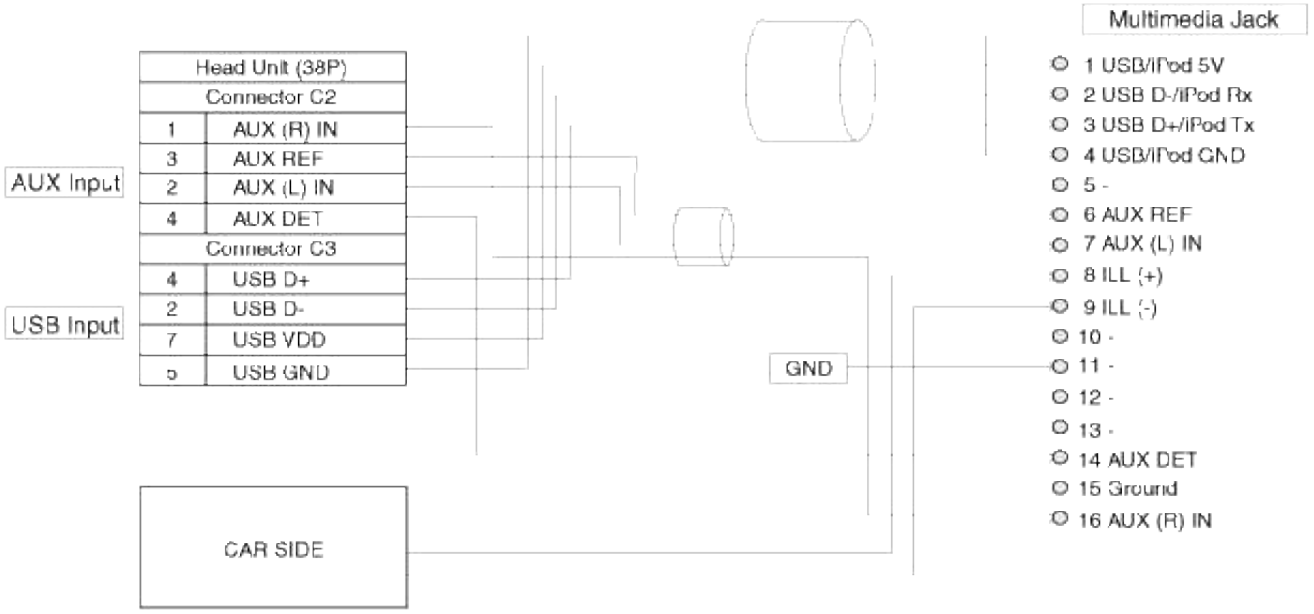
> NOTE
>
> Make sure that the switch connector is plugged in properly.

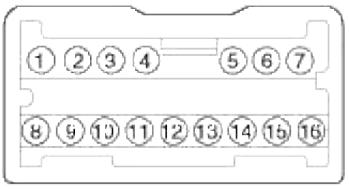
4. Install the driver airbag module.
5. Connect the negative (-) battery terminal.

Body Electrical System > Audio > AUX(Auxiliary) Jack > Schematic Diagrams

Circuit Diagram

[AUX, USB, iPod Jack]



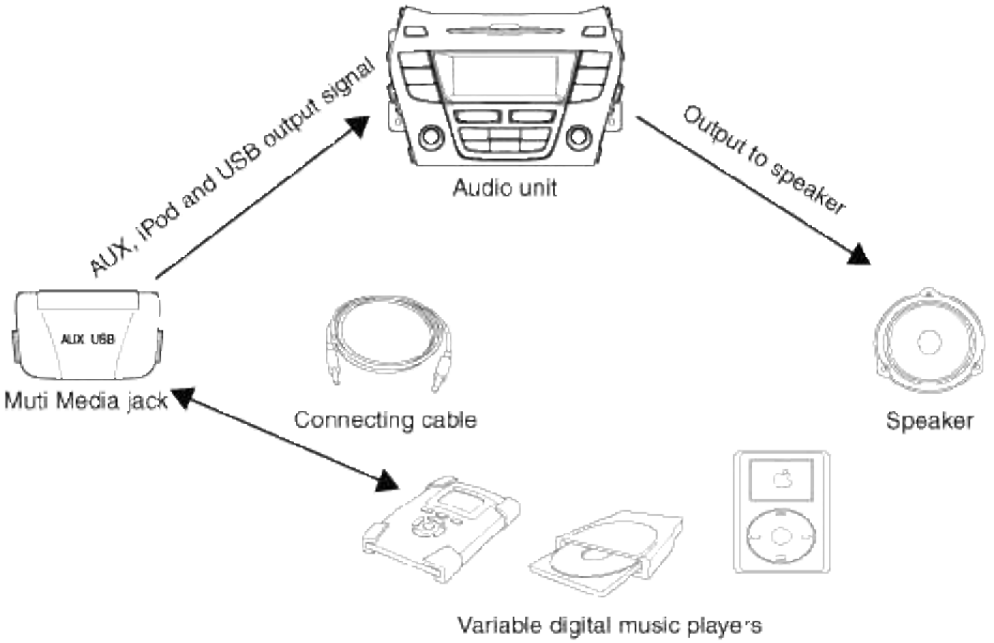
OUTPUT Connector	No.	Description
	1	USB/iPod 5V
	2	USB D-/iPod Rx
	3	USB D+/iPod Tx
	4	USB/iPod GND
	5	-
	6	AUX REF
	7	AUX (L) IN
	8	ILL (+)
	9	ILL (-)
	10	-
	11	-
	12	-
	13	-
	14	AUX DET
	15	Ground
	16	AUX (R) IN

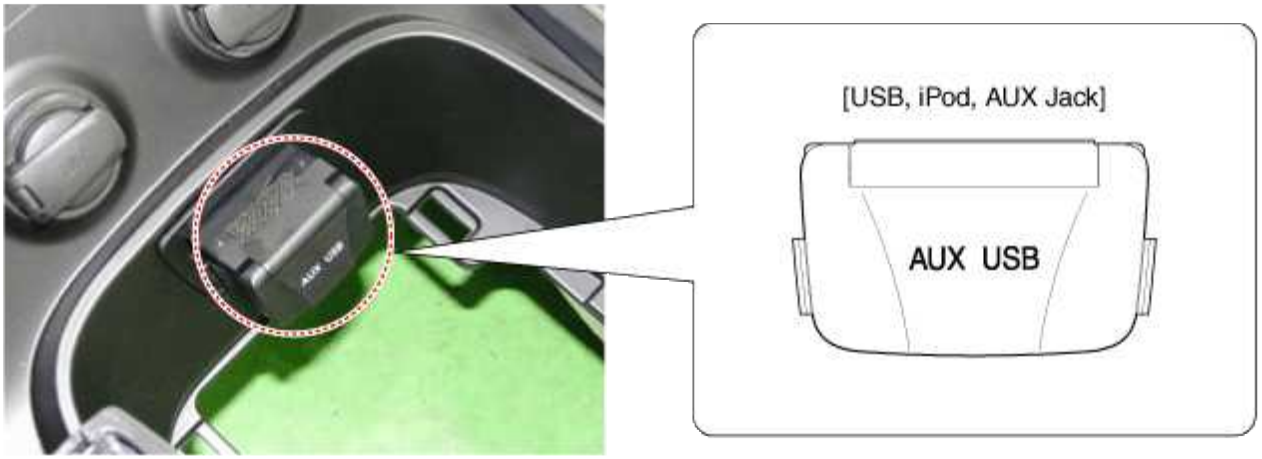
Body Electrical System > Audio > AUX(Auxiliary) Jack > Description and Operation

Description

The AUX, iPod and USB JACK on the center console is for customers who like to listen to external portable music players like the MP3, iPod, earphone, USB memory stick, CD player and etc., through the vehicle's sound system when it is linked to this jack.

If sound distortion occurs it may be due to a mismatch of specifications between units.





Body Electrical System > Audio > AUX(Auxiliary) Jack > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.

2. Remove the console front complete assembly (A).
<a href="content.asp?
vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
target="_blank">(Refer to Body - "Floor Console Assembly")



3. Remove the multimedia jack (B) after disconnecting the connector (A) from the console front complete assembly.





Installation

1. Install the multimedia jack.
2. Install the console front complete assembly.
3. Connect the negative (-) battery connector.

Body Electrical System > Audio > Troubleshooting

Troubleshooting

Customer Complaint Analysis Check Sheet

TROUBLE IN	☐ ALL ☐ AM ☐ FM ☐ Sirius ☐ CD ☐ MP3 ☐ CD changer ☐ AMP ☐ Others
TROUBLE OCCURS	☐ Always ☐ Engine start ☐ Engine Running ☐ Cold ☐ Warm ☐ Sometimes ☐ Most of the time ☐ Engine off
TYPE OF TROUBLE	☐ Will not play ☐ Weak ☐ Squealing noise ☐ Display/illumination poor ☐ CD skips & jumps ☐ CD will not eject or insert ☐ Others (Describe) :
OTHERS	▶ Customer complaint contents : ▶ Have you checked customer's defects :
* Using the customer complaint analysis check sheet for reference, ask the customer for as much detail as possible about the problem.	

There are six areas where a problem can occur: wiring harness, the radio, the CD player, and speaker. Troubleshooting enables you to confine the problem to a particular area.

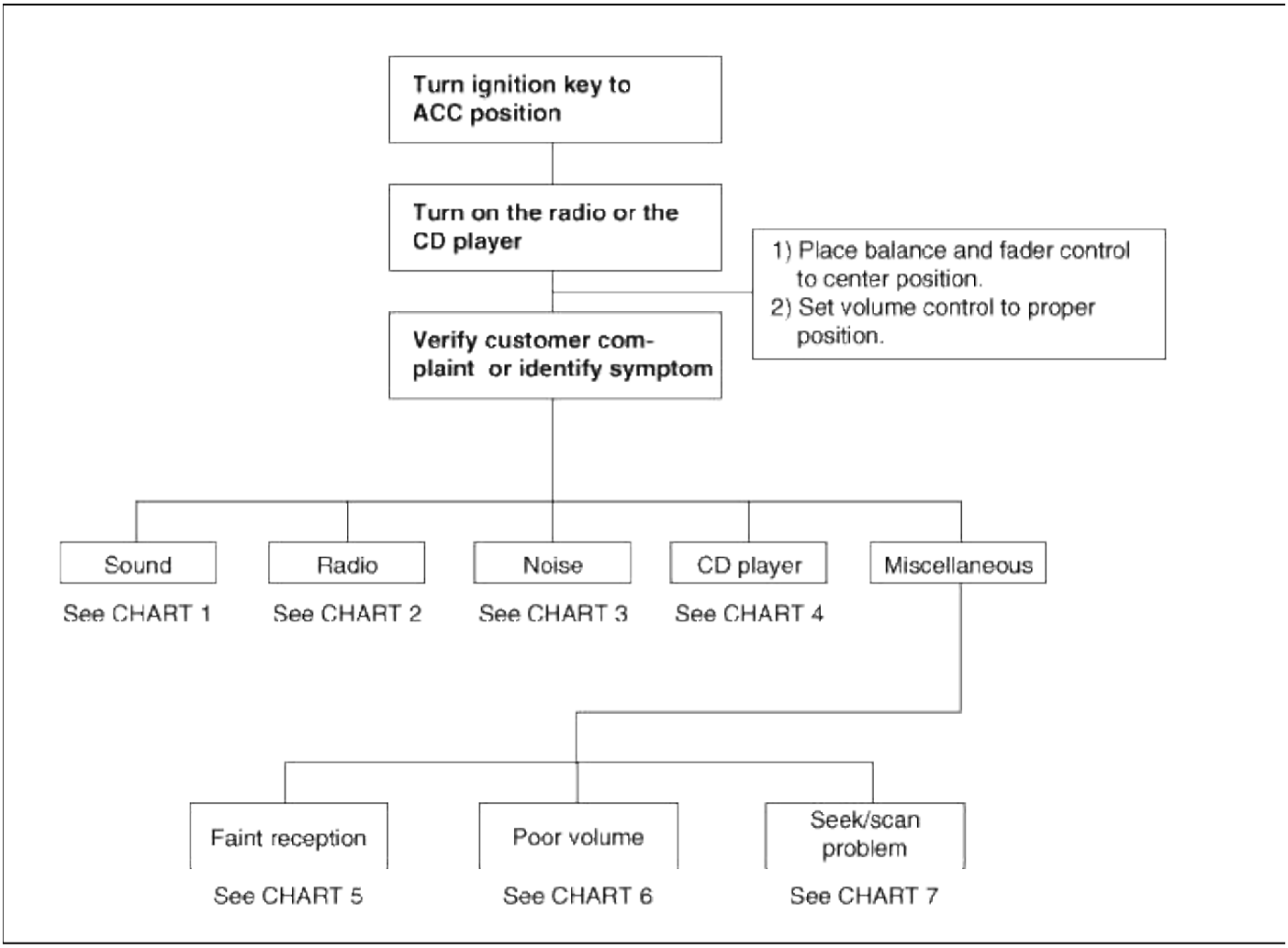
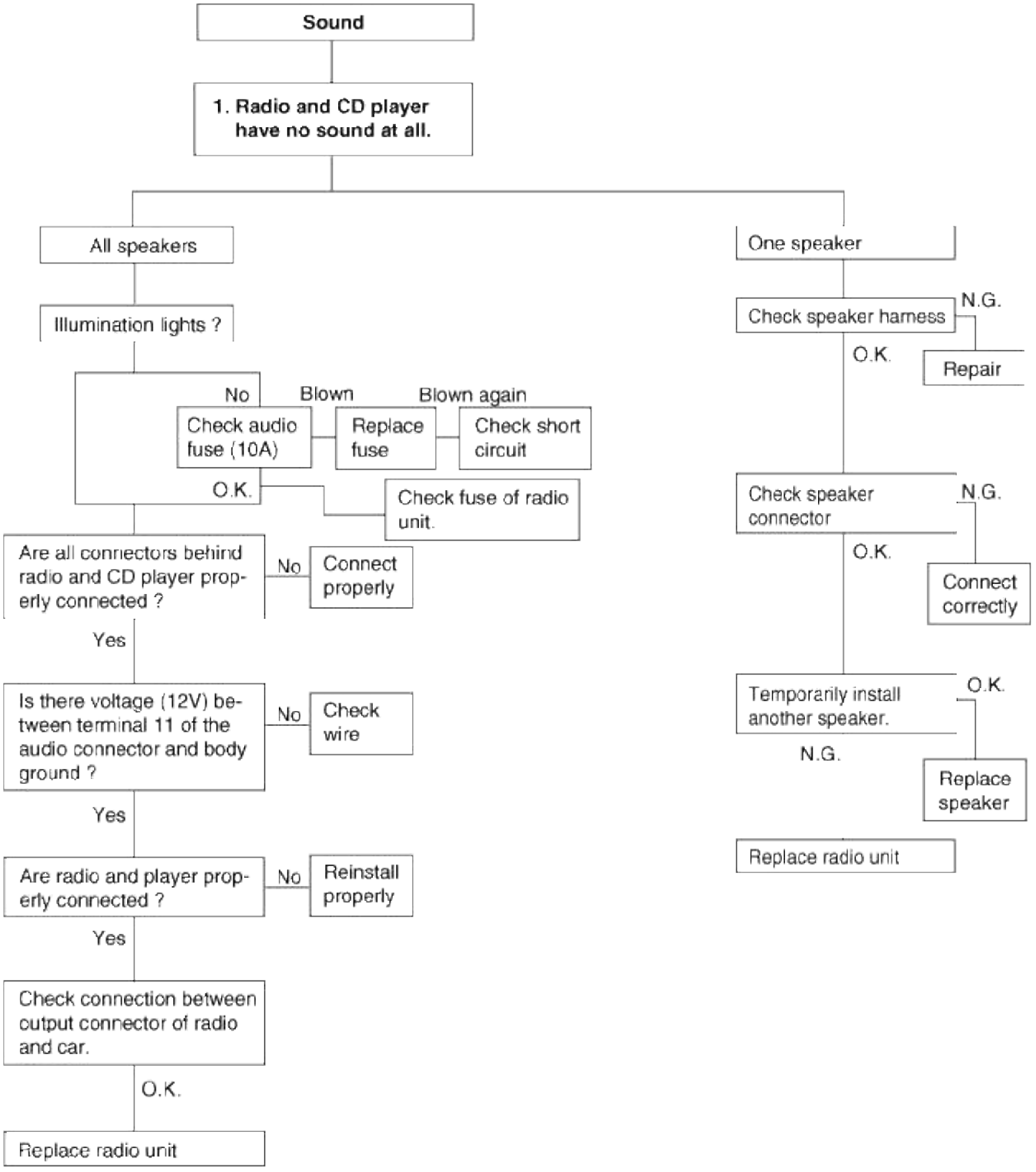
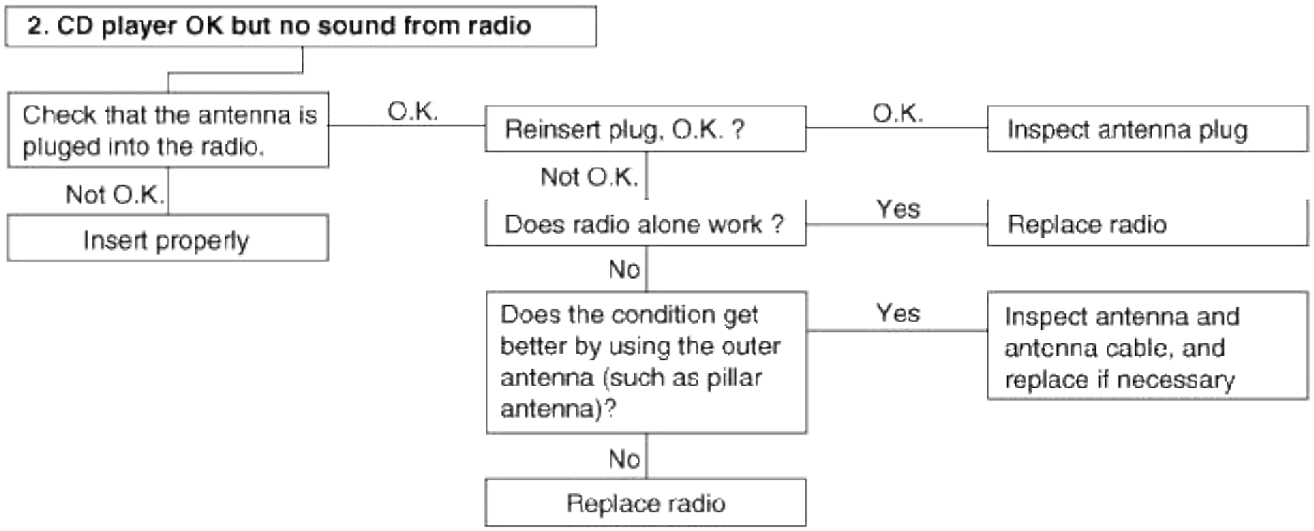


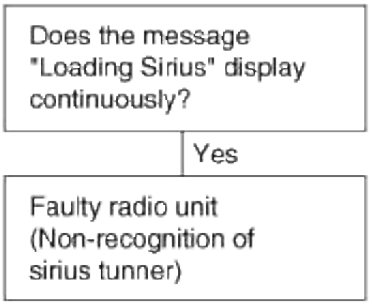
Chart 1

1. RADIO


Sound
1. Radio and CD player have no sound at all.
All speakers
Illumination lights ?
No
Blown
Blown again
Check audio fuse (10A)
Replace fuse
Check short circuit
O.K.
Check fuse of radio unit.
Are all connectors behind radio and CD player properly connected ?
No
Connect properly
Yes
Is there voltage (12V) between terminal 11 of the audio connector and body ground ?
No
Check wire
Yes
Are radio and player properly connected ?
No
Reinstall properly
Yes
Check connection between output connector of radio and car.
O.K.
Replace radio unit
One speaker
Check speaker harness
N.G.
O.K.
Repair
Check speaker connector
N.G.
O.K.
Connect correctly
Temporarily install another speaker.
O.K.
N.G.
Replace speaker
Replace radio unit


2. CD player OK but no sound from radio
Check that the antenna is pluged into the radio.
O.K.
Reinsert plug, O.K. ?
O.K.
Inspect antenna plug
Not O.K.
Insert properly
Not O.K.
Does radio alone work ?
Yes
Replace radio
No
Does the condition get better by using the outer antenna (such as pillar antenna)?
Yes
Inspect antenna and antenna cable, and replace if necessary
No
Replace radio

2. Sirius


Does the message "Loading Sirius" display continuously?
Yes
Faulty radio unit (Non-recognition of sirius tunner)

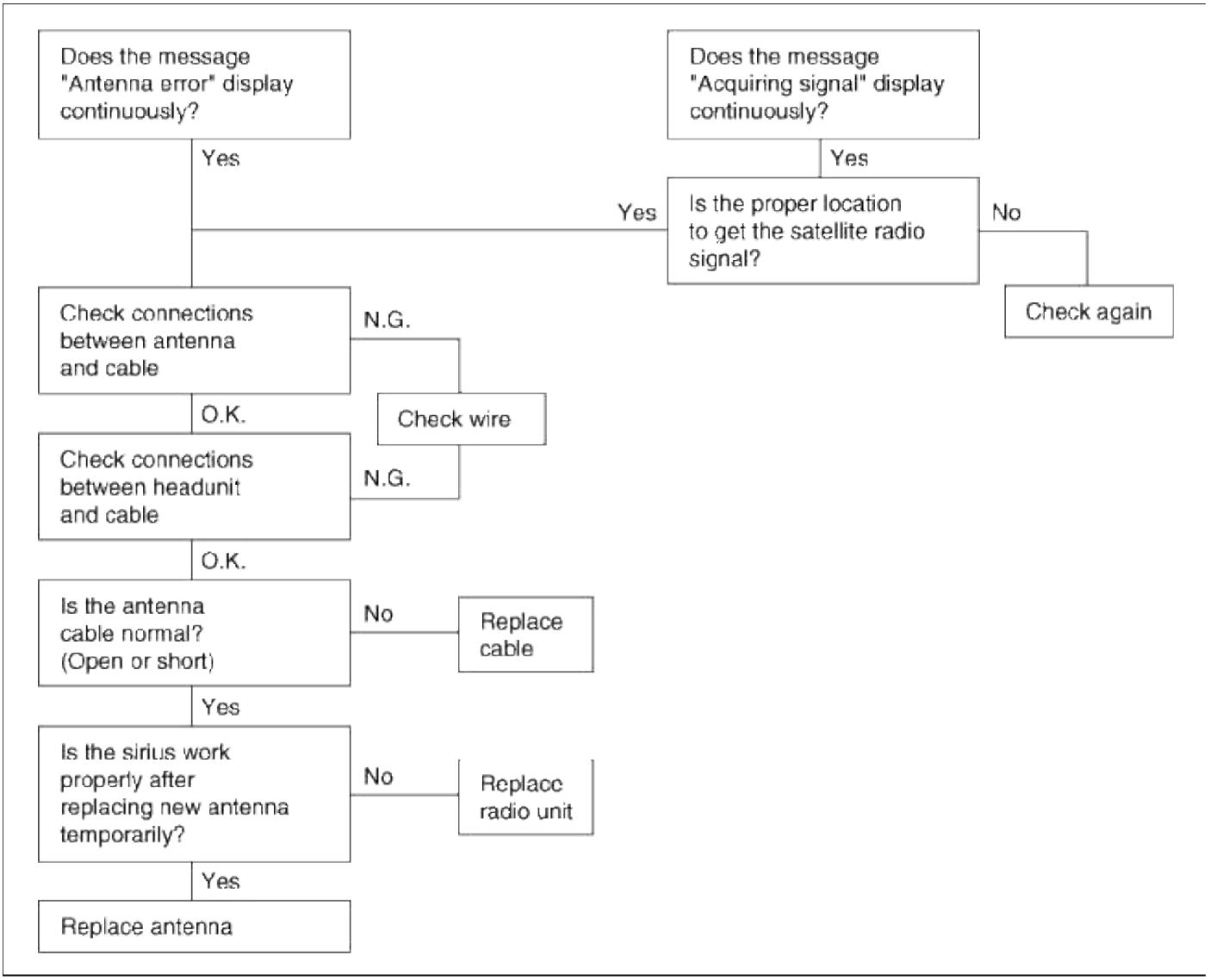

Does the message "Antenna error" display continuously?
Yes
Does the message "Acquiring signal" display continuously?
Yes
Yes
Is the proper location to get the satellite radio signal?
No
Check again
Check connections between antenna and cable
N.G.
Check wire
O.K.
Check connections between headunit and cable
N.G.
O.K.
Is the antenna cable normal? (Open or short)
No
Replace cable
Yes
Is the sirius work properly after replacing new antenna temporarily?
No
Replace radio unit
Yes
Replace antenna

Chart 2

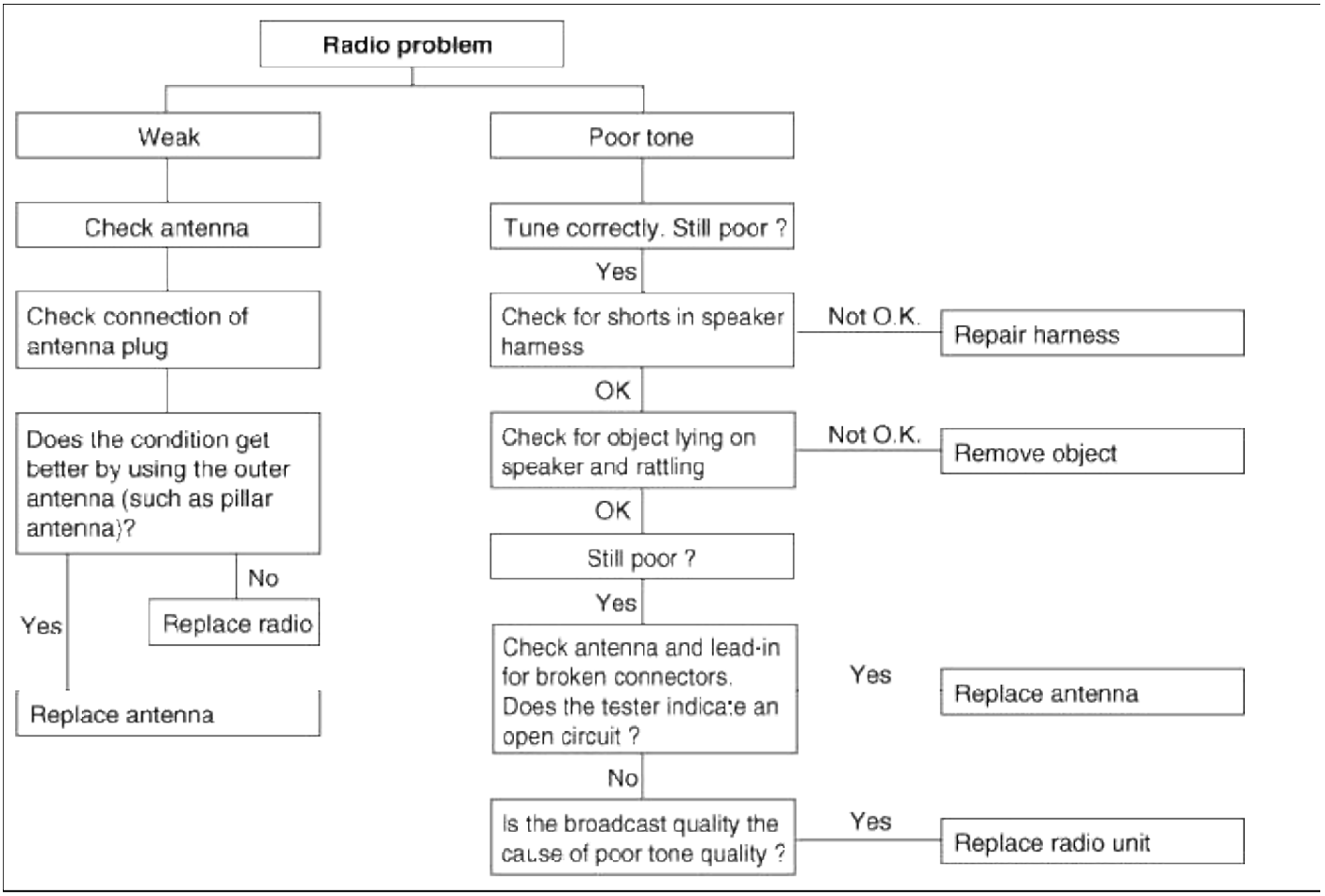

Radio problem
Weak
Check antenna
Check connection of antenna plug
Does the condition get better by using the outer antenna (such as pillar antenna)?
No
Yes
Replace radio
Replace antenna
Poor tone
Tune correctly. Still poor ?
Yes
Check for shorts in speaker harness
Not O.K.
Repair harness
OK
Check for object lying on speaker and rattling
Not O.K.
Remove object
OK
Still poor ?
Yes
Check antenna and lead-in for broken connectors. Does the tester indicate an open circuit ?
Yes
Replace antenna
No
Is the broadcast quality the cause of poor tone quality ?
Yes
Replace radio unit

Chart 3

1. RADIO

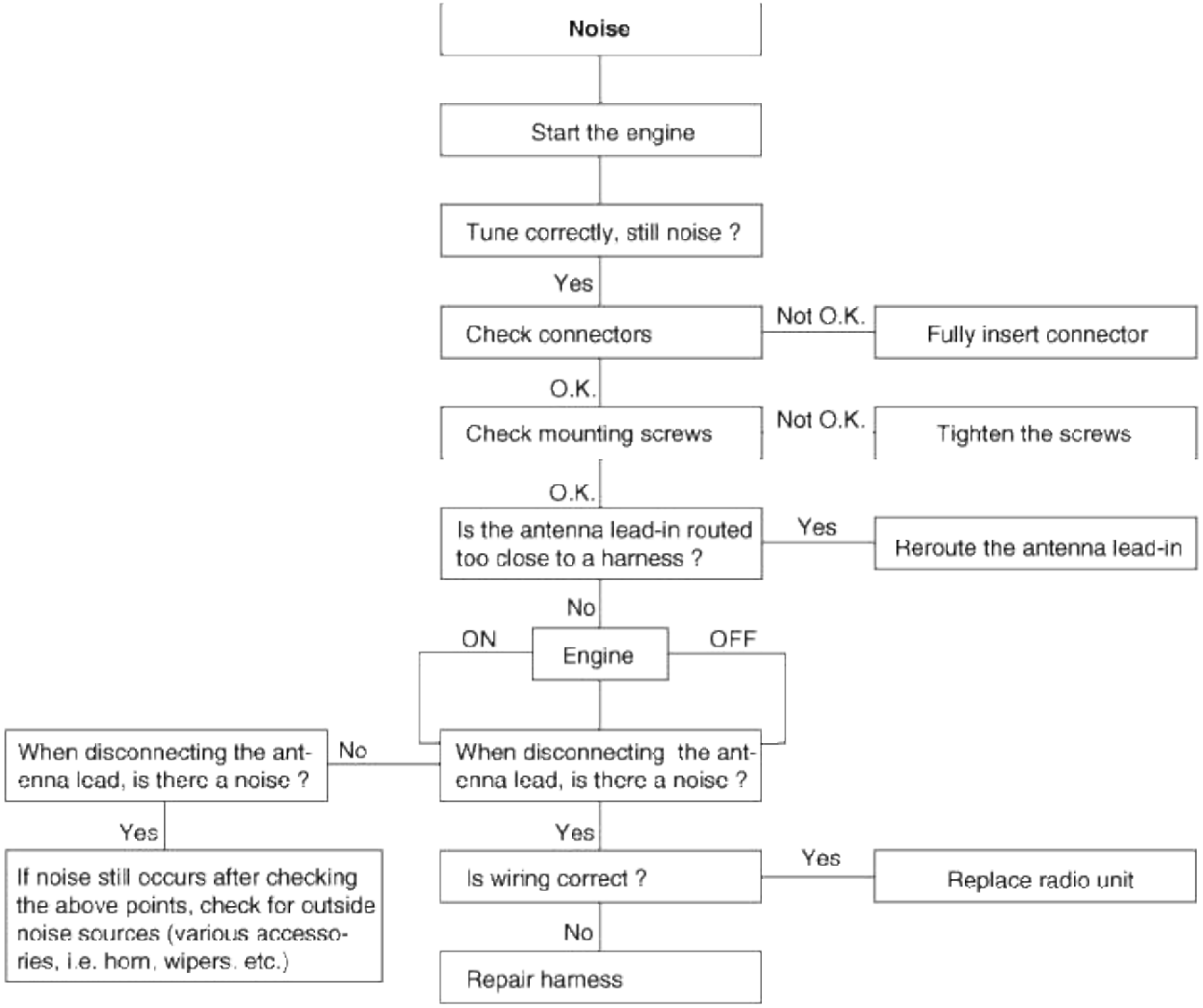
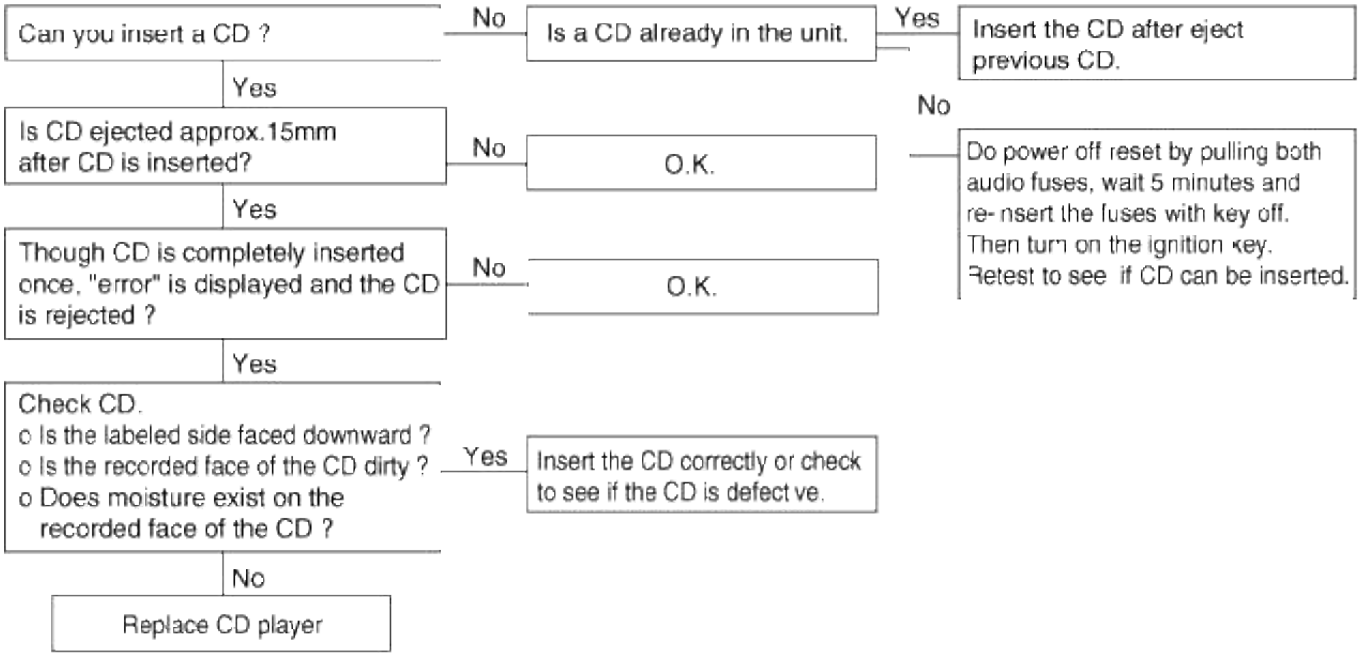
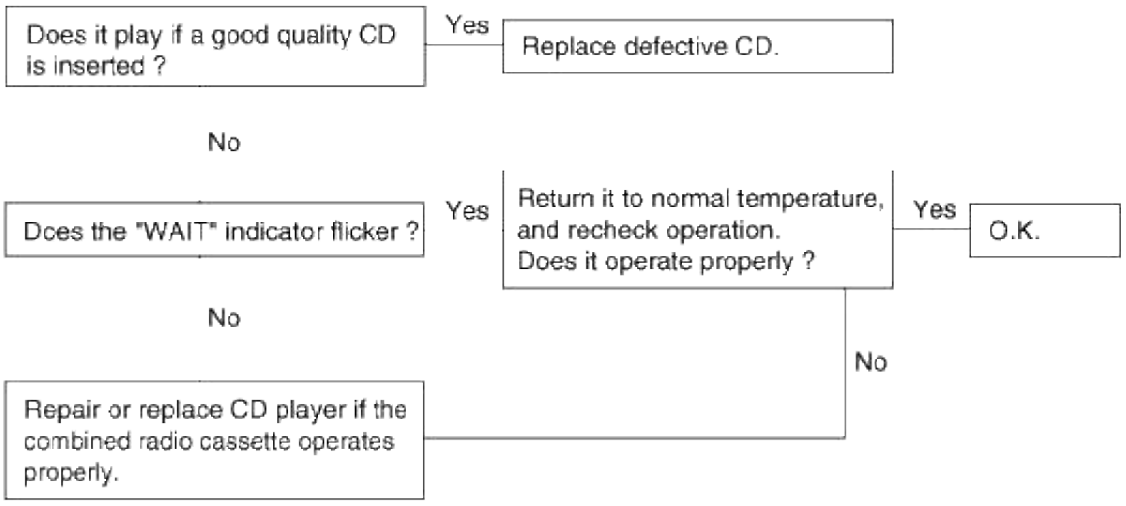


Chart 4

1. CD WILL NOT BE ACCEPTED

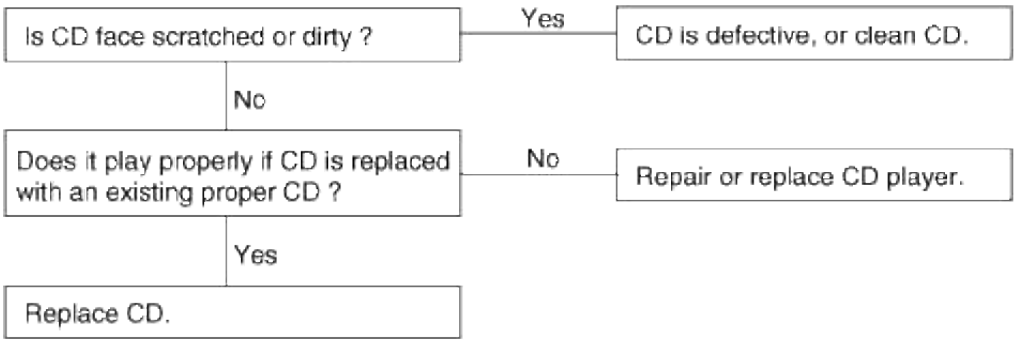


2. NO SOUND

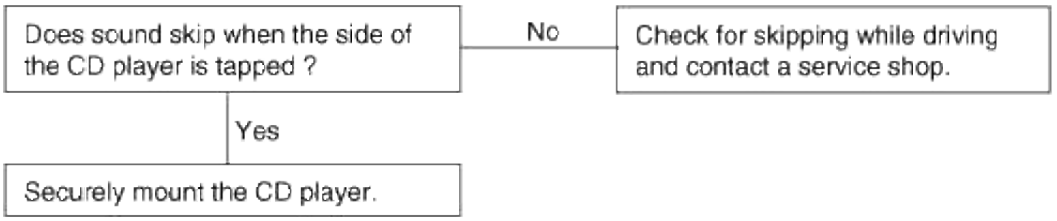


3. CD SOUND SKIPS

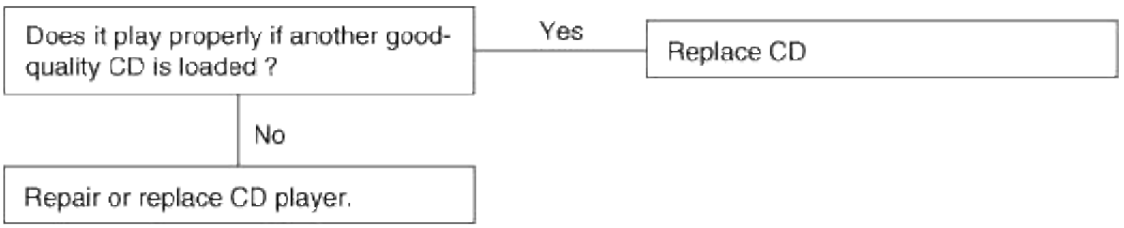
1) Sound sometimes skips when parking.



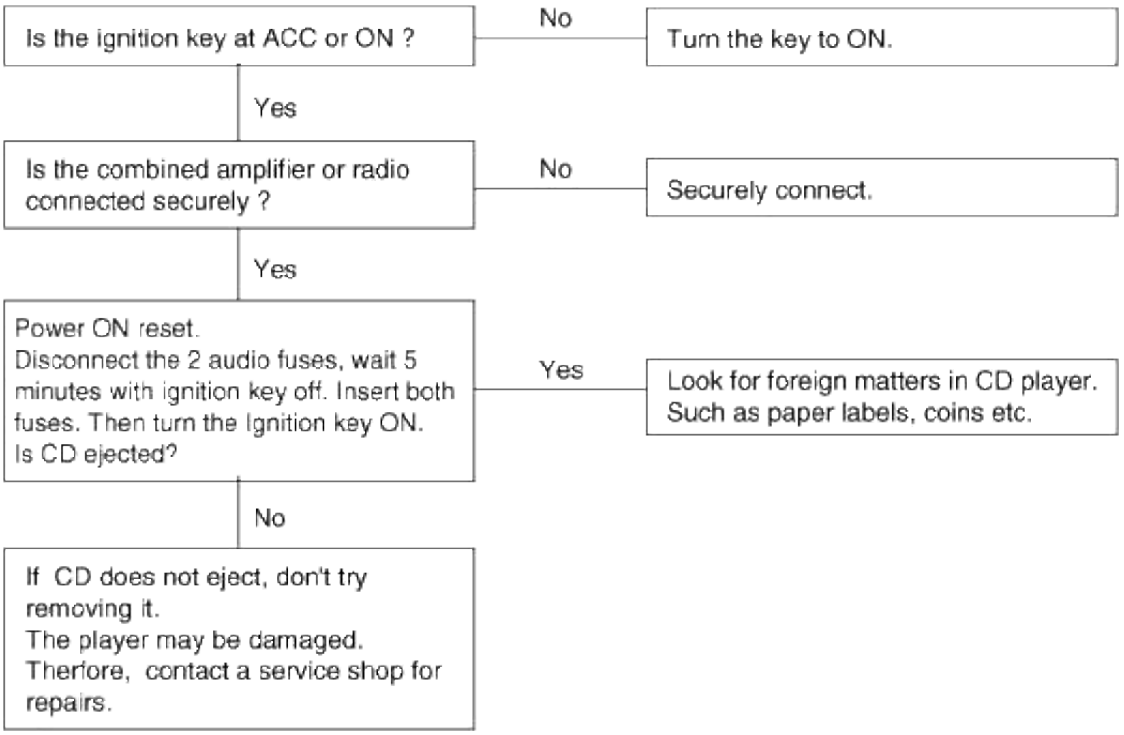
2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)



4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT



6. NO SOUND FROM ONE SPEAKER

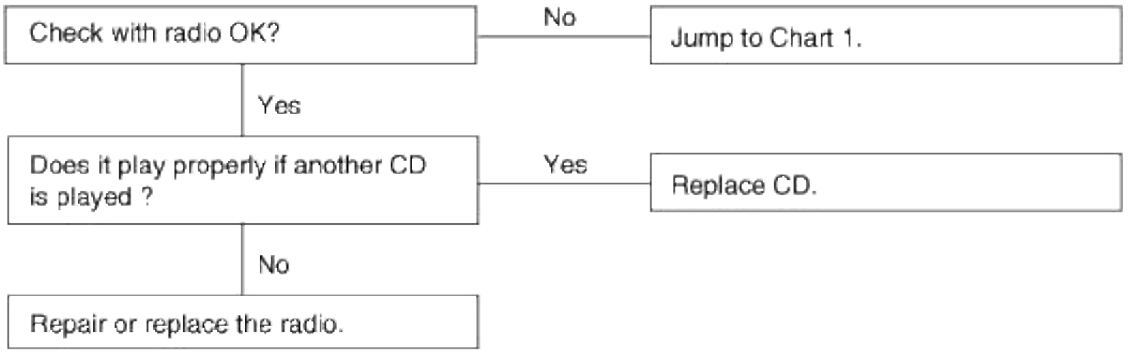


Chart 5

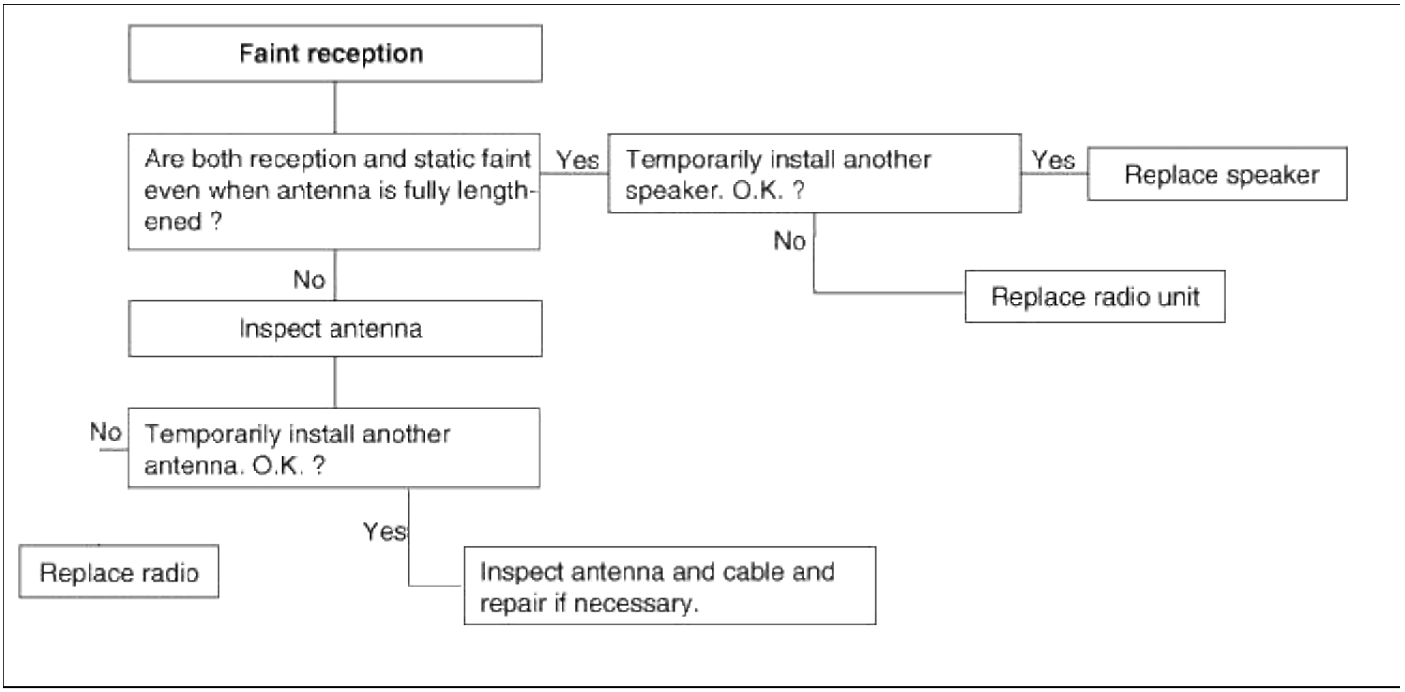


Chart 6

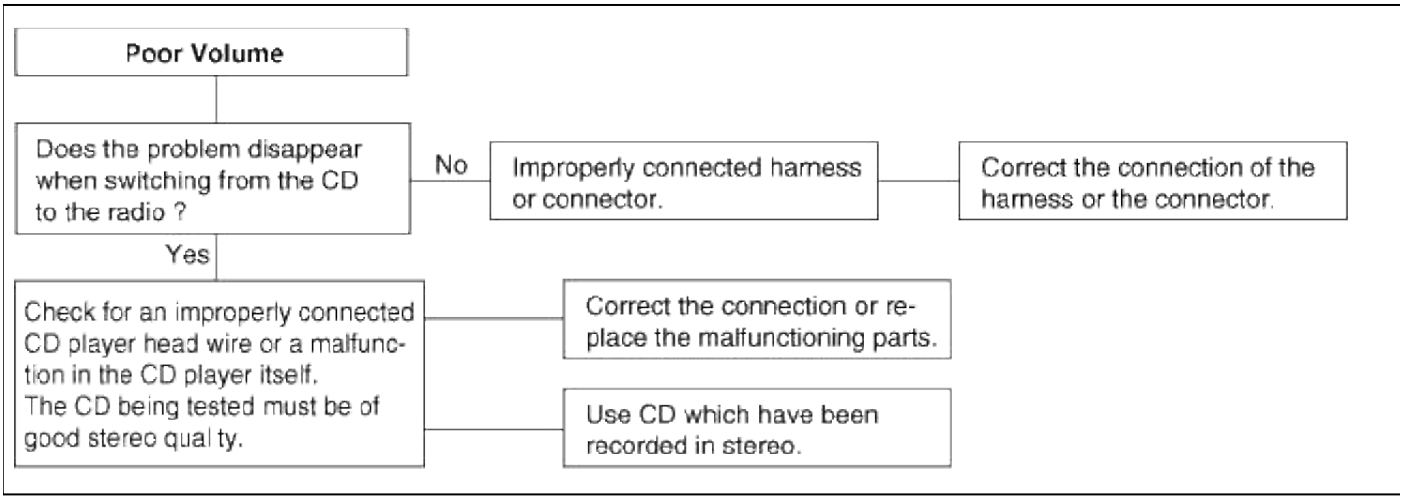
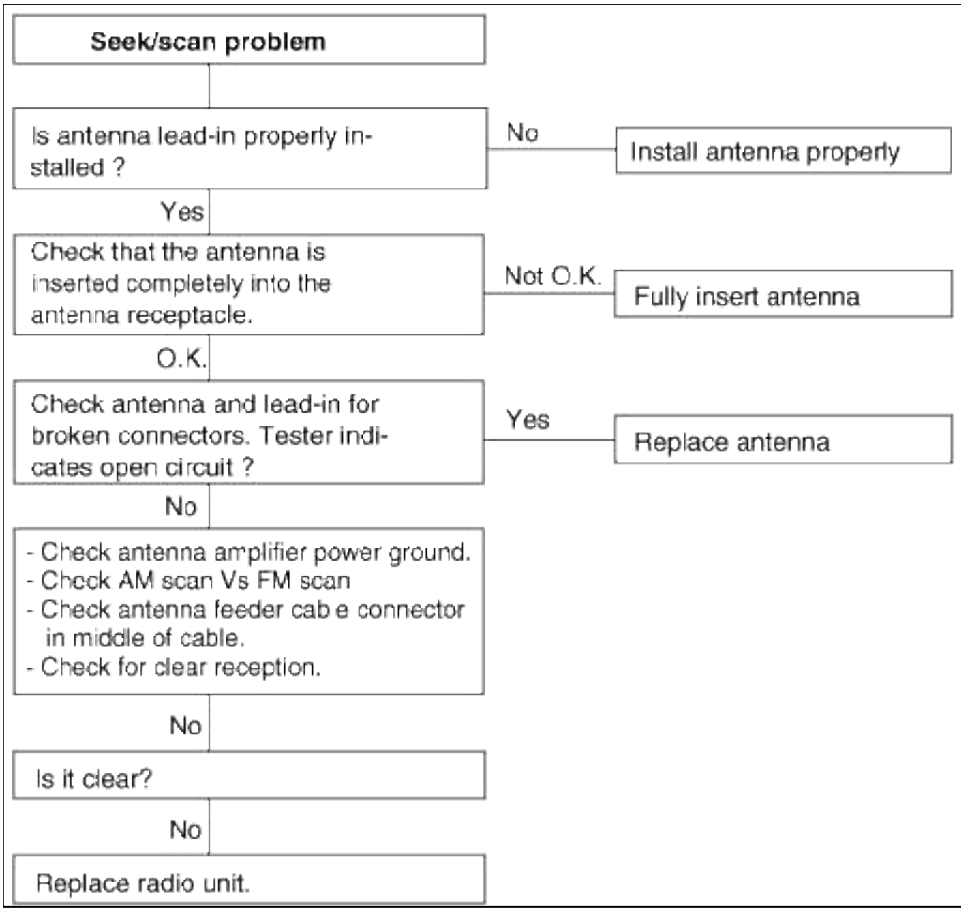


Chart 7



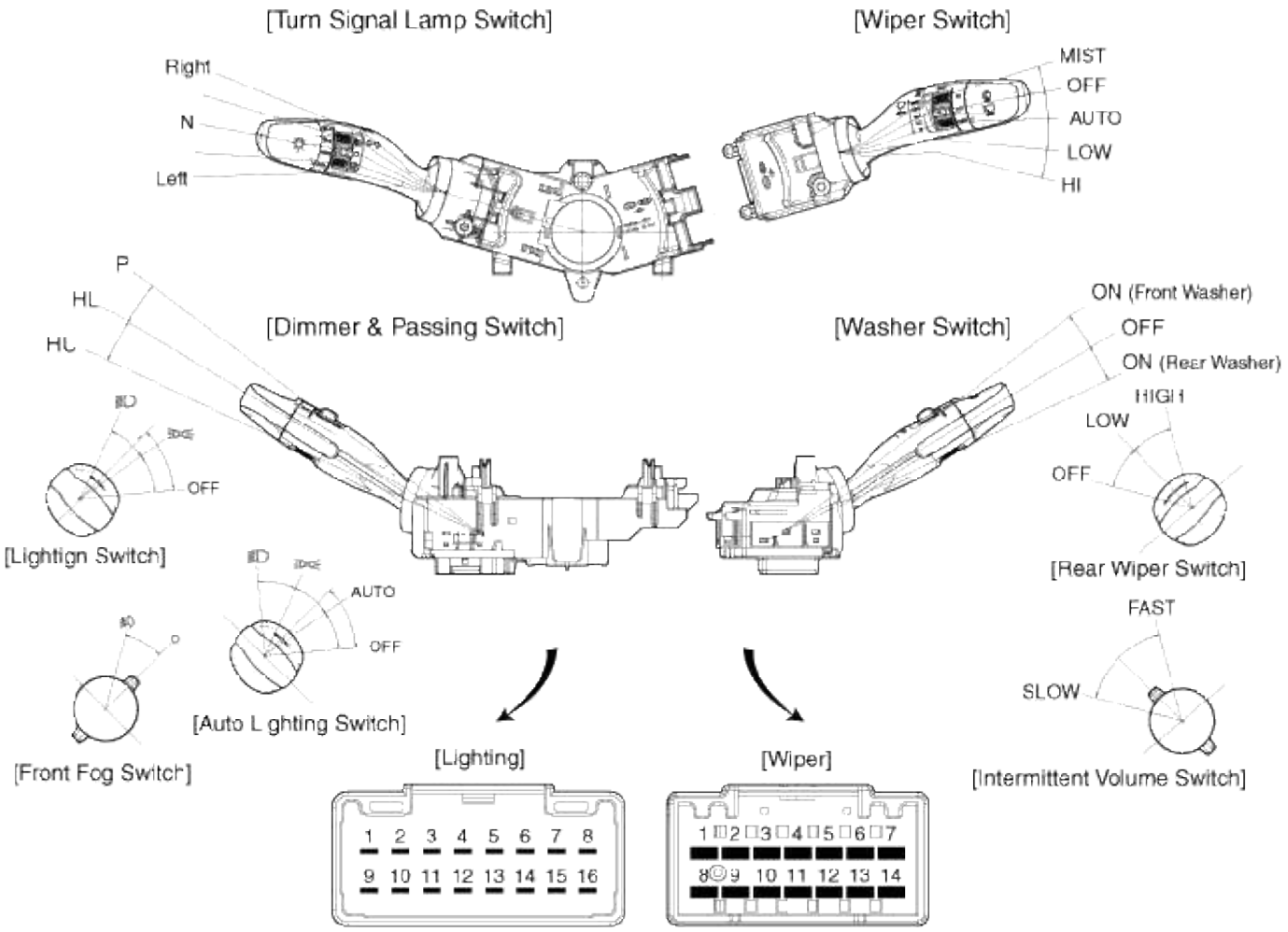
Body Electrical System > Multifunction Switch > Specifications

Specifications

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-22 ~ +176°F (-30°C ~ +80°C)
Rated load	Dimmer & passing switch	High : 0.2A (Relay load) Low : 0.2A (Relay load) Passing : 0.2A (Relay load)
	Lighting switch	Lighting : 0.2A (Relay load) (High, Low, Auto)
	Front & rear fog lamp switch	0.2A (Relay load)
	Turn signal switch	6.6A (Lamp load)
	Wiper & mist switch	Low : 4.5A (Motor load) High : 4.5A (Motor load) Intermittent : 0.25 mA Lock : Max. 28A (Motor load) Washer : 4.0A (Motor load)
	Rear wiper & washer	Wiper : 1.0A (Relay load) Washer : 4.0A (Motor load)

Body Electrical System > Multifunction Switch > Components and Components Location

Component



Circuit connection

Connector name	No.	Description	Connector name	No.	Description
Lighting (16 Pin)	1	Passing circuit	Wiper & Washer (14 Pin)	1	IGN R2 - Rear washer
	2	Head lamp low		2	Rear washer switch
	3	Head lamp high		3	Front washer switch
	4	Dimmer switch base		4	IGN - Front washer & wiper
	5	Dimmer & passing ground		5	Wiper high speed
	6	Turn signal right		6	Intermittent wiper switch
	7	Turn signal base		7	Mist switch
	8	Turn signal left		8	IGN R1-Rear wiper
	9	-		9	Intermittent volume base
	10	Fog switch base		10	Rear wiper switch
	11	Front fog switch		11	Intermittent time base
	12	Rear fog switch		12	Rear wiper INT
	13	Lightign ground		13	Wiper low speed
	14	Auto light switch		14	Wiper parking
	15	Tail lamp switch			
	16	Head lamp switch			

Body Electrical System > Multifunction Switch > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.

2. Remove the steering wheel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Steering System - "Steering Wheel")
3. Remove the steering column upper and lower shrouds (A) after removing 3 screws.



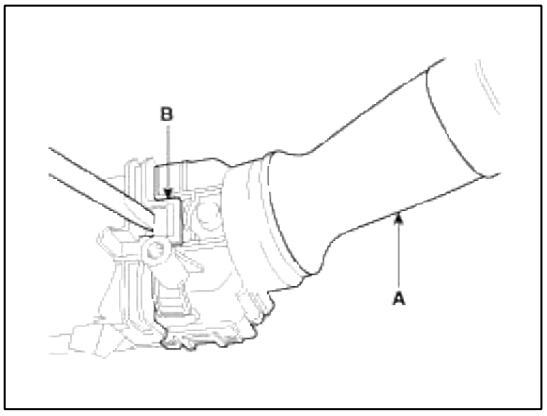
4. Disconnect the light switch connector (A) and the wiper switch connector (B).





5. Remove the wiper switch (A) by pushing the lock pin (B).

> NOTE
>
> When removing the wiper & washer switch only, release the lock of wiper switch without removing the steering wheel.



6. Remove the clock spring.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
7. Loosen the screws (2EA) from the multifunction switch assembly (A).



Installation

1. Install the multifunction switch.
2. Install the clock spring and steering wheel.
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.

Inspection

Lighting Switch Inspection

1. With the multi function switch in each position, make sure that continuity exists between the terminals below.
   If continuity is not as specified, replace the multi-function switch



Lighting switch (Auto light)

Terminal / Position	13	14	15	16
OFF				
Auto	○	○		
Tail Lamp	○		○	
Head Lamp	○			○

Lighting Switch

Terminal / Position	15	16	13
OFF			
Tail Lamp	○		○
Head Lamp	○	○	○

Dimmer And Passing Switch

Terminal / Position	4	2	3	5	1
HU	○		○		
HL	○	○			
P				○	○

HU : Head lamp high beam
HL : Head lamp low beam
P : Head lamp passing switch

Turn Signal Switch

Hazard Switch / Terminal / Turn Signal Switch	7	8	6
OFF — L	○	○	
OFF — N			
OFF — R	○		○

Front Fog Lamp

Terminal / Position	10	11
OFF		
ON	○	○

Wiper And Washer Switch Inspection

1. With the multi function switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.



Wiper Switch

Terminal / Position	13	5	14	6	4	7	9	11
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○	○		○	○
LOW	○				○			
HI		○			○			

Washer Switch

Termina / Position	3	4
OFF		
ON	○	○

Rear Wiper Switch

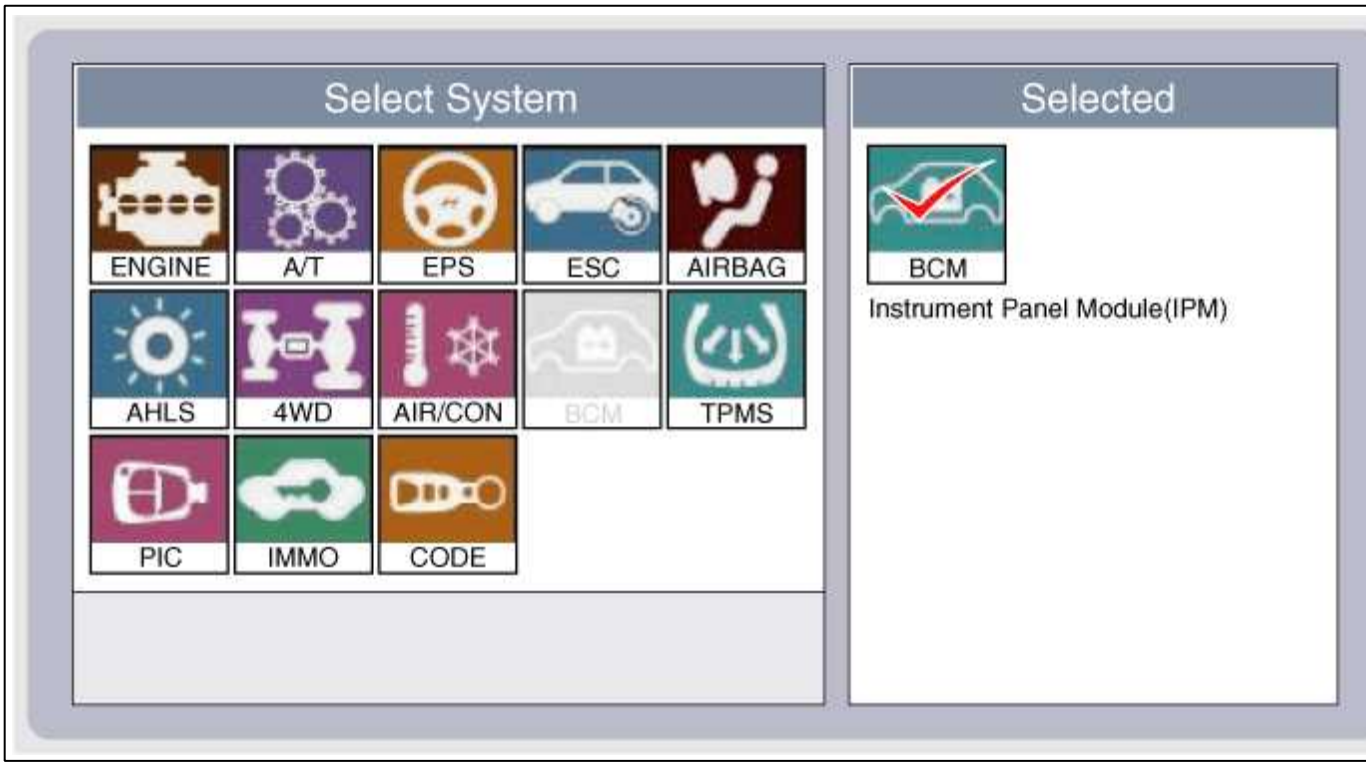
Terminal / Position	8	12	10
OFF			
INT	○	○	
ON	○		○

Rear Washer Switch

Termina / Position	2	1
OFF		
ON	○	○

Inspection (With GDS)

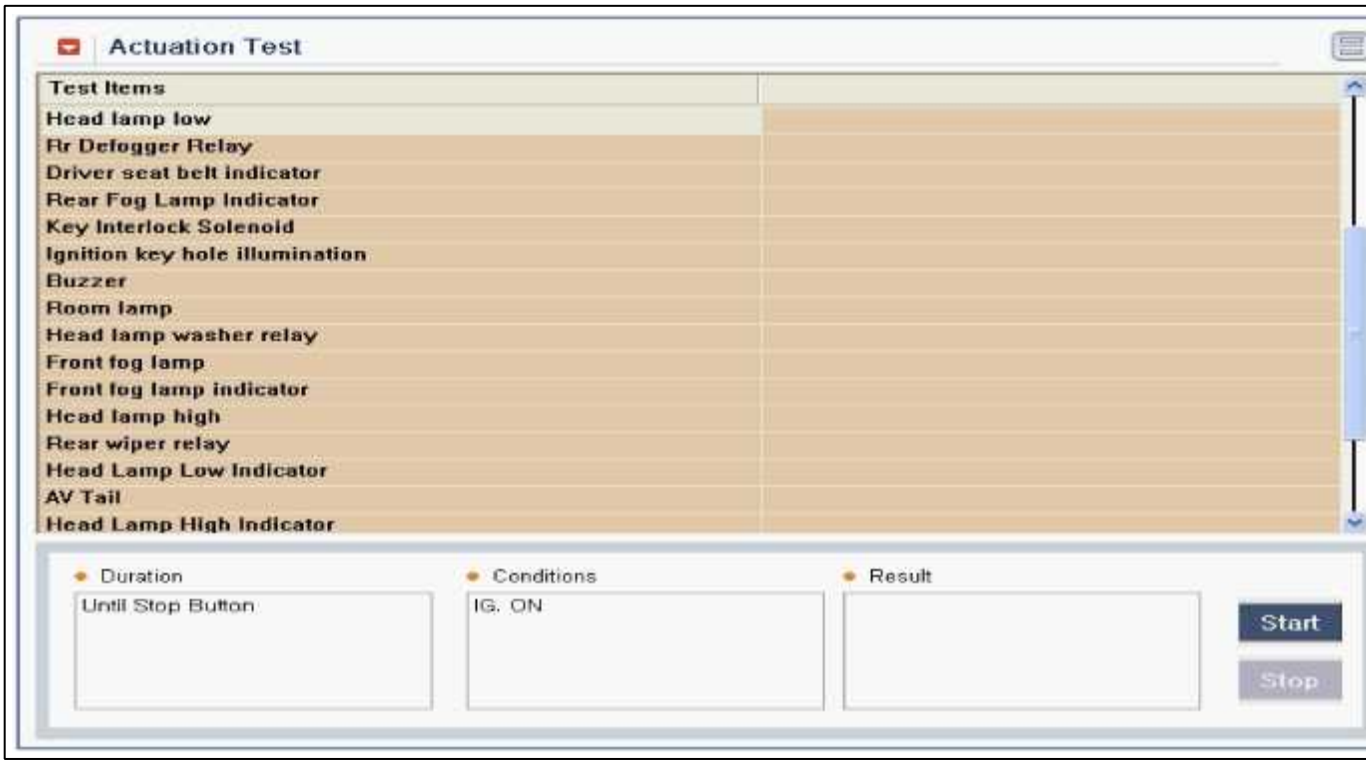
1. Check IPM input/output specification of multifunction switch using the GDS. If the specification is abnormal, replace the lamp or wiper switch.
2. If diagnosis is required on the multifunction switch, select model and "IPM".



3. Select "Current data" and check the input/output condition of "Multifunction switch".

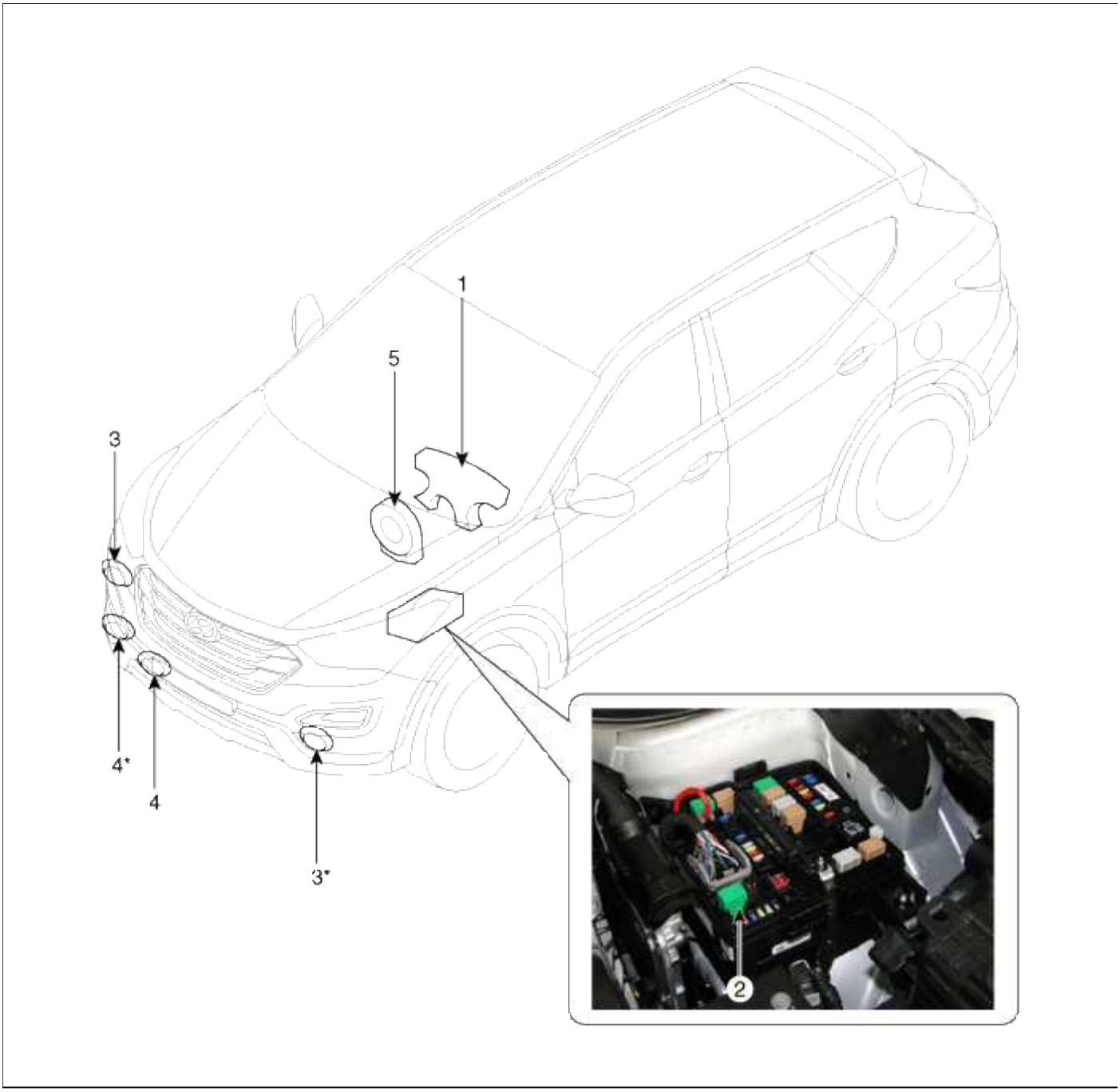


4. To perform test on "Multifunction switch" outputs, select "Actuation test".



Body Electrical System > Horn > Components and Components Location

Component Location



1. Horn switch 2. Horn relay (Engine room compartment) 3. Horn (Low pitch/Disk type) 3*. Horn (Low pitch/Shell type)	4. Horn (High pitch/Disk type) 4*. Horn (High pitch/Shell type) 5. Clock spring

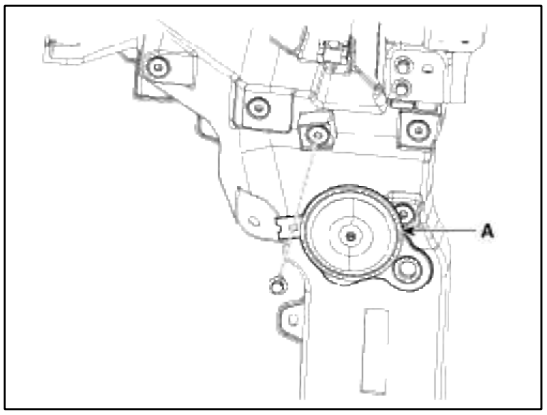
Body Electrical System > Horn > Repair procedures

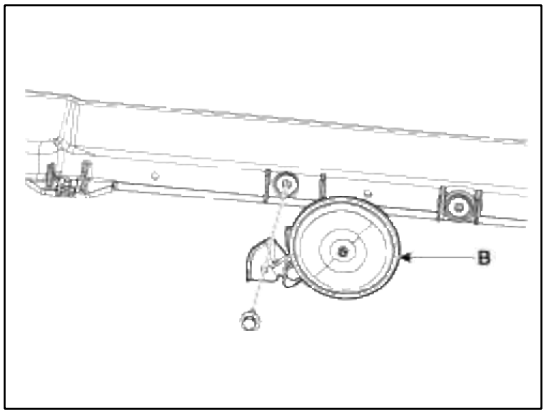
Removal

1. Remove the front bumper cover.
   (Refer to Body - "Front Bumper Cover")

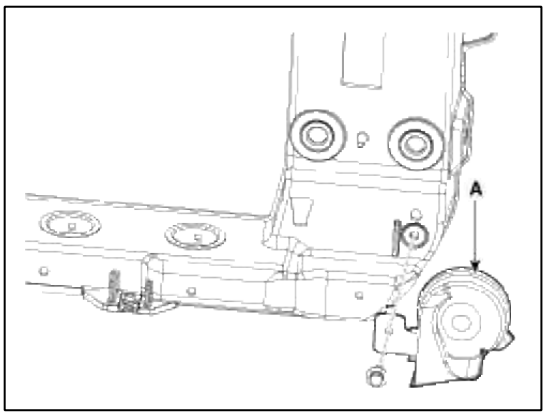
2. Remove the bolts and disconnect the horn connectors, then remove the high pitch horn (A) and low pitch horn (B).

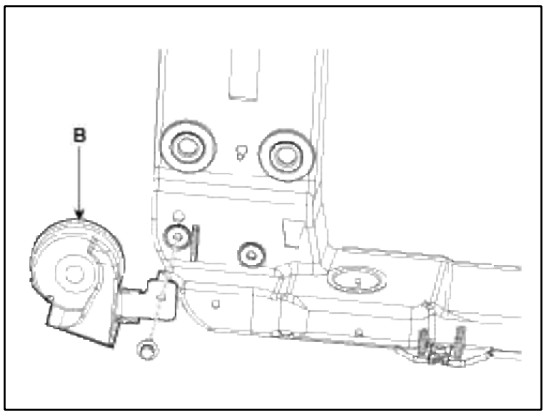
[Disk type]





[Shell type]





Installation

1. Install the horns after connecting the horn connectors.
2. Install the front bumper cover.

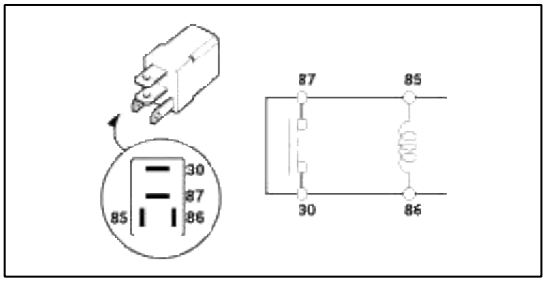
Inspection

Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.
The horn should make a sound. If the horn fails to make a sound, replace it.

Horn Relay Inspection

1. Remove the horn relay (A) from the engine room relay box.
2. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
3. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.





Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

Body Electrical System > AVN System > Specifications

Specifications

Item	Specification
Power source	DC 14.4V (-) ground
Frequency range / Channel space	FM : 87.5 ~ 107.9 MHz / 200 KHz AM : 530 ~ 1710 KHz / 10 KHz
Tuning type	PLL SYNTHESIZED TUNING
Impedance	2 ohm x 4
Antenna	80 pF 75 ohm
Dark current	MAX 2mA (Head unit only)
S/N	FM : MIN 50 dB AM : MIN 40 dB

GPS

Body Electrical System.

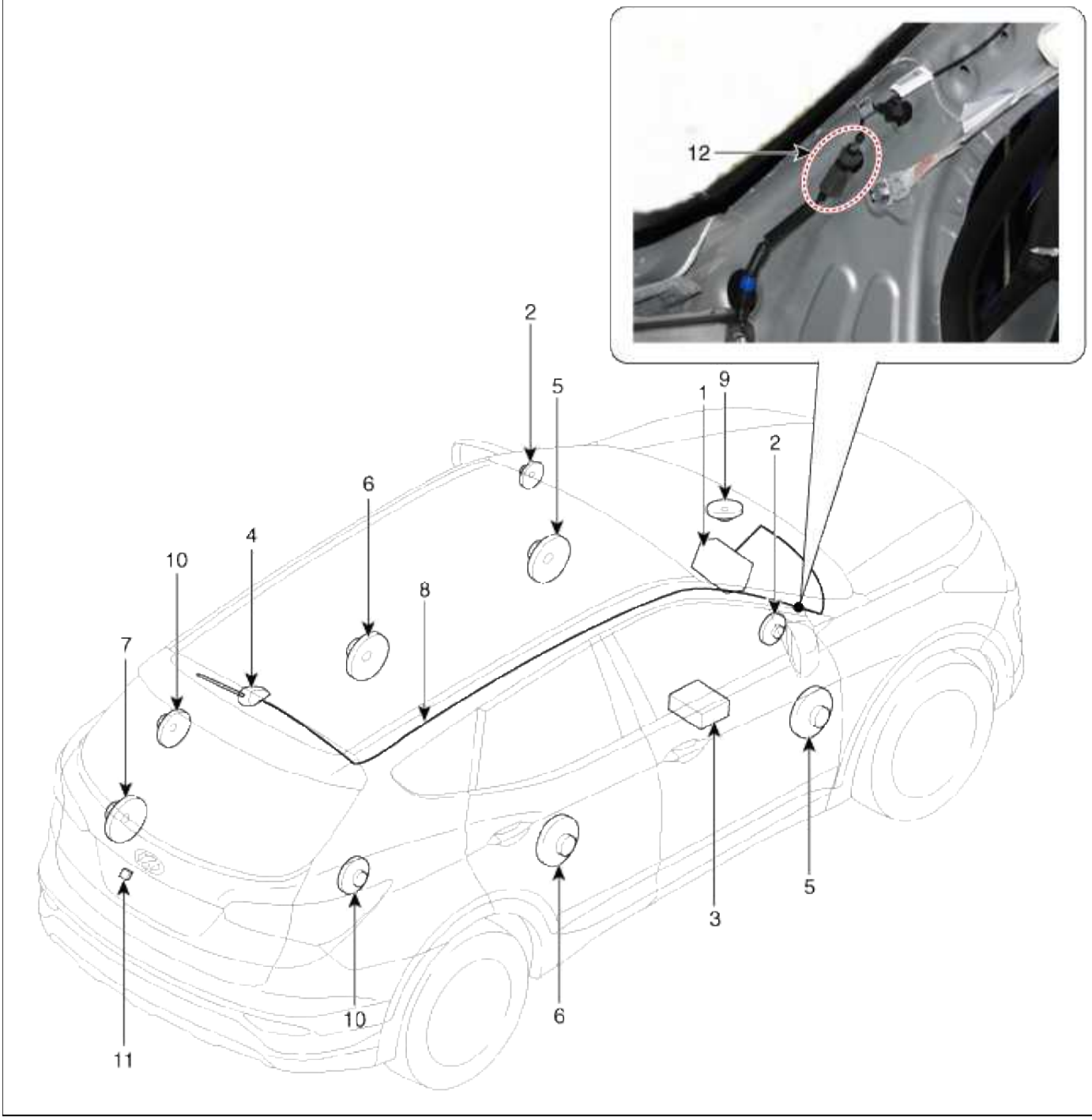
Item	Specification
Frequency	1.57542 GHz
Sensitivity level	- 144 dbm
Channel	12CH

Speaker

Item		Dimension	Infinity
Input Power (W or V)	Front	20W (Max 40W)	25W (Max 50W)
	Rear	20W (Max 40W)	25W (Max 50W)
	Front Center	20W (Max 40W)	20W (Max 40W)
	Front Tweeter	20W (Max 40W)	13W (Max 25W)
	Surround	15W (Max 30W)	25W (Max 50W)
	Sub woofer	20W per channel (Max 40W) -2 channels	25W per channel (Max 50W) -2 channels
Speaker Impedance (Ω)	Front	1.8 ± 0.3	2.1 ± 0.3
	Rear	1.8 ± 0.3	2.0 ± 0.3
	Front Center	2.6 ± 0.4	2.0 ± 0.3
	Front Tweeter	4 ± 0.6	4 ± 0.3
	Surround	1.8 ± 0.3	1.9 ± 0.3
	Sub woofer	2.0 ± 0.3	5.0 ± 0.8
Speaker Number		10	10

Body Electrical System > AVN System > Components and Components Location

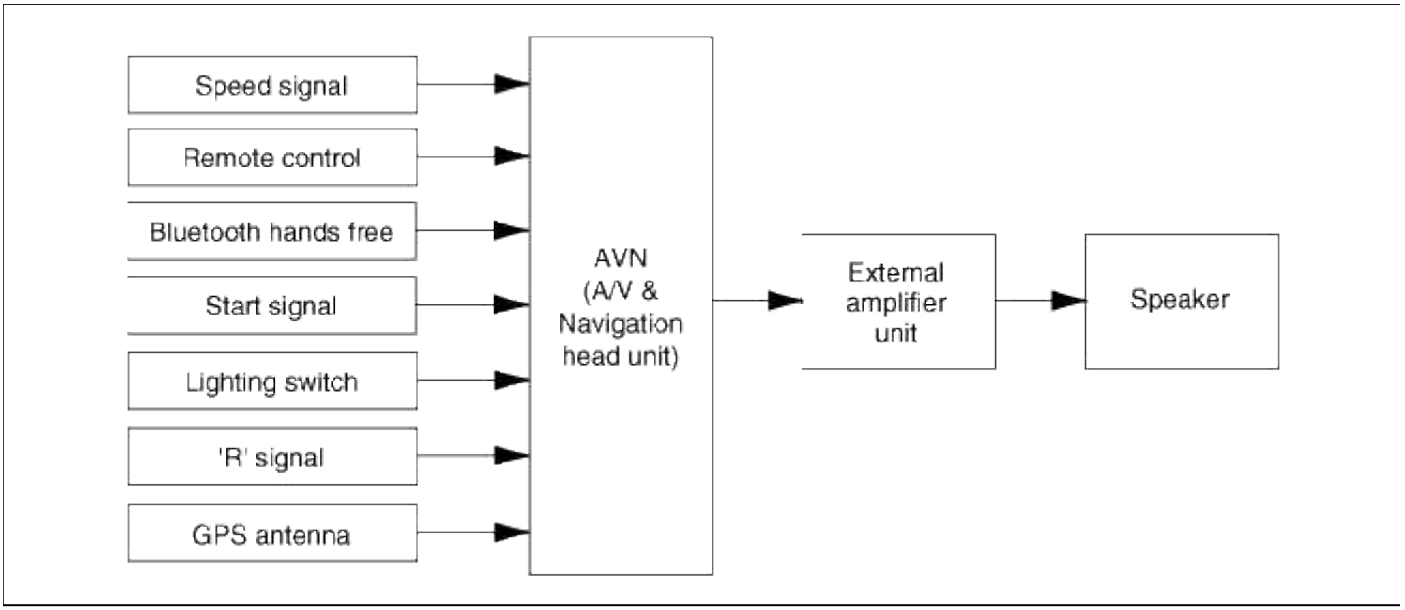
Components Location



1. AVN (A/V & Navigation head unit) 2. Tweeter speaker 3. External amplifier 4. Roof antenna (GPS) 5. Front door speaker 6. Rear door speaker	7. Subwoofer speaker 8. Antenna feeder cable 9. Center speaker 10. Surround speaker (Option) 11. Back view camera 12. Feeder cable joint connector

Body Electrical System > AVN System > Schematic Diagrams

System Block Diagram



Body Electrical System > AVN System > Description and Operation

Description

Limitations Of The Navigation system

GPS Signal Reception State

As the GPS satellite frequency is received/transmitted in straight lines, reception may not work if hiding devices are placed on or near the GPS antenna or when traveling through the following locations.

- Tunnels
- Basement parking structures
- Underneath an overpass
- Roads within forested areas
- Areas near high rise buildings
- Roads within canyons

Vehicle Position Display

1. If multipass errors occur due to reflections from buildings or related causes, the current position mark on the navigation may differ from the actual position of the vehicle.
2. The position of the vehicle on the navigation may be different from the actual position if this occurs, improve map matching and GPS information (several minutes may be necessary in certain cases).
   A. When driving on a Y-shaped road with a narrow angle, the current position may be displayed in the opposite direction.
   B. If the vehicle is loaded onto a car transport vehicle, the current position mark may be stalled on the last position prior to loading.
   C. When driving on a spiral-shaped road.
   D. When driving in mountain regions with sharp turns or sudden brakes.
   E. When entering a road after having been in an underground parking structure, building parking structure, or turnable with many rotations.
   F. When the tires have recently been replaced (Especially upon use of spare or studless tires)
   G. If the battery terminal is removed.
   H. When driving in city streets, the current position may be displayed on the opposite side or on an off-road position.
   I. When changing the zoom level from the maximum zoom in level to a different zoom level, the current position mark may be displayed on a different road.
   J. When driving in heavy traffic with frequent go · stops in traffic or intersections.

K. When driving under slippery conditions, such as heavy sand, snow, etc.
L. When driving with the tire chain in place.
M. When using a tire with an incorrect size specification.
N. When the tire pressure for the 4 tires are different.
O. When the replacement tire is a worn or used tire (Especially studless tires having passed a 2nd seasons, etc.)
P. When driving near high-rise buildings
Q. If a roof carrier has been installed
R. When driving under high speeds or having calculated a long-distance route.

Route Guidance

Suitable route guidance may not occur due to conditions or the driving position.

- Guidance to go straight may be given while driving on a straight road.
- Guidance may not be given even when having turned at an intersection.
- There are certain intersections in which guidance may not occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc.)
- Guidance may be given to a position removed from the actual destination if roads to reach the actual destination do not exist or are too narrow.
- Faulty voice guidance may be given if the vehicle breaks from the designated route (ex : if a turn is made at an intersection while the navigation provided guidance to go straight).
- Map Data may be missing or incorrect causing route guidance to not be given.

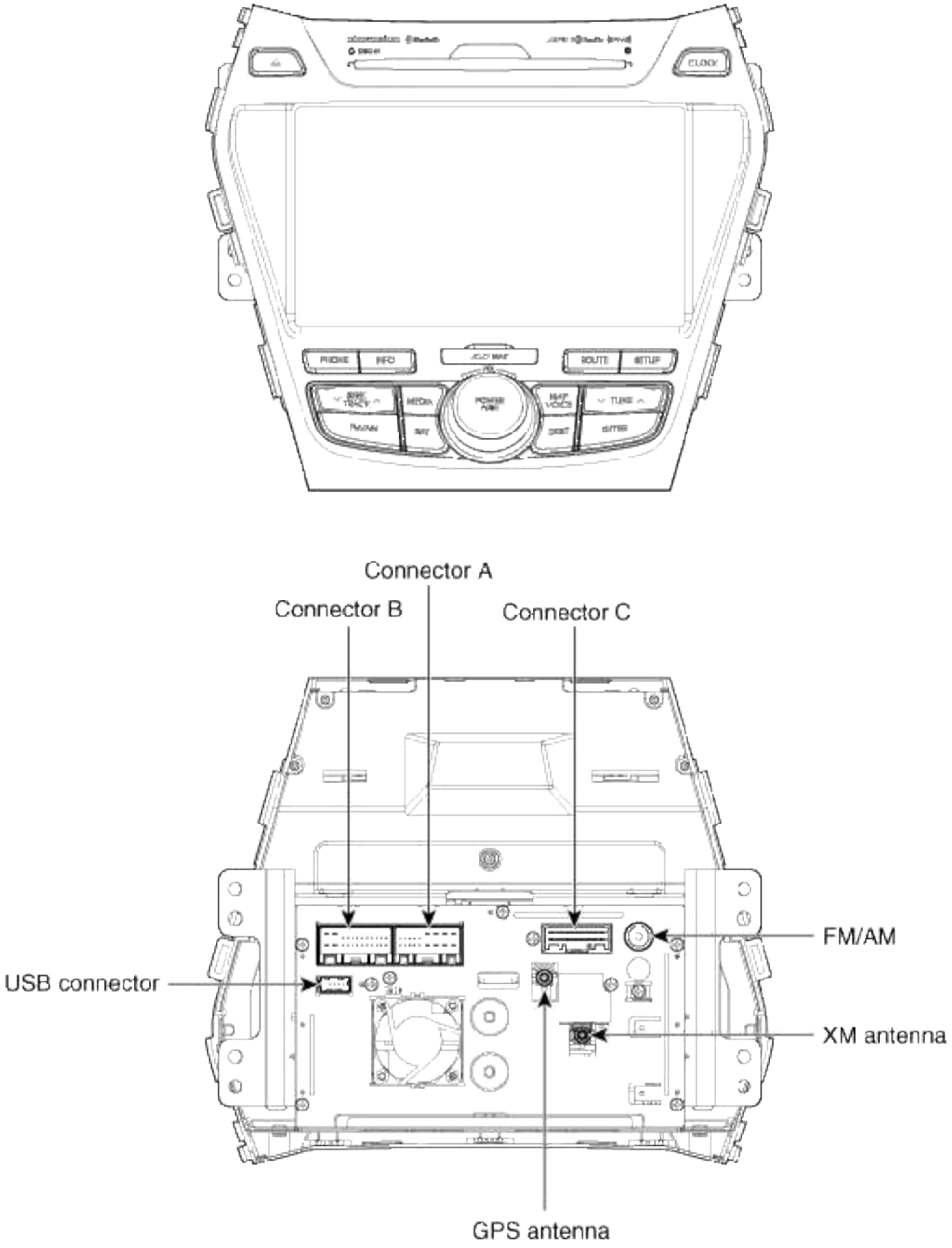
Route Re-calculation

The following phenomena may occur after conducting route recalculation.

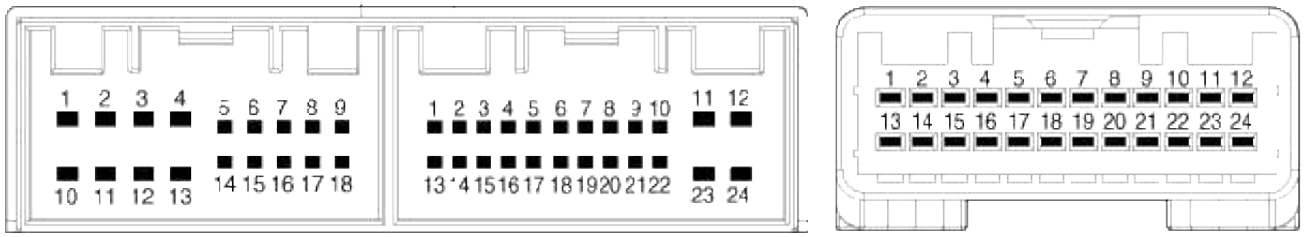
- Guidance may be given to a position differing from the current position when turning at an intersection.
- Route recalculation may take a longer period of time when driving under high speeds.
- A route guidance signaling for a U-Turn in a No U-Turn location may occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc).
- Guidance may be given to a position removed from the actual destination does not exist or two narrow.
- Faulty voice guidance may be given if the vehicle breaks from the designated route (ex : if a turn is made at an intersection while the navigation provided guidance to go straight)

Body Electrical System > AVN System > AVN Head Unit > Components and Components Location

Components

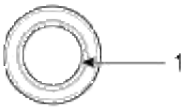


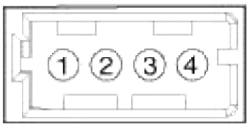
AVN (A/V & Navigation) Head Unit Connector

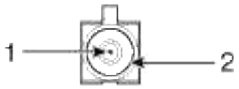


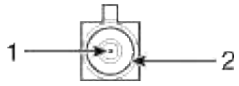
Connector Pin Information

No.	Connector A	Connector B	Connector C
1	-	MM CAN High	-
2	Parking V VIDEO	- (Dimming output)	-
3	Parking V GND	Parking	-
4	Rear camera shield ground	Steering wheel remocon	MTS/TMU ground
5	SPDIF ground	- (Rear remocon)	RS422 Tx +
6	SPDIF (+)	IGN	RS422 Tx -
7	ALT L	AUX VIDEO	RS422 Rx -
8	Illumination (+)	AUX right input	RS422 Rx +
9	R position	AUX ground	- (LVDS PDN)
10	-	MIC (+)	-
11	Rear camera power	ACC (+)	-
12	Navigation voice (-)	Battery (+)	Ground
13	Navigation voice (+)	MM CAN Low	- (LVDS LOCK)
14	PGS/ Rear camera	Auto light	- (BL ON)
15	SPDIF (-)	P position	- (TOUCH Rx +)
16	Door key unlock	Vehicle speed	- (TOUCH Rx -)
17	Illumination (-)	Remocon ground	Ground
18	Antenna remocon power	-	- (TOUCH Tx -)
19		AUX VIDEO ground	- (TOUCH Tx +)
20		AUX detect	MTS/TMU voice (+)
21		AUX left input	MTS/TMU voice (-)
22		MIC (-)	-
23		Power ground	Ground
24		Power ground	-

Radio antenna	No.	Description
	1	FM/AM signal

USB connector	No.	Description	No.	Description
	1	USB VCC	3	USB D (+)
	2	USB D (-)	4	USB ground

XM antenna	No.	Description	No.	Description
	1	XM signal	2	Ground

GPS antenna	No.	Description	No.	Description
	1	GPS signal	2	Ground

Body Electrical System > AVN System > AVN Head Unit > Repair procedures

Removal

NOTE

- Take care not to scratch the center fascia panel and related parts.
- Eject all the disc before removing the AVN head unit to prevent damaging the CD player's load mechanism.

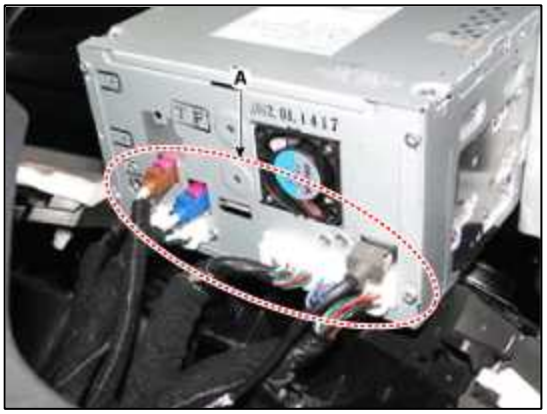
1. Disconnect the negative (-) battery terminal.
2. Remove the center air vent duct (A).



3. Remove the AVN head unit (A) after loosening the mounting screws (4EA).



4. Remove the AVN head unit after disconnecting connectors and cables (A).



NOTE

- If CD does not eject, don't try to remove it.
- The CD player may get damaged.
- Contact the nearest Hyundai Dealer for assistance.

Installation

1. Connect the AVN head unit connectors and cable.
2. Install the AVN head unit.
3. Install the center air vent duct.
4. Connet the negative (-) battery terminal.

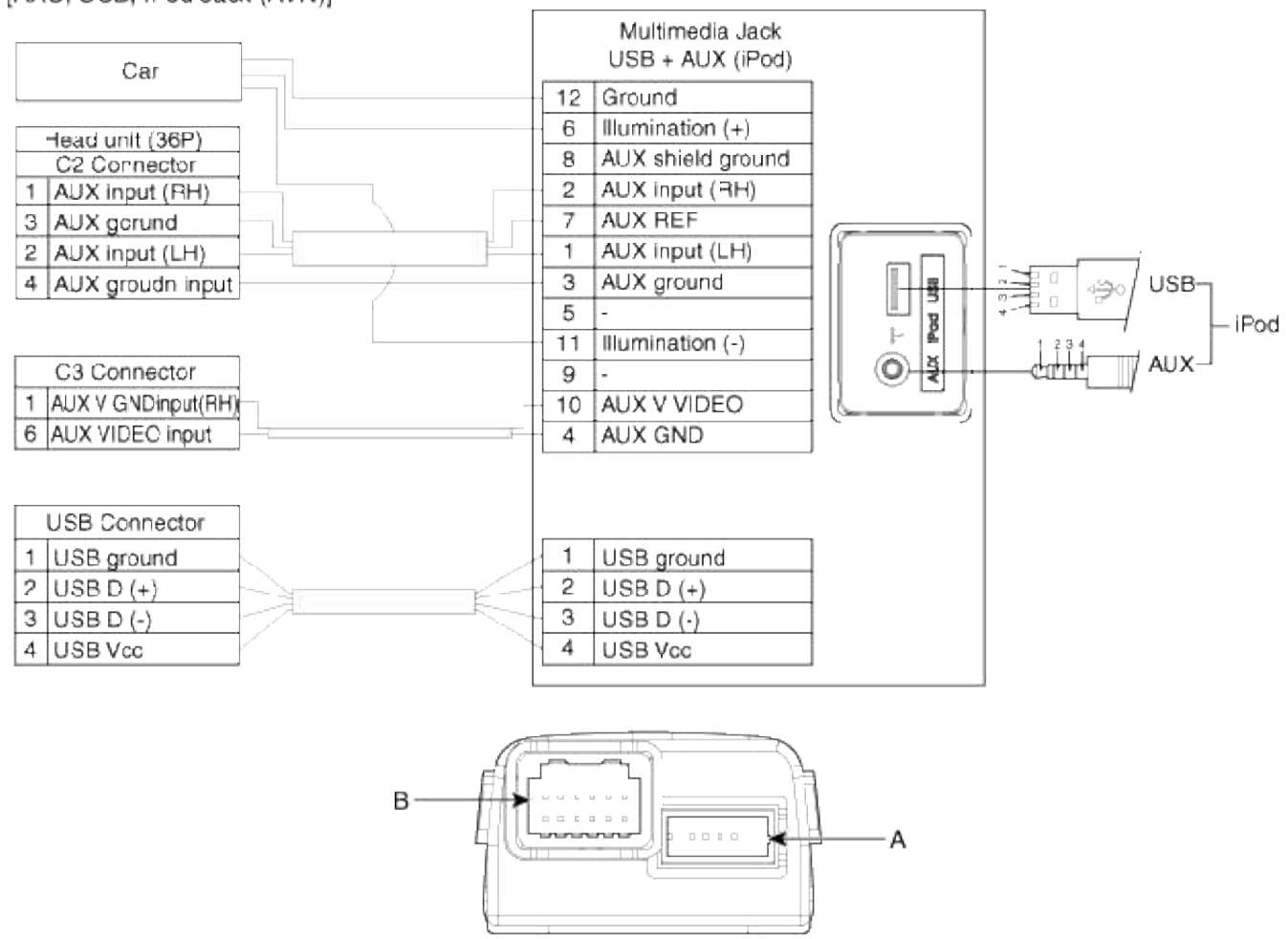
NOTE

Make sure the AVN Head unit connectors are plugged in properly and the antenna cable is connected properly.

Body Electrical System > AVN System > Multimedia Jack > Schematic Diagrams

Circuit Diagram

[AXU, USB, iPod Jack (AVN)]



Connector A	No.	Description
① ② ③ ④	1	USB/iPoc VOD
	2	LSB D(+)
	3	USB D(-)
	4	USB/iPod ground

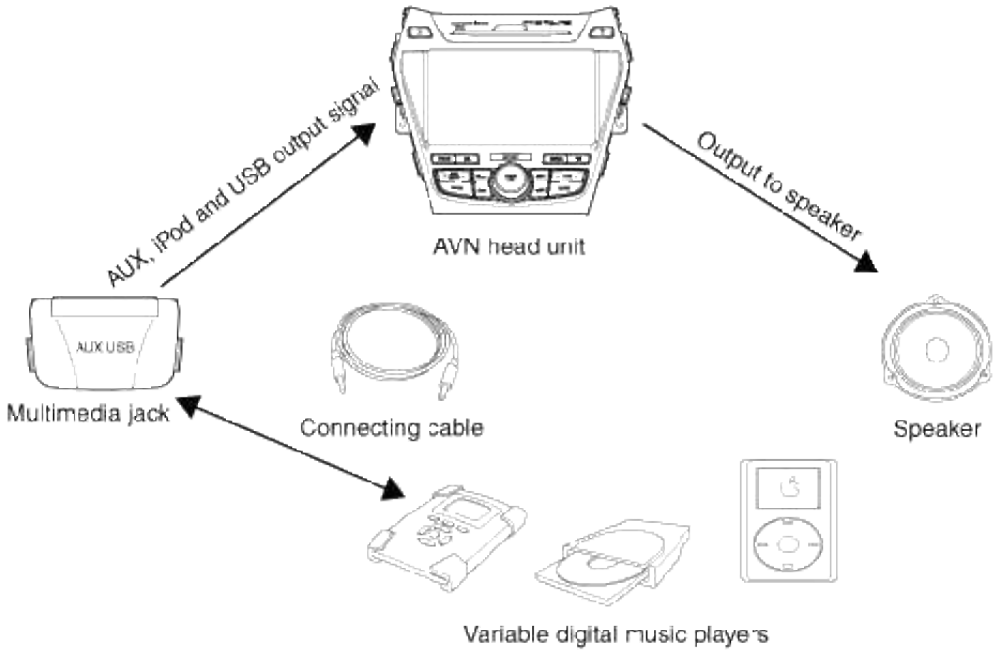
Connector B	No.	Description
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫	1	AUX input (LH)
	2	AUX input (RH)
	3	AUX detect
	4	AUX VIDEO
	5	
	6	Illumination (+)
	7	Sheild ground
	8	-
	9	-
	10	AUX VIDEO GND
	11	-
	12	Ground

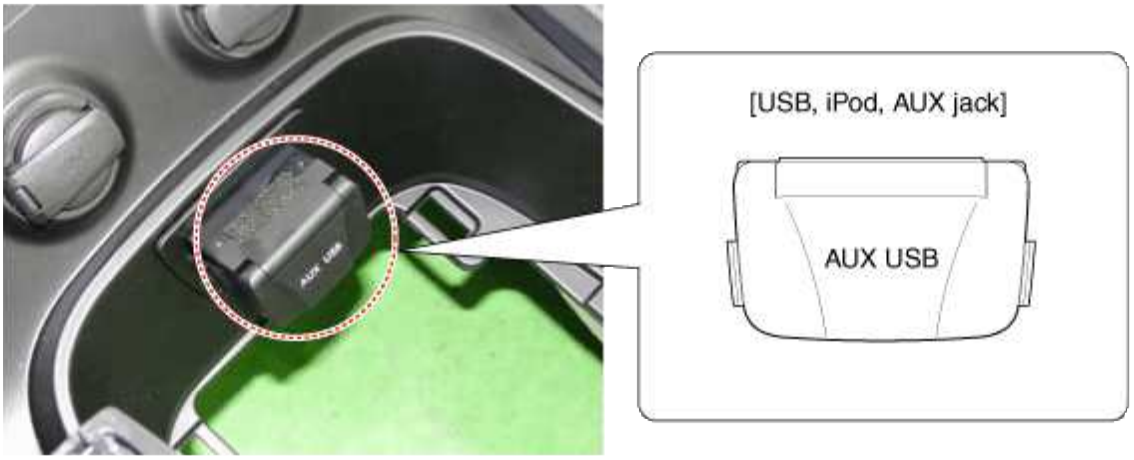
Body Electrical System > AVN System > Multimedia Jack > Description and Operation

Description

The multimedia jack on the console upper cover is for customers who like to listen to external portable music players like the MP3, iPod and etc., through the vehicle's sound system when it is linked to this jack. The customer has this added option.

In case of distortions from media connected to the AUX source, the audio unit may not be defective but the output level of the used media does not match the specification of the AUX input.





Body Electrical System > AVN System > Multimedia Jack > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.

2. Remove the console front complete assembly (A).
<a href="content.asp?
vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
target="_blank">(Refer to Body - "Floor Console Assembly")



3. Remove the multimedia jack (B) after disconnecting the connector (A) from the console front complete assembly.





Installation

1. Install the multimedia jack.
2. Install the console front complete assembly.
3. Connect the negative (-) battery connector.

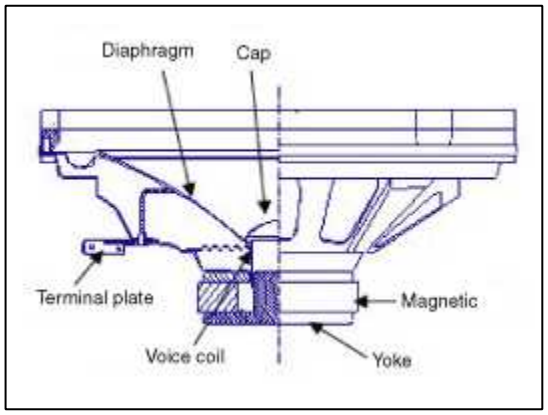
Body Electrical System > AVN System > Speakers > Repair procedures

Inspection

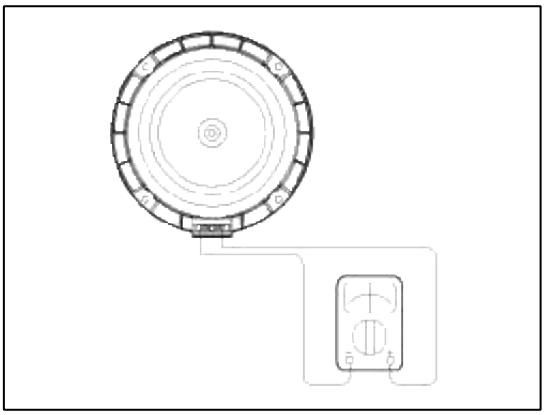
1. Troubleshooting for Speaker

(1) Basic inspection of speaker

Inspect the sound from speaker after verifying that the speaker mounting screws are removed and the wiring connector is connected to remove any possible vibration transmitted from body trims and surrounding parts.



(2) Case Troubleshooting

No.	Case	Inspection/Remedy
1	Trembling sound	1. Before replacing the speaker, inspect that the mounting screw is installed normally. 2. After re-installing the speaker, verify that no trembling sound is heard. 3. When hearing a trembling sound again, replace the speaker with new one.
2	Noise	1. Check if the wiring connector is connected normally. If not, reconnect the wiring connector. 2. In case of radio static, check if there is a noise from CD. 3. When a noise is heard on turning radio and CD on, replace the speaker with new one. NOTE In case there is only radio static, this causes from poor radio reception. Thus the speaker needs no repair and replacement.
3	Poor working	Inspection of the wiring connection between the battery and the speaker 1. Before replacing the speaker, inspect the wiring connection between the battery and the speaker is normal. 2. Check the supply power to the speaker and the resistance, then inspect the sound quality.  3. If the speaker works poorly, replace it with new one.

CAUTION

When handling the speaker :

- Dropping or rough handling of the speaker can cause damage.
- Be careful not to spill water or oil on the speaker.
- Caution when dealing with speaker because the diaphragm is paper and can be easily torn by impact and external force.
- Electrical mishandling of speakers is not covered by manufacturers warranty.

Removal

Front Speaker

1. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
2. Remove the front speaker (A) after loosening the screws (4EA).



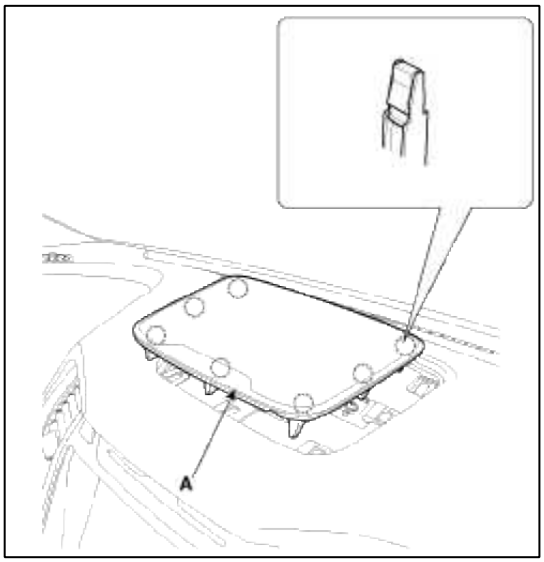
Rear Speaker

1. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear speaker (A) after loosening the screws (4EA).

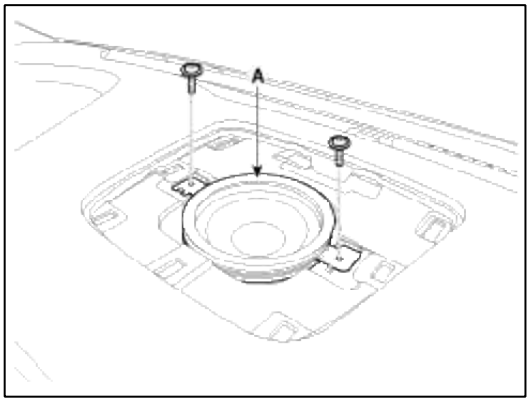


Front Center Speaker

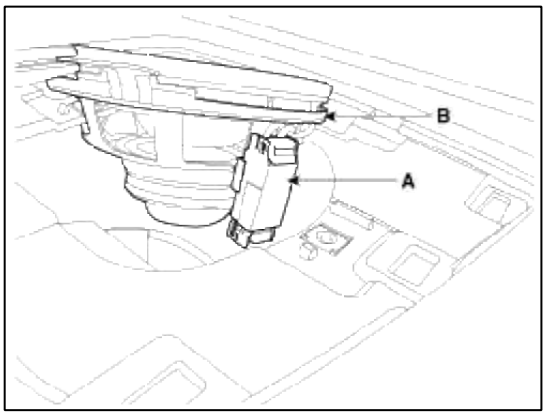
1. Remove the front center speaker grill (A).



2. Remove the front center speaker (A) after loosening the mounting screws (2EA).

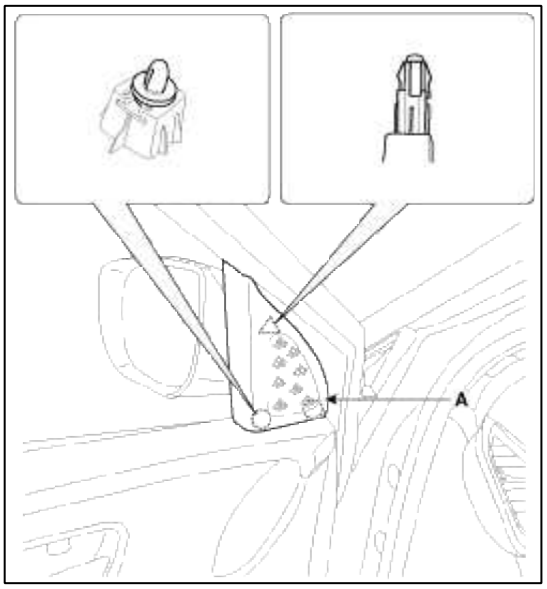


3. Remove the front center speaker (B) after disconnecting the connector (A).

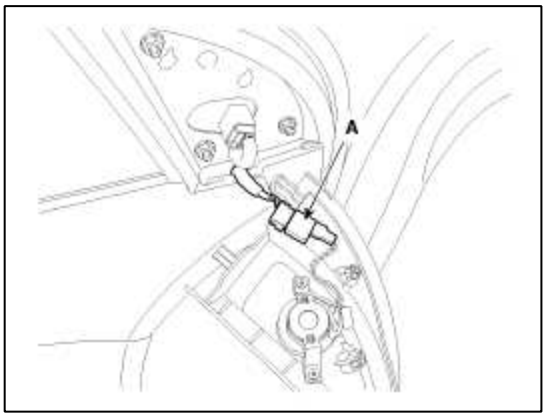


Tweeter Speaker (Front)

1. Using a screwdriver or remover, remove the front door quadrant inner cover (A).



2. Disconnect the tweeter speaker connector (A).



Woofer Speaker

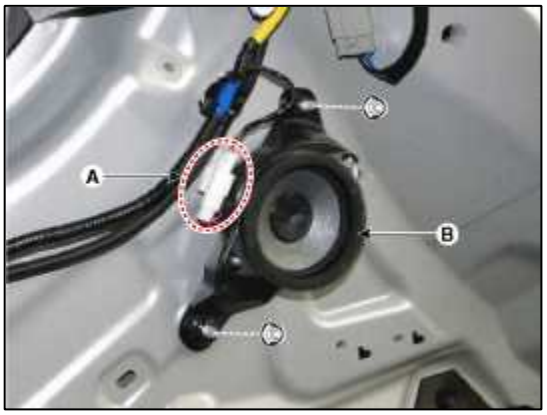
1. Remove the left luggage side trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Luggage Side Trim")
2. Disconnect the woofer speaker connector (A).
3. Remove the woofer speaker (B) after loosening the mounting nuts (2EA) and bolts (2EA).



Rear Surround Speaker

1. Remove the luggage side trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Luggage Side Trim")
2. Disconnect the surrond speaker connector (A).

3. Remove the woofer speaker (B) after loosening the mounting nuts (2EA).



Installation

Front Speaker

1. Install the front speaker.
2. Install the front door trim.

Rear Speaker

1. Install the rear speaker.
2. Install the rear door trim.

Front Center Speaker

1. Install the front center speaker.
2. Install the front center speaker grill.

Tweeter Speaker (Front)

1. Connect the connector.
2. Install the tweeter speaker and front door quadrant inner cover

Woofer Speaker

1. Install the woofer speaker.
2. Install the left luggage side trim.

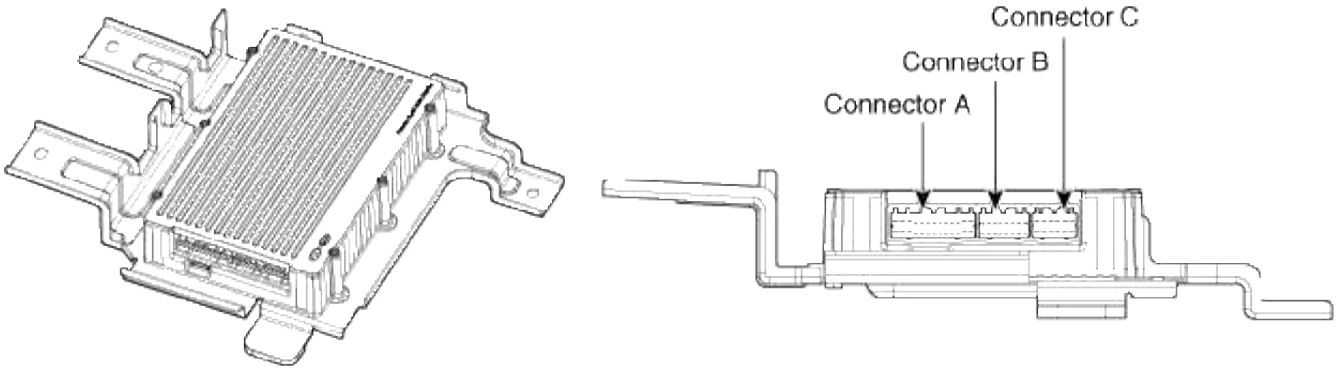
Rear Surround Speaker

1. Install the surround speaker.
2. Install the luggage side trim.

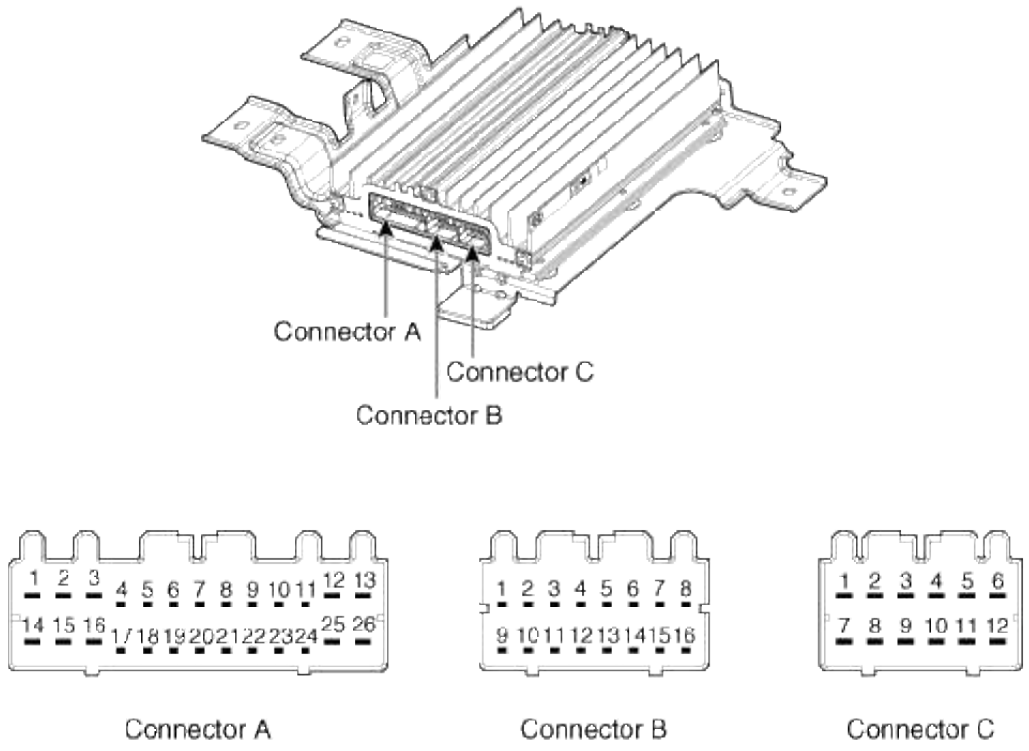
Body Electrical System > AVN System > External Amplifier > Components and Components Location

Components

[96370-2W000/ MOBIS]



[96370-4Z100/ HARMAN-BECKER]



Connector Pin Information

No.	Connector A (26 pin)	Connector B (16 pin)	Connector C (12 pin)
1	Battery +	Right surround speaker +	Rear right door +
2	Battery +	Left surround speaker +	Rear left door speaker +
3	Battery +	-	Front right tweeter speaker +
4	-	-	Front left tweeter speaker +
5	CAN +	-	Front right door speaker +
6	CAN -	-	Rear left door speaker +
7	ACC	Front center speaker +	Rear right door speaker -
8	-	-	Rear left door speaker -
9	-	Right surround speaker -	Front right tweeter speaker -
10	-	Left surround speaker -	Front left tweeter speaker -
11	Navigation voice +	-	Front right door speaker -
12	Subwoofer 2 +	-	Rear left door speaker -
13	Subwoofer 1 +	-	
14	Ground	-	
15	Ground	Front center speaker -	
16	Ground	-	
17	-		
18	SPDIF +		
19	SPDIF -		
20	SPDIF ground		
21	-		
22	-		
23	-		
24	Navigation voice -		
25	Subwoofer 2 -		
26	Subwoofer 1 -		

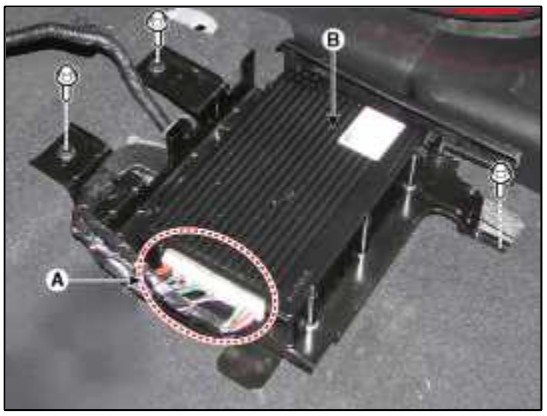
Body Electrical System > AVN System > External Amplifier > Repair procedures

Body Electrical System.

Removal

External Amplifier

1. Remove the passenger seat assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Seat Assembly")
2. Remove the external amplifier (A) after disconnecting the connectors and loosening the mounting bolts (3EA).



Installation

External Amplifier

1. Install the external amplifier after connecting the connector.
2. Install the passenger seat assembly.

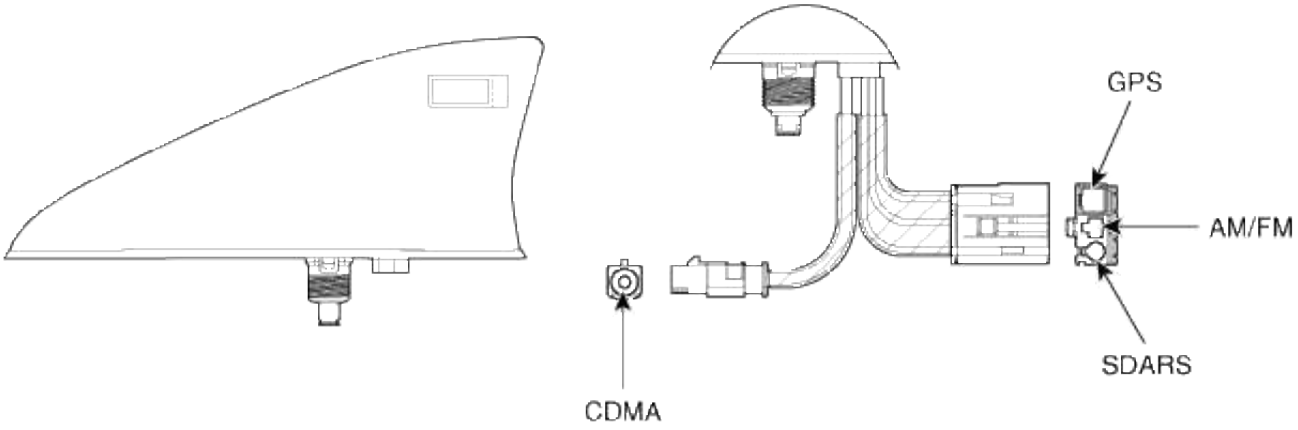
NOTE

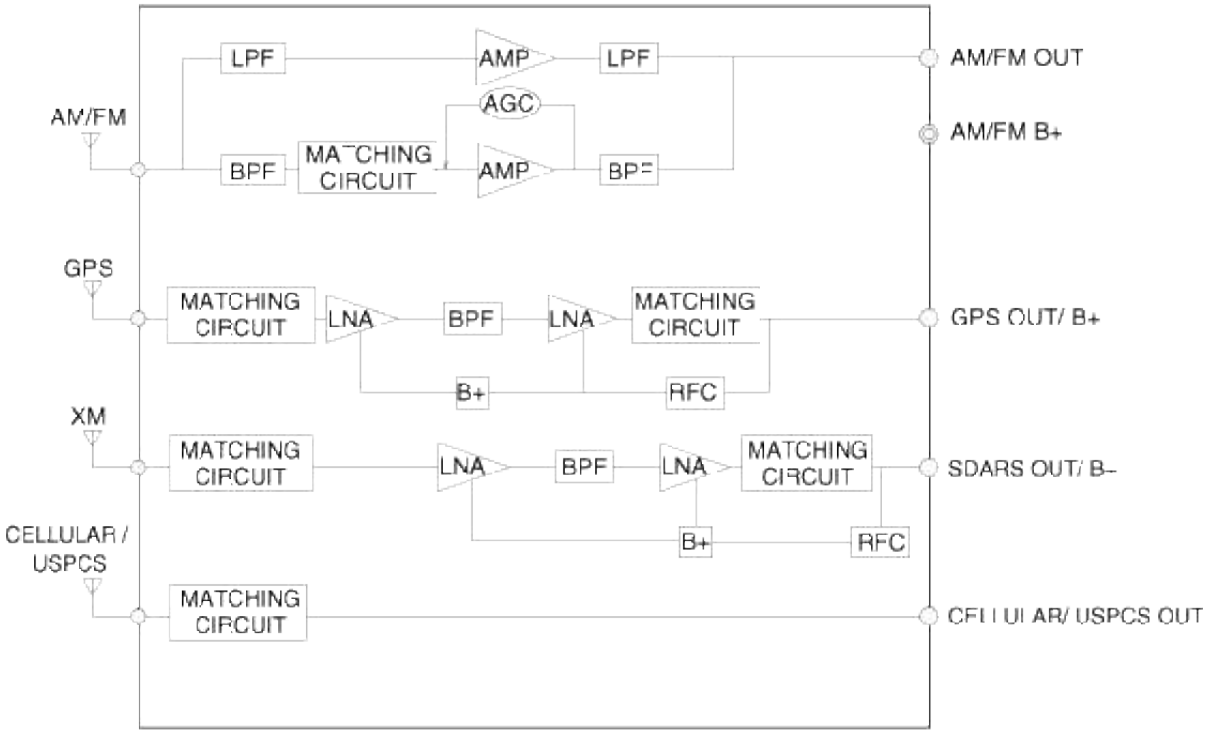
- Make sure the speaker and related connectors are plugged in properly.

Body Electrical System > AVN System > Roof Antenna > Components and Components Location

Components

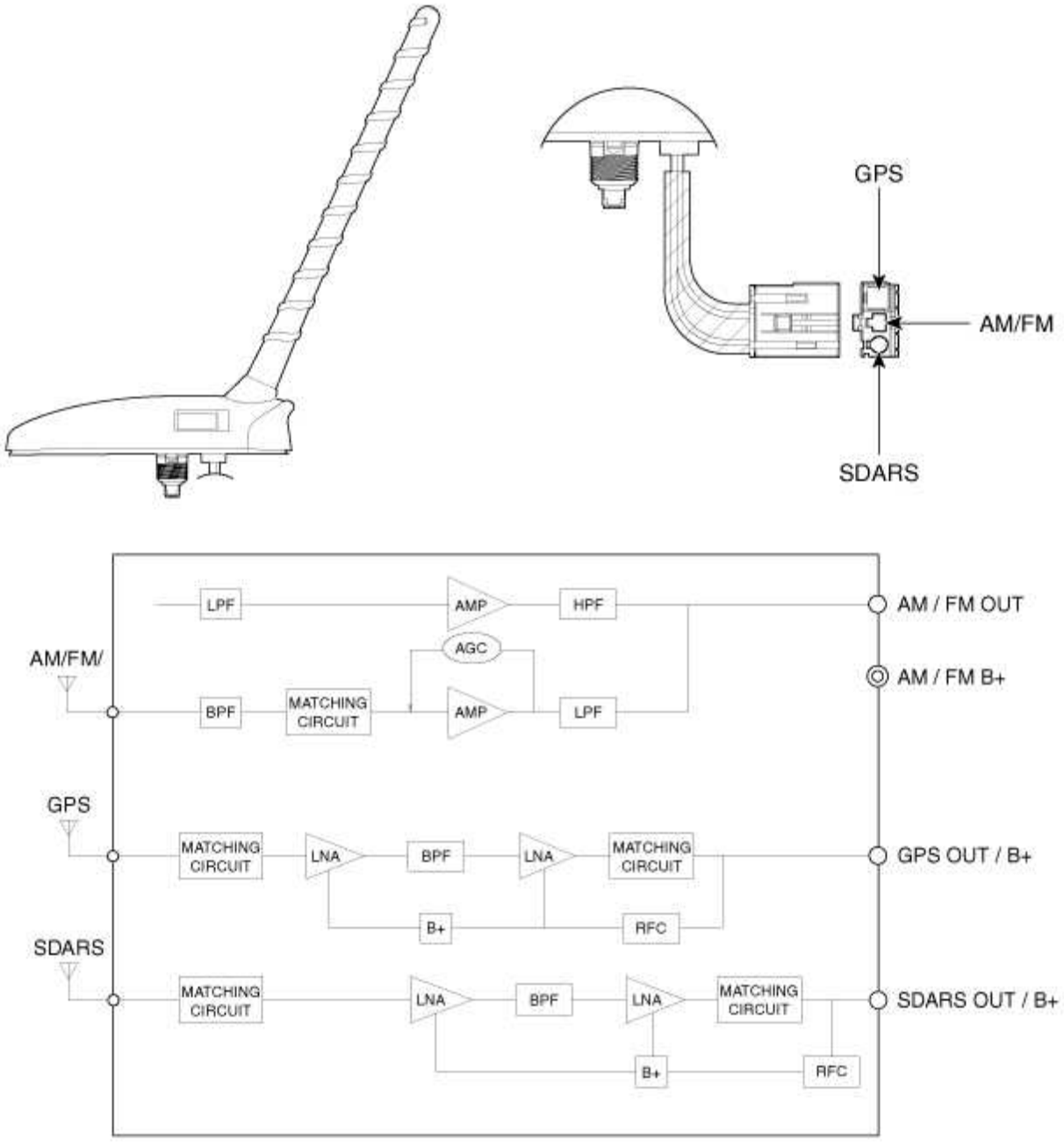
[RADIO+GPS+SDARS+CDMA]





※ LNA : Low Noise Amplifier
BPF : Band Pass Filter
RFC : Radio Frequency Choke

[RADIO + GPS + SDARS (CANADA)]



※ LNA : Low Noise Amplifier
BPF : Band Pass Filter
RFC : Radio Frequency Choke

Body Electrical System > AVN System > Roof Antenna > Repair procedures

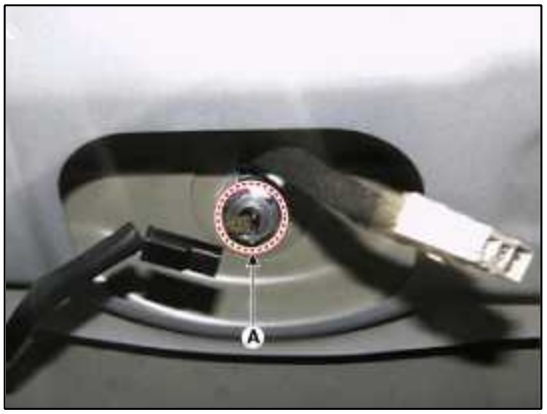
Removal

1. Remove the rear roof trim.
<a href="content.asp?
vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
target="_blank">(Refer to Body - "Roof Trim Assembly")

2. Disconnect the roof antenna connectors (A) from the roof antenna.



3. Remove the roof antenna (A) after removing a nut.



Installation

1. Connect the roof antenna connectors.
2. Install the rear roof trim.

NOTE

- Make sure that the cables and connectors are plugged in properly.
- Check the audio system.

Body Electrical System > AVN System > Troubleshooting

Troubleshooting Guide

Before Thinking The Product Has Malfunctioned

1. Errors which occur during the operation or installation of the device may be mistaken as a malfunction of the actual device.
2. If you are having problems with the divice, try the suggestions listed below.
3. If the problems persist, contact your point of purchase or the nearest service center.

Problem	Function
There are small red, blue, or green dots on the screen	Because the LCD is manufactured with technology requiring high point density, a pixel deficiency or lighting may occur within 0.01% of total pixels.
The sound or image is not working	• Has the switch for the vehicle been turned to [ACC] or [ON]? • Has the SYSTEM been turned OFF?
The video is being displayed but sound is not working	• Has the volume been set to a low level? • Has the volume been set on mute?
When the power is turned on, the corners of the screen are dark	• The display looking somewhat darker after prolonged periods of use is a normal phenomenon with LCD panels. It is not a malfunction. • If the screen is very dark, contact your point of purchase or the nearest service center.
Sound is working from only one speaker	• Is the position of FAL/BAL sound controls or volume adjusted to only one side?
Sound and video does not work in AUX mode	Is the audio and video connector jacks fully inserted into the AUX terminal?
The external device is not working	Is the external device connected with a standard connector cable?
The road is missing	Some map data may be missing or incorrect.
The road name is spoken incorrectly	The TTS(Text To Speech) engine speaks the street name based off of the phonetic spelling. This will continuously be update with the map datebase.

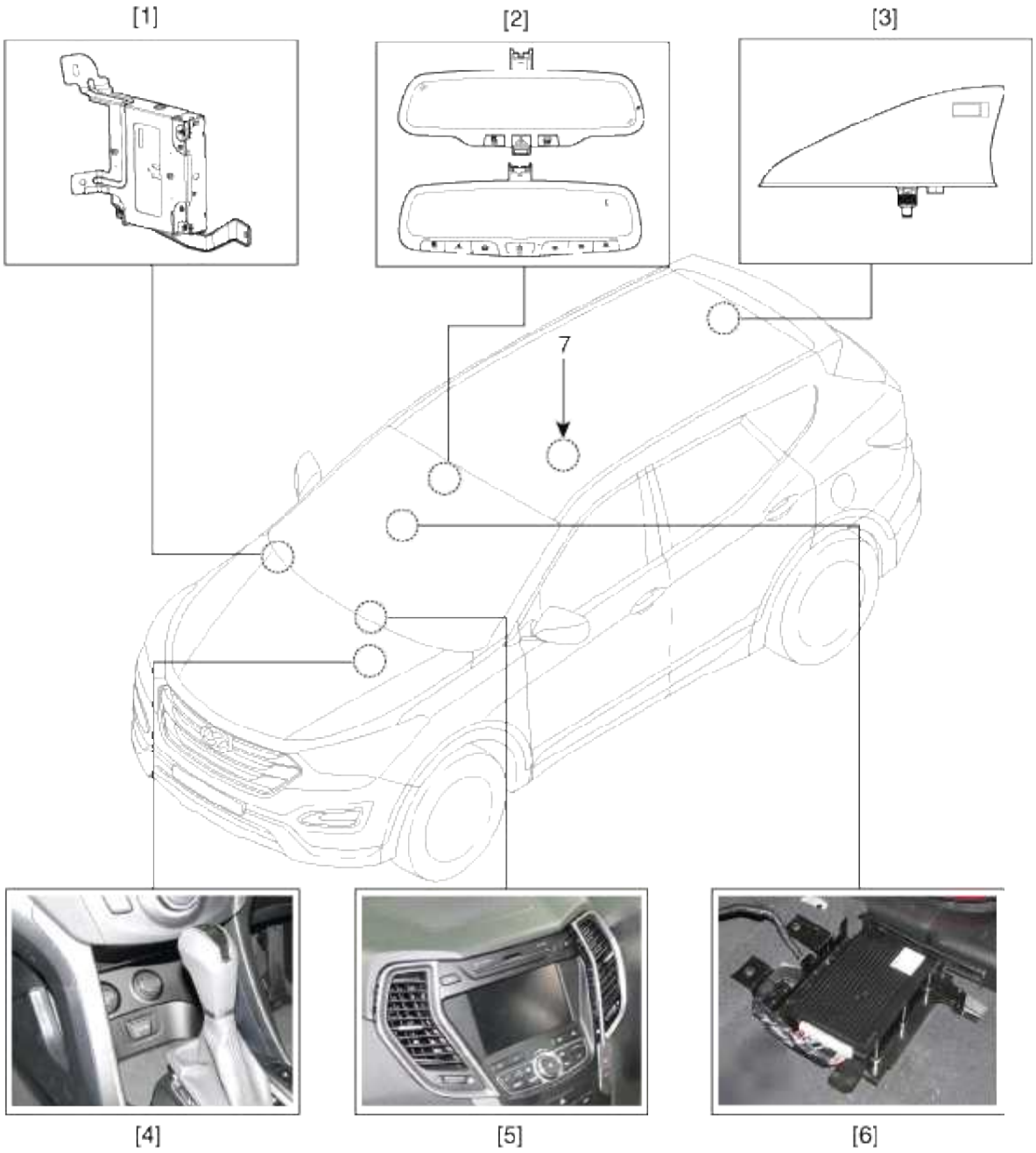
Troubleshooting

Problem	Possible Cause	Solution
The power does not turn on.	The fuse is disconnected.	Replace with a suitable fuse. If the fuse is disconnected again, please contact your point of purchase or service center.
	Device is not properly connected.	Check to see that the device has been properly connected.
The CD does not play.	The DISC has not been inserted or has been inserted upside down.	Insert the disc properly so that the sides are facing the correct direction.
	The DISC has been contaminated.	Wipe dirt dirt and other foreign substances from the DISC.
	The vehicle battery is low.	Charge the battery. If the problem persists, please contact your point of purchase or service center.
	A disc which is not supported by the device has been inserted.	Insert a disc which is supported for play by the device.
The sound does not work.	• The volume level is set the lowest level.	• Adjust the volume level. • Check the connection state.

	• The connector is not properly connected. • The device is currently fast-forwarding, rewinding, scanning, or playing in slow mode.	• The sound will not work when the device is fast-forwarding, rewinding, scanning, or playing in slow mode.
The sound or video quality is low.	• The DISC is dirty or scrached. • Vibration is occuring from the position in which the conversion switch has been installed. • The color and tone quality of the image is low.	• Wipe off water or dirt from the DISC. Do not use a disc which has been scrached. • The sound may be short-circuited and the image distorted if the device begins to vibrate. The device will return to normal operation once the vibration has stopped. • Aging of the video display and deterioration in performance may cause certain quality degradations.
The USB does not work.	• USB memory is damaged. • USB memory has been contaminated. • A separately purchased USB HUB is being used. • A USB extension cable is being used. • A USB which is not a Metal Cover Type USB Memory is being used. • A HDD type, CF, SD Memory is being used. • There are no music files which can be played.	• Please use after formatting the USB into FAT 12/16/32 format. • Remove any foreign substances on the contact surface of the USB memory and multimedia terminal. • Directly connect the USB memory with the multimedia terminal on the vehicle. • Directly connect the USB memory with the multimedia terminal on the vehicle. • Use a standard USB memory. • Use a standard USB memory. • Only MP3, WMA file formats are supported. Please use only the supported music file formats.
The iPod is not recognized even though it has been connected.	• There are no titles which can be played. • The iPod firmware version has not been properly updated. • The iPod device does not recognize downloads.	• Use iTunes to download and save MP3 files into the iPod. • Use iTunes to update the firmware version and reconnect the iPod with the device. • Reset the iPod and reconnect with the device.

Body Electrical System > MTS System > Components and Components Location

Components



1. Telematic unit (TMU) 2. BlueLink keypad 3. Roof Antenna 4. AUX jack	5. AVN or Audio head unit 6. External amplifier 7. Mic

Body Electrical System > MTS System > Description and Operation

Description

Mobile Telemetics System (MTS)

Hyundai motor companies are now faced with the task of shifting their paradigm from vehicle-centered services to customer valuecentered services, with the ultimate goal of securing global leadership in the fi eld of vehicle IT and telematics.

Hyundai Motor plans to achieve this by realizing a terminal platform fl exible to changes in IT technology, cooperating with global IT companies, creating an eco-system and providing the latest contents & services based on an open environment.

Body Electrical System.

Blue Link is a dynamic, telematics technology that allows Hyundai vehicles to send—and receive—important and useful information.

The system uses an enhanced cellular network, with automatic roaming, that optimizes connections and prioritizes emergency requests.

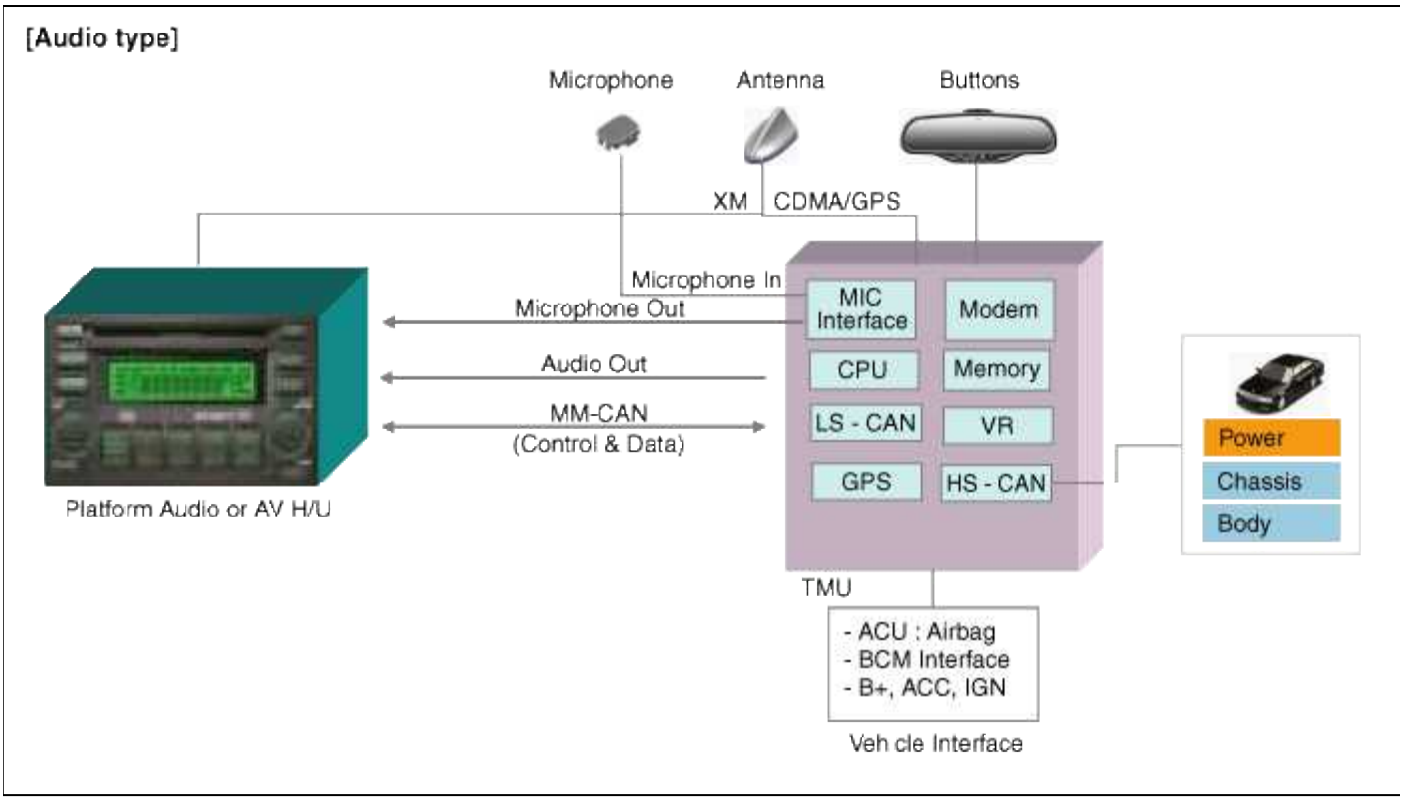
With Blue Link you get…

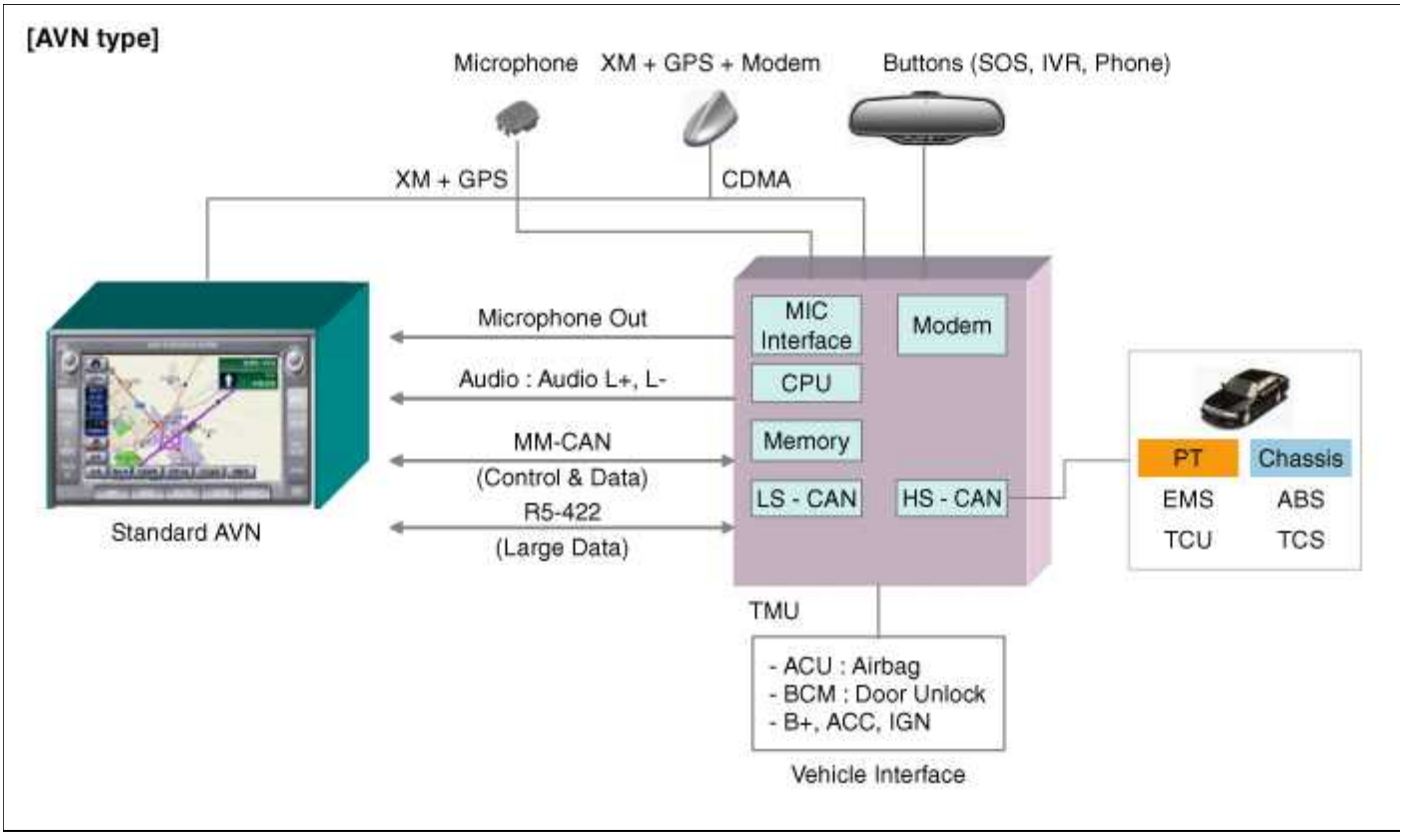
- Automatic emergency assistance, in the unfortunate event of a collision.
- The convenience of point-of-interest search and navigation assistance, as well as the ability to remotely operate various vehicle features.
- The peace of mind of self-diagnostic vehicle reports, and more.

Main Features

1. TMU Concept : Registered driver request the Service from Call Center (Safety and Security, TBT service, etc.)
2. GPS & CDMA Communication : Connect the Call Center by CDMA. Use Simple Navigation System by GPS & CDMA (Only Audio type).
3. Integrate a Voice Recognition & Communication : User can operate the service by Speech Recognition (only Audio) User can use downloaded POI Data by CDMA (only AVN).
4. Control BCM by Call Center Service : Door Lock/Unlock, Horn/Light, Remote Start/Stop be operate by Service.

System Components





Using procedures

1. Enrolling in Blue Link

After the enrollment process, you can use to access your Blue Link preferences.

> NOTE
>
> For more detail procedure, please refer to the Blue Link owner's manual.

2. Subscribe the Blue Link Packages

Blue Link services come in three groupings, or packages:

Assurance	• Automatic Collision Notification and Assistance • SOS Emergency Assist • Enhanced Roadside Assist • Monthly Vehicle Report		
Essentials	• Convenience: – Remote Door Lock – Remote Door Unlock – Remote Horn/Lights – Remote Vehicle Start* – Quick Tips – Location Sharing – Voice Text Messaging	• Vehicle Self Diagnostics: – Automatic Diagnostics Trouble Code Notification – Maintenance Alert – Recall Advisor – Service Link	• Safeguard: – Stolen Vehicle Recovery – Stolen Vehicle Slowdown – Vehicle Immobilization – Valet Alert – Panic Notification – Alarm Notification – Geo-Fence – Speed Alert – Curfew Alert
	• Point of Interest Search by Advanced Voice Recognition • Point of Interest Web Search & Download		

Guidance	• Turn-by-Turn Navigation** • Daily Route Guidance with Traffic Conditions • Traffic • Gas Station Locations & Gas Prices • Eco-Coach • Restaurant Ratings & Locations • Weather

Owners can subscribe to Blue Link packages in the following groupings;

A. Assurance

B. Assurance + Essentials

C. Assurance + Essentials + Guidance

3. Setting Blue Link preferences

Many Blue Link features, reports, or alerts require setup, with input from you.

> NOTE
>
> For more detail procedure, please refer to the Blue Link owner's manual.

4. Accessing Blue Link preferences

(1) Smart Phone Mobile Application

You can download the Blue Link mobile app to your compatible smart phone.
For more detail procedure, please refer to the Blue Link owner's manual.

(2) In-car Application

Controls for Blue Link in-vehicle voice-response use are located on the rearview mirror.

> NOTE
>
> For more detail procedure, please refer to the Blue Link owner's manual.

(3) Web Application

Many Blue Link features can be customized, activated, or accessed at www.MyHyundai.com.
This is your important link to getting the most out of your Blue Link system.

> NOTE
>
> For more detail procedure, please refer to the Blue Link owner's manual.

Service List

1. Safety and Security

Service Name	Service Trigger
- Auto Collision Notification	In the event of an accident or air bag deployment, ACN notification will be triggered automatically.
- SOS – Emergency Assistance	It will be triggered by manually pressing the SOS button on the inside mirror. It will connect you to emergency assistance helper.
- Alarm/Panic Notification	when the vehicle alarm system is activated, it will be automatically triggered and inform to owner. If the customer push the panic button of key FOB near the vehicle, it will be triggered and notify that driver or vehicle occupant may be in danger
- Enhanced roadside	Push the Interactive Voice Recognition (IVR) button on the inside mirror and ask the operator for help.
- Speed Alert	Customer can setup notification limit of vehicle speed on the web or by asking operator using IVR call.
- Remote Door Control – Lock	Customer can ask for Remote Door Lock service by using the Smart Phone application or on the web(CWP) or asking the operator by IVR call.
- Remote Door Control – Unlock	Customer can ask for Remote Door Unlock service by using the Smart Phone application or on the web(CWP) or asking the operator by IVR call.
- Remote Horn and Lights	Customer can ask Horn&Light or Light Only services by using the Smart Phone application or on the web(CWP) or asking the operator by IVR call.
- Stolen Vehicle Recovery	- In the event your vehicle or reported stolen, to law enforcement authorities, the BlueLink Customer Care Center can use the GPS system to help pinpoint the exact location of the vechicle and assist in its recovery. - The customer can ask stolen vehicle recovery by using phone, or on the web.
- Vehicle Immobilization/Slowdown	This service can be triggered on request by police only
- Curfew Alert	The customer can setup notification time interval that vehicle being used on the web or by asking operator using IVR call.
- Vehicle Remote Start	The customer can ask remote start service by using the Smart Phone application or on the web(CWP) or asking to operator by IVR call. (Automatic transmission only)

2. Voice Recognition Module (VRM)

Service Name	Service Trigger
- Eco Coach	1. Showing the eco-coach window. The customer can see the average efficiency curve of fuel consumption by selecting eco-coach software button into the Info menu (AVN) or saying "eco-coach on" using PTT button on the inside mirror. (Audio) (1) AVN TMU A. Selecting eco-coach button (2) Audio TMU A. Saying "Eco-coach on" menu : Press PTT button on the inside mirror, after heard "Please say command" sound, say "Eco- coach on" 2. See the fuel consumption on the web. Refer to the telematics web service manual for detail information.
- Maintenance Alert Notification	Refer the telematics web service manual for detail information about setup mile triggered to diagnostic service
- Automated DTC notification	If the vehicle has identified a problem, this information will be sent for server automatically.
- Recall and campaign advisor	When any recall or campaign notification for his vehicle is sent by HMC, it will be shown on the screen. The customer can hear notification by using IVR call, after the notification, the popup will be removed automatically.
- Web- Based Diagnostics	The customer can check the status of vehicle using telematics web server. Refer to the telematics web service manual for more information.
- Scheduled Diagnostics	There are two kinds of scheduled diagnostic options. Please see telematics web service manual for more information.

3. Geographic Information System (GIS)

Service Name	Service Trigger
- Traffic Flow Accident Construction Control	The customer can hear construction or accident condition on the driving road flow using IVR call. Please ask operator after IVR call connected.
- Daily Route Guide with Traffic	The customer can hear traffic comparison between several road using IVR call. Please ask Operator after IVR call connected. Before listen this service, the customer should establish the routes on the web. Refer to the telematics web service manual for more information.
- Gas Station Location and Fuel Prices	The customer can hear Gas station location and Fuel prices using IVR call, Point of Interests (POI) information can be downloaded on the vehicle.
- Geo-Fence	The customer can setup valid boundary of vehicle driving. It can be used for Varlet geo-fence or normal geofence. Both can be setup by web or by asking operator using IVR call.
- Operator Navigation	The customer can hear navigation using IVR call.

- POI by Guided IVR with Operator Backup	POI download can be requested via IVR call.
- POI Download via Web Portal	POI download can be requested using web portal.
- POI Searching by IVR (TMU and Phone)	POI download can be requested via IVR call.
- Location Sharing	For this service, the customer should pre-register a friend information on the web. When your friend asks inform he's/she's location to you, it can will be download by a kinds of POI.

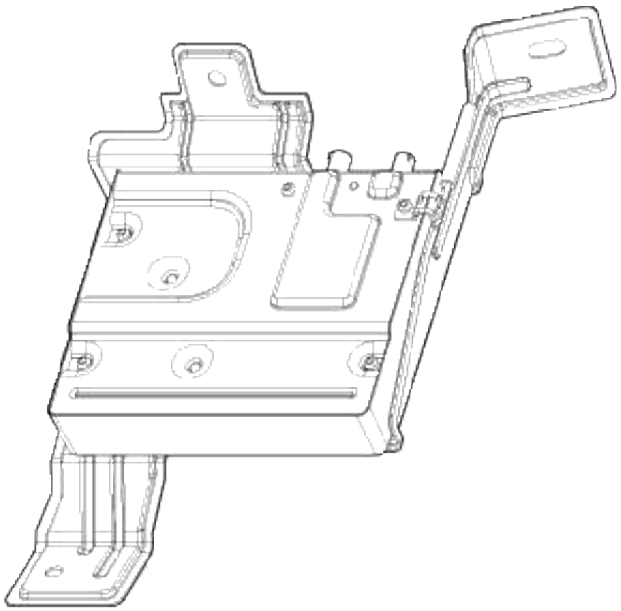
4. Operator Service & ETC

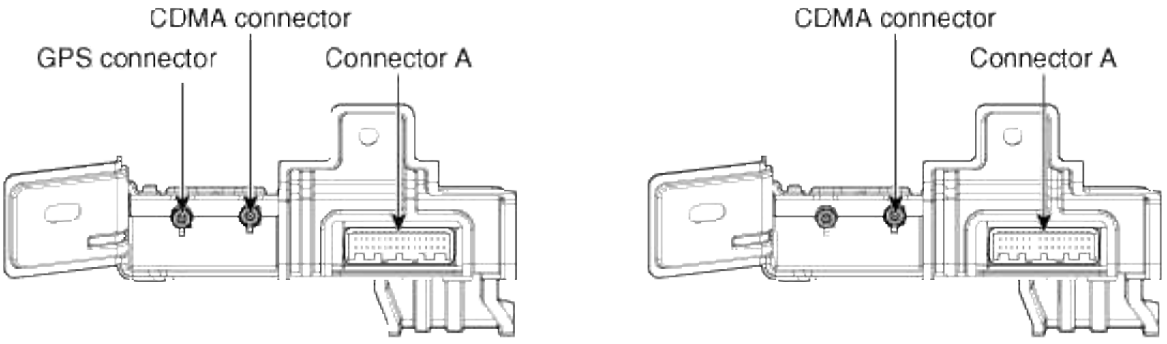
Service Name	Service Trigger
- IVR Owner's Manual	The Customer can hear how to using about any kinds of vehicle Manual. Please ask operator on the IVR call.
- Operator Assisted Owner's Manual	The Customer can hear how to use any Manual. Please ask operator on the IVR call.
- Q-feedback	This is a diagnostic services. When customer hear any unusual noise on the vehicle, customer can ask to check the vehicle using IVR call.

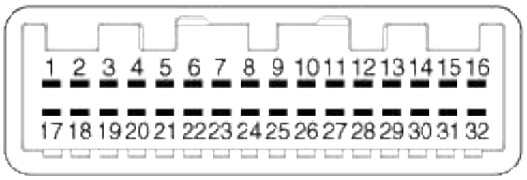
Service Name	Service Trigger
- Voice Text Messaging	Pair a Bluetooth phone to the vehicle's Bluetooth system. Use the vehicle's Bluetooth system to call, toll-free, 877-730-2896
- Provisioning	In case of being powered on for the first time at the Hyundai Factory for North American or US Port.
- TMU Disable Mode	"blueLink not active. Please call xxx-xxx-xxxx" will be displayed when any button is pushed.
- TMU Swap	The Proper TMU (TeleMatics Unit) should be installed on the vehicle. "Incorrect Telematics Unit Contact Dealer" will be displayed if incorrect TMU is installed.

Body Electrical System > MTS System > Telemetics Unit (TMU) > Components and Components Location

Component







Connector Pin Information

[Audio type]

No.	Description	No.	Description
1	Ground	17	-
2	Ground	18	Battery 1
3	-	19	IGN 1
4	Keypad ground	20	ACC
5	MIC output -	21	Airbag
6	MIC output +	22	Keypad input
7	BCM Tx	23	BCM Rx
8	-	24	MIC shield
9	-	25	-
10	-	26	-
11	-	27	-
12	HS CAN -	28	MIC input
13	HS CAN +	29	MIC ground
14	-	30	-
15	Audio output -	31	MM CAN -
16	Audio output +	32	MM CAN +

[AVN type]

No.	Description	No.	Description
1	Ground	17	Battery 2
2	Ground	18	Battery 1
3	-	19	IGN 1
4	Keypad ground	20	ACC
5	MIC output -	21	Airbag
6	MIC output +	22	Keypad input
7	BCM Tx	23	BCM Rx
8	RS422 shield	24	MIC shield
9	RS422 Rx -	25	RS422 Tx -
10	RS422 Rx +	26	RS422 Tx +
11	-	27	-
12	HS CAN -	28	MIC input
13	HS CAN +	29	MIC ground
14	-	30	-

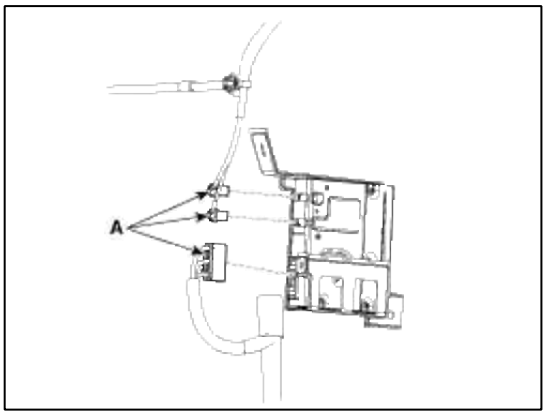
15	Audio output -	31	MM CAN -
16	Audio output +	32	MM CAN +

Body Electrical System > MTS System > Telemetics Unit (TMU) > Repair procedures

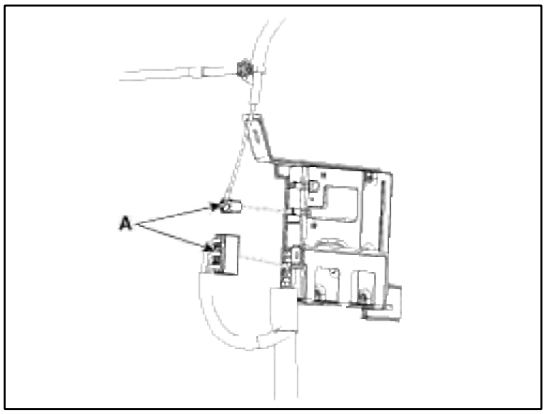
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.
   (Refer to Body - "Glove Box Housing")
3. Disconnect the cables and connector (A) from the MTS unit.

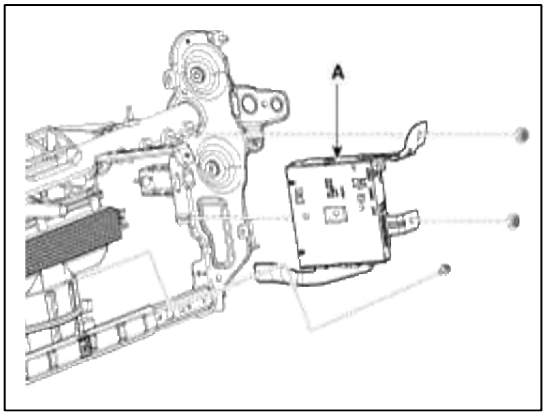
   [Audio type]



   [AVN type]



4. Remove the MTS unit after loosening the nuts(2EA) and a bolt.



Installation

1. Connect the connector and cables.
2. Install the MTS unit.
3. Install the glove box housing.
4. Connect the negative (-) battery terminal.

Inspection

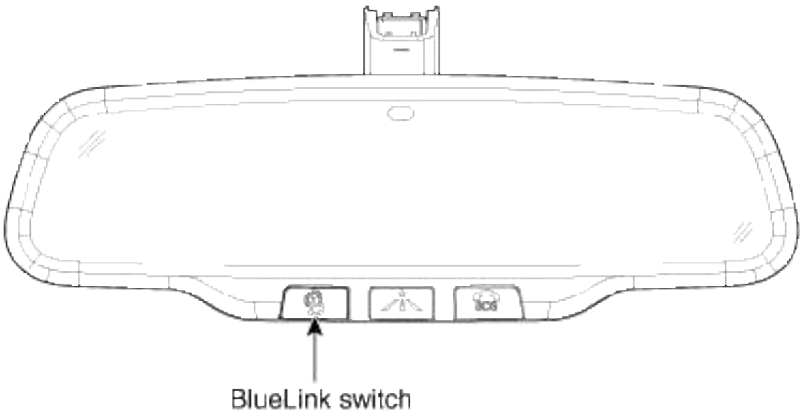
1. After replacing the TMU, connect to "call center" by pushing the Blue Link button.
2. If Blue Link service connected successfully, and then technician can hear the "Welcome to Hyundai Bluelink" sound.

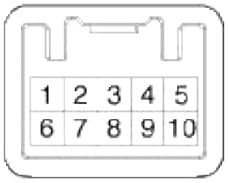
> NOTE
>
> After replacing the TMU, the TMU automatically read the Vehicle Identity Number (VIN) and send it to Blue Link service center.
> In this reason, technician have to test that Blue Link connect normally.

Body Electrical System > MTS System > BlueLink Control Switch > Components and Components Location

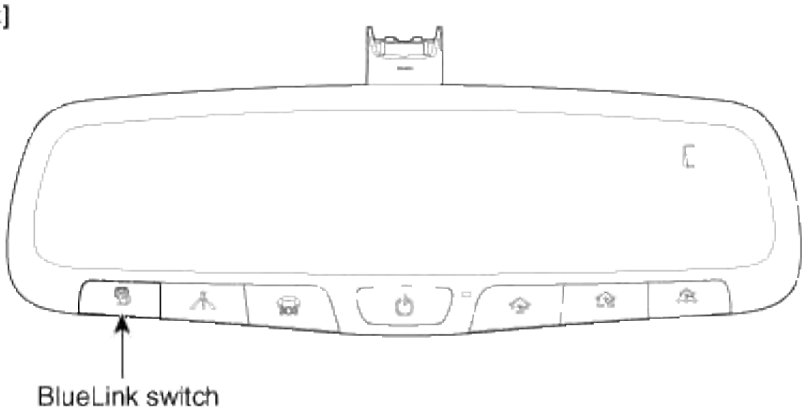
Components

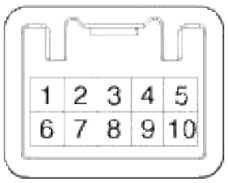
[BlueLink]



Connector	No.	Description	No.	Description
	1	Keypad signal	6	Tail (+)
	2	OEC (+)	7	OEC (-)
	3	keypad ground	8	Ground
	4	-	9	Reverse inhibit
	5	-	10	Ignition

[BlueLink + Homelink]



Connector	No.	Description	No.	Description
	1	Keypad power	6	Battery (+)
	2	OEC (+)	7	OEC (-)
	3	keypad output	8	Ground
	4	-	9	Reverse inhibit
	5	-	10	Ignition

Body Electrical System > MTS System > BlueLink Control Switch > Repair procedures

Removal

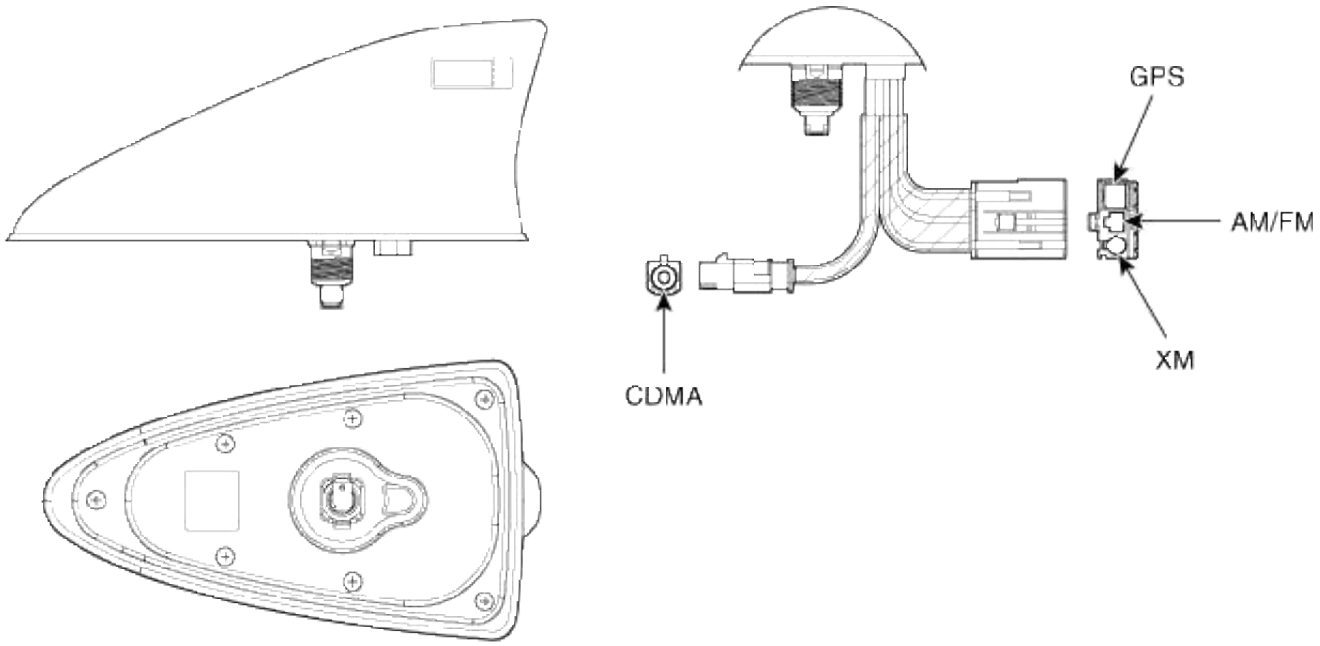
1. Remove the Electro chromic Inside rear view mirror.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Electro Chromic Inside Rear View Mirror)

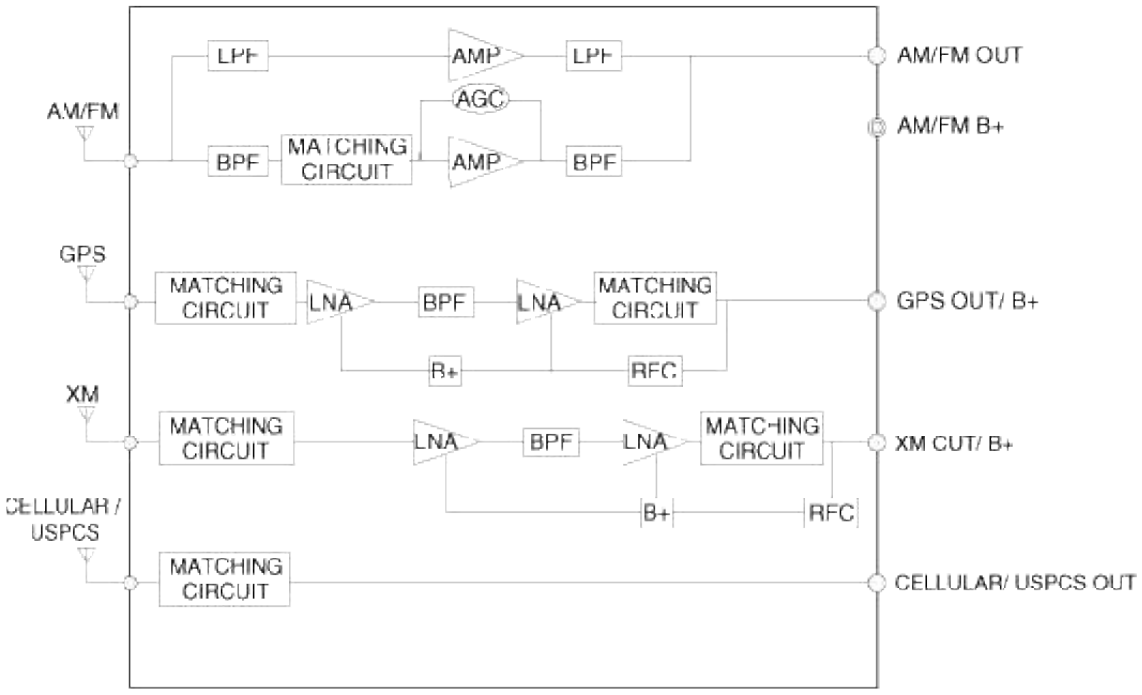
Installation

1. Install the Electro chromic Inside rear view mirror.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmcty
   target="_blank">(Refer to Electro Chromic Inside Rear View Mirror)

Body Electrical System > MTS System > MTS Antenna > Components and Components Location

Components





※ M/C : Matching Circuit
LNA : Low Noise Amplifier
BPF : Band Pass Filter
RFC : Radio Frequency Choke

Body Electrical System > MTS System > MTS Antenna > Repair procedures

Removal

1. Remove the roof antenna.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Audio - "Antenna")
   <a href="content.asp?vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&n

Installation

1. Install the roof antenna.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Audio - "Antenna")
   <a href="content.asp?vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&n

Body Electrical System > Smart Key System > Specifications

Specifications

Smart Key Unit

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F ~ 167°F (-30°C ~ 75°C)
Load	Max. 2.9mA (When welcome light function off)

RF Receiver

Items	Specification
Frequency	315 Mhz
Antenna type	FSK (Frequency Shift Keying)

Smart Key Fob

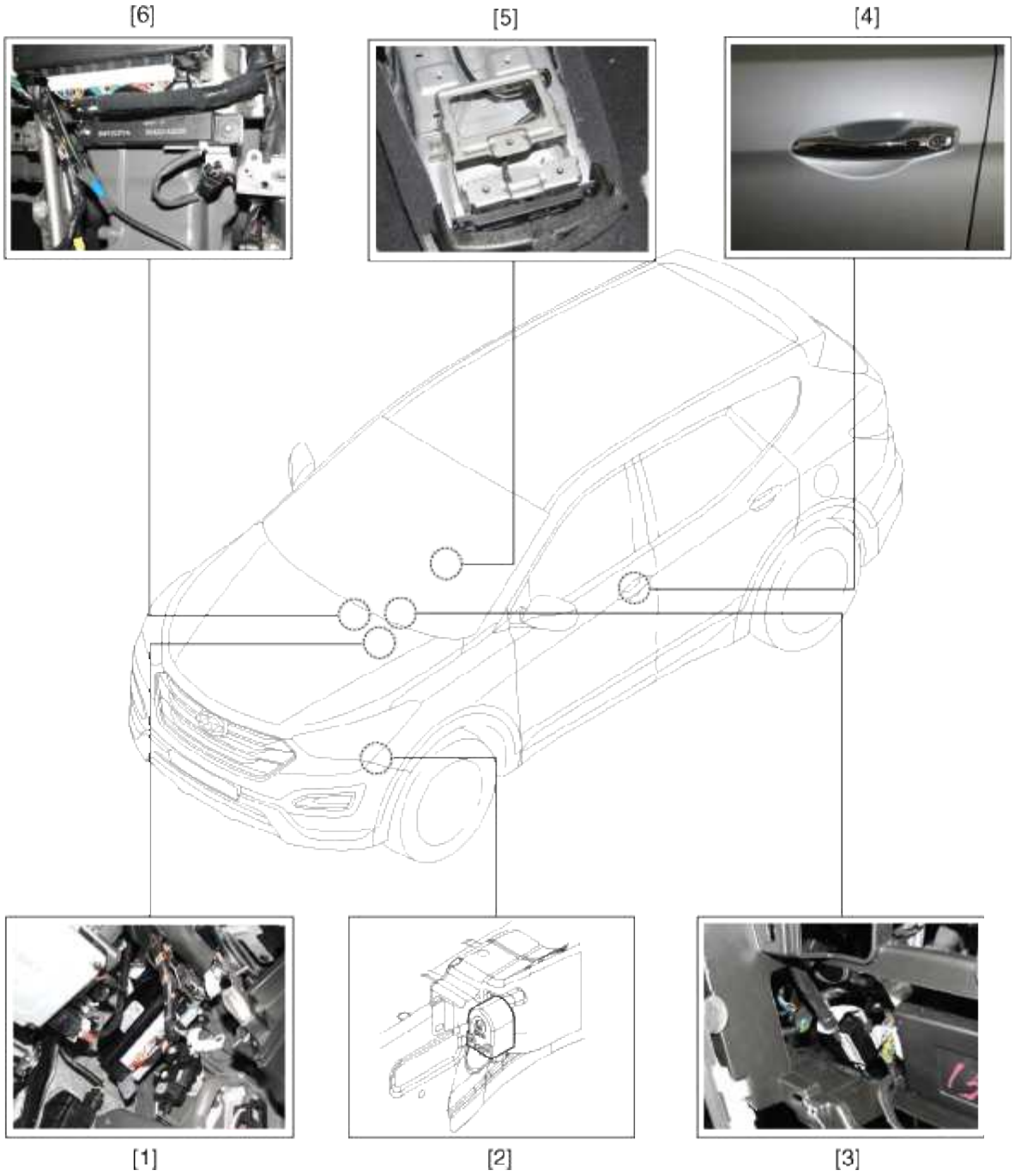
Items	Specification
Battery	Lithium battery 3V 1EA
Distance	30m from vehicle, RF : 30m, Passive(LF) : 0.7m
Battery life	More than 2 years (10 times / a day) WARNING An inappropriately disposed battery can be harmful to the environment and human health. Dispose the battery according to your local law(s) or regulation.
Push buttons	4 (Door lock / unlock, Tailgate, Panic)
Frequency(Rx)	125 kHz
Frequency(Tx)	315 MHz
Numbers	2EA

Antenna

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F ~ 167°F (-30°C ~ 75°C)
Frequency	125kHz
Numbers	Interior(3EA), Door(2EA), Bumper(1EA)

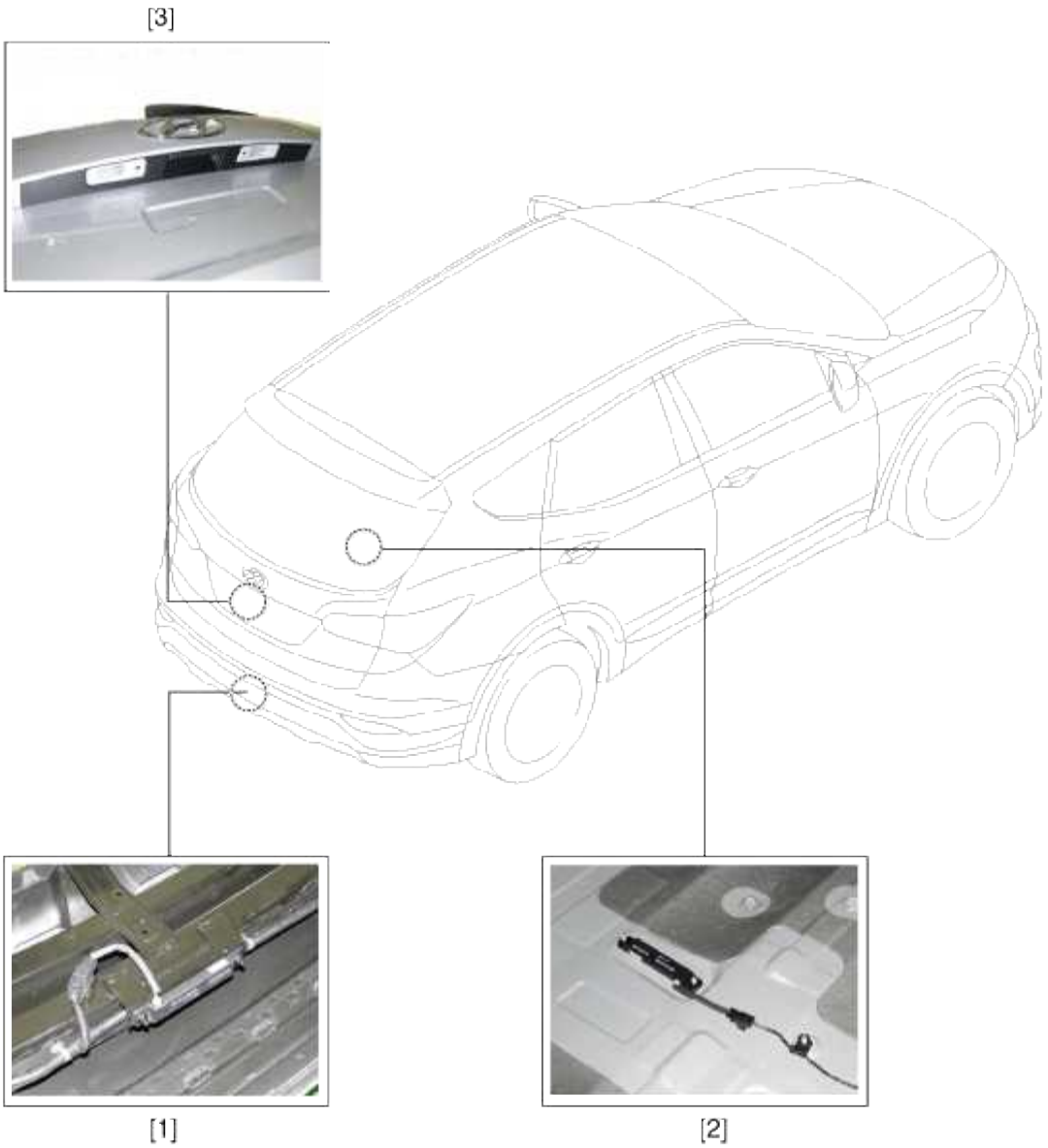
Body Electrical System > Smart Key System > Components and Components Location

Component Location (1)



1. Smart key unit 2. Buzzer 3. RF receiver	4. Door outside handle 5. Interior antenna 2 6. Interior antenna 1

Component Location (2)



1. Tailgate open switch 2. Bumper antenna	3. Interior 3 antenna

Body Electrical System > Smart Key System > Description and Operation

Description

The SMART KEY system is a system that allows the user to access and operate a vehicle in a very convenient way. To access the vehicle, no traditional key or remote control unit is needed.

The user carries a SMART KEY FOB which does not require any conscious actions by the user (e.g. operate a RKE button). The SMART KEY system is triggered by pressing a push button in the door handle.

After being triggered the vehicle sends out a request in a limited range. If the SMART KEY FOB receives this request, it automatically sends a response to the vehicle. Then the system decides whether to perform a particular action (unlocking, locking…) or remain inactive.

Again, a communication between the vehicle and the SMART KEY FOB is needed before any actions will be

performed.

The System offers the following features :

- Passive unlock via door driver side and passenger side
- Passive locking via door driver side and passenger side
- Passive start
- Passive access trunk via the trunk lid switch at the trunk
- Passive locking via tailgate
- Max. 2 fobs can be handled by the system
- Immobilizer backup antenna driver integrated into SSB for TP authentication (i.e. limp home mode)
- Communication with engine management system
- Communication with SRX
- LF-RF communication

1. Passive unlock
   The system allows the user to access (unlock) the vehicle without performing any actions with the SMART KEY FOB. This feature could be different depending on platform as follows:
   A. Pressing Push button in door handle
2. Passive locking
   The system allows the user to lock the vehicle by pushing a button on door handle with the SMART KEY FOB.
3. Button start
   The system allows to switch the power modes (Off, Accessory, Ignition), as well as to start and stop the vehicle's engine without performing any actions with the SMART KEY FOB. See Button Engine Start system specification.
4. LIMP HOME Mode
   Additionally, the system offers so called "limp home mode", which is the user can operate all vehicle functions by pushing the key into the SSB.

Smart Key ECU (SMK ECU)

The SMK ECU manages all functions related to "Passive Unlock", "Passive Lock" and "Passive Authorization for Engine Start Operation".

It reads the inputs (Push button in door handle, Start Stop Button (SSB), PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates via the CAN/LIN (depends on the vehicle) as well as a single line interface to further devices of the car.

It reads the inputs (Push button in door handle, Start Stop Button (SSB), PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates via the CAN as well as a single line interface to further devices of the car.

For communication with the SMART KEY FOB, SMK ECU generates a request (challenge) as an encoded and modulated 125 kHz signal at the inductive antenna outputs and receives the SMART KEY FOB's response via the external RF receiver.

The main functional blocks of the SMK ECU are:

- Power supply
- Microcontroller with FLASH Memory
- Single Line Interface to SRX
- Single Line Interface to EMS
- Input stage
- LF antenna amplifier/driver
- CAN communication with BCM
- LIN communication with other unit (depending on platform)

The LF antenna amplifier/driver generates a 125 kHz sinusoidal carrier signal which is distributed to the different antennas.

Smart Key FOB

The system supports up to 2 SMART KEY FOBs.
The main functions of the SMART KEY FOB are:

- Passive functionality: receives LF-challenge and sends automatically RF response.
- Classic RKE function by action up to 6 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.
- LED for operation feedback and battery monitoring.

NOTE

The FOB's LED indicator may continue to light even with a low transmitter battery.
If the performance or range of the FOB is less than expected, check the transmitter battery.

Antennas

1. Emitting LF Antennas:
   Inductive antennas in and at the vehicle are used to transform the current, driven by the SMK ECU antenna driver, into a 125 kHz magnetic field, which is the carrier for the SMART KEY challenge.
   Three antennas cover the vehicle's exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors; one antenna in the rear bumper covers the area around the trunk.
   Two antennas cover the vehicle's exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors.
   Up to three antennas cover the vehicle's interior and the trunk interior: two in the passenger compartment and one in the trunk.
2. Bidirectional Immobilizer Antenna (for Limp Home):
   The Immobilizer Backup Antenna is used for sending and receiving data: it emits a magnetic field (125 - 135 kHz challenge) and receives changes in the field strength (response of Transponder).

Door Handle

The front door handles of the two doors (driver door / passenger door) are equipped with emitting LF-antennas to emit the 125 kHz signals. The front door handles are also equipped with a push button.

Push Button

The push button in door handle serves as a trigger to indicate the user's intent to unlock or lock the vehicle.
The push buttons are installed at front doors, integrated into the door handles.
Another button is installed at the trunk lid.

Operation

Passive Functions

The system allows the user to access the vehicle without having to perform any actions (e.g. RKE button pressing) with the SMART KEY FOB. It is sufficient that a valid SMART KEY FOB is located within a defined and limited range with respect to the vehicle. So the system is capable of detecting and authenticating a SMART KEY FOB in the ranges as specified below.

Operating Range

The SMART KEY FOB receives and interprets a challenge sent from the vehicle via the exterior antennas in a free space range of min. 0.7m measured around the exterior antennas which are integrated in the door handles; refer to the below given picture. The trunk access range is also min. 0.7m measured from the antenna position.
The SMART KEY FOB receives and interprets a challenge sent from the vehicle via the exterior antennas in a free space range of min. 0.7m measured around the exterior antennas which are integrated in the door handles; refer to the below given picture

Passive Access (Passive Entry)

Pressing one of the push buttons in the door handles when all doors locked indicates the operator's intent to access the vehicle and thus triggers the system for unlock

Passive Locking (Exit)

Pressing one of the push buttons in the door handles when one of the following condition is fulfilled:

- At least one door is unlocked and two_steps timer is not running or

• Two_steps timer is running and one of the push button except Front Left side is triggered

indicates the operator's intent to lock the vehicle and thus triggers the system for a lock.

Passive Open Tailgate

Pressing the Trunk Lid Switch when trunk is closed indicates the operator's intent to open the trunk and thus triggers the system. Subsequently, the SMK ECU sends a LF-challenge to the SMART KEY FOB via the exterior bumper antenna. The SMART KEY FOB answers with a RF-response. If the received response matches the expected answer, SMK ECU sends a "trunk open" message via the CAN network.

Smart Key Reminder 1

1. Preconditions:
   All terminals OFF & at least one door open & locking status is not locked checked by SMK periodically every 100ms, as long as CAN/LIN active.
2. Event:
   At least 1 door knob status changed from unlock to lock.
3. SMK actions:
   A. IF NO FOB-IN ACTIVE
      SMK performs a search for the fobs in the interior of the vehicle. The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication)
   B. IF FOB-IN ACTIVE
      SMK searches valid TP
   If no fob or no TP has been found, no action is required.
   If any valid fob or valid TP has been found, SMK unlocks the vehicle by sending a CAN Key Reminder unlock message with the fob number.
   If any valid fob has been found, SMK unlocks the vehicle by sending a CAN/LIN Key Reminder unlock message with the fob number.

Smart Key Reminder 2

1. Preconditions:
   All terminals OFF & any door (including trunk) open & no FOB-IN & no locking status (checked by SMK periodically every 100ms, as long as CAN/LIN active)
2. Vehicle action:
   Closing last door or trunk with knobs locked state, or with a locking in progress
3. SMK actions:
   Before elapsing 500ms after the closing if all doors are locked then:
   A. IF NO FOB-IN ACTIVE
      SMK performs a search for the fobs in the interior of the vehicle.
      The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication)
   B. IF FOB-IN ACTIVE
      SMK searches valid TP
   If no fob has been found, no action is required.
   If any valid fob or valid TP has been found, SMK sends unlock command via CAN and activates ext. buzzer warning.
   If any valid fob has been found, SMK sends unlock command via CAN/LIN and activates ext. buzzer warning.

Smart Key Door Lock Warning

Door Lock Warning 1

1. Preconditions:
   While (at least one door knob is unlocked) & (ACC ON or IGN ON) & (No FOB-IN) :
   A. (All doors are closed) & (trunk closed)
2. Event:
   A. User presses the push button in door handle or trunk

3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".

Door Lock Warning 2

1. Preconditions:
   Same as passive locking precondition but with at least one door open.
2. Event:
   User presses the door handle Push button .
3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".
   If no fob has been found, no action is required.
   If the preconditions are no longer valid during buzzer active time (3 seconds), the SMK ECU stops the buzzer immediately.

Door Lock Warning 3

1. Preconditions:
   Same as passive locking precondition
2. User action:
   A. User presses the door handle Push button
3. SMK ECU actions:
   A. If ATWS(Anti Theft Warning System) is in DISARM status, SMK ECU performs a search for the fob inside of the vehicle (use "Door Lock Warning 3" scenario)

If no fob has been found, the passive locking is performed.
If any valid fob has been found, SMK ECU activates the external buzzer.
If the activity timer elapsed or ACC ON or IGN1 ON or NOT All door closed or FOB-IN, the SMK ECU stops the buzzer immediately.
After searching of inside fob, SMK ECU also performs a search for fobs outside of the vehicle.

Smart Key Lamp Warning

1. SMK actions:
   As long as the preconditions are valid, the SMK ECU performs a periodical search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication); periodical means, the search is done every 3 seconds.
   If no fob has been found, the SMK ECU starts Key out indicator lamp activation as all preconditions are valid and will perform another search 3 seconds later.

If any valid fob has been found, the SMK ECU stops the Key out indicator lamp and will (if one door is open) perform another search 3 seconds later; if no door is open then it’s only at the next When the preconditions are still valid, the search resumes by opening of one door.

Failsafe Functions (Backup For Limp Home)

In case of a discharged battery of the SMART KEY FOB or disturbed transmission, the following functions are available:

- Unlocking / locking of doors or trunk (or tailgate depending of the vehicle configuration): use of mechanical key

User Information Functions

ID OUT Warning

1. Preconditions:
   A. (ACC or IGN1) & (any door open or trunk open)
2. Event:
   The last opened door is closed

3. SMK action:
   SMK searches for a SMART KEY FOB in the interior.
   A. If no valid SMART KEY FOB is found, the SMK activates external buzzer and also sends ID OUT warning via CAN (exterior buzzer warning and internal buzzer warning).
   B. If a door is opened and closed again during terminals on and inside valid fob, SMK re-enables the authentication and stops the warning. If the terminal is in ACC, SMK shall turn on immobilizer lamp.

NOTE

If there is a LF error (LF overheating or LF antenna failure), the system will have the same behavior as it is with no fob found.

Immobilizer Lamp

Removing the PIF from the MSL and reinserting the PIF and pushing the MSL Knob will switch the lamp on again.

Fob Battery Low Voltage Detection

To detect fob low battery condition, certain battery voltage measurement and low voltage detection strategy are implemented into fob. The measurement of the battery voltage will be done if fob button is pressed or if a LF measurement command is received.

If the fob has detected a low battery voltage, the LED will not be switched on at button press.

Learning Description

In this chapter, the learning procedure for SMK, FOBs is described.

For the learning of the SMK, FOBs, it's necessary to have a connection to the diagnostic tool.

Learning MODE

Whatever the mode, the learning procedures are managed by the SMK.

Prior to start learning service, have the FOB and the vehicle secret code (called as PIN code) should be known.

Teaching MODE

This mode is used by the dealers in order to replace SMK and/or the set of keys, or to register additional keys for an existing system. That means the system already has been learnt with certain PIN Code. The PIN Code is fixed for the life time of the vehicle, therefore the same PIN Code must be used in this mode. Otherwise learning will be failed

Teaching MODE Procedure Description (Step By Step)

Objective: Key teaching procedure at service station

Initial state:

- SMK replacement: SMK is not learnt, SMART FOB are already learnt with same PIN code
- Additional or new keys teaching: SMK is already learnt with same PIN code

Body Electrical System > Smart Key System > Smart Key > Repair procedures

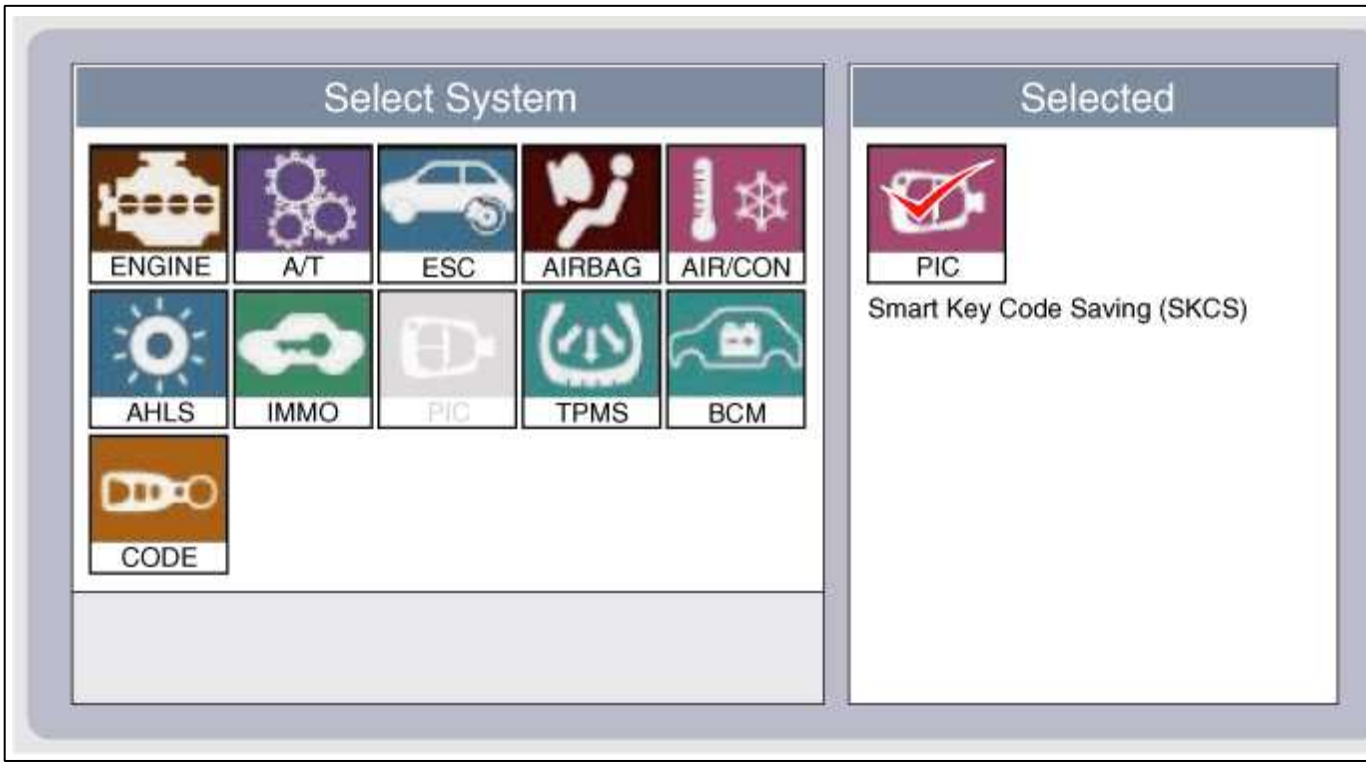
Smart Key

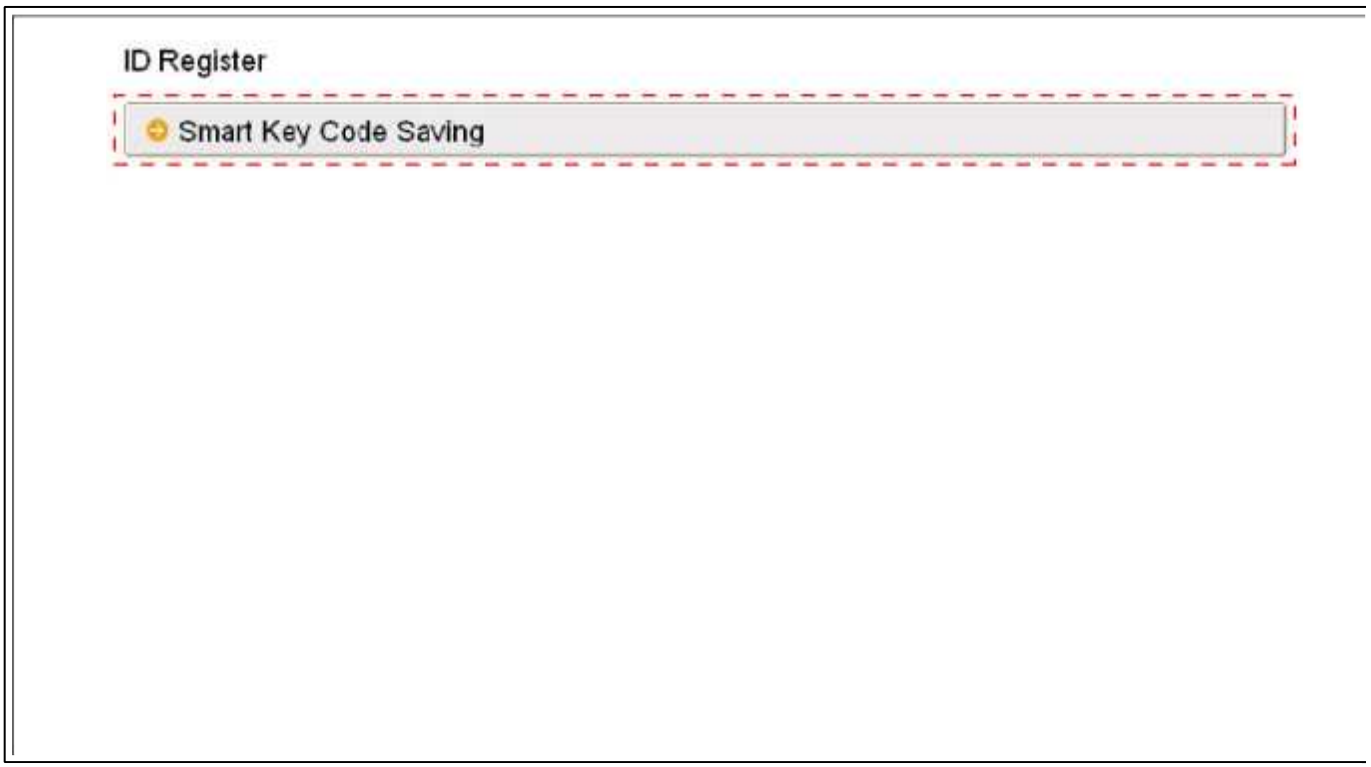
Smart Key Code Saving

1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.

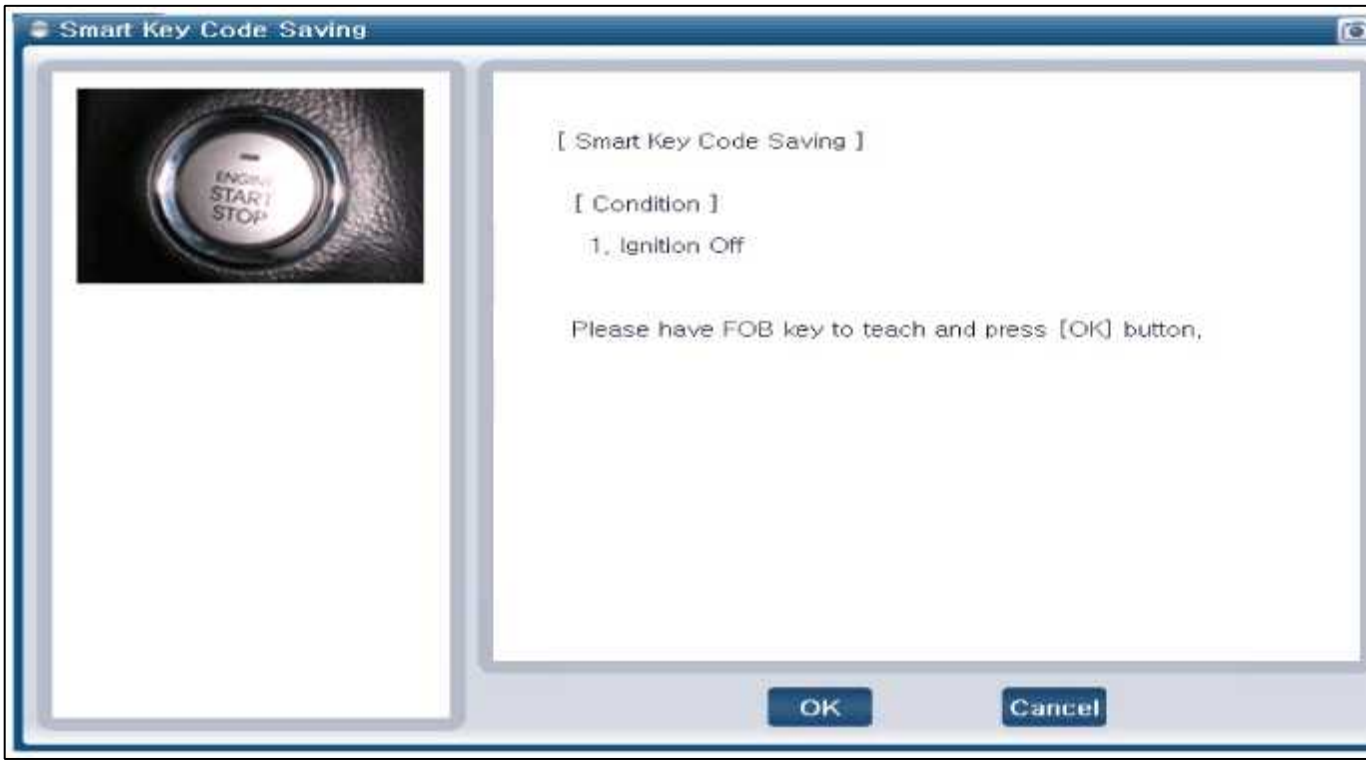


2. Select the vehicle model and then do "Smart key code saving".

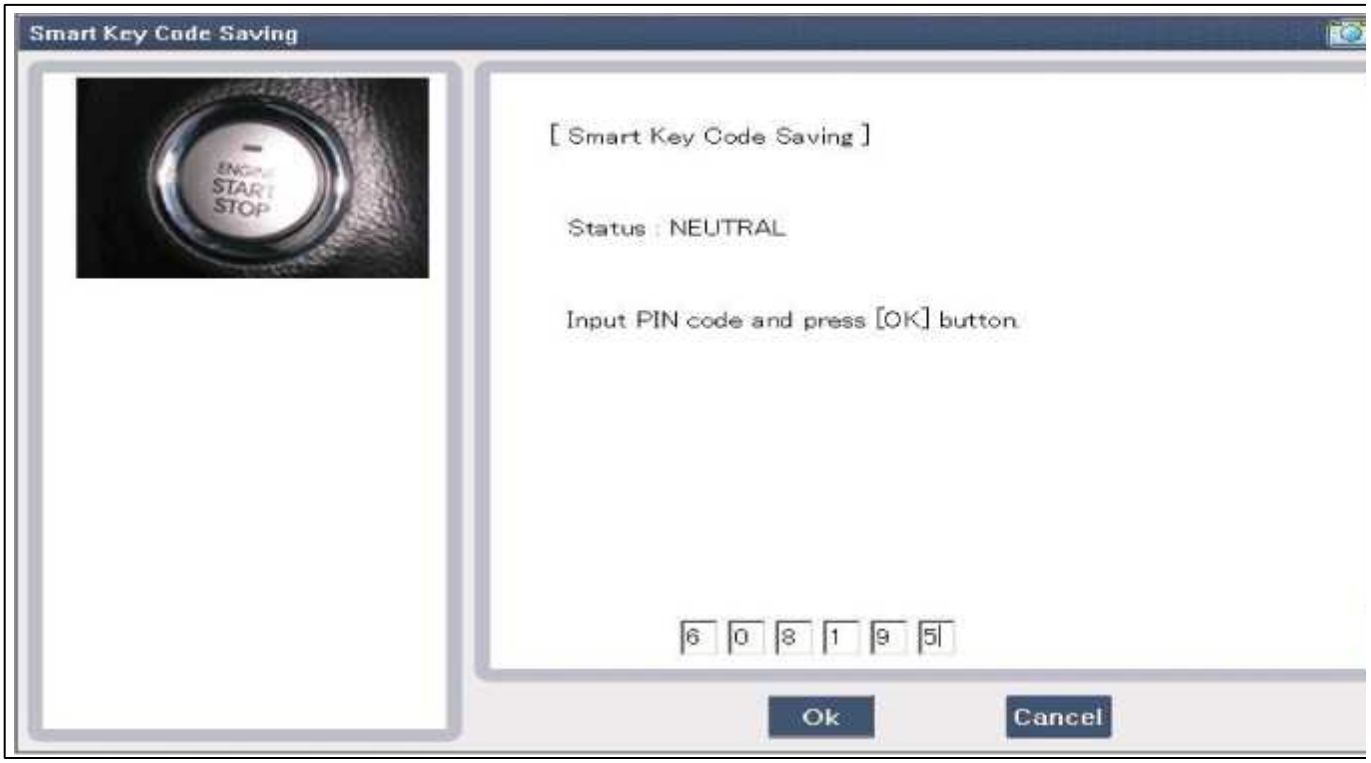


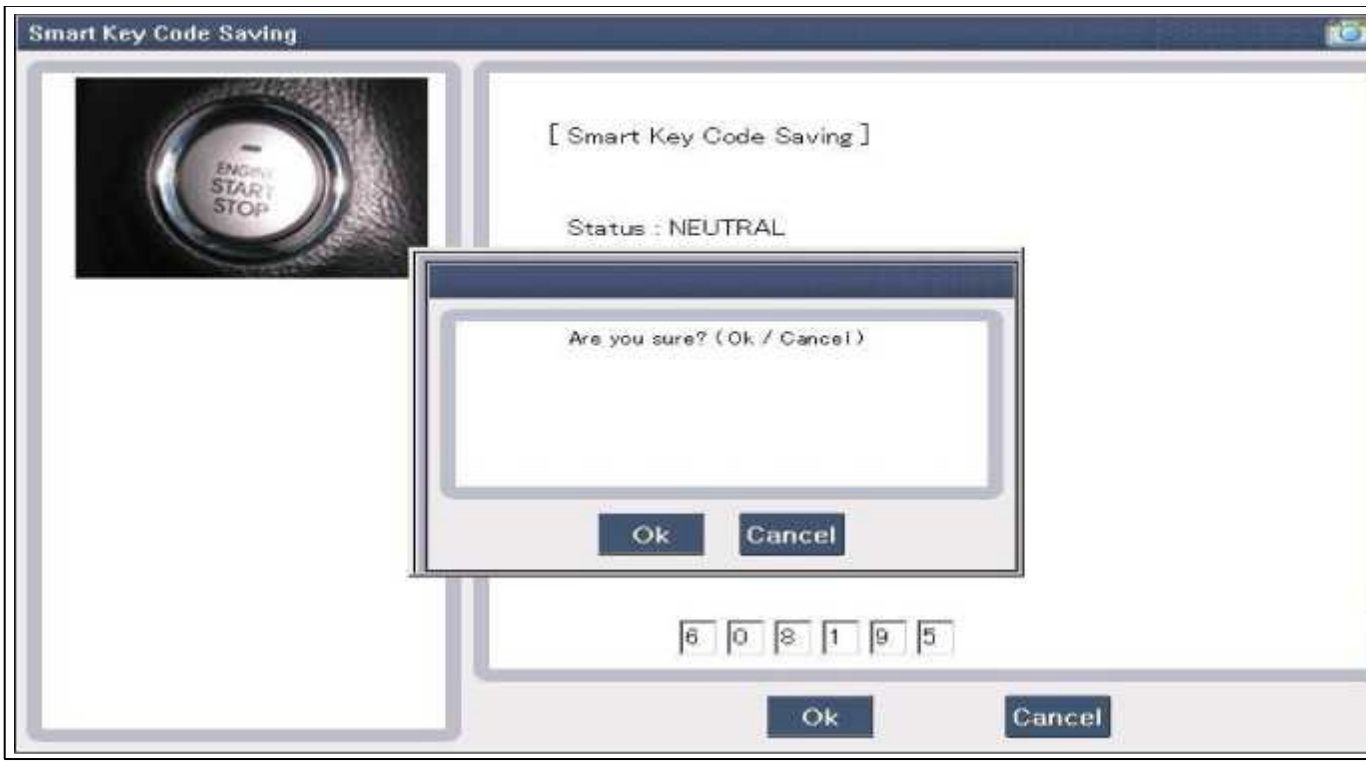


3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

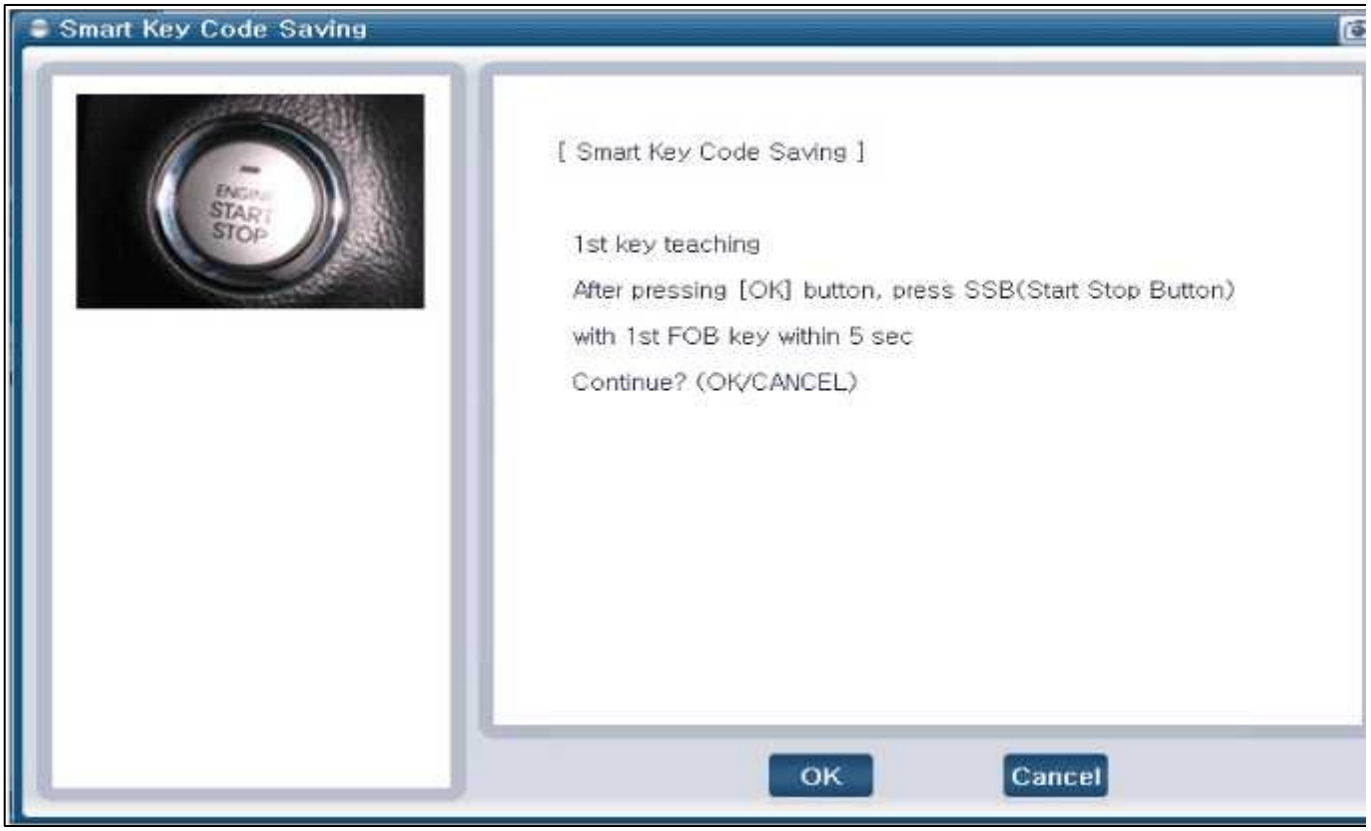


4. After having the teaching smart key, push "ENTER" key.
5. Input the "Pin code" for first key teaching.

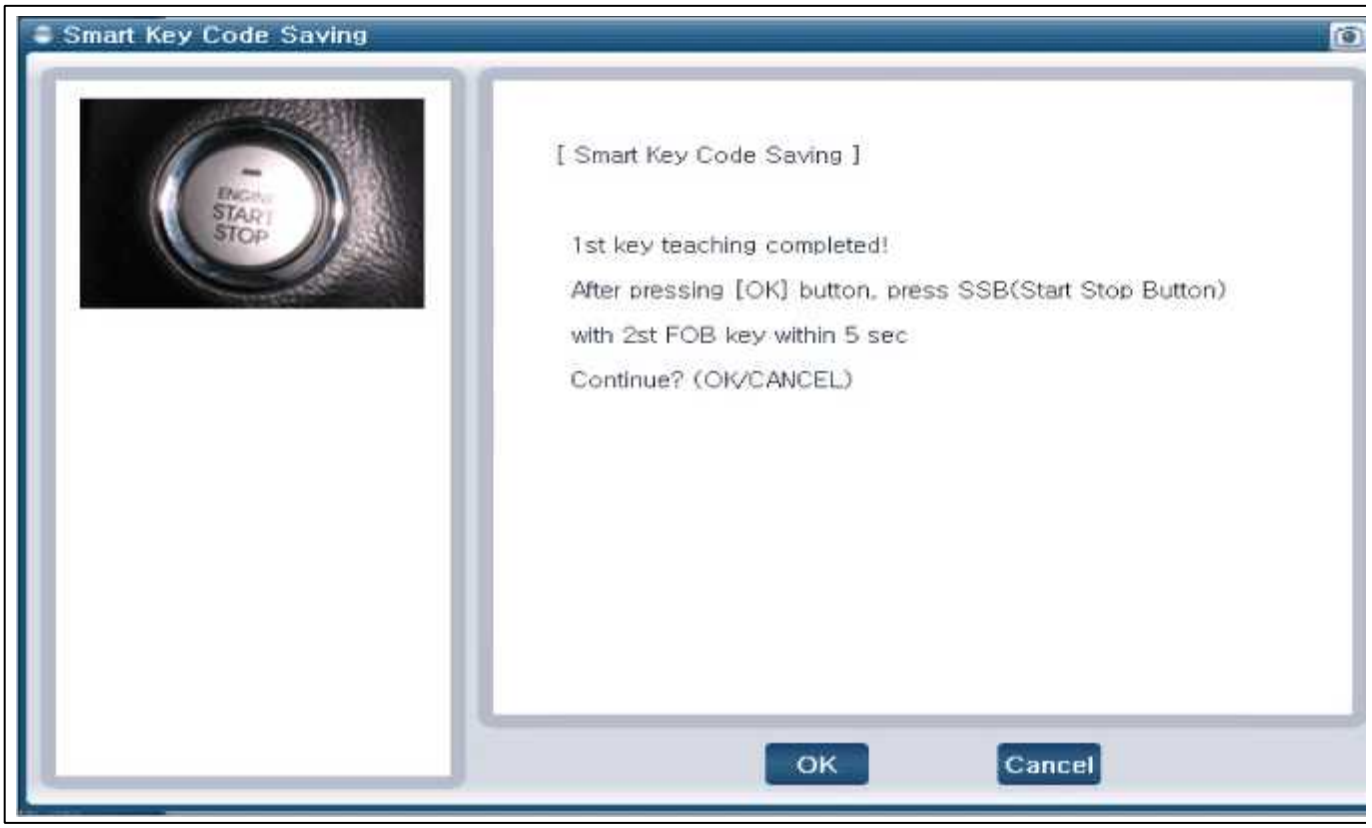




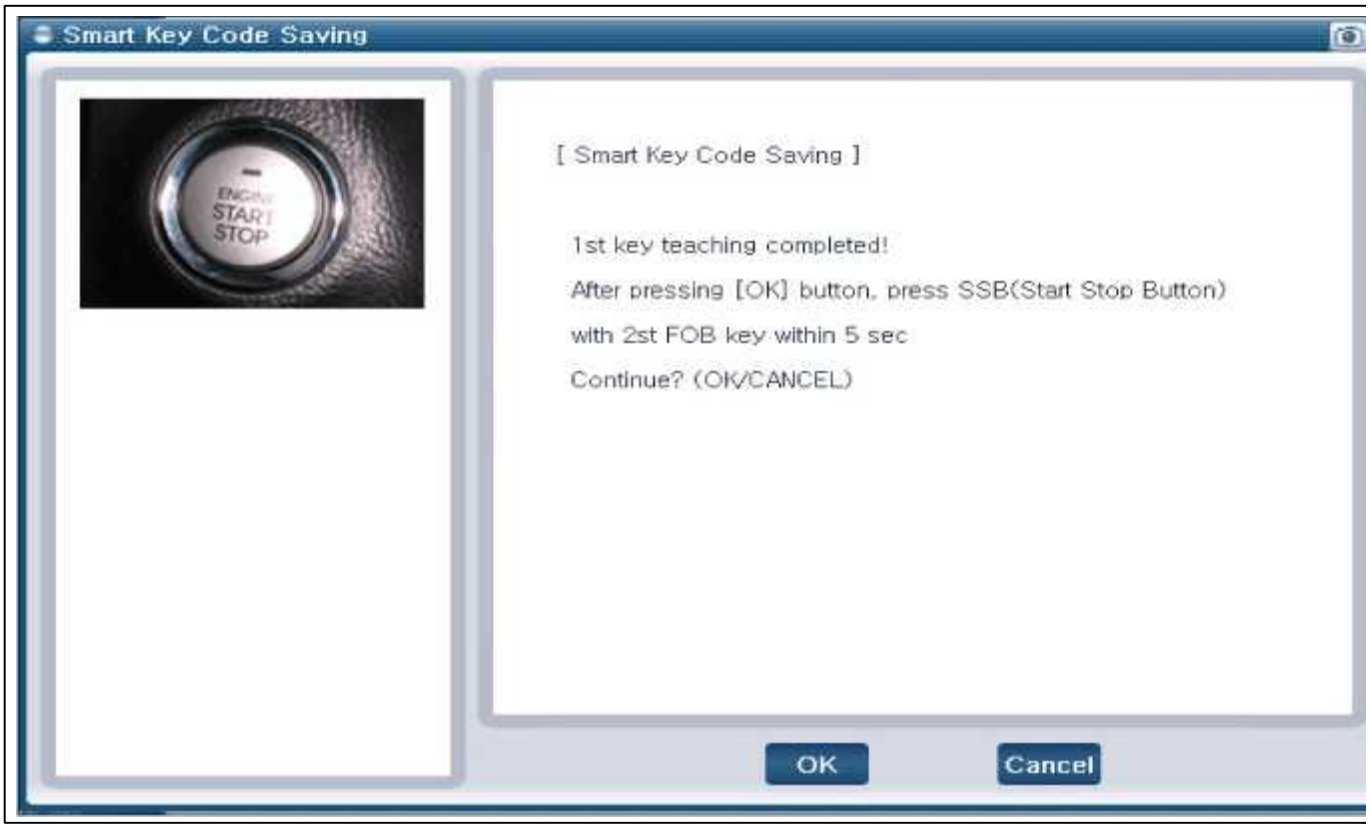
6. Press the SSB with smart key within 5 sec after pressing "OK".



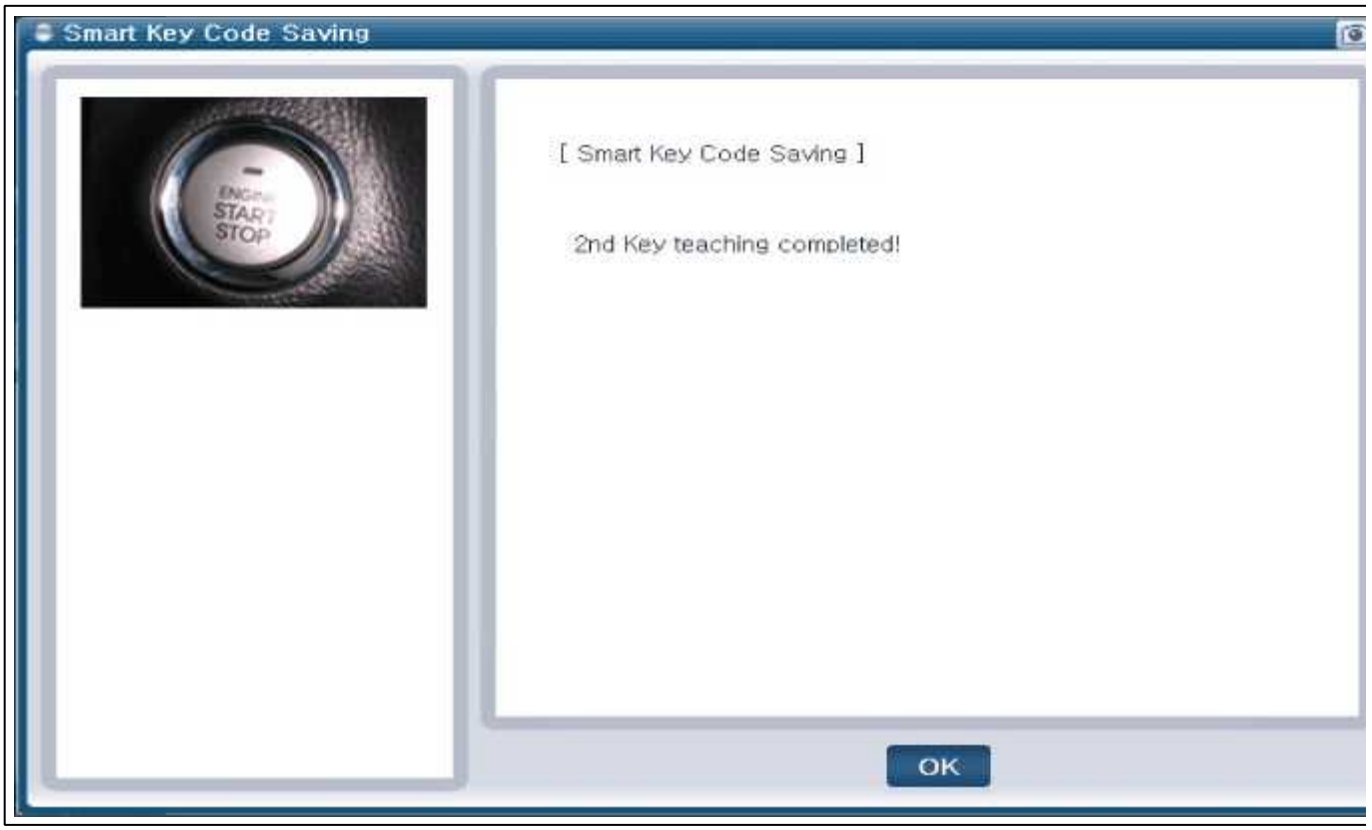
7. Confirm the message "First key teaching completed".



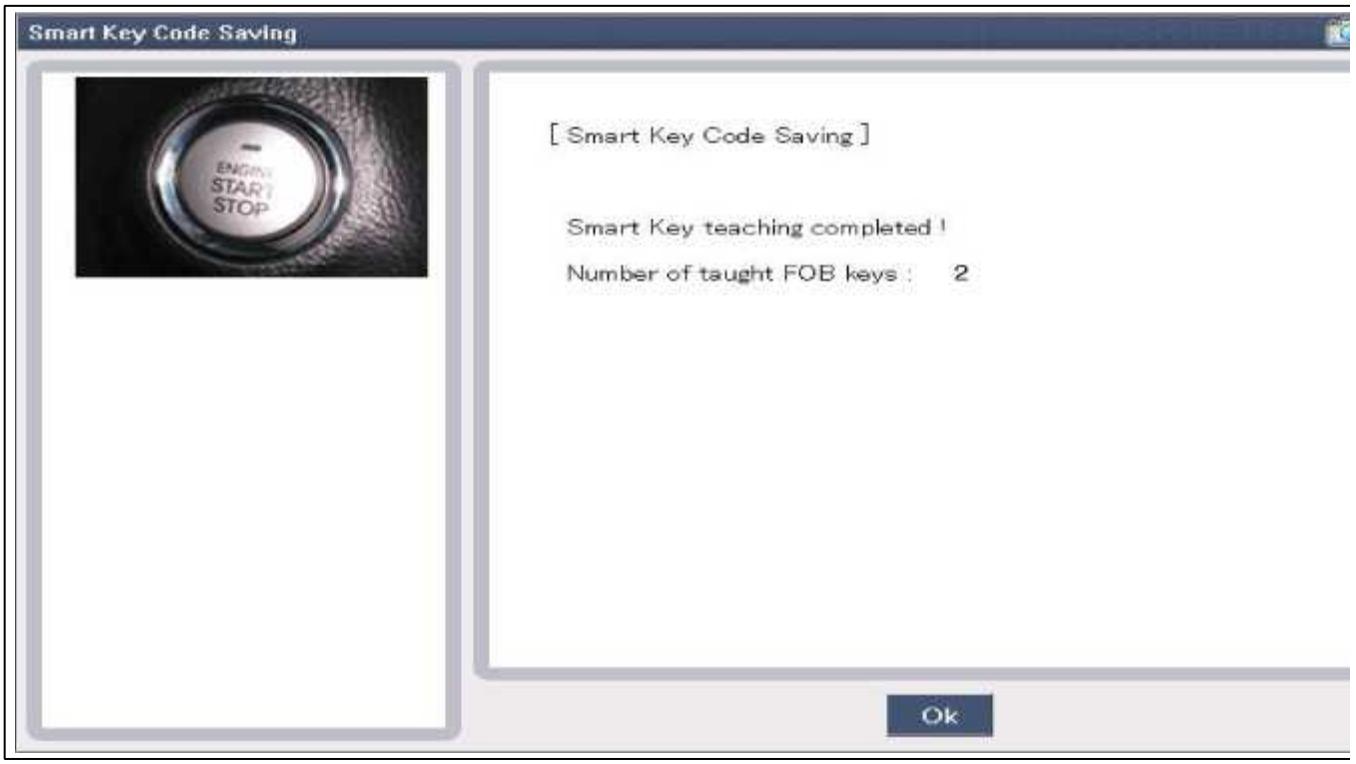
8. Press the SSB with smart key within 5 sec after pressing "OK".



9. Confirm the message "Second key teaching completed".

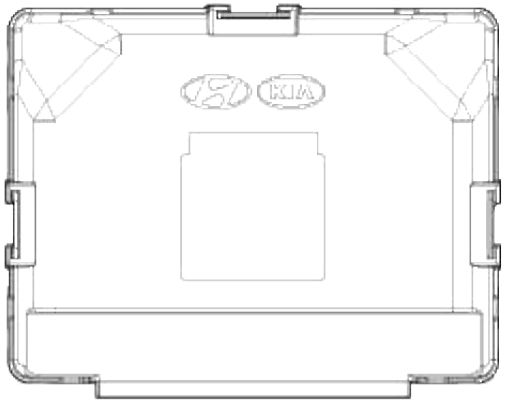


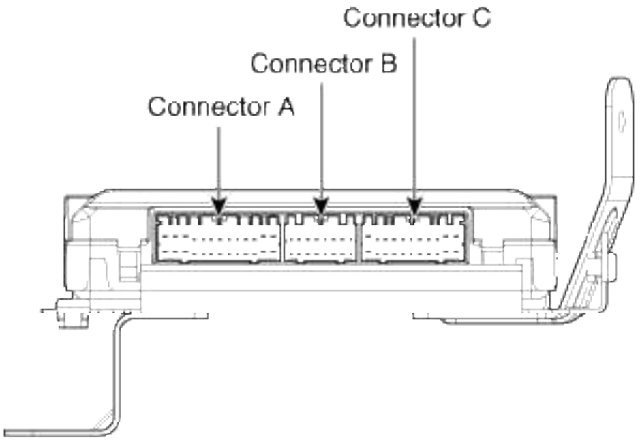
10. Then the screen will be shown as below when key teaching process is completed.

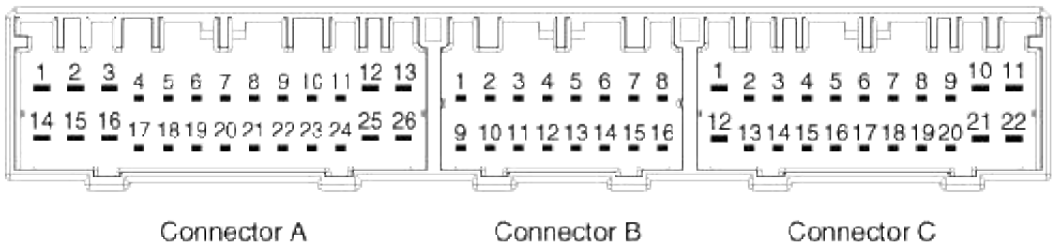


Body Electrical System > Smart Key System > Smart Key Unit > Components and Components Location

Components (1)



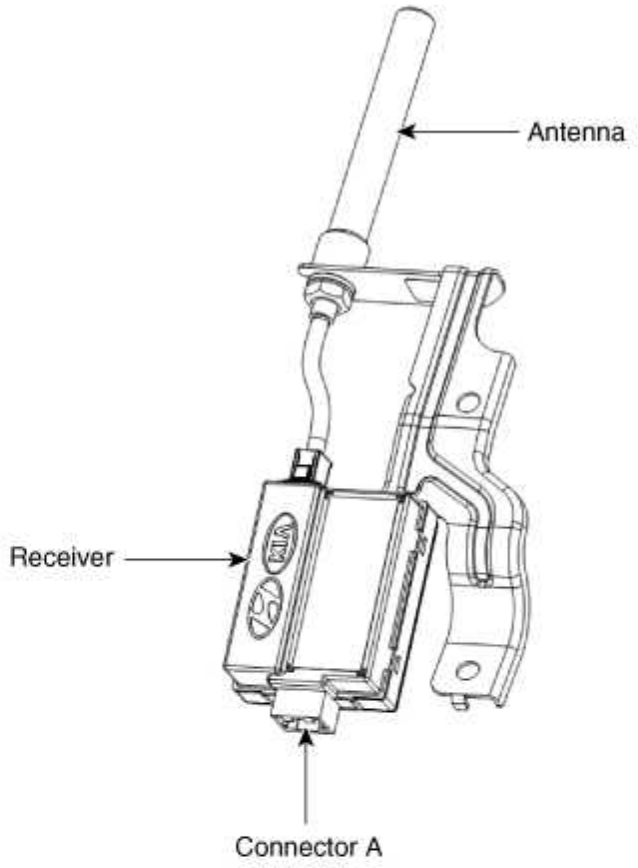


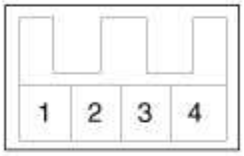


Connector Pin Information

No.	Connector A	Connector B	Connector C
1	V_BAT load	C_CAN Low	SSB illumination ground
2	-	C_CAN High	-
3	Power ground1	-	SSB LED OFF
4	IGN1	-	Interior antenna #2 power
5	IGN1 relay	Brake switch	Interior antenna #1 power
6	ACC	Immobilizer antenna power	-
7	IGN2	-	-
8	SSB switch2	Wheel speed	Interior antenna #3 power
9	-	Driver toggle button	Bumper antenna power
10	RF COM	-	Passenger side antenna power
11	-	External buzzer	Driver side antenna power
12	B_CAN High	P position/ Clutch switch	SSB LED IGN
13	B_CAN Low	Start feedback	SSB illumination power
14	V_BAT CPU	Immobilizer antenna ground	-
15	-	-	Interior antenna #2 ground
16	Power ground2	SSB LED ACC	Interior antenna #1 ground
17	Starter relay		-
18	IGN2 relay		-
19	ACC relay		Interior antenna #3 power
20	-		Bumper antenna ground
21	-		Passenger side antenna ground
22	-		Driver side antenna ground
23	RPM		
24	EMS COM		
25	SSB switch1		
26	Assistant toggle button		

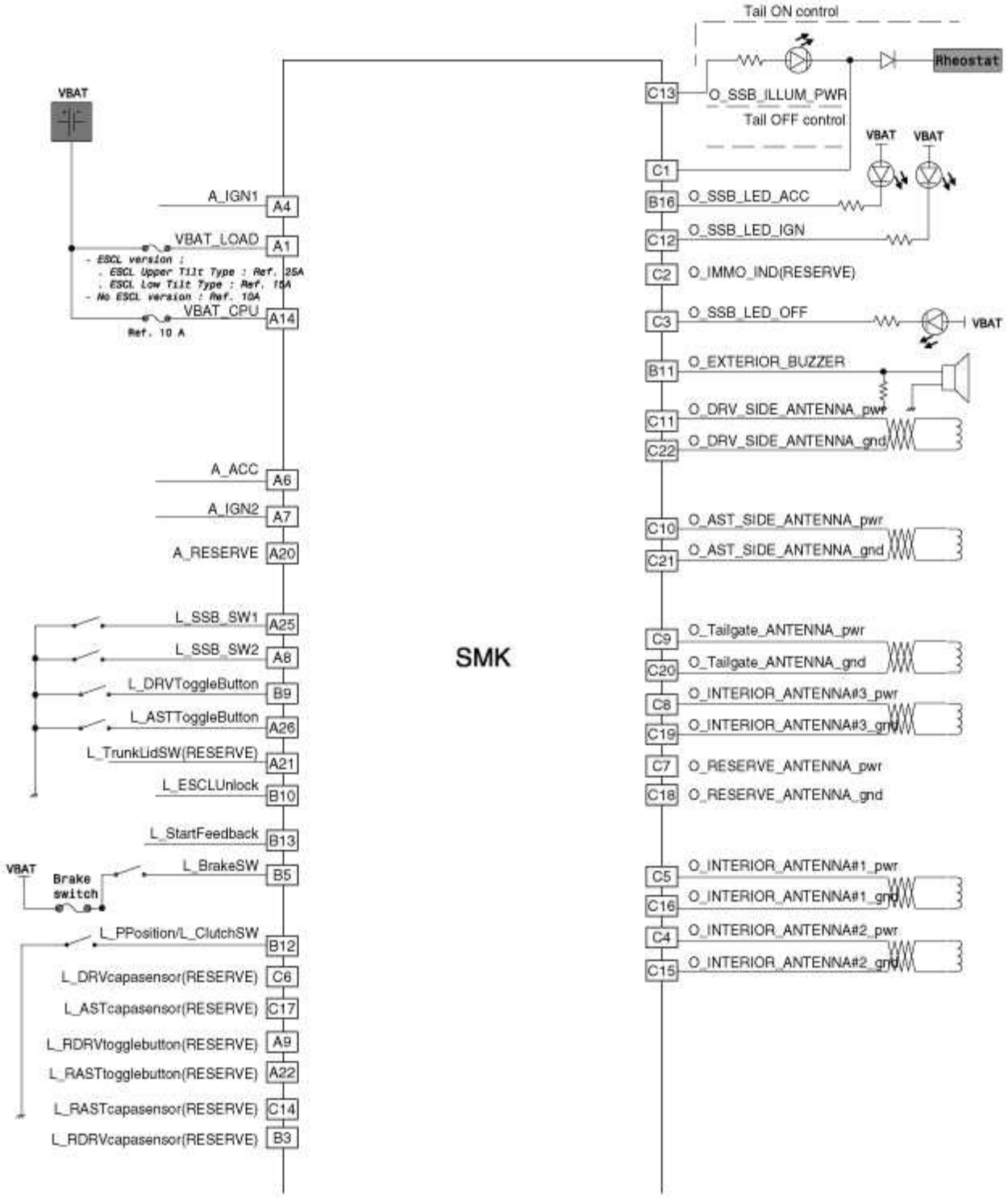
Components (2)

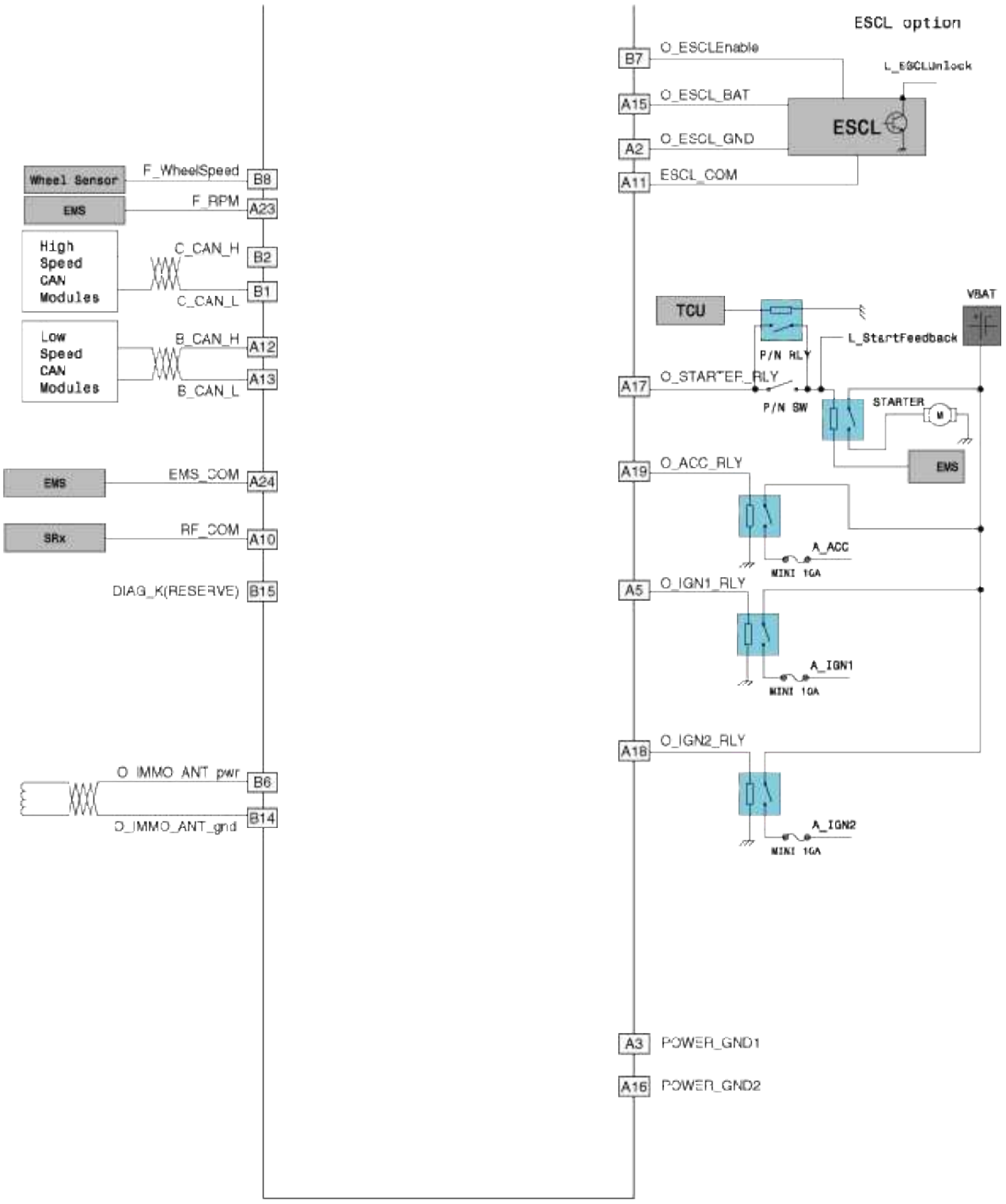


Connector A	
	
No.	Description
1	Data
2	-
3	Power
4	Ground

Body Electrical System > Smart Key System > Smart Key Unit > Schematic Diagrams

Circuit Diagram


Tail ON control
Rheostat
VBAT
C13
O_SSB_ILLUM_PWR
Tail OFF control
VBAT
VBAT
C1
B16
O_SSB_LED_ACC
C12
O_SSB_LED_IGN
C2
O_IMMO_IND(RESERVE)
C3
O_SSB_LED_OFF
VBAT
B11
O_EXTERIOR_BUZZER
C11
O_DRV_SIDE_ANTENNA_pwr
C22
O_DRV_SIDE_ANTENNA_gnd
C10
O_AST_SIDE_ANTENNA_pwr
C21
O_AST_SIDE_ANTENNA_gnd
C9
O_Tailgate_ANTENNA_pwr
C20
O_Tailgate_ANTENNA_gnd
C8
O_INTERIOR_ANTENNA#3_pwr
C19
O_INTERIOR_ANTENNA#3_gnd
C7
O_RESERVE_ANTENNA_pwr
C18
O_RESERVE_ANTENNA_gnd
C5
O_INTERIOR_ANTENNA#1_pwr
C16
O_INTERIOR_ANTENNA#1_gnd
C4
O_INTERIOR_ANTENNA#2_pwr
C15
O_INTERIOR_ANTENNA#2_gnd
SMK
VBAT
A_IGN1
A4
VBAT_LOAD
A1
- ESCL version :
. ESCL Upper Tilt Type : Ref. 25A
. ESCL Low Tilt Type : Ref. 15A
- No ESCL version : Ref. 10A
VBAT_CPU
A14
Ref. 10 A
A_ACC
A6
A_IGN2
A7
A_RESERVE
A20
L_SSB_SW1
A25
L_SSB_SW2
A8
L_DRVToggleButton
B9
L_ASTToggleButton
A26
L_TrunkLidSW(RESERVE)
A21
L_ESCLUnlock
B10
L_StartFeedback
B13
VBAT
Brake switch
L_BrakeSW
B5
L_PPosition/L_ClutchSW
B12
L_DRVcapasensor(RESERVE)
C6
L_ASTcapasensor(RESERVE)
C17
L_RDRVtogglebutton(RESERVE)
A9
L_RASTtogglebutton(RESERVE)
A22
L_RASTcapasensor(RESERVE)
C14
L_RDRVcapasensor(RESERVE)
B3



Body Electrical System > Smart Key System > Smart Key Unit > Repair procedures

Removal

Smart Key Unit

1. Disconnect the negative (-) battery terminal.
2. Remove the driver crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")

3. Remove the smart key unit (B) after loosening the mounting bolts(2EA) and disconnecting the connector (A).

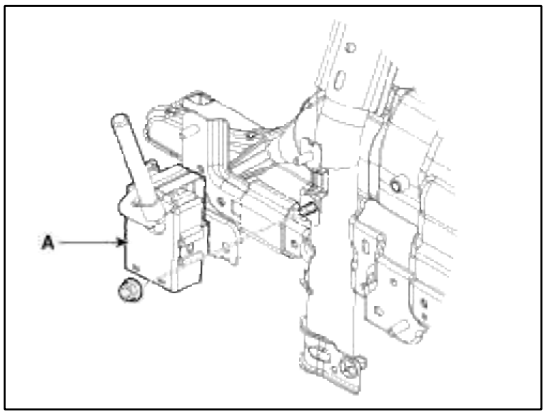


RF Receiver

NOTE

Take care not to scratch the crash pad and related parts.

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Crash Pad Center Panel")
3. Remove the RF receiver after loosening the mounting nut (1EA) and disconnecting the connector.



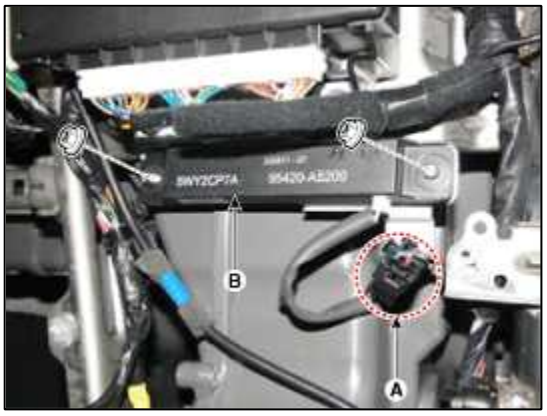
Interior 1 Antenna

NOTE

Take care not to scratch the crash pad and related parts.

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Crash Pad Center Panel")

3. Remove the interior 1 antenna (B) after loosening the mounting nuts (2EA) and disconnecting the connector (A).



Interior 2 Antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the console rear complete assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Console Rear Complete Assembly")
3. Remove the interior 2 antenna (B) after loosening the mounting nuts (2EA) and disconnecting the connector (A).



Interior 3 Antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage covering mat (A).



3. Remove the luggage floor box (A) after loosening the screws (4EA).



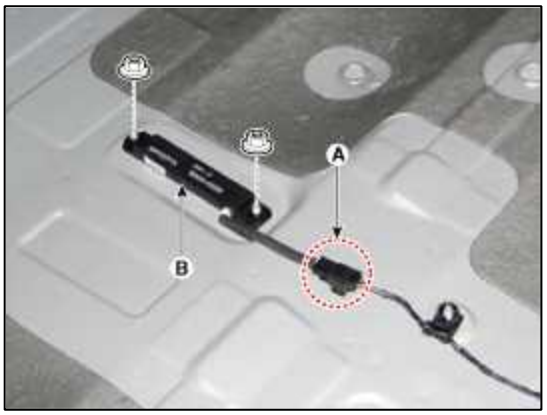
4. Remove the luggae tray box (A).



5. Remove the floor mat (A) after loosening the screws (4EA).



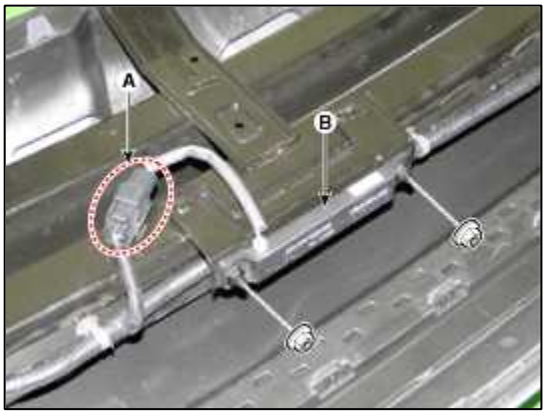
6. Remove the interior 3 antenna (B) after loosening the mounting screws(2EA) and disconnecting the connector (A).



Exterior Bumper Antenna

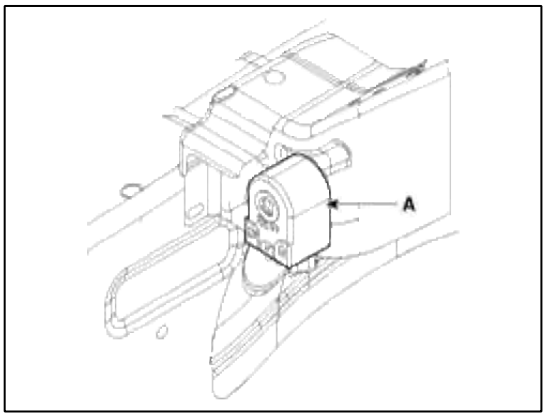
1. Disconnect the negative (-) battery terminal.

2. Remove the rear bumper cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Rear Bumper Cover")
3. Disconnect the antenna connector (A) on the center of rear bumper.
4. After loosening the nuts (2EA), remove the exterior bumper antenna (B).



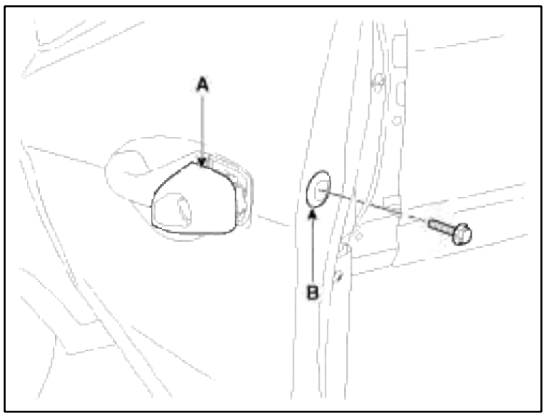
Buzzer

1. Disconnect the negative (-) battery terminal.
2. Remove the front left wheel guide.
3. Disconnect the connectors, then remove the buzzer (A).

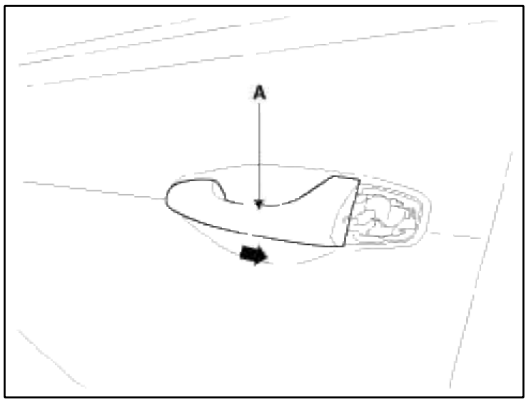


Door Outside Handle

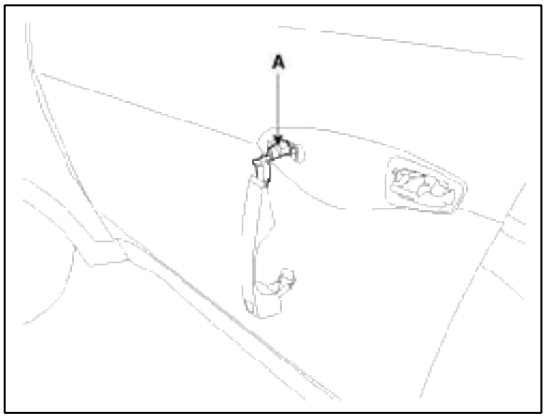
1. Disconnect the negative (-) battery terminal.
2. Remove the door outside handle cover (A) after seperating the plug hole (B) from the door and loosening the mounting bolt.



3. Remove the outside handle (A) by sliding it rearward.



4. Disconnect the door outside handle connector (A).



Tailgate Open Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Trim")
3. Remove the tailgate back panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Back Panel")
4. Loosen the tailgate switch mounting screws (2EA).



5. Remove the tailgate switch (A) after seperating the license lamp wiring.



Inspection

Smart Key Unit

Refer to Smart Key System - "Smart Key Diagnostic"

Smart Key Switch

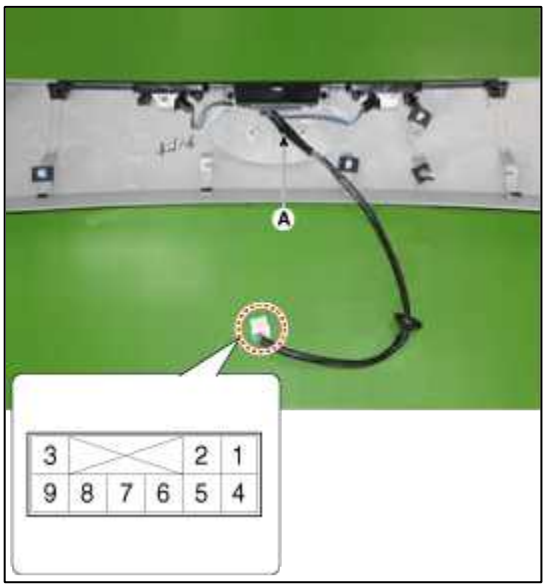
Refer to Smart Key System - "Smart Key Diagnostic"

Antenna

Refer to Smart Key System - "Smart Key Diagnostic"

Tailgate Switch

1. Check for continuity between the tailgate latch terminals.



2. If continuity is not specified, inspect the switch

Terminal / Position	6	9
ON	○	○
OFF		

Installation

Smart Key Unit

1. Install the smart key unit.
2. Install the smart key unit mounting bolts and connect the connector.
3. Install the driver side crash pad lower panel.
4. Install the negative (-) battery terminal and check the smart key system.

RF Receiver

1. Install the RF receiver.

2. Install the RF receiver mounting nut and connect the connector.
3. Install the crash pad center panel.
4. Install the negative (-) battery terminal and check the smart key system.

Interior 1 Antenna

1. Install the interior 1 antenna.
2. Install the crash pad center panel.
3. Install the negative (-) battery terminal and check the smart key system.

Interior 2 Antenna

1. Install the interior 2 antenna.
2. Install the console rear complete assembly.
3. Install the negative (-) battery terminal and check the smart key system.

Interior 3 Antenna

1. Install the interior 3 antenna.
2. Install the floor mat, the luggage tray box, the luggage floor box and luggage covering mat.
3. Install the negative (-) battery terminal and check the smart key system.

Exterior Bumper Antenna

1. Install the exterior bumper antenna.
2. Install the rear bumper cover.
3. Install the negative (-) battery terminal and check the smart key system.

Buzzer

1. Install the buzzer.
2. Install the front left wheel guide.
3. Install the negative (-) battery terminal and check the smart key system.

Door Outside Handle

1. Install the outside handle.
2. Install the door trim.
3. Install the negative (-) battery terminal and check the smart key system.

Tailgate Switch

1. Install the tailgate switch.
2. Install the tailgate garnish.
3. Install the tailgate trim.
4. Install the negative (-) battery terminal and check the smart key system.

Body Electrical System > Smart Key System > Smart Key Diagnostic > Repair procedures

Inspection

Self Diagnosis With Scan Tool

It will be able to diagnose defects of SMART KEY system with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.

The following three features will be major problem in SMART KEY system.

1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

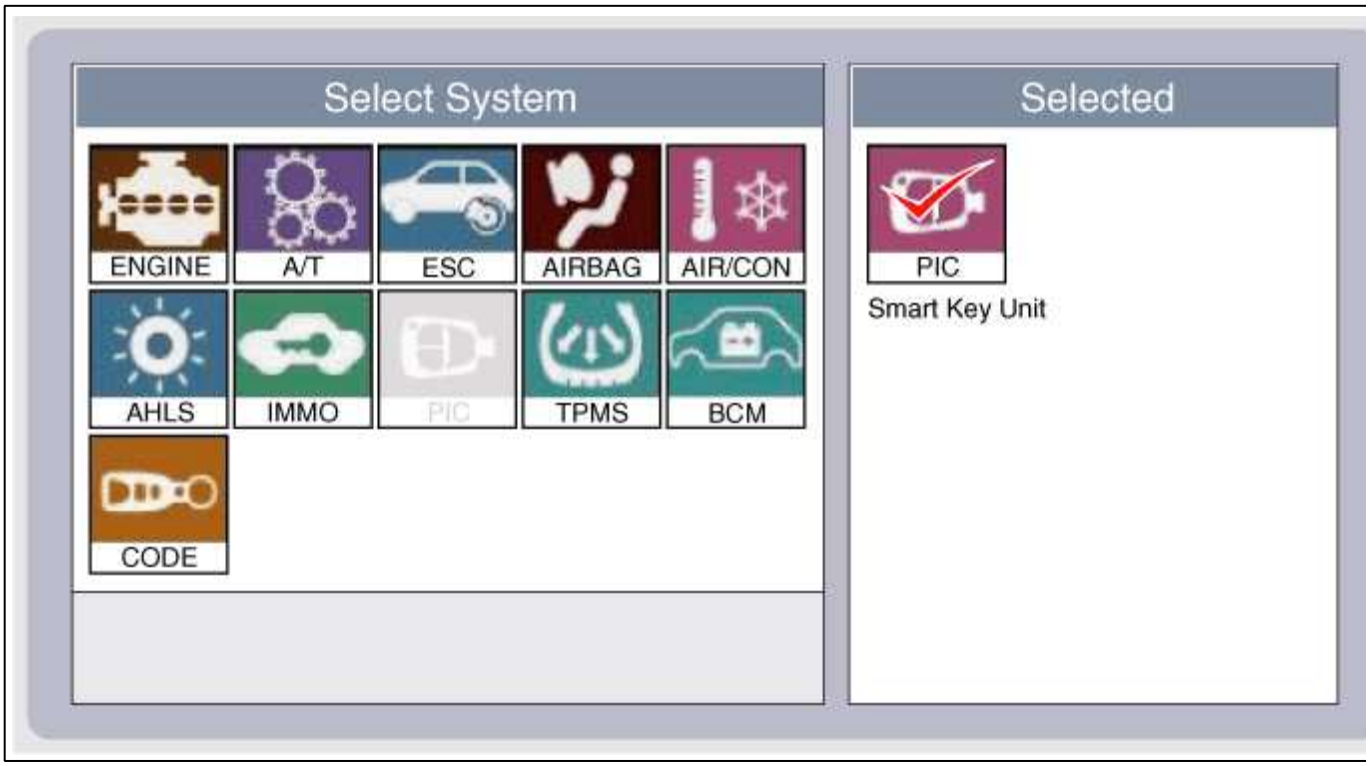
So the following three diagnosis operates will be the major problem solution process.

1. SMART KEY unit Input problem : switch diagnosis
2. SMART KEY unit problem : communication diagnosis
3. SMART KEY unit Output problem : antenna and switch output diagnosis

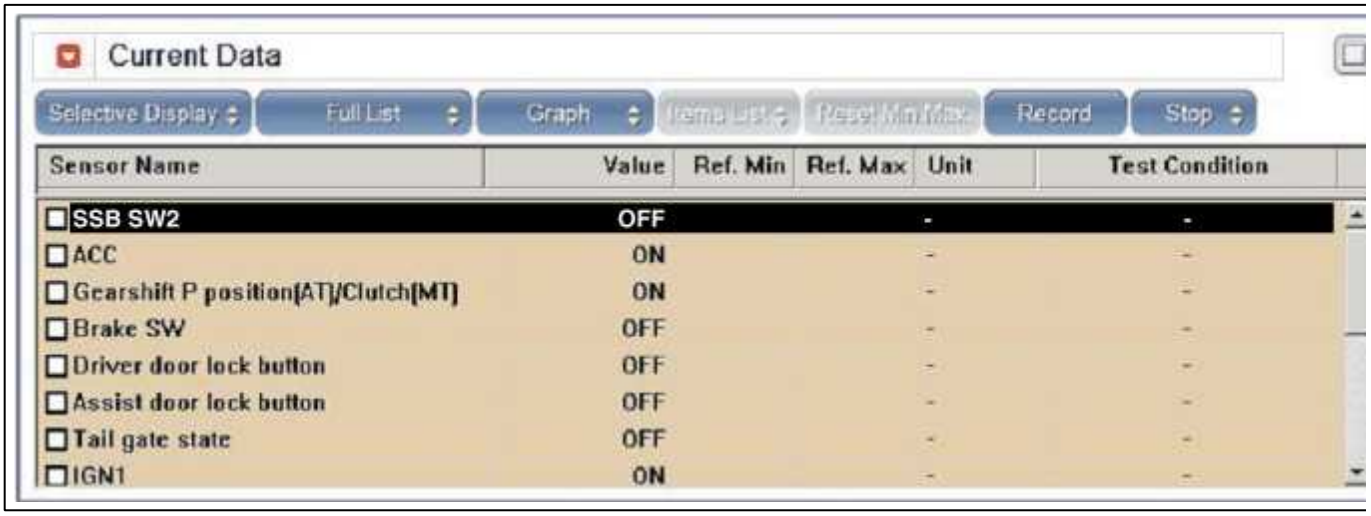
Switch Diagnosis

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.

2. Select the vehicle model and then SMART KEY system.



3. Select the "SMART KEY unit".
4. After IG ON, select the "Current data".



5. You can see the situation of each switch on scanner after connecting the "current data" process.

Display	Description
FL Toggle SW	ON : Push button is ON in the driver door handle.
FR Toggle SW	ON : Push button is ON in the assist door handle.
Tailgate open SW	ON : Tailgate button is ON.
Gear P Position	ON : Shift lever is P position.
IGN 1	ON : IGN switch is IG position.
ACC	ON : IGN switch is ACC position.
Brake SW	ON : Brake switch is ON.

Communication Diagnosis With GDS (Self Diagnosis)

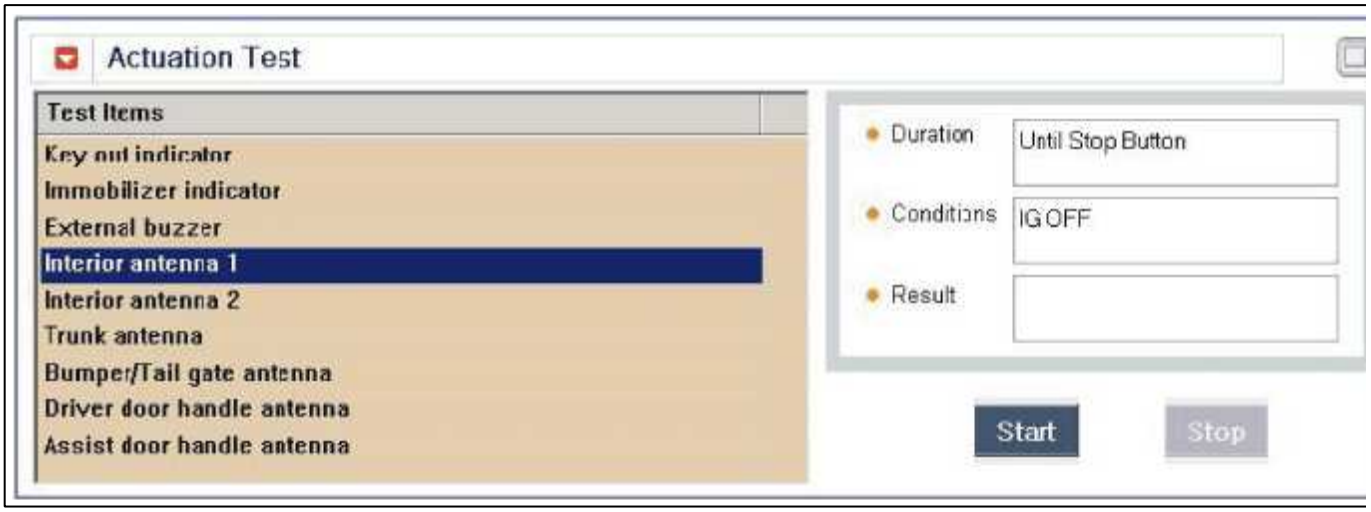
1. Communication diagnosis checks that the each linked components operates normal.
2. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.

3. After IG ON, select the "DTC".

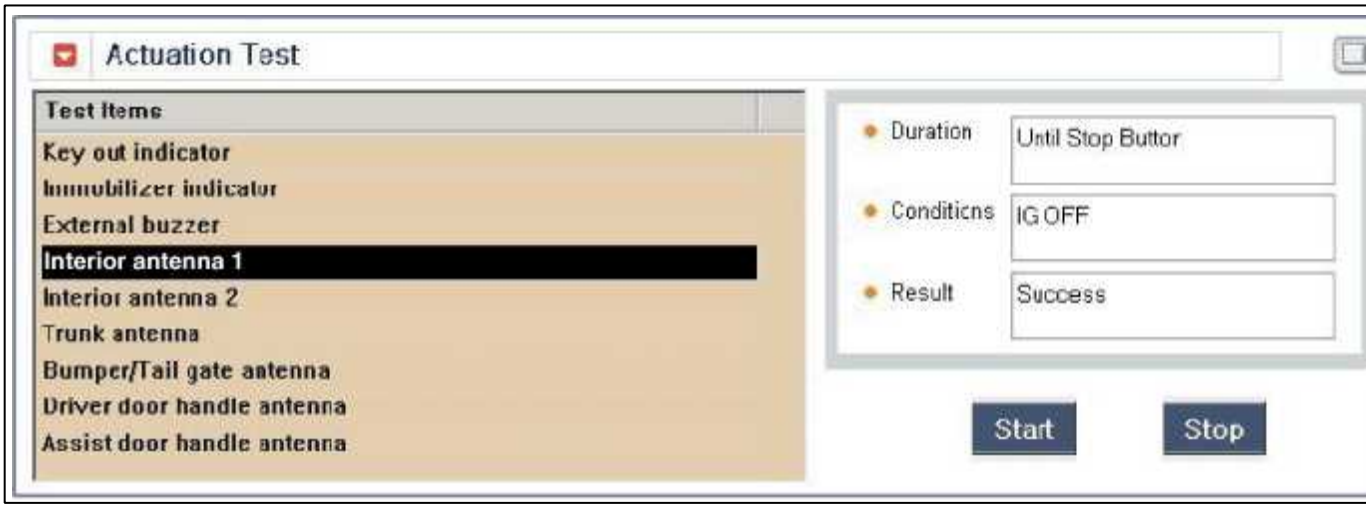


Antenna Actuation Diagnosis

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "ACTUATION TEST".



3. Set the smart key near the related antenna and operate it with a GDS.

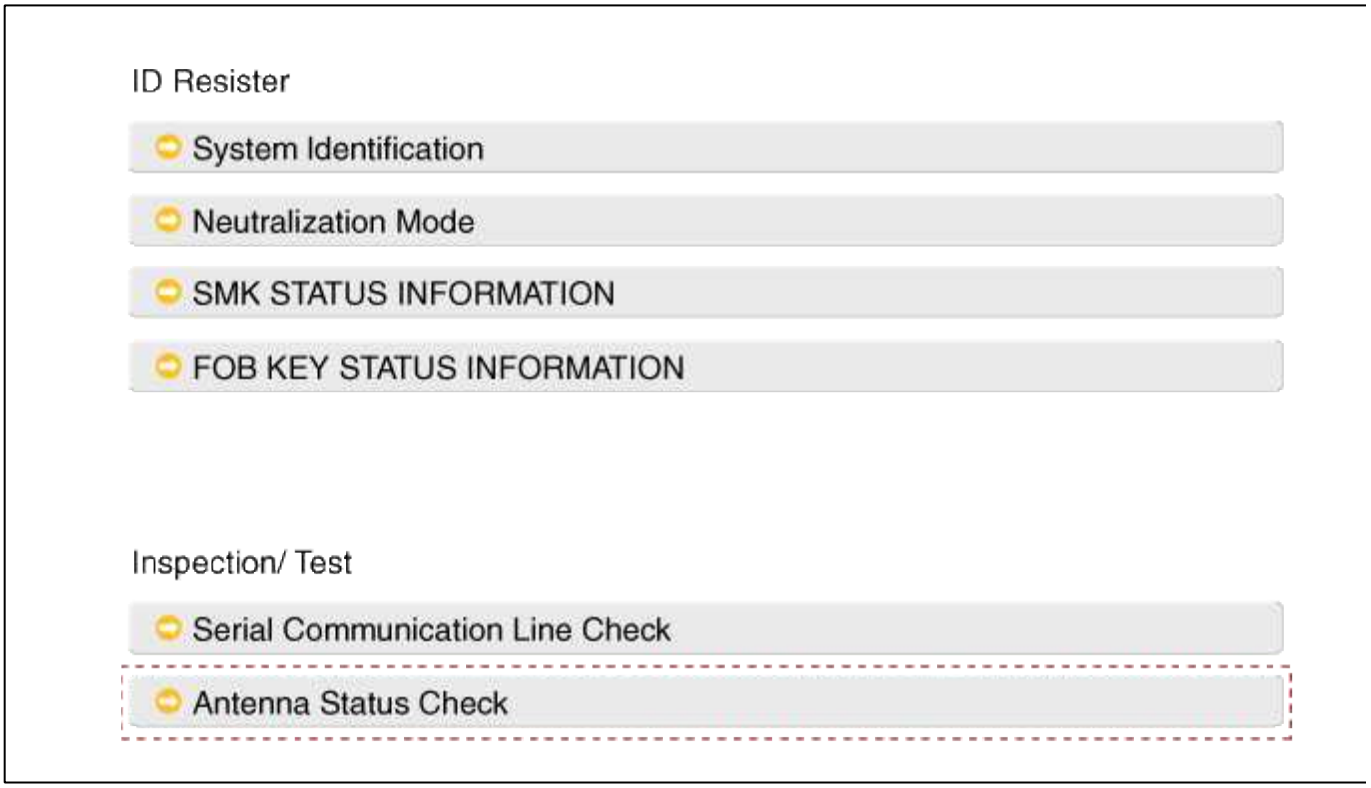


4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.

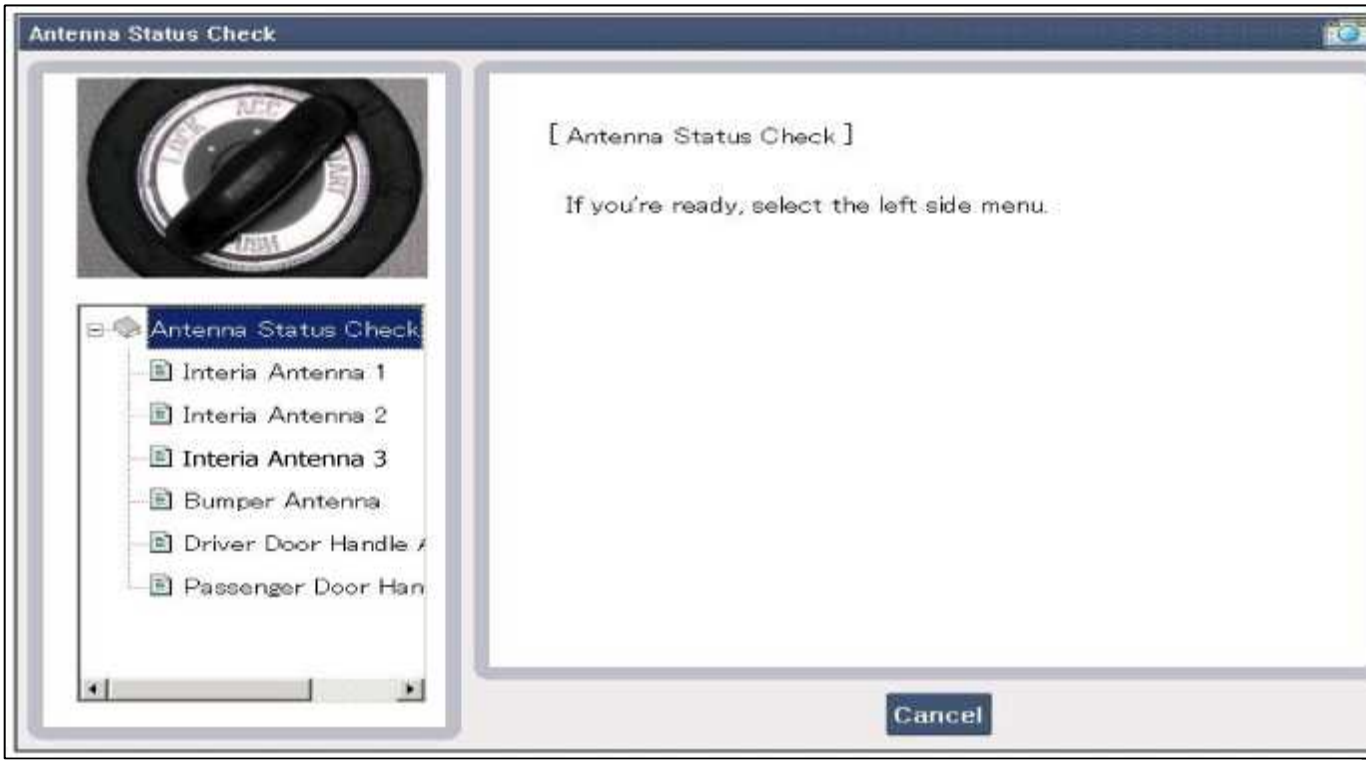
6. Antenna actuation
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. INTERIOR Antenna 3
   D. BUMPER/ Trunk Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

Antenna Status Check

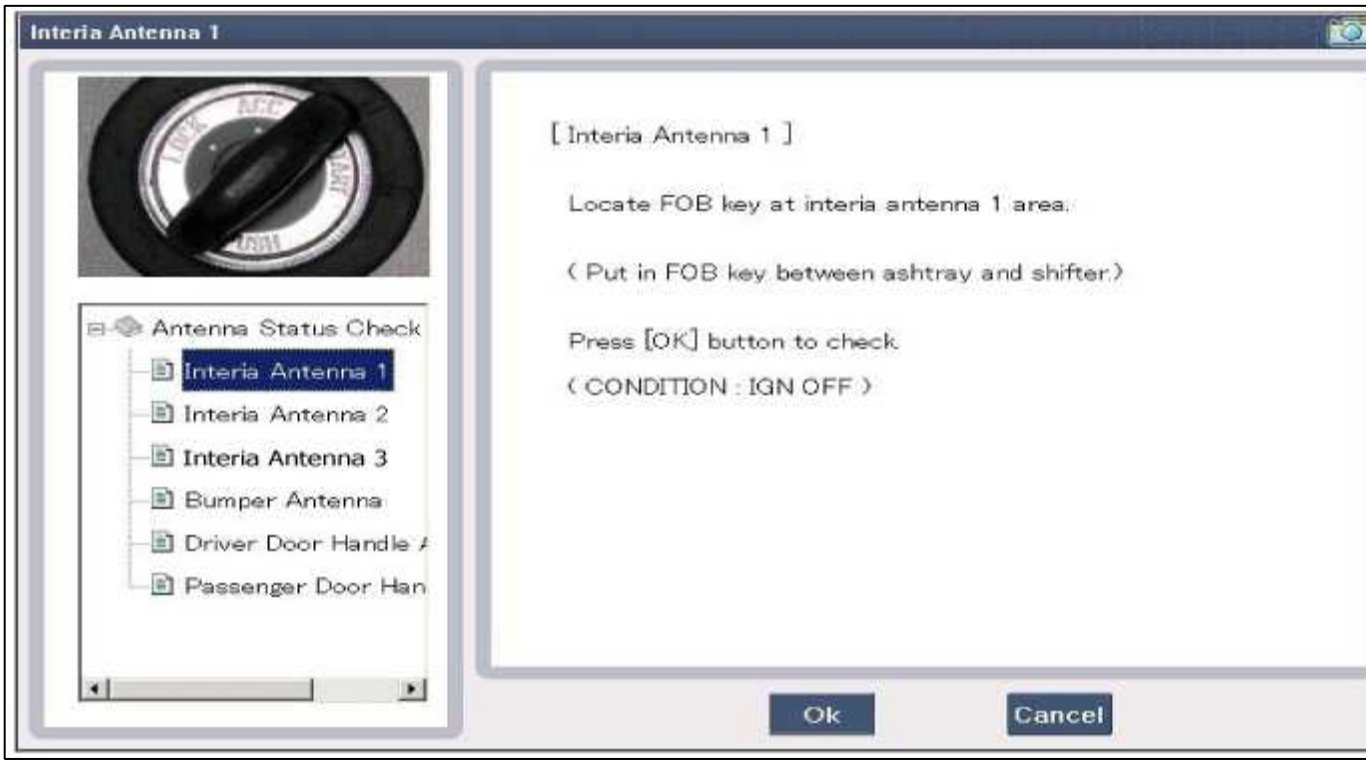
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. Select the "Antenna Status Check".

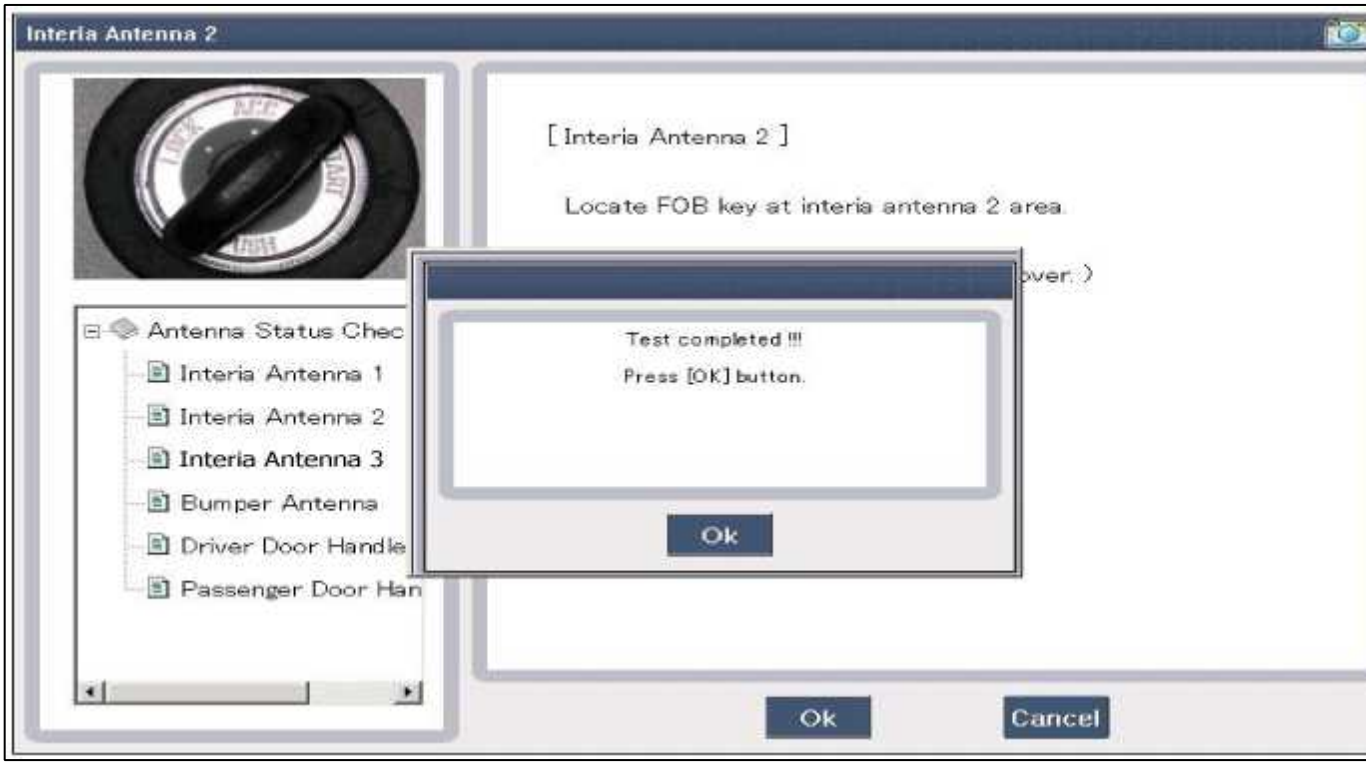


3. After IG ON, select the "Antenna Status Check".



4. Set the smart key near the related antenna and operate it with a GDS.



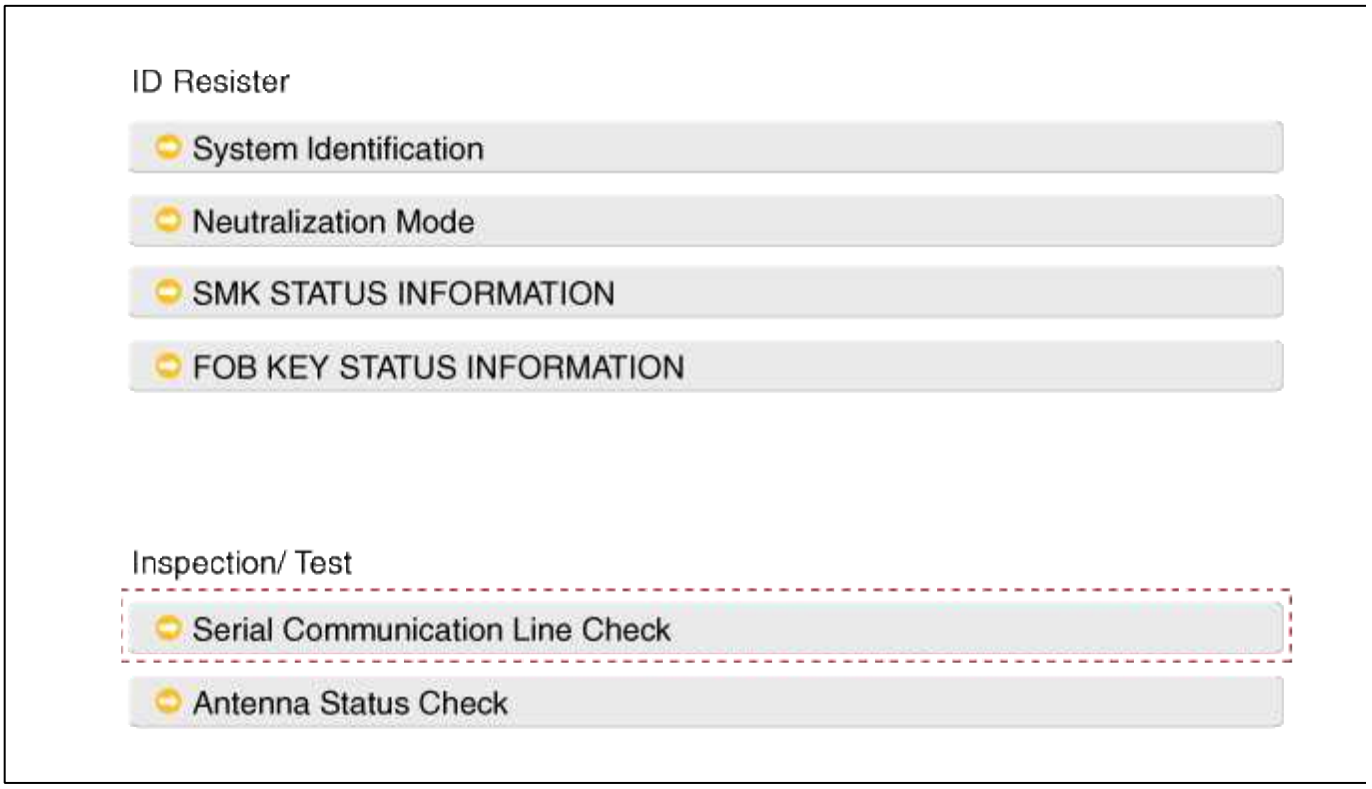


5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. INTERIOR Antenna 3
   D. BUMPER/ Trunk Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

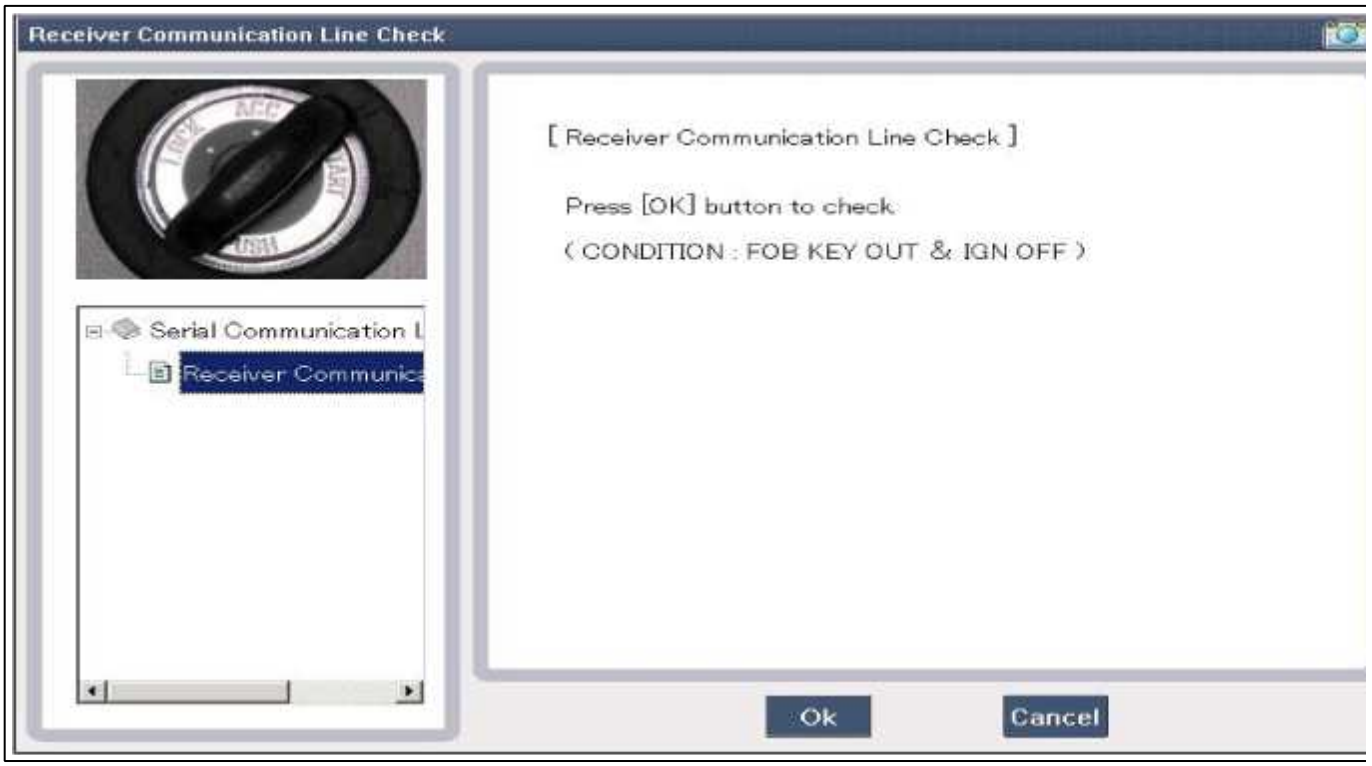
Serial Communication Status Check

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.

2. Select the "Serial Communication Line Check".



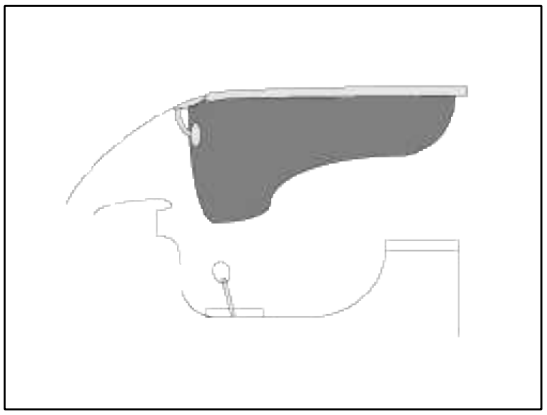
3. After IG ON, select the "Receiver Communication Line Check".



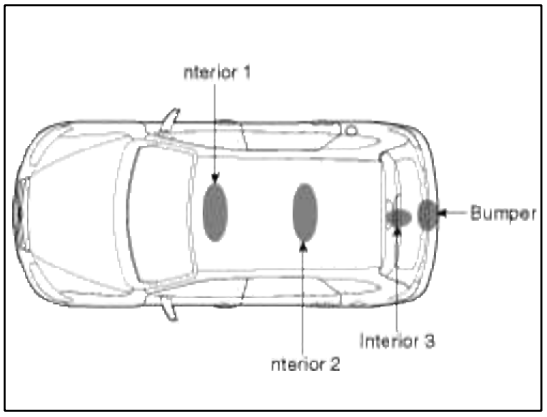
4. Check the serial communication line with a GDS.
5. If the smart key runs normal, the communication of smart key unit and exterior receiver are normal.
6. If the smart key runs abnormal, check the following items.
   A. Disconnection or no response of the exterior receiver communication line.
   B. The exterior receiver communication line disconnection and ground connection.

Interior Antenna Actuation Check

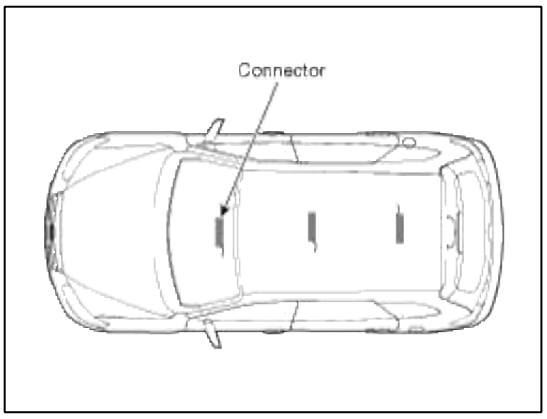
1. Set the smart key in the following shade area and turn the IG ON.



2. If the ignition is ON, the antenna runs normal.
3. Check the interior antenna ignition mode.
4. Set the smart key in the following shade area and actuate the antenna. Check the LED of smart key is blinking.



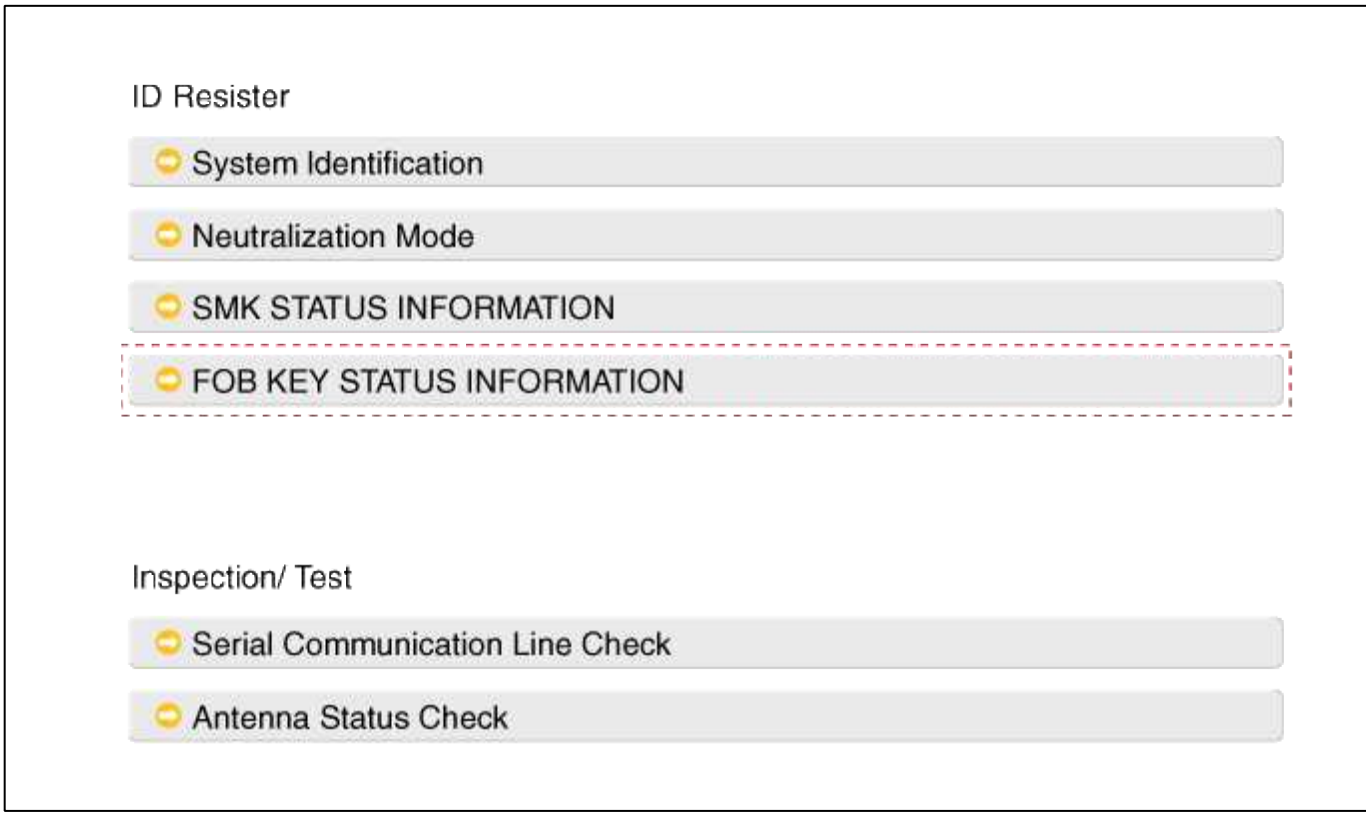
5. If the LED of smart key is not blinking, check the antenna in shade area.

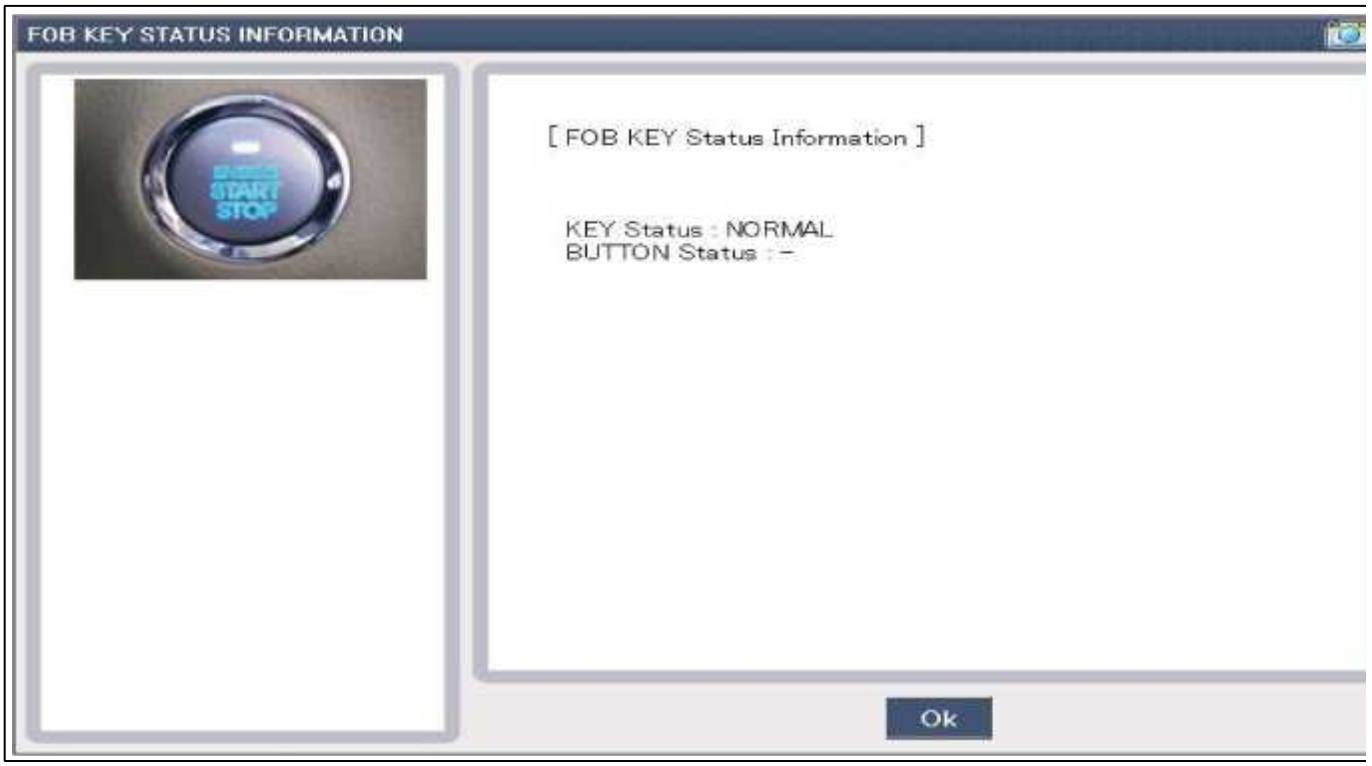


FOB Status Check

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.

2. After IG ON, select the "FOB KEY STATUS INFO".

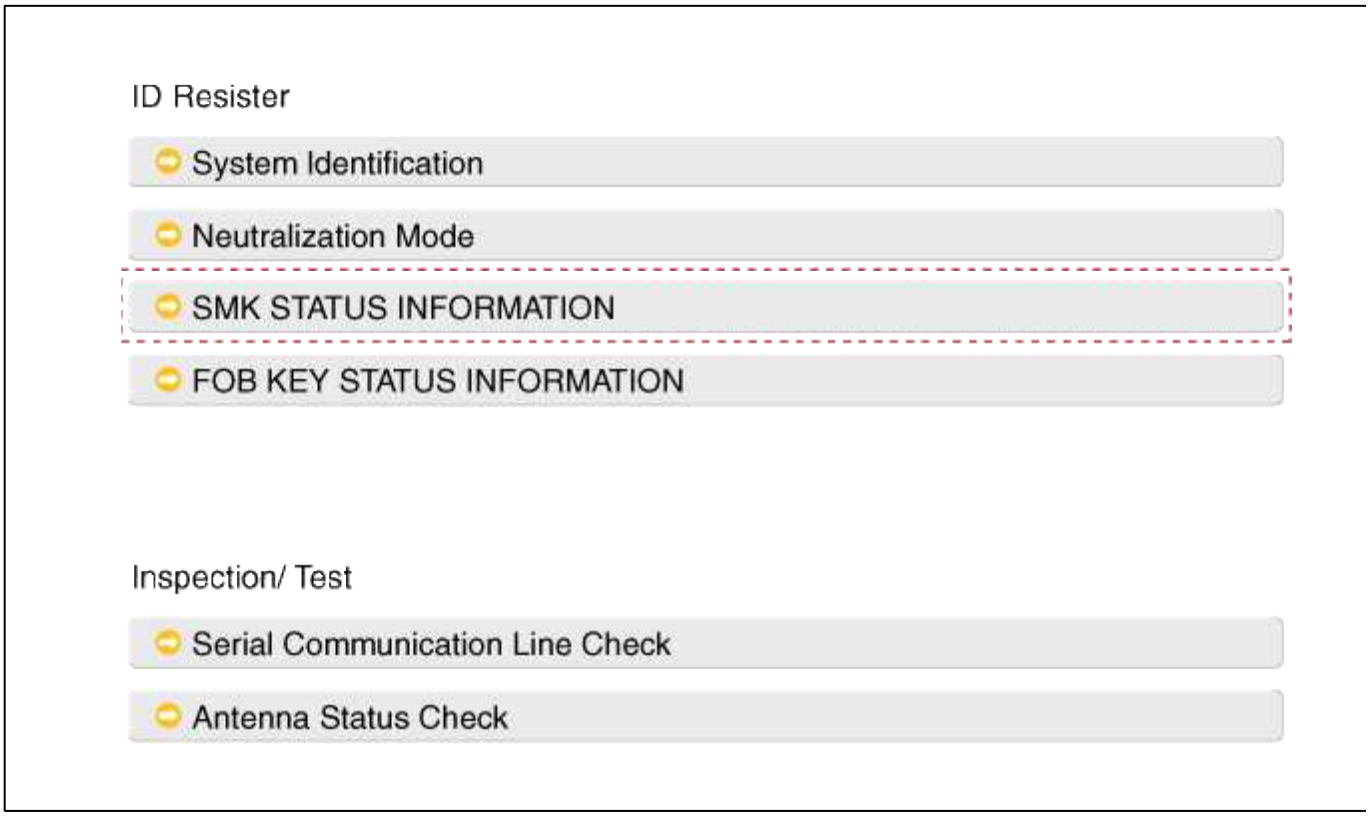


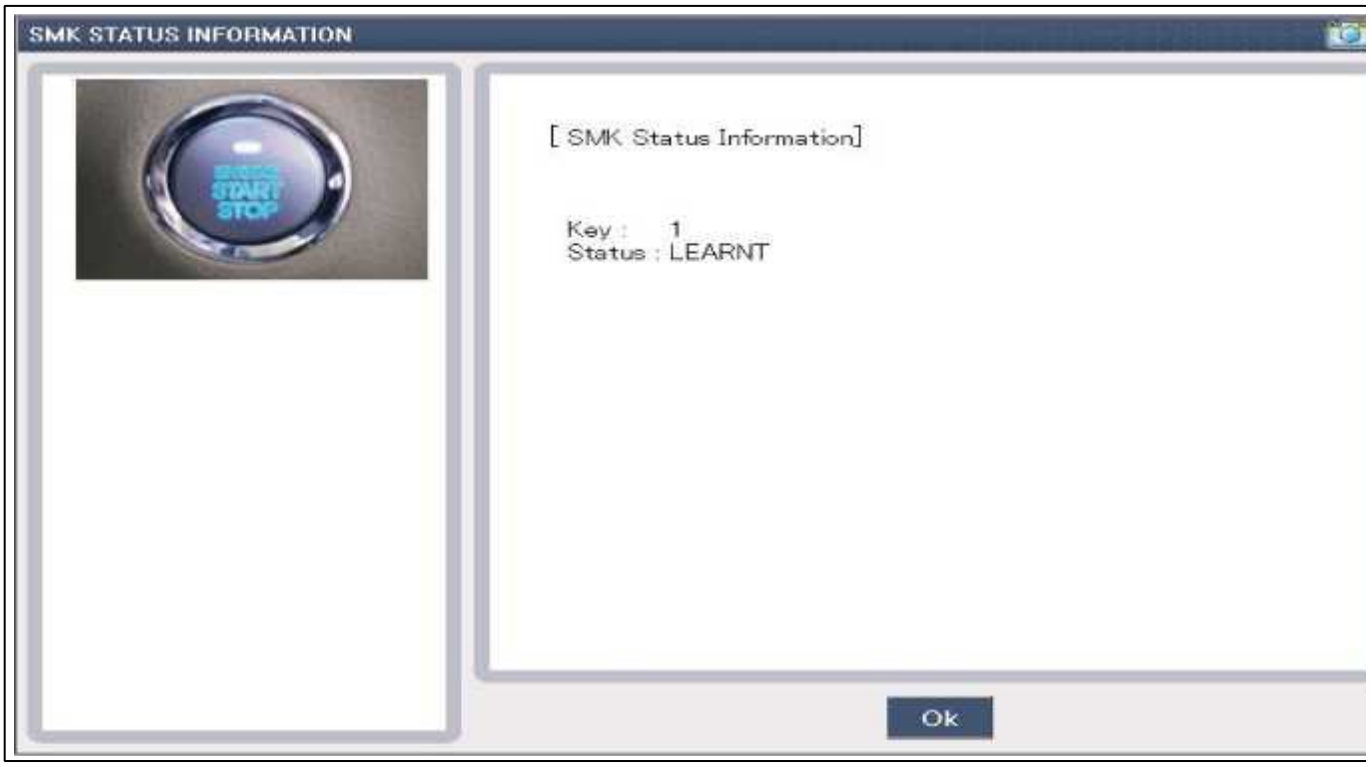


Smart Key Status Check

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.

2. After IG ON, select the "SMK STATUS INFO".





Neutralization Status Check

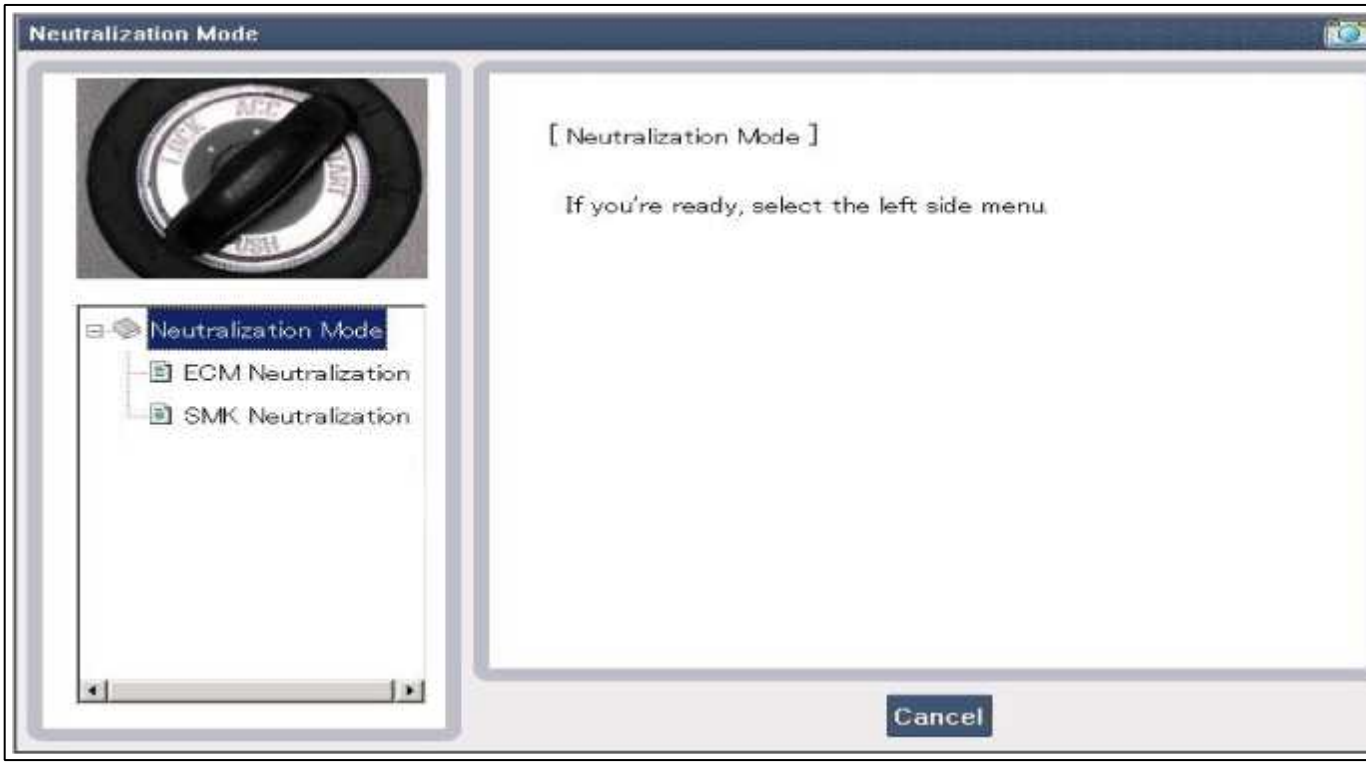
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "Neutralization mode".

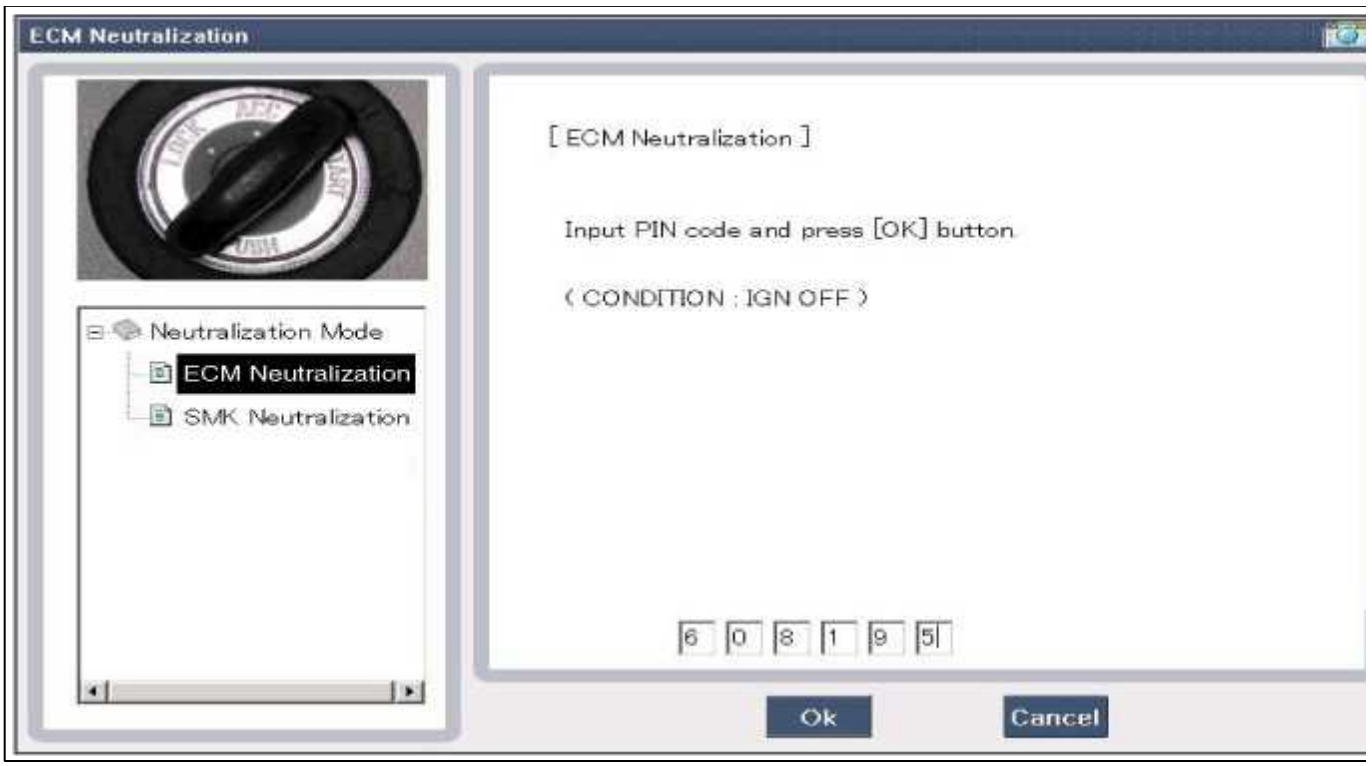
ID Resister

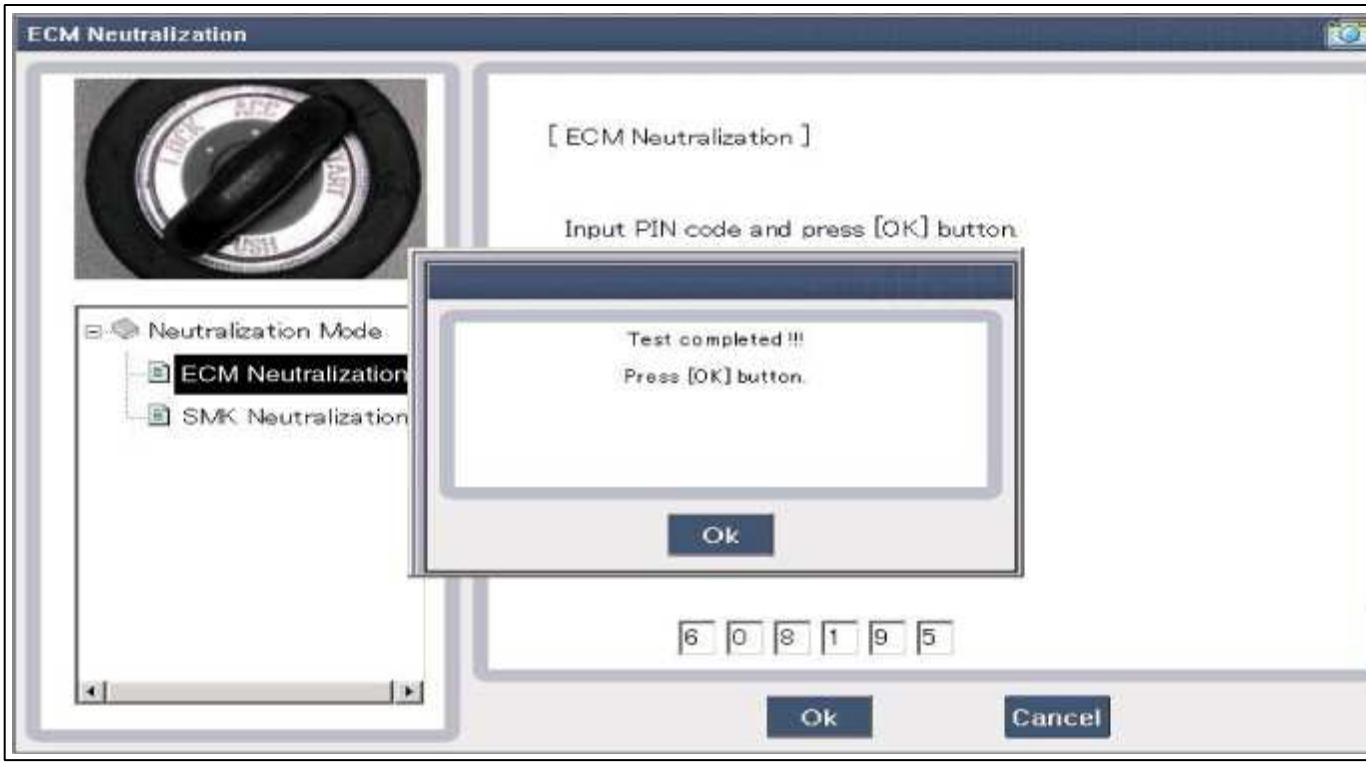
- System Identification
- Neutralization Mode
- SMK STATUS INFORMATION
- FOB KEY STATUS INFORMATION

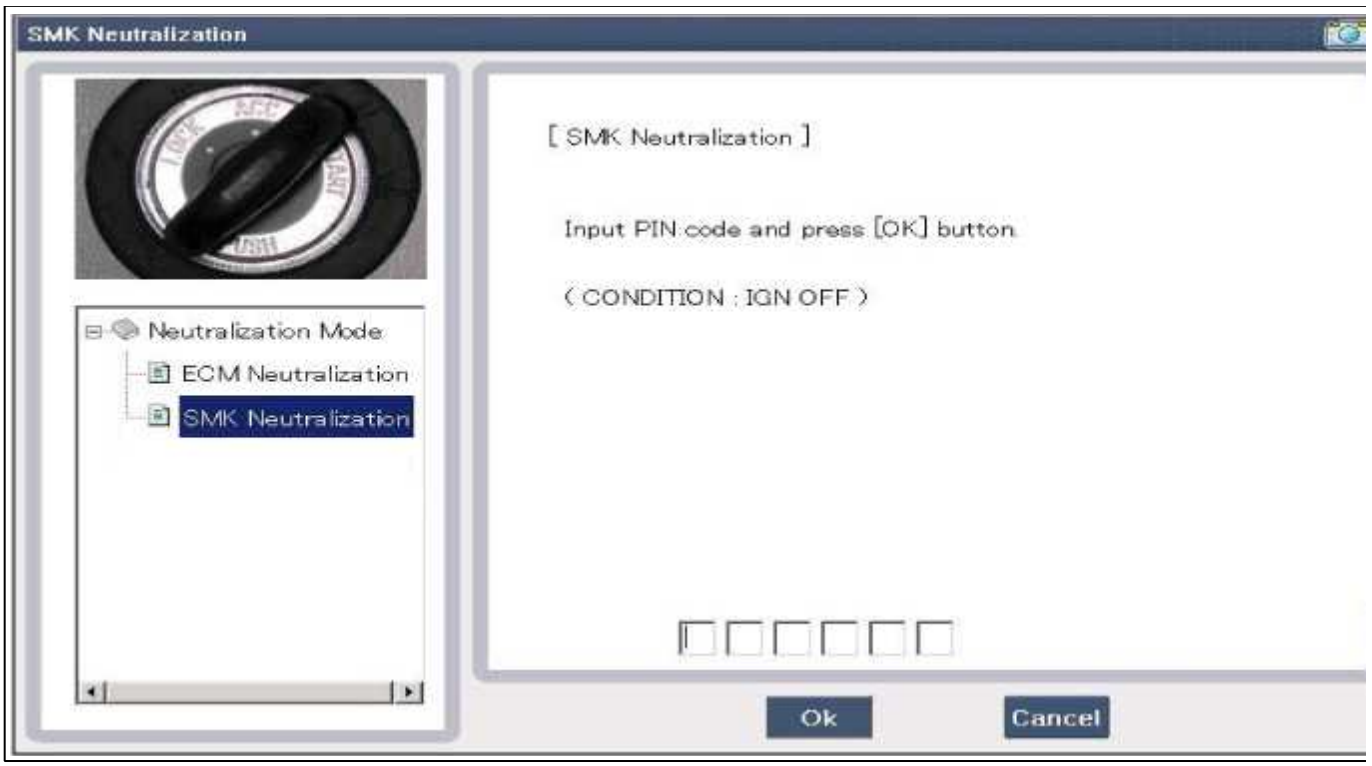
Inspection/ Test

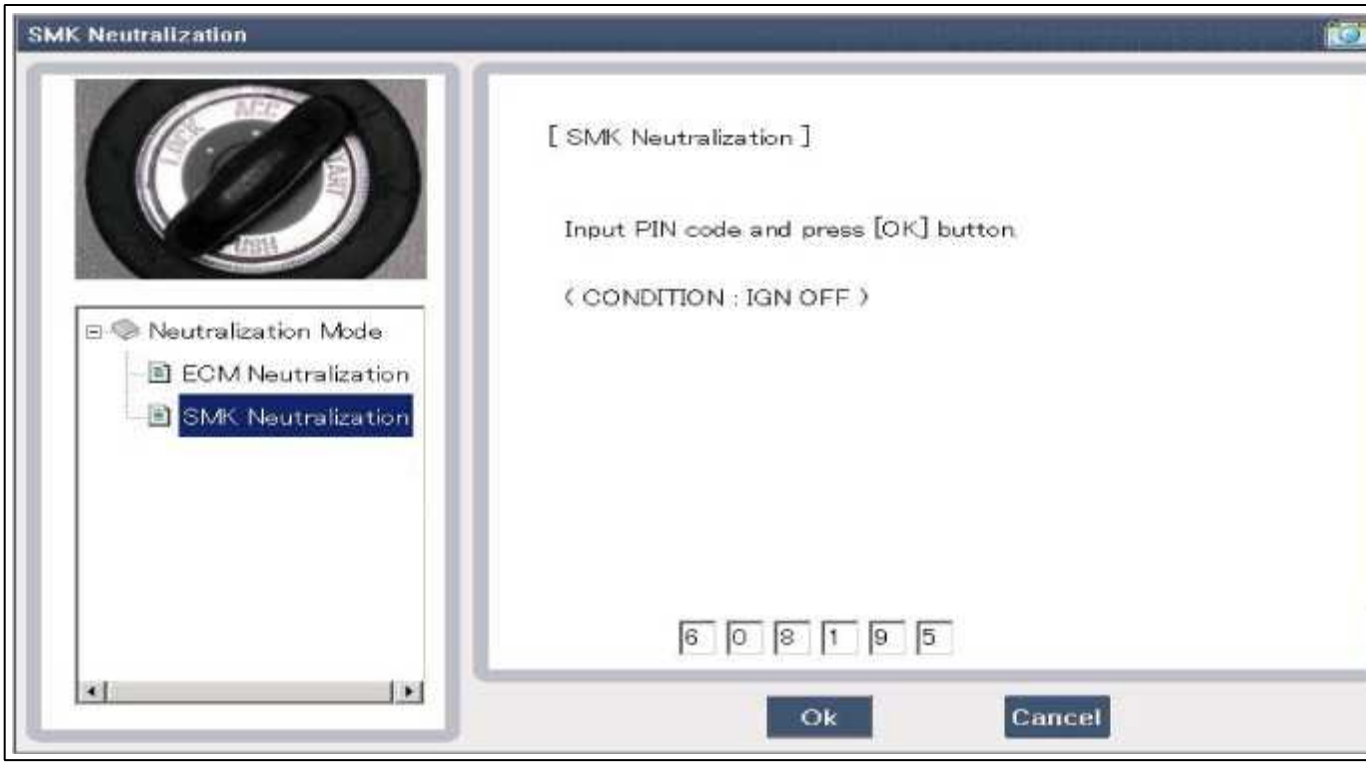
- Serial Communication Line Check
- Antenna Status Check

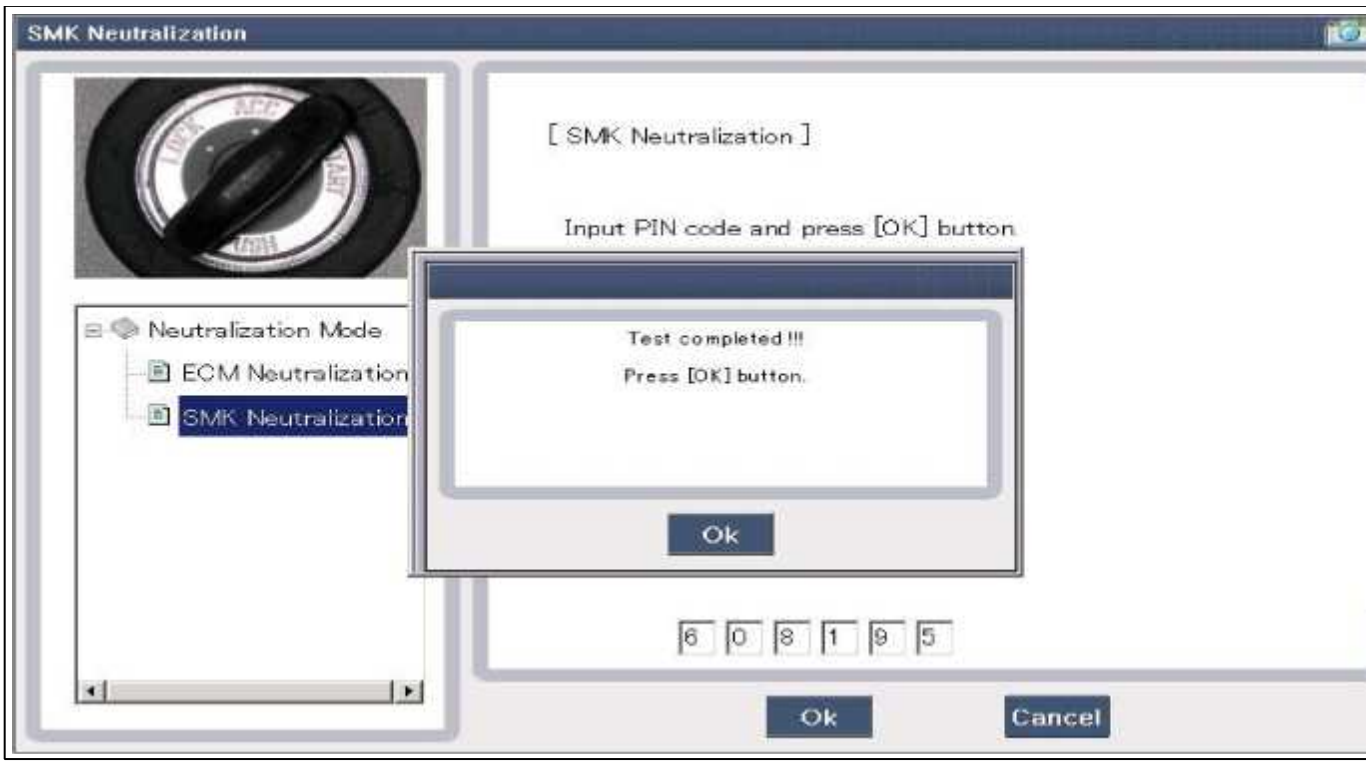



ECM Neutralization
[ECM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
6 0 8 1 9 5
Ok
Cancel


ECM Neutralization
[ECM Neutralization]
Input PIN code and press [OK] button.
Neutralization Mode
ECM Neutralization
SMK Neutralization
Test completed !!!
Press [OK] button.
Ok
6 0 8 1 9 5
Ok
Cancel


SMK Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button
(CONDITION : IGN OFF)
Ok
Cancel


SMK Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button
(CONDITION : IGN OFF)
6 0 8 1 9 5
Ok
Cancel



Input Switch List

No	Item name	Unit
1	SSB SW1	-
2	SSB SW2	-
3	ACC	-
4	IGN1	-
5	IGN2	-
6	ACC/IGN1/IGN2 Relay	-
7	Gear 'P' Position (A/T) Clutch SW (M/T)	-
8	Brake SW	-
9	FL Door Lock Button	-
10	FR Door Lock Button	-
11	Tailgate Release Button	-
12	Battery Voltage	-
13	Wheel Speed	-

Actuator List

No.	Item name	Condition
1	Immobilizer indicator Lamp (Cluster)	Ignition switch ON Engine off
2	External Buzzer	Ignition switch ON Engine off
3	Interior Antenna 1 Active	Ignition switch ON Engine off
4	Interior Antenna 2 Active	Ignition switch ON Engine off
5	Interior Antenna 3 Active	Ignition switch ON Engine off
6	Bumper/trunk Antenna Active	Ignition switch ON Engine off
7	DRV_DR Antenna Active	Ignition switch ON Engine off
8	AST_DR Antenna Active	Ignition switch ON Engine off
9	BBS Illumination (OFF/ACC/ON)	Ignition switch ON Engine off
10	ACC/IGN1/IGN2 Relay	Ignition switch ON Engine off

Body Electrical System > Keyless Entry And Burglar Alarm > Specifications

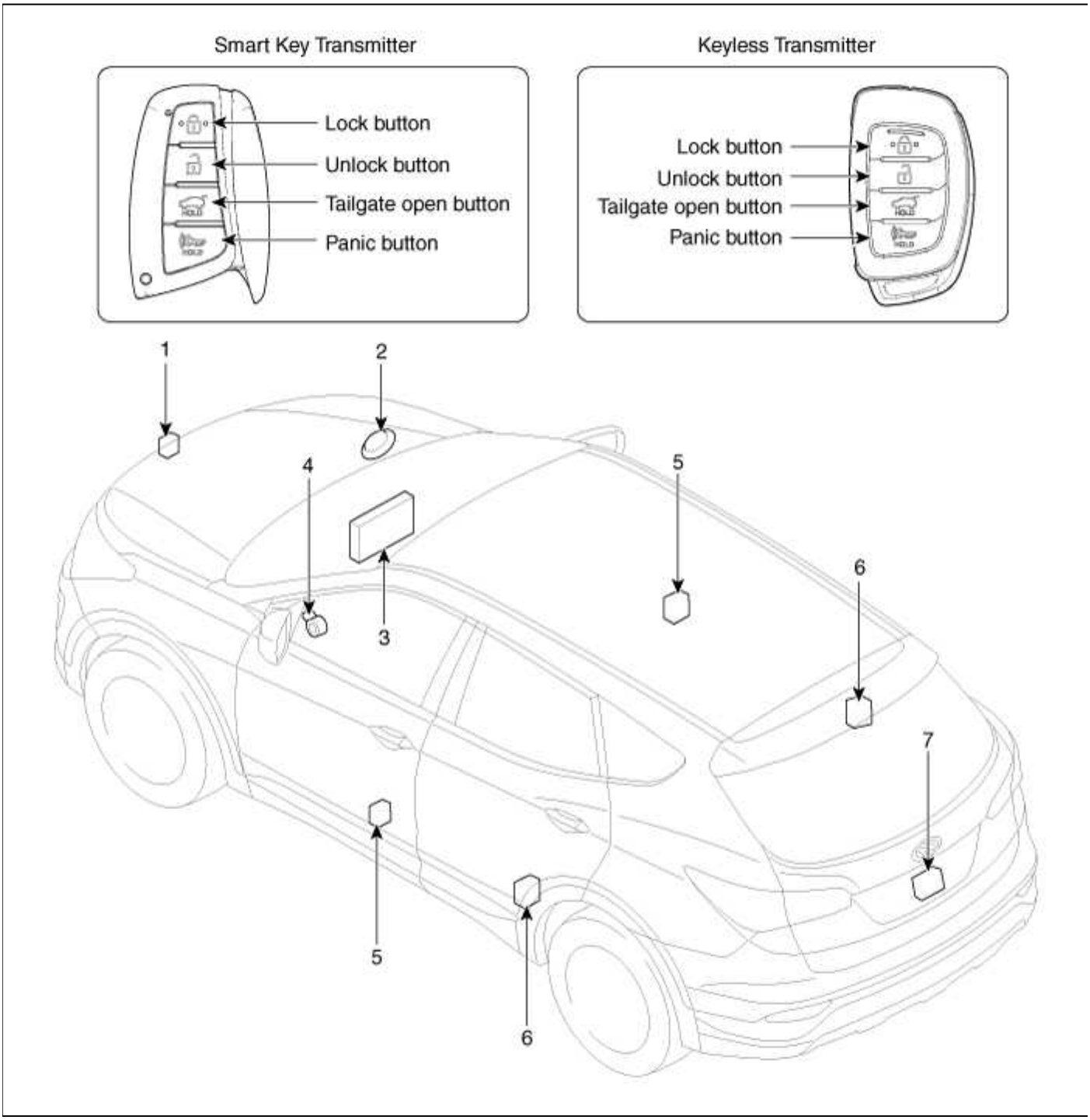
Specification

Item	Specification
Power source	3V
Operating temperature	-20°C ~ +60°C (-4°F ~ +140°F)
RF Modulation	FSK
LF Modulation	ASK
RF frequency	315MHz
Battery	CR2032
Transmissible distance	30m or more
Life of battery	2years or more (at 20 times per day)
Button number	4
Function	Door lock
	Door unlock
	Tailgate unlock

	Panic

Body Electrical System > Keyless Entry And Burglar Alarm > Components and Components Location

Component Location



1. Hood switch 2. Burglar horn 3. BCM & RF receiver 4. Key warning switch	5. Front door lock actuator & switch 6. Rear door lock actuator & switch 7. Tailgate open switch

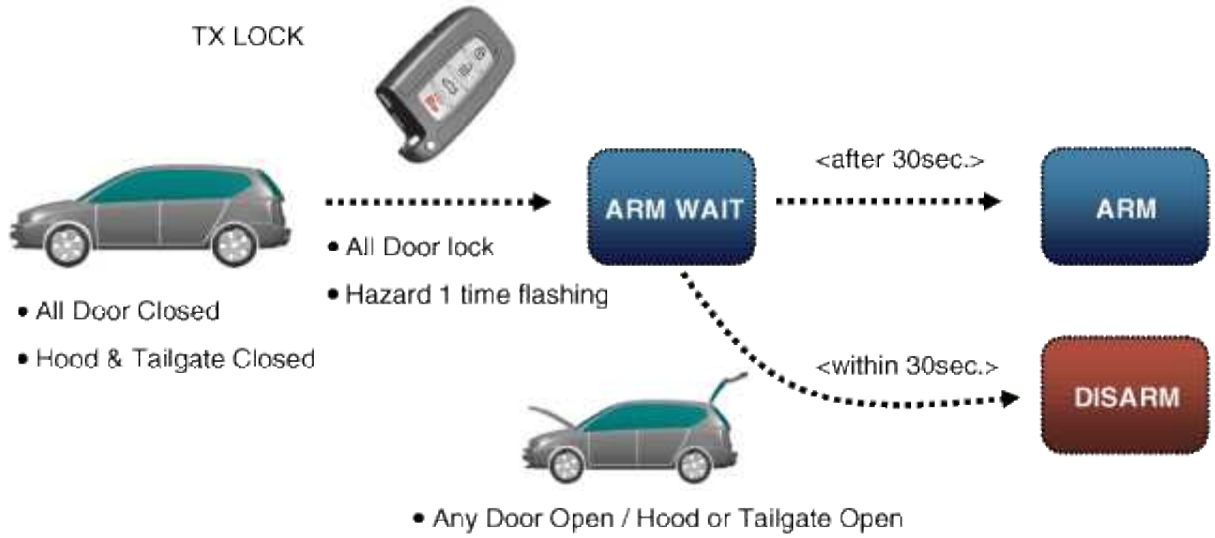
Body Electrical System > Keyless Entry And Burglar Alarm > Description and Operation

Description

Burglar Alarm State [B/A State]

B/A State	Description
DISARM	1. In "DISARM" state, no vehicle start inhibition. So, when door, hood, or Tailgate is opened, there is no alarm sound and flashing. 2. If the battery is disconnected while the state is not "ARM/ARMWAIT/ALARM/REARM", B/A state is set to "DISARM" state. 3. In “DISARM” state, security indicator keeps blinking.
ARMWAIT	1. In "ARMWAIT" state, when timer “30sec." is running, if this timer reaches “30sec”, state transits to "ARM" state. 2. If the battery is disconnected while the state is "ARMWAIT", B/A state is set to "ARMWAIT" state and timer "30sec" is restarted. 3. In “ARMWAIT” state, security indicator keeps on.

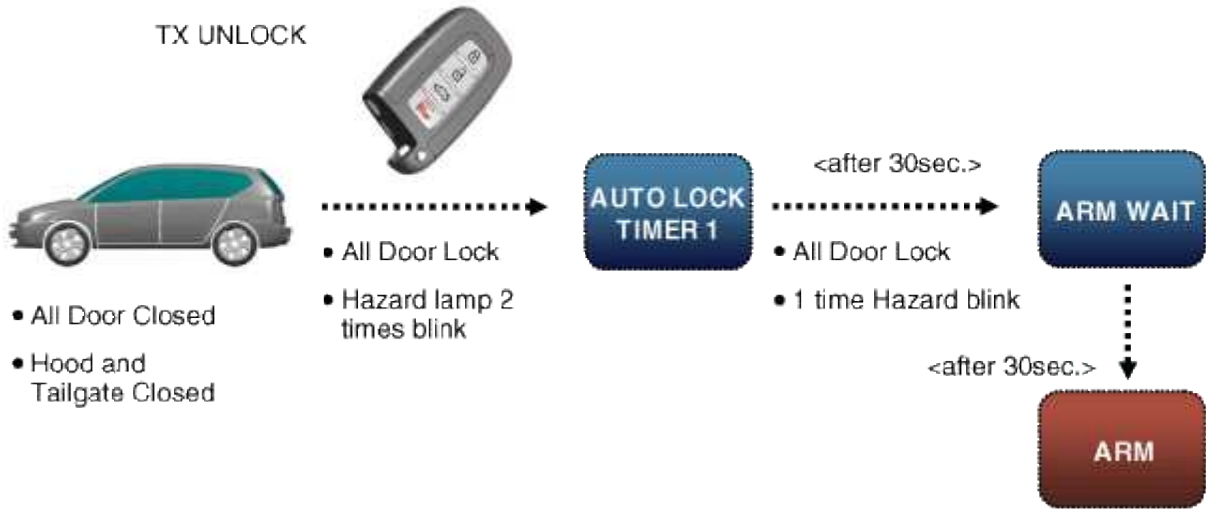
[ARM WAIT Procedure]



Remark: On Smart key system, it works the same way with passive lock

B/A State	Description
AUTO LOCK TIMER 1	1. In "AUTOLOCKTIMER1" state, timer “30sec."is running. If this timer expired, the auto lock command is generated “Lock command”. 2. When “Lock command” operated, All Door changed lock and closed then B/A state changes “AUTOLOCKTIMER1” to “ARMWAIT 3. In "AUTOLOCKTIMER1" state, Security Indicator keeps blinking. In "AUTOLOCKTIMER1" state, timer “30sec."is running. If this timer expired, the auto lock command is generated “Lock command”. When “Lock command” operated, All Door changed lock and closed then B/A state changes “AUTOLOCKTIMER1” to “ARMWAIT

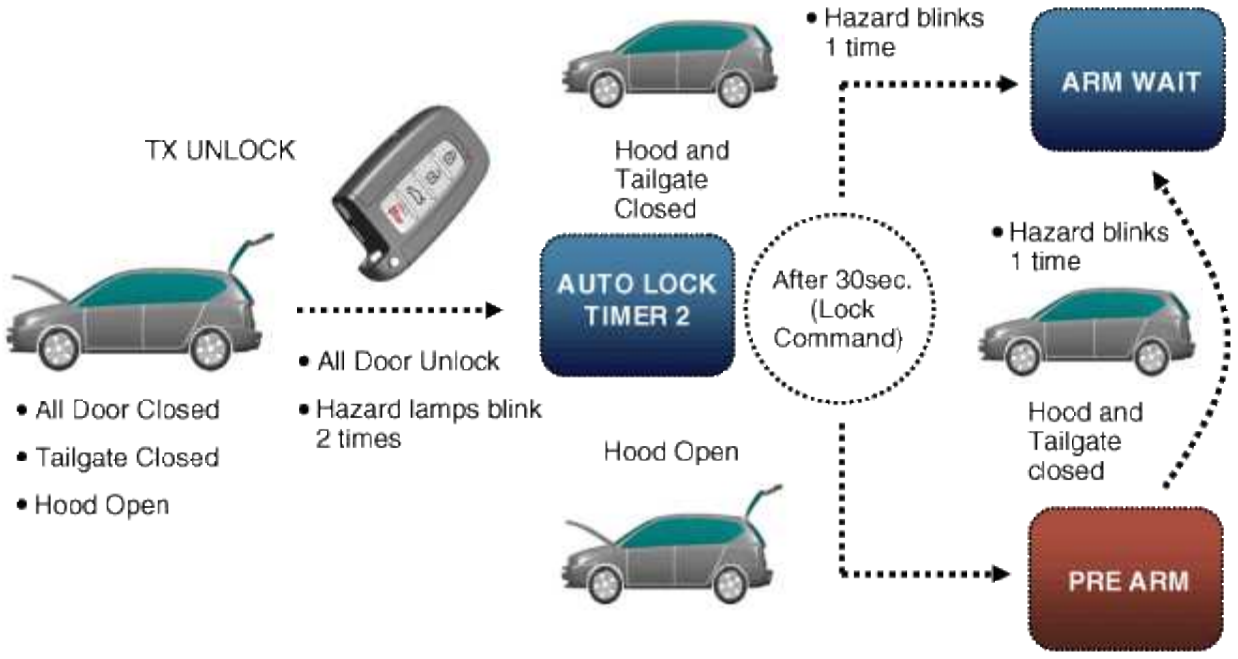
[AUTO LOCK TIMER 1 Procedure]



Remark: On Smart key system, it works the same way with passive unlock

B/A State	Description
AUTO LOCK TIMER 2	1. In "AUTOLOCKTIMER2" state, when timer “30sec."is running, if this timer expired, the auto lock command is generated “Lock command”. 2. All doors are Locked, Hood is closed and Tailgate is closed when “Lock command” operated, then B/A state changes to“AUTOLOCKTIMER2” when “Lock Command” generated with Hood open. 3. When “Unlock command” operated on the condition of All Door closed and Hood open, B/A state changes to “AUTOLOCKTIMER2”. 4. In "AUTOLOCKTIMER2" state, Security Indicator keeps blinking.

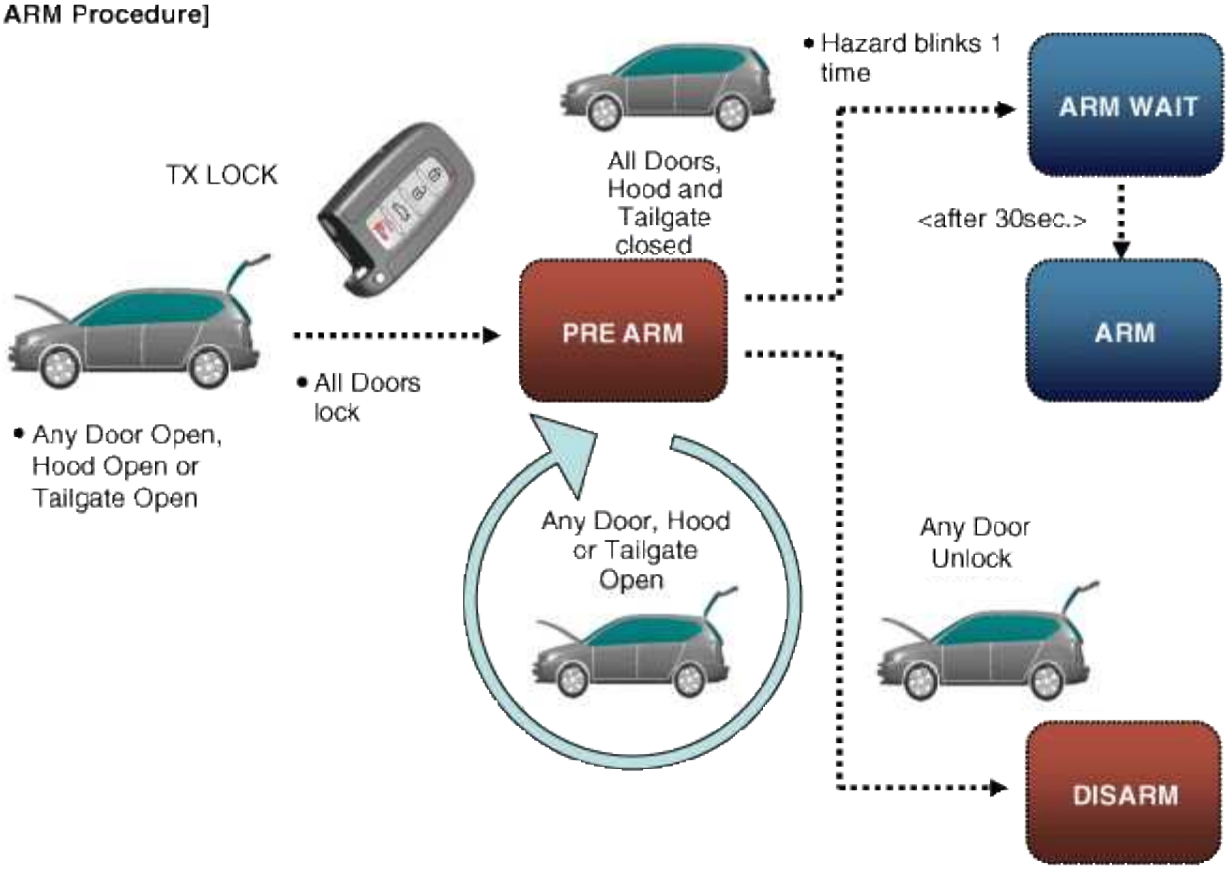
[AUTO LOCK TIMER 2 Procedure]



Remark: On Smart key system, it works the same way with passive unlock

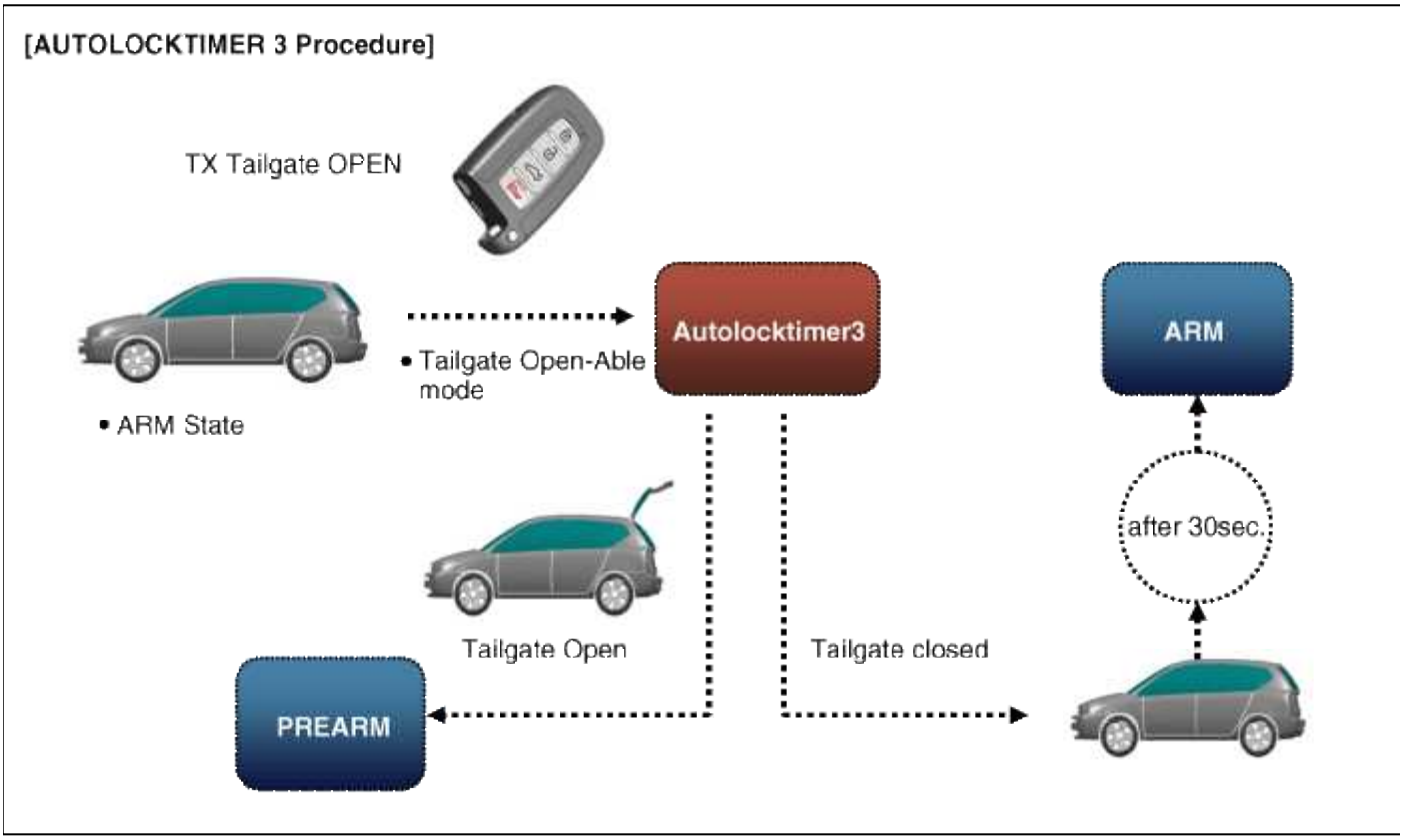
B/A State	Description
PRE ARM	1. The "PREARM" state is when user try to change to arm but pre-condition are not satisfied (door open, tailgate open, or hood open). 2. B/A state changes to “PREARM” when TX Lock command occurs with any door Open, Hood or Tailgate Open. 3. B/A state changes to “PREARM” when “30sec.” timer expired in“AUTOLOCKTIMER2”with Hood or Tailgate Open 4. The “PREAMR” state changes to “ARM” when all doors closed, All doors locked and Hood and Tailgate closed. 5. The “PREAMR” state changes to “DISARM” when Any Door Unlock 6. In this state, Security indicator keeps blinking.

[RPE ARM Procedure]



B/A State	Description
RE ARM	1. In "REARM" state, if the vehicle intrusion is detected, flashing and sound is restarted, again and state transitions to "ALARM" state. 2. B/A state changes to “REARM” after the timer “27sec.” expires in “ALARM” state with All doors closed and lock. 3. Security Indicator keeps blinking.

B/A State	Description
AUTOLOCK TIMER3	1. B/A state changes to “AUTOLockTIMER3”, when TX-Tailgate command operated. 2. B/A state changes “AUTOLOCKTIMER3” to “ARMWAIT”, when the “30sec.” timer expires with all doors lock and closed. 3. B/A state changes “AUTOLOCKTIMER3” to “DISARM”, when any door open. 4. In "AUTOLOCKTIMER3" state, timer “30sec.“ timer is running. If this timer expired, state transits to "PREARM" state with Tailgate Open. 5. In this state, Security indicator keeps blinking



Body Electrical System > Keyless Entry And Burglar Alarm > Repair procedures

Inspection

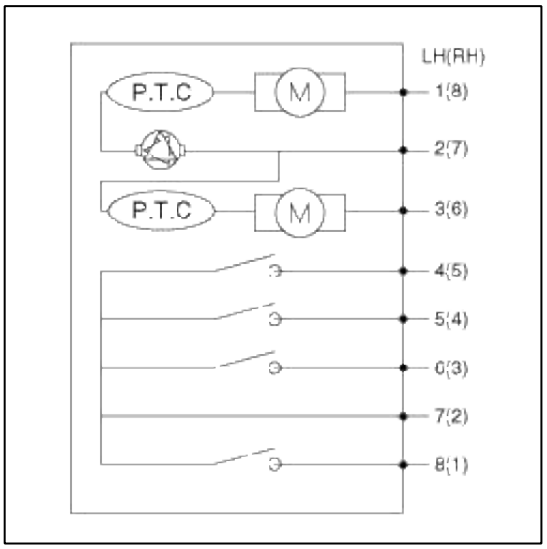
Front Door Lock Module Inspection

1. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
2. Remove the front door module.
   (Refer to Body - "Front Door Module")

3. Disconnect the connectors from the actuator.



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



Terminal \ Operation		Central Lock	Central Unlock
LH	2	⊕	⊖
	3	⊖	⊕
RH	7	⊖	⊕
	6	⊕	⊖

5. Check for continuity between the terminals in each switch position according to the table.

Terminal \ Operation		Central Lock	Central Unlock
LH	6 and 7	ON → OFF	OFF → ON
	4 and 7	Turn key clockwise/ counterclockwise : ON	
		Key return back : OFF	
	5 and 7	Turn key counterclockwise/ clockwise : ON	
		Key return back : OFF	
	7 and 8	Door open & latching ON	
		Full latching : OFF	

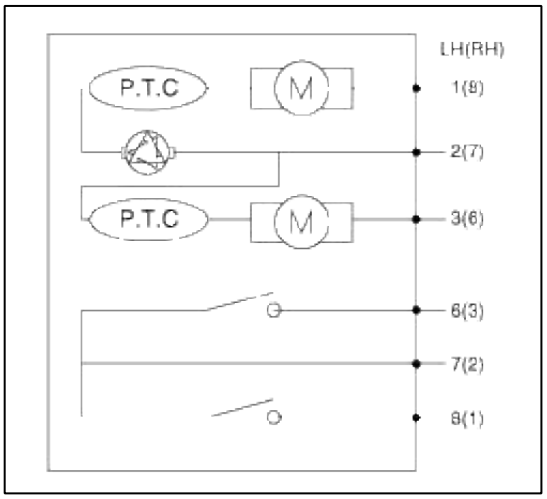
Rear Door Lock Module Inspection

1. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")

2. Remove the rear door module.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Rear Door Module")
3. Disconnect the connectors from the actuator.



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



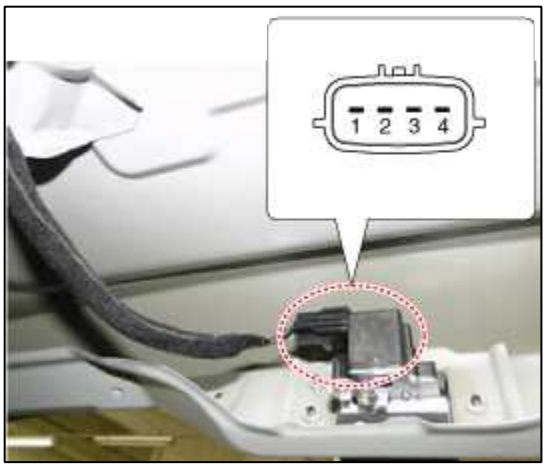
Terminal \ Operation		Central Lock	Central Unlock
LH	2	⊕	⊖
	3	⊖	⊕
RH	7	⊖	⊕
	6	⊕	⊖

5. Check for continuity between the terminals in each switch position according to the table.

Terminal \ Operation		Central Lock	Central Unlock
LH	6 and 7	ON → OFF	OFF → ON
	7 and 8	Door open & latch ng : ON Full latching : OFF	
RH	2 and 3	ON → OFF	OFF → ON
	1 and 2	Door open & latch ng : ON Full latching : OFF	

Tailgate Lock Module Inspection

1. Remove the tailgate trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Trim")
2. Disconnect the 4P connector from the actuator.

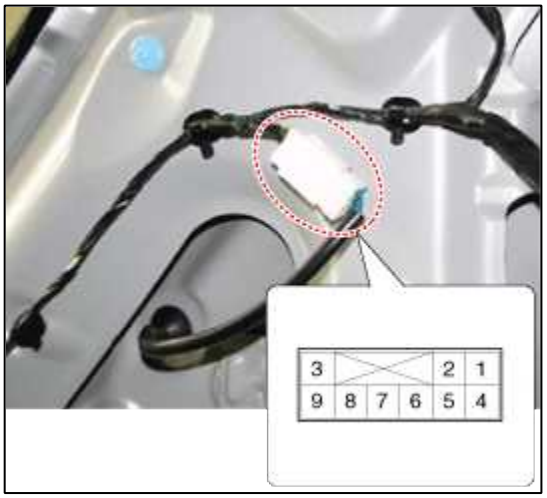


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal / Position	3	4
Unlock	⊕	⊖

Tailgate Open Switch

1. Remove the tailgate trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Trim")
2. Disconnect the 4P connector from the actuator.

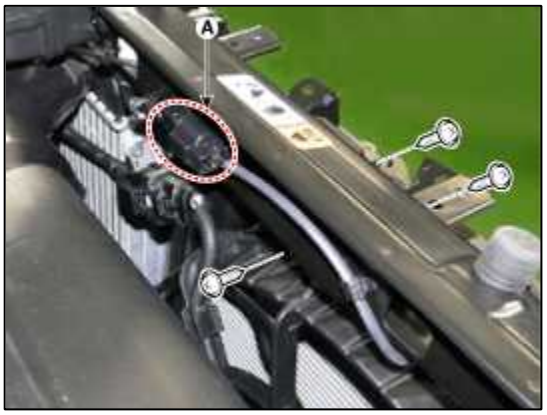


3. Check for continuity between the terminals in each switch position according to the table.

Terminal / Position	8	6
Unlock		
Lock	○	○

Hood Switch

1. Disconnect the connector (A) and bolts from the hood switch.



2. Check for continuity between the terminals and ground according to the table.

Position \ Terminal	1	2
Hood Open(Free)	○	○
Hood Close(Push)		

Burglar Horn

1. Remove the burglar horn after removing a bolt and disconnect the 2P connector from the burglar horn.



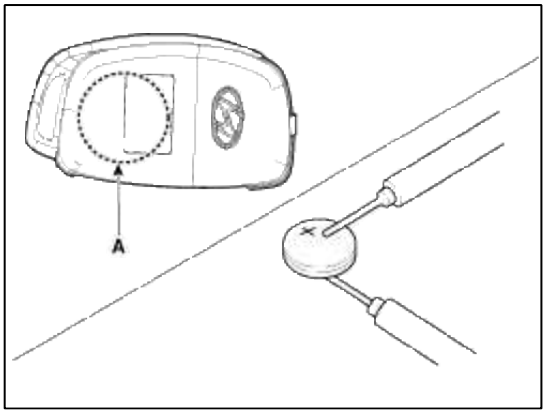
2. Test the burglar horn by connecting battery power to the terminal 1 and ground the terminal 2.
3. The burglar horn should sound. If the burglar horn fails to sound replace it.

Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Repair procedures

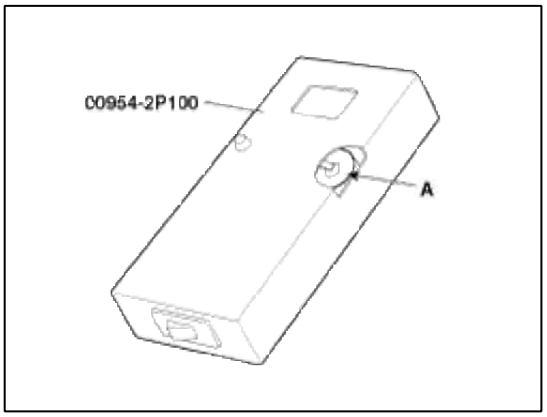
Inspection

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery (A) and check voltage if the red light doesn't flicker.

Standard voltage : 3V



3. Insert the battery (A) into the tester (09954-2P100).



4. Push the test button and If "0.00" is displayed on screen, it means that the battery voltage is 2V or less.
5. If "L" is displayed on screen, it means that the battery is low power and it needs to replace.
6. To prevent the discharge of electricity, turn the tester power off.
7. Replace the transmitter battery with a new one, if voltage is low power then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
8. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter code, then try to lock and unlock the doors.
9. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, replace the transmitter.

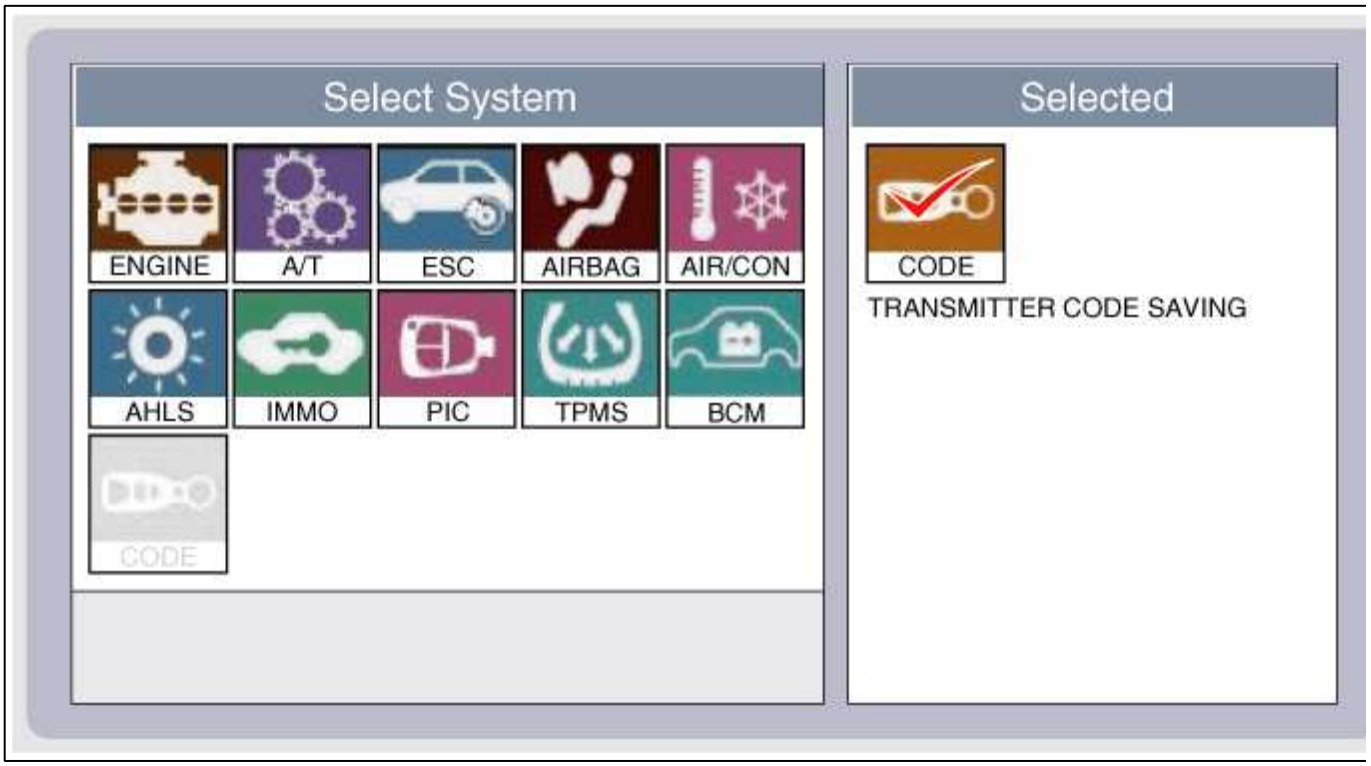
> WARNING
>
> An inappropriately disposed battery can be harmful to the environment and human health.
> Dispose the battery according to your local law(s) or regulation.

Transmitter Code Registration (Using GDS)

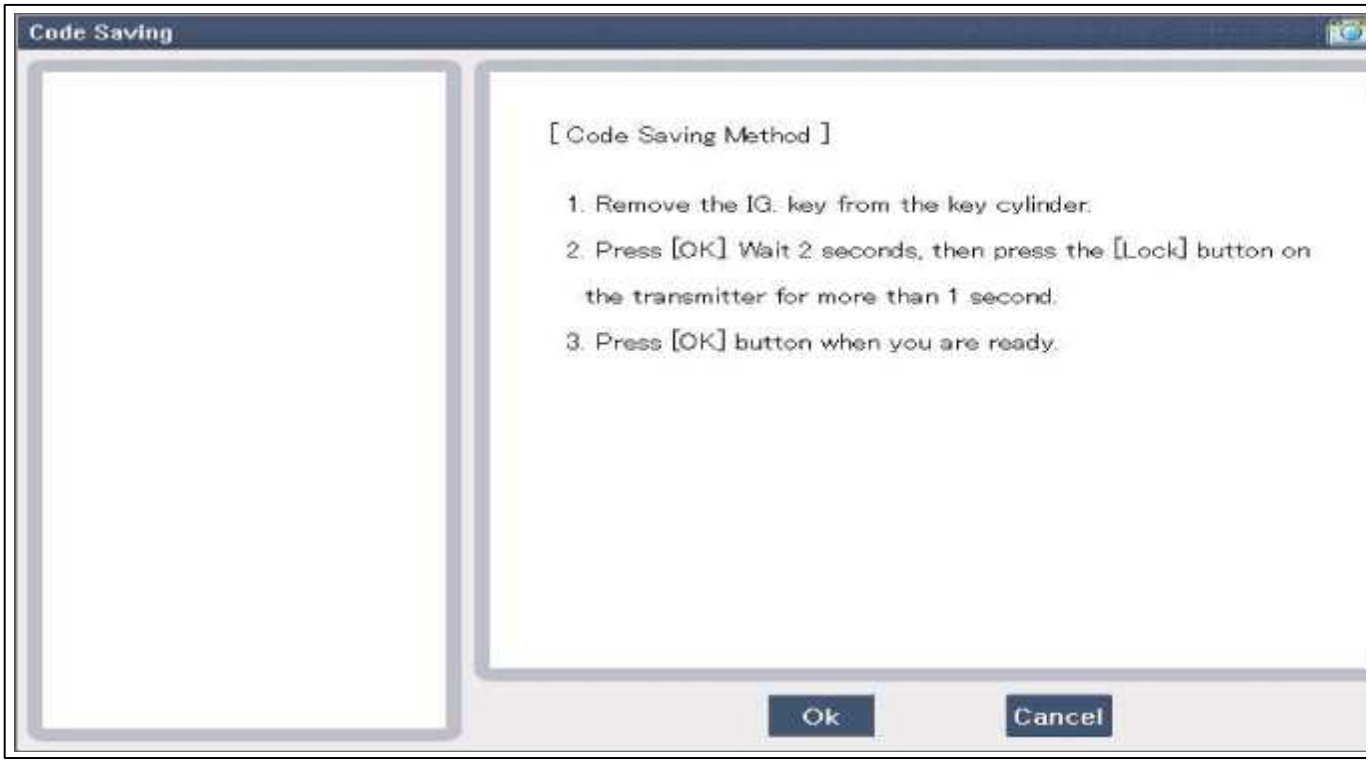
1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.



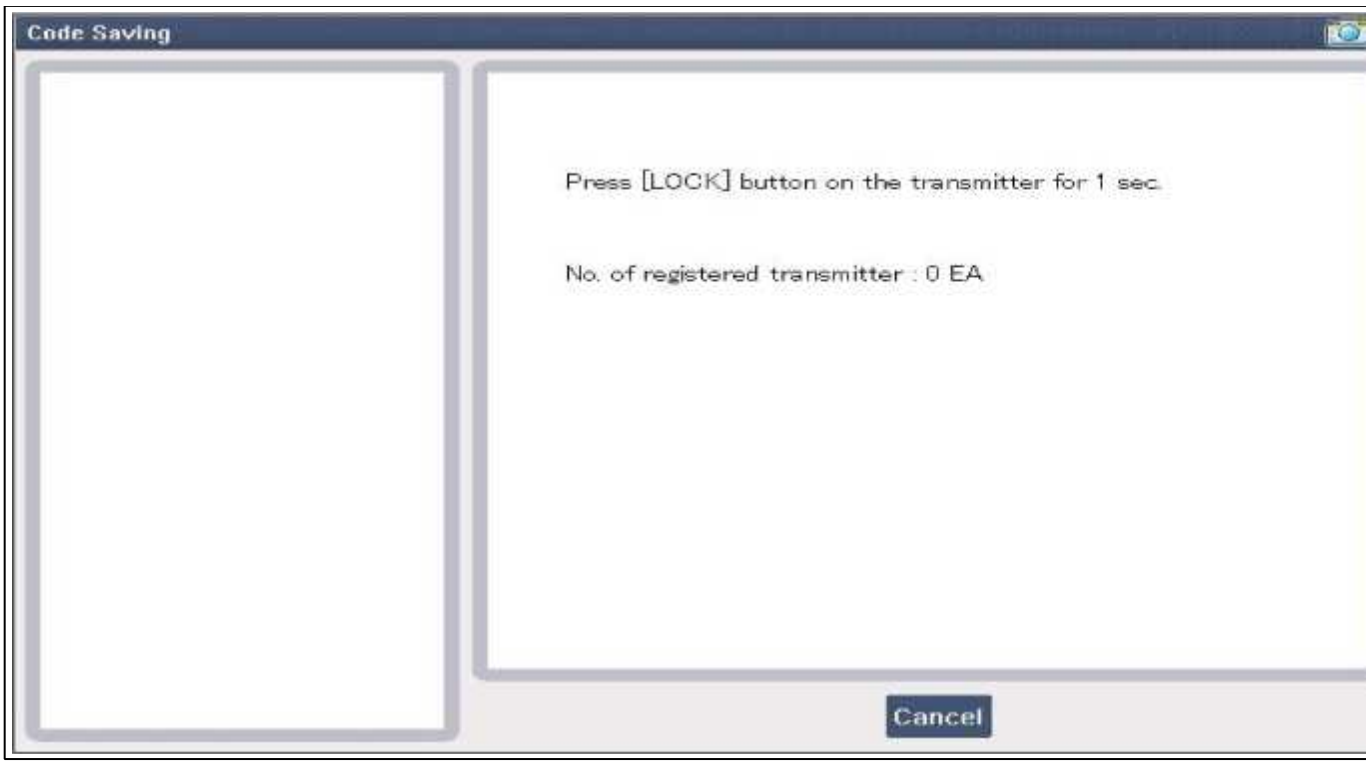
2. Select the vehicle model and then do "CODE SAVING"

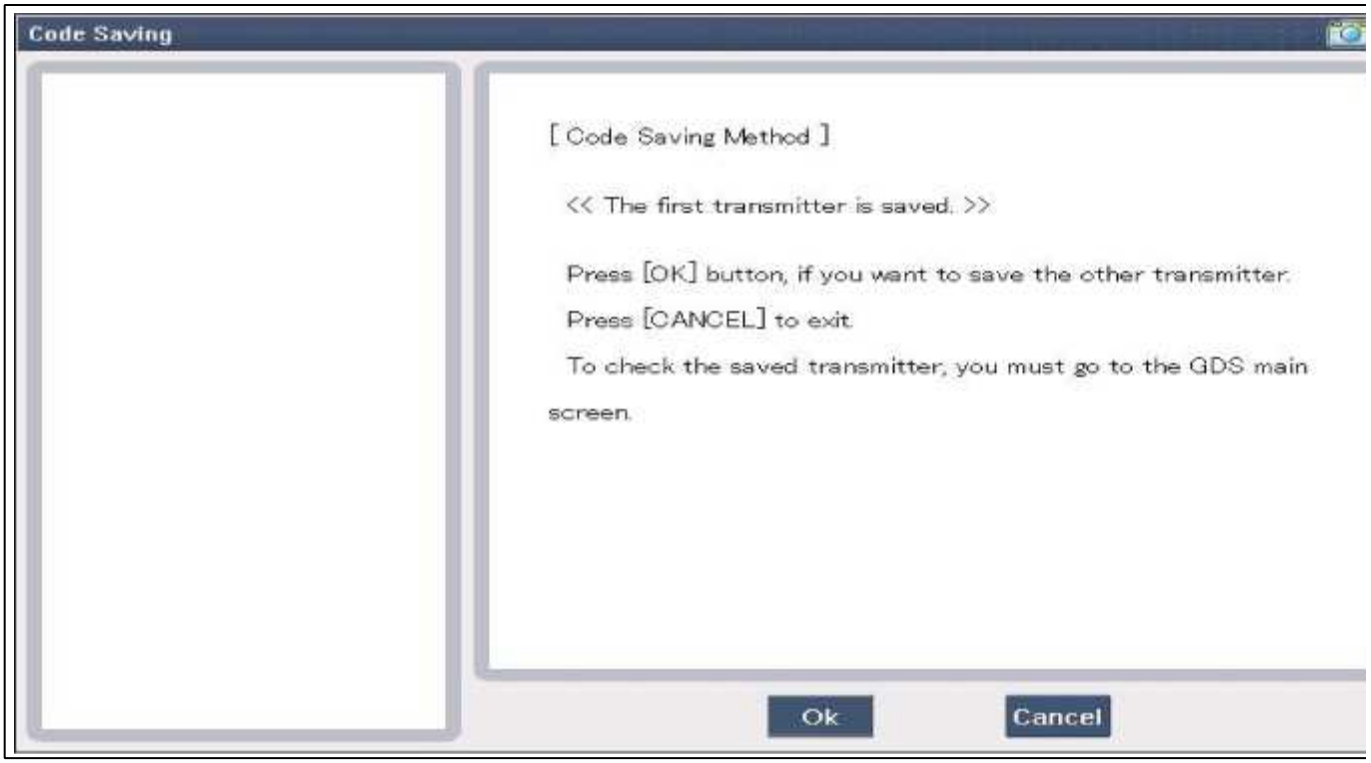


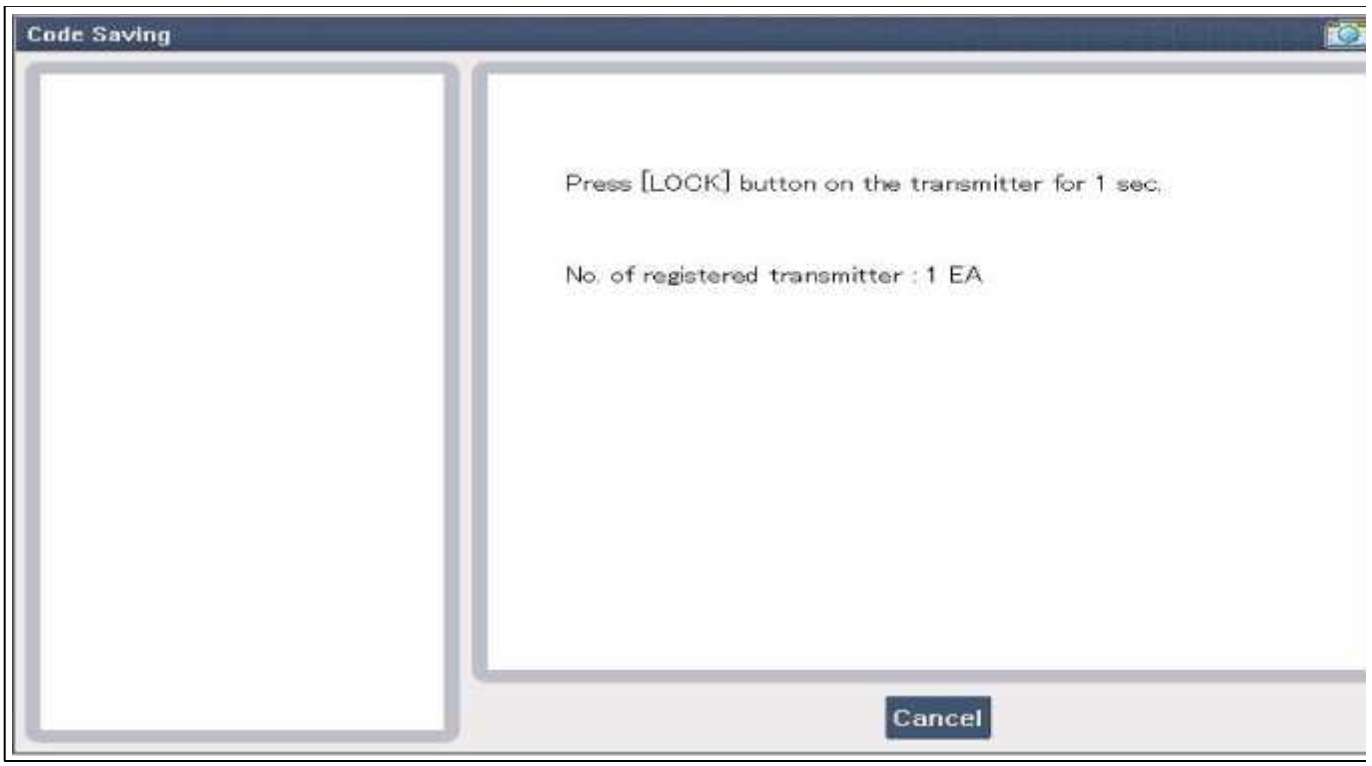
3. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.

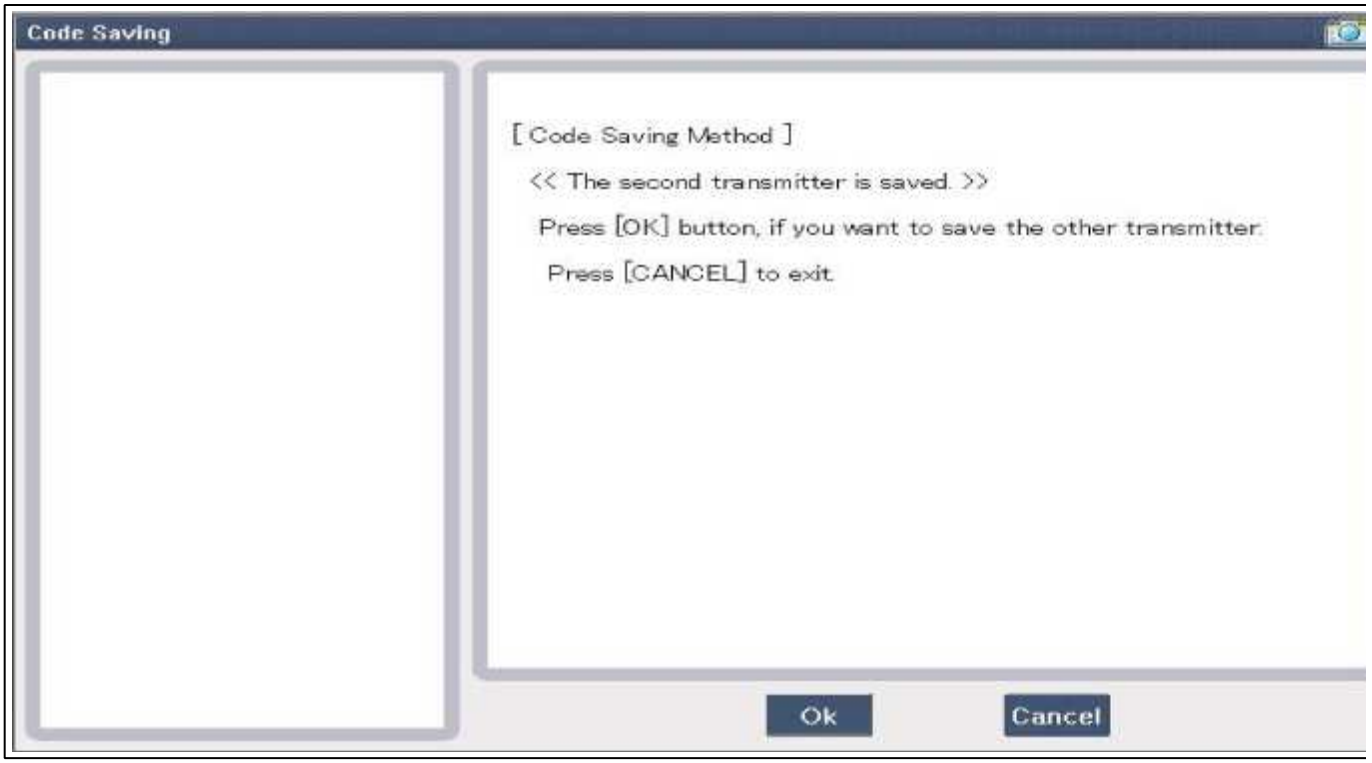


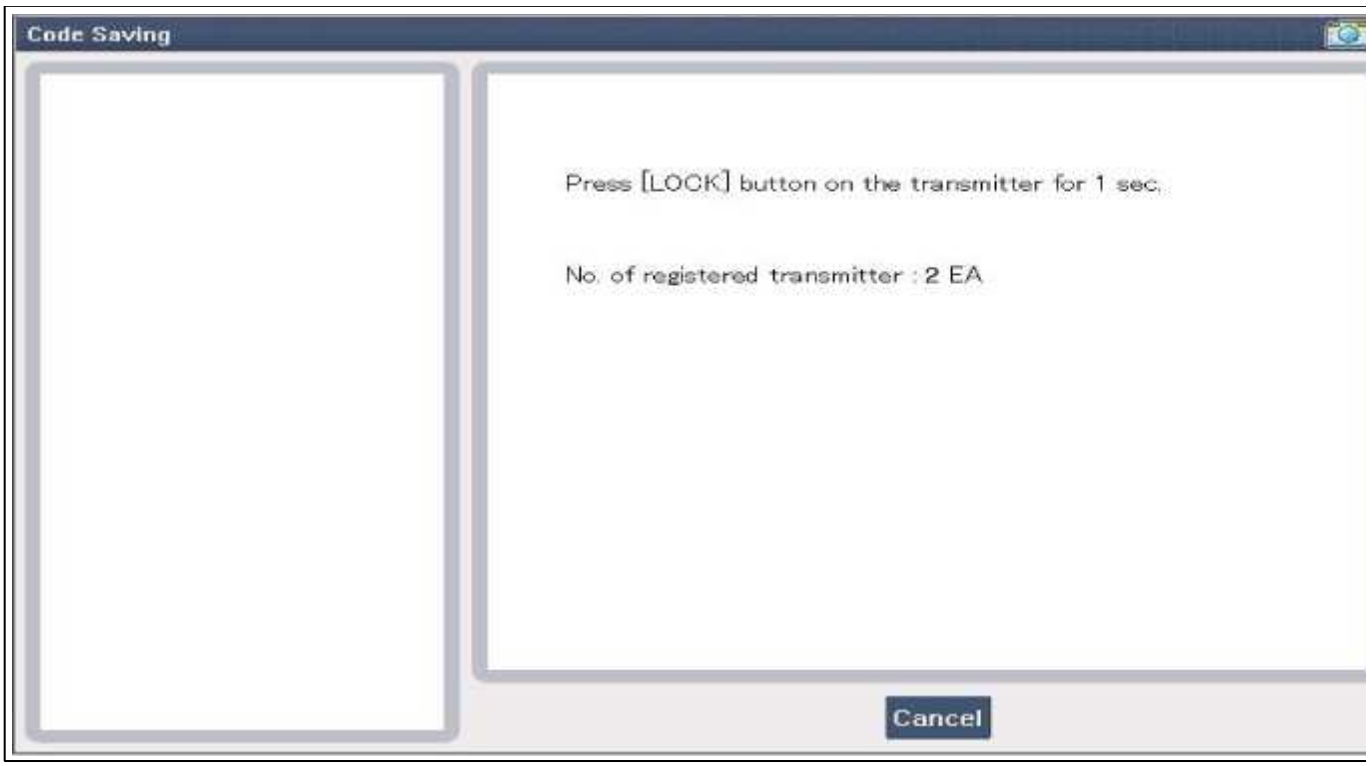
4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code savin
Follow steps 1 to 4 and then code saving is completed.

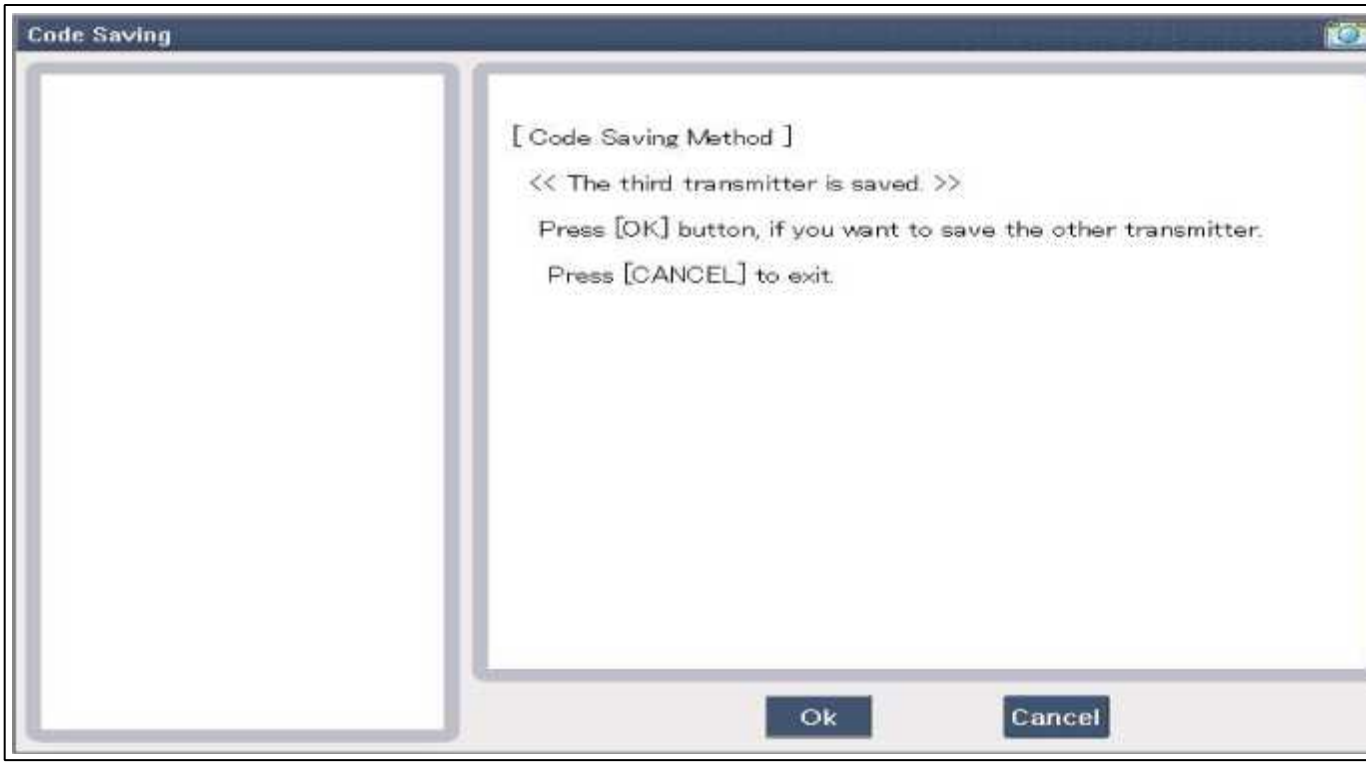

Code Saving
Press [LOCK] button on the transmitter for 1 sec.
No. of registered transmitter : 0 EA
Cancel

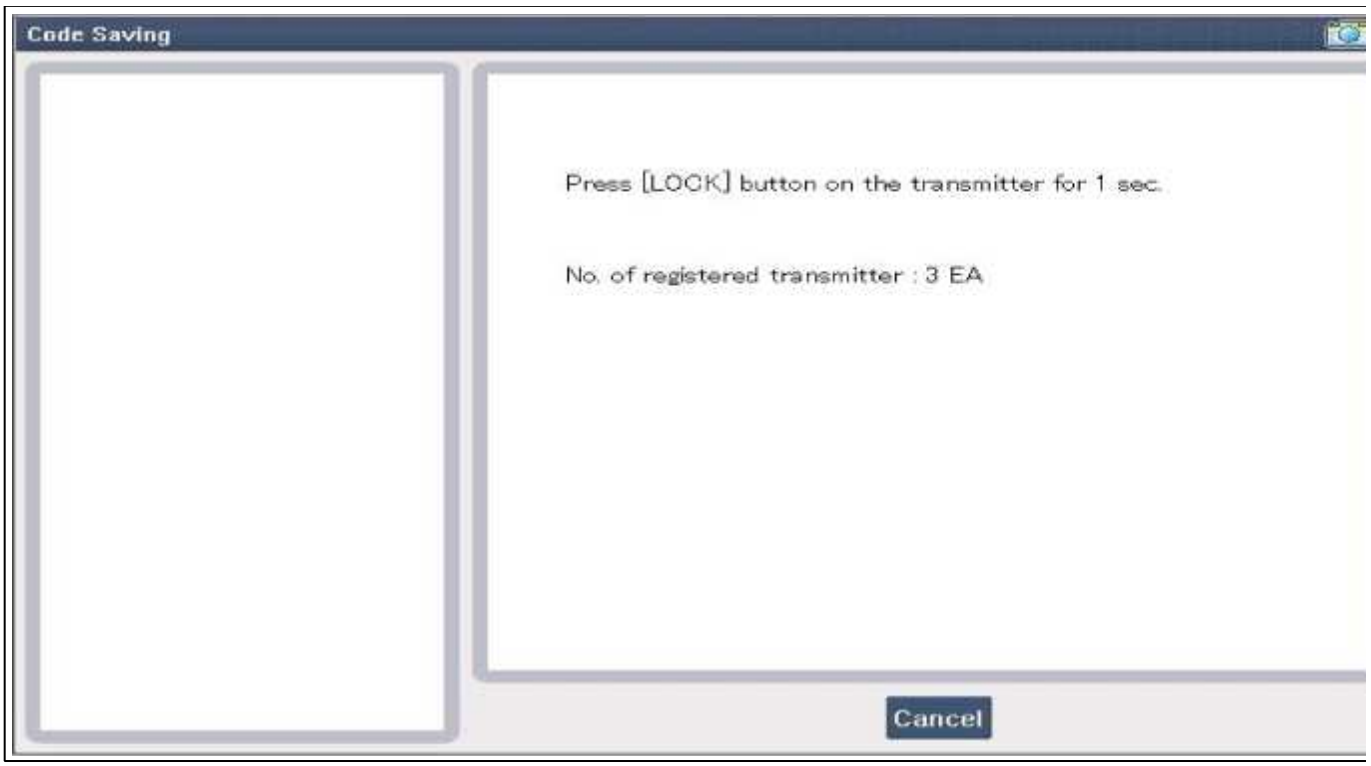

Code Saving
[Code Saving Method]
<< The first transmitter is saved. >>
Press [OK] button, if you want to save the other transmitter.
Press [CANCEL] to exit.
To check the saved transmitter, you must go to the GDS main screen.
Ok
Cancel

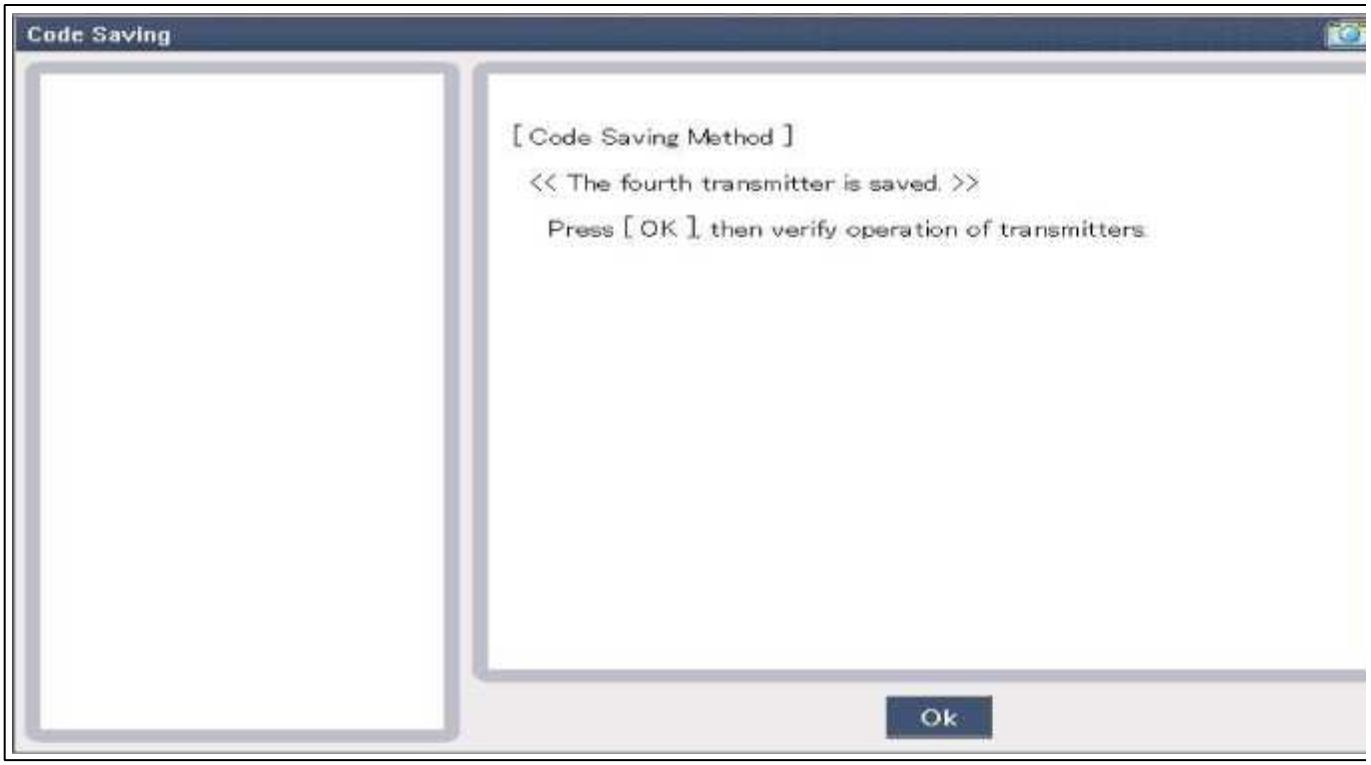

Code Saving
Press [LOCK] button on the transmitter for 1 sec.
No. of registered transmitter : 1 EA
Cancel

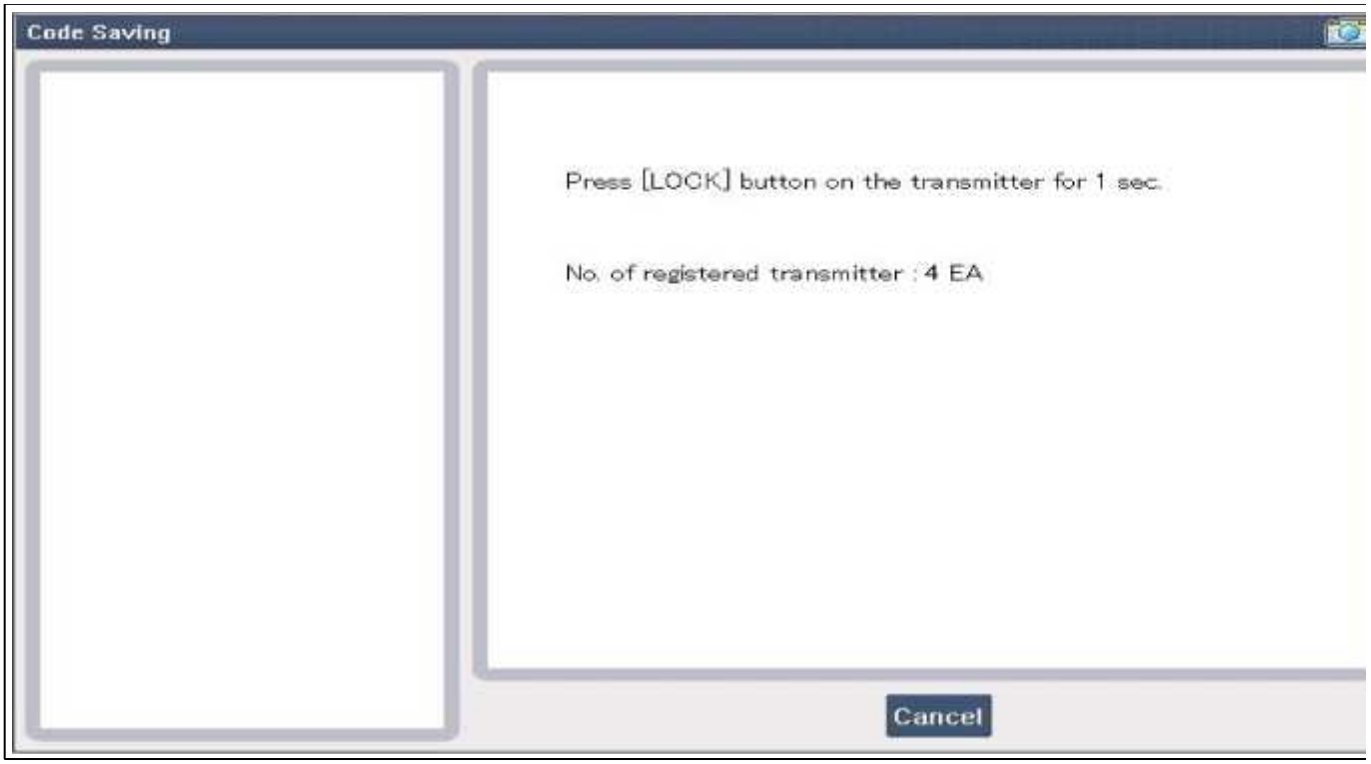

Code Saving
[Code Saving Method]
<< The second transmitter is saved. >>
Press [OK] button, if you want to save the other transmitter.
Press [CANCEL] to exit.
Ok
Cancel


Code Saving
Press [LOCK] button on the transmitter for 1 sec.
No. of registered transmitter : 2 EA
Cancel


Code Saving
[Code Saving Method]
<< The third transmitter is saved. >>
Press [OK] button, if you want to save the other transmitter.
Press [CANCEL] to exit.
Ok
Cancel


Code Saving
Press [LOCK] button on the transmitter for 1 sec.
No. of registered transmitter : 3 EA
Cancel


Code Saving
[Code Saving Method]
<< The fourth transmitter is saved. >>
Press [OK], then verify operation of transmitters.
Ok



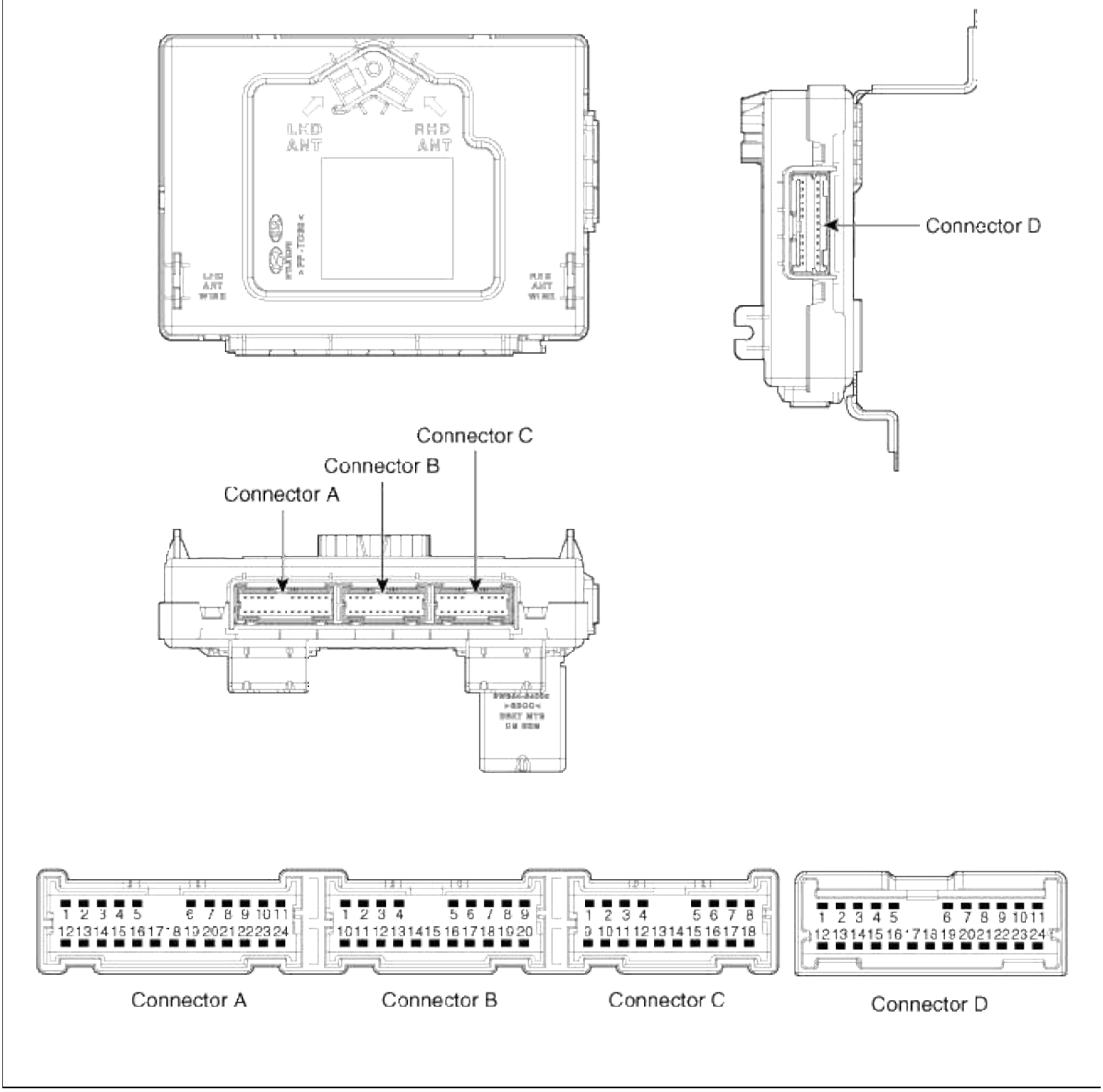
Body Electrical System > BCM (Body Control Module) > Specifications

Specifications

Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-4°F ~ 158°F)
Dark current	Keyless type : 5.5 mA Non keyless type : 3.0 mA SMK type : 4.5 mA

Body Electrical System > BCM (Body Control Module) > Components and Components Location

Components

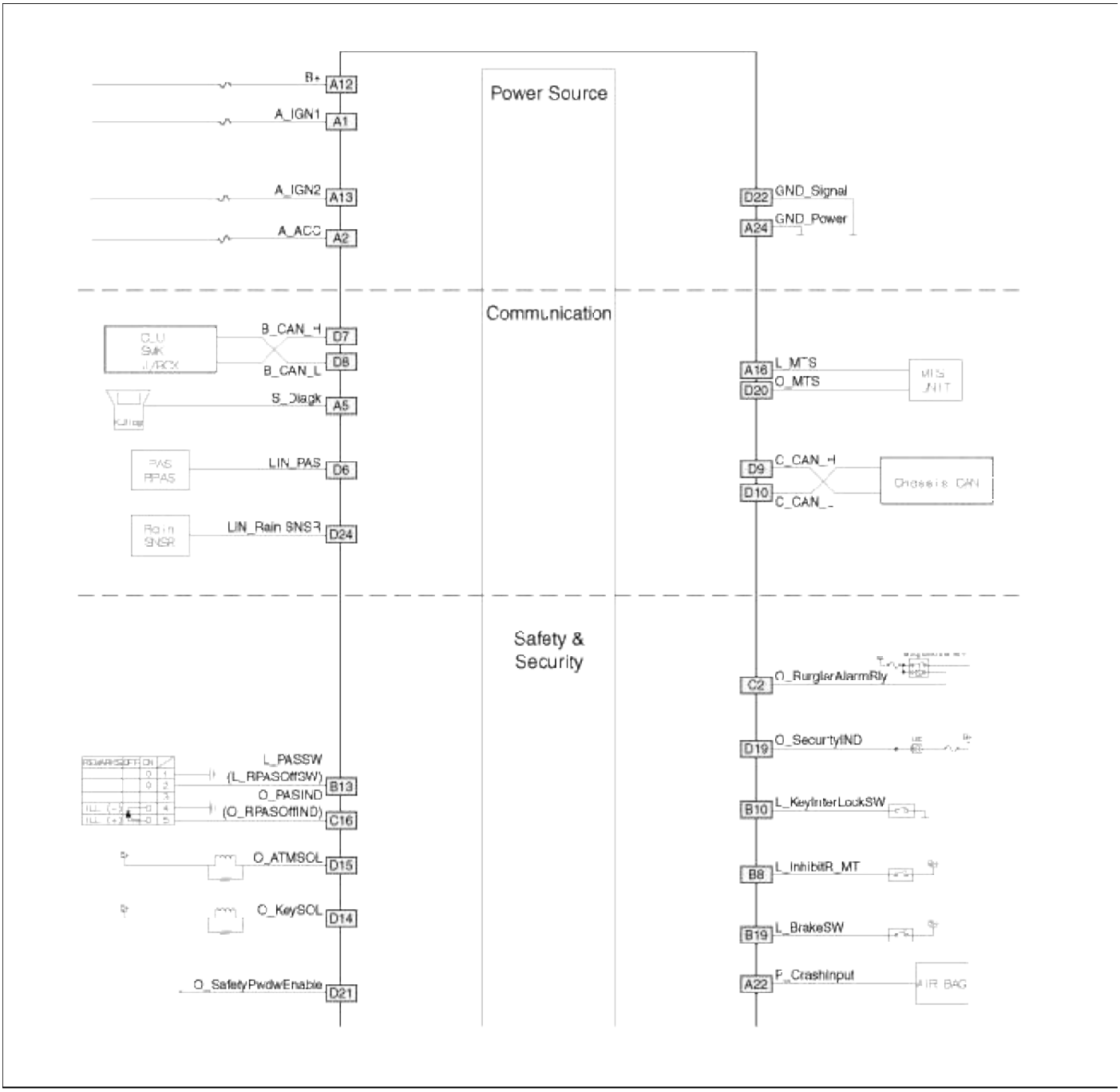


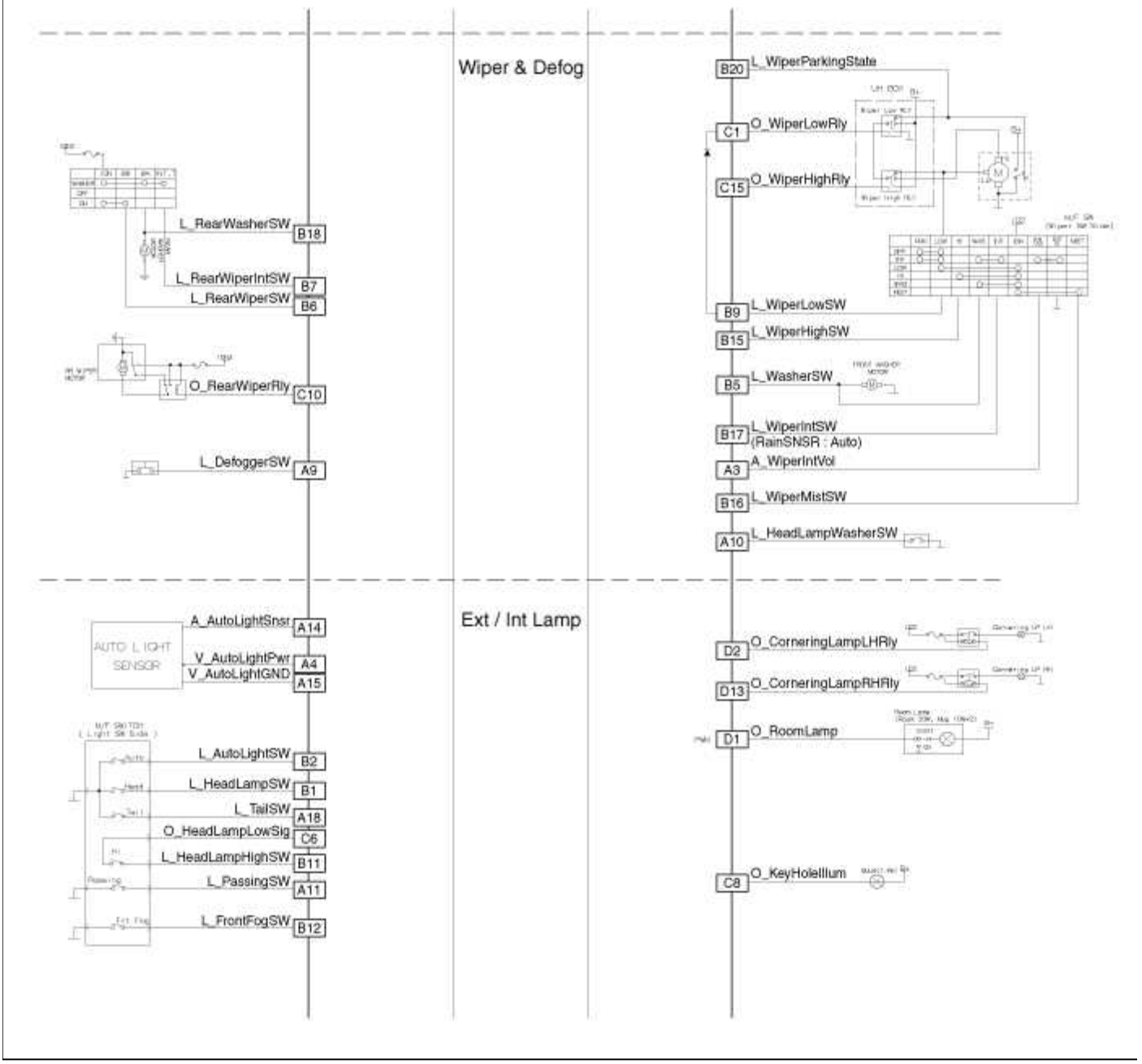
Connector Pin Information

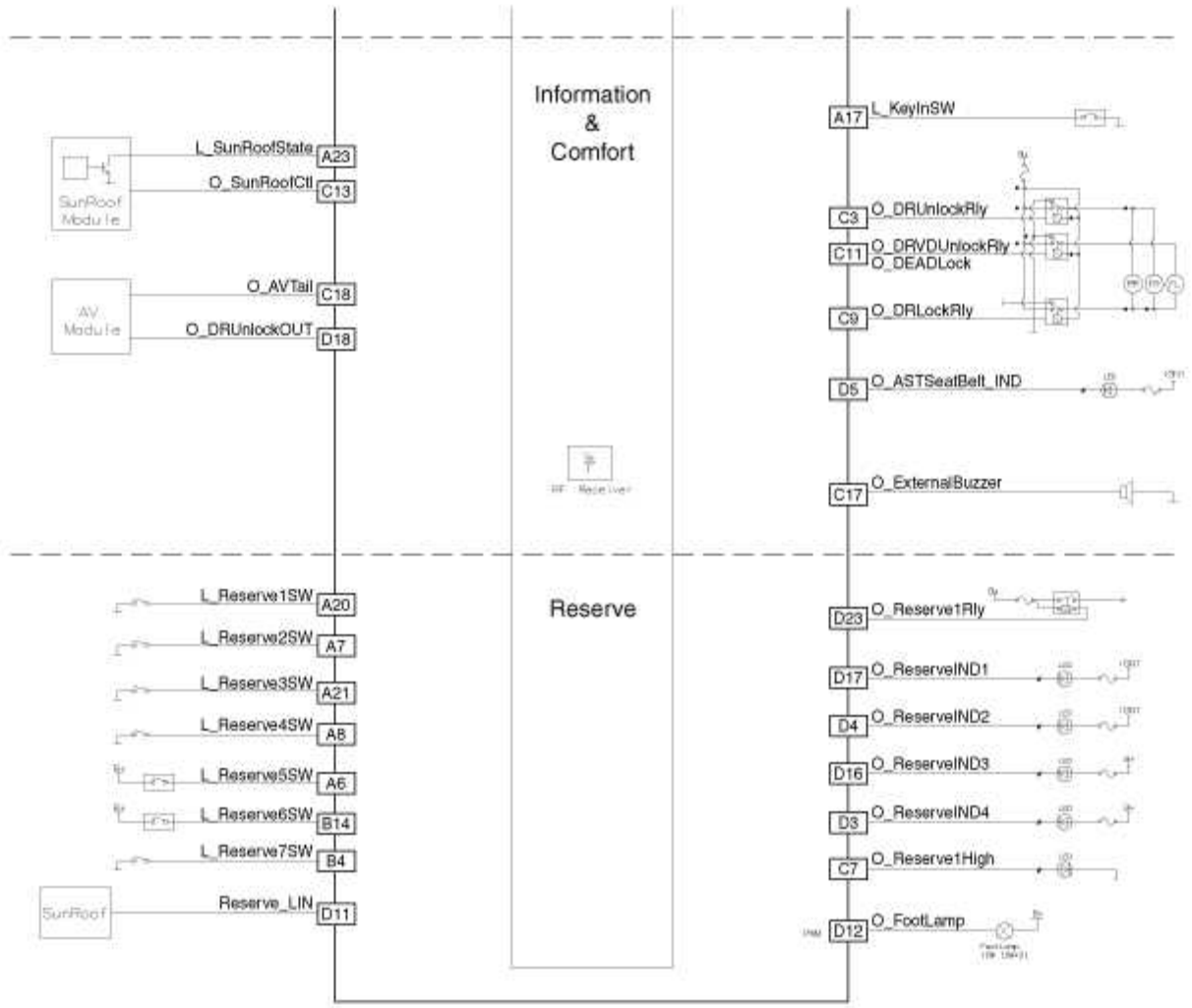
No.	Connector A	Connector B	Connector C	Connector D
1	IGN1	Head lamp low switch	Wiper low relay	Room lamp
2	ACC	Auto light switch	Burglar alarm relay	Cornering lamp left relay
3	Wiper INT volume	-	Door unlock relay	-
4	Auto light power	-	-	-
5	K-Line	Washer switch	-	Assistant seat belt indicator
6	-	Rear wiper switch	Head lamp low signal	LIN_PAS
7	-	Rear wiper INT switch	-	B_CAN High
8	-	Inhibit R (M/T)	Key hole illumination	B_CAN Low
9	Defogger switch	Wiper low switch	Door lock relay	C_CAN High
10	Head lamp washer switch	Key interlock switch	Rear wiper relay	C_CAN Low
11	Passing switch	Head lamp high switch	Driver door unlock relay	-
12	Battery +	Front fog switch	-	-
13	IGN2	PAS switch (RPAS OFF switch)	Sunroof control	Cornering lamp right relay
14	Auto light sensor	-	-	Key solenoid
15	Auto light ground	Wiper high switch	Wiper high relay	ATM solenoid
16	MTS input	Wiper MIST switch	PAS indicator (RPAS OFF indicator)	-
17	Key in switch	Wiper INT switch	External buzzer	-
18	Tail switch	Rear washer switch	AV tail	Door unlock output (AV)
19	-	Brake switch		Security indicator
20	-	Wiper parking state		MTS output
21	-			Safety power window enable
22	Crash input			Ground enable
23	Sunroof state			-
24	Power ground			LIN_Rain sensor

Body Electrical System > BCM (Body Control Module) > Schematic Diagrams

Circuit Diagram


Power Source
Communication
Safety &
Security
B+
A12
A_IGN1
A1
A_IGN2
A13
A_ACC
A2
GND_Signal
D22
GND_Power
A24
B_CAN_H
D7
B_CAN_L
D8
S_Diagk
A5
LIN_PAS
D6
LIN_Rain SNSR
D24
L_MTS
A16
O_MTS
D20
C_CAN_H
D9
C_CAN_L
D10
Chassis CAN
O_RunglarAlarmRly
C2
O_SecurtyIND
D19
L_KeyInterLockSW
B10
L_InhibitR_MT
B8
L_BrakeSW
B19
P_CrashInput
A22
L_PASSW
(L_RPASOffSW)
O_PASIND
(O_RPASOffIND)
B13
C16
O_ATMSOL
D15
O_KeySOL
D14
O_SafetyPwdwEnable
D21


Wiper & Defog
L_RearWasherSW
B18
L_RearWiperIntSW
B7
L_RearWiperSW
B6
O_RearWiperRly
C10
L_DefoggerSW
A9
B20
L_WiperParkingState
C1
O_WiperLowRly
C15
O_WiperHighRly
B9
L_WiperLowSW
B15
L_WiperHighSW
B5
L_WasherSW
B17
L_WiperIntSW
(RainSNSR : Auto)
A3
A_WiperIntVol
B16
L_WiperMistSW
A10
L_HeadLampWasherSW
Ext / Int Lamp
AUTO LIGHT SENSOR
A_AutoLightSnsr
A14
V_AutoLightPwr
A4
V_AutoLightGND
A15
L_AutoLightSW
B2
L_HeadLampSW
B1
L_TailSW
A18
O_HeadLampLowSig
C6
L_HeadLampHighSW
B11
L_PassingSW
A11
L_FrontFogSW
B12
D2
O_CorneringLampLHRly
D13
O_CorneringLampRHRly
D1
O_RoomLamp
C8
O_KeyHoleIllum



Body Electrical System > BCM (Body Control Module) > Description and Operation

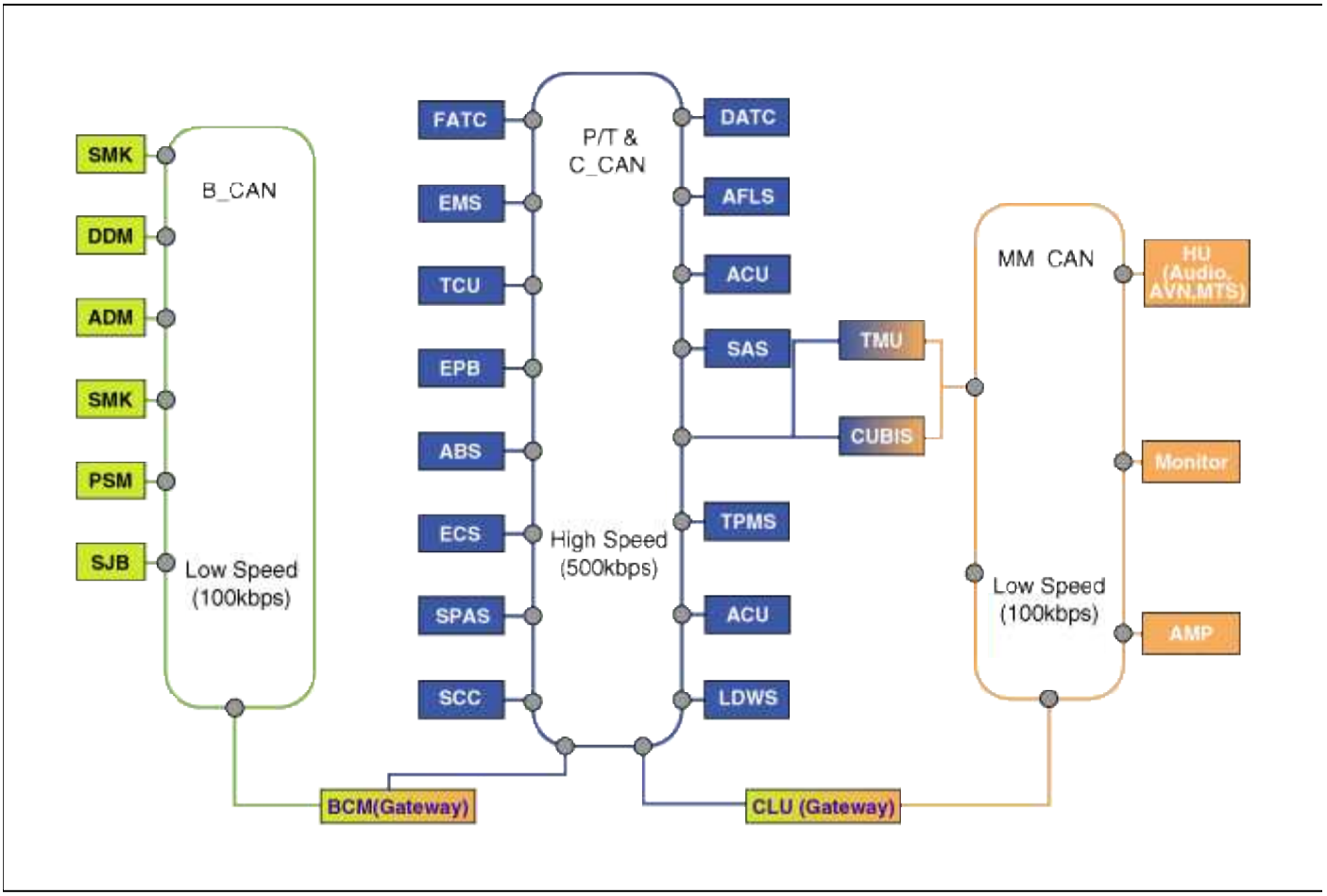
Description

Body Control Module Controls The Followings

- Wiper & Washer Control
- Defroster Control
- Driving Control
- Tailgate Control
- Window Control
- Interior Control
- Exterior Control
- Panic alarm Control
- MTS
- Flasher output Control
- Door lock/unlock Control
- Burglar alarm Control
- Remote start Control
- UMS(User Mode Setting) Control
- Gateway/ Diagnosis

Communication Network Diagram

Body Electrical System.



Abbreviation	Explanation
C_CAN	Chassis Controller Area Network
B_CAN	Body Controller Area Network
MM_CAN	Multi media Controller Area Network
SMK	Smart Key ECU
DDM	Driver Door Module
ADM	Assist Door Module
PSM	Power Seat Module
SJB	Smart Junction Box
ESC	Electronic Stabilty Control
SPAS	Smart Parking Assist System
SWRC	Steering Wheel Remote Controller
PCU	Power-train Control Unit
ECU	Engine Control Unit
TCU	Transmission Control Unit
EPB	Electronic Parking Brake
ABS	Anti-lock Brake System
BCM	Body Control Module

Body Electrical System.

SCC	Smart Cruise Control
DATC	Dual Automatic Temp Control
MDPS	Motor Driven Power Steering
SAS	Steering Angle Sensor
TPMS	Tire Pressure Monitoring System
ACU	Airbag Control Unit
CLU	Cluster
HU	Head Unit (Audio, AVN, MTS)

Function

1. Wiper & Washer Control
   A. Front wiper MIST Control Function
   B. Front wiper INT Control Function
   C. Front wiper washer Control Function
   D. Front wiper low/high Control Function
   E. Head lamp washer Control Function
   F. Rear wiper low Control Function
   G. Rear wiper INT Control Function
   H. Rear wiper washer Control Function
2. Defroster Control
   A. Rear defogger Control Function
   B. Front deicer control Function
3. Driving Control
   A. Key interlock solenoid Control Function
   B. ATM solenoid Control Function
4. Tailgate Control
   A. Tailgate open Control Function
5. Window Control
   A. Power window main timer Control Function
   B. Safety power window Control Function
   C. Seat bel reminder Control Function
   D. Key reminder(Key operated warning) Control Function
   E. Parking brake Control Function
   F. RKE key teaching Control Function
   G. SMK system warning Control Function
   H. Alarm horn Control Function
   I. Sunroof open warning Control Function
   J. Rear area parking assist system Control Function
6. Interior Control
   A. Room lamp Control Function
   B. Key hole illumination Control Function

7. Exterior Control
   A. Tail lamp Control Function
   B. Head lamp DRL Control Function
   C. Head lamp high Control Function
   D. Head lamp welcome Control Function
   E. Escort Control Function
   F. Auto light Control Function
   G. DRL Control Function
   H. Front fog Control Function
   I. AV tail Control Function
8. Panic alarm Control
9. MTS Control
10. Flasher output Control
    A. Alarm flashing Control Function
    B. Arm/Disarm flashing Control Function
    C. Panic flashing Control Function
    D. MTS flashing Control Function
    E. Tailgate open/close flashing Control Function
    F. Two turn unlock set/reset flashing Control Function
    G. Crash unlock flashing Control Function
    H. Remote start flashing Control Function
11. Door lock/unlock Control
    A. Central door lock/unlock Control Function
    B. Mechanical door lock/unlock Control Function
    C. Two turn unlock Control Function
    D. SMK door lock/unlock Control Function
    E. RKE door lock/unlock Control Function
    F. MTS door unlock Control Function
    G. ATWS relcok Control Function
    H. Auto door lock/unlock Control Function
    I. Crash unlock Control Function
    J. Key reminder unlock Control Function
12. Burglar alarm Control
13. Remote start Control

Body Electrical System > BCM (Body Control Module) > Repair procedures

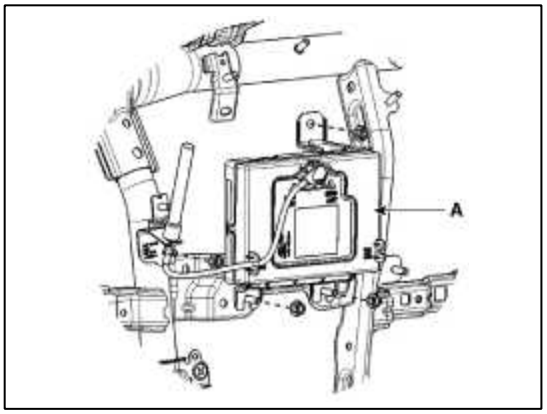
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Crash Pad Center Panel")

3. Disconnect the body control module connectors (A).



4. Remove the body control module (A) after loosening the nuts.



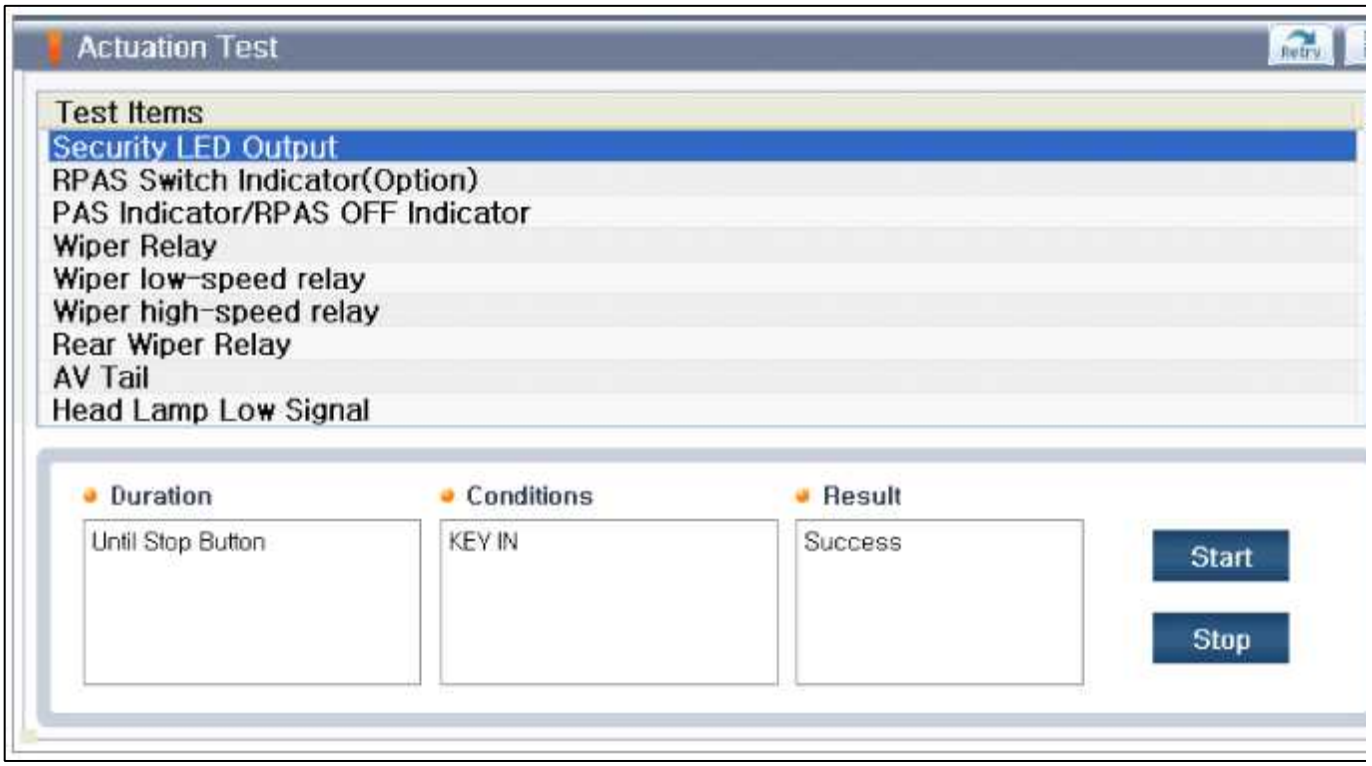
Installation

1. Install the body control module.
2. Connect the body control module.
3. Install the crash pad center panel.

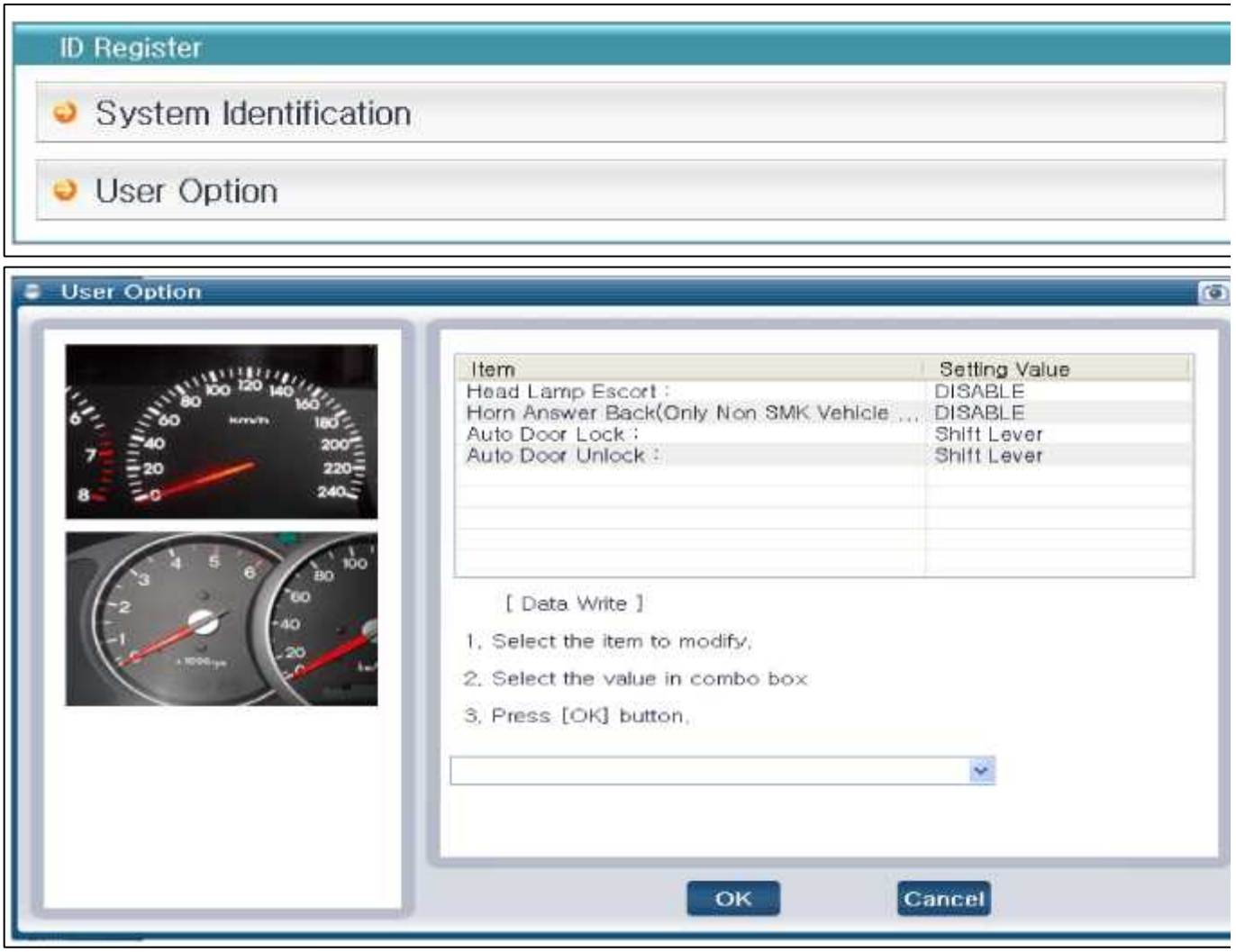
BCM Diagnosis With GDS

1. The body control module can diagnose by using the GDS more quickly.
   The BCM communicates with the GDS and then reads the input/output value and drives the actuator.
2. To diagnose the BCM function, select the menu of model and body control module.
3. Select "Input/output monitoring", if you will check current data of body network system. It provides input/output status of each module.
   A. BCM service data, CLU service data, SJB service data

4. If you will check each module data operation forcefully, select "Actuation test".



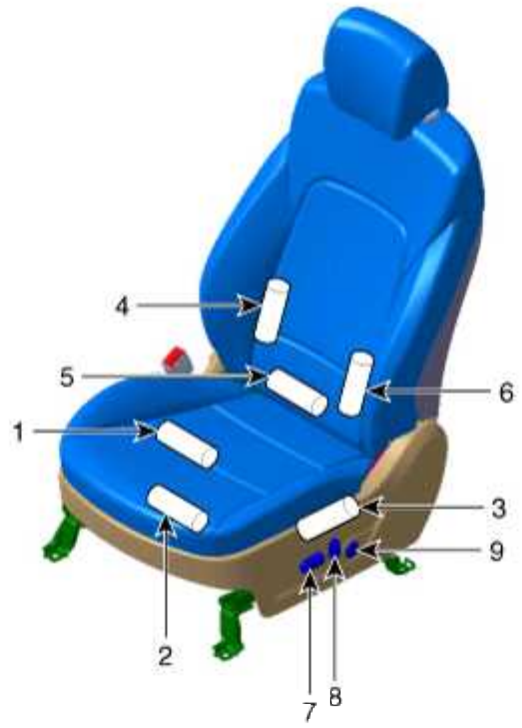
5. If you want to change user option, select “user option”.



Body Electrical System > Seat Electrical > Components and Components Location

Body Electrical System.

Component Location



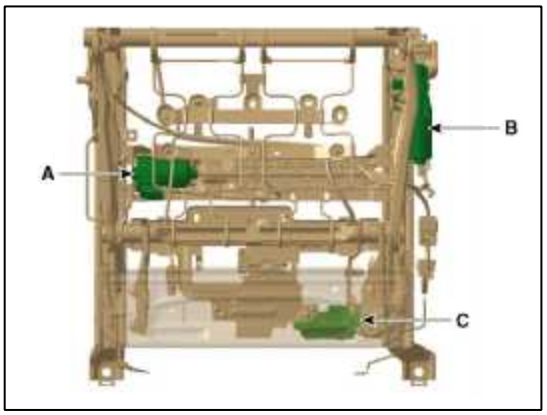
1. Slide motor 2. Front height motor 3. Rear height motor 4. Lumbar support motor (Horizontal) 5. Lumbar support motor (Vertical)	6. Reclining motor 7. Power seat switch 8. Reclining switch 9. Lumbar support switch

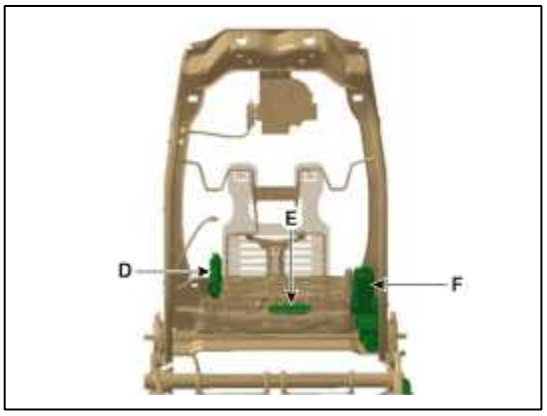
Body Electrical System > Seat Electrical > Power Seat Motor > Repair procedures

Inspection

Power Seat Motor

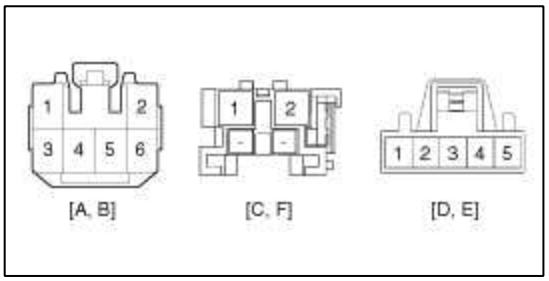
1. Disconnect the connectors for each motor.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Seat Assembly")
   A : Slide motor
   B : Front height motor
   C : Rear height motor
   D : Lumbar support motor (Horizontal)
   E : Lumbar support motor (Vertical)
   F : Recline motor





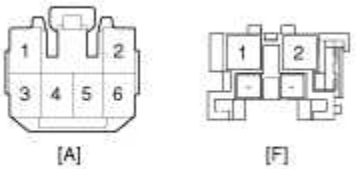
2. With the battery connected directly to the motor terminals, check if the motors run smoothly.
3. Reverse the connections and check that the motor turns in reverse.
4. If there is an abnormality, replace the motors.

   [Driver]



Position \ Terminal		+	-
Slide motor A	Forward	5	6
	Backward	6	5
Front height motor B	UP	6	5
	DOWN	5	6
Rear height motor C	UP	1	2
	DOWN	2	1
Lumbar support motor (Horizontal) D	Forward	4	2
	Backward	2	4
Lumbar supprot motor (Vertical) E	UP	2	4
	DOWN	4	2
Recline motor F	Forward	1	2
	Backward	2	1

[Passenger]



Position \ Terminal		+	-
Slide motor A	Forward	5	6
	Backward	6	5
Recline motor F	Forward	1	2
	Backward	2	1

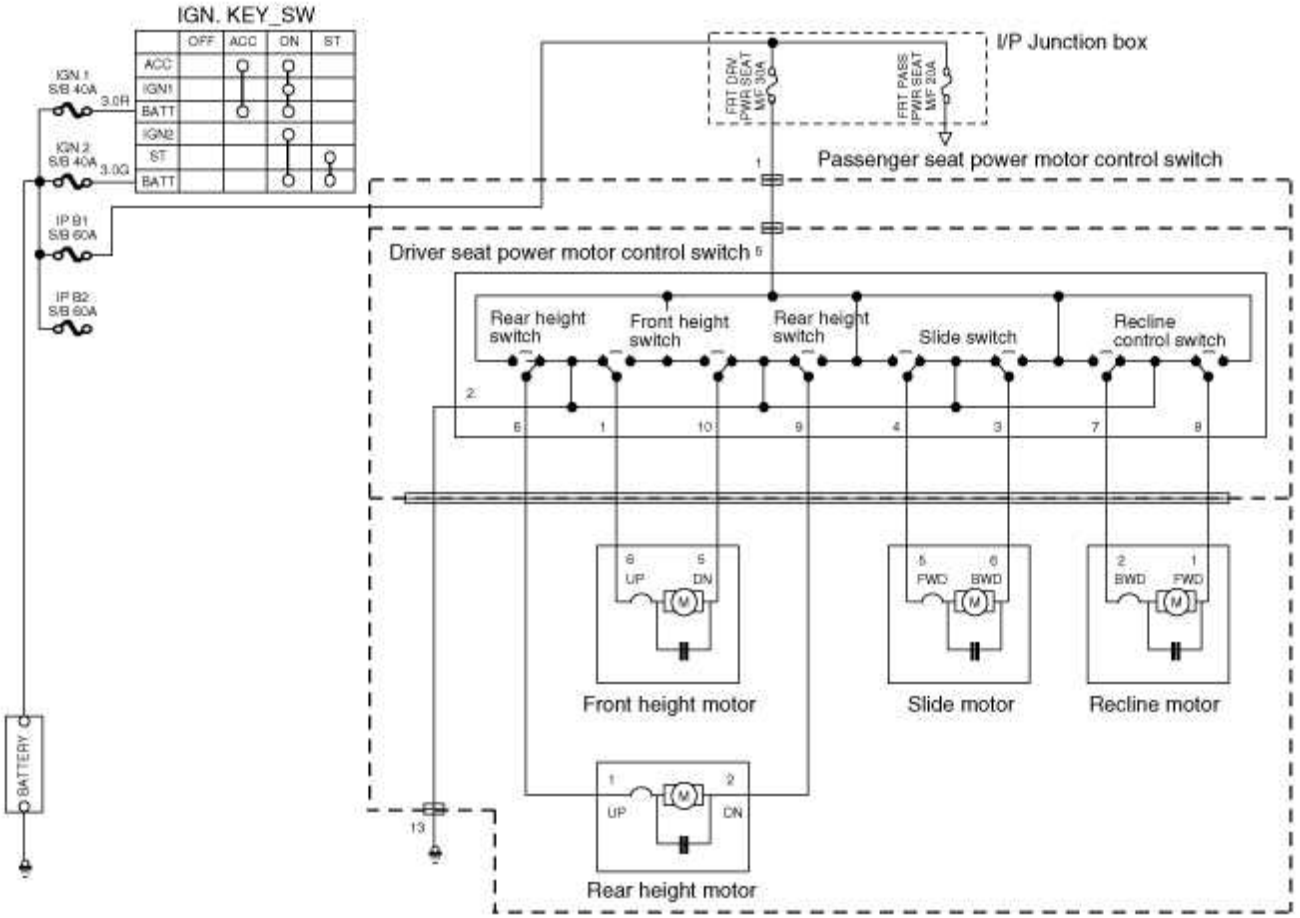
NOTE

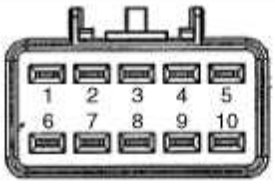
Make sure that the motor connectors are plugged in properly.

Body Electrical System > Seat Electrical > Power Seat Control Switch > Schematic Diagrams

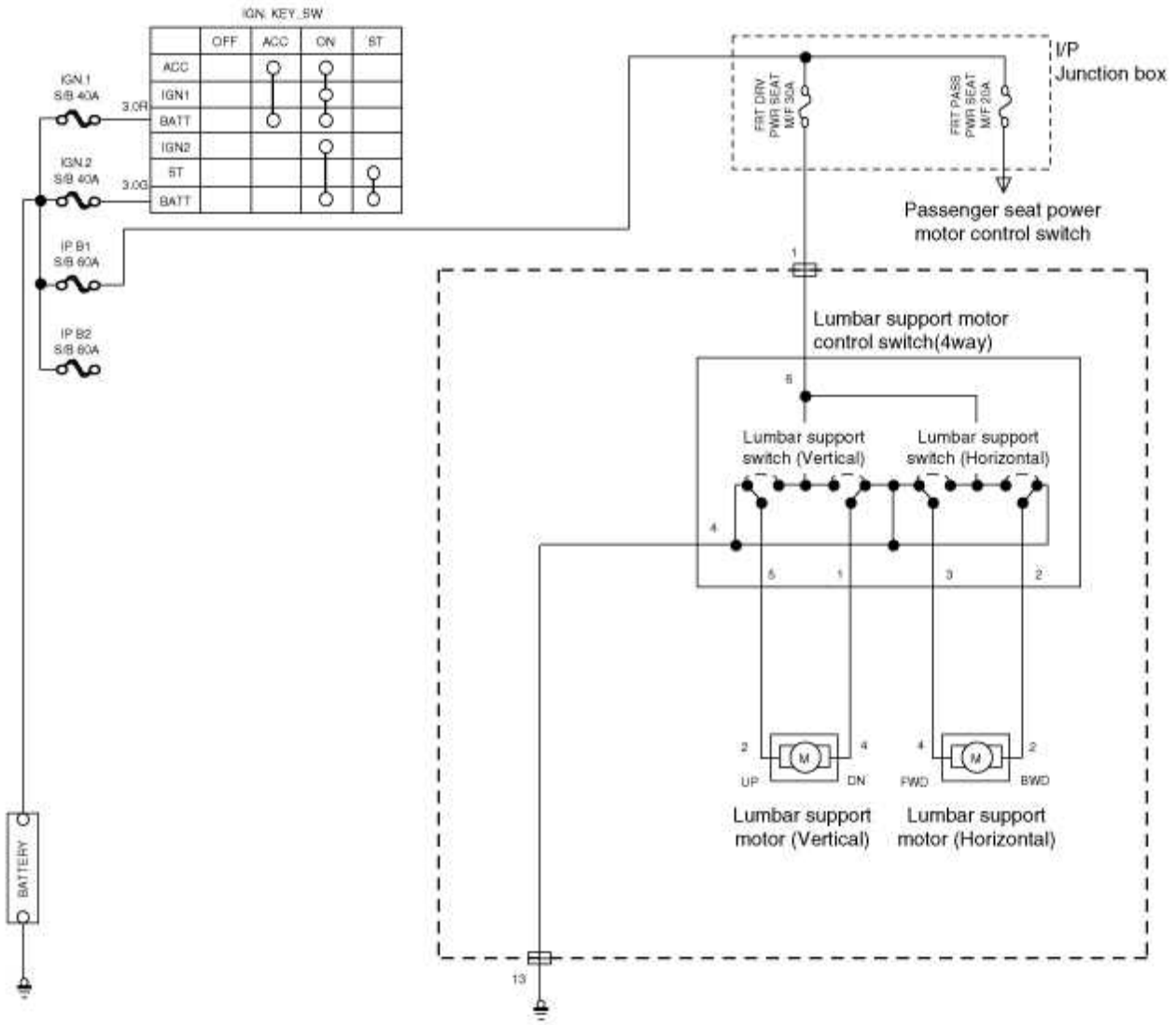
Circuit Diagram

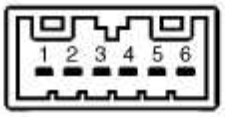
[Driver Power Seat Control Switch]



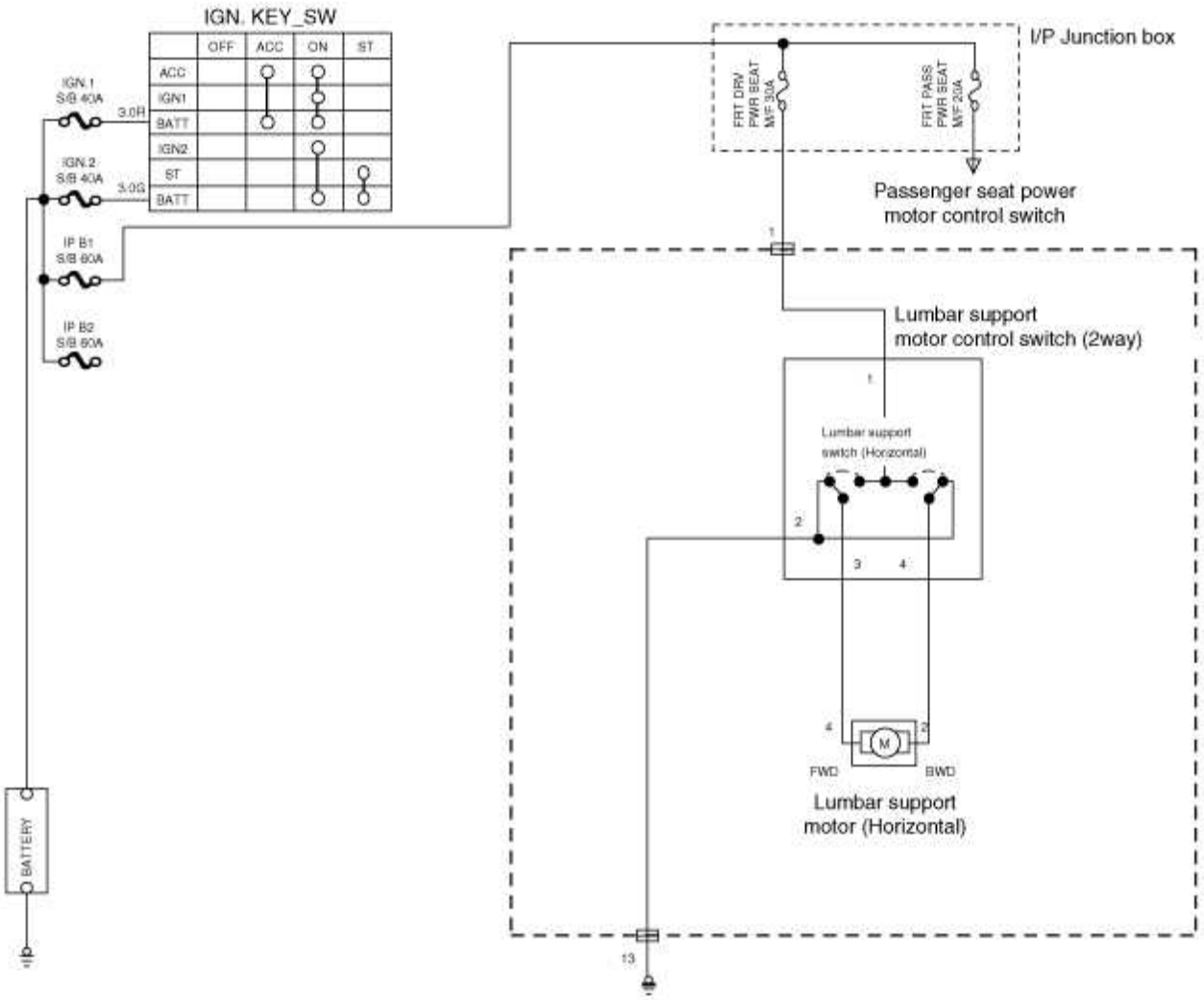
Connector	No.	Description	No.	Description
	1	Front height motor (UP)	6	Rear height motor (UP)
	2	Ground	7	Recline motor (Backward)
	3	Slide motor (Backward)	8	Recline motor (Forward)
	4	Slide motor (Forward)	9	Rear height motor (DOWN)
	5	Battery +	10	Front height motor (DOWN)

[Drvier Lumbar Supprot Control Switch(4way)]



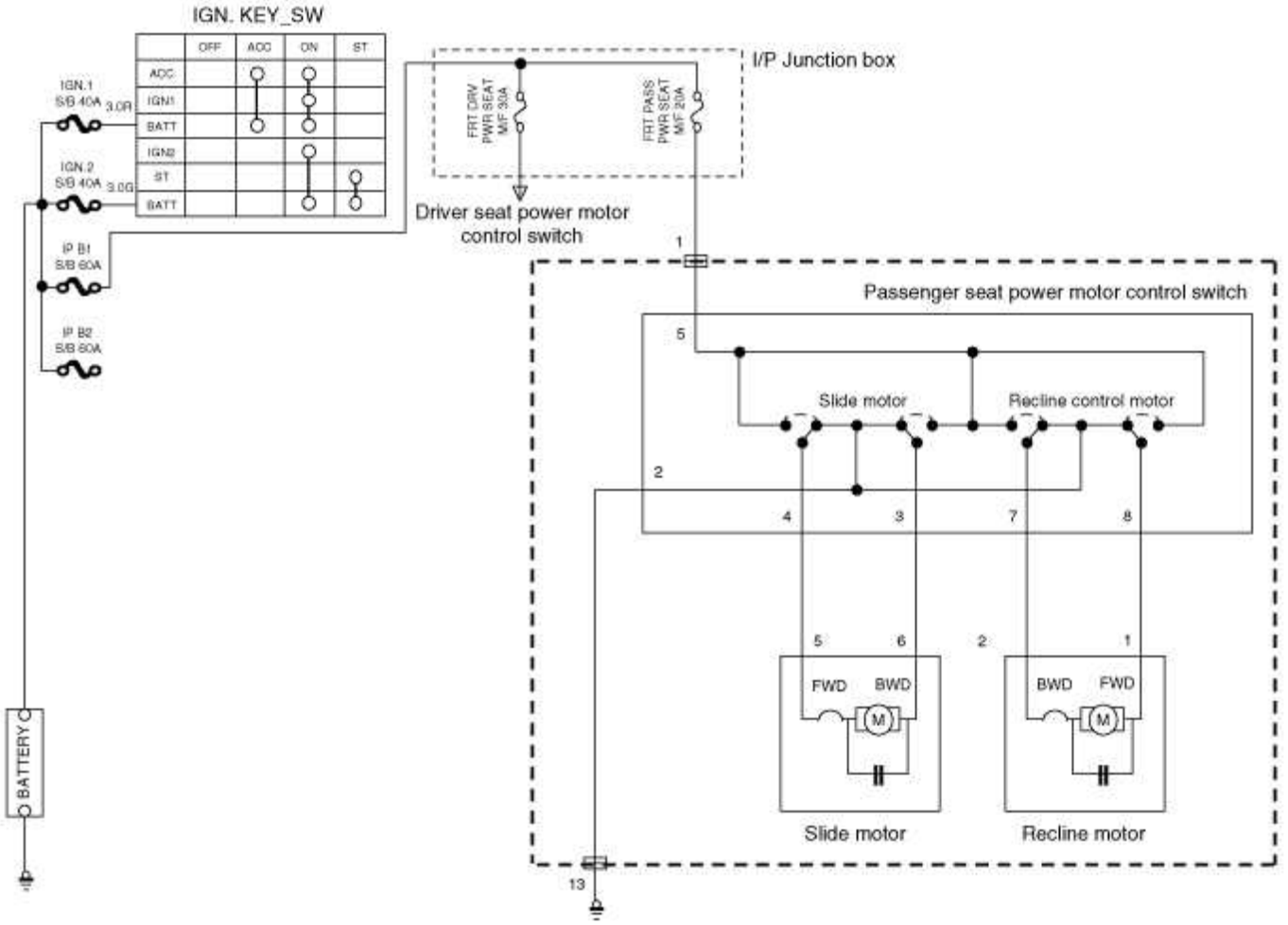
Connector	No.	Description	No.	Description
	1	Lumbar support motor (DN)	4	Ground
	2	Lumbar support motor (BWD)	5	Lumbar support motor (UP)
	3	Lumbar support motor (FWD)	6	Battery +

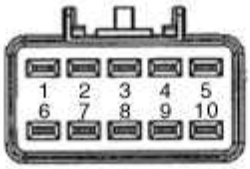
[Drvier Lumbar Supprot Control Switch(2way)]



Connector	No.	Description	No.	Description
	1	Lumbar support motor (BWD)	3	Lumbar support motor (FWD)
	2	Battery +	4	Ground

[Passenger Power Seat Control Switch]



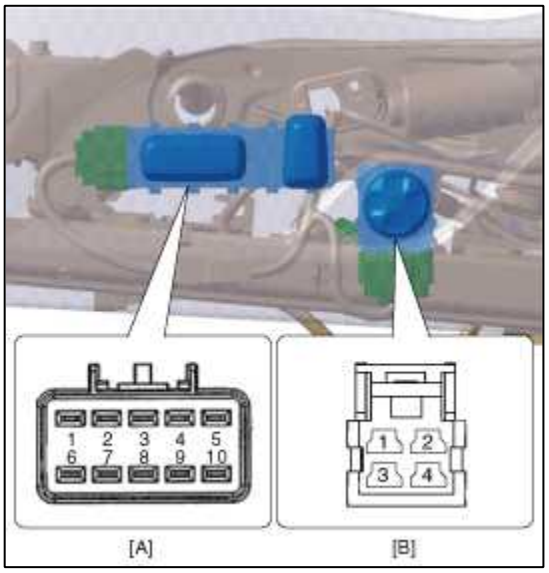
Connector	No.	Description	No.	Description
	1	-	6	-
	2	Ground	7	Recline control motor (BWD)
	3	Slide motor (BWD)	8	Recline control motor (FWD)
	4	Slide motor (FWD)	9	-
	5	Battery +	10	-

Body Electrical System > Seat Electrical > Power Seat Control Switch > Repair procedures

Inspection

Power Seat Control Switch

1. With the power seat switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the power seat switch.



Driver Power Seat Control Switch A

	Front Height Switch			Slide Switch			Rear Height Switch			Reclining Switch			PIN name
	Up	Down	N HEI	N Slide	Forward	Backward	Up	Down	N HEI	N Recline	Forward	Backward	
5	○	○			○	○	○	○			○	○	Battery +
4				○	○	○							Slide motor (FWD)
3				○	○	○							Slide motor (BWD)
8										○	○	○	Recline motor (FWD)
7										○	○	○	Recline motor (BWD)
1	○	○	○										Front height motor (UP)
10	○	○	○										Front height motor (DN)
6							○	○	○				Rear height motor (UP)
9							○	○	○				Rear height motor (DN)
2	○	○	○	○	○	○	○	○	○	○	○	○	Ground

Driver Lumbar Support Control Switch (4way) B

	Lumbar Support Control Motor				PIN name
	UP	DOWN	Forward	Backward	
6	○	○	○	○	Battery +
5	○	○			Lumbar support motor (UP)
1	○	○			Lumbar support motor (DW)
3			○	○	Lumbar support motor (FWD)
2			○	○	Lumbar support motor (BWD)
4	○	○	○	○	Ground

Driver Lumbar Support Control Switch (2way) B

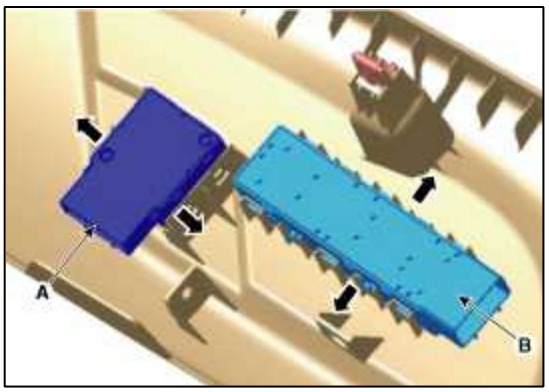
	Lumbar Support Control Motor			PIN name
	Forward	OFF	Backward	
2	○		○	Power
4	○	○	○	Ground
3	○	○	○	Lumbar support motor (FWD)
1	○	○	○	Lumbar support motor (BWD)

Passenger Power Seat Control Switch A

	Slide Switch				Recline Switch		PIN name
	Forward	Backward	N		Forward	Backward	
			Slide motor	Recline motor			
5	○	○			○	○	Battery +
4	○	○	○				Slide motor (FWD)
3	○	○	○	○			Slide motor (BWD)
8				○	○	○	Recline motor (FWD)
7					○	○	Recline motor (BWD)
2	○	○	○	○	○	○	Ground

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front seat shield outer cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Seat Shield Outer Cover")
3. Remove the power seat control switch (A) and lumbar support switch (B).



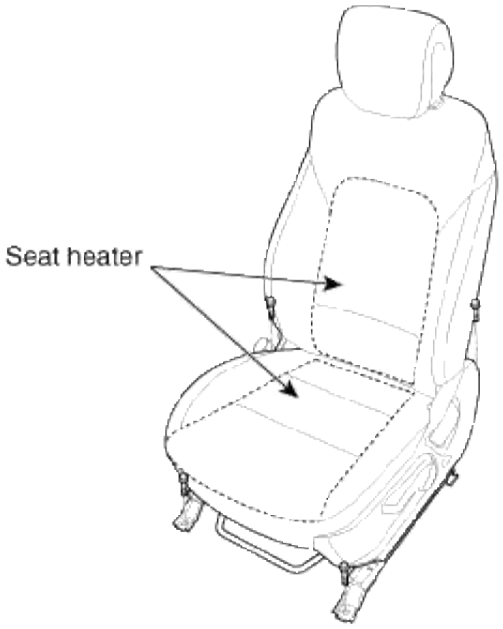
Installation

1. Install the power seat control switch after connecting the connector.

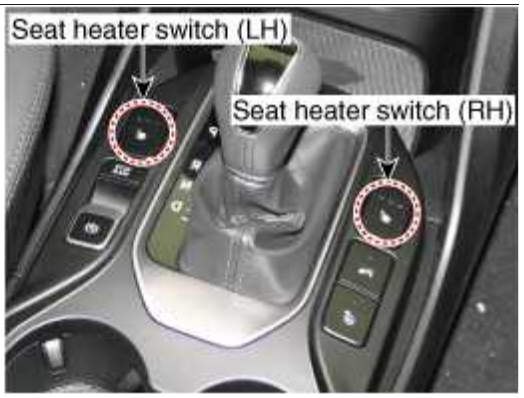
Body Electrical System > Seat Electrical > Seat Heater (Non-Air Ventilation) > Components and Components Location

Components

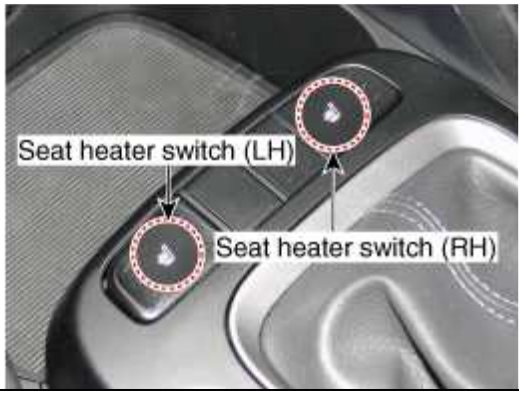
[Driver/ Passenger seat]



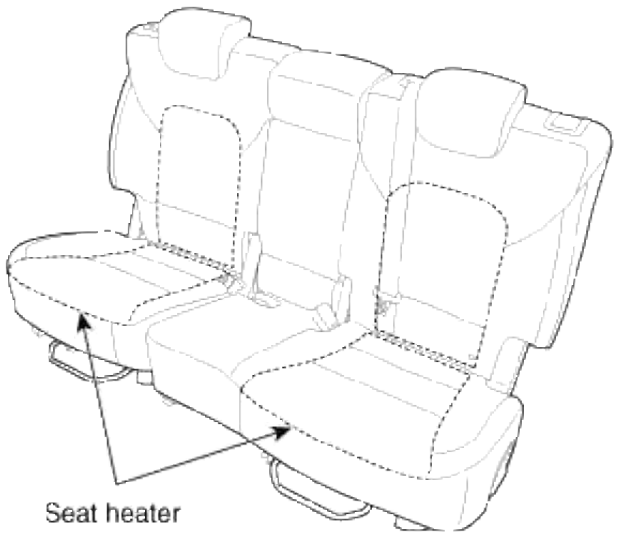
[A/T]



[M/T]



[Second seat]





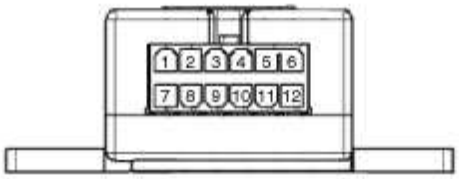


Body Electrical System > Seat Electrical > Seat Heater (Non-Air Ventilation) > Schematic Diagrams

Circuit Diagram

[First Seat]

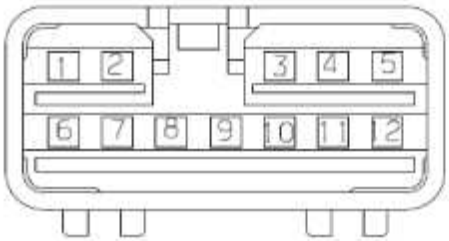




Pin No.	Description	Pin No.	Description
1	IGN1	7	Groumd
2	-	8	LED Low
3	Battery +	9	LED Mid
4	Heater +	10	LED High
5	Switch signal	11	IGN2
6	NTC +	12	NTC -

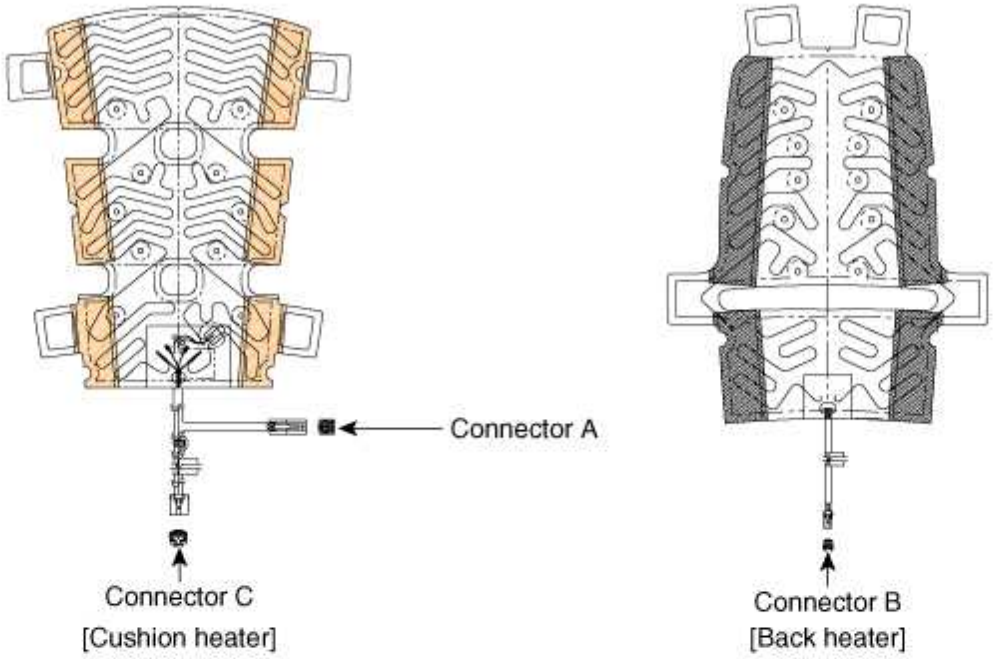
[Second Seat]

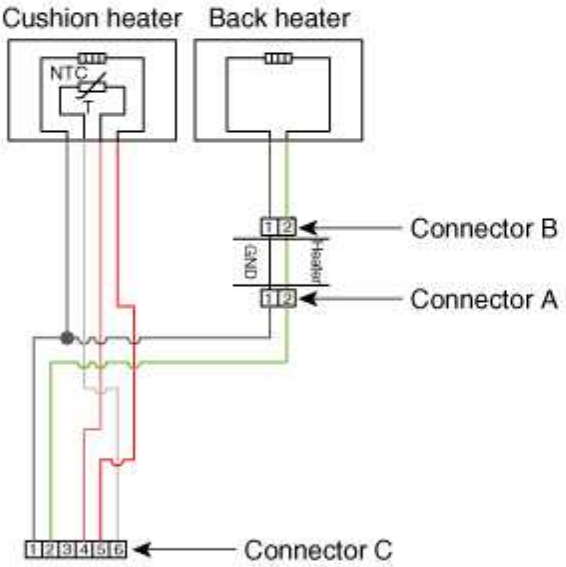


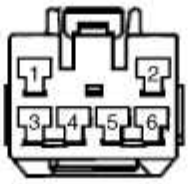


Pin No.	Description	Pin No.	Description
1	NTC +	7	Heater -
2	Heater +	8	Ground
3	Switch signal	9	IGN2
4	Battery +	10	LED Low
5	IGN1	11	-
6	NTC -	12	LED High

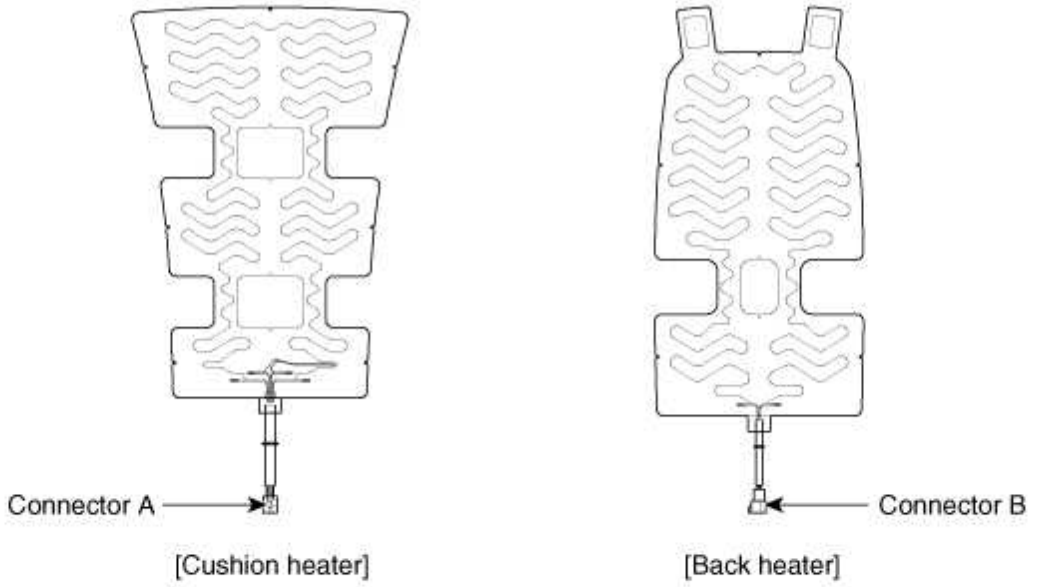
[Front seat heater]

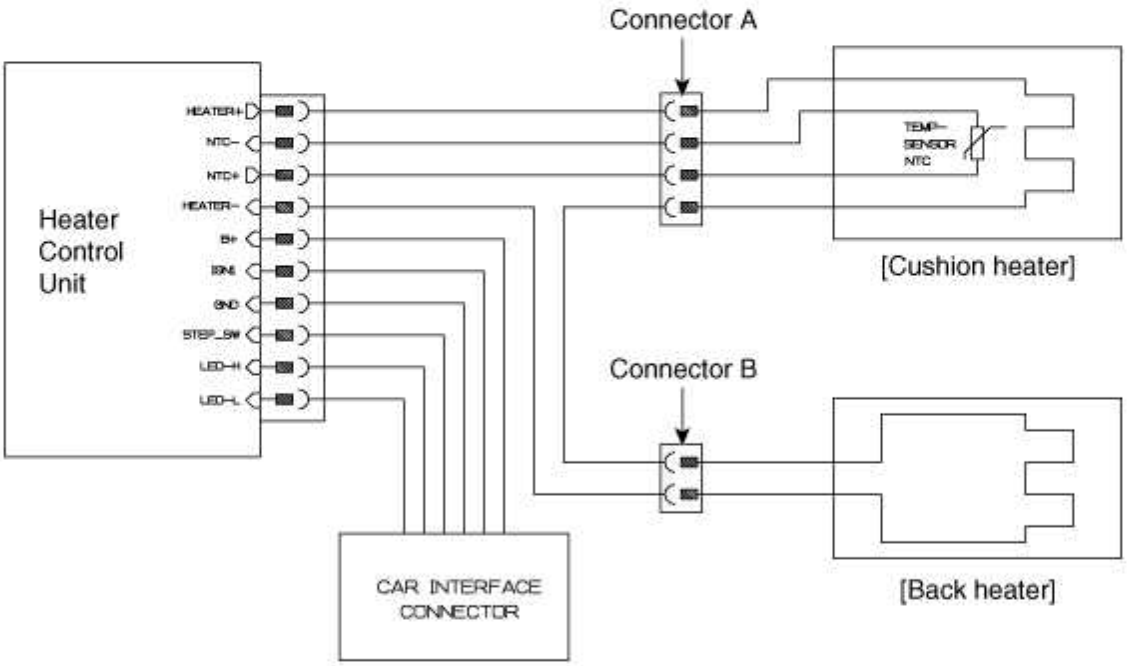


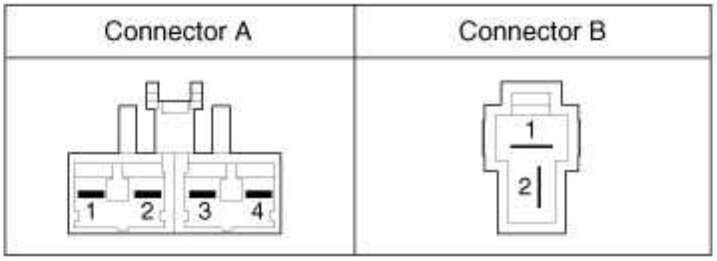


Connector A	Connector B	Connector C
		

[Second seat heater]





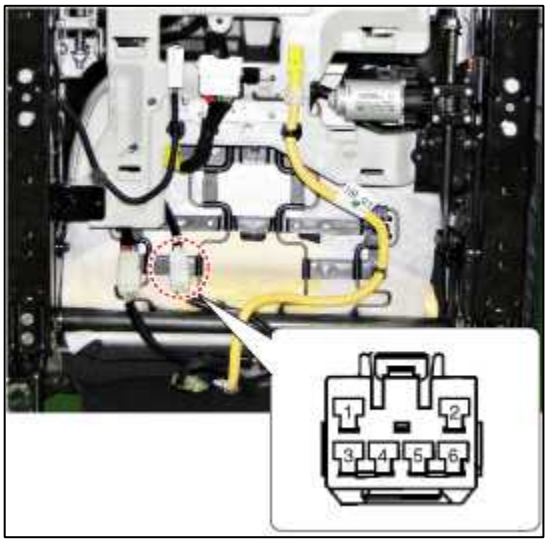


Body Electrical System > Seat Electrical > Seat Heater (Non-Air Ventilation) > Repair procedures

Inspection

Front Seat

1. Check for continuity and measure the resistance between terminals.



No.	Description	No.	Description
1	Heater cushion +	4	Heater back +
2	NTC +	5	-
3	Ground	6	NTC -

Standard value (Fabric / Leather)
Cushion : 3.90 Ω ± 10%
Back : 5.52 Ω ± 10%
Set : 9.42 Ω ± 10%

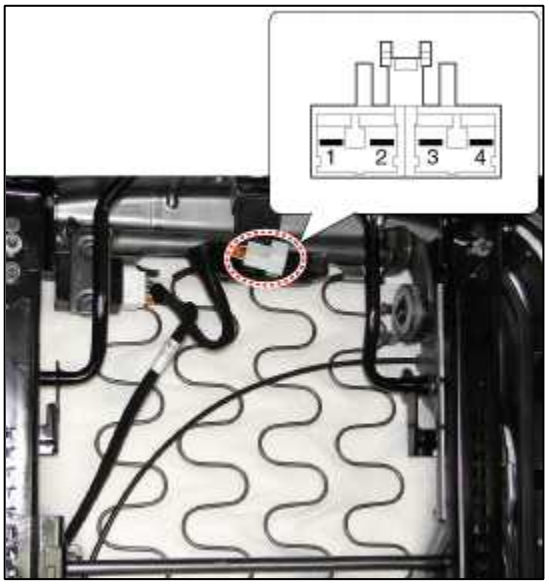
2. Operate the seat heater after connecting the connector, and then check the thermostat by measuring the temperature of seat surface.

	1st	2nd	3rd
Cushion (± 2°C)	36	39	42
Back (± 2°C)	40	45	50

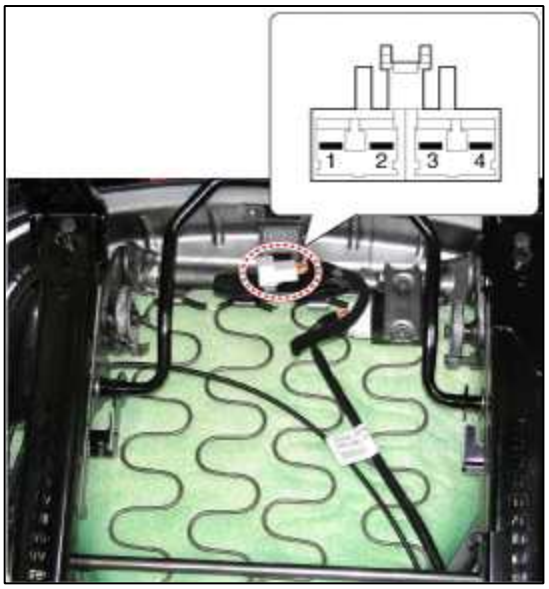
Second Seat

1. Check for continuity and measure the resistance between terminals.

[Rear Seat (RH)]



[Rear Seat (LH)]



No.	Description	No.	Description
1	Heater -	3	NTC +
2	NTC -	4	Heater +

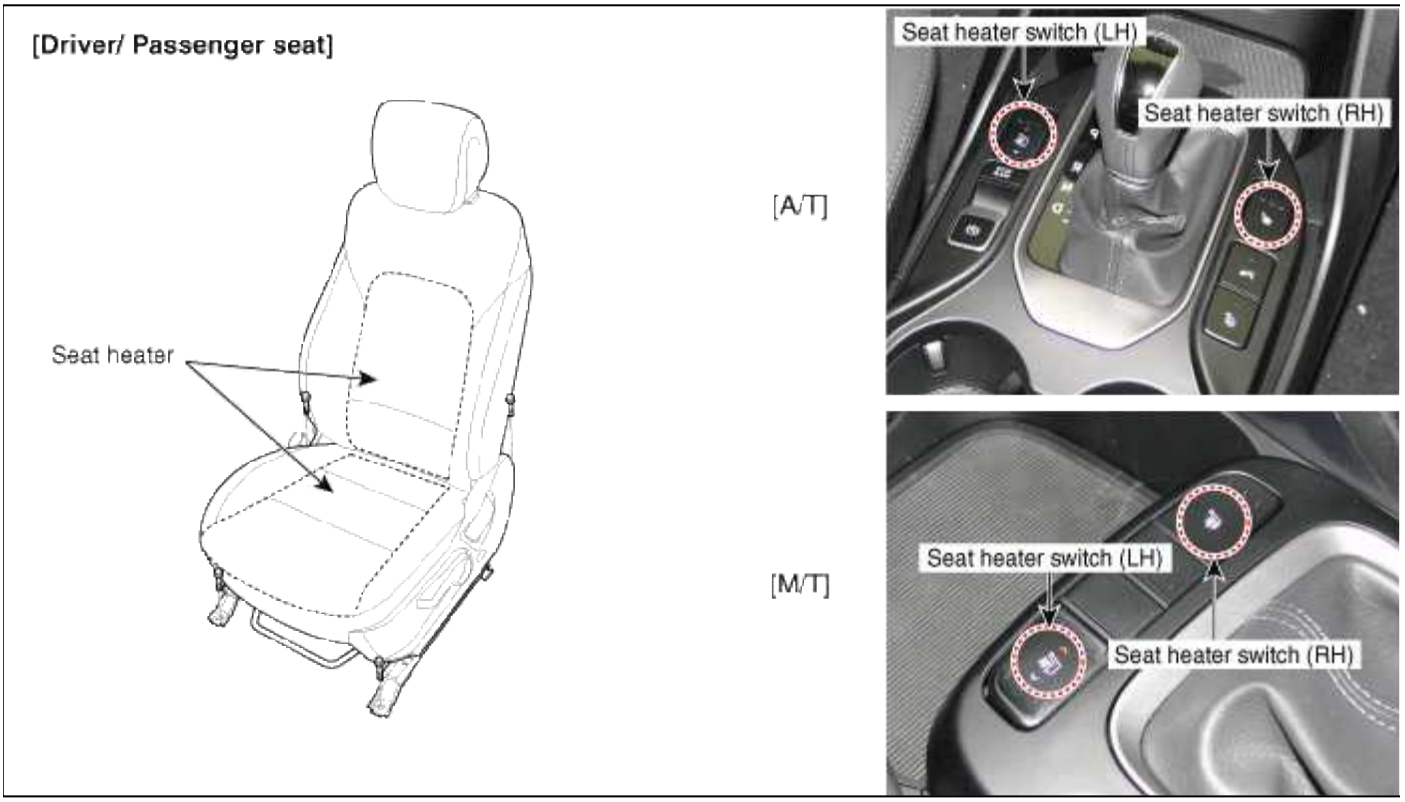
Standard value (Fabric / Leather)
Cushion : 1.19 Ω ± 10%
Back : 1.05 Ω ± 10%
Set : 2.24 Ω ± 10%

2. Operate the seat heater after connecting the connector, and then check the thermostat by measuring the temperature of seat surface.

Standard value
Cushion : 36.2±2°C(LOW)/ 69.0±2°C(HIGH)
Back : 40.0±2°C(LOW)/ 45.0±2°C(HIGH)

Body Electrical System > Seat Electrical > Seat Heater (Air Ventilation) > Components and Components Location

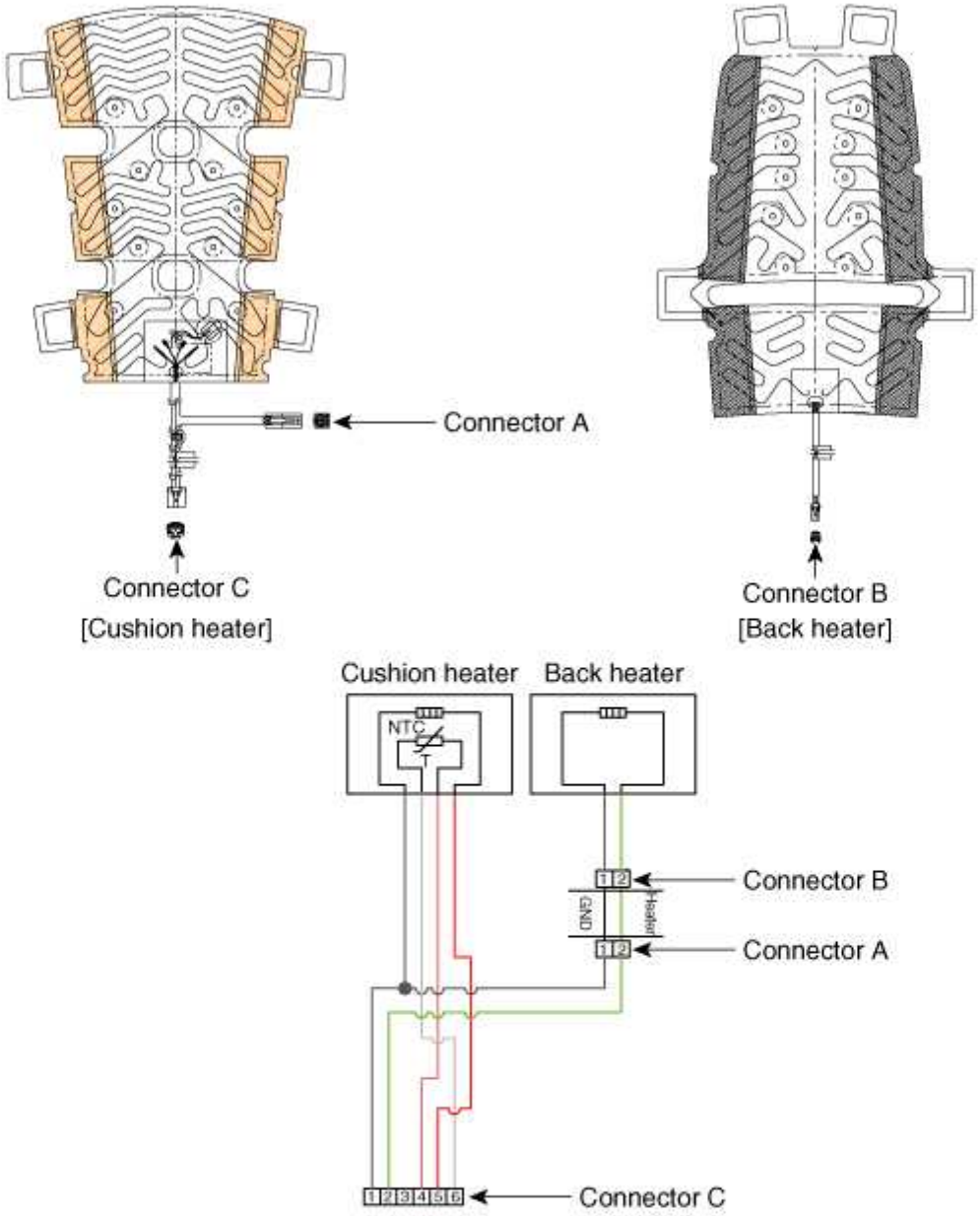
Components

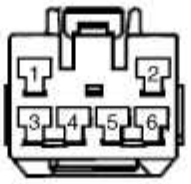


Body Electrical System > Seat Electrical > Seat Heater (Air Ventilation) > Schematic Diagrams

Circuit Diagram

[Front seat heater]



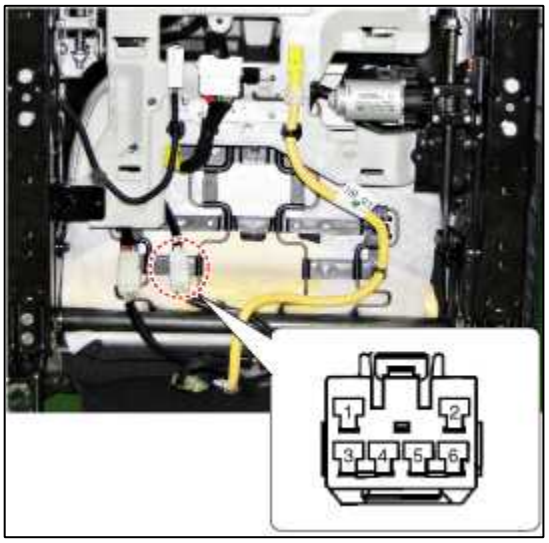
Connector A	Connector B	Connector C
		

Body Electrical System > Seat Electrical > Seat Heater (Air Ventilation) > Repair procedures

Inspection

Front Seat

1. Check for continuity and measure the resistance between terminals.



No.	Description	No.	Description
1	Heater cushion +	4	Heater back +
2	NTC +	5	-
3	Ground	6	NTC -

Standard value (Fabric / Leather)
Cushion : 3.90 Ω ± 10%
Back : 5.52 Ω ± 10%
Set : 9.42 Ω ± 10%

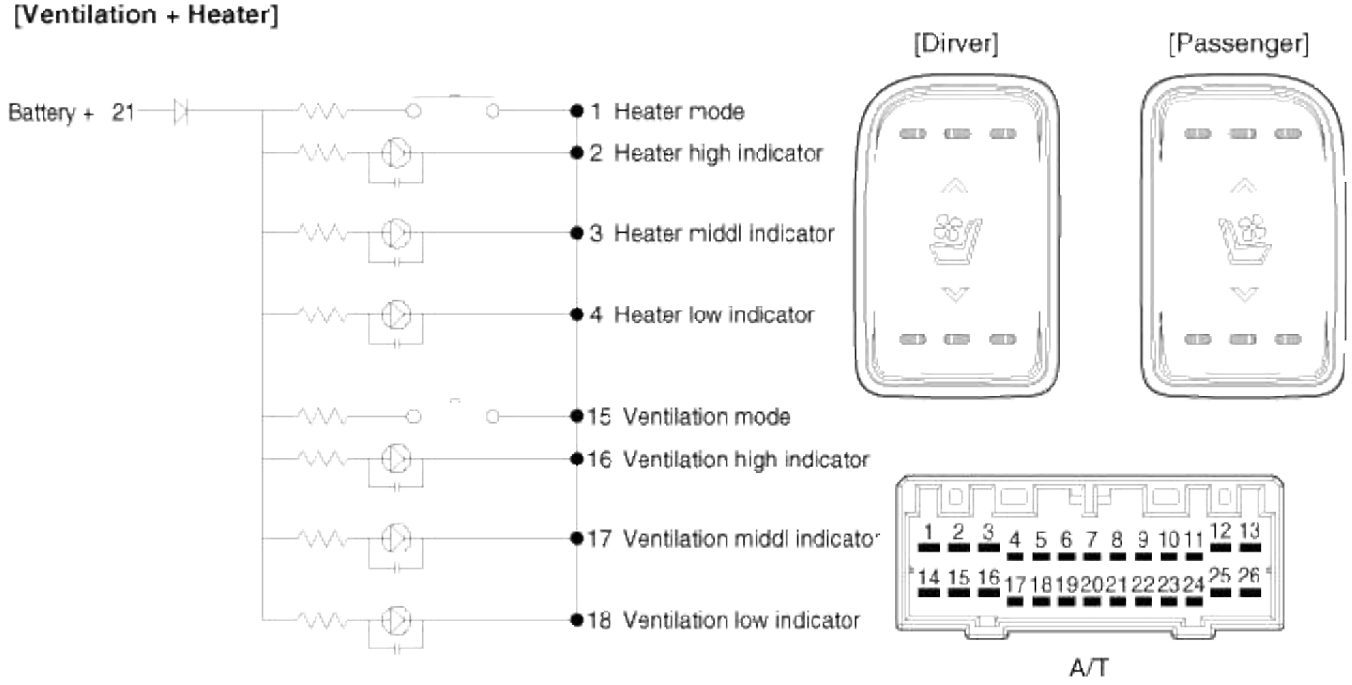
2. Operate the seat heater after connecting the connector, and then check the thermostat by measuring the temperature of seat surface.

	1st	2nd	3rd
Cushion (± 2°C)	36	39	42
Back (± 2°C)	40	45	50

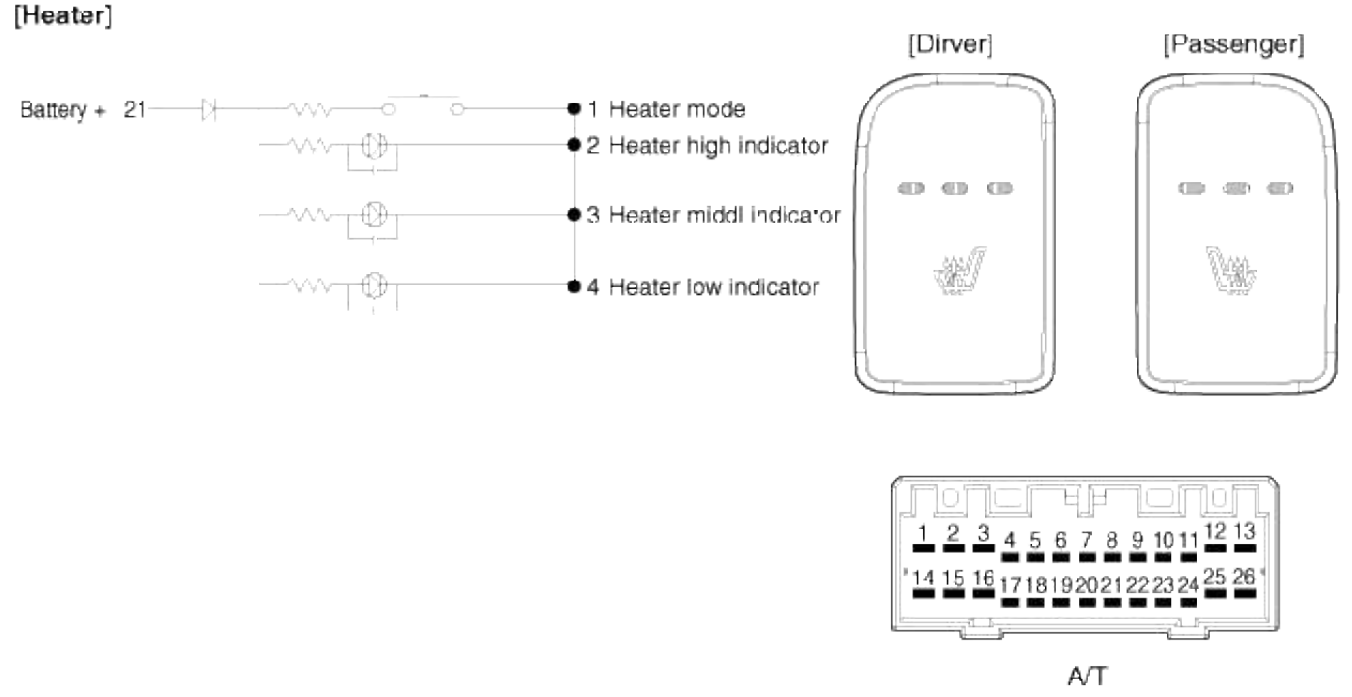
Body Electrical System > Seat Electrical > Seat Heater Switch > Schematic Diagrams

Circuit Diagram

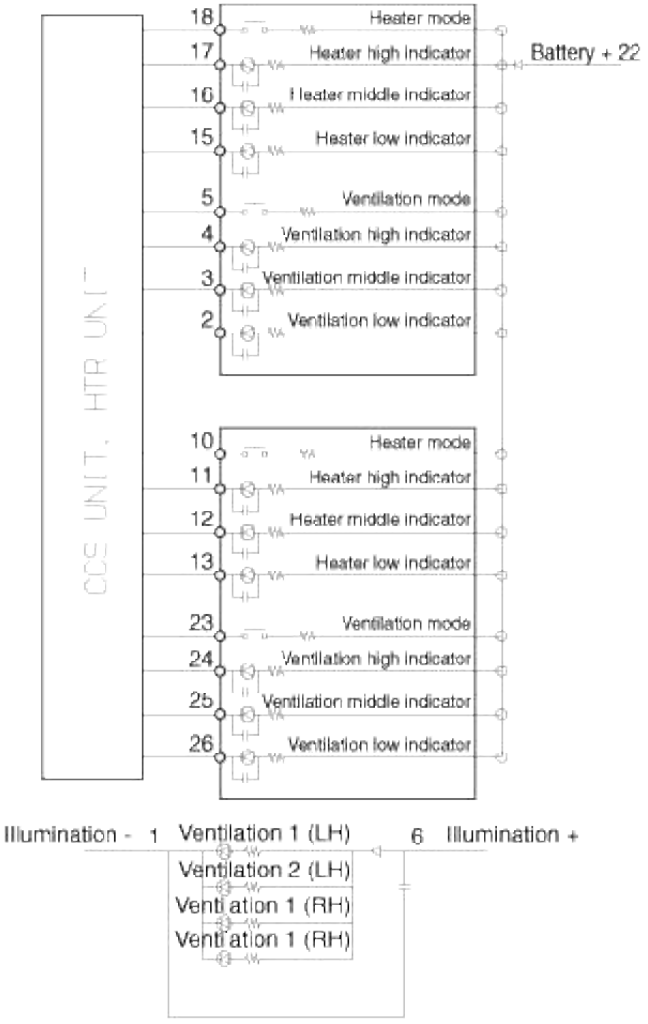
[Ventilation + Heater]

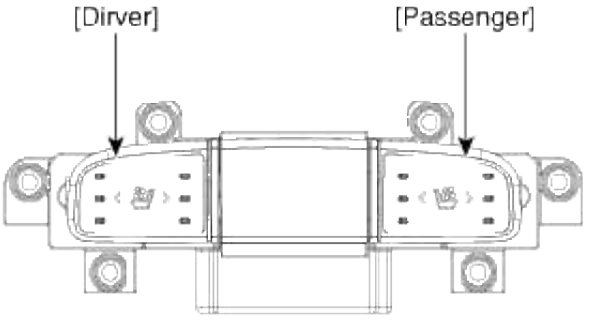


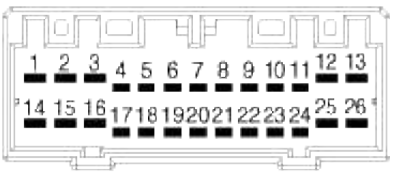
[Heater]



[Ventilation + Heater]

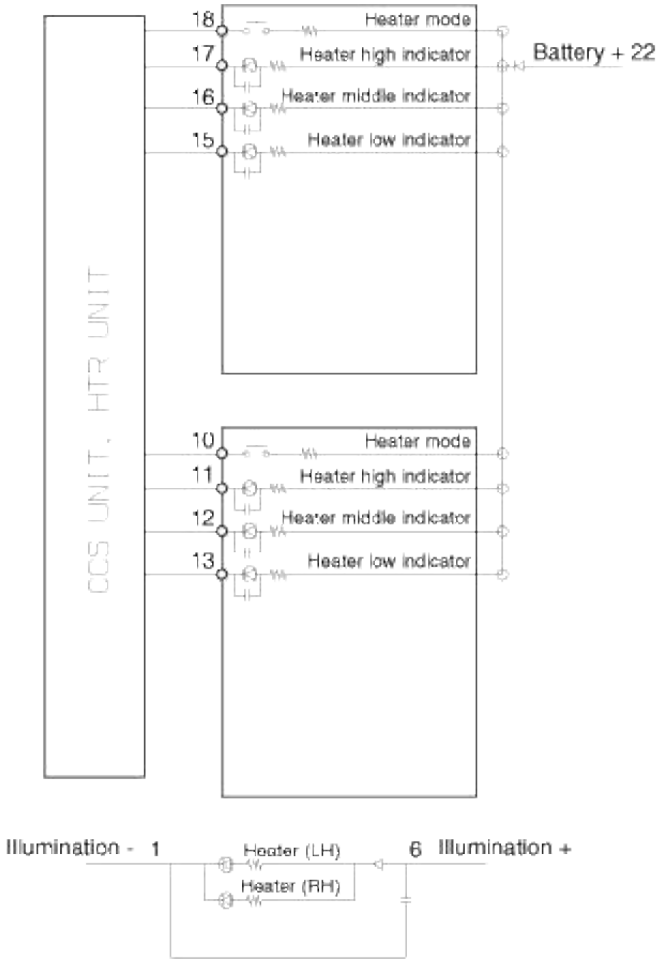




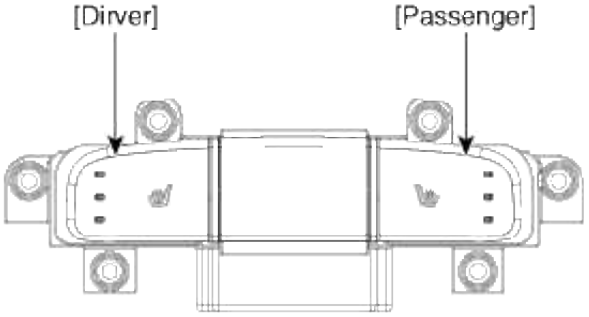


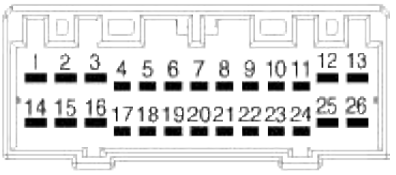
M/T

[Heater]


CCS UNIT, HTR UNIT
18
Heater mode
17
Heater high indicator
16
Heater middle indicator
15
Heater low indicator
Battery + 22
10
Heater mode
11
Heater high indicator
12
Heater middle indicator
13
Heater low indicator

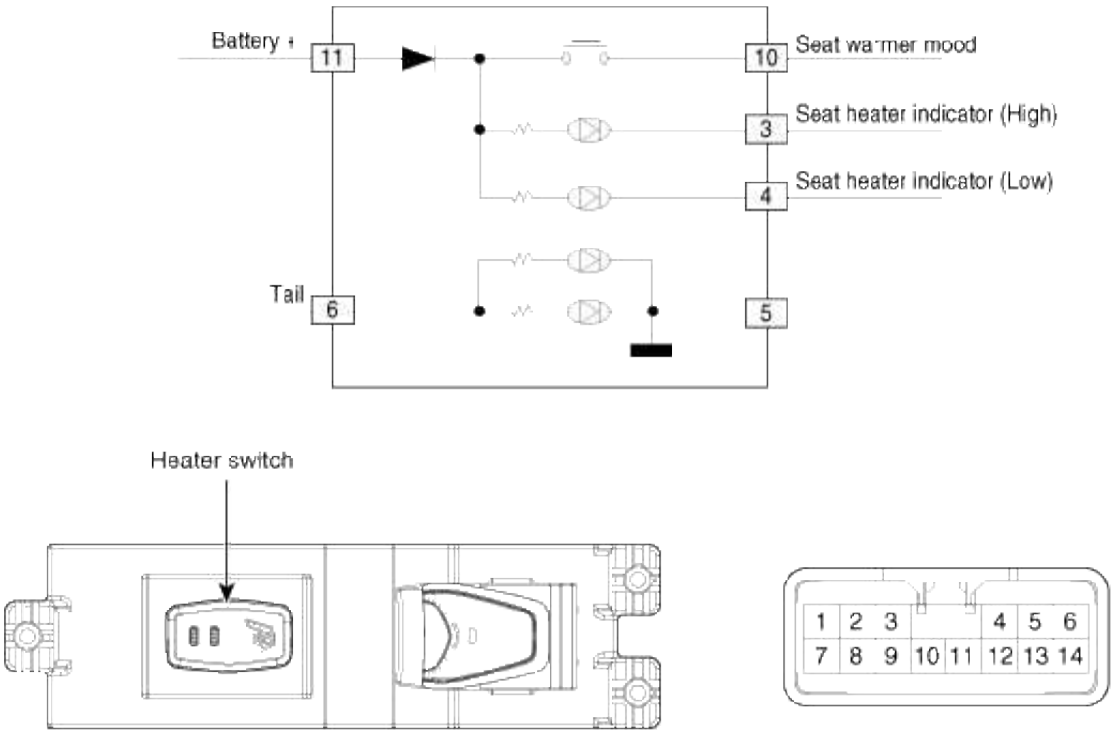
Illumination - 1
Heater (LH)
Heater (RH)
6 Illumination +


[Diver]
[Passenger]


1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26

M/T

[Second Seat Heater]



Body Electrical System > Seat Electrical > Seat Heater Switch > Repair procedures

Removal

Driver/ Passenger

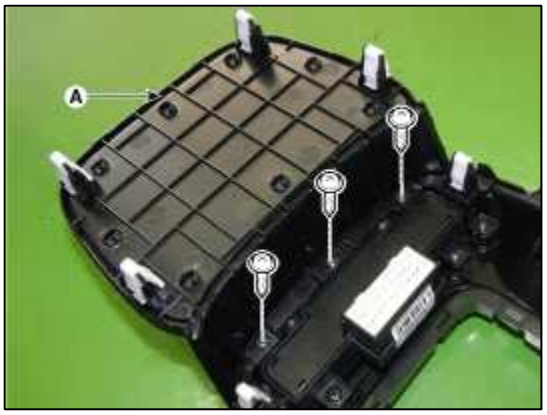
1. Disconnect the negative (-) batttery terminal.
2. Remove the floor console assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Floor Console Assembly")
3. Remove the heater switch after loosening the screws.

[A/T]



4. Remove the front tray cover (A).

[M/T]



5. Remove the heater switch after loosening the screws.



Second Seat

1. Disconnect the negative (-) batttery terminal.
2. Remove the rear door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Rear Door Trim")
3. Remove the power window switch after loosen the screws (3EA).

Installation

Driver/ Passenger

1. Install the heater switch.
2. Install teh floor console upper cover.
3. Connect the negative (-) battery terminal.

Second Seat

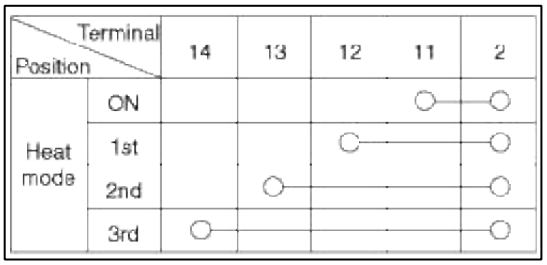
1. Install the power window switch.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

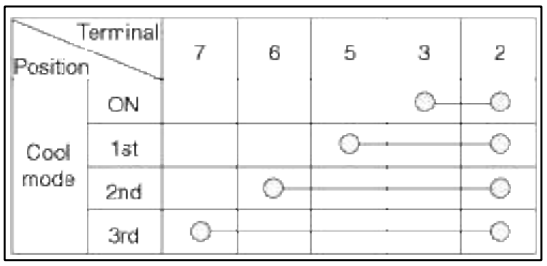
Inspection

Driver/ Passenger Seat

1. Disconnect the negative (-) batttery terminal.
2. Remove the floor console assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Floor Console Assembly")

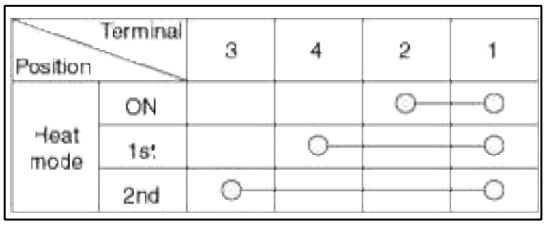
3. Operate driver seat heater switch and check that continuity exists between the terminals.
   If there is no continuity, replace the seat heater switch.





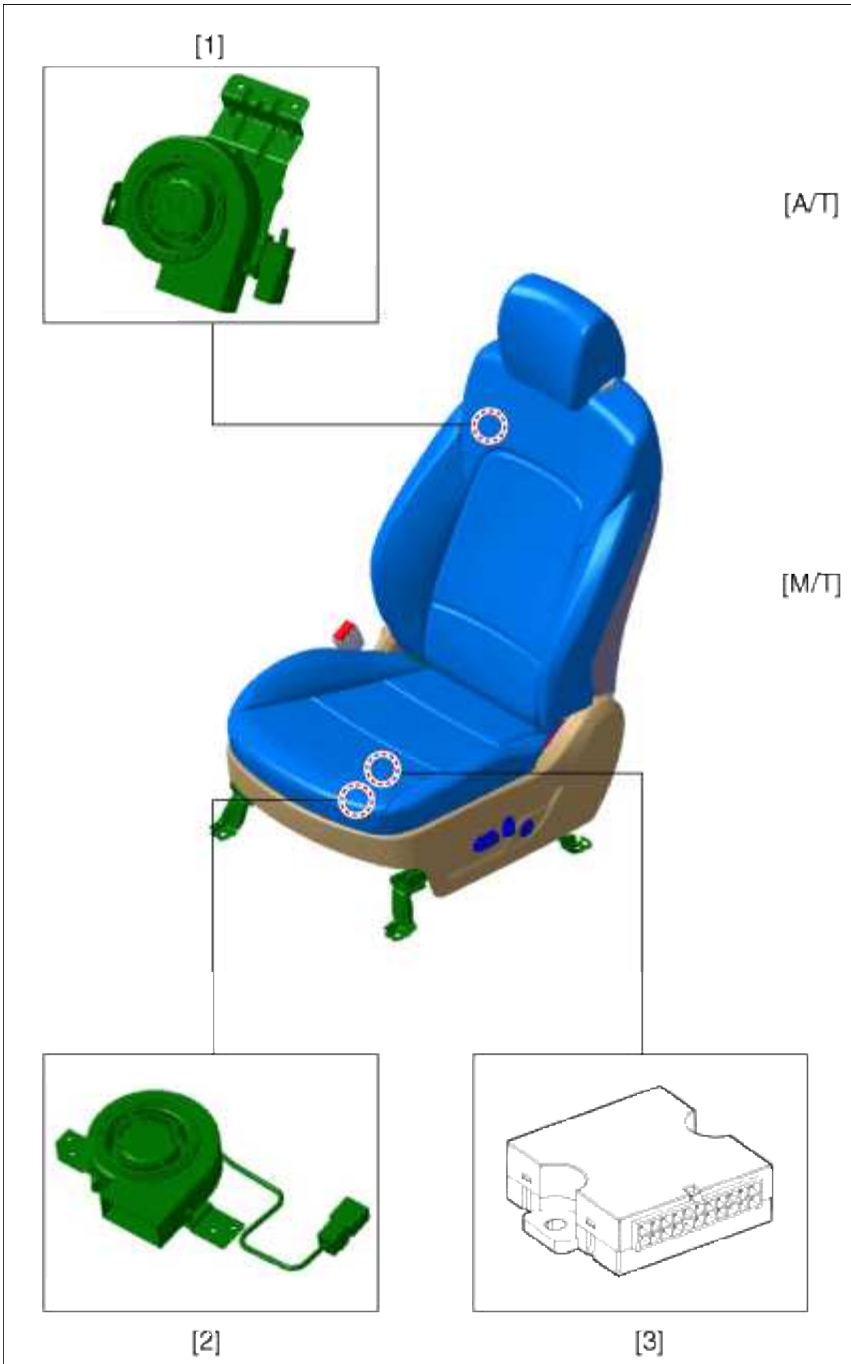
Second Seat

1. Disconnect the negative (-) batttery terminal.
2. Remove the rear door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Rear Door Trim")
3. Operate driver seat heater switch and check that continuity exists between the terminals.
   If there is no continuity, replace the seat heater switch.

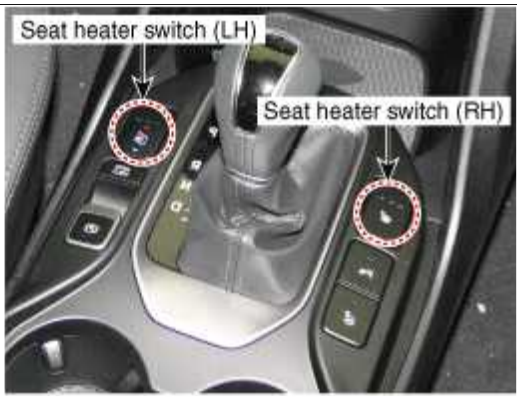


Body Electrical System > Seat Electrical > Air Ventilation Seat > Components and Components Location

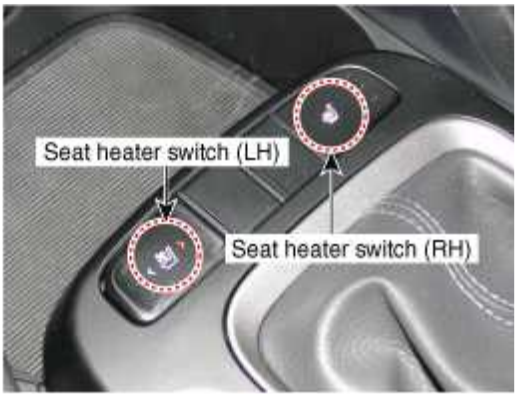
Components



[A/T]



[M/T]

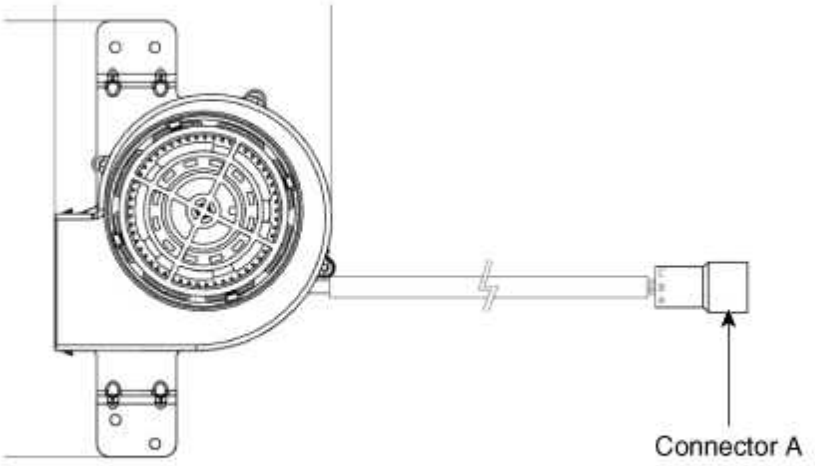


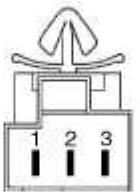
1. Seat back blower 2. Seat cushion blower	3. Air ventilation seat control unit

Body Electrical System > Seat Electrical > Air Ventilation Seat > Schematic Diagrams

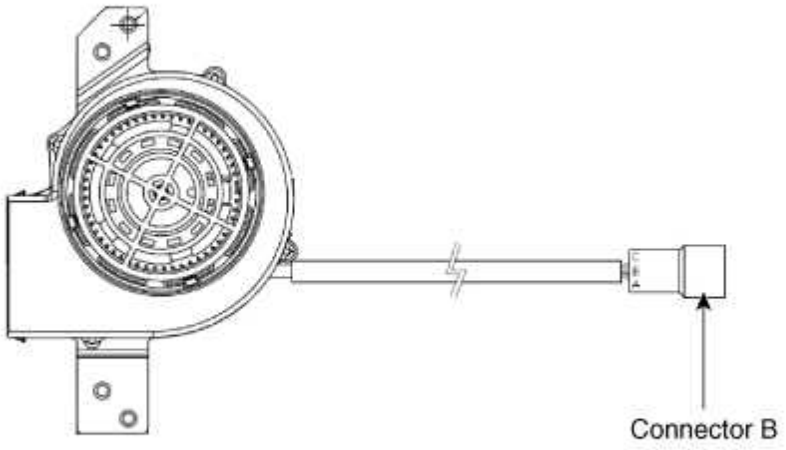
Circuit Diagram

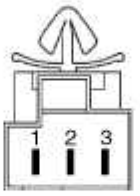
[Seat back blower]



Connector A	
	
No.	Description
1	Igntion
2	Blower
3	Ground

[Seat cushion blower]

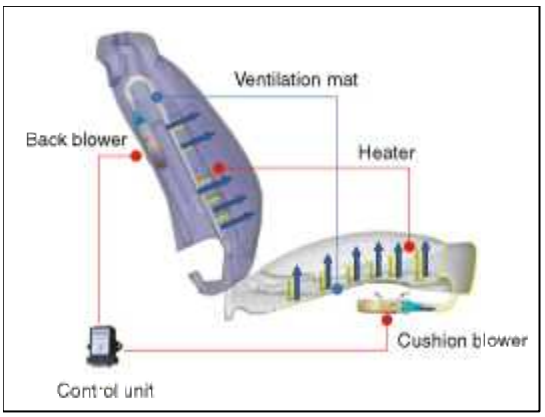


Connector B	
	
No.	Description
1	Igntion
2	Blower
3	Ground

Body Electrical System > Seat Electrical > Air Ventilation Seat > Description and Operation

Description

The ventilated seat system uses a Push method to cool the seat. A blower mounted in the seat generates the cool air, which then travels through ducts to the seat back and cushion.

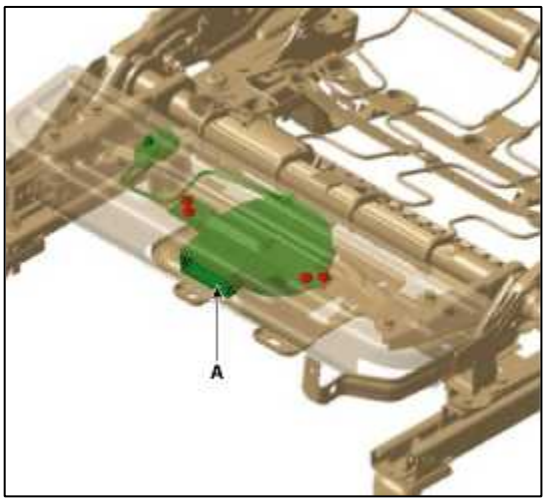


Body Electrical System > Seat Electrical > Air Ventilation Seat > Repair procedures

Removal

Cushion Blower

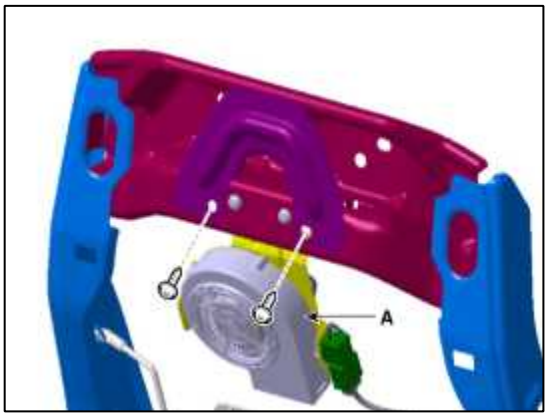
1. Remove the front seat assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Seat Assembly")
2. Remove the cushion blower(A) after loosening the screws(4EA) and disconnecting the connector.



Back Blower

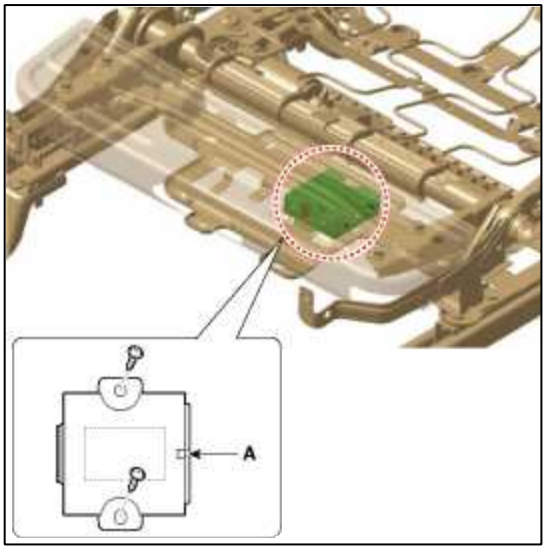
1. Remove the front seat assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Seat Assembly")
2. Remove the front seat back cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Seat Back Cover")

3. Remove the back blower (A) after loosening the screws (2EA) and disconnecting the connector.



Air Ventilation Unit

1. Remove the front seat assembly.
   (Refer to Body - "Front Seat Assembly")
2. Remove the air ventilation unit (A) after loosening the screws (2EA) and disconnecting the connector.



Installation

Cushion Blower

1. Install the cushion blower.
2. Install the front seat assembly.

Back Blower

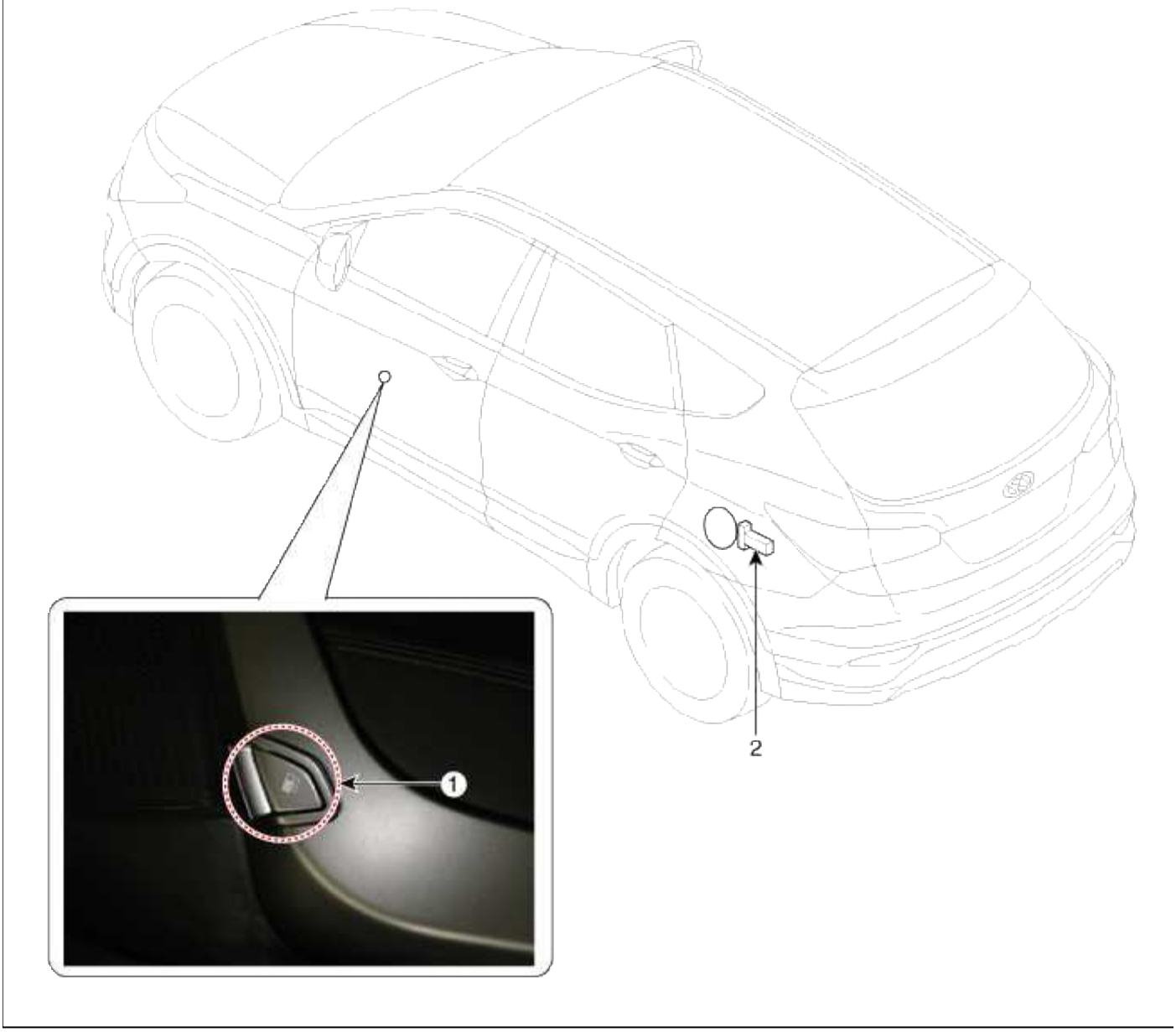
1. Install the back blower.
2. Install the front seat back cover.
3. Install the front seat assembly.

Air Ventilation Unit

1. Install the air ventilation unit.
2. Install the front seat assembly.

Body Electrical System > Fuel Filler Door > Components and Components Location

Component Location



1. Fuel filler door open switch	2. Fuel filler door release actuator

Body Electrical System > Fuel Filler Door > Fuel Filler Door Release Actuator > Repair procedures

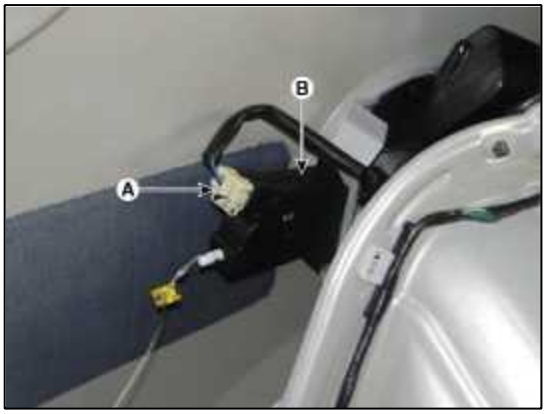
Inspection

1. Remove the left luggage side trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Luggage Side Trim")
2. Remove the subwoofer.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to AVN System - "Speakers")

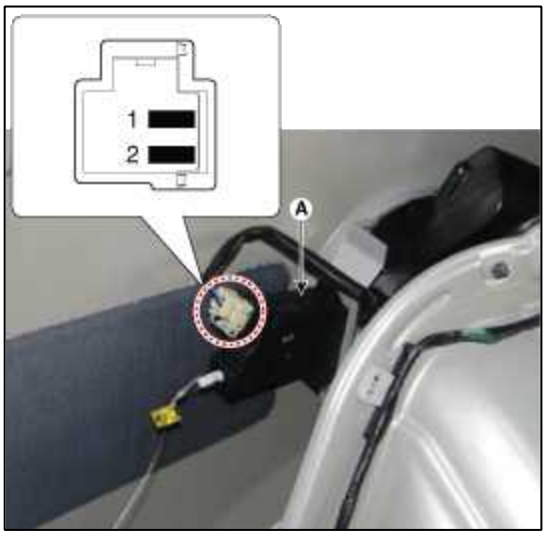
3. Remove the fuel filler housing after opening the fuel filler door.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Fuel Filler Door")
4. Loosen the fuel filler actuator mounting bolts (2EA).



5. Remove the fuel filler door release actuator (A) after disconnecting the fuel filler door release actuator connector (A).



6. Check for continuity between terminal No. 1 and No. 2. If there is no continuity, replace the fuel filler door release actuator (A).



Body Electrical System > Fuel Filler Door > Fuel Filler Door Open Switch > Repair procedures

Inspection

1. Remove the front door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")

2. Disconnect the switch connector (A) from wiring.

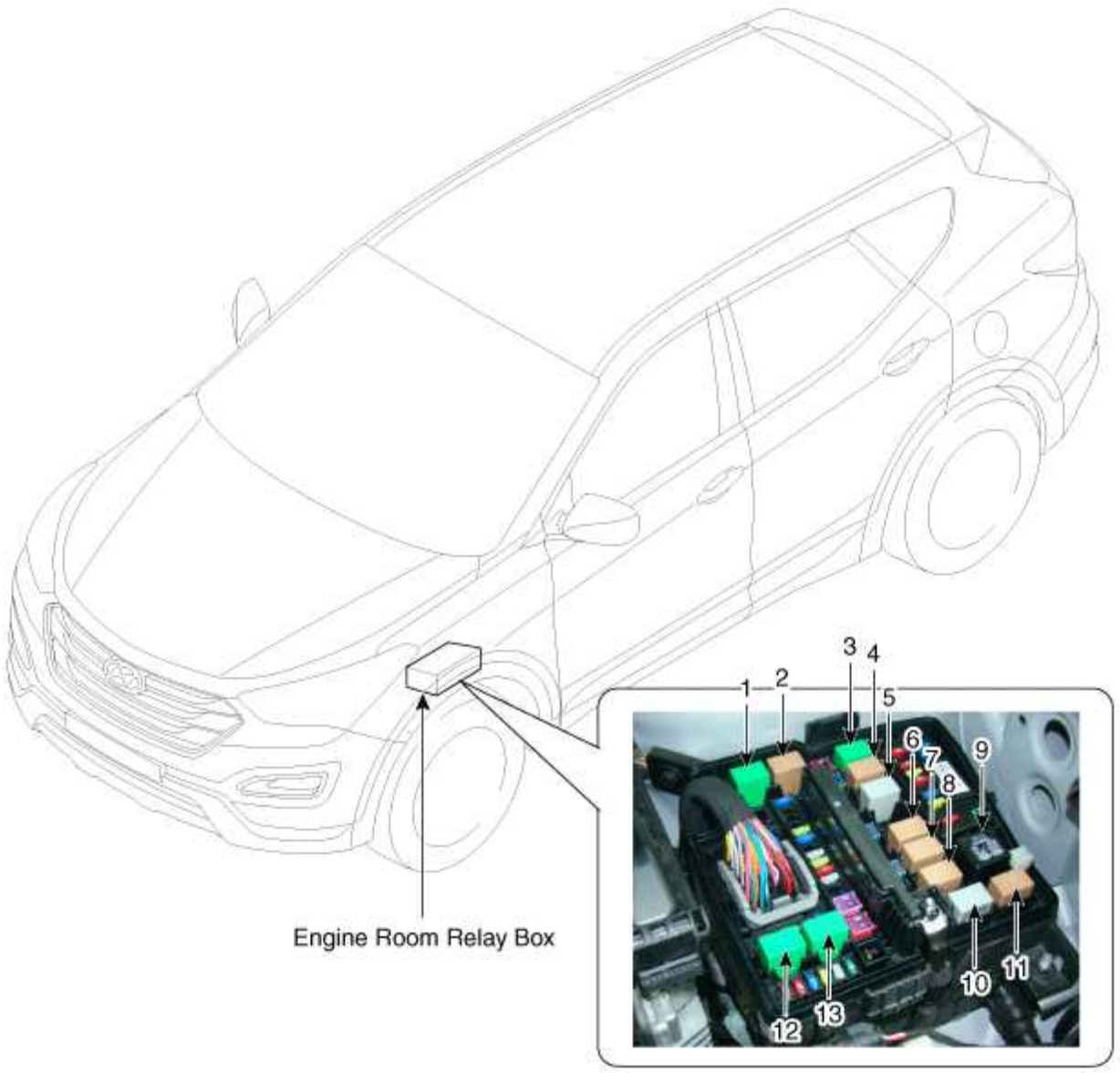


3. Check the switch for continuity between the No. 1 and No. 2 terminals. If the continuity is not as specified, replace the switch.

Body Electrical System > Fuses And Relays > Components and Components Location

Component Location

[Engine Room Relay Box]



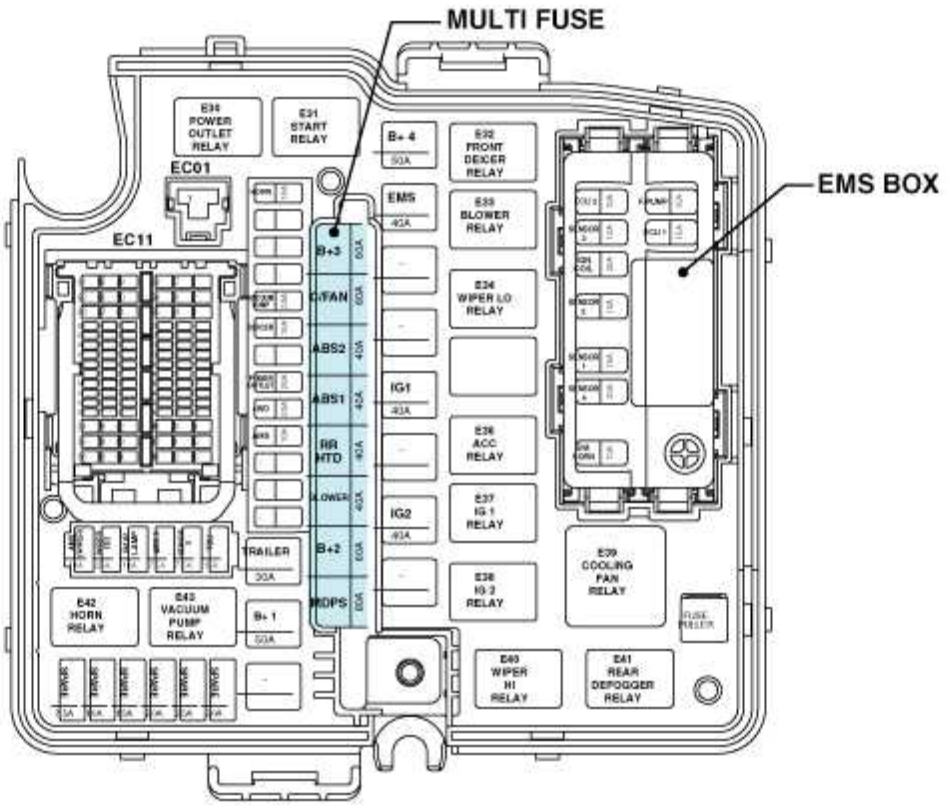
1. Power outlet relay	6. ACC relay	11. Rear defogger relay
2. Start relay	7. IG1 relay	12. Horn relay
3. Front deicer relay	8. IG2 relay	13. Vaccum pump relay
4. Blower relay	9. Cooling fan relay	
5. Wiper relay (Low)	10. Wiper relay (High)	

[Passenger Compartment Relay]



Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Components and Components Location

Component Location



Relay NO.	Relay Name	Type
E30	POWER OUTLET RELAY	ISO MICRO
E31	START RELAY	ISO MICRO
E32	FRONT DEICER RELAY	ISO MICRO
E33	BLOWER RELAY	ISO MICRO
E34	WIPER LO RELAY	ISO MICRO
E36	ACC RELAY	ISO MICRO
E37	IG1 RELAY	ISO MICRO
E38	IG2 RELAY	ISO MICRO
E39	COOLING FAN RELAY	ISO MINI
E40	WIPER HI RELAY	ISO MICRO
E41	REAR DEFOGGER RELAY	ISO MICRO
E42	HORN RELAY	ISO MICRO
E43	VACUUM PUMP RELAY	ISO MICRO

※USE THE DESIGNATED FUSE AND RELAY ONLY

Circuit (E/R Fuse & Relay Box)

Fuse Name		(A)	Circuit Protected
MULTI FUSE	MDPS	80A	MDPS Unit
	B+2	60A	Smart Junction Box (IPS 1 (4CH), IPS 2 (1CH), IPS 5 (1CH), Fuse - SUNROOF 1, P/SEAT PASS, P/SEAT DRV)
	BLOWER	40A	Blower Relay
	RR HTD	40A	Rear Defogger Relay
	ABS1	40A	ESC Module, Multipurpose Check Connector
	ABS2	40A	ESC Module
	C/FAN	60A	Cooling Fan Relay
	B+3	60A	Smart Junction Box (Fuse - MODULE 1, SMART KEY 4, SUNROOF 2, SMART KEY 1, Leak Current Autocut Device)
FUSE	B+4	50A	Smart Junction Box (IPS 3 (4CH), IPS 6 (2CH), Fuse - F/LID, STOP LAMP, DR LOCK, BRAKE SWITCH)
	EMS	40A	EMS Box
	IG1	40A	W/O Smart Key : Ignition Switch, With Smart Key - ACC Relay, IG1 Relay
	IG2	40A	Start Relay, IG2 Relay, W/O Smart Key : Ignition Switch
	TRAILER	30A	Trailer Power Outlet
	B+1	50A	Smart Junction Box (Fuse - S/HEATER RR, S/HEATER FRT, P/WDW RH, P/WDW LH)
	HORN	15A	Horn Relay
	VACUUM PUMP	20A	Vacuum Pump Relay
	DEICER	15A	Front Deicer Relay
	POWER OUTLET	25A	Power Outlet Relay
	4WD	20A	4WD ECM
	AMS	10A	Battery Sensor
	AMS (WIPER)	10A	BCM, PCM
	WIPER FRT	25A	Wiper LO Relay, Front Wiper Motor
	B/UP LAMP	10A	Rear Combination Lamp (IN) LH/RH, Electro Chromic Mirror, Audio, A/V & Navigation Head Unit
	ABS3	7.5A	ESC Module
	SENSOR5	7.5A	PCM
	TCU	15A	Transaxle Range Switch

※USE THE DESIGNATED FUSE AND RELAY ONLY

Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Pull out the relay from the engine compartment relay box.

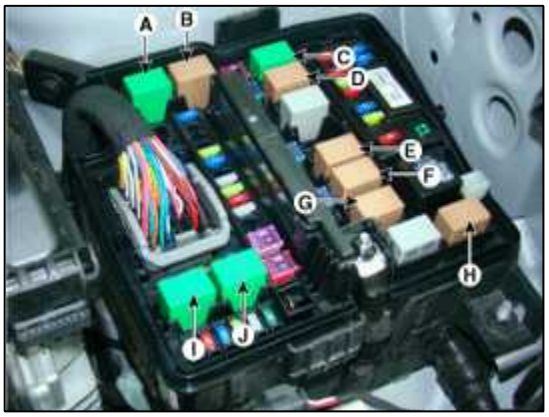
Power Relay (Type A)

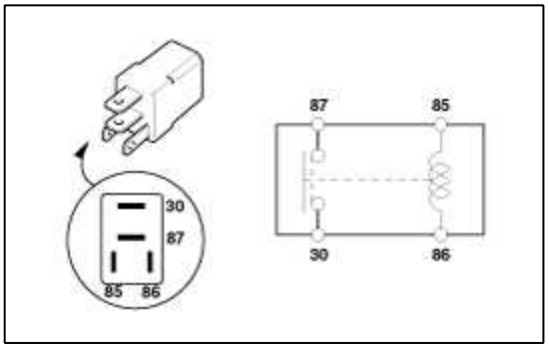
Check for continuity between the terminals.

A : Power outlet relay
B : Start relay
C : Front deicer relay
D : Blower relay
E : ACC relay
F : IG1 relay
G : IG2 relay
H : Rear defogger relay
I : Horn relay
J : Vaccum pump relay

1. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.

2. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.





Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

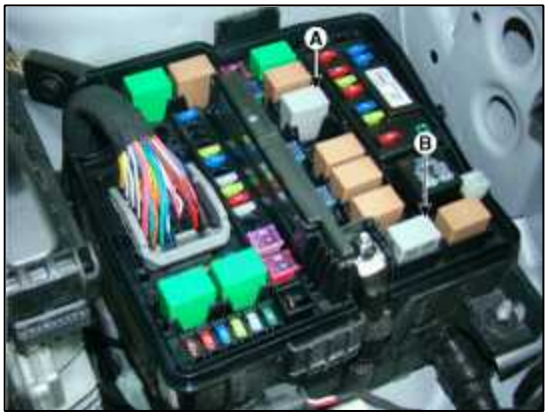
Power Relay (Type B)

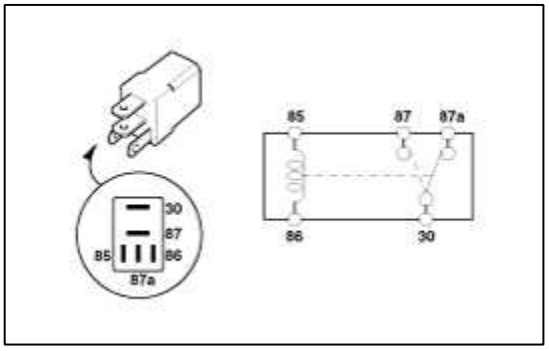
Check for continuity between the terminals.

A : Wiper relay (Low)

B : Wiper relay (High)

1. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
2. There should be continuity between the No.30 and No.87 terminals when power is disconnected.





Terminal / Power	85	86	30	87	87a
Disconnected			○		○
Connected	⊖	⊕	○	○	

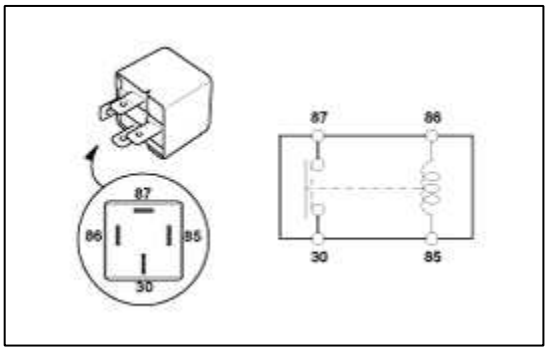
Power Relay (Type C)

Check for continuity between the terminals.

A : Cooling fan relay

1. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
2. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.

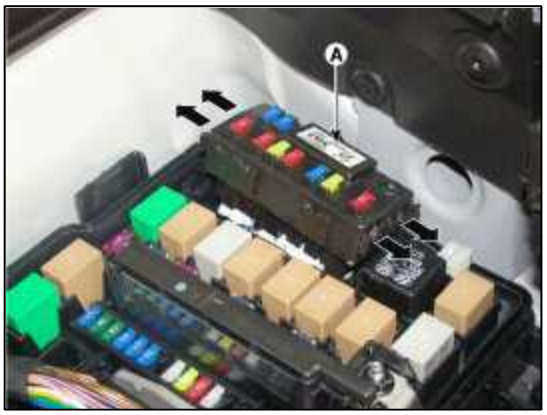




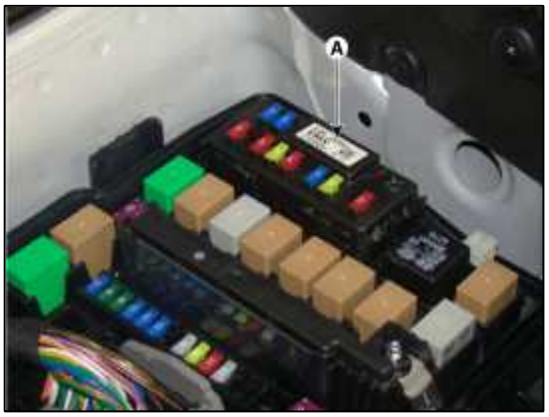
Terminal / Power	86	85	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

Replacement of EMS box

1. Disconnect the negative(-) battery terminal.
2. Push 4 hooks in the engine room relay box out to the arrow direction and put up the EMS box assembly (A).



3. Disconnect the connector and remove the EMS box assembly (A).



Fuse

1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

> NOTE
>
> If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

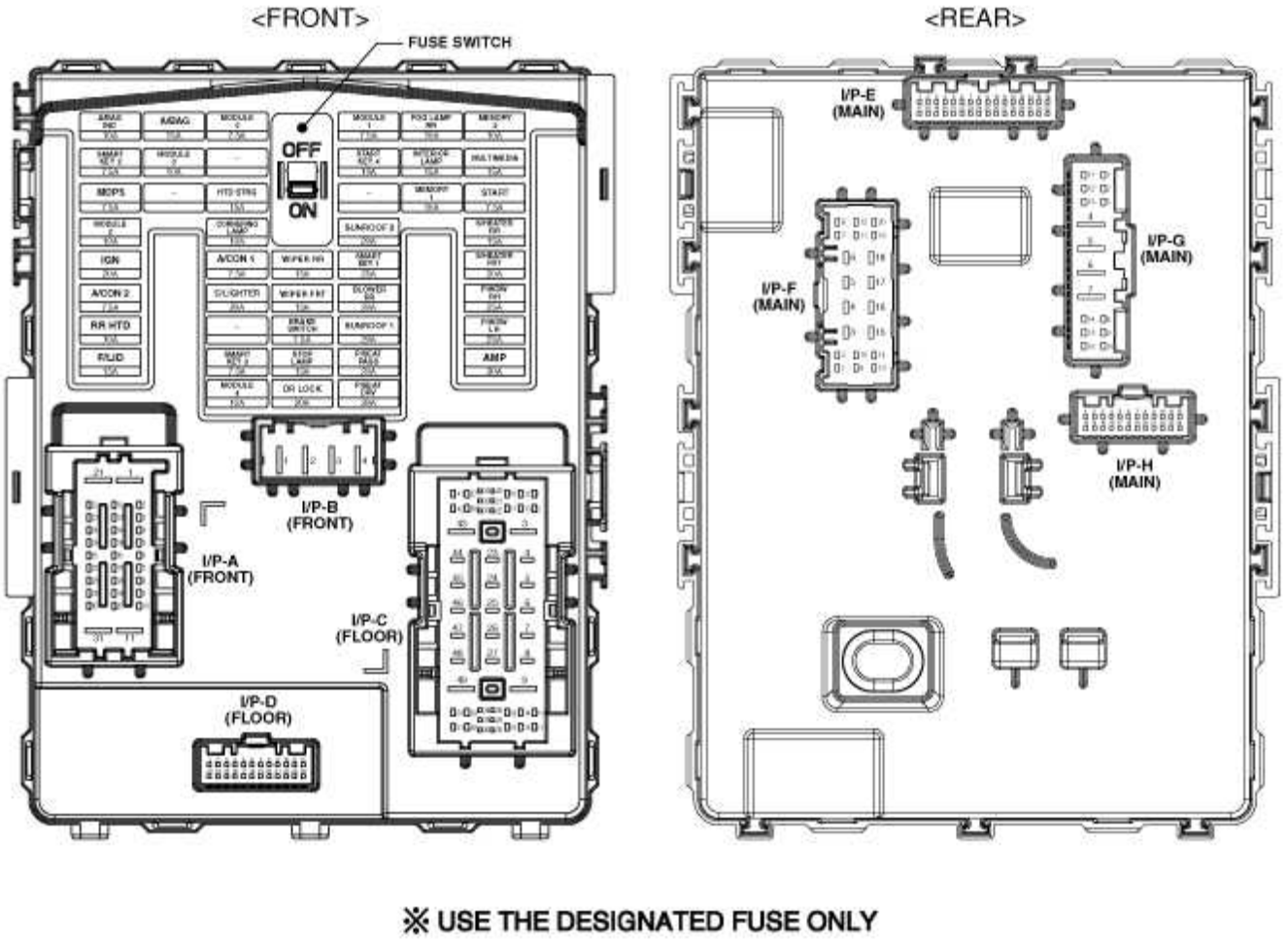
Multi Fuse



> CAUTION
>
> - Multi fuse has to replace in the mass when it damaged only one fuse.
> - When replacing the multi fuse, refer to the "Engine compartment - component location" diagram exactly.
> - Use the multi fuse capacities for each circuit correctly.

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Components and Components Location

Component Location



※ USE THE DESIGNATED FUSE ONLY

Circuit (Smart Junction Box)

Fuse Name	(A)	Circuit Protected
A/BAG IND	10A	Instrument Cluster
A/BAG	10A	SRS Control Module, A/C Control Module, Passenger Occupant Detection Sensor
MODULE 5	7.5A	Sunroof, Smart Key Control Module, BCM, Rear Seat Warmer LH/RH, Electro Chromic Mirror, Driver/Passenger CCS Control Module, Driver/Passenger Seat Warmer Module,
MODULE 1	7.5A	Sport Mode Switch, Key Solenoid, Console Switch LH/RH Front Console Switch, Rear Power Window Switch LH/RH
FOG LAMP RR	10A	-
MEMORY 2	10A	BCM, Tire Pressure Monitoring Module, Electro Chromic Mirror, Driver/Passenger Door Module, Auto Light & Photo Sensor, Data Link Connector, A/C Control Module, Instrument Cluster
SMART KEY 2	7.5A	Smart Key Control Module, Immobilizer Module
MODULE 3	10A	BCM, Instrument Cluster, Tire Pressure Monitoring Module, A/C Control Module, Audio, Driver/Passenger Door Module, ATM Shift Lever Indicator, Rear Seat Warmer LH/RH, 4WD ECM, Driver/Passenger CCS Control Module, Driver/Passenger Seat Warmer Module, MTS Module, Rear Parking Assist Sensor LH/RH, A/V & Navigation Head Unit, Rear Parking Assist Sensor (Center) LH/RH, AMP
SMART KEY 4	10A	Start/Stop Button Switch, Immobilizer Module
INTERIOR LAMP	15A	Cargo Lamp, Vanity Lamp LH/RH, Overhead Console Lamp, Center Room Lamp, Personal Lamp LH/RH
MULTI MEDIA	15A	Audio, A/V & Navigation Head Unit, MTS Module
MDPS	7.5A	MDPS Unit
HTD STRG	15A	Steering Wheel Switch
MEMORY 1	10A	RF Receiver, Ignition Key III, & Door Warning Switch
START	7.5A	W/O IMMO. & Smart Key : ICM Relay Box (Burglar Alarm Relay) With IMMO. or Smart Key : PCM, Transaxle Range Switch, Smart Key Control Module, E/R Fuse & Relay Box (Start Relay)
MODULE 2	10A	Crash Pad Switch, Multipurpose Check Connector, Head Lamp Leveling Device Actuator LH/RH, Auto Head Lamp Leveling Device Module, Stop Lamp Switch

Fuse Name	(A)	Circuit Protected
CORNERING LAMP	10A	-
SUNROOF 2	20A	Sunroof
S/HEATER RR	15A	Rear Seat Warmer LH/RH
IGN	20A	E/R Fuse & Relay Box (Fuse - ABS 3, SENSOR 6, TCU)
A/CON 1	7.5A	E/R Fuse & Relay Box (Blower Relay), A/C Control Module, Cluster Ionizer
WIPER RR	15A	Rear Wiper Relay, Rear Wiper Motor, Multifunction Switch
SMART KEY 1	25A	Smart Key Control Module
S/HEATER FRT	20A	Driver/Passenger CCS Control Module Driver/Passenger Seat Warmer Module
A/CON 2	7.5A	A/C Control Module
CIGHTER	20A	Front Power Outlet & Cigarette Lighter, Luggage Power Outlet
WIPER FRT	15A	Multifunction Switch, E/R Fuse & Relay Box (Wiper HI Relay, IG2 Relay)
BLOWER RR	20A	-
P/WDW RH	25A	Passenger Door Module, Rear Power Window Switch RH
RR HTD	10A	A/C Control Module
BRAKE SWITCH	7.5A	Smart Key Control Module, Stop Lamp Switch
SUNROOF 1	20A	Sunroof
P/WDW LH	25A	Driver Safety Power Window Module, Driver Door Module, Rear Power Window Switch LH
FUEL LID	15A	Fuel Filler Door Switch
SMART KEY 3	7.5A	Smart Key Control Module
STOP LAMP	15A	Stop Signal Electronic Module
P/SEAT PASS	20A	Passenger Seat Manual Switch
AMP	30A	AMP
MODULE 4	10A	Audio, A/V & Navigation Head Unit, BCM, Overhead Console Lamp, AMP, MTS Module, Power Outside Mirror Switch, E/R Fuse & Relay Box (Power Outlet Relay)
DR LOCK	20A	Door Lock/Unlock Relay, Tail Gate Relay, ICM Relay Box (Two Turn Unlock Relay)
P/SEAT DRV	30A	Driver Seat Manual Switch, Driver Lumbar Support Switch

※ USE THE DESIGNATED FUSE ONLY

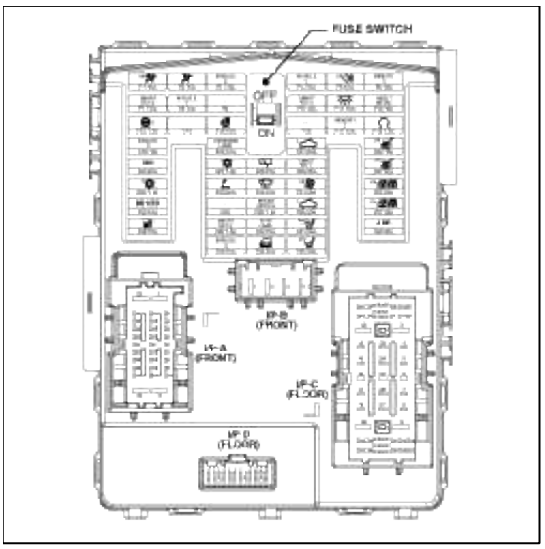
Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Description and Operation

Description

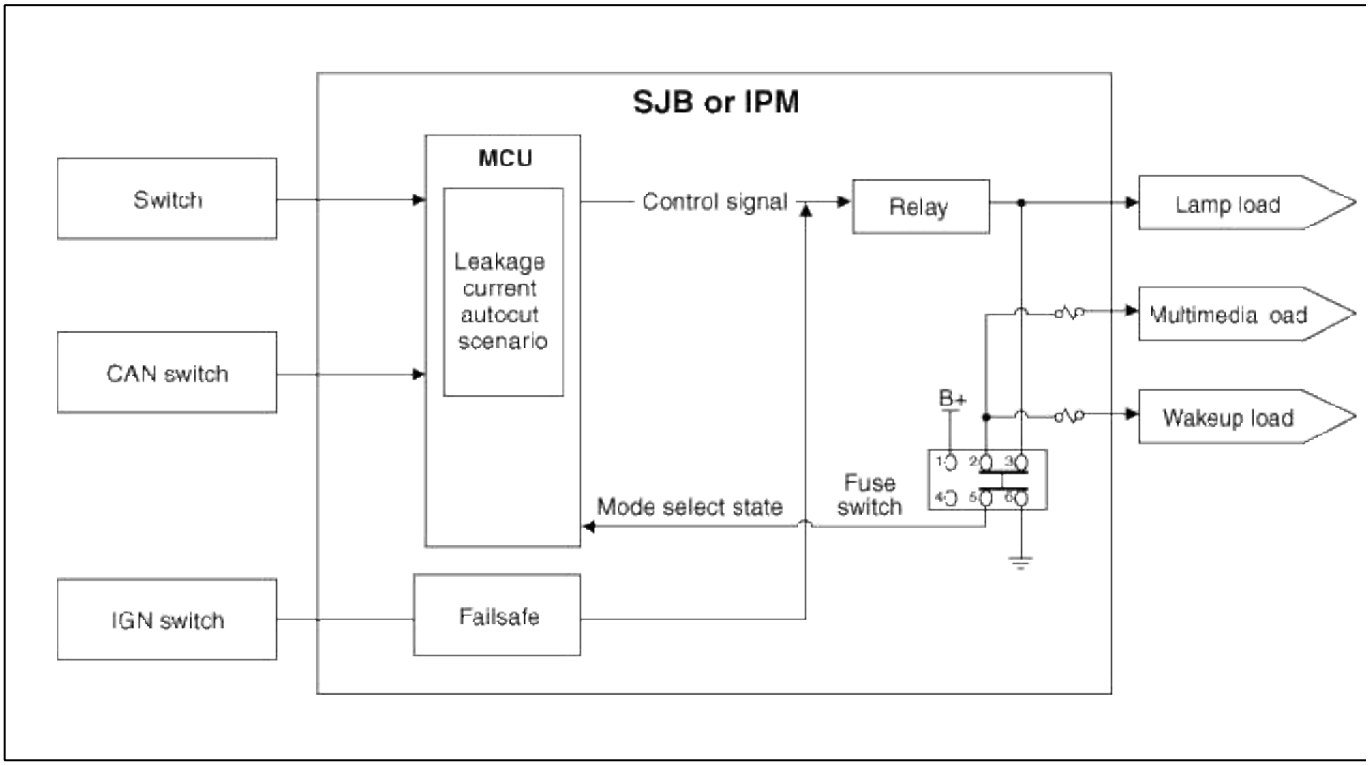
Smart Junction Box(SJB)

1. General function : Interior Junction Box + some functions of BCM
   It controls loads with CAN communication and IPS.
2. Main function
   A. Low speed CAN communication(100 kbps)
   B. Self diagnostics(Lamp open/short)
   C. Fail safe(When MCU/CAN is fail, Head lamp / Tail lamp directly drive)
   D. Protection of bulb over-voltage(PWM function)
   E. Cut of Over-load and Short : PCL(Program Current Limit)

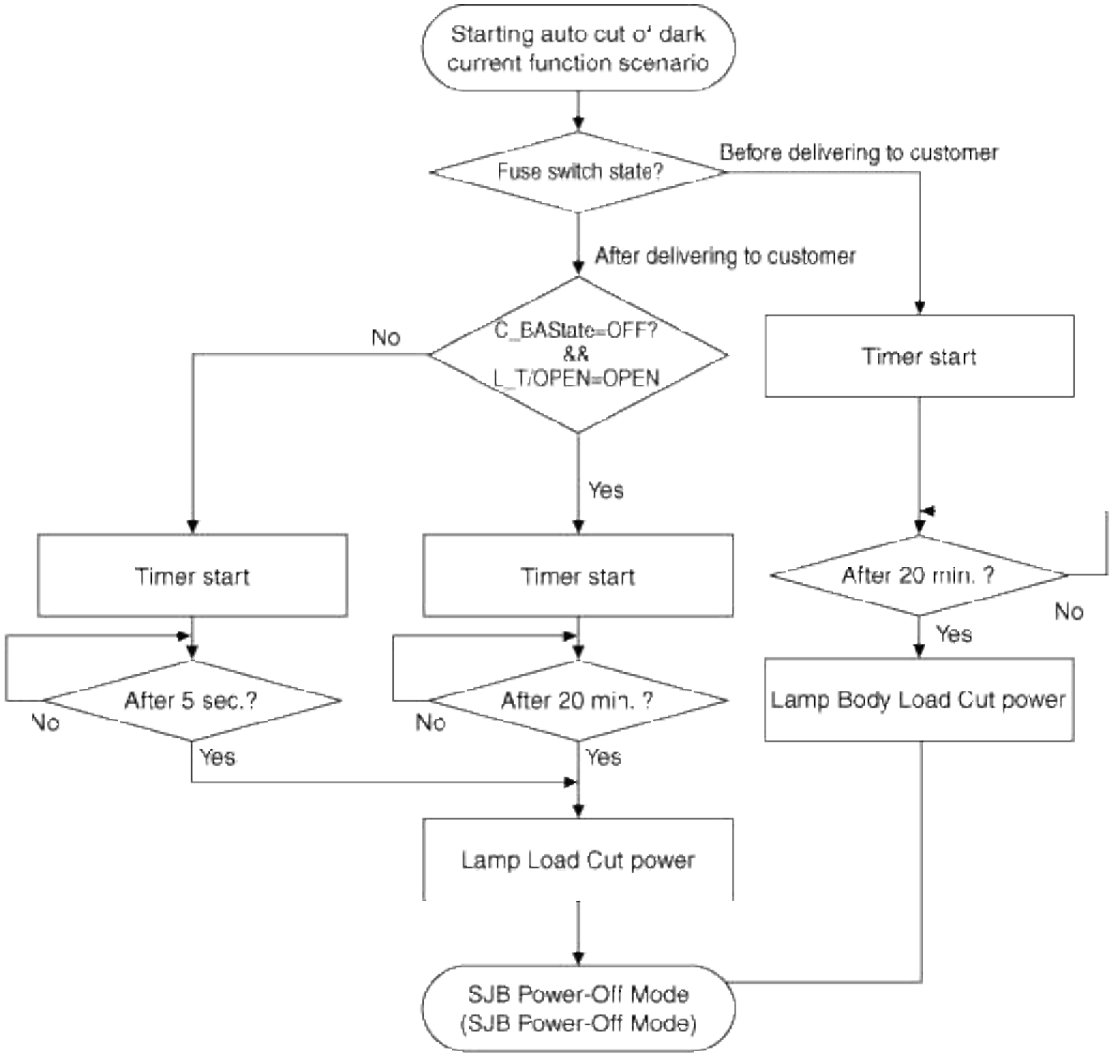
Auto Cut System Of Dark Current



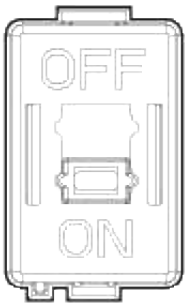
1. Description : It cuts automatically power to be provided with load for reducing useless dark current according to vehicle state.



2. SJB had 3 modes, "Normal Mode", "Sleep Mode", "Power Off Mode". Auto cut of dark current practice in "Sleep Mode".
   A. "Sleep" condition : IG OFF, constant input switch, CAN network doesn't activate.
   B. "Sleep" resolutive condition : Any switch inputs, CAN network activates, KEY ON, IGN ON
   C. "Power OFF" condition : The setting time of timer which is used by cutting a load power expires.
   D. "Normal Mode" : SJB function normally activates.
   E. "Sleep Mode" : It is low power mode and activates for reducing electricity consumption of SJB or IPM. Auto cut of dark current function activates.
   F. "Power OFF Mode" : Power of MCU and circumferential circuit is cut for minimizing electricity consumption. Operation stops.
3. The explanation - The auto cut of dark current



Before delivering to customer	Fuse switch OFF
•All door close & RKE door lock or Constant switch state (Auto cut of dark current scenario starts.) -After "sleep" state is for 20 min. -SJB power down(SJB dark current : 200 μA) and cutting power of Lamp/Body Load/Wake up	
After delivering to customer	Fuse switch ON

•All door close & Constant switch state : C_BAState=OFF (Auto cut of dark current scenario starts.) -After "sleep" state is for 20 min. -SJB power down(SJB dark current : 200 μA) and cutting power of Lamp Load •In case RKE door lock : C_BAState=ON & Trunk SW=CLOSE (Auto cut of dark current scenario starts.) -After "Sleep" state 35s~65s (Waiting time of other unit : 30~60s + SJB sleep counts 5s) -SJB Powerdown(SJB dark current : 200 μA) and cutting power of Lamp Load	

4. Problem when fuse switch setting is wrong
   : If a fuse switch is set to OFF(Before delivering to customer) by a customer or technician and auto cut function of dark current activates, below problems may happen.

Symptom	Related part
•Door lock/unlock, trunk open don't activate by RKE. (Wakeup of each module don't activate.)	BCM
•Digital clock is reset.(Memory is reset.)	Digital clock
•Setting value of audio(Volume, Frequency setting) is reset. (Memory is reset.)	Audio

*If fuse switch OFF(before delivering to customer) is set, power of BCM, Digital clock and audio is shut off.

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Repair procedures

Fuse Inspection

1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

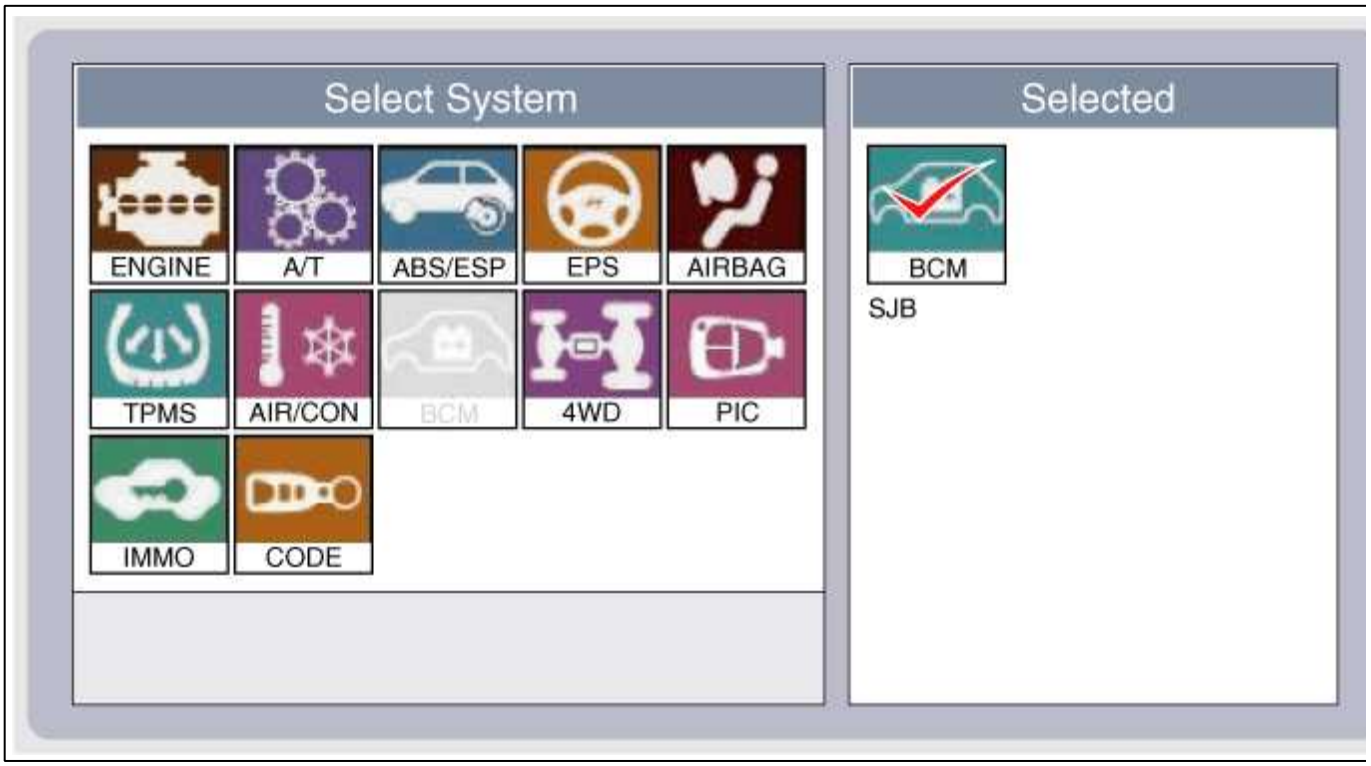
NOTE

If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

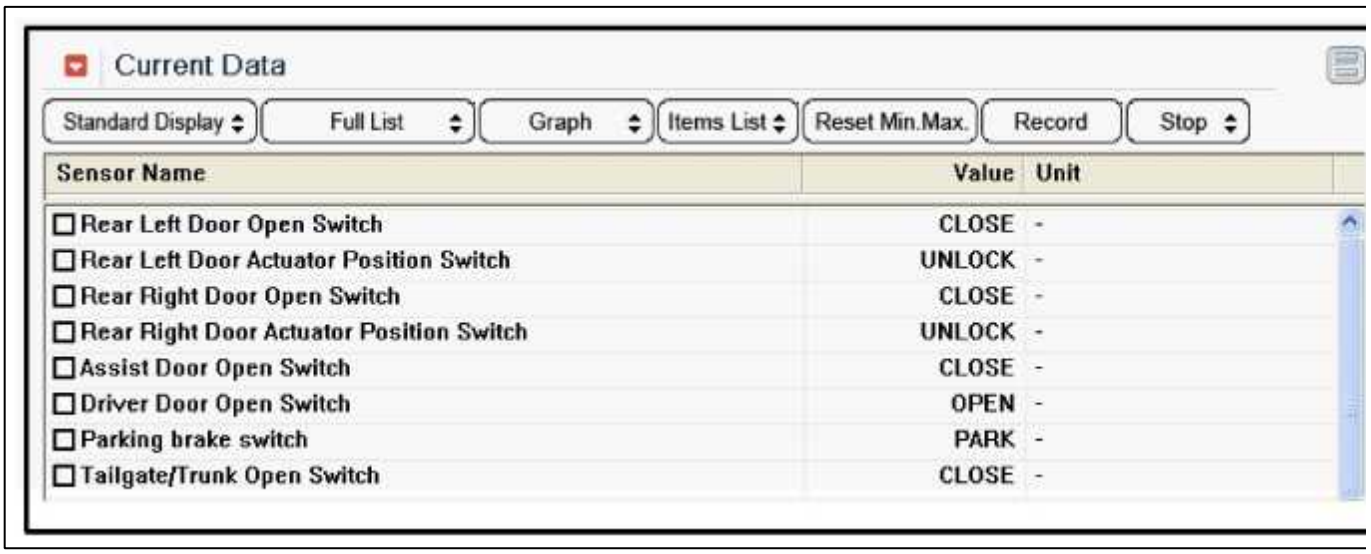
Inspection

1. The SJB can be diagnosed by using the GDS. The SJB communicates with the GDS which then displays inputs and outputs along with codes.

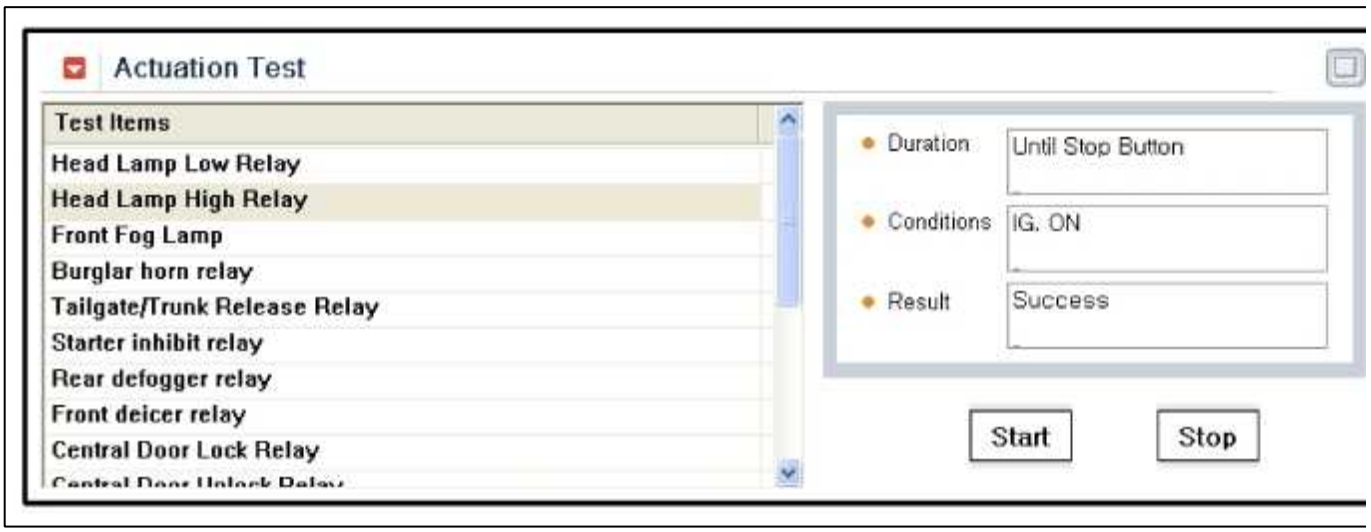
2. To diagnose the SJB function, select the vehicle model, BCM and SJB.



3. To consult the present input/out value of SJB, "Current DATA". It provides information of SJB input/output conditions.



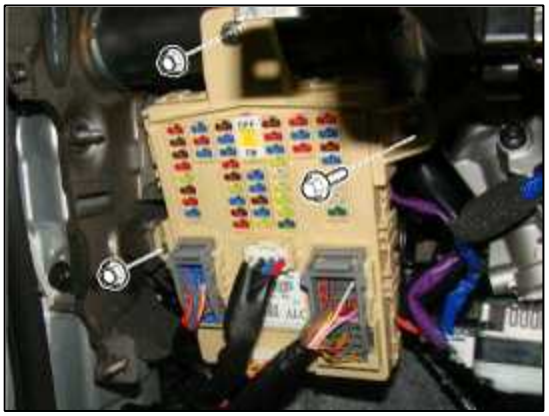
4. To perform functional test on SJB outputs, select "Actuation Test"



Removal

Passenger Compartment Junction Box (SJB)

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Crash Pad Lower Panel")
3. Disconnect the connectors from the fuse side of the smart junction box.
4. Remove the smart junction box after loosening the mounting nuts (2EA) and bolt.



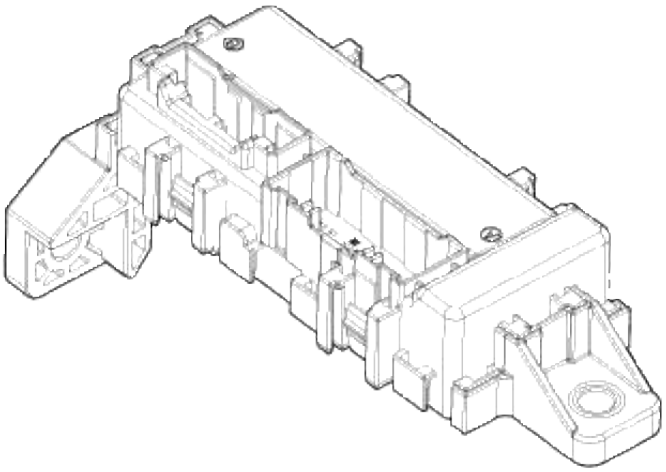
5. Disconnect the connectors from the back side of the smart junction box.

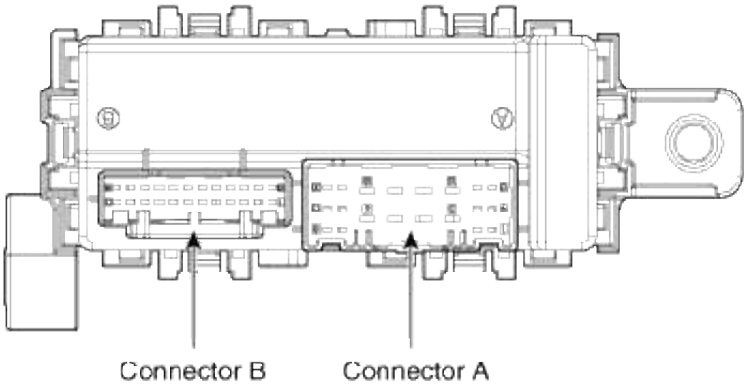
Installation

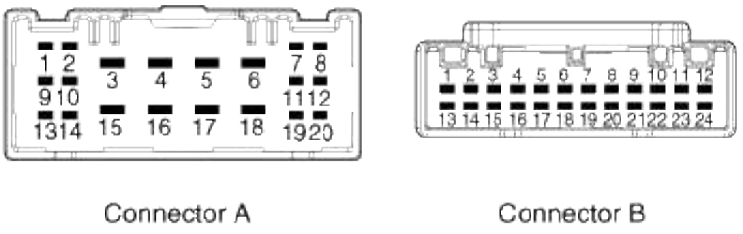
1. Install the smart junction box.
2. Install the crash pad lower panel.
3. Check that all system operates normally.

Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Components and Components Location

Component







Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Description and Operation

Description

The ICM relay is united with (rear blower motor, cornering lamp, rear fog lamp, two turn unlock, burglar alram relay) which installed inside the lower crash pad.



Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Repair procedures

Inspection

Rear Blower Motor relay

Check for continuity between the terminals.

1. There should be continuity between the No.16 and No.15 terminals when power and ground are connected to the No.13 and No.14 in the ICM-A.

Cornering Lamp(LH) Relay

Check for continuity between the terminals.

1. There should be continuity between the No.8 and No.20 terminals when power and ground are connected to the No.13 and No.12 in the ICM-A.

Cornering Lamp(RH) Relay

Check for continuity between the terminals.

1. There should be continuity between the No.19 and No.7 terminals when power and ground are connected to the No.13 and No.11 in the ICM-A.

Rear Fog Lamp Relay

Check for continuity between the terminals.

1. There should be continuity between the No.11 and No.10 terminals when power and ground are connected to the No.11 and No.14 in the ICM-B.

Two Turn Unlock Relay

Check for continuity between the terminals.

1. There should be continuity between the No.12 and No.22 terminals when power and ground are connected to the No.21 and No.22 in the ICM-B.

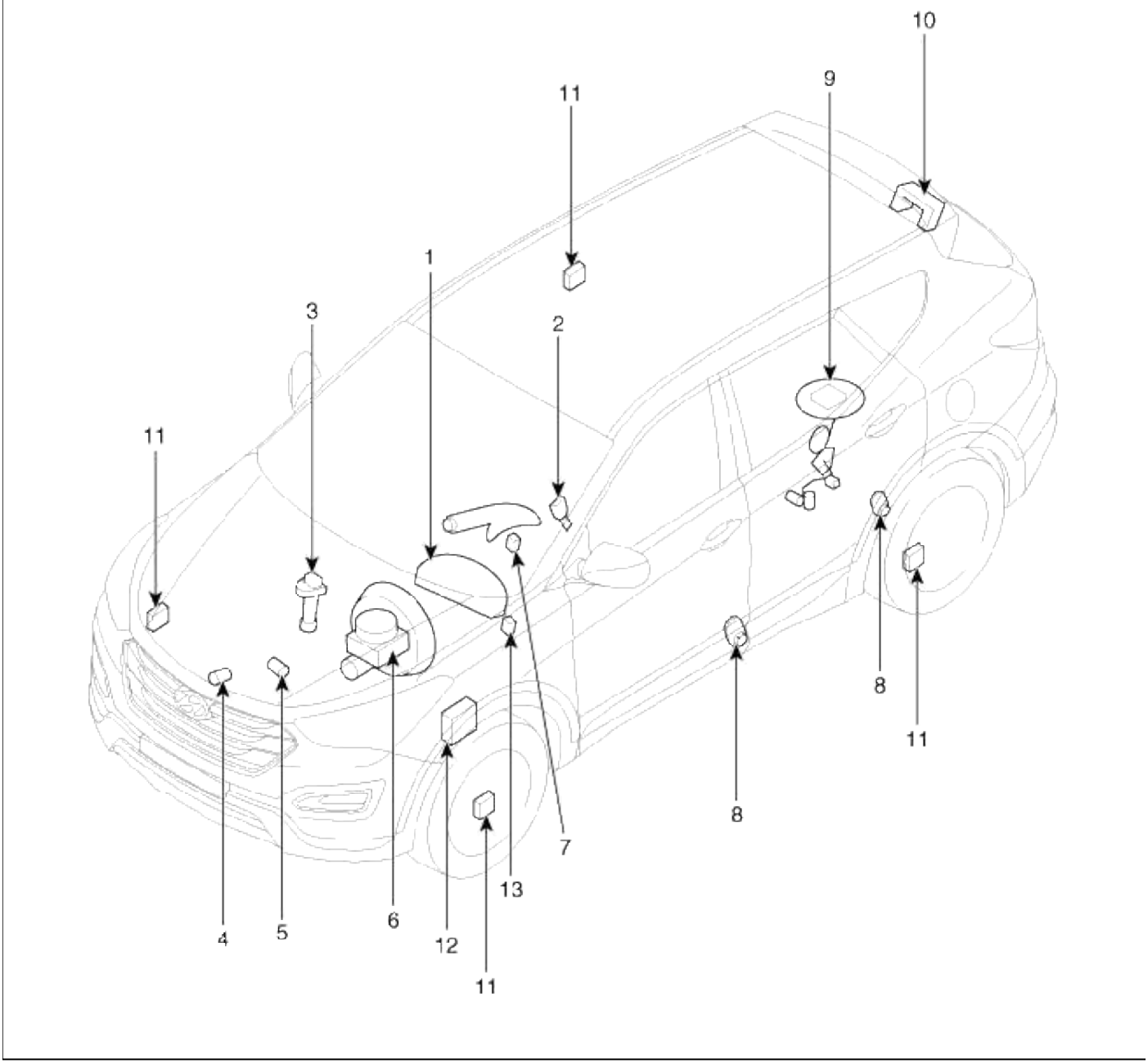
Burglar Alarm Relay

Check for continuity between the terminals.

1. There should be continuity between the No.20 and No.16 terminals when power and ground are connected to the No.17 and No.6 in the ICM-B.

Body Electrical System > Indicators And Gauges > Components and Components Location

Component Location



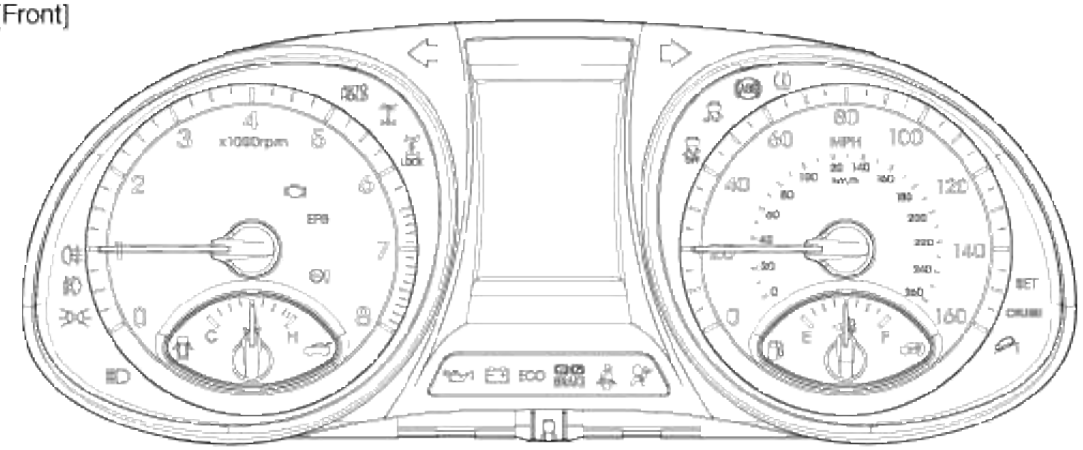
1. Cluster assembly 2. Seat belt switch 3. Vehicle speed sensor 4. Engine coolant temperature sender 5. Oil pressure switch 6. Brake fluid level warning switch 7. Parking brake switch	8. Door switch 9. Fuel gauge sender 10. Tailgate switch 11. Wheel speed sensor 12. ABS ECU 13. Active ECO switch

Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

Components

[Standard]

[Front]



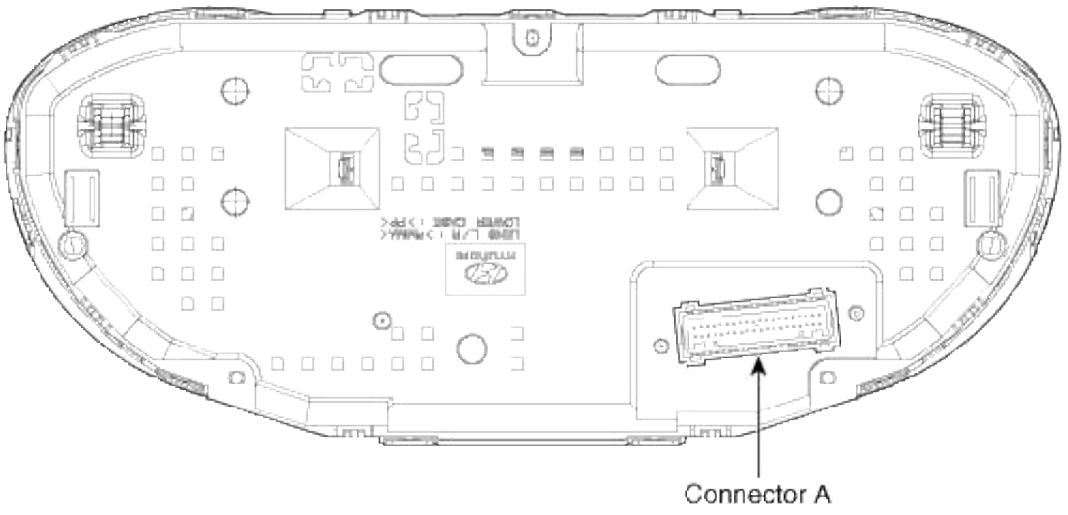


Speedo meter (MPH)



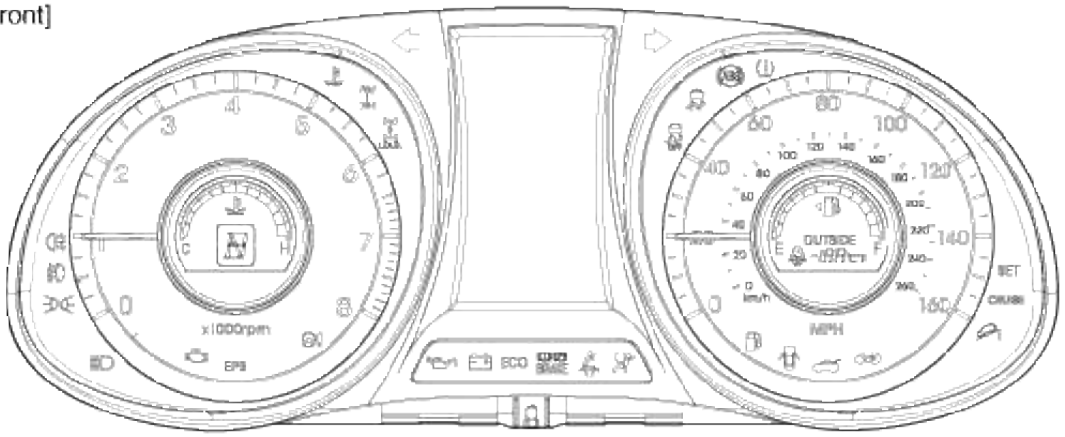
Speedo meter (KPH)

[Rear]



[Supervision]

[Front]



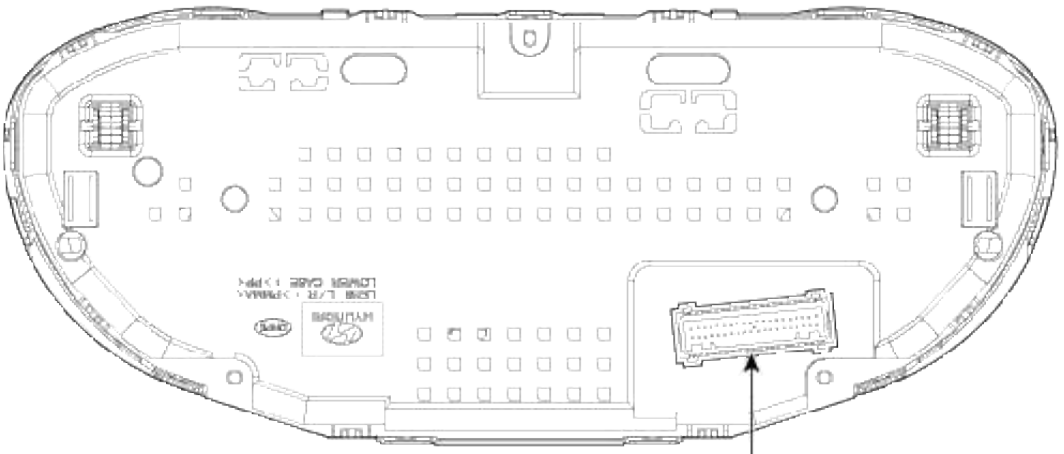


Speedo meter (MPH)

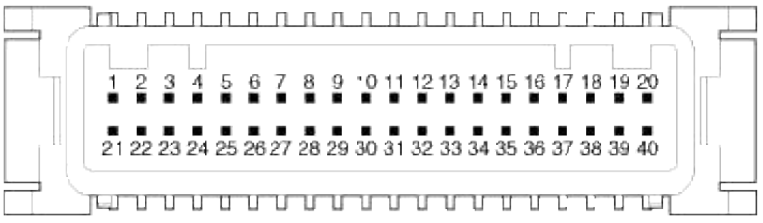


Speedo meter (KPH)

[Rear]



Connector A



Connector A

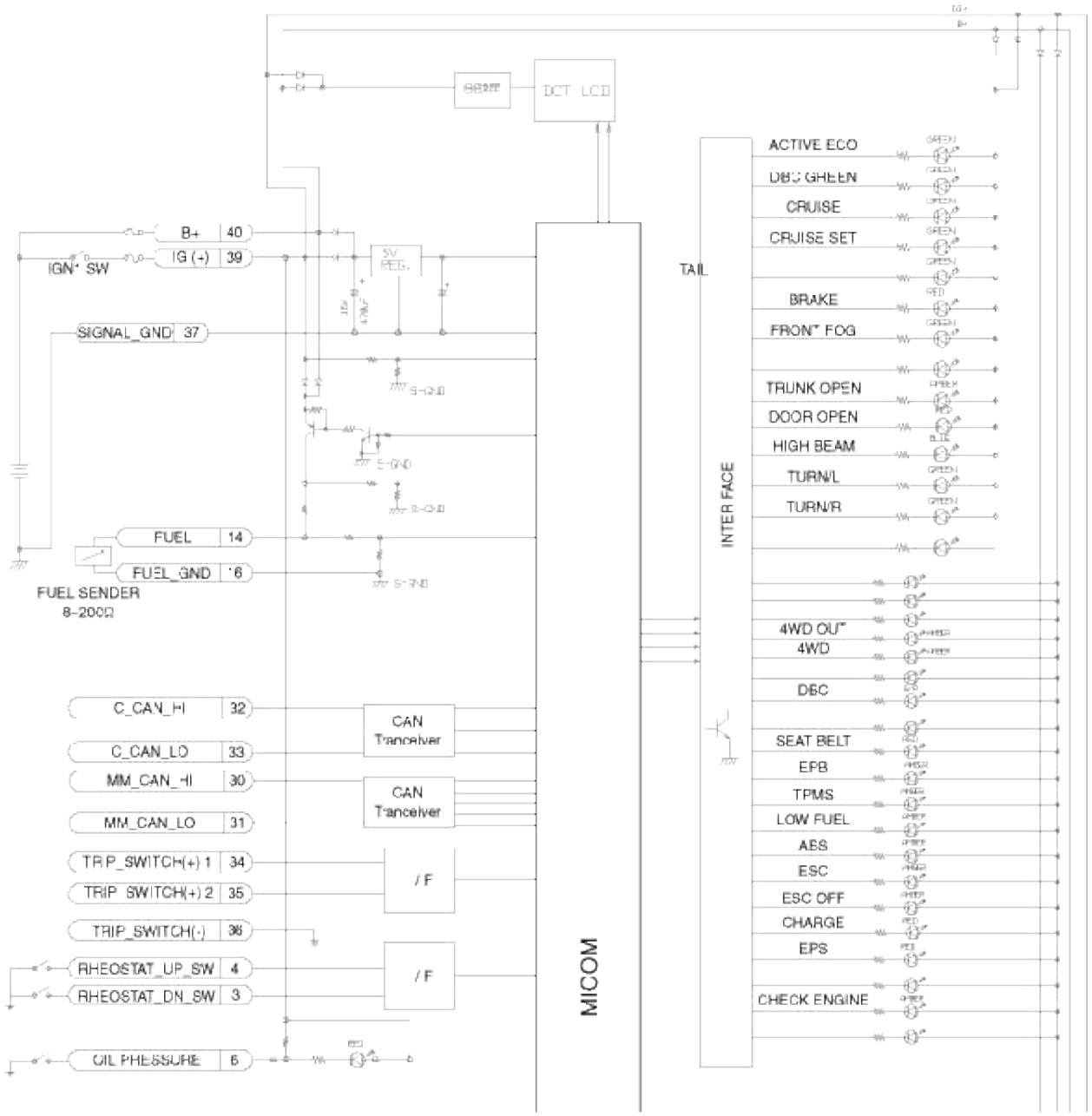
Connector Pin Information

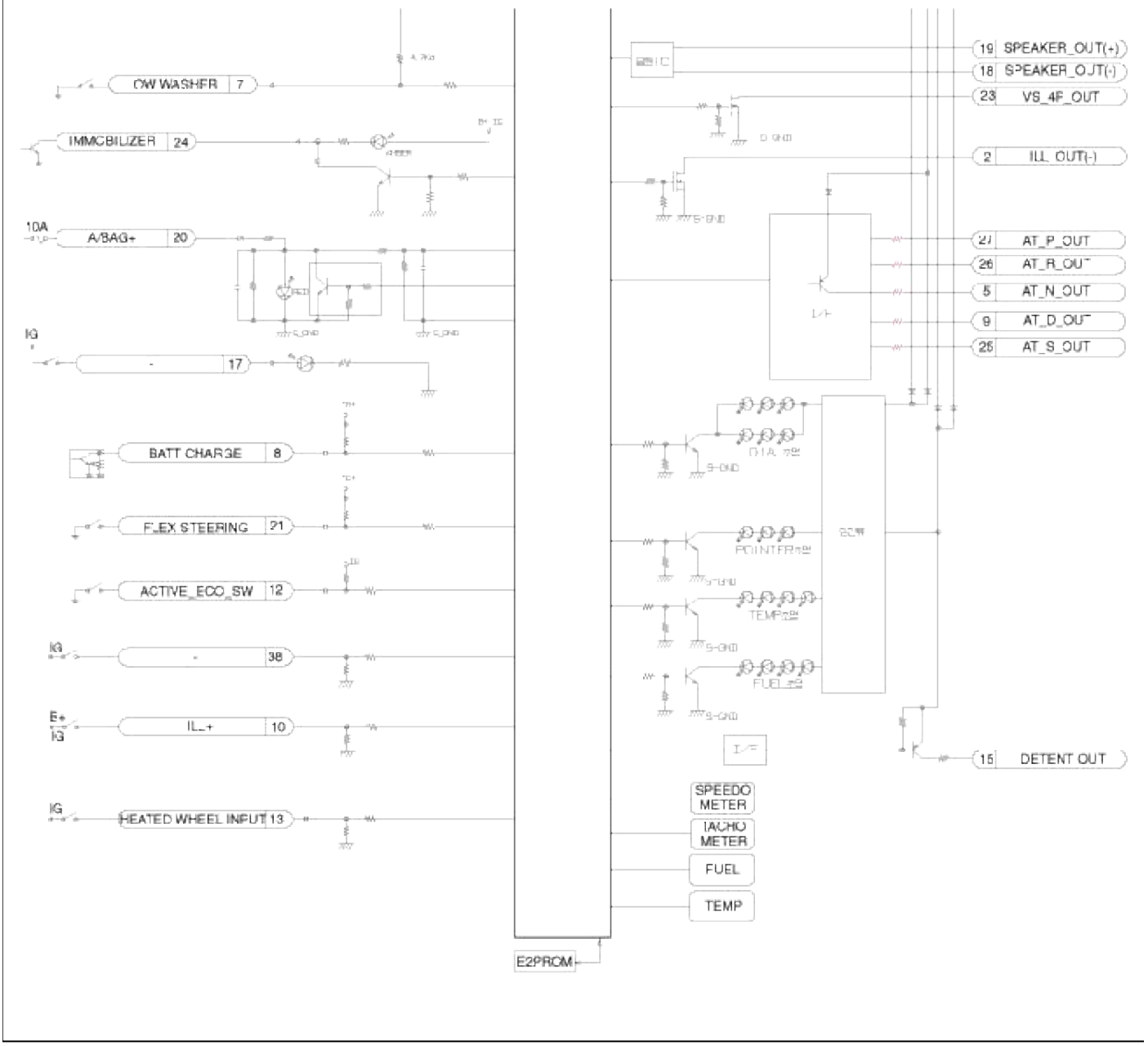
No.	Description	No.	Description
1	-	21	-
2	Illumination output	22	-
3	Rheostat down switch	23	4P output
4	Rheostat up switch	24	Immobilizer
5	AT N output	25	AT S output
6	Oil pressure	26	AT R output
7	Low washer	27	AT P output
8	Charge	28	-
9	AT D output	29	-
10	Illumination +	30	MM_CAN High
11	-	31	MM_CAN Low
12	Active ECO	32	C_CAN High
13	Heated wheel indicator	33	C_CAN Low
14	Fuel	34	Trip switch1
15	Detent output	35	Trip switch2
16	Fuel ground	36	Trip switch ground
17	-	37	Signal ground
18	Speaker -	38	-
19	Speaker +	39	IGN +
20	Aig bag +	40	Battery +

Body Electrical System > Indicators And Gauges > Instrument Cluster > Schematic Diagrams

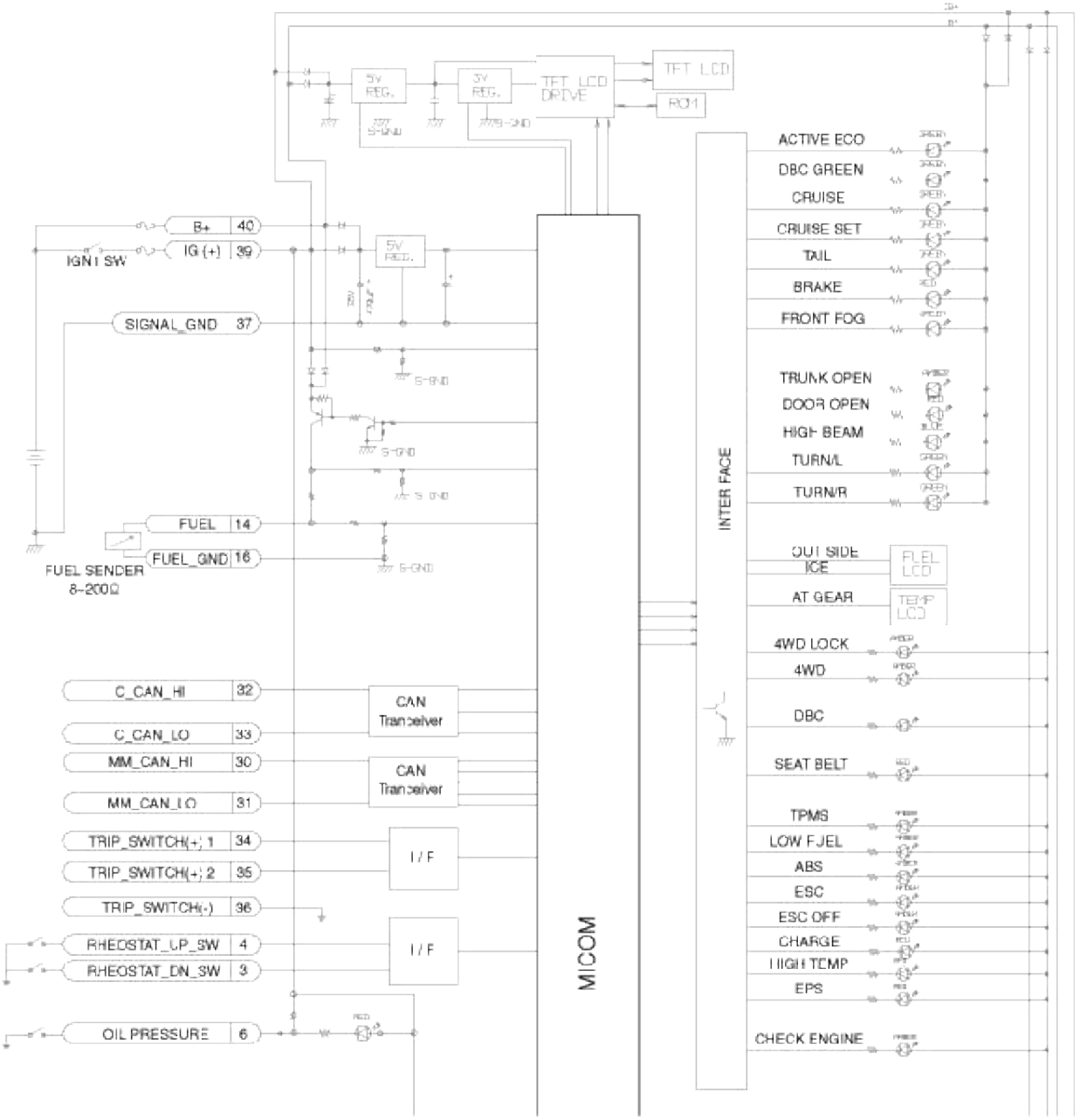
Circuit Diagram

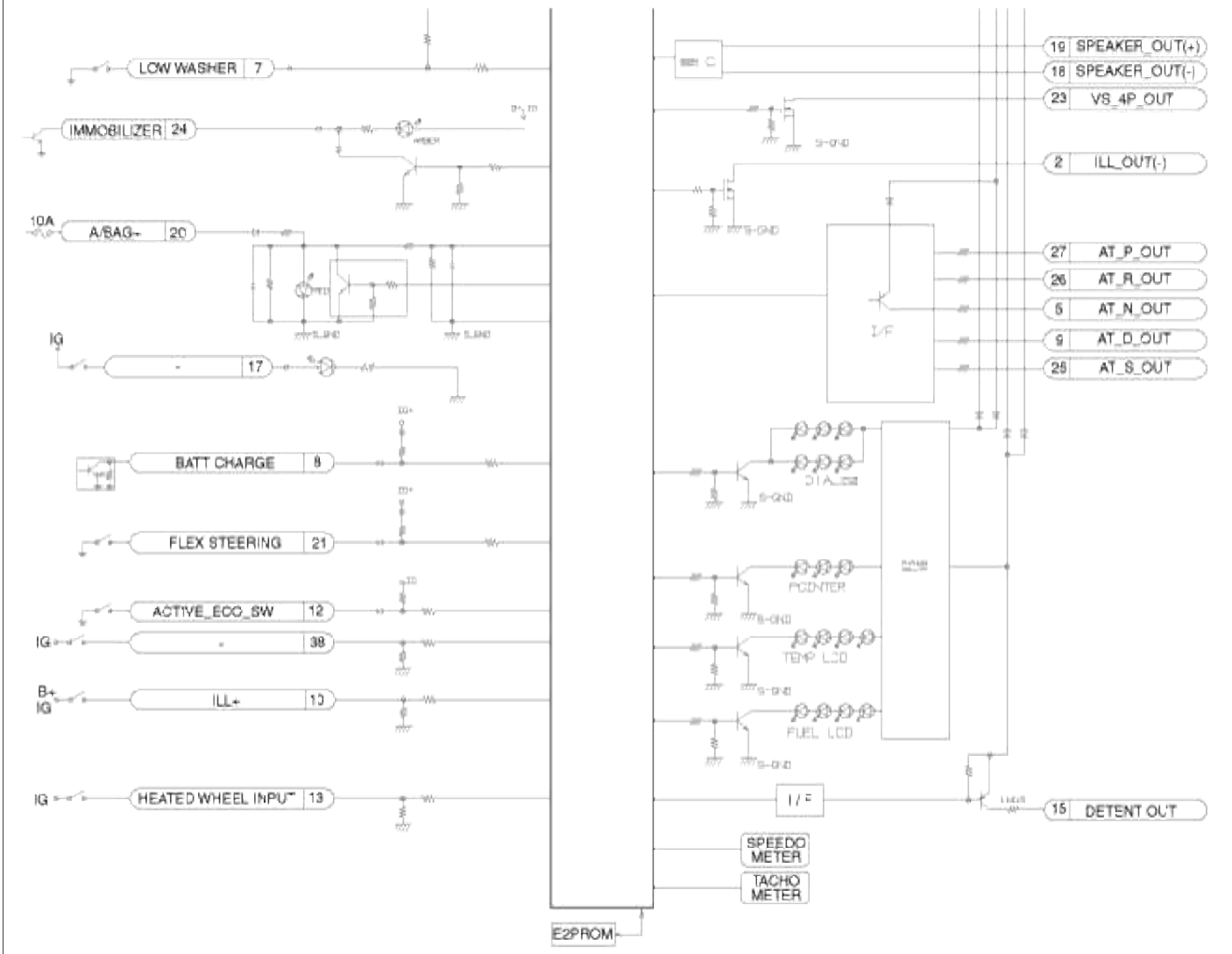
[Standard]


DCT LCD
B+ 40
IG (+) 39
IGN SW
SIGNAL_GND 37
FUEL 14
FUEL_GND 6
FUEL SENDER
8-200Ω
C_CAN_HI 32
C_CAN_LO 33
M_CAN_HI 30
M_CAN_LO 31
CAN Tranceiver
CAN Tranceiver
TRIP_SWITCH(+)1 34
TRIP_SWITCH(+)2 35
TRIP_SWITCH(-) 36
/ F
RHEOSTAT_UP_SW 4
RHEOSTAT_DN_SW 3
/ F
OIL PRESSURE 5
MICOM
INTER FACE
TAIL
ACTIVE ECO
CRUISE
CRUISE SET
BRAKE
FRONT FOG
TRUNK OPEN
DOOR OPEN
HIGH BEAM
TURN/L
TURN/R
4WD
DBC
SEAT BELT
EPB
TPMS
LOW FUEL
ABS
ESC
ESC OFF
CHARGE
EPS
CHECK ENGINE


CW WASHER 7
IMMOBILIZER 24
10A
A/BAG+ 20
IG
- 17
BATT CHARGE 8
FLEX STEERING 21
ACTIVE_ECO_SW 12
IG
- 38
E+
IG
IL_+ 10
IG
HEATED WHEEL INPUT 13
E2PROM
SPEEDO METER
TACHO METER
FUEL
TEMP
19 SPEAKER_OUT(+)
18 SPEAKER_OUT(-)
23 VS_4F_OUT
2 ILL_OUT(-)
27 AT_P_OUT
26 AT_R_OUT
5 AT_N_OUT
9 AT_D_OUT
25 AT_S_OUT
15 DETENT OUT

[Supervision]

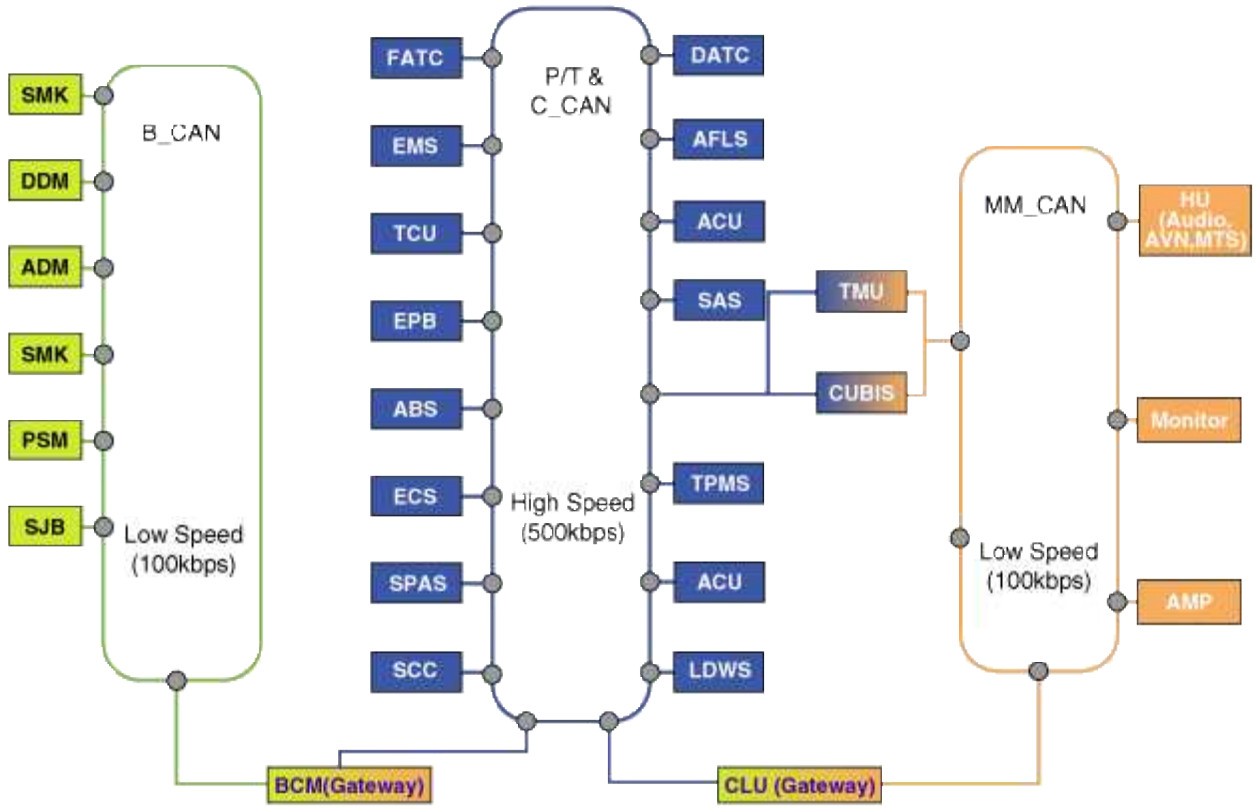




Body Electrical System > Indicators And Gauges > Instrument Cluster > Description and Operation

Description

Communication Network Diagram



Abbreviation	Explanation
C_CAN	Chassis Controller Area Network
B_CAN	Body Controller Area Network
MM_CAN	Multi media Controller Area Network
SMK	Smart Key ECU
DDM	Driver Door Module
ADM	Assist Door Module
PSM	Power Seat Module
SJB	Smart Junction Box
ESC	Electronic Stabilty Control
SPAS	Smart Parking Assist System
SWRC	Steering Wheel Remote Controller
PCU	Power-train Control Unit
ECU	Engine Control Unit
TCU	Transmission Control Unit
EPB	Electronic Parking Brake
ABS	Anti-lock Brake System
BCM	Body Control Module
SCC	Smart Cruise Control

DATC	Dual Automatic Temp Control
MDPS	Motor Driven Power Steering
SAS	Steering Angle Sensor
TPMS	Tire Pressure Monitoring System
ACU	Airbag Control Unit
CLU	Cluster
HU	Head Unit (Audio, AVN, MTS)

Cluster Variant Coding
As we have more options (ESC, TPMS, SCC, etc.) in the car, the dashboard now have more information to display depending on the chosen options.
For this reason, we need to learn which options the current vehicle when we replace the dashboard.
To address this issue, a course of learning based on the option required for the vehicle when replacing the dashboard should be carried out.
This is called Variant Coding.

Body Electrical System > Indicators And Gauges > Instrument Cluster > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the cluster fascia panel (A).
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Cluster Fascia Panel")
3. Remove the cluster (A) from the housing after removing 2 screws.



4. Disconnect the cluster connecter (A) and then remove the cluster (B).

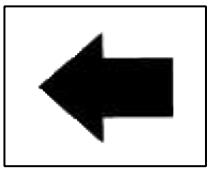
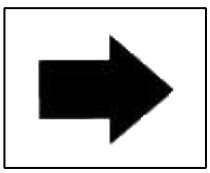
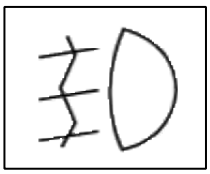
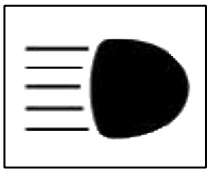
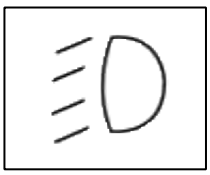
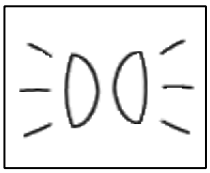


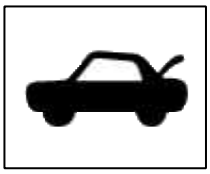
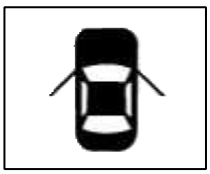
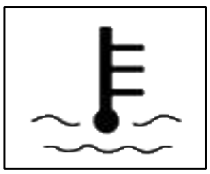
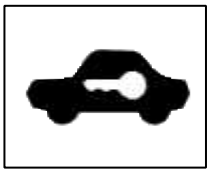
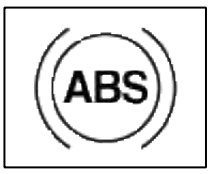
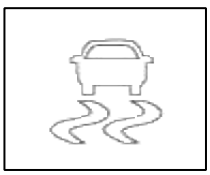
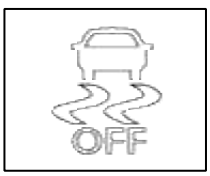
Installation

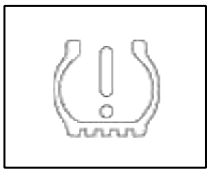
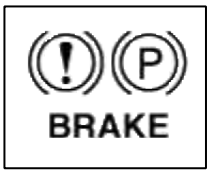
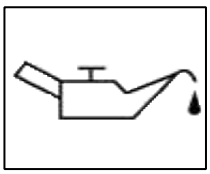
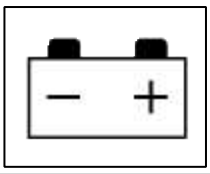
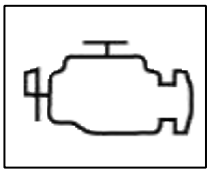
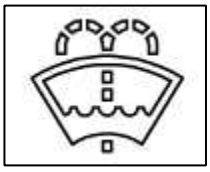
1. Connect the cluster connector.
2. Install the cluster assembly.
3. Install the cluster facia panel.
4. Connect the negative (-) battery terminal.

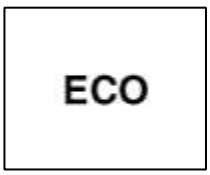
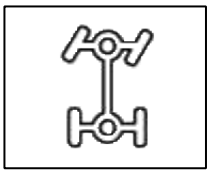
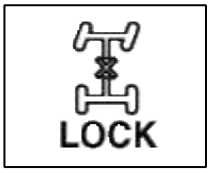
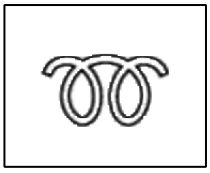
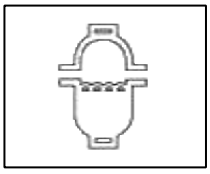
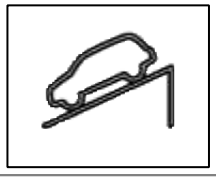
Inspection

1. Check point (Warning indicator)

NO	Ref Symbol	Color	Name	Signal Input	Signal Control (Unit / Sensor)	Check Point
1		Green	Turn Left	C-CAN	BCM	1. CAN line failure
2		Green	Turn Right	C-CAN		
3		Green	Front Fog	C-CAN	BCM	1. CAN line failure
4		Blue	High Beam	C-CAN	BCM	1. CAN line failure
5		Green	Low Beam	C-CAN	BCM	1. CAN Line failure
6		Green	Tail Lamp	C-CAN	BCM	1. CAN Line failure
7		Green	Cruise	C-CAN	EMS	1. CAN line failure
8		Green	SET	C-CAN	EMS	1. CAN line failure

9		Red	Seat Belt	C-CAN	BCM	1. CAN line failure
10		Red	Air Bag	C-CAN	ACU	1. CAN line failure
11		Yellow	Trunk Open	C-CAN	BCM	1. CAN line failure
12		Red	Door Open	C-CAN	BCM	1. CAN line failure
13		Red	High Temperature	C-CAN	EMS	1. CAN line failure
14		Yellow	Immobilizer	C-CAN	SMK	1. CAN line failure
15		Yellow	ABS	C-CAN	ESC	1. CAN line failure
16		Yellow	EPB	C-CAN	EPB	1. CAN line failure
17		Yellow	ESC	C-CAN	ESC	1. CAN line failure
18		Yellow	ESC OFF	C-CAN	ESC	1. CAN line failure

19		Yellow	TPMS (Tread & Fail)	C-CAN	TPMS	1. CAN line failure
20		Yellow	Fuel Low	Hardwire	Fuel Sender	1. Fuel sender failure 2. Wiring failure
21		Red	Parking Brake	C-CAN	BCM TCS EPB	1. CAN line failure
22		Yellow	Oil Pressure	Hardwire	Oil Pressure Sensor	1. Wiring failure
23		Red	Battery Charge	Hardwire	Battery Sensor	1. Wiring failure
24		Yellow	Check Engine	C-CAN	EMS	1. CAN line failure
25		Yellow	Low Washer	Hardwire	Water Level Sensor	1. Wiring failure
26		Green	AUTOHOLD (Green)	C-CAN	ESC	1. CAN line failure
		Yellow	AUTOHOLD (Yellow)	C-CAN	ESC	1. CAN line failure
		White	AUTOHOLD (White)	C-CAN	ESC	1. CAN line failure

27		Green White Yellow	LDWS	C-CAN	LDWS	1. CAN line failure
28		Green	Active ECO	Hardwire	ECO ON/OFF Switch	1. Switch failure 2. Wiring failure
29		Yellow	4WD Diagnosis	C-CAN	4WD Unit	1. 4WD unit failure 2. CAN line failure
30		Yellow	4WD LOCK	C-CAN	4WD ECU	1. 4WD ECU failure 2. CAN line failure
31		Yellow	Glow	C-CAN	Glow Plug	1. Glow plug failure 2. CAN line failure
32		Red	EPS	C-CAN	EPS Unit	1. EPS unit failure 2. CAN line failure
33		Red	Water Seperator	C-CAN	Fuel filter water seperator sensor	1. Water seperator sensor failure 2. CAN line failure
34		Green Yellow	DBC	C-CAN	TCU	1. TCU failure 2. CAN line failure

2. Check point (Gauge)

No.	Name	Signal Input	Signal Control (Unit/Sensor)	Check Point
1	Speedometer	C-CAN	TCU, ABS	1. CAN Line failure
2	Tachometer	C-CAN	EMS	1. CAN Line failure
3	Cooling water temperature	C-CAN	EMS	1. CAN Line failure
4	Fuel	Hardwire	Fuel sender	1. Fuel sender failure 2. Wiring failure

3. Connector terminal check list

No.	Description	Input/Output	Communication	Check Point	
				Spec	Condition
A1	-				
A2	Illumination output	Output	Hardwire	9 ~ 16 V	IGN switch ON Illumination (+) switch ON
A3	Rheostat down switch	Input	Hardwire	Below 2V	IGN switch ON Rheostat down switch ON
A4	Rheostat up switch	Input	Hardwire	Below 2V	IGN switch ON
					Rheostat up switch ON
A5	AT N position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A6	Oil pressure indicator	Input	Hardwire	Below 1.5V	IGN switch ON Oil pressure switch ON
A7	Low washer indicator	Input	Hardwire	Below 1.5V	IGN switch ON Washer fuild switch ON
A8	Charge indicator	Input	Hardwire	Below 1.5V	IGN switch ON Charge switch ON
A9	AT D position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A10	Illumination +	Input	Hardwire	Above 6 V	IGN switch ON Illumination (+) switch ON
A11	-				
A12	Active ECO	Input	Hardwire	Below 1.5V	IGN switch ON
A13	Heated steering indicator	Input	Hardwire	Above 6 V	IGN switch ON Heated steering switch ON
A14	Fuel low indicator	Input	Hardwire	Below 1.1 V	IGN switch ON Fuel Full
				Above 10.7V	IGN switch ON Fuel Empty

A15	Detent output	Output	Hardwire	9 ~ 16 V	IGN switch ON Rheostat MAX
A16	Fuel ground	Input	Hardwire	Below 1V	Always
A17	Water seperator indicator	Input	Hardwire	Below 1.5V	IGN switch ON
A18	Speaker -	Output	Hardwire	2.7 ~ 5.5 V	IGN switch ON
A19	Speaker +	Output	Hardwire	2.7 ~ 5.5 V	IGN switch ON
A20	Aig Bag +	Input	Hardwire	9 ~ 16 V	IGN switch ON
A21	-				
A22	-				
A23	4P output	Output	Hardwire	9 ~ 16 V	IGN switch ON Vehicle speed 1 /h excess
A24	Immobilizer indicator	Input	Hardwire/CAN	Below 1.5V	IGN switch ON
A25	AT S output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A26	AT R position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A27	AT P position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A28	-				
A29	-				
A30	MM CAN High	Input	CAN	-	-
A31	MM CAN Low	Input	CAN	-	-
A32	C CAN High	Input	CAN	-	-
A33	C CAN Low	Input	CAN	-	-
A34	Trip switch1	Input	Hardwire	0.7 ~ 4.4 V	IGN switch ON
A35	Trip switch2	Input	Hardwire	0.7 ~ 4.4 V	IGN switch ON
A36	Trip switch ground	Input	Hardwire	Below 1V	Switch ground input
A37	Signal ground	Input	Hardwire	Below 1V	Switch ground input
A38	MT R postion input	Input	CAN	9 ~ 16 V	IGN switch ON
A39	IGN +	Input	Hardwire	9 ~ 16 V	IGN switch ON
A40	Battery +	Input	Hardwire	9 ~ 16 V	Always

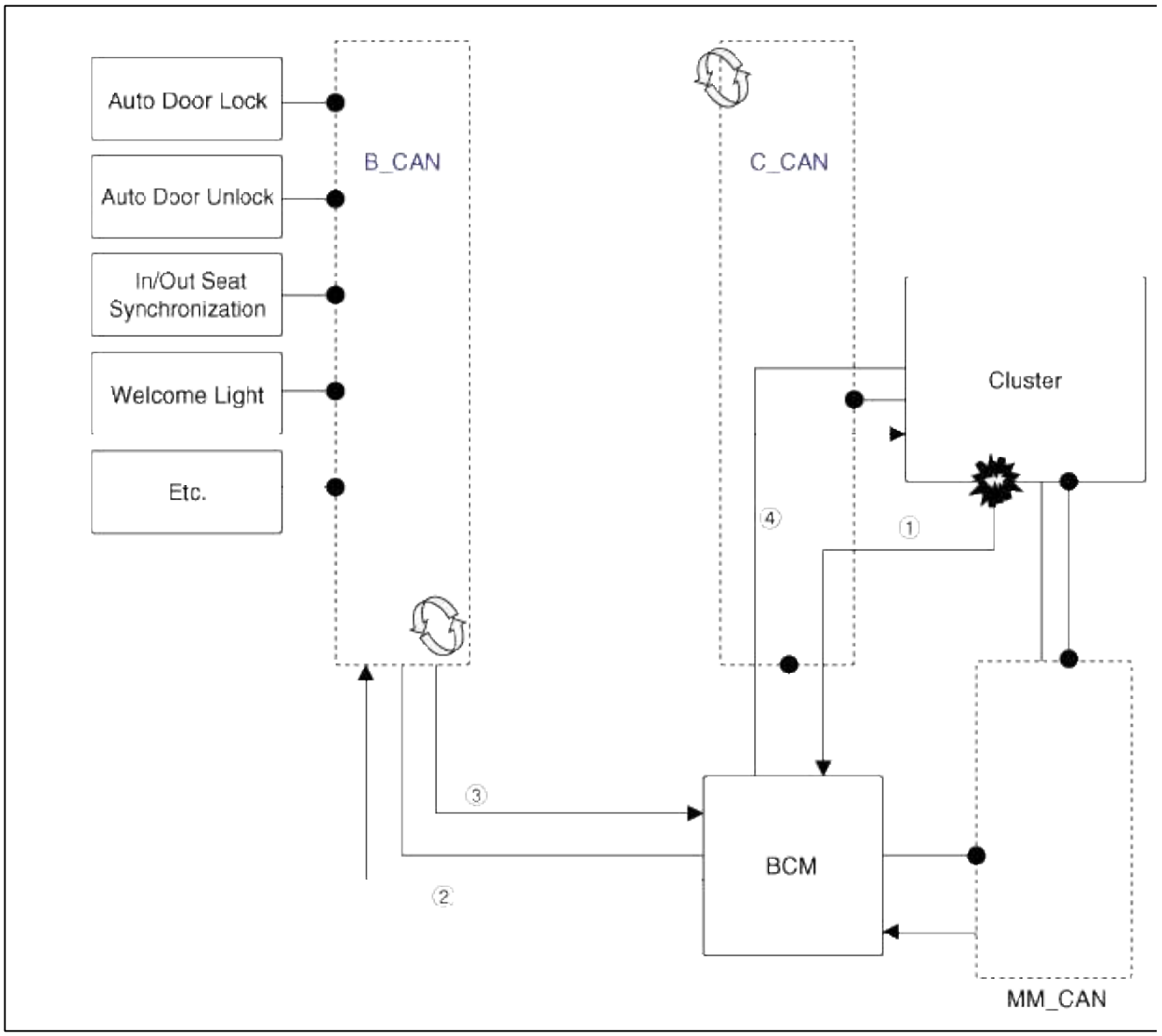
4. Communication information

Transmision Unit	Receive Unit	CAN communication	Reference
Cluster	BCM	C-CAN	Refuel detecede state
			Instant fuel consumption information
			Low fuel warning information
			Vehicle setting condition
			Illumination setting
Cluster	EMS	C-CAN MM-CAN	SPORT/ECO Mode
	TCU		
	ECS		
	ESP		
	AVN		
Cluster	SCC	C-CAN	Vehicle speed
Cluster	ACU	C-CAN	Airbag state
ACU	Cluster	CAN	Airbag warning indicator control
BCM	Cluster	CAN	Hood indicator display
DATC	Cluster	CAN	External temperature display
ECS	Cluster	CAN	Warning control
EMS	Cluster	CAN	Tachometer control
			Temperature guage control
			Check engine symbol, CRUISE and SET indicator control
EPB	Cluster	CAN	EPB indicator, Parking brake indicator control
			Sound control
ESC	Cluster	CAN	-
BCM	Cluster	CAN	Vehicle setting control
			Warnig indicator and warning sound, PAS control
LDWS	Cluster	CAN	LDWS warning indicator, massage display and steering angle display
SAS	Cluster	CAN	
SMK	Cluster	CAN	Smart key indicator display
TCS	Cluster	CAN	ESC OFF switch condition display
			SCC turn stop lamp on/off
			Warning indicator display
TCU	Cluster	CAN	AT gear information display
			Speed input
			SBW indicator
TPMS	Cluster	CAN	TPMS indicator

5. Other cluster check list

(1) UMS Setting Mode

There are items (for example Two Turn Unlock, Auto Door Dock/Unlock, In/Out Seat Synchronization, Doo Sound, Head Lamp Escrot, One Touch Triple Turn, Welcome Light, and Content Setup) that can be set and customized



(2) UMS Setting Procedure

A. Module setting

① UMS settings are sent to BCM →

② Settings are sent via BCM B_CAN to the relevant module →

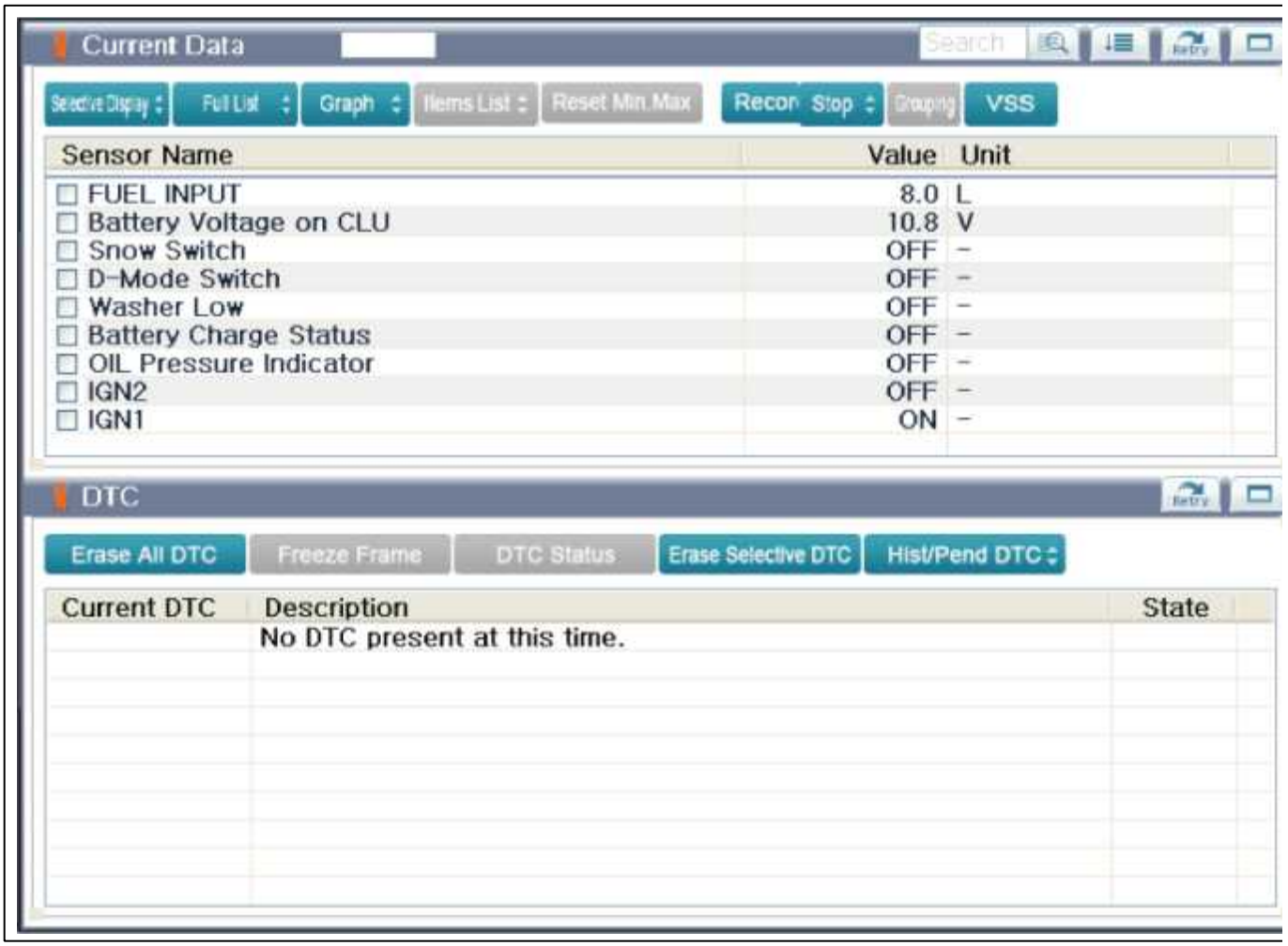
③ When the module setting is completed, the current settings are sent to BCM →

④ The final settings are sent via BCM C-CAN to the dashboard.

Diagnosis with GDS

1. It will be able to diagnose defects of CLU with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and "BCM".
3. Select the "Cluster Moduel" to check.
4. Select "Input/output monitoring", if you will check current data of instrument cluster.

5. If you will check each module data operation forcefully, select "Actuation test".

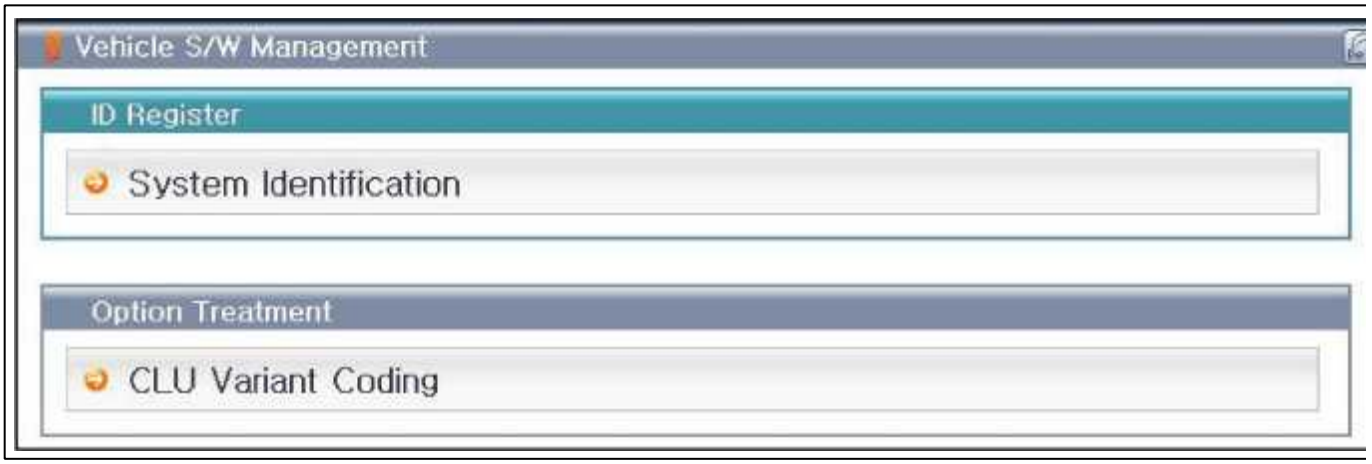


6. To check the DTC of the each module, select "DIAGNOSTIC TROUBLE CODES".

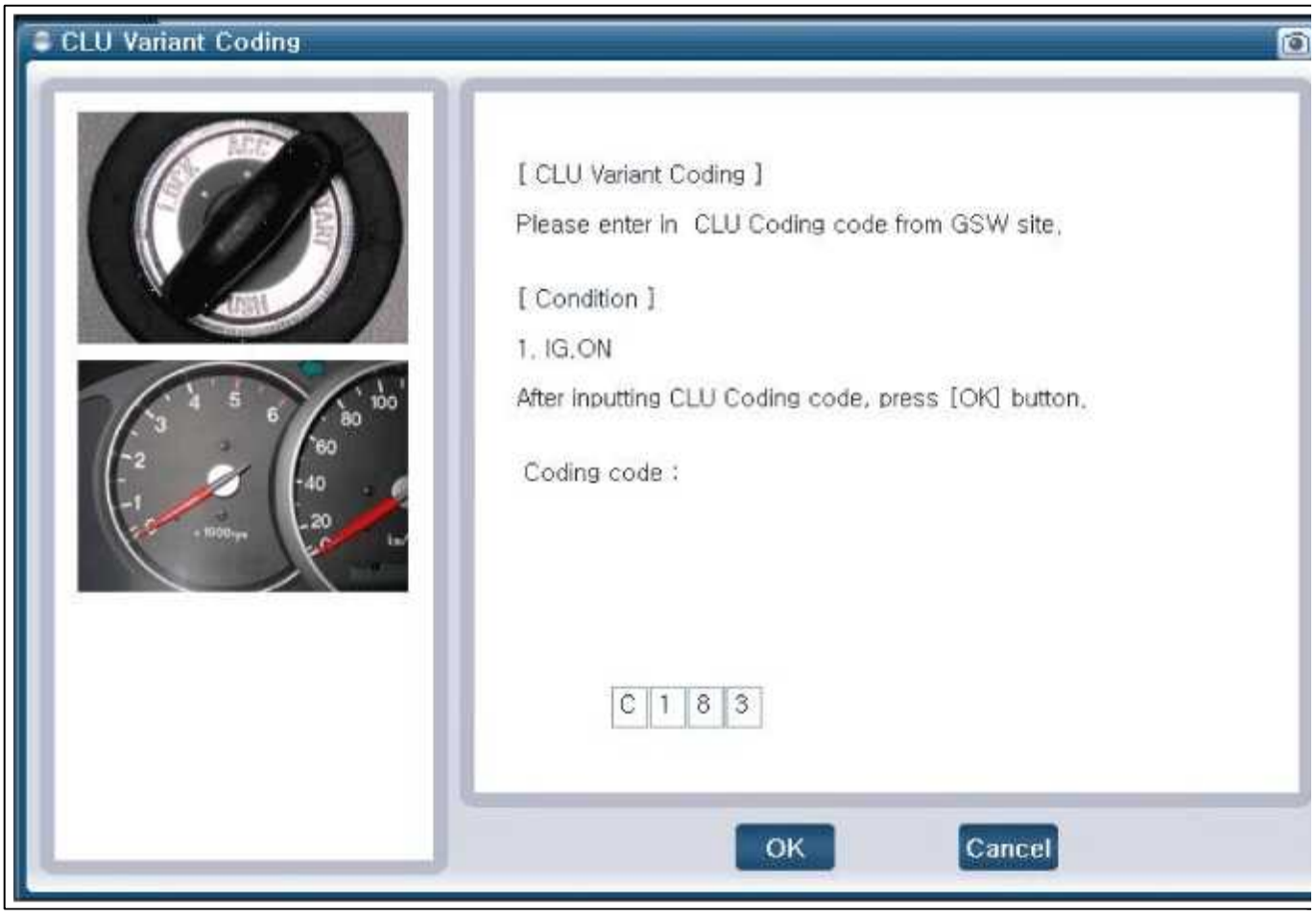
CLU Variant Coding

After replacing the cluster with a new one, must be performed the “Variant Coding” procedure.

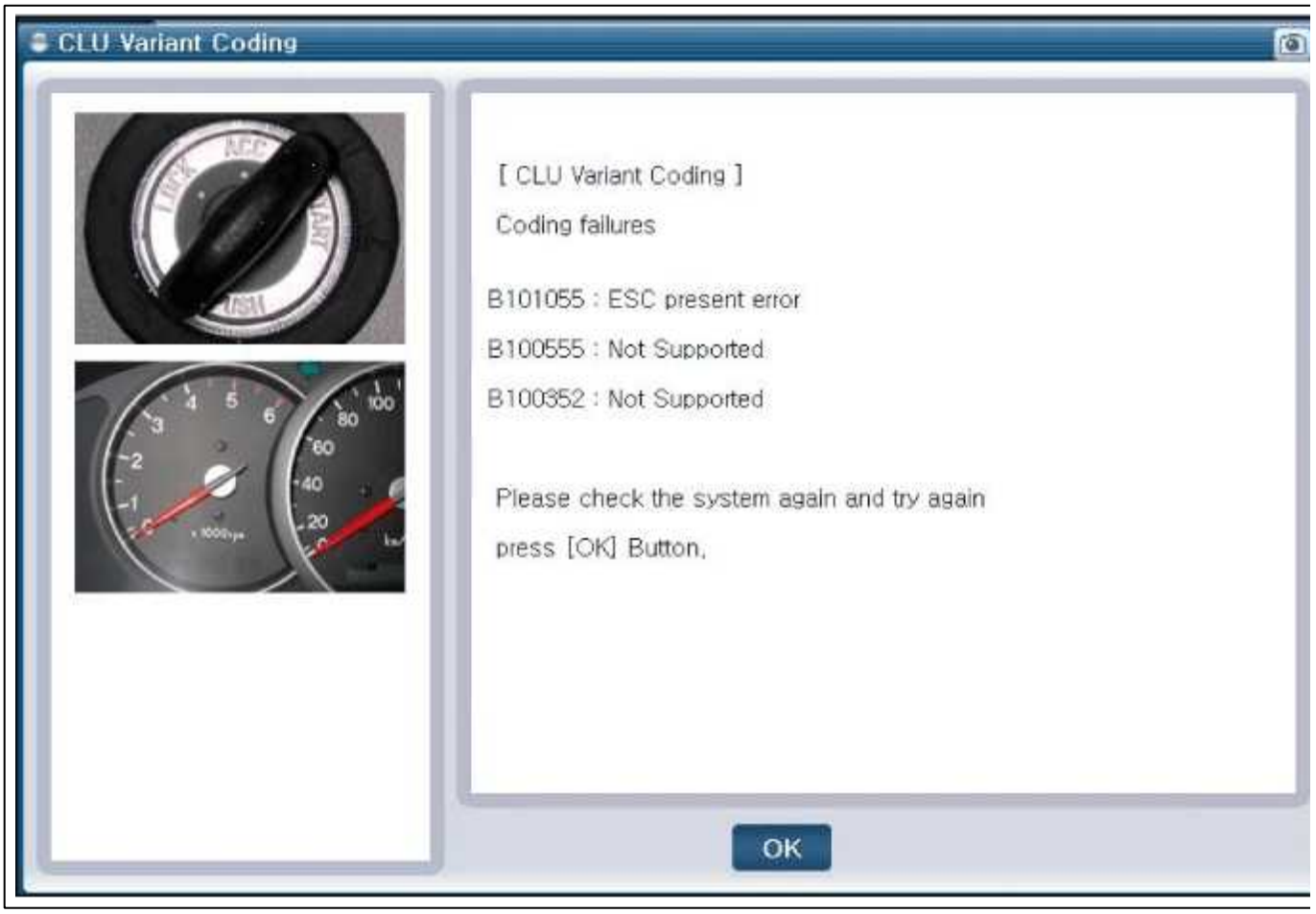
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.
2. Select model and "BCM".
3. Select Variant coding mode to perform.




CLU Variant Coding
[CLU Variant Coding]
This function is intended to set for the specification of cluster in the vehicle which is applied to the vehicle CAN communication controller. (ESP, MDPS, TPMS, EPB, SCC and so on)
Press [OK] button for next step.
(CONDITION : IGN On & ENG Off)
OK
Cancel


CLU Variant Coding
[CLU Variant Coding]
Please enter in CLU Coding code from GSW site.
[Condition]
1. IG.ON
After inputting CLU Coding code, press [OK] button.
Coding code :
C 1 8 3
OK
Cancel

4. If the trouble codes occurred when performing variant coding, try the CLU variant coding again after checking the installation status of CLU system.



Body Electrical System > Indicators And Gauges > Troubleshooting

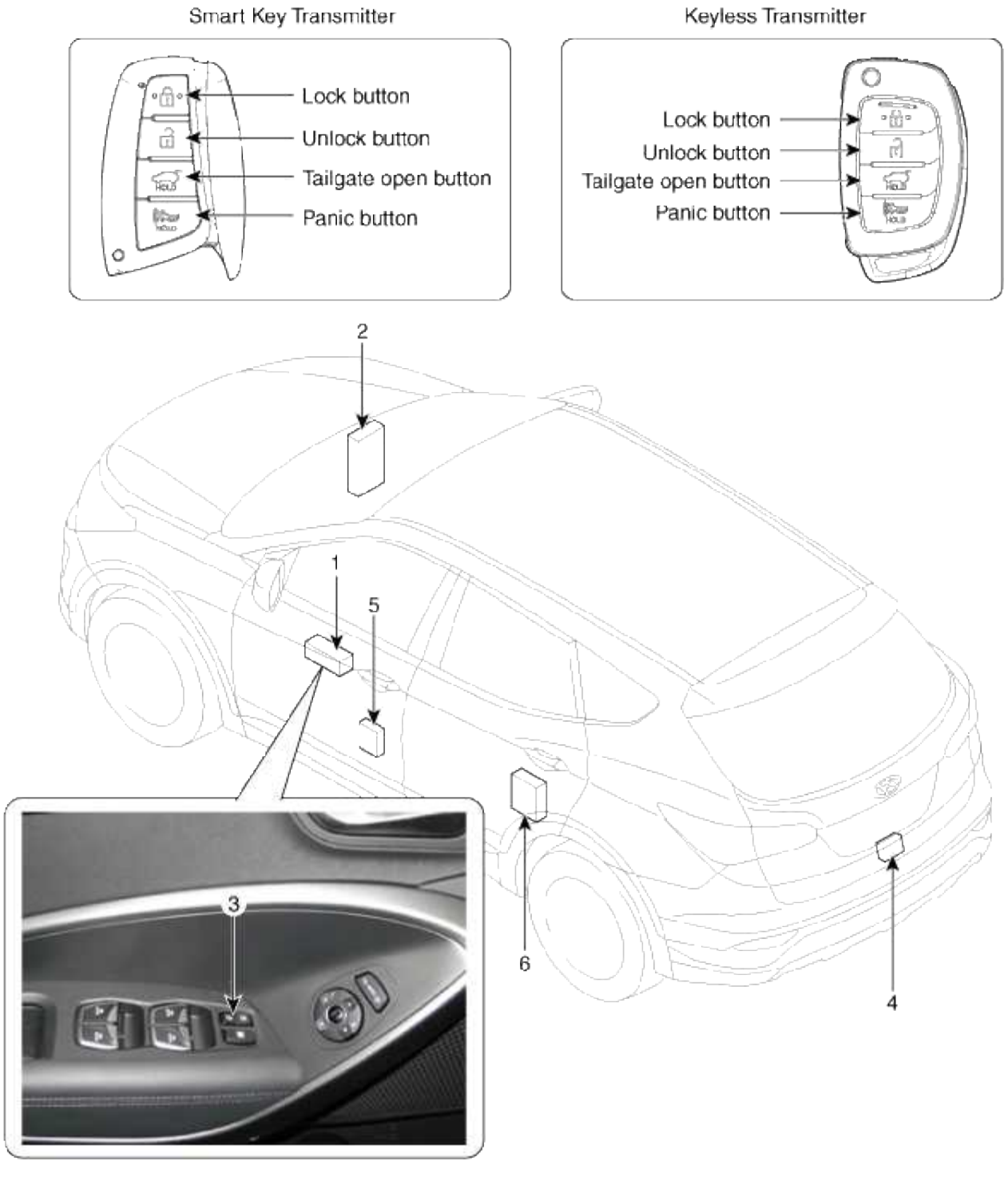
Troubleshooting

Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	CAN line faulty	Check the EMS
	Wiring or ground faulty	Repair if necessary
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Tachometer faulty	Check tachometer
	CAN line faulty	Check the EMS
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Fuel gauge faulty	Check gauge
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Low fuel warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb

	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	CAN line faulty	Check the EMS
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Brake fluid level warning switch faulty	Check switch
	Parking brake switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Open door warning lamp and tailgate warning lamp do not light up	Memory fuse (15A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Seat belt warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Speedometer and odometer does not operate	CAN line faulty	Check the ABS ECU
	Wheel speed sensor faulty	Check the wheel speed sensor

Body Electrical System > Power Door Locks > Components and Components Location

Component Location



1. Driver power window main switch 2. Passenger window switch 3. IPM (Intalligent intergrated Platform Module) 4. Door lock switch	5. Tailgate lock actuator & switch 6. Front door lock actuator & switch 7. Rear door lock actuator & switch

Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

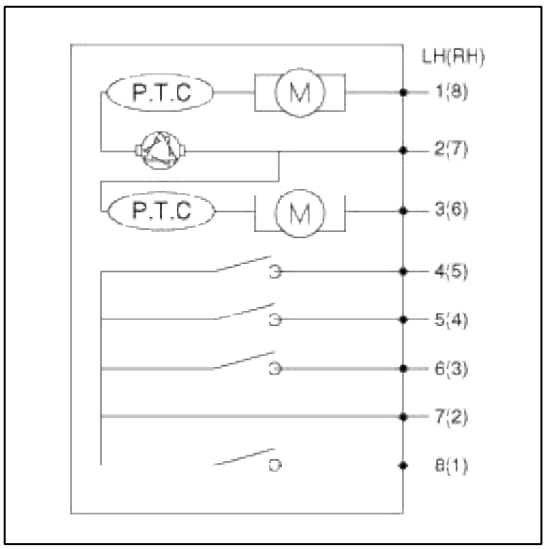
Inspection

Front Door Lock Module Inspection

1. Remove the front door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")
2. Remove the front door module.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Module")
3. Disconnect the connectors from the actuator.



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



Terminal \ Operation		Central Lock	Central Unlock
LH	2	⊕	⊖
	3	⊖	⊕
RH	7	⊖	⊕
	6	⊕	⊖

5. Check for continuity between the terminals in each switch position according to the table.

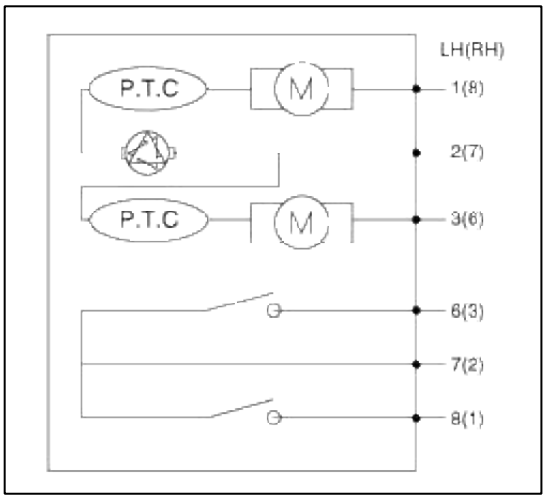
Terminal \ Operation		Central Lock	Central Unlock
LH	6 and 7	ON → OFF	OFF → ON
	4 and 7	Turn key clockwise/ counterclockwise : ON	
		Key return back : OFF	
	5 and 7	Turn key counterclockwise/ clockwise : ON	
		Key return back : OFF	
	7 and 8	Door open & latching : ON	
		Full latching : OFF	

Rear Door Lock Module Inspection

1. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear door module.
   (Refer to Body - "Rear Door Module")
3. Disconnect the connectors from the actuator.



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



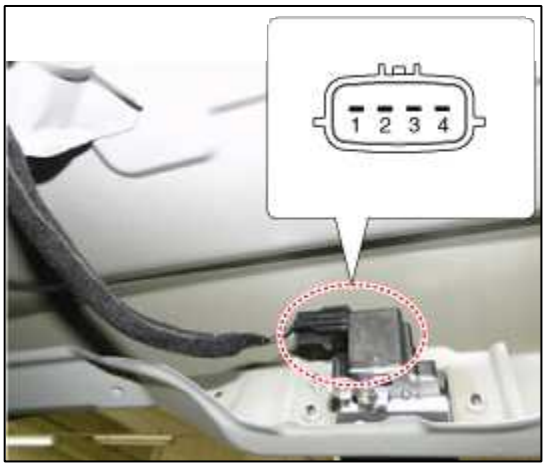
Terminal \ Operation		Central Lock	Central Unlock
LH	2	⊕	⊖
	3	⊖	⊕
RH	7	⊖	⊕
	6	⊕	⊖

5. Check for continuity between the terminals in each switch position according to the table.

Terminal \ Operation		Central Lock	Central Unlock
LH	6 and 7	ON → OFF	OFF → ON
	7 and 8	Door open & latching : ON Full latching : OFF	
RH	2 and 3	ON → OFF	OFF → ON
	1 and 2	Door open & latching : ON Full latching : OFF	

Tailgate Lock Module Inspection

1. Remove the tailgate trim.
   (Refer to Body - "Tailgate Trim")
2. Disconnect the 4P connector from the actuator.



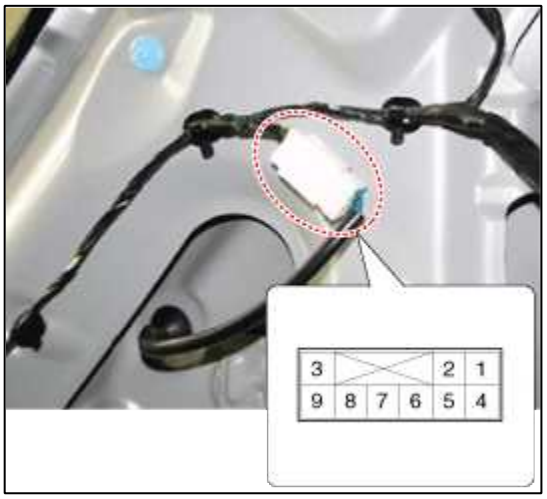
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	3	4
Unlock	⊕	⊖

Tailgate Open Switch

1. Remove the tailgate trim.
   (Refer to Body - "Tailgate Trim")

2. Disconnect the 4P connector from the actuator.

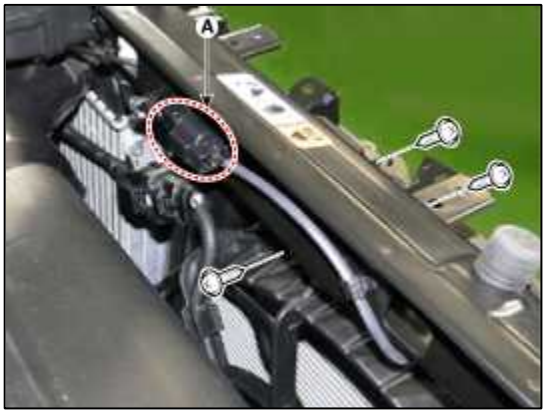


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	8	6
Unlock		
Lock	○	○

Hood Switch

1. Disconnect the connector (A) and bolts from the hood switch.



2. Check for continuity between the terminals and ground according to the table.

Position \ Terminal	1	2
Hood Open(Free)	○	○
Hood Close(Push)		

Burglar Horn

1. Remove the burglar horn after removing a bolt and disconnect the 2P connector from the burglar horn.

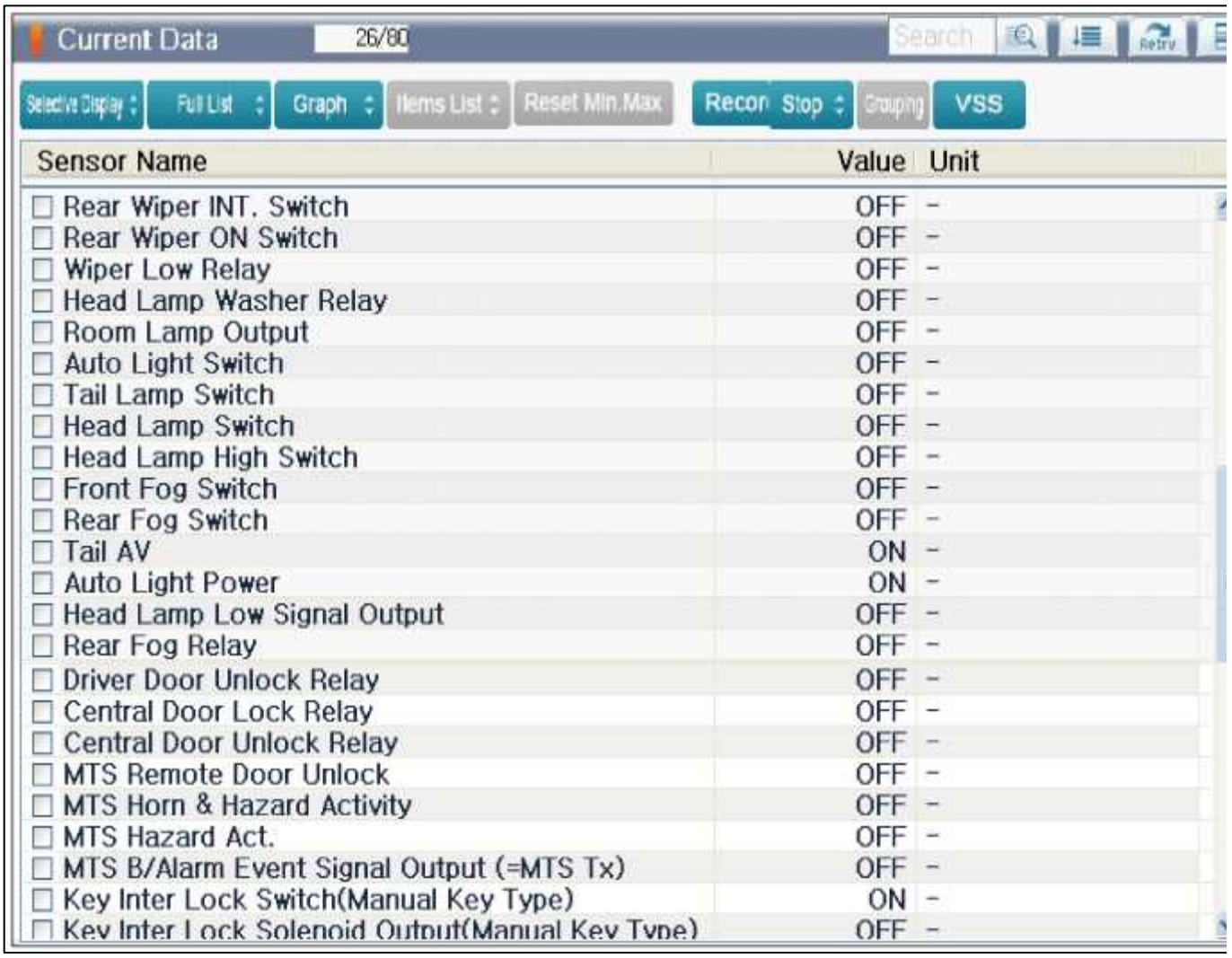


2. Test the burglar horn by connecting battery power to the terminal 1 and ground the terminal 2.
3. The burglar horn should sound. If the burglar horn fails to sound replace it.

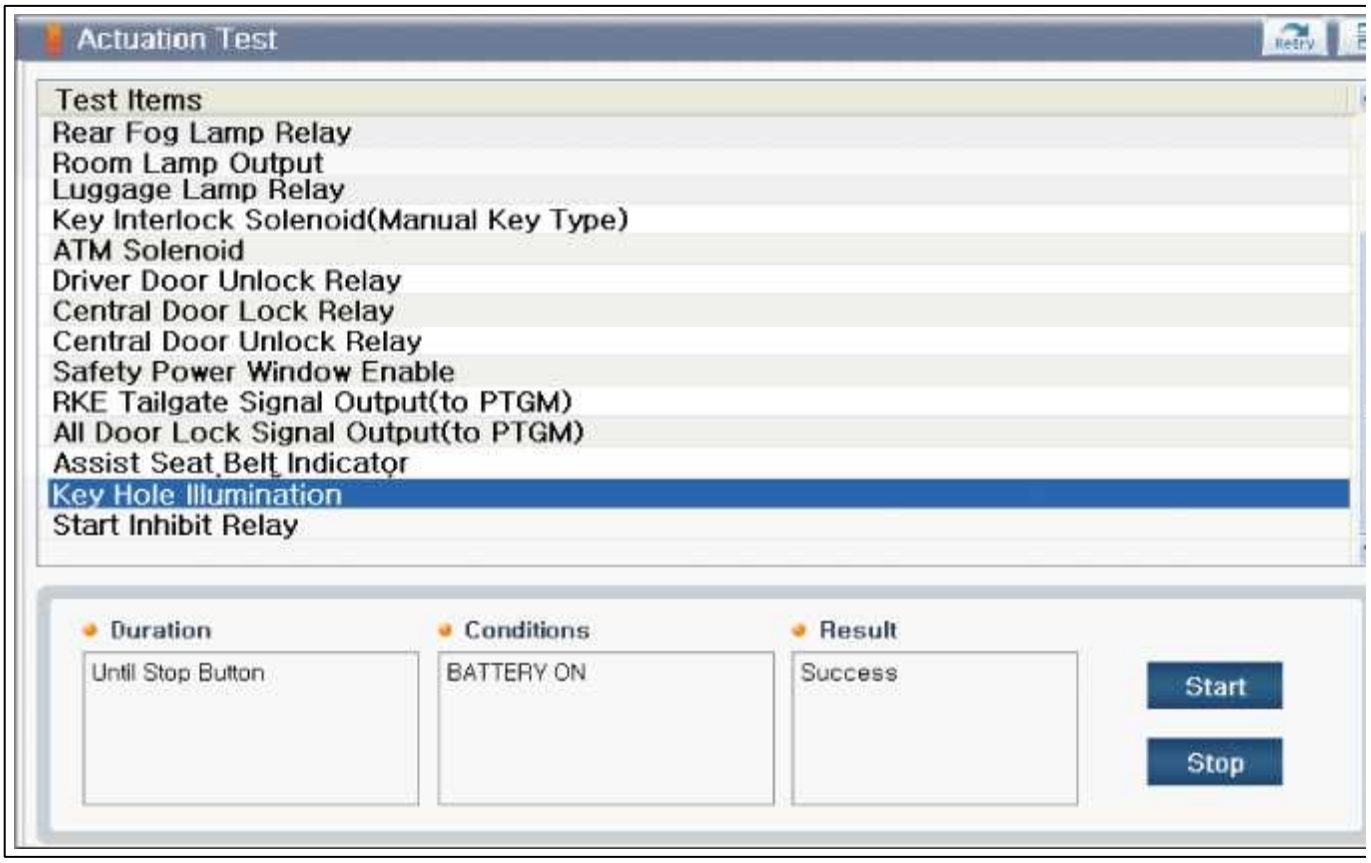
Body Electrical System > Power Door Locks > Power Door Lock Switch > Repair procedures

Diagnosis With GDS

1. The BCM can be diagnosed by using the GDS. The BCM communicates with the GDS which then displays inputs and outputs along with codes.
   It will be able to diagnose defects of power door lock/unlock with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. To diagnose the SJB function, select the vehicle model, BCM and DDM.
3. Select "Input/output monitoring", if you will check current data of power door lock system. It provides input/outpu status of DDM.



4. To perform functional test on SJB outputs, select "Actuation Test".



Removal

Driver Power Window Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Remove the power window bezzel assembl (A) after loosening the mounting screws (12EA).



4. Remove the power window switch assembly (A) after loosening the mounting screws (6EA).



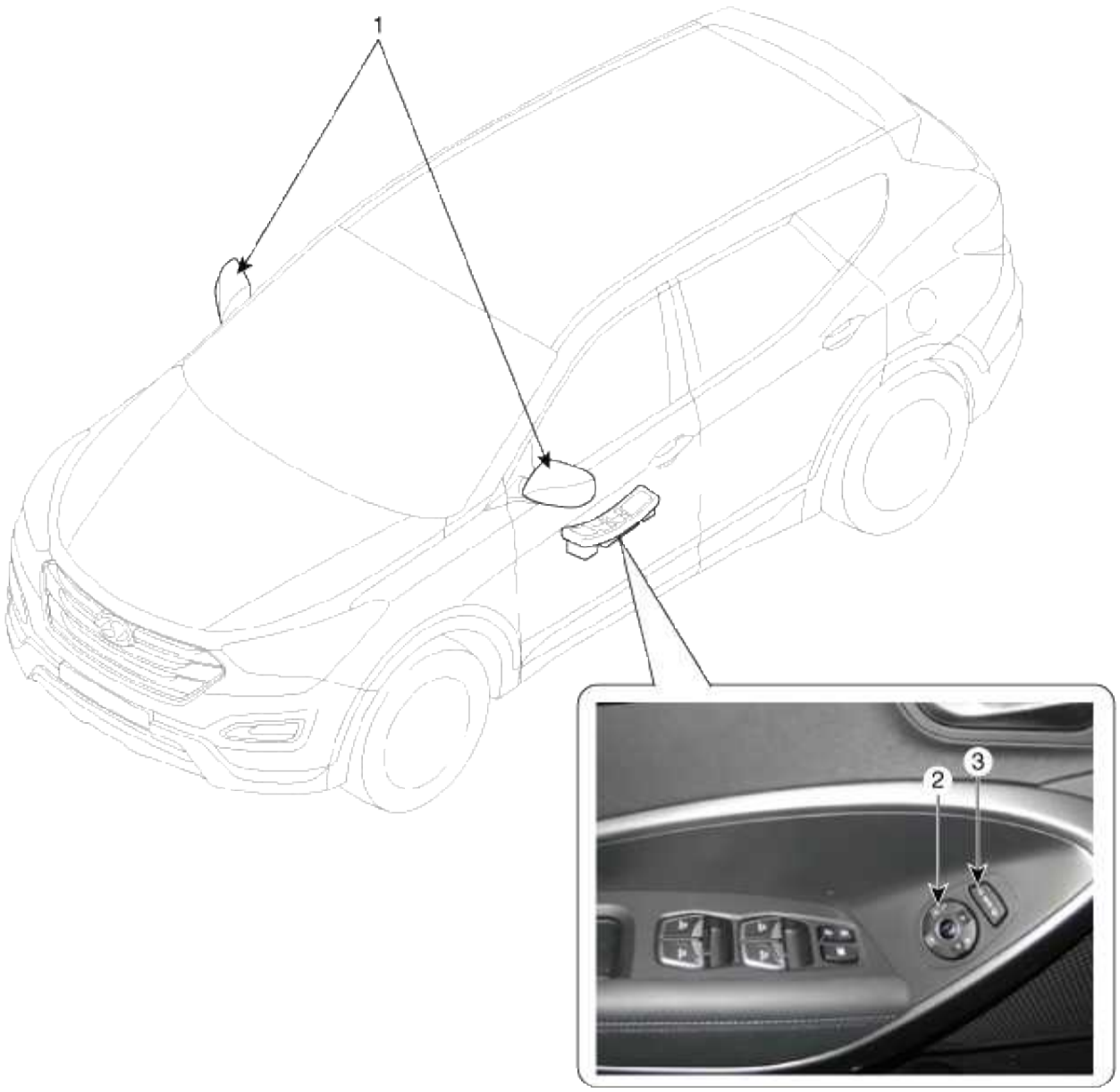
Installation

Driver Power Window Switch

1. Install the power window switch assembly.
2. Install the front door trim after connect the connector.

Body Electrical System > Power Door Mirrors > Components and Components Location

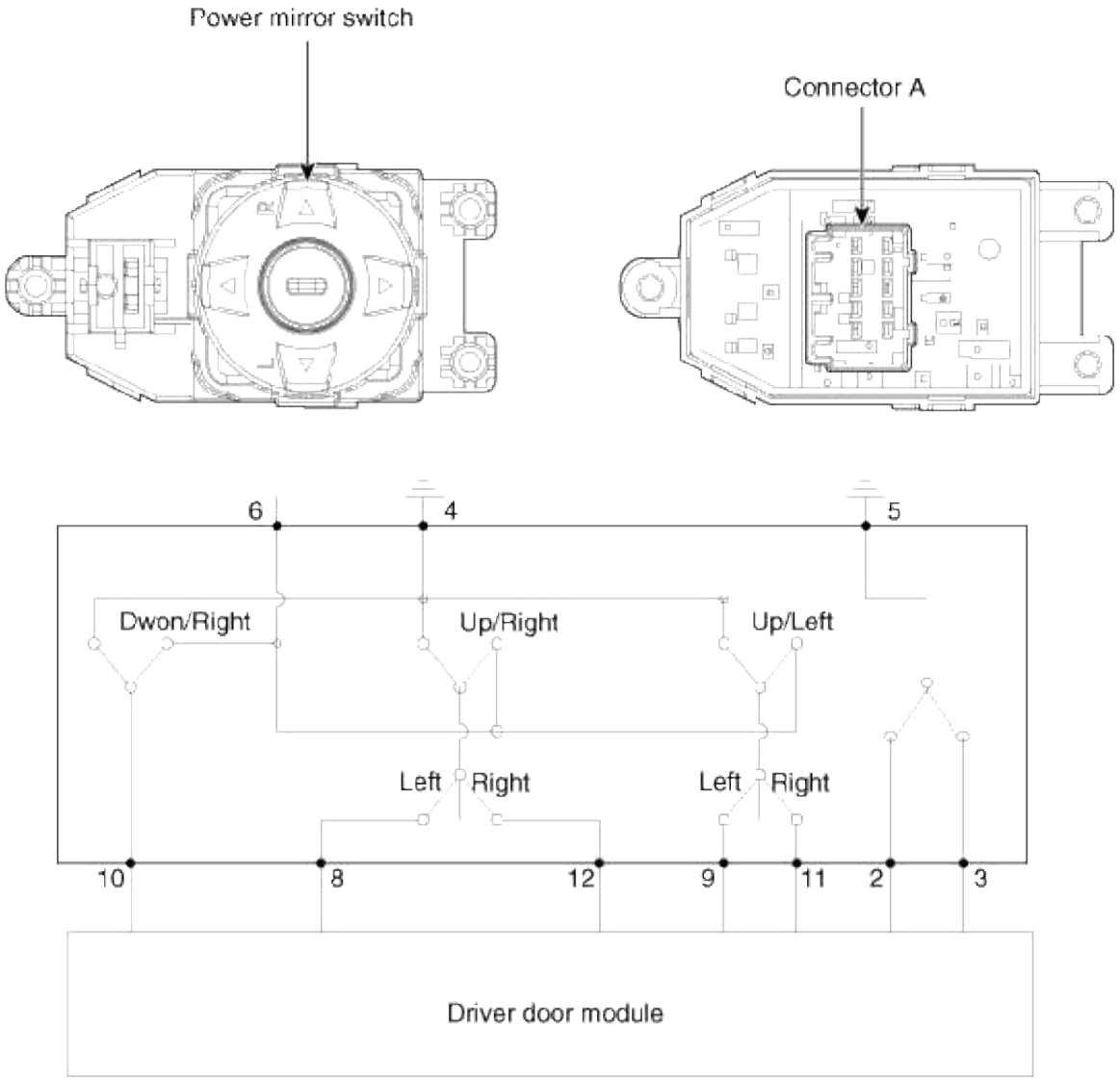
Component Location

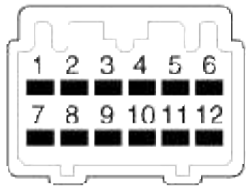


1. Power door mirror 2. Power door mirror switch	3. Power folding mirror switch

Body Electrical System > Power Door Mirrors > Power Door Mirror Switch > Schematic Diagrams

Circuit Diagram



Connector A	No.	Description	No.	Description
	1	-	7	-
	2	-	8	Driver mirror vertical motor
	3	-	9	Driver mirror horizontal motor
	4	Ground	10	Common
	5	Ground	11	Assist mirror horizontal motor
	6	ACC +	12	Assist mirror vertical motor

Body Electrical System > Power Door Mirrors > Power Door Mirror Switch > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front left door trim.
   (Refer to Body - "Front Door Trim")

3. Remove the power mirror switch (A) from the door trim.



Installation

1. Install the power mirror switch.
2. Install the front door trim after connecting the connector.
3. Connect the negative (-) battery terminal.

Inspection

1. Remove the front left door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")
2. Remove the power mirror switch (A) from the door trim.



3. Check for continuity between the terminals in each switch position according to the table.

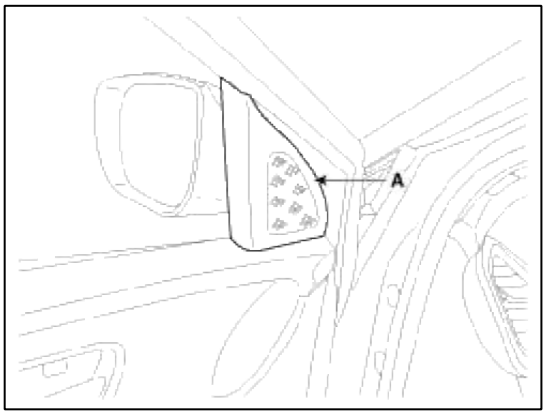
[Power Mirror Switch]

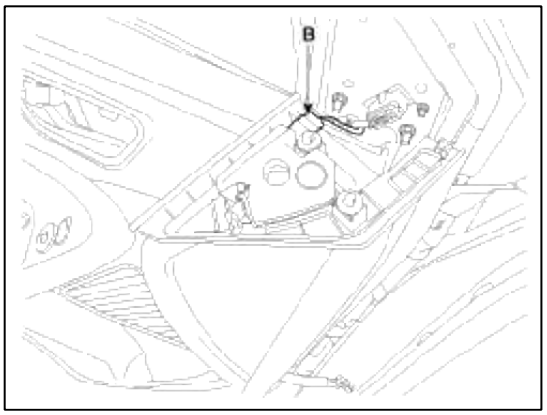
Position \ Terminal		6	5	8	9	10	11	12
Left	Up		○			○		
		○		○	○			
	Down		○	○	○			
		○				○		
	Off		○	○	○	○		
	Left		○	○		○		
		○			○			
	Right		○		○			
		○		○		○		
Right	Up		○			○		
		○					○	○
	Down		○				○	○
		○				○		
	Off		○			○	○	○
	Left	○					○	
			○			○		○
	Right		○			○		○
		○					○	

Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

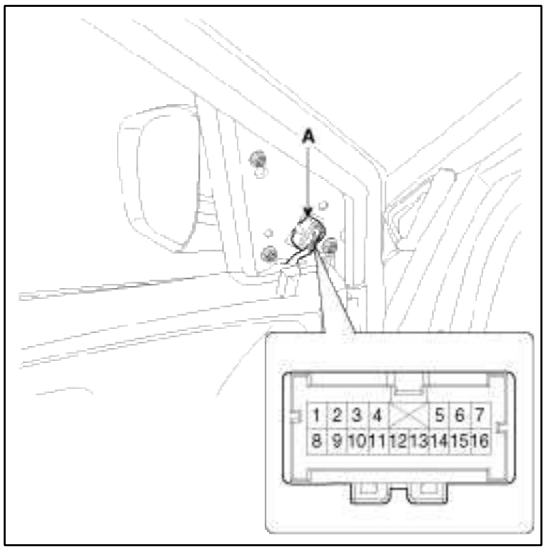
Inspection

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector (B) after removing the front door quadrant cover (A).



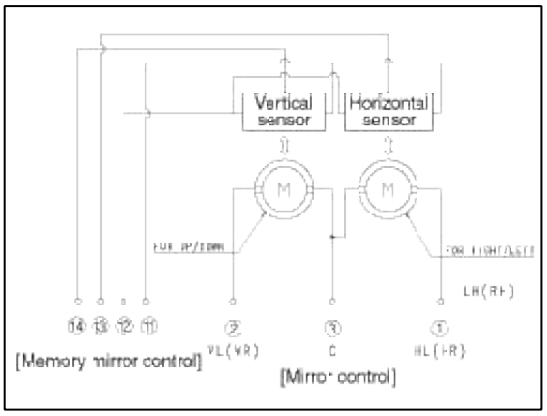


3. Disconnect the power door mirror connector (A) from the harness.



4. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.

[Actuator]



Position \ Terminal		1	2	3	B+	E
Left	Up		○	○	○	○
	Down		○	○	○	○
	Right	○		○	○	○
	Left	○		○	○	○
Right	Up		○	○	○	○
	Down		○	○	○	○
	Right	○		○	○	○
	Up	○		○	○	○

Mirror Heater

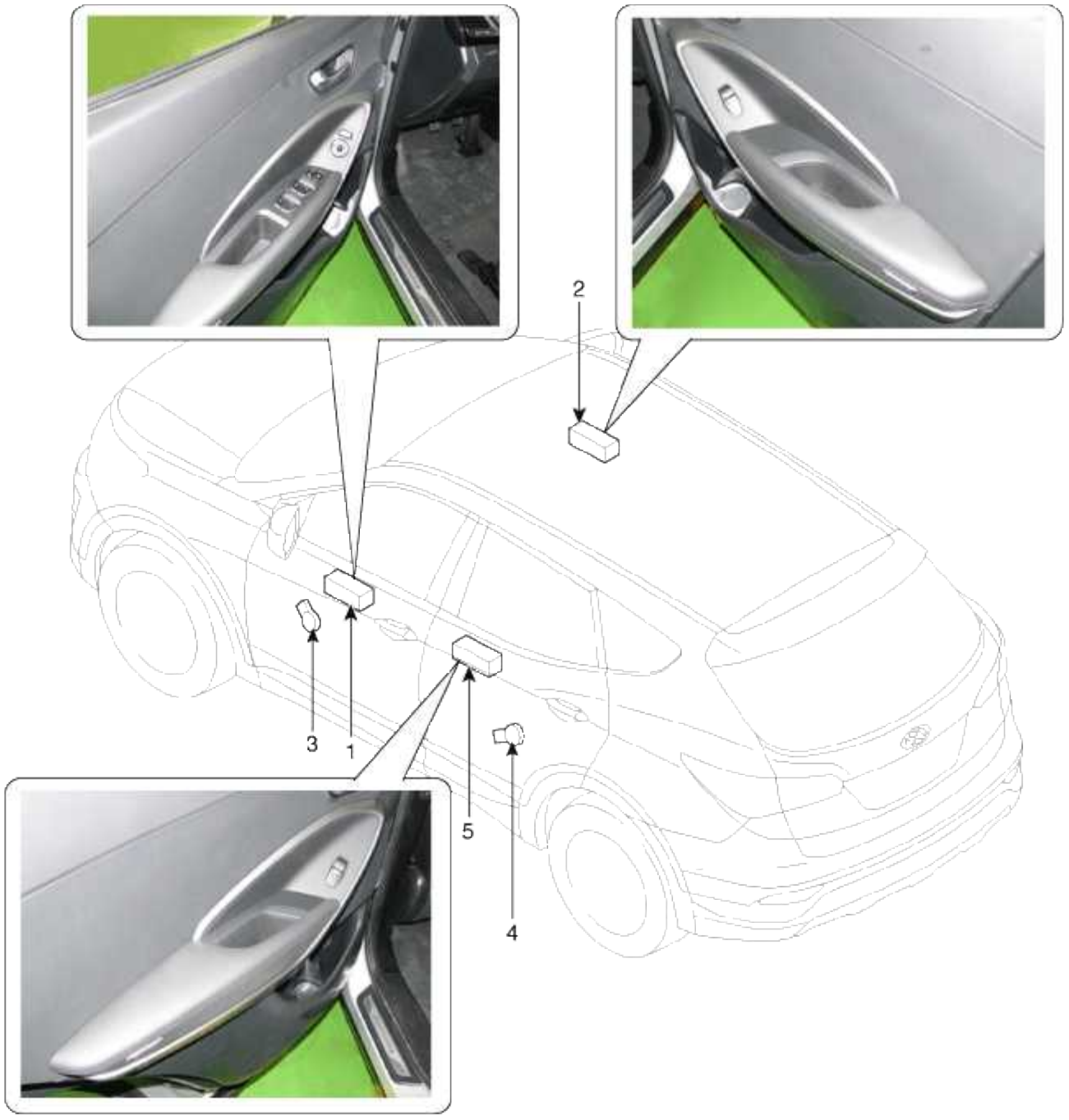
Position \ Terminal	4	5
Heater	○	○

Turn Signal Lamp

Position \ Terminal	5	8
Side repeater	○	○

Body Electrical System > Power Windows > Components and Components Location

Component Location



1. DDM (Driver door module) 2. ADM (Assistant door module) 3. Front window motor	4. Rear window motor 5. Rear window switch

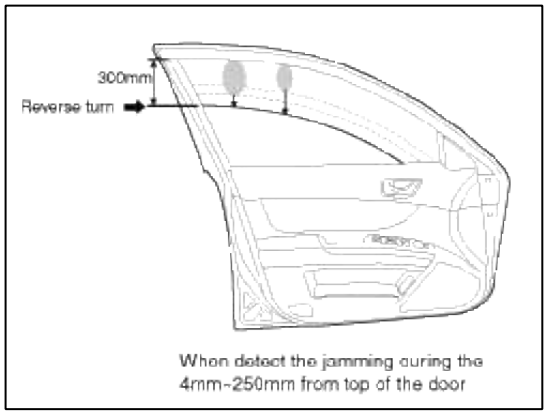
Body Electrical System > Power Windows > Description and Operation

Function Of Safety Power Window

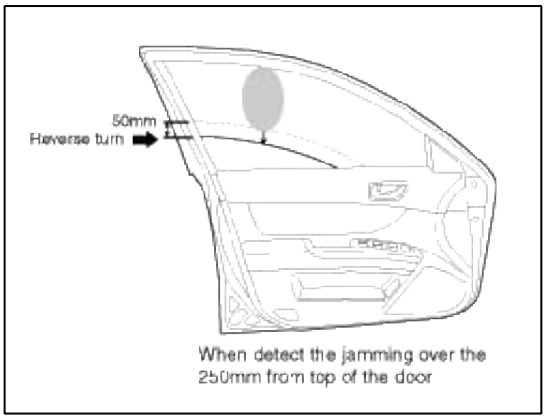
Body Electrical System.

When driver door power window auto-up switch is operated, safety function is activated.

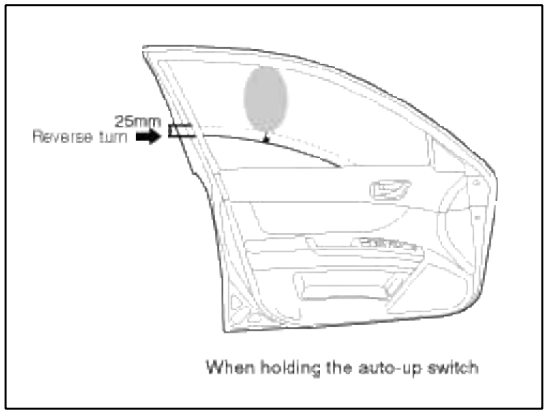
1. Safety function condition
   When detect the force of 100N (using the 10N/mm spring) during the window rising, window is reversed.
2. Length of window reversing (except holding the auto-up switch)
   A. When detect the jamming during the 4mm ~ 250mm from top of the door.
      → Window is reversed until 300mm from top of the door.



   B. When detect the jamming over the 250mm from top of the door.
      → Window is reversed until 20mm from jamming position.



3. Length of window reversing (holding the auto-up switch)
   A. When detect the jamming during holding the auto-up switch.
      → Window is reverse until 25mm from jamming position.
   B. Auto-up function is not available during the 5 seconds from above condition.
      → When holding the auto-up switch, window is operated as a manual-up function. (Safety function is not activated.)
   C. When holding the auto-up switch after 5 seconds from above condition.
      → Window is reverse until 25mm from jamming position.



4. Safety function is not available area
   Safety function is not available during the 4mm from top of the door.

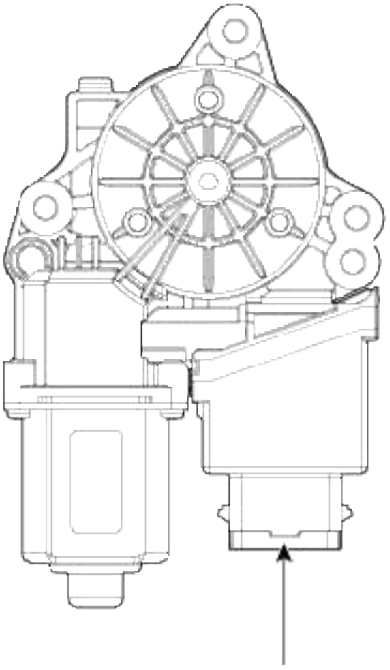
Initializing Method Of The Safety Power Window

1. Initializing of Battery Connection
   When the battery power is removed for over 5 minutes, safety power window switch need the initializing.
   (1) Power window operation before initializing
      A. Manual-Up/Down function is available
      B. Auto-Up function is not available
         (When holding the auto-up/down switch, window is operated as a manual-up/down.)
   (2) Initializing method
      Close the window in window open position, and holding the switch in window full close position over the 0.2 second.
      (If start the closing the window in window full close position, initializing could be failed.)
   (3) If initialize the safety power window in jamming status, could occur below conditions.
      A. Safety function is not available
2. Initializing of fail safe mode
   (1) If the window moved by compulsion and motor have a problem, power window switch could be entering the fail safe mode for user's safety.
   (2) Power window operation in fail mode
      A. Auto/Manual-Down function is available
      B. Auto/Manual-Up function is not available
         (When auto/manual-up is operated, window is rising 20mm and is stopped the moving.)

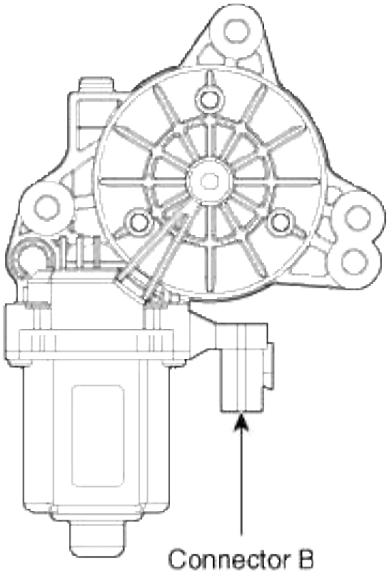
Body Electrical System > Power Windows > Power Window Motor > Components and Components Location

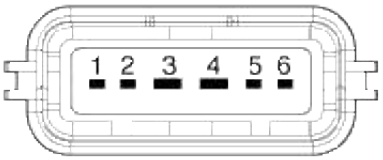
Components

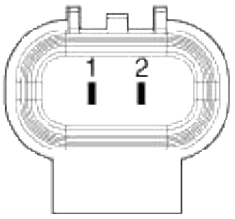
[Safety window motor]



[General window motor]



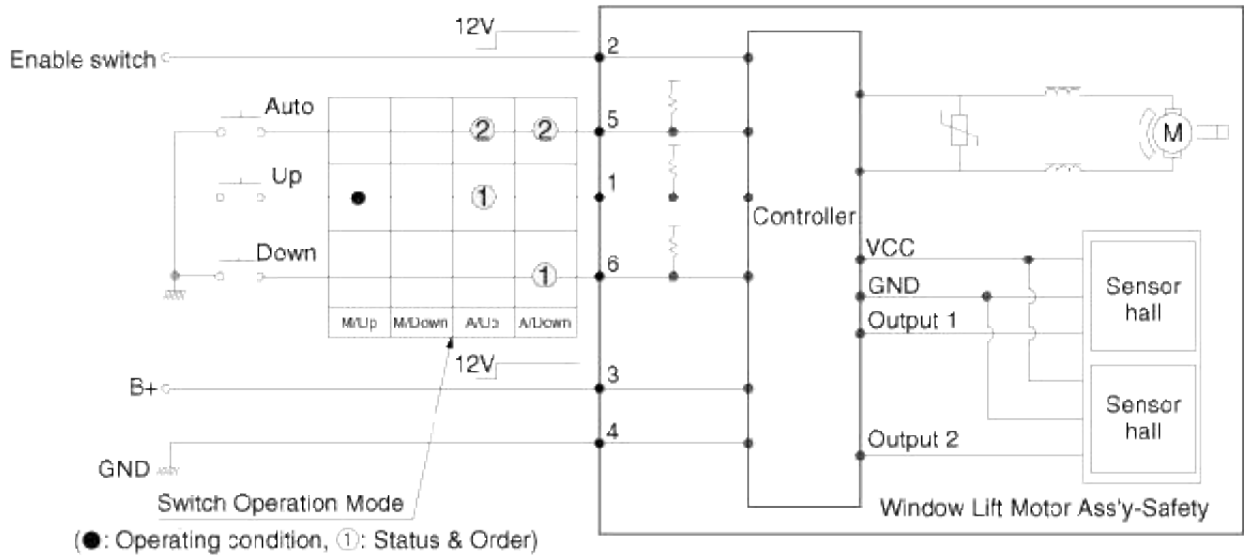
Connector A		
		
No.	**Description**	
1	Up	
2	Enable	
3	Battery +	
4	Ground	
5	Auto	
6	Down	

Connector B	
	
No.	**Description**
1	Battery +
2	Ground

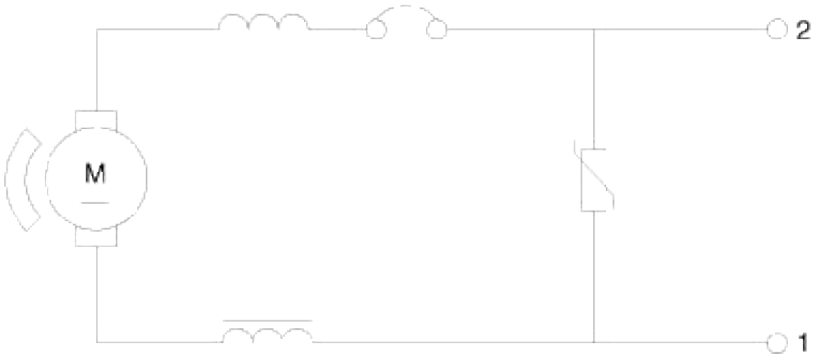
Body Electrical System > Power Windows > Power Window Motor > Schematic Diagrams

Circuit Diagram

[Safety]



[Standard]



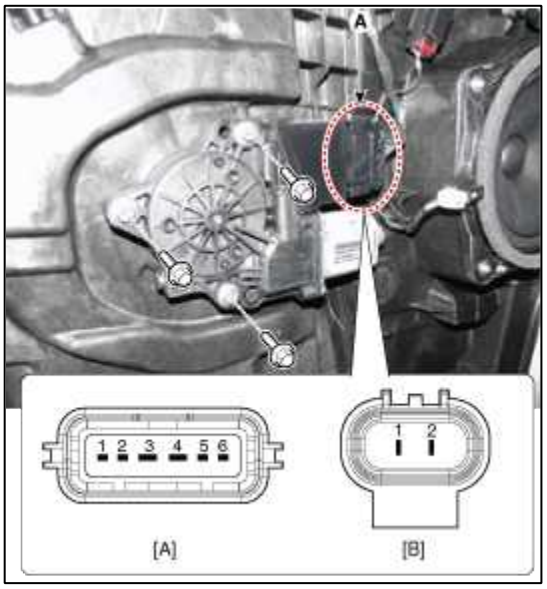
Body Electrical System > Power Windows > Power Window Motor > Repair procedures

Inspection

Front Power Window Motor

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")

3. Disconnect the connector (A) from the motor.
   (A : Safety, B : Standard)



4. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

Position \ Terminal			1	2
Left	Up	Clockwise	⊕	⊖
	Down	Counter-clockwise	⊖	⊕
Right	Up	Counter-clockwise	⊕	⊖
	Down	Clockwise	⊖	⊕

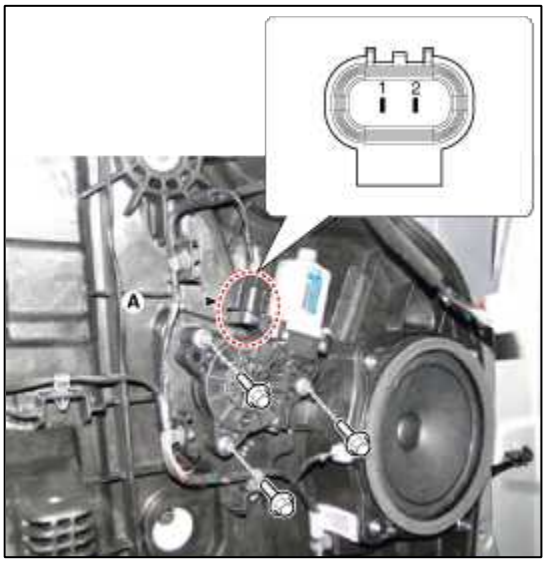
5. Connect the terminal No. 2 and No. 3 to battery voltage (12V) and check that the motor operates smoothly when connecting the terminals below.

Position \ Terminal			1	4(GND)	6
Left	Up	Clockwise	○—○		
	Down	Counter-clockwise		○—○	
Right	Up	Counter-clockwise	○—○		
	Down	Clockwise		○—○	

Rear Power Window Motor

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")

3. Disconnect the connector (A) from the motor.



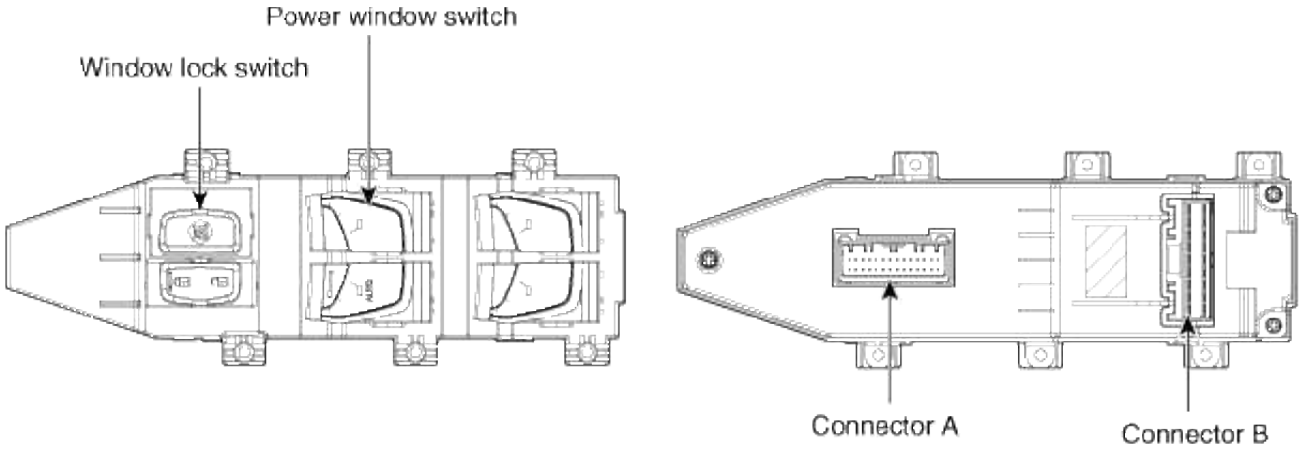
4. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

Position		Terminal	1	2
Left	Up	Clockwise	⊕	⊖
	Down	Counter-clockwise	⊖	⊕
Right	Up	Counter-clockwise	⊕	⊖
	Down	Clockwise	⊖	⊕

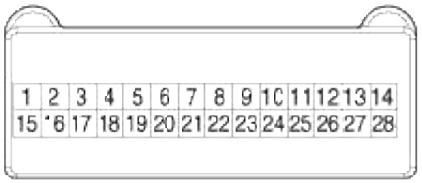
Body Electrical System > Power Windows > Power Window Switch > Components and Components Location

Components

Driver Power Window Switch

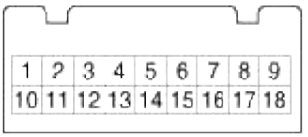


Connector A



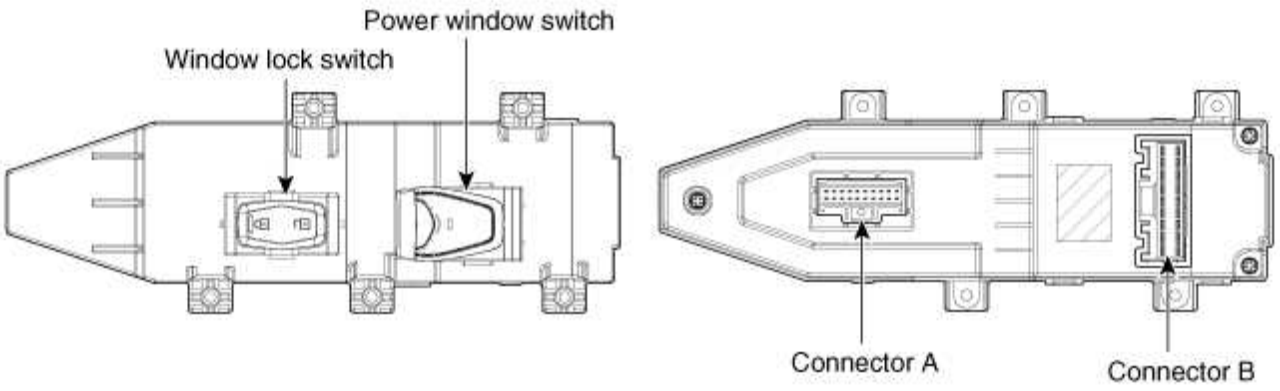
No.	Description	No.	Description
1	Safety enable	15	Tail +
2	Assist mirror horizontal switch	16	IMS switch 2
3	Assist mirror vertical switch	17	IMS switch 1
4	Mirror common	18	IMS SET
5	Driver mirror horizontal switch	19	Front left door oper switch
6	Driver mirror vertical switch	20	Front left door key lock switch
7	Fold	21	Front left door key unlock switch
8	Unfold	22	Front left door unlock monitoring switch
9	Mirror sensor 5V (+)	23	Safety down
10	Mirror horizontal sensor	24	Safety auto
11	Mirror vertical sensor	25	Rear left window auto
12	CAN High	26	Rear left Window down
13	CAN Low	27	Rear left window up
14	Safety up	28	Rear left window lock

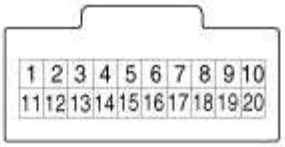
Connector B

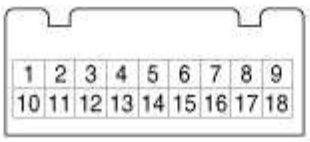


No.	Description
1	Signal ground 1
2	Driver mirror vertical motor
3	Battery + (Micro)
4	IGN (Back up)
5	Door courtesy lamp
6	Pocket lamp output
7	Mirror heater
8	Mirror common (motor)
9	Assist mirror horizontal motor
10	Mirror sensor ground (-)
11	Front left motor up
12	Front left motor down
13	Battery + (Power)
14	-
15	Unfold motor
16	Power ground 1
17	Fold motor
18	Battery + (Mirror)

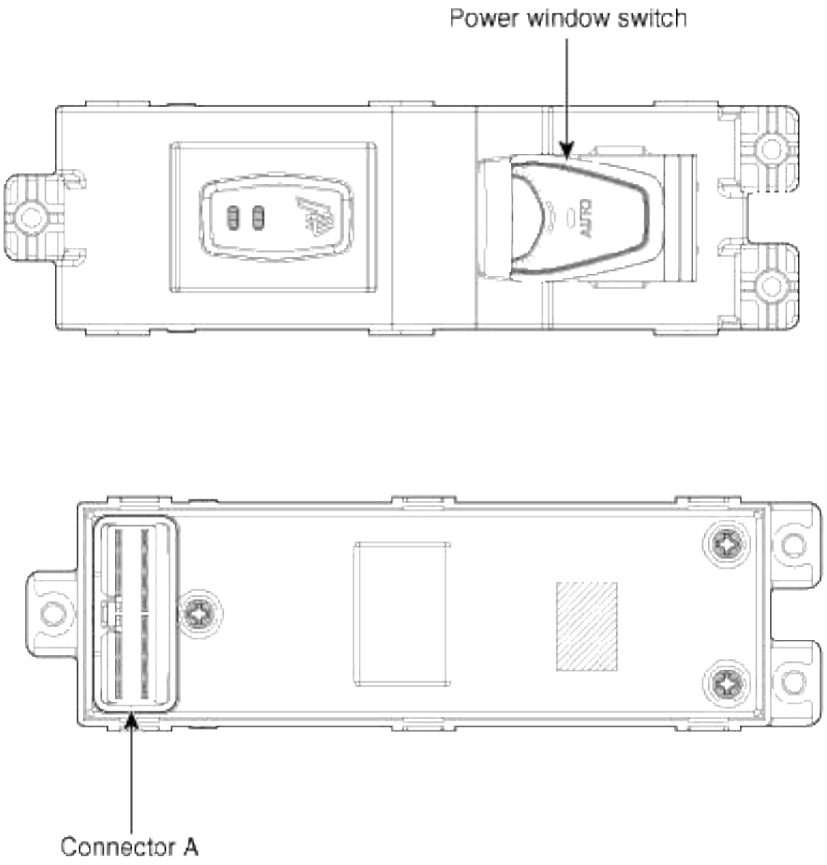
Assist Power Window Switch

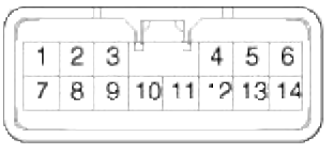


Connector A	
	
No.	**Description**
1	Safety up
2	Safety down
3	Safety auto
4	Rear right window lock
5	Rear right window up
6	Rear right window down
7	Rear right window auto
8	Front right door unlock monitoring switch
9	Front right door key unlock switch
10	Front right door key lock switch
11	CAN Low
12	CAN High
13	Mirror sensor vertical
14	Mirror sensor horizontal
15	-
16	Mirror sensor 5V (+)
17	Safety enable
18	-
19	-
20	Front right door open switch

Connector B	
	
No.	**Description**
1	Signal ground 1
2	Assist mirror vertical motor
3	Battery + (Micro)
4	IGN (Back up)
5	Door courtesy lamp
6	Pocket lamp output
7	Mirror heater
8	Mirror common (motor)
9	Assist mirror horizontal motor
10	Mirror sensor ground (-)
11	Front right motor up
12	Front right motor down
13	Battery + (Power)
14	-
15	Unfold motor
16	Power ground 1
17	Fold motor
18	Battery + (Mirror)

Rear Power Window Switch

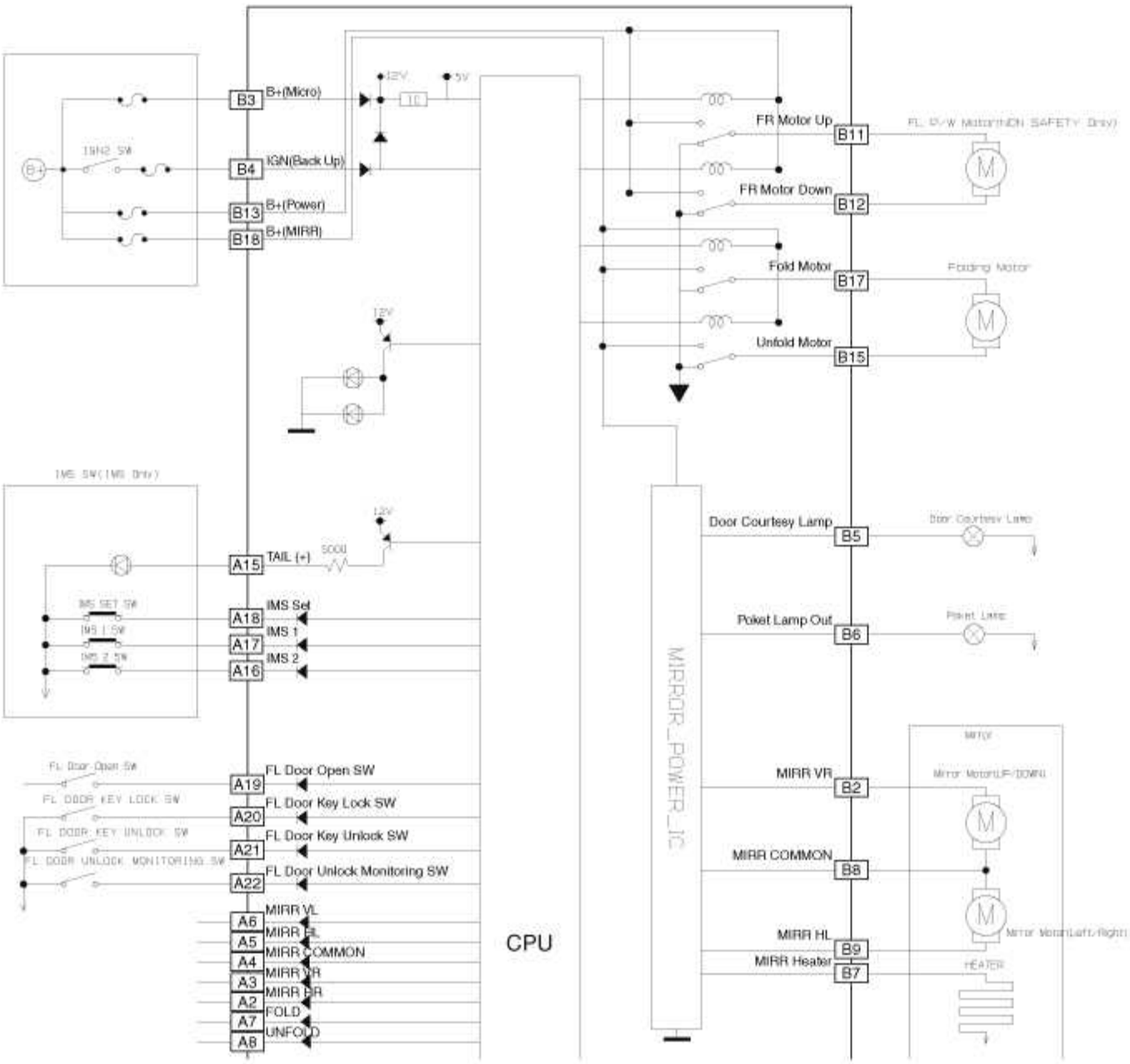


Connector A	No.	Description	No.	Description
	1	Window lock	8	Left battery + (Right battery +)
	2	-	9	Up output
	3	Heater indicator high	10	Seat warmer mood
	4	Heater indicator low	11	Battery +
	5	-	12	Down output
	6	Tail +	13	Ground
	7	Up	14	Down

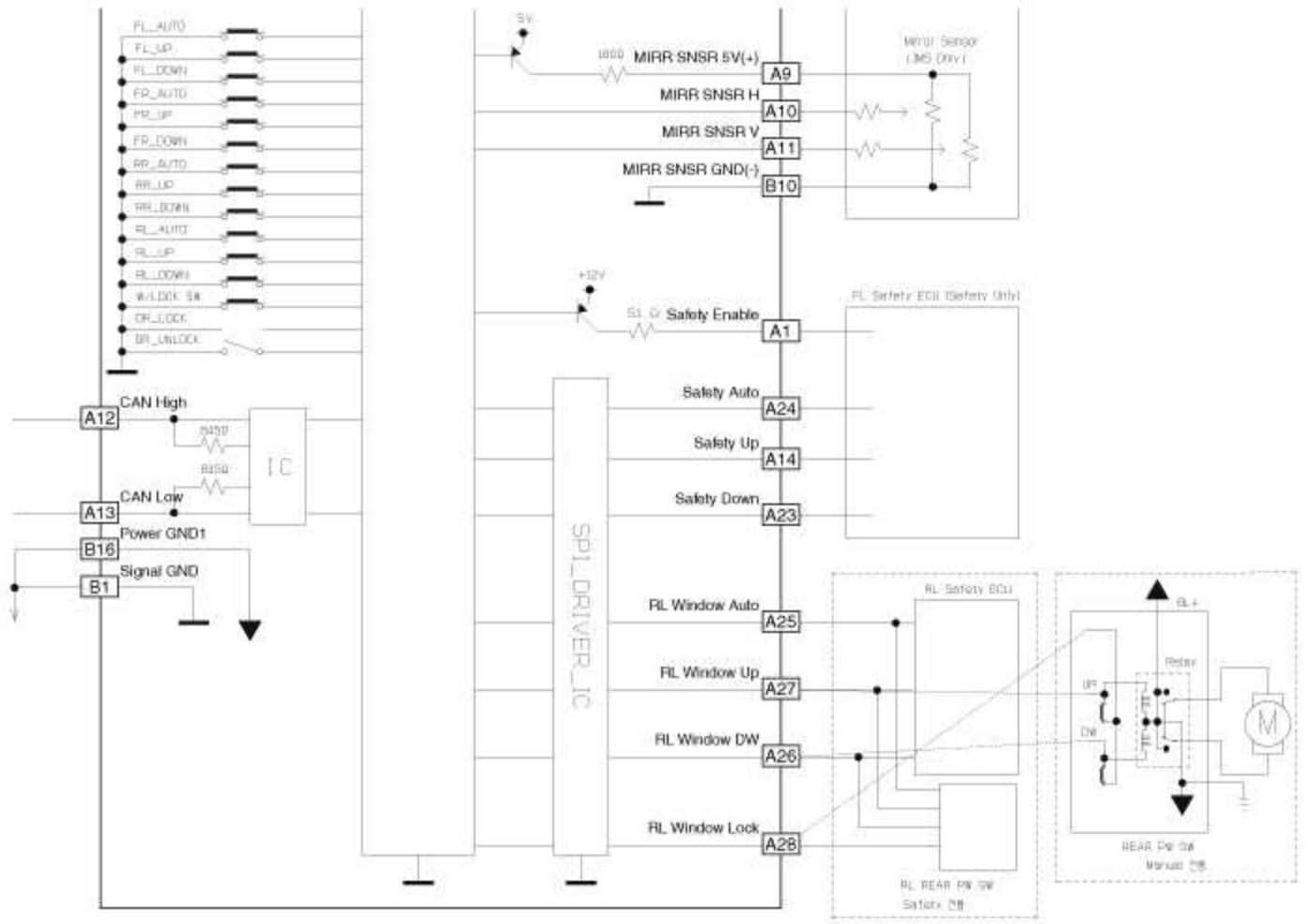
Body Electrical System > Power Windows > Power Window Switch > Schematic Diagrams

Circuit Diagram

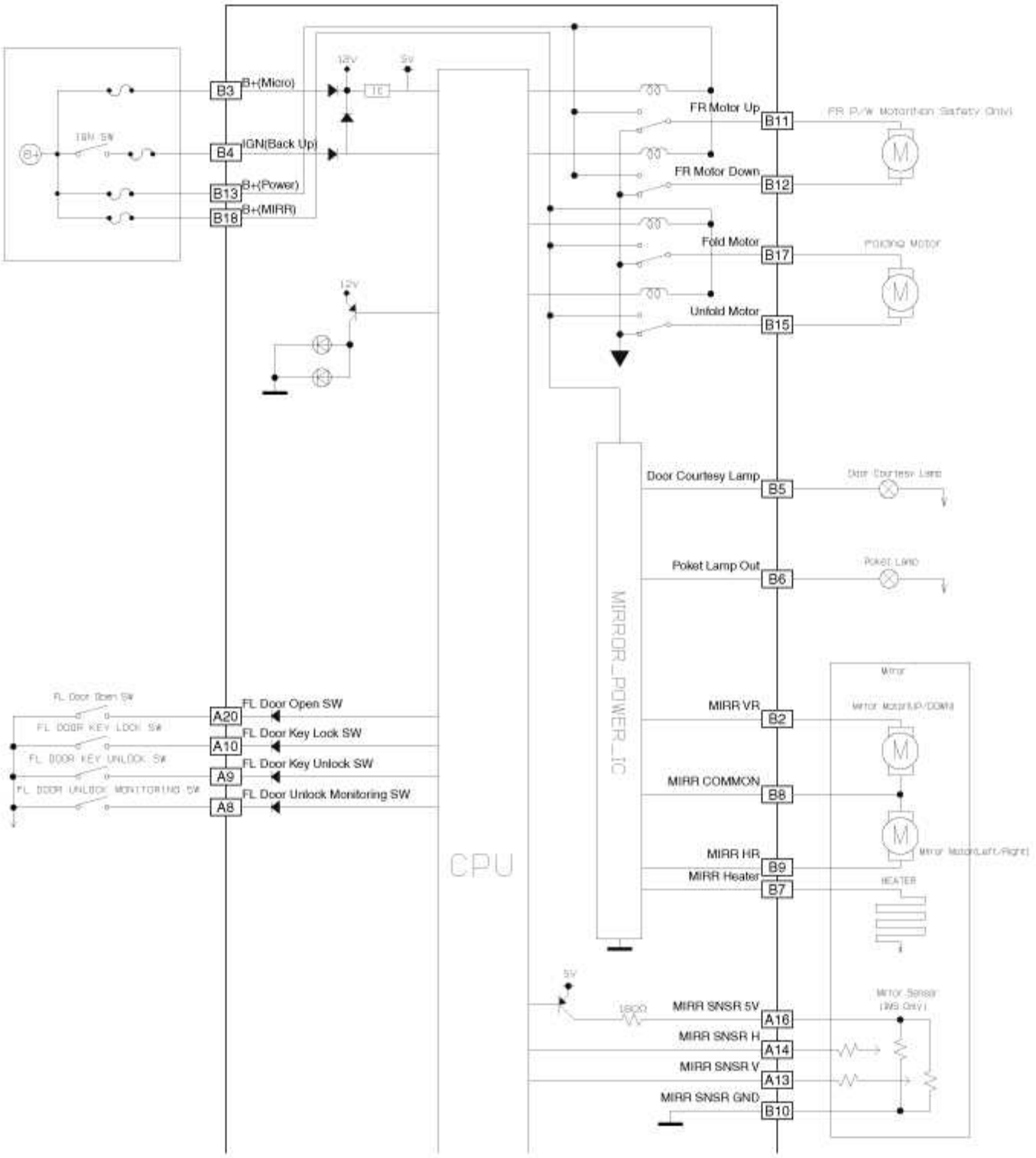
Driver Power Window Switch

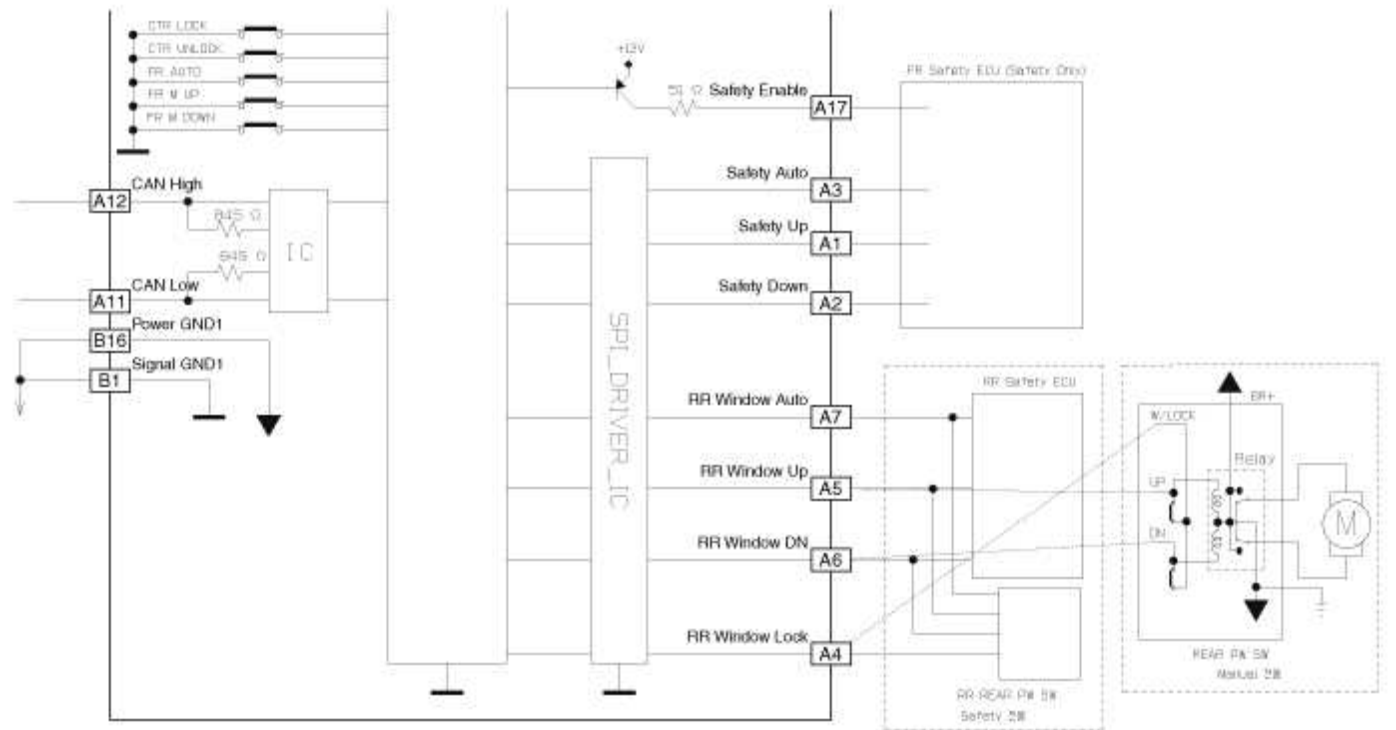


Body Electrical System.

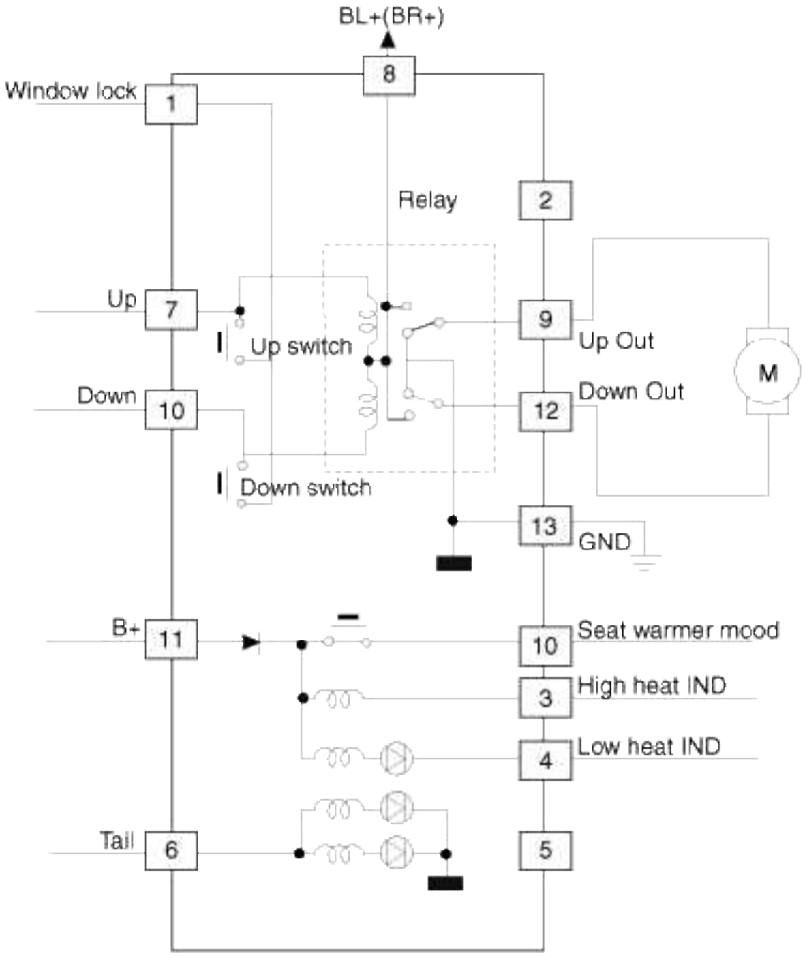


Assist Power Window Switch


B3
B+(Micro)
12V
5V
IC
IGN SW
B+
B4
IGN(Back Up)
B13
B+(Power)
B18
B+(MIRR)
FR Motor Up
B11
FR P/W Motor(non Safety Only)
FR Motor Down
B12
Fold Motor
B17
Folding Motor
Unfold Motor
B15
Door Courtesy Lamp
B5
Door Courtesy Lamp
Poket Lamp Out
B6
Poket Lamp
MIRROR_POWER_IC
Mirror
MIRR VR
B2
Mirror Motor(UP/DOWN)
MIRR COMMON
B8
MIRR HR
B9
Mirror Motor(Left/Right)
MIRR Heater
B7
HEATER
FL Door Open SW
A20
FL Door Key Lock SW
A10
FL Door Key Unlock SW
A9
FL Door Unlock Monitoring SW
A8
CPU
MIRR SNSR 5V
A16
Mirror Sensor (IMS Only)
MIRR SNSR H
A14
MIRR SNSR V
A13
MIRR SNSR GND
B10



Rear Power Window Switch



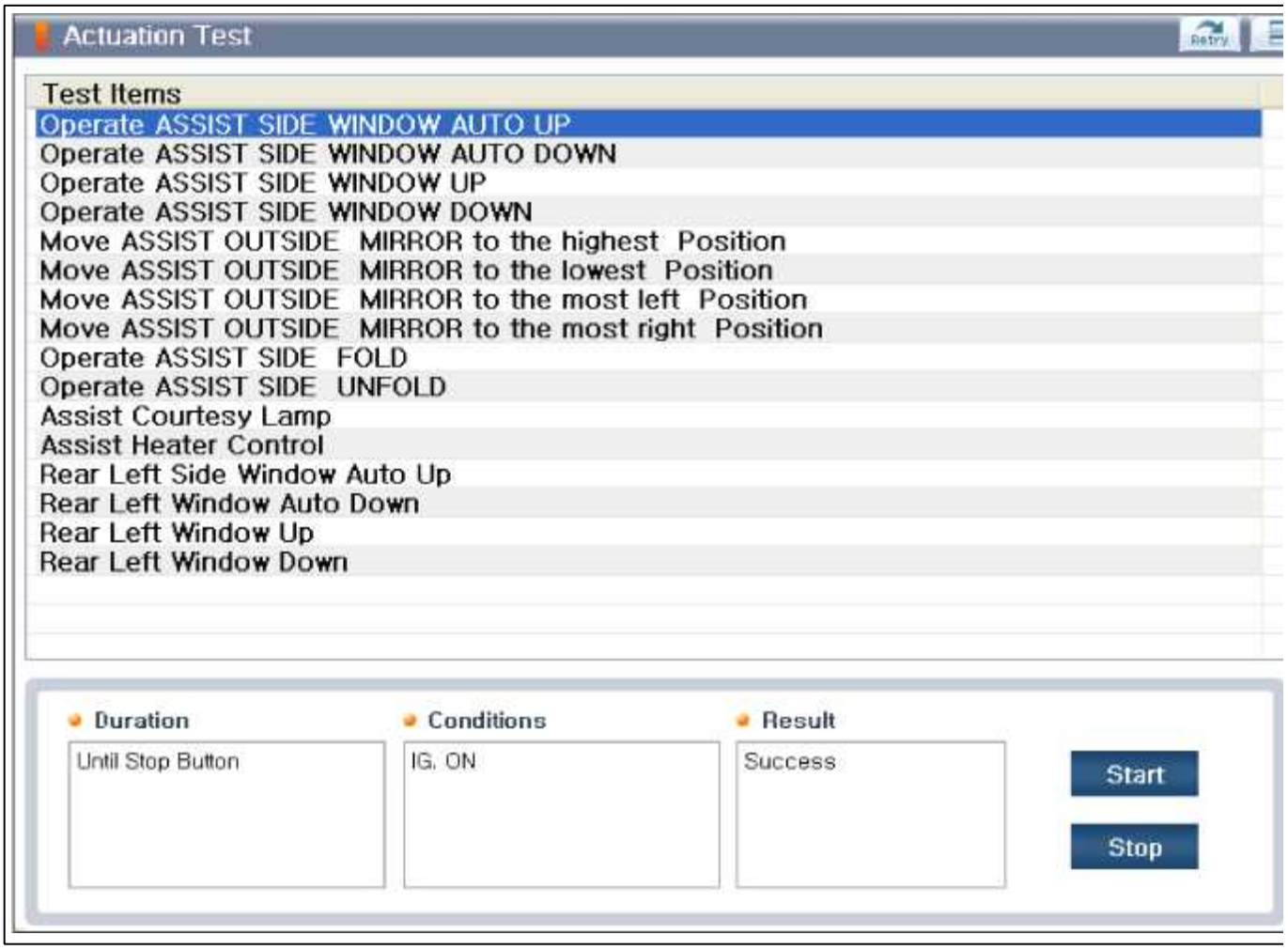
Body Electrical System > Power Windows > Power Window Switch > Repair procedures

Diagnosis With GDS

1. The BCM can be diagnosed by using the GDS. The BCM communicates with the GDS which then displays inputs and outputs along with codes.
   It will be able to diagnose defects of power door lock/unlock with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. To diagnose the SJB function, select the vehicle model, BCM and DDM/ADM.
3. Select "Input/output monitoring", if you will check current data of power door lock system. It provides input/outpu status of DDM/ADM.



4. To perform functional test on SJB outputs, select "Actuation Test".



Removal

Driver Power Window Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")
3. Remove the power window bezzel assembl (A) after loosening the mounting screws (12EA).



4. Remove the power window switch assembly (A) after loosening the mounting screws (6EA).



Assist Power Window Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")
3. Remove the power window switch assembly (A) after loosening the mounting screws (5EA).

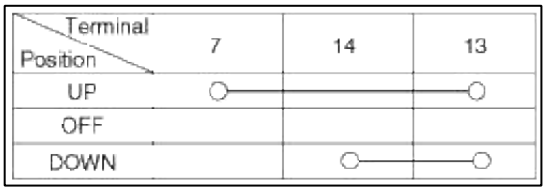


Rear Power Window Swtich

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Rear Door Trim")
3. Remove the power window switch assembly (A) after loosening the mounting screws (3EA).



4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.



Installation

Driver Power Window Switch

1. Install the power window switch assembly.
2. Install the front door trim after connect the connector.

Assist Power Window Switch

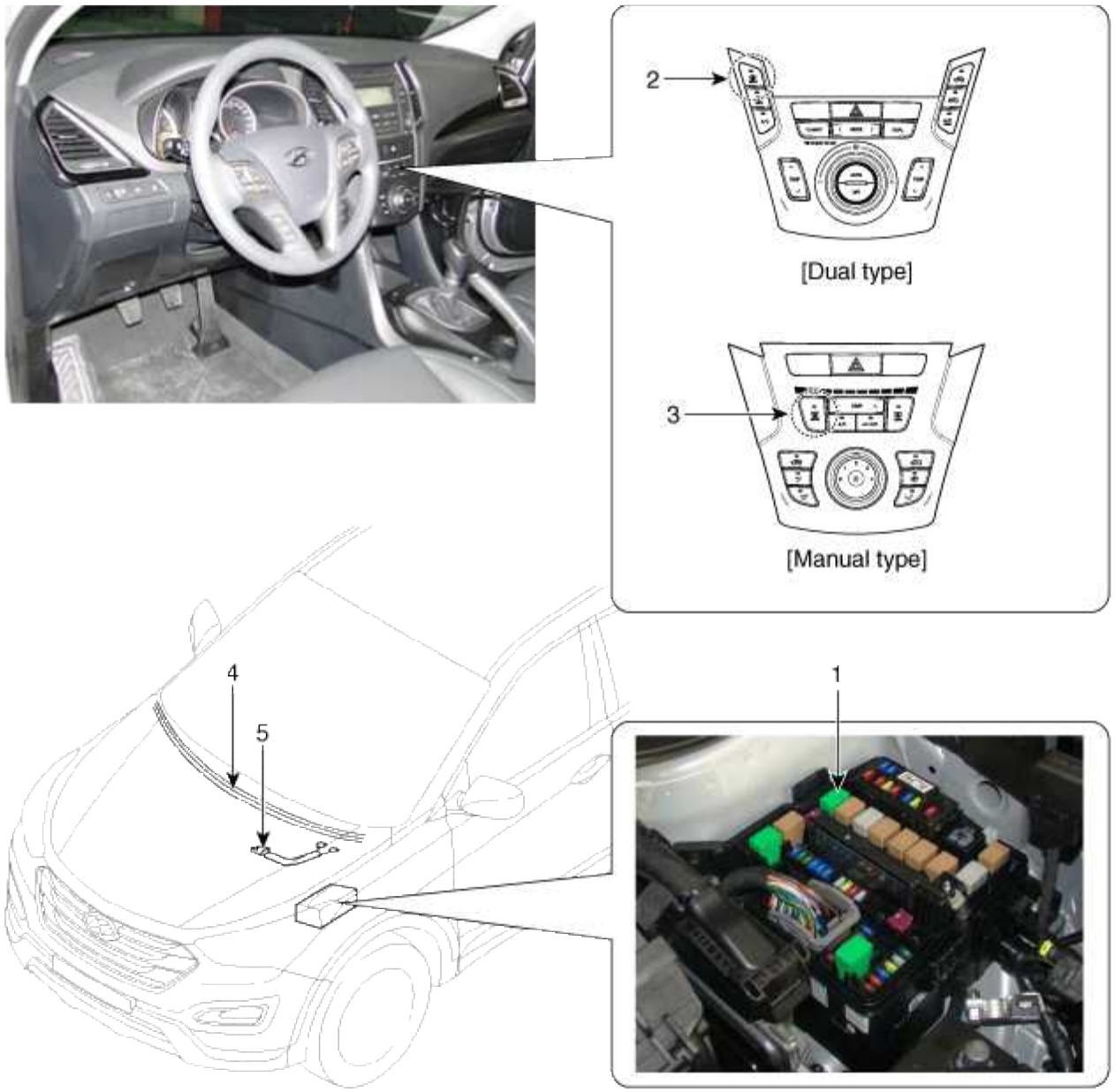
1. Install the power window switch assembly.
2. Install the front door trim after connect the connector.

Rear Power Window Swtich

1. Install the power window switch assembly.
2. Install the rear door trim after connect the connector.

Body Electrical System > Windshield Deicer > Components and Components Location

Component Location



1. Windshield deicer relay (Built-in engine room relay box) 2. Windshield deicer switch (Dual type) 3. Windshield deicer switch (Manual type)	4. Windshield deiecr 5. Deicer connector

Body Electrical System > Windshield Deicer > Description and Operation

Description

Windshield deicer system prevent windshield wiper from freezing in the winter season. It consists of deicer in the lower part of windshield, switch and relay. Body control module receives an input signal from the front defroster switch, then controls relay.

When the front defroster switch is switched ON, and the engine is running with generator output, the deicer will go ON for a maximum of 20 minutes.

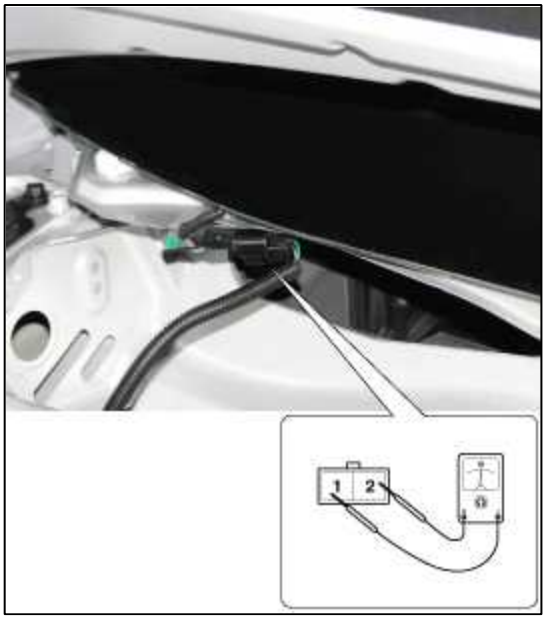
Body Electrical System > Windshield Deicer > Windshield Deicer > Repair procedures

Inspection

1. Remove the cowl top cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Cowl Top Cover")
2. Disconnect the windshield deicer connector (A) from the wiper motor linkage.

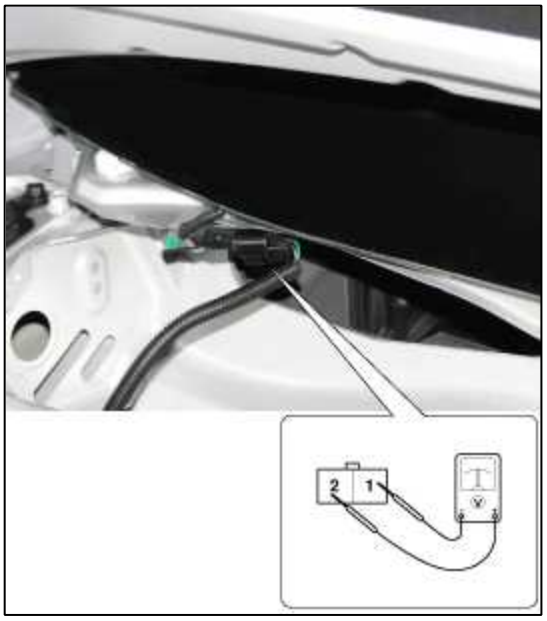


3. Check for continuity between the terminals of deicer lines.



4. Turn the ignition switch ON and the windshield deicer switch ON, then measure the voltage between the terminals of harness side deicer connector.

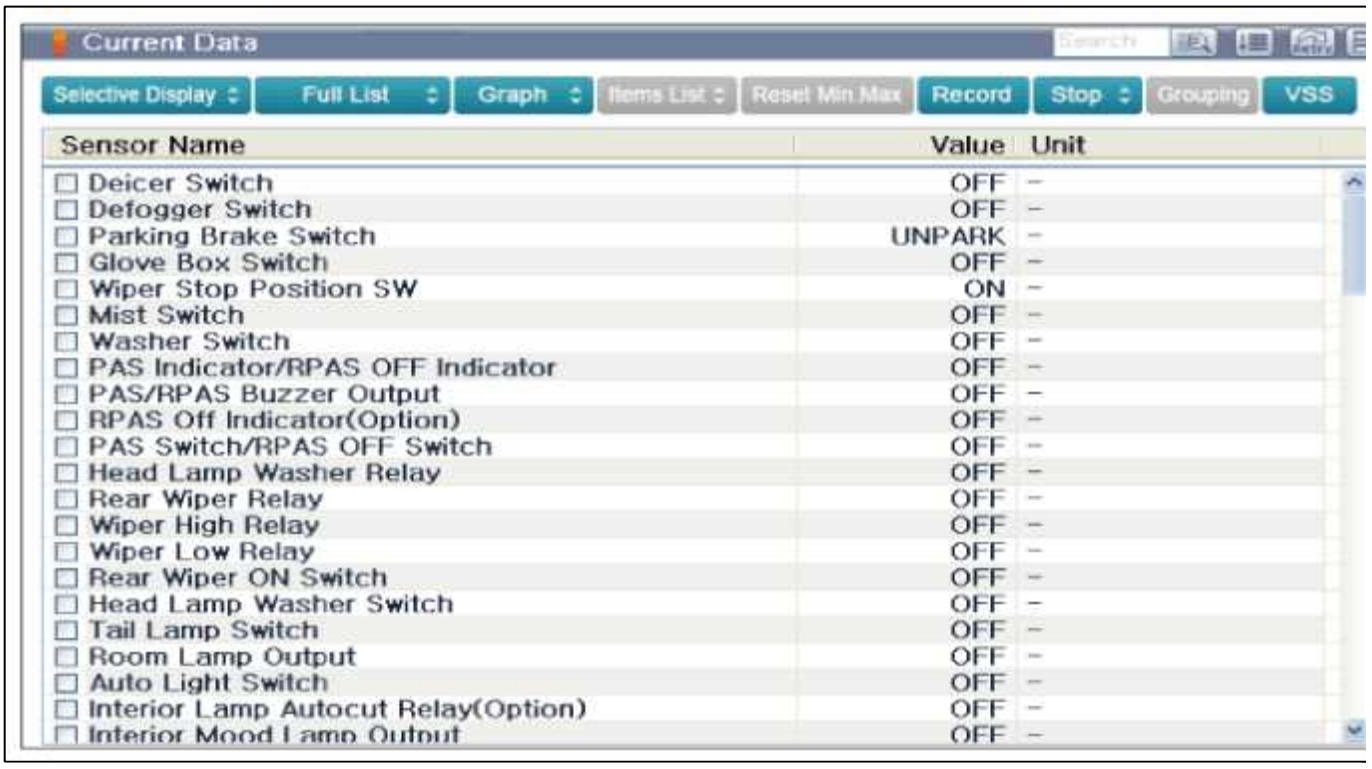
OK : approx. Battery voltage (12V)



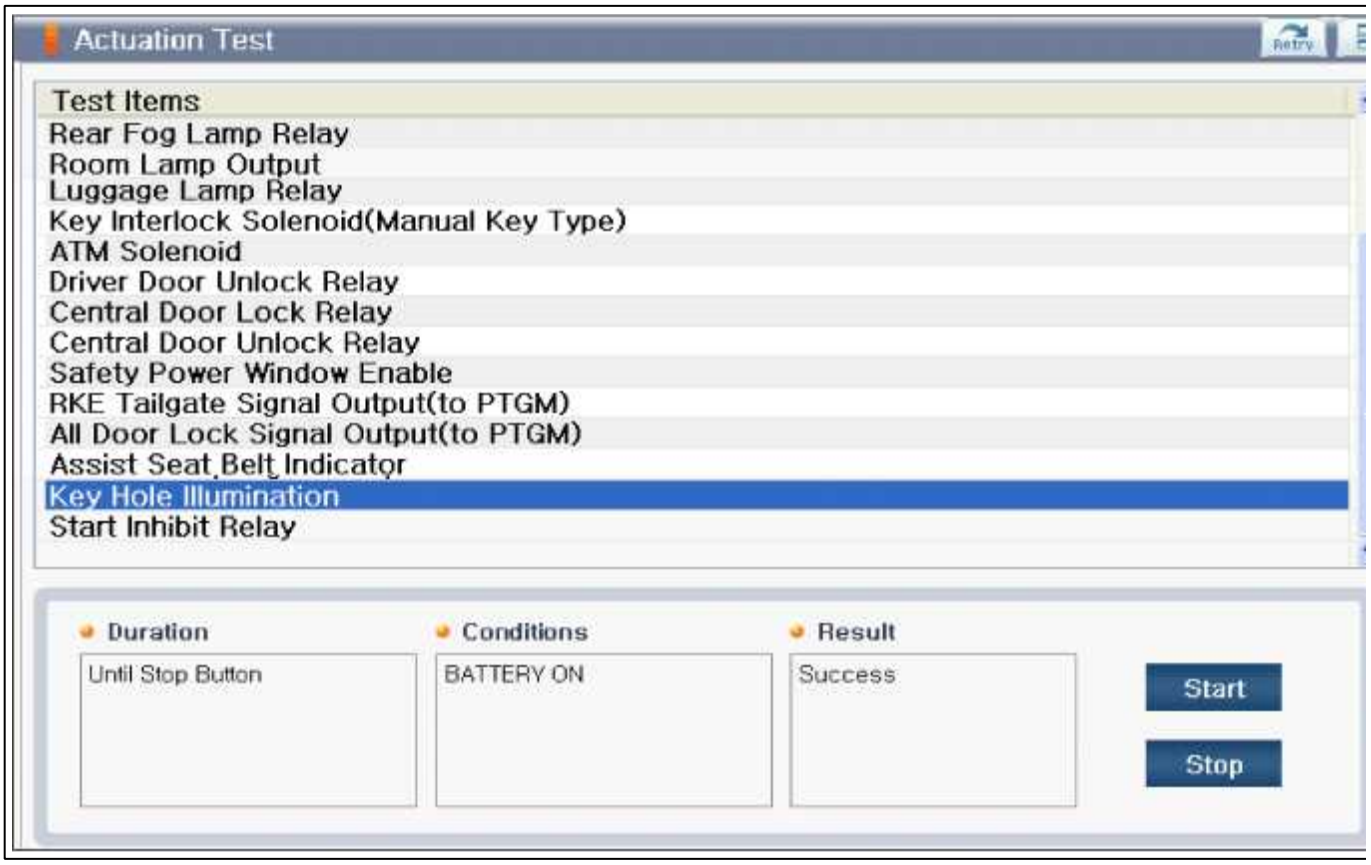
Body Electrical System > Windshield Deicer > Windshield Deicer Switch > Repair procedures

Inspection

1. The windshield deicer switch inputs can be checked using the GDS.
2. To check the input value of windshield deicer switch, select option "Body Control Module".
3. Select option "Current Data".



4. To perform functional test on SJB outputs, select "Actuation Test".



Removal

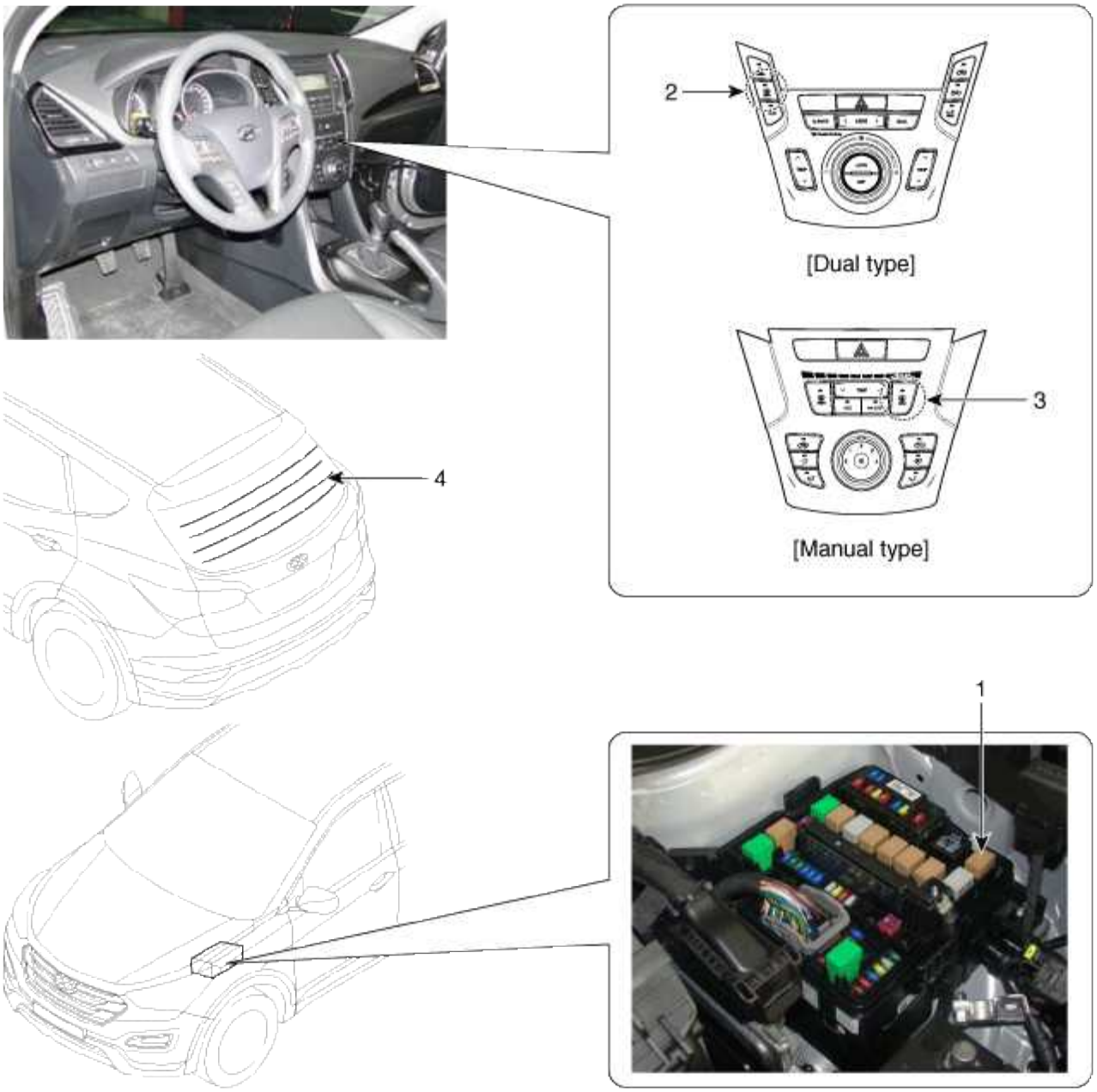
1. Disconnect the negative (-) battery terminal.
2. Remove the audio unit or the AVN head unit.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Audio - "Audio Unit")
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to AVN system - "AVN Head Unit")
3. Remove the heater and A/C controll unit.
   <a href="content.asp?vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&m
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Heating, Ventilation, Air conditioning - "Heater & A/C Control Unit (Dual)")

Installation

1. Install the heater and A/C control unit.
2. Install the audio unit or the AVN head unit.
3. Connect the negative (-) battery terminal.

Body Electrical System > Rear Glass Defogger > Components and Components Location

Component Location



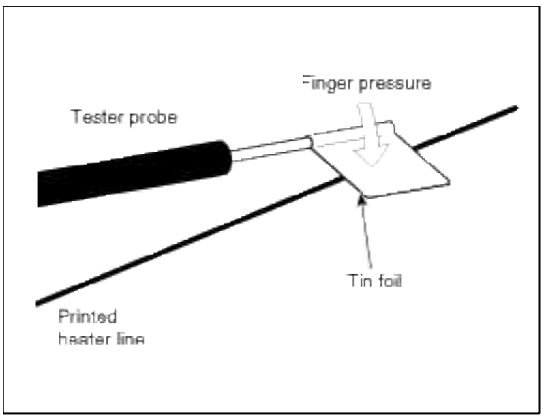
1. Rear glass defogger relay (Buil-in engine room relay box) 2. Rear glass defogger switch (Dual type)	3. Rear glass defogger switch (Manual type) 4. Rear glass defogger

Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Printed Heater > Repair procedures

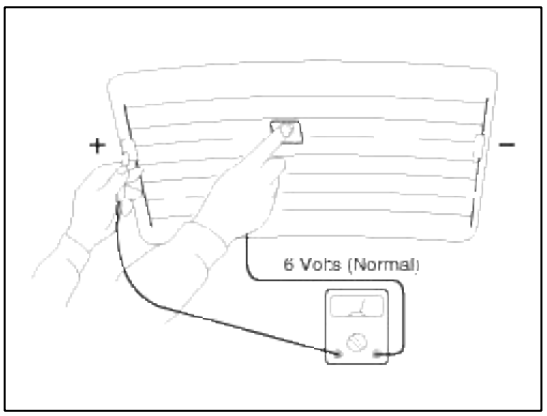
Inspection

CAUTION

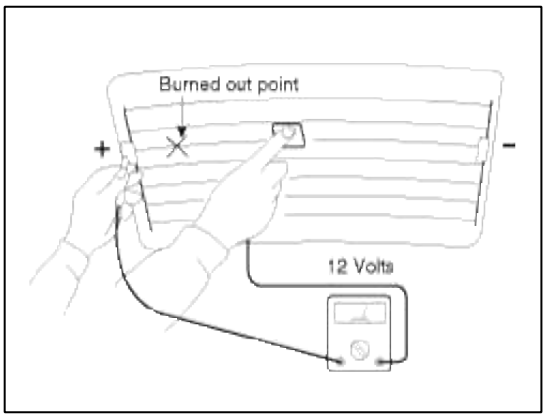
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.



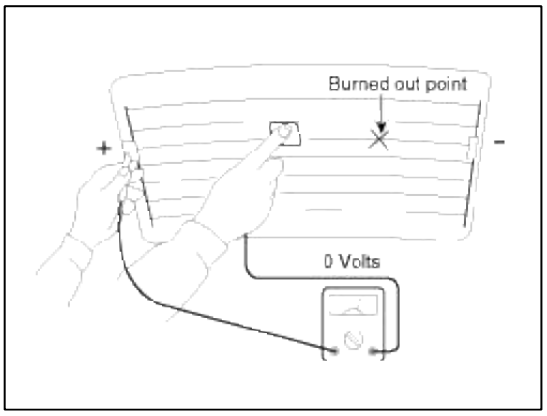
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



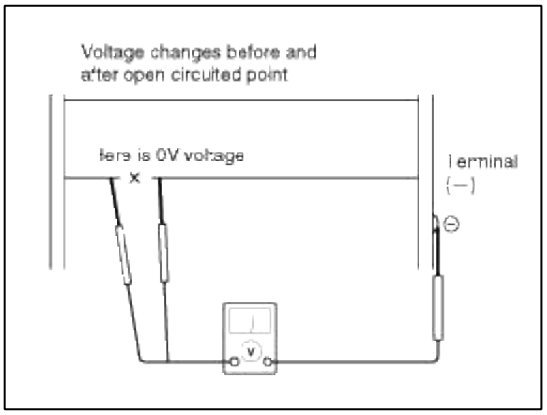
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.



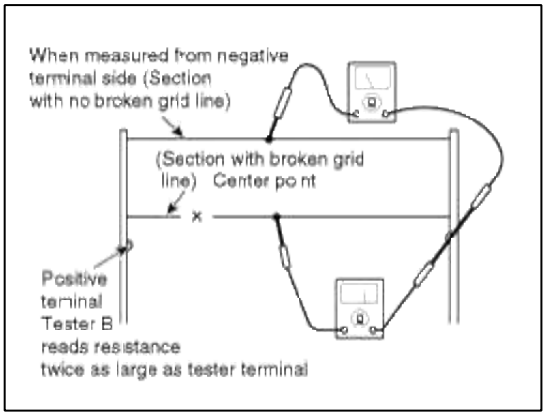
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.



4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.



5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice that in other sections. In the affected section, move the test lead to a position where the resistance sharply changes.

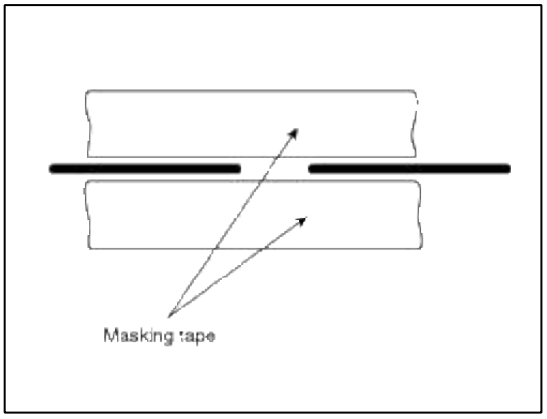


Repair Of Broken Heater Line

Prepare the following items :

1. Conductive paint.
2. Paint thinner.
3. Masking tape.
4. Silicone remover.
5. Using a thin brush :

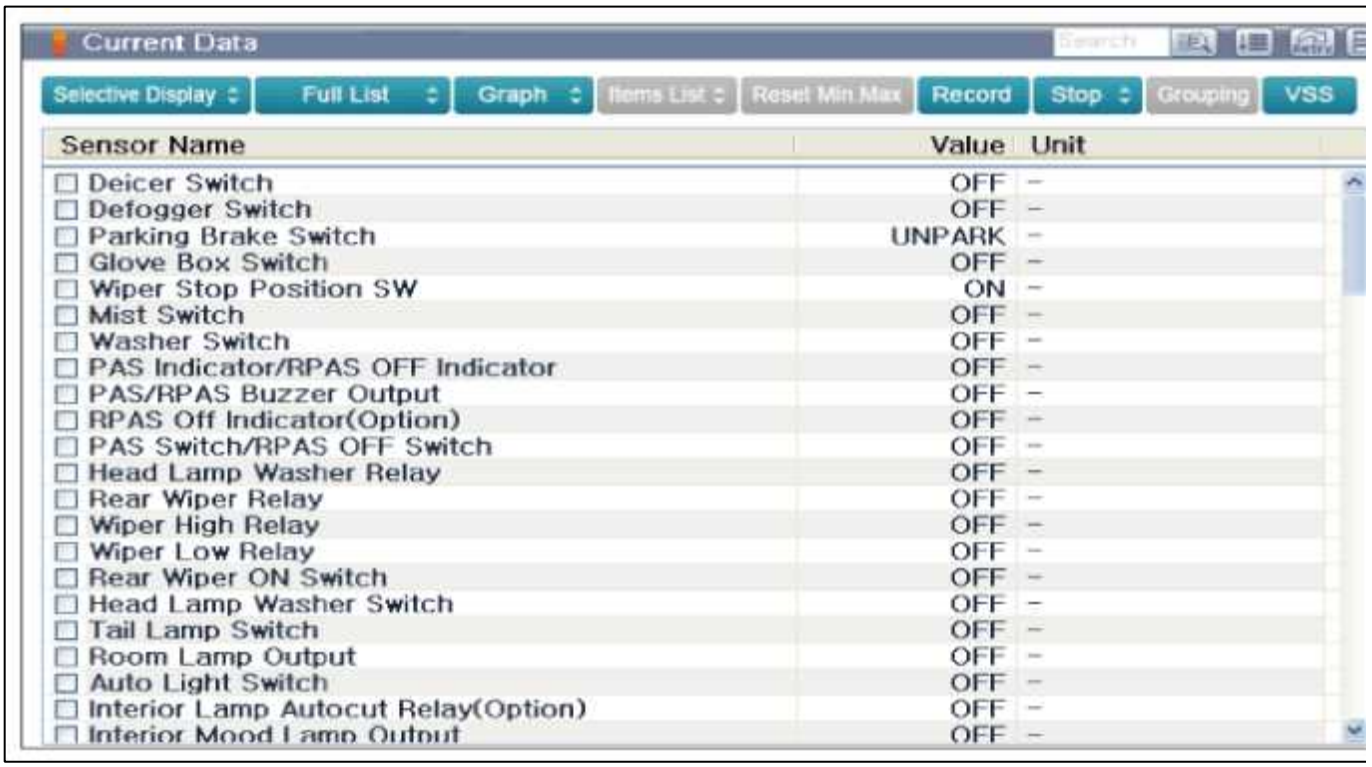
   Wipe the glass adjacent to the broken heater line, clean with silicone remover and attach the masking tape as shown. Shake the conductive paint container well, and apply three coats with a brush at intervals of about 15 minutes apart. Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after the paint has completely dried. (Allow 24 hours).



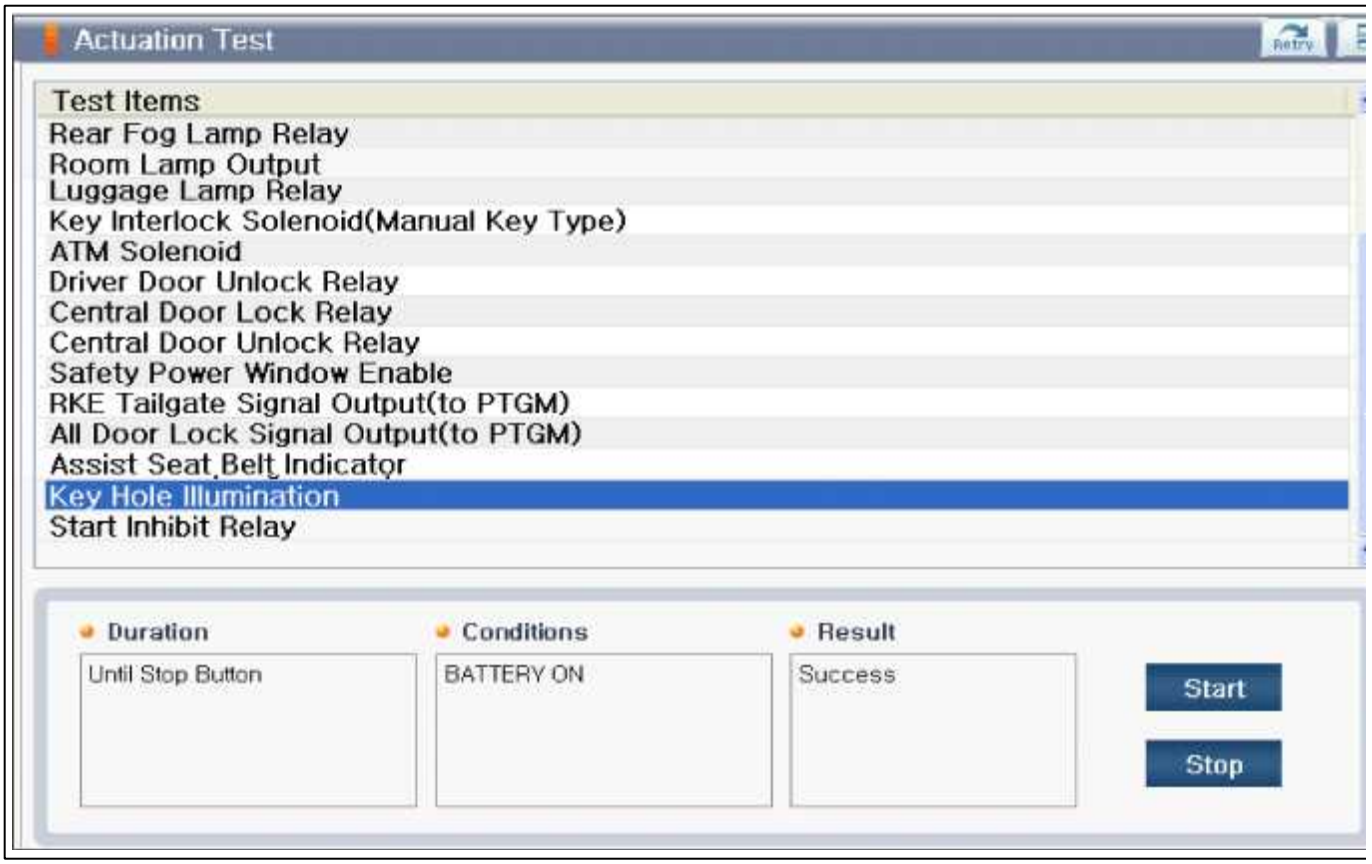
Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Switch > Repair procedures

Inspection

1. The windshield deicer switch inputs can be checked using the GDS.
2. To check the input value of windshield deicer switch, select option "Body Control Module".
3. Select option "Current Data".



4. To perform functional test on SJB outputs, select "Actuation Test".



Removal

1. Disconnect the negative (-) battery terminal.

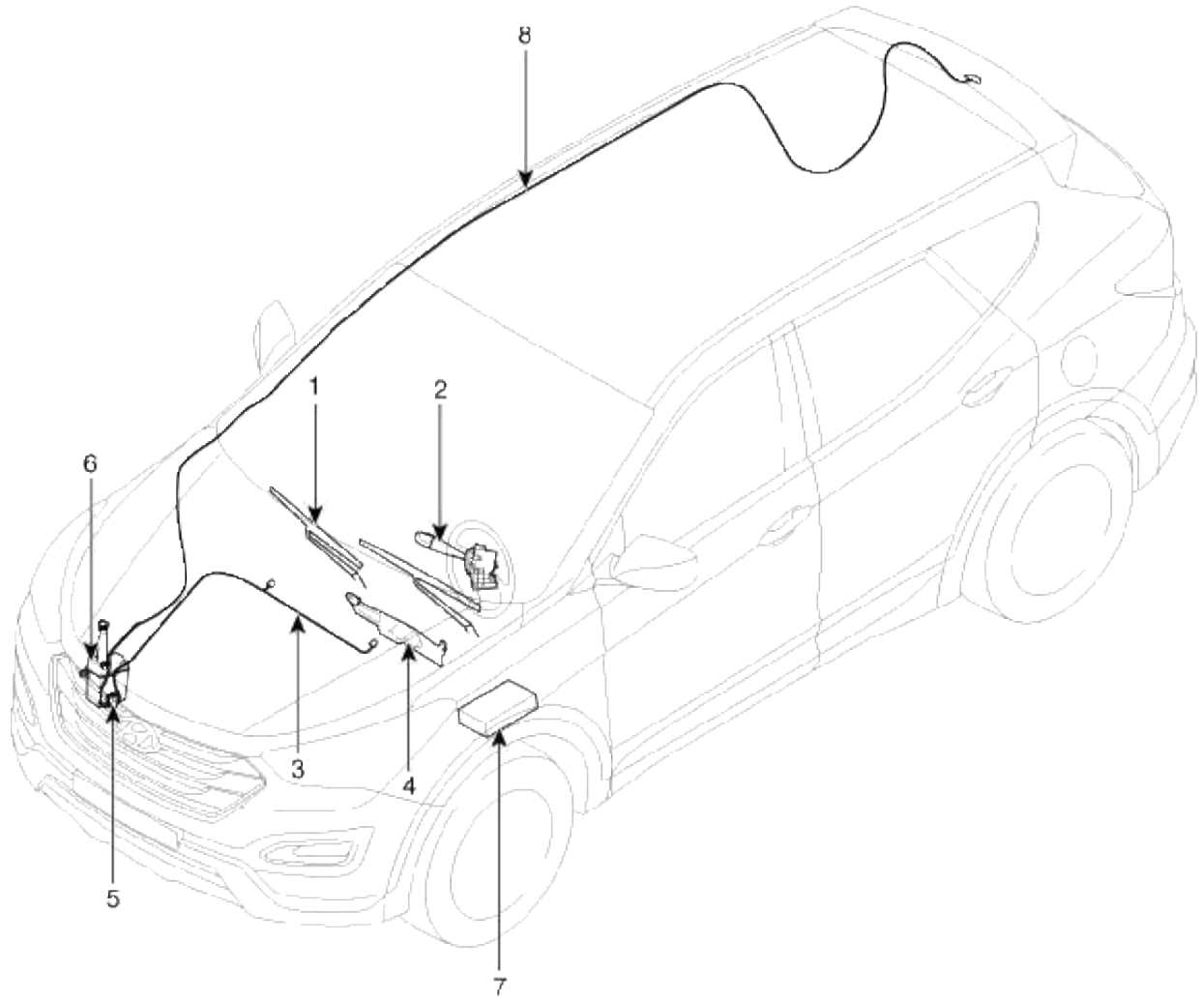
2. Remove the audio unit or the AVN head unit.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Audio - "Audio Unit")
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to AVN system - "AVN Head Unit")
3. Remove the heater and A/C controll unit.
   <a href="content.asp?vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&m
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Heating, Ventilation, Air conditioning - "Heater & A/C Control Unit (Dual)")

Installation

1. Install the heater and A/C control unit.
2. Install the audio unit or the AVN head unit.
3. Connect the negative (-) battery terminal.

Body Electrical System > Windshield Wiper/Washer > Components and Components Location

Component Location



1. Windshield wiper arm & blade 2. Wiper & washer switch (Front) 3. Windshield washer hose 4. Windshield wiper motor & linkage	5. Washer motor 6. Washer reservoir 7. Front wiper relay (Engine room relay box) 8. Rear washer hose & nozzle

Body Electrical System > Windshield Wiper/Washer > Windshield Wiper-Washer Switch > Repair procedures

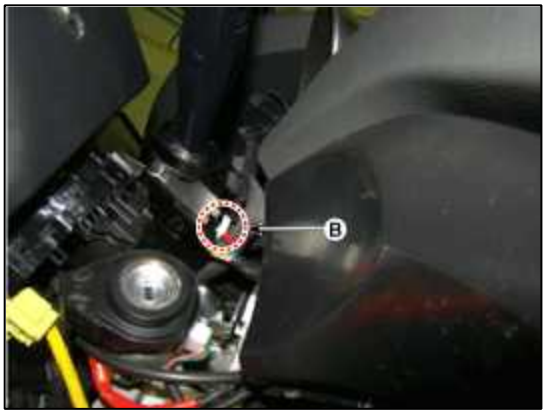
Removal

1. Disconnect the negative (-) battery terminal.

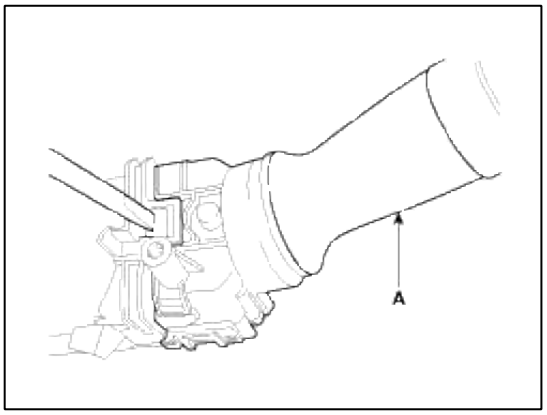
2. Remove the steering column upper and lower shrouds (A) after loosening 3 screws.



3. Disconnect the connector (A).



4. If necessary of removing the wiper & washer switch (A), release the lock of wiper switch using tool without removing the steering wheel and the clock spring.



5. Remove the steering wheel.
<a href="content.asp?
vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
target="_blank">(Refer to Steering System - "Steering Wheel")
6. Remove the clock spring.
<a href="content.asp?
vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
target="_blank">(Refer to Airbag System - "Driver Airbag(DAB) Module and Clock Spring")

7. Remove the multifunction switch (A) after loosening the mounting screws (2EA).



Installation

1. Install the multifunction switch after connecting the connector.
2. Install the clock spring and steering.
3. Install the upper and lower shroud.
4. Install the steering wheel.

Inspection

Check for continuity between the terminals while operating the wiper and washer switch. If it is not normal condition, replace wiper and wiper switch.



Wiper Switch

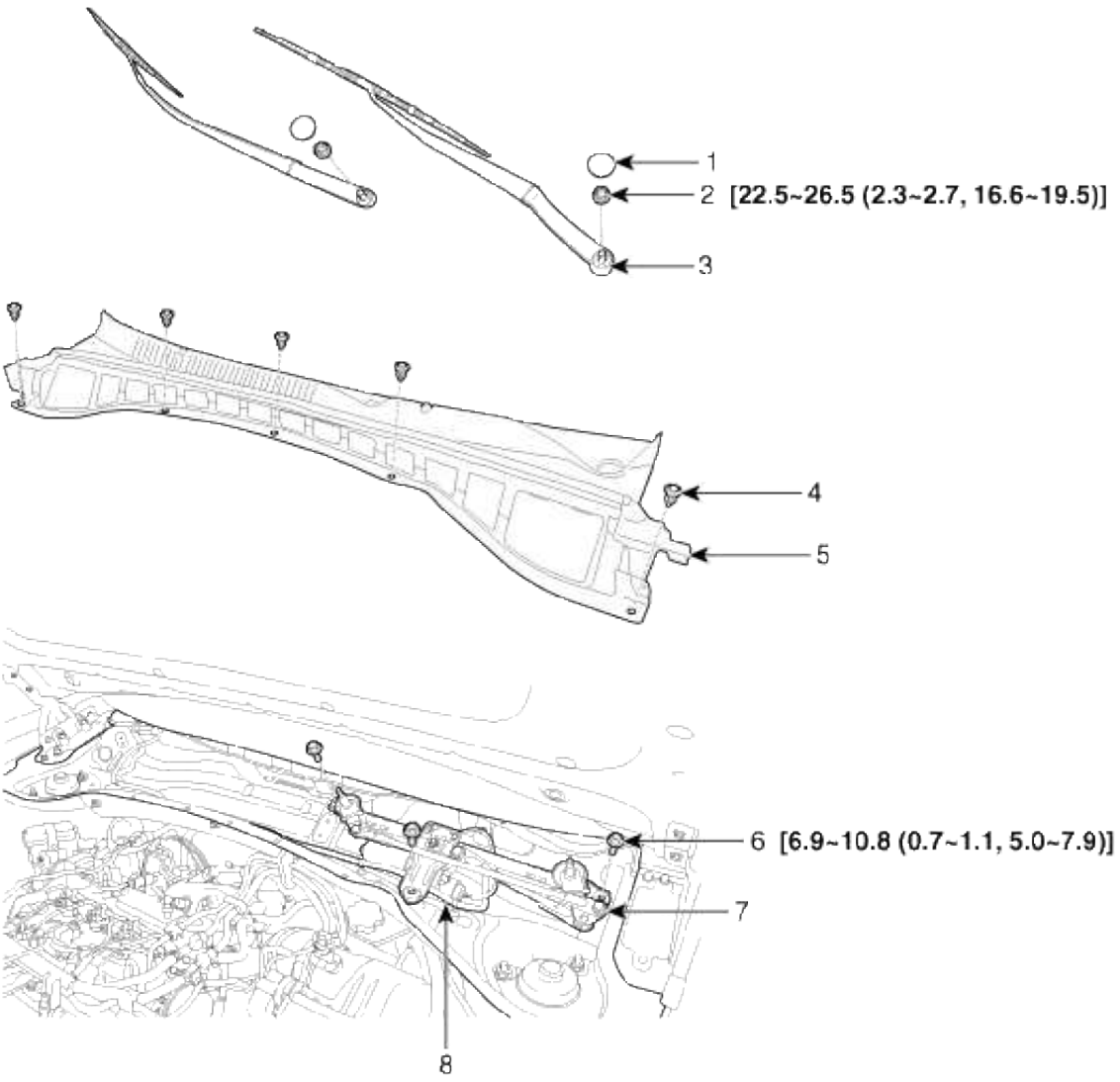
Terminal / Position	13	5	14	6	4	7	9	11
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○	○		○	○
LOW	○				○			
HI		○			○			

Washer Switch

Terminal / Position	3	4
OFF		
ON	○	○

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Components and Components Location

Component Location



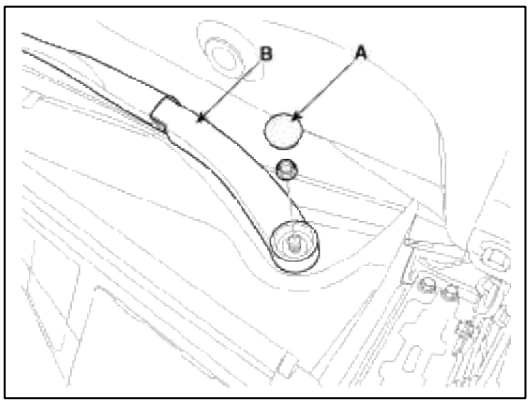
Torque : N.m (kgf.m, lbf.ft)

1. Cap 2. Nut 3. Wiper arm & blade 4. Rivet	5. Cowl top cover 6. Bolt 7. Wiper motor & linkage assembly 8. Wiper motor connector

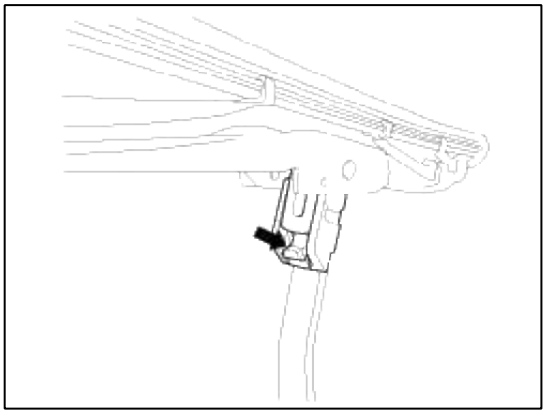
Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

Removal

1. Loosen the windshield wiper arm nut after removing a wiper cap (A).
2. Remove the windshield wiper arm and blade (B)



3. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius of wiper arm.



4. Remove the cowl top cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Cowl Top Cover")
5. Disconnect the wiper motor connector (A) from the wiper motor & linkage assembly.



6. Remove the windshield wiper motor and linkage assembly (A) after removing 3 bolts.



7. Hold the wiper motor crank arm and remove the upper linkage (A) from the wiper motor crank arm.



CAUTION

Before removing the wiper motor and linkage assembly, make sure that the linkage is stoped at auto stop position.
To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.
Be careful not to bend the linkage.

8. Remove the lower linkage (A) from the wiper motor crank arm.



CAUTION

To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.
Be careful not to bend the linkage.

9. Remove the crank arm (B) after loosening a nut (A).



10. Remove the bracket (A) after loosening the screws (3EA).



11. Remove the wiper motor (A) from the tube.



Installation

1. Install the wiper motor.
2. Install the crank arm.

Tightening torque:
12.7~17.6 Nm (1.3~1.8 kgf.m, 9.4~13.0 lbf.ft)

CAUTION

To install the wiper motor crank arm, make sure that the linkage is aligned with the crank arm in straight line and set the angle of each linkages exactly.

3. Install the lower and upper linkage to the wiper motor crank arm.

> CAUTION
>
> To install the wiper motor crank arm, make sure that the linkage is aligned with the crank arm in straight line and set the angle of each linkages exactly.
> Be careful not to bend the linkage.

4. Install the wiper motor and linkage assembly and then connect the wiper motor connector.

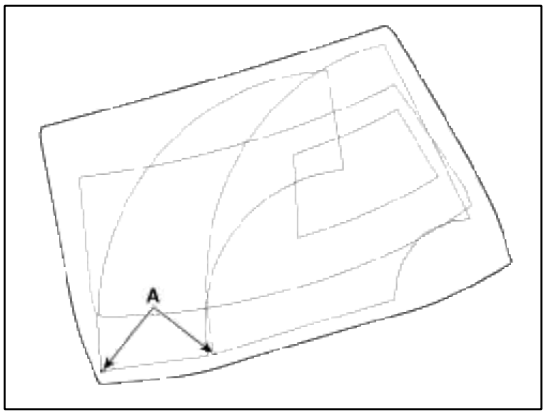
Tightening torque:
6.9~10.8 Nm (0.7~1.1 kgf.m, 5.0~7.9 lbf.ft)

5. Install the cowl top cover.
6. Install the windshield wiper arm and blade.

Tightening torque:
22.5~26.5 Nm (2.3~2.7 kgf.m, 16.6~19.5 lbf.ft)

> NOTE
>
> - The windshield wiper motor must be cycled to make sure that it is in the park position. If necessary, adjust the wiper arm and blade.

7. Install the wiper arm and blade to the specified position.
   A: Auto stop position (Blade)



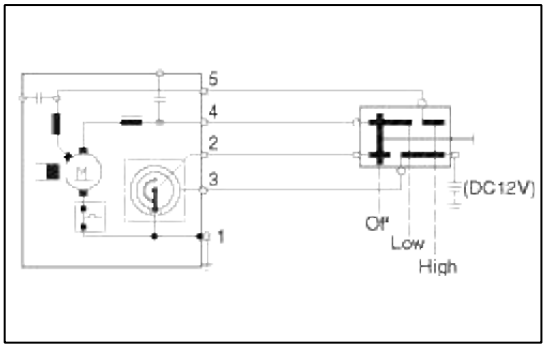
Inspection

Speed Operation Check

1. Remove the connector (A) from the wiper motor.



2. Attach the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 1.
3. Check that the motor operates at low or high speed as below table.



Terminal / Position	1	2	3	4	5
OFF	○	○			
LOW	○		○	○	
HIGH	○		○		○

CAUTION

Common sources of contamination are insects, tree sap, and hot wax treatments used by some commercial car washes. If the blades are not wiping properly, clean both the window and the blades with a good cleaner or mild detergent, and rinse thoroughly with clean water.

Body Electrical System > Windshield Wiper/Washer > Front Washer Motor > Repair procedures

Inspection

Front and Rear Washer Motor

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.

NOTE

Before filling the reservoir tank with water, check the filter for foreign material or contamination. if necessary, clean the filter.

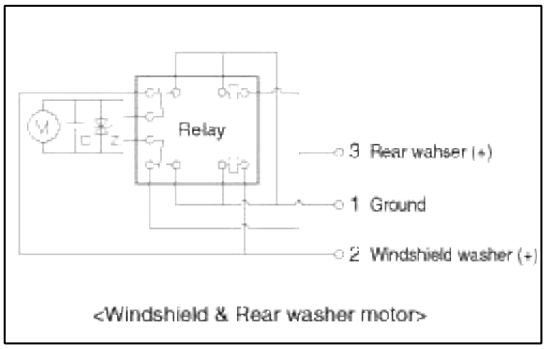
2. Connect positive (+) battery cables to terminal 3 and negative (-) battery cables to terminal 1 respectively.
3. Check that the motor operates normally and the washer motor runs and water sprays from the front nozzles.

4. If they are abnormal, replace the washer motor.

[Front & Rear washer]

No.	Description
1	Ground
2	Windshield washer (+)
3	Rear washer (+)





<Windshield & Rear washer motor>

Washer Fluid Level Sensor Switch

1. Disconnect the negative(-) battery terminal.
2. Drain the washer fluid less than 650 cc.
3. Check for continuity between the No. 1 and No.2 terminal in each float position.
   There should be continuity when the float is down.
   There should be no continuity when the float is up.

4. If the continuity is not as specified, replace the washer fluid level switch



Terminal / Position	1	2
Over 650cc		
Jnder 650cc	○	○

(Tolerance : -50cc ~ +100cc)

Removal

CAUTION

- When servicing the washer pump, be careful not to damage the washer pump seal.
- Do not operate the washer pump before filling the washer reservoir.
  Failure to do so could result in premature pump failure.

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Bumper Cover")
3. Remove the washer hose and disconnect the washer motor connector and washer fluid level sensor connector.
4. Remove the washer motor (A).



5. Remove the washer reservoir after removing bolts (A).



Installation

1. Reassemble the washer reservoir.

> NOTE
>
> Before installing the pump motor, check the filter for foreign material or contamination. if necessary, clean the filter into the pump motor.

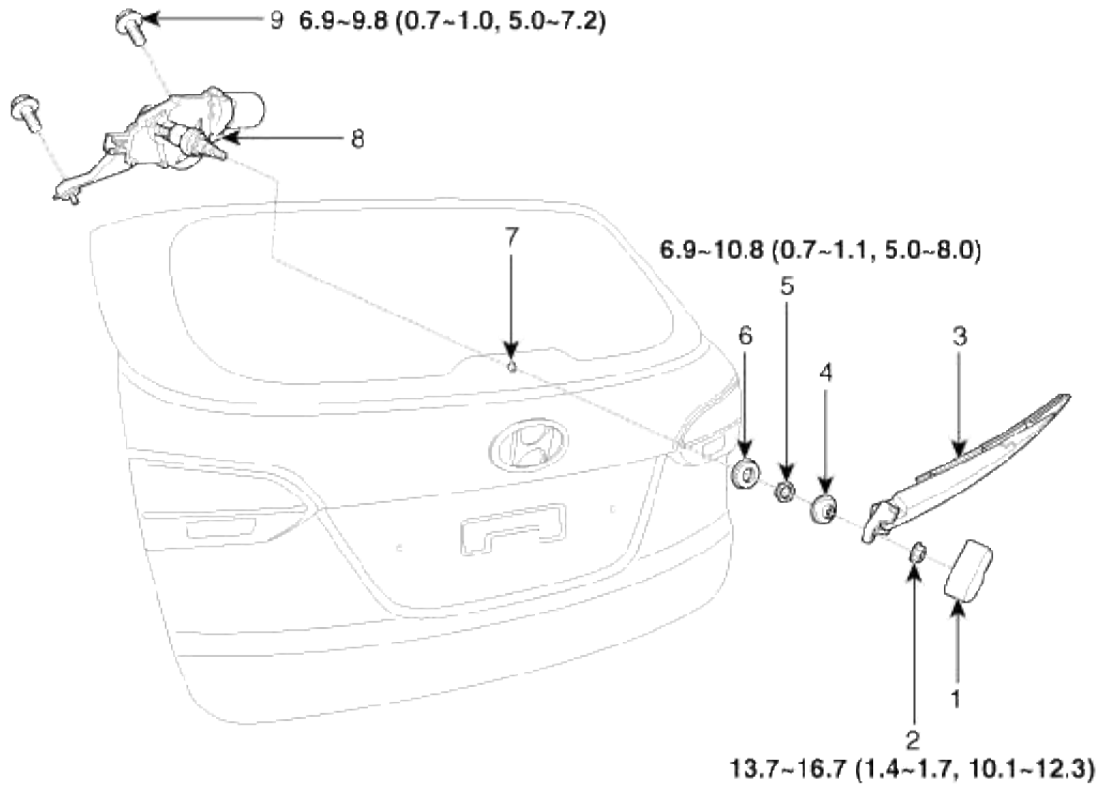
2. Connect the washer motor connector and washer hose.
3. Install the washer reservoir.

Tightening torque (Bolt)
3.9 ~ 5.9 Nm (0.4 ~ 0.6 kgf.m, 2.9 ~4.3 lbf.ft)

4. Reassemble the front bumper cover.

Body Electrical System > Rear Wiper/Washer > Components and Components Location

Component Location



Torque : N.m (kgf.m, lbf.ft)

1. Rear wiper arm & blade 2. Tailgate glass hole 3. Grommet 4. Rear wiper arm nut	5. Rear wiper motor assembly 6. Head cap 7. Rear wiper motor bolt

Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

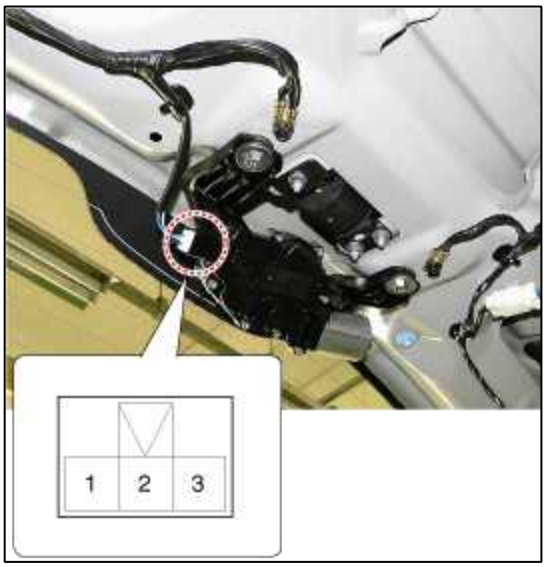
Inspection

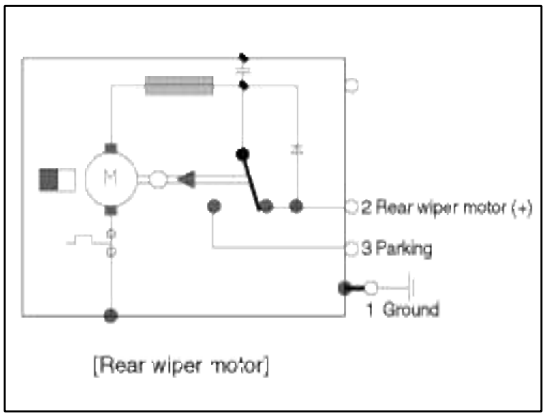
Rear Wiper Motor

1. Remove the connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 2 and 1 respectively.

3. Check that the motor operates normally. Replace the motor if it operates abnormally.

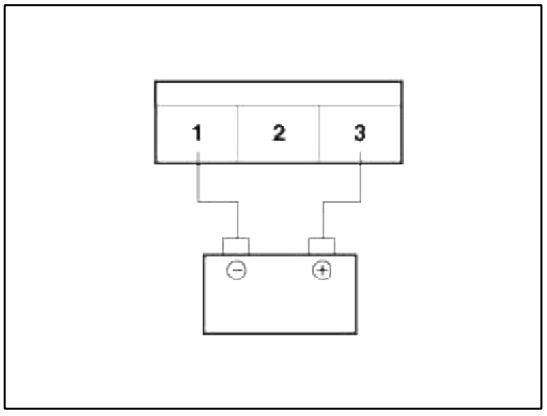
No.	Description
1	Ground
2	Rear wiper motor (+)
3	Parking





Automatic Stop Operation Check

1. Operate the motor at low speed using the stalk control.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 3.
3. Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 1.
4. Check that the motor stops running at the off position.



Removal

1. Detach the rear wiper cap (A).



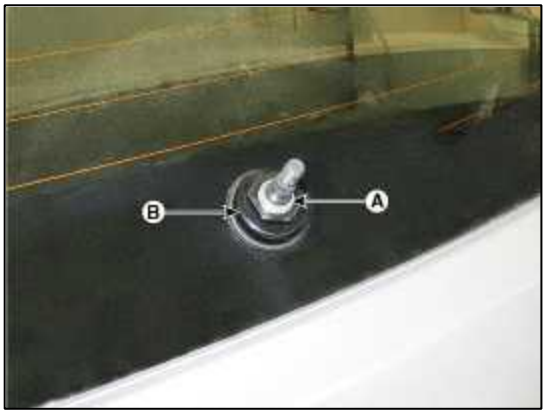
2. Remove the rear wiper arm & blade (A) after removing rear wiper HEX nut (B).



3. Remove the rear wiper cap & pad (A).



4. Remove the cover (B) after loosening a rear wiper nut (A).



5. Remove the tailgate trim after opening the tailgate.
<a href="content.asp?
vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
target="_blank">(Refer to Body - "Tailgate Trim")

6. Disconnect the rear wiper motor connector (A) then remove the rear wiper motor (B) after loosening bolts (2EA).



Installation

1. Install the rear wiper motor assembly.

Tightening torque Nut :
6.9~9.8 Nm (0.7~1.0 kgf.m, 5.0~7.2 lbf.ft)

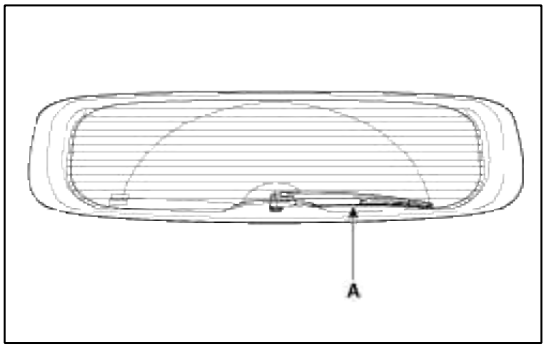
2. Install the tailgate trim.
3. Install the rear wiper arm and rear wiper cap.

Tightening torque Nut (B) :
6.9~10.8 Nm (0.7~1.1 kgf.m, 5.0~8.0 lbf.ft)

4. Install the rear wiper arm cap after tighting the nut.

Tightening torque Bolt :
13.7~16.7 N.m (1.4~1.7 kgf.m, 10.1~12.3 lbf.ft)

5. Set the rear wiper blade and to the lowest defogger heat line and tailgate glass.



Body Electrical System > Rear Wiper/Washer > Rear Washer Switch > Repair procedures

Inspection

1. Check for continuity between the terminals while operating the wiper and washer switch. If it is not normal condition, replace wiper and wiper switch.



Rear Wiper Switch

Terminal / Position	8	12	10
OFF			
INT	○	○	
ON	○	○	○

Rear Washer Switch

Terminal / Position	2	1
OFF		
ON	○	○

Body Electrical System > Rear Wiper/Washer > Rear Washer Motor > Repair procedures

Inspection

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.

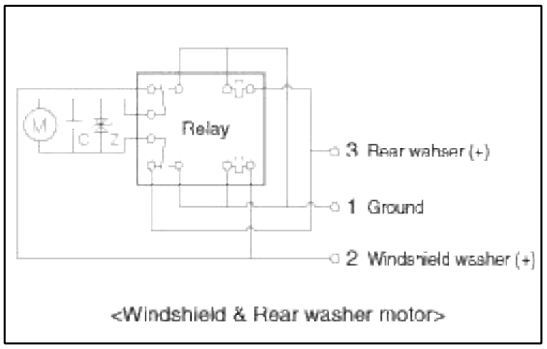
> NOTE
>
> Before filling the reservoir tank with water, check the filter for foreign material or contamination. if necessary, clean the filter.

2. Remove the front bumper cover.
(Refer to Body - "Front Bumper Cover")
3. Connect positive (+) and negative (-) battery cables to terminals 3 and 2 respectively to see that the washer motor runs and water is pumped.

4. Check that the motor operates normally.
   Replace the motor if it operates abnormally.

No.	Description
1	Ground
2	Windshield washer (+)
3	Rear washer (+)



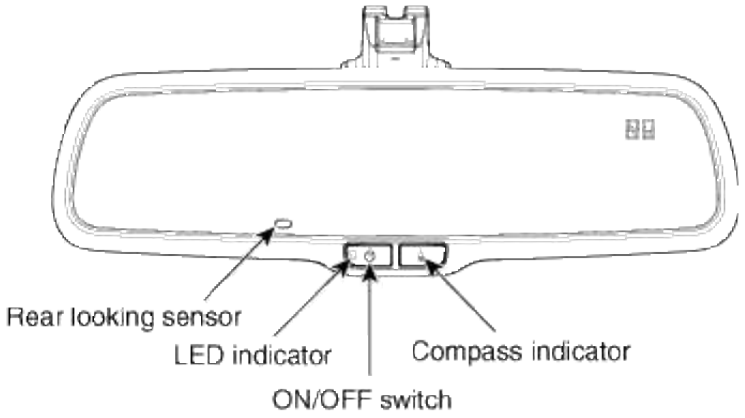


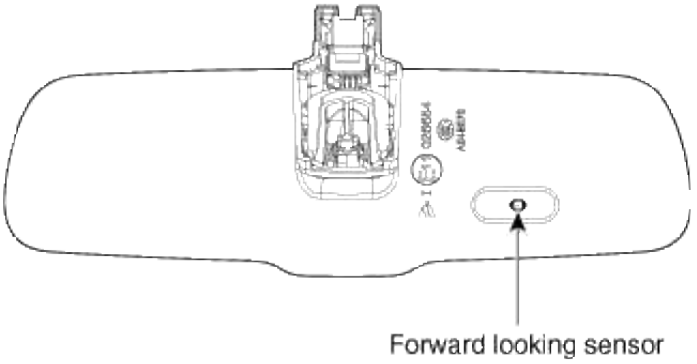
<Windshield & Rear washer motor>

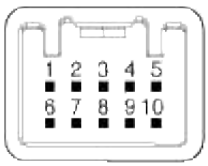
Body Electrical System > Electro Chromic Inside Rear View Mirror > Components and Components Location

Components

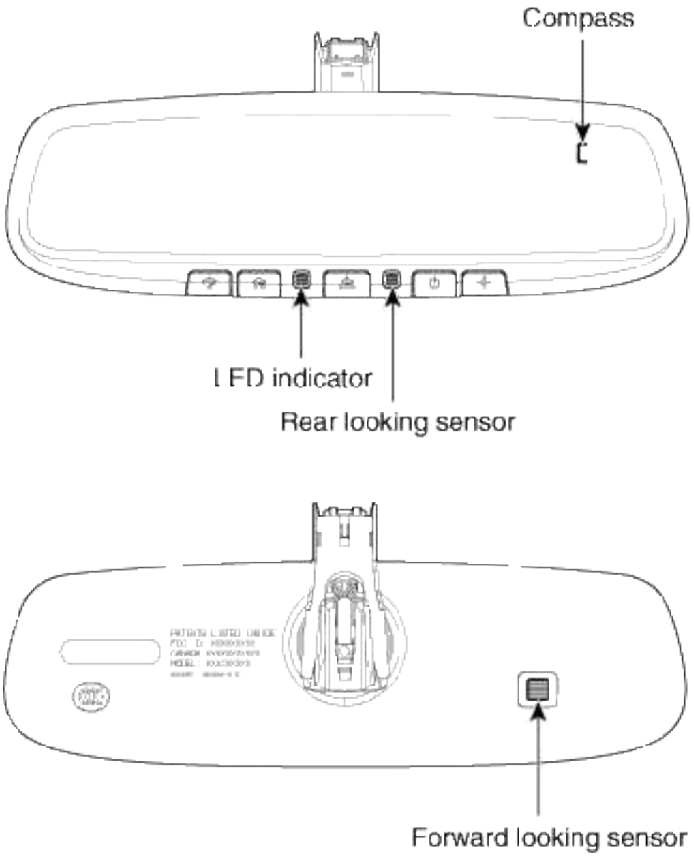
[ECM + Compass]

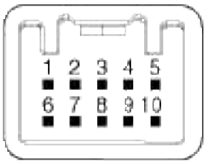




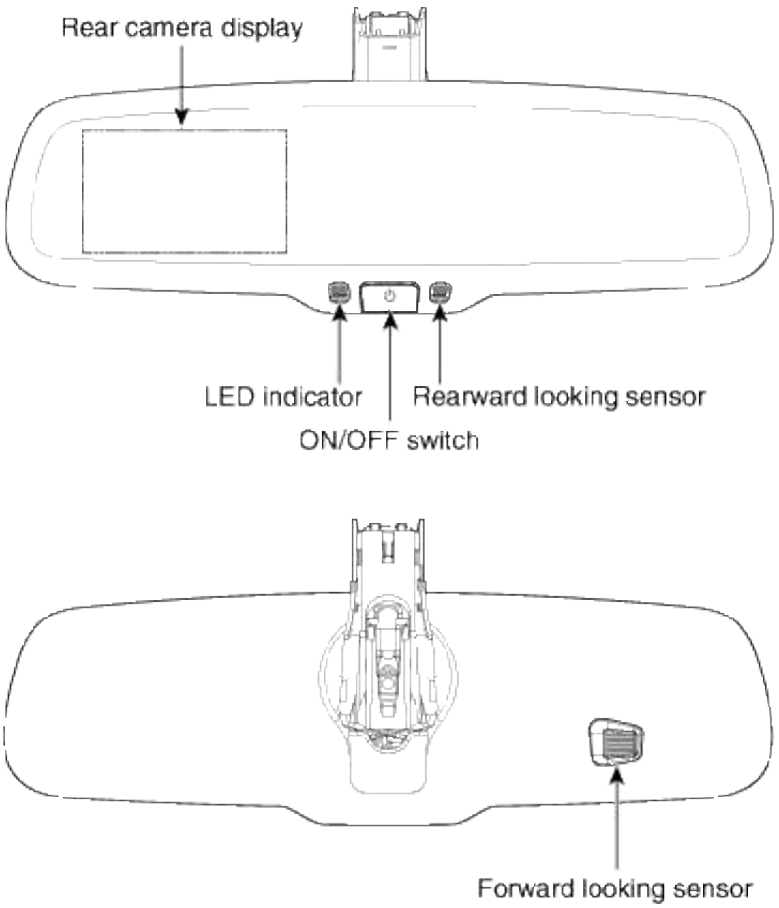
Connector	No.	Description	No.	Description
	1	-	6	-
	2	OEC (+)	7	OEC (-)
	3	-	8	GND
	4	-	9	Reverse signal
	5	-	10	IGN (+)

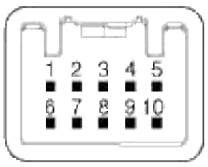
[ECM + Homelink + Compass]



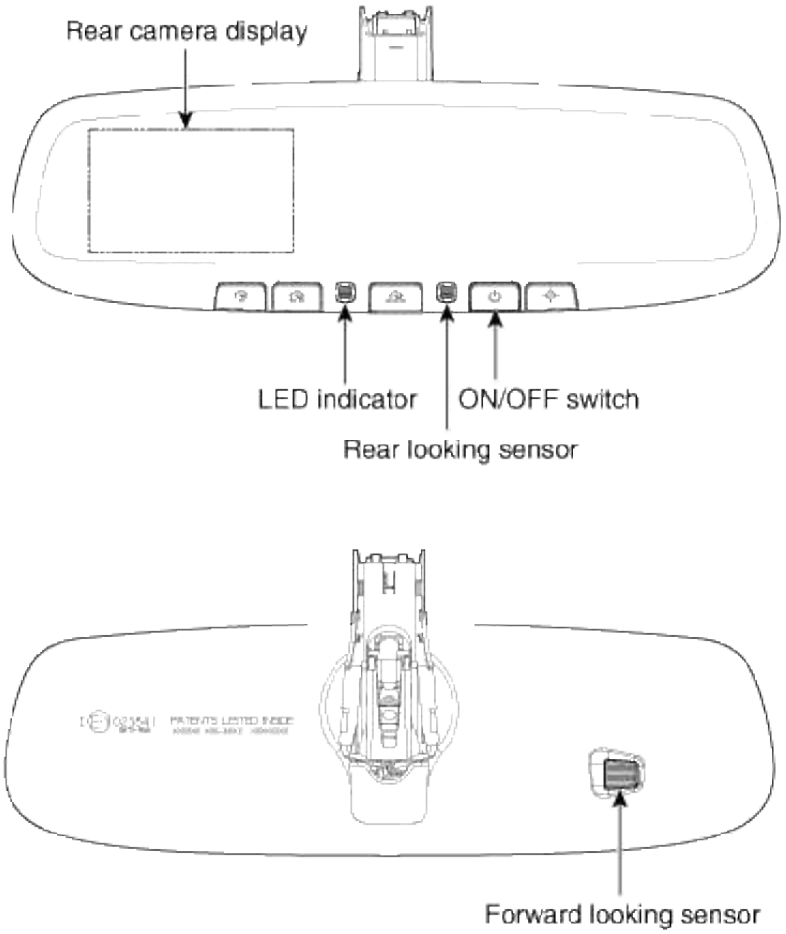
Connector	No.	Description	No.	Description
	1	-	6	IGN (+)
	2	-	7	Reverse signal
	3	-	8	Ground
	4	OEC (+)	9	OEC (-)
	5	-	10	Battery (+)

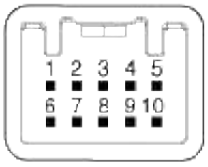
[Reverse Display]



Connector	No.	Description	No.	Description
	1	Camera power (-)	6	Battery (+)
	2	OEC (+)	7	OEC (-)
	3	Camera power (+)	8	GND
	4	Video (-)	9	Reverse signal
	5	Video (+)	10	IGN (+)

[ECM + Homelink + Compass + Reverse Display]



Connector	No.	Description	No.	Description
	1	Camera power (-)	6	Battery (+)
	2	OEC (+)	7	OEC (-)
	3	Camera power (+)	8	GND
	4	Video (-)	9	Reverse signal
	5	Video (+)	10	IGN (+)

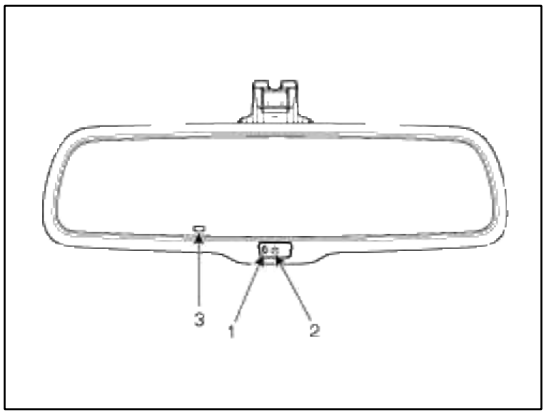
Body Electrical System > Electro Chromic Inside Rear View Mirror > Description and Operation

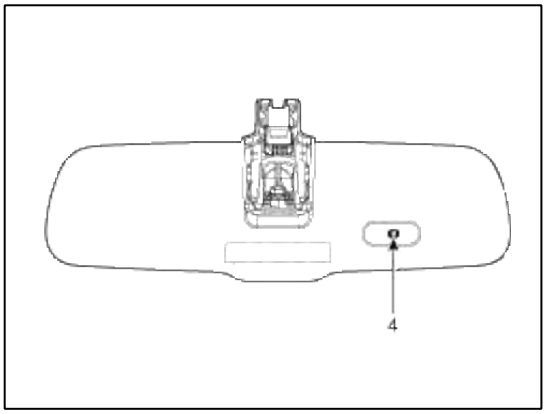
Description

The ECM (Electro Chromatic inside rear view Mirror) is intended dim the reflecting light in the rear view mirror. The forward facing sensor detects brightness of the surroundings, while the rearward looking sensor is for the light from the rear. The strength of the light in the rear sensor is used by the mirror to adjust the shading. It ranges from 7 to 85%. When the reverse gear is engaged, it stops functioning.

1. The forward facing sensor sees if the brightness of the surroundings is low enough for the mirror to operate its function.
2. The rearward looking sensor detects glaring of the reflecting light from a vehicle behind.

3. The ECM is darkened to the level as determined by the rearward looking sensor. When the glaring is no longer detected, the mirror stops functioning.
   (1. LED indicator , 2. ON/OFF Switch , 3. Rearward looking sensor , 4. Forward looking sensor)





Automatic-dimming Function

To protect your vision during nighttime driving, your mirror will automatically dim upon detecting glare from the vehicles traveling behind you. The auto-dimming function can be controlled by the Dimming ON/OFF Button :

1. Pressing and holding the Feature Control button for more than 3 but less than 6 seconds turns the auto-dimming function OFF which is indicated by the green Status Indicator LED turning off.
2. Pressing and holding the Feature Control button again for more than 3 but less than 6 seconds turns the auto-dimming function ON which is indicated by the green Status Indicator LED turning on.

> NOTE
>
> The mirror defaults to the "ON" position each time the vehicle is started.

Body Electrical System > Electro Chromic Inside Rear View Mirror > Repair procedures

Inspection

Check it by the procedure below to see if the function of the ECM is normal.

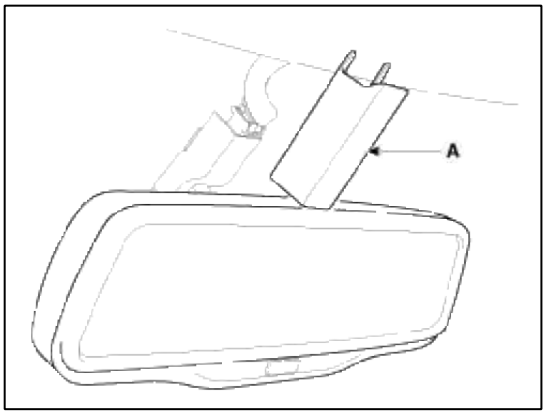
1. Turn the ignition key to the "ON" position.
2. Cover the forward facing sensor.
3. Head a light to the rearward looking sensor.
4. The ECM should be darkened as soon as the rearward looking sensor detects the light.

> NOTE
>
> If this test is performed in daytime, the ECM may be darkened as soon as the forward facing sensor is covered.

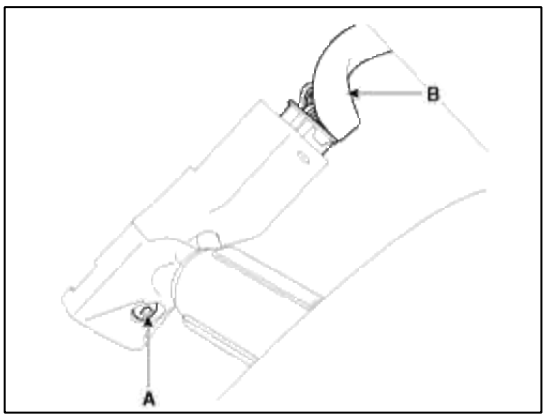
5. When the reverse gear is engaged, the ECM should not be darkened.
   When heading lights to both the forward facing and rearward looking sensors, the ECM should not be darkened.

Removal

1. Remove the mirror wiring cover (A).



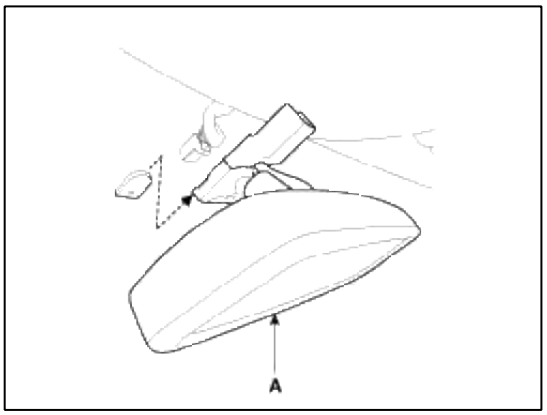
2. Remove the mirror mounting screw (A) and connector (B).



3. Remove the mirror (A) pulling up in the arrow direction.

NOTE

Make sure not to damage the mounting bracket when removing the mirror.



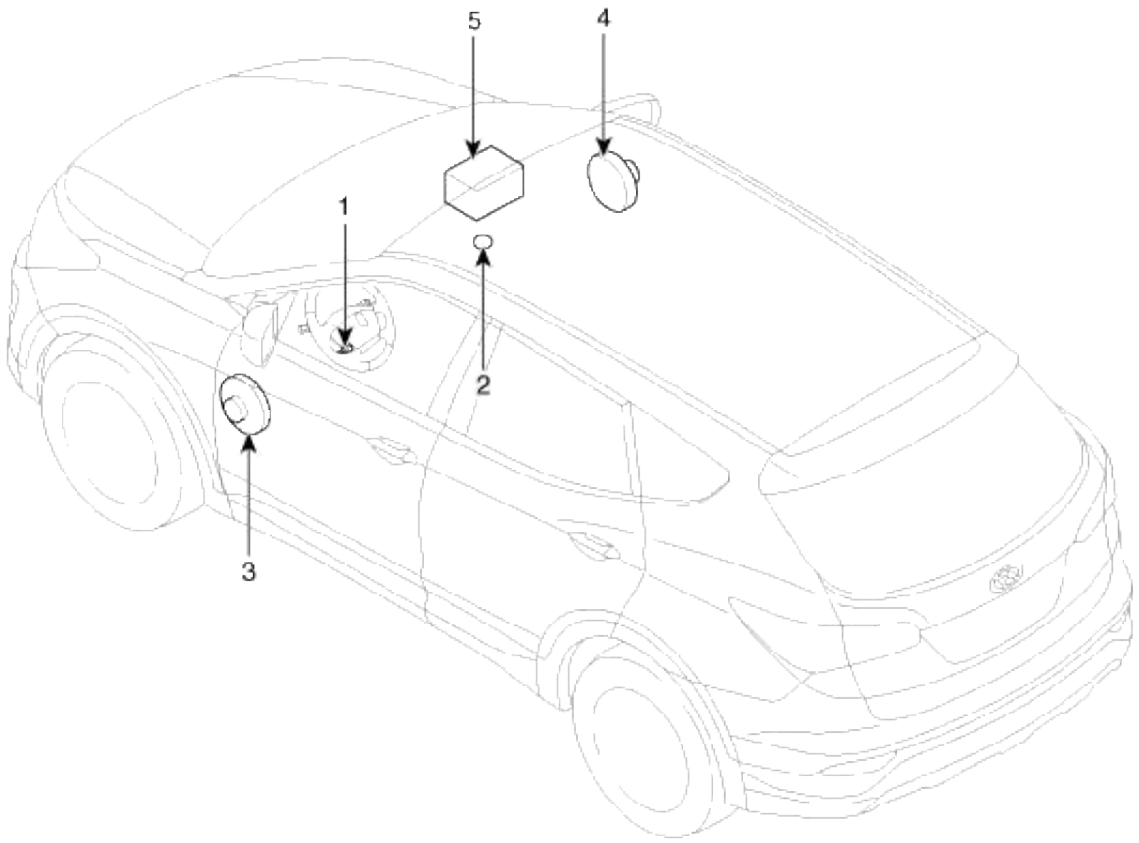
Installation

1. Install the mirror making sure the mounting bracket not to be damaged.
2. Install the mirror wiring cover after reconnecting the connector and tightening the screw.

Body Electrical System > Hands Free System > Components and Components Location

Components

Body Electrical System.



1. Hands free call switch 2. Mic 3. Front left speaker	4. Front right speaker 5. Audio head unit (hands free control)

There is no hands free jack. This system supports Bluetooth(wireless system).

Body Electrical System > Hands Free System > Description and Operation

Function

Audio Bluetooth System

General Features

- This audio system supports Bluetooth® hands-free and stereo-headset features.
- HANDS-FREE feature : Making or receiving calls wirelessly.
- STEREO-HEADSET feature : Playing music from cellular phones (that supports A2DP feature) wirelessly.

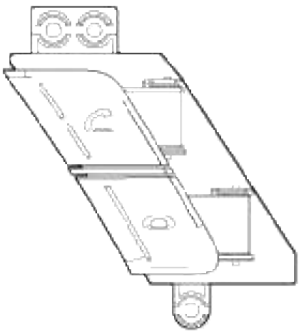
NOTE

- The phone must be paired to the system before using Bluetooth® features.
- Only one selected (connected) cellular phone can be used with the system at a time.
- Some phones are not fully compatible with this system.

Body Electrical System > Hands Free System > Hands Free Switch > Schematic Diagrams

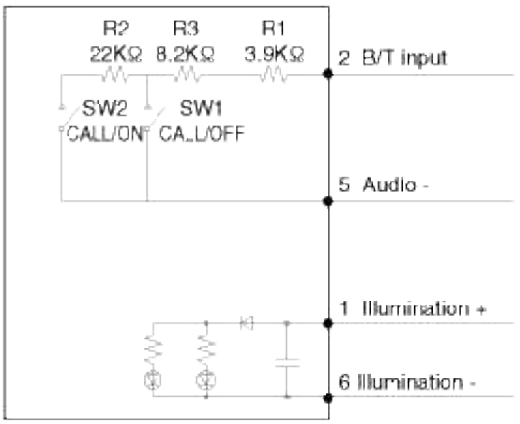
Circuit Diagram

[Bluetooth]

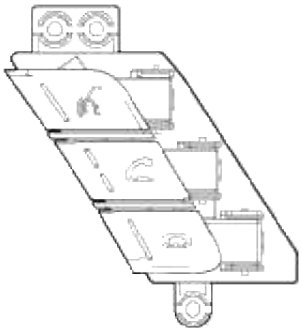




No.	Description
1	Illumination +
2	Bluetooth input
3	-
4	-
5	Audio -
6	Illumination -

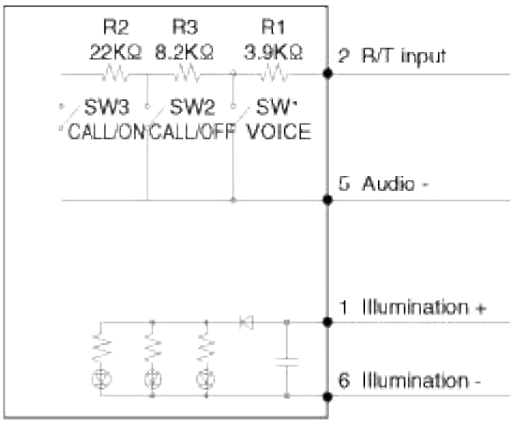


[Bluetooth + Voice recognition]





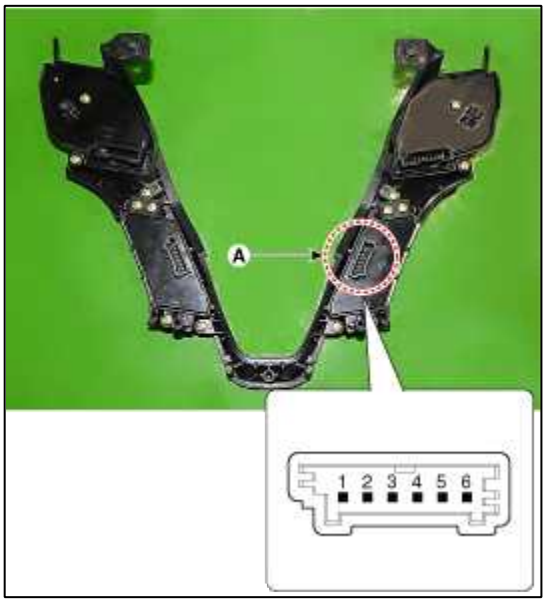
No.	Description
1	Illumination +
2	Bluetooth input
3	-
4	-
5	Audio -
6	Illumination -



Body Electrical System > Hands Free System > Hands Free Switch > Repair procedures

Inspection

1. Check for resistance between terminals in each switch position.



[Bluetooth]

Switch	Connector terminal	Resistance (± 5%)
End	2-5	12.1 kΩ
Send	2-5	34.1 kΩ

[Bluetooth + Voice]

Switch	Connector terminal	Resistance (± 5%)
Voice	2-5	3.9 kΩ
End	2-5	12.1 kΩ
Send	2-5	34.1 kΩ

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
3. Remove the steering wheel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Steering System - "Steering Column and Shaft")

4. Remove the steering wheel cover (A) after loosening the screws.





5. Loosen the screws after disconnecting the steering wheel remote control switch connector (A).



6. Remove the handsfree remote control switchs (A).



Installation

1. Install the remote control switch on the steering wheel.
2. Install the steering wheel.

3. Reconnect the remote control switch connector and airbag connectors.

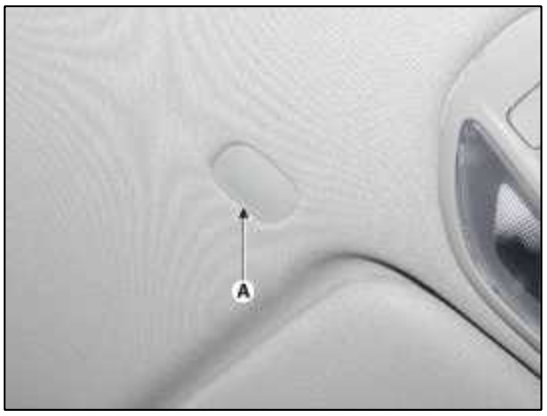
> NOTE
>
> Make sure that the switch connector is plugged in properly.

4. Install the driver airbag module.
5. Connect the negative (-) battery terminal.

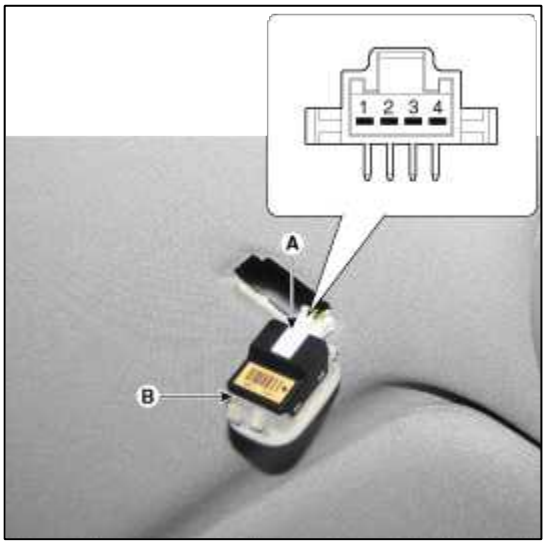
Body Electrical System > Hands Free System > Hands Free Mic > Repair procedures

Inspection

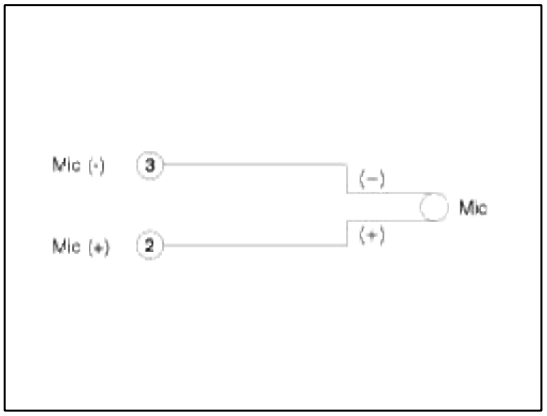
1. Disconnect the negative (-) battery terminal.
2. Seperate the handsfree mic (A) from the roof trim.



3. Remove the handsfree mic (B) after disconnecting the handsfree mic connector (A).



4. Check the continuity of Mic between terminals.



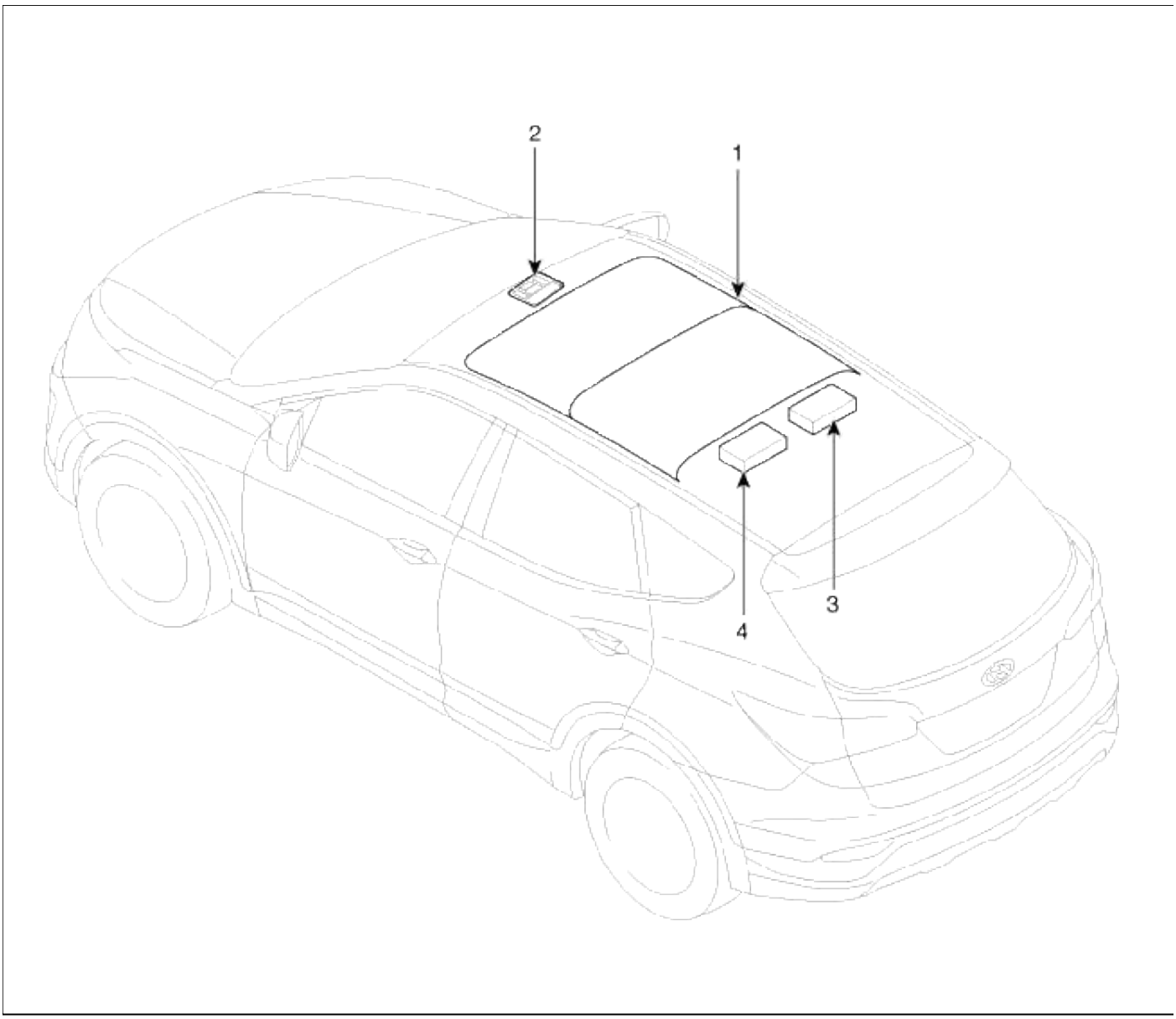
Body Electrical System > Hands Free System > Troubleshooting

Troubleshooting

Problem	Possible cause	Solution
Not pairing	Bluetooth device of Car is not discoverable mode	Enter Bluetooth pairing (searching) mode
	User's phone is Bluetooth off mode	User's phone set Bluetooth on
	Making an attempt pairing others bluetooth system	Check Bluetooth device name and address (12 word) to attempt paring Ex) 000B24FFF123
	Pass key error	Input the passkey displayed on the audio screen into the phone.
	5 phones have already been registered.	Delete paired phone list
	Bluetooth system cannot communicate with the phone.	Refer to IOP sheet IOP : Inter-operability
Not connection	User's phone or Bluetooth device of Car dose not register Bluetooth device to connect	Retry pairing
	Bluetooth system cannot communicate with the phone.	Waiting 1minute then Retry connection or phone power off/on. Refer to IOP sheet
Not redial	User phone system issue	Push the 2 times Send button
Not accept call	User phone system issue	Refer to IOP sheet
Not dialing	User's phone playing other menu (internet, mp3, game, etc..)	Stop other menu then set normal mode
	Bluetooth system cannot communicate with the phone	Refer to IOP sheet

Body Electrical System > Panorama Sunroof > Components and Components Location

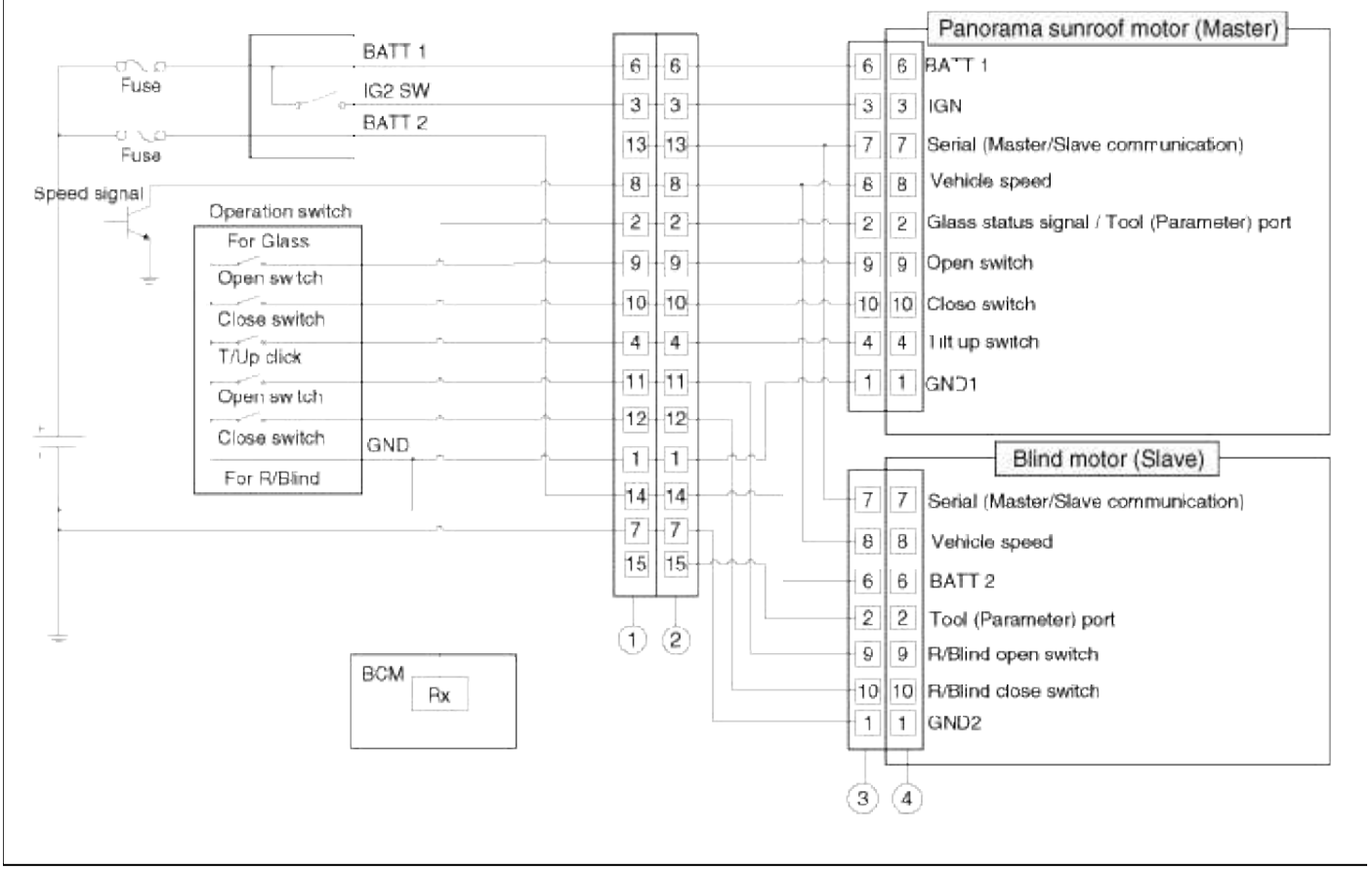
Component Location



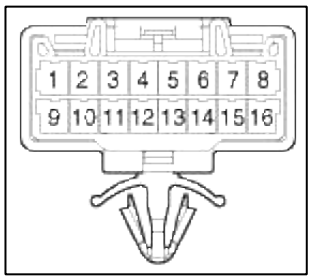
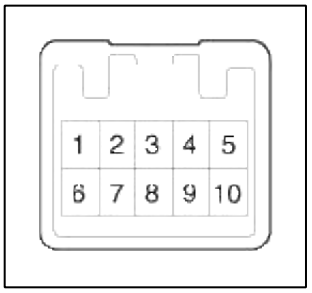
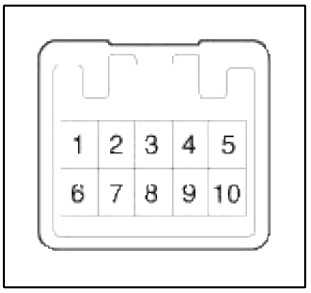
1. Panorama sunroof 2. Panorama sunroof switch	3. Panorama sunroof motor & controller 4. Roller blind motor & slave controller

Body Electrical System > Panorama Sunroof > Schematic Diagrams

Circuit Diagram



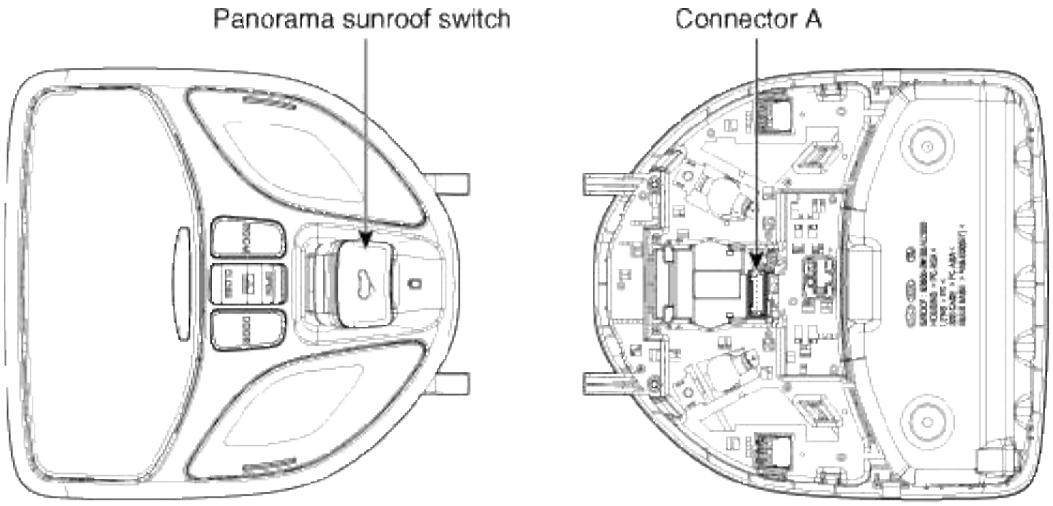
Connector Pin Information

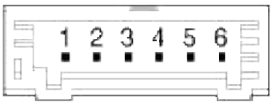
No.	Wire harness connector	Panorama motor	Blind motor
			
1	Ground 1	Ground 1	Ground 2
2	Glass status signal / Tool fot glass	Glass status signal/ Tool (Parameter)	Tool (Parameter)
3	IGN 2	IGN 2	-
4	Tilu up switch	Tilu up switch	-
5	-	-	-
6	Battery 1	Battery 1	Battery 2
7	Ground 2	Serial	Serial
8	Vehicle speed signal	Vehicle speed signal	Vehicle speed signal
9	Glass open switch	Glass open switch	Blind open switch
10	Glass close switch	Glass close switch	Blind close switch
11	Blind open switch		

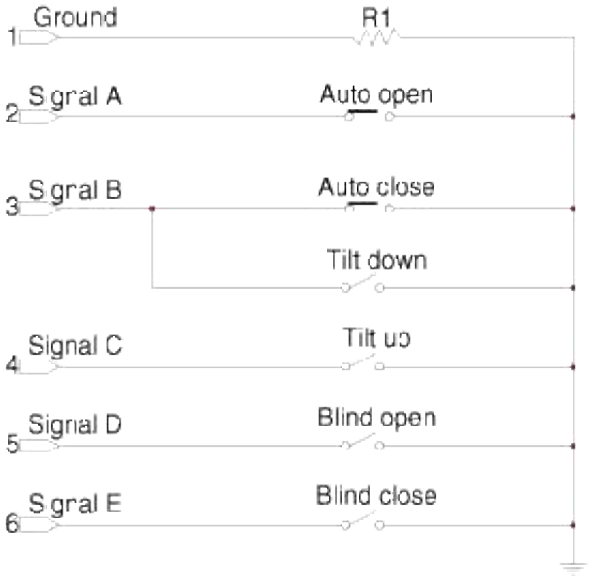
12	Blind close switch		
13	Serial		
14	Battery 2		
15	Blind tool		
16	-		

Body Electrical System > Panorama Sunroof > Panorama Sunroof Switch > Components and Components Location

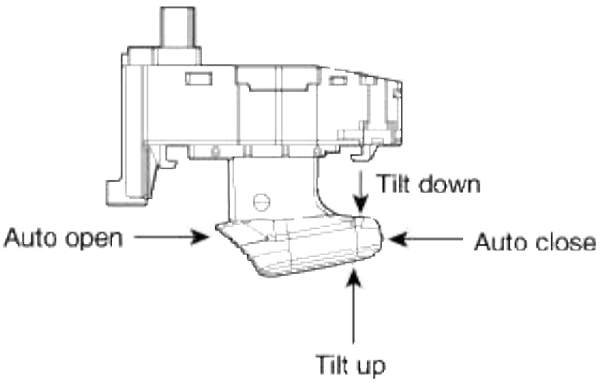
Components



Connector A	No.	Description	No.	Description
	1	Ground	4	Signal C
	2	Signal A	5	Signal D
	3	Signal B	6	Signal E



Panorama sunroof & blind signal logic						
	Auto open	Auto close	Tilt down	Tilt up	Blind open	Blind close
Signal A	1	0	0	0	0	0
Signal B	0	1	1	0	0	0
Signal C	0	0	0	1	0	0
Signal D	0	0	0	0	1	0
Signal E	0	0	0	0	0	1



Body Electrical System > Panorama Sunroof > Panorama Sunroof Switch > Repair procedures

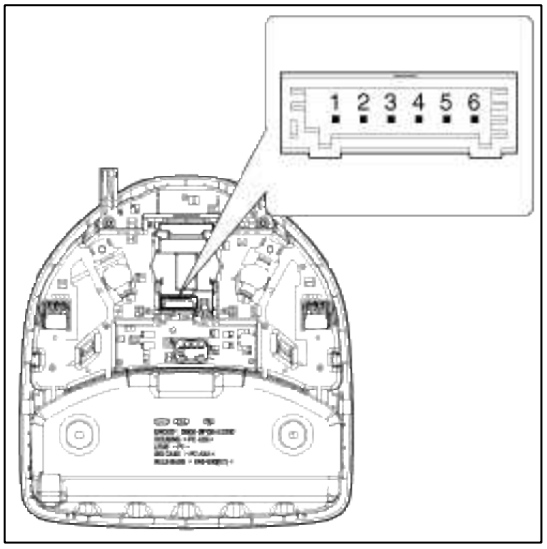
Inspection

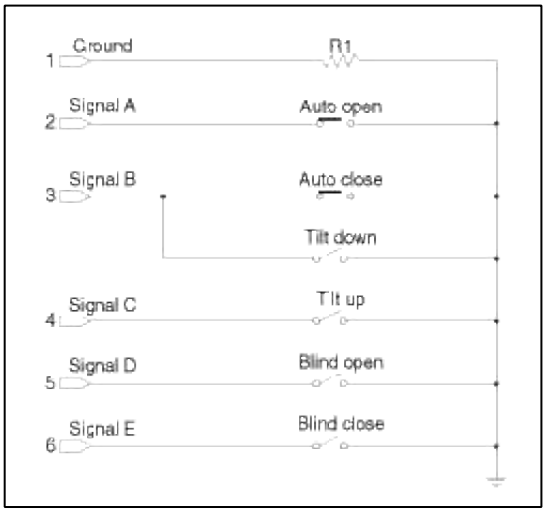
1. Disconnect the negative (-) battery terminal.

2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console. Disconnect the switch connector and Map lamp connector, and then remove the overhead console lamp (A).



3. Check for continuity between the terminals. If the continuity is not as specified, replace the panoramaroof switch.



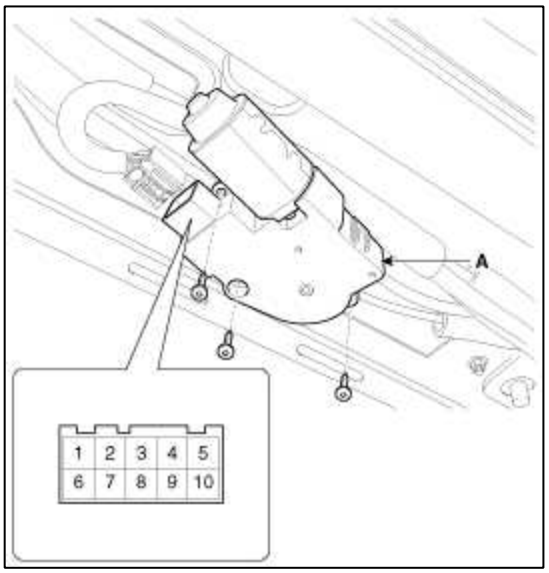


Terminal / Position	1	2	3	4	5	6
Auto open	○	○				
Auto close/ Tilt down	○		○			
Tilt up	○			○		
Blind open	○				○	
Blind close	○					○

Body Electrical System > Panorama Sunroof > Panorama Sunroof Motor > Repair procedures

Inspection

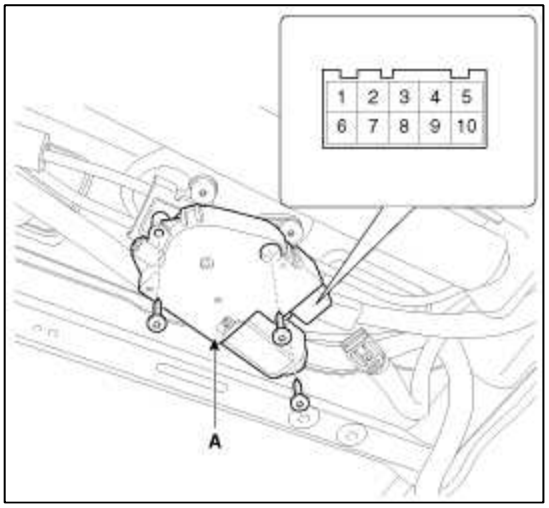
1. Close the panorama sunroof glass and blind completely (Full close position).
2. Disconnect the negative (-) battery terminal.
3. Remove the roof trim assembly.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Roof Trim")
4. Remove the panorama sunroof glass motor (A) after loosening the screws and disconnecting the connector.



5. Check the wiring connector of the panorama sunroof glass motor as below table.

Terminal	Test condition	Test : Desired result
3 - GND	IG2 ON	Check for voltage to ground : There should be battery voltage
1 - GND	Under all conditions	Check for continuity to ground : There should be continuity.
6 - GND	Under all conditions	Check for voltage to ground : There should be battery voltage.

6. Remove the blind motor (A) after loosening the screws and disconnecting the connector.



7. Check the wiring connector of the blind motor as below table.

Terminal	Test condition	Test : Desired result
1 - GND	Under all conditions	Check for continuity to ground : There should be continuity.
6 - GND	Under all conditions	Check for voltage to ground : There should be battery voltage.

8. Connect the panorama sunroof glass and blind motor and each connectors.

> NOTE
>
> Be careful not to reinstall the motors on the panorama sunroof.

9. Connect the negative (-) battery terminal.
10. Start the vehicle engine.
11. Check the motor's operation by pressing the panorama sunroof switch.

Terminal	Operation Test
Auto open switch	Both the glass and blind motors operate
Auto close switch	Both the glass and blind motors operate
Auto tilt up switch	Both the glass and blind motors operate
Blind open switch	The blind motor operates
Blind close switch	The blind motor operates

12. Pless the auto close switch after checking the motor's operation.
13. Install the panorama sunroof glass motor and blind motor. And then perform the resetting procedure of the panorama sunroof.

> NOTE
>
> Use only the auto close switch.

Replacement

Resetting The Panoramaroof

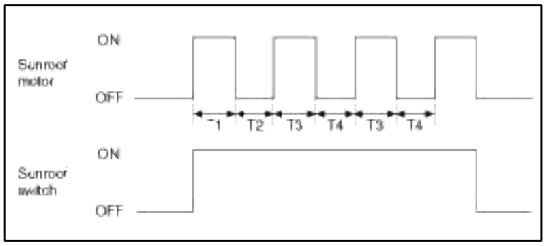
Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the panoramaroof, you have to reset your panoramaroof system as follows :

1. Turn the ignition key to the ON position and then close the panoramaroof completely.
2. Release the panoramaroof control lever.
3. Press and hold the CLOSE button for more than 10 seconds until the sunroof has moved slightly.
4. Release the panoramaroof control lever.
5. Press and hold the CLOSE button once again within 5 seconds until the panorama sunroof do as follows ;
   A. Blind open and glass open → Glass close → Blind close
      Then release the lever.
6. Reset procedure of panorama system is finished.

Protecting The Overheated Motor

In order to protect the overheated panoramaroof motor by continuous motor operation, the panoramaroof ECU controls the Run-time and Cool-time of motor as followings;

1. The panoramaroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st Run-time(120 ± 10sec.).
3. Motor which is operated continuously stops operating after the 1st Run-time(120 ± 10sec.).
4. And then Motor is not operated for the 1st Cool-time(18 ± 2sec.).
5. Motor is operated for the 2nd Run-time(10 ± 2sec.) at the continued motor operation after 1st Cool-time(18 ± 2sec.)
6. Motor which is operated continuously stops operating after the 2nd Run-time(10 ± 2sec.)
7. Motor is not operated for the 2nd Cool-time(18 ± 2sec.).
8. Motor repeats the 2nd Run-time and 2nd Cool-time at the continued motor operation.
   A. In case that motor is not operated continuously, the Run-time which is limited for protecting the overheated motor is increased.
   B. The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

Body Electrical System > Panorama Sunroof > Roller Blind Motor > Repair procedures

Replacement

1. Refer to the inspection procedure in the panorama sunroof motor.
   <a href="content.asp?vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to the "Panorama Sunroof Motor")

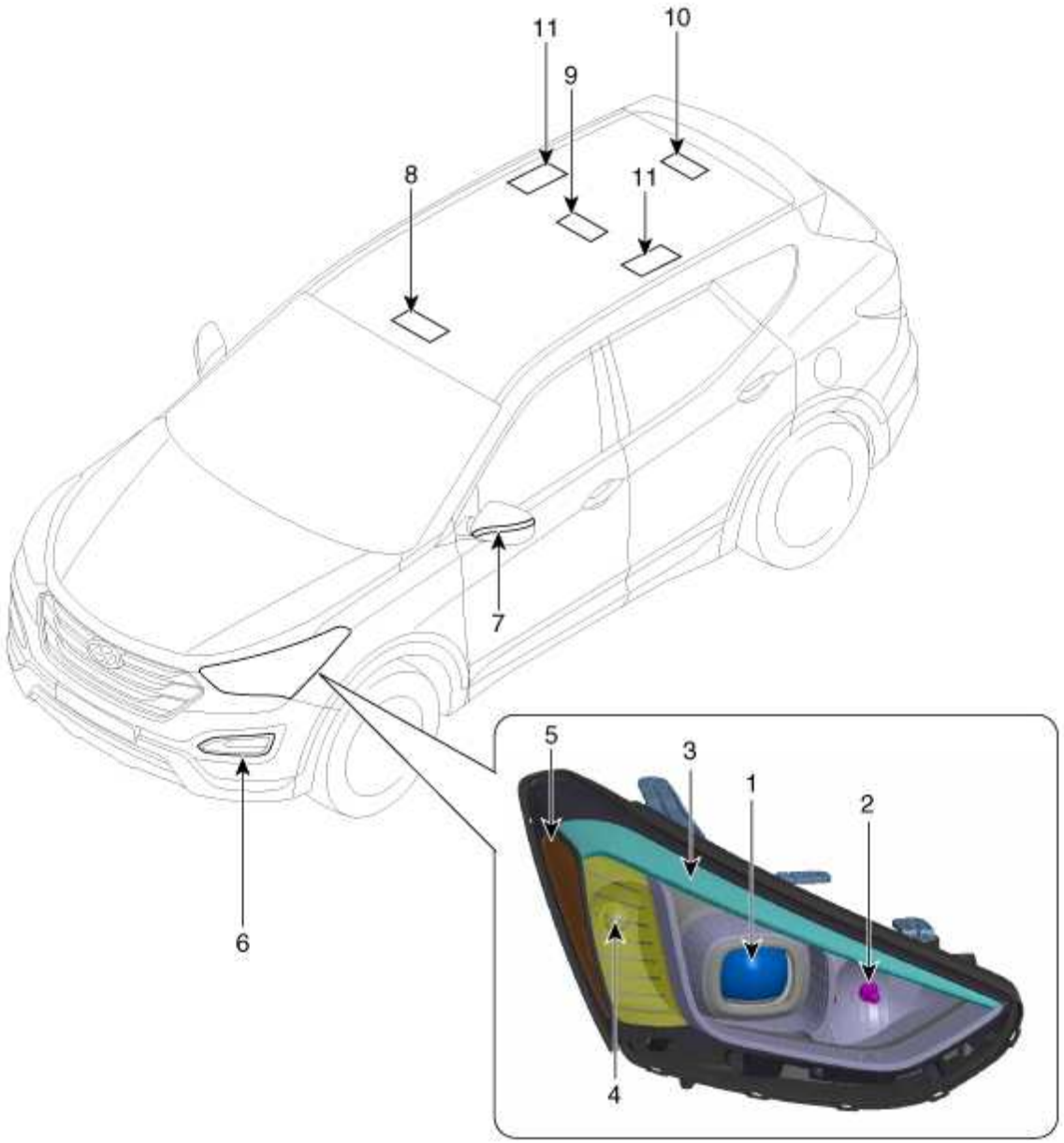
Body Electrical System > Lighting System > Specifications

Specifications

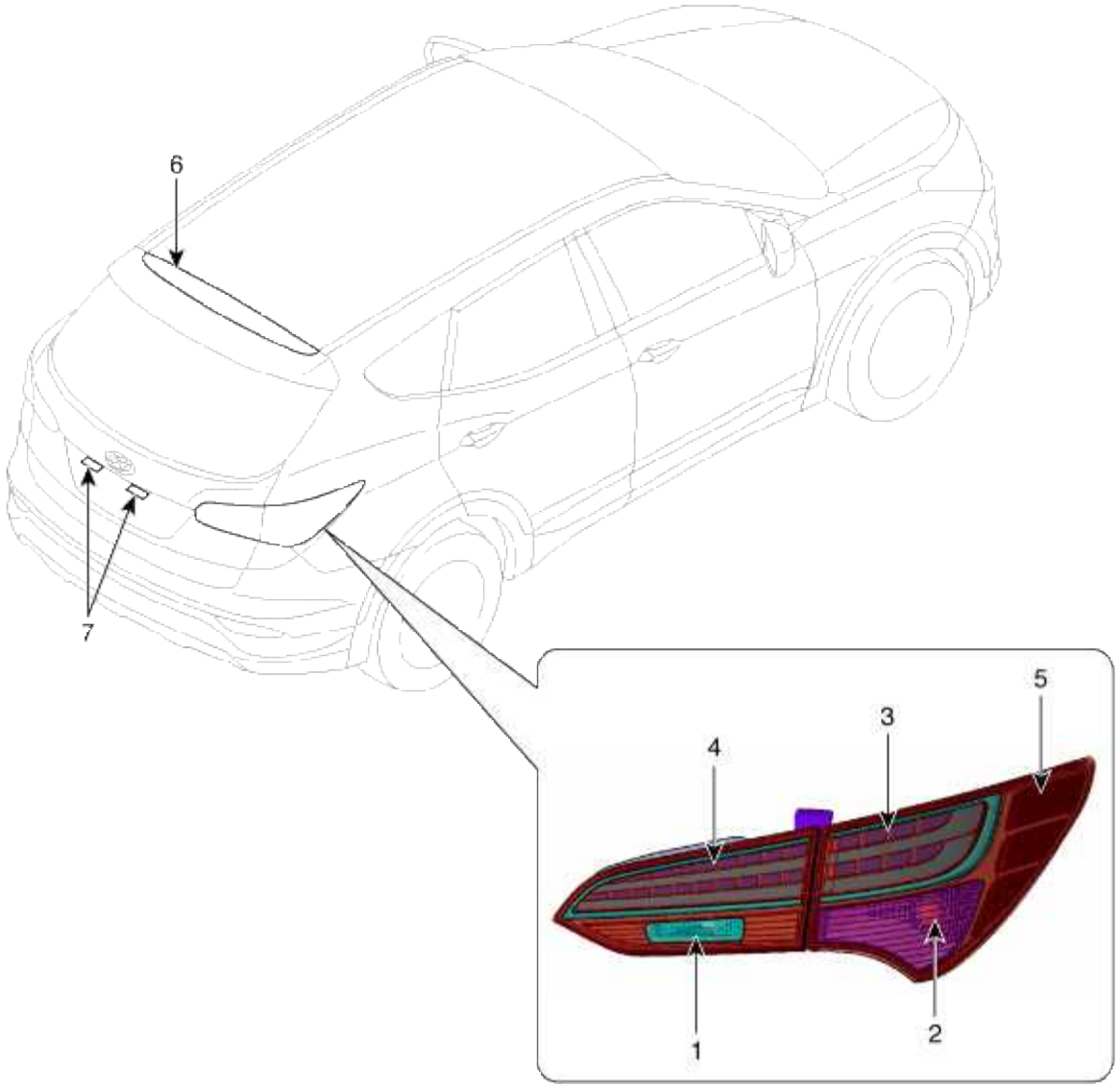
Items			Bulb Type	Bulb Wattage (W)
Front	Head lamp	Low	H11	55
		High	H7	55
	Turn signal lamp		PY28W	28
	Position lamp		LED	LED
	Side marker		W5W	5
	Fog lamp		H8	35
Rear	Rear combination lmap	Turn signal lamp	PY27W	27
		Stop/ Tail lamp (Outside)	P28/ 8W	28/ 8
		Tail lamp (Inside)	P28/ 8W	8
		Side marker	LED	LED
		Back up lamp	W16W	16
	High mounting stop lamp		LED	LED
License plate lamp			W5W	5
Cargo lamp			FESTOON	5
Overhead console lamp			FESTOON	10
Room lamp			FESTOON	8
Vanity lamp			FESTOON	5

Body Electrical System > Lighting System > Components and Components Location

Component Location



1. Head lamp (Low) 2. Head lamp (High) 3. Position lamp 4. Turn signal lamp 5. Side marker 6. Fog lamp	7. Turn signal lamp (Door mirror) 8. Overhead console lamp 9. Room lamp 10. Cargo lamp 11. Room lamp (Panorama sunroof only)

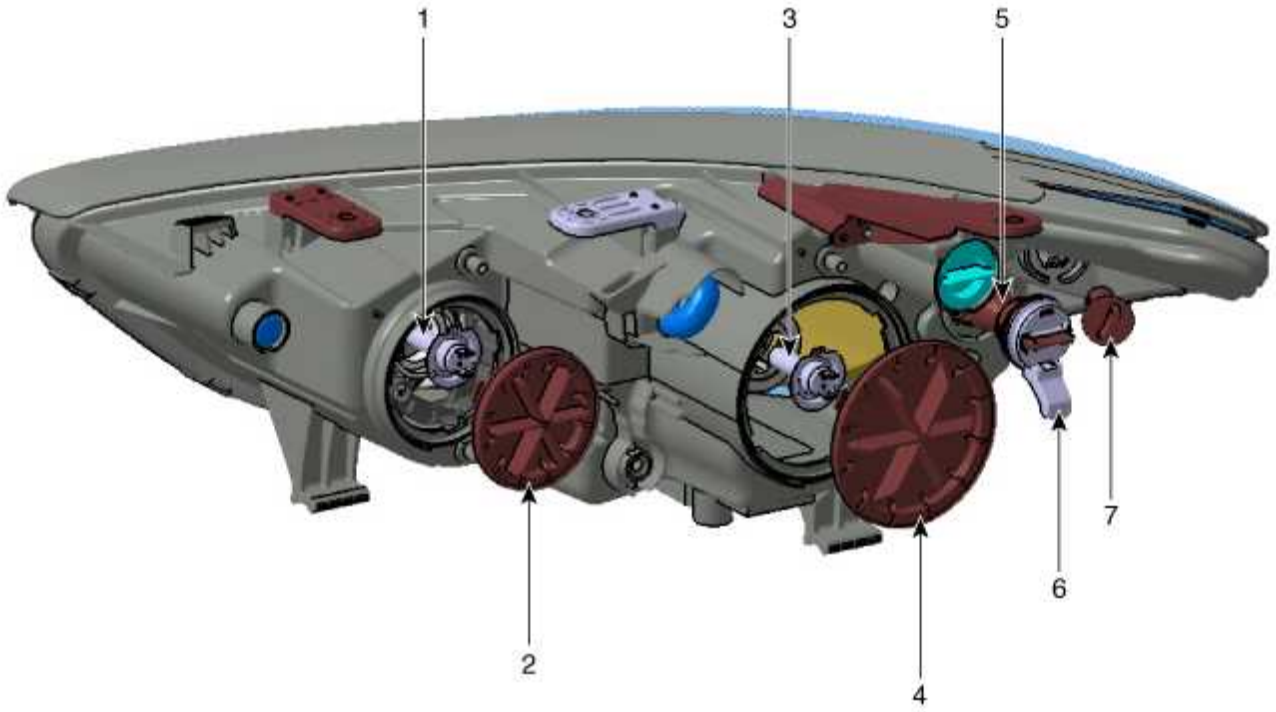


1. Back up lamp 2. Turn singal lamp 3. Stop/Tail lamp 4. Tail lamp	5. Side marker 6. High mounting stop lamp 7. License plate lamp

Body Electrical System > Lighting System > Head Lamps > Components and Components Location

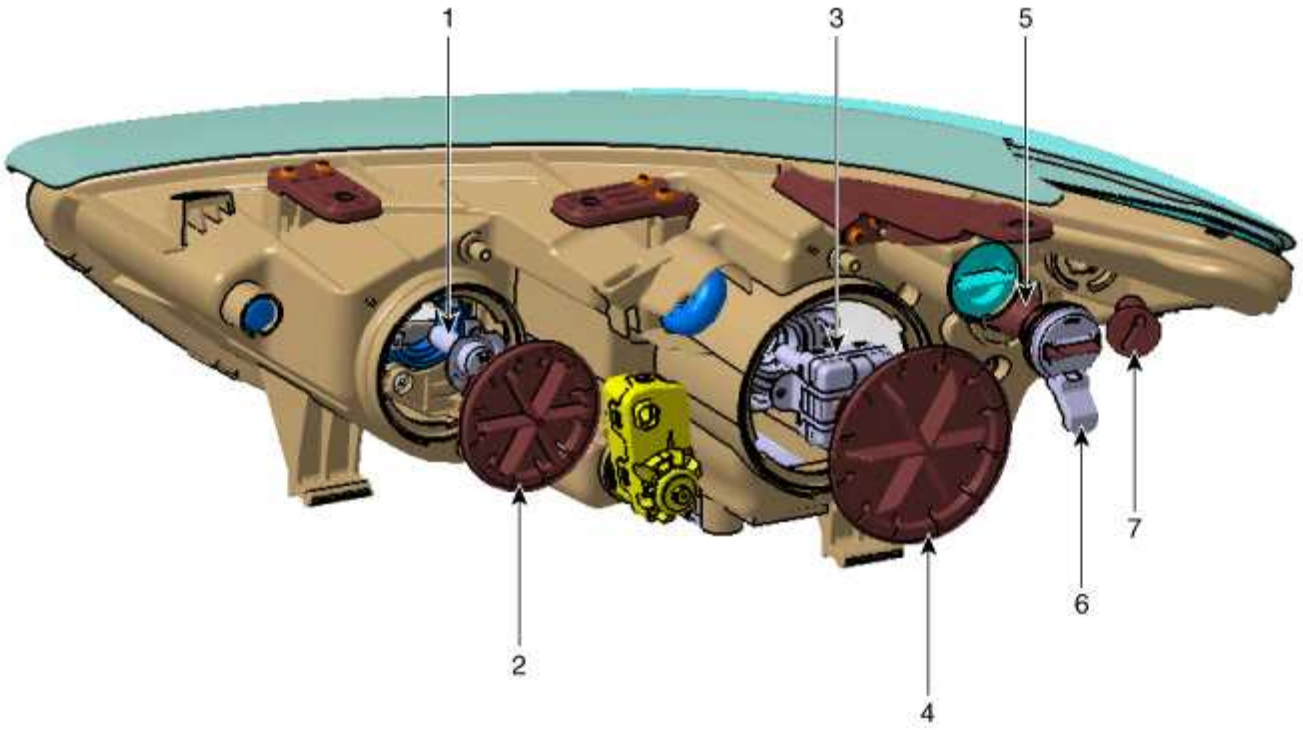
Component

[General]



1. Head lamp high beam bulb 2. Dust cap (High) 3. Head lamp low beam bulb 4. Dust cap (Low)	5. Turn signal lamp bulb 6. Turn signal lamp socket 7. Side marker bulb

[HID]



1. Head lamp high beam bulb 2. Dust cap (High) 3. Head lamp low beam bulb (HID) & ignitor 4. Dust cap (Low)	5. Turn signal lamp bulb 6. Turn signal lamp socket 7. Side marker bulb

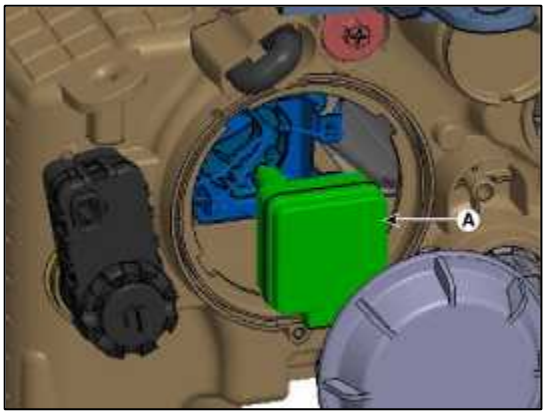
Body Electrical System > Lighting System > Head Lamps > Description and Operation

HID Head Lamp

1. Bulb
   (1) Elements
   Xenon gas: Xenon gas activates the initial reaction for rapid illuminating.
   Molybdenum electrode: anode arcing
   Metal halide salts: color composing component
   (2) Lightening principle
   When Xenon gas and metal halide salt will discharge the molybdenum anode in a capsule, it emits light.

2. Ignitor

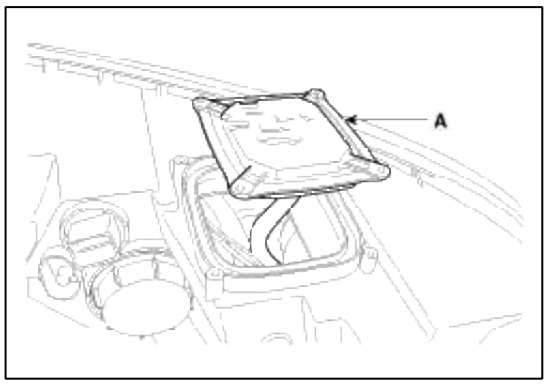
Ignitor (A) is an electromagnetic transformer that receives current from ballast and boost voltage to light on the arc light source in any environment.



3. Ballast

(1) Ballast (A) delivers an instant high voltage pulse to the ignitor electrode, to initialize discharge in the source.

(2) Ballast supplies the stable power to the bulb and the ignitor during initialization and normal state of arc.



4. Stability

(1) Durable for vibration as there is no filament.

(2) Does not operate if polarity are changed.

(3) Doesn't operate if the input voltage is not in the range of 10-16V.

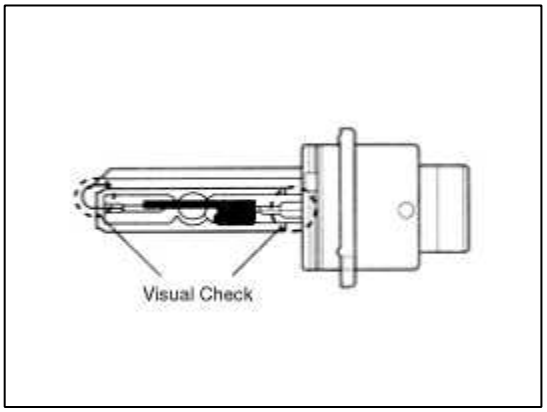
(4) Doesn't operate if the circuit is short.

(5) Doesn't operate if the bulb burnt out.

Body Electrical System > Lighting System > Head Lamps > Repair procedures

Inspection

1. Check-points upon head lamp failure (HID)
   (1) Check the battery voltage. (Low beam will be on when the battery voltage above 9V.)
   (2) Check the fuse and relay.
   (3) Check the polarity of ballast. (If the polarity are changed, low beam doesn't lighten)
   (4) Check the bulb connector securely.
   (5) Visually bulb checking (no filament): damaged glass, damaged for upper parts and lower parts of glass tube.
   (6) After (1)~(5), replace the ballast and the ignitor. (ballast assembly).



2. Service procedure and warning (HID)

No.	Item	Service procedures	Warning	Remarks
1	Replacement of lamp assembly	1. Disconnect the power connector from the lamp. 2. Remove and replace the lamp assembly. 3. Connect the power connector after removing the front bumper cover.	• Disconnect the head lamp power connector to avoid high voltage.	• Other description is the same as the halogen bulbs.
2	Replacement of the Bulb	1. Disconnect the power connector from the lamp. (head lamp, turn signal, head lamp leveling device) 2. Remove the lamp assembly. 3. Remove the ballast and dust cover. 4. Remove the bulb socket and replace the bulb. 5. Installation is the reverse of removal.	• Disconnect the head lamp power connector to avoid high voltage. • Be careful not to damage the bulb and use genuine bulbs only. • Do not apply excessive force and fit it correctly.	
		1. Disconnect the power connector from the lamp.		

3	Replacement of the Ballast (with built-in ignitor)	2. Remove the lamp and then the ballast and the dust cover. 3. Remove the head lamp leveling device and then the bulb socket. 4. Connect the bulb socket on the replacement ballast and install the leveling device. 5. Installation is the reverse of removal.	• Disconnect the head lamp power connector to avoid high voltage.	• Replace the ballast only and install the used lamp. • Replace the sub assembly except the ballast.
4	Others	1. Power supply should be according to the rated capacity. 2. Use the rated fuse and wire. 3. Bulb socket shall be free from moisture or dirt. 4. Do not apply the ballast severe shock, water, or extreme	• All parts should be serviced only at specified service centers.	• HID lamp should not be installed on other cars (Dangerous, fire may occur.)

CAUTION

HID lamp shall not be used on other cars.(Fire may occur.)
Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 30,000V) and high current (12-13A), and are different from the halogen lamp specification.

Characteristic

1. Durable for vibration as there is no filament.
2. HID lamp had a more long life than halogen lamp.
3. Does not operate if polarity is changed.
4. Operating input voltage : 9-16V

Removal

CAUTION

Head lamps become very hot during use; do not touch them or any attaching hardware immediately after they have been turned off.

NOTE

The headlamp bulb should not be removed from the headlamp assembly until just before a new bulb is installed.
Removing bulb for an extended period of time may affect headlamp bulb performance.
Contaminants may enter the headlamp assembly where they can settle on the lens and reflector.
Never turn on the head lamps with the bulb removed from the headlamp assembly.

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover.
   (Refer to Body - "Front Bumper Cover")

3. Loosen the mounting bolts (3EA) of head lamp. Remove the head lamp assembly (B) after disconnecting the lamp connectors (A).





NOTE

Take care that retaining clip (A) is not to be damaged.



Installation

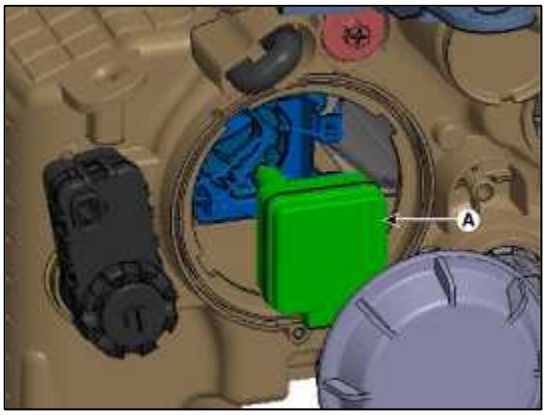
1. Install the head lamp bulbs.
2. Reassemble the head lamp bulb covers.
3. Reassemble the head lamp assembly after connecting the lamp connector.

Replacement

Bulb (HID)

1. Turn the head lamp switch off.
2. Disconnect the power connector from the lamp.
3. Remove the dust cap.
4. Remove the ignitor clip from the lamp assembly.
5. Disconnect the ignitor connector.

6. Remove the ignitor and bulb (A).



7. Installation is the reverse of removal.

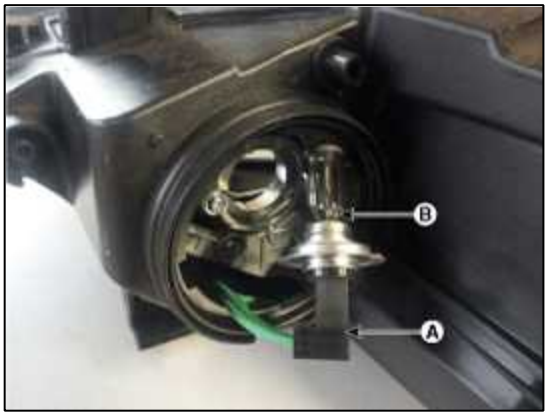
> CAUTION
>
> Turn the head lamp switch off to avoid high voltage
> Be careful not to damage the bulb and use genuine bulbs only
> - Do not apply excessive force and fit it correctly.
> - Confirm the bulb locking

Bulb (high/low)

1. Turn the head lamp switch off.
2. Disconnect the power connector from the lamp.
3. Remove the dust cap.
4. Turn the connector (A) counterclockwise and then remove it.
   Remove the head lamp low beam bulb (B) after disconnecting the connector (A) from the bulb.



5. Remove the head lamp high beam bulb (B) after disconnecting the connector (A) from the bulb.

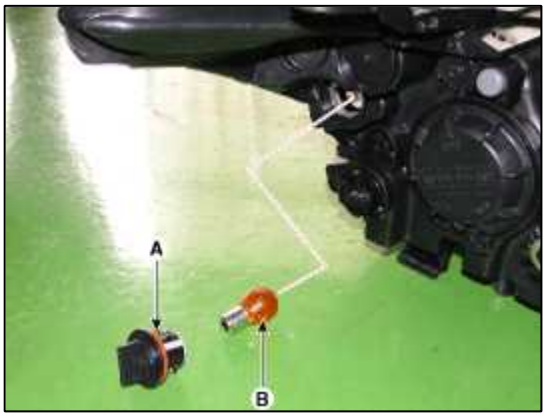


6. Installation is the reverse of removal.

Turn signal lamp

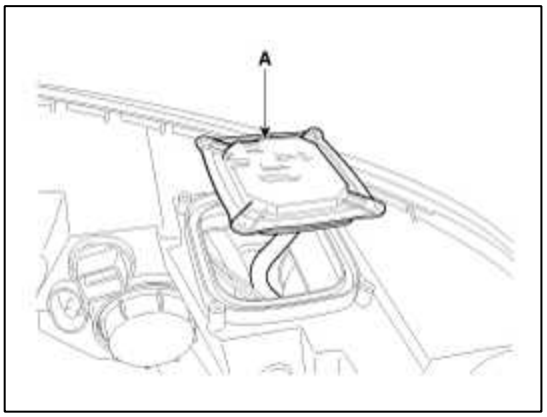
1. Turn the head lamp switch off.

2. Remove the bulb socket (A) and bulb (B) from the lamp assembly.



Ballast

1. Turn the head lamp switch off.
2. Disconnect the power connector from the lamp.
3. Remove the head lamp assembly.
4. Remove the ballast (A) after loosening the screws (4EA).



5. Installation is the reverse of removal.

NOTE

- Turn the head lamp switch off to avoid high voltage.

CAUTION

- HID lamp shall not be used on other cars.(Fire may occur.)
- Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 20,000V) and high current (12-13A), and are different from the halogen lamp specification.
- Install the dust cover after confirming the locking state between bulb and bulb holder.
- When testing the HID head lamp, turn the power on or off with switch between power supply and lamp because of high voltage.
- Do not operate the head lamp switch with the bulb not installed, because it generates spark momently.

Adjustment

Head Lamp Aiming Instructions

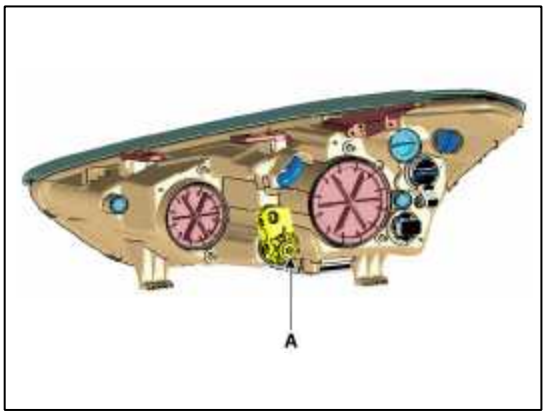
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

NOTE

If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

Alternately turn the adjusting gear to adjust the head lamp aiming. If beam-setting equipment is not available, proceed as follows :

1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the vertical lines.
   A : Vertical (Low/High)



Head Lamp And Fog Lamp Aiming Point

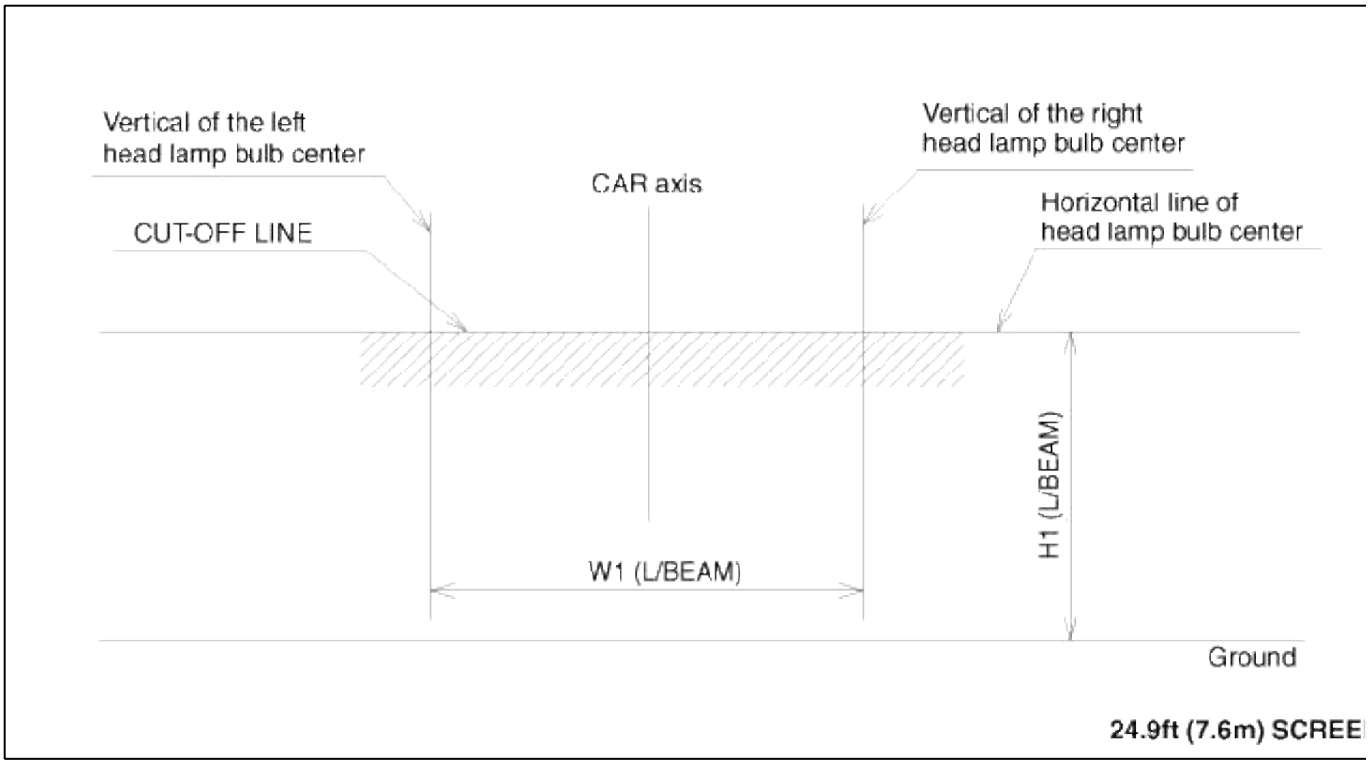


H1 : Height between the head lamp bulb center and ground (Low beam)
H2 : Height between the head lamp bulb center and ground (High beam)
H3 : Height between the fog lamp bulb center and ground
W1 : Distance between the two head lamp bulbs centers (Low beam)
W2 : Distance between the two head lamp bulbs centers (High beam)
W3 : Distance between the two fog lamp bulbs centers
L : Distance between the head lamp bulb center and screen

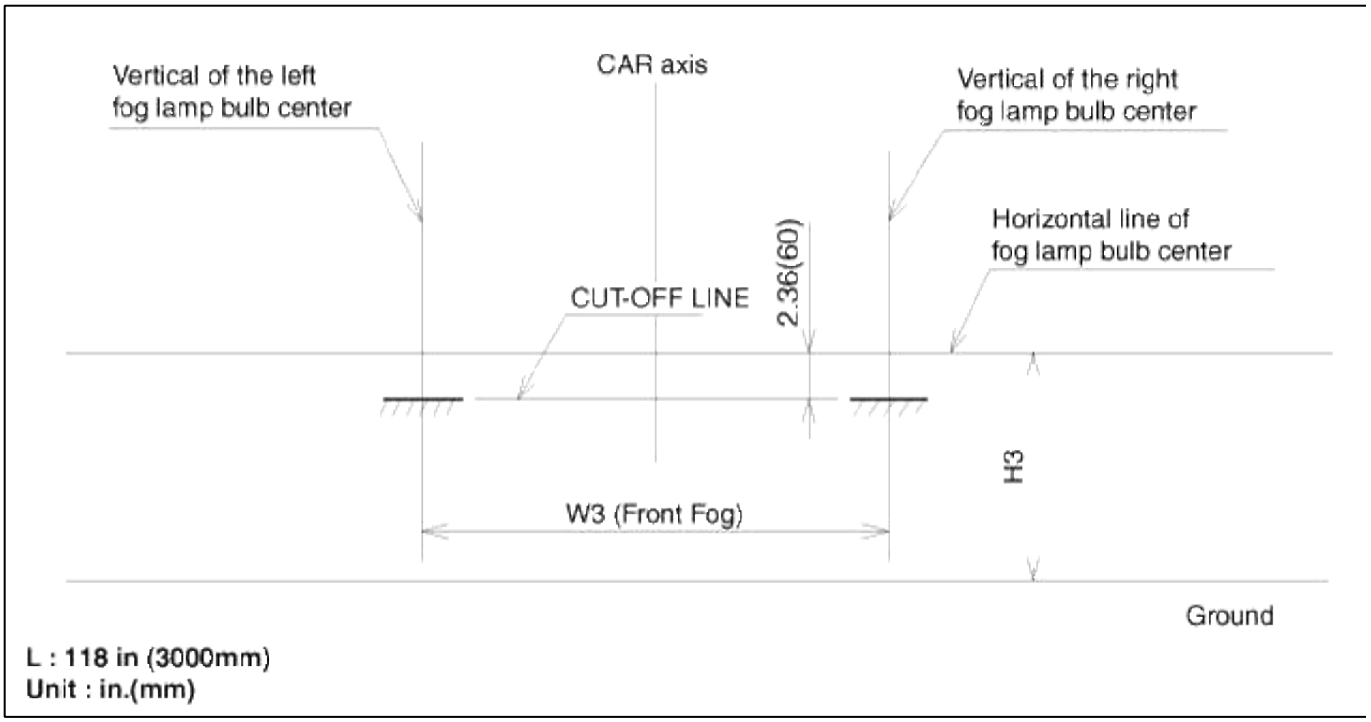
Unit : in (mm)

Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	35.0(888)	34.2(869)	23.0(584)	56.1(1,426)	47.0(1,194)	56.8(1,443)	Refer to aiming condition
With driver	34.8(883)	34.0(864)	22.8(579)				

1. General Type (VOR)
   A. Turn the low beam on without driver aboard.
   B. The cut-off line should be projected in the allowable range (shaded region) shown in the picture.
   C. If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.



2. Turn the front fog lamp on with driver seated in the vehicle.
   The cut-off line should be projected in the allowable range shown in the picture.



Body Electrical System > Lighting System > Turn Signal Lamp > Repair procedures

Removal

Door Mirror Turn Signal Lamp

1. Disconnect the negative (-) battery terminal.

2. Remove the mirror holder (A) from the outside mirror assembly.



NOTE

Be careful not to damage the fixing clip

3. Remove the door mirror housing (A) after loosening a screw.



4. Remove the door mirror cover (A).



5. Loosen the mirror turn signal lamp mounting screw.



6. Remove the door mirror turn signal lamp (B) after disconnecting the connector (A).



Installation

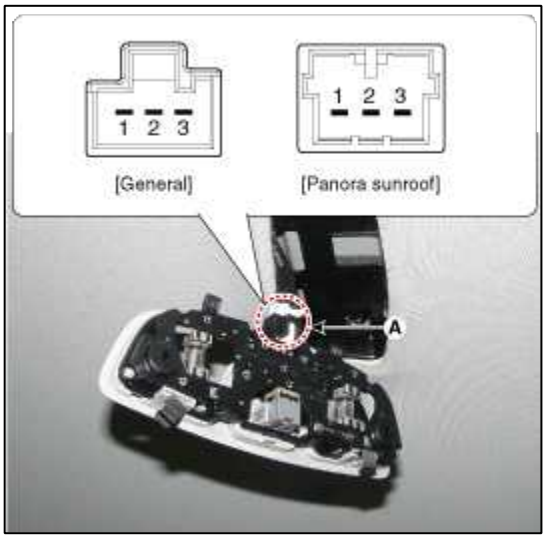
Door Mirror Turn Signal Lamp

1. Install the door mirror turn signal lamp.
2. Install the door mirror cover and housing.
3. Install the door mirror.
4. Connect the negative (-) battery terminal.

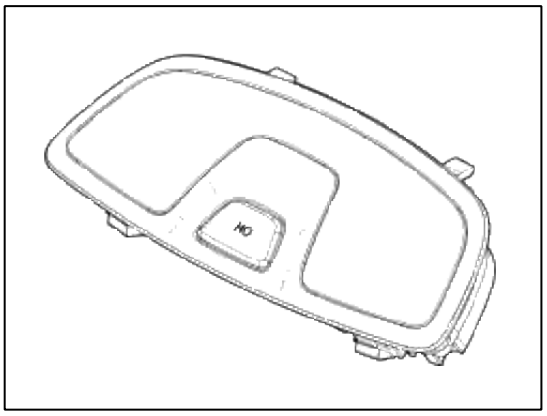
Body Electrical System > Lighting System > Room Lamp > Repair procedures

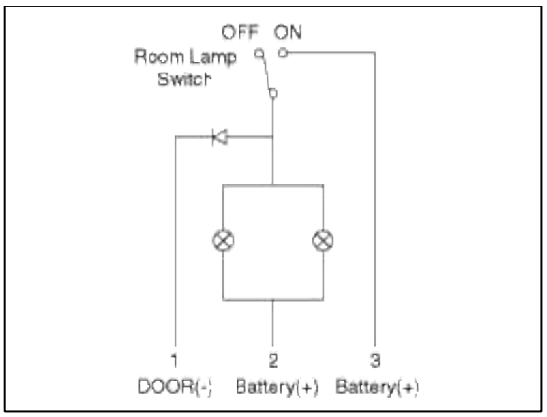
Inspection

1. Remove the room lamp assembly then check for continuity between terminals.



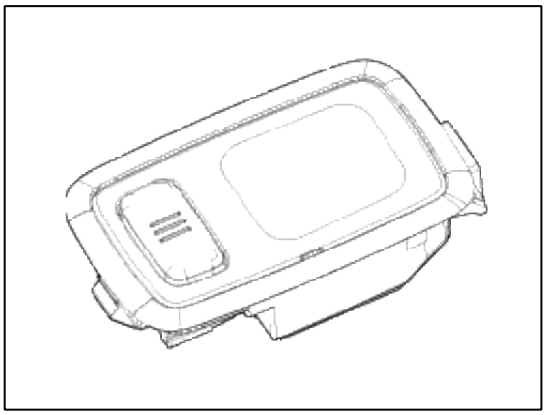
[General]

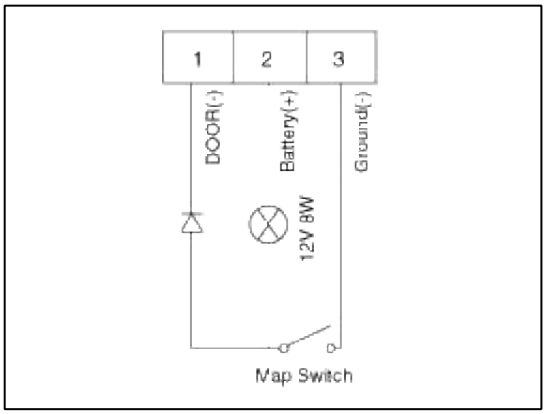




Terminal / Position	1	2	3
OFF	○	○	
ON		○	○

[Panorama Sunroof]





Terminal / Position	1	2	3
DOOR	○	○	
ON		○	○

Removal

1. Disconnect the negative (-) battery terminal.

2. Detach the lamp lens (A) from the room lamp with a flat-tip screwdriver.



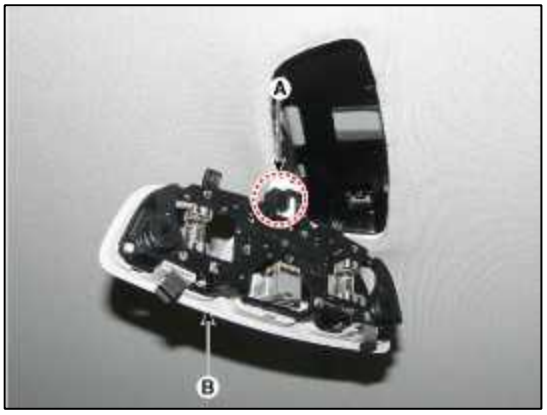
3. Replace the room lamp bulb (A).



4. Separate the room lamp (A) from the roof trim after loosening the screws (2EA).



5. Remove the room lamp (B) after disconnecting the connector (A).



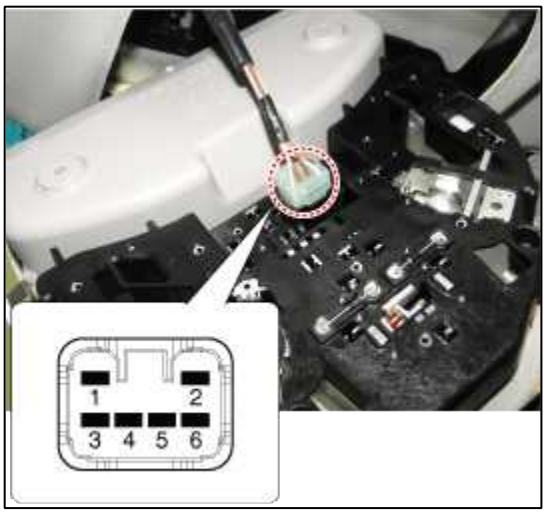
Installation

1. Install the room lamp assembly after connecting the lamp connector.
2. Install the lamp lens after assembling the bulb.

Body Electrical System > Lighting System > Overhead Console Lamp > Repair procedures

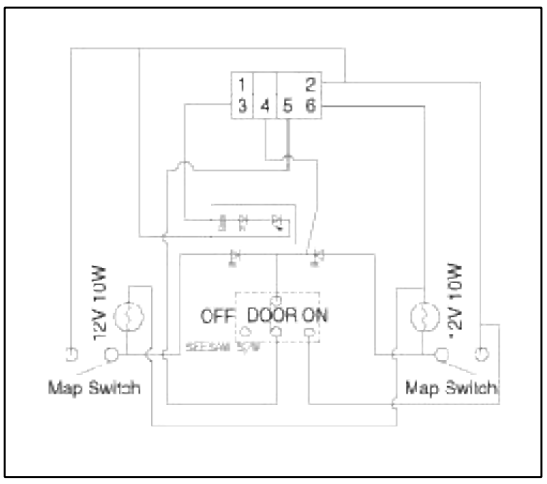
Inspection

1. Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.

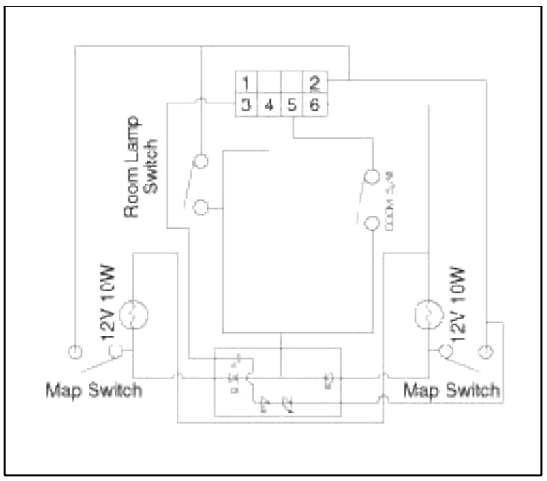


Item / Position / Terminal	Map lamp switch			
	Left		Right	
	ON	OFF	ON	OFF
2	●		●	
6	●		●	

[General]



[Panorama Sunroof]



Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the mounting screws (2EA).
   And then remove the overhead console (A).



3. Remove the overhead console after disconnect the connector (A).



4. If it is necessary to replace the bulb, replace the bulb after removing the lens (A).



Installation

1. Install the overhead console lamp after connecting the connector.
2. Install the lens after tightening 2 screws.

Body Electrical System > Lighting System > Door Mood Lamp > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Front Door Trim")
3. Disconnect the door mood lamp connectors (A).



4. Remove the door mood lamp (A) after loosening the screws (3EA).



5. If it is necessary to replace the bulb, replace the bulb (A) after disconnecting the connector.



Installation

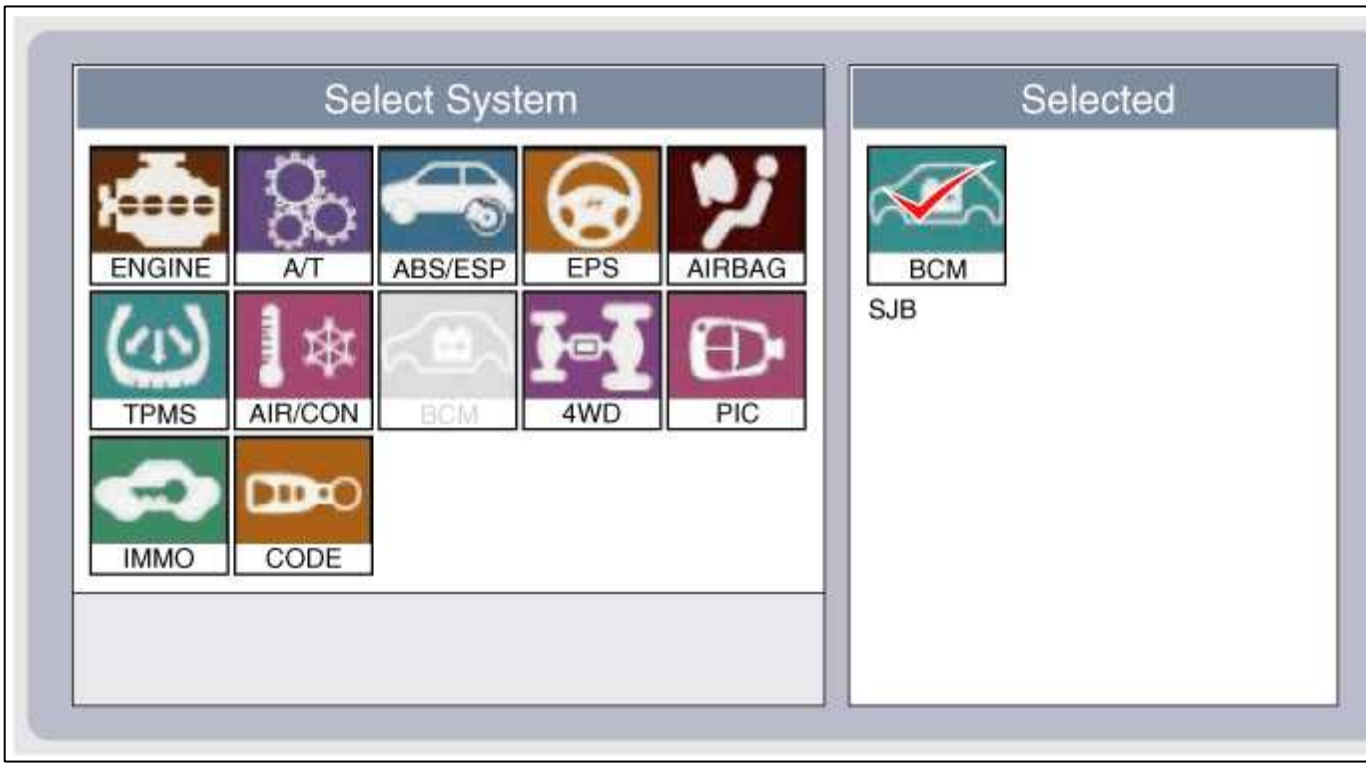
1. Install the door mood lamp and connector.
2. Install the front door trim.

3. Connect the negative (-) battery terminal.

Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

Inspection

1. The SJB can be diagnosed by using the GDS. The SJB communicates with the GDS which then displays inputs and outputs along with codes.
   It will be able to diagnose defects of hazard lamp switch with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. To diagnose the SJB function, select the vehicle model, BCM and SJB.



3. To consult the present input/out value of SJB, "Current DATA". It provides information of SJB input/output conditions.



Removal

1. Disconnct the negative (-) battery terminal.
2. Remove the audio unit or AVN head unit.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Audio - "Audio Unit")
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to AVN system - "AVN Head Unit")
3. Remove the heat & A/C control module unit.
   <a href="content.asp?vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&m
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Heating, Ventilation, Air Conditioning - "Heater & A/C Control Unit (DATC)")

Installation

1. Install the heater & A/C control module unit.
2. Install the audio or AVN head unit.
3. Connect the negative (-) battery terminal.

Body Electrical System > Lighting System > Rheostat > Repair procedures

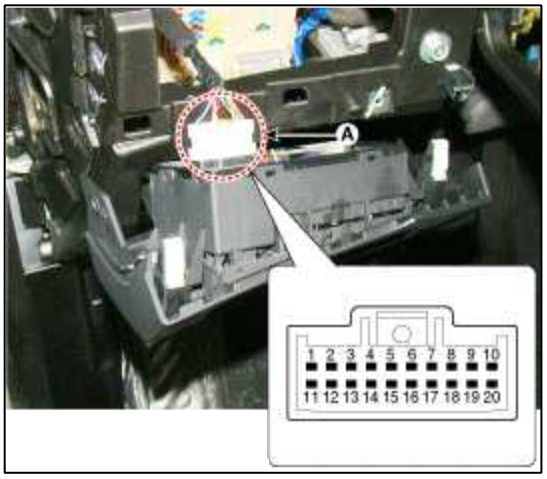
Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover.

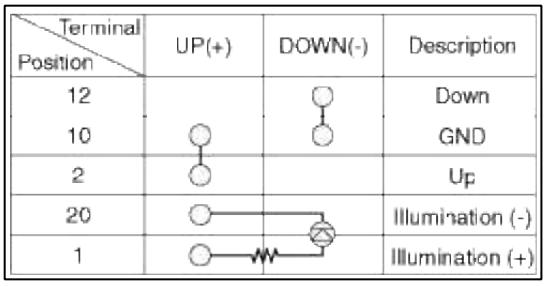
3. Remove the lower crash pad switch assembly (A) after loosening the screws (3EA).



4. Remove the rheostat switch connector (A).



5. Check for intensity of new rheostat switch. If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is normal.



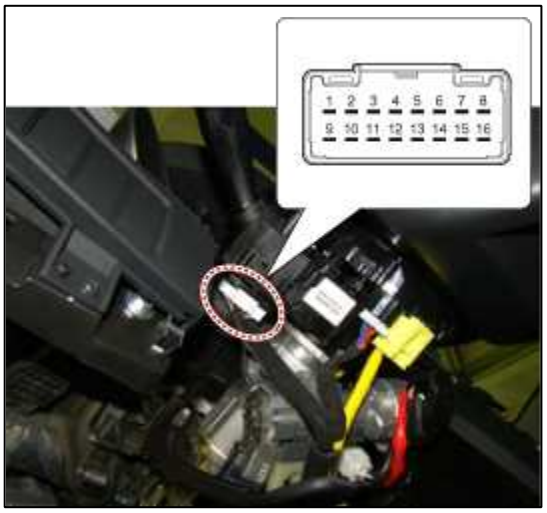
Terminal / Position	UP(+)	DOWN(-)	Description
12			Down
10			GND
2			Up
20			Illumination (-)
1			Illumination (+)

Body Electrical System > Lighting System > Front Fog Lamps > Repair procedures

Inspection

Front Fog Lamp Switch

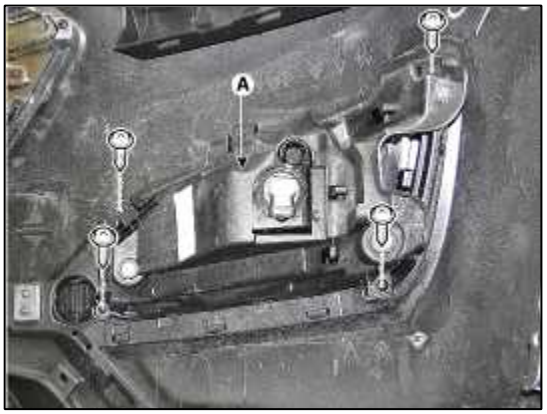
1. With the fog lamp switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multifunction switch.



Terminal / Position	10	11
ON	○	○
OFF		

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper.
   (Refer to Body - "Front Bumper Cover")
3. Remove the front fog lamp assembly (A) after loosening the mounting screws (4EA).



4. Remove the front fog lamp (A) by turning in the counter clock-wise direction after disconnecting the connector.



Installation

1. Install the front fog lamp bulb.
2. Connect the front fog lamp connector.
3. Install the front bumper.

Body Electrical System > Lighting System > License Lamps > Repair procedures

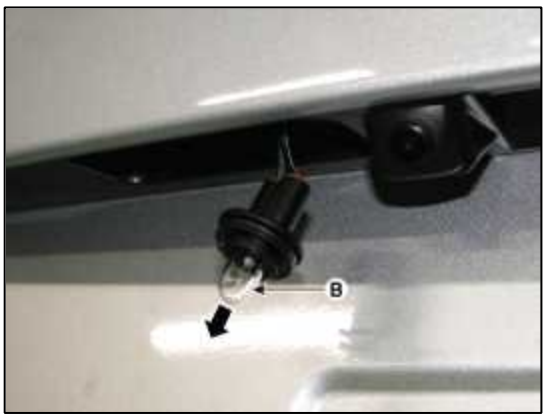
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the license lamp lens (A) from the panel after loosening a screw.



3. Replace the bulb (B) after removing the license lamp (A).





Installation

1. Install the bulb.
2. Install the license lamp lens.

Body Electrical System > Lighting System > High Mounted Stop Lamp > Repair procedures

Removal

High Mounted Stop Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the rear spoiler.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank"> (Refer to Body - "Rear Spoiler")
3. Remove the high mounted stop lamp assembly (A) after loosening screws (4EA).



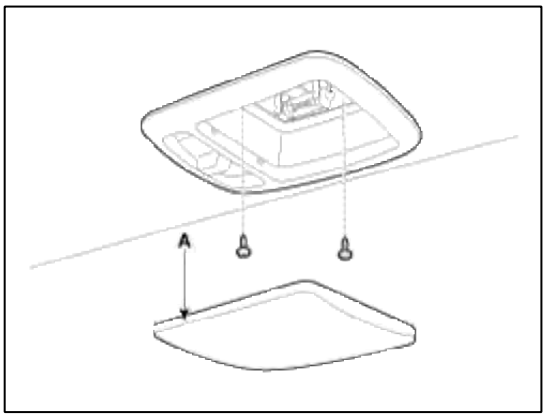
Installation

1. Install the high mounted stop lamp.
2. Install the rear spoiler.
3. Connect the negative (-) battery terminal.

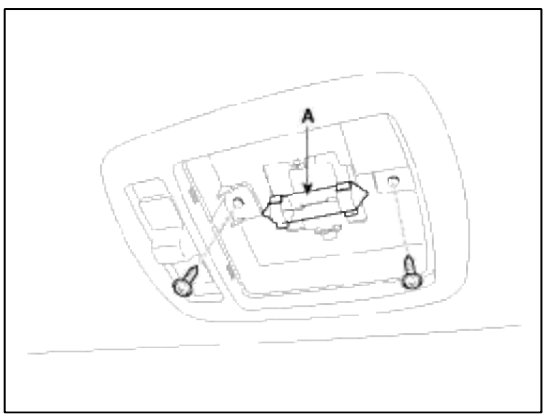
Body Electrical System > Lighting System > Luggage Room Lamp > Repair procedures

Removal

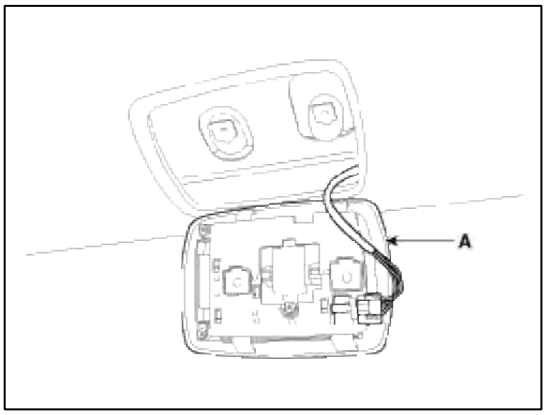
1. Disconnect the negative (-) battery terminal.
2. Remove the luggage room lamp lens (A) with a flat-tip screwdriver after loosening the screws (2EA).



3. Remove the luggage room lamp bulb (A).



4. Remove the luggage room lamp assembly (A) after disconnecting the connector.



5. If it is necessary to replace the bulb, replace the luggage room lamp bulb.

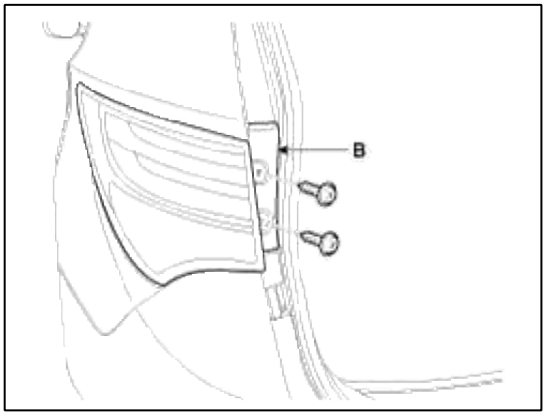
Installation

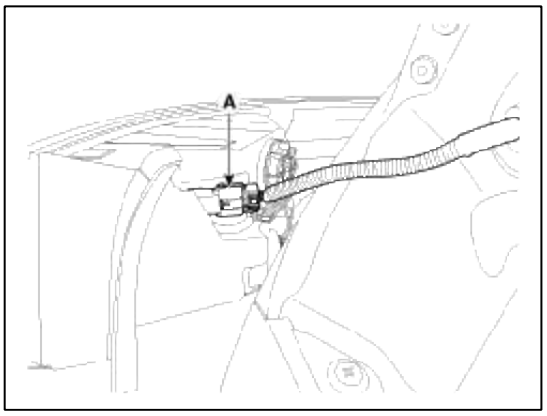
1. Install the luggage room lamp assembly after connecting the lamp connector.

Body Electrical System > Lighting System > Rear Combination Lamp > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Loose the screws (2EA) holding the rear combination lamp then disconnect the connector (A) then remove the outside rear combination lamp (B).





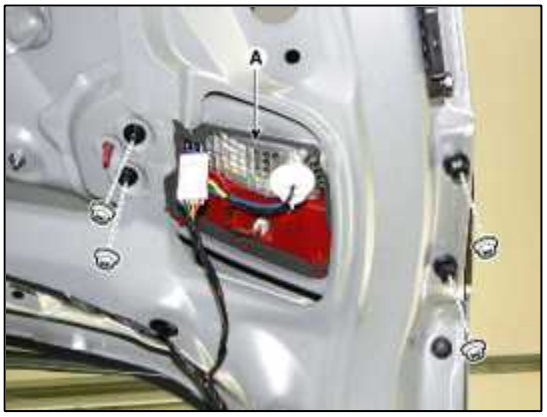
3. If it is necessary to replace the bulb, remove the rear combination cover (A).



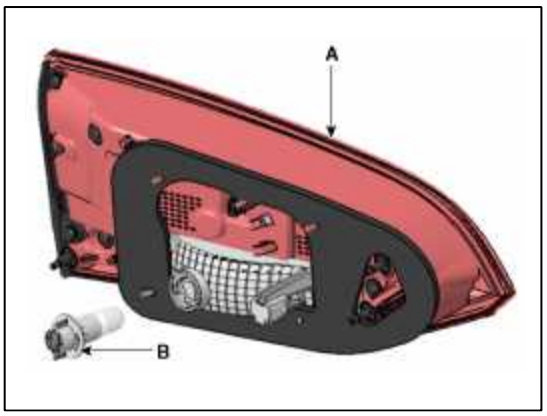
4. Remove the bulb (A) after disconnecting the connector.



5. Remove the tailgate trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Trim")
6. Remove the inside rear combination lamp assembly (A) after loosening the nuts (4EA) and disconnecting the connector.



7. Remove the bulb (B) after separating the inside rear combination lamp assembly (A).



8. If it is necessary to replace the bulb, remove the bulb after removing the tailgate cover.

Installation

1. Install the tailgate combination lamp assembly after assembling the bulb.
2. Install the lamp cover to the tailgate after connecting the lamp connector.
3. Install the rear combination lamp assembly after assembling the bulbs and connecting the lamp connector.

Body Electrical System > Lighting System > Troubleshooting

Troubleshooting

Symptom	Possible cause	Remedy
One lamp does not light (all exterior)	Bulb burned out	Replace bulb
	Socket, wiring or ground faulty	Repair if necessary
Head lamps do not light	Bulb burned out	Replace bulb
	Ignition fuse (LOW:10A, HIGH:20A) blown	Check for short and replace fuse
	Head lamp fuse (15A) blown	Check for short and replace fuse
	Head lamp relay faulty	Check relay
	Lighting switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Tail lamps and license plate lamps do not light	Bulb burned out	Replace bulb
	Tail lamp fuse (10A) blown	Check for short and replace fuse
	Tail lamp relay faulty	Check relay
	Lighting switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Stop lamps do not light	Bulb burned out	Replace bulb
	Stop lamp fuse (15A) blown	Check for short and replace fuse
	Stop lamp switch faulty	Adjust or replace switch
	Wiring or ground faulty	Repair if necessary
Stop lamps do not turn off	Stop lamp switch faulty	Repair or replace switch
Instrument lamps do not light (Tail lamps light)	Rheostat faulty	Check rheostat
	Wiring or ground faulty	Repair if necessary
Turn signal lamp does not flash on one side	Bulb burned out	Replace bulb
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
	Bulb burned out	Replace bulb

Turn signal lamps do not light	Turn signal lamp fuse (10A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Hazard warning lamps do not light	Bulb burned out	Replace bulb
	Hazard warning lamp fuse (15A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Hazard switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps
	Flasher unit faulty	Check flasher unit
Back up lamps do not light	Bulb burned out	Replace bulb
	Back up lamp fuse (10A) blown	Check for short and replace fuse
	Back up lamp switch (M/T) faulty	Check switch
	Transaxle range switch (A/T) faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Front fog lamps do not light	Bulb burned out	Replace bulb
	Front fog lamp fuse (15A) blown	Check for short and replace fuse
	Front fog lamp relay faulty	Check relay
	Front fog lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Wiring or ground faulty	Repair if necessary	
Map lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Map lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
	Bulb burned out	Replace bulb

Trunk room lamp does not light	Room lamp fuse (10A) blown	Check for short and replace fuse
	Trunk room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

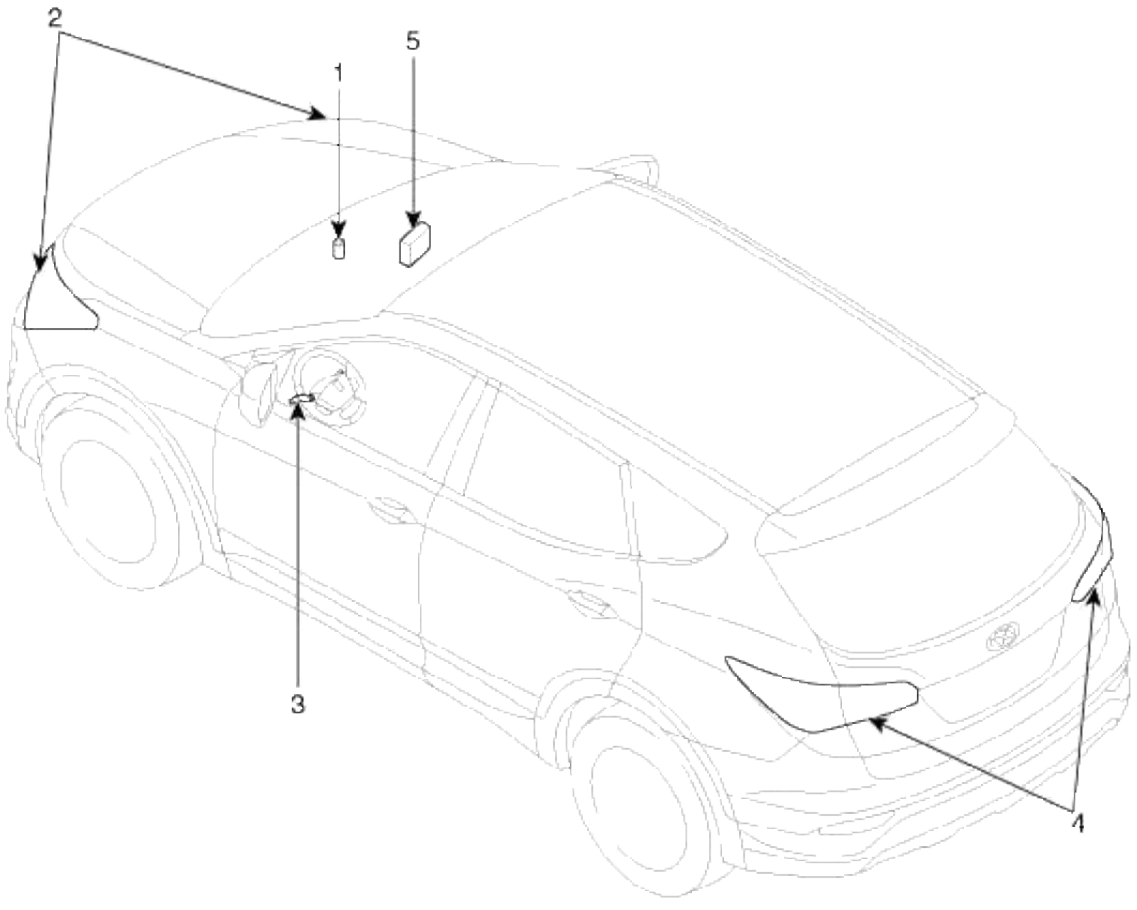
Body Electrical System > Auto Lighting Control System > Specifications

Specifications

Items		Specifications
Rated voltage		5V
Load		Max. 1mA (When head lamp lighting)
Illuminations (LUX)	50	1.42 ± 0.31V
	100	2.63 ± 0.58V
	150	3.84 ± 0.84V

Body Electrical System > Auto Lighting Control System > Components and Components Location

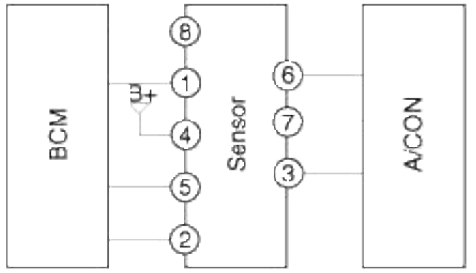
Component Location

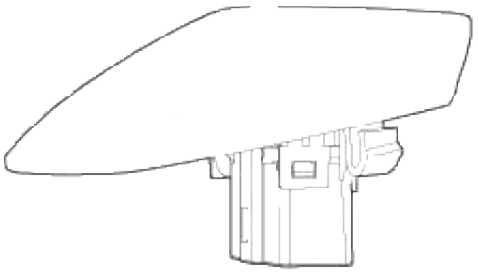


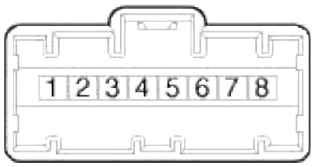
1. Auto light sensor 2. Head lamps 3. Lighting switch (Auto)	4. Tail lamps 5. BCM (Body Control Module)

Body Electrical System > Auto Lighting Control System > Schematic Diagrams

Circuit Diagram







[Auto l ight Connector]

No.	Description
1	Auto light signal
2	Auto light GND
3	Photo signal (RH)
4	LED power (B+)
5	LED GND (To BCM)
6	Photo signal (LH)
7	Photo power (SW)
8	Auto light power (5V)

Body Electrical System > Auto Lighting Control System > Auto Light Switch > Repair procedures

Inspection

Operate the auto light switch, then check for continuity between terminals of multi-function switch connector.



Terminal / Position	13	14	15	16
OFF				
Auto	○	○		
Tail Lamp	○		○	
Head Lamp	○			○

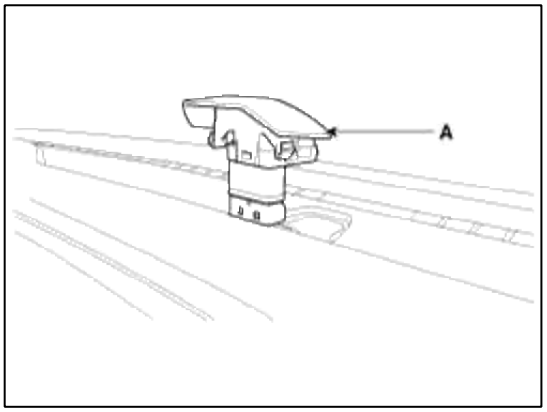
Body Electrical System > Auto Lighting Control System > Auto Light Sensor > Repair procedures

Inspection

In the state of IGN1 ON, when the multi function switch module detects auto light switch on, tail lamp relay output and head lamp low relay output are controlled according to auto light sensor's input.
If IGN1 ON, The BCM monitors the range of this supply and raises up a failure as soon as the supply’s voltage is out of range. Then this failure occurs and as long as this is present, the head lamp must be turned on without taking care about the sunlight level provided by the sensor.
This is designed to prevent any head lamp cut off when the failure occurs during the night.

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the photo & auto light sensor (A) from crash pad upper side by using screw (-) driver.



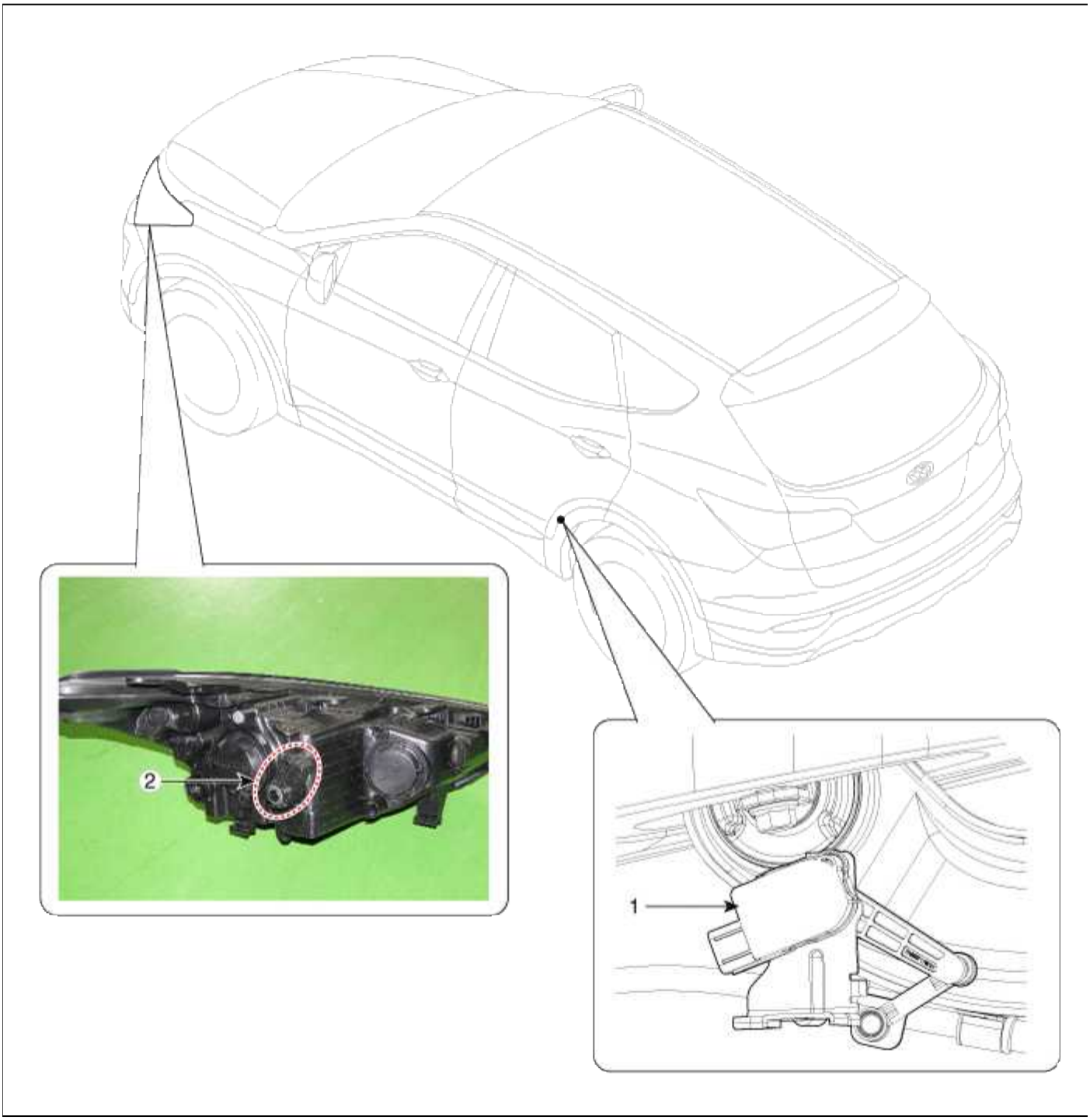
3. Remove the auto light connector.

Installation

1. Reconnect the auto light connector.
2. Install the auto light sensor.

Body Electrical System > Auto Head Lamp Leveling Device > Components and Components Location

Component Location



1. Head lamp leveling unit and sensor	2. Head lamp leveling actuator

Body Electrical System > Auto Head Lamp Leveling Device > Head Lamp Leveling Actuator > Repair procedures

Inspection with GDS

Initialization and diagnosis sequence by using GDS equipment.

Body Electrical System.

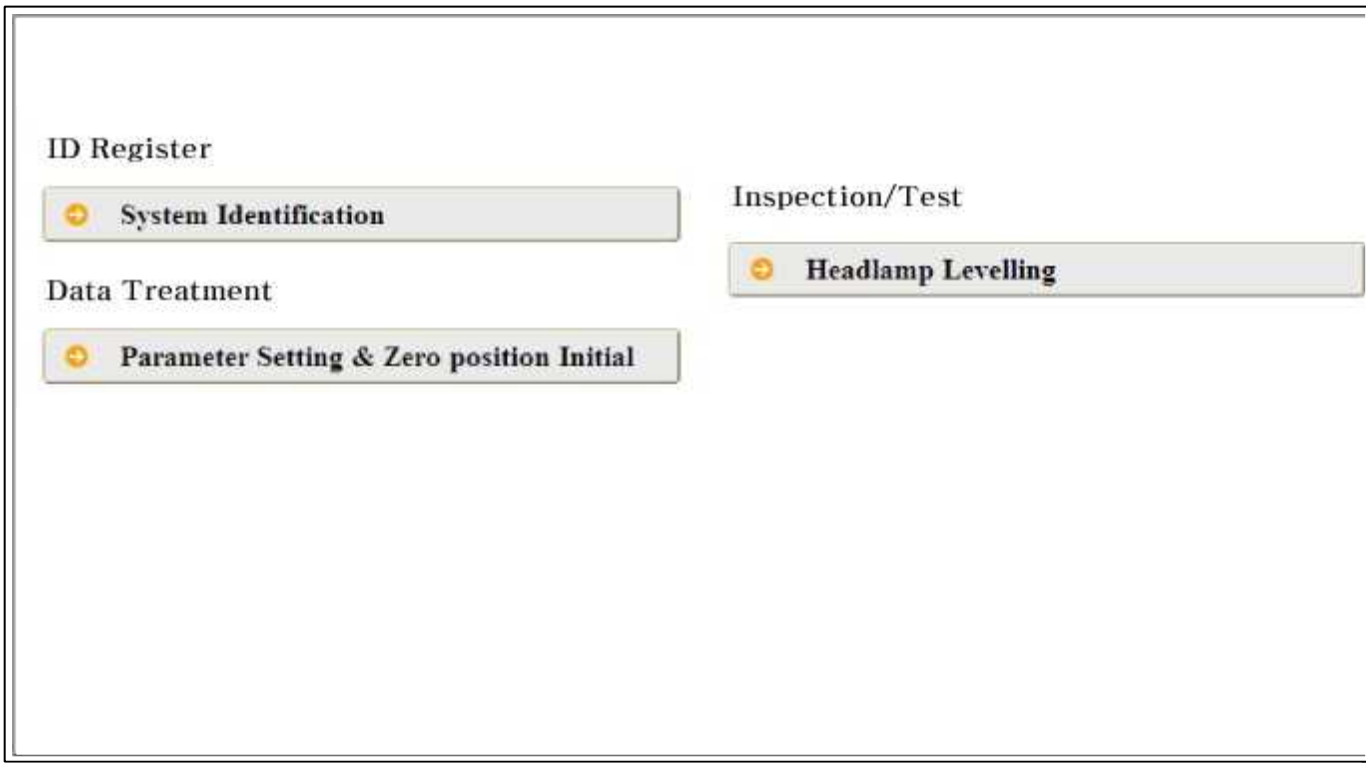
Below content summarize the procedure for A/S using GDS.

No.	Procedure
1	Locate vehicle to flat plane
2	Tire check
3	IGN1 ON
4	Head lamp Low Beam ON
5	Connection with diagnostic tool
6	Initial command by diagnostic tool
7	Clear DTC Code
8	IGN1 OFF → ON
9	Re- Connection with diagnostic tool
10	Checking of HLLD output value as 15% and DTC Code
11	HLLD actuating by diagnostic tool command
12	Head lamp mechanical Initial Aiming

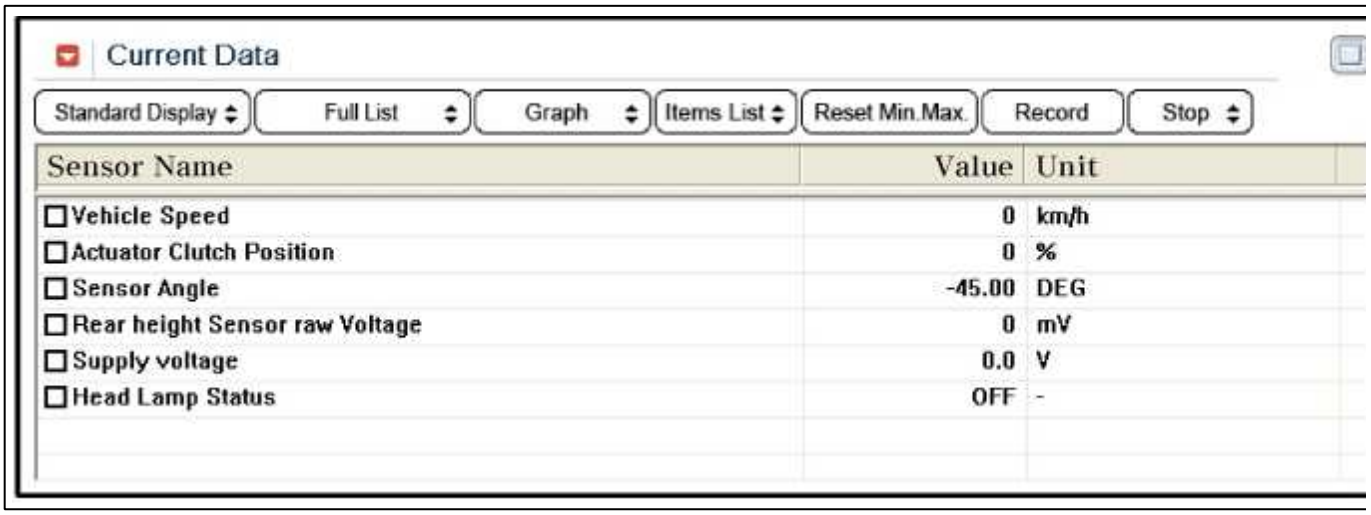
NOTE

1. There's no load in vehicle and vehicle should be on flat plane.
2. Should check of HLLD output value(15%) after initial setting.
3. Should do first electrical initial setting by diagnostic tool and then mechanical aiming afterward.

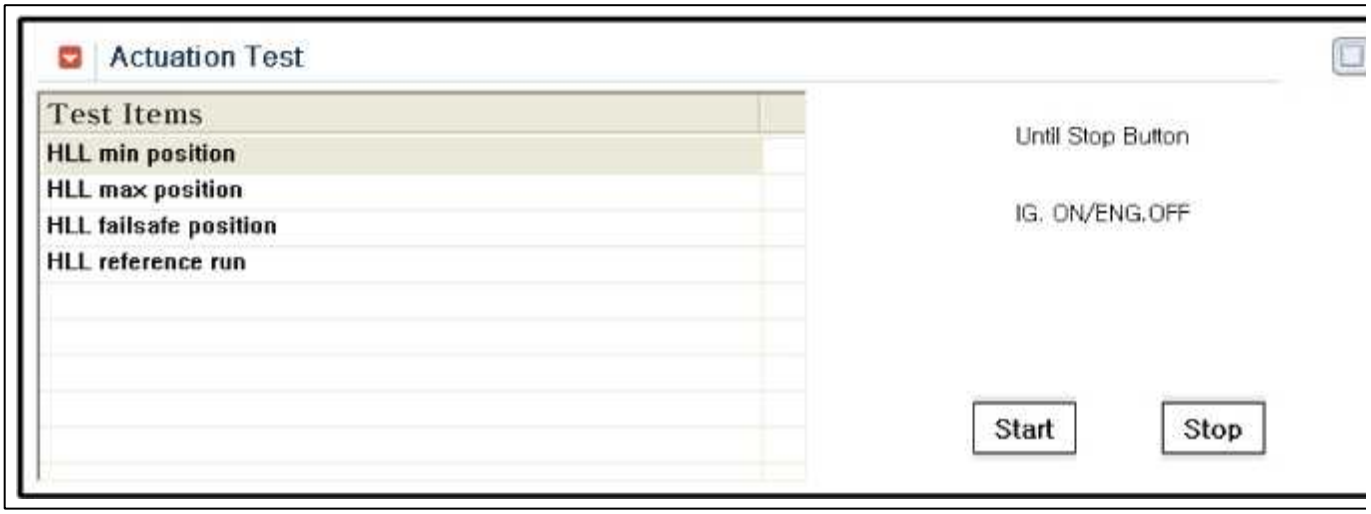
1. Select the vehicle model and "Head lamp leveling".



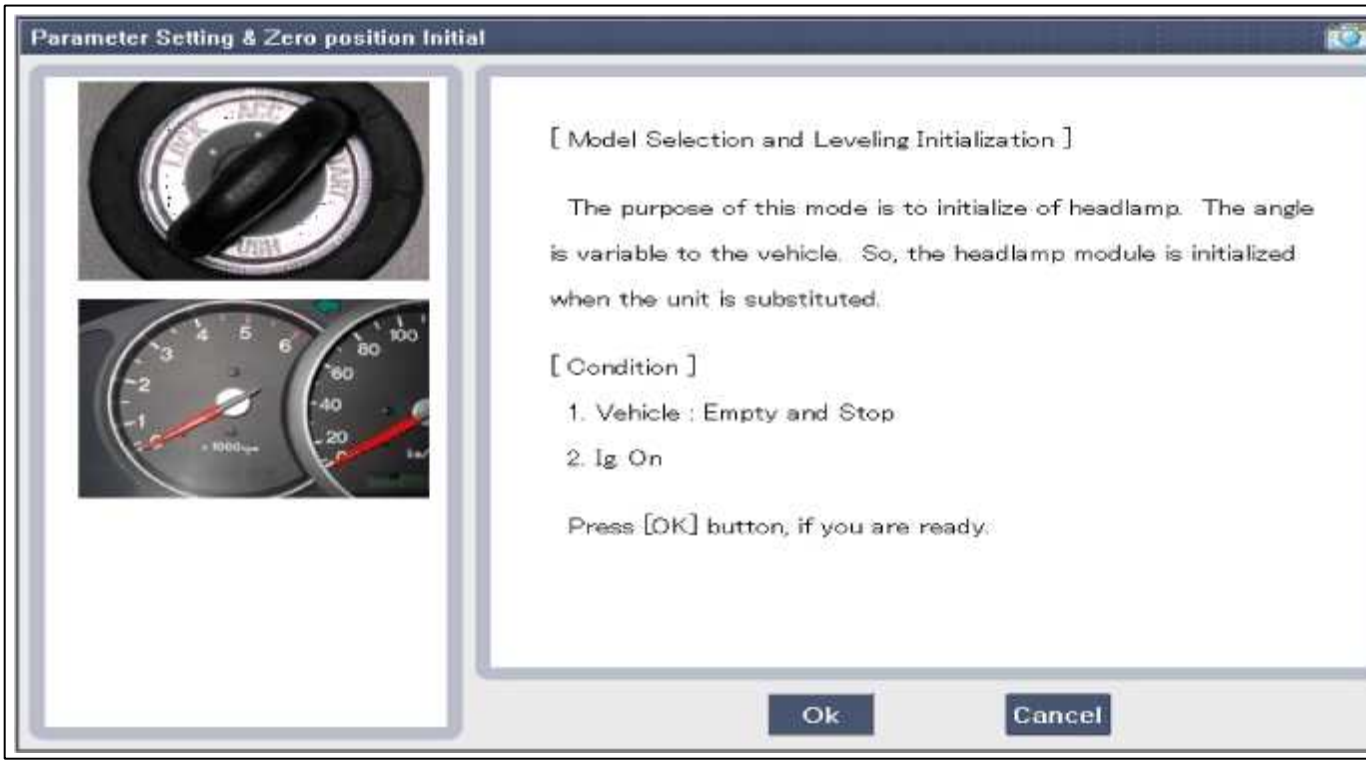
2. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.

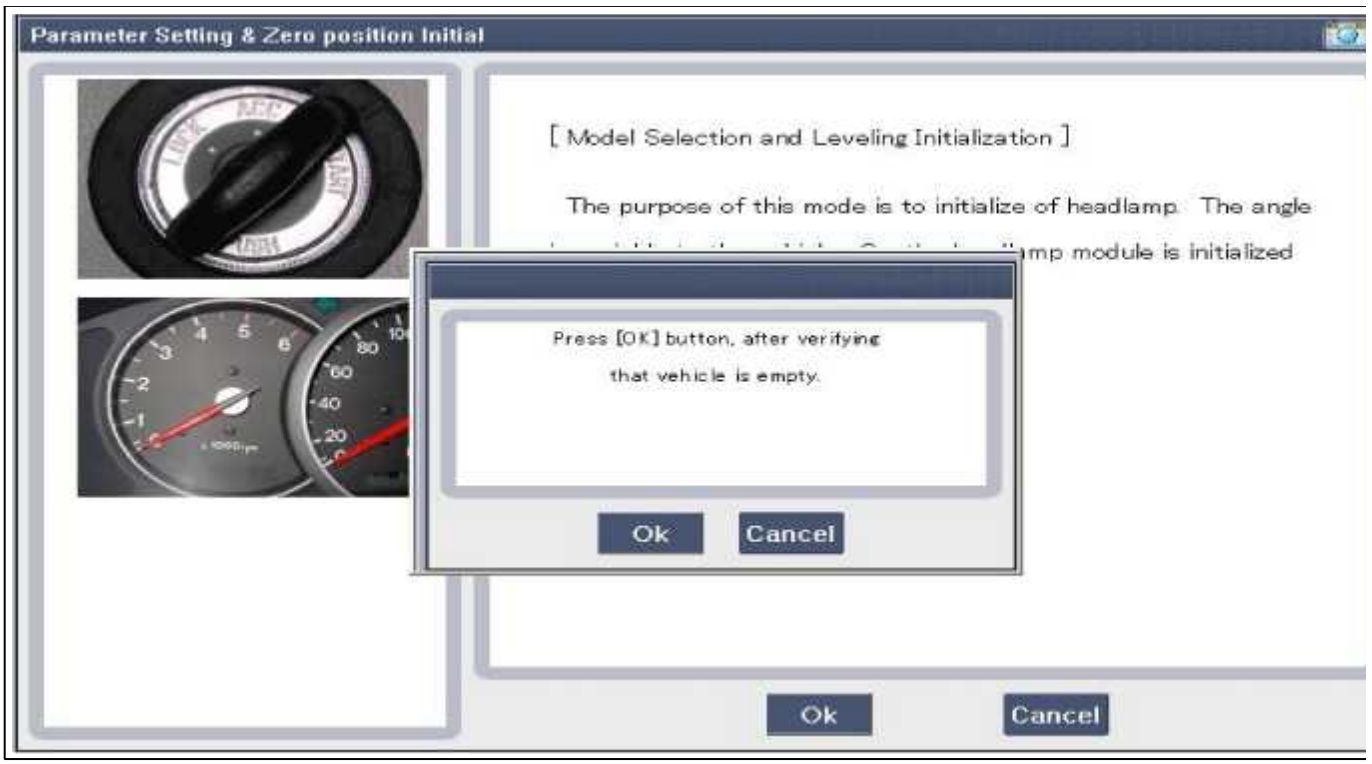


3. To perform functional test on AHLS outputs, select "Actuation Test".

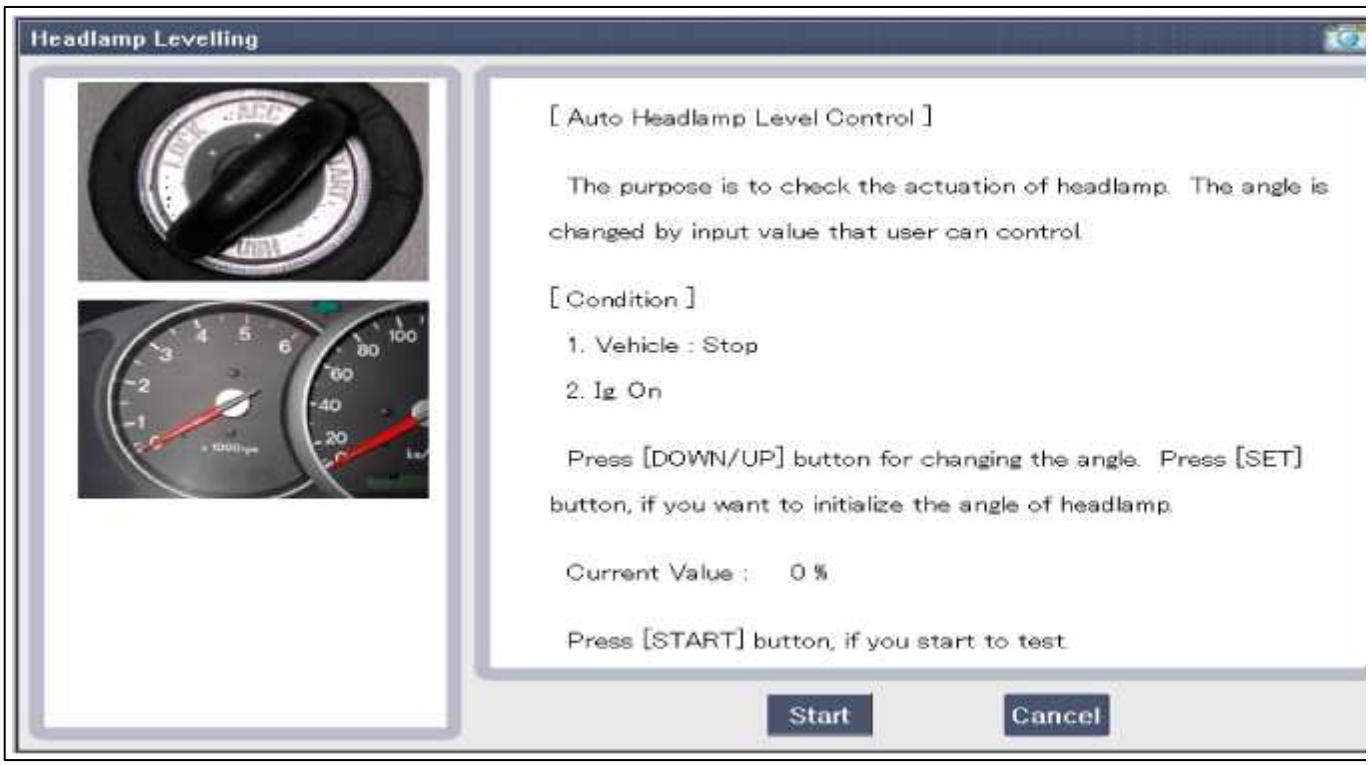


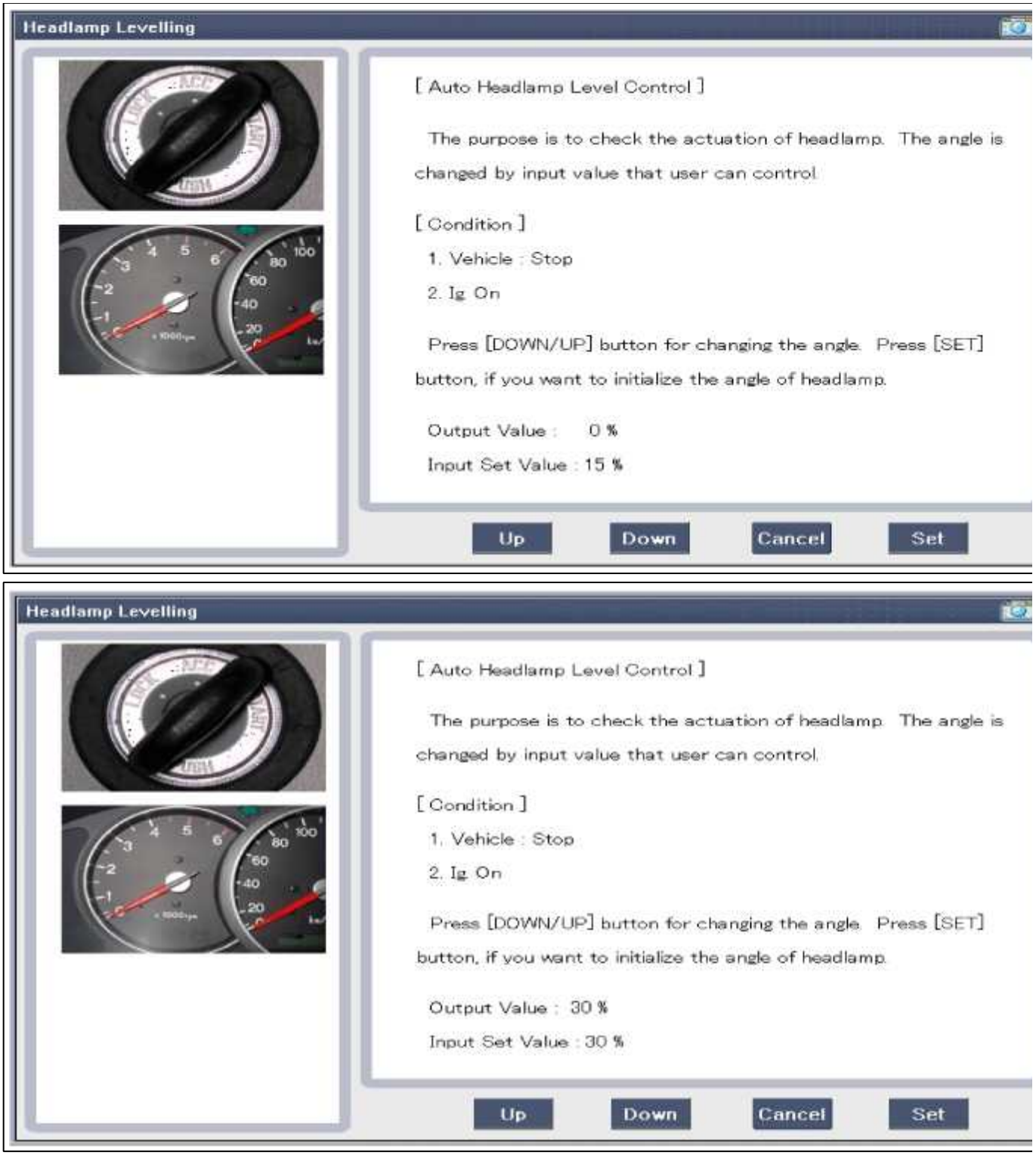
4. Select " Parameter setting & Zero position Initial".





5. Confirm that AHLS operate forcefully in "Head lamp leveling" menu.

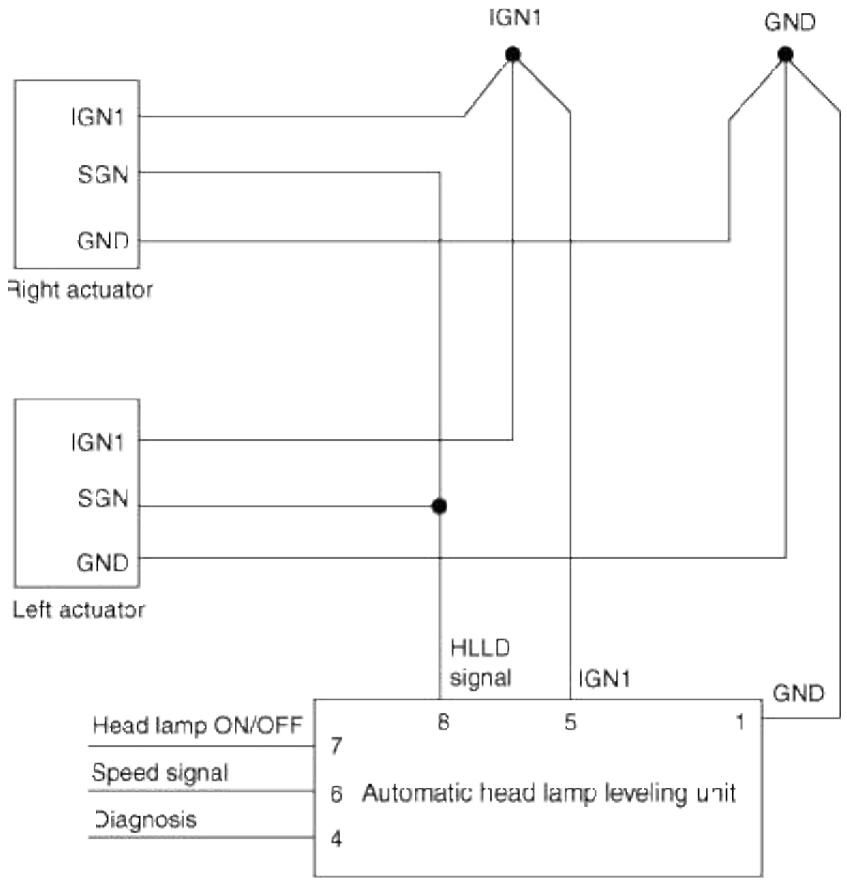


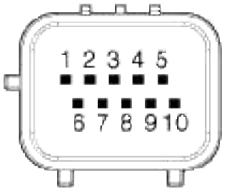


6. To check the DTC of the head lamp leveling system, select "Diagnostic trouble codes"

Body Electrical System > Auto Head Lamp Leveling Device > Auto Head Lamp Leveling Unit > Schematic Diagrams

Circuit Diagram



Connector	No.	Description	No.	Description
	1	Ground	6	Vehicle speed
	2	-	7	Head lamp ON/OFF
	3	-	8	HLLD signal
	4	Diagnosis	9	-
	5	IGN1	10	-

Body Electrical System > Auto Head Lamp Leveling Device > Auto Head Lamp Leveling Unit > Description and Operation

Description

According to driving environment and loading state of vehicle, head lamp lighting direction is changed to keep the driver's visibility range and to protect the driver's vision from glare, aiming at safety driving.
Sensor integrated ECU mounting on the rear center arm drives the actuator mounting on the head lamp since sensing the input signal following the vehicle's statically changes.
Head lamp beam is automatically operated by chassis tilt.

Operation

Operating Procedure

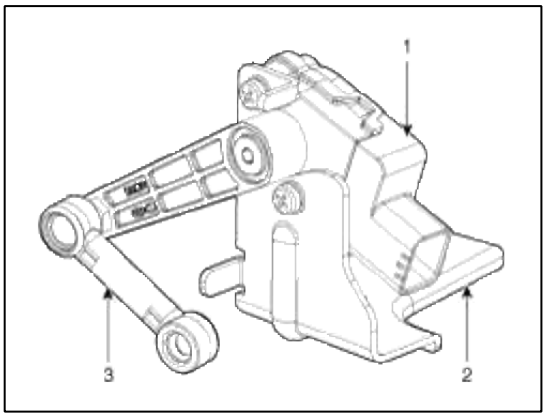
1. Suspension angle change resulted from vehicle's load change.
2. Sensor angle change.
3. Microprocessor calculates necessary head lamp angle change amount.
4. Sending a proper signal to head lamp leveling device and driving actuator.

Operating Condition

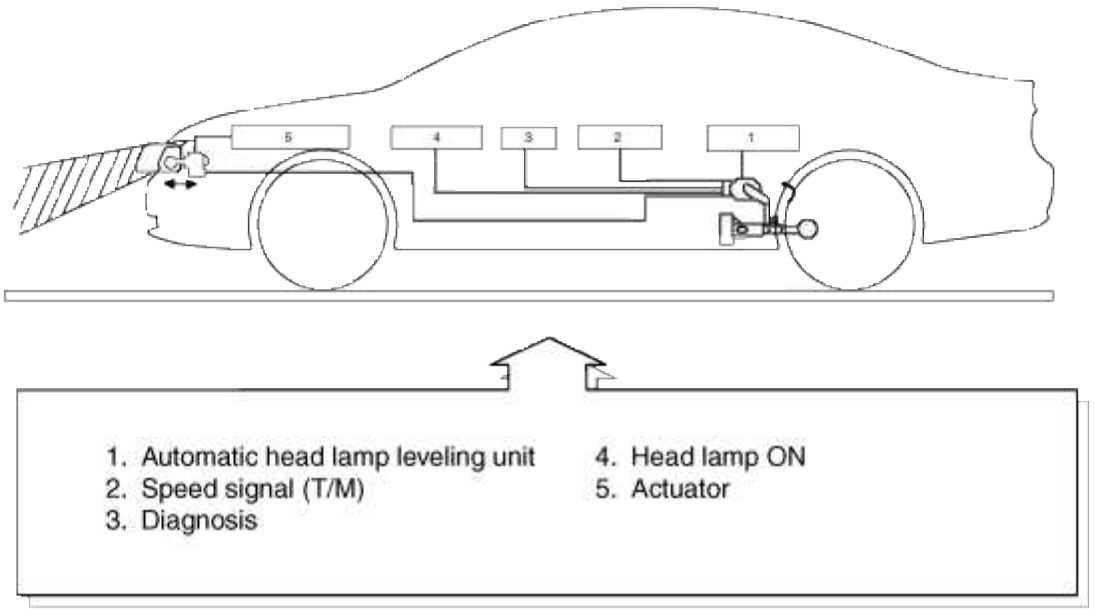
1. Ignition on
2. Low beam on
3. On stop : If sensor lever change is 0.3° and above, head lamp is operated after max. 1.5 sec.
4. On driving : If vehicle velocity is over 4km/h(2.48mile/h), velocity change is not over 0.8-1.6km/h(0.5 ~ 1.0mile/h) per second, and loading condition is changed, then head lamp is operated.

Components

1. Auto head lamp leveling unit
   1. Leveling unit & sensor
   2. Sensor mounting bracket
   3. Sensor linkage



   A. Using a Micro-processor, percept the operation lever's mechanical angle change or speed signal.
   B. As an actuator control device of inner control program, mounting on the rear center arm.
2. Actuator
   A. Change the head lamp lighting direction up or down since automatic head lamp leveling unit sensing the input signal following the vehicle's statically changes.



Body Electrical System > Auto Head Lamp Leveling Device > Auto Head Lamp Leveling Unit > Repair procedures

Inspection

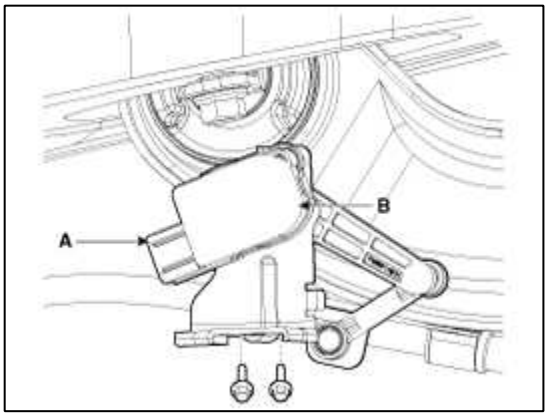
1. Ignition "ON".
2. Turn on the head lamp switch.
3. Check for operation. If the aim of the head lamps changes smoothly when the head lamp leveling switch is turned.
4. If the operation does not work well, inspect the connector and terminals to be sure they are all making good contact.
   If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system.
   If the terminals look OK, go to step 5.
5. Substitute with a known-good head lamp assembly and check for proper operation.

Removal

1. Remove the head lamp leveling unit connector (A).

2. Loosen the mounting bolts (2EA) of automatic head lamp leveling unit (B).

Tightening torque:
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lbf.ft)



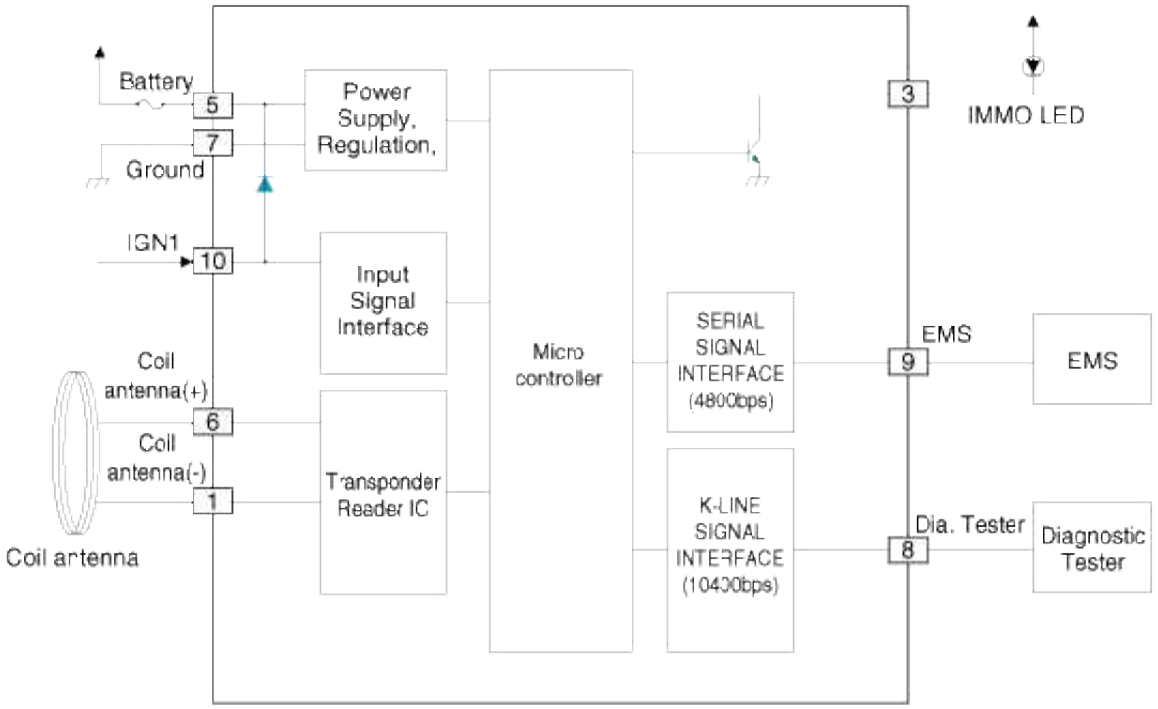
3. Remove the head lamp leveling unit assembly.

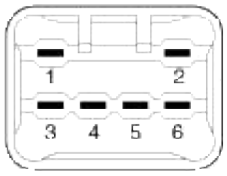
Installation

1. Install the head lamp leveling unit.
2. Reconnect the head lamp leveling unit connector.

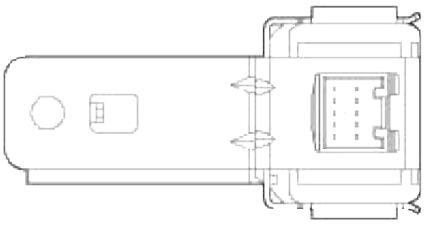
Body Electrical System > Immobilizer System > Schematic Diagrams

Circuit Diaram

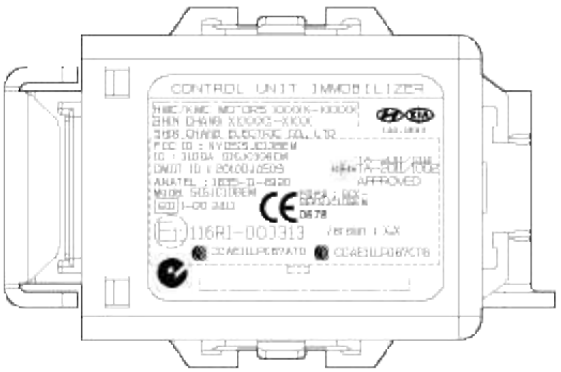




[Coil antenna]



[Immobilizer connector]

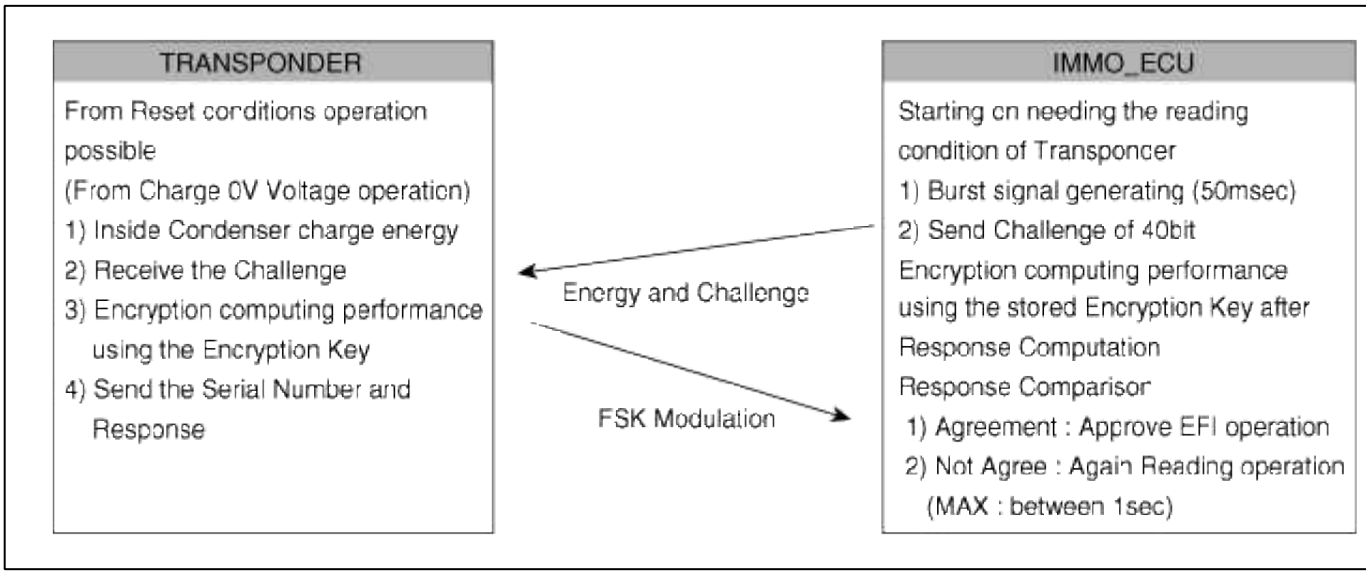


Body Electrical System > Immobilizer System > Description and Operation

Description

The immobilizer system will disable the vehicle unless the proper ignition key is used, in addition to the currently available anti-theft systems such as car alarms, the immobilizer system aims to drastically reduce the rate of auto theft.

1. Transponder (TP) – IMMO ECU Communication



TP Read Protocol

(1) IMMO_ECU after IGN on(or CPU Reset cancellation) is sent Challenge to TP and confirmed Serial Number and Signature.

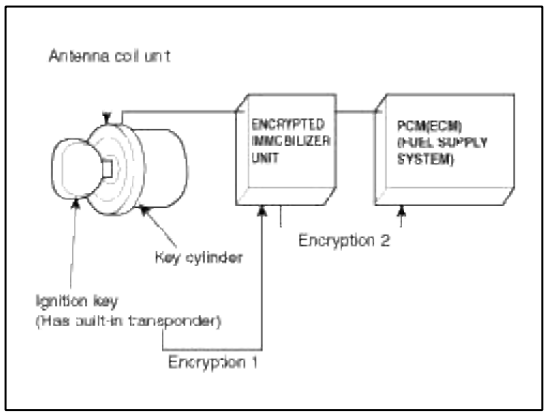
(2) When response of input transponder is not correct, input is retry.

(3) When response of input transponder is correct, The data that calculate Encryption operation in the EEPROM program compared with received data from TP.
When Codes is same, input is finished.
If the codes are not same, input are continued until when codes are same.

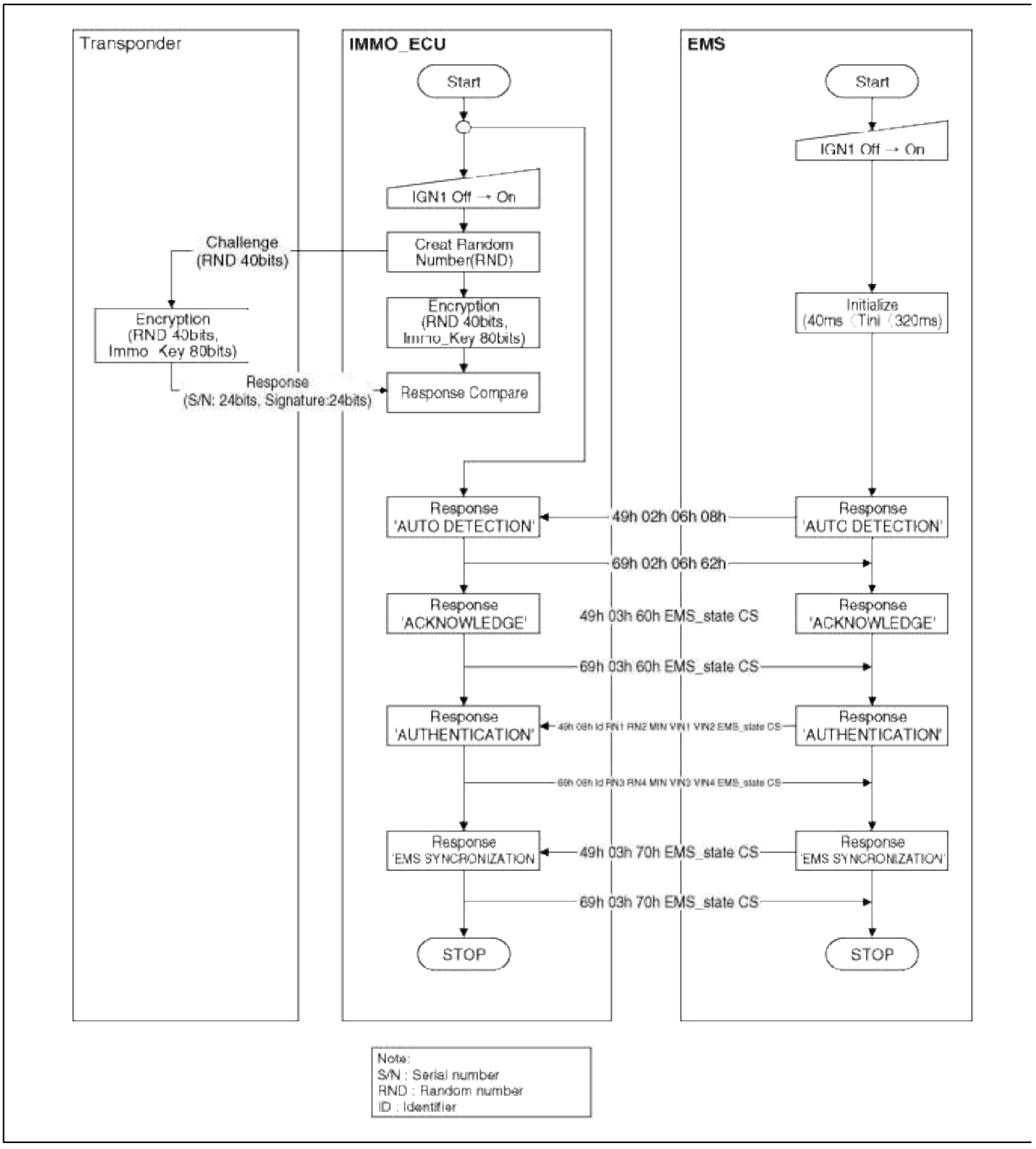
(4) If IMMO_ECU EEPROM code is not programming, when correct transponder is inputted (CRC Check OK input is finished.

(5) After IGN1 on(CPU Reset cancellation), IMMO_ECU is reading the maximum 5times Transponder Code

(6) In the IGN1 ON&EMS_state=Lock state, when received ANKNOWLEDGE, TP is re-authenticated



2. Transponder / IMMO ECU / EMS authentication



Components Operations

PCM (Power Train Control Module)

1. The PCM(ECM) (A) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the PCM(ECM) simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the PCM(ECM). ERN (Encrypted Randorm Number) value between EMS and encrypted smartra unit is checked and the validity of coded key is decided by EMS.



ENCRYPTED IMMOBILIZER unit (A)

The IMMOBILIZER carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The IMMOBILIZER is mounted behind of the crash pad close to center cross bar.

The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the IMMOBILIZER device. And, the received messages from the PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna.

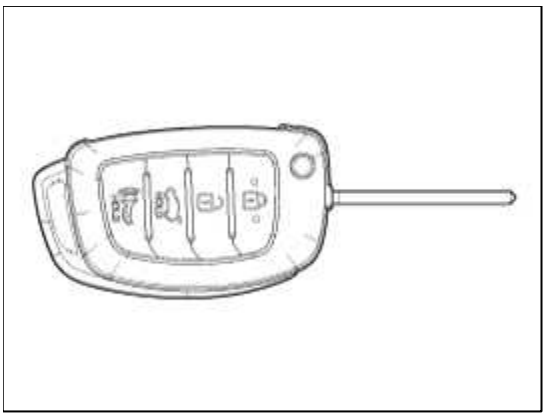
The IMMOBILIZER does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the PCM(ECM) and vice versa.



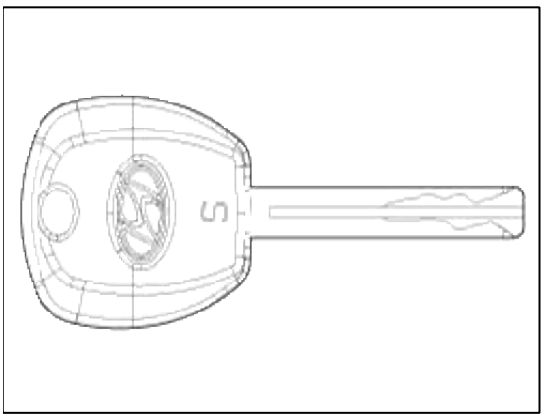
TRANSPONDER (Built-in keys)

The transponder has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.

[Master Folding Key]



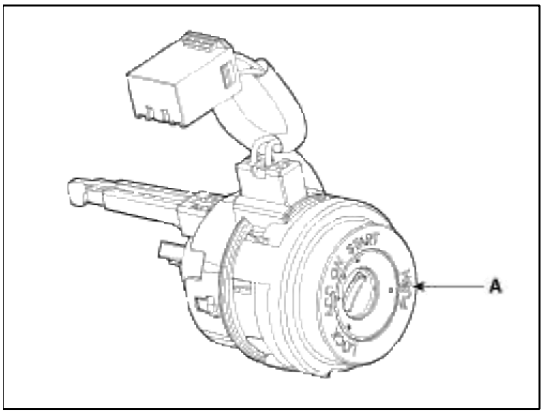
[Assistant Master Key]



Antenna Coil

The antenna coil (A) has the following functions.

- The antenna coil supplies energy to the transponder.
- The antenna coil receives signal from the transponder.
- The antenna coil sends transponder signal to the IMMOBILIZER.
  It is located directly in front of the steering handle lock.



Body Electrical System > Immobilizer System > Repair procedures

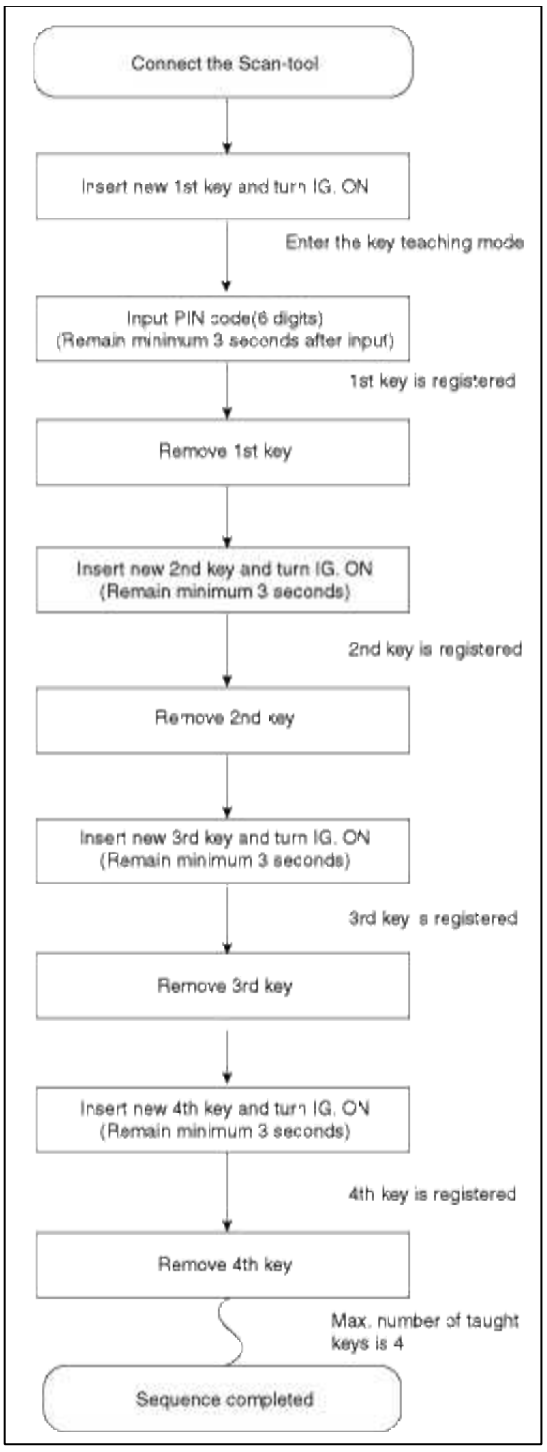
Teaching Procedures

1. Key Teaching Procedure
   Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehic owner.
   The procedure starts with a PCM(ECM) request for vehicle specific data (PIN code: 6digits) from the tester. The "virgin" PCM(ECM) stores the vehicle specific data and the key teaching can be started. The "learnt" PCM(ECM

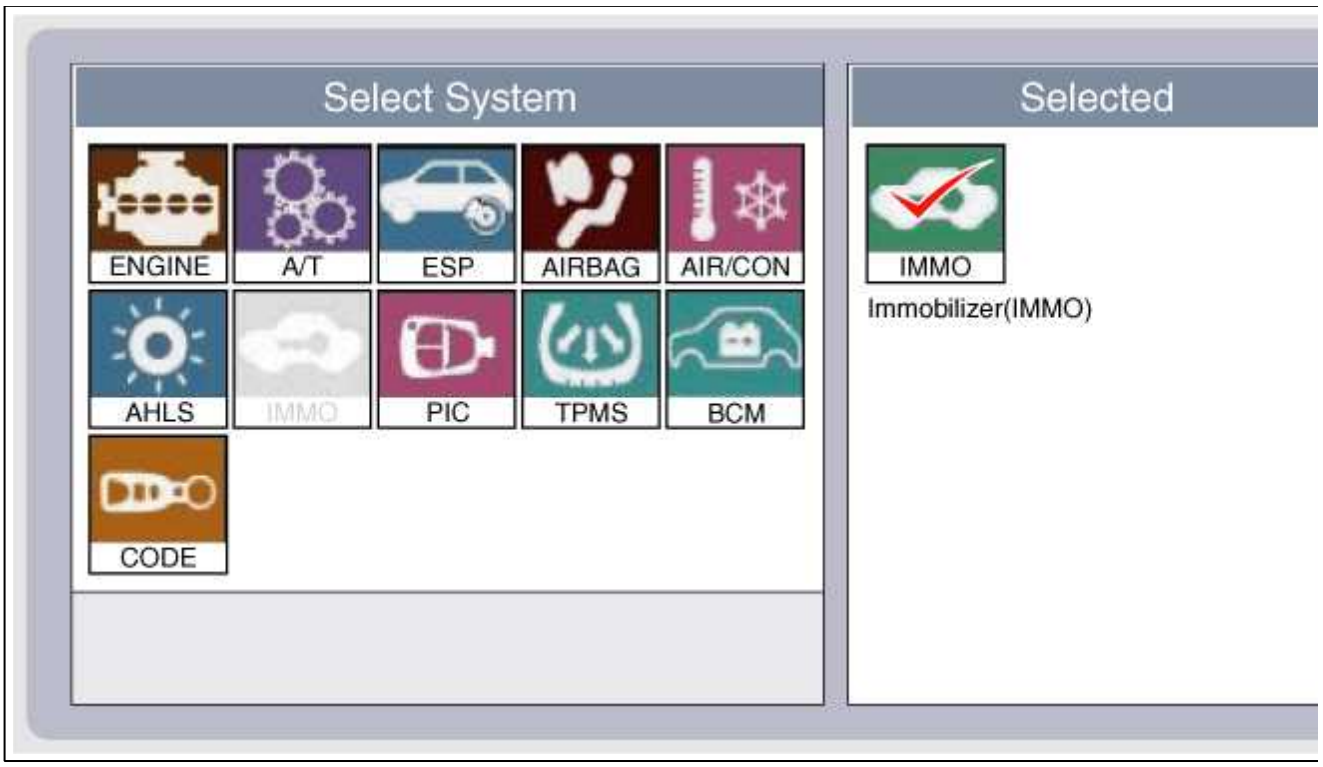
compares the vehicle specific data from the tester with the stored data. If the data are correct, the teaching can pr
If incorrect vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the re
of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation.
reconnecting the battery, the timer starts again for one hour.
The key teaching is done by ignition on with the key and additional tester commands. The PCM(ECM) stores the
relevant data in the EEPROM and in the transponder. Then the PCM(ECM) runs the authentication required for
confirmation of the teaching process. The successful programming is then confirmed by a message to the tester.
If the key is already known to the PCM(ECM) from a previous teaching, the authentication will be accepted and t
EEPROM data are updated. There is no changed transponder content (this is impossible for a learnt transponder)
The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognize
the PCM(ECM). This rejects the key and a message is sent to the tester.
The PCM(ECM) rejects invalid keys, which are presented for teaching. A message is sent to the tester. The key c
invalid due to faults in the transponder or other reasons, which result from unsuccessful programming of data. If the
PCM(ECM) detects different authenticators of a transponder and an PCM(ECM), the key is considered to be inv
The maximum number of taught keys is 8
If an error occurs during the Immobilizer Service Menu, the PCM(ECM) status remains unchanged and a specific
code is stored.
If the PCM(ECM) status and the key status do not match for teaching of keys, the tester procedure will be stoppe
a specific fault code will be stored at PCM(ECM).

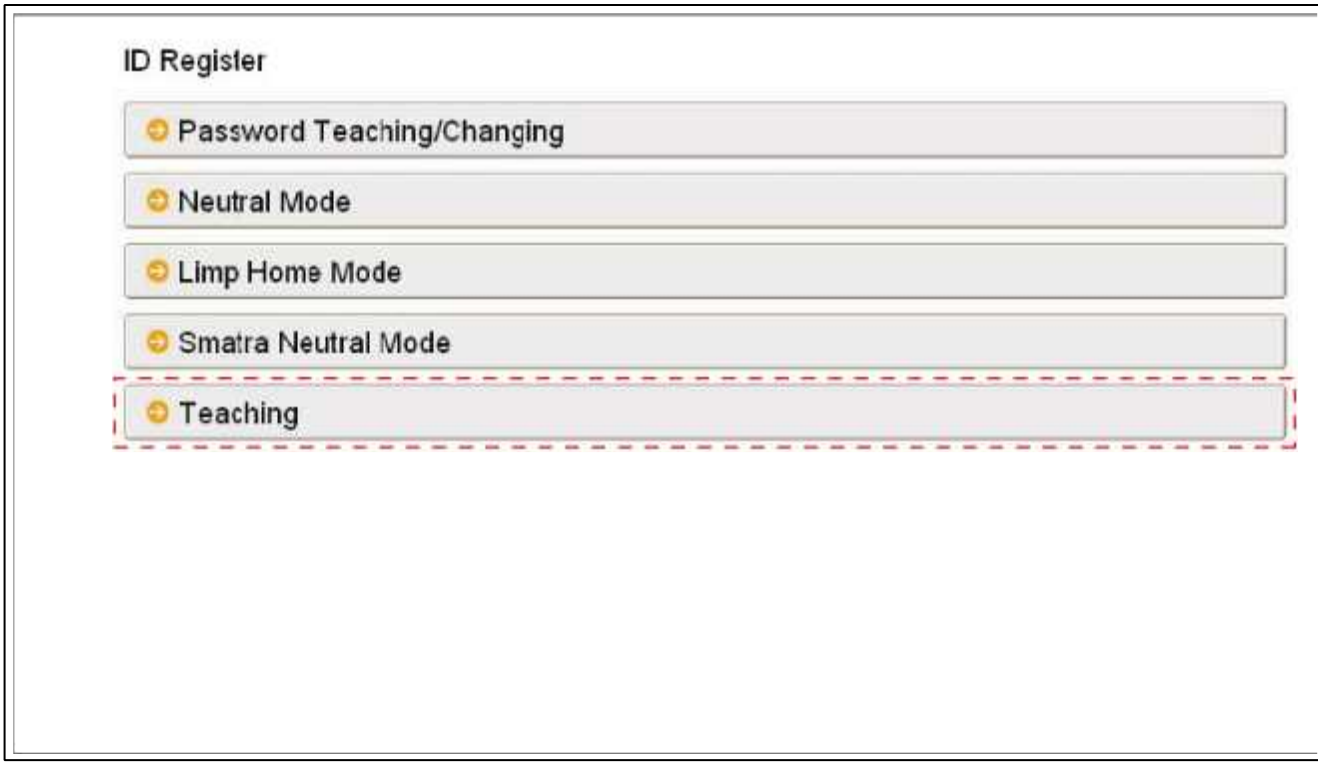
NOTE

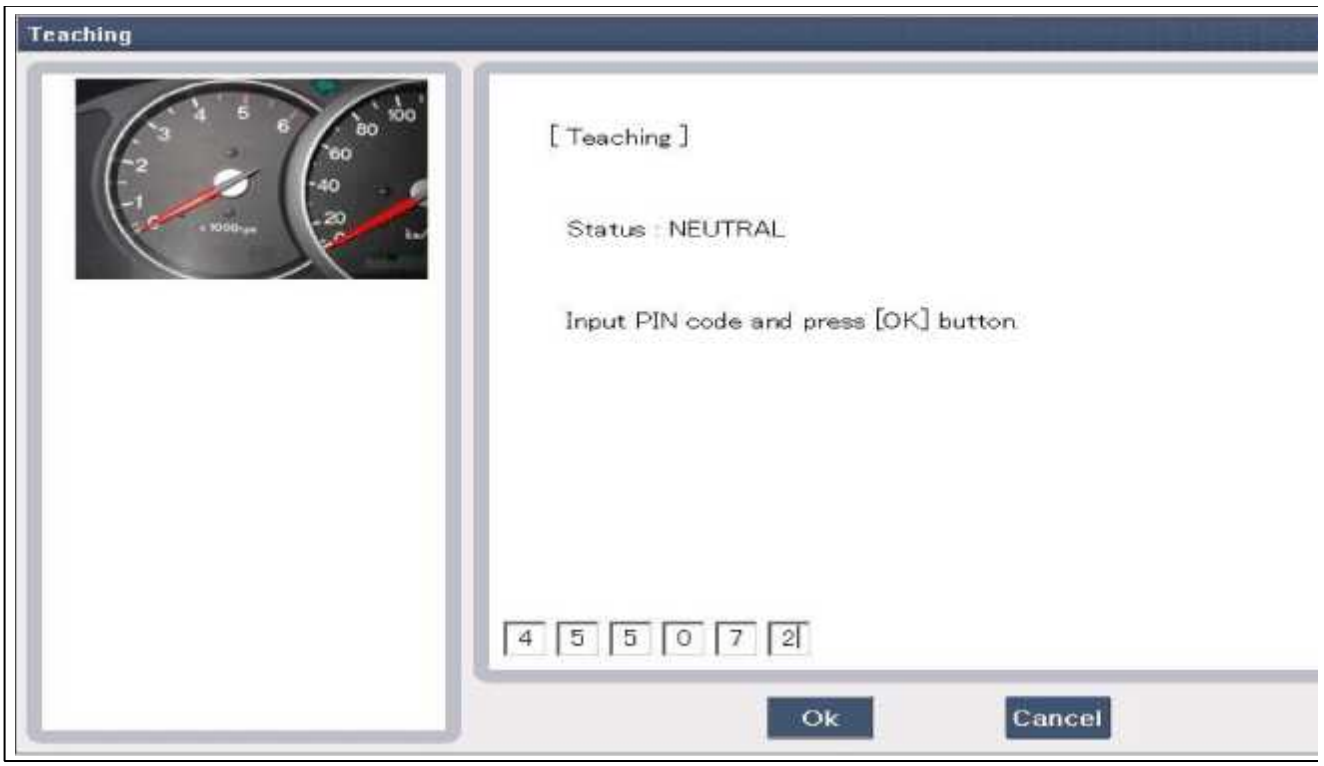
When teaching the 1st key, Smartra registers at the same time.

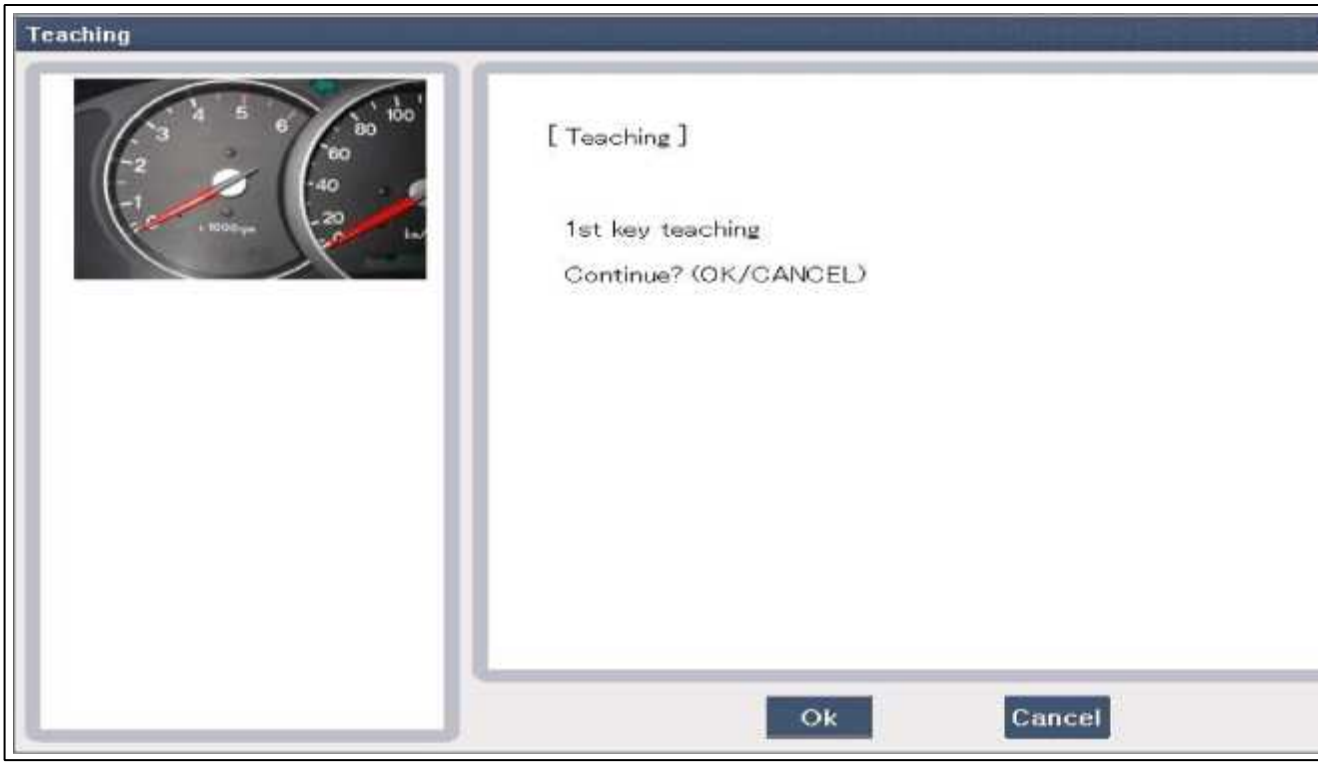


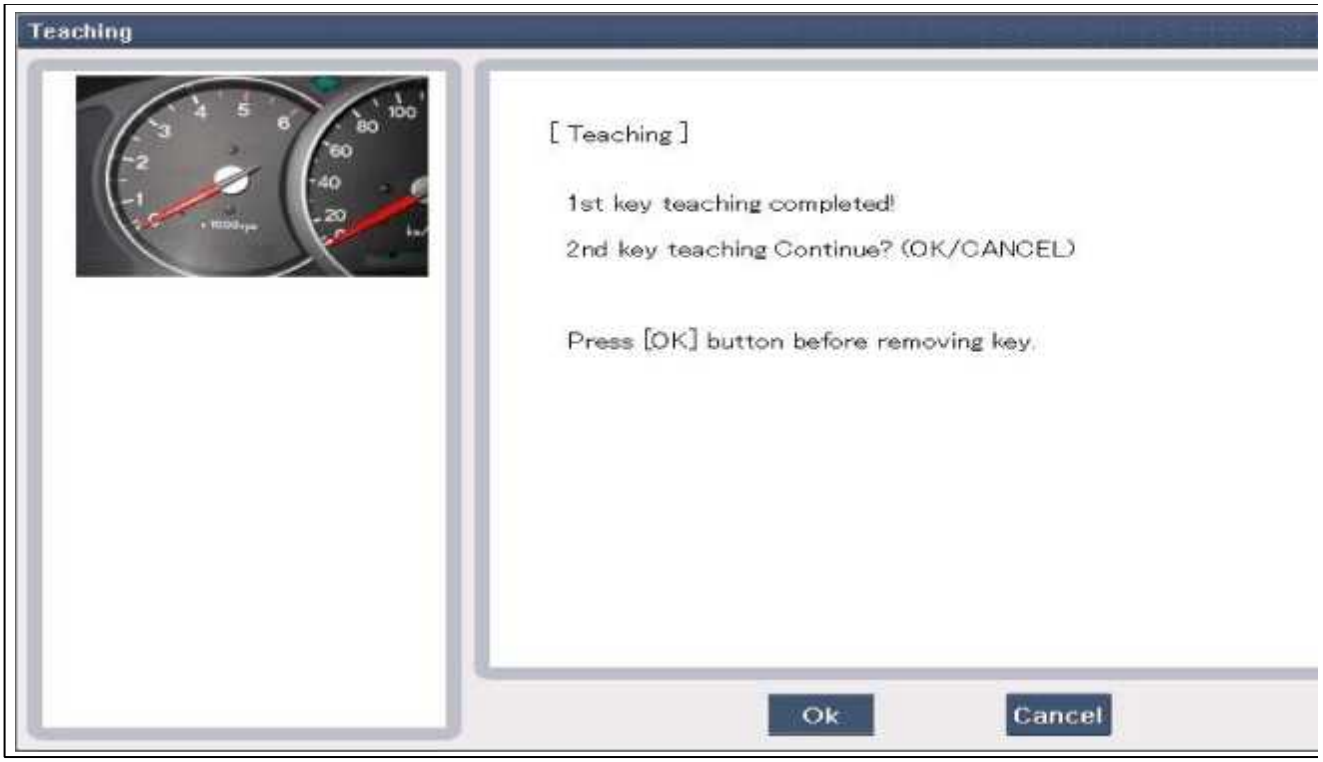
(1) PCM(ECM) learnt status.

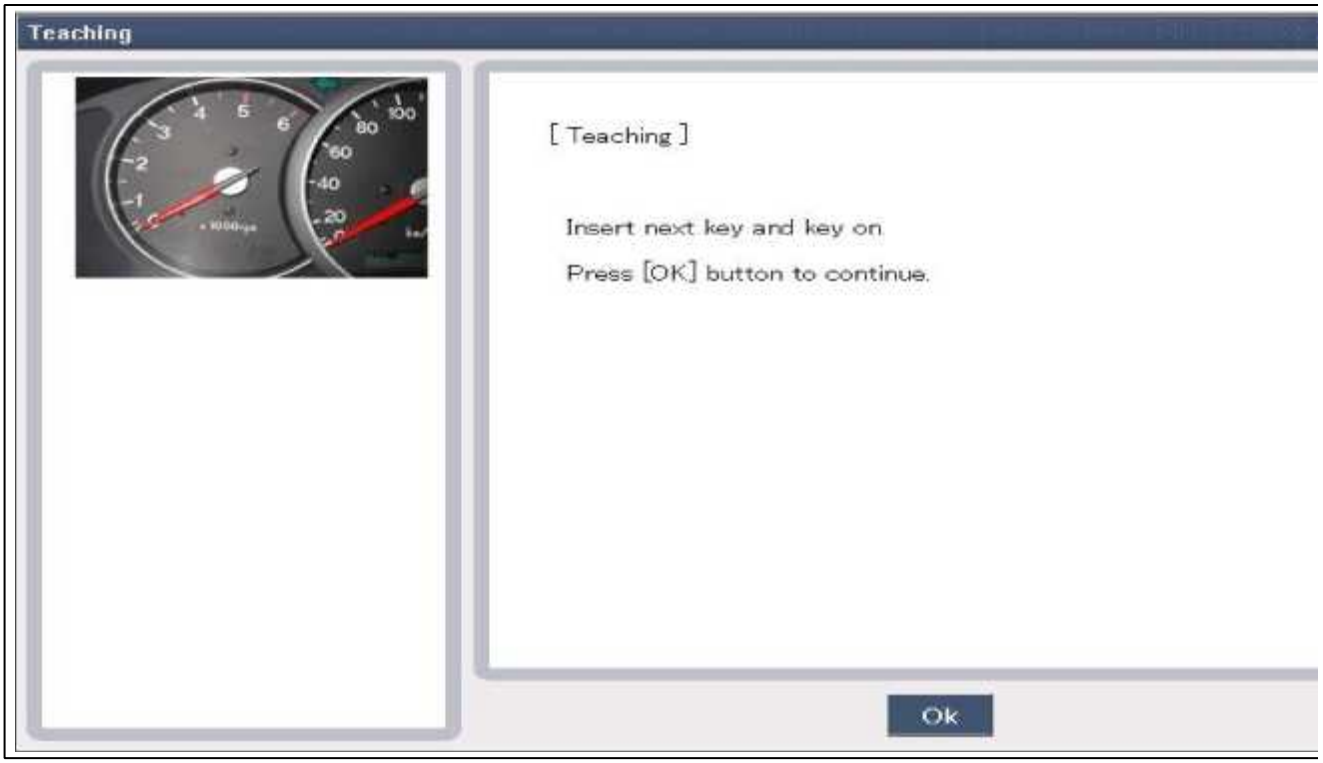

Select System
ENGINE
A/T
ESP
AIRBAG
AIR/CON
AHLS
IMMO
PIC
TPMS
BCM
CODE
Selected
IMMO
Immobilizer(IMMO)

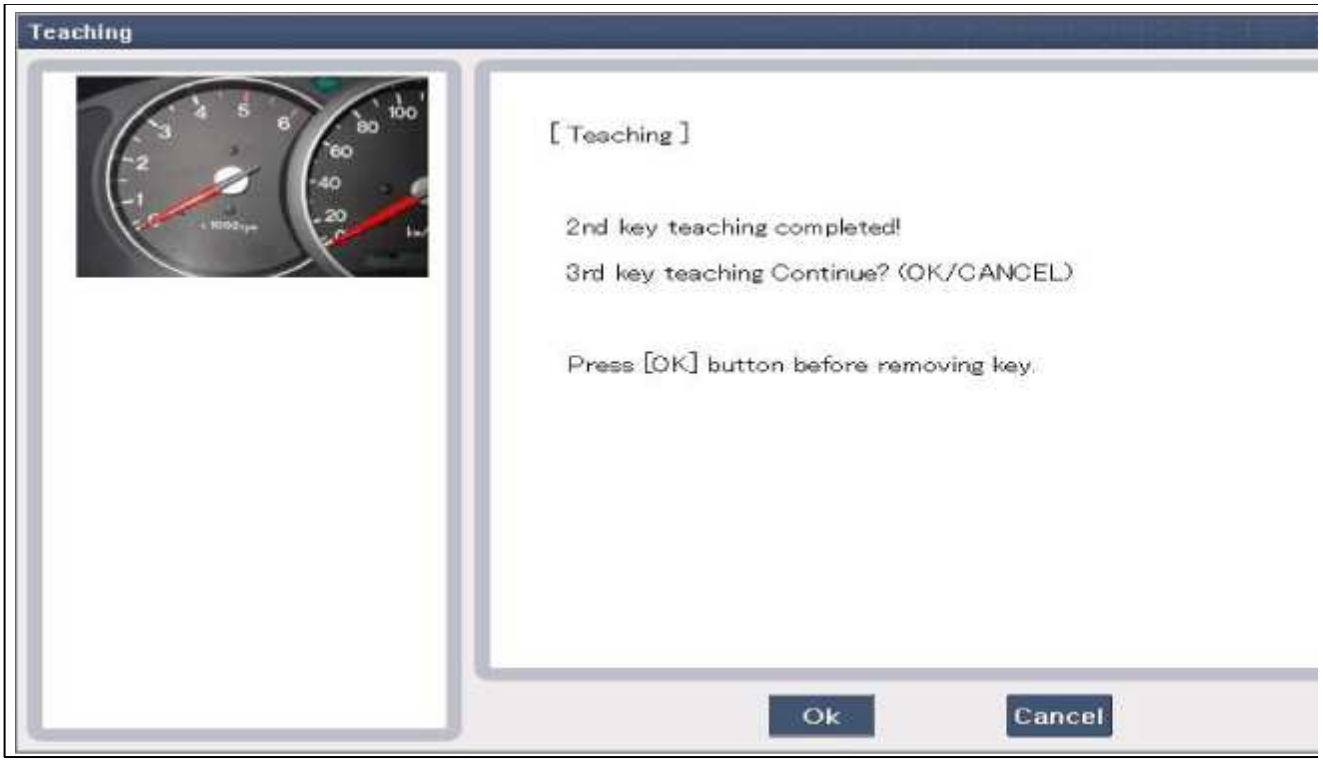

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching

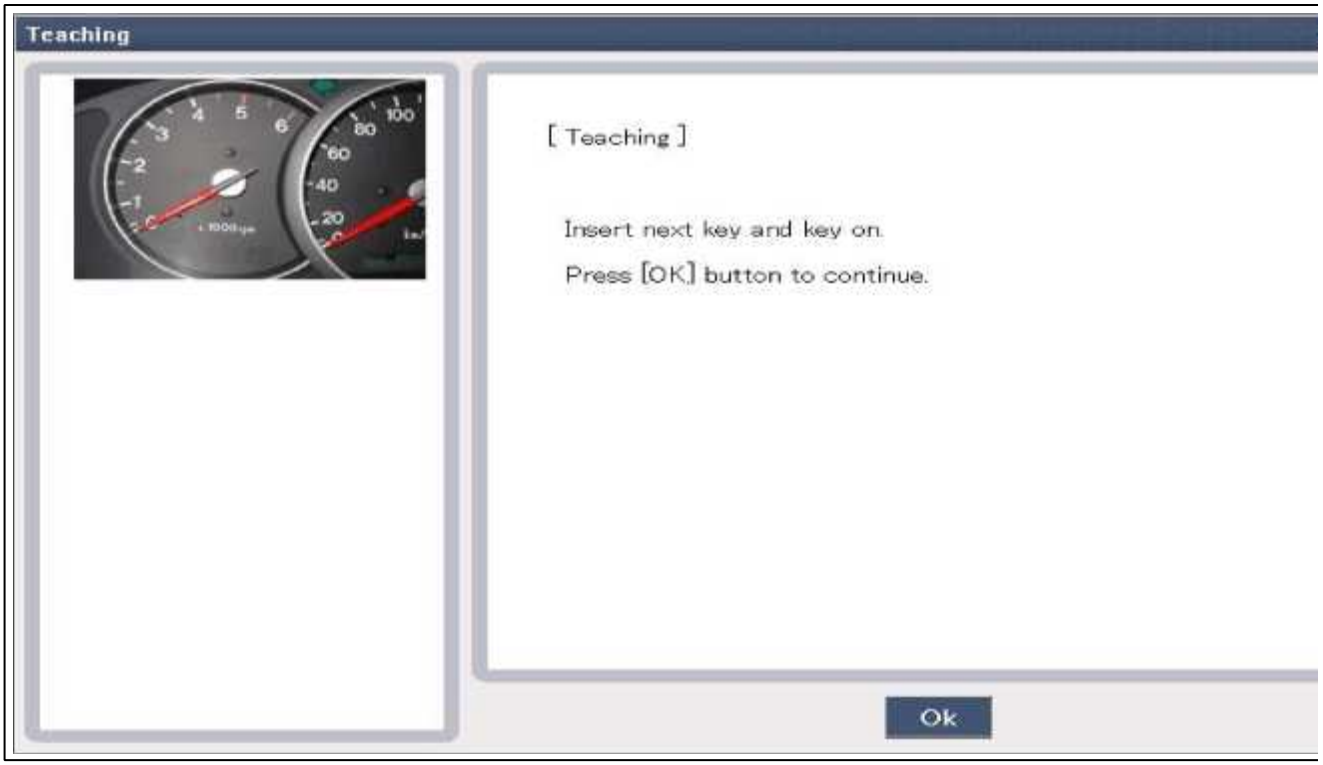

Teaching
[Teaching]
Status : NEUTRAL
Input PIN code and press [OK] button
4 5 5 0 7 2
Ok
Cancel

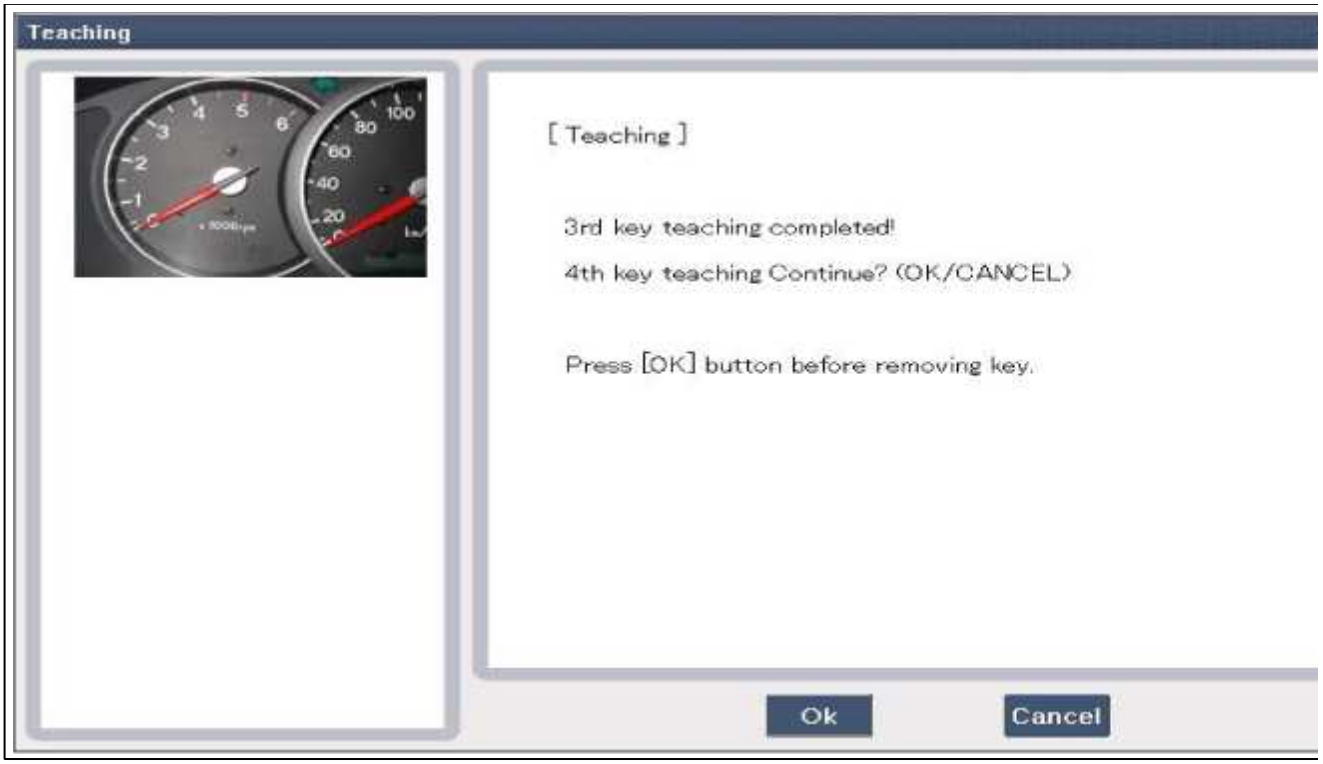

Teaching
[Teaching]
1st key teaching
Continue? (OK/CANCEL)
Ok
Cancel

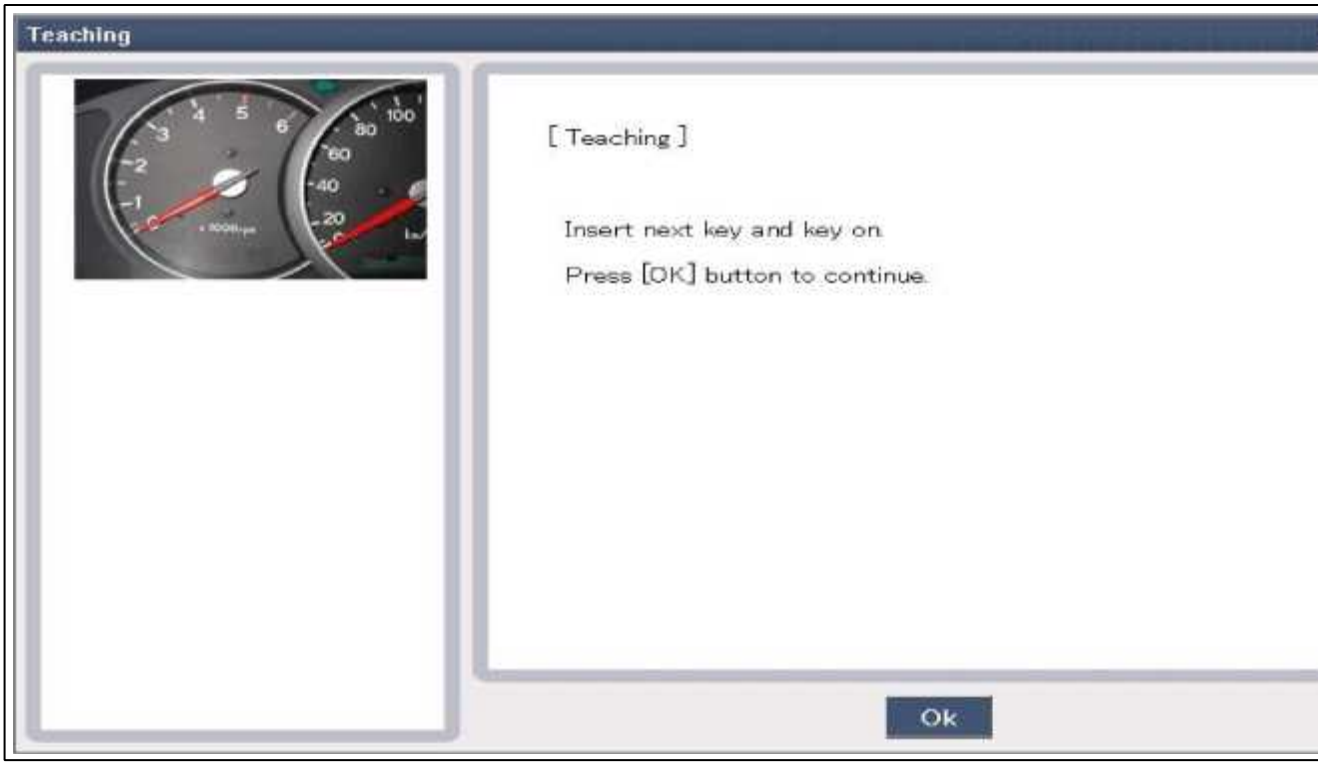

Teaching
[Teaching]
1st key teaching completed!
2nd key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel

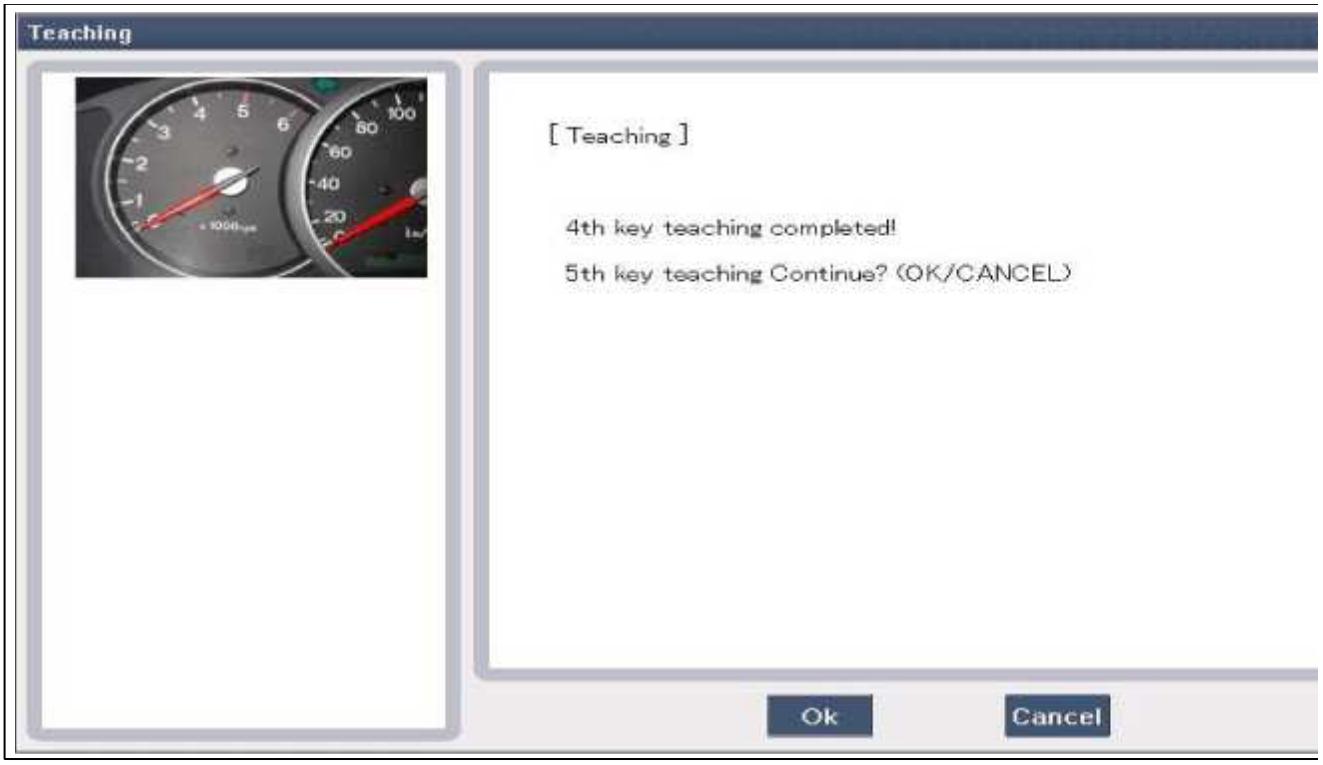

Teaching
[Teaching]
Insert next key and key on
Press [OK] button to continue.
Ok


Teaching
[Teaching]
2nd key teaching completed!
3rd key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel


Teaching
[Teaching]
Insert next key and key on.
Press [OK] button to continue.
Ok


Teaching
[Teaching]
3rd key teaching completed!
4th key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel


Teaching
[Teaching]
Insert next key and key on.
Press [OK] button to continue.
Ok



(2) PCM(ECM) virgin status.

After replacing new "PCM(ECM)" GDS displays that PCM(ECM) is virgin status in Key Teaching mode. "VIRGIN" status means that PCM(ECM) has not matched any PIN code before.

2. User Password Teaching Procedure

The user password for limp home is taught at the service station. The owner of the vehicle can select a number wit digits.

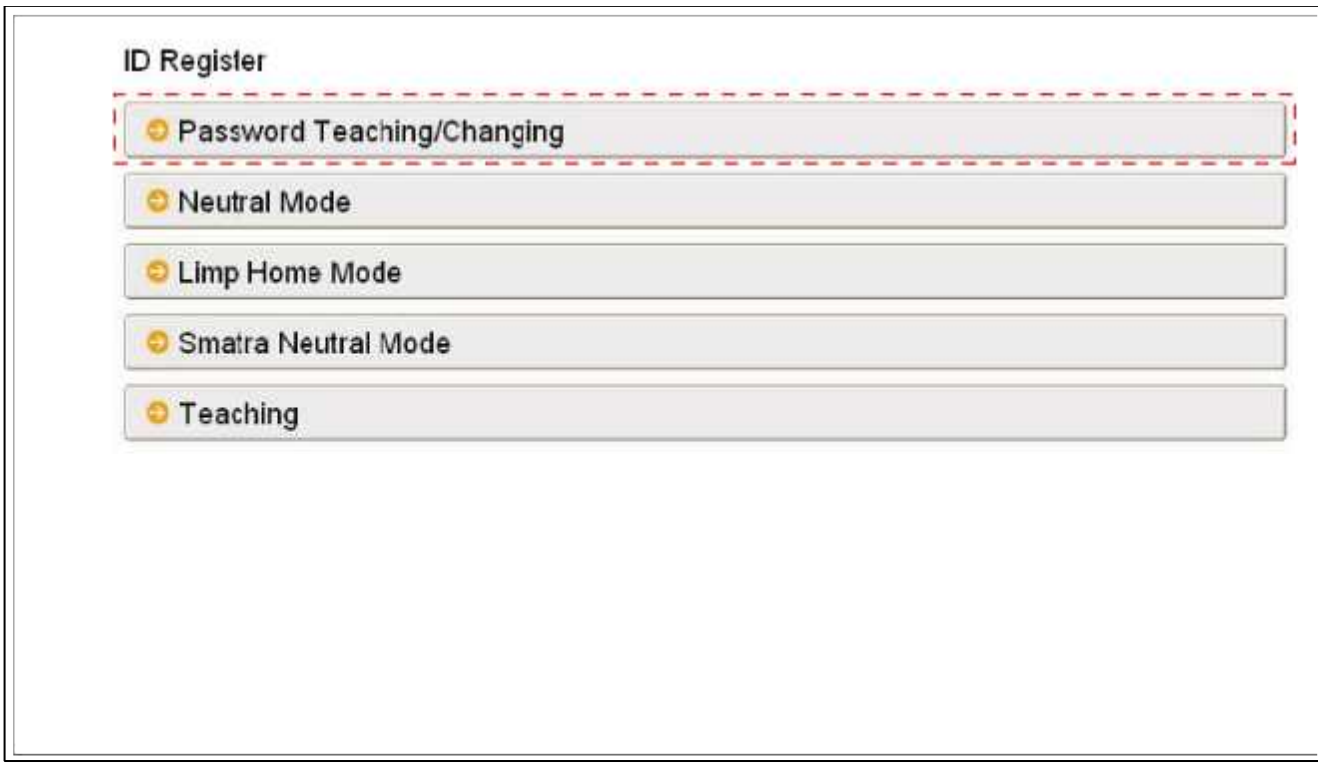
The user password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to PCM(ECM), the status of the password is "virgin" No limp home function is possible.

The teaching is started by ignition on, with a valid key(learnt key) and sending the user password by tester. After successful teaching, the status of the user password changes from "virgin" to "learnt"

The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tes sends authorization of access, either the old user password or the vehicle specific data. After correct authorization PCM(ECM) requests the new user password. The status remains "learnt" and the new user password will be valic the next limp home mode.

If wrong user passwords or wrong vehicle specific data have been sent to the PCM(ECM) three times continuous intermittently, the PCM(ECM) will reject the request to change the password for one hour. This time cannot be re by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hou

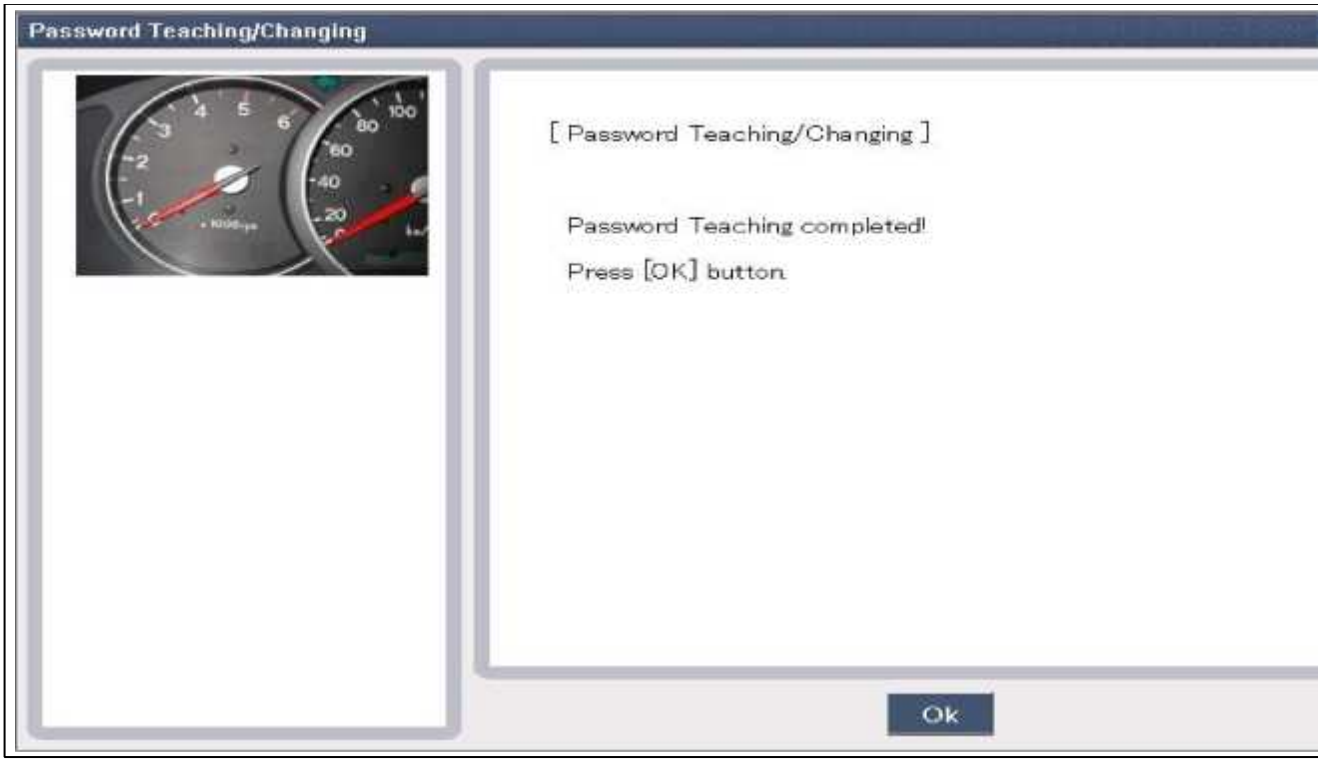
(1) User password teaching


ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching


Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button.
Ok
Cancel

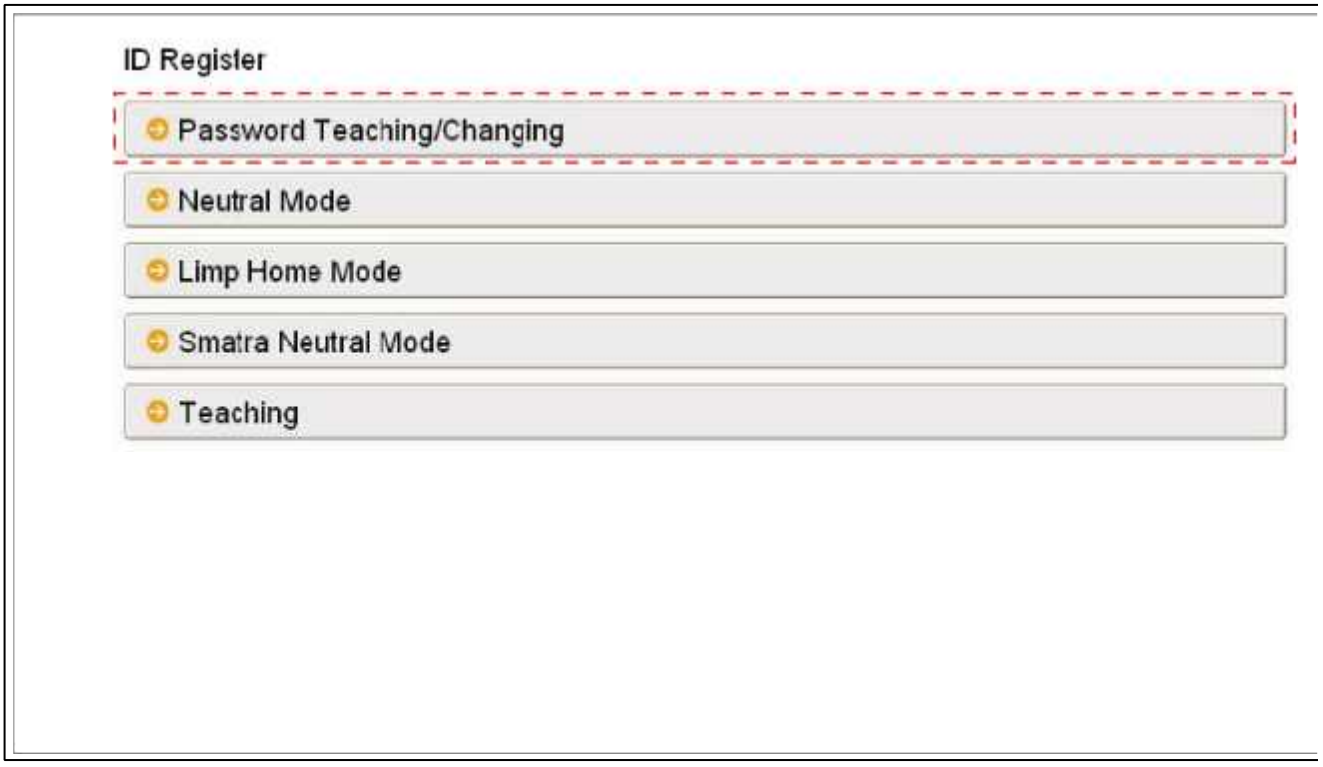

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button
1 1 1 1
Ok
Cancel

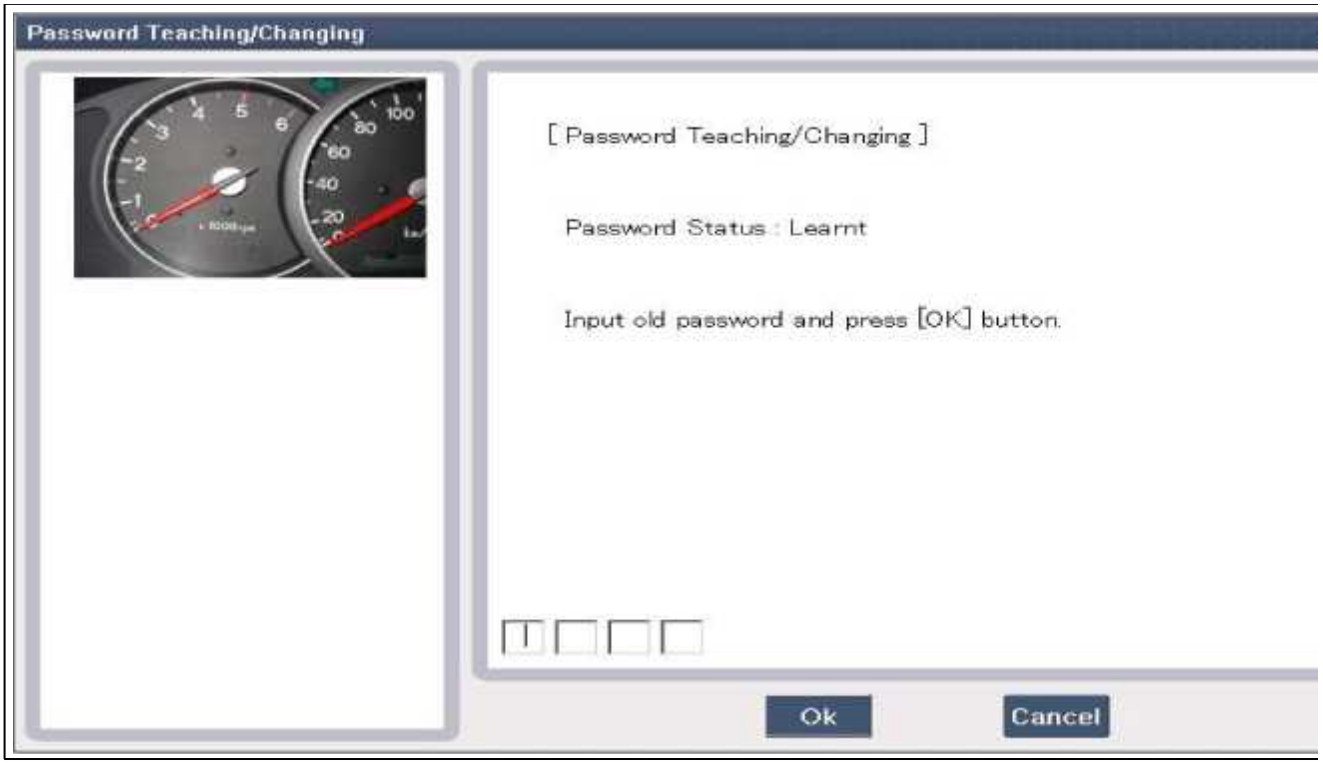

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Are you sure? (Ok/Cancel)
[Condition : IG. On, ENG. Off]
Ok
Cancel

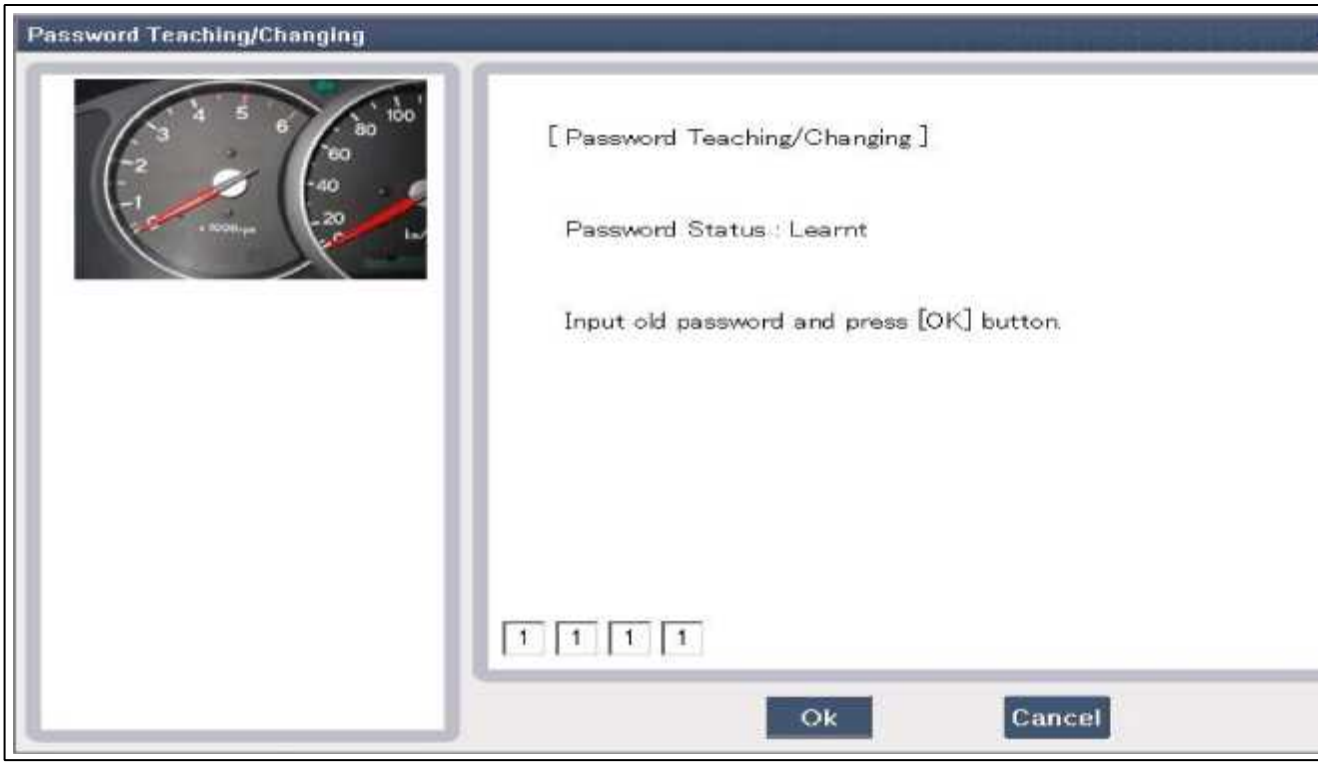


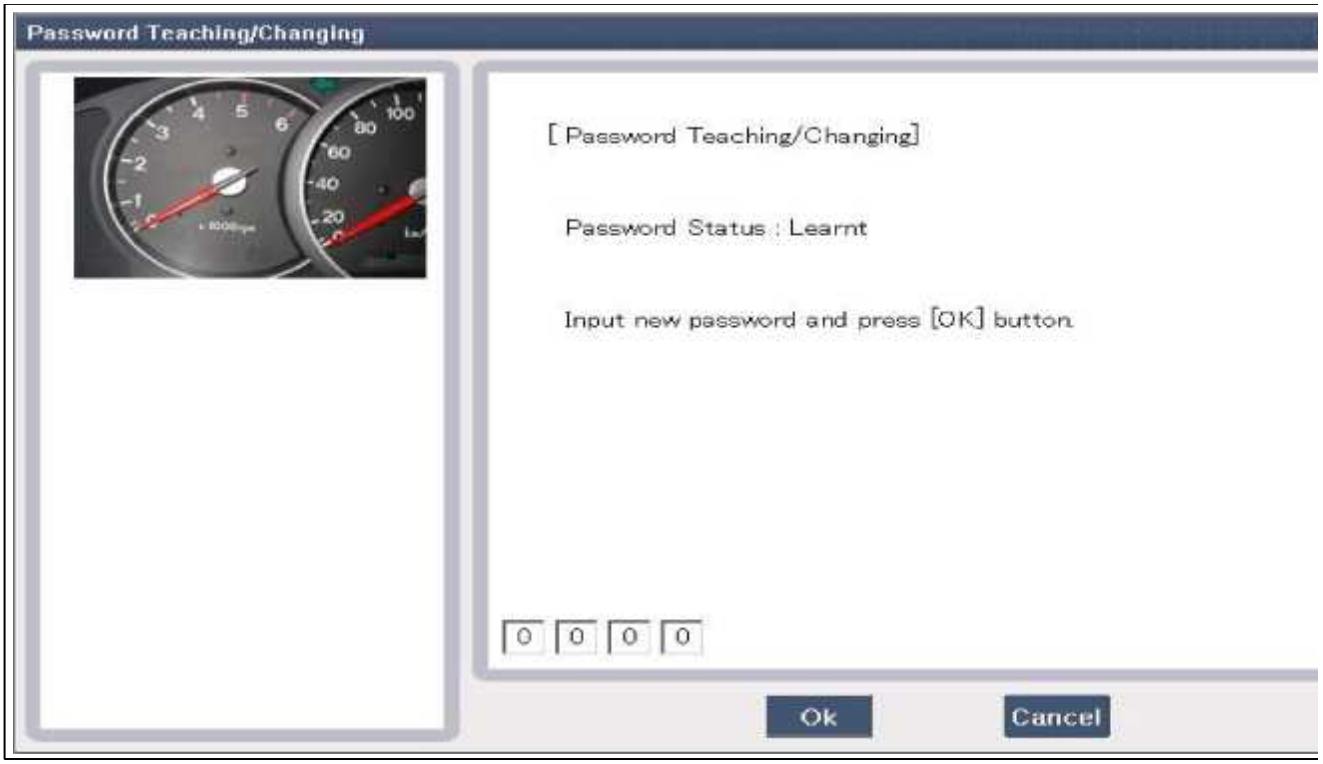
In case of putting wrong password, retry from first step after 10 seconds.

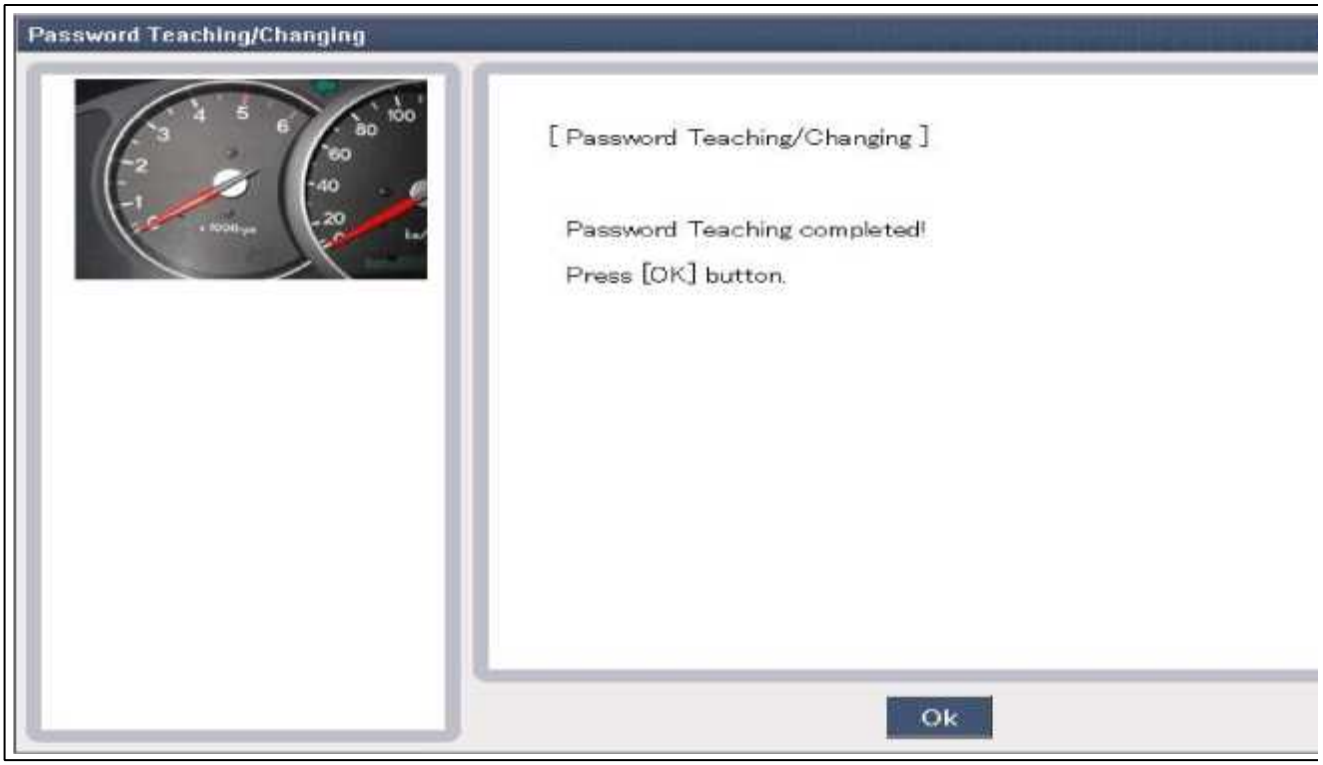
(2) User password changing




Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Learnt
Input old password and press [OK] button.
Ok
Cancel


Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Learnt
Input old password and press [OK] button.
1 1 1 1
Ok
Cancel



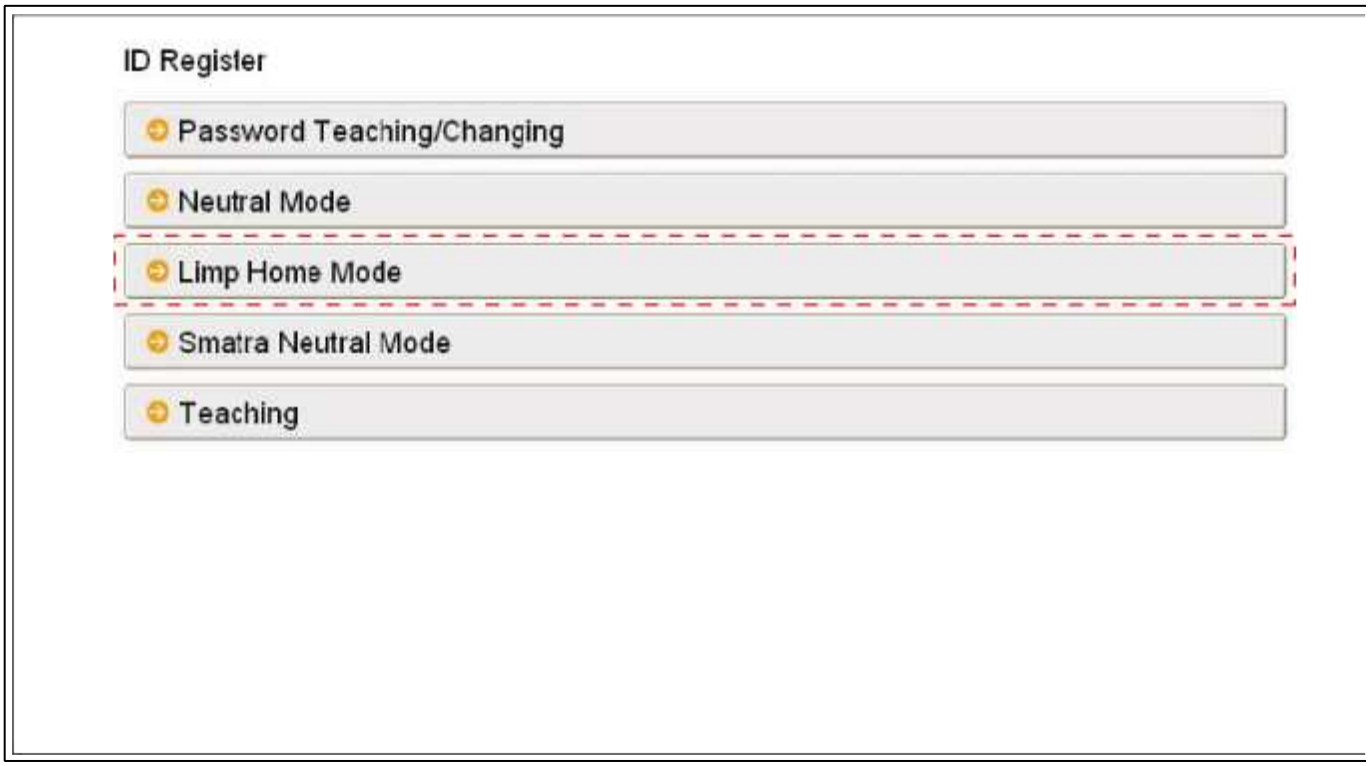


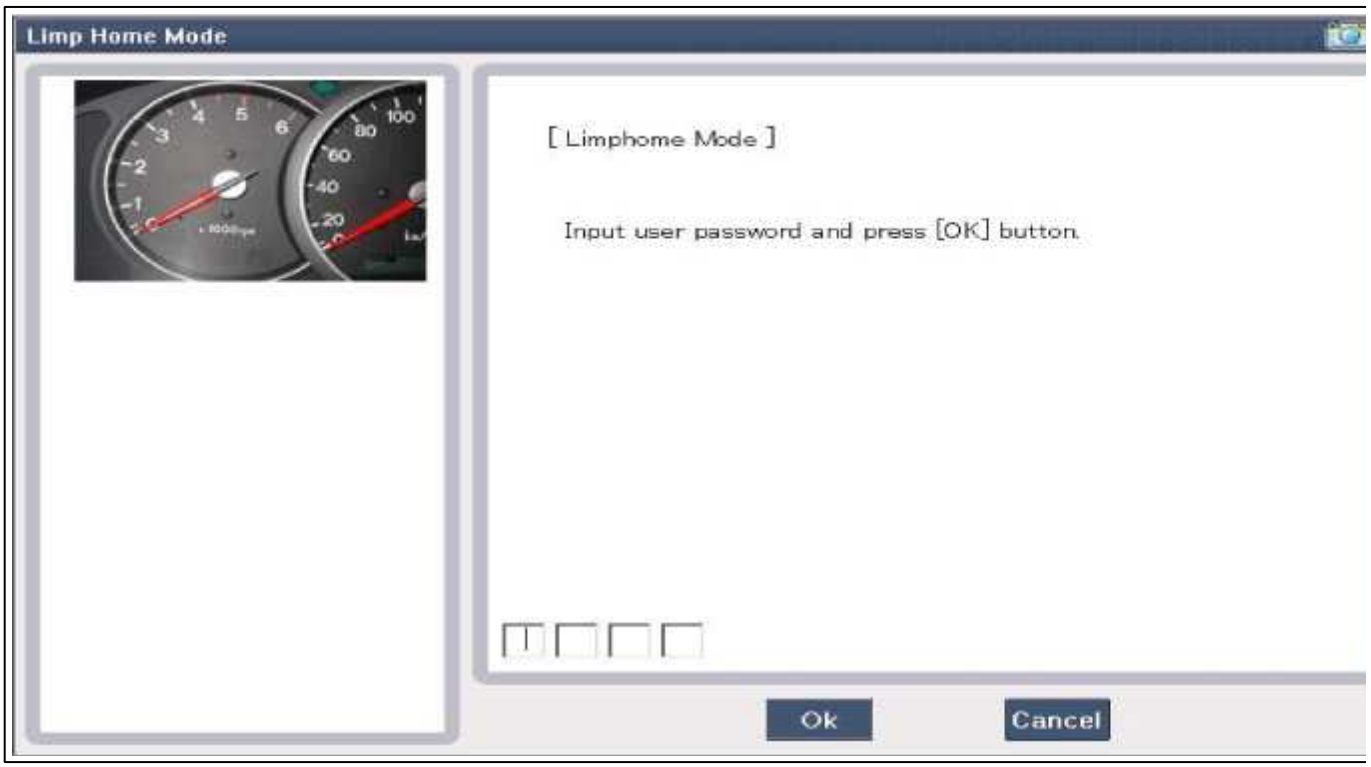
Limp Home Function

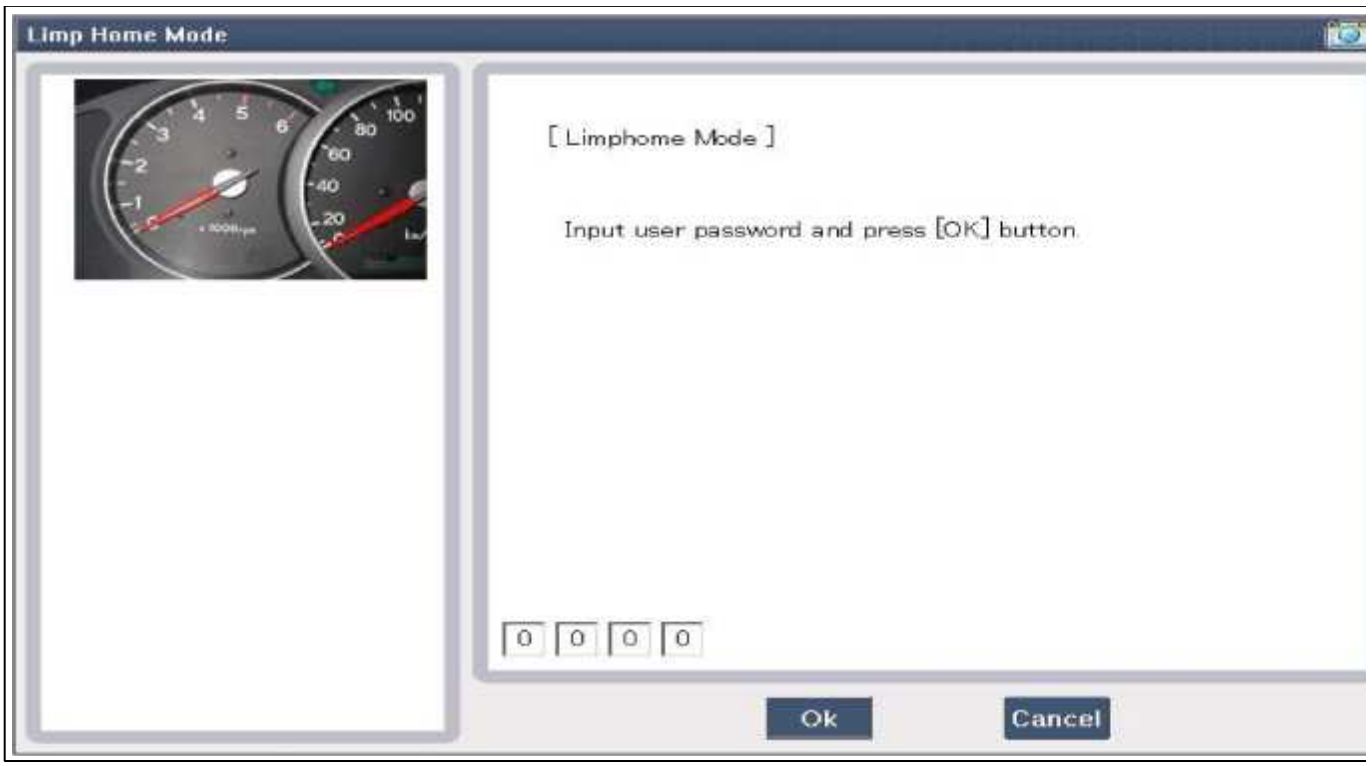
1. Limp Home By Tester

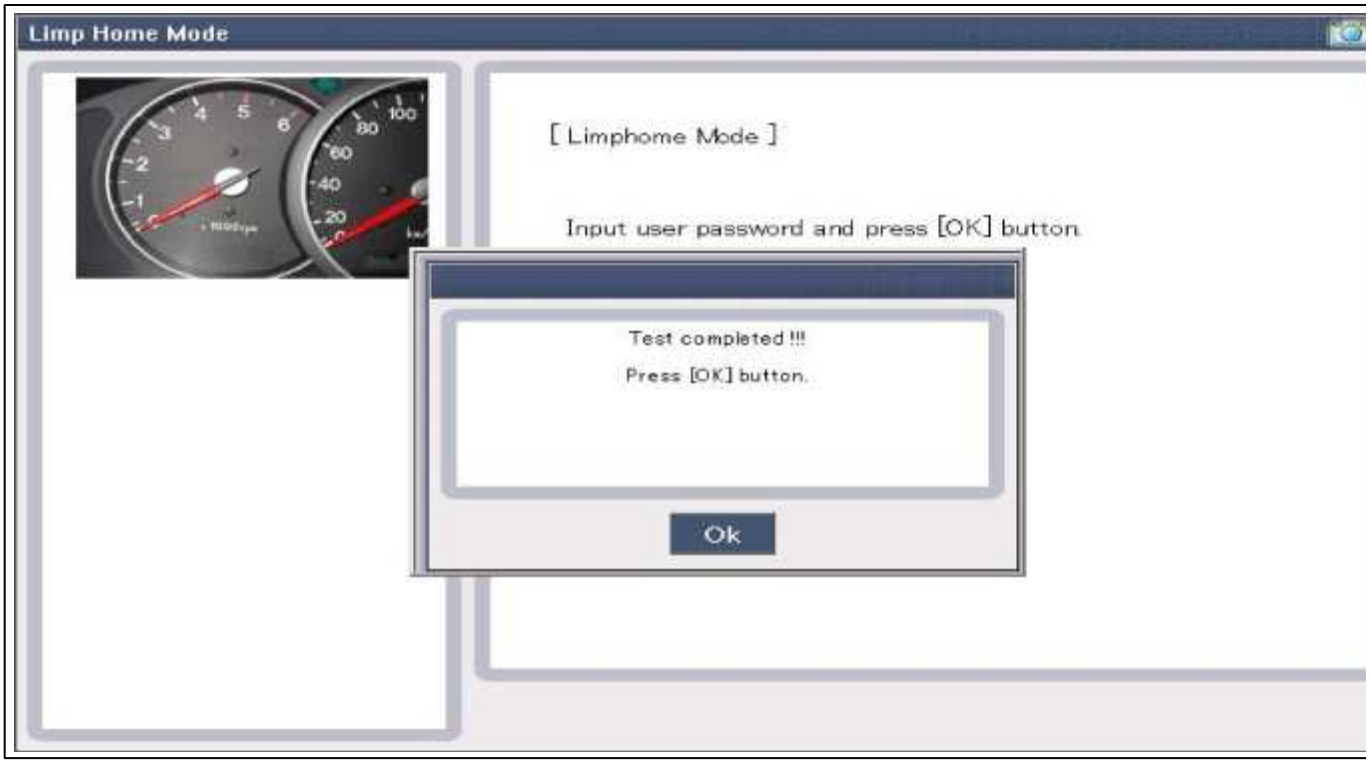
If the PCM(ECM) detects the fault of the SMARTRA or transponder, the PCM(ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service statio
The user password can be sent to the PCM(ECM) via the special tester menu.
Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is corre the PCM(ECM) will be unlocked for a period of time (30 sec.). The engine can only be started during this time. After the time has elapsed, engine start is not possible.
If the wrong user password is sent, the PCM(ECM) will reject the request of limp home for one hour. Disconnecti the battery or any other action cannot reduce this time. After connecting the battery to the PCM(ECM), the timer

starts again for one hour.









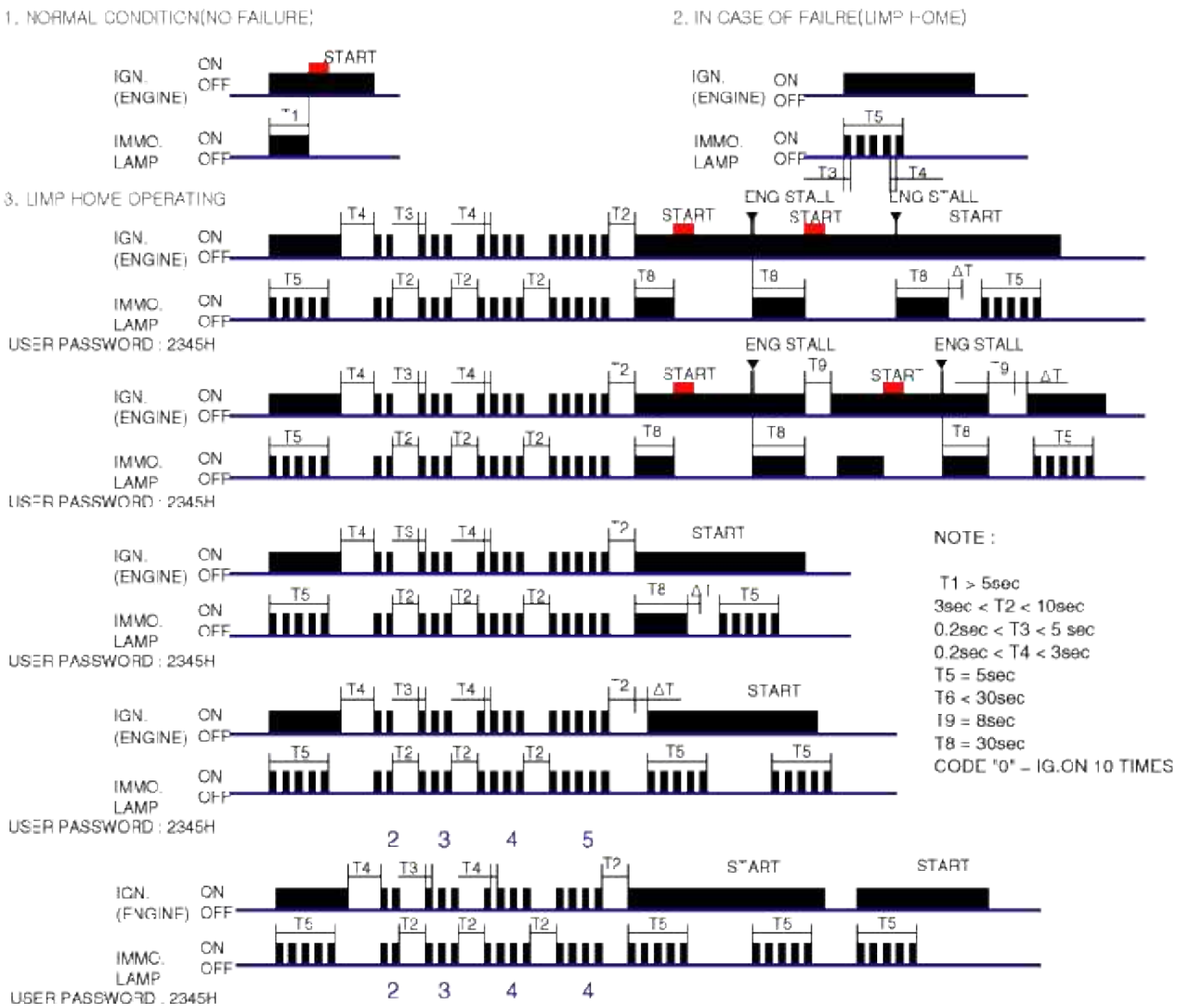
2. Limp Home By Ignition Key

The limp home can be activated also by the ignition key. The user password can be input to the PCM(ECM) by a special sequence of ignition on/off.

Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM(ECM) will be unlocked for a period of time (30 sec.).

The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again.

After ignition off, the PCM(ECM) is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.



Replacement

Problems And Replacement Parts:

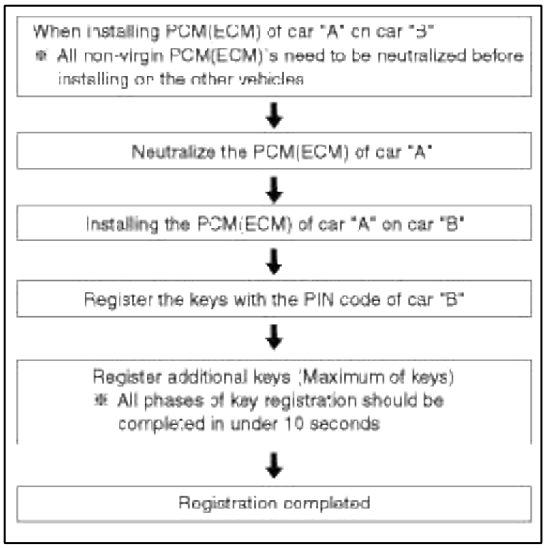
Problem	Part set	GDS required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

Replacement Of ECM And Smartra

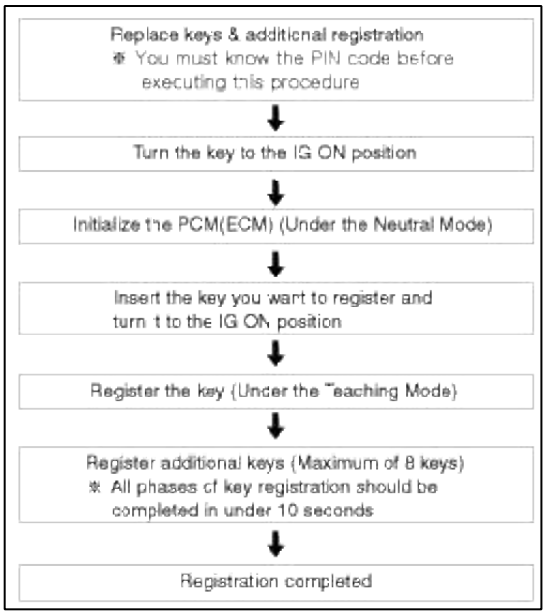
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching

procedure). The vehicle specific data have to be left unchanged due to the unique programming of transponder. In case of a defective SMARTRA, it needs teaching the smartra. A new SMARTRA device replaces the old one and smartra need teaching.

1. Things to remember before a replacement (PCM(ECM))



2. Things to remember before a replacement (Keys & Additional registration)



NOTE

1. When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.
2. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2.
   (Note that key #2 must be used within 10 seconds of removing key #1)
3. When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.
   The engine cannot be started even with the registered key #1.
4. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.
   Always remember the 10 seconds zone.
5. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
6. Be cautious not to overlap the transponder areas.
7. Problems can occur at key registration or vehicle starting if the transponders should overlap.

Neutralizing Of ECM

The PCM(ECM) can be set to the "neutral" status by a tester.

A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) is neutralized.

The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function, is accepted by the PCM(ECM).

The teaching of keys follows the procedure described for the virgin PCM(ECM). The vehicle specific data have to be unchanged due to the unique programming of the transponder. If data should be changed, new keys with a virgin transponder are requested.

This function is for neutralizing the PCM(ECM) and Key. Ex) when lost key, Neutralize the PCM(ECM) then teach keys.

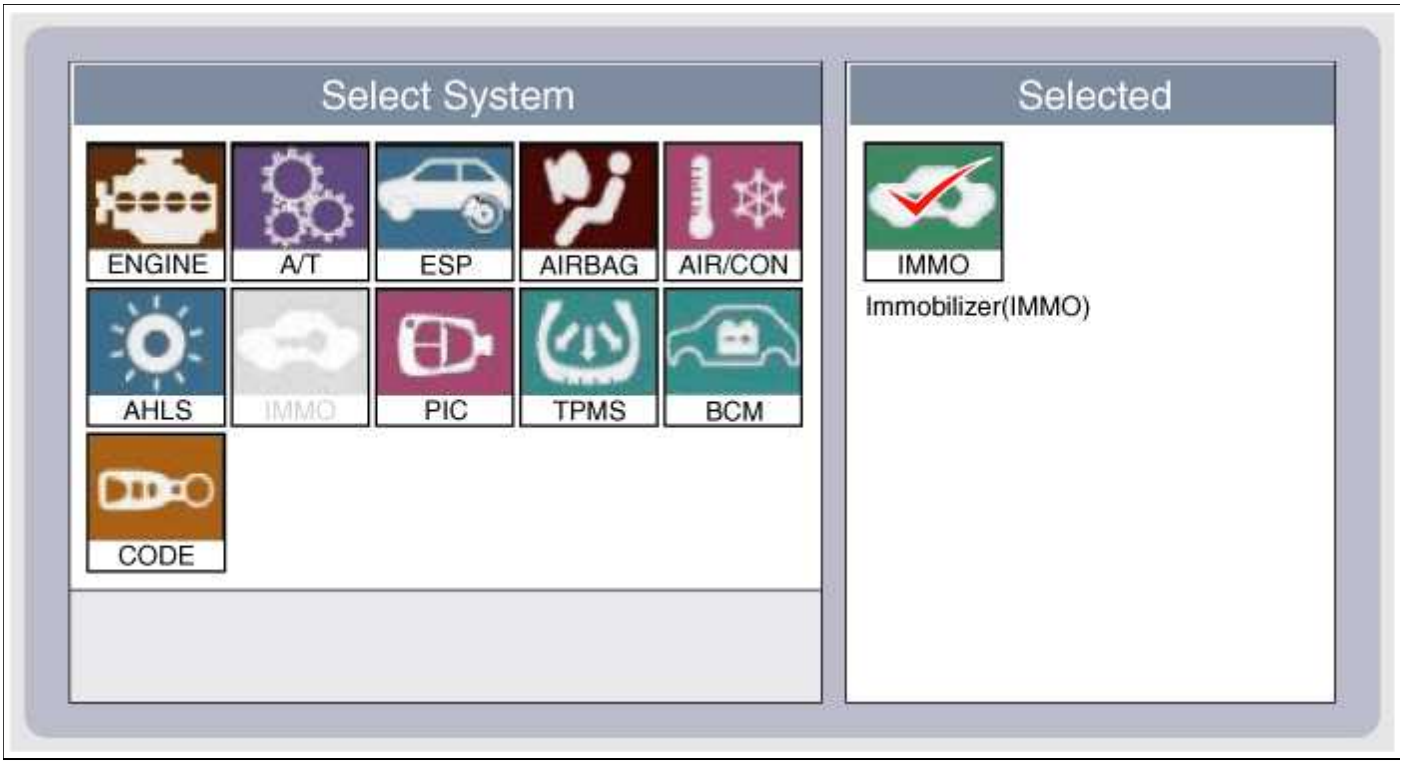
(Refer to the Things to do when Key & PIN Code the PCM(ECM) can be set to the "neutral" status by a scanner.

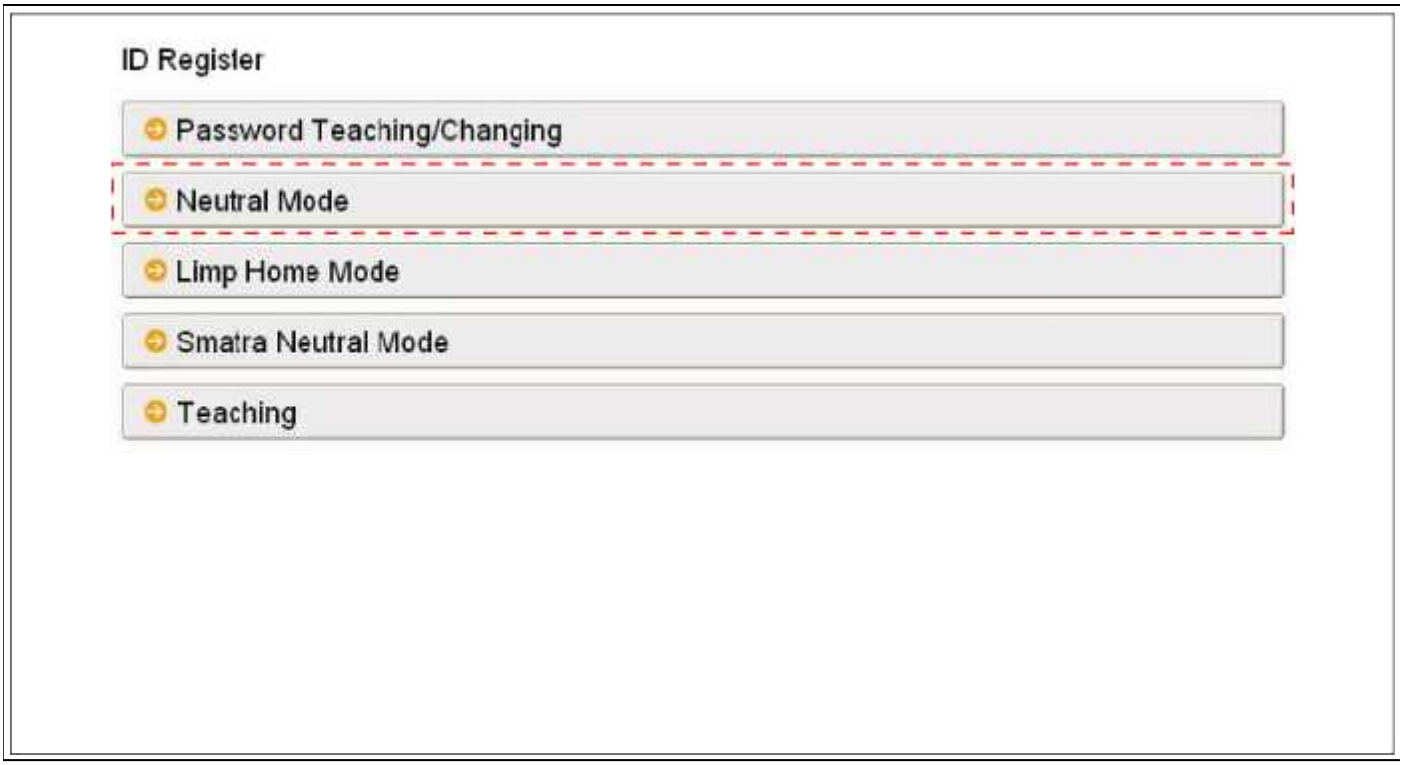
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

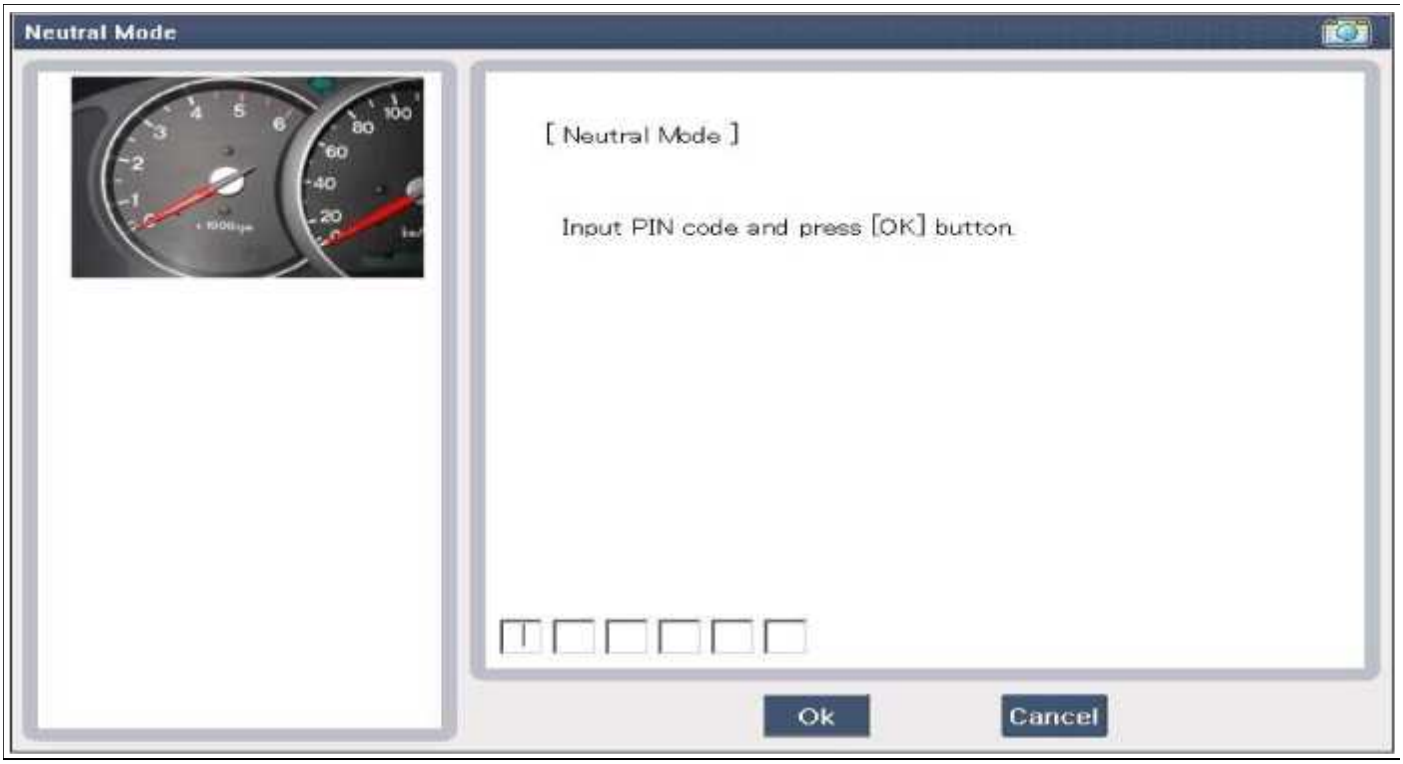
NOTE

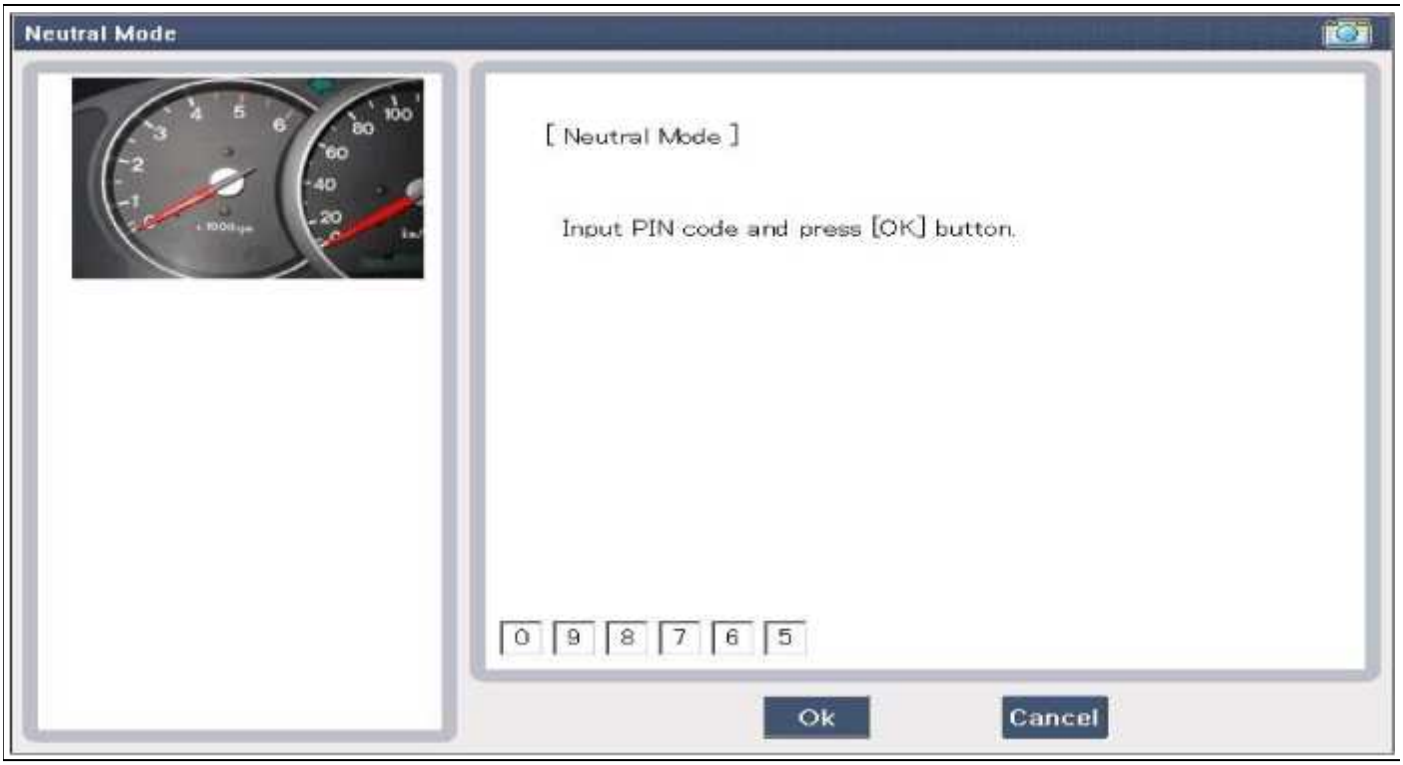
- Neutralizing setting condition
  - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)
- Neutralizing meaning:
  - PIN Code(6) & User P/Word(4) deletion
  - Locking of EMS(except Key Learning permission)

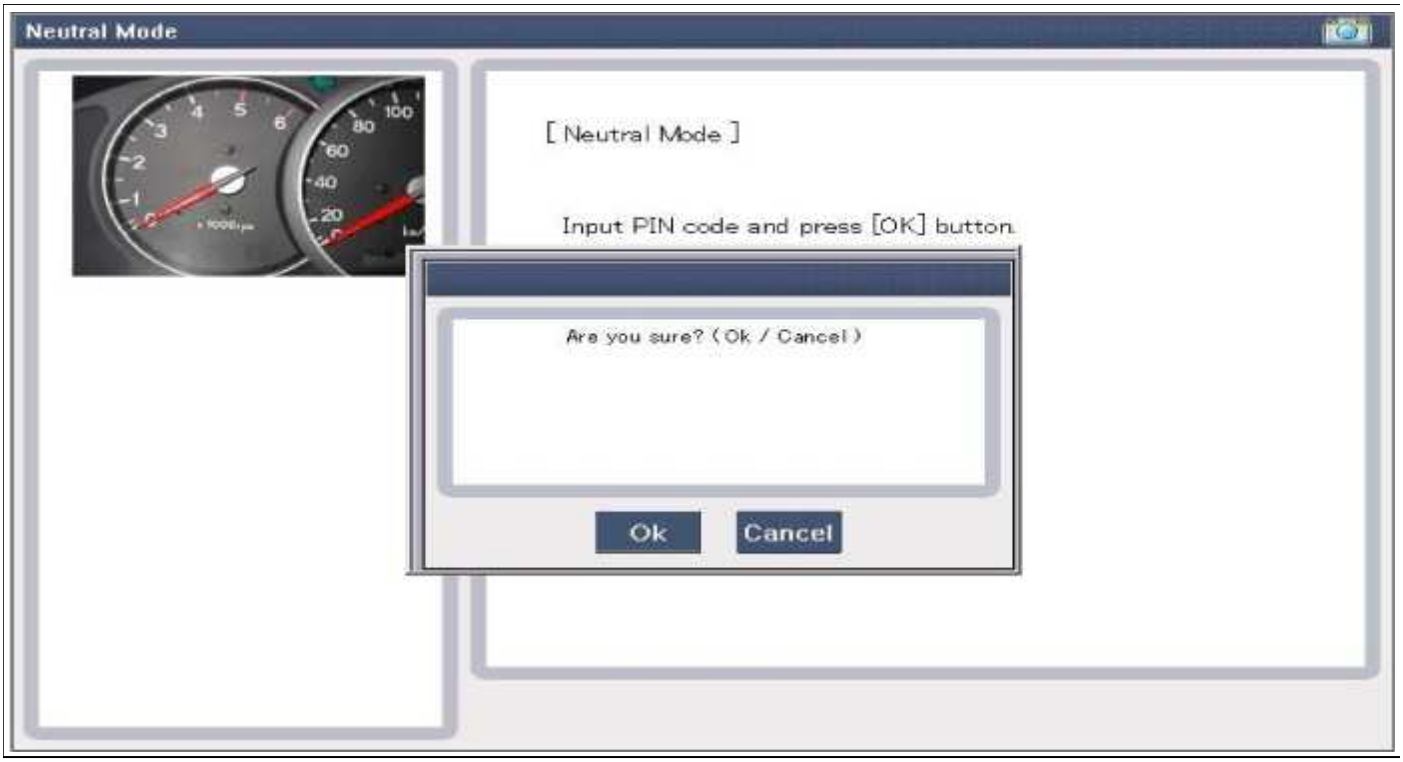
Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No

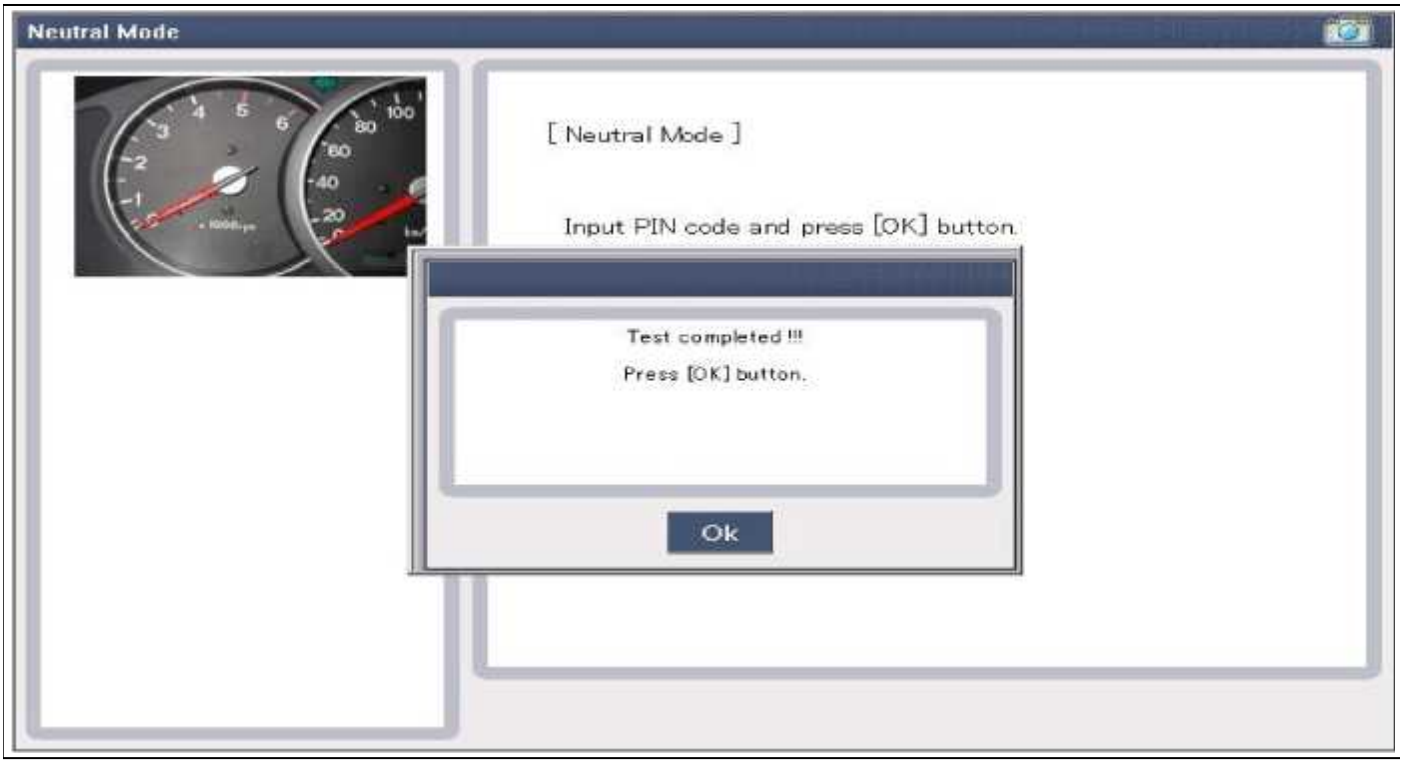

Select System
ENGINE
A/T
ESP
AIRBAG
AIR/CON
AHLS
IMMO
PIC
TPMS
BCM
CODE
Selected
IMMO
Immobilizer(IMMO)

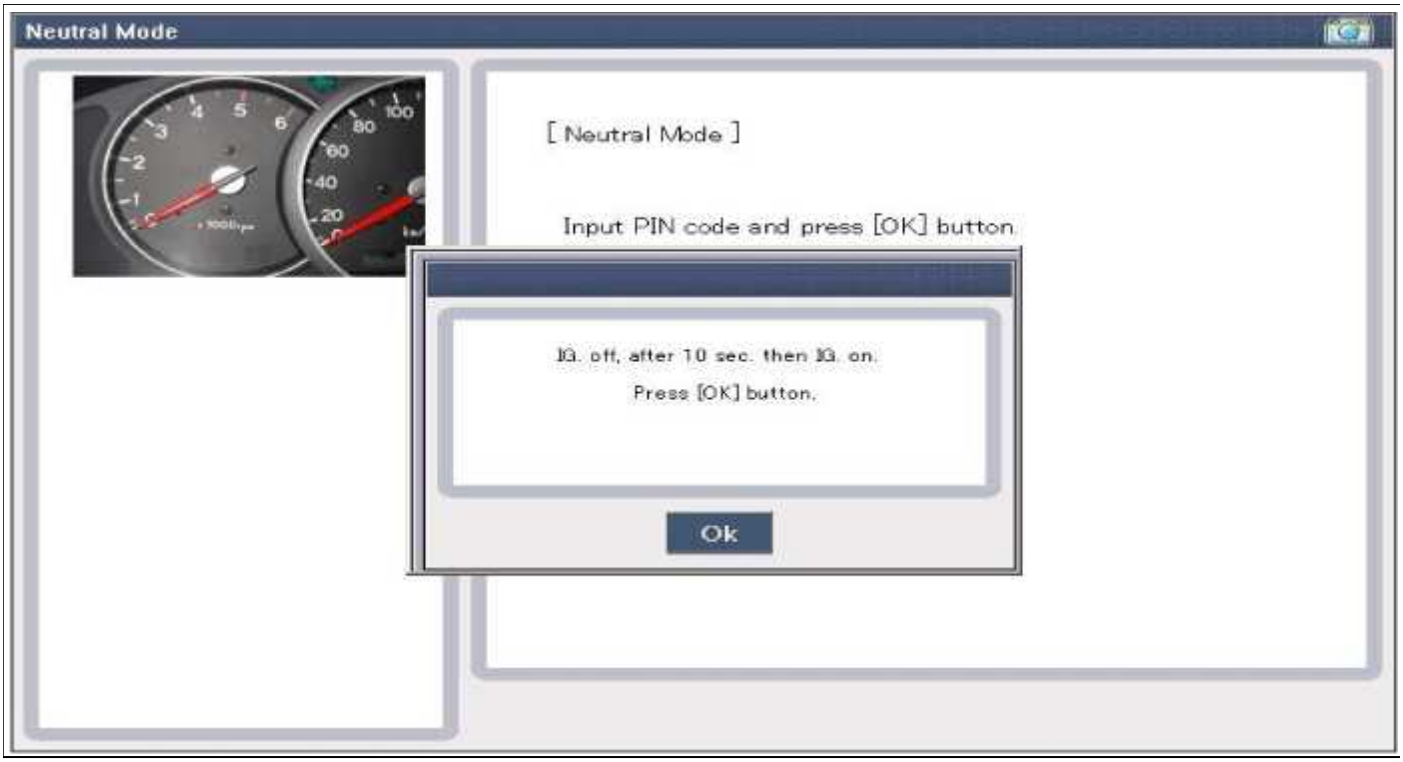

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching

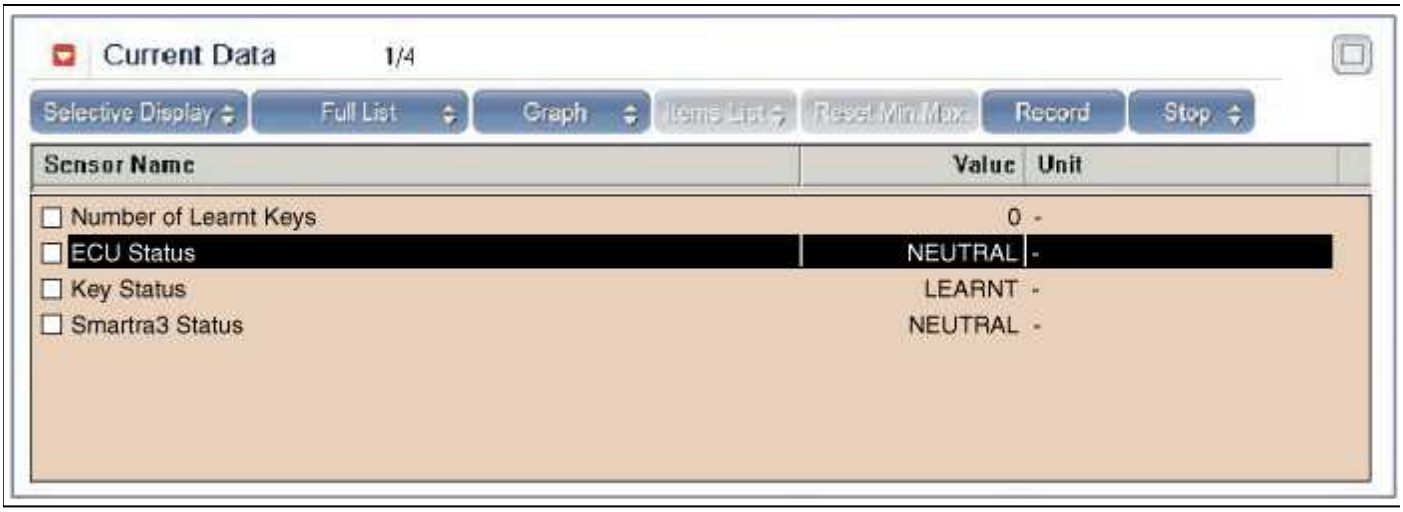

Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Ok
Cancel


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
0 9 8 7 6 5
Ok
Cancel


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Are you sure? (Ok / Cancel)
Ok
Cancel


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok





Neutralizing Of SMARTRA

The EMS can be set to the status "neutral" by tester

Ignition key (regardless of key status) is inserted and after IGN ON. If receiving the correct vehicle password from GST, SMARTRA can be neutralized. The neutralization of SMARTRA is possible if DPN is same as the value inputted by GST.

In case that the SMARTRA status is neutral, the EMS keeps the lock state. And the start is not possible by "twice ignition".

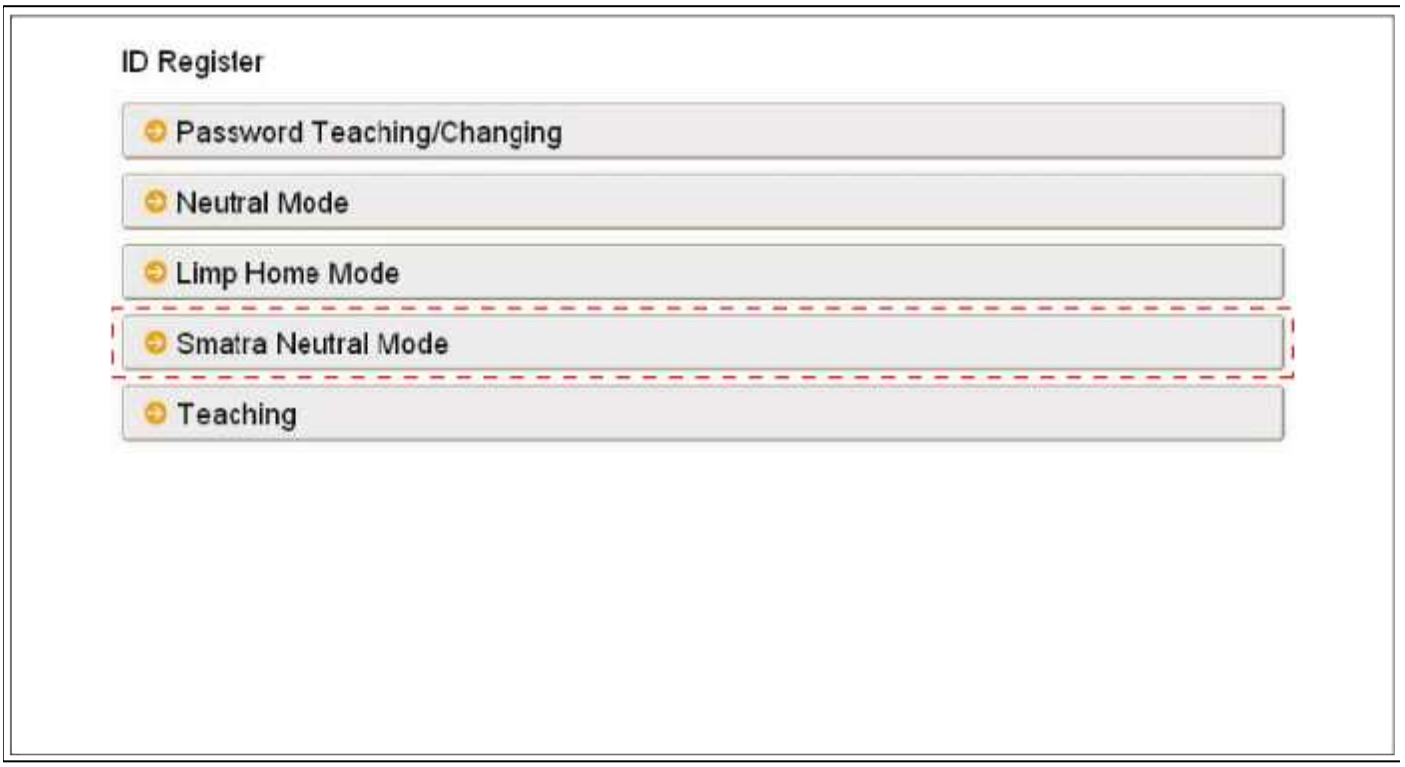
In case of changing the vehicle password, new virgin transponder must be only used. And in case of virgin key, after Learning the key of vehicle password, it can be used.

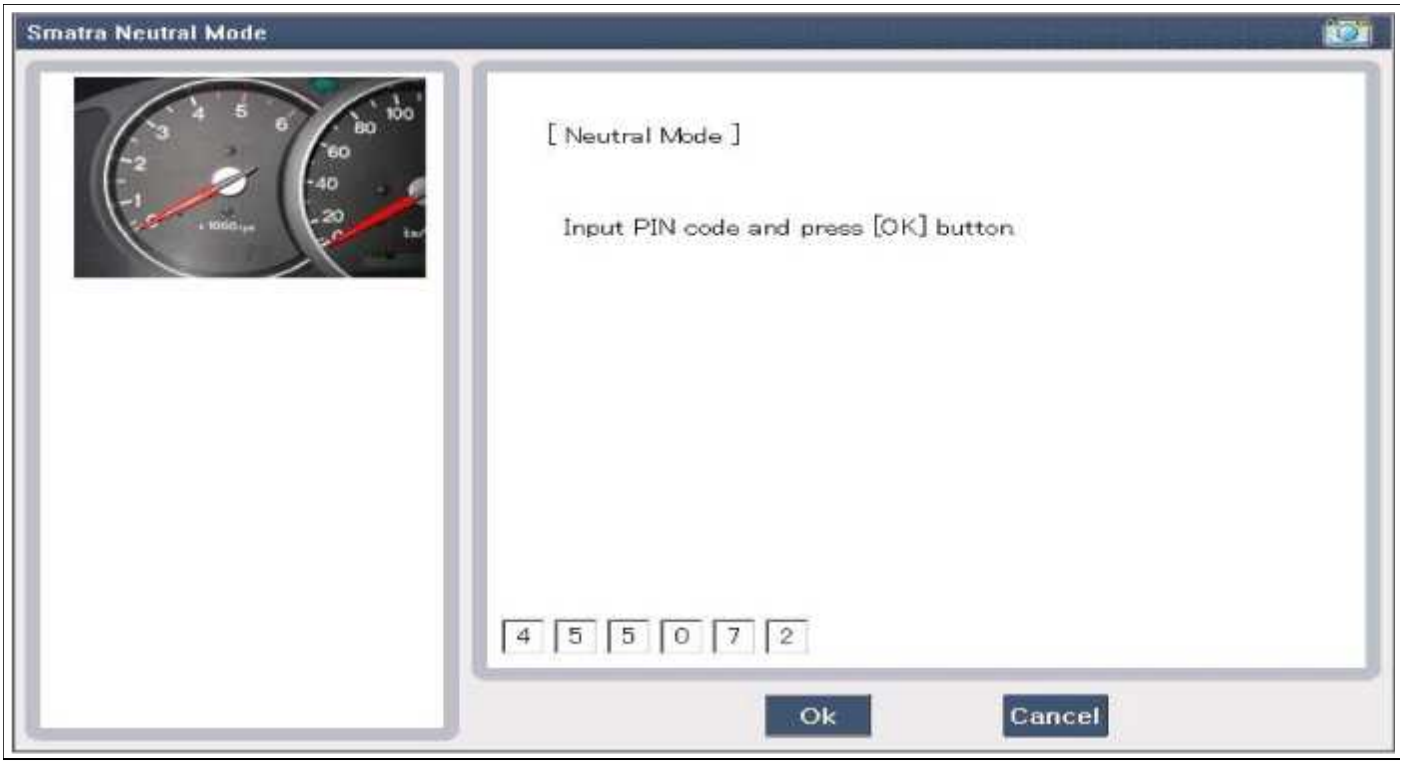
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

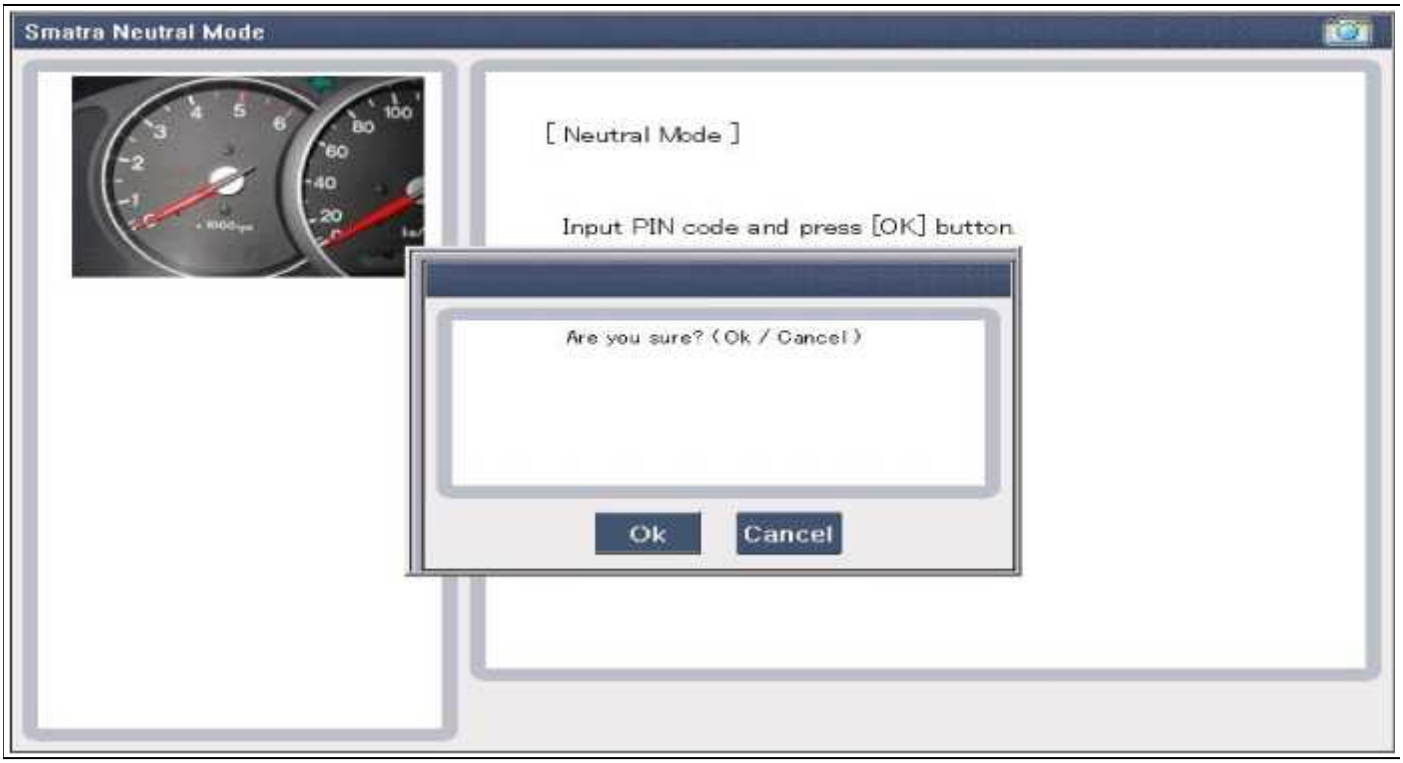
NOTE

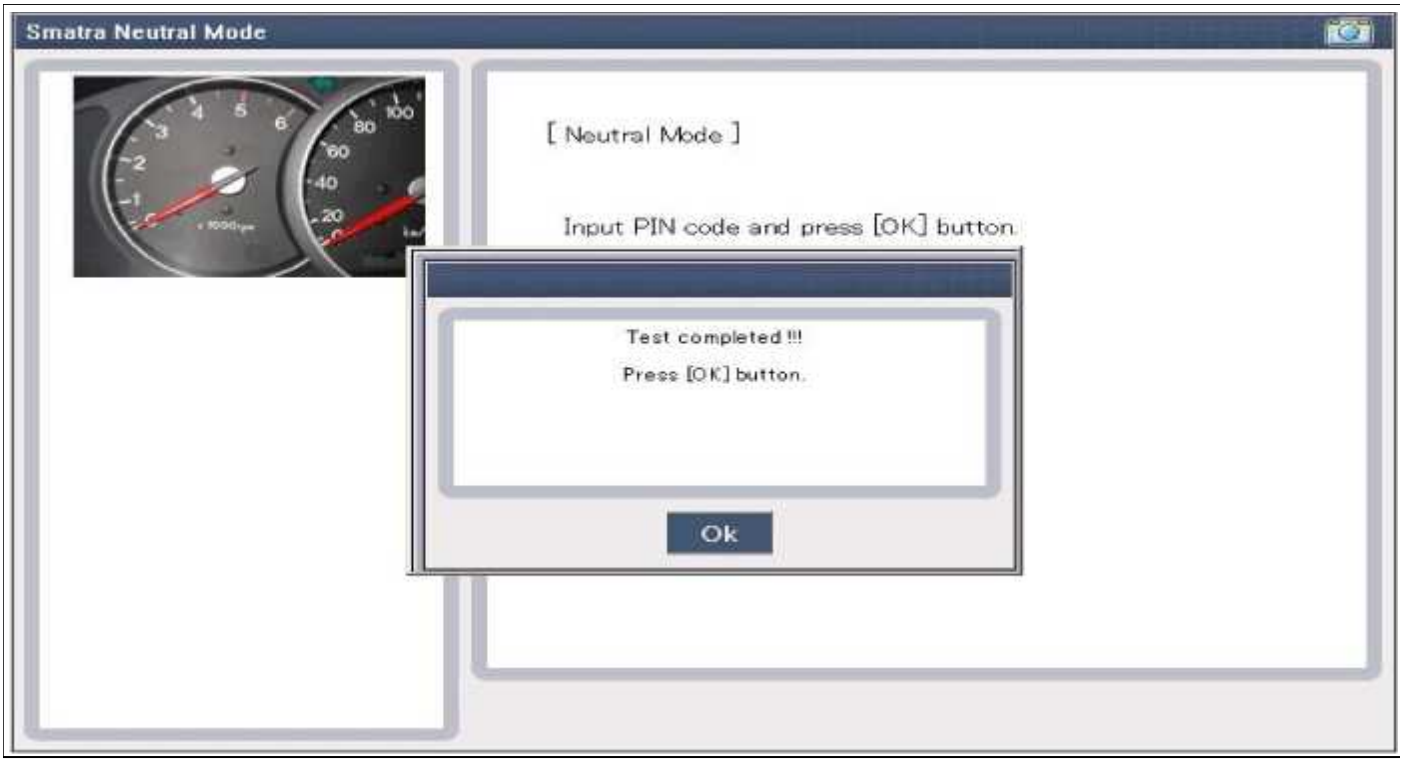
- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learned"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

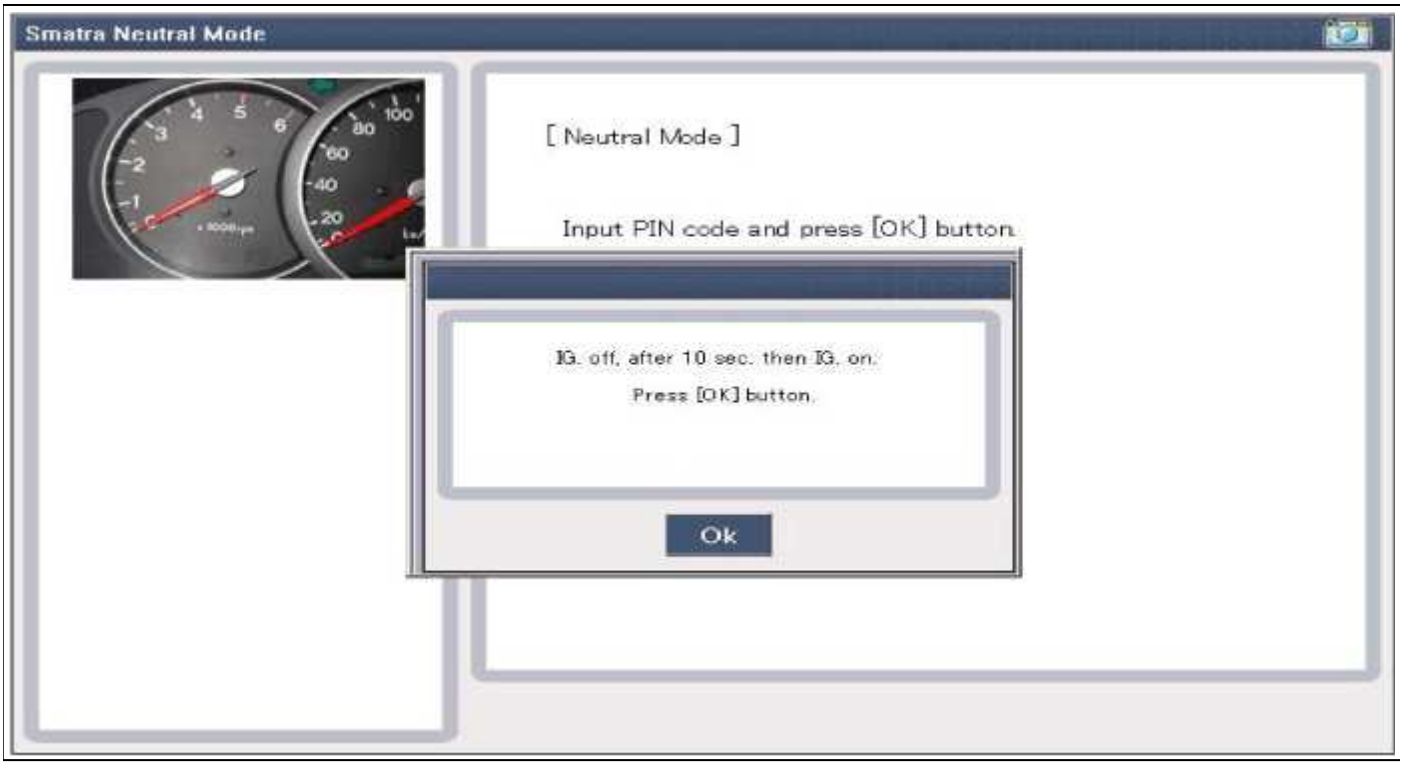
Function / SMARTRA	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutra	No	Yes (EMS learnt)	No	Yes	No

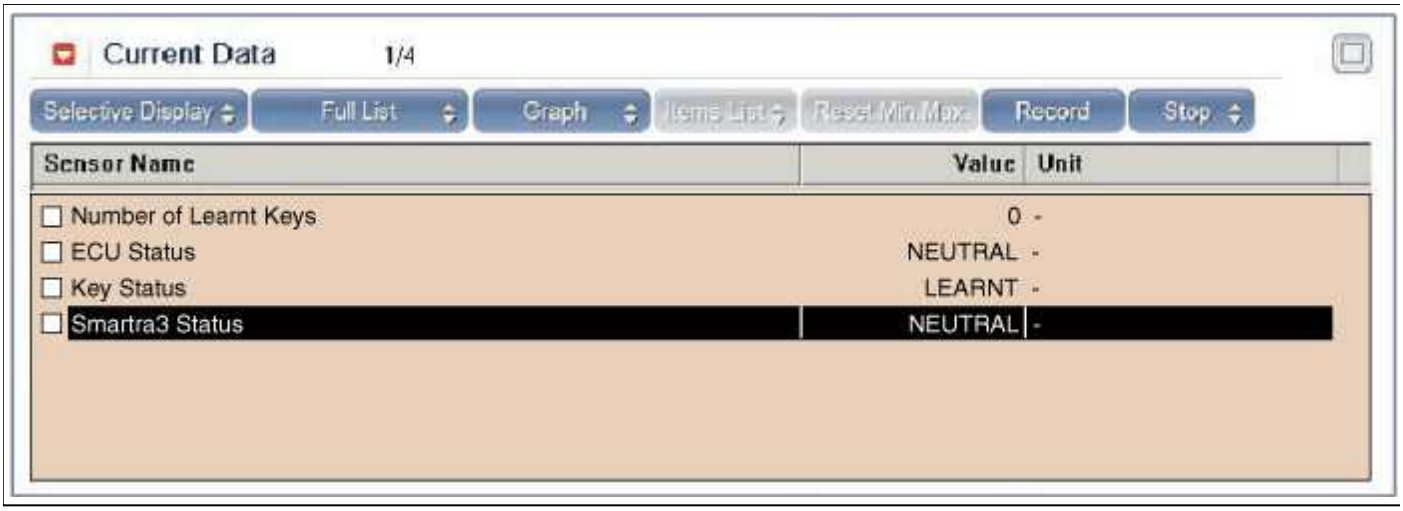



Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button
4 5 5 0 7 2
Ok
Cancel


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button
Are you sure? (Ok / Cancel)
Ok
Cancel


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
IG. off, after 10 sec. then IG. on.
Press [OK] button.
Ok



Body Electrical System > Immobilizer System > Immobilizer Control Unit > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver crash pad lower panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - " Crash Pad Lower Panel")
3. Remove the knee airbag module.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Restraint - "Knee Airbag (KAB) Module")
4. Disconnect the connector of the immobilizer unit and then remove the immobilizer bolt (A) after loosening a nut.



Installation

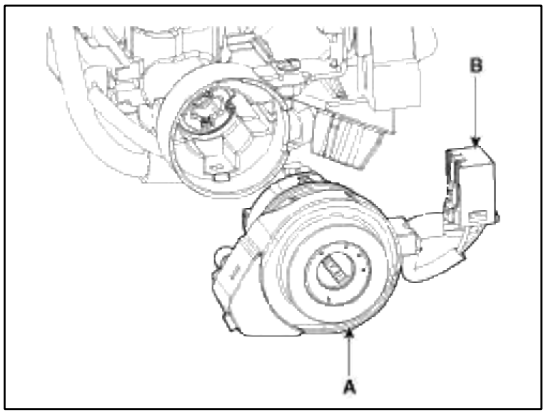
1. Install the immobilizer control unit after connecting the unit connector.
2. Install the crash pad lower panel and knee airbag module.
3. Connect the negative (-) battery terminal.

Body Electrical System > Immobilizer System > Antenna Coil > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.

2. Remove the crash pad lower panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - " Crash Pad Lower Panel")
3. Disconnect the 6P connector (B) of the coil antenna and then remove the coil antenna (A) after loosening the screw.



Installation

1. Install the coil antenna and connect the 6P connector.
2. Install the crash pad lower panel.
3. Connect the negative (-) battery terminal.

Body Electrical System > Rear Parking Assist System > Specifications

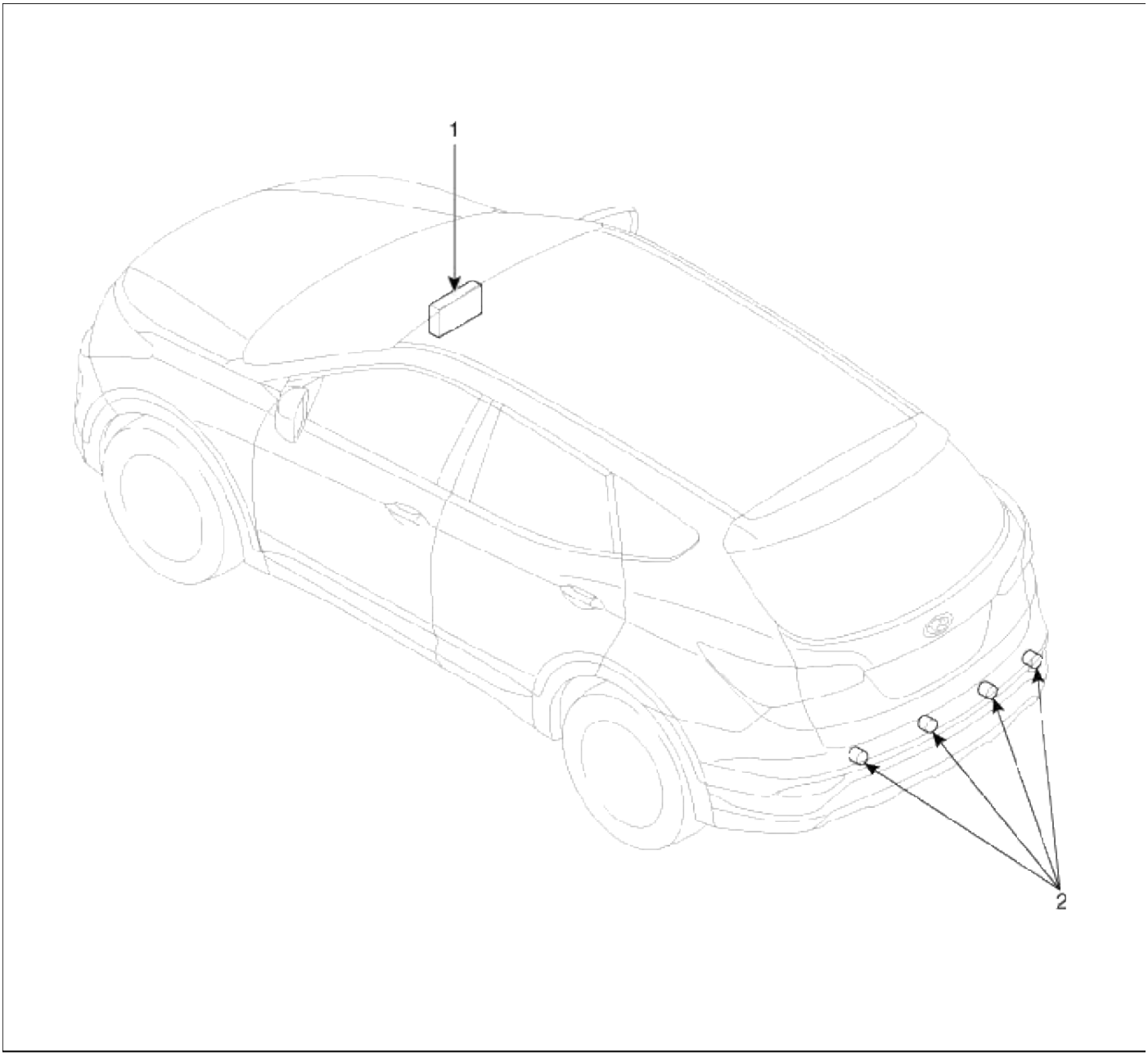
Specification

Item		Specification
Ultrasonic sensor	Voltage rating	DC 12 V
	Detecting range	30 cm ~ 120 cm
	Operation voltage	DC 9 ~ 16 V
	Operation current	MAX 300 mA
	Operation temperature	-30°C ~ +80°C (-22°C ~ +176°C)
	Operation frequency	48 ± 5 KHz
	Number of sensors	4 (Left side, Left center, Right center, Right side)

Rear parking assist control unit function is built in BCM (body control unit).

Body Electrical System > Rear Parking Assist System > Components and Components Location

Component Location



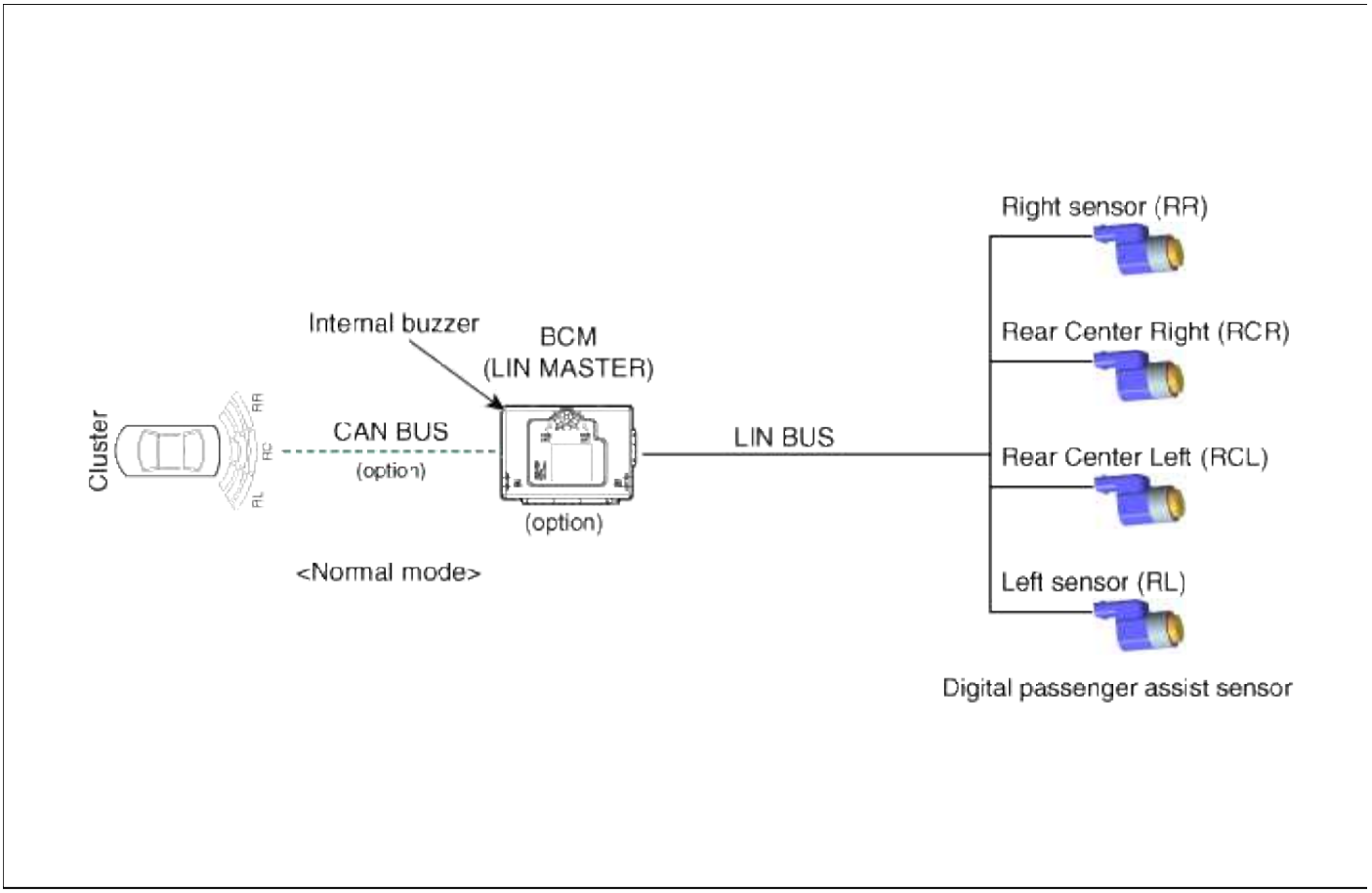
1. BCM (Body Control Module)	2. Ultrasonic sensor

Rear parking assist control unit function is built in BCM (body control unit).

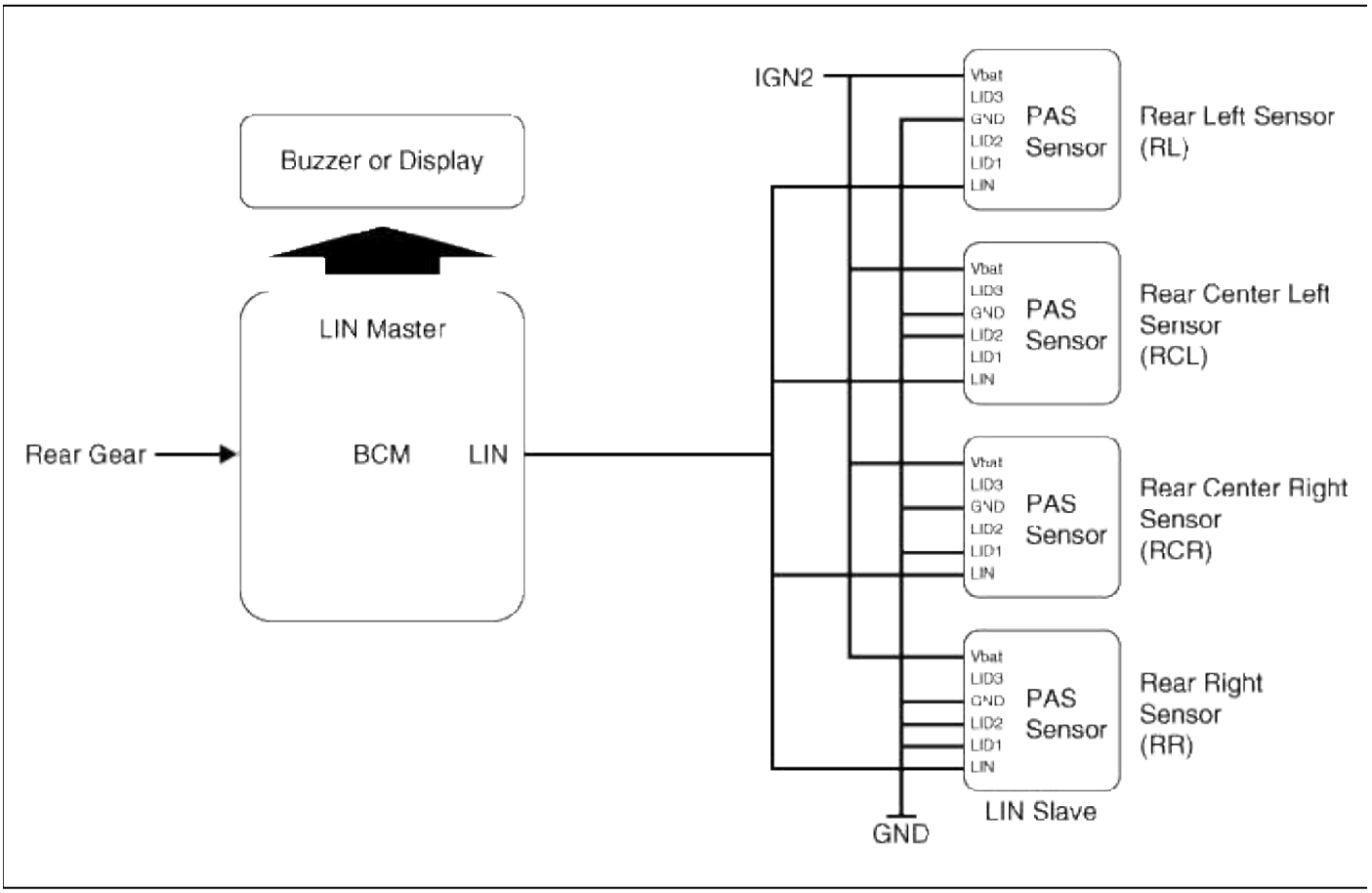
Body Electrical System > Rear Parking Assist System > Description and Operation

System Overview

RPAS (Rear Parking Assist System) is an electronic driving aid that warns the driver to be cautious while parking or in low speed environments. The sensor uses ultrasonic waves to detect objects within proximity of the vehicle. RPAS consists of four RPS sensors which are detecting the obstacles and transmit the result separated into three warning levels, the first, second and third to BCM by Lin communication. BCM decides the alarm level by the transmitted communication message from the slave sensors, then operate the buzzer or transmits the data for display.



System Block Diagram



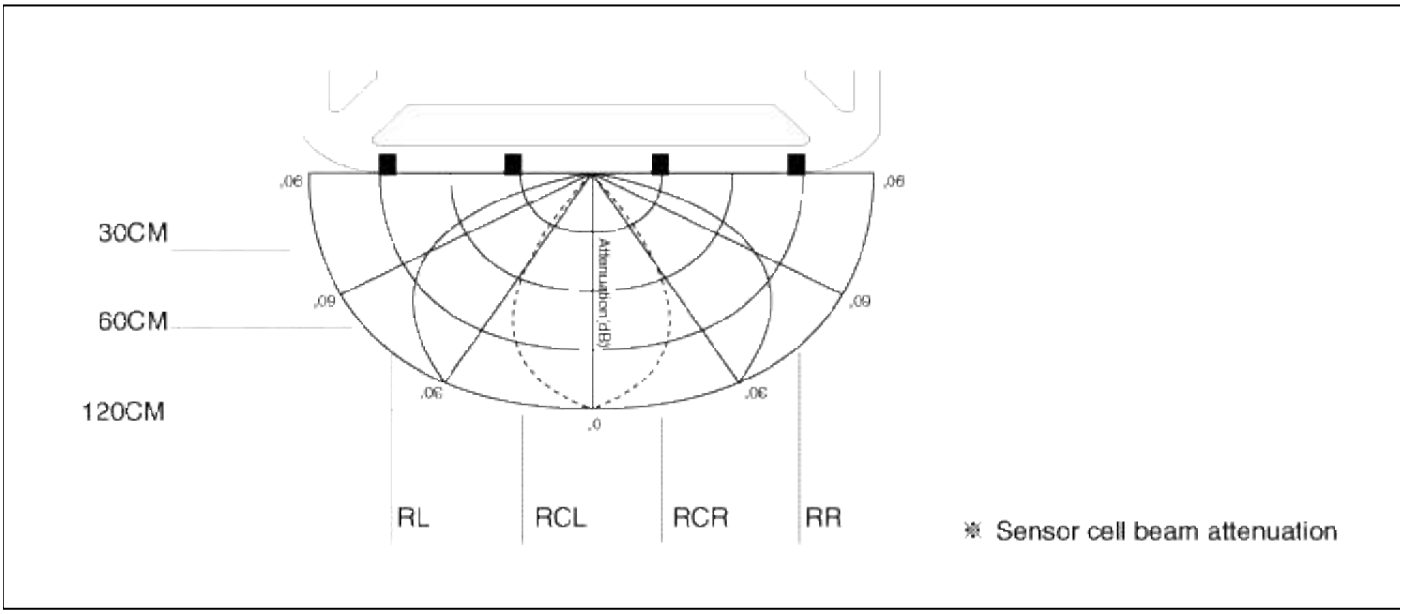
System Operation Specification.

1. INIT mode
   (1) System initializing time is 500ms after IGN1+ R Gear.
   (2) RPAS recognizes LID and sets the sensor ID up during initialization.
   (3) RPAS activates each sensor and then executes the diagnosis after finishing initialization of BCM
   (4) R-PAS Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.
   (5) If any failure is received from the any sensors, R-PAS Starting Buzzer" does not work but the failure alarm is operated for a moment.
   If you have display option, warning sign is also shown on it.
   (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.
2. NORMAL Mode
   (1) Lin communication starts and keeps the routine after IGN1 ON+R gear
   (2) BCM send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.
   (3) After initialization, normal mode starts 100ms later after finishing alarm output.
   (4) Alarm for obstacles is divided into 3 levels.
   The first and second are intermittent sound, and the third alarms continuously
   (5) The efficient vehicle speed of RPAS operation is under 10Km/h.
   (6) Refer to 'Digital PAS Project LIN communication' for the more detailed communication specification.

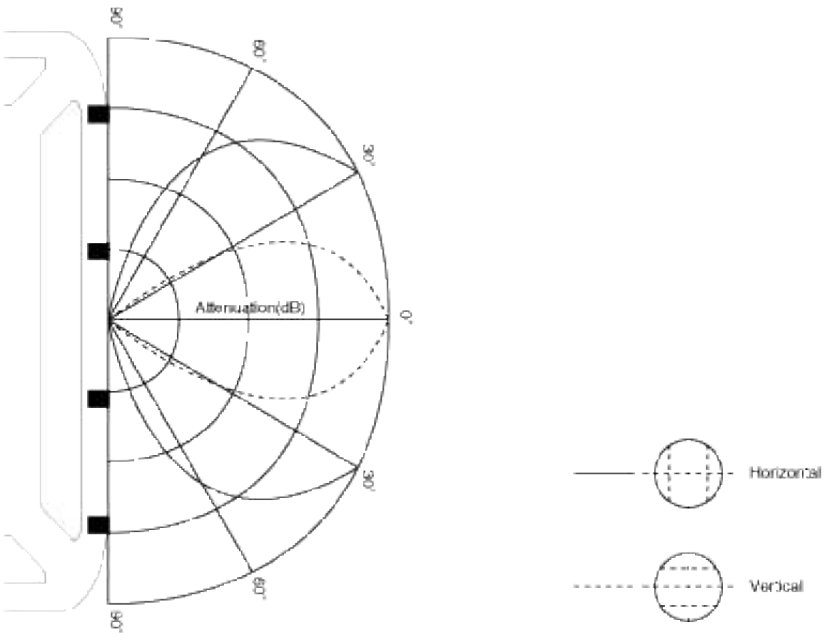
Sensing Area

1. Measurement condition – PVC pole (diameter 75mm, length 3m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)
   61cm(24.0in) ~ 120cm(47.2in) : ± 15cm(5.9in)
   31cm(12.2in) ~ 60cm(23.6in): ± 15cm(5.9in)
   Less than 30cm(11.8in) : ± 10cm(3.9in)

Horizontal Sensing Area



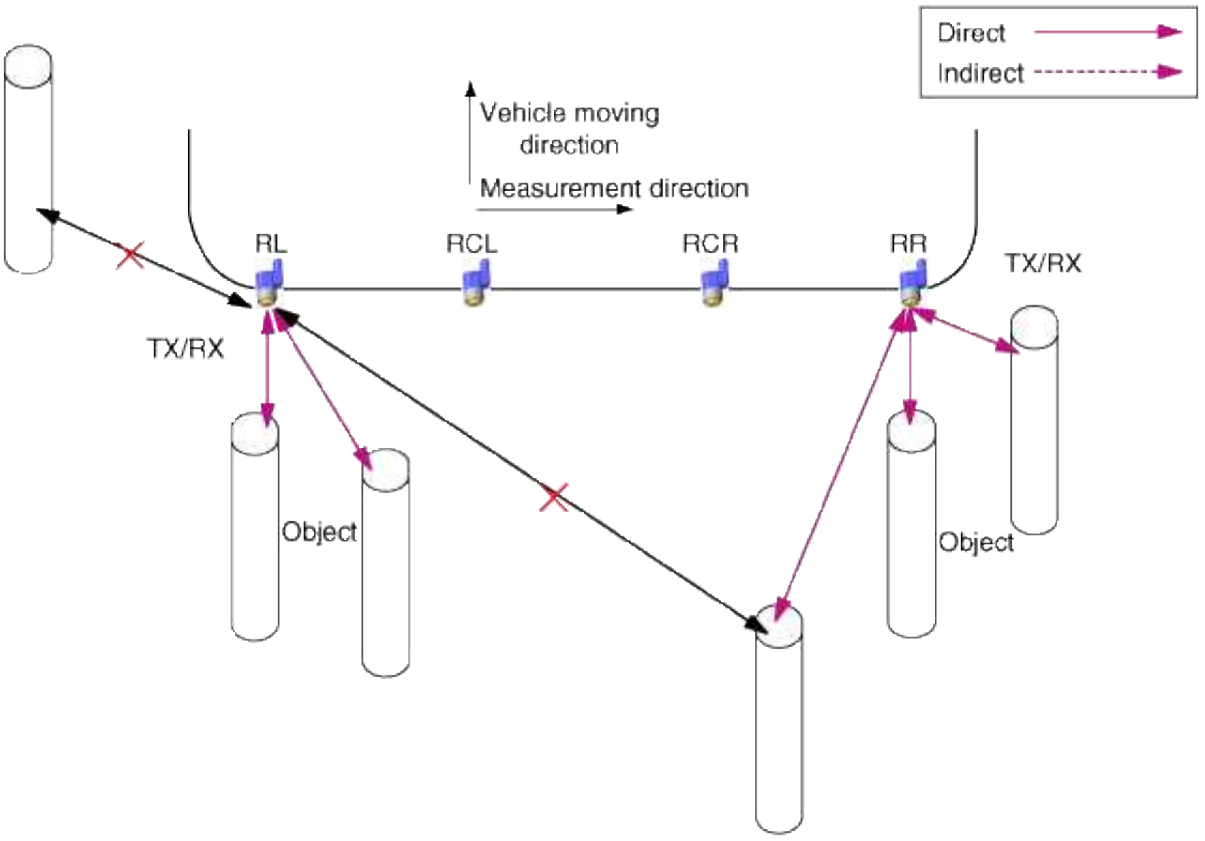
Vertical Sensing Area



Distance Measurement

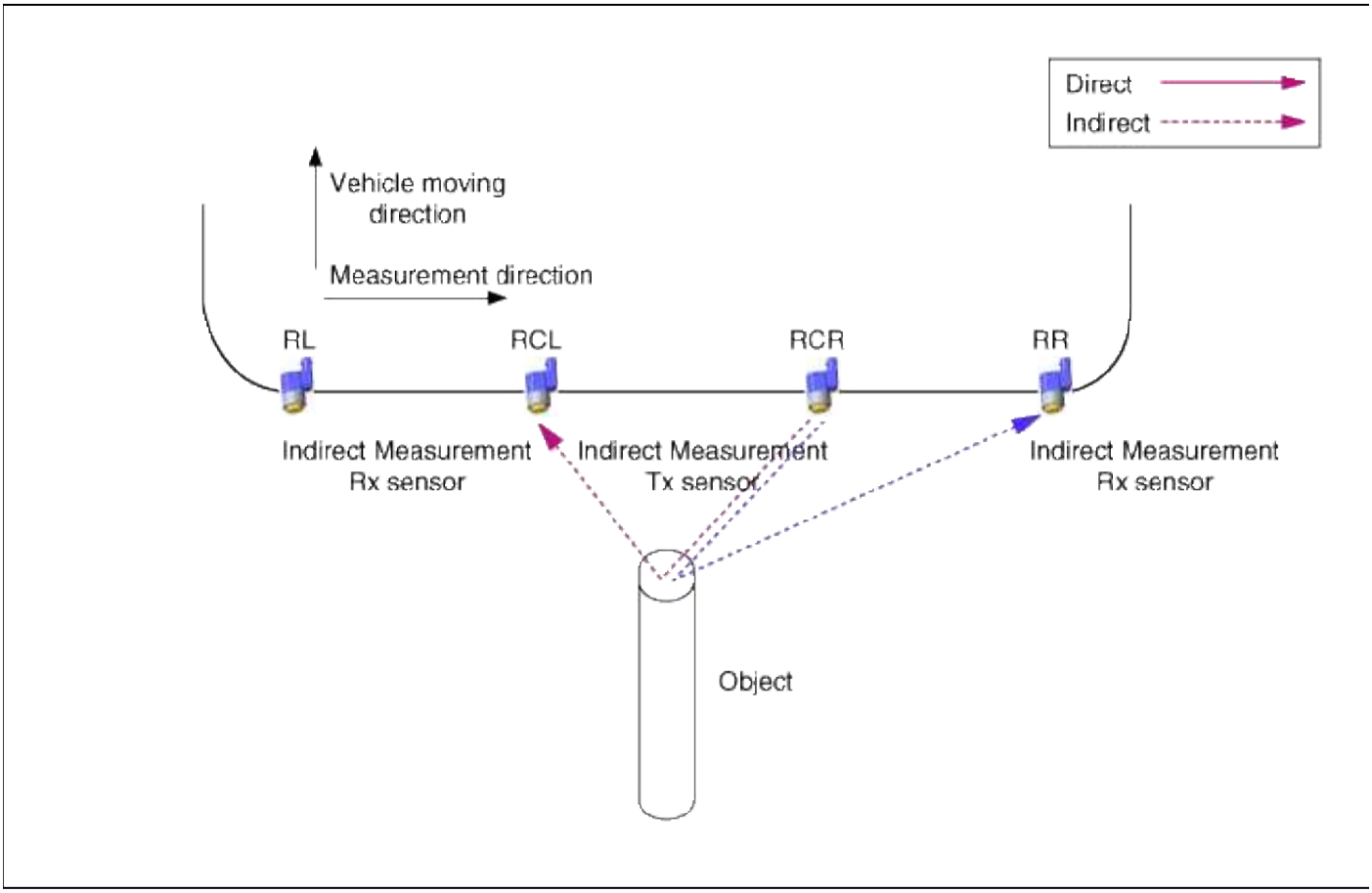
Direct Measurement

Transmission and Reception are executed with one sensor
(RL, RCL, RCR, RR each sensor execution)



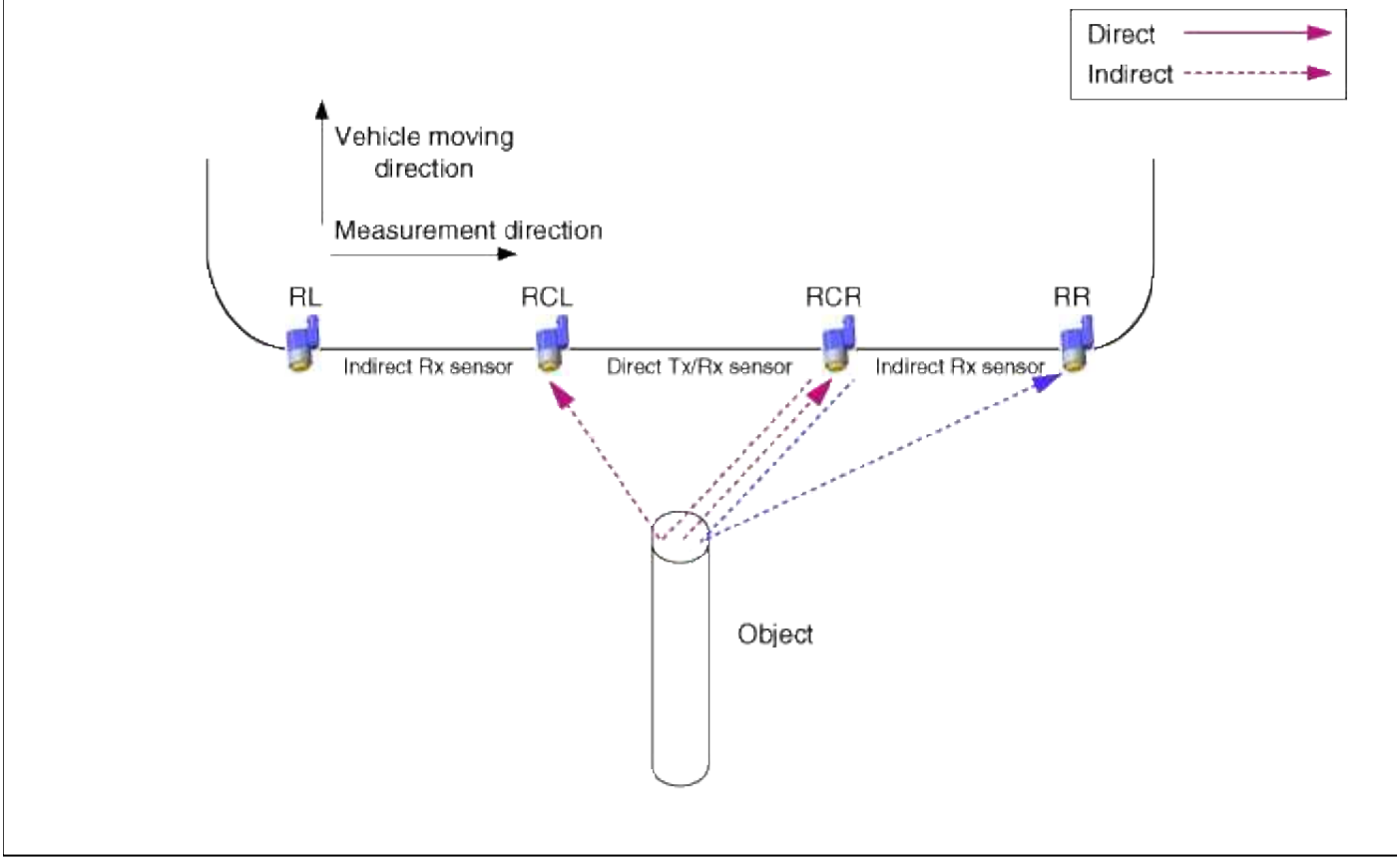
Indirect Measurement

(RCL → RL, RCL → RCR, RCR → RCL, RCR → RR Execution in order)
With two or three sensors, one of them sends the transmission and the others get the reception.



Direct and Indirect Measurement at once

With two or three sensors, the one sensor performs both transmission and reception, and the others perform only reception.



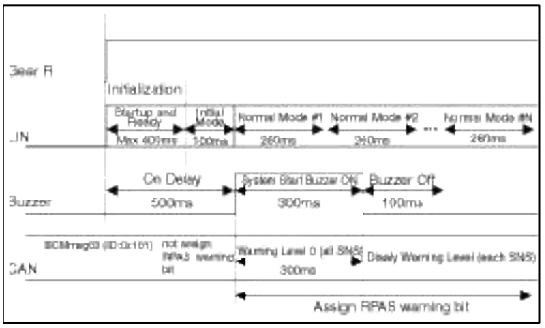
RPAS alarm system

When the RPAS sensor detects the object, warning is operated by audible alarm device as like buzzer. RPAS sensor sends data to BCM with LIN communication and BCM implements audible warning for each RPAS SENSOR by priority. And it performs a role of gateway only when it sends visible alarm device such as Cluster.

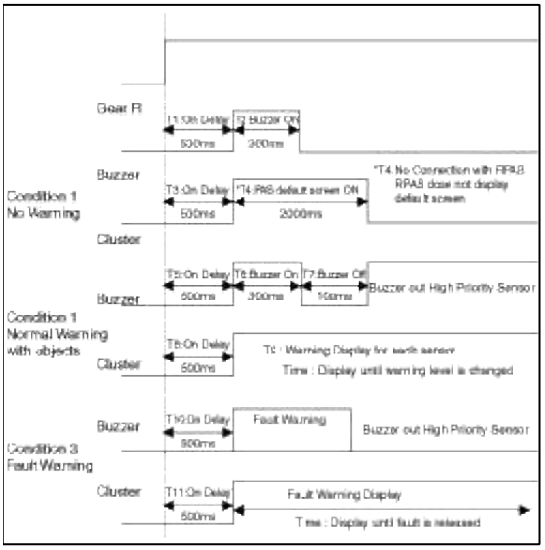
- Sensor buzzer/display information processing method of BCM In case of RL/RR sensor information, the BCM handles each sensor information directly about Display and buzzer output function. Buzzer output of CL/CR sensor, BCM handles center combination information by priority both sensor.

System Operation Spec

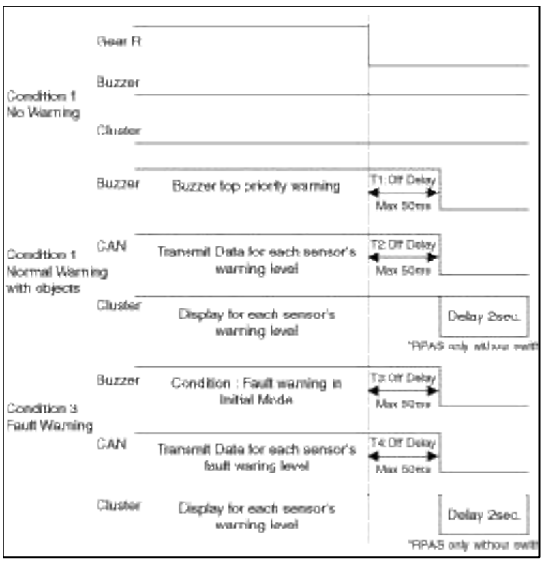
When the system has the power (after IGN ON and R gear), MICOM checks every sensor channel. In case it finds any error, it sounds 300ms buzzer 500ms afterward. But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. Function for normal mode entrance is as below



With R Gear, system function is as below



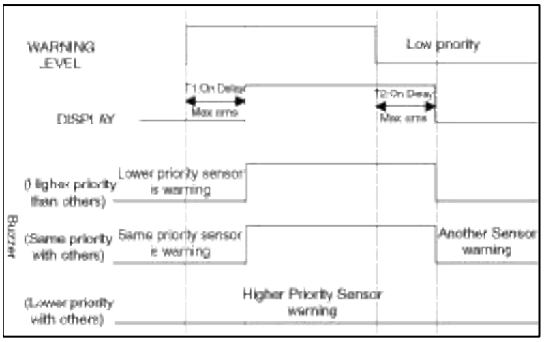
With R gear releasing, system function is as below



acceptable error range on waveform ±10%

Alarm Output Specification classified by distance between sensors

Condition logic according to priority of alarm level is as below. (the identical sensor)



*α value definition

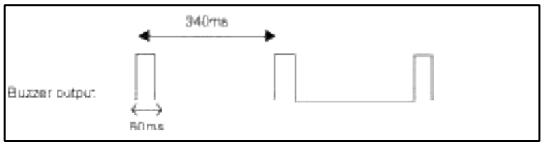
1. low priority sensor off : α = 0ms
2. low priority sensor is 1st warning level : α < 340ms
3. low priority sensor is 2nd warning level : α < 170ms

*β value definition

1. low priority sensor is 1st warning level : β = 1700ms
2. low priority sensor is 2nd warning level : β = 1700ms
3. low priority sensor is 3rd warning level : β = 700ms

Alarm control by sensing distance is as below

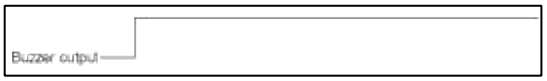
1. First warning area (61cm ~ 120cm)



2. Second warning area (31cm ~ 80cm)



3. Third warning area (less than 30cm)

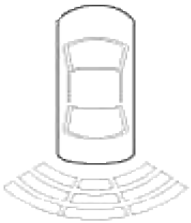
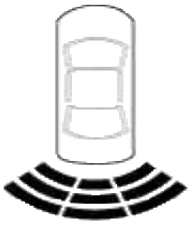
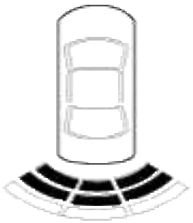
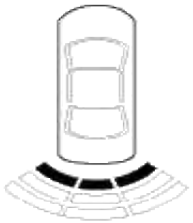


Visible Alarm Indicator Specification

When the gear is applied to R, cluster lights the indicator as below figure.

When the system finds an object, it lights indicator immediately. During sensing an object, if there is no object, it

lights indicator that is no alarm status for two seconds and then turns out afterward detecting an object.
(But when it turns third step alarm to No alarm status, it lights third step alarm for two second and turns out.)

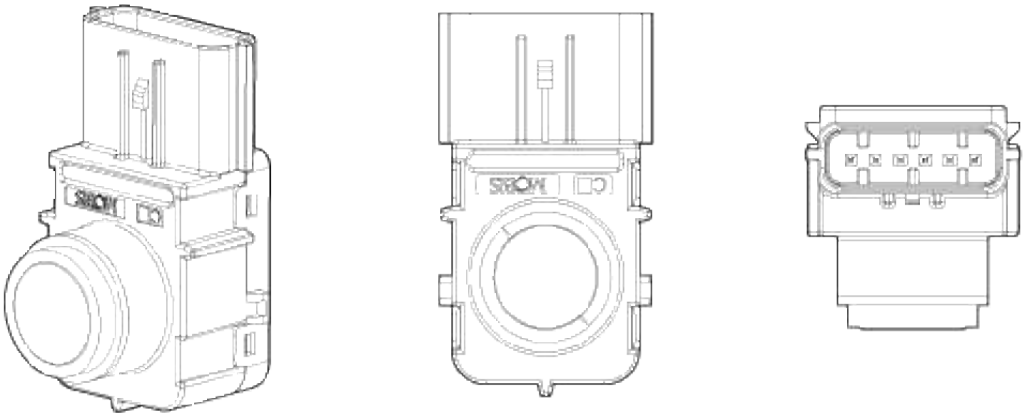
Alarm level	No alarm	First step alarm (Lighting) (61cm ~ 100cm)	Second step alarm (Lighting) (31cm ~ 60cm)	Third step alarm (Flickering) (Less than 30cm)
Indicator display				

- It shows only the detecting position of obstacles.
- In third level alarm, indicator flickers at intervals of a second.
- In normal alarm level display, RCR/RCL indicator is combinated by priority.

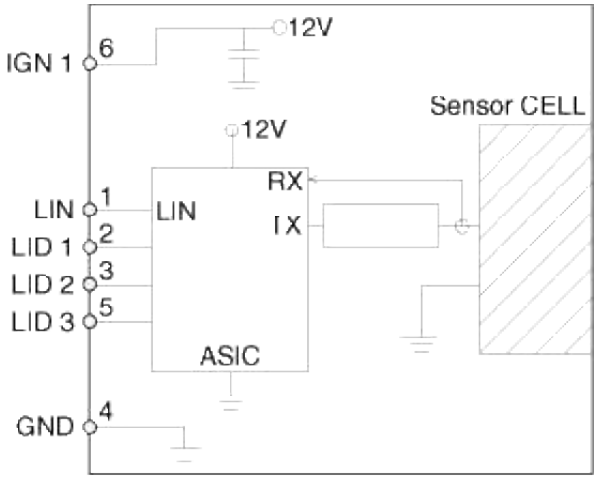
Communication Standard
This section defines the communication between RPAS and BCM.
RPAS send a detecting result of object and sensor diagnosis result to BCM according to this document, and BCM takes a role to alarm.
Indicator shows the transmitted position and alarm data, in alarm case, it finds the nearest DATA and alarms the nearest DATA first.
(Ex. In case, RL is first step alarm and RR is third step, RR alarm has priority.)

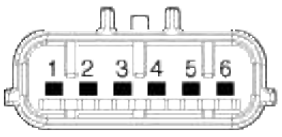
Body Electrical System > Rear Parking Assist System > Parking Assist Sensor > Components and Components Location

Component



Circuit Diagram



Connector	No.	Description
	1	LIN
	2	LID 1
	3	LID 2
	4	GND
	5	LID 3
	6	IGN 1

Body Electrical System > Rear Parking Assist System > Parking Assist Sensor > Repair procedures

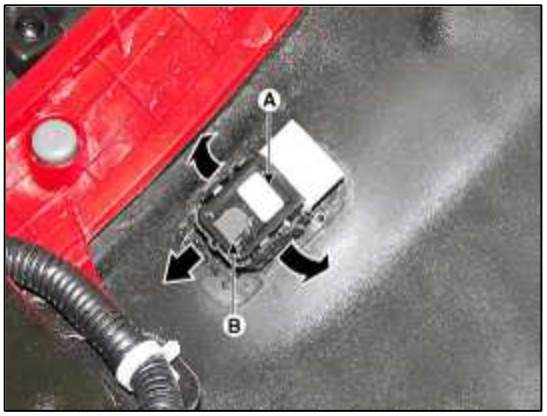
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper cover.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Rear Bumper Cover")

3. Disconnect the connector (B) from the parking assist sensor (A).



4. Pull out the sensor (A) by opening the sensor holder (B) out.

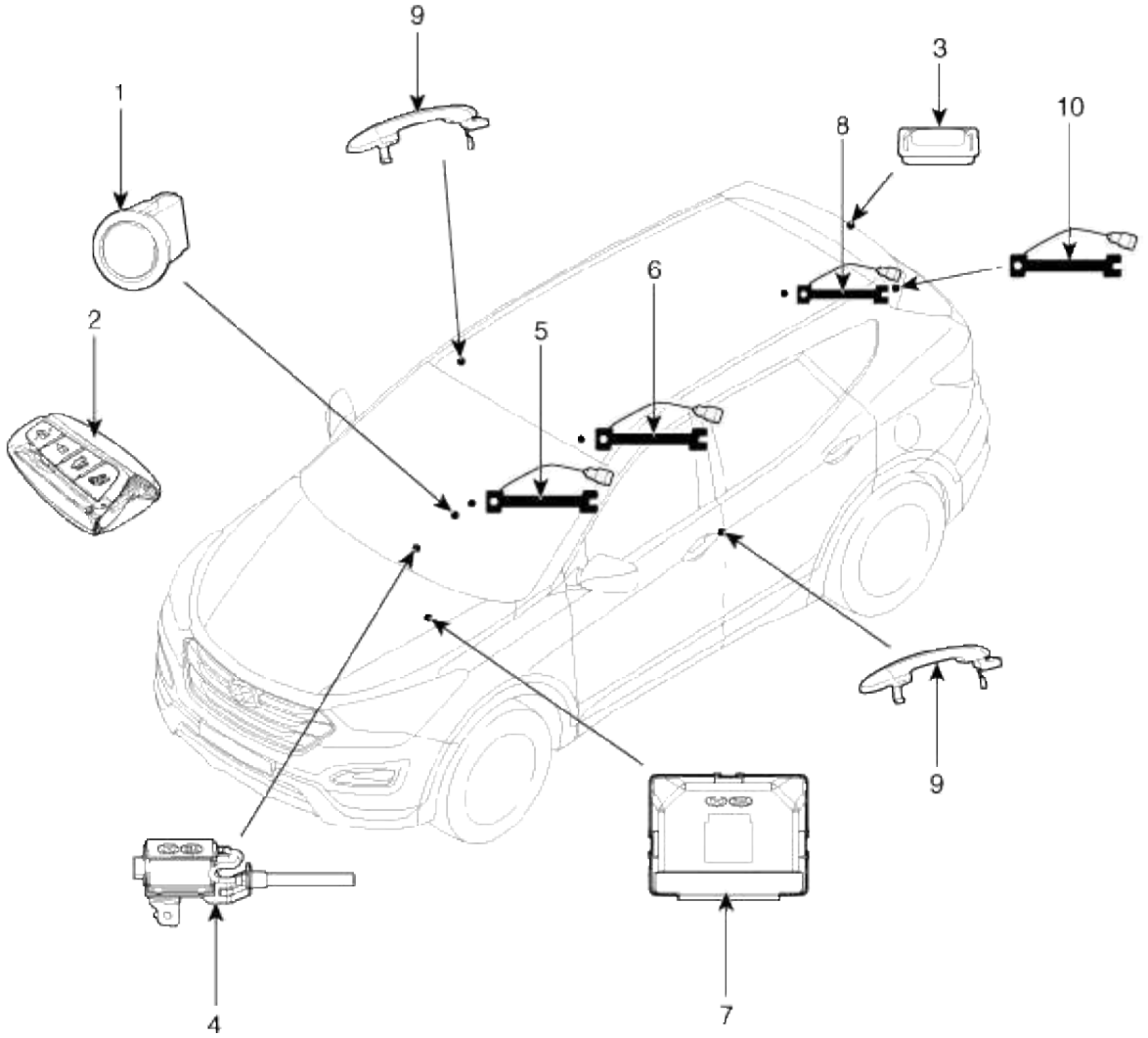


Installation

1. Install the rear ultra sensor after connecting the connector.
2. Install the rear bumper cover.
3. Connect the negative (-) battery terminal.

Body Electrical System > Button Engine Start System > Components and Components Location

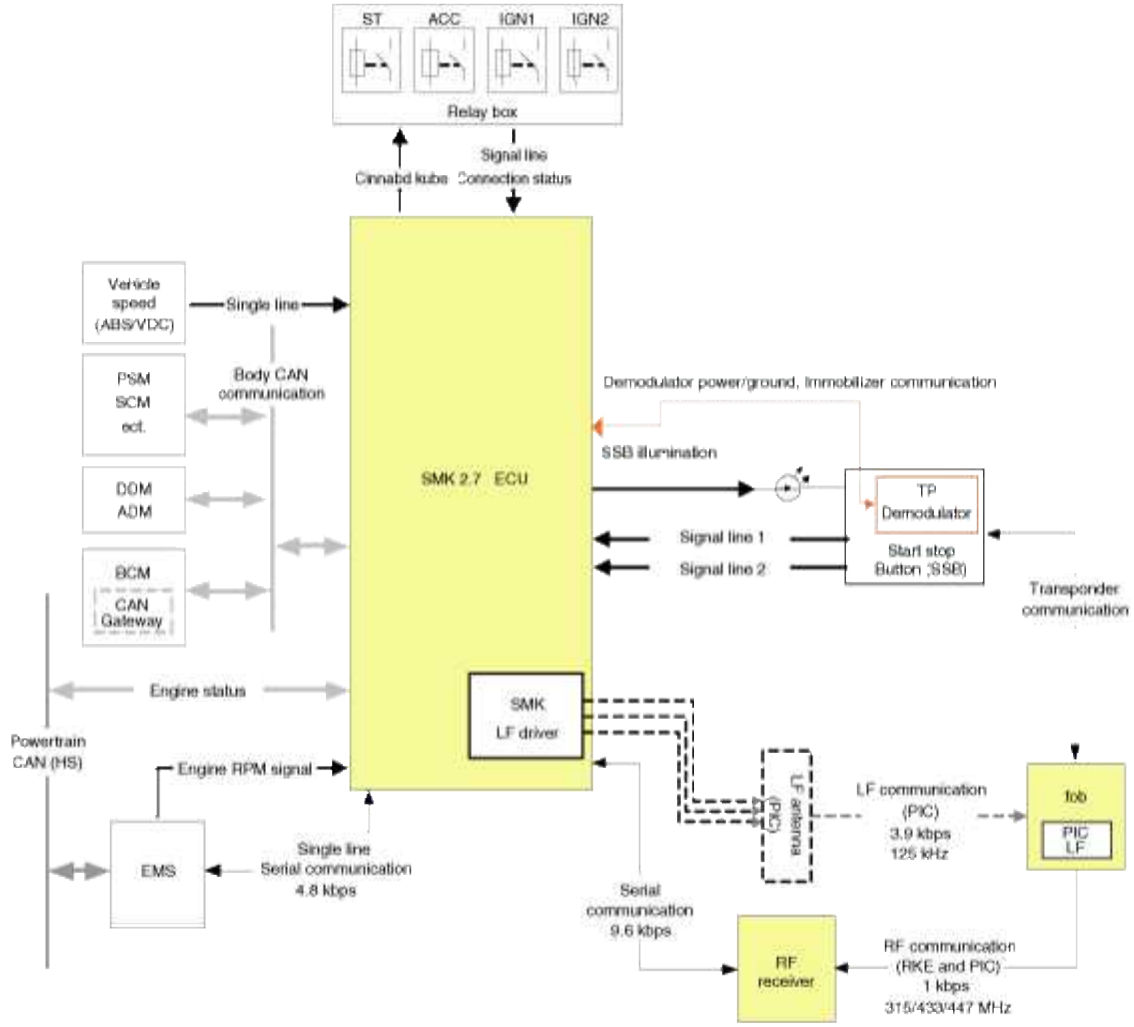
Component Location



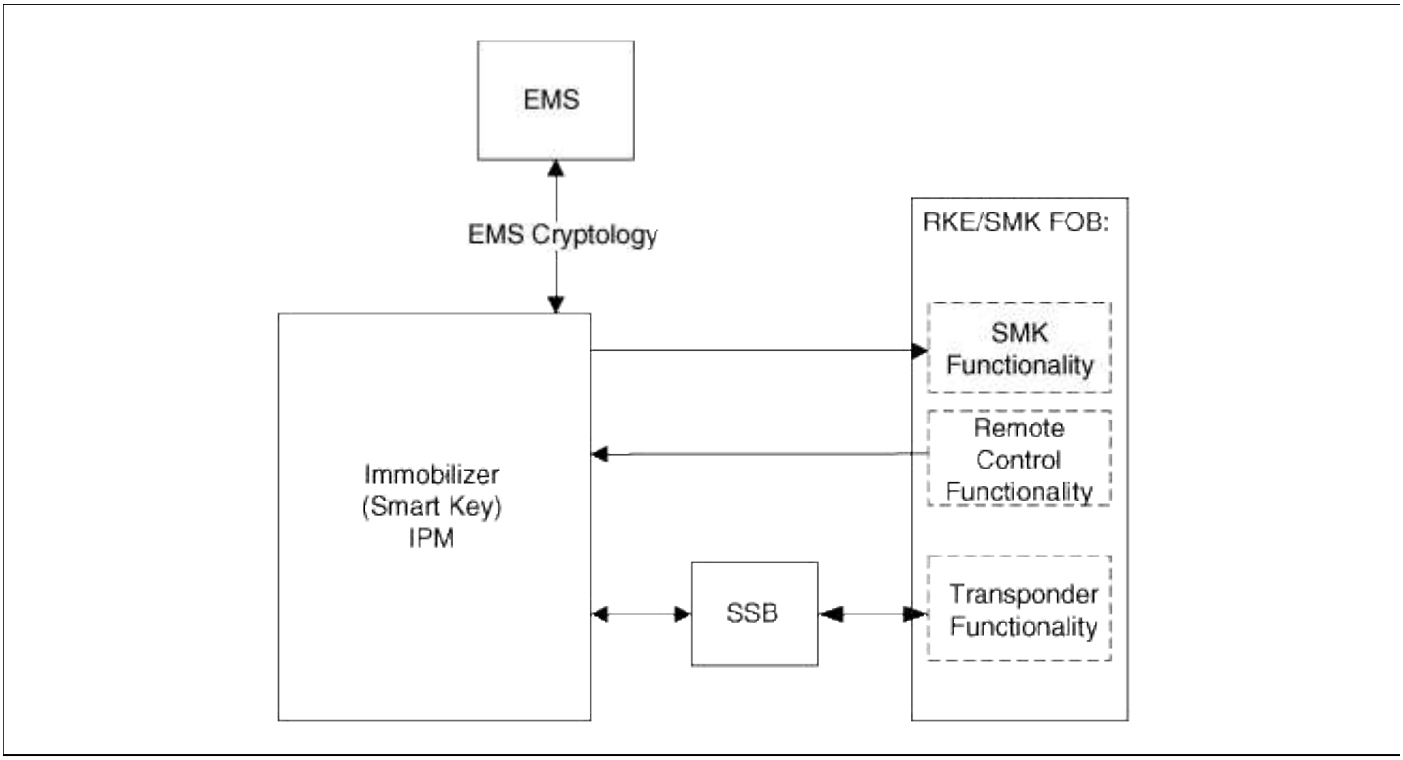
1. Start Stop Button(SSB) 2. FOB key 3. Tailgate open switch 4. RF receiver 5. Interior antenna 1	6. Interior antenna 2 7. Smart key unit 8. Trunk antenna 9. Door handle & door antenna 10. Bumper antenna

Body Electrical System > Button Engine Start System > Schematic Diagrams

Circuit Diagram (1)



Circuit Diagram (2)



Body Electrical System > Button Engine Start System > Description and Operation

Description

System Overview

The System offers the following features:

- Human / machine interface through a 1-stage button, for terminal switching and engine start.
- Control of external relays for ACC / IGN1 / IGN2 terminal switching and STARTER, without use of mechanical ignition switch.
- Indication of vehicle status through LED or explicit messages on display.
- Immobilizer function by LF transponder communication between fob and fob holder.
- Redundant architecture for high system dependability .
- Interface with Low Speed CAN vehicle communication network.
- Interface with LIN vehicle communication network depending on platform .

The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in separated system.

System Main Function

- Switching of ACC / IGN1 / IGN2 terminals.
- Control of the STARTER relay BAT line (high side) based on communication with EMS ECU.
- Management of the Immobilizer function.
- Management of BES warning function.

Button Engine Start System

The Button Start System allows the driver to operate the vehicle by simply pressing a button (called as SSB) instead of using a standard mechanical key.

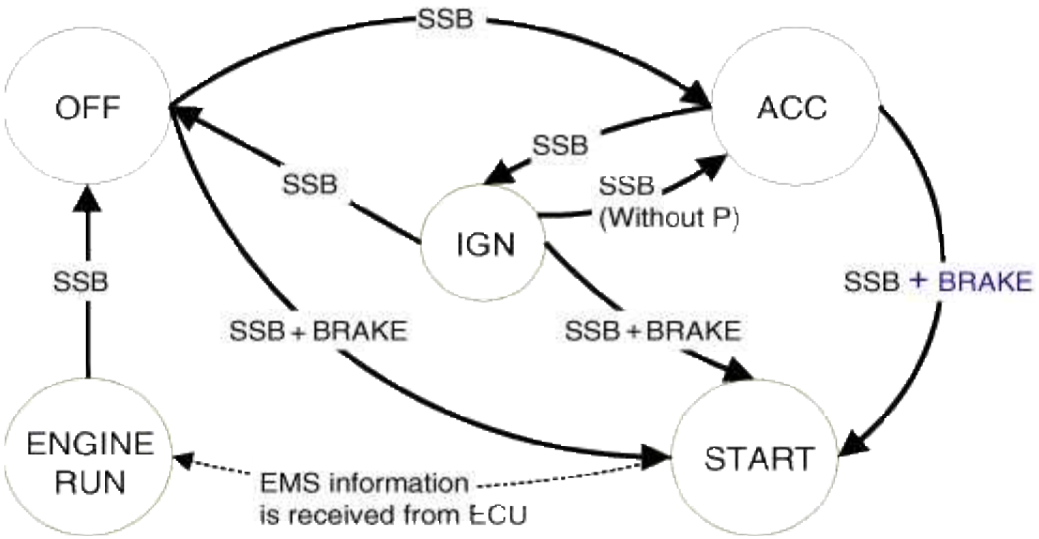
If the driver press the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the locking/unlocking of the steering column, the control of the terminal, and the cranking of the engine.

The driver can release the SSB as soon as this sequence initiated. After positive response from immobilizer interrogation, the system will activate the starter motor and communicate with the EMS to check the engine running status for starter release.

The driver will be able to stop the engine by a short push on the SSB if the vehicle is already in standstill. Emergency engine stop will be possible by a long press of the SSB or 3 consecutive presses in case the vehicle is in ENGINE RUNNING.

If the conditions for engine cranking are not satisfied while a push on the SSB is detected and a valid fob authenticated, the system will unlock the steering column and switch the terminals to IGN. Another push on the SSB will be necessary to start the engine.

In case of a vehicle equipped with SMART KEY system, fob authentication will not require any action from the driver. For limp home start or in case of vehicle without SMART KEY, the driver will have to insert the fob into the fob holder.



- Control Ignition and engine ON/OFF by Sending signal to IPM.
- Display status by LED Lamp ON/OFF. (Amber or Green)

Indicator ON/OFF Condition At Ignition Key Off Condition

No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

Indicator ON/OFF Condition According To Ignition Key's Position

No.	Ignition conditions	Start Button LED status
1	IG OFF	White color LED ON
2	IG ACC	Amber color LED ON
3	IG ON (Engine OFF)	Green color LED ON
4	Cranking	Maintain LED status before cranking
5	Engine running	LED OFF

Smart Key Unit



The SMK manages all function related to:

- "Start Stop Button (SSB) monitoring",
- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication),
- "System consistency monitoring",
- "System diagnosis",
- Control of display message / warning buzzer .

The unit behaves as Master role in the whole system.
In case of SMART KEY application, for example “Passive Access”, “Passive Locking” and “Passive Authorization are integrated for Terminal switching Operations”.
It collects information about vehicle status from other modules (vehicle speed, alarm status, driver door open...), reads the inputs (e.g. SSB, Capacitive Sensor / Lock Button, PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates with others devices via the CAN network as well as a single line interfaces.
The diagnosis and learning of the components of the BES System are also handled by the SMK.
The SMK manages the functions related to the "terminal control" by activating external relays for ACC, IGN1 and IGN2. This unit is also responsible for the control of the STARTER relay.
The SMK is also controlling the illumination of the SSB as well as the "system status indicator", which consists of 2 LEDs of different color. The illumination of the fob holder is also managed by the SMK.
The SMK reads the inputs (Engine fob in, vehicle speed, relays contact status), controls the outputs (Engine relay output drivers), and communicates with others devices via the CAN.
The internal architecture of the SMK is defined in a way that the control of the terminal is secured even in case of failure of one of the two microcontrollers, system inconsistency or interruption of communication on the CAN network.
In case, failure of one of the two controllers, the remaining controller shall disable the starter relay. The IGN1 and IGN2 terminals relays shall be maintained in the state memorized before the failure and the driver shall be able to switch those IGN terminals off by pressing the SSB with EMERGENCY_STOP pressing sequence. However, engine restart will not be allowed. The state of the ACC relay will depend on the type of failure.
The main functions of the SMK are:

- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/ESP ECU.
- Control of SSB LEDs (illumination, clamp state).
- Control of the base station located in SSB through direct serial interface.
- System consistency monitoring to diagnose SMK failure and to switch to relevant limp home mode.
- Providing vehicle speed information
- Start Stop Button (SSB) monitoring

- Starter power control

Start/Stop Button (SSB)

A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes ‘Off’, ’Accessory’, ‘Ignition’ and 'Start' by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.

Three (3) LED colors are located in the outside ring of the switch assy. They display the status of the system. They are OFF(White) / ACC(Amber) / ON(Green).



BES(Button Engine Start) System State Chart

System STATES in LEARNT MODE

In learnt mode, the BES System can be set in 6 different sates, depending on the status of the terminals and Engine status:

System State	Terminal Status	Engine status
1. OFF - Locked	OFF	Stopped
2. OFF - Unlocked	OFF	Stopped
3. ACC	ACC	Stopped
4. IGN	IGN1, IGN2, ACC	Stopped
5. Start	IGN1, Start	Cranking
6. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch.

The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

System STATES IN VIRGIN MODE

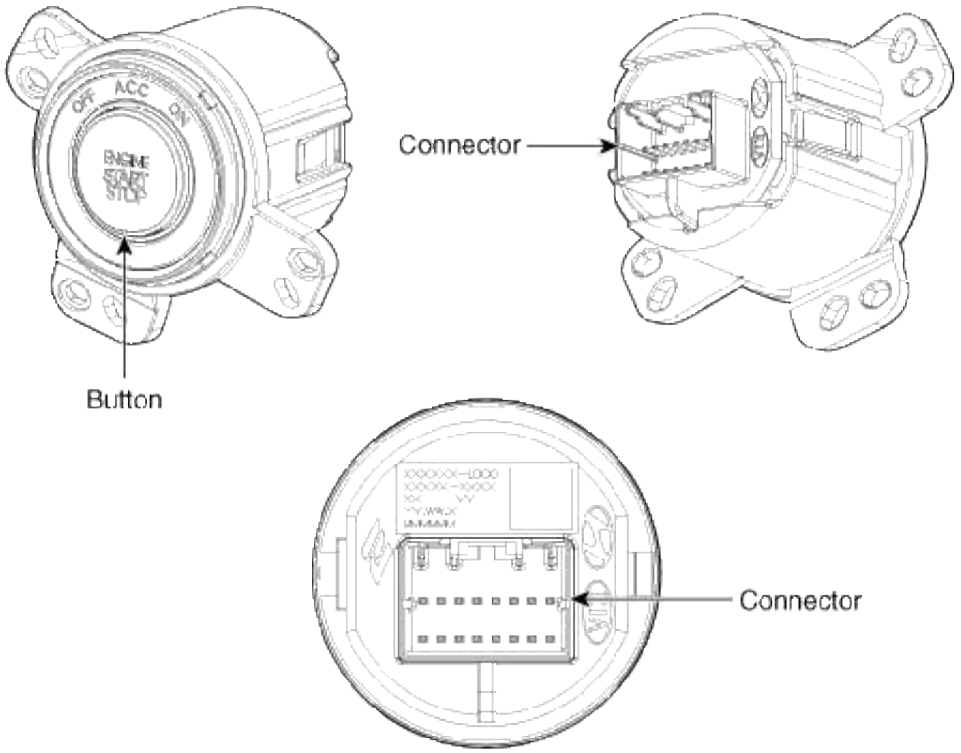
The BES System can be set in 5 different states (OFF LOCKED is not available in virgin mode), depending on the status of the terminals and Engine status :

System State	Terminal Status	Engine status
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

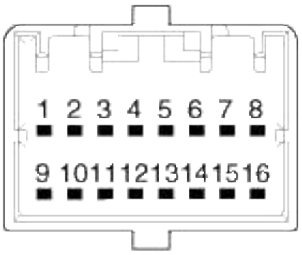
Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch.
The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

Body Electrical System > Button Engine Start System > Start/Stop Button > Components and Components Location

Component



Connector (16 pin)



No.	Description	No.	Description
1	Battery	9	Immobilizer power
2	SSB switch 1	10	Immobilizer ground
3	SSB switch 2	11	SSB illumination power
4	SSB ring illumination	12	SSB LED OFF
5	Rheostat input	13	Ground
6	-	14	SSB illumination ground
7	-	15	SSB LED ACC
8	-	16	SSB LED ON

Body Electrical System > Button Engine Start System > Start/Stop Button > Repair procedures

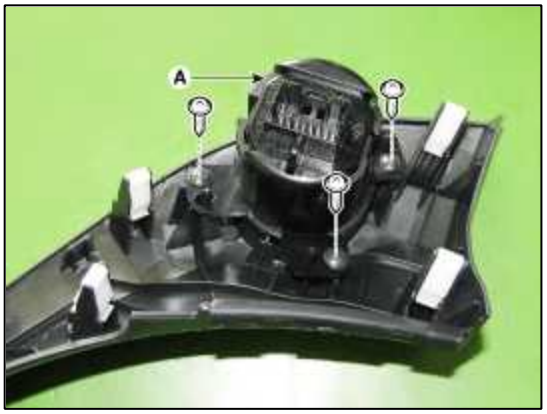
Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the driver crash pad lower panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Crash Pad Lower Panel")

3. Disconnect the start/stop button connector (B) after removing the center fascia garnish (A).



4. Remove the start/stop button (A) after removing the screws (3EA).



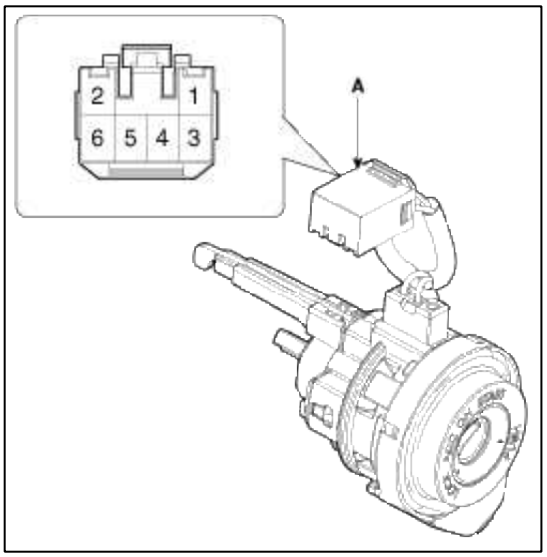
Installation

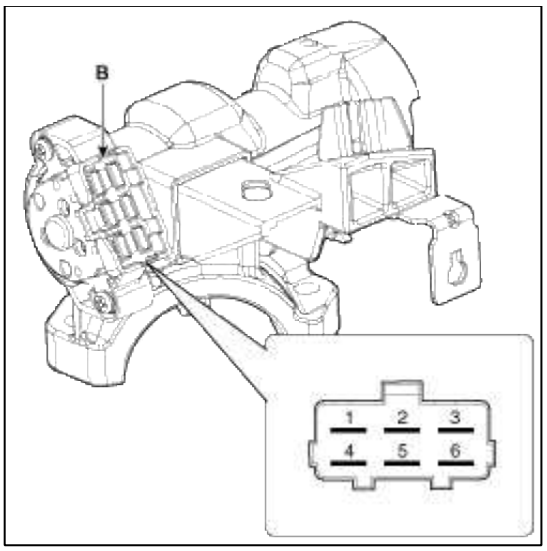
1. Install the start/stop button.
2. Install the crash pad lower panel.
3. Connect the negative (-) battery terminal.

Body Electrical System > Ignition Switch Assembly > Repair procedures

Inspection

1. Disconnect the ignition switch connector (B) and key warning switch connector (A) from under the steering column.



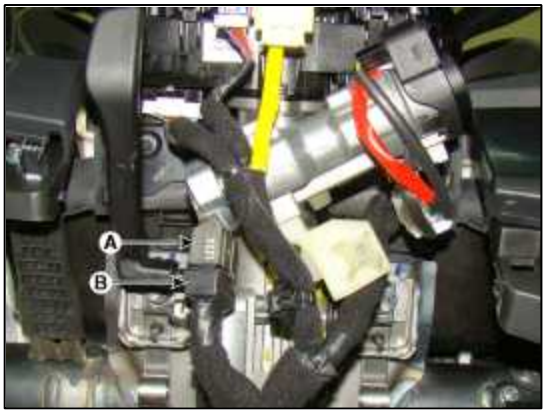


2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

Terminal / Position	Key	Ignition switch (B) 5 (B1)	6 (ACC)	4 (IGN1)	1 (B2)	2 (IGN2)	3 (ST)	Immobilizer antenna (A) 2	1	Key warning switch (A) 3	4	Key hole illumination (A) 5	6
LOCK	Removal												
	Insert												
ACC		○	○					⊕	⊖	○	○	○	○
ON		○	○	○	○	○							
START		○		○	○		○						

Removal

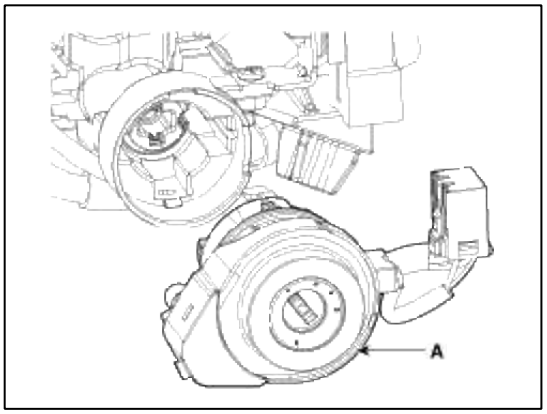
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Crash Pad Lower Panel")
3. Remove the steering column upper and lower shrouds.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Steering Column Shroud Panel")
4. Remove the ignition switch (A) after disconnecting the 6P connector (B).



5. Remove the key warning and immobilizer connector (A).



6. If it is necessary to remove the key lock cylinder (A), remove the key lock cylinder with key ACC.

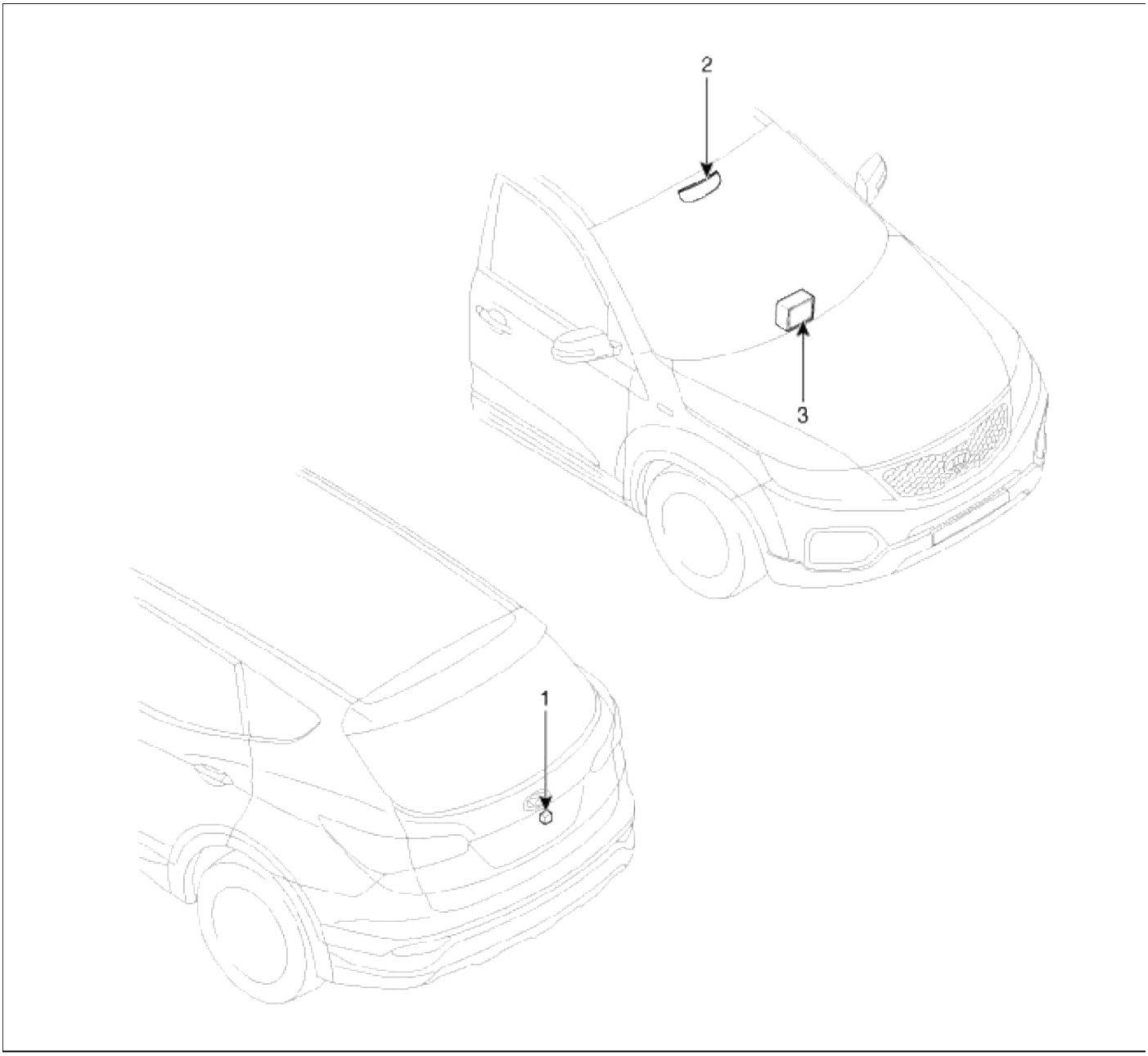


Installation

1. Install the key lock cylinder.
2. Install the key warning and immobilizer connector.
3. Install the ignition switch.
4. Install the steering column shrouds and crash pad lower panel.

Body Electrical System > Back View Camera System > Components and Components Location

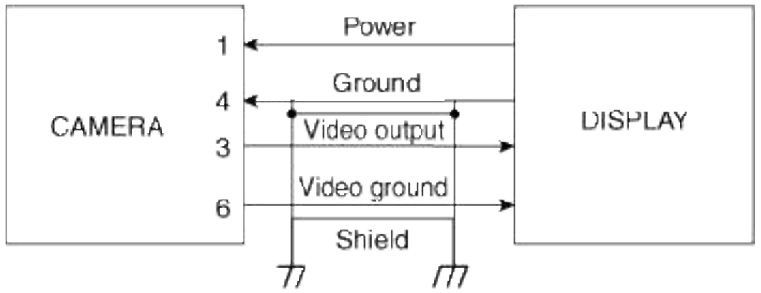
Component Location

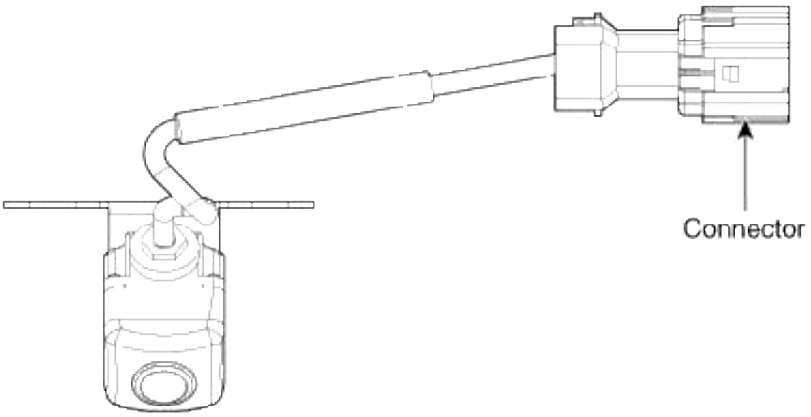


1. Back view camera 2. ECM mirror	3. AVN head unit

Body Electrical System > Back View Camera System > Schematic Diagrams

Circuit Diagram





Connector	
	
No.	**Description**
1	Power
2	-
3	Video output
4	Ground
5	-
6	Video ground

Body Electrical System > Back View Camera System > Description and Operation

Description

Back view camera will activate when the backup light is ON with the ignition switch ON and the shift lever in the R position.

This system is a supplemental system that shows behind the vehicle through the AV monitor or the ECM (Reverse Display Room Mirror) mirror while backing-up.

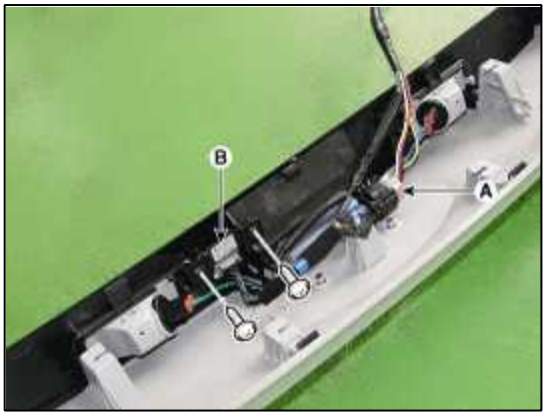
WARNING

This system is a supplementary function only. It is the responsibility of the driver or always check the inside/ outside rearview mirror and the area behind the vehicle before and while backing up because there is a dead zone that can't see through the camera.

Body Electrical System > Back View Camera System > Repair procedures

Removal

1. Remove the tailgate trim.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Trim")
2. Remove the tailgate back panel.
   <a href="content.asp?
   vehicletype=Passenger&mfrcode=HY&area=HMA&langcode=ENG&modelid=AN13&modelyr=2013&mmct
   target="_blank">(Refer to Body - "Tailgate Back Panel")
3. Disconnector the connector (A) from the back view camera.
4. Remove the back view camera (B) after loosening the screws (2EA).



Installation

1. Install the back view camera.
2. Install the tailgate back panel and tailgate trim.