General Troubleshooting Information

Before Troubleshooting

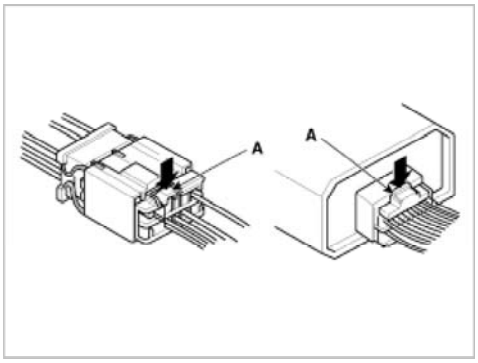
1. Check applicable fuses in the appropriate fuse/relay box.
2. Using the battery checker (MCR-570 KIT), check the battery for damage, state of charge, and clean and tight connections. (Refer to the EE group - "Battery")

> 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.

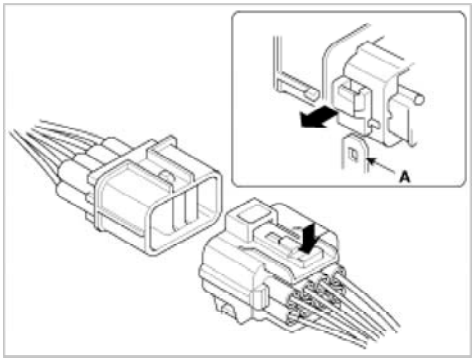
3. Check the alternator belt tension.

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).

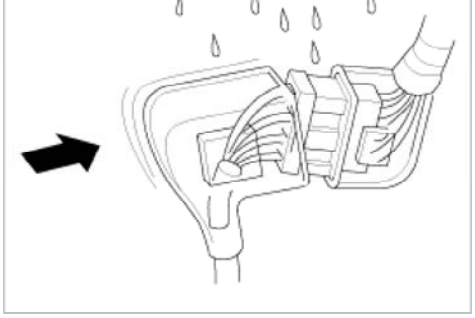


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

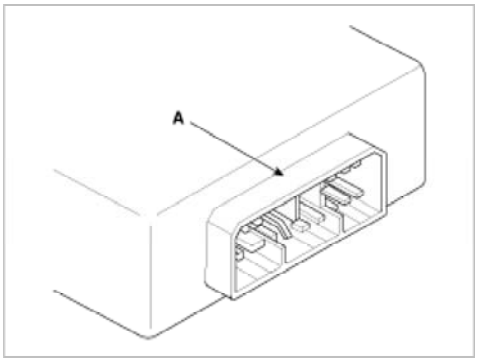


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.
7. Always reinstall plastic covers.

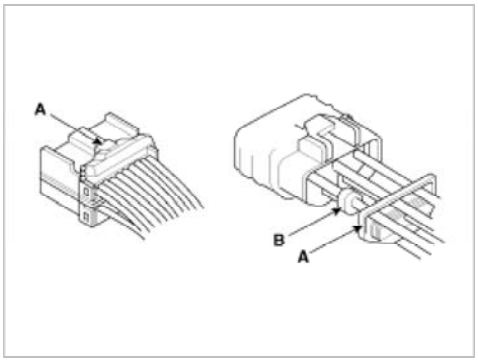
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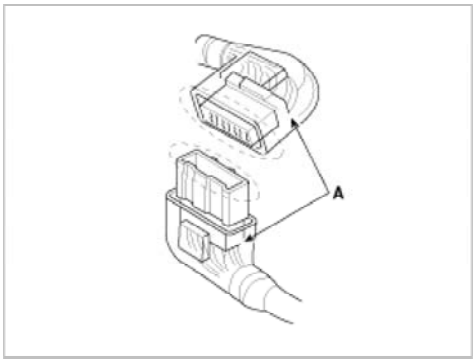
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



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

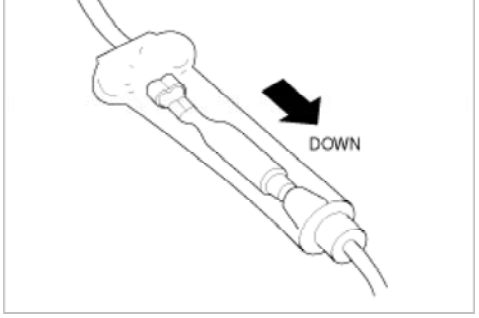


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



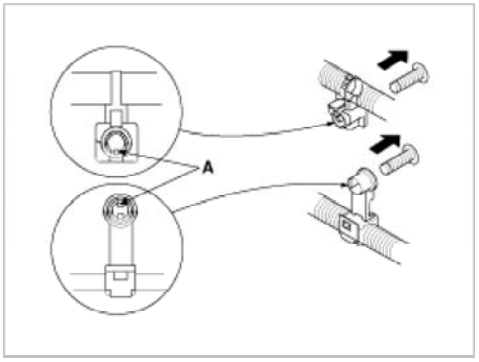
11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.

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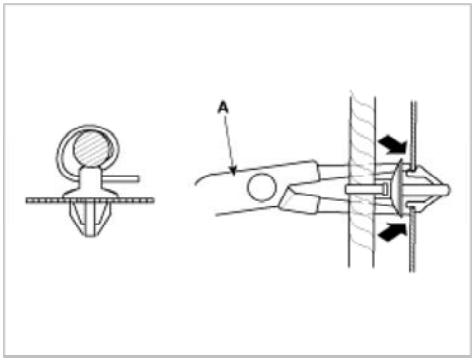


Handling Wires And Harnesses

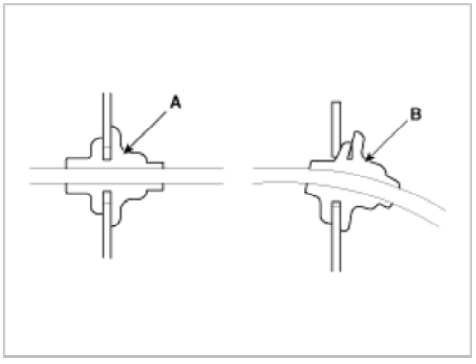
1. Secure wires and wire harnesses to the frame with their respective wire ties at the designated locations.
2. Remove clips carefully; don't damage their locks (A).



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).

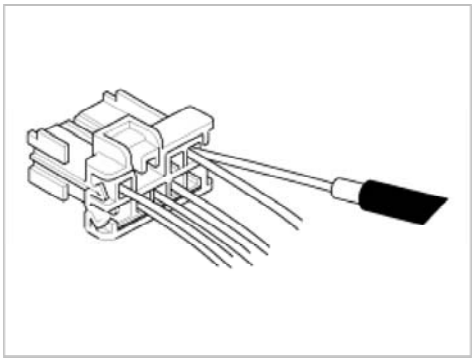


Testing And Repairs

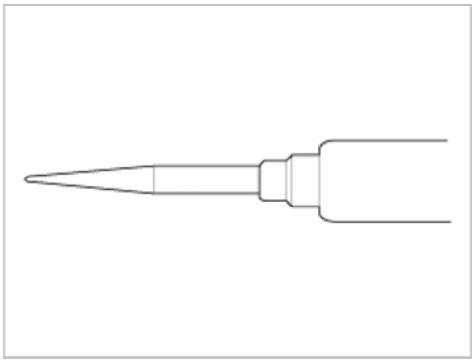
1. Do not use wires or harnesses with broken insulation.
   Replace them or repair them by wrapping the break with electrical tape.
2. After installing parts, make sure that no wires are pinched under them.

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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.

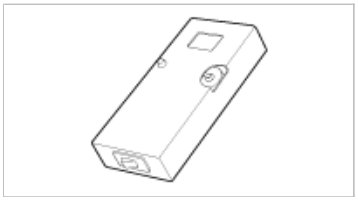
System	Resetting
Auto up/down window	Whenever the battery is disconnected, discharged or the related fuse is replaced or reinstalled, reset the Auto up/down window system according to the procedure below. 1. Turn the ignition switch to the ON position. 2. Pull up the power window switch in order that the window can close completely, and then keep pulling up the power switch for about 1 second.

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Panoramaroof	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	▸ With audio off 1. Press the [SETUP] button until the clock of the display blinks. 2. Set the clock by turning the [ENTER] knob and press it. ▸ With audio on 1. Press the [SETUP] button until the clock of the display blinks. 2. Select the [CLOCK] mode by turning the [ENTER] knob and press it. 3. Set the clock by turning the [ENTER] knob and press it.
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 > General Information > Special Service Tools

Special Service Tools

Tool (Number and Name)	Illustration	Application
RKE Battery Checker (09954-2P100)		Measuring the RKE battery voltage

Body Electrical System > Audio > Specifications

Specifications

Audio

Item		Specification
Model		RADIO/CD/MP3 (PA710)
SDARS (Option)		○ (PA710S)
Power supply		DC 14.4V
Rated output		Max 3.2Vrms
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

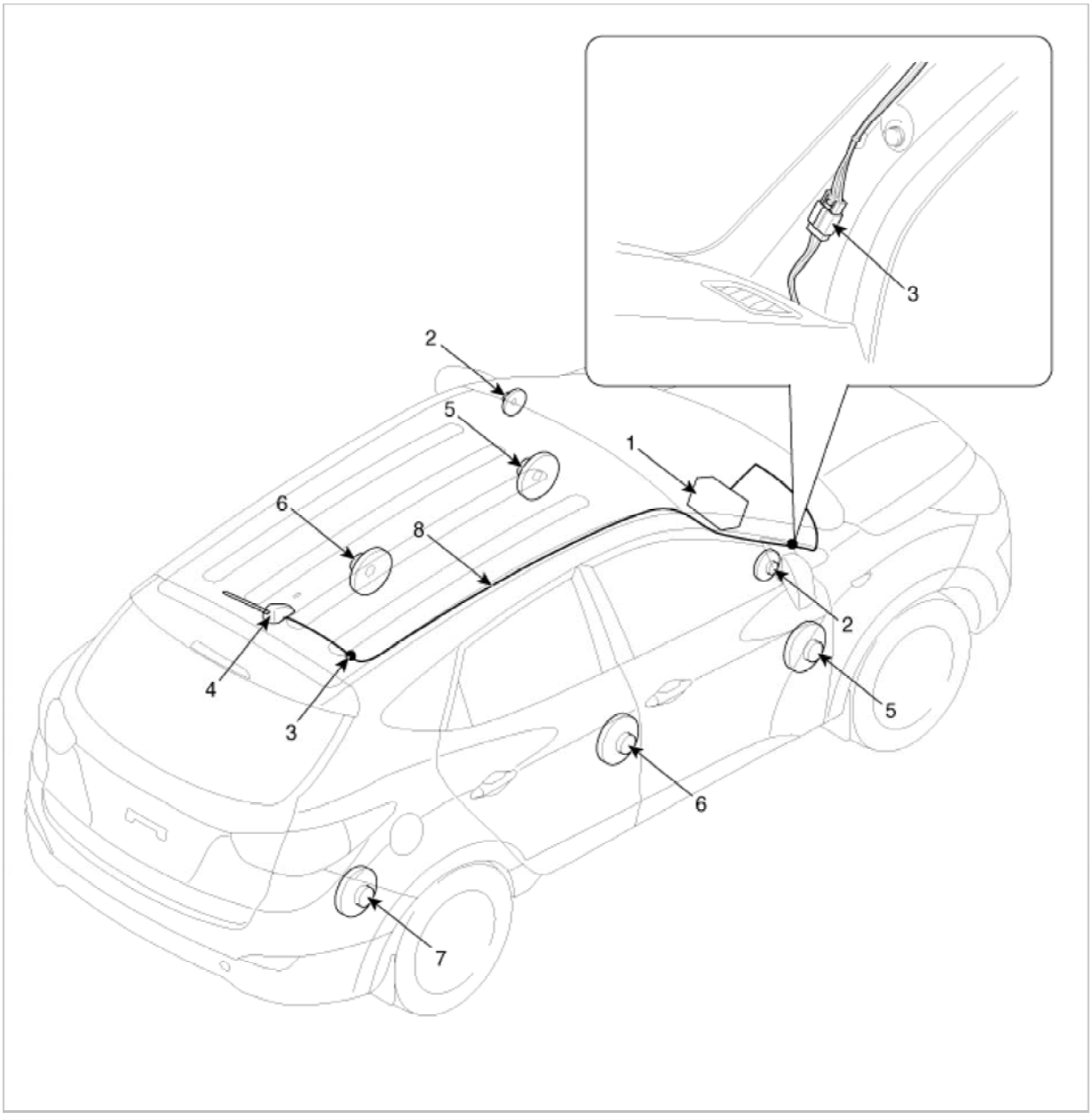
Item		PA710/710S	AVN
	Front	Max 40W	

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Input Power (W or V)	Front Tweeter	Max 40W	
	Sub woofer	-	MAX 40W
Speaker Impedance (Ω)	Front	4 ± 0.6	2 ± 0.3
	Rear	4 ± 0.6	2 ± 0.3
	Front Tweeter	3.4 ± 0.5	
	Sub woofer	-	2 ± 0.3
Speaker Number		6	8

Body Electrical System > Audio > Components and Components Location

Component Location



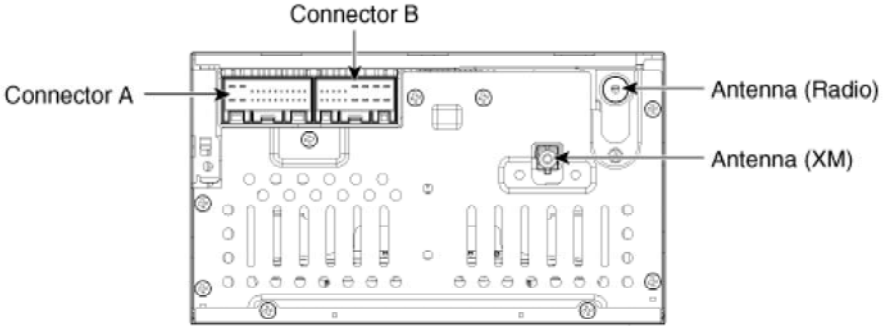
1. Audio unit	5. Front door speaker
2. Tweeter speaker	6. Rear door speaker
3. Antenna cable connector	7. Sub woofer speaker
4. Roof antenna (Radio)	8. Antenna feeder cable

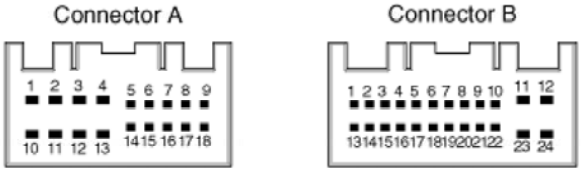
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Components

[RADIO/CD/MP3(PA710)]



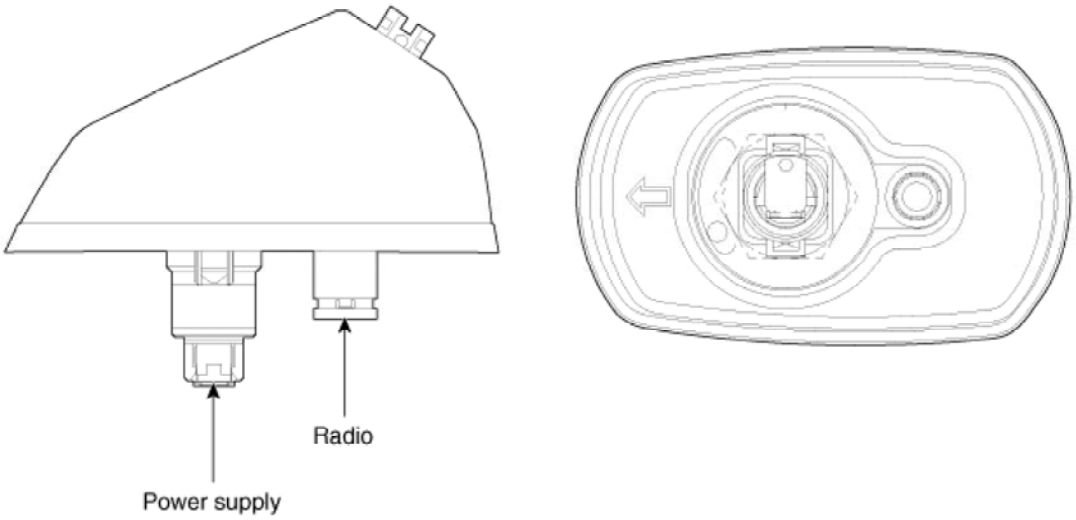


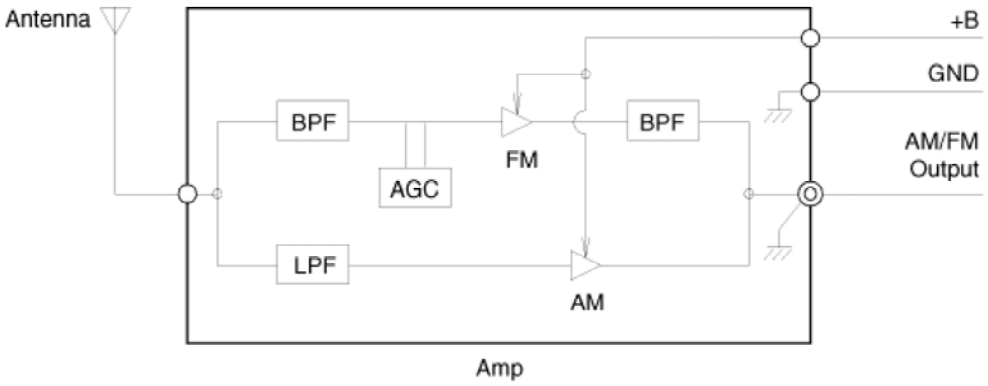


Connector A				Connector B			
No	Description	No	Description	No	Description	No	Description
1	Speaker RL (+)	13	Speaker RR (-)	1	-	13	-
2	Speaker FL (+)	14	-	2	-	14	-
3	Speaker FR (+)	15	-	3	-	15	-
4	Speaker RR (+)	16	-	4	Steering remote	16	Vehicle speed
5	-	17	Illumination (-)	5	-	17	Remote GND
6	-	18	Remote Antenna	6	USB D (+)	18	USB D (-)
7	IGN			7	USB/iPod VDD	19	USB/iPod GND
8	Illumination (+)			8	AUX Input R	20	AUX Detect
9	-			9	AUX GND	21	AUX Input L
10	Speaker RL (-)			10	Mic (+)	22	Mic (-)
11	Speaker FL (-)			11	ACC	23	-
12	Speaker FR (-)			12	Battery (+)	24	Power GND

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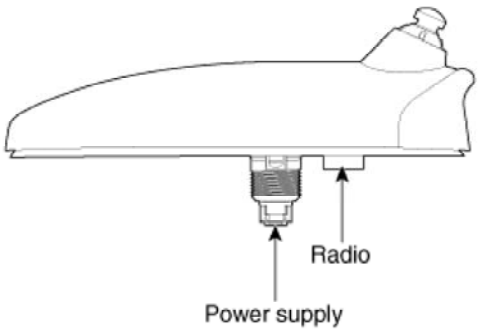
[Roof Antenna (Radio)]

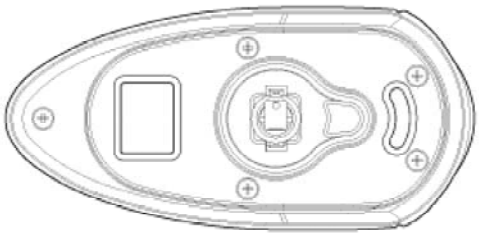


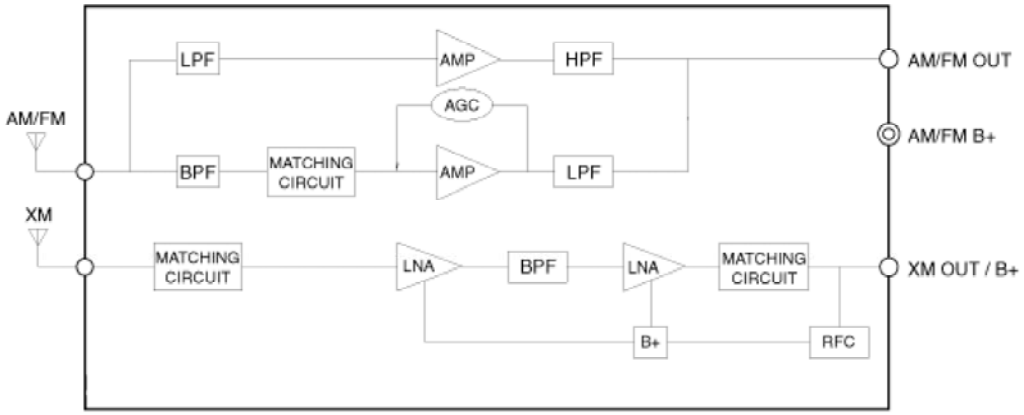


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[Roof Antenna (Radio+XM)]



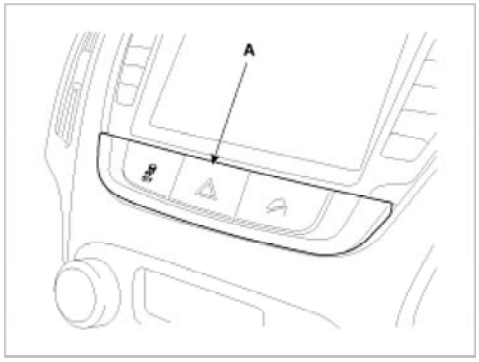




Body Electrical System > Audio > Audio Unit > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the hazard lamp switch assembly (A).

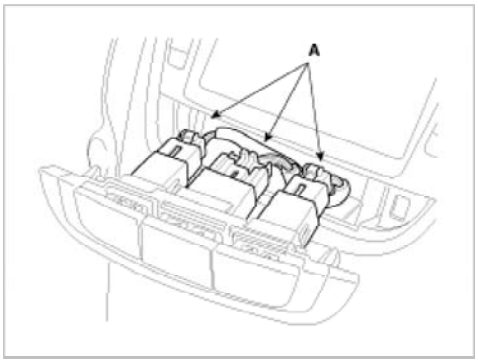


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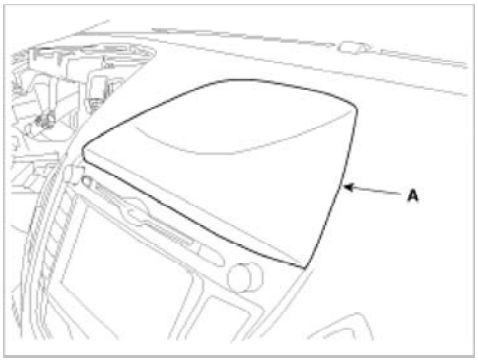
NOTE

Take care not to damage and scratch the hazard lamp switch assembly and its related parts.
Apply the protective tapes to the hazard lamp switch assembly and its related parts.

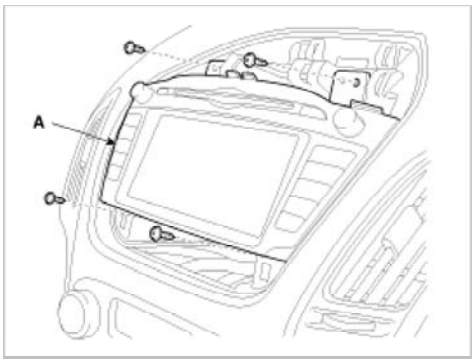
3. Disconnect the connectors (A).



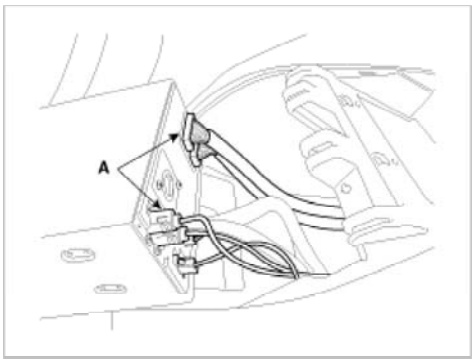
4. Remove the center fascia panel (A).



5. Remove the audio assembly (A) after loosening the mounting screws.



6. Disconnect the audio connectors and cable (A), then remove the audio unit completely.



NOTE

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

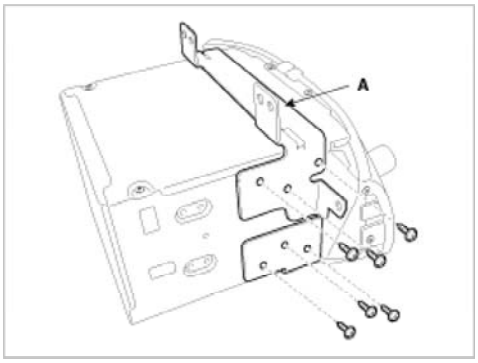
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1. Connect the audio unit connectors and cable.
2. Install the audio unit.
3. Install the center facia panel.
4. Install the hazard switch module.
5. Connect the negative (-) battery terminal.

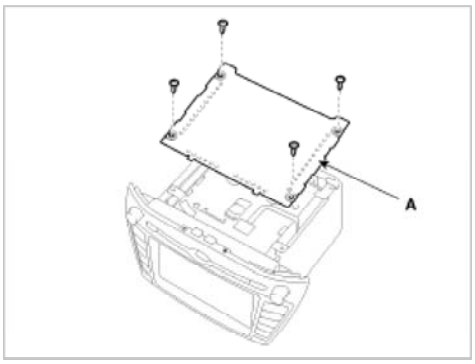
> NOTE
>
> Make sure the connector are connected in properly.
> Check the audio system.

Disassembly

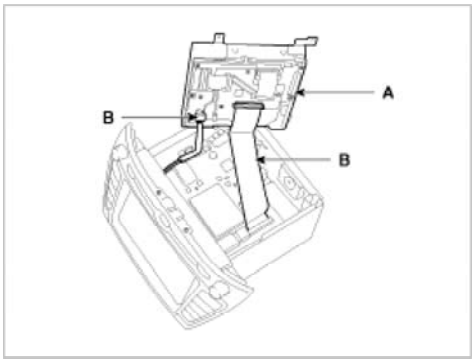
1. When separate the CD rom drive, if necessary, remove the brackets (A) after loosening the screws (6EA).



2. Remove the screws (4EA) on the head unit and, and then disassemble the top cover (A).



3. After loosening the screws, remove the CD rom drive (A).



> NOTE
>
> Take care not to damage the cable connectors (B) when removing drive.

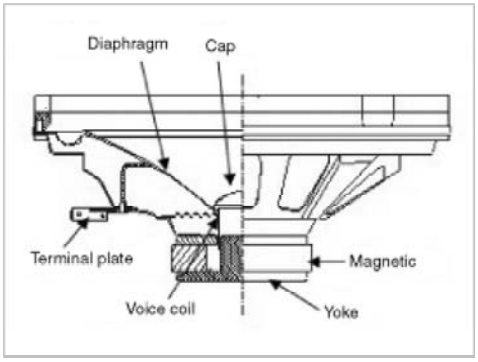
Body Electrical System > Audio > Speakers > Repair procedures

Inspection

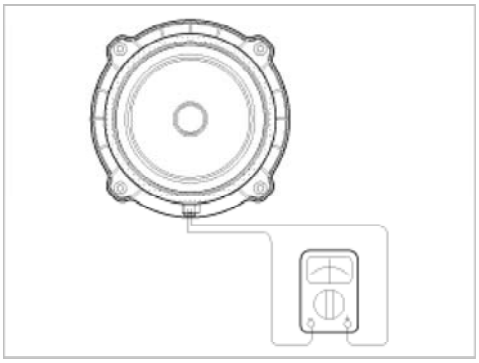
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(1) Basic inspection of speaker

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 connection between the battery and the speaker is normal. 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.

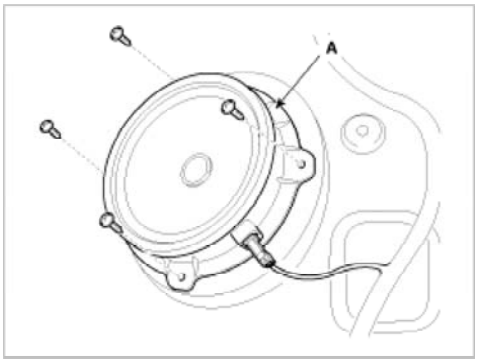
CAUTION

- During dealing of speaker
- Do not damage the speaker with impact as like a drop and a throw.
- Be careful not to cover water and oil over the speaker.
- Caution during dealing of speaker because the material of diaphragm is paper which is easy to be torn by impact and external force.
- When modifying audio system as customer pleases, this does electric damage to speaker.
- And, in this case the speakers are not covered by the manufacturer's warranty.

Removal

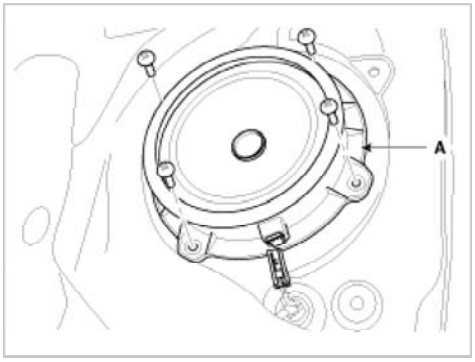
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1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front speaker (A) after removing 4 screws.



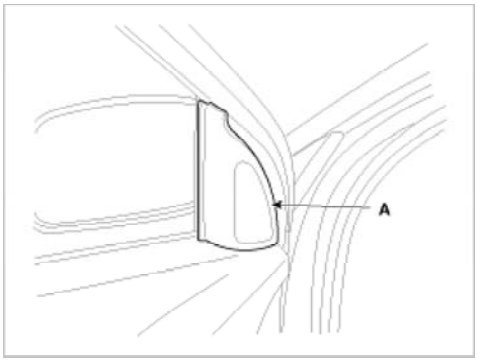
Rear Speaker

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear speaker (A) after removing 4 rivets.



Tweeter Speaker (Front)

1. Remove the front door delta cover (A).

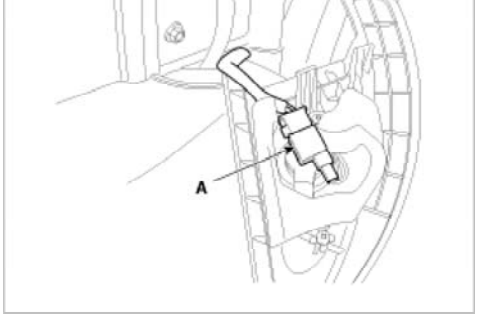


NOTE

Take care not to damage and scratch the delata cover and its related parts.

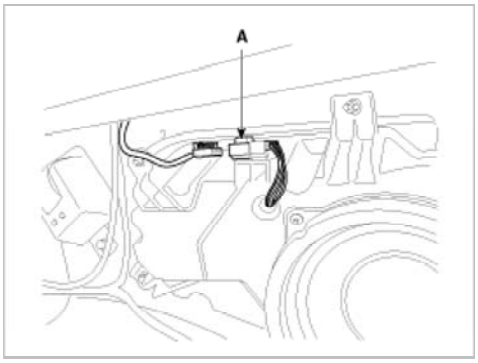
2. Remove the tweeter speaker after disconnecting the connector (A).

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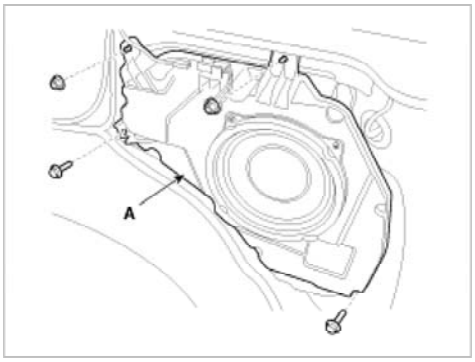


Woofer Speaker

1. Remove the right luggage side trim.
   (Refer to the BD group – "Interior trim")
2. Remove the woofer speaker connector (A).

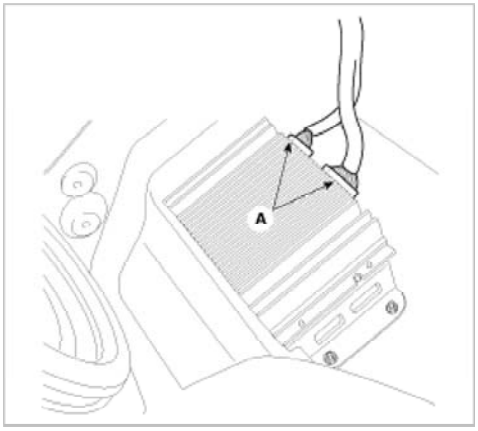


3. Remove the woofer speaker (A) after removing screws (2EA) and nuts (2EA).



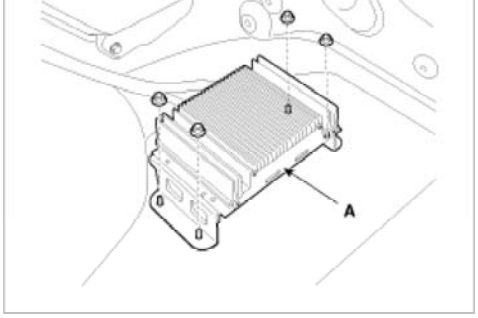
External Amplifier

1. Remove the right luggage side trim.
   (Refer to the BD group – "Interior trim")
2. Disconnect the external amplifier connectors (A).



3. Remove the external amplifier (A) after loosening the mounting nuts (4EA).

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Installation

Front speaker

1. Install the speaker to the speaker mounting hole in the door in-panel.
2. Reconnect the speaker connector.

Rear speaker

1. Install the speaker to the speaker mounting hole in the door in-panel.
2. Reconnect the speaker connector.

Tweeter speaker (Front)

1. Install the front tweeter speaker to the front door delta cover.
2. Reconnect the connector and then install the delta cover.

Woofer speaker

1. Install the woofer speaker to the left quarter inner panel.
2. Reconnect the connector
3. Install the right luggage side trim.

External amplifier

1. Reassemble the external amplifier after connecting the connector.
2. Install the right luggage side trim.

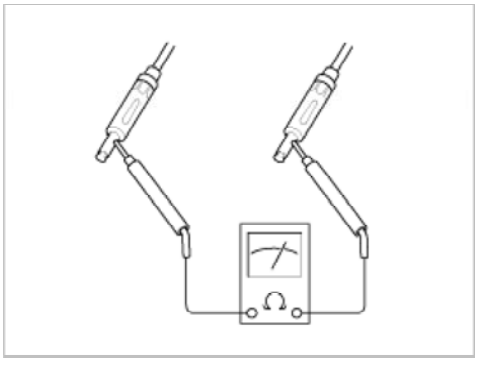
> NOTE
>
> - Make sure that the amplifier connectors are plugged in properly.
> - Check the audio system.

Body Electrical System > Audio > Antenna > Repair procedures

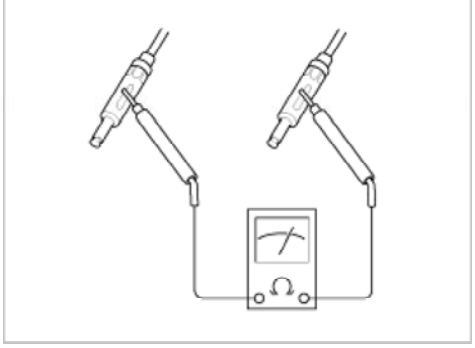
Inspection

Antenna Cable

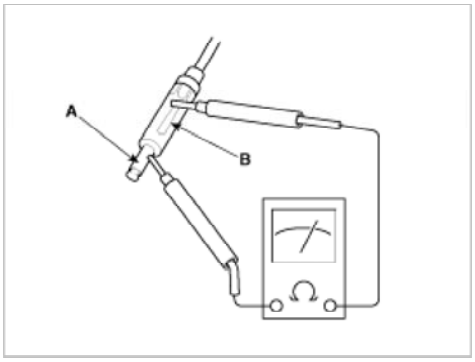
1. Remove the antenna jack from the audio unit and antenna.
2. Check for continuity between the center poles of antenna cable.



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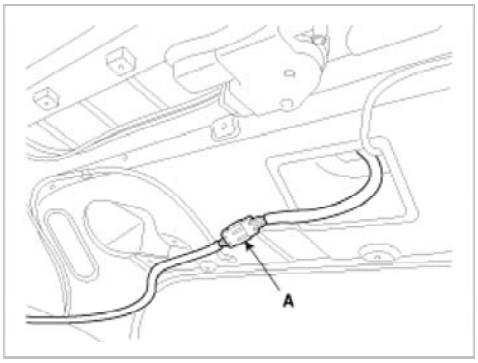
4. If there is no continuity, replace the antenna cable.
5. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.



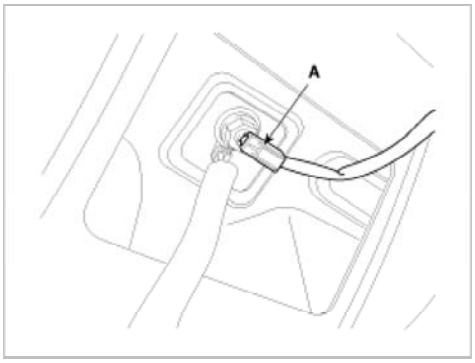
6. If there is continuity, replace the antenna cable.

Removal

1. Remove the rear roof trim.
   (Refer to the BD group - "Roof trim")
2. Disconnect the roof antenna feeder cable and connector (A) from the roof antenna.

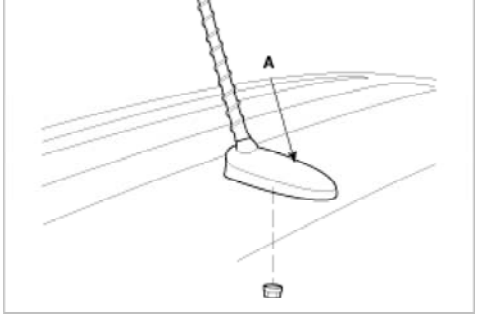


3. Disconnect the antenna power cable (A).



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

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Installation

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

NOTE

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

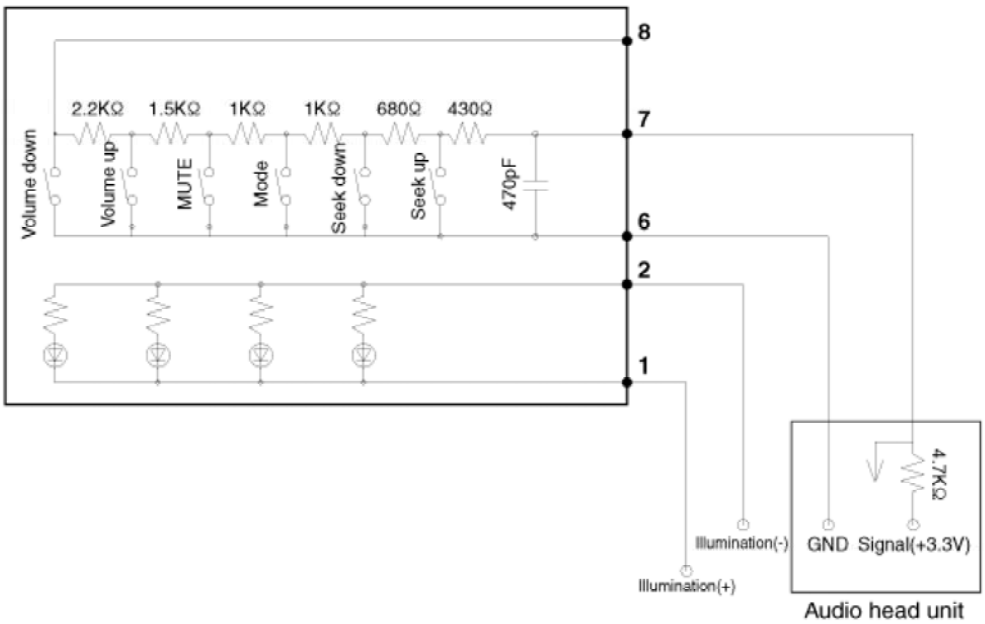
Body Electrical System > Audio > Audio Remote Control > Schematic Diagrams

Circuit Diagram

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[Audio]

Audio [LH]

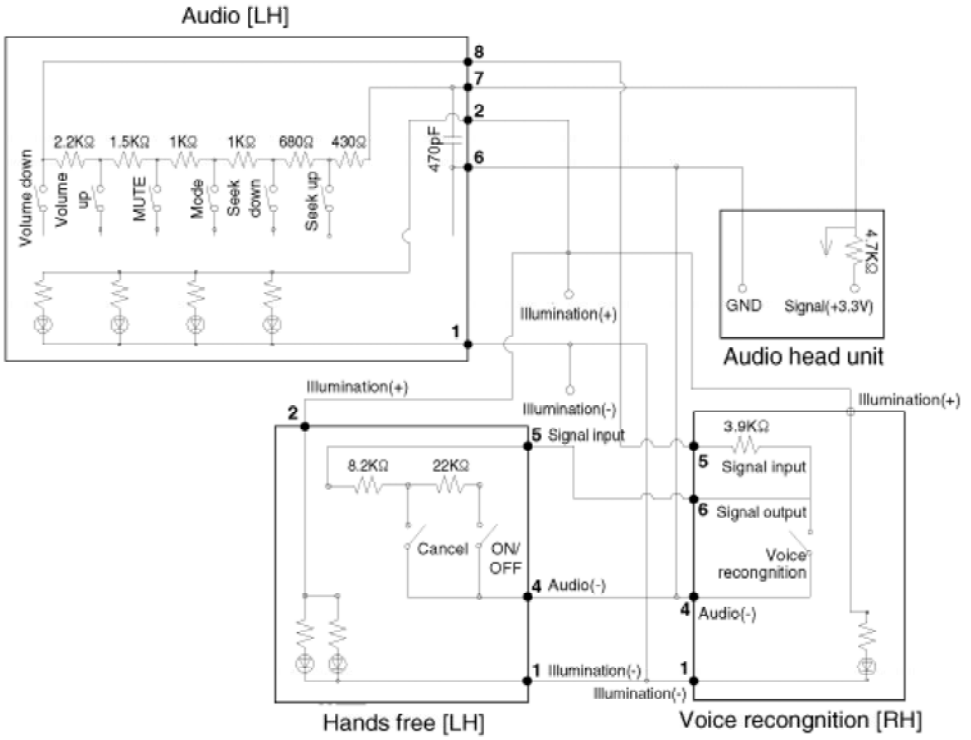


Remote connector			
Audio [LH]		Audio [RH]	
1 2 3 4 5 6 7 8			
No.	Description	No.	Description
1	Illumination (-)	1	-
2	Illumination (+)	2	-
3	-	3	-
4	-	4	-
5	-	5	-
6	Audio (-)	6	-
7	Audio (+)	7	-
8	Signal output	8	-





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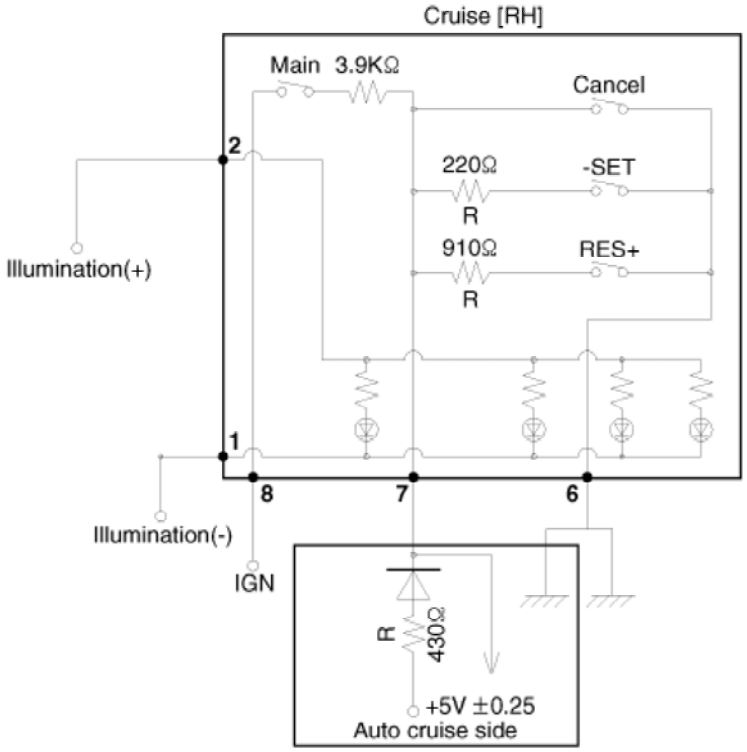




Audio [LH]		Hands free [LH], Voice recongnition [RH]	
1 2 3 4 5 6 7 8		1 2 3 4 5 6	
No.	Description	No.	Description
1	Illumination (-)	1	Illumination (-)
2	Illumination (+)	2	Illumination (+)
3	-	3	-
4	-	4	Audio (-)
5	-	5	Signal input
6	Audio (-)	6	Signal output (Voice recongnition)
7	Audio (+)		
8	Signal output		



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Cruise [RH]	
1 2 3 4 5 6 7 8	
No.	Description
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	ACC (-)
7	ACC (+)
8	ACC ON/OFF

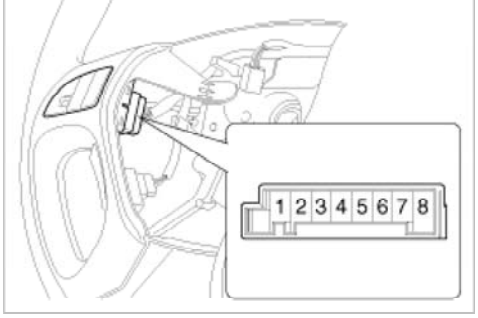


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Body Electrical System > Audio > Audio Remote Control > Repair procedures

Inspection

1. Check for resistance between No.6 and No.7 terminals in each switch position.



[Audio System]

Switch	Connector terminal	Resistance (±5%)
Volume down	6 - 7	6.81 kΩ
Volume up	6 - 7	4.61 kΩ
Mute	6 - 7	3.11 kΩ
Mode	6 - 7	2.11 kΩ
Seek down	6 - 7	1.11 kΩ
Seek up	6 - 7	430 Ω

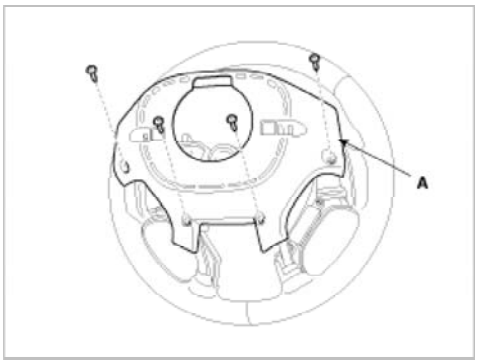
2. Check for voltage between No.6 and No.7 terminal in each switch position.

[Audio System]

Switch	Connector terminal	Output voltage
Volume down	6 - 7	1.95 ± 0.16 V
Volume up	6 - 7	1.63 ± 0.16 V
Mute	6 - 7	1.31 ± 0.16 V
Mode	6 - 7	1.02 ± 0.16 V
Seek down	6 - 7	0.63 ± 0.16 V
Seek up	6 - 7	0.28 ± 0.16 V

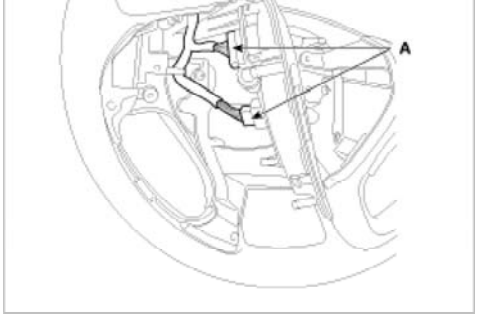
Removal

1. Remove the driver airbag module.
   (Refer to the RT group - "Airbag module")
2. Remove the steering wheel.
   (Refer to the ST group - "Steering column and shaft")
3. Remove the steering wheel cover (A) after loosening the screws.



4. Disconnect the audio remote control switch connector (A).

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5. Remove the audio remote control switch (A).

> NOTE
>
> Be careful not to damage the hook when removing the switch.



Installation

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

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

4. Install the driver airbag module.

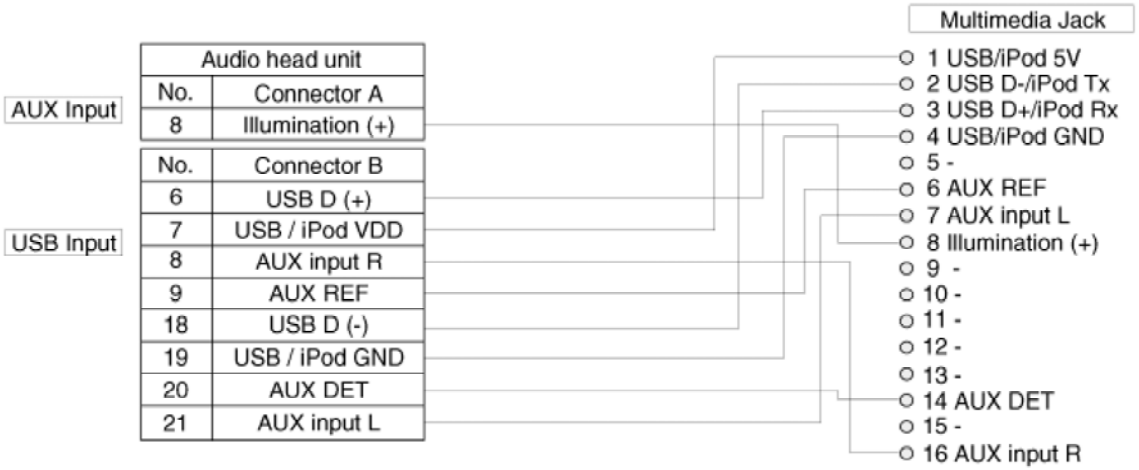
> NOTE
>
> Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.
> Make sure horn button works.

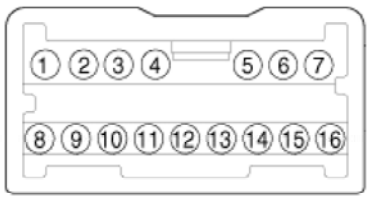
Body Electrical System > Audio > AUX(Auxiliary) Jack > Schematic Diagrams

Circuit Diagram

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[AUX, USB, iPod Jack]



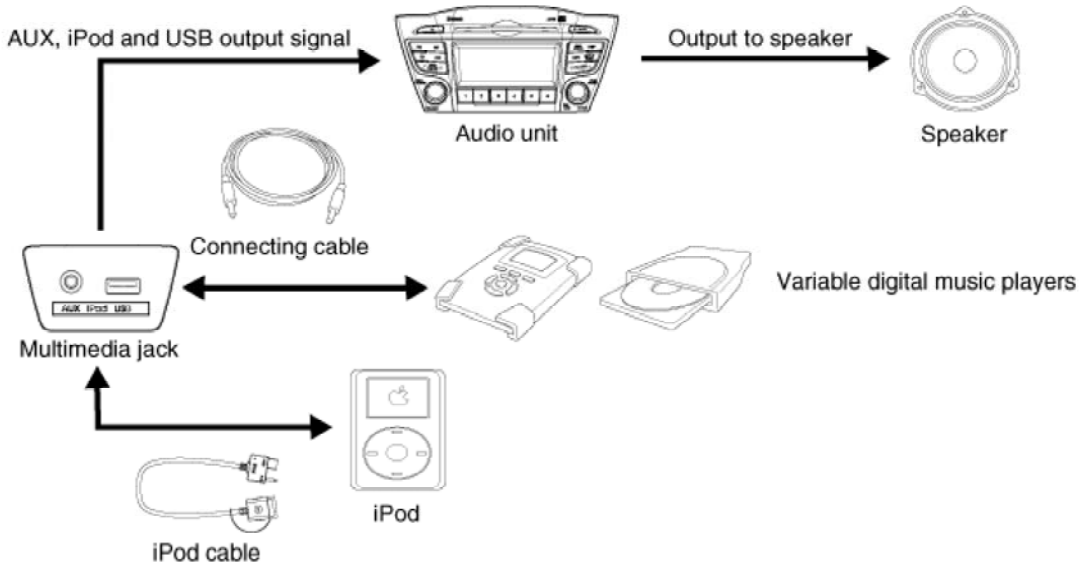
OUTPUT Connector	Pin No.	Description
	1	USB/iPod 5V
	2	USB D-/iPod Tx
	3	USB D+/iPod Rx
	4	USB/iPod GND
	5	-
	6	AUX REF
	7	AUX (L) IN
	8	ILL (+)
	9	-
	10	-
	11	-
	12	-
	13	-
	14	AUX DET
	15	-
	16	AUX (R) IN

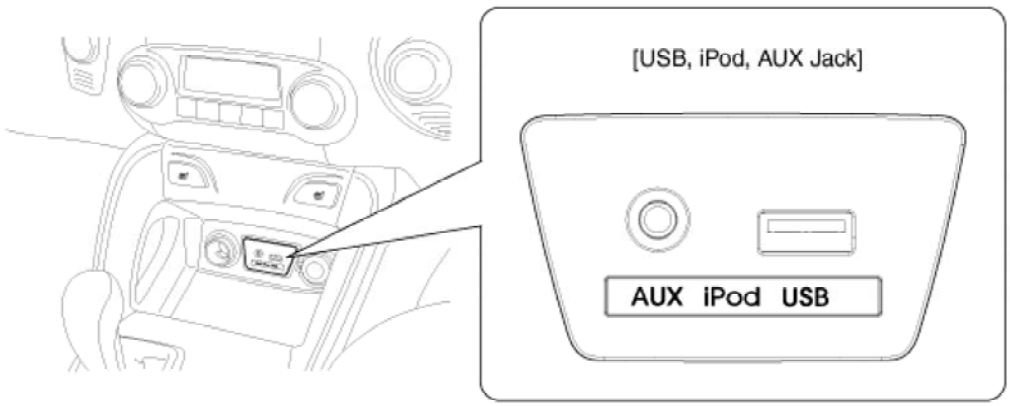
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Body Electrical System > Audio > AUX(Auxiliary) Jack > Description and Operation

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. The customer has this added option.
In case of distortions from media connected to the AUX source, the audio unit may not be defect but the output level of the used media does not match the specification of the AUX input.

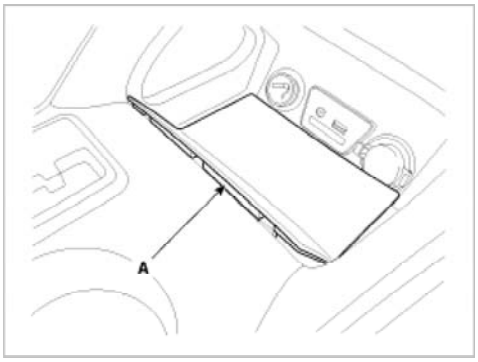




Body Electrical System > Audio > AUX(Auxiliary) Jack > Repair procedures

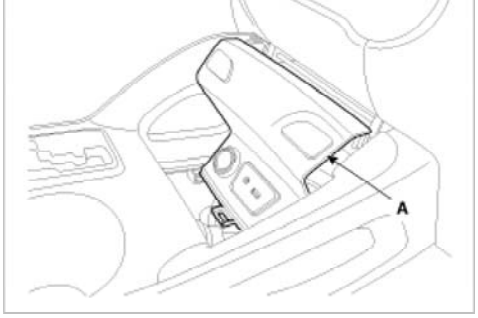
Removal

1. Remove the floor console upper cover (A) using the appropriate tool.



2. Remove the seat heater switch module (A).

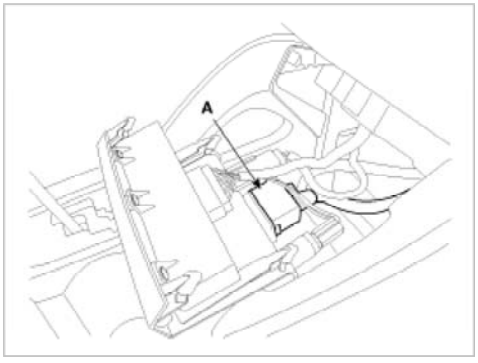
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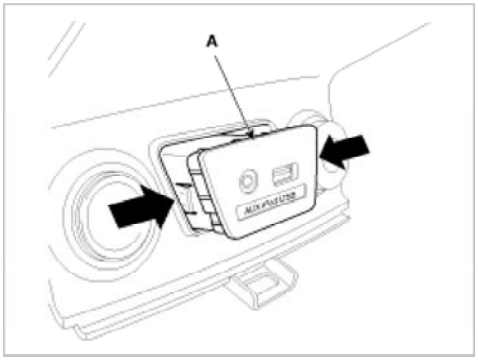
NOTE

Take care not to damage the hook when removing the switch.

3. Disconnect the connectors (A) from the seat heater switch module.



4. Remove the Multimedia Jack (A) from the seat heater switch module after pressing the hooks.



Installation

1. Install the multimedia jack.
2. Connect the AUX jack connector.
3. Install the center console.
4. Install the console upper cover.
5. Install the shift lever knob.

NOTE

Make sure the Aux connector and the console connectors are plugged in properly.

Body Electrical System > Audio > XM Radio > Description and Operation

Description

Introduction to XM radio

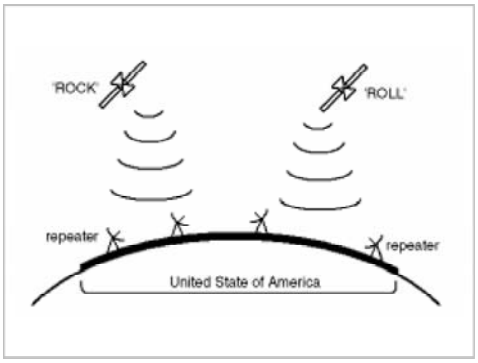
XM-Radio is a Satellite Based Radio Broadcast System that operates around 2.3 GHz from two 15,000 watts satellites; one named "ROCK," at 115 Degrees West, the other named "ROLL" at 85.0 Degrees West. Or another way of saying, the satellites

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Due to the limitations of satellite transmission, the signal is not able to penetrate buildings, so it cannot effectively cover dense urban areas. The terrestrial repeater network extends SDARS coverage and allows providers to reach the greatest number of subscribers and provide quality coverage. The repeaters receive the XM signal directly from the satellites and then re-transmit it to XM radios anywhere.

XM provides digitalized radio programs in terms of channels. Each channel is a program that the user can tune to. A category is a group of channels. Examples of categories are classical, news and sports.

XM is a paid service. That means users have to make a subscription to XM before they can enjoy the programs. However, XM does give some free-to-air channels. The users can listen to one of them without making any subscription.



Body Electrical System > Audio > Troubleshooting

Troubleshooting

Customer Complaint Analysis Check Sheet

TROUBLE IN	☐ ALL ☐ AM ☐ FM ☐ XM ☐ 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.

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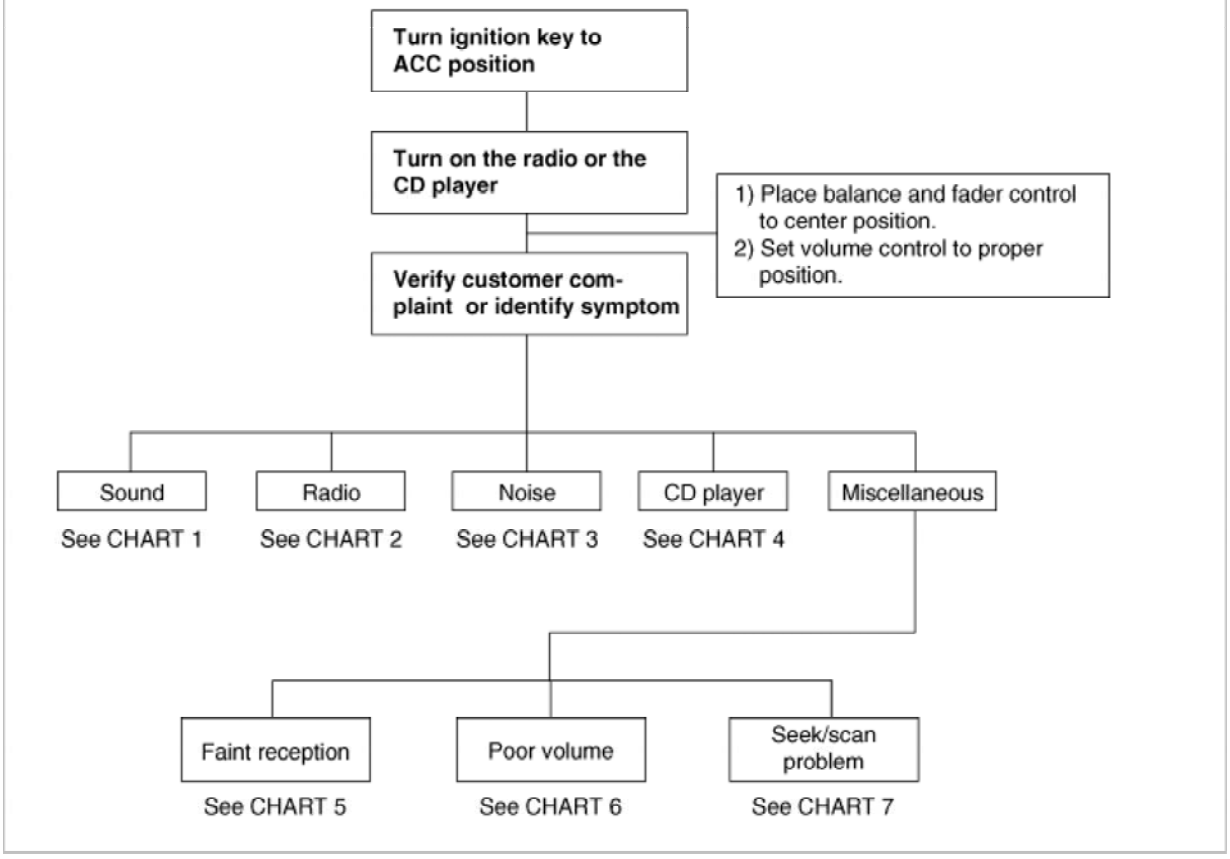
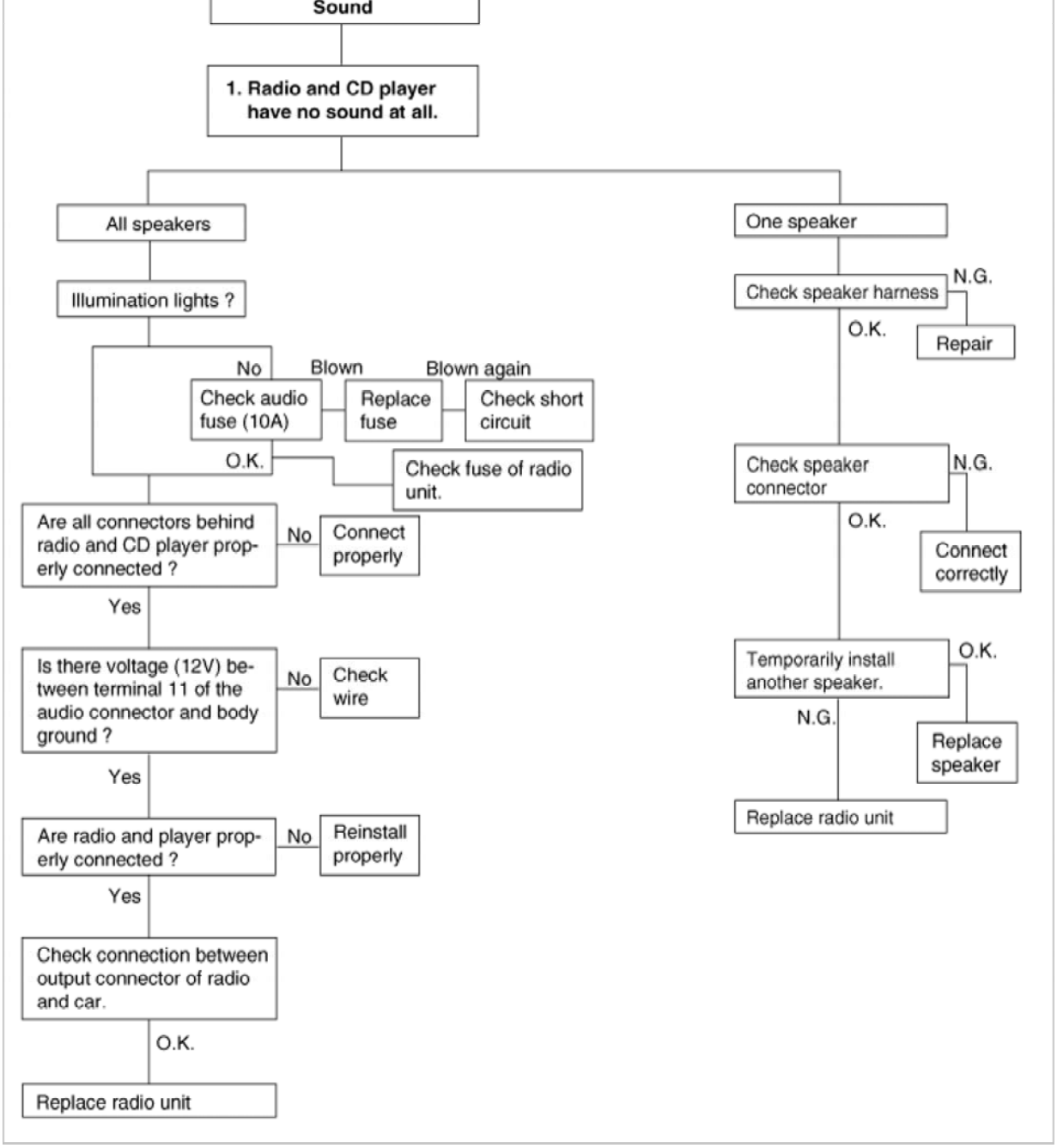
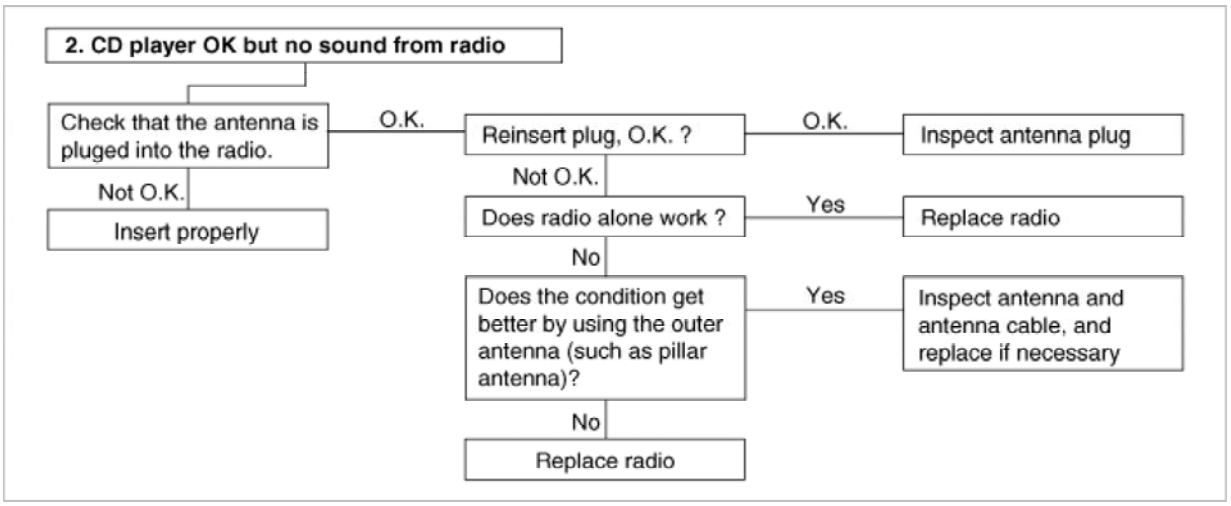


Chart 1

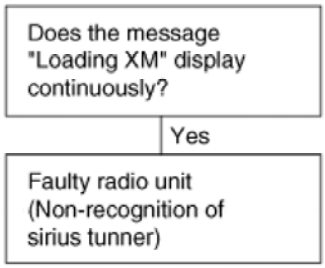
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Sound
1. Radio and CD player have no sound at all.
All speakers
Illumination lights ?
No
Blown
Blown again
Check audio fuse (10A)
Replace fuse
Check short circuit
O.K.
Check fuse of radio unit.
Are all connectors behind radio and CD player properly 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

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2. XM



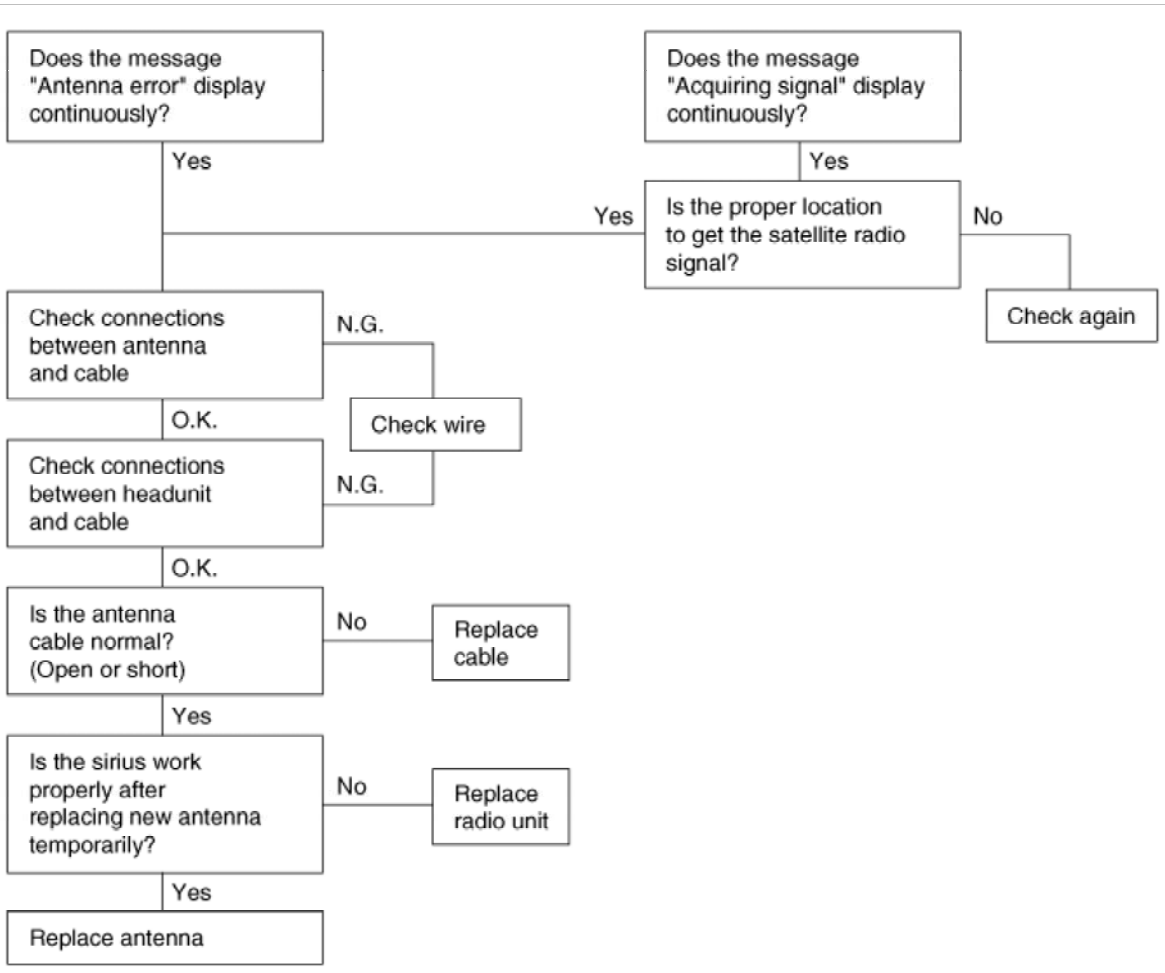


Chart 2

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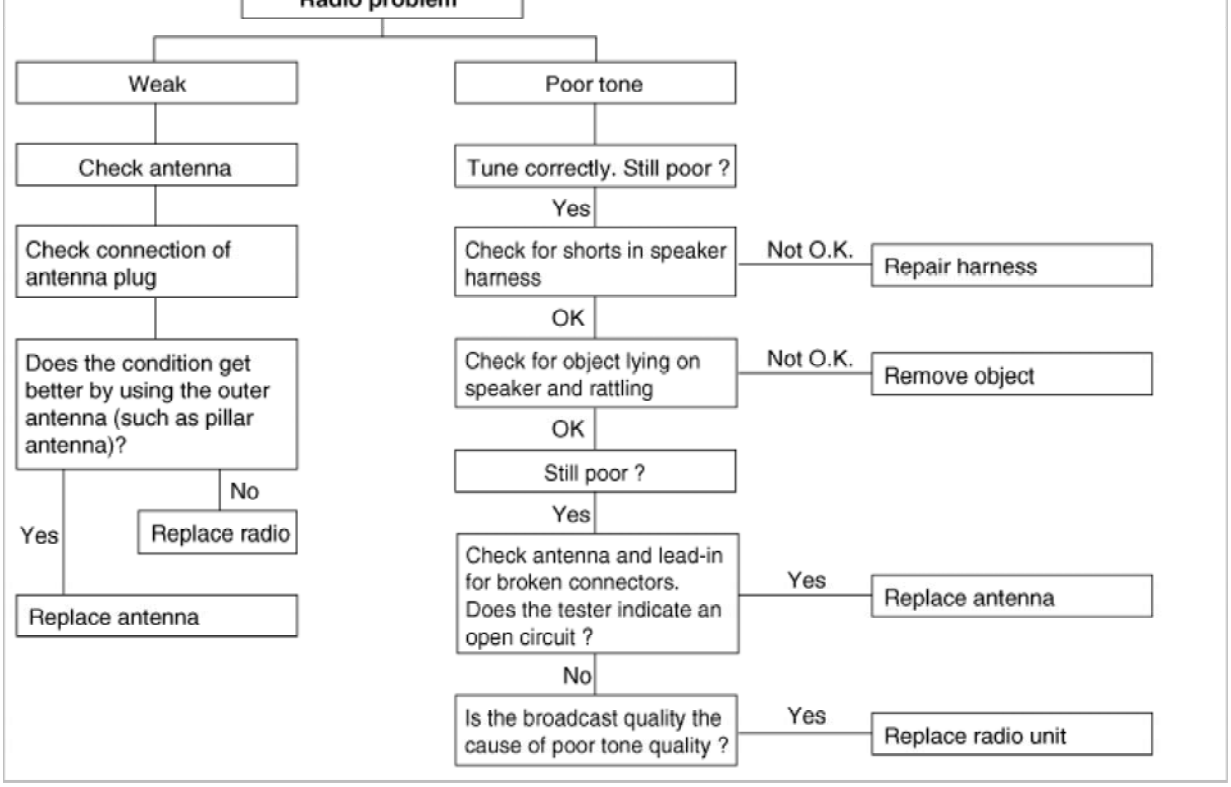


Chart 3

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1. RADIO

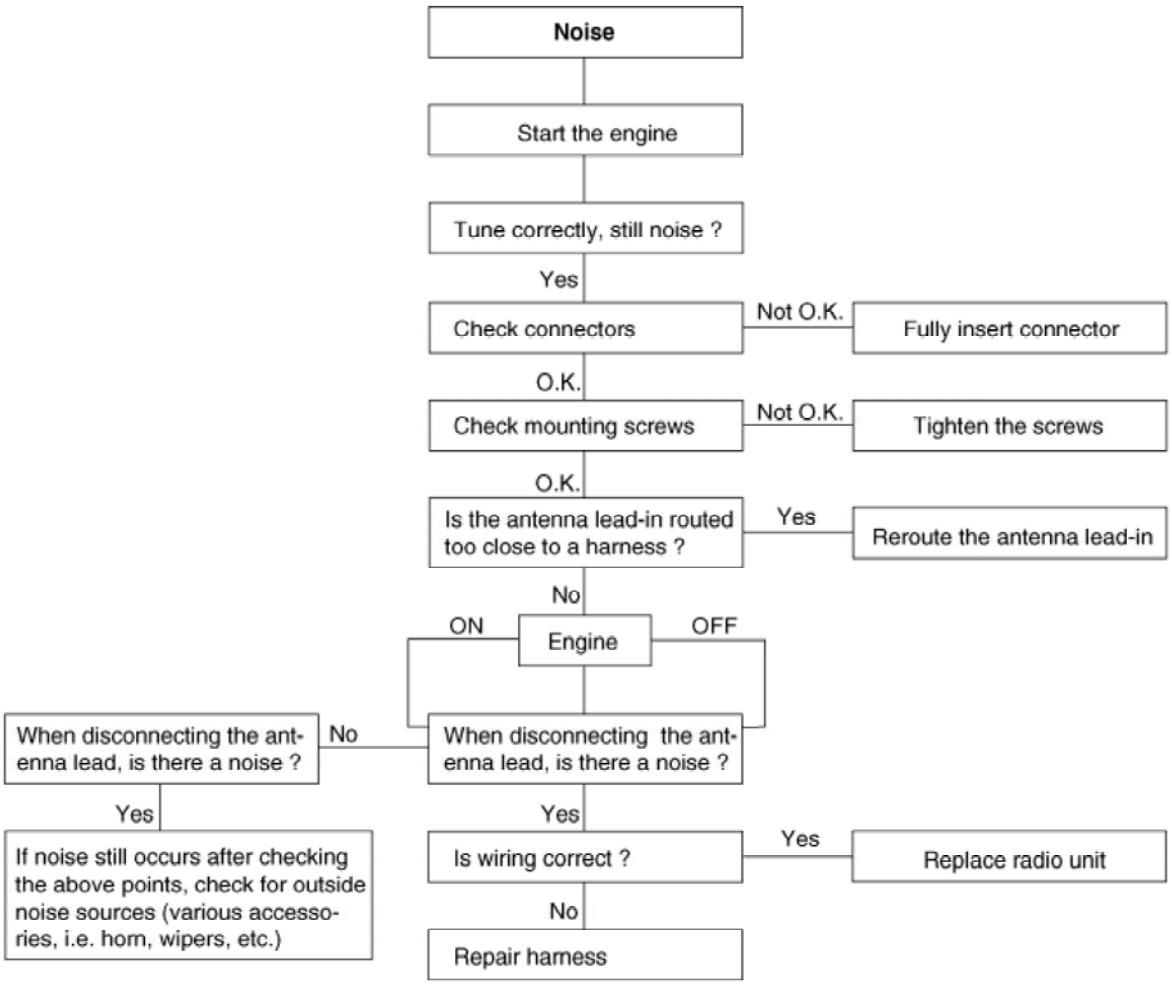
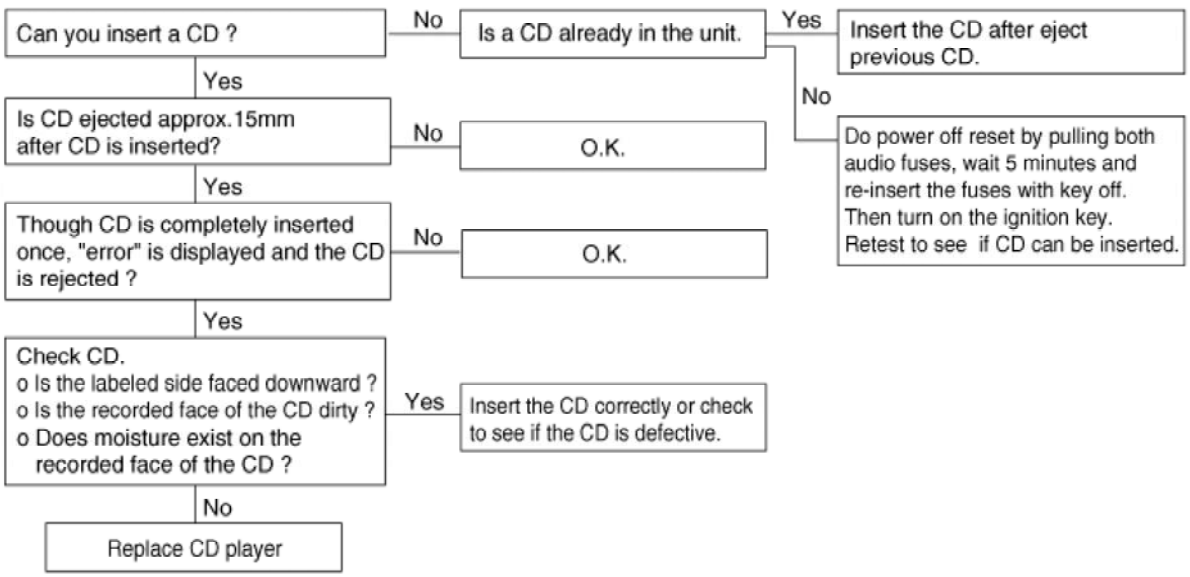
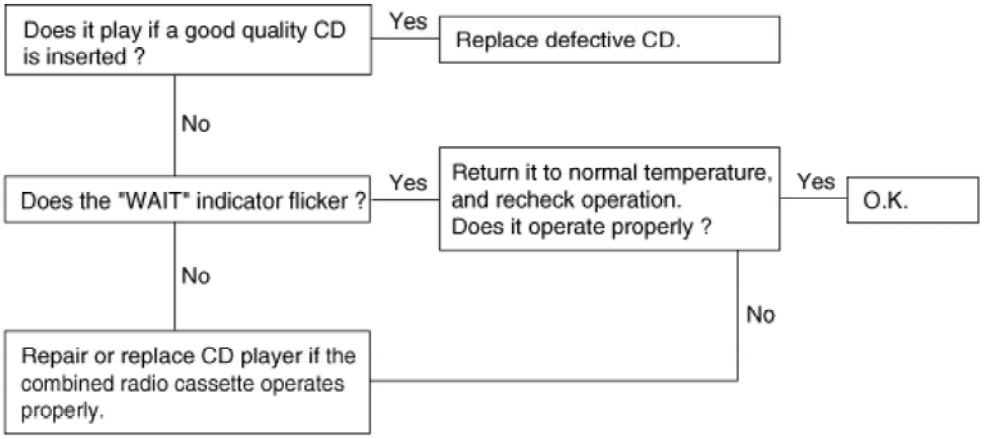


Chart 4

1. CD WILL NOT BE ACCEPTED

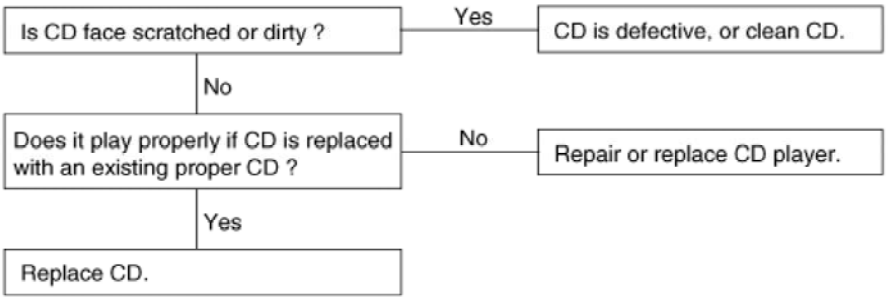


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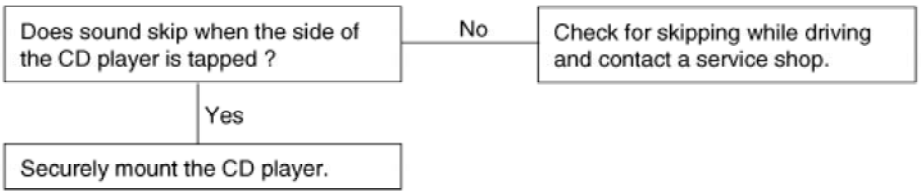


3. CD SOUND SKIPS

1) Sound sometimes skips when parking.

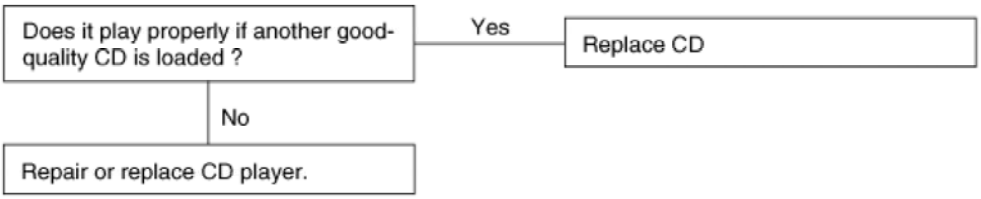


2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)

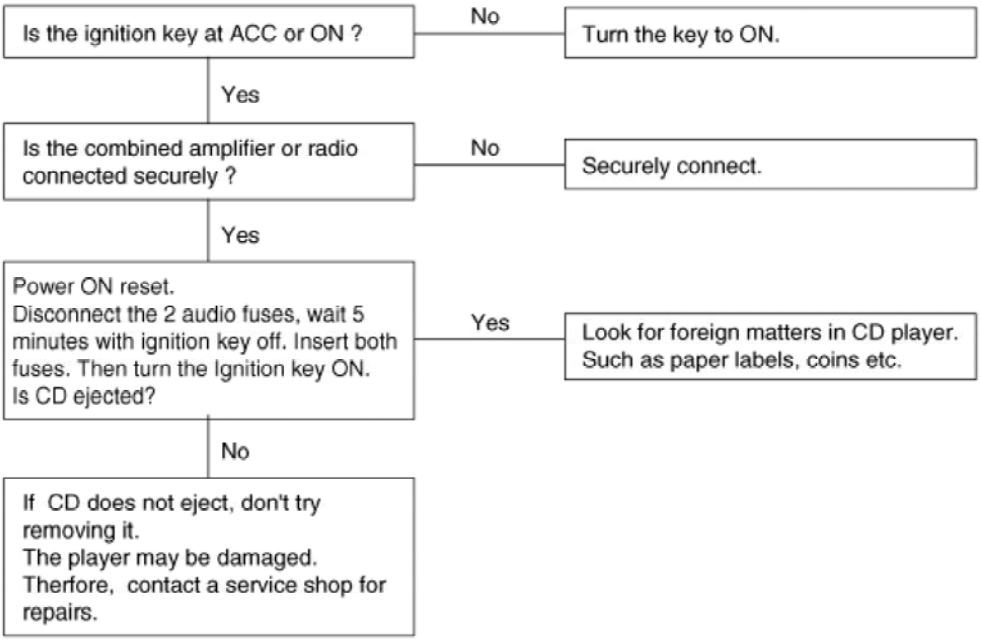


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4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT



6. NO SOUND FROM ONE SPEAKER

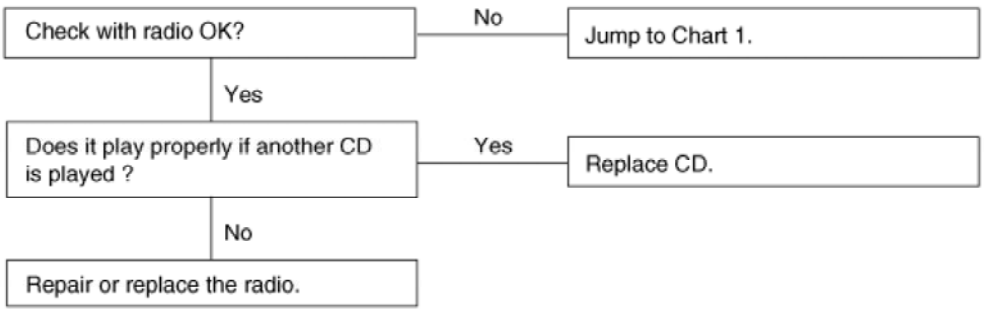


Chart 5

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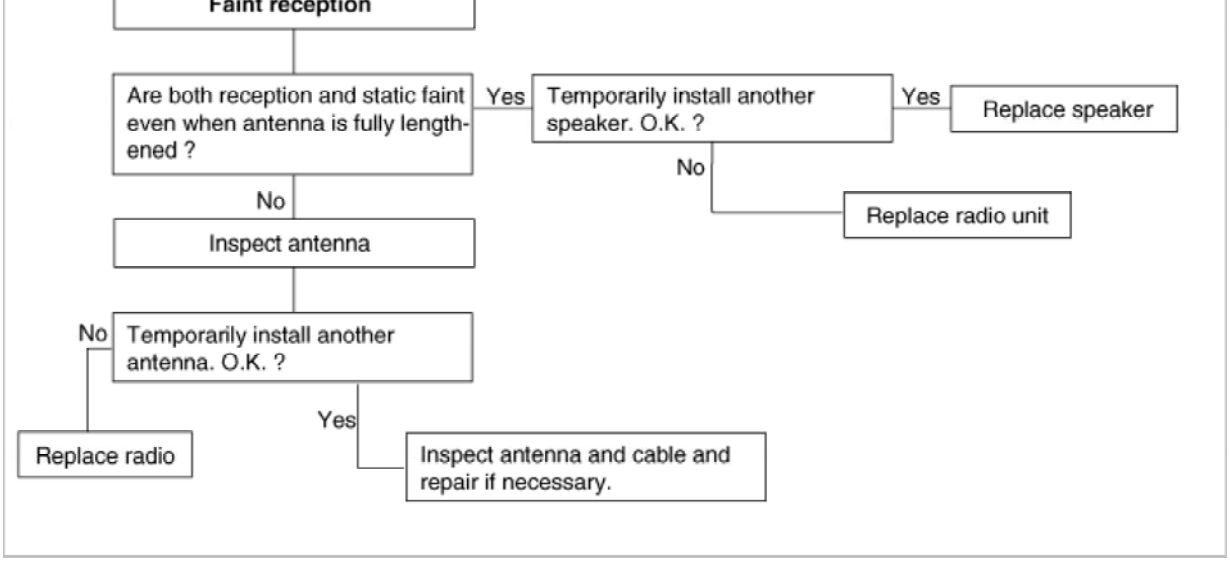


Chart 6

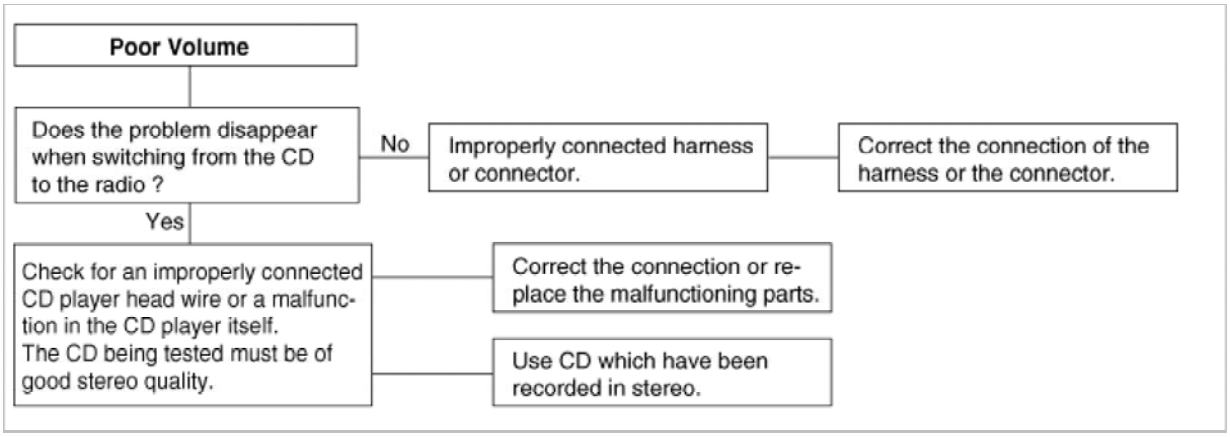
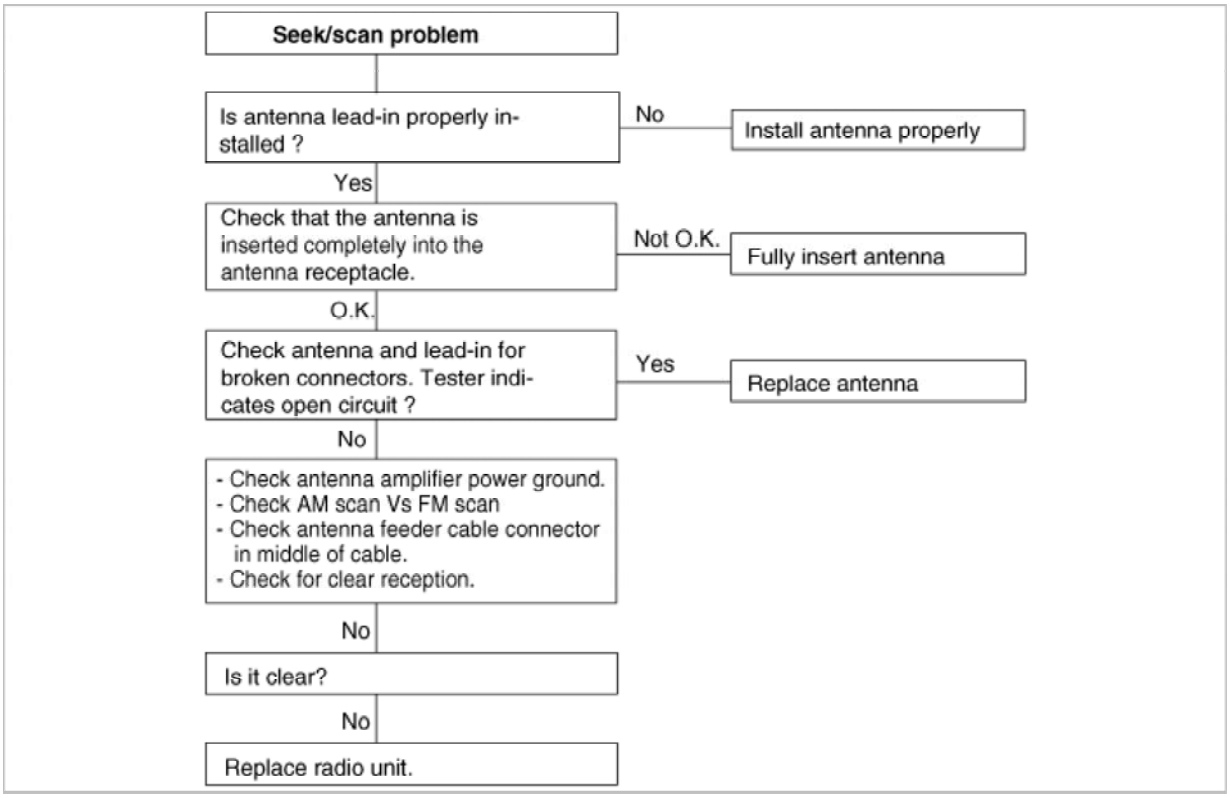


Chart 7



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Body Electrical System > Multifunction switch > Specifications

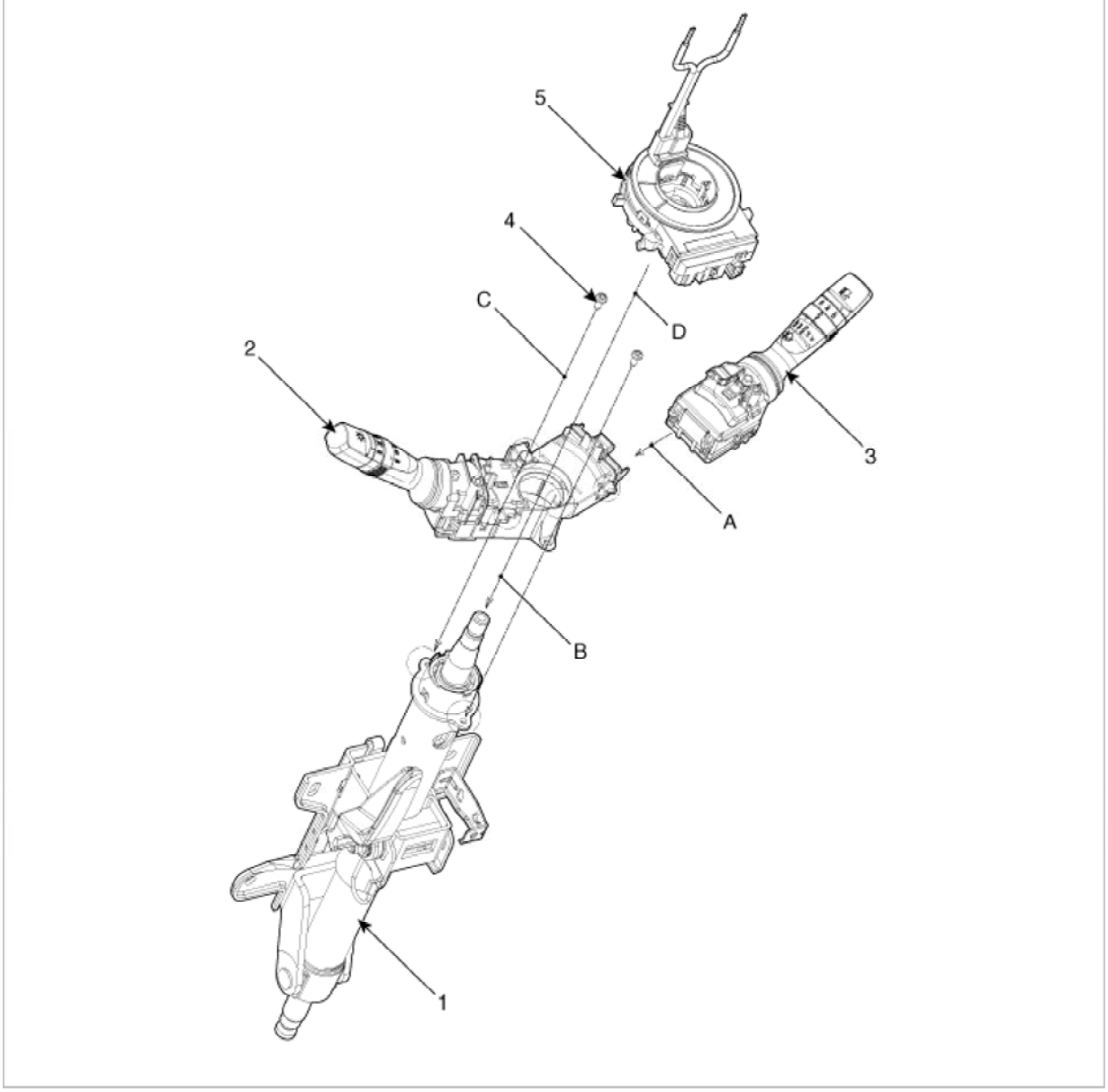
Specifications

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)
	Turn signal switch	6.6 ± 0.5A (Lamp load)
	Wiper & mist switch	Low, High : 4.5A (Motor load) Intermittent : 0.22 ± 0.05A (Relay load) Lock : Max. 28A (Motor load) Mist : 4.0A (Motor load) Washer : 4.0A (Motor load)
	Front fog lamp switch	0.2A (Relay load)
	Rear wiper & washer	Wiper : 1.0A (Relay load) Washer : 4.0A (Motor load)

Body Electrical System > Multifunction switch > Components and Components Location

Component (1)

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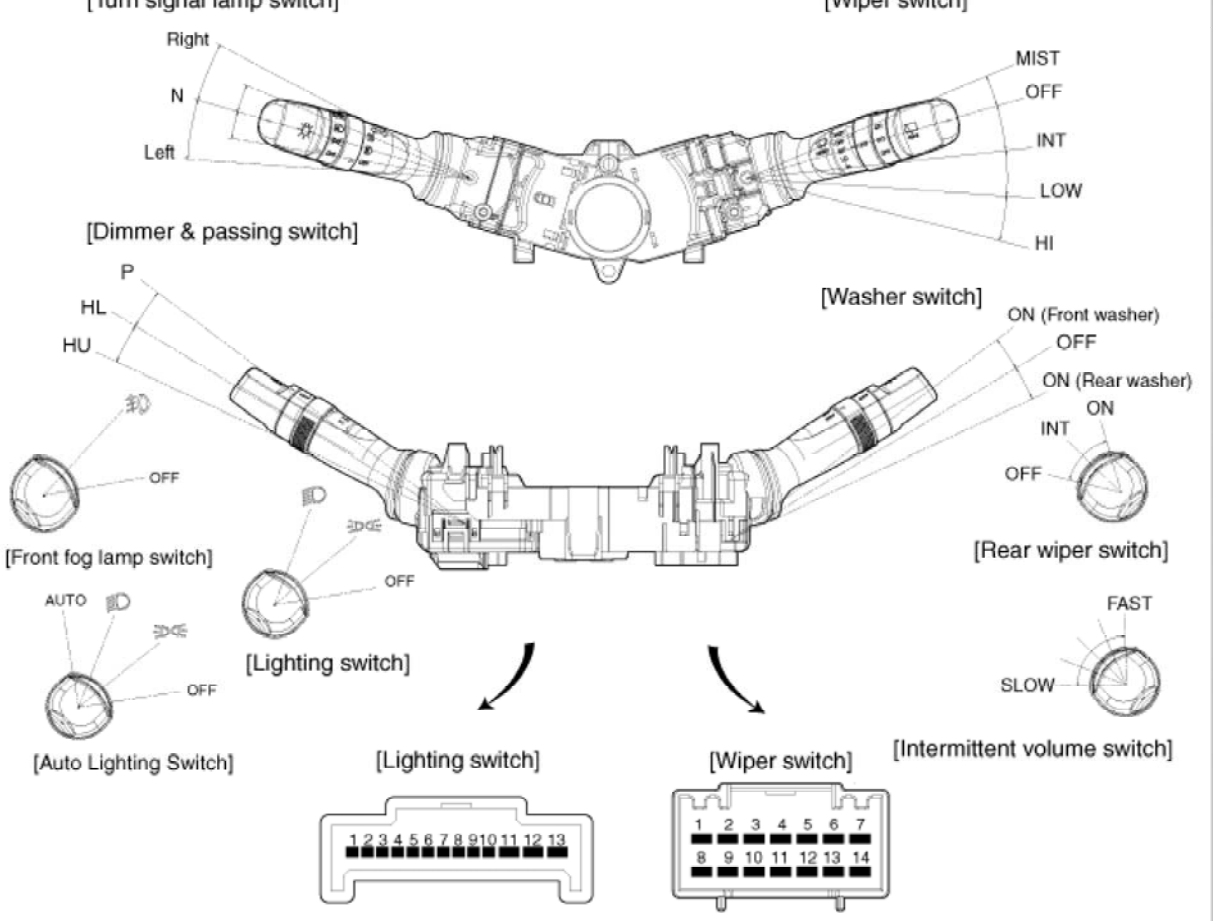


<Installation order : A→B→C→D>

1. Steering column shaft 2. Lighting switch 3. Wiper and washer switch	4. Screw 5. Clock spring

Component (2)

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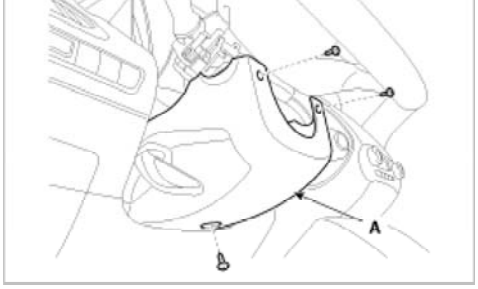
Connector name	No	Description	Connector name	No	Description
Lighting (13 pin)	1	Tail lamp switch	Wiper & Washer (14 pin)	1	Mist switch
	2	Lighting switch GND		2	Wiper parking
	3	Auto light switch		3	Wiper low speed
	4	Head lamp switch		4	Intermittent volume base
	5	Fog lamp switch base		5	Intermittent time base
	6	Front fog lamp switch		6	Rear wiper switch
	7	-		7	Intermittent rear wiper switch
	8	Head lamp low		8	Intermittent wiper switch
	9	Head lamp high		9	Wiper high speed
	10	Dimmer switch base		10	IGN2 (front washer & wiper)
	11	Turn signal left		11	Washer switch
	12	Turn signal base		12	IGN2 (rear wiper & washer)
	13	Turn signal right		13	Rear washer switch
				14	-

Body Electrical System > Multifunction switch > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering column upper and lower shrouds (A) after removing 3 screws.

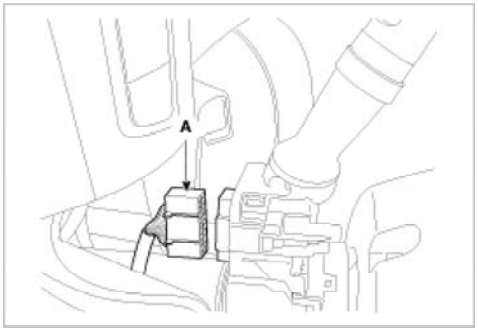
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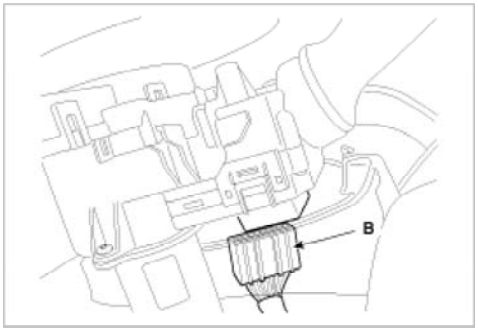


NOTE

Take care not to damage and scratch the shrouds and its related parts.
Take care not to damage the hook when removing the upper and lower shrouds.

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

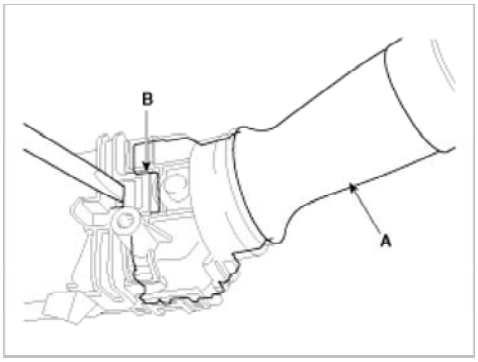




4. Remove the wiper switch (A) by pushing the lock pin (B).

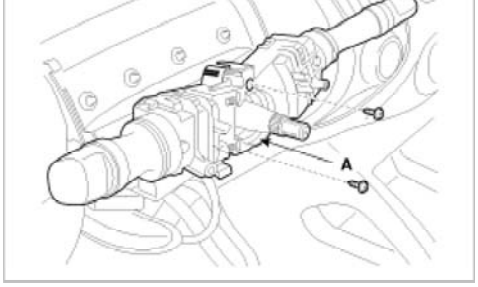
NOTE

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



5. Remove the steering wheel.
   (Refer to the ST group - "Steering column and shaft")
6. Remove the clock spring.
   (Refer to the RT group - "Airbag module")
7. Loosen the screws from the multifunction switch assembly (A).

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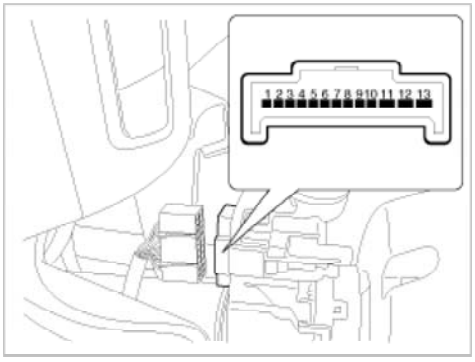
Installation

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

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	2	4	3	1
OFF				
Tail Lamp	○			○
Head Lamp	○	○		○
Auto			○	○

Lighting Switch

Terminal / Position	1	4	2
OFF			
Tail Lamp	○		○
Head Lamp	○	○	○

Dimmer And Passing Switch

Terminal / Position	2	9	8	10
HU		○		○
HL			○	○
P	○	○		○

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

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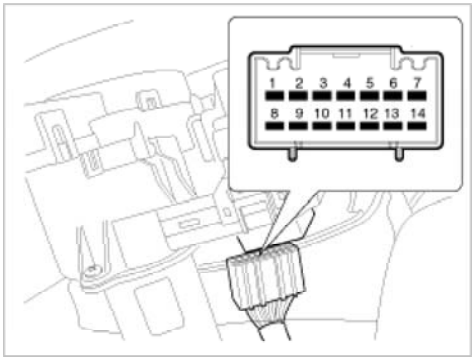
Hazard Switch	Turn Signal Switch \ Terminal	13	12	11
OFF	L		○——	——○
	N			
	R	○——	——○	

Front Fog Lamp

Position \ Terminal	5	6
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

Position \ Terminal	3	9	2	8	10	1	4	5
MIST	○	——	○		○	—○		
OFF	○	——	○					
INT	○	——	○	○	—○		○	~○
LOW	○	——	——	——	——○			
HI		○	——	——	——○			

Washer Switch

Position \ Terminal	10	11
OFF		
ON	○——	——○

Rear Wiper Switch

Position \ Terminal	12	6	7
INT	○——	——	——○
OFF			
ON	○——	——○	

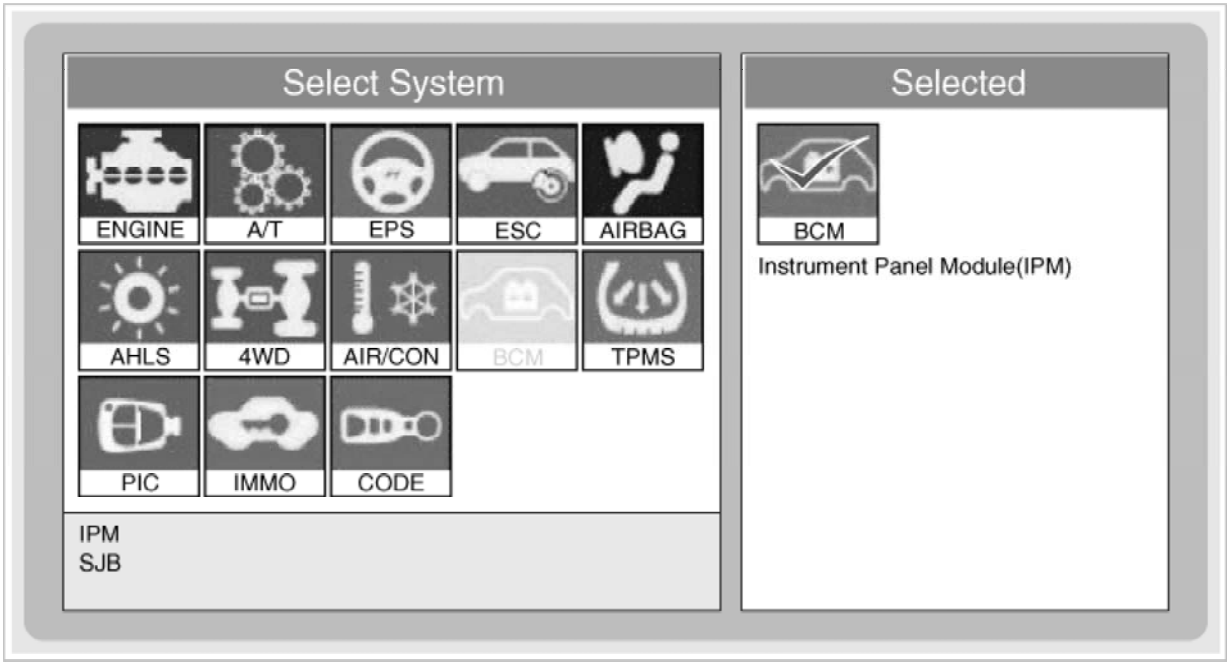
Rear Washer Switch

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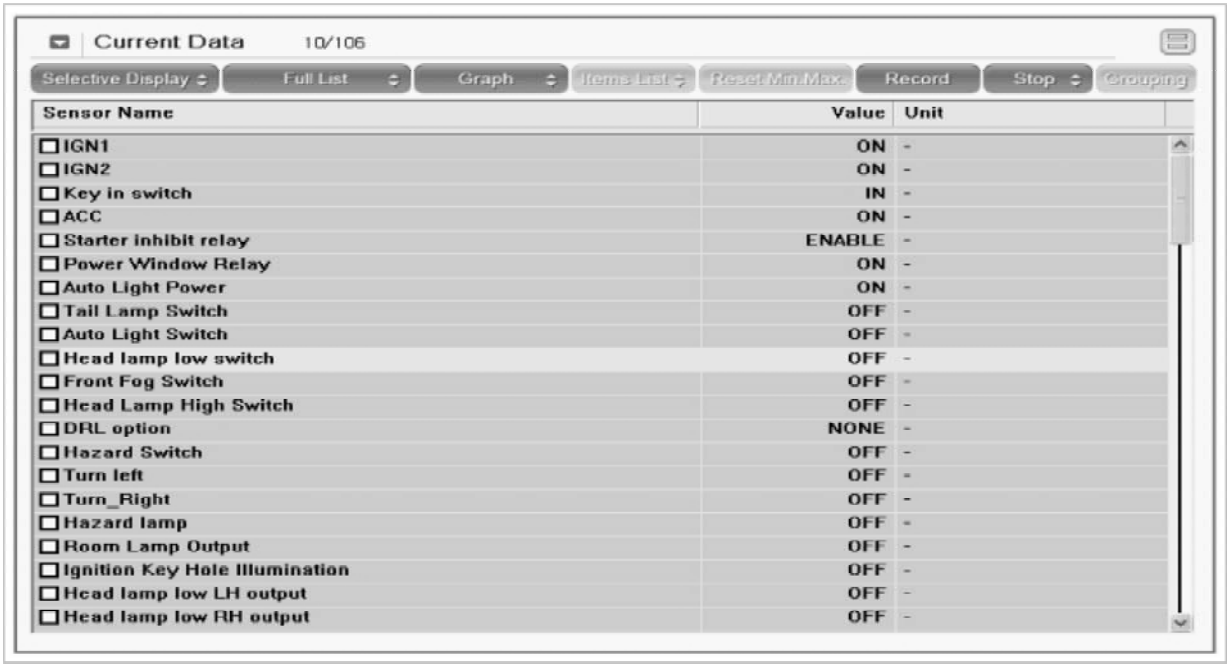
Position		
OFF		
ON	○	○

Inspection (With GDS)

1. Check BCM 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".



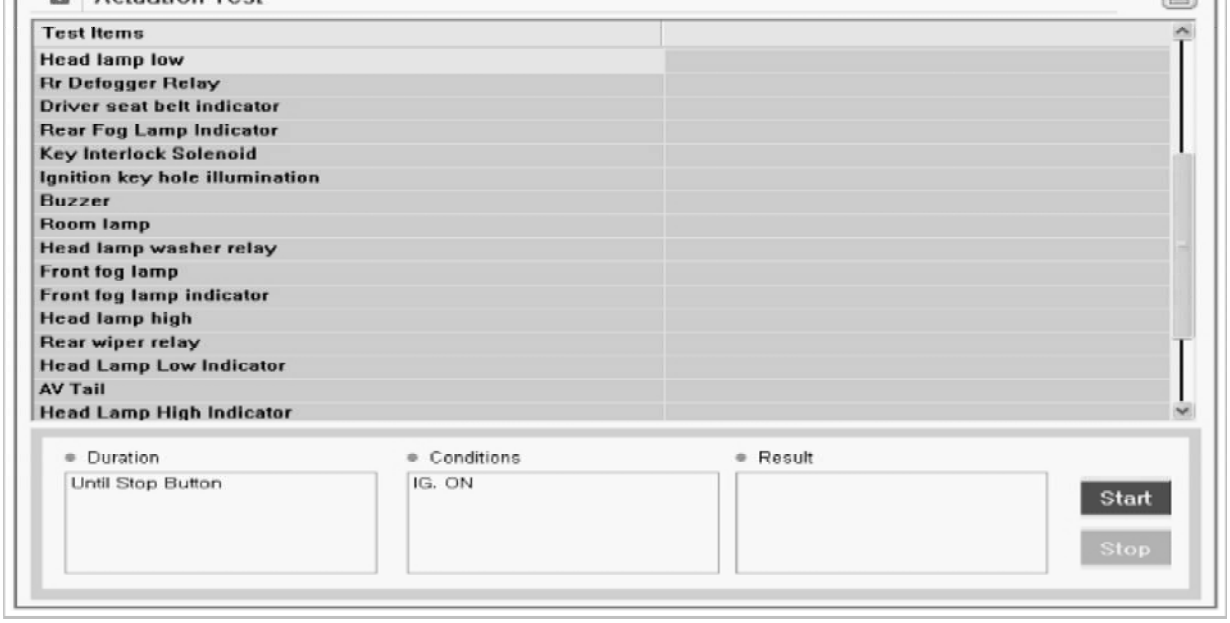
3. Select "Current data" and check the input/output condition of "Multifunction switch".



Sensor Name	Value	Unit
IGN1	ON	-
IGN2	ON	-
Key in switch	IN	-
ACC	ON	-
Starter inhibit relay	ENABLE	-
Power Window Relay	ON	-
Auto Light Power	ON	-
Tail Lamp Switch	OFF	-
Auto Light Switch	OFF	-
Head lamp low switch	OFF	-
Front Fog Switch	OFF	-
Head Lamp High Switch	OFF	-
DRL option	NONE	-
Hazard Switch	OFF	-
Turn left	OFF	-
Turn_Right	OFF	-
Hazard lamp	OFF	-
Room Lamp Output	OFF	-
Ignition Key Hole Illumination	OFF	-
Head lamp low LH output	OFF	-
Head lamp low RH output	OFF	-

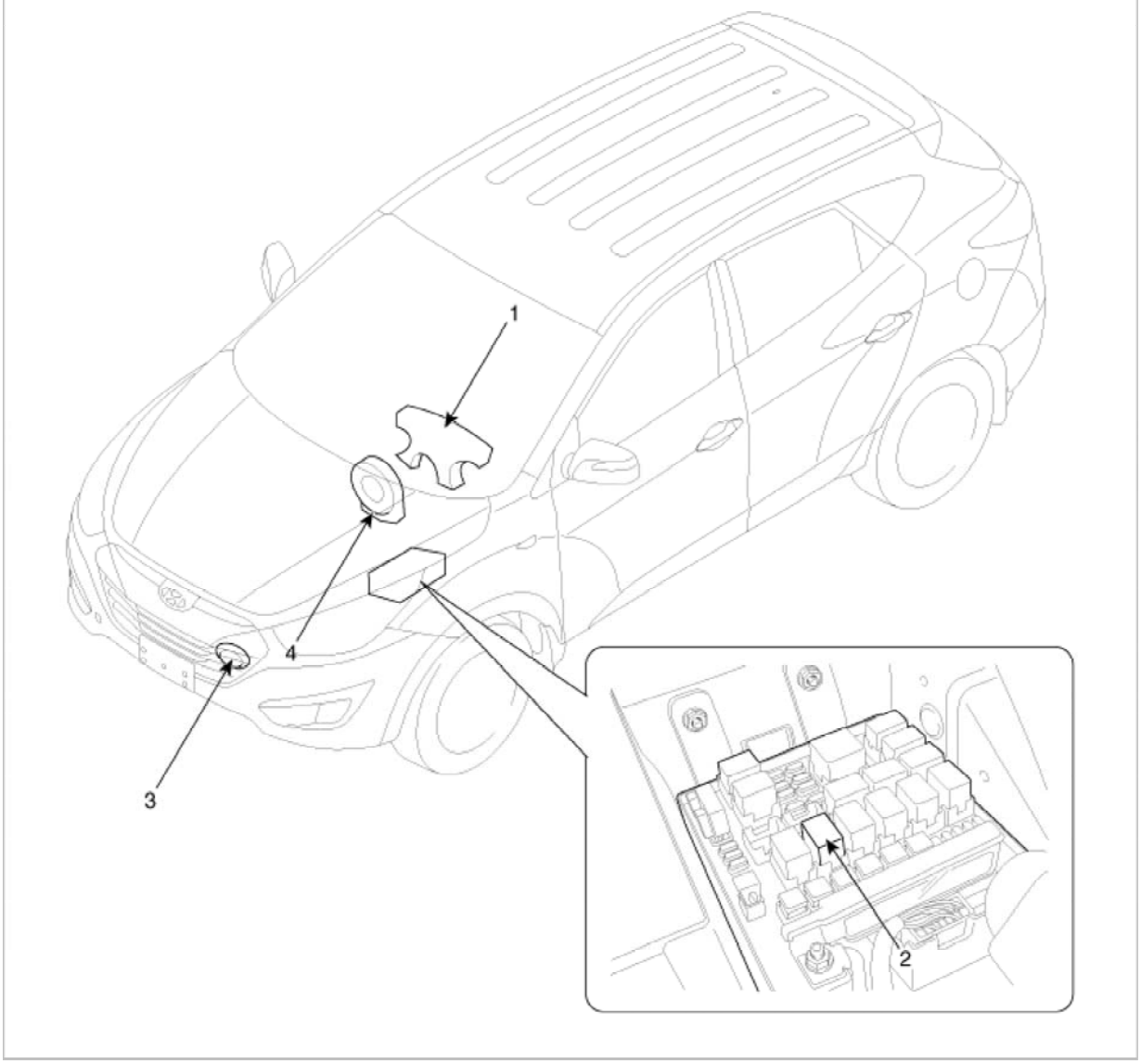
4. To perform test on "Multifunction switch" outputs, select "Actuation test".

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Body Electrical System > Horn > Components and Components Location

Component Location

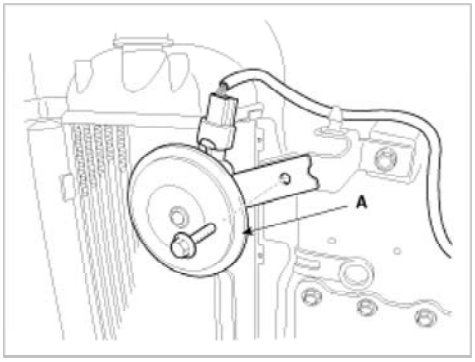


1. Horn switch 2. Horn relay (Engine room compartment)	3. Horn (Low pitch) 4. Clock spring

Body Electrical System > Horn > Repair procedures

Removal

1. Remove the front bumper.
   (Refer to the BD group - "Front bumper")
2. Remove the bolts and disconnect the horn connectors, then remove the low pitch horn (A).



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Installation

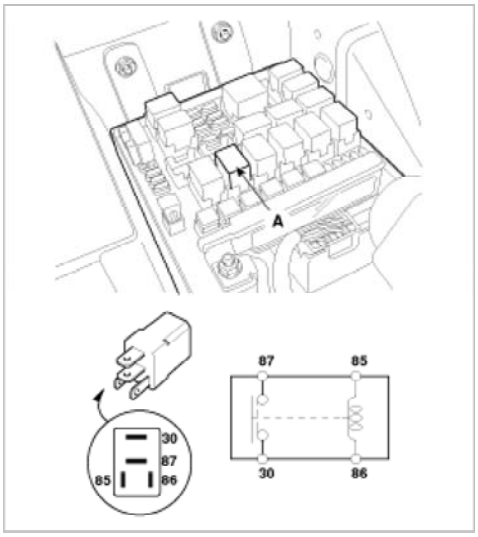
1. Install the horns after connecting the horn connectors.
2. Install the front bumper.

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.

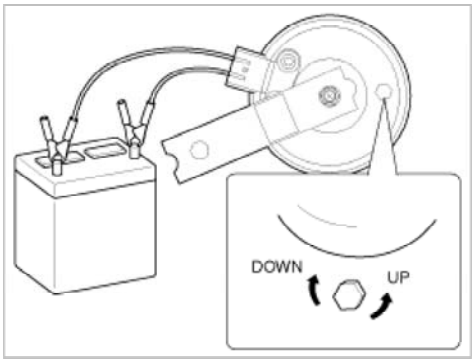


Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

Adjustment

1. Operate the horn, and adjust the tone to a suitable level by turning the adjusting screw.

> **NOTE**
>
> Horn adjustment screw is automatically sealed with silicon sealant.
> The shape and size of the applied sealant is variable and tails or dribbles are acceptable and not to be tampered with.



Body Electrical System > AVN System > Specifications

Specifications

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Power supply	DC 14.4V (-) Negative ground
Frequency range / Channel space	FM : 87.5~108.0MHz, AM : 531~1602KHz
Tuning type	PLL SYNTHESIZED TUNING
Antenna	80 pF 75 Ohm
Dark current	Max 4mA (Head unit)
S/N	FM : MIN 50 dB AM : MIN 40 dB
Temperature range	Operating : -4°F~ +158°F (-20°C~ +70°C) Storage : -22°F~ +316.4°F (-30°C~ +80°C)

Display System

Item	Specification
Size	6.5 inch, WVGA
TFT-LCD Deffect dot	800 X 400

DVD Deck

Item	Specification
Power supply	8V, 5V

Bluetooth

Item	Specification
Power supply	+ 3.3V (Max 600mA)
Functions	Hands free, Audio streaming, Phone book

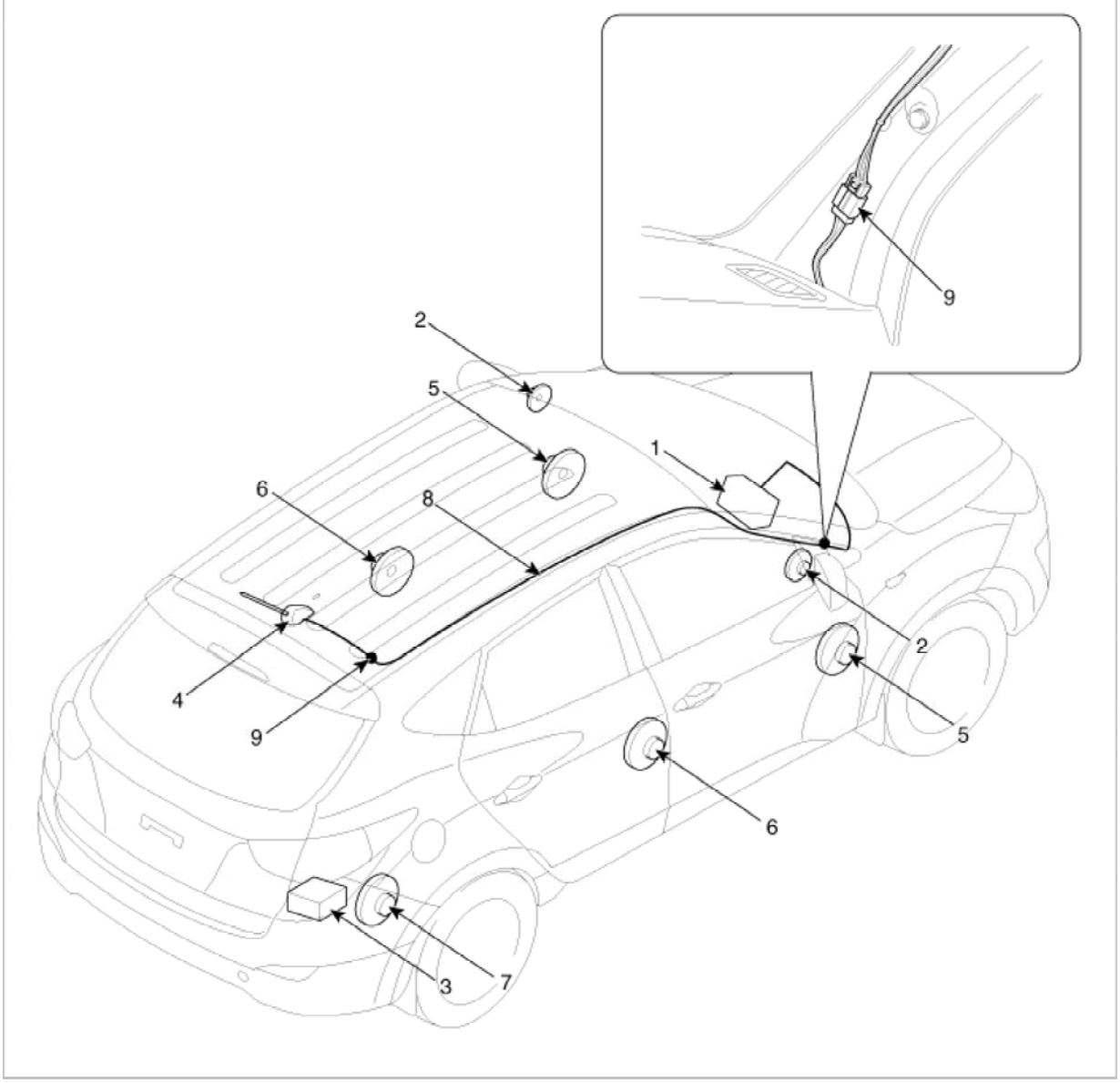
Storage Memory

Item	Specification
Type	USB (Map data)
Capacity	8GB

Body Electrical System > AVN System > Components and Components Location

Component Location

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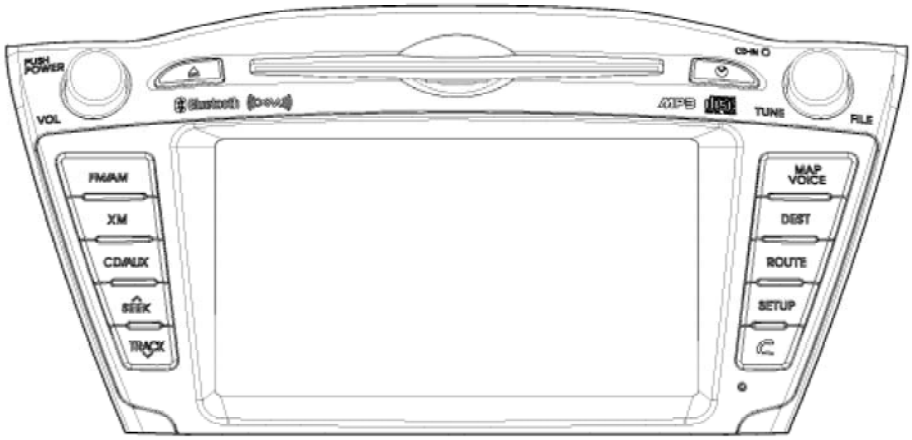
1. AVN (A/V & Navigation) head unit 2. Tweeter speaker 3. External Amplifier 4. Roof antenna (GPS + SDARS + Radio) 5. Front door speaker	6. Rear door speaker 7. Woofer speaker 8. Antenna feeder cable 9. Feeder cable joint connector

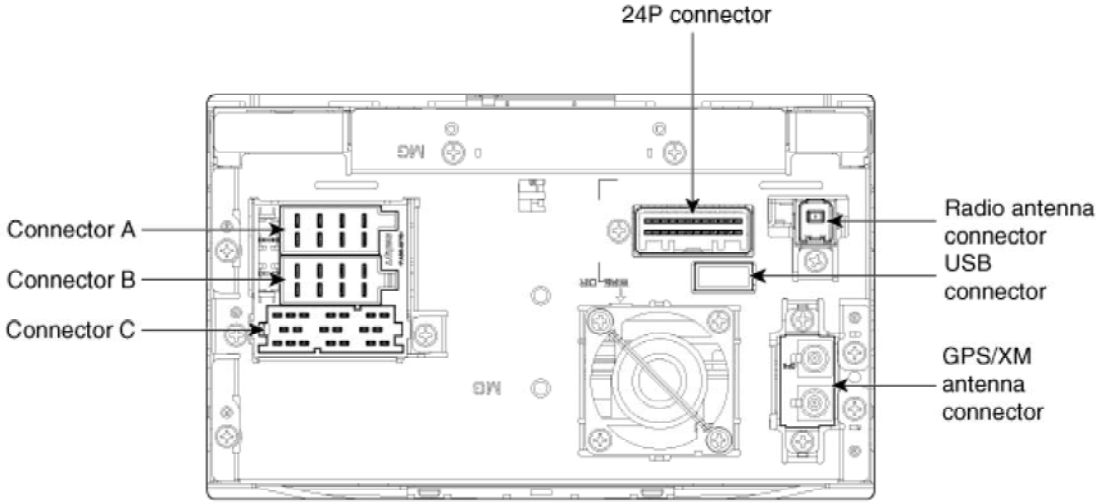
※ SDARS : Satellite Digital Audio Radio Service

Components

AVN (A/V & Navigation) Head Unit

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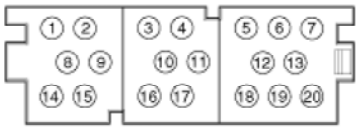

PUSH POWER
VOL
TUNE
FILE
FM/AM
XM
CD/AUX
SEEK
TRACK
MAP VOICE
DEST
ROUTE
SETUP


24P connector
Connector A
Connector B
Connector C
Radio antenna connector
USB connector
GPS/XM antenna connector

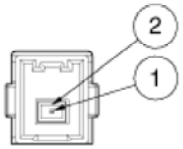
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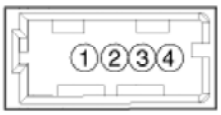
Connector A	NO	Description	NO	Description
	1	Speed	5	R Inhibit
	2	Illummination (+)	6	ACC
	3	Remote antenna	7	Illummination (-)
	4	Battery (+)	8	Power GND

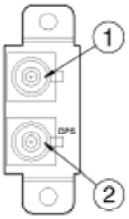
Connector B	NO	Description	NO	Description
	1	-	5	-
	2	-	6	-
	3	-	7	-
	4	-	8	-

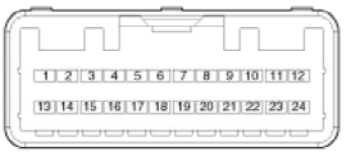
Connector C	NO	Description	NO	Description
	1	Mic (+)	11	Aux Input DET
	2	Miic (-)	12	-
	3	Aux input right	13	-
	4	Aux input left	14	-
	5	Aux V GND	15	Door unlock
	6	-	16	Remote control
	7	-	17	Remote control GND
	8	ALT L	18	Aux video input
	9	Auto light input	19	-
	10	Aux GND	20	-

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Radio antenna	No.	Description	No.	Description
	1	Signal	2	GND

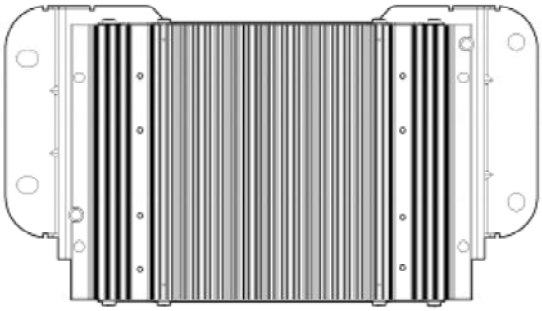
USB connector	No.	Description	No.	Description
	1	USB GND	3	USB D (-)
	2	USB D (+)	4	USB VCC

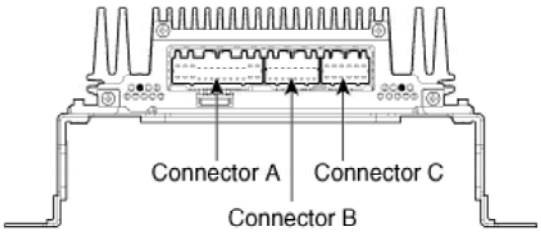
GPS/DMB antenna	No.	Description	No.	Description
	1	XM signal	5	GPS signal

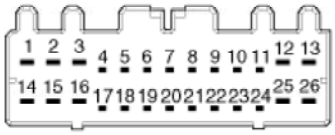
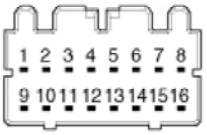
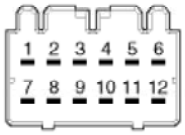
24P connector	No.	Description	No.	Description
	1	SPDIF output (+)	13	Camera B (+)
	2	SPDIF output (-)	14	Camera P GND
	3	SPDIF GND	15	Camera video
	4	-	16	Camera V GND
	5	-	17	-
	6	Navigation voice (+)	18	Navigation voice (-)
	7	-	19	-
	8	-	20	Navigation GND
	9	-	21	-
	10	-	22	-
	11	-	23	-
	12	CAN High	24	CAN Low

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[External Amplifier]

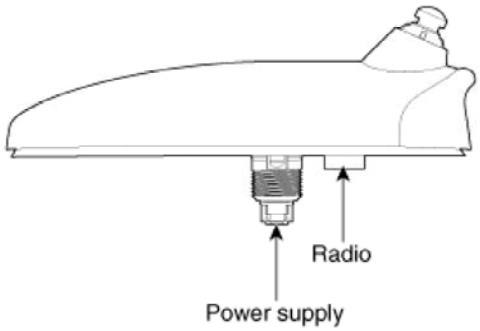


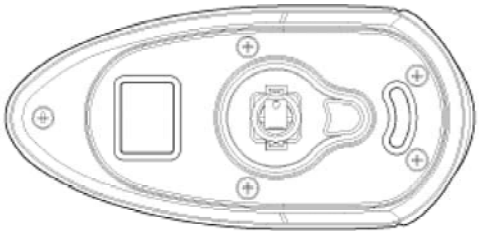


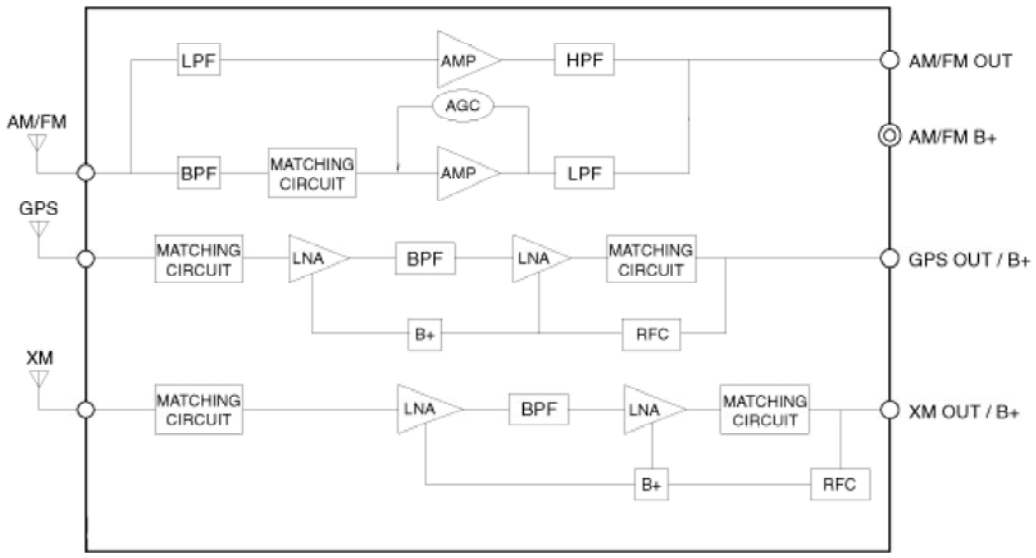
NO	Connector A	Connector B	Connector C
			
1	B (+)	-	Rear Door Right (+)
2	B (+)	-	Rear Door Lift (+)
3	B (+)	-	Front Tweeter Right (+)
4	-	-	Front Tweeter Lift (+)
5	CAN (+)	-	Front Door Right (+)
6	CAN (-)	-	Front Door Lift (+)
7	ACC	-	Rear Door Right (-)
8	-	-	Rear Door Lift (-)
9	-	-	Front Tweeter Right (-)
10	-	-	Front Tweeter Lift (-)
11	Navigation (+)	-	Front Door Right (-)
12	Sub woofer 2 (+)	-	Front Door Lift (-)
13	Sub woofer 1 (+)	-	
14	GND	-	
15	GND	-	
16	GND	-	
17	-		
18	SPDIF (+)		
19	SPDIF (-)		
20	-		
21	-		
22	-		
23	-		
24	Navigation (-)		
25	Sub woofer 2 (-)		
26	Sub woofer 1 (-)		

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[Roof Antenna (Radio+XM+GPS)]



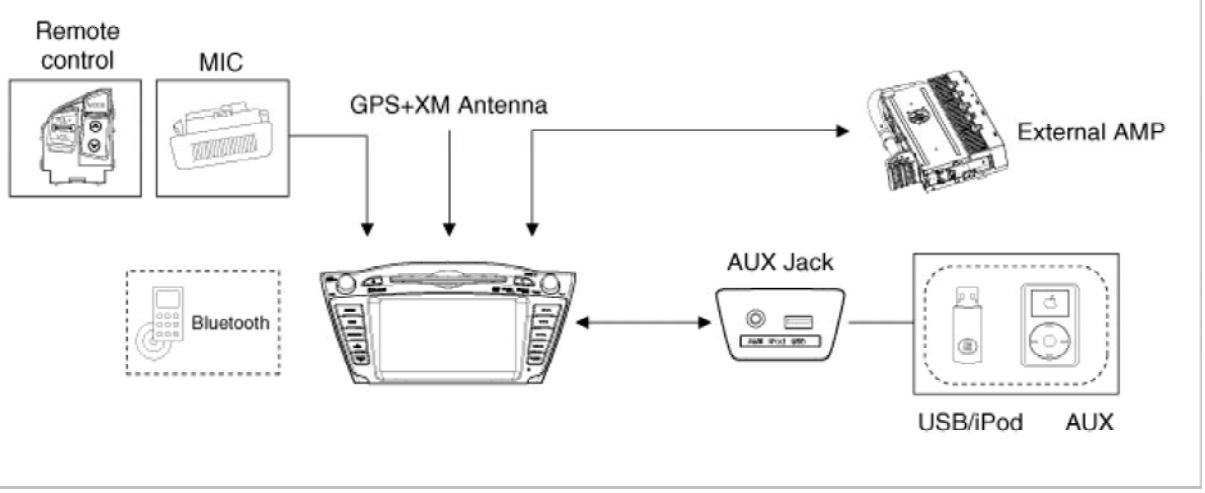




Body Electrical System > AVN System > Schematic Diagrams

System Block Diagram

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Body Electrical System > AVN System > Description and Operation

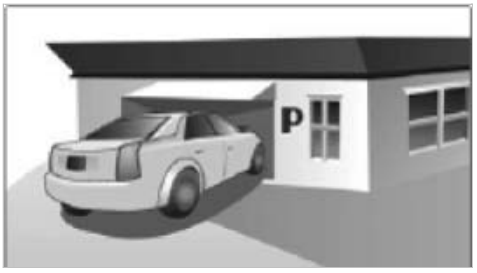
Limitations Of The Navigation system

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

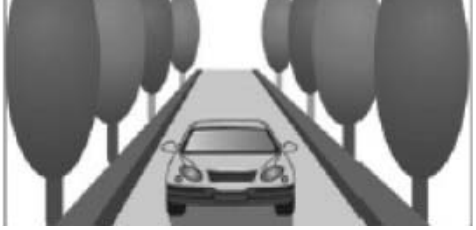


• Basement parking structures



• Underneath an overpass

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• 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 the vehicle is under the occur, driving for a short period of time will vehicle through map matching or 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 caused by search conditions or the driving position.

• Guidance to go straight may be given while driving on a straight road.

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- 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

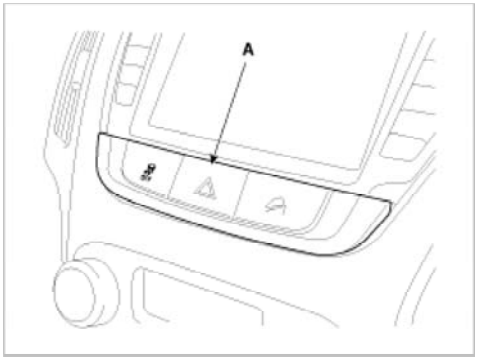
The following phenomena may occur after conducting route recalculation.

- 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 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)

Body Electrical System > AVN System > Repair procedures

Removal

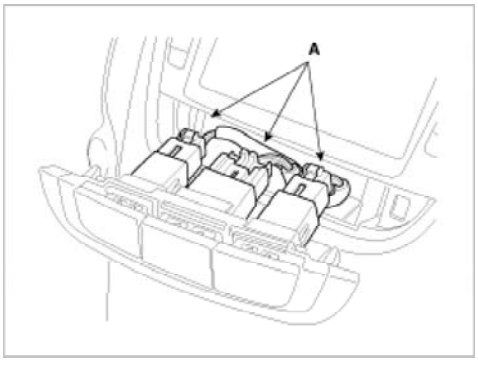
1. Disconnect the negative (-) battery terminal.
2. Remove the hazard lamp switch assembly (A).



NOTE

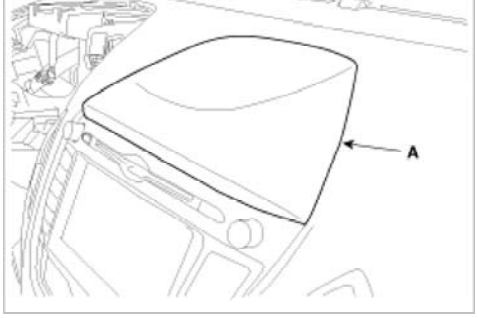
Take care not to damage and scratch the hazard lamp switch assembly and its related parts.
Apply the protective tapes to the hazard lamp switch assembly and its related parts.

3. Disconnect the connectors (A).

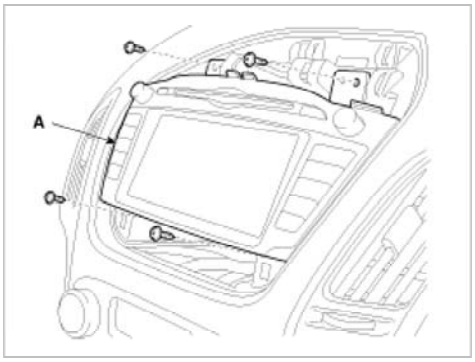


4. Remove the center fascia panel (A).

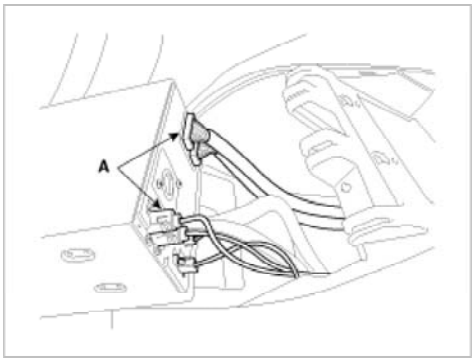
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5. Remove the AVN assembly (A) after loosening the mounting screws.



6. Disconnect the AVN connectors and cable (A), then remove the AVN unit completely.



NOTE

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

Installation

1. Connect the AVN head unit connectors and cable.
2. Install the AVN head unit.
3. Install the center facia panel.
4. Install the hazard switch module.
5. Connect the negative (-) battery terminal.

NOTE

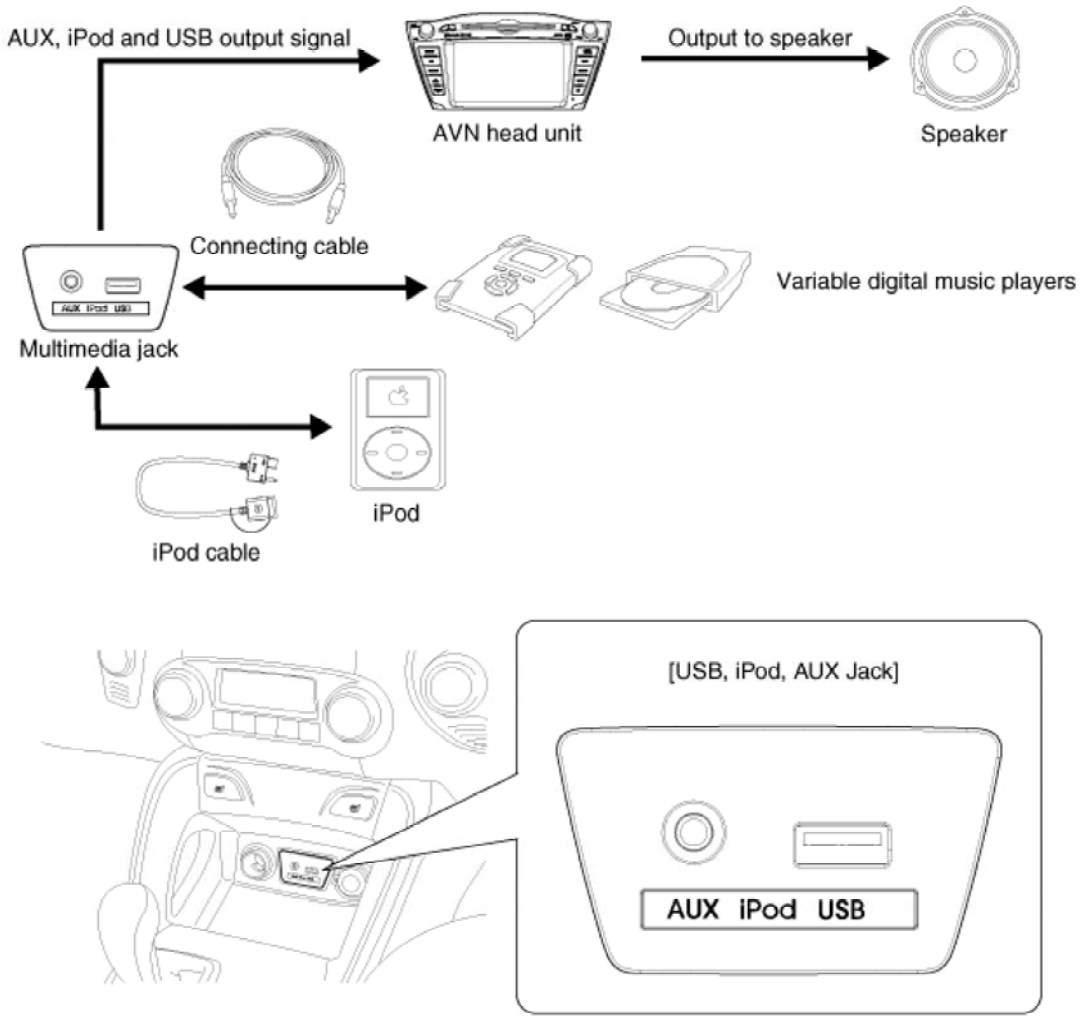
Make sure the connector are connected in properly.
Check the AVN system.

Body Electrical System > AVN System > AUX(Auxiliary) 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 defect but the output level of the used

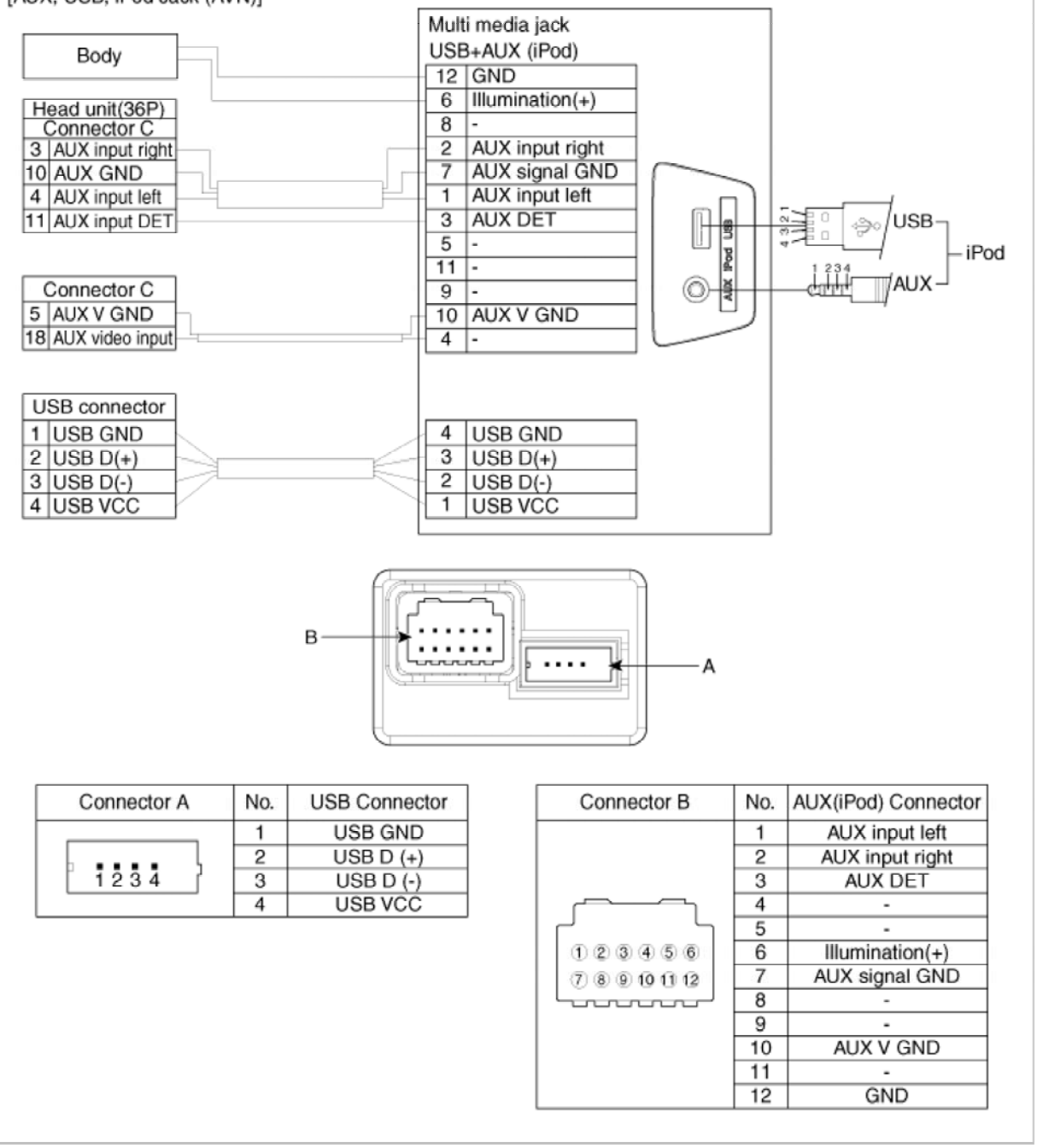
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Body Electrical System > AVN System > AUX(Auxiliary) Jack > Schematic Diagrams

Circuit Diagram (1)

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Connector A	No.	USB Connector
1 2 3 4	1	USB GND
	2	USB D (+)
	3	USB D (-)
	4	USB VCC

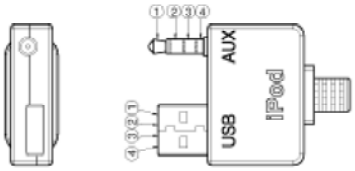
Connector B	No.	AUX(iPod) Connector
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ 10 11 12	1	AUX input left
	2	AUX input right
	3	AUX DET
	4	-
	5	-
	6	Illumination(+)
	7	AUX signal GND
	8	-
	9	-
	10	AUX V GND
	11	-
	12	GND

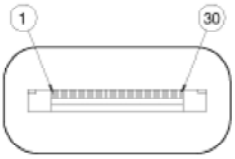
Circuit Diagram (2)

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[AUX, USB, iPod Jack]



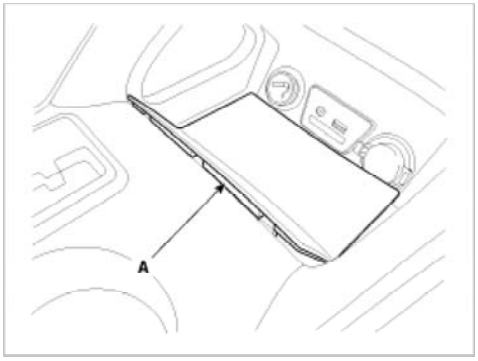
USB & AUX Jack		
		
Pin	USB	AUX
1	USB/iPod 5V	AUX1 L in
2	USB D-/iPod Tx	AUX1 R in
3	USB D+/iPod Rx	Option/Video
4	USB/iPod GND	AUX1 GND

iPod Connector (30P, Male)			
			
Pin	iPod Male	Pin	iPod Male
1	GND	16	GND
2		17	-
3	-	18	Rx
4	D+	19	Tx
5	-	20	ACC-DET
6	D-	21	-
7	-	22	-
8	5V	23	Video
9	-	24	-
10	ACC ID	25	-
11	-	26	-
12	-	27	AUX1 L IN
13	-	28	AUX1 R IN
14	-	29	AUX1 GND
15	GND	30	Signal wire GND

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

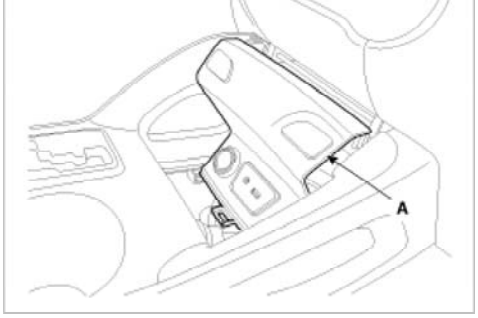
Removal

1. Remove the floor console upper cover (A) using the appropriate tool.



2. Remove the seat heater switch module (A).

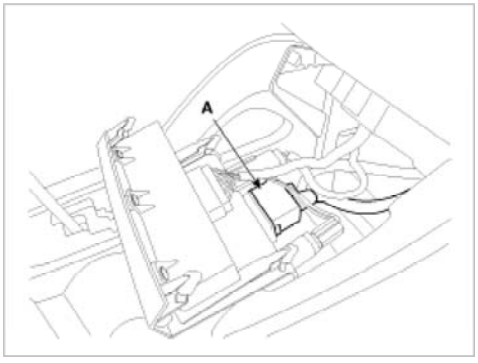
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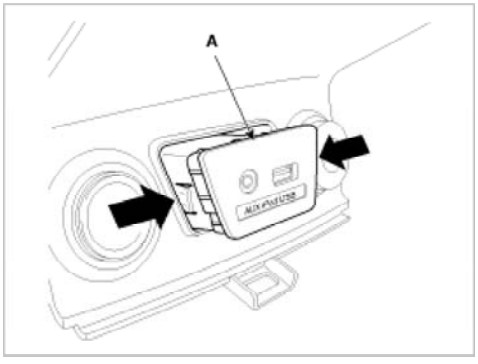
NOTE

Take care not to damage the hook when removing the switch.

3. Disconnect the connectors (A) from the seat heater switch module.



4. Remove the Multimedia Jack (A) from the seat heater switch module after pressing the hooks.



Installation

1. Install the multimedia jack.
2. Connect the AUX jack connector.
3. Install the center console.
4. Install the console upper cover.
5. Install the shift lever knob.

NOTE

Make sure the Aux connector and the console connectors are plugged in properly.

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.

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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.
XM only goes through one category	The XM mode is in category.	Press the mode button to change to channel mode.
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. • The connector is not properly connected. • The device is currently fast-forwarding, rewinding, scanning, or playing in slow mode.	• Adjust the volume level. • Check the connection state. • 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	• 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.

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	• 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.	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 > 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. 2mA

RF Receiver

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

Smart Key Fob

Items	Specification
Battery	Lithium battery 3V
Distance	30m
Battery life	More than 2 years 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

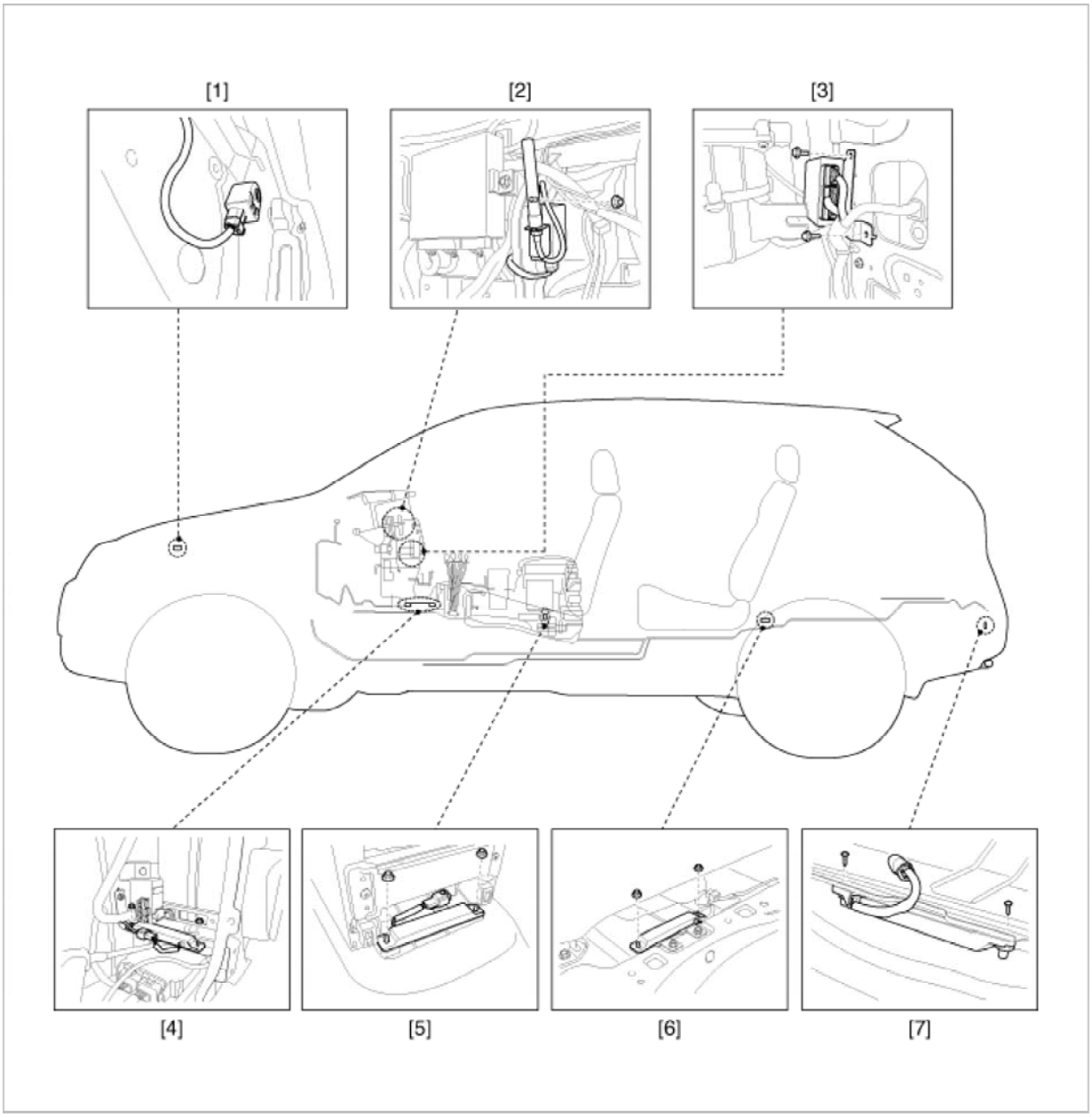
Items	Specification
Rated voltage	DC 12V

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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

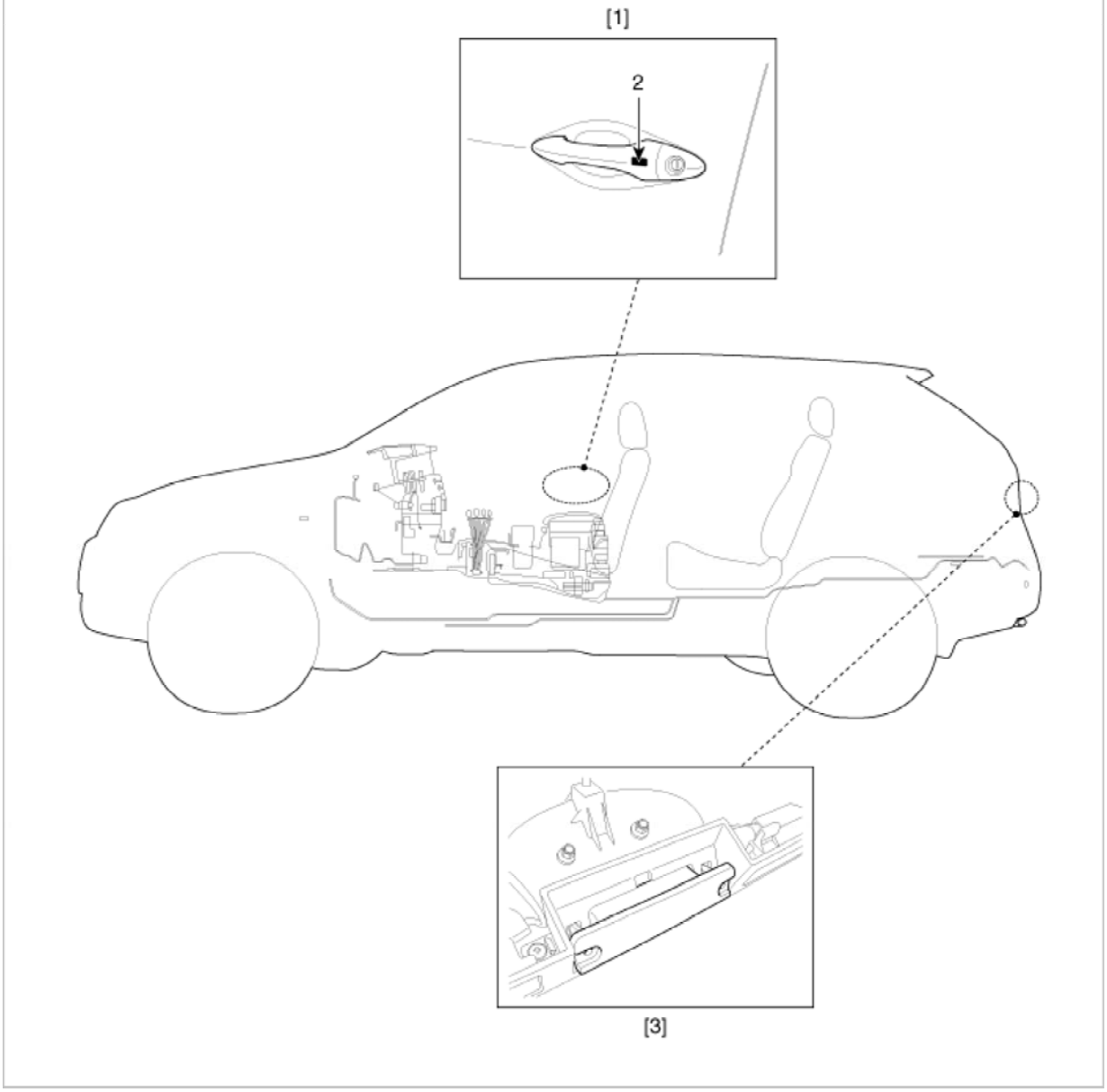
Component Location (1)



1. Buzzer 2. RF receiver 3. Smart key unit 4. Interior antenna 1	5. Interior antenna 2 6. Interior antenna 3 7. Bumper antenna

Component Location (2)

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1. Door outside handle 2. Door outside handle button	3. Tailgate switch

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
- Max. 2 fobs can be handled by the system
- Immobilizer backup antenna driver integrated into FOB-HOLDER for TP authentication (i.e. limp home mode)

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- 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 the user to release ESCL and 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 inserting the key into the FOB HOLDER.

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), P(A/T) or N(M/T) 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), P(A/T) or N(M/T) 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).

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The SMART KEY FOB's response is received via the external RF receiver, which is connected to the SMK ECU via a serial communication Line.
The SMK ECU provides a connector pin for the serial communication Line.

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.

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 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 Tailgate Lid Switch when tailgate is closed indicates the operator's intent to open the tailgate 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 "tailgate open" message via the CAN network.

Passive Trunk Warning

Whenever the trunk is closed, SMK ECU uses a suitable search strategy to avoid trunk buzzer warning by a fob outside the vehicle. Then SMK searches for a SMART KEY FOB in the interior of the trunk. If a valid SMART KEY FOB is found in the trunk, the SMK ECU activates SMK external buzzer to inform the user that the trunk has been closed with a fob inside the trunk.
SMK will send the trunk open command to BCM for trunk reopening if Trunk reopening bit is set(BK)For this functionality, a "valid" SMART KEY FOB means any SMART KEY FOB that belongs to the vehicle, even if it's DEACTIVATED.

> NOTE
>
> - A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning. Due to the penetration of the bumper antenna into the trunk area the lid may open without an Identification Device outside.
> - A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning

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

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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 sends request toward PDM to search 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

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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 WNG 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, PDM and FOBs is described.
For the learning of the SMK, PDM and 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, Fob-In signal must be active 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 PDM 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, PDM and SMART FOB are already learnt with same PIN code
- PDM replacement: PDM is not learnt, SMK and SMART FOB are already learnt with same PIN code
- ESCL replacement: ESCL is not learnt, SMK and PDM and SMART FOB are already learnt with same PIN code
- Additional or new keys teaching: SMK and PDM are already learnt with same PIN code

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Smart key teaching

Insert smart key #1 to key holder
↓
SMK start to learn
↓
Input the PIN code
↓
PDM start to learn
↓
Smart key #1 learnt
↓
SMK/PDM learnt
↓
Pull out smart key #1
↓
Insert smart key #2 to holder
↓
Smart key #2 learnt

- Smart key and transponder are programmed simultaneously.

<Smart key neutralization mode>

- Neutralization mode is for replacing Smart key unit, PDM ECM easily.
- It is possible that smart key is learnt again, after neutralizing Smart key system.
- Virgin start (twice ignition) is impossible in neutralized condition

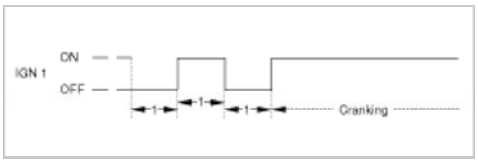
<Lock by timer>

- If PIN code is inputted over 3 times, it is impossible to learnt and neutralization during 1 hour.

Starting After Replacing (Virgin Start)

Starting is possible by following process after replacing new smart key unit , PDM and FOB key.

- It is for starting at virgin condition
- All related parts are virgin condition (Smart key, IPM, PDM, ECM)
- When virgin smart key is inserted in smart key holder, possible to start, IG ON and ACC position
- Press brake pedal in P or N range
- After inserting virgin smart key to holder, push start button once.



Body Electrical System > Smart key System > 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.

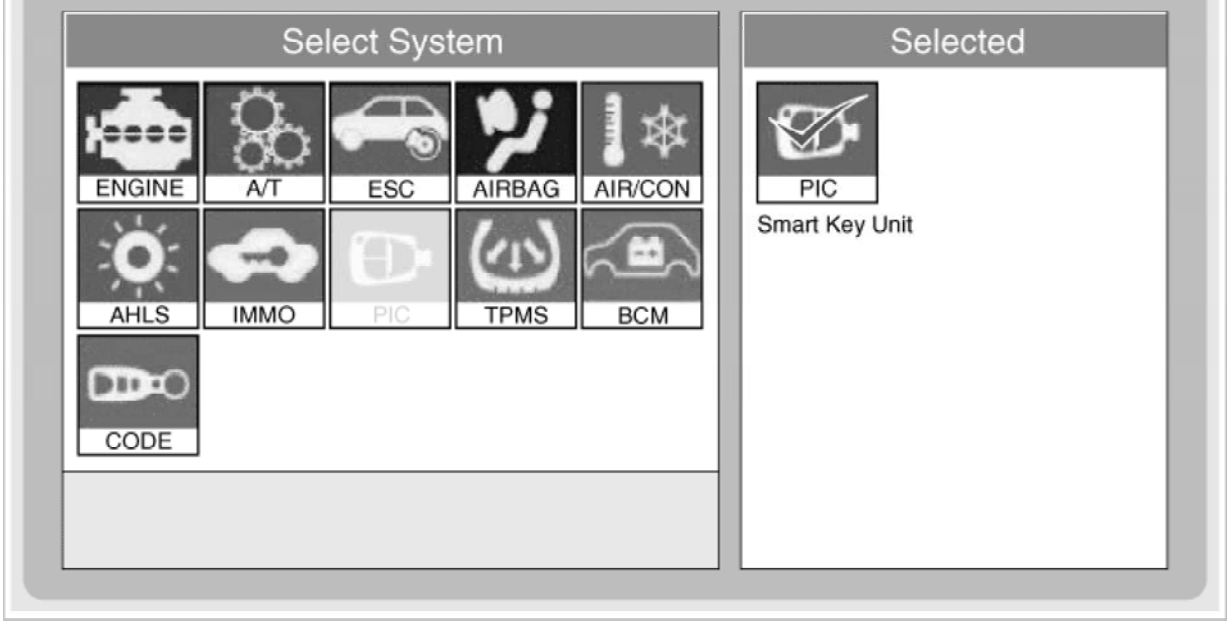
So the following three diagnosis operates will be the major problem solution process.

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

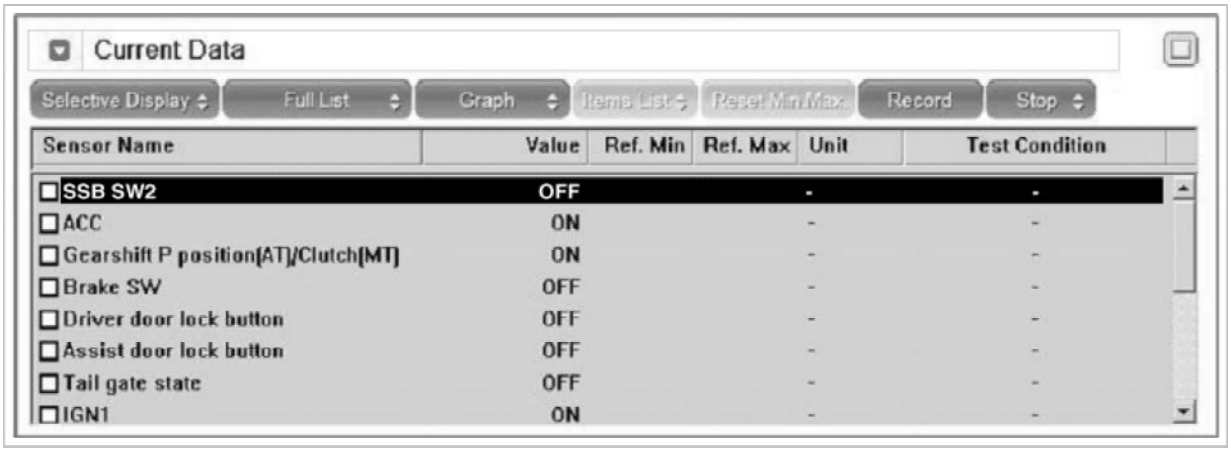
Switch Diagnosis

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.

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



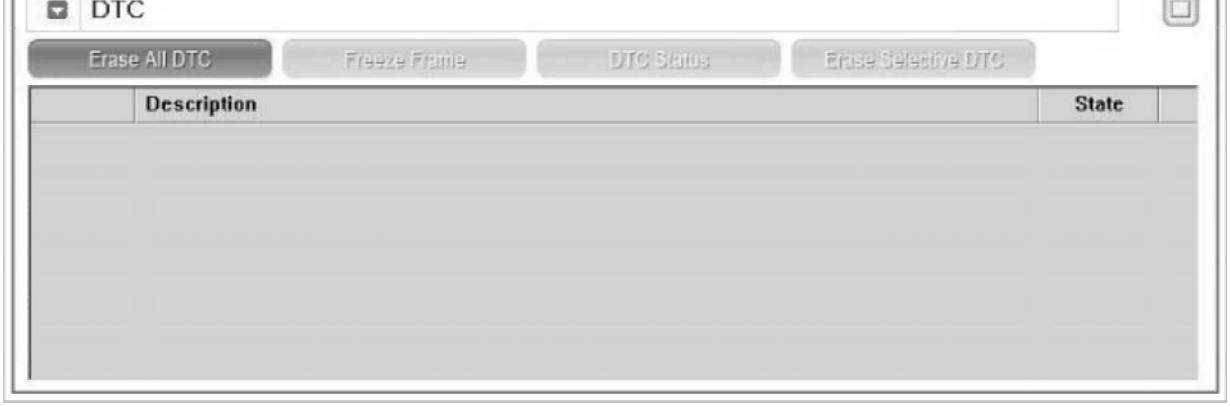
5. You can see the situation of each switch on scanner after connecting the "current data" process.

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.
Trunk SW	ON : Trunk 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.
Push Knob SW	ON : Push knob switch is ON.
External Buzzer	ON : Buzzer is ON.

Communication Diagnosis With GDS (Self Diagnosis)

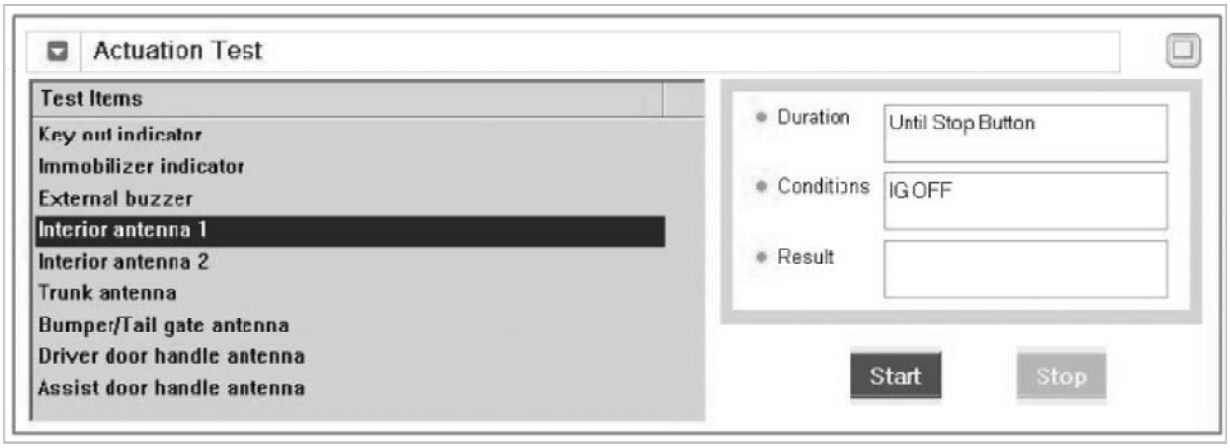
1. Communication diagnosis checks that the each linked components operates normal.
2. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
3. After IG ON, select the "DTC".

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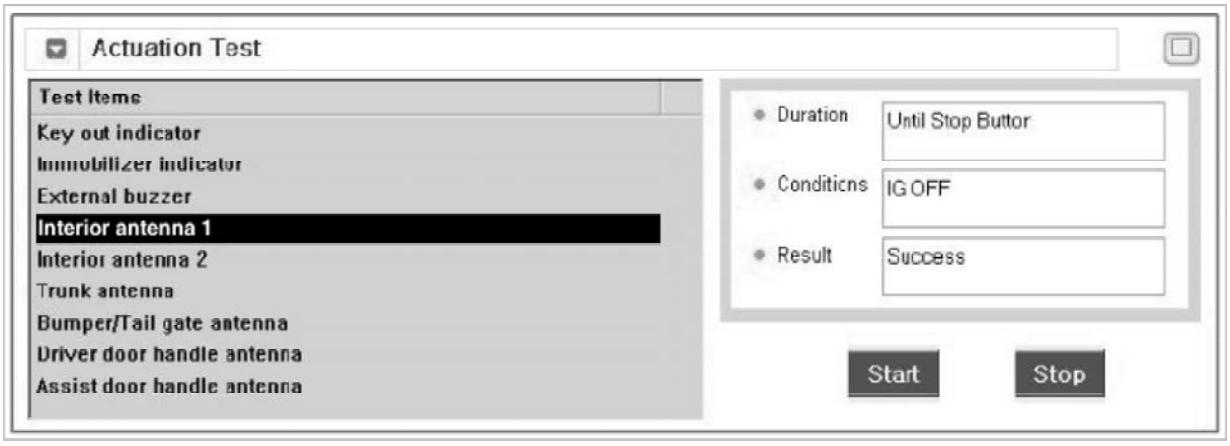


Antenna Actuation Diagnosis

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.

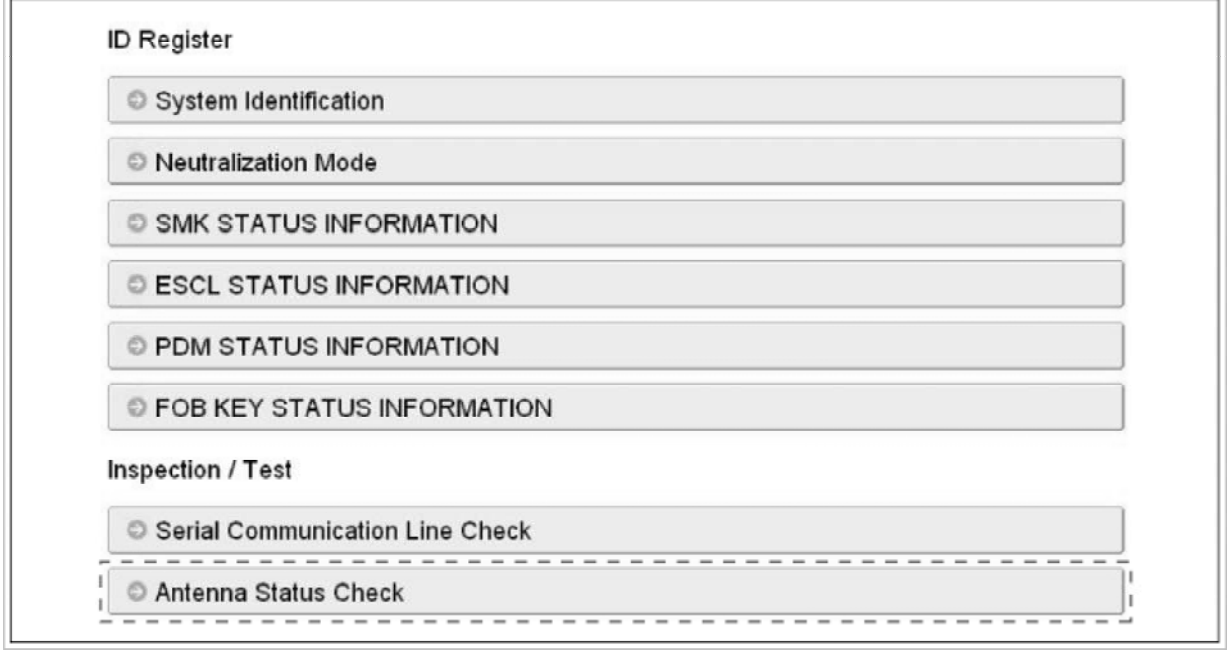


4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/ Trunk Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

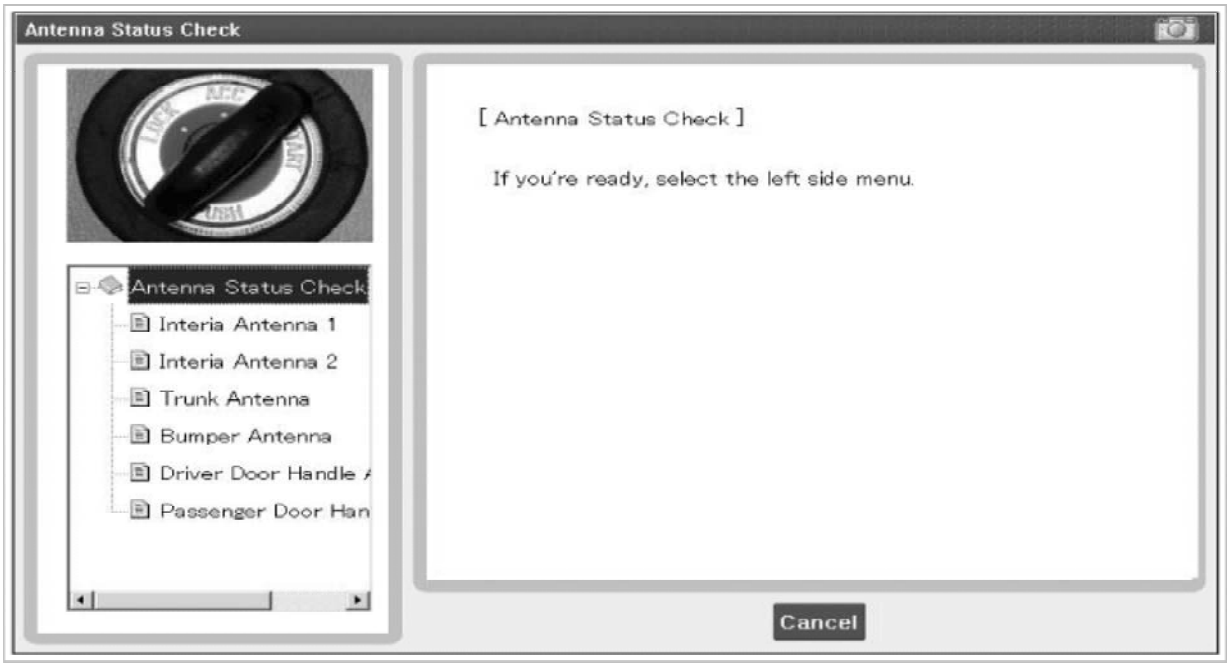
Antenna Status Check

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

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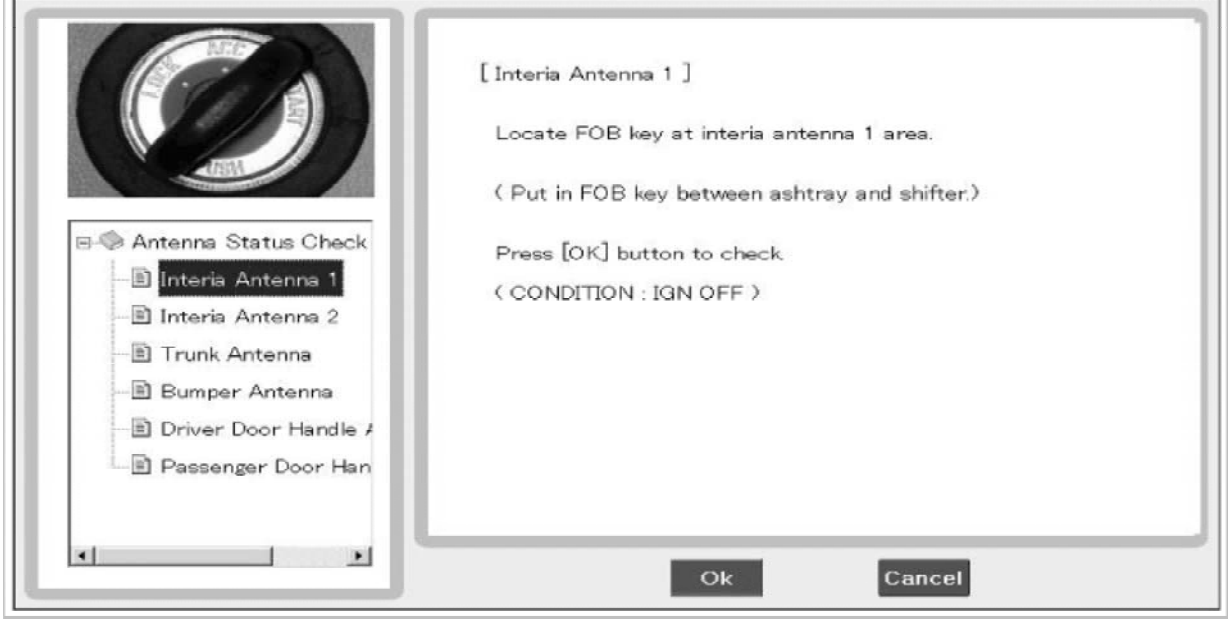


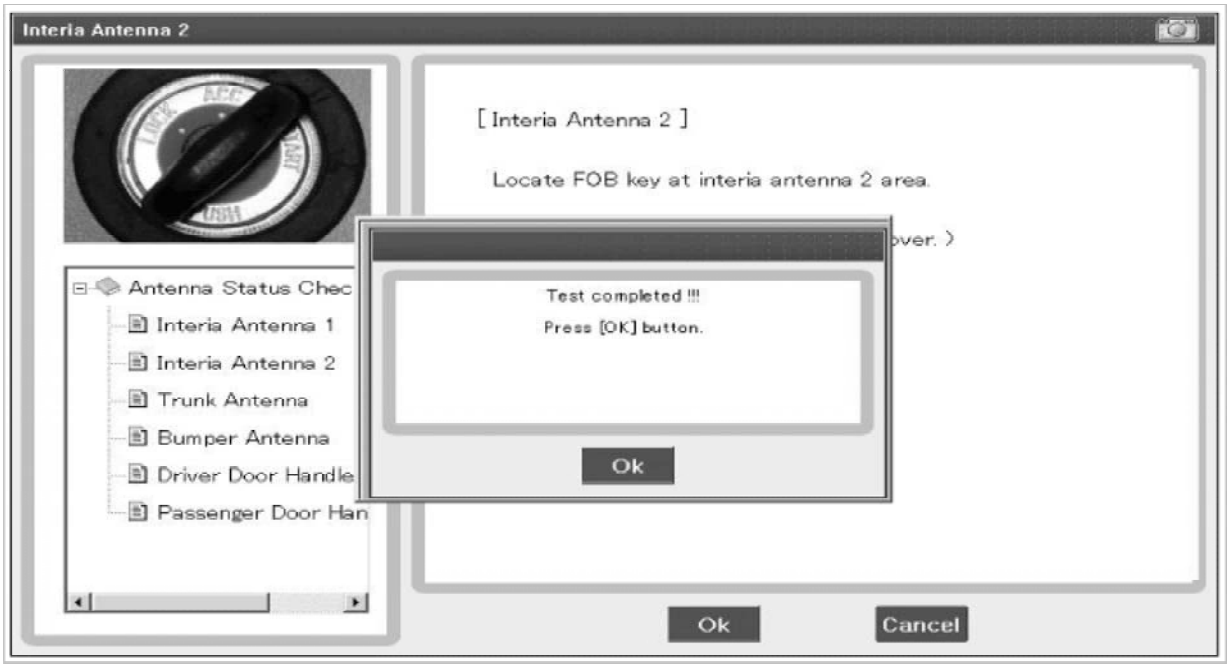
3. After IG ON, select the "Antenna Status Check".



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

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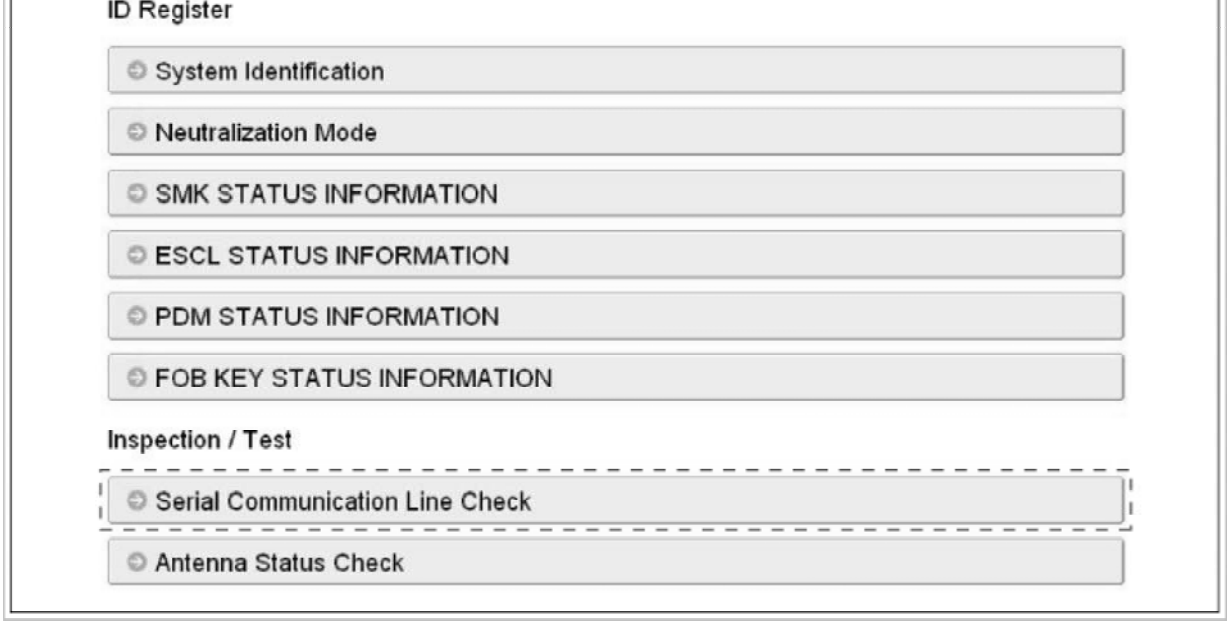


5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/ Trunk Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

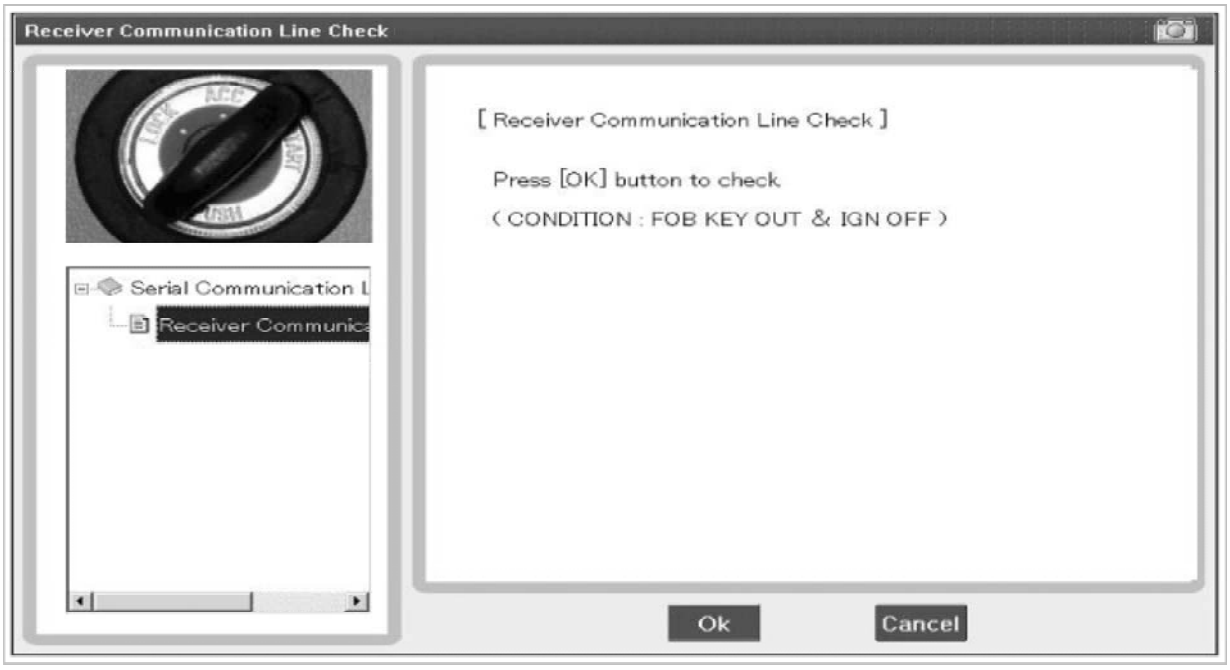
Serial Communication Status Check

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".

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

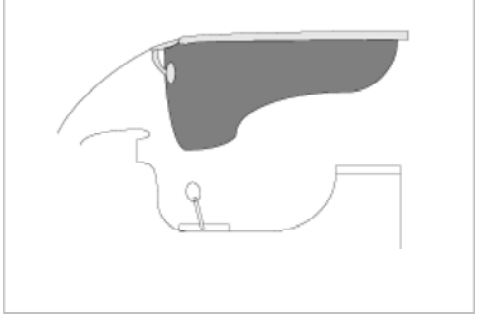


4. Check the serial communication line with a GDS.
5. If the smart key runs normal, the communication of smart key unit and exterior receiver are normal.
6. If the smart key runs abnormal, check the following items.
   A. Disconnection or no response of the exterior receiver communication line.
   B.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

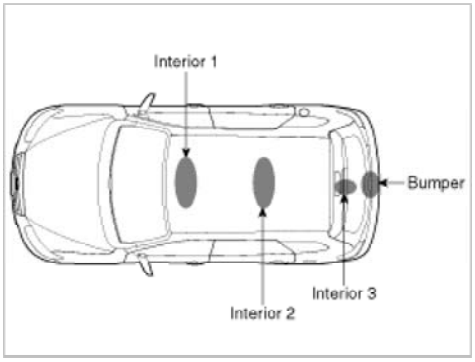
Interior Antenna Actuation Check

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

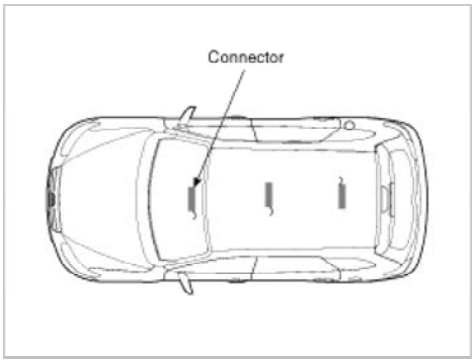
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2. If the ignition is ON, the antenna runs normal.
3. Check the interior antenna ignition mode.
4. Set the smart key in the following shade area and actuate the antenna. Check the LED of smart key is blinking.



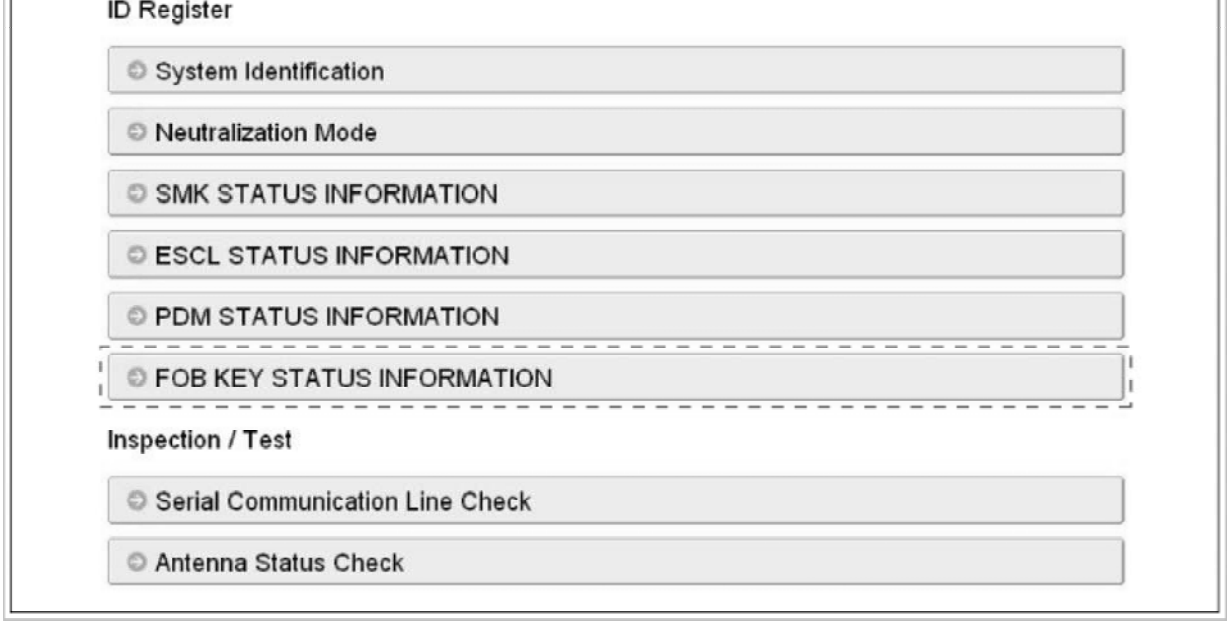
5. If the LED of smart key is not blinking, check the antenna in shade area.

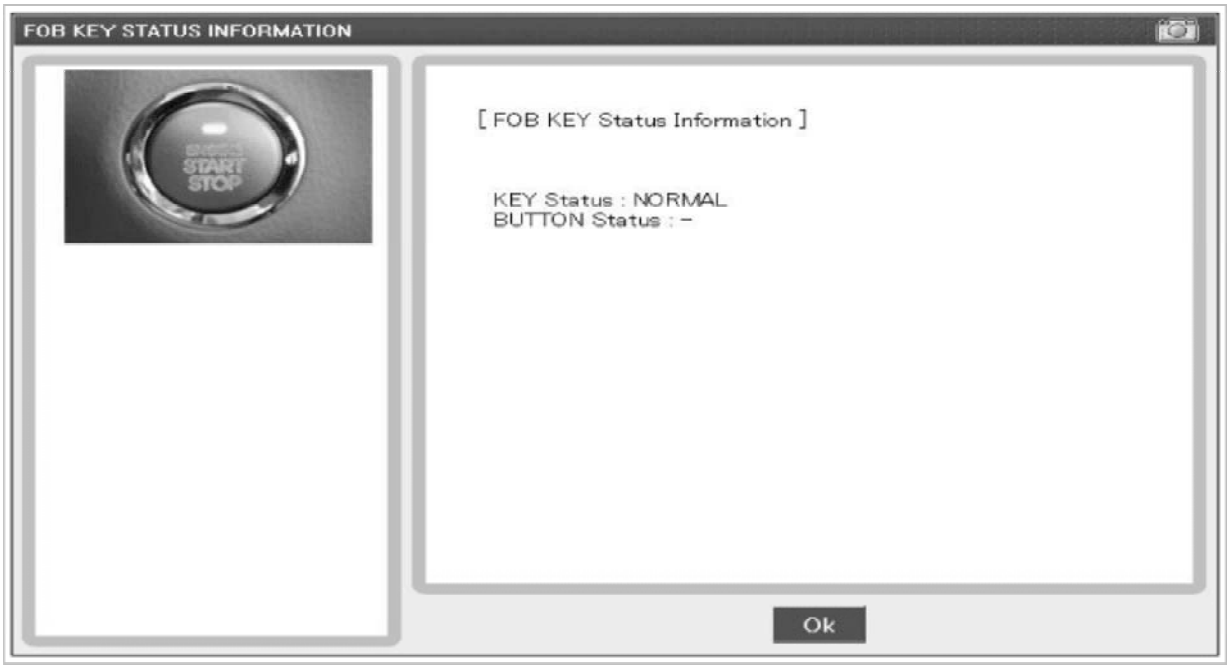


FOB Status Check

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".

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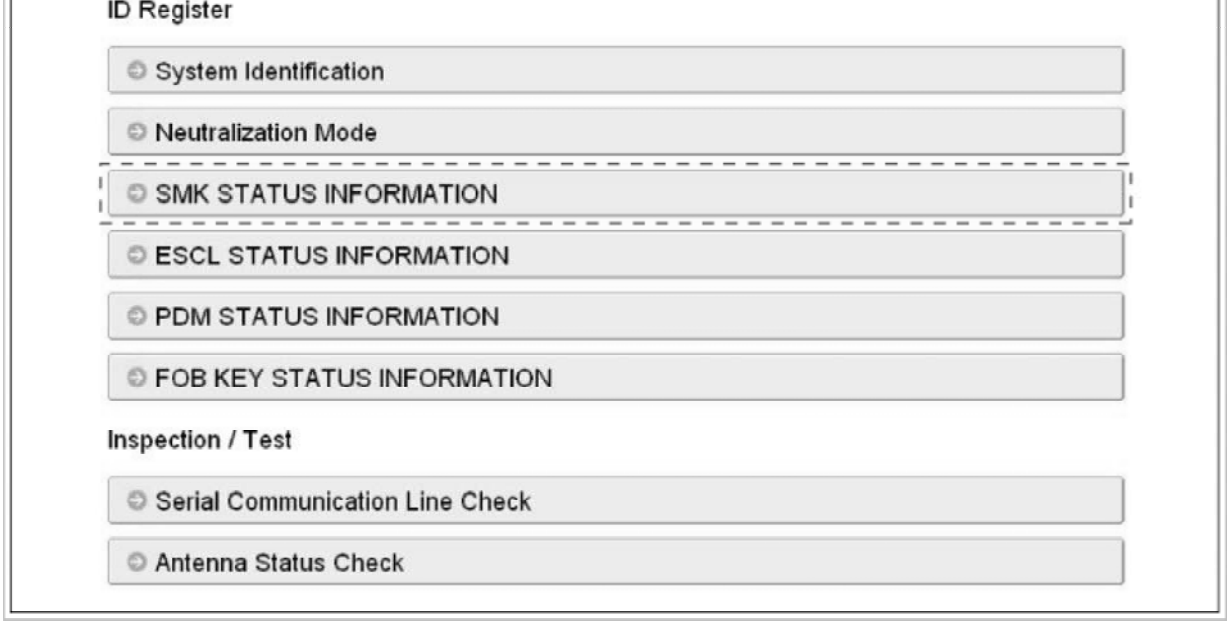


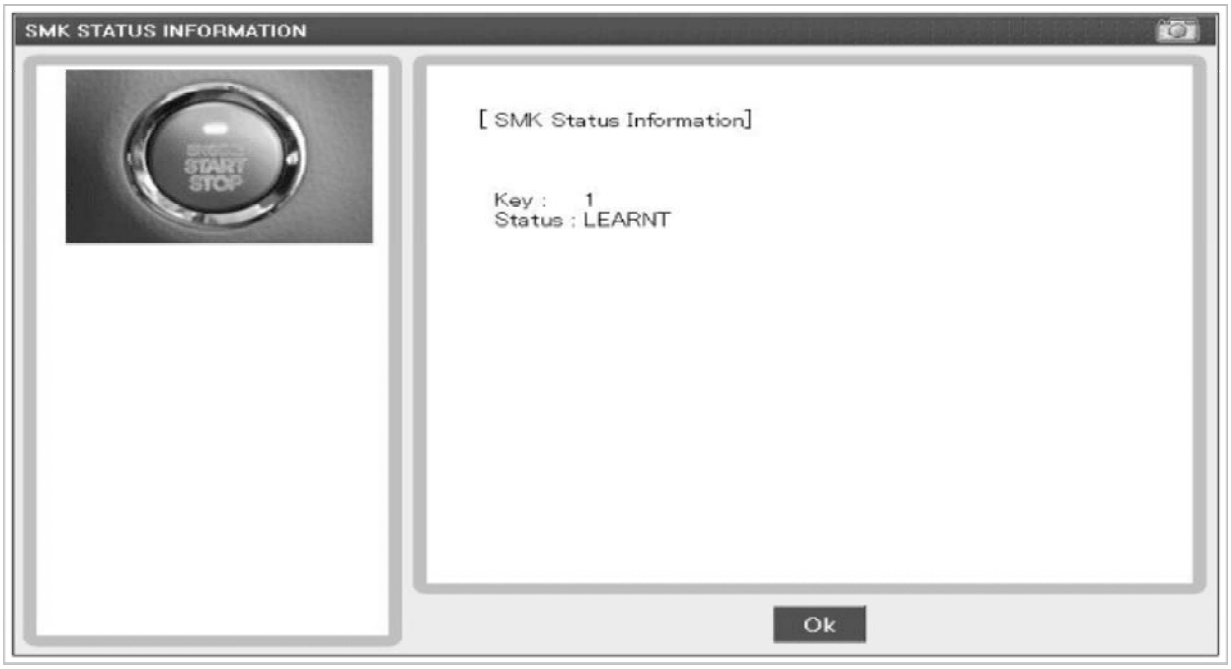


Smart Key Status Check

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".

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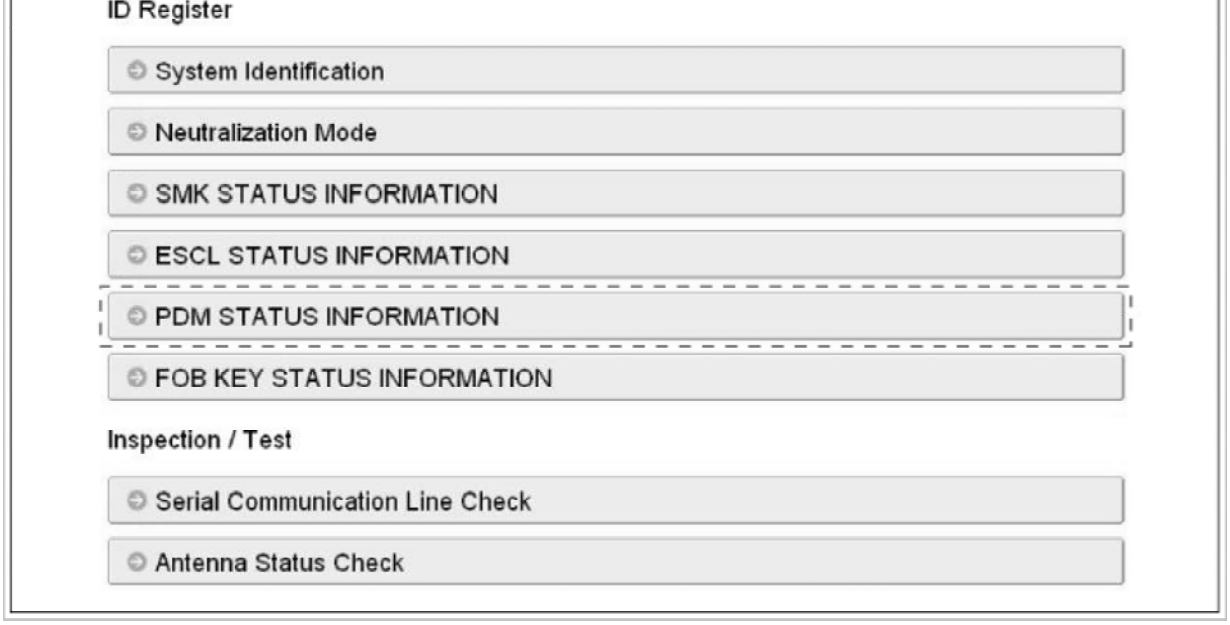


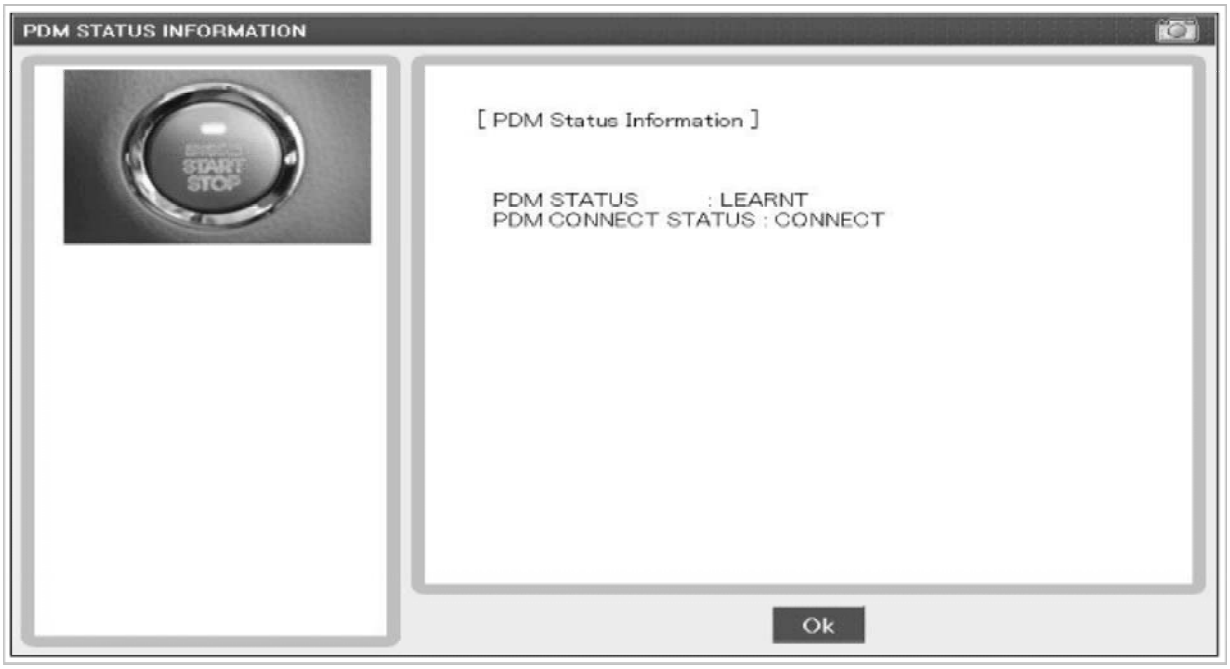


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PDM Status Check

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

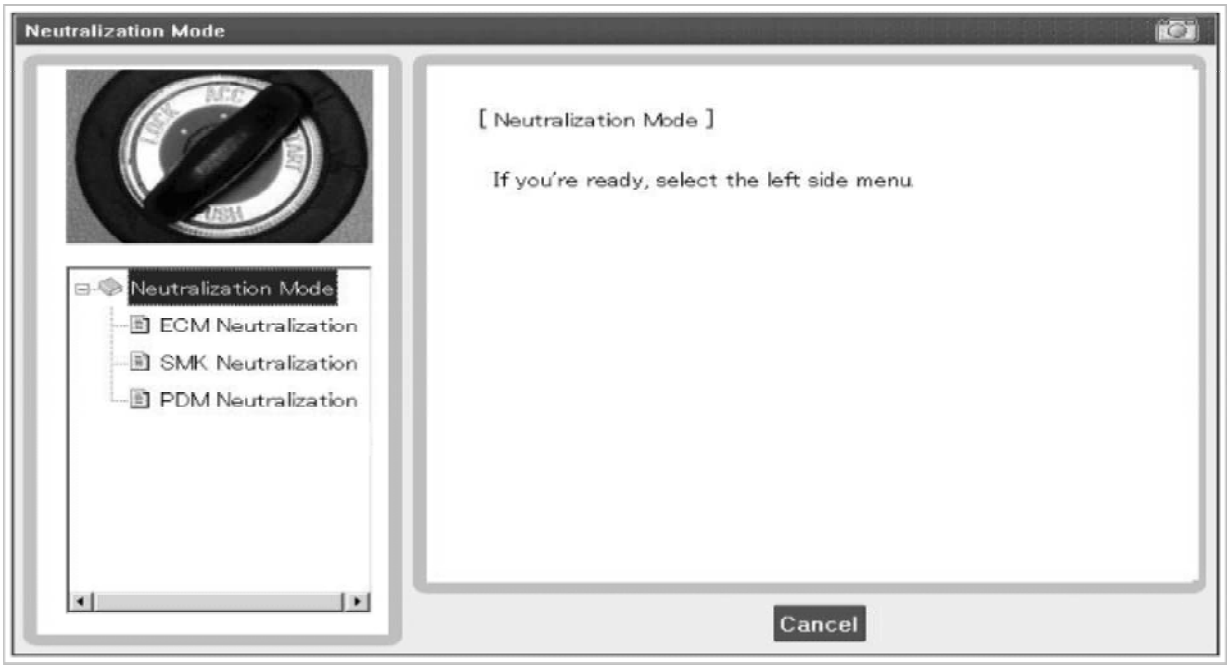
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ID Register

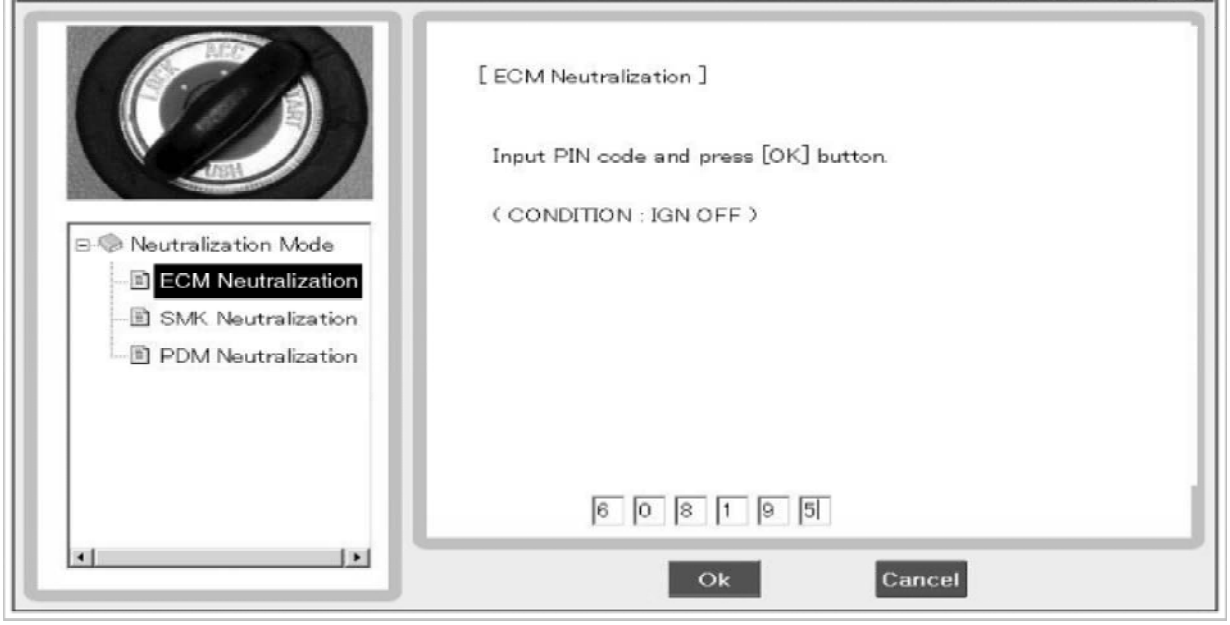
- System Identification
- Neutralization Mode
- SMK STATUS INFORMATION
- ESCL STATUS INFORMATION
- PDM STATUS INFORMATION
- FOB KEY STATUS INFORMATION

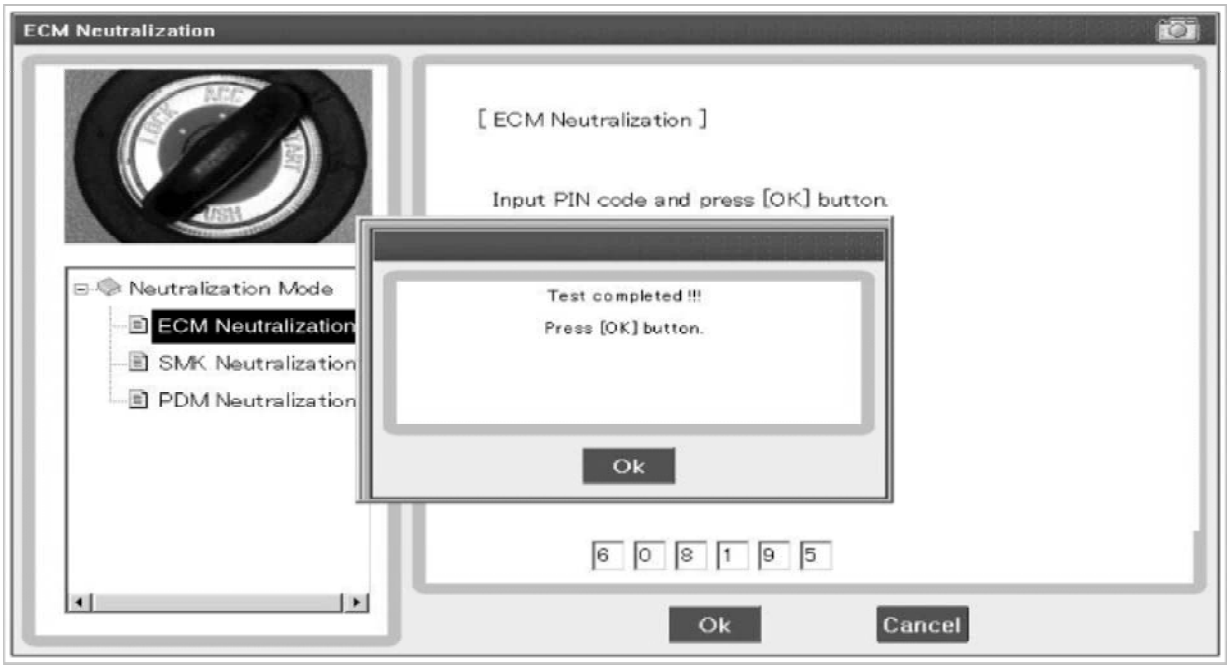
Inspection / Test

- Serial Communication Line Check
- Antenna Status Check

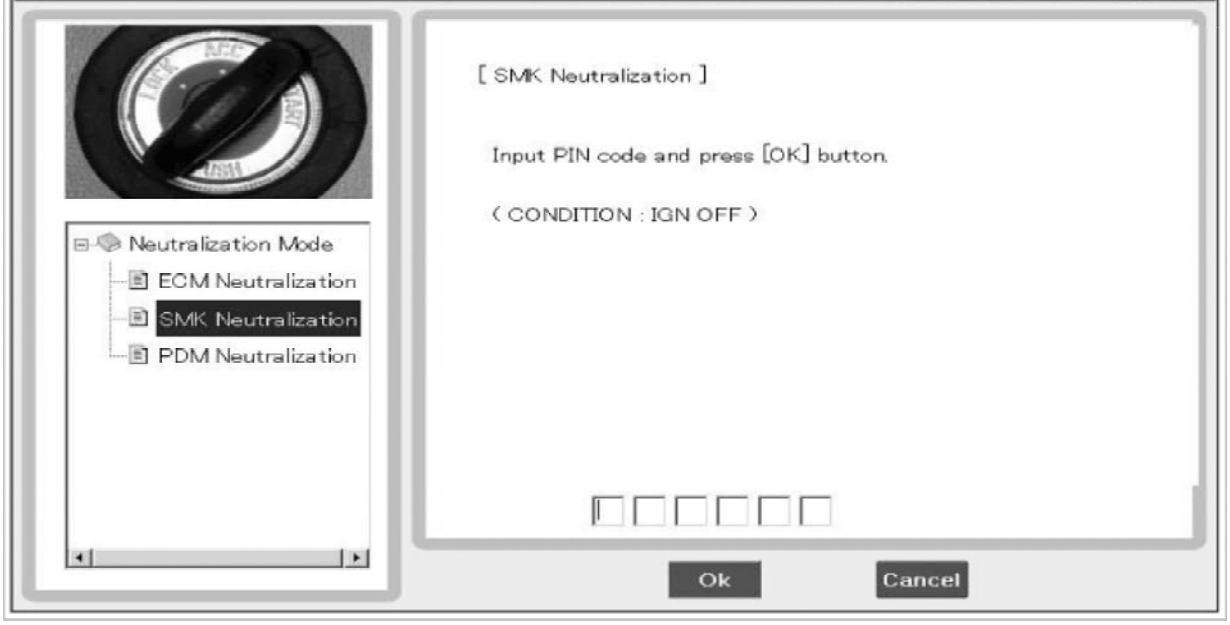


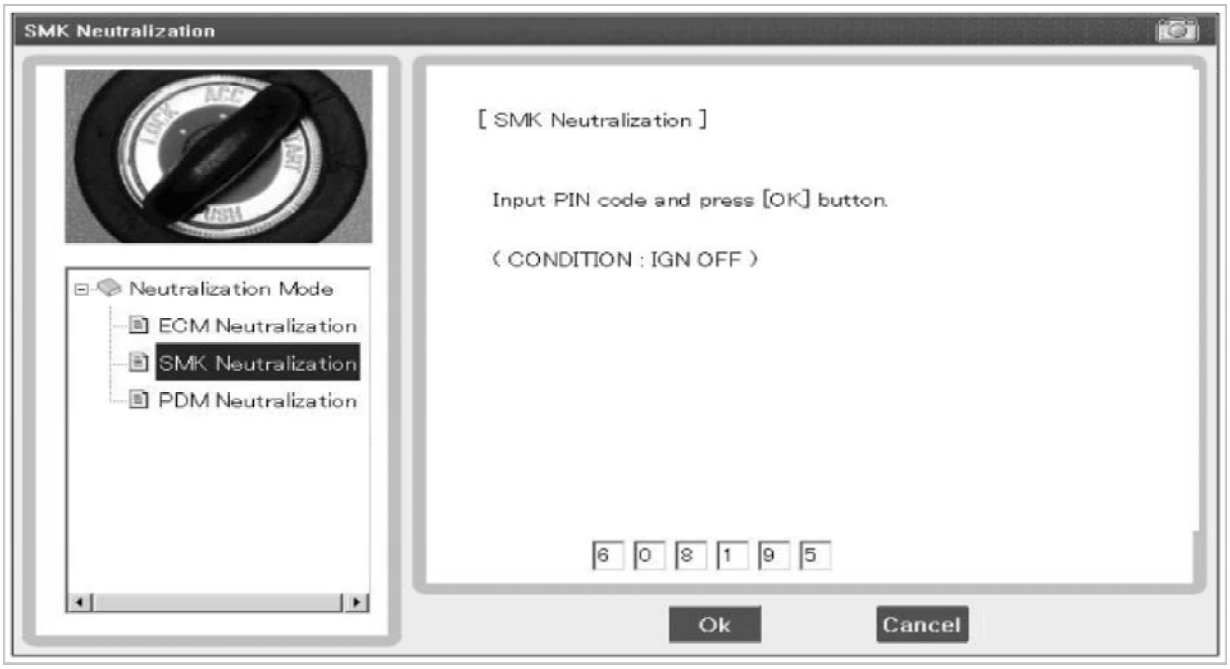
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[ECM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
6 0 8 1 9 5
Ok
Cancel

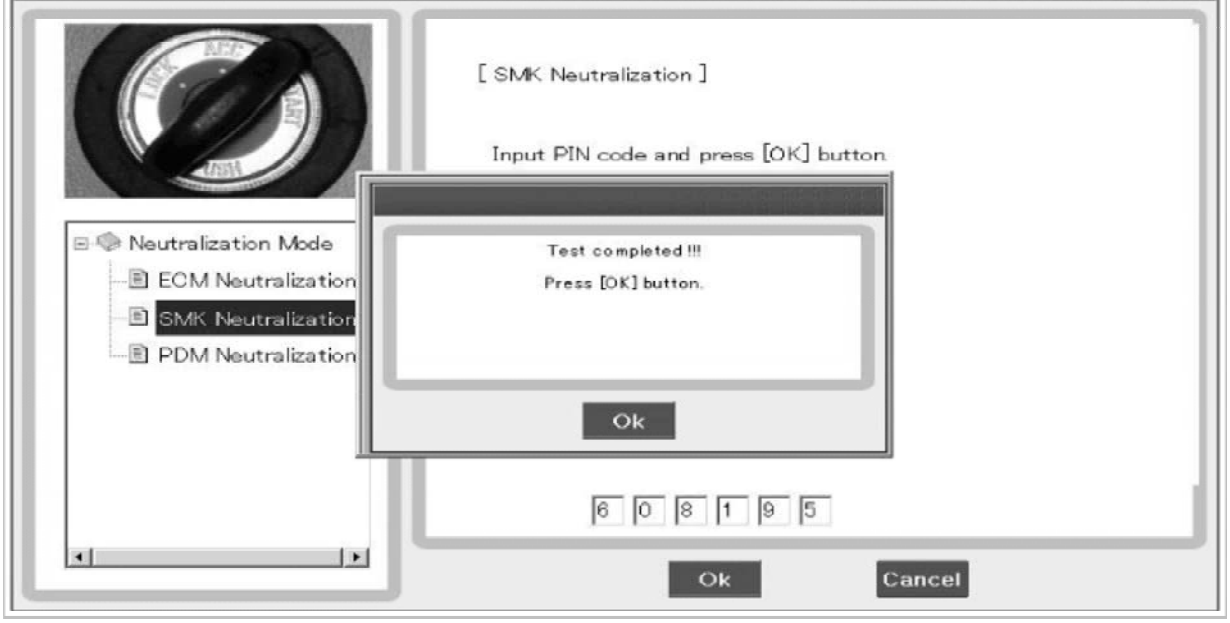

ECM Neutralization
[ECM Neutralization]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
6 0 8 1 9 5
Ok
Cancel

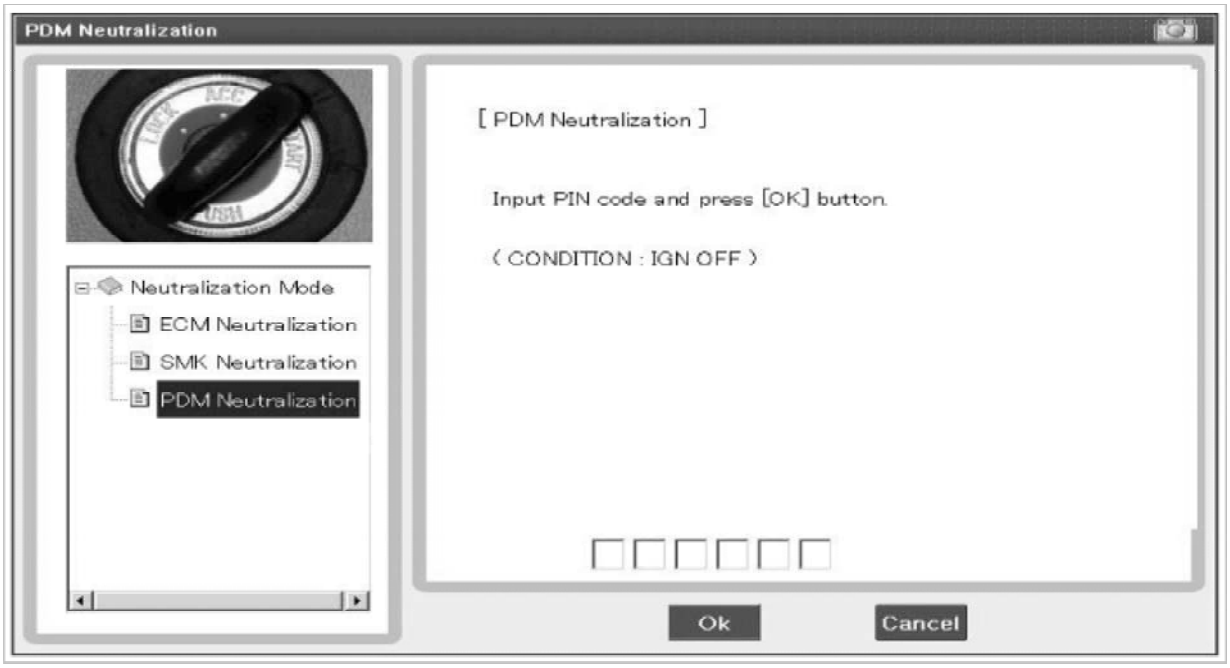
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[SMK Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
Ok
Cancel

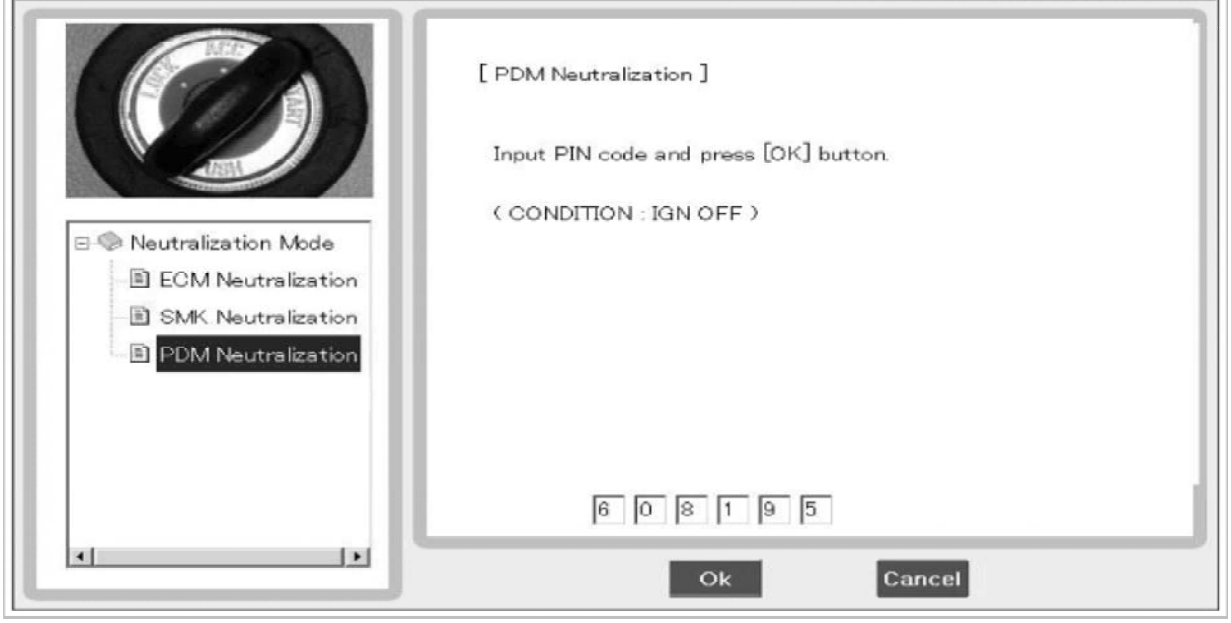

SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
6 0 8 1 9 5
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
Ok
Cancel

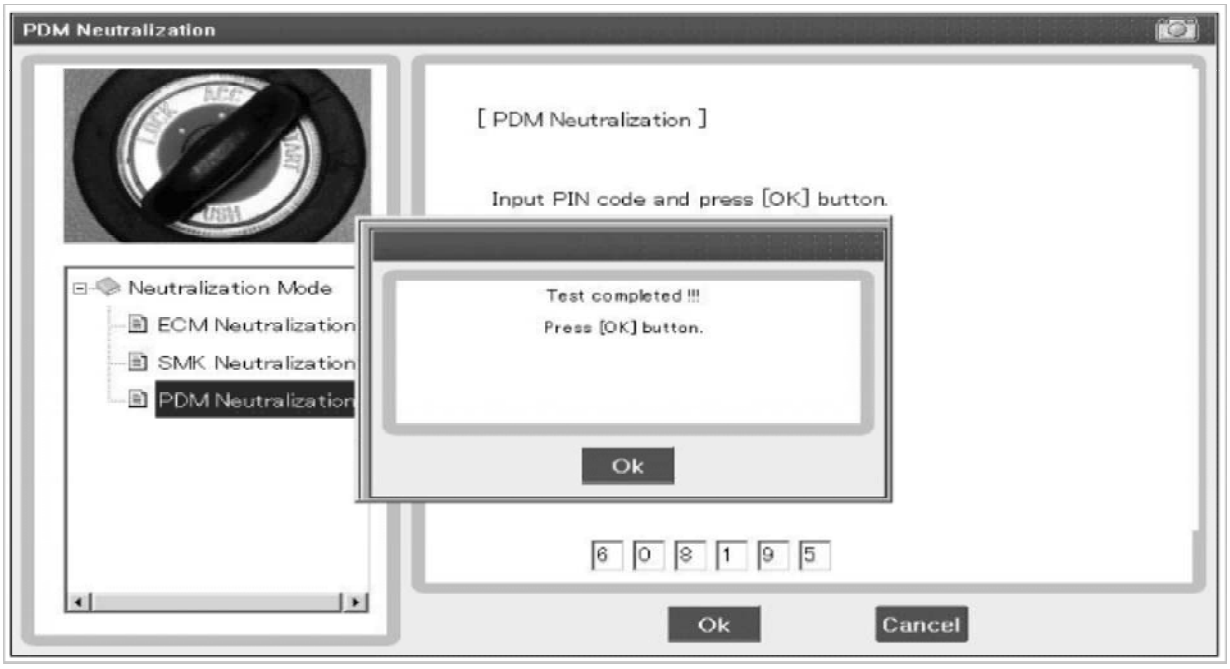
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[SMK Neutralization]
Input PIN code and press [OK] button.
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
Test completed !!!
Press [OK] button.
Ok
6 0 8 1 9 5
Ok
Cancel


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

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Input Switch List

No	Item name	Unit
1	SSB SW2	-
2	ACC	-
3	IGN1	-
4	Gear 'P' Position	-
5	Brake SW	-
6	FL Door Lock Button	-
7	FR Door Lock Button	-
8	Trunk Lid SW	-
9	Battery Voltage	-
10	Alternator Voltage	-
11	KEY out Indicator Lamp	-
12	Immobilizer Lamp	-

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Actuator List

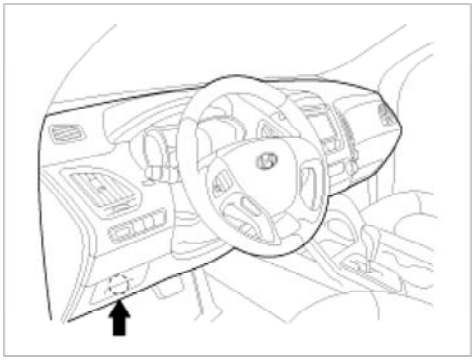
No.	Item name	Condition
1	KEY out Indicator Lamp	Ignition switch ON Engine off
2	Immo.indicator Lamp	Ignition switch ON Engine off
3	External Buzzer	Ignition switch ON Engine off
4	Interior Antenna 1 Active	Ignition switch ON Engine off
5	Interior Antenna 2 Active	Ignition switch ON Engine off
6	Interior Antenna 3 Active	Ignition switch ON Engine off
7	Bumper/trunk Antenna Active	Ignition switch ON Engine off
8	DRV_DR Antenna Active	Ignition switch ON Engine off
9	AST_DR Antenna Active	Ignition switch ON Engine off

Body Electrical System > Smart key System > Smart key > Repair procedures

Smart Key

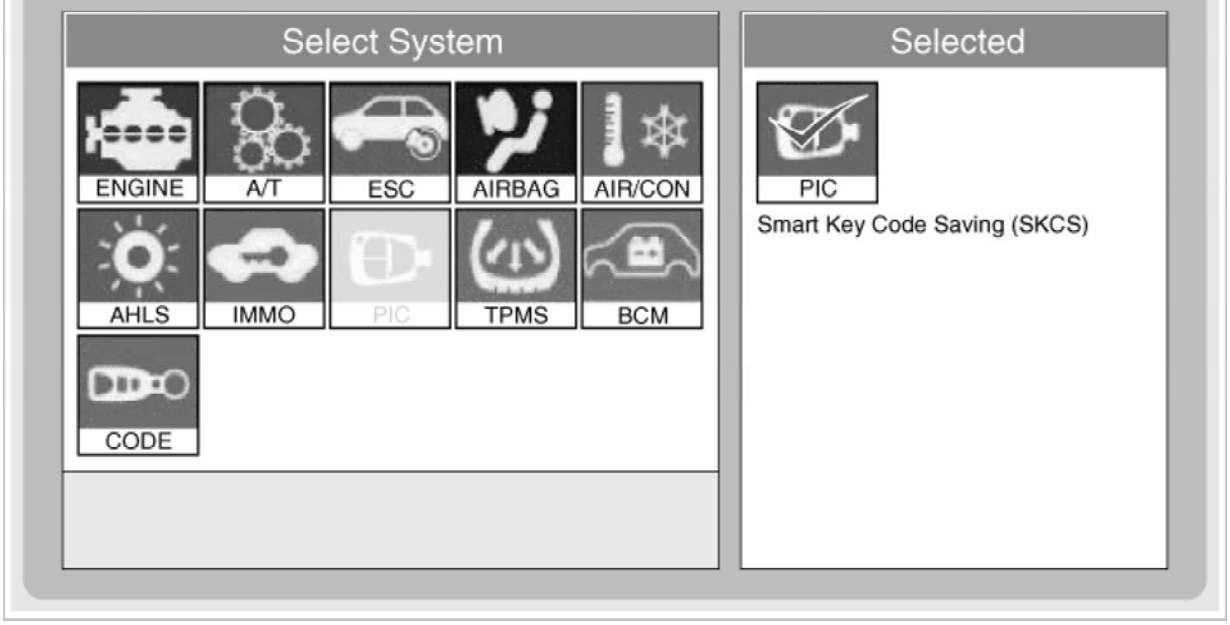
Smart Key Code Saving

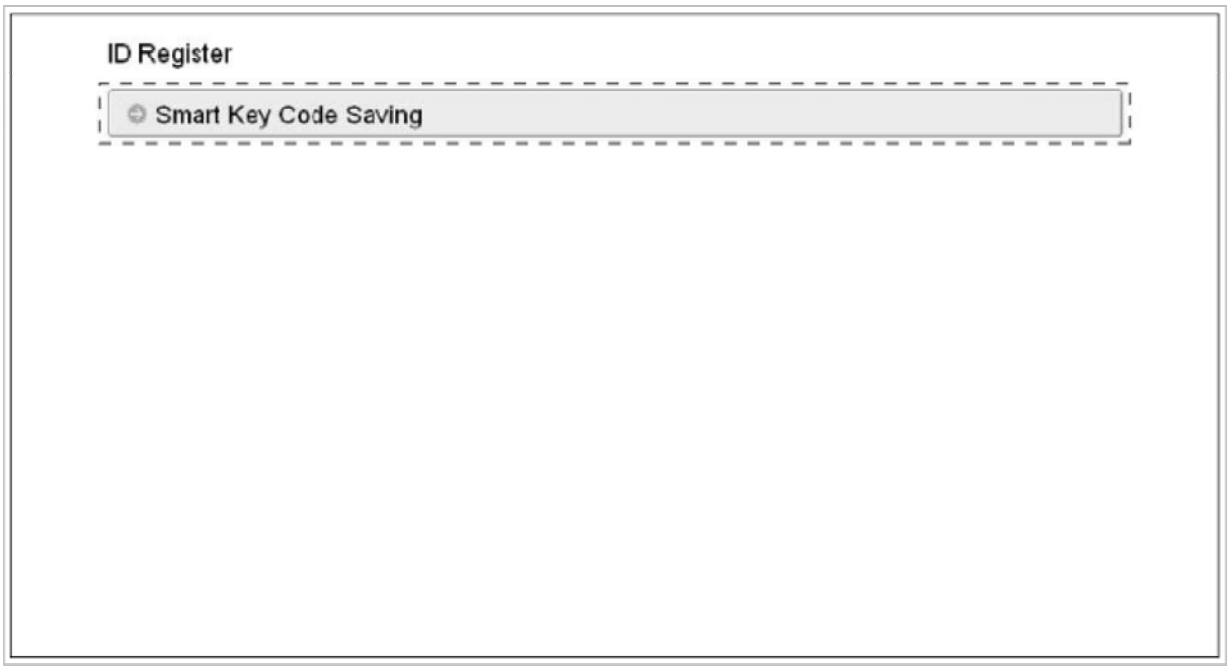
1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.



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

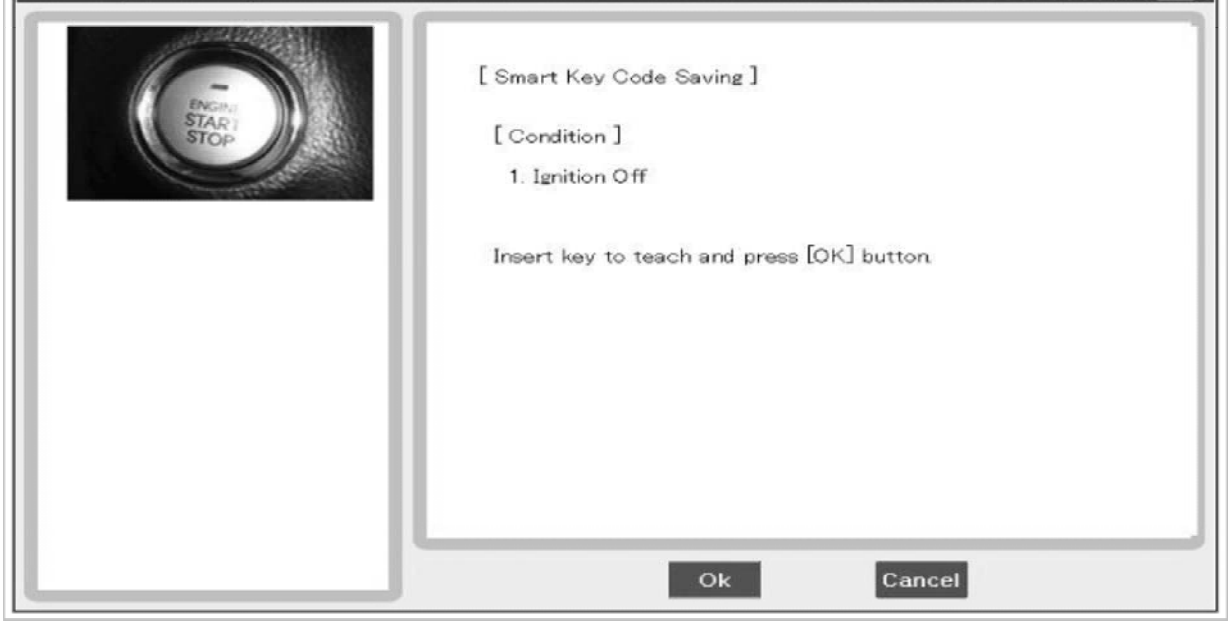
mcx30.com



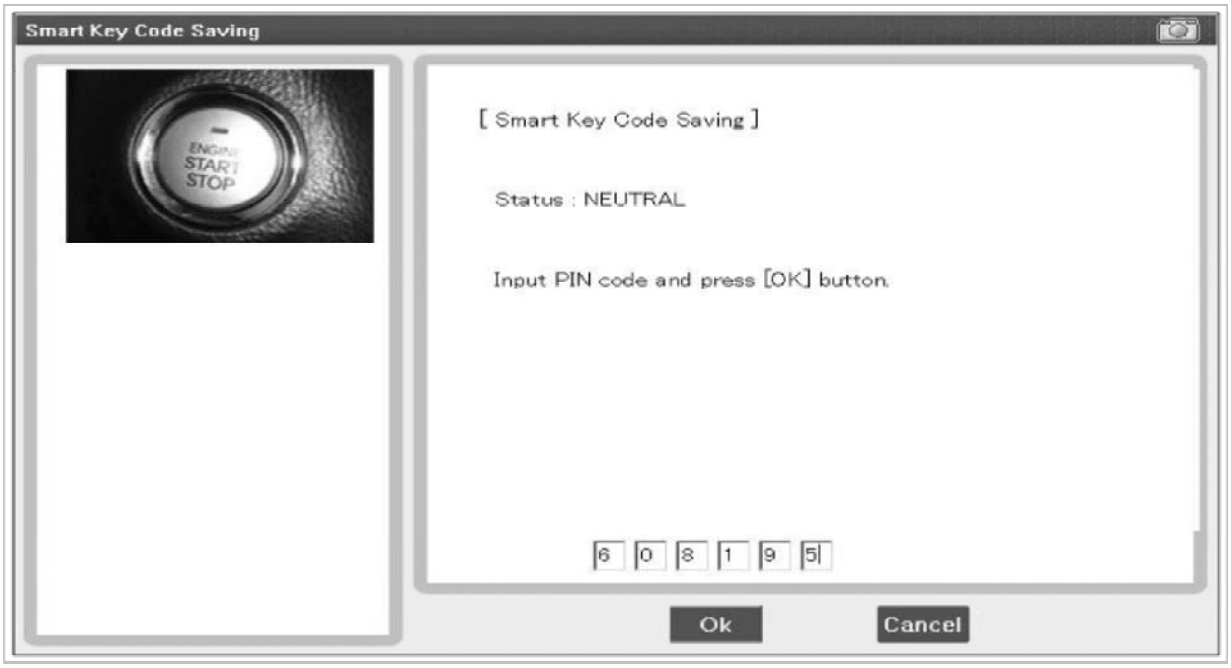


3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

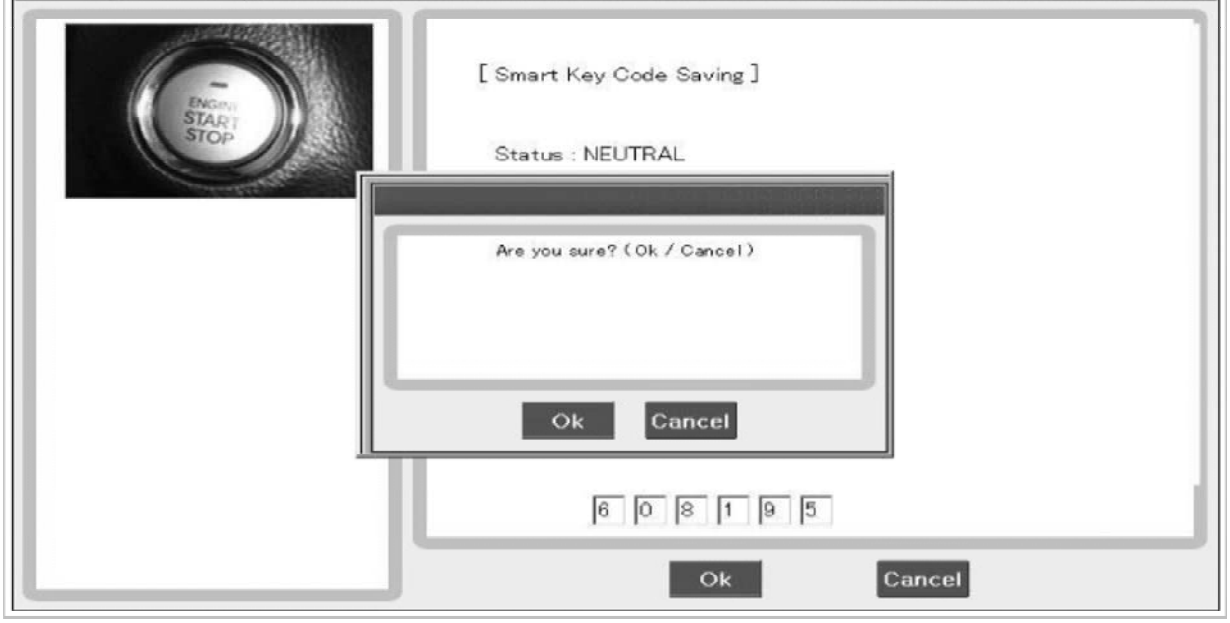
mcx30.com



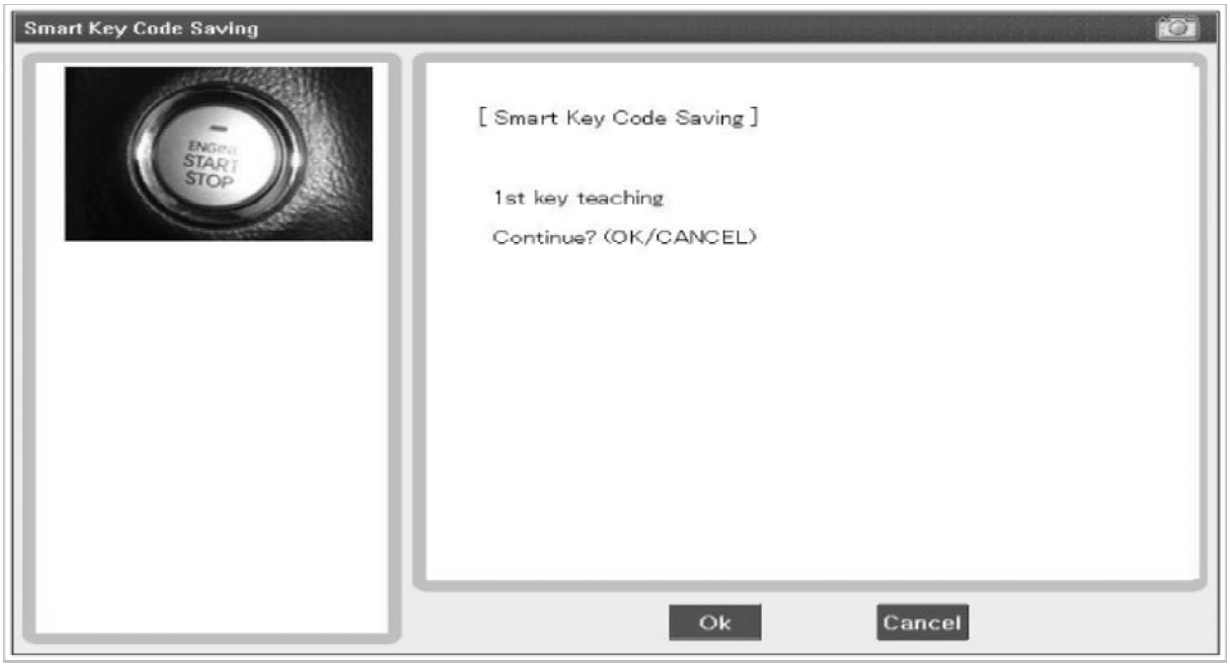
4. After inserting the teaching key, push "ENTER" key.
5. Input the "Pin code" for first key teaching.



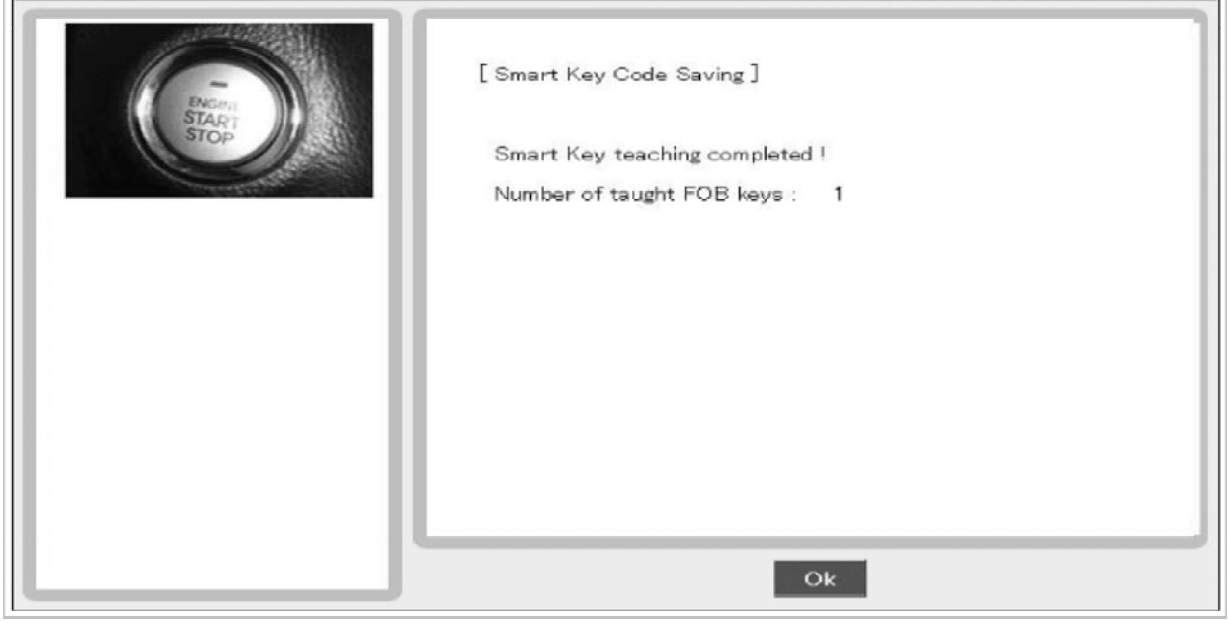
mcx30.com



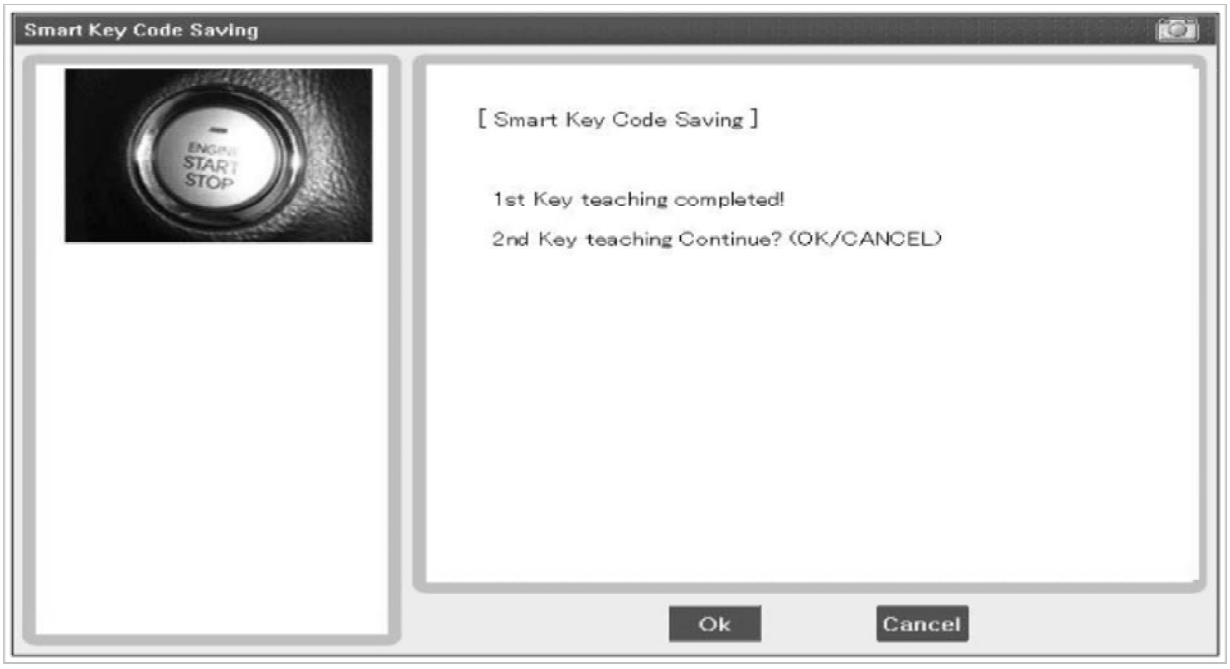
6. Confirm the message "First key teaching completed".



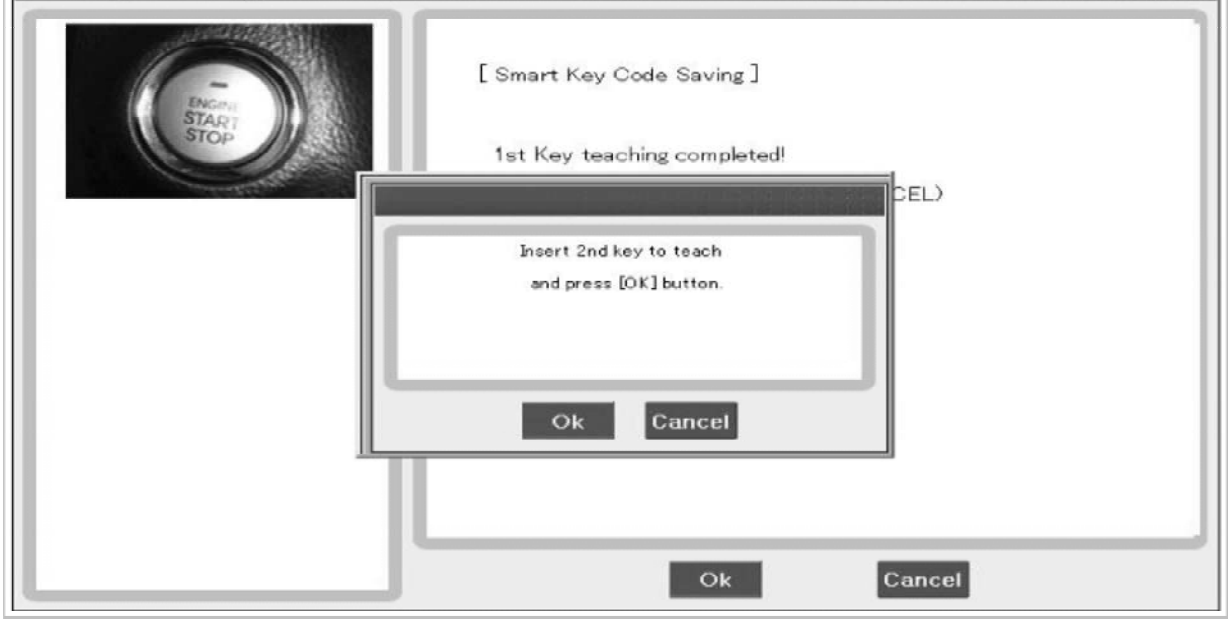
mcx30.com



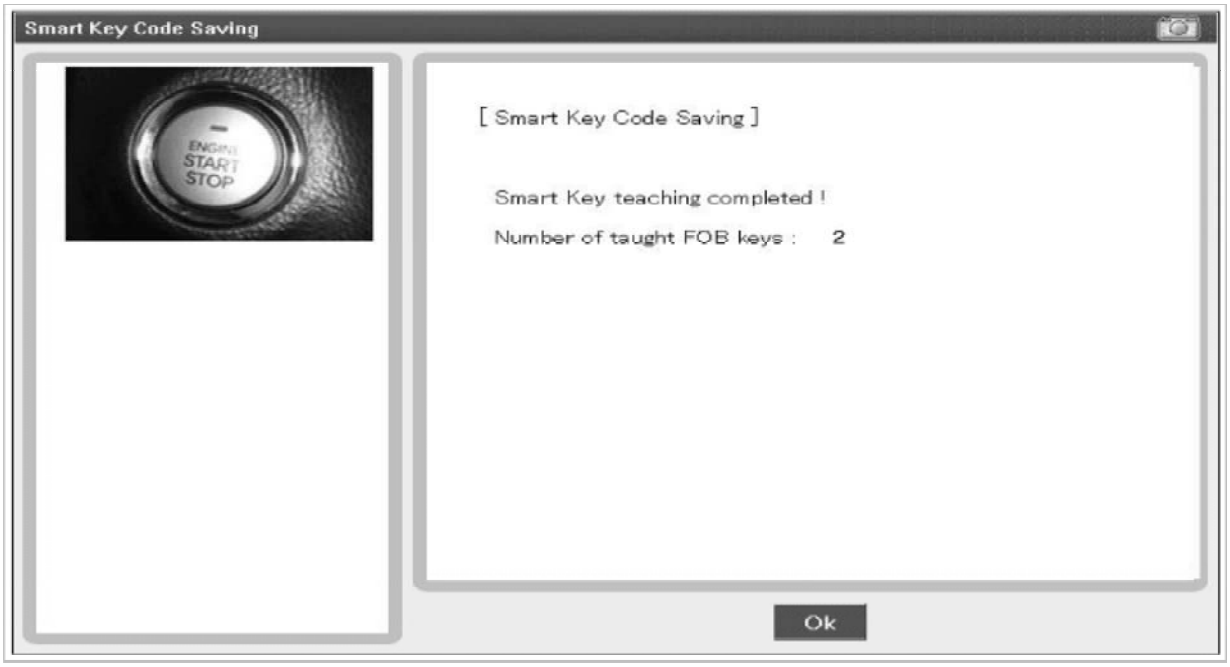
7. Input the "Pin code" for second key teaching.



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

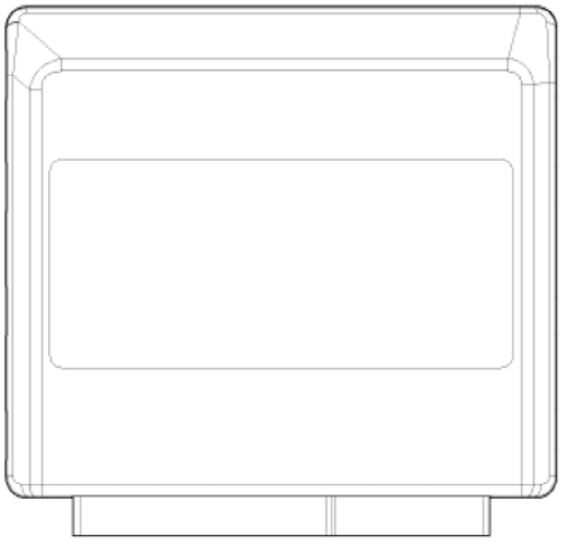


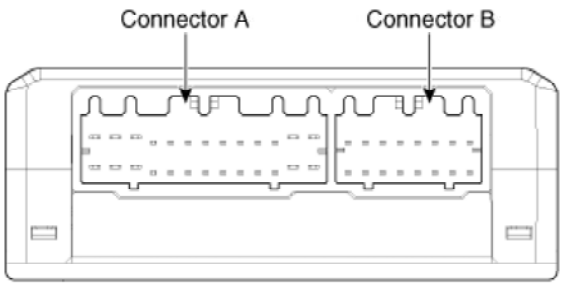
9. Then the screen will be shown as below when key teaching process is completed.

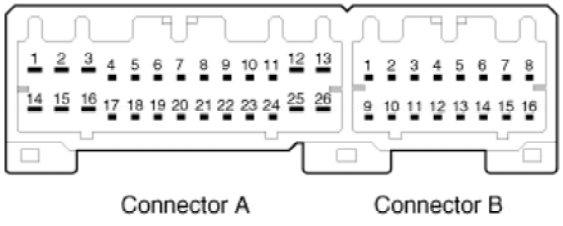
Body Electrical System > Smart key System > Smart key unit > Components and Components Location

Components

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Connector Pin Information

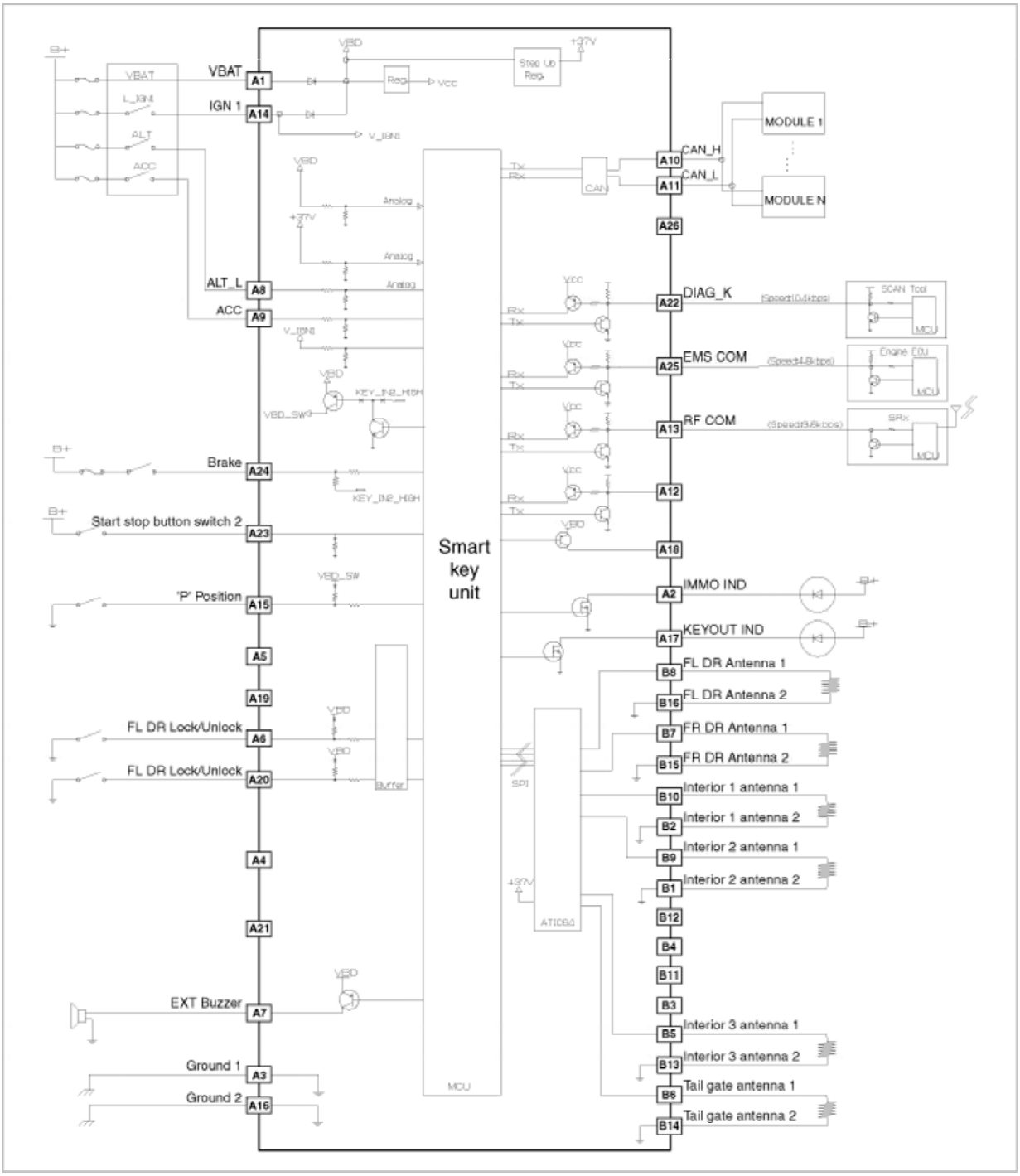
No	Connector A (26 Pin)			No	Connector B (16 Pin)
1	BAT. Voltage	17	-	1	Interior 2 Antenna 2
2	IMMO indicator	18	ESCL enable	2	Interior 1 Antenna 2
3	Ground 1	19	-	3	-
4	-	20	Front-right door Lock/Unlock	4	-
5	Tailgate switch	21	-	5	Interior 3 Antenna 1
6	Front-left door Lock/Unlock	22	DIAGNOSIS	6	Bumper Antenna 1
7	Exterior Buzzer	23	Start stop button switch	7	Front-right door Antenna 1
8	ALT 'L	24	Brake	8	Front-left door Antenna 1
9	ACC	25	EMScommunication	9	Interior 2 Antenna 1
10	CAN HIGH	26	-	10	Interior 1 Antenna 1
11	CAN LOW			11	-
12	ESCL communication			12	-

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14	IGN 1		14	Bumper Antenna 2
15	P position		15	Front-right door Antenna 2
16	Ground 2		16	Front-left door Antenna 2

Body Electrical System > Smart key System > Smart key unit > Schematic Diagrams

Circuit Diagtam



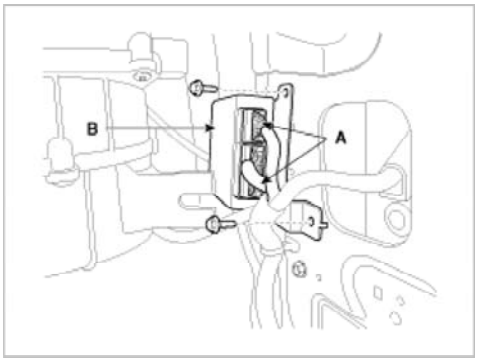
Body Electrical System > Smart key System > Smart key unit > Repair procedures

Removal

Smart Key Unit

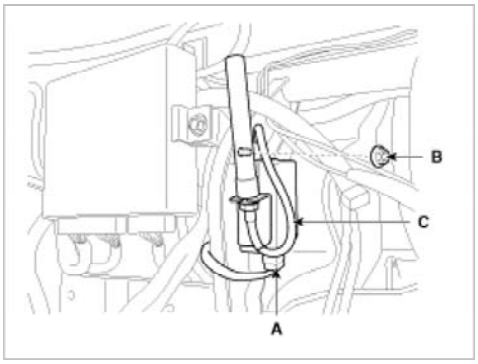
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2. Remove the glove box housing.
   (Refer to the BD group - "Crash pad")
3. After disconnecting the smart key unit connector (A), loosen the smart key unit mounting bolts, and remove the smart key unit (B).



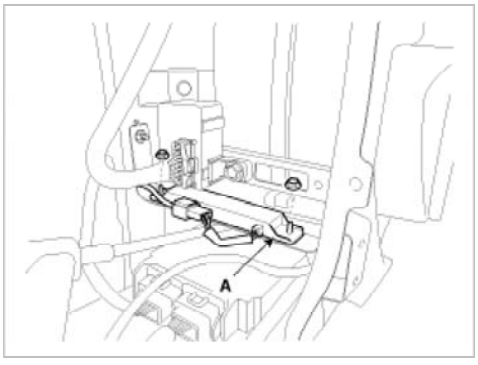
RF Receiver

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.
   (Refer to the BD group - "Crash pad")
3. Remove the air vent housing in front of the assist seat.
   (Refer to the BD group - "Crach pad")
4. After loosening the mounting nut (B), disconnect the connector (A) and remove the receiver (C).



Interior 1 Antenna

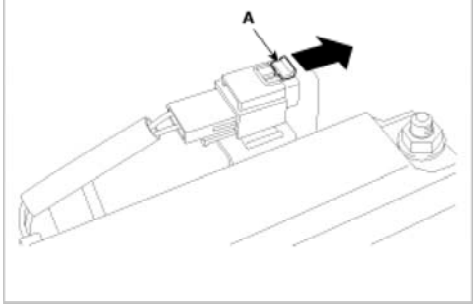
1. Disconnect the negative (-) battery terminal.
2. Remove the seat heater switch assembly.
   (Refer to the BE group - "Seat heater")
3. After loosening the antenna nuts (2EA) and connector (B), remove the interior 1 antenna (A).



NOTE

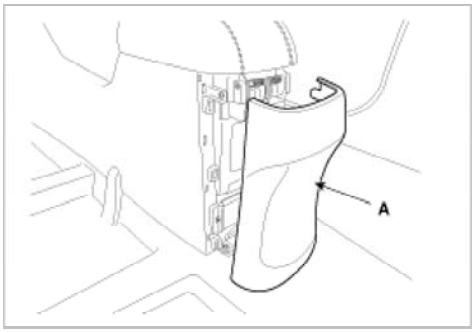
Release the connector lock (A) as indicated by the arrow, and then push-down the lock.
Make sure the connector is locked completely when installing.

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Interior 2 Antenna

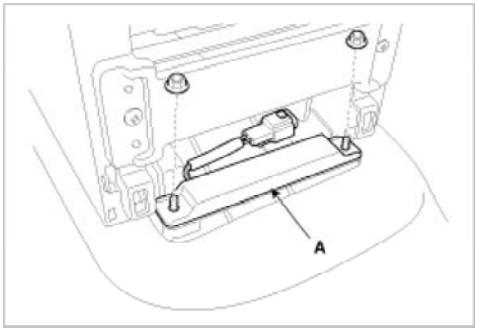
1. Disconnect the negative (-) battery terminal.
2. Remove the floor console rear panel (A) using the appropriate tool.



NOTE

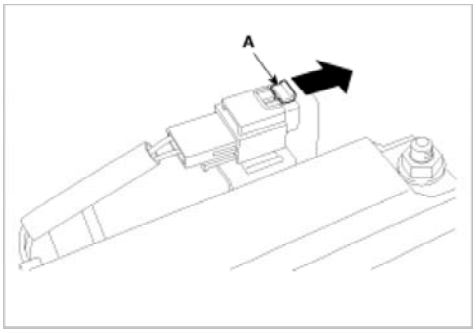
Take care not to damage and scratch the floor console rear panel and its related parts.
Take care not to damage the hook when removing the floor console rear panel.

3. After loosening the antenna nuts (2EA) and connector, remove the interior 2 antenna (A).



NOTE

Release the connector lock (A) as indicated by the arrow, and then push-down the lock.
Make sure the connector is locked completely when installing.



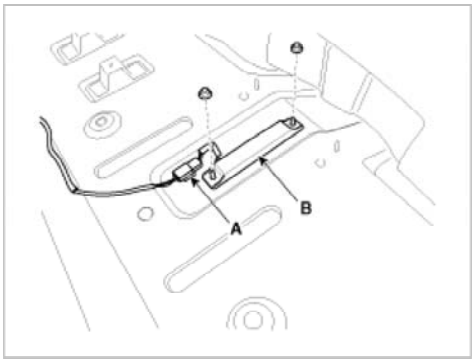
Interior 3 Antenna

1. Disconnect the negative (-) battery terminal.

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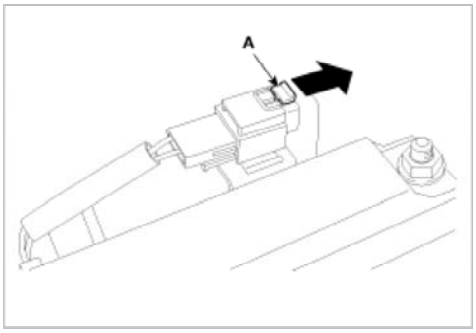
(Refer to the BD group - "Rear seat")

3. After loosening the antenna nuts (2EA) and connector (A), remove the interior 3 antenna (B).



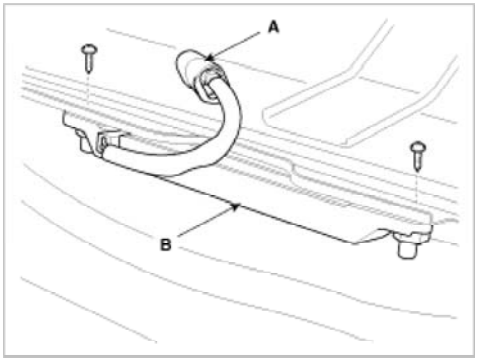
NOTE

Release the connector lock (A) as indicated by the arrow, and then push-down the lock.
Make sure the connector is locked completely when installing.



Exterior Bumper Antenna

1. Disconnect the negative (-) battery terminal.
2. Lift the vehicle up using the lift.
   (Refer to the GI group - "Lift And Support Points")
3. Disconnect the antenna connector (A) on the center of rear bumper.

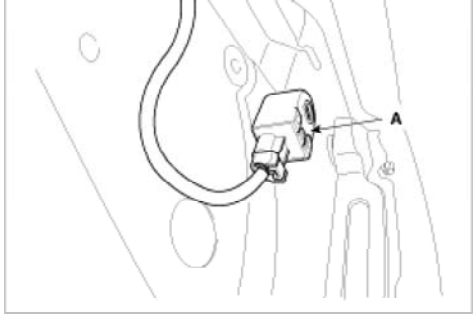


4. After loosening the nuts (2EA), remove the exterior bumper antenna (B).

Buzzer

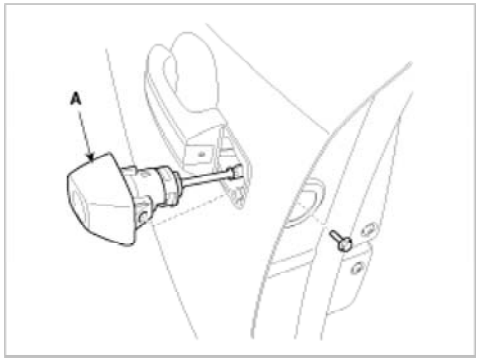
1. Disconnect the negative (-) battery terminal.
2. Remove the front left fender.
   (Refer to the BD group - "Fender")
3. Disconnect the connectors, then remove the buzzer (A).

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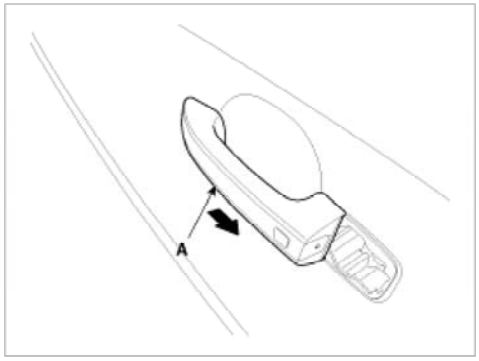


Door Outside Handle

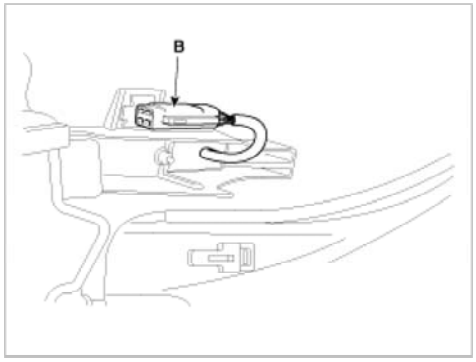
1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector after removing the door trim.
   (Refer to the BD group - "Front door")
3. After loosening the mounting bolt, then remove the key holder (A).



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



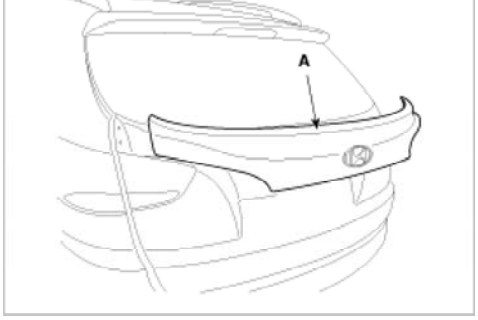
5. Disconnect the outside handle connector (B).



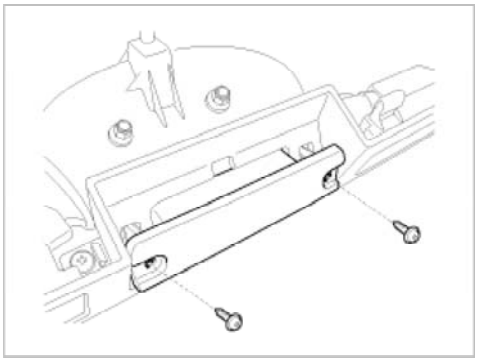
Tailgate Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate trim")
3. Disconnect the connector. After loosening the tailgate garnish mounting nuts (13EA), remove the tailgate garnish (A).

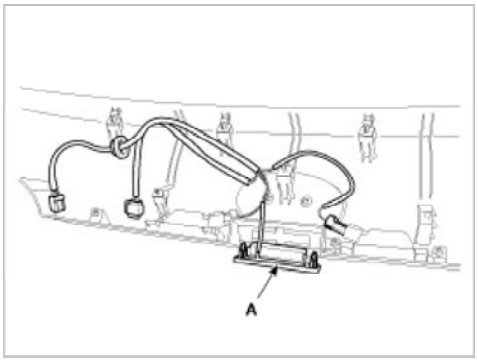
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4. Remove the outside handle (A) after loosening the outside handle mounting screws.



5. Remove the other wiring connectors which connected with outside handle, then remove the tailgate switch assembly (A).



Inspection

Smart Key Unit

- Refer to BE group - inspection / self diagnosis with scan tool.

Smart Key Switch

- Refer to BE group - inspection / self diagnosis with scan tool.

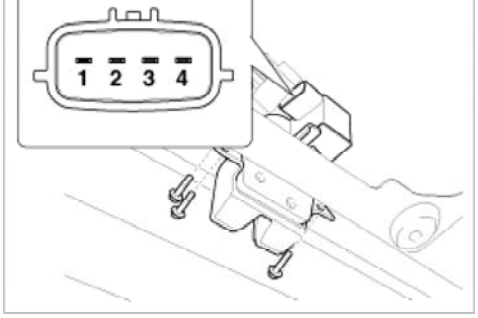
Antenna

- Refer to BE group - inspection / self diagnosis with scan tool.

Tailgate Switch

1. Check for continuity between the tailgate latch terminals.

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2. If continuity is not specified, inspect the switch

Terminal / Position	1	2	3	4
Unlock			○	○
Lock				

Installation

Smart Key Unit

1. Install the smart key unit.
2. Install the smart key unit mounting bolt and nut, and then connect the connector.
3. Install the glove box.
4. Install the negative (-) battery terminal and check the smart key system.

RF Receiver

1. Install the RF receiver.
2. Install the glove box housing and air vent housing.
3. Install the negative (-) battery terminal and check the smart key system.

Interior 1 Antenna

1. Install the interior 1 antenna.
2. Install the front seat heater switch assembly.
3. Install the negative (-) battery terminal and check the smart key system.

Interior 2 Antenna

1. Install the interior 2 antenna.
2. Install the floor console rear cover after connecting the connector.
3. Install the negative (-) battery terminal and check the smart key system.

Interior 3 Antenna

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

Exterior Bumper Antenna

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

Buzzer

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

Door Outside Handle

1. Install the outside handle.

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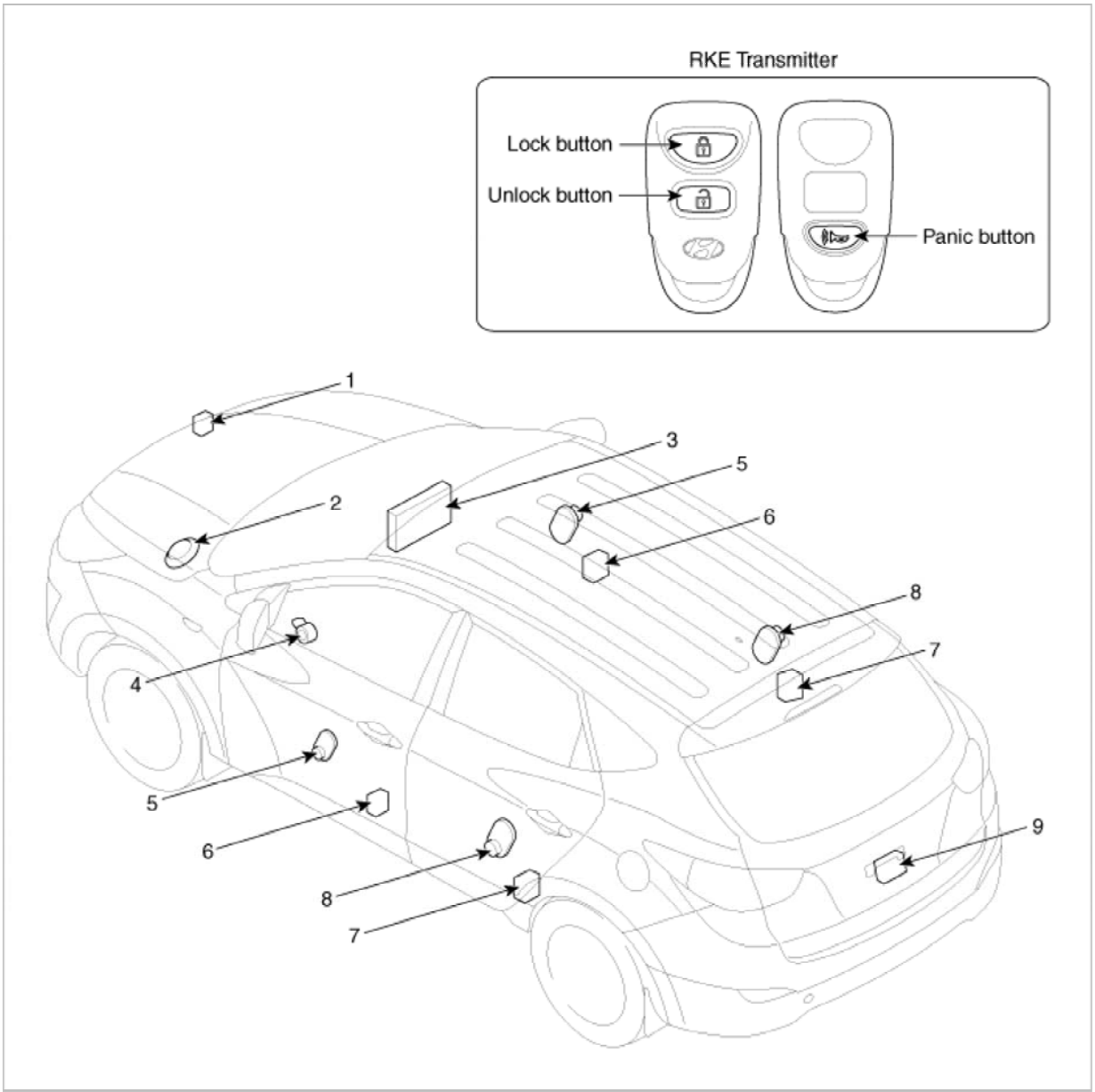
3. Install the negative (-) battery terminal and check the smart key system.

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.

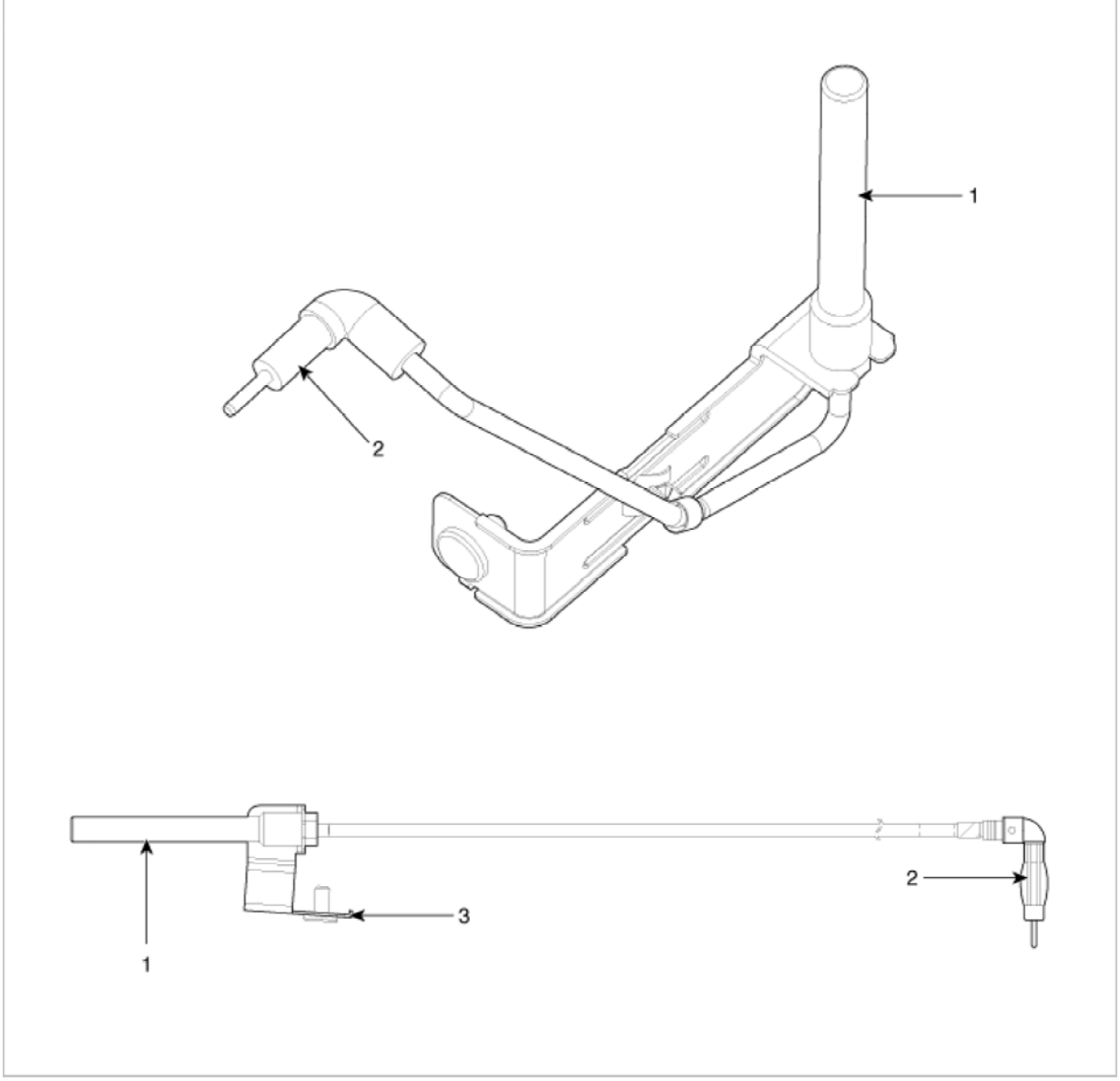
Body Electrical System > Keyless Entry And Burglar Alarm > Components and Components Location

Component Location



1. Hood switch	6. Front door lock actuator & switch
2. Burglar horn	7. Rear door lock actuator & switch
3. BCM & RF receiver	8. Rear door switch
4. Key warning switch	9. Tailgate lid switch
5. Front door switch	

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1. Antenna 2. BCM connector	3. Antenna bracket

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

Description

Keyless Entry System

The burglar alarm system is integrated with the keyless entry system. The keyless entry system allows you to lock and unlock the vehicle with the remote transmitter. When you push the LOCK button, all doors lock. When you push the UNLOCK button again, all doors unlock.

Function

Keyless Entry Function

DOOR LOCK / UNLOCK and panic operations are performed with remocon

1. Keyless entry function is performed in a state that key in switch is eliminated from key cylinder
2. LOCK / UNLOCK and panic signals are received from the transmitter and DOOR LOCK / UNLOCK and panic signals are output.

Transmitter(TX) Spec

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2. Registration procedure of the transmitter
   (1) In registration mode, it shall be possible to register up to Max 4EA.
   (2) At re-registration, data are registered newly after deleting the previous TX DATA

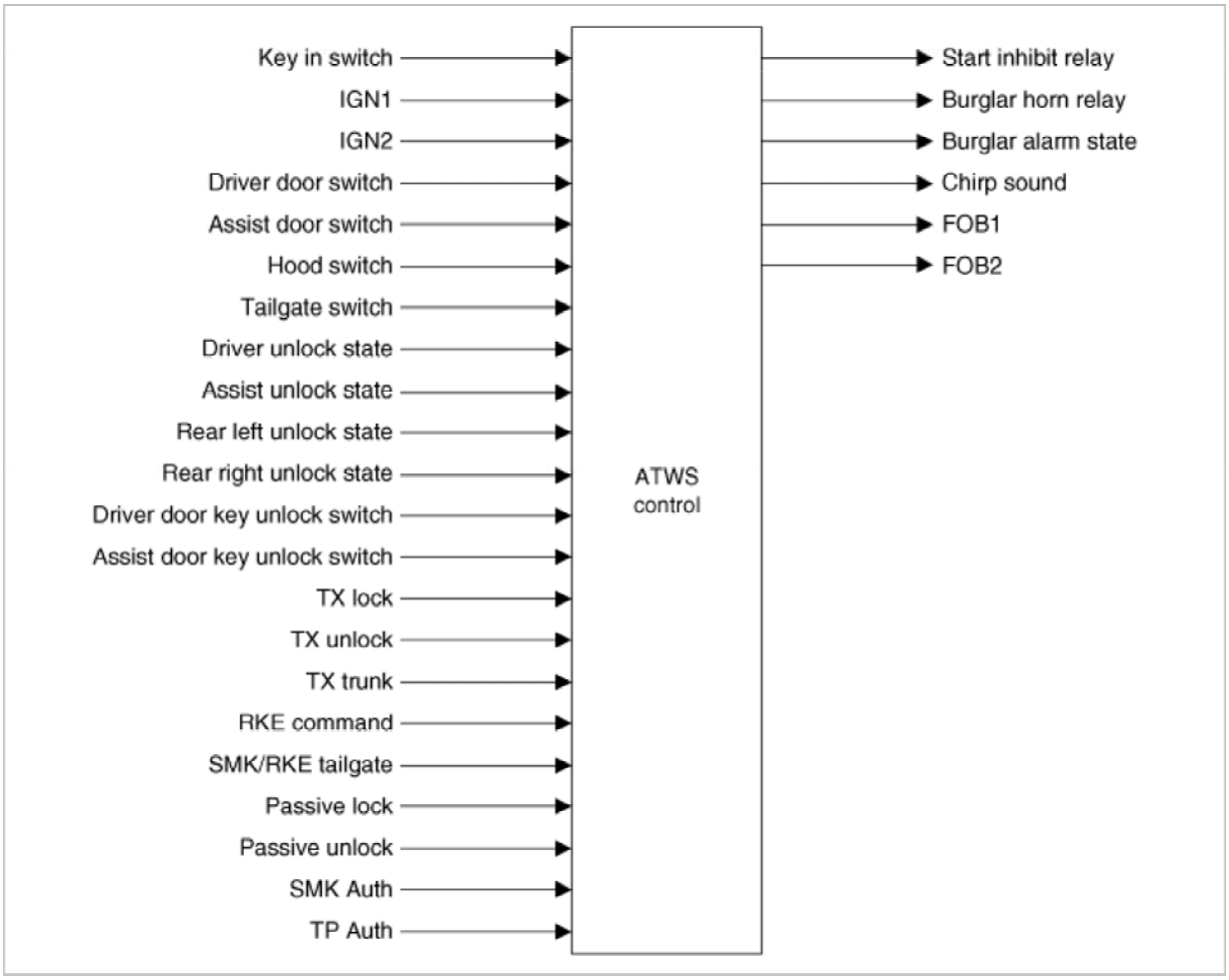
No.	Saved code	Code to change	Changed code
1	A	C	C (A is deleted)
2	A, B, C, D	E	E (A, B, C, D is deleted)
3	A, B	C, D, E	C, D, E
4	A, B	C, C, D	C

   (3) For the registration procedures by using Hi-scan tool, refer to "TRANSMITTER CODE REGISTRATION".

3. Transmitter signal & Receiver Spec
   (1) Transmission signal
      A. Transmit relevant transmission DATA (Transmission frame) twice by pushing TX SW.
      B. Only LOCK signal is output when pushing TX LOCK switch and UNLOCK switch at the same time.

Anti-theft function

1. Anti-theft control data flow



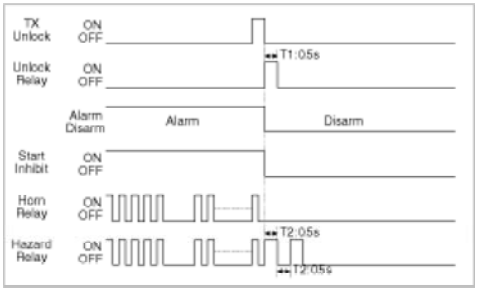
Functions

1. **DISARM**
   Condition 1

State	Description
Initial Condition	ALARM
Event	- IGN KEY ON during 30sec or ALT"L"=on during 3 sec.

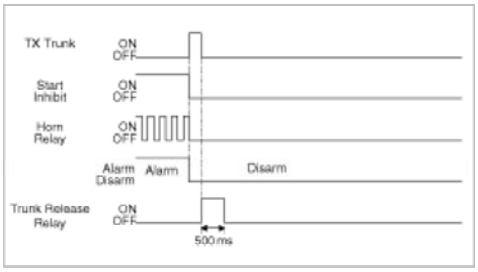
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	- Any door open & TX UNLOCK - TX Tailgate - TX Lock & Lock confirm Failed
	SMK : - Any door open & RKE CMD=UNLOCK/Passive Access Unlock=1 - RKE_Tailgate=1-TP(Transponder)AUTH=1 / PIC AUTH=1 - RKE CMD=LOCK/Passive Access Lock=1 & Lock confirm Failed
	Mechanical Key OPTION Enable: - Mechanical UNLOCK - Mechanical LOCK&Lock confirm Failed
Action	The state goes to DISARM state - Horn Relay, Hazard Relay, Start Inhibit Relay OFF - TX Unlock →Unlock Relay on for 0.5 sec →Hazard Relay on (twice)



T1 : 0.5s

T2 : 0.5s ± 0.1s



Condition 2

State	Description
Initial Condition	DISARM state & (IGN KEY OUT) & Any Door open
Event	NON SMK : - Any door open & TX UNLOCK
	SMK : - Any door open & RKE CMD=UNLOCK / Passive Access Unlock=1 / RKE Tailgate=1 / Tailgate reopen=1 - TP AUTH=1 / PIC AUTH=1
Action	No state change - TX UNLOCK, RKE CMD=UNLOCK, Passive Access Unlock=1 →Hazard Relay for 0.5s ON/OFF(twice)

Condition 3

State	Description
Initial Condition	ARM WAIT state
Event	- Any door open or Hood Switch OPEN or Tailgate switch OPEN - Any door is unlocked - Key In switch ON

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	TP AUTH=1 / PIC AUTH=1 / FOB=IN/ P Tailgate
	Mechanical Key OPTION Enable: Mechanical UNLOCK
Action	The state goes to DISARM state

Condition 4

State	Description
Initial Condition	AUTOLOCK TIMER1 STATE
Event	- Any door open or Hood Swithc OPEN or Tailgate Switch OPEN - Key In Switch ON - AUTO LOCK & Lock confirmation failure
	NON SMK spec: - TX LOCK & Lock confirmation failure
	SMK spec: - RKE CMD=LOCK / Passive Access Lock=1& Lock confirmation failure - TP AUTH=1 / PIC AUTH=1
	Mechanical Key option Enable: - Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state

Condition 5

State	Description
Initial Condition	AUTOLOCK TIMER2 STATE
Event	- Any door open - Key In Switch ON - AUTO LOCK & Lock confirmation failure
	NON SMK : - TX LOCK & Lock confirmation failure
	SMK : - RKE CMD=LOCK/ Passive Access Lock=1& Lock confirmation failure - TP AUTH=1/ PIC AUTH=1 / FOB IN
	Mechanical Key option Enable: Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state

Condition 6

State	Description
Initial Condition	ARM STATE
Event	- IGN KEY ON
	SMK : - TP AUTH=1 / PIC AUTH=1
	Mechanical Key option Enable: - Mechanical UNLOCK
Action	The state goes to DISARM state

Condition 7

State	Description
Initial Condition	REARM state
Event	Execpt china spec:

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	NON SMK : - TX LOCK & Lock confirmation failure - TX Tailgate
	SMK : - TP AUTH=1 / PIC AUTH=1 - RKE CMD=LOCK / PassiveAccess Lock=1 & Lock confirmation failure - RKE Tailgate=1
	Mechanical Key option Enable: - Mechanical UNLOCK - Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state Start Inhibit Relay OFF

Condition 8

State	Description
Initial Condition	PREARM state
	- Key In Switch ON - All entrance closed & Any Door is unlocked
	NON SMK: - Any door open & TX UNLOCK
	SMK : - TP AUTH=1 / SMK AUTH=1 / FOB IN - Any door open & RKE CMD=UNLOCK/ Passive Access Unlock=1
	Mechanical Key option Enable : - MECHANICAL UNLOCK
Action	The state goes to DISARM state - Hazard Relay for 0.5s ON/OFF(twice)

Condition 9

State	Description
Initial Condition	AUTOLOCK TIMER3 state
Event	- DRV or AST or RL or RR DOOR OPEN or HOOD OPEN or KEY IN
	SMK spec: - TP AUTH=1 or SMK AUTH=1
	Mechanical Key option Enable: - Mechanical UNLOCK - Mechanical LOCK & Lock confirmation failure
Action	DISARM state entry

2. **ARM**

Condition 1

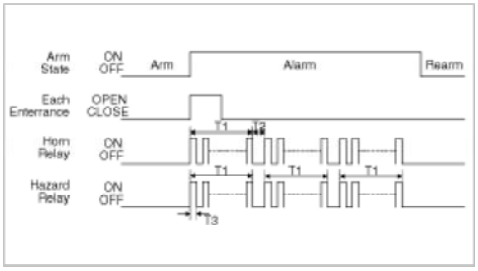
State	Description
Initial Condition	ARM state
Event	NON SMK : - TX LOCK
	SMK: - RKE CMD=LOCK / Passive Access Lock=1
Action	No state change HazardRly 1Time on(1sec)

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State	Description
Initial Condition	ARM WAIT state
Event	- Afte ARM WAIT TIMER finished
Action	The state goes to ARM state

3. **ALARM**
Condition 1

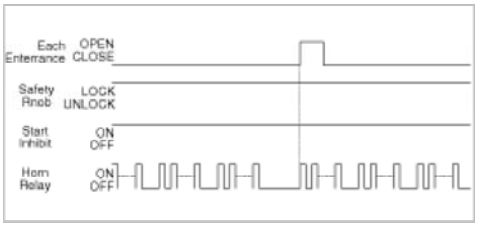
State	Description
Initial Condition	ARM state
Event	Any door open or Hood Switch open
Action	The state goes to ALARM state - Engine Start Inhibit is ON - The horn relay is ON one time for 27sec(±2sec) and OFF two times for 10sec(±1sec). - The hazard is driven also (During Horn driving)



T1 : 27s(±2sec),
T2 : 10s(±2sec),
T3 : 0.5s ± 0.1sec

Condition 2

State	Description
Initial Condition	REARM state
Event	Any door open or Hood Switch OPEN
Action	The state goes to ALARM state The horn relay is ON one time for 27sec(±2sec) and OFF two times for 10sec(±1sec). The hazard is driven also (During Horn driving)



4. **ARM WAIT Mode**
Condition 1

State	Description
Initial Condition	ARMWAIT state
Event	NON SMK : - TX LOCK
	SMK: - RKE CMD = LOCK / Passive Access Lock=1
Action	No state change Hazard Relay 1Time on(1sec)

Condition 2

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Initial Condition	DISARM state & IGN KEY OUT & All entrances closed
Event	NON SMK: - Tx Lock & locked confirmed
	SMK: - RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: - MECHANICAL LOCK & locked confirmed - DOOR LOCK state : Any door open → All door closed
Action	- The state goes to ARMWAIT State - Start ARMWAITTIMER - Hazard Relay 1Time on(1sec)

Condition 3

State	Description
Initial Condition	ALARM state & All entrances closed & IGN key out
Event	NON SMK: - Tx Lock & locked confirmed
	SMK : - RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: - MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State - Horn Relay, Start Inhibit Relay = OFF - Hazard Relay 1Time on(1sec) (MECHANICAL LOCK : Except) - Start ARMWAIT TIMER

Condition 4

State	Description
Initial Condition	AUTOLOCK TIMER1 state
Event	AUTOLOCK & locked confirmed
	NON SMK: - Tx Lock & locked confirmed
	SMK: - RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) - Start ARMWAIT TIMER

Condition 5

State	Description
Initial Condition	PREARM state
Event	All door closed and ALL door=Lock
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) - Start ARMWAIT TIMER

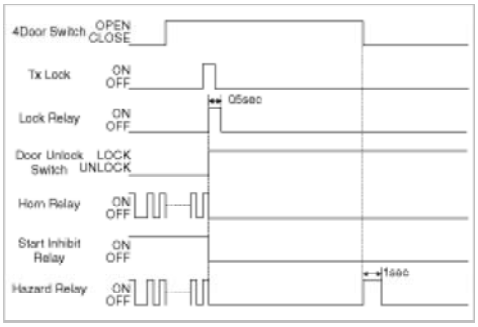
Condition 6

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Initial Condition	REARM state
Event	NON SMK : TX LOCK & locked confirmed
	SMK : - RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: - MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) (MECHANICAL LOCK : Except) - Start Inhibit Relay OFF - Start ARMWAIT TIMER

Condition 7

State	Description
Initial Condition	AUTOLOCK3 state
Event	NON SMK spec: - TX LOCK & locked confirmed
	SMK spec: - RKE CMD=LOCK or PassiveAccessLock=1& locked confirmed
	Mechanical Key option Enable: - Mechanical LOCK & locked confirmed
Action	ARM WAIT state entry - Hazard relay 1Time on(1sec). (Mechanical LOCK item Except) - Start ARMWAIT Timer.



5. **REARM Mode**
   Condition 1

State	Description
Initial Condition	ALARM state
Event	All entrance is closed & ALARM Patten finished
Action	The state goes to REARM state

6. **Autolocktimer1 Mode**
   Condition 1

State	Description
Initial Condition	ARM state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state

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	- Hazard Relay Twice on (0.5s ON/0.5s OFF)

Condition 2

State	Description
Initial Condition	AUTO-LOCK TIMER1 state
Event	AUTOLOCK TIMER1 finished
	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	No change state
	CASE1: AUTOLOCK TIMER1 Finished AUTOLOCK
	CASE2: TX UNLOCK, RKE CMD=UNLOCK, Passive Access Unlock=1 Hazard Relay Twice on(0.5s ON/0.5s OFF) Restart AUTOLOCK TIMER1

Condition 3

State	Description
Initial Condition	ARM WAIT state
Event	NON SMK : TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 4

State	Description
Initial Condition	DISARM state & All entrances closed(DOORS, HOOD & Tailgate) & IGN KEY OUT
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 5

State	Description
Initial Condition	ALARM state & All Enterance closed
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Start Inhibit Relay off / Horn Relay off

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State	Description
Initial Condition	REARM state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Start Inhibit Relay off

7. **Autolocktimer2 Mode**

Condition 1

State	Description
Initial Condition	AUTO-LOCK TIMER2 state
Event	Finished AUTOLOCK TIMER2
	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	No change state
	CASE1: AUTOLOCK TIMER2 finished AUTOLOCK
	CASE2: TX UNLOCK, RKE CMD=UNLOCK, Passive Access Unlock=1 - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT & ALL door close state
Event	NON SMK : TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/ Trunk state

Condition 3

State	Description
Initial Condition	ALARM state & All door closed & (Trunk or Hood Switch OPEN) state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Horn Relay, Start Inhibit Relay = OFF - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

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Condition 4

State	Description
Initial Condition	PREARM state & All door closed & (Hood OPEN)state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

8. **PREARM Mode**

Condition 1

State	Description
Initial Condition	AUTO-LOCK TIMER2 state
Event	AUTO LOCK & locked confirmed
	NON SMK: TX LOCK & locked confirmed
	SMK : RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	The state goes to PREARM state

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT
Event	NON SMK: - Any door open or Hood Switch OPEN or Trunk Switch OPEN state & locked confirmed
	SMK : - Any door open or Hood Switch OPEN or Trunk Switch OPEN state RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed ALL DOOR LOCK state (Any door open → All doors closed) and (Trunk Switch OPEN or Hood Switch OPEN)
Action	The state goes to PREARM state

Condition 3

State	Description
Initial Condition	ALARM state& IGN KEY OUT and(Any door open or Hood Switch OPEN or TrunkSwitch OPEN)
Event	NON SMK : TX LOCK & locked confirmed
	SMK : RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	The state goes to PREARM state Horn Relay, Hazard Relay, Start Inhibit Relay → OFF

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State	Description
Initial Condition	AUTOLOCK3 state
Event	TIMER IS EXFIRED TAILGATE IS OPEN
Action	PREARM state entry

9. **Autolock Time3 Mode**

Condition 1

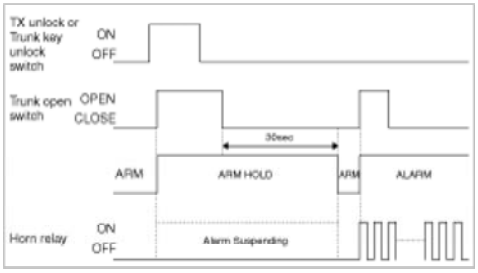
State	Description
Initial Condition	AUTOLOCK3 state
Event	NON SMK spec: - TX TAILGATE
	SMK spec: - RKE TAILGATE=1
Action	AUTOLOCK3 state maintenance & - HazardRly Twice on(0.5s ON/0.5s OFF)

Condition 2

State	Description
Initial Condition	ARM state
Event	NON SMK spec: - TX TAILGATE
	SMK spec: - RKE TAILGATE=1 or Passive TAILGATE
Action	AUTOLOCK3 state entry & Hazard relay Twice on(0.5s ON/0.5s OFF)

Condition 3

State	Description
Initial Condition	ARMWAIT state
Event	NON SMK spec: - TX TAILGATE
	SMK spec: - RKE TAILGATE=1
Action	AUTOLOCK3 state entry & Hazard relay Twice on(0.5s ON/0.5s OFF)



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

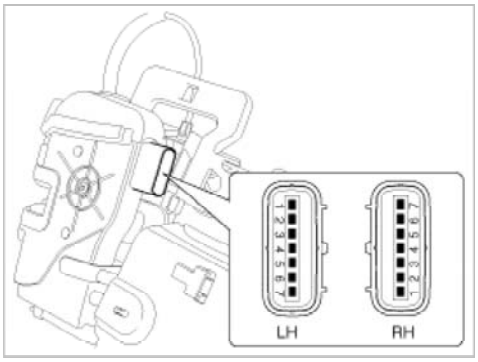
Inspection

Front Door Lock Actuator

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.

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3. Disconnect the connectors from the actuator.



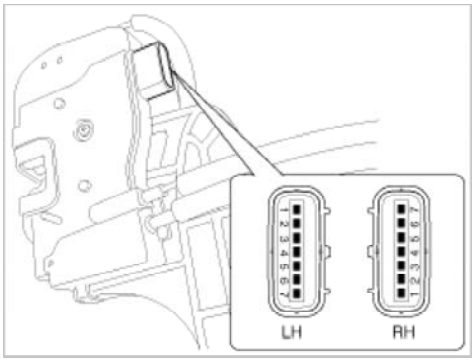
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock]

Position \ Terminal		2	1
Front left	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕
Position \ Terminal		7	6
Front right	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖

Rear Door Lock Actuator

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
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.

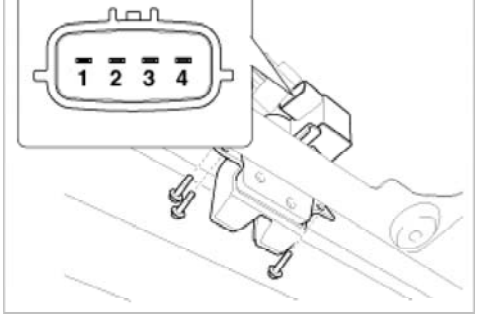
[Central Lock]

Position \ Terminal		2	1
Rear left	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕
Position \ Terminal		7	6
Rear right	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖

Tailgate Lock Actuator Inspection

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

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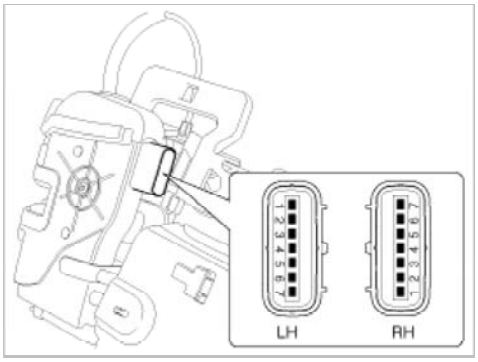


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	3	4
Unlock	⊕	⊖

Front Door Lock Switch

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors from the actuator.



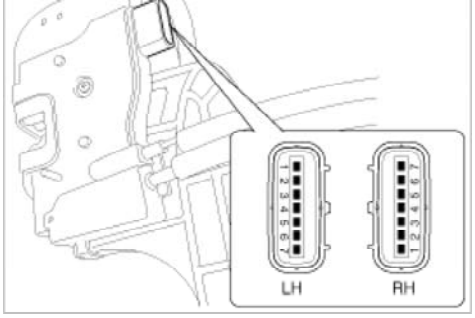
4. Check for continuity between the terminals in each switch position when inserting the key into the door according to the table.

Position \ Terminal		5	6	3	4
Front left	C/Unlock	○—○			
	Counter-clock wise	○——		——○	
	Clock wise	○——		——	——○
Position \ Terminal		**3**	**2**	**5**	**4**
Front right	C/Unlock	○—○			
	Clock wise	○——		——○	
	Counter-clock wise	○——		——	——○

Rear Door Lock Switch

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
3. Disconnect the connectors from the actuator.

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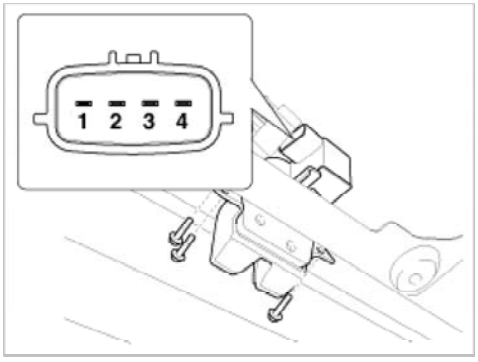


4. Check for continuity between the terminals in each switch position according to the table.

Position		Terminal	5	6
Central Door Lock	Rear Left	Lock		
		Unlock	○——	——○
Position		Terminal	2	3
Central Door Lock	Rear Right	Lock		
		Unlock	○——	——○

Tailgate Switch

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

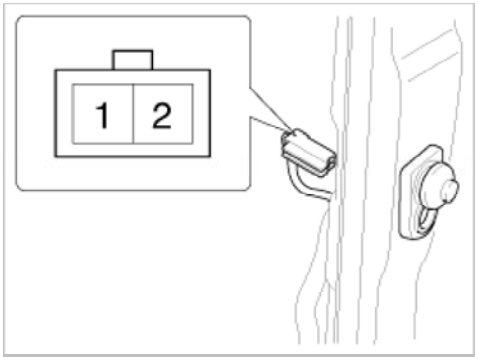


3. Check for continuity between the terminals in each switch position according to the table.

Position	Terminal	3	4
Lock			
Unlock		○——	——○

Door Switch

Remove the door switch and check for continuity between the terminals.

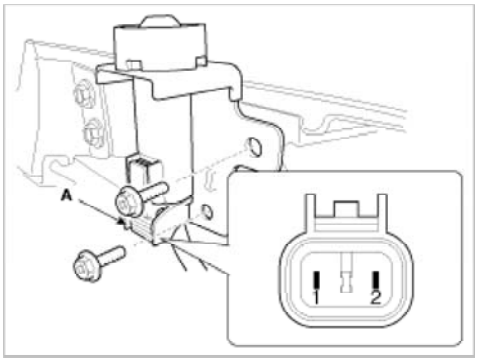


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Position			
Free(Door open)	○	○	○
Push(Door close)			

Hood Switch

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

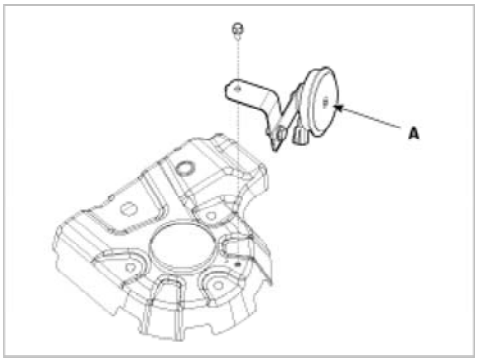


2. Check for continuity between the terminals and ground according to the table.

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 make a sound. If the burglar horn fails to make a sound replace it.

Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Specifications

Specifications

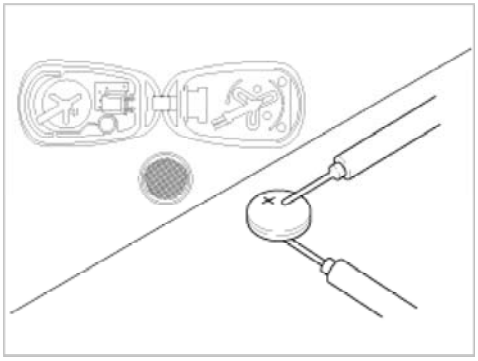
Item	Specification
Rated voltage	DC 3V
Temperature range	-4°F ~ 140°F (-20°C ~ +60°C)
RF Modulation method	FSK
Keyless entry transmitterPower source	Lithium 3V battery (1EA)
Transmissible distance	30m or more
Life of battery	2 years or more (at 20 times per day)
Button	3 (Door lock, Door unlock, Tailgate)
Transmission frequency	313.85 MHz

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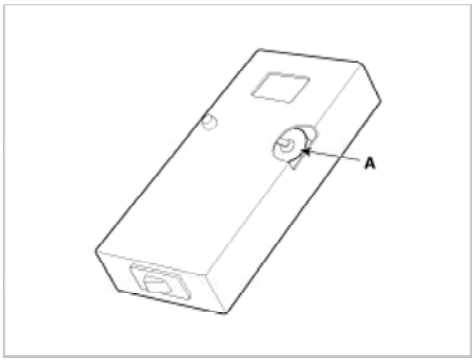
Inspection

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery 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. If voltage is low power, replace the transmitter battery with a new one. 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.

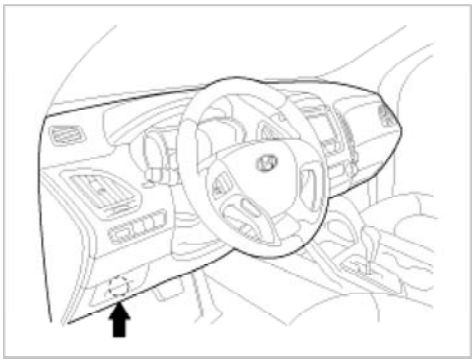
> WARNING
>
> An inappropriately disposed battery can be harmful to the environment and human health.
> Dispose the battery according to your local law(s) or regulation.

Transmitter Code Registration (Using Code Saver)

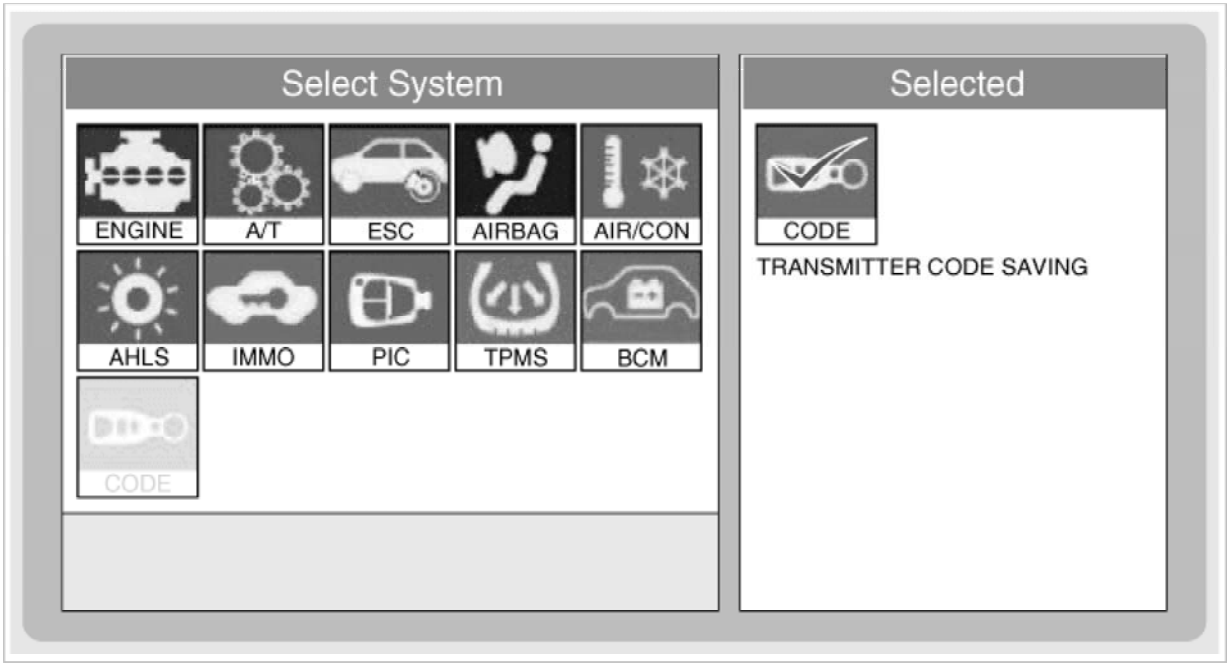
1. Open Door.
2. Connect POWER (B+) and GND, signal line of Code Saver.
3. If connection is normal, signal line is activated and RED LED turns ON.
4. If SW of Code Saver turns ON, data via signal line will be transmitted.
5. BCM enters into Code Save mode when it receives data from Code Saver and send Code Save Start signal via signal line.
6. Code Saver turns Green LED ON when it receives Code Save Start signal.
7. When you press Lock or Unlock button of transmitter, BCM will save Codes.
8. If there are 2 transmitters for Code Saving, register by performing item 7).
9. If SW of Code Saver turns OFF or is disconnected, Code Saving mode will be finished.

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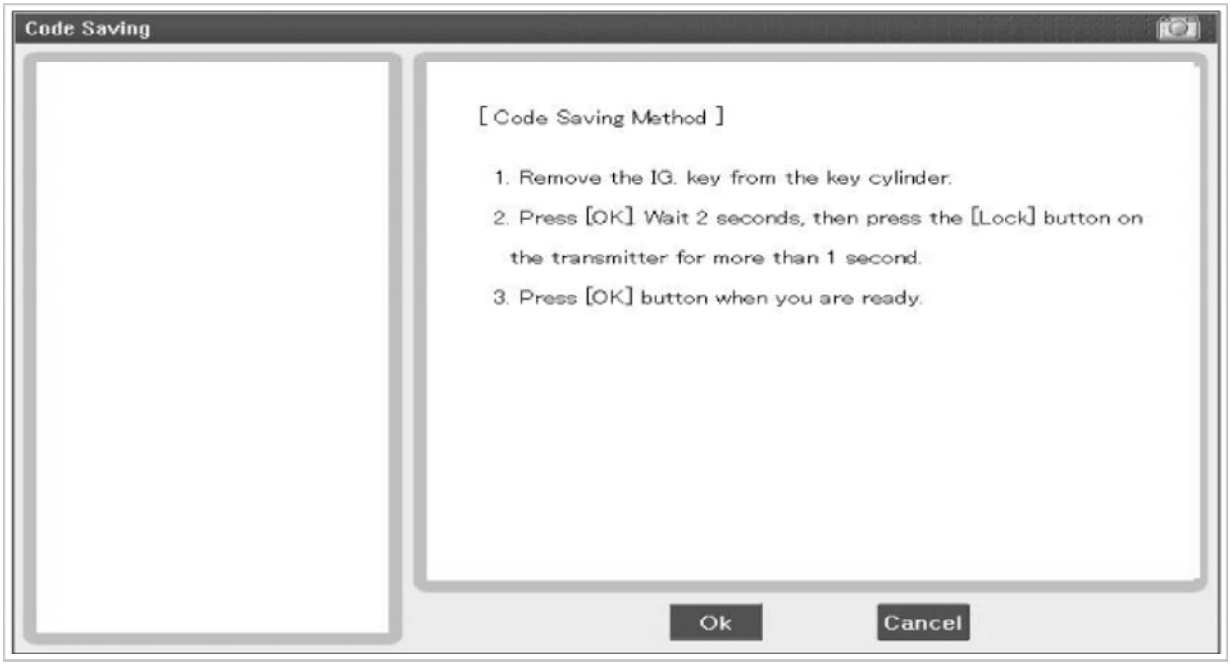
1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.



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

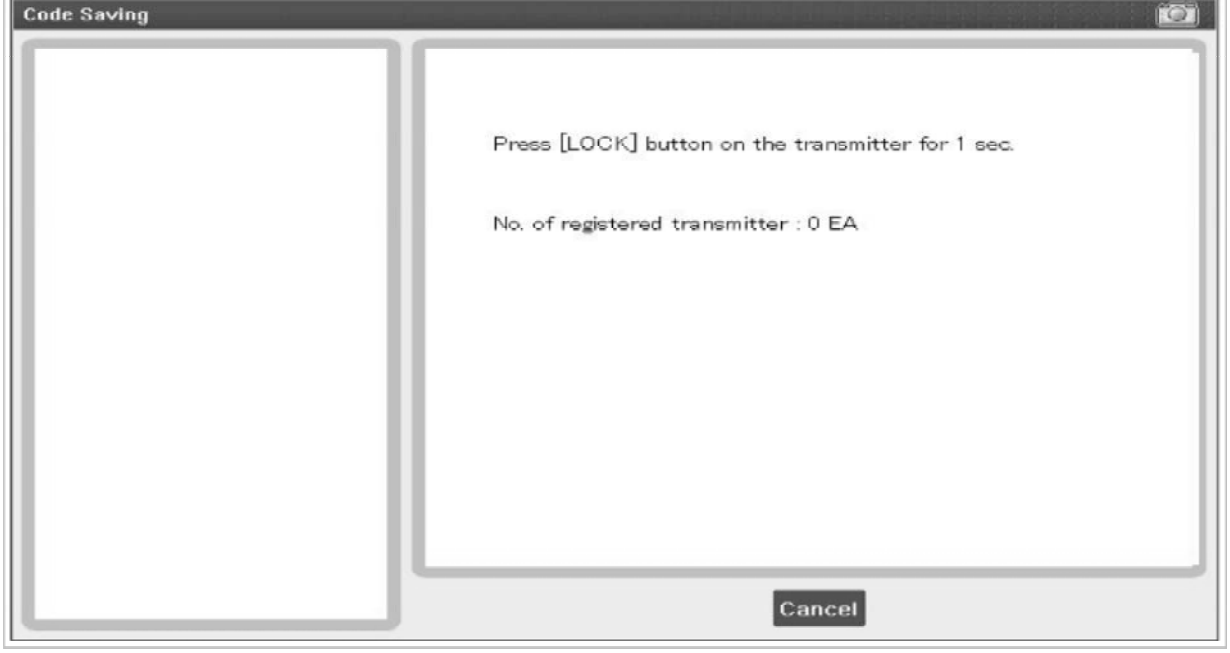


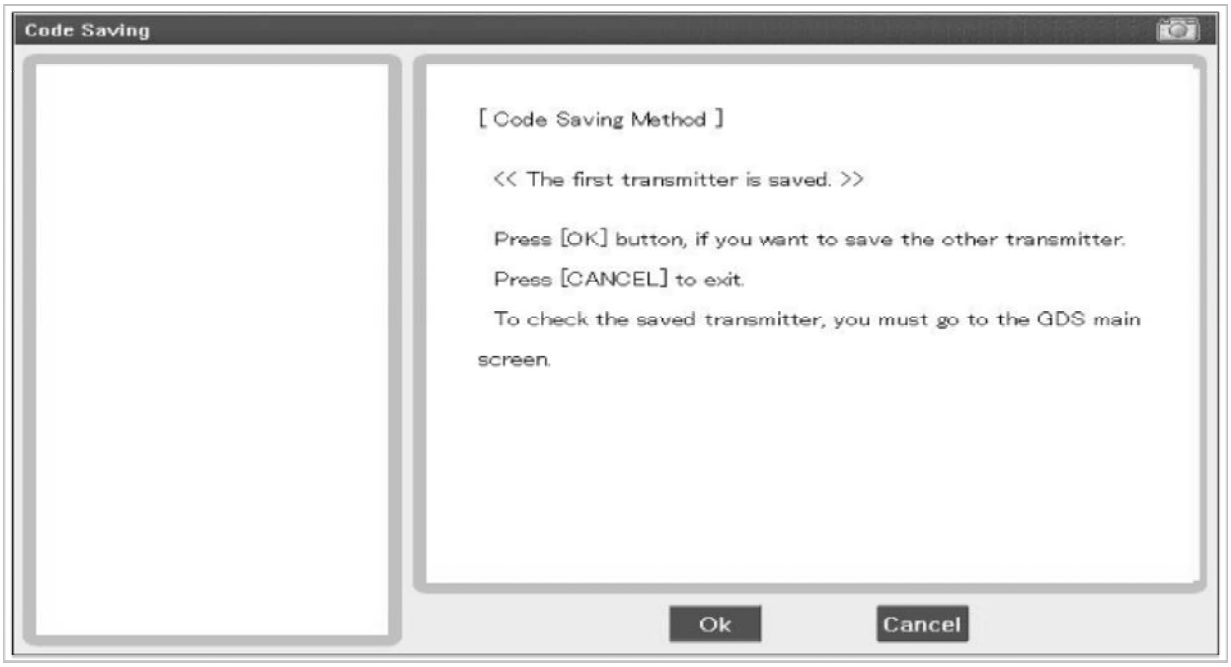
3. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.



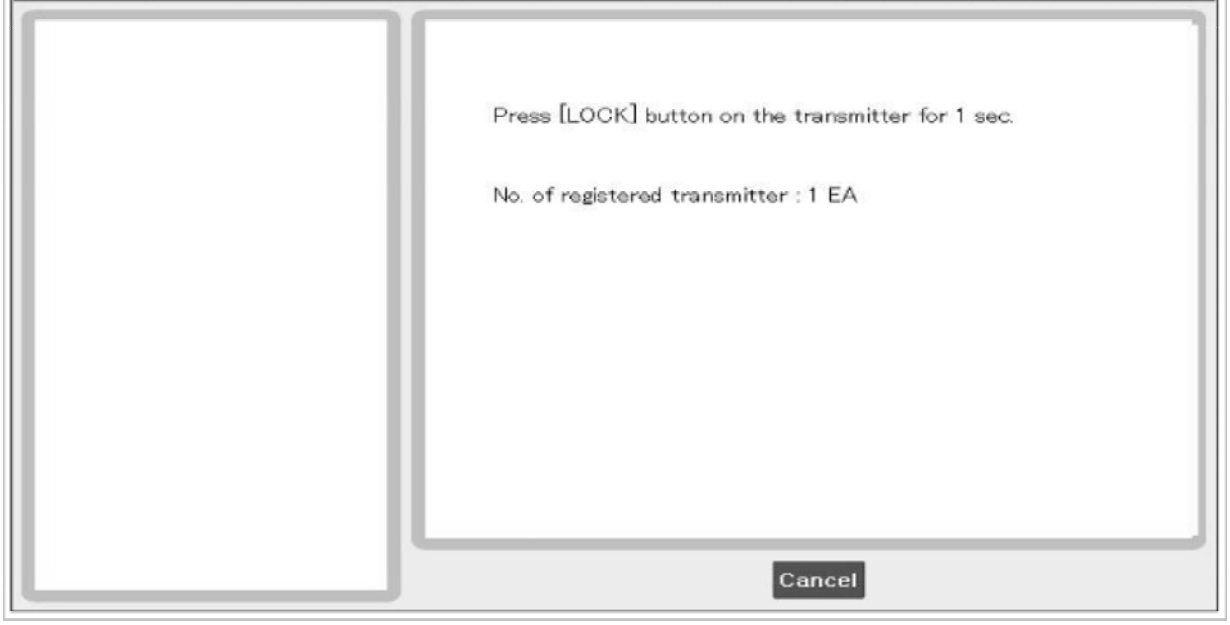
4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow

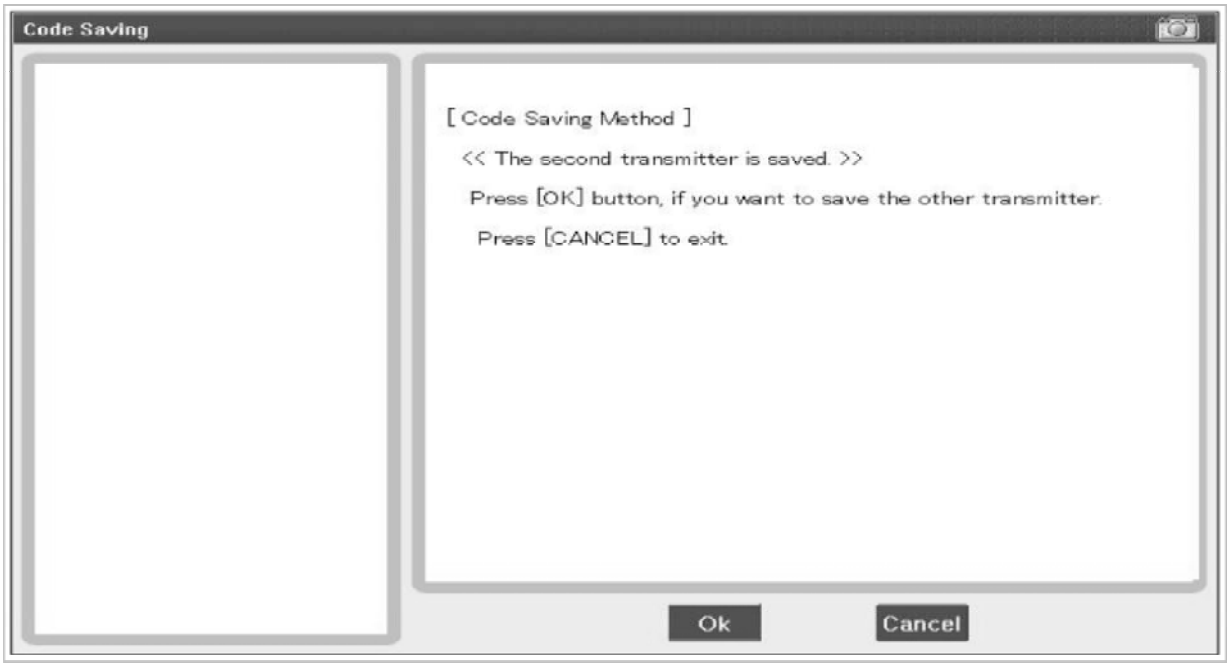
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Code Saving
Press [LOCK] button on the transmitter for 1 sec.
No. of registered transmitter : 0 EA
Cancel

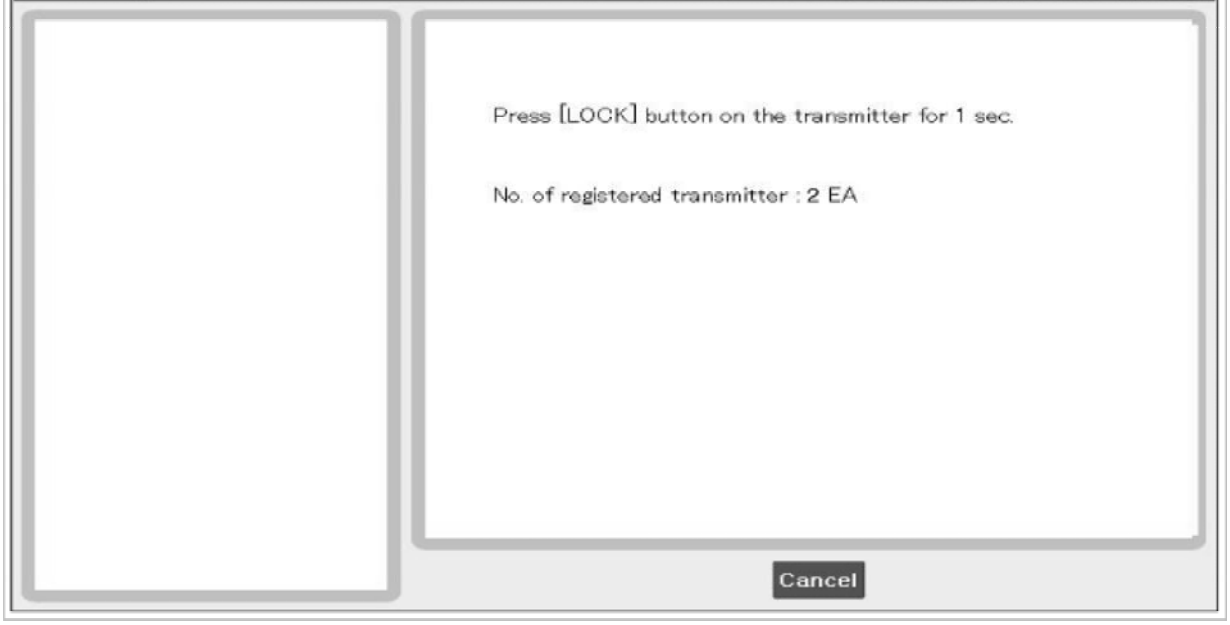

Code Saving
[Code Saving Method]
<< The first transmitter is saved. >>
Press [OK] button, if you want to save the other transmitter.
Press [CANCEL] to exit.
To check the saved transmitter, you must go to the GDS main screen.
Ok
Cancel

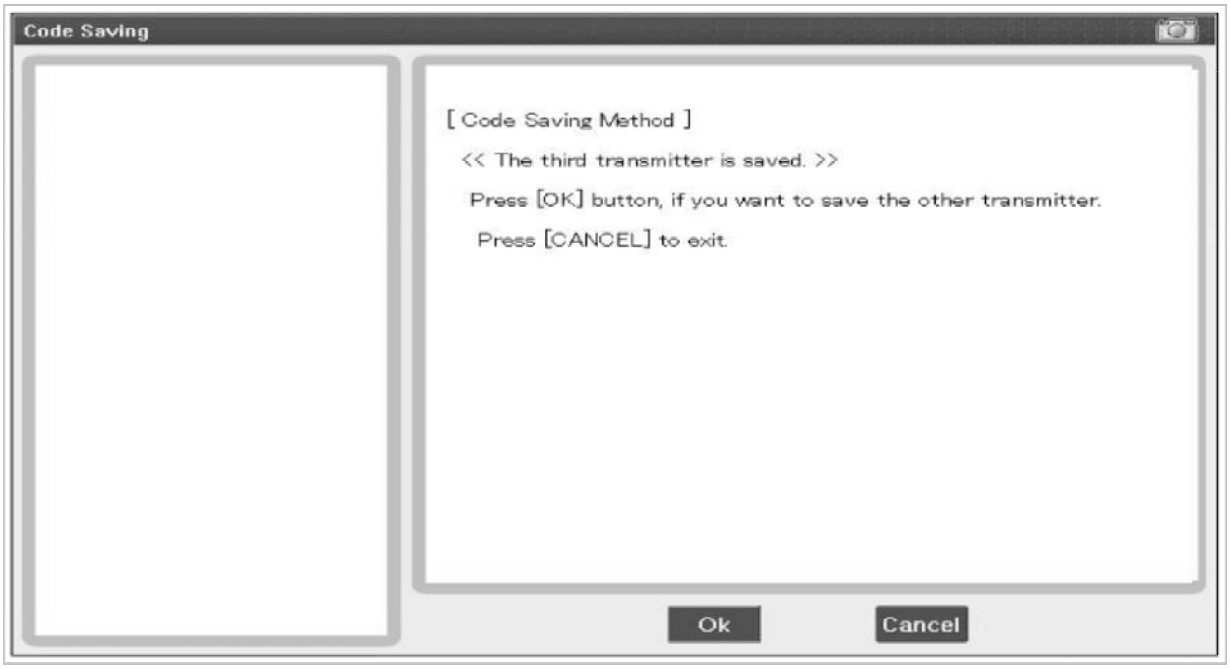
mcx30.com


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

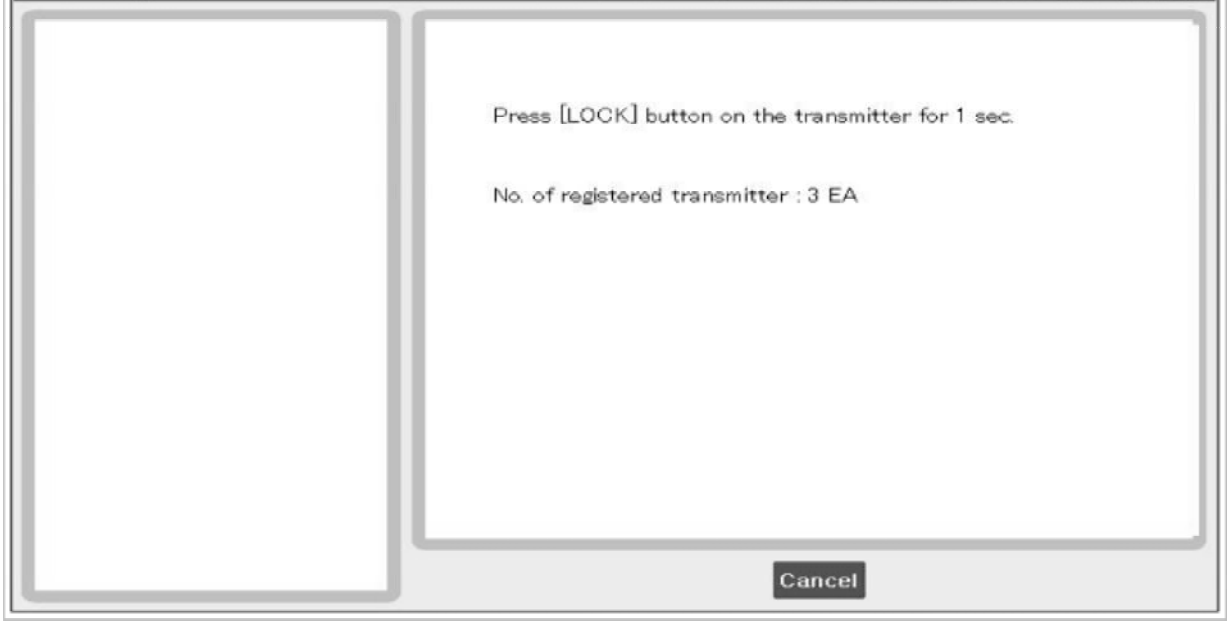

Code Saving
[Code Saving Method]
<< The second transmitter is saved. >>
Press [OK] button, if you want to save the other transmitter.
Press [CANCEL] to exit.
Ok
Cancel

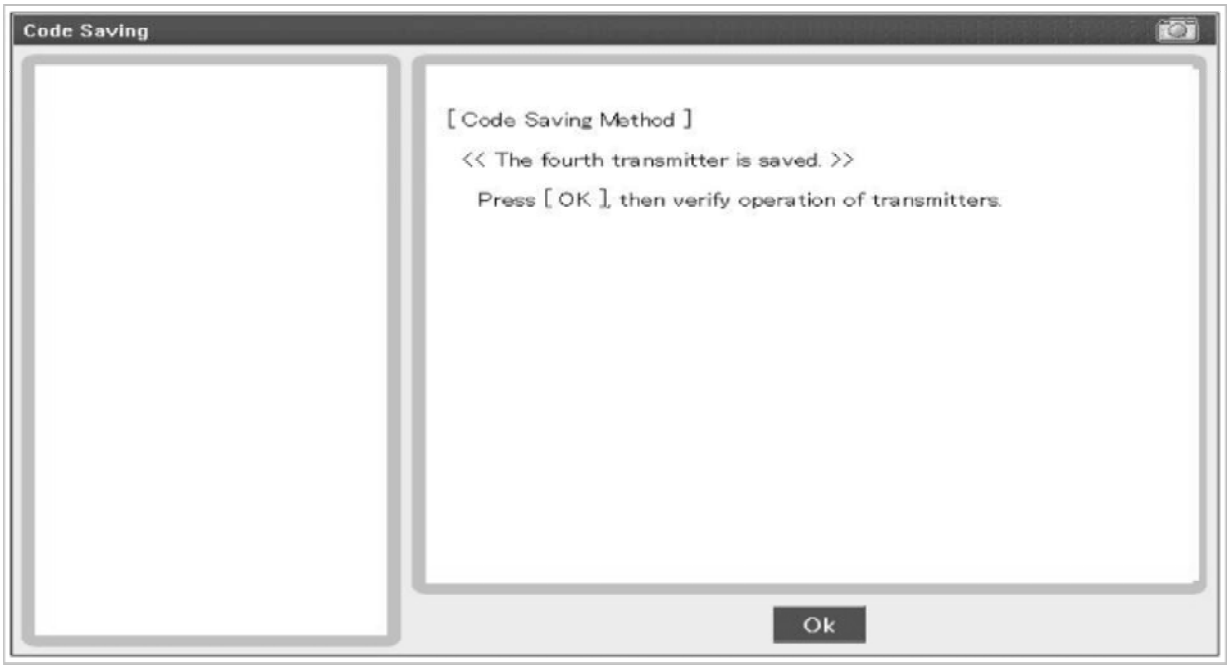
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Press [LOCK] button on the transmitter for 1 sec.
No. of registered transmitter : 2 EA
Cancel

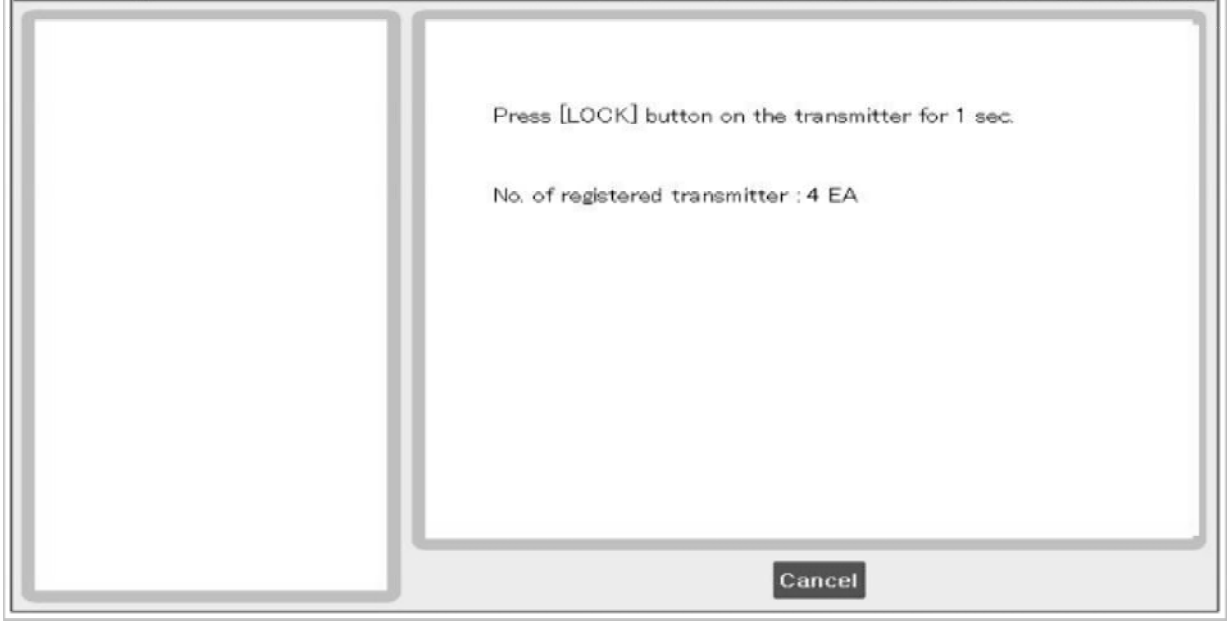

Code Saving
[Code Saving Method]
<< The third transmitter is saved. >>
Press [OK] button, if you want to save the other transmitter.
Press [CANCEL] to exit.
Ok
Cancel

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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

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

Specifications

Electrical Performance

Item	Requirement	Remark
Rated voltage	DC 12V	
Operating voltage range	DC 9 ~ 16V	Shall activate normally in these range
Operating temperature range	-30°C ~ +80°C	Shall conserve normally in these range.
Storage temperature range	-40°C ~ +85°C	
Max humidity in use	95%	
High voltage resistance	24V/1min, 18V/1hour	After overvoltage is the Normal behavior
Insulation resistance	100MΩ or more (measured with 500V MEGGER)	Specify as well as parts that insulation like PCB, moisture-proof COATING is required.
Quiescent current	KEYLESS spec : 6mA or less SMK spec : 5mA or less NON-KEYLESS : 3mA or less	Measure when the state, all output loads are OFF and there are no Input SW(including TX operation) changes, continues 2sec.
Voltage drop	1.2V or less	but, Terminal C01, C02, C03, C13, C14, C16, C19, C21 is 2.0V or less.

Rated Load

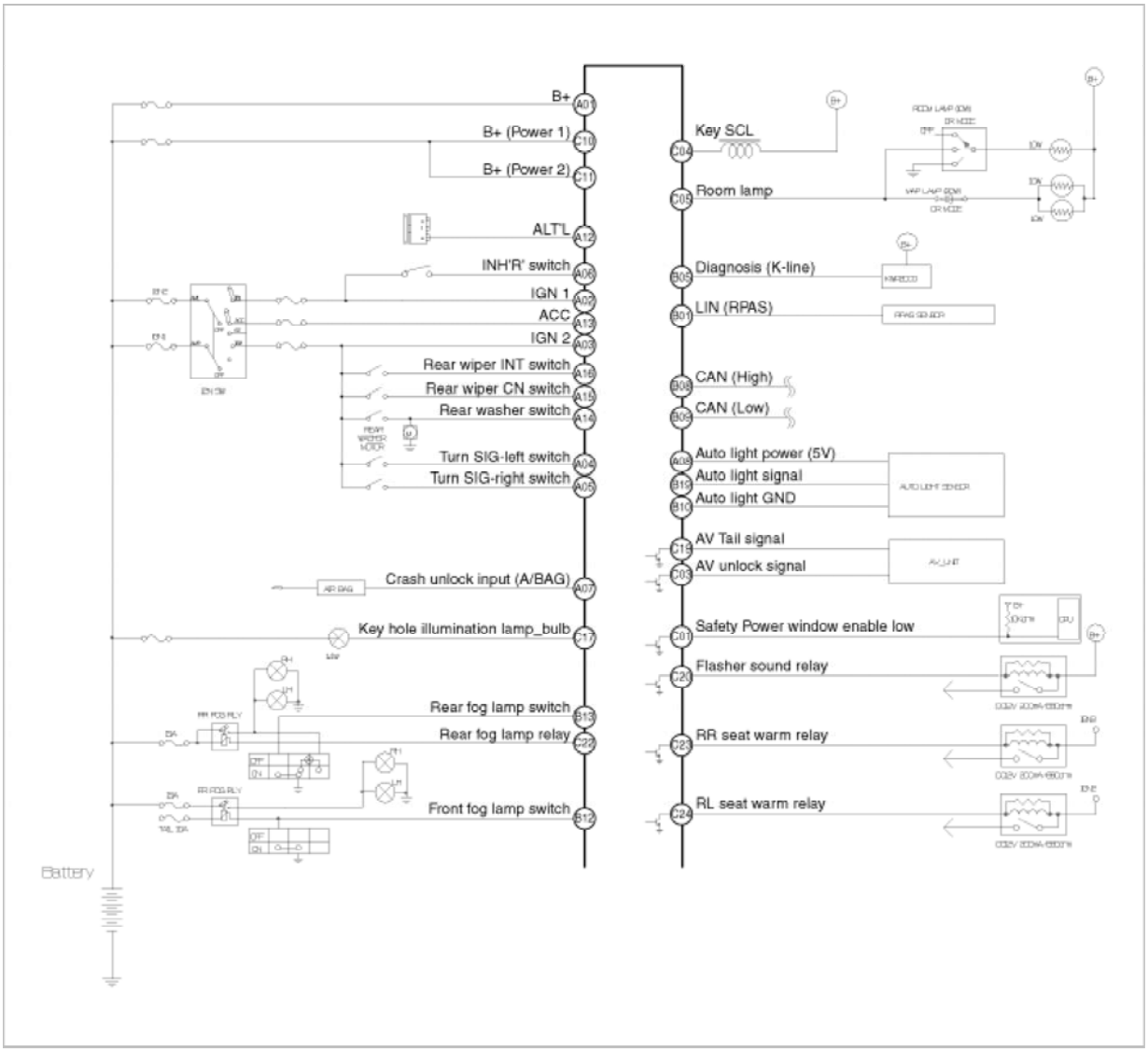
No	Item	Rated Road
1	Room lamp	30W
2	KEY SOL	MAX 1A (B+)
3	Front left turn signal lamp	33W
4	Front right turn signal lamp	33W
5	Front left turn signal lamp	28W
6	Front left turn signal lamp	28W
7	Rear right seat warmer relay	200mA
8	Rear left seat warmer relay	200mA
9	Key hole illumination lamp	1.4W (BULB)

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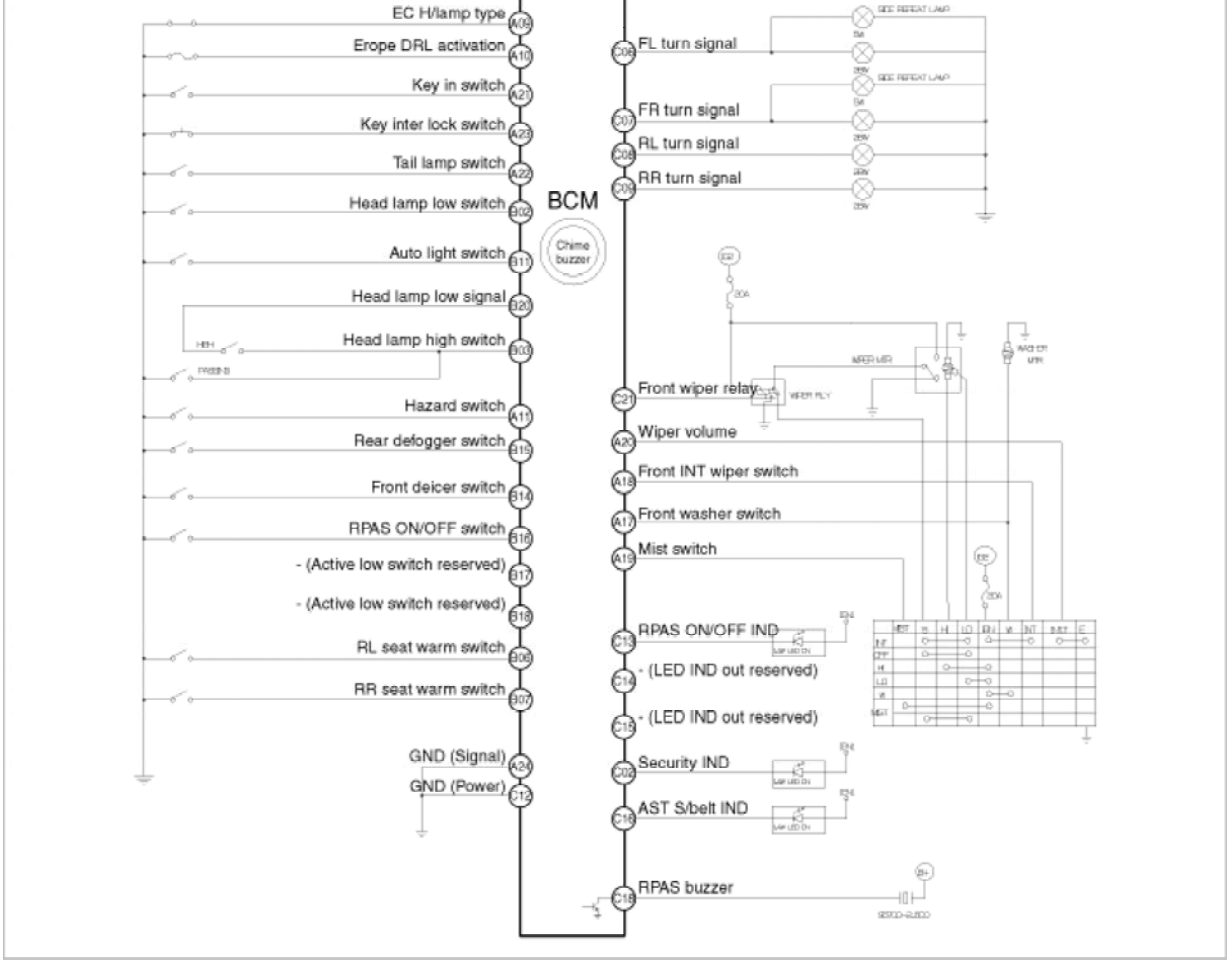
11	Flasher sound relay	200mA
12	Rear fog lamp relay	200mA
13	Assist seat belt indicator	1.4W (LED)
14	RPAS off indicator	1.4W (LED)
15	Security IND LED	1.4W (LED)
16	Auto light sensor power	MAX 1mA

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

Circuit Diagram



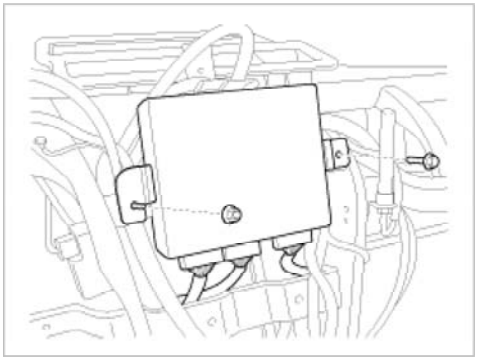
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Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Description and Operation

Description

Body control module receives various input switch signals controlling time and alarm functions for front washer interlocking wiper, front intermittent wiper, mist wiper, rear washer interlocking wiper, rear intermittent wiper, seat belt reminder, key operated warning, parking start warning, RKE teaching sound, SMK warning, power window timer, safety power window, rear defogger timer, windshield deicer timer, decayed room(map) lamp, tail lamp autocut, DRL, escort, head lamp low/high, tail lamp, Turn signal lamp, hazard lamp, ESS lamp, lane change, auto light, front fog lamp, AV tail, central door lock/unlock, AV unlock signal, 2 turn unlock, auto door lock/unlock, IGN key reminder, crash door unlock, key inter lock, buglar alarm, panic, answer back control.

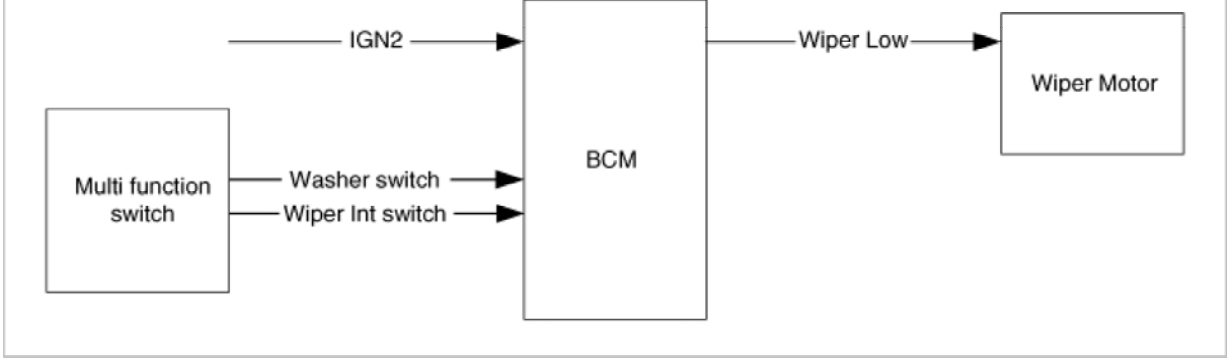


Function

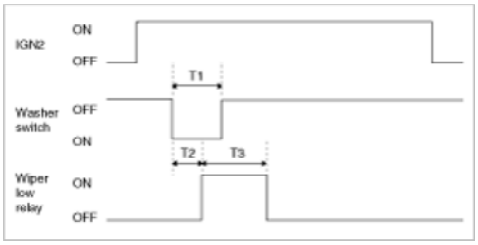
Wiper Control

1. Control of front washer interlocking wiper

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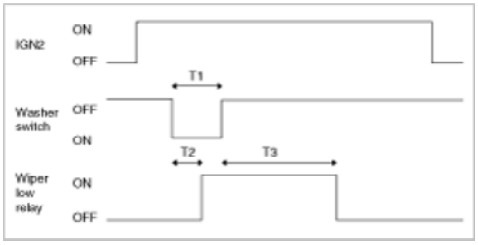


(1) In a state of IGN2 switch=ON, if WASHER switch is turned on during T1, Wiper low relay is turned ON T2 after Washer switch=ON, and Wiper low relay is OFF after T3.



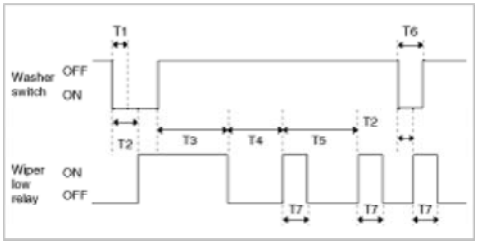
T1 : 0.06s ~ 0.2s, T2 : 0.3s ± 0.1s, T3 : 0.7s ± 0.1s

(2) In a state of IGN2 switch=ON, If Washer switch is ON during T1, Wiper low relay is turned ON T2 after Washer switch=ON. Wiper low relay is turned OFF T3 after Washer switch=OFF.



T1 : 0.2s (MIN), T2 : 0.3s ± 0.1s, T3 : 2.5s ~ 3.8s (2~3 Turn)

(3) If washer switch is ON T1 or more by Wiper INT switch during wiper operation, It operates item (2). And if washer siwtch is ON during T6, it operates Item (1).



T1 : 0.2s (MIN), T2 : 0.3s ± 0.1s, T3 : 2.5s ~ 3.8s (2~3 Turn), T4 : T5 - 0.7s, T5 : INT TIME, T6 : 0.06s ~ 0.2s, T7 : 0.7s ± 0.1s

(4) Operation is cancelled in case of IGN=OFF during T3.

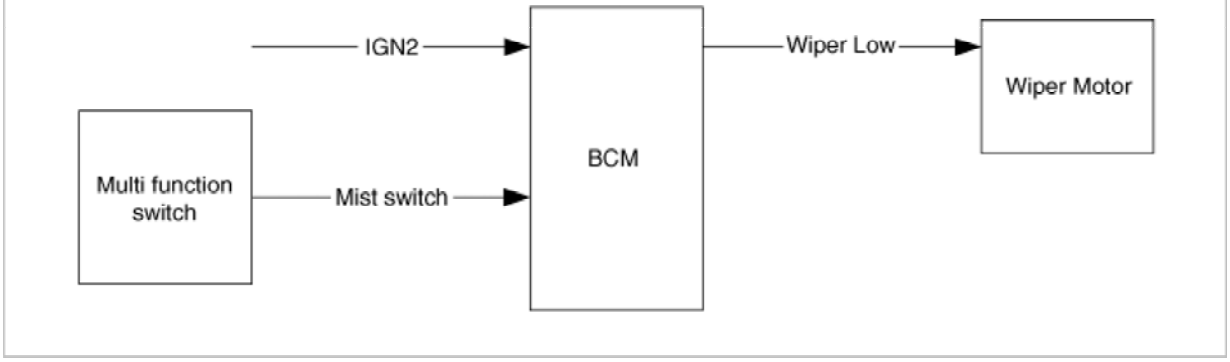
(5) Give priority to Washer interlocking wiper than speed sensing INT wiper function.

(6) Washer switch signal input shall be ignored at start-up (IGN1 ON& IGN2 OFF states).

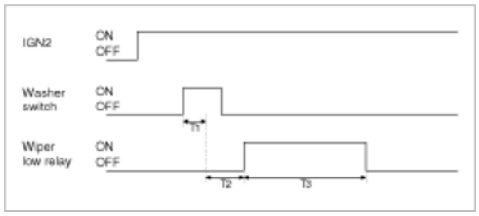
(7) Switch ON time includes chattering time.

2. MIST wiper control

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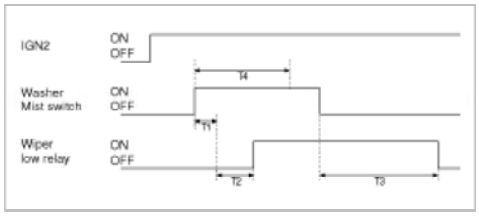


(1) When turning on wiper mist switch with IGN2 ON, turning ON wiper low relay output for 700ms.



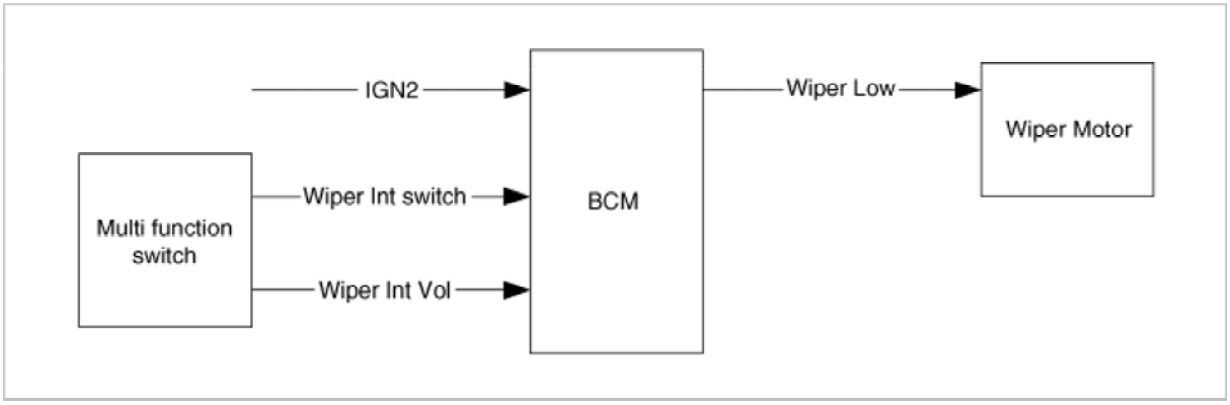
T1 : Min 60ms, T2: Max 100ms, T3 : 700±100ms

(2) If Wiper Mist switch input lasts for over 700ms, maintain Wiper low relay ON. IF Wiper Mist switch is OFF, turn ON Wiper low relay output for 700ms from it is turned OFF.



T1 : Min 60ms, T2: Max 100ms, T3 : 700±100ms, T4 : 700ms

3. INT wiper control



(1) Intermittent time of intermittent wiper is controlled dependent on the following conditions.

(1) Wiper low relay time is 0.7s ±0.1s.

(2) Intermittent time is from output ON to the next output ON.

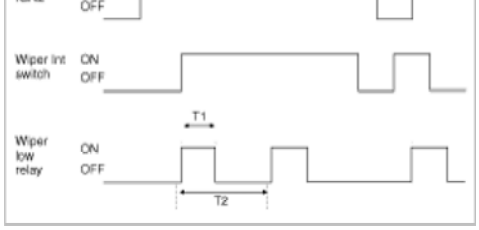
(3) Wiper low relay output is continued for remaining ON time if INT switch is turned OFF during output.

(4) Intermittent time is restarted when IGN2 switch is ON and Wiper INT switch is changed from OFF to ON.

(5) Intermittent time is restarted when Wiper INT switch is ON and IGN2 switch is changed from OFF to ON.

(6) 2.5V is used when VOLUME value is 2.5V or more.

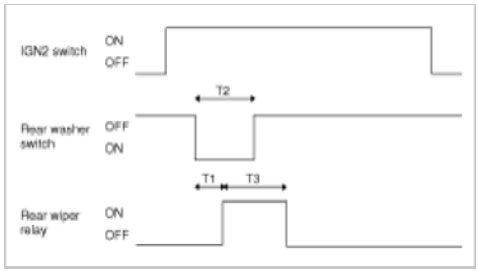
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T1 : 0.7s ± 0.1s, T2 : INT TIME (2.2 ± 0.2s ~ 10 ± 1s)

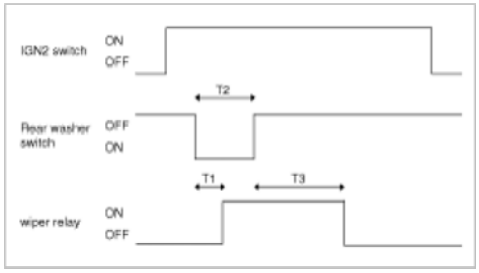
4. Rear wiper control

(1) If IGN2 switch=ON and Rear washer switch is turned on during T2, Rear wiper relay is turned ON T1 after Rear washer switch=ON. And Rear wiper relay is OFF after T3.



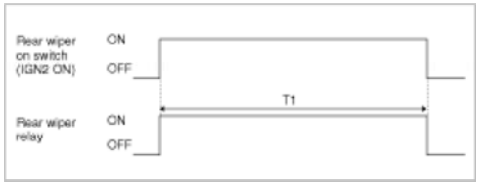
T1 : 0.3s, T2 : 0.2 ~ 0.59s, T3 : 0.7s

(2) If IGN2 switch=ON and Rear washer switch is ON more than T2, Rear wiper relay is turned ON later T1 after Rear washer switch=ON. And Rear wiper relay is turned OFF after T3 from Rear washer switch=OFF.

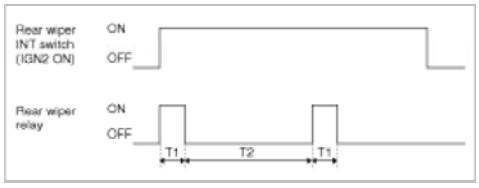


T1 : 0.3s, T2 : MIN 0.6s, T3 : 2.5s ~ 3.8s

(3) If IGN2 switch=`N and Rear wiper INT switch=ON is, Rear wiper relay outputs ON.At this time, If IGN2 switch=OFF or Rear wiper INT switch=OFF, Rear wiper relay outputs OFF.



(4) If IGN2 switch=ON and Rear wiper INT switch=ON, Rear wiper relay outputs T1(ON)/T2(OFF) cycle. At this time, if IGN2 switch=OFF or Rear wiper INT switch=OFF, Rear wiper relay outputs OFF.

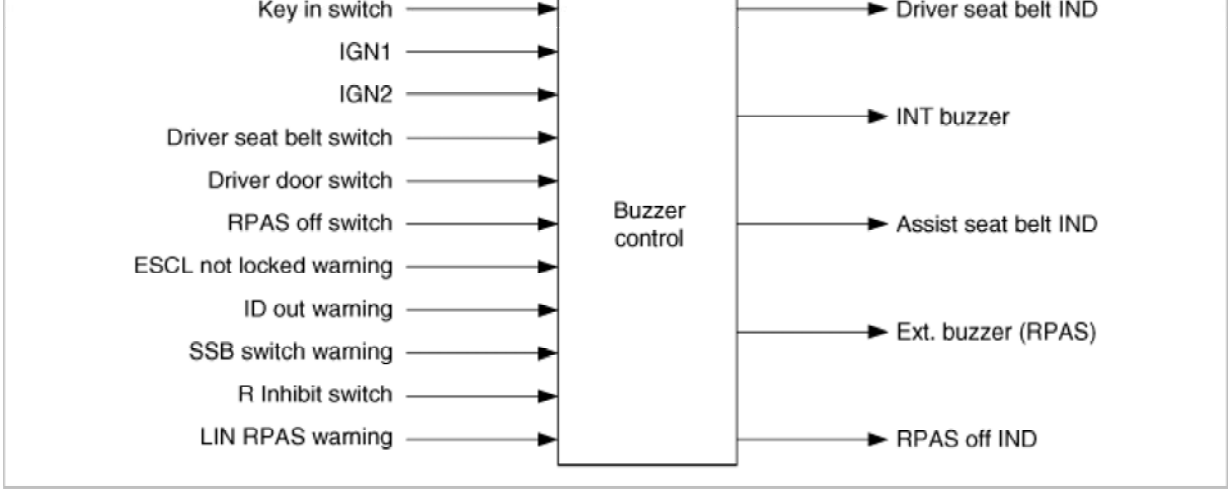


T1 : 0.7s, T2 : 5.3s

Buzzer Control

1. Buzzer control

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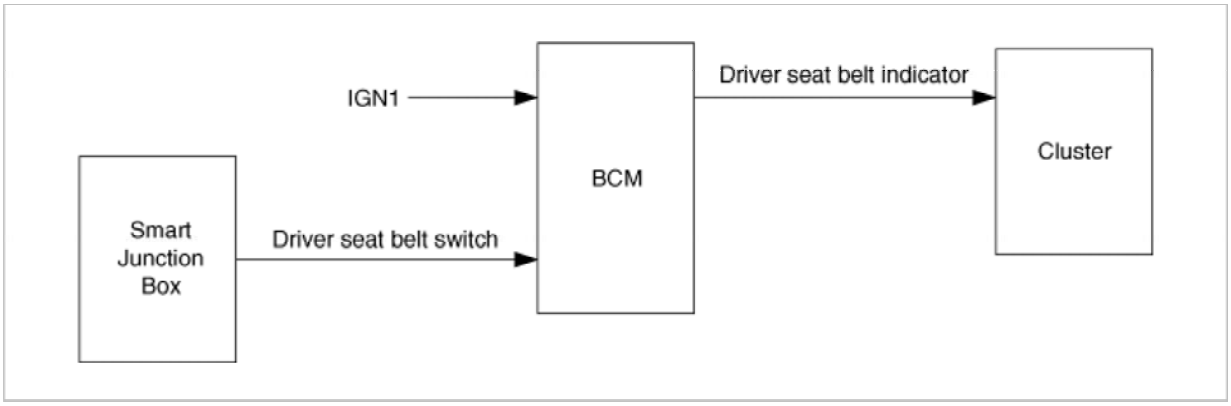
2. Buzzer sound

(1) Buzzer sound specification

Priority	Name	Cycle
1	Diagnostic sound	Continuous Sound
2	SeatBelt Warning	1s / Reductive
3	Key Operated Warning	0.6s / Reductive
4	Overspeed Warning	1s / Reductive
5	Parking Brake Warning	0.6s / Reductive
6	Key Teaching Sound (Non SMK Option)	0.6s / Reductive
7	ESCL Not Locked Warning	0.6s / Reductive
8	ESCL Not Unlocked Warning	0.6s / Reductive
9	Vehicle not P warning	0.6s / Reductive
10	ID Out Warning	Continuous Sound
11	SSB Button Warning	0.6s / Reductive
12	Rheostat Detent Warning	0.4s / ontinuous

(2) Buzzer output to estimate BCM INT Buzzer in cluster, and data transmission.

3. Seat belt reminder (Driver seat)



(1) From IGN1 switch ON, Warning lamp for 1sec(DUTY 50%) and Chime buzzer for 6 time every 1sec. (in case of S/BELT unfastened state) But, within 6sec in the S/BELT fastened, the Chime buzzer output is stop, and Warning lamp is the remaining time.

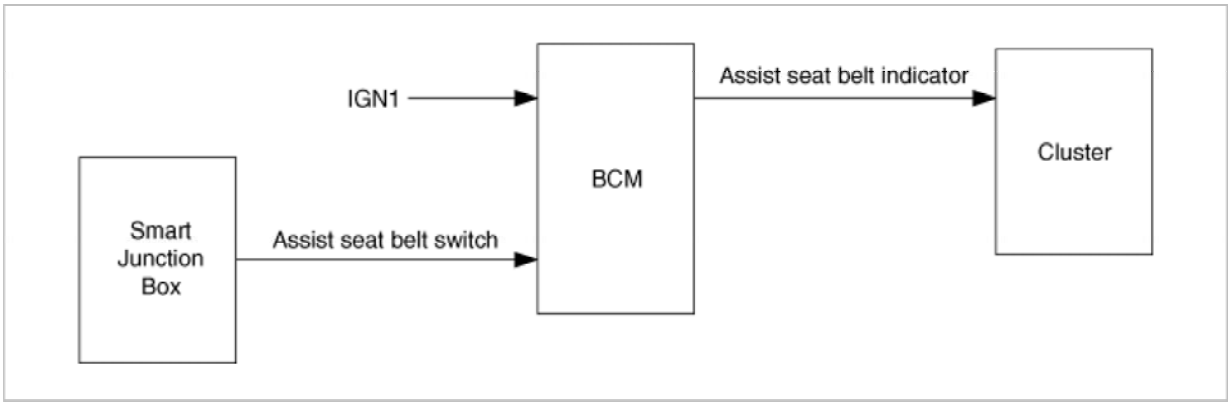
(2) Lamp and Chime buzzer become output stop when IGN1 is turned OFF within 6sec-output.

(3) If vehicle speed over 10Km/h, Warning lamp and Chime buzzer are work for 1time when Seat belt unfastened after IGN ON.

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(5) Seat belt fastened→unfastened when IGN1=ON state : if vehicle speed over 10Km/h,1time ouput. And if vehicle speed 5~10Km/h, Warning lamp for 1s(DUTY 50%) and Chime buzzer for 6 every 1s. If vehicle speed less than 5Km/h, Warning lamp for 6 every 1s(DUTY 50%)

4. Seat belt reminder (Assist seat)



(1) Warning lamp lights continuously every 1sec(DUTY 50%) for 6sec when IGN is turned ON under unfastened seat belt.

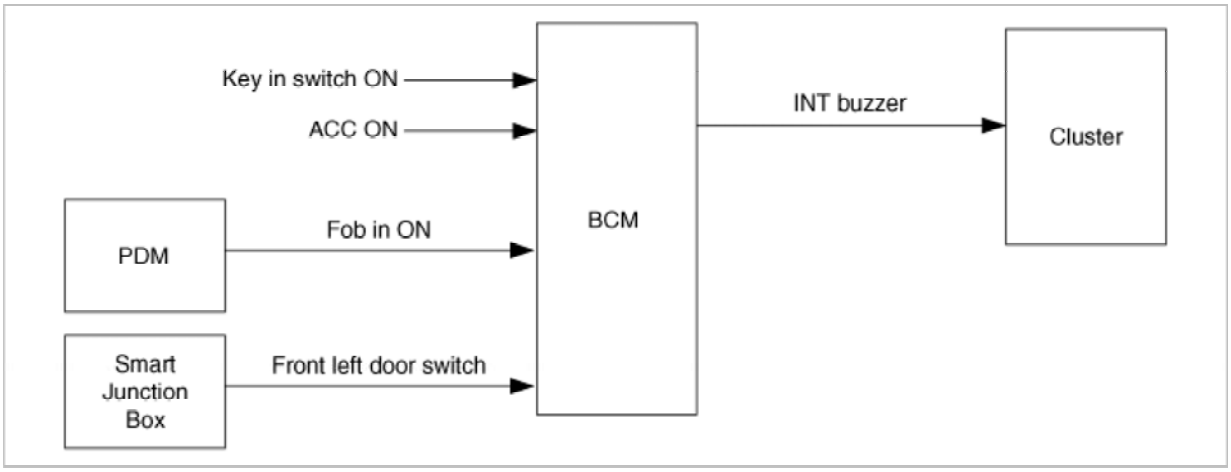
(2) Warning lamp is turned OFF when IGN is turned OFF within in time.

(3) When IGN is ON under unfastened seat belt, the warning lamp lights. The lamp continues to light for remaining time of 6sec when seat belt is fastened within 6sec. The lamp is OFF if seat belt is fastened after 6sec.

(4) When IGN is ON and vehicle speed becomes 10Km or more and unfastened seat belt, warning lights ON continuously.

(5) Under the (4)state, warning lamp is stopped when seat belt is unfastened or vehicle speed becomes under 5Km/h or IGN is turned OFF.

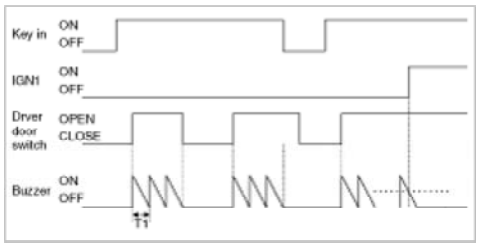
5. Key operated warning



(1) INT buzzer every 0.6sec when Driver door switch is ON under key in ON.

(2) If key in=OFF or driver door switch=close, buzzer output is OFF.

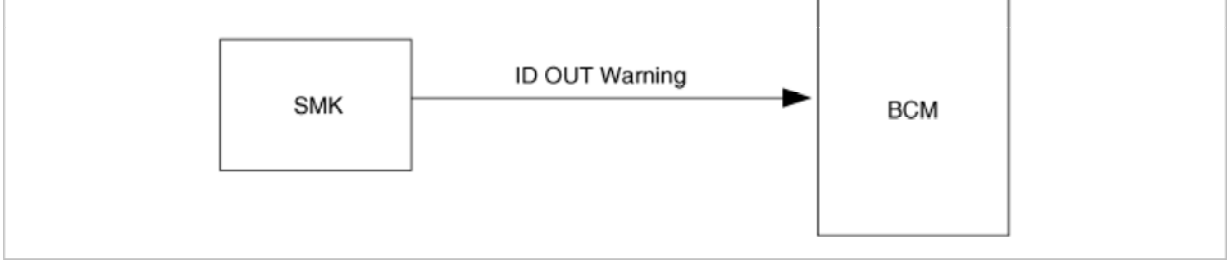
(3) If IGN1=ON, output is OFF.



T1 : 0.6 ± 0.1 sec

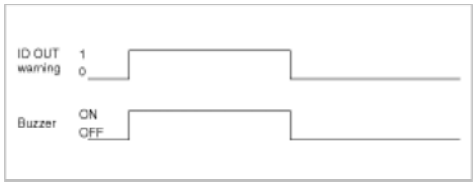
6. ID OUT Warning (SMK)

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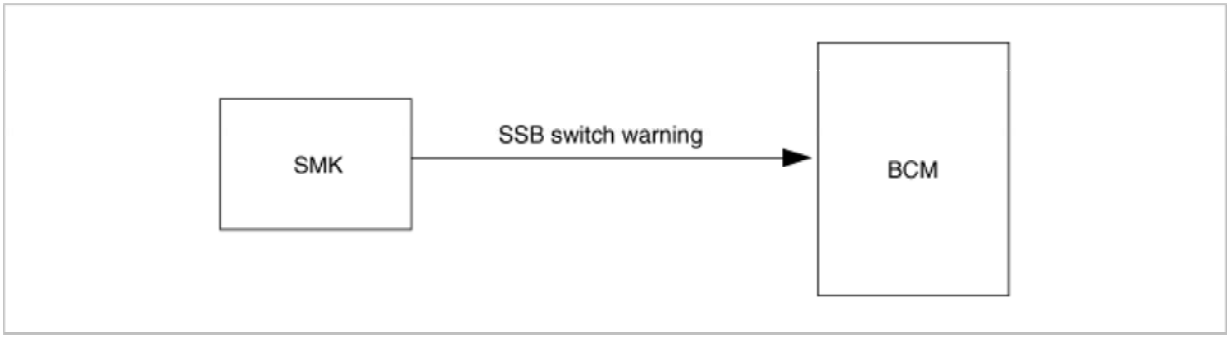


(1) If ID OUT warning (CAN)=ON, warning buzzer output for the time.

(2) Warning buzzer output=STOP, when receive OFF signal.

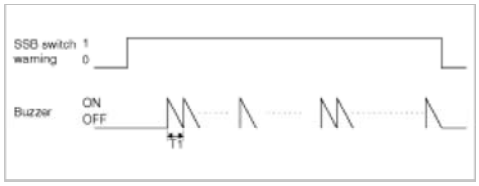


7. SSB switch warning (SMK)



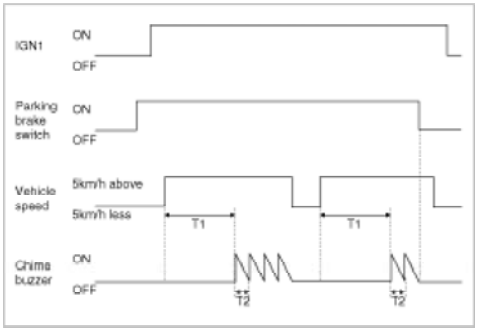
(1) If SSB warning(CAN)=ON, warning buzzer output for the time.

(2) Warning buzzer output=STOP, when receive OFF signal.



T1 : 0.6 ± 0.1 sec

8. Parking start warning
If vehicle speed is 5Km/h or above and Parking brake switch=ON, Buzzer is alarming at T2 cycle.



9. Key teaching sound (KEYLESS ONLY)
When key teaching by code saving unit or GDS(K-LINE), outputs 0.6s (800Hz) diminution sounds once.

10. Vehicle NOT P warnign (SMK)

(1) When vehicle NOT P warning(CAN) signal=ON, warning buzzer output for the time.

(2) Warning buzzer output=STOP, when receive OFF signal.

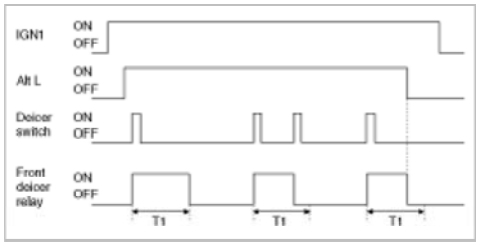
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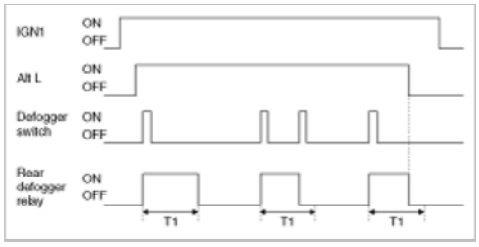
T1 : 0.6 ± 0.1 sec

Defogger & deicer timer control

1. Deicer timer
   (1) Front deicer relay is turned ON for 20 min, if defogger switch=ON after Alt L=ON & IGN1=ON.
   (2) Front deicer relay is turned OFF, if defogger switch=ON during front deicer relay=ON.
   (3) Front deicer relay is turned OFF, if Alt L=OFF or IGN1=OFF during front deicer relay=ON.
   (4) Front deicer relay OFF, if Alt L=ON after defogger switch=ON.

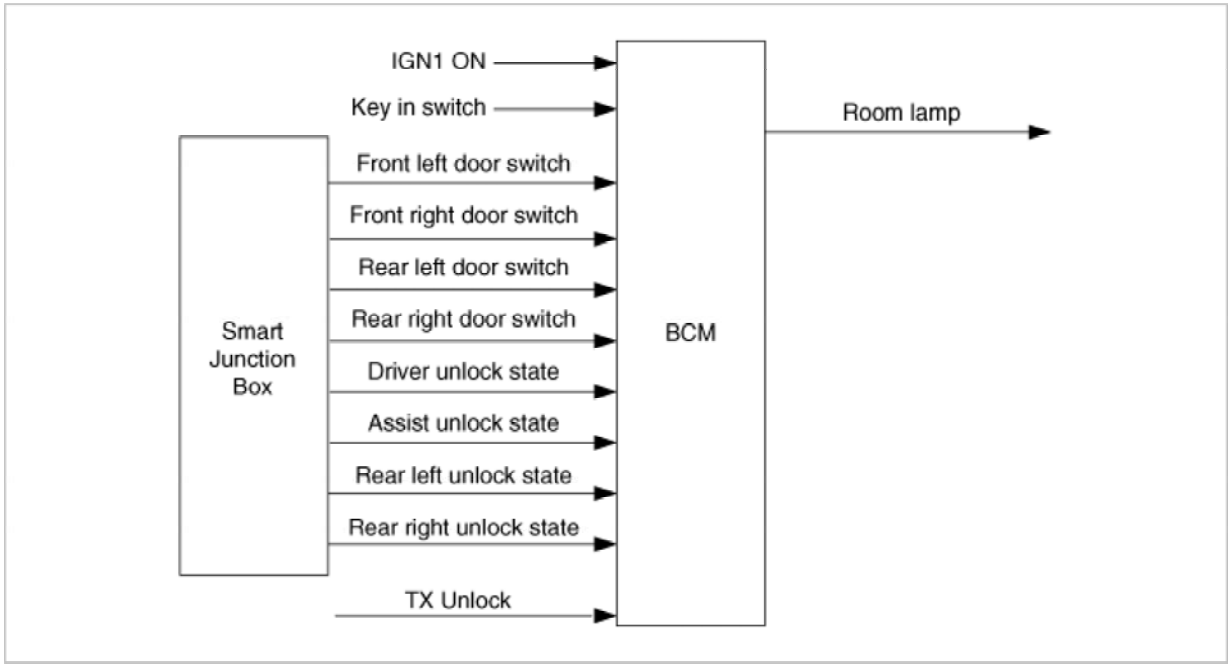


2. Defogger timer
   (1) Defogger relay is turned ON for 20min, if defogger switch=ON after Alt L=ON & IGN1=ON.
   (2) Defogger realy is turned OFF, if defogger switch=ON during defogger relay=ON.
   (3) Defogger relay is turned OFF if Alt L=OFF or IGN1=OFF during defogger relay=ON.
   (4) Defogger relay OFF, if Alt L=ON after defogger switch=ON.



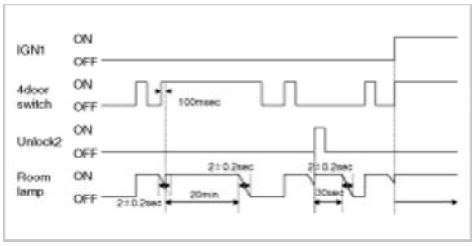
Decyed Room Lamp

1. Data flow



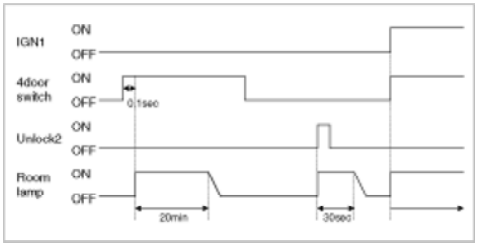
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Initial Condition	Room Lamp Decaying
Event	Decay finished
Action	Room Lamp off enter



(2) Room Lamp on

Initial Condition	Room Lamp off
Event	IGN1=on & 4 door switch=on
Action	Room Lamp on enter



(3) Room Lamp Decaying

Initial Condition	Room Lamp Decaying
Event	IGN1=on & 4 door switch=on
Action	Room Lamp on enter

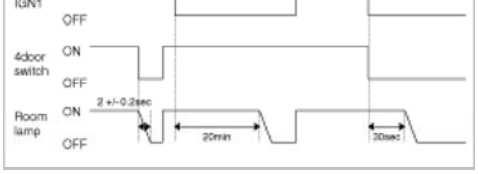
Initial Condition	Room Lamp on for 20min
Event	IGN1=on
Action	Room Lamp on enter

(4) Room Lamp on for 30s

Initial Condition	Room Lamp on for 30s
Event	TX Unlock or Key In switch=on→off
Action	Restart Room Lamp on for 30s

Initial Condition	Room Lamp on
Event	IGN1=off & 4 door switch=off
Action	Start Room Lamp on for 30s

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NOTE

1. The flickering of lamp is not allowed even though IGN1 ON.
2. The resolution of Decayed Room Lamp must be more than 32 step.

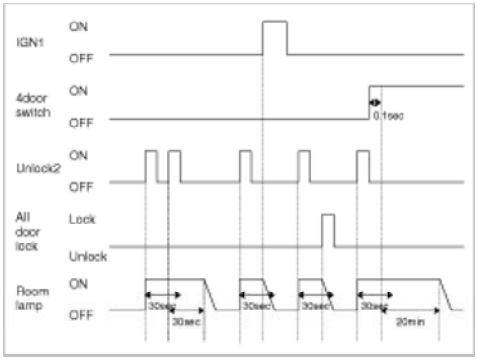
Initial Condition	Room Lamp on for 20min
Event	IGN1=off & 4 door switch=off
Action	Start Room Lamp on for 30s

Initial Condition	Room Lamp Decaying
Event	IGN1=off & 4 door switch=off & (TX Unlock or Key In switch=on→off)
Action	Start Room Lamp on for 30s

Initial Condition	Room Lamp off
Event	IGN1=off & 4 door switch=off & (TX Unlock or Key In switch= on→off)
Action	Start Room Lamp on for 30s

(5) Room Lamp Decaying

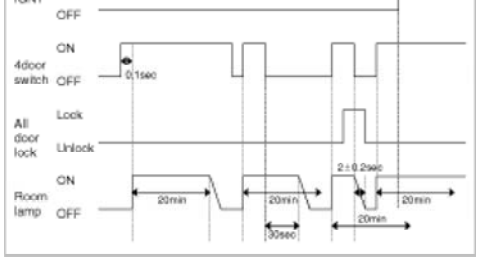
Initial Condition	Room Lamp on for 30s
Event	IGN1=on or 30s elapsed or Any Door Unlock→All Door Lock1
Action	Start Room Lamp Decaying



Initial Condition	Room Lamp on
Event	IGN1=on or 4 door switch=off
Action	Start Room Lamp Decaying

Initial Condition	Room Lamp on for 20min
Event	20min elapsed or (IGN1=off & 4 door switch=off & All Door Lock1)
Action	Start Room Lamp Decaying

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(6) Room Lamp on for 20min

Initial Condition	Room Lamp off
Event	IGN1=off & (4 door switch=off→on for 100ms)
Action	Start Room Lamp on for 20min

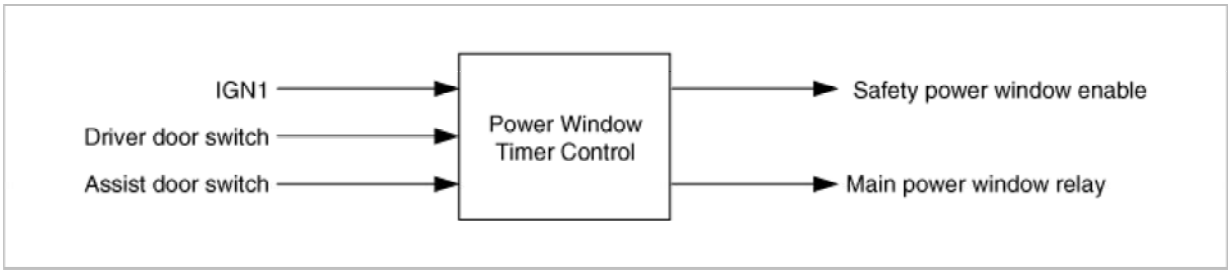
Initial Condition	Room Lamp Decaying
Event	IGN1=off & (4 door switch=off→on for 100ms)
Action	Start Room Lamp on for 20min

Initial Condition	Room Lamp on for 30s
Event	IGN1=off & (4 door switch=off→on for 100ms)
Action	Start Room Lamp on for 20min

Initial Condition	Room Lamp on
Event	IGN1=off & 4 door switch=on
Action	Start Room Lamp on for 20min

Power Window Timer

1. Data flow



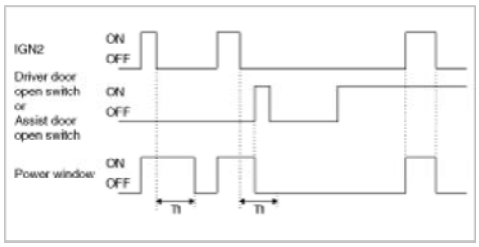
2. Function

(1) Turn ON Power window if IGN2 switch ON.

(2) Power window output is maintained for 30 seconds and OFF if IGN2 switch is OFF.

(3) The output is immediately OFF if Driver door open switch ON or Assist door open switch ON in the (2) above.

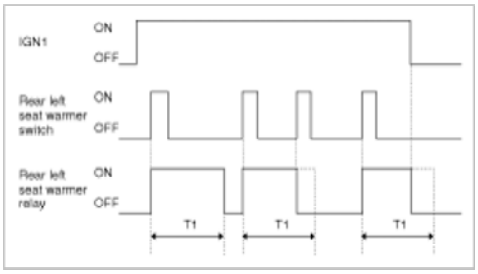
(4) If IGN2 is OFF with Driver door open switch ON or Assist door open switch ON, Power window is OFF.



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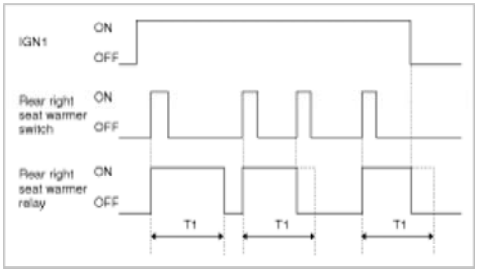
Rear Seat Heater Relay Control

1. Rear left seat heater relay is ON for T1 if IGN=ON & Rear left seat heater switch=ON.
   Rear left seat heater relay is OFF if IGN=OFF & Rear left seat heater switch=ON(again) within T1.



T1 : 20minute ± 1minute

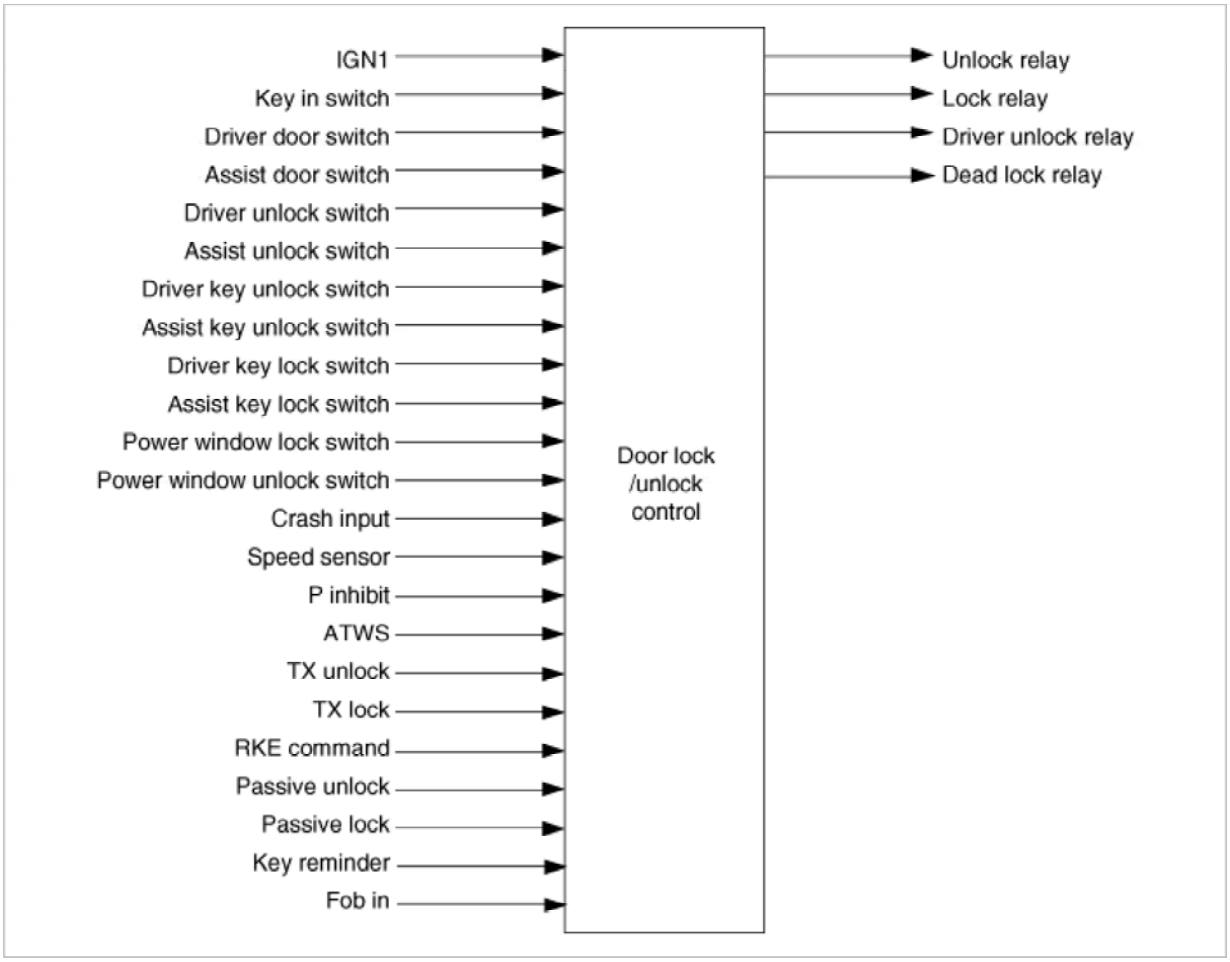
2. Rear right seat heater relay is ON for T1 if IGN=ON & Rear right seat heater switch=ON.
   Rear right seat heater relay is OFF if IGN=OFF & Rear right seat heater switch=ON(again) within T1.



T1 : 20minute ± 1minute

Door Lock/Unlock Control

1. Data flow



2. Central Door Lock/unlock

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But prohibit the output when KEY IN ON and IGN Part ON.

(2) When Driver Door Key Unlock and Passenger Door Key Unlock turn ON, turn Door Unlock Relay and Driver Door Unlock Relay output ON during T1.

(3) Turn CENTRAL LOCK *1) ON during T1 when receiving TX LOCK signal.
But ignore LOCK input when Driver Door SW or Passenger Door SW is ON.

(4) Turn CENTRAL UNLOCK *2) ON during T1 when receiving TX UNLOCK signal.

(5) LOCK/UNLOCK by SAFETY KNOB is not interlock (Mechanical operation).

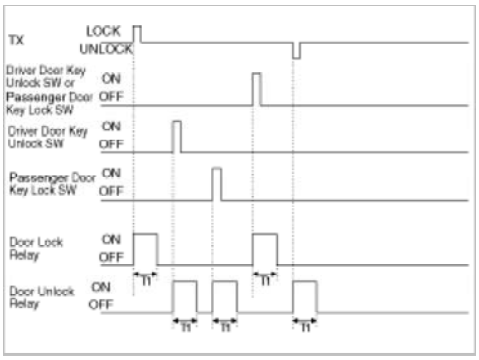
(6) Malfunction should be free when joining BATTERY (Also malfunction should be free at the location of Key In Switch ON).

(7) Input which is less than 60msec should not be received (KEY LOCK/UNLOCK Switch).

(8) Do not execute the output of DOOR LOCK (UNLOCK) by KNOB change.

(9) If Power Window Lock Switch is ON, turn Lock Relay output ON for T1. (NORTH AMERICA)

(10) If Power window Lock Switch is ON, turn CENTRAL UNLOCK output ON for T1. (NORTH AMERICA) But, inhibit operating by Power window Unlock Switch at Lock state by TX.
*1) CENTRAL LOCK : Refer to control mode for each Spec.
*2) CENTRAL LOCK : Refer to control mode for each Spec.



T1 : 0.5 ± 0.1sec

3. 2-Turn Unlock

(1) If Driver Door Key Unlock Switch turns OFF from ON within T1 after Driver Door Key Unlock Switch turns ON from OFF (Driver Door Unlock Switch becomes UNLOCKED mechanically and does not output BCM.), turn Driver Unlock Relay, Unlcok Relay(Central Unlock) output ON duting T2.

(2) If TX UNLOCK is received within T1 after Driver Door Key Unlock Switch turns ON from OFF (Driver Door Unlcok Switch becomes UNLOCKED mechanically and does not output BCM.), turn Driver Unlock Relay and Unlock Relay(Central Unlock) output ON during T2.

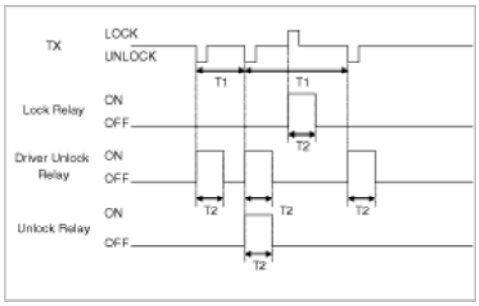
(3) Turn Driver Unlock Relay output ON during T2 when receiving TX UNLOCK signal. However, turn Driver Unlock Relay, Unlock Relay (Central Unlock) output duting T2 if TX UNLOCK is received within T1.

(4) Also, turn Driver Unlock Relay, Unlock Relay (Central Unlock) ON during T2 in case that Driver Door Key Unlock Switch turns ON from OFF within T1 after receiving TX UNLOCK.

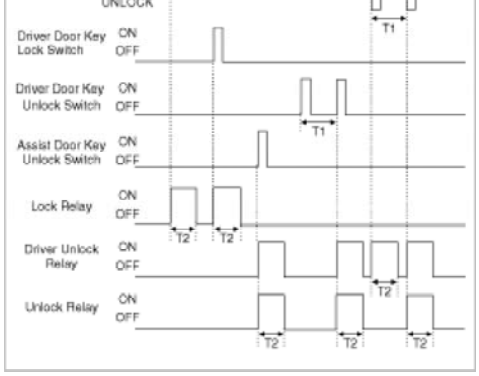
(5) Regard as the same TX even though different signal which is registered within T1 is received.

(6) If turn Lock Relay output ON by TX Lock or Driver/Assist Key lock Switch, T1 is initialized.

(7) Assist Key Unlock Switch turns ON from OFF, turn Driver Unlock Relay and Unlock Relay (Central Unlock) output ON during T2.



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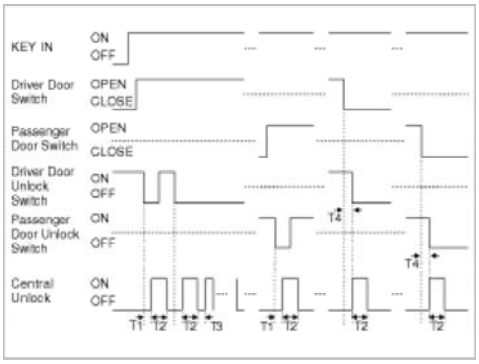
T1 : 4 ± 1sec, T2 : 0.5 ± 0.1sec

4. 2-Turn Unlock (SMK)
   (1) All DOOR UNLOCK output are ON during T2 if Driver ddor unlock switch is unlock within 3s and Driver door key unlock switch is OFF→ON within T1 after Driver door key unlock switch is OFF→ON (mechanically, Driver door unlock switch is unlocked and BCM signal is not output).
   (2) All DOOR UNLOCK output are ON during T2 if Driver door unlock switch is UNLOCK within 3s and SMK/RKE command= UNLOCK is received within T1 after Driver door key unlock switch isOFF → ON (mechanically, Driver door unlock switch is unlocked and BCM signal is not output).
   (3) DRIVER DOOR UNLOCK signal is output for T2 when SMK/RKE command=UNLOCK signal is received. But, ALL DOOR UNLOCK signals are output for T2 if SMK/RKE command=UNLOCK signal is received within T1.
   (4) All DOOR UNLOCK output are ON during T2 if Driver door key unlock switch is OFF→ON (mechanically, Driver door unlock switch is unlocked and BCM signal is not output) within T1 and Driver door unlock switch is UNLOCK within 3s after SMK/RKE command = UNLOCK received.
   (5) DRIVER DOOR UNLOCK output is ON during T2 when Passive unlock ON & P_FL ON is input. But, ALL DOOR UNLOCK output are ON during T2 if Passive unlock ON & P_FL ON is input within T1.
   (6) DRIVER DOOR UNLOCK output is ON during T2 when Passive unlock ON & P_FL ON is input. But, ALL DOOR UNLOCK output are ON during T2 if Driver door key unlock switch is OFF → ON within T1.
   (7) DRIVER DOOR UNLOCK output is ON during T2 when Passive unlock ON & P_FL ON is input. But, ALL DOOR UNLOCK output are ON during T2 if SMK/RKE command = UNLOCK is received within T1.
   (8) Driver door unlock switch UNLOCK state of the output from the DRIVER DOOR UNLOCK does not require.
   (9) ALL DOOR UNLOCK output will be according to DRIVER DOOR UNLOCK output when the DRIVER DOOR UNLOCK output of the ALL DOOR UNLOCK output requirements.

5. IGN Key Reminder
   (1) This function will not be operated if the speed of cars exceeds 3km/h.
   (2) Perform Unlock Relay output for 1s after 0.5s when the condition becomes to be KEY IN = ON& Driver Door open Switch = OPEN & Driver Door Unlock Switch = LOCK(Regions for North America).
   (3) Perform Driver Unlock Relay output for 1s after 0.5s when the condition becomes to be KEY IN = ON & Driver Door open Switch = OPEN & Driver Door Unlock Switch = LOCK.(Spec for North America ONLY)
   (4) Perform Unlock Relay output for 1s in 0.5s when the condition becomes to be KEY IN = ON & Assist Door Open Switch =OPEN & Assist Door Unlock Switch = LOCK.
   (5) Output CENTRAL UNLOCK for 1s in 0.5s based on (4) if (1), (3) and (4) are satisfied.
   (6) Output UNLOCK up to 3 times(excluding output for 1s) if LOCK condition is maintained though UNLOCK output is performed for 1s by (2), (3), (4)(cycle for 1s: 0.5s ON/OFF).
   (7) Try UNLOCK once when DOOR is CLOSED while keeping LOCK condition after performing (6).
   (8) Output Driver Unlock Relay once only for 1s when Driver Door open Switch is closed within 0.5s since Driver Door Unlock Switch is changed from UNLOCK to LOCK during KEY IN = ON(North America SPEC ONLY).
   (9) Output CENTRAL UNLOCK once only for 1s when Assist Door Open Switch is closed within 0.5s since Assist Door Unlock Switch is changed from UNLOCK to LOCK during KEY IN = ON.
   (10) Output Driver Unlock Relay for 1s when Driver Door Unlock Switch becomes LOCK from UNLOCK within 0.5s since Driver Door open Switch is changed from OPEN to CLOSE during KEY IN = ON(North America SPEC ONLY)
   (11) Output CENTRAL UNLOCK once only for 1s if Assist Door Unlock Switch becomes to be LOCK from UNLOCK within 0.5s since Assist Door Open Switch is changed from OPEN to CLOSE during KEY IN = ON.
   (12) Jugde if RETRY output is performed or not at the point of the beginnig of RETRY output(in 1.5s from the initial UNLOCK

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(13) Output UNLOCK though the condition is not kept for 0.5sec after realizing that of UNLOCK. But, do not output UNLOCK in case that KEY IN is OFF at the point of 0.5s passed after realizing the condition by the change of UNLOCK → LOCK in Driver Door Unlock Switch or Assist Door Unlock Switch.



T1, T3 : 0.5 ± 0.1sec, T2 : 1 ± 0.1sec,
T4 : 0.5sec Max
** KEY IN ON : Key In ON or IGN1 ON or IGN2 ON
KEY IN OFF : Key In OFF and IGN1 OFF and IGN2 OFF

6. Crash Door Unlock

(1) Always perform CENTRAL UNLOCK *9) output whenever Crash Input signal is inputted while IGN1 is ON.

(2) Keep CENTRAL UNLOCK output for the time left though IGN1 turns OFF from ON while outputting CENTRAL UNLOCK.

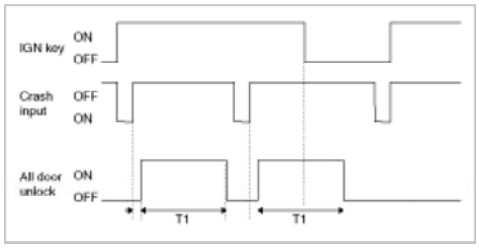
(3) Do not output CENTRAL UNLOCK if IGN1 switch turns ON from OFF after Crash Input signal is already inputted.

(4) Output CENTRAL UNLOCK during T3 if Driver Door Unlock switch or Passenger Door Unlock switch or Rear Right Door Unlock switch or Rear Left Door Unlock switch turns to LOCK from UNLOCK after outputting CENTRAL UNLOCK.

(5) Do not perform AUTO DOOR LOCK function at the condition of CRASH UNLOCK.

(6) CRASH DOOR UNLOCK function has priority to LOCK/UNLOCK control by other functions.

(7) Ignore the request for LOCK/UNLOCK by other functions while or after outputting CRASH DOOR UNLOCK. But, control LOCK/UNLOCK by other functions if IGN1 switch becomes OFF.



T1 : 5 sec
* IGN KEY_ON : ON = KEY IN or FOB IN or ACC ON or IGN1 ON or IGN2 ON
OFF = KEY OUT or FOB OUT or ACC OFF or IGN1 OFF or IGN2 OFF

7. Auto Door Lock (User Option)

(1) AUTO DOOR LOCK is classified into non-activation/ 15km actiovation/ shift lever change by using SCAN TOOL.

(2) On condition of IGN1 switch ON, turn Door Lock Relay output ON within T1 when keeping more than setting speed in (1). But, do not output LOCK if all DOORS are LOCKED or FAIL at first.

(3) Perform outputting LOCK up to 3 times (cycle for 1s) if either of DOORS is UNLOCKED after outputting LOCK in (2). But, ignore the DOOR that has changed to LOCK condition from UNLOCK during the output 3 times.

(4) Regard the respective DOOR FAILED if it is UNLOCKED after outputting 3 times.

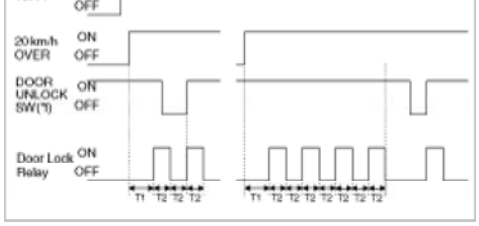
(5) Output LOCK once only if the DOOR is UNLOCKED after the failed DOOR changes(UNLOCK→LOCK).

(6) Output LOCK once only if DOOR which was LOCKED after outputting LOCK in (2) becomes to be UNLOCKED. But, output LOCK once for the respective DOOR although it keeps UNLOCK after LOCK output.

(7) Clear the FAILED DOOR when IGN1 switch is OFF.

(8) Do not perform AUTO DOOR LOCK function on condition of CRASH UNLOCK.

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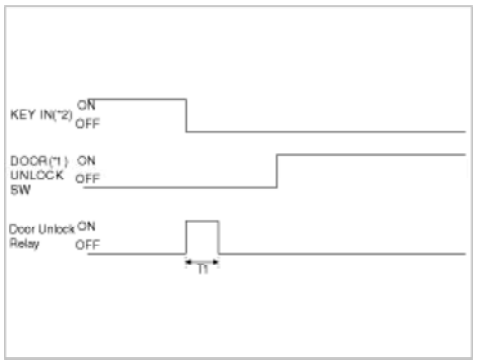


T1 : Max 1.5sec, T2 : 0.5 ± 0.1sec

*1 ON (UNLOCK) : Driver DR Unlock switch | Passenger DR Unlock switch | Rear Right DR Unlock switch | Rear Left DR Unlock switch UNLOCK

OFF (LOCK) : Driver DR Unlock switch | Passenger DR Unlock switch | Rear Right DR Unlock switch | Rear Left DR Unlock switch LOCK

8. Auto Door Unlock (User Option)
   (1) AUTO DOOR UNLOCK is classified into non-activation / Key Off / Driver safty knob state / shift lever change by using SCAN TOOL.
   (2) If it is set up to be activated, turn DR Unlock Relay ON when turning KEY IN OFF after KEY IN is ON. (But, if all conditions for KNOB are UNLOCK, it will not output.)
   (3) AUTO DOOR UNLOCK should operate after outputting AUTO DOOR LOCK (UNLOCK OUTPUT will not occur though the key is removed later if LOCK OUTPUT did not occur because all KNOBS are already LOCKED even though it reached to the operating speed of AUTO DOOR LOCK.)



T1 : 0.5 ± 0.1sec

*1 ON (UNLOCK) : Driver DR Unlock switch | Passenger DR Unlock switch | Rear Right DR Unlock switch | Rear Left DR Unlock switch UNLOCK

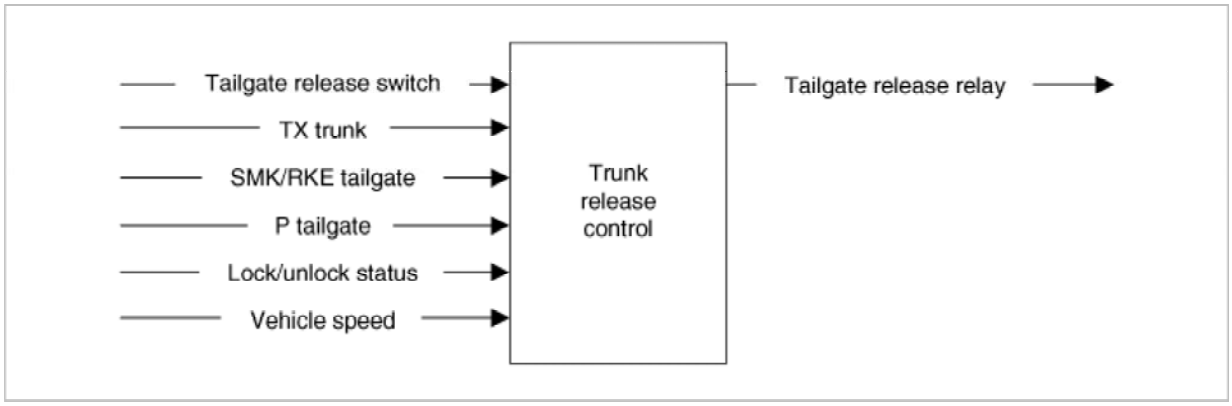
OFF (LOCK) : Driver DR Unlock switch | Passenger DR Unlock switch | Rear Right DR Unlock switch | Rear Left DR Unlock switch LOCK

*2 KEY IN ON : Key In ON or IGN1 ON or IGN2 ON

KEY IN OFF : Key In OFF and IGN1 OFF and IGN2 OFF

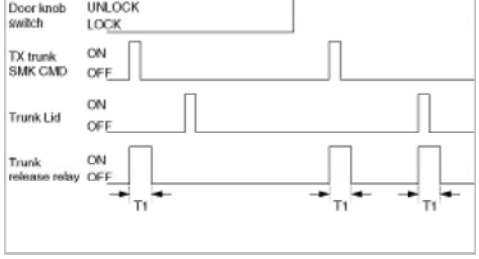
Tailgate Release Control

1. Data flow



2. Tailgate Release Control
   (1) Turn Trunk Release Relay ON during T1 when TX TRUNK or SMK(RKE TRUNK, TRUNK REOPEN) is ON.
   (2) If ALL DOOR UNLOCK and TRUNK LID is OFF → ON, Trunk Release Relay is ON during T1.(SMK option)

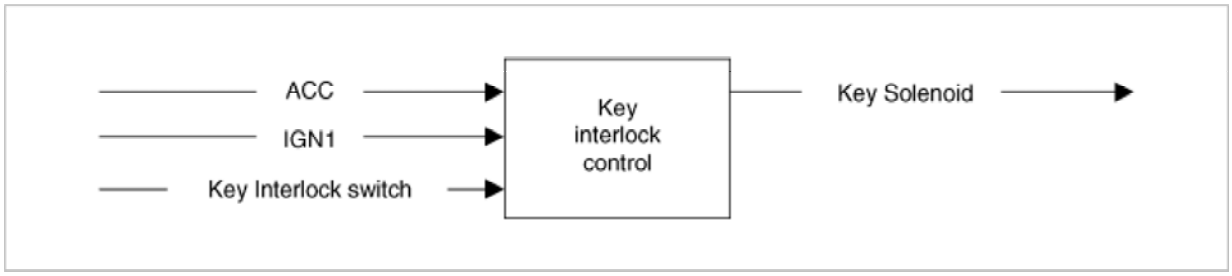
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T1 : 0.5 ± 0.1sec

Key Interlock Control

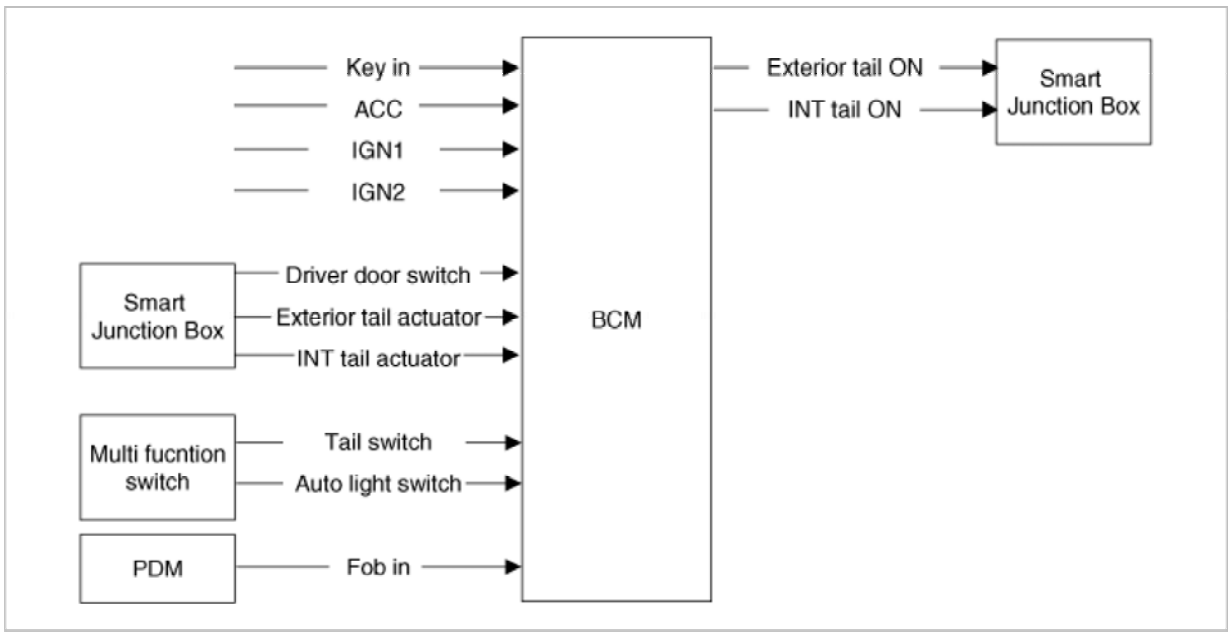
1. Data flow



2. Key Interlock Control
   (1) Key solenoid to the output of the ON KEY to make the subject does not fall. (if IGN1=ON or ACC=ON subject to the key Interlock switch input is OFF)
   (2) In addition to the above conditions, the KEY OFF key solenoid output to fall out, to make conditions.

Exterior Lamp Control

1. Tail lmap function



(1) General Function Condition
   A. In BATTERY ON and Tail Lamp is off state, if user turns on the Tail lamp switch (TailSW=ON), Tail Lamps are turned on.

(2) Tail Auto Cut Function Condition
   A. The “Tail Auto Cut” strategy ensures that Tail lamps are turned off even if a driver forgets to turn them off.
   B. When the Tail lamp is turned on by Tail lamp switch, after key insertion , and if a user removes key and opens the driver side door, the Tail lamps are automatically turned off.
   C. While “Tail Auto Cut” function is active, if a user turns off the Tail lamp switch or inserts key, “Tail Auto Cut” function will be deactivated and Tail lamps can be turned on.
   D. “Tail Auto Cut” state is memorized in ECU, so even if battery reset, this state is not erased.

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(3) CAN signal Tail Activity Condition

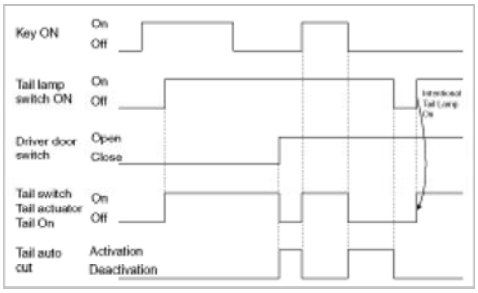
A. When tail lamp output condition is met, Tail Lamp activity CAN data is also turned on.

B. When tail lamp output condition is not met, Tail Lamp activity CAN data is also turned off.

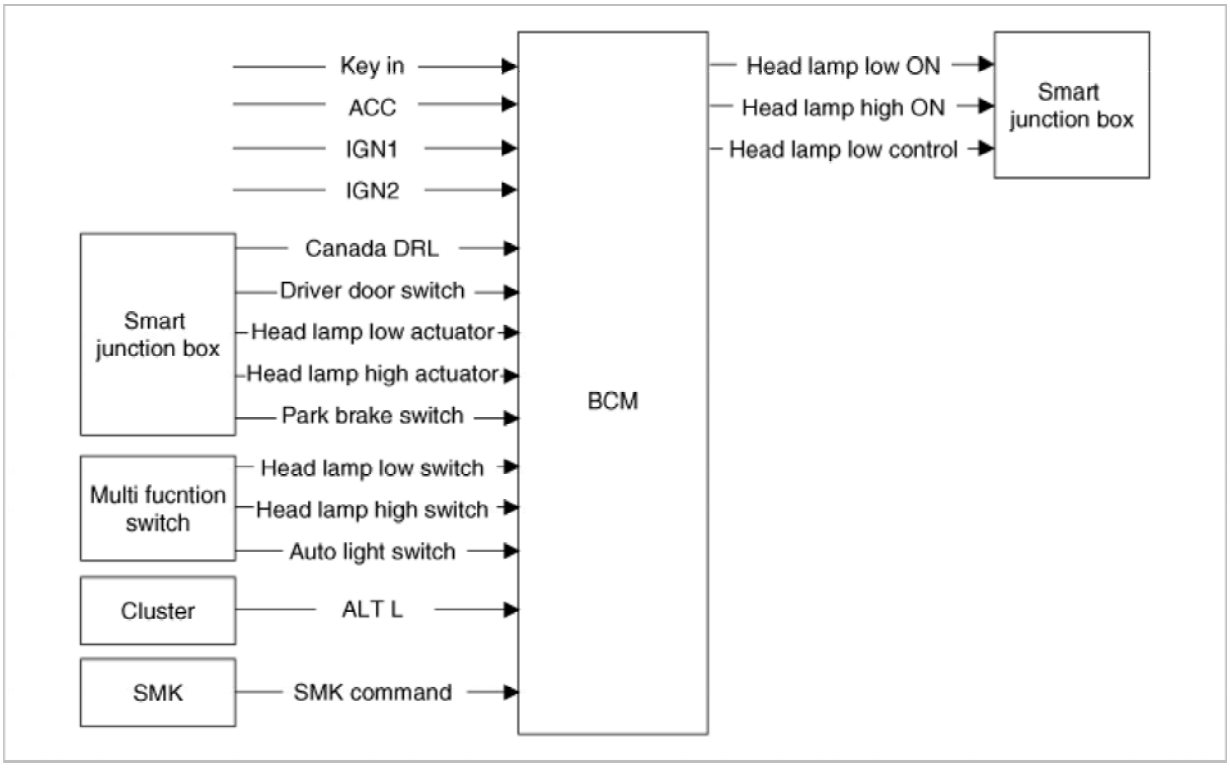
(4) Internal signal Tail Activity Condition

A. When tail lamp output is on, internal signal Tail Lamp activity is also turned on.

B. When tail lamp output is off, internal signal Tail Lamp activity is also turned off.



2. Head lmap function



(1) Head Lamp Low Control

A. In IGN terminal State(IGN=ON), if turn on the Head lamp low switch=ON, Head lamp low outputs are turned on.

B. When Tail lamp Off and headlamp Off conditions are satisfied at the same time, Head lamp low and Tail lamp turned off simultaneous immediately.

(2) Head Lamp High Control

A. In IGN terminal state(IGN=ON) and Head lamp low switch On, if turn on the Head lamp high switch=ON, Head lamp high outputs are turned on.

(3) Passing Control

A. In IGN terminal State(IGN=ON), If Head lamp passing switch Input is detected then Head lamp high output are turned on and Head lamp low output=On at the same time.

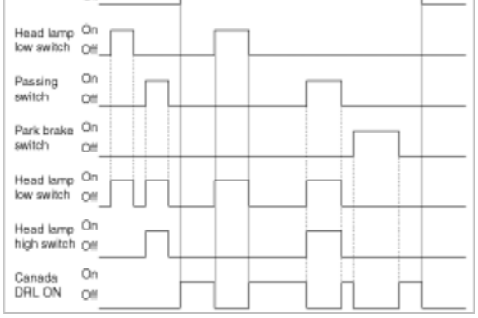
(4) Canada DRL

A. If alternator level is high(ALT L=On), BCM activates Canada DRL functionality and turns on the Head lamp high (CANADA DRL=On).

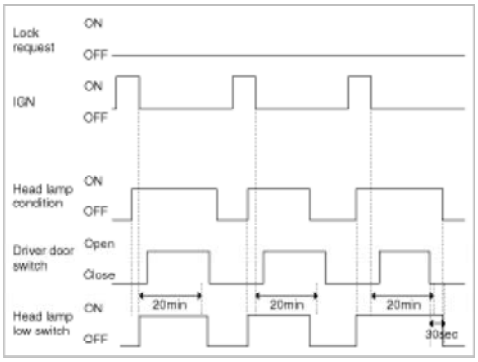
B. Deactivation if:

- Head lamp low On request by Head lamp switch or auto light head lamp Low control or
- Head high On request by passing switch or
- Parking brake switch On

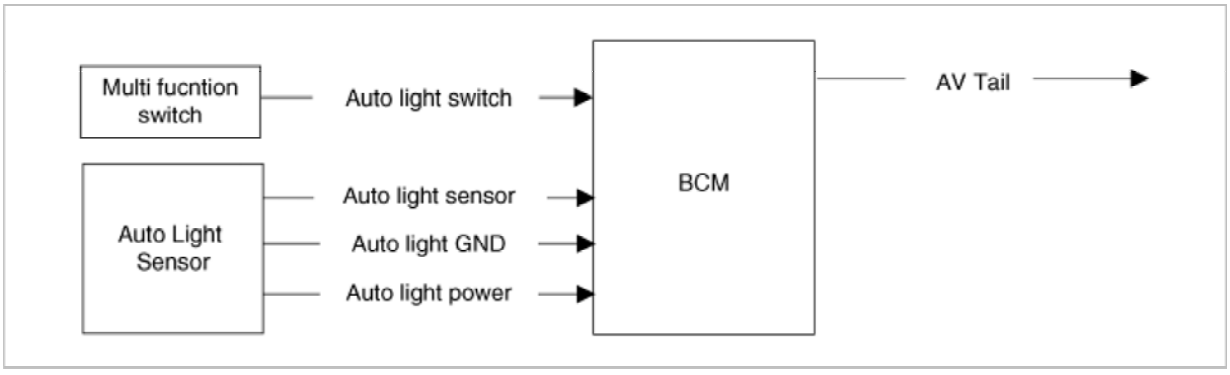
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3. Escort function
   (1) After user generates the call of head lamp low light(HeadLampLowSWOn=ON), if switch off ignition (IGN=Off and START=Off), and then keep Head lamp low output On (HeadLampLowON=ON) state during 20min.
   (2) And after open and close driver side door(DRVDRSW=ON→Off), user will have consequently lighting of head lamp low (HeadLampLowON=ON) during only 30sec.
   (3) During active “Escort Function”, if receive Lock request 2 times (2LOCK=2) or cancel the lighting request of head lamp low (HeadLampLowSW=Off & AutoLightSW=Off), this function is released.
   (4) While escort function is activated, Tail lamp is keeping the turn on state and does not go to Autocut and after finish escort state and user removes key, it can go Autocut mode.
   (5) While the “Escort Function” is activated by ‘Head Lamp Low Switch’, if change from ‘Head Lamp Low Switch’ to ‘Lamp Auto Switch’, “Escort Function” is deactivated, because Lamp Auto mode is ‘Lamp Off’ condition.
   (6) While the “Escort Function” is activated by ‘Lamp Auto Switch’, if change from ‘Lamp Auto Switch’ to ‘Head Lamp Low Switch’, “Escort Function” is keeping the activation state, because of ‘Head Lamp On’ condition.
   (7) After IGN terminal off 20 minute timers is started, but as soon as door is opened and closed then 30sec timer is engaged.



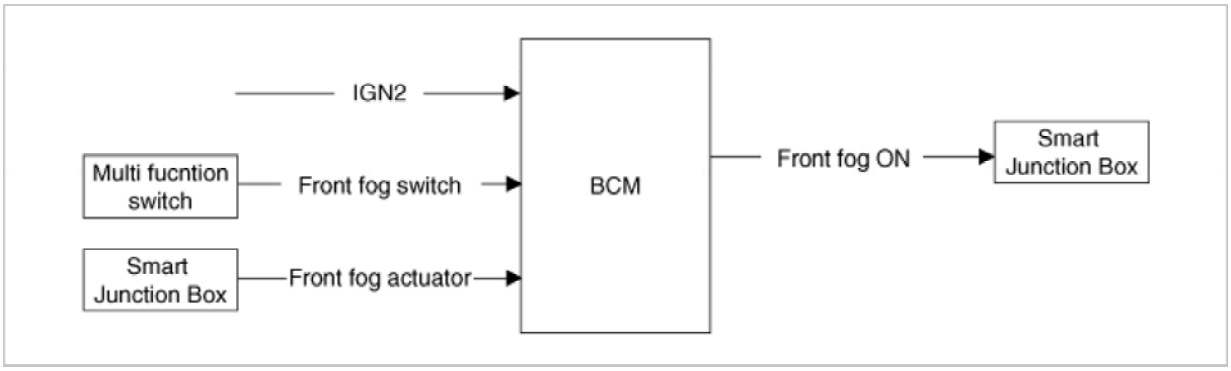
4. Auto light control



5. AV Tail output control
   (1) In ACC, IGN, START terminal states, monitoring of the auto light sensor supply’s range (AutoLightPwr) is performed and a failure is raises up (Auto Light failure) when the supply’s voltage is out of range (outside of range [4V:6V]).
   If Auto Light failure occurs and as long as this error is present, the tail lamp and head lamp low must be turned on regardless of the sunlight level provided by the sensor.
   When physical Auto light sensor failure occurs the Lamps are turned on, because a zero voltage level is provided by the sensor when internal failure is present.
   This is designed to prevent any head lamp cut off when the failure occurs during the night.
   AV Tail Output Control is started In ACC, IGN, START regardless of MFSW Auto Light switch.

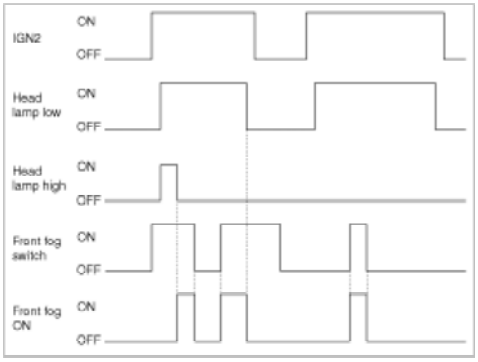
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6. Front fog lamp control



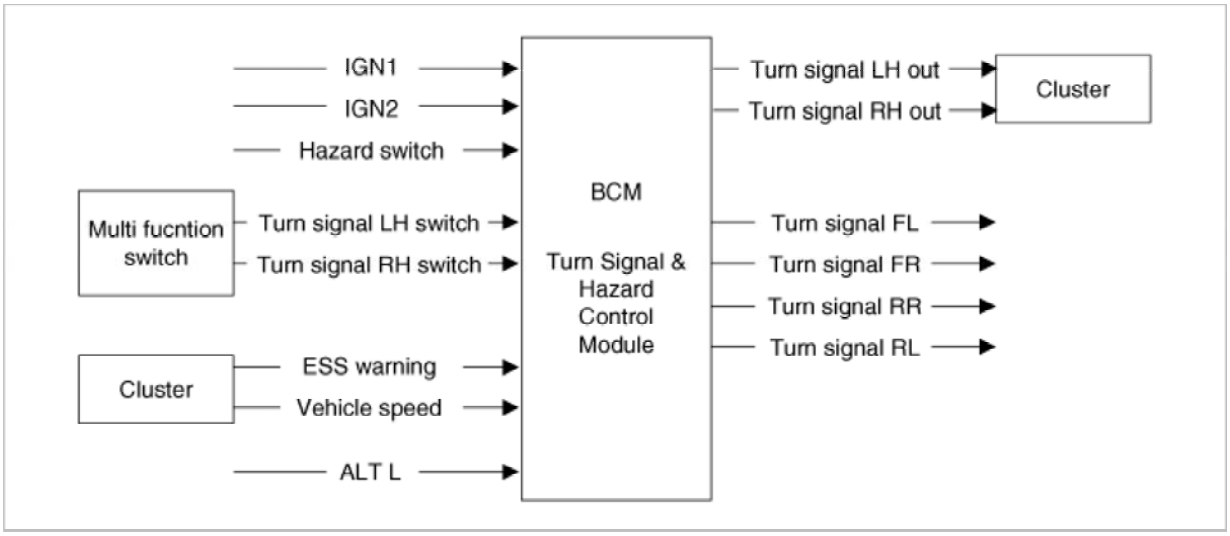
(1) In case of (IGN2=ON) & (HeadLampLow=ON) & (HeadLampHigh=Off), if Front fog lamp switch input is detected (FrontFogSW=On), Front fog lamp output (FrontFogON=On) is turned ON.

(2) If fails to activate front fog lamp output, indicator (FrontFogIND) is also turn off.



Hazard & Turn Signal Lamp Control

1. Hazard lamp & ESS control



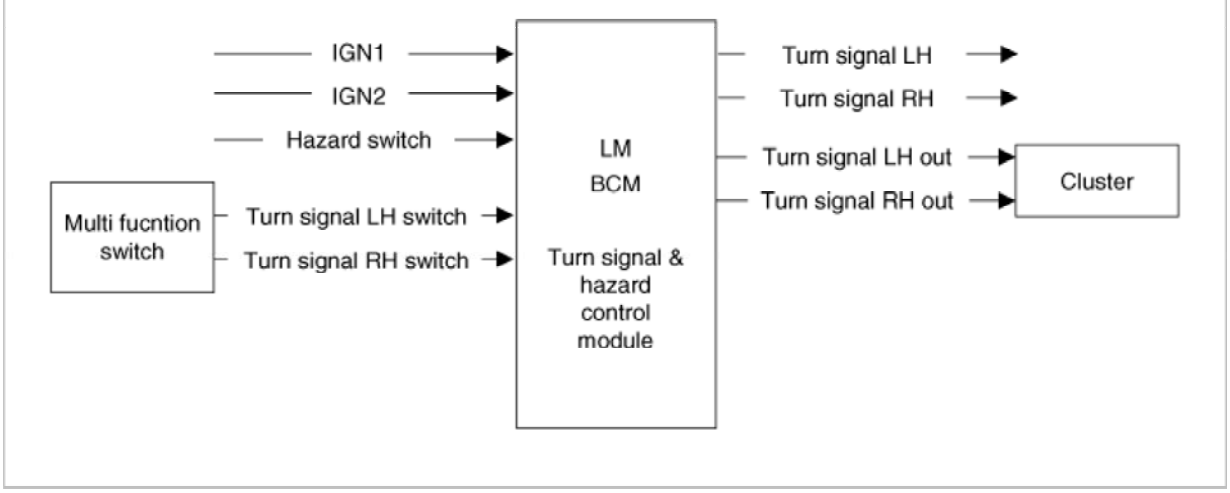
(1) To provide an audible feedback to the driver when flasher is active, a Flasher Sound Relay is controlled.

(2) While Flasher Lamp is operated, at the time of Output On/Off transition, the Flasher Sound Relay is activated.

(3) Flasher Sound Relay is controlled by the BCM.

2. Turn signal and hazard control

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(1) Turn Left/ Right Signal Flashing Function

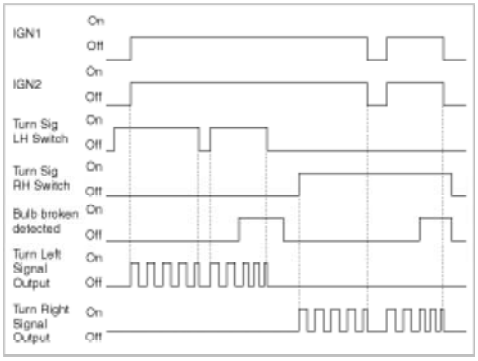
A. If the Left (or Right) turn switch is active and if IGN2 is On, the left (or Right) turn signal outputs are driven.

B. The turn signal is active as long as both conditions ((TurnSigLHSW or TurnSigRHSW=On) and IGN2=On) are true and is turned Off when one of these conditions is no longer detected.

C. If a failure is detected (Bulb/LED) outage or open load on the activated turn signal side, the flasher frequency is doubled.

D. This failure can be detected when IGN1 and IGN2 On (IGN1=On and IGN2=On).

E. While Turn switch is On and failure was detected, even if bulb (or LED) failure is no longer detected, keep the double blinking flashing and after next Turn switch On transition, only then, flasher is activated with normal blinking.

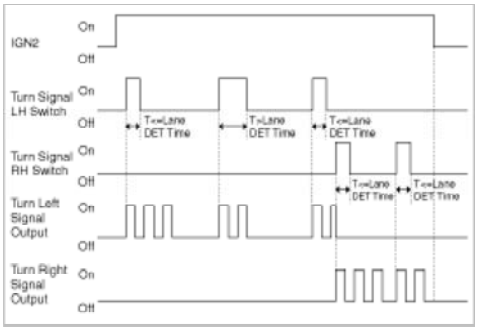


(2) Lane Change Turn Left/ Right Signal Control Function

A. Flasher lane-change feature means that a momentary activation of the turn switch will cause 3 flashes on the indicator circuit.

B. This lane-change feature operates under the following conditions:

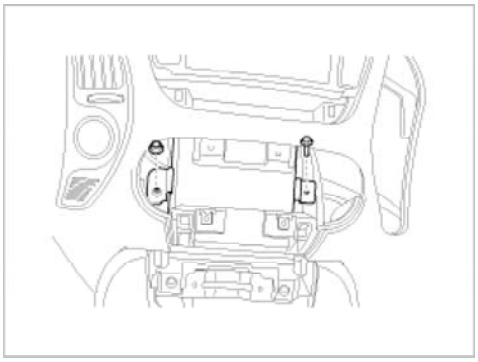
- Lane change mode enabled
- Ignition 2 shall be On, the lane change feature is not available if Ignition 2 is Off.
- The "bulb-fail" mode is not working and the flashing frequency is always Normal Blinking in Lane Change mode (85±10period/min).
- During the Lane Change mode operation, if the user moves the turn switch in the other direction, then Lane change mode is finished and the other direction’s flashing (Normal or Lane change flashing) will start depending on the switch detection time.



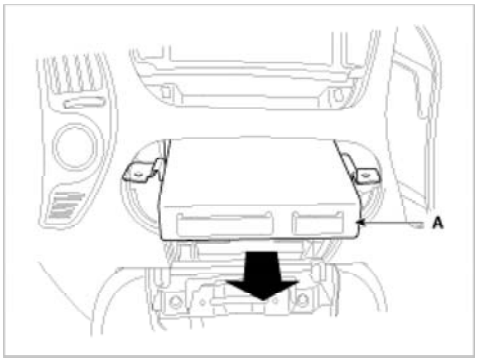
procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the heater & A/C controller from center facia panel.
   (Refer to BD group - "Controller")
3. Remove the front seat heater switch assembly.
   (Refer to BE group - "Seat electrical")
4. Remove the right air vent.
   (Refer to BE group - "Rear Glass Defogger")
5. Loosen the nut and bolt from BCM.



6. Insert the hand to right air vent hole to disconnect the BCM connectors.
   And then remove the BCM (A) from the heater & A/C controller hole.



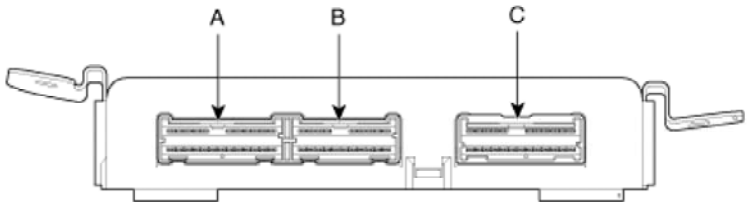
Installation

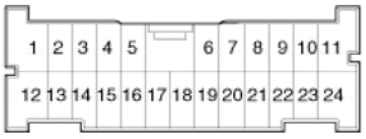
1. Install the BCM and connect the connectors.
2. Install the right air vent.
3. Install the front seat heater switch assembly.
4. Install the heater & A/C controller from center facia panel.

Inspection

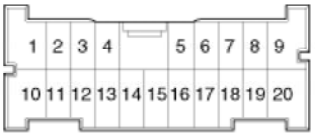
BCM Pin Information

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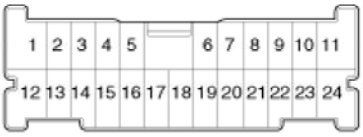




Connector A



Connector B



Connector C

Connector (A/B/C)

No	Descrition	No	Descrition	No	Description
A01	B+ (Signal)	B01	LIN (RPAS)	C01	Safety Power Window Enable Low
A02	IGN1	B02	Head Lamp Low Switch	C02	Security Indicator
A03	IGN2	B03	Head Lamp High Switch (PASSING)	C03	AV Unlock Signal
A04	Turn Signal Left Switch	B04	-	C04	Key Solenoid
A05	Turn Signal Right Switch	B05	DIAGNOSIS (K-LINE)	C05	Room Lamp
A06	Inhibit 'R'Switch	B06	RL Seat Warmer Switch	C06	FL Turn Signal
A07	Crash Unlock	B07	RR Seat Warmer Switch	C07	FR Turn Signal
A08	Auto Light Power	B08	CAN-High	C08	RL Turn Signal
A09	-	B09	CAN-Low	C09	RR Turn Signal
A10	-	B10	Auto Light GND	C10	B+ (Power1)
A11	Hazard Switch	B11	Auto Light Switch	C11	B+ (Power2)
A12	ALT L	B12	Front Fog Lamp Switch	C12	GND (Power)
A13	ACC	B13	Rear Fog Lamp Switch	C13	RPAS OFF Indicator
A14	Rear Washer Switch	B14	Front Deicer Switch	C14	Hazard Switch Indicator
A15	Rear Wiper ON Switch	B15	RR Defogger Switch	C15	N.C
A16	Rear Wiper INT Switch	B16	RPAS OFF Switch	C16	Assist S/BELT Indicator
A17	Front Washer Switch	B17	-	C17	Key Hole Illumination (BULB)
A18	Front INT Wiper Switch	B18	-	C18	RPAS Buzzer
A19	MIST Switch	B19	Auto Light Signal	C19	AV Tail Signal
A20	Wiper Voulume	B20	H/Lamp Low Signal	C20	Flasher Sound Relay
A21	Key In Switch			C21	Front Wiper Relay
A22	Tail Lamp Switch			C22	RR Fog Lamp Relay
A23	Key Inter Lock Switch			C23	RR Seat Warmer Relay
A24	GND (Signal)			C24	RL Seat Warmer Relay

Input Signal Specification

			On/off Voltage	

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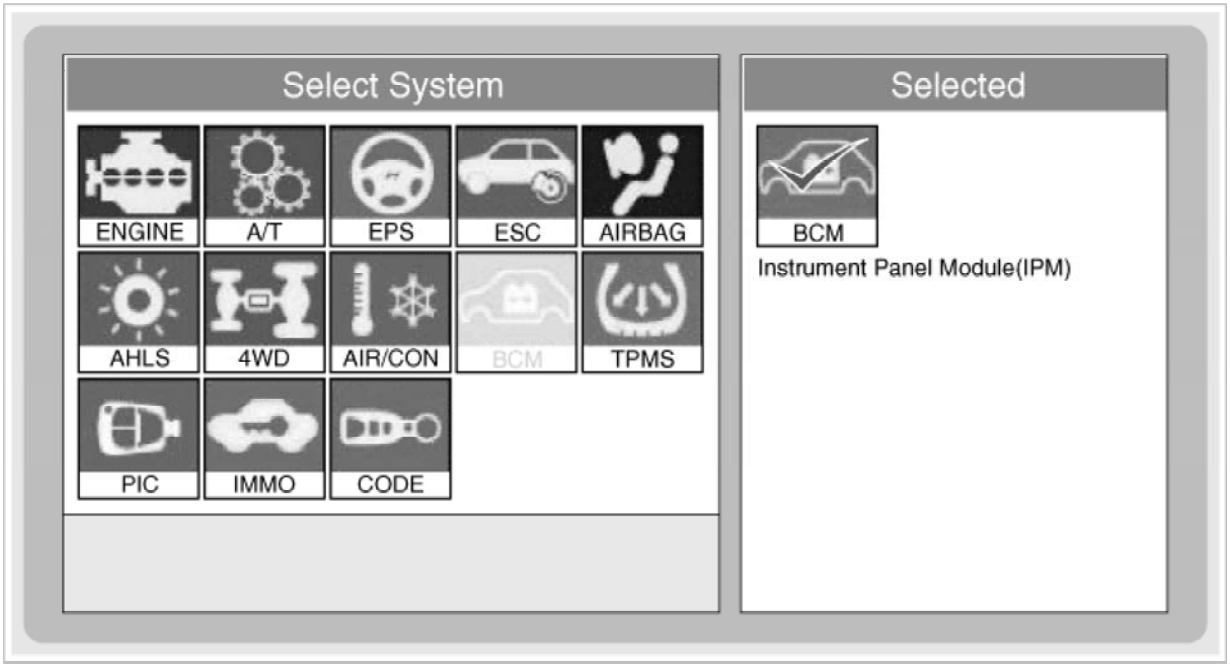
1	A_B+ (Signal)	ON = BAT	9V~16V	
2	A_B+ (Power1)	ON = BAT	9V~16V	
3	A_B+ (Power2)	ON = BAT	9V~16V	
4	L_IGN1	ON = BAT (IGN KEY is ON or START position)	8V or more /4V or less	
5	L_INH'R' SW	ON = BAT	8V or more /4V or less	
6	L_IGN2	ON = BAT (IGN KEY is ON position)	8V or more /4V or less	
7	L_FRT INT WIPER SW	ON = BAT	8V or more /4V or less	
8	L_FRT WASHER SW	ON = BAT	8V or more /4V or less	
9	L_MIST SW	ON = BAT	8V or more /4V or less	
10	L_RR WIPER_INT SW	ON = BAT	8V or more /4V or less	
11	L_RR WIPER_ON SW	ON = BAT	8V or more /4V or less	
12	L_RR WASHER SW	ON = BAT	8V or more /4V or less	
13	A_ALT'L'	ON = BAT (Starting State)	8V or more /4V or less	
14	L_ACC	ON = BAT	8V or more /4V or less	
15	L_TurnSignal Left SW	ON = BAT	8V or more /4V or less	
16	L_TurnSignal Right SW	ON = BAT	8V or more /4V or less	
17	L_Key Inter Lock SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
18	L_KEY IN SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
19	L_Tail Lamp SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
20	L_EC HeadLampType	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
21	L_Hazard SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
22	L_Front Fog Lamp SW	OPEN = GND	2V or less /OPEN (Reference:7.7V or more)	
23	L_HeadLamp LOW SW	OPEN = GND	2V or less /OPEN (Reference:7.7V or more)	
24	L_HeadLamp HIGH SW	OPEN = GND	2V or less /OPEN (Reference:7.7V or more)	
25	L_Rear Fog Lamp SW	OPEN = GND	2V or less /OPEN (Reference:7.7V or more)	
26	L_RL SeatWarmer SW	OPEN = GND	2V or less /OPEN (Reference:7.7V or more)	
27	L_RR SeatWarmer SW	OPEN = GND	2V or less /OPEN (Reference:7.7V or more)	
28	L_FRONT DEICER SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
29	L_REAR DEFOGGER SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
30	L_RPAS OFF SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	
31	L_Auto Light SW	ON = GND	2V or less /OPEN (Reference:7.7V or more)	

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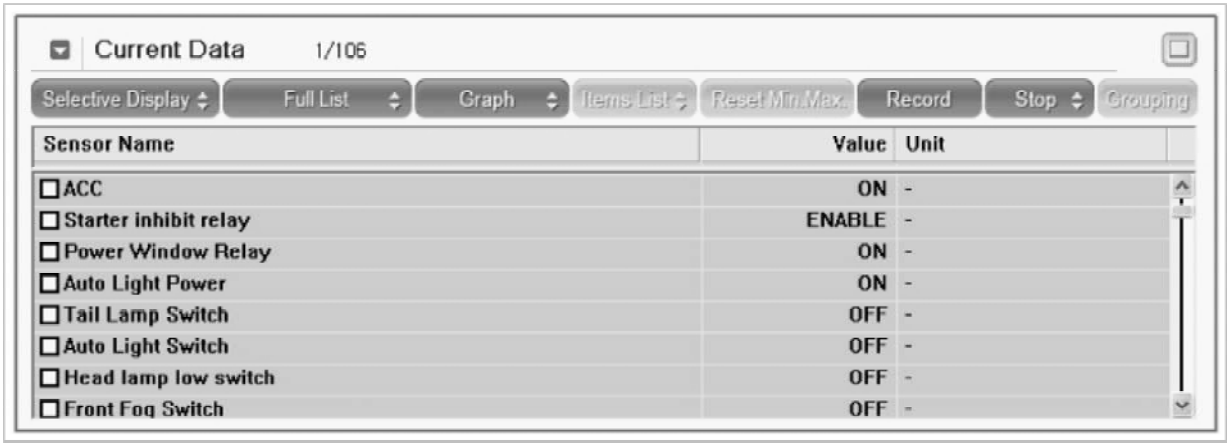
33	A_Wiper Int Volume	-	-	A/D
34	L_CRASH UNLOCK INPUT (PWM)	-	-	PWM
35	LIN_RPAS	-	-	Communication
36	CAN_HIGH	-	-	Communication
37	CAN_LOW	-	-	Communication
38	DIAGNOSIS (K-Line)	-	-	Communication

Trouble Diagnostics When Using GDS

1. The IPM can be diagnosed by using the GDS. The BCM communicates with the GDS which then displays inputs and outputs along with codes.
2. To diagnose the IPM function, select the vehicle model and IPM.



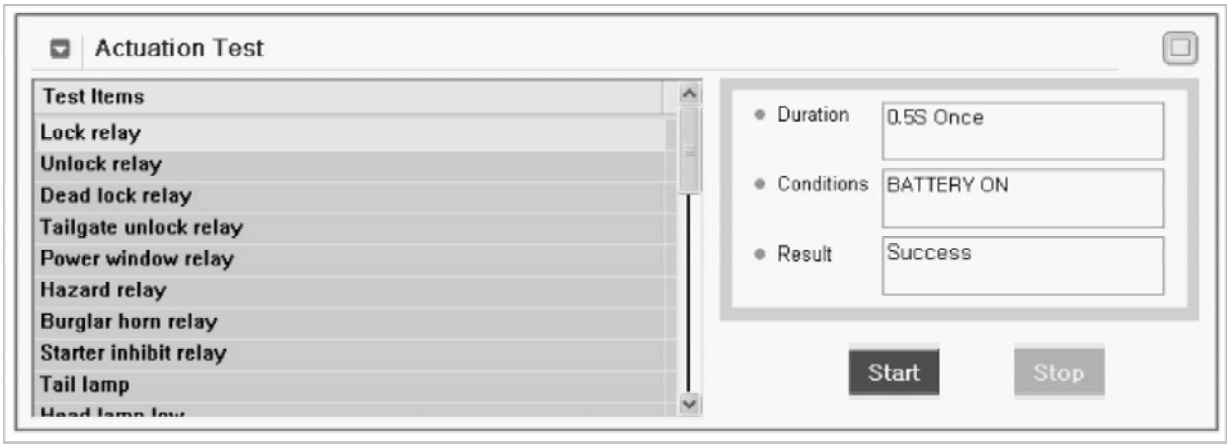
3. To consult the present input/out value of IPM, "Current DATA". It provides information of IPM input/output conditions of power supply, turn signal/brake lamp, headlamp, door locks, outside mirror, wiper, auto-light and transmitters etc.



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

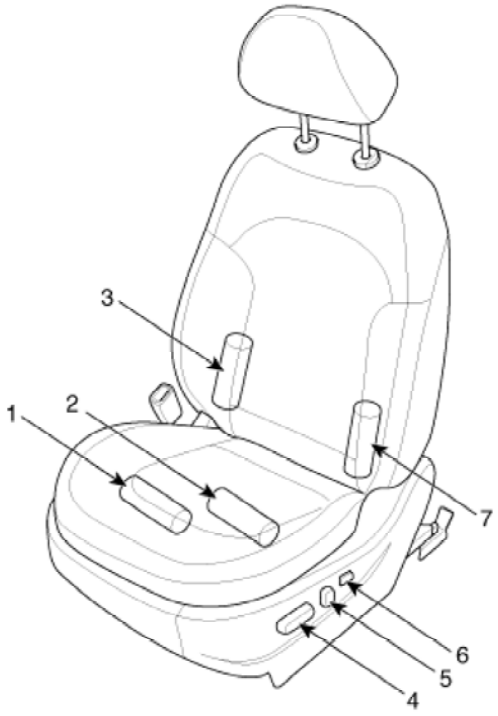
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Body Electrical System > Seat Electrical > Components and Components Location

Component Location



1. Slide motor	5. Reclining switch
2. Rear height motor	6. Lumbar support switch
3. Reclining motor	7. Lumbar support motor

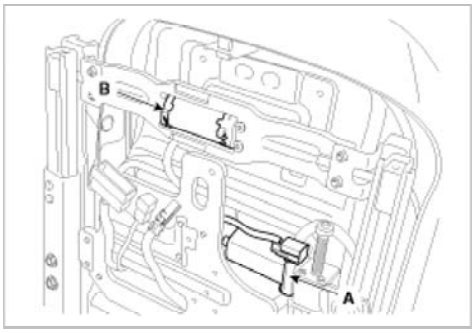
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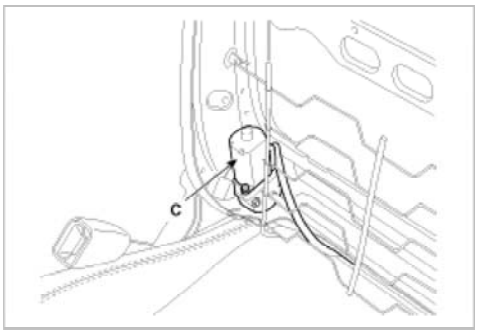
Body Electrical System > Seat Electrical > Power Seat Motor > Repair procedures

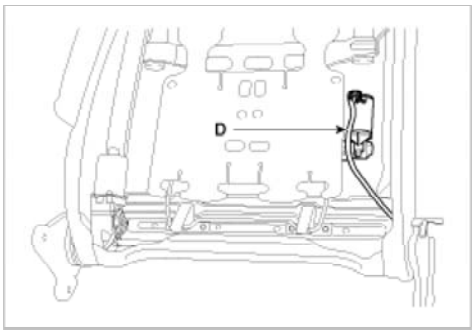
Inspection

Power Seat Motor

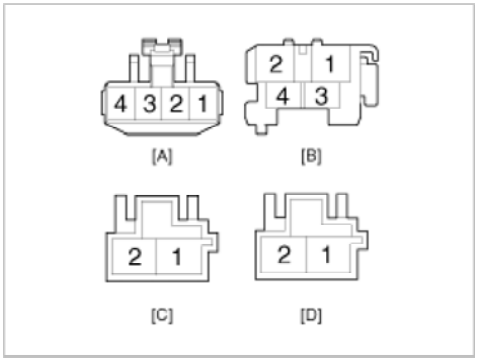
1. Remove the front seat.
   (Refer to BD group - "Front seat")
2. Disconnect the connectors for each motor.







3. With the battery connected directly to the motor terminals, check if the motors run smoothly.



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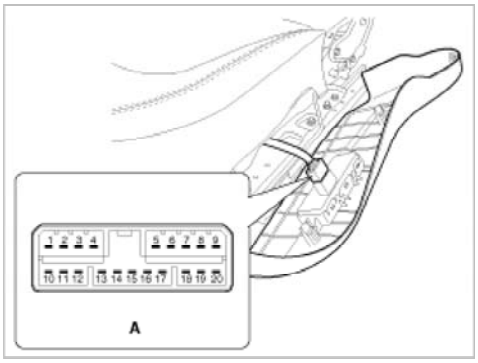
Position			
Slide motor A	Frontward	1	4
	Backward	4	1
Rear height motor B	Up	1	2
	Down	2	1
Reclining motor C	Forward	1	2
	Rearward	2	1
Lumbar support motor D	Forward	1	2
	Rearward	2	1

4. Reverse the connections and check that the motor turns in reverse.
5. If there is an abnormality, replace the motors.

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

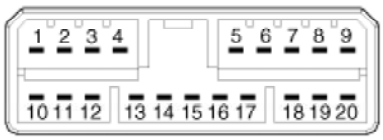
Inspection

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)

	Slide Switch			Rear height switch		Reclining switch				Lumber switch			PIN name
	N	Driver		Up	Down	N		Driver		N	Driver		
	Seat	Forward	Backward			HEI	REC	Forward	Backward	-	Forward	Backward	
15		○	○	○	○			○	○		○	○	Battery +
17													GND
4	○		○										Rear slide moter
3	○	○											Front slide moter
8	○												GND (relay)
2	○												GND (relay)
7				○		○							Rear height motor up
6					○	○							Rear height motor down
11							○	○					Front reclining motor
13							○		○				Rear reclining motor
12							○						GND (relay)
10							○						GND (relay)
1										○		○	Lumber motor backward
16										○	○		Lumber motor forward
5						○	○			○	○		GND

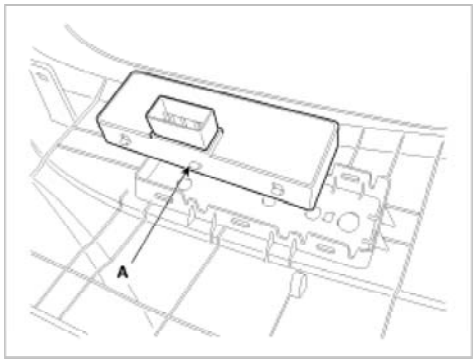


[Driver Power Seat Control Switch]

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the power seat recliner cover.
   (Refer to the BD group - "Front seat")
3. Remove the power seat control switch (A).



Installation

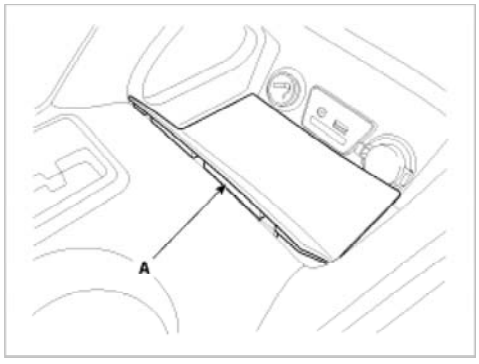
1. Install the power seat control switch after connecting the connector.
2. Install the recliner cover and front power seat.

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

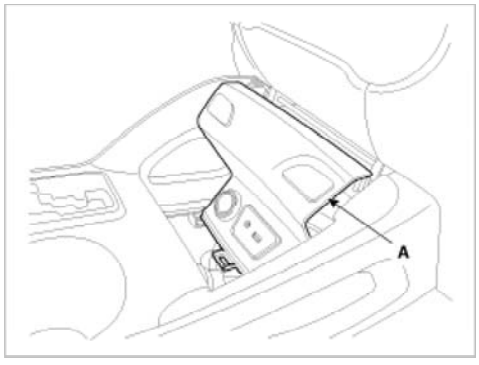
Inspection

Front Seat Heater Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the floor console upper cover (A) using the appropriate tool.



3. Remove the seat heater switch module (A).

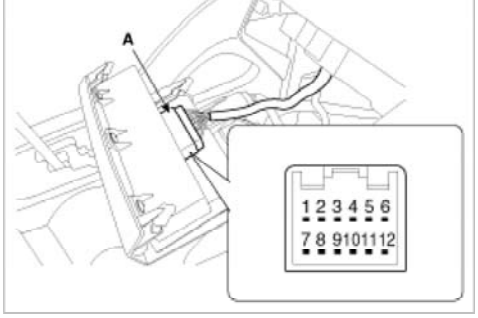


NOTE

Take care not to damage the hook when removing the switch.

4. Disconnect the driver and assist seat heater switch connector (A).

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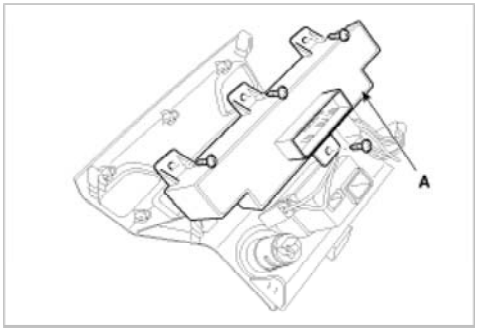
5. Check that continuity exists between the terminals after turning the driver seat heater switch ON.

Terminal / Position	Inspection	Remarks
9		Illumination(-)
10		Illumination(+)
12		High
7		Low
11		Indicator-High
8		Indicator-Low
2		GND

6. Check that continuity exists between the terminals after turning the assist seat heater switch ON.

Terminal / Position	Inspection	Remarks
9		Illumination(-)
10		Illumination(+)
12		High
7		Low
11		Indicator-High
8		Indicator-Low
2		GND

7. If the switch fails to operate, replace the driver and assist seat heater switch (A).

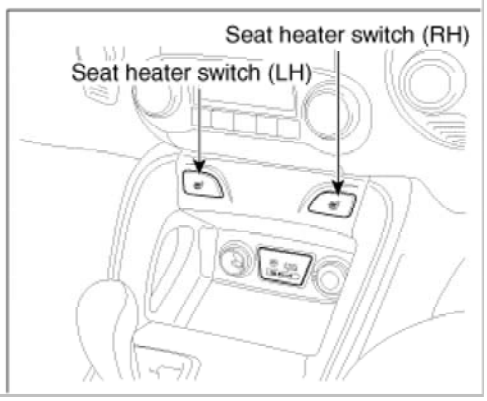


Body Electrical System > Seat Electrical > Seat Heater > Components and Components Location

Component Location

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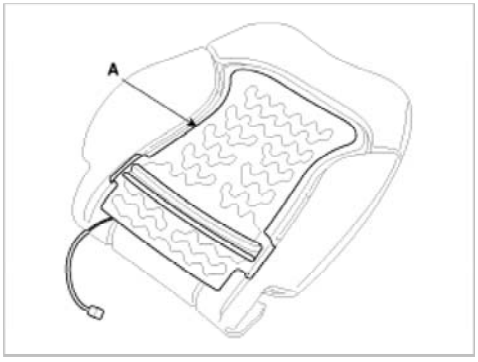


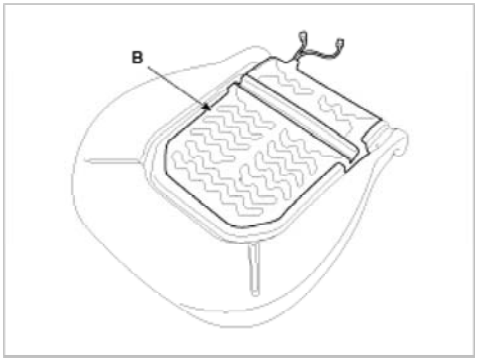


Body Electrical System > Seat Electrical > Seat Heater > Repair procedures

Removal

1. Remove the seat back cover and cushion cover.
   (Refer to the BD group - "Front seat")
2. Remove the driver / assist seat back heater (A) and cushion heater (B).





Installation

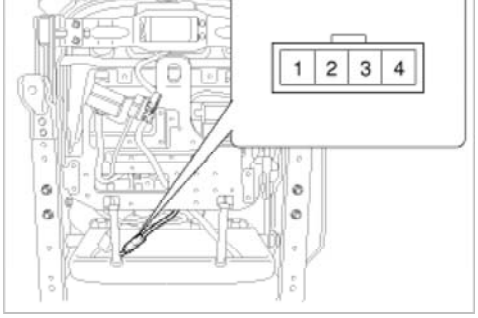
1. Install the driver / assist seat back and cushion heater.

Inspection

First Seat Heater

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

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No.	Description	No.	Description
1	High	3	GND
2	Low	4	Indicator

Standard value
Cushion : 1.32Ω ± 10% (leather), 1.76Ω ± 10% (fabric)
Back : 1.85Ω ± 10%
Set : 3.17Ω ± 10% (leather), 3.61Ω ± 10% (fabric)

Terminal / Position	1	2	3	4
Cushion	⊕	⊕		
Back			⊖	⊖

2. Operate the seat warmer after connecting the 4P connector, and then check the thermostat by measuring the temperature of seat surface.

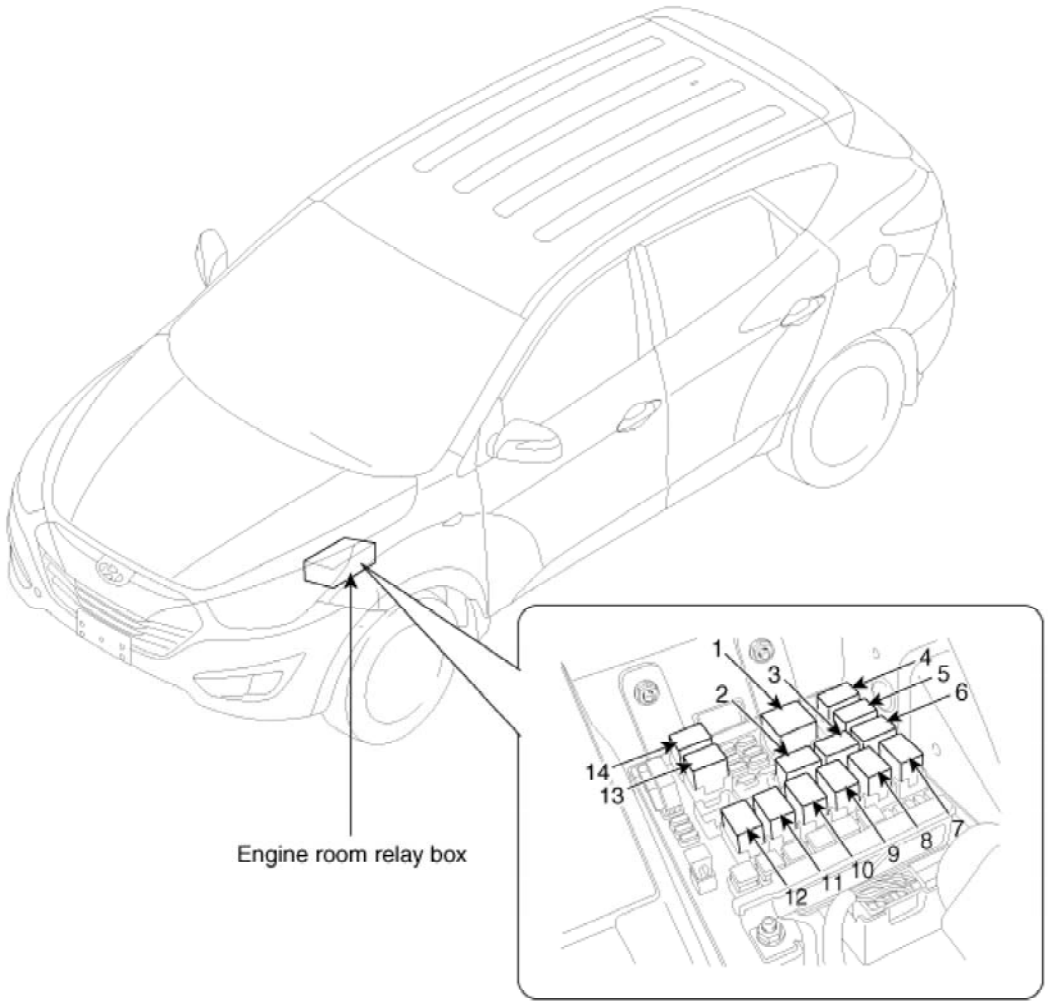
Standard value
High : 107.6 ± 3.6°F (42 ± 2°C) (Cushion),
125.6 ± 3.6°F (52 ± 2°C) (Back)
Low : 104 ± 3.6°F (40 ± 2°C) (Cushion),
114.8 ± 3.6°F (46 ± 2°C) (Back)

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

Component Location

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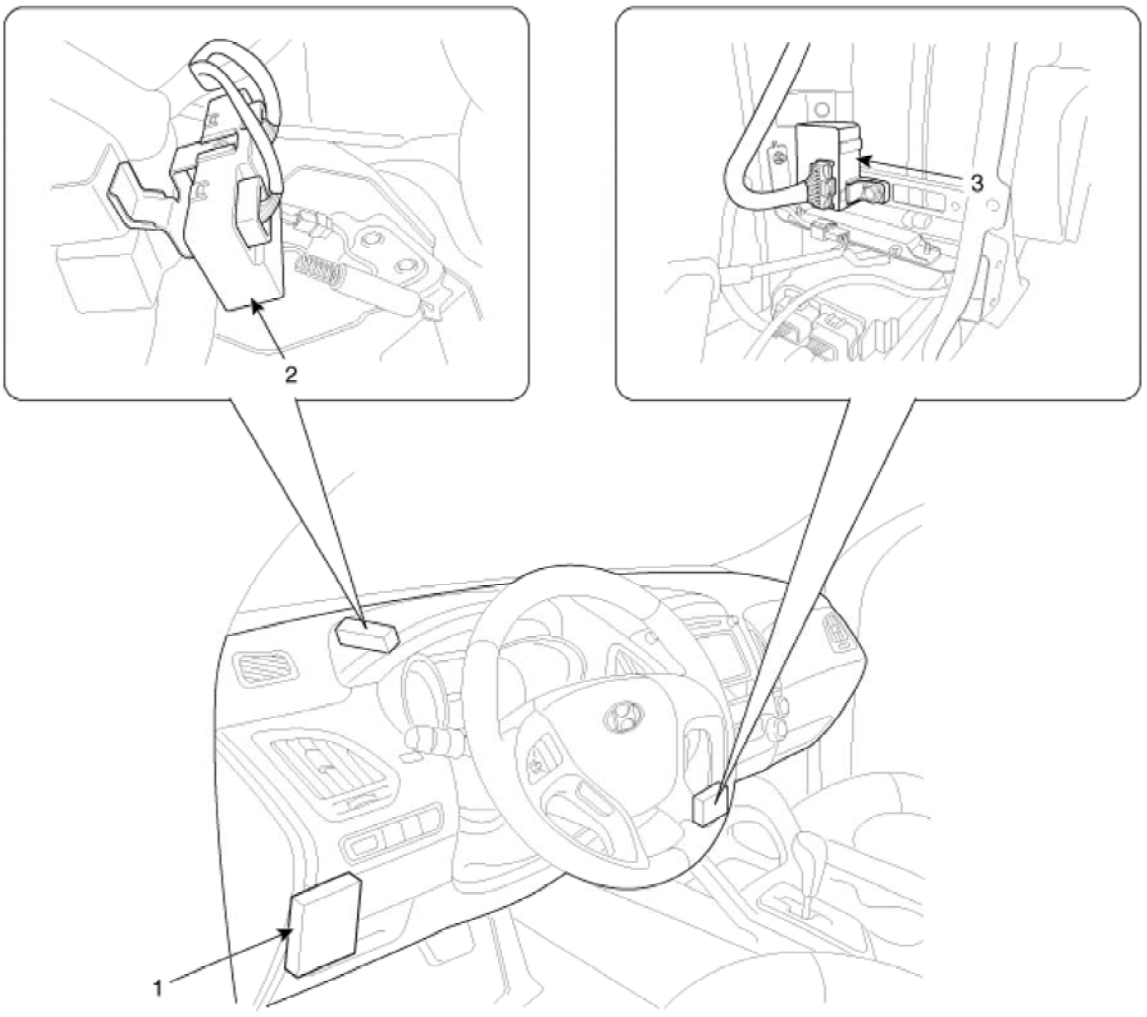
[Engine Room Relay Box]



1. Main relay	8. Burglar horn relay
2. Cooling fan relay (High)	9. Start relay
3. Windshied deicer relay	10. Cooling fan relay (Low)
4. Wiper relay (High)	11. Horn relay
5. Wiper relay (Low)	12. Blower relay
6. ATM relay	13. A/C relay
7. Rear glass defogger relay	14. Fuel pump relay

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[Passenger Compartment Relay]

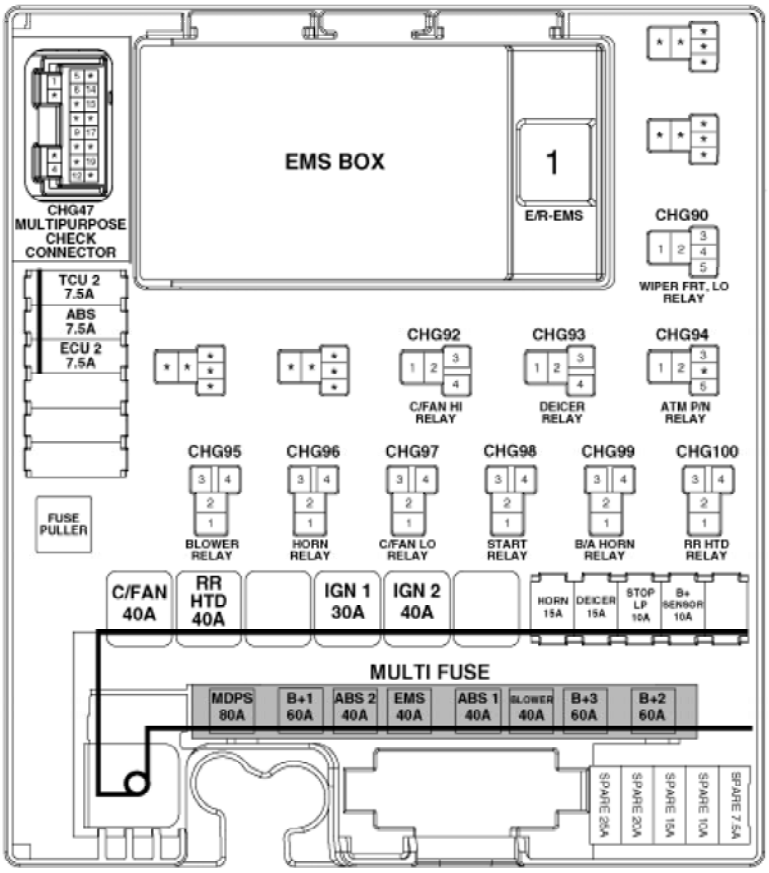


1. SJB (Smart Junction Box)
2. Rear wiper relay, Rear seat heater relay, DBC (Downhill Brake Control) relay, Flasher sound relay (Built-in ICM relay box)
3. ACC relay, IG1 relay, IG2 relay (Built-in PDM relay box)

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

Component Location

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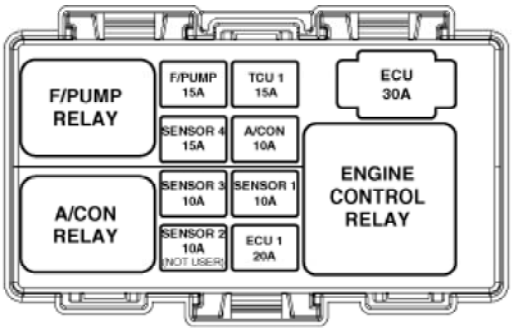
NO.	RELAY NAME	TYPE
CHG90	Wiper FRT, LO Relay	Plug Micro(5P)
CHG92	C/FAN HI Relay	Plug Micro(4P)
CHG93	Deicer Relay	Plug Micro(4P)
CHG94	ATM P/N Relay	Plug Micro(5P)
CHG95	Blower Relay	Plug Micro(4P)
CHG96	Horn Relay	Plug Micro(4P)
CHG97	C/FAN LO Relay	Plug Micro(4P)
CHG98	Start Relay	Plug Micro(4P)
CHG99	B/A Horn Relay	Plug Micro(4P)
CHG100	RR HTD Relay	Plug Micro(4P)

※ USE THE DESIGNATED FUSE AND RELAY ONLY

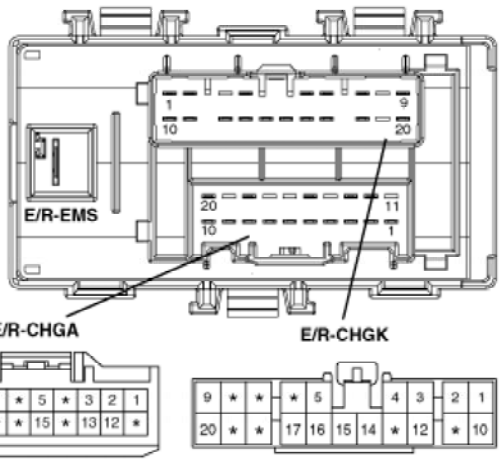
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Fuse Name		(A)	Circuit Protected
MULTI FUSE	MDPS	80A	EPS Control Module
	B+1	60A	I/P Junction Box(PDM 15A, DR LOCK 15A, HAZARD 15A, IPS 4, IPS 5, IPS 6, IPS 7)
	ABS 2	40A	Multipurpose Check Connector, ESC Module
	EMS	40A	EMS Box(TCU 1 15A, ECU 30A, A/CON 10A, F/PUMP 15A)
	ABS 1	40A	Multipurpose Check Connector, ESC Module
	BLOWER	40A	Blower Relay
	B+3	60A	I/P Junction Box(P/SEAT(DRV) 20A, SAFETY POWER WINDOW 20A, SMART KEY 10A, TPMS 7.5A Power Connector(AUDIO 1 10A, ROOM LP 10A))
	B+2	60A	I/P Junction Box(Power Window Relay, SUNROOF 15A, AMP 25A, IPS 0, IPS 1, IPS 2, IPS 3)
FUSE	C/FAN	40A	E/R Fuse & Relay Box(C/FAN LO Relay, C/FAN HI Relay)
	RR HTD	40A	E/R Fuse & Relay Box(RR HTD Relay)
	IGN 1	30A	PDM Relay Box(IGN1 Relay), Ignition Switch
	IGN 2	40A	E/R Fuse & Relay Box(Start Relay), PDM Relay Box(IGN2 Relay), Ignition Switch
	HORN	15A	E/R Fuse & Relay Box(Horn Relay, B/A Horn Relay)
	DEICER	15A	E/R Fuse & Relay Box(Deicer Relay, RR HTD Relay)
	STOP LP	10A	Stop Lamp Switch, ICM Relay Box(DBC Relay)
	B+ SENSOR	10A	Batter Sensor
	ECU 2	7.5A	E/R Fuse & Relay Box(ATM P/N Relay), Mass Air Flow Sensor, PCM
	ABS	7.5A	Multipurpose Check Connector, ESC Module
	TCU 2	7.5A	Transaxle Range Switch(A/T), Vehicle Speed Sensor(M/T)

※ USE THE DESIGNATED FUSE AND RELAY ONLY



RELAY NAME	TYPE
F/PUMP Relay	Plug Micro
A/CON Relay	Plug Micro
Engine Control Relay	Plug Mini



Circuit (EMS Box)

Fuse Name	(A)	Circuit Protected
F/PUMP	15A	EMS Box(F/PUMP Relay)
SENSOR 4	15A	E/R Fuse & Relay Box(C/FAN HI, LO Relay), EMS Box(F/PUMP Relay), Oxygen Sensor (UP, DOWN), PCM
SENSOR 3	10A	EMS Box(A/CON Relay), Injector(#1, #2, #3, #4)
SENSOR 2	10A	-
TCU 1	15A	PCM
A/CON	10A	EMS Box(A/CON Relay)
SENSOR 1	10A	Immobilizer Module, Crankshaft Position Sensor, Camshaft Position Sensor #1/2, Oil Control Valve #1/2 Canister Purge Control Solenoid Valve, Variable Intake Manifold Valve, Canister Close Valve
ECU 1	20A	Ignition Coil (#1, #2, #3, #4), Condenser
ECU	30A	EMS Box(Engine Control Relay)

※ USE THE DESIGNATED FUSE AND RELAY ONLY

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

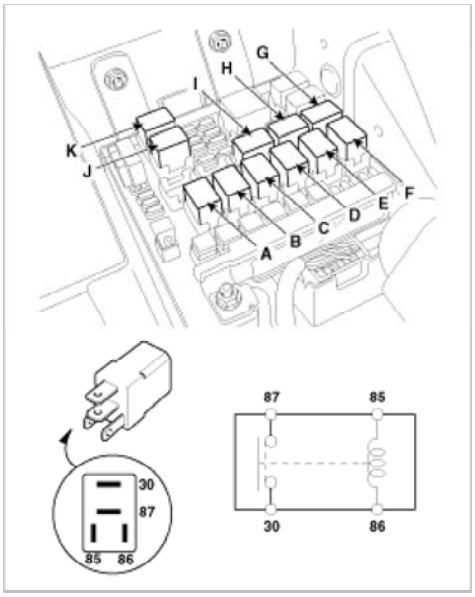
Inspection

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

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Check for continuity between the terminals.
A : Blower relay
B : Horn relay
C : Cooling fan relay (Low)
D : Start relay
E : Burglar horn relay
F : Rear glass defogger relay
G : ATM relay
H : Windshied deicer relay
I : Cooling fan relay (High)
J : A/C relay
K : Fuel 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.



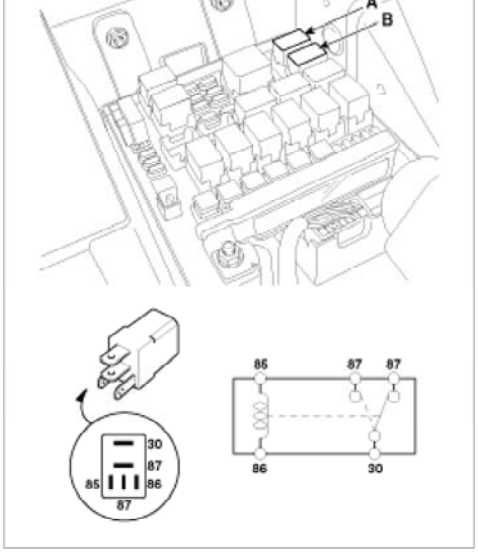
Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

Power Relay (Type B)

Check for continuity between the terminals.
A : Wiper relay (High)
B : Wiper relay (Low)

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.

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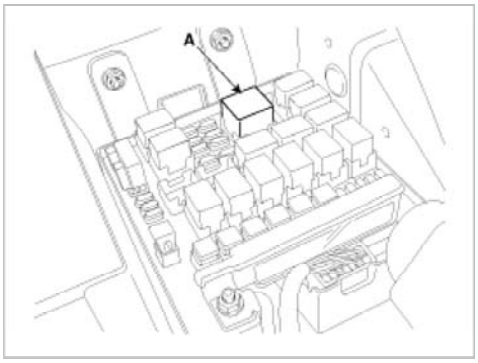
Terminal / Power	85	86	30	87	87
Disconnected			○		○
Connected	⊖	⊕	○	○	

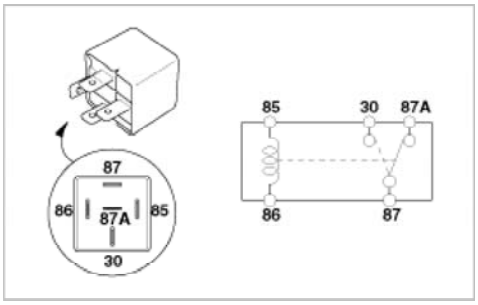
Power Relay (Type C)

Check for continuity between the terminals.

A : Main 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	87a	30
Disconnected	○	○			
Connected	⊖	⊕	○	○	○

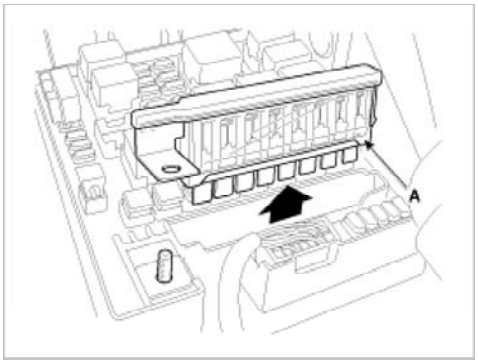
Fuse

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?

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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

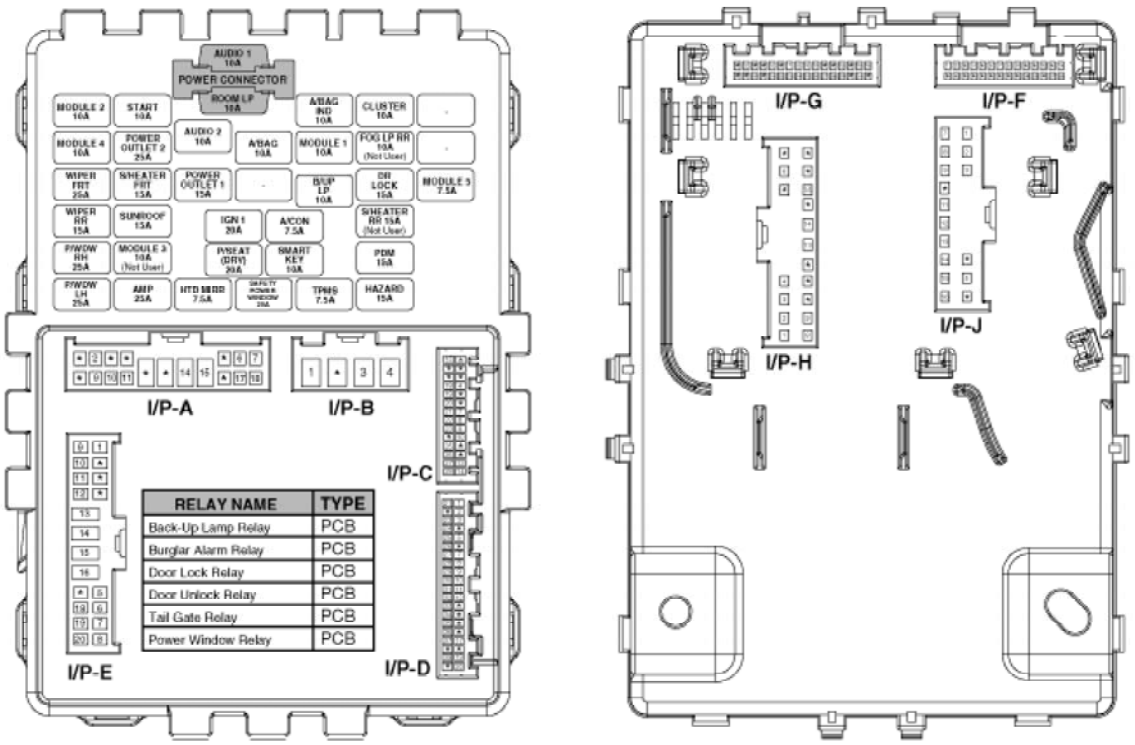


NOTE

- Multi fuse is needed to replace in the mass when it damaged only one fuse.
- When replace 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 AND RELAY ONLY

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Circuit (IP Junction Box)

Fuse Name		(A)	Circuit Protected
POWER CONNECTOR	AUDIO 1	10A	Audio, A/V & Navigation Head Module
	ROOM LP	10A	BCM, Auto Light & Photo Sensor, Room Lamp, Driver/Passenger Vanity Lamp Switch, Date Link Connector, Door warning Switch, RF Receiver A/C Control Module, Luggage Lamp, IPS Control Module, Instrument Cluster (IND.), Map Lamp, Electro Chromic Mirror
MODULE 2		10A	IPS Control Module, BCM, Electro Chromic Mirror, PDM
START		10A	W/O Smart Key : Burglar Alarm Relay, E/R Fuse & Relay Box(Start Relay) With Smart Key : E/R Fuse & Relay Box(ATM P/N Relay), PCM
A/BAG IND		10A	Instrument Cluster (Air Bag IND.)
CLUSTER		10A	Audio, Console Switch, Instrument Cluster(IND.), BCM, Alternator, A/V & Navigation Head Module, Smart Key Control Module
MODULE 4		10A	E/R Fuse & Relay Box(Blower Relay), Cluster Ionizer, A/C Control Module, Sunroof Motor
POWER OUTLET 2		25A	Cigarette Lighter & Front Power Outlet, Rear Power Outlet
AUDIO 2		10A	Smart Key Control Module, Power Outside Mirror Switch, AMP, BCM, PDM, A/V & Navigation Head Module, Audio
A/BAG		10A	SRS Control Module, Passenger Occupant Detection Sensor, Telltale Lamp
MODULE 1		10A	IPS Control Module, Tire Pressure Monitoring Module, EPS Control Module, Steering Angle Sensor, ESC OFF Switch DBC Switch, ICM Relay Box(DBC Relay), Multifunction Switch(Light), Stop Lamp Switch, 4WD ECM
FOG LP RR		10A	-
WIPER FRT		25A	Front Wiper Motor, Multifunction Switch(Wiper), E/R Fuse & Relay Box(Front Wiper Relay)
S/HEATER FRT		15A	Console Switch
POWER OUTLET 1		15A	Cigarette Lighter & Front Power Outlet
B/UP LP		10A	B/UP LP Relay
DR LOCK		15A	Door Lock Relay, Tail Gate Relay, Door Unlock Relay
MODULE 5		7.5A	BCM, Smart Key Control Module, PDM
WIPER RR		15A	ICM Relay Box (Rear Wiper Relay), Rear Wiper Motor, Multifunction Switch (Wiper)
SUNROOF		15A	Sunroof Motor
IGN 1		20A	E/R Fuse & Relay Box(ECU 2 7.5A, ABS 7.5A, TCU 2 7.5A)
A/CON		7.5A	A/C Control Module
S/HEATER RR		15A	-
P/WDW RH		25A	Power Window Main Switch, Passenger Power Window Switch, Rear Power Window Switch RH
MODULE 3		10A	-
P/SEAT (DRV)		20A	Driver Seat Manual Switch
SMART KEY		10A	PDM, Smart Key Control Module, Start Stop Button Switch, FOB Holder, Key Solenoid
PDM		15A	PDM
P/WDW LH		25A	Power Window Main Switch, Rear Power Window Switch LH
AMP		25A	AMP
HTD MIRR		7.5A	Rear Defogger Switch, Rear Defogger (+), Driver/Passenger Power Outside Mirror
SAFETY POWER WINDOW		20A	Driver Safety Power Window Module
TPMS		7.5A	ATM Shift Lever, 4WD ECM, Tire Pressure Monitoring Module
HAZARD		15A	ICM Relay Box(Flasher Sound Relay), BCM

※ USE THE DESIGNATED FUSE AND RELAY ONLY

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

Description

SJB (Smart Junction Box)

1. Specification

Item	Requirement	Remark
Rated voltage	DC 12V	
Voltage range	DC 8 ~ 16V	Normal operating in this range
Storage temperature	-40°C ~ +95°C	
Operating temperature	-30°C ~ +85°C	
Operating humidity	85%	PCB, Damp proofing, Coating, etc.
Dark current	Max. 200uA	All Load Open
Operation Voltage Range	DC 8 ~ 16V	Should activate normally in normal range
Max Use Humidity	85%	Regulated together with parts needing insulation such as PCB, damp-proofing, coating, etc
Insulation Resistance	Should be no ignition caused by electrical shorts	

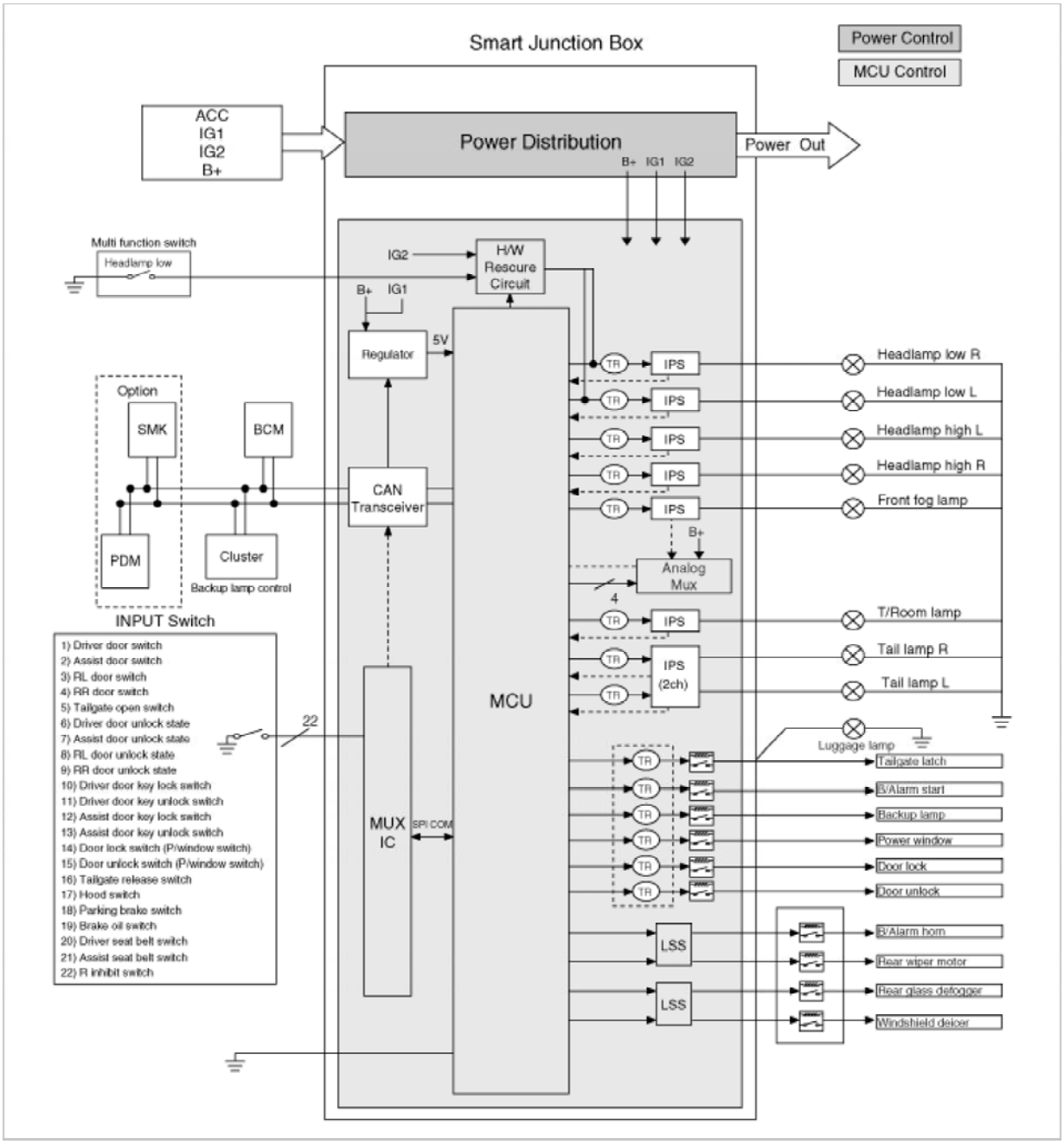
2. Rated Burden

Item	Rated Burden
Head Lamp Low LH	55W
Head Lamp Low RH	55W
Head Lamp High LH	60W (Max)
Head Lamp High RH	60W (Max)

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Tail Lamp RH	31W(Max)
Front Fog Lamp LH+RH	54W
Interior Lamp	45W
B/Alarm Start Relay Coil Control	0.9W
RR FOG Relay Coil Control	0.6W
Tail Gate Latch or Luggage Room Lamp (Power Tail Gate) Relay Coil Control	0.6W
Back Up Relay Coil Control	0.45W
RR Wiper Relay Coil Control (External)	12W (Output Max)
B/Alarm Horn Relay Coil Control (External)	12W (Output Max)
RR.HTD Relay Coil Control (External)	12W (Output Max)
Front Deicer Relay Coil Control (External)	12W (Output Max)

3. Block Diagram



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(1) Lamp control and wire protection through IPS .

(2) When Reference Voltage exceeded, PWM normal voltage control to prevent lamp loss or damage

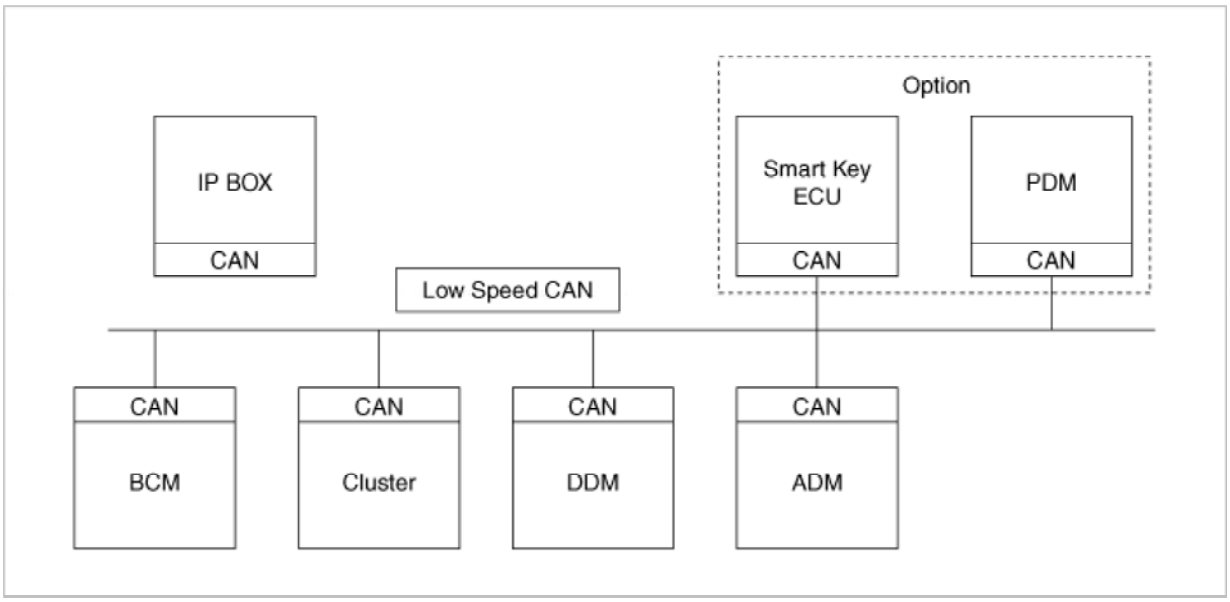
(3) CAN outpout for switch signal input .

(4) Diagnosis using CAN (Short to GND, Open Circuit)

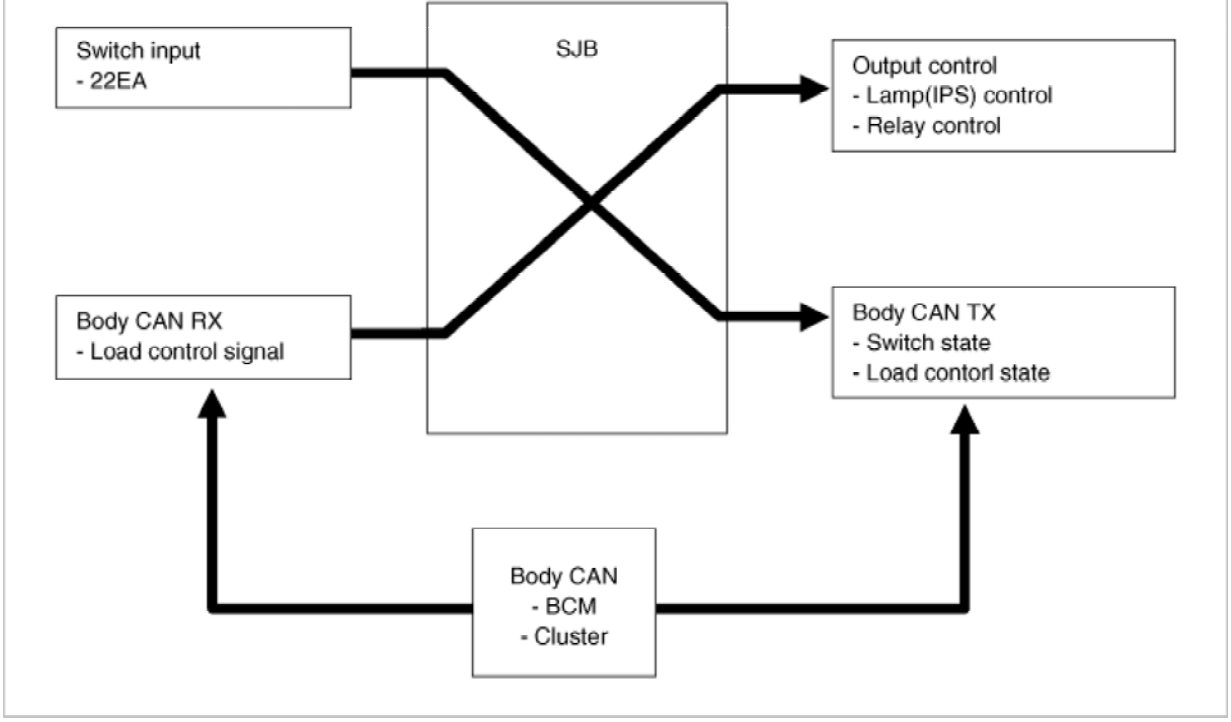
(5) Fail Safe lamp control.

NO	Section	Content
1	Enter Input SW	Receive switch input and send switch status as CAN message to each module
2	Lamp Control (IPS)	Receive commands from BCM as CAN message to control Lamps with IPS
3	Internal Relay Control	Receive commands from BCM as CAN message and control relays in the IP Box
		T/Gate latch, B/Alarm start, Backup, Rear Fog lamp
4	External Relay Control	Receive commands from BCM as CAN message and control relays outside of the IP Box
		B/Alarm horn, Rear Wiper motor, Rear deffogger, Front deicer
5	Low Power Mode (Sleep Mode)	When there is no change in the CAN message or switch input for 5 seconds, converts to low-power mode (sleep mode)
6	WakeUp Mode	When there is a change in the CAN message or Input switch in low-power mode, converts to normal mode
7	Output status send	Lamps and Rear Fog output status sent to BCM as CAN message
8	H/W Rescure	When MCU fails, and Head Lamp Low Switch is input, Head Lamp Low Beam activates

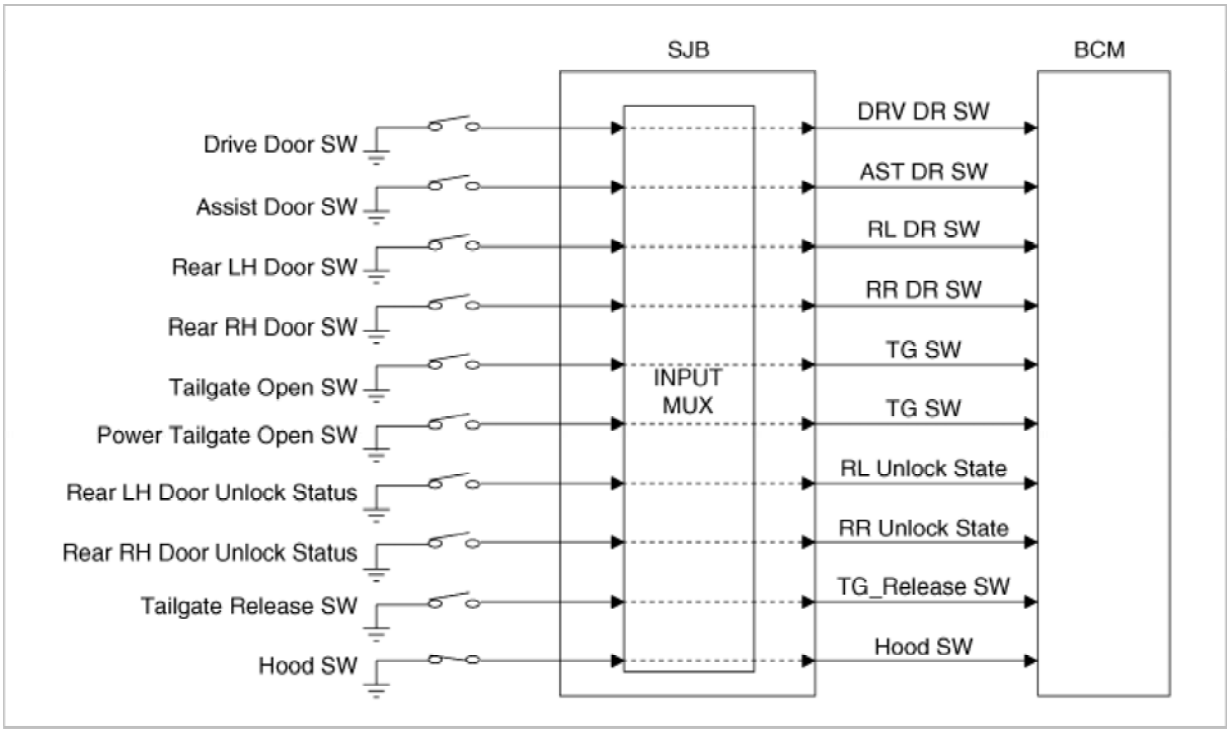
5. Network



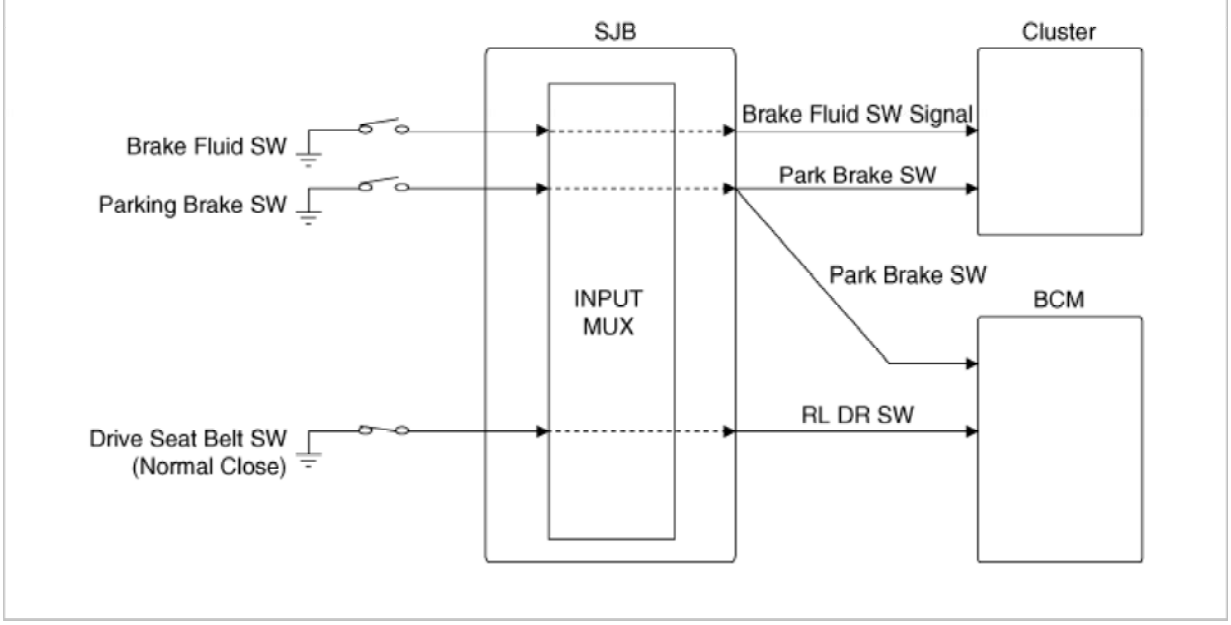
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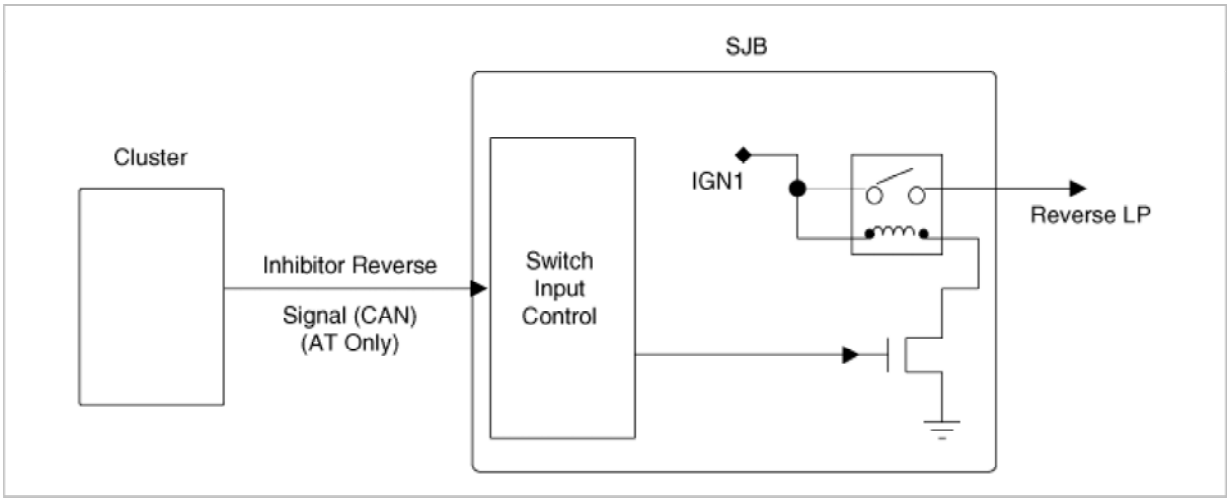


6. CAN input & output flow

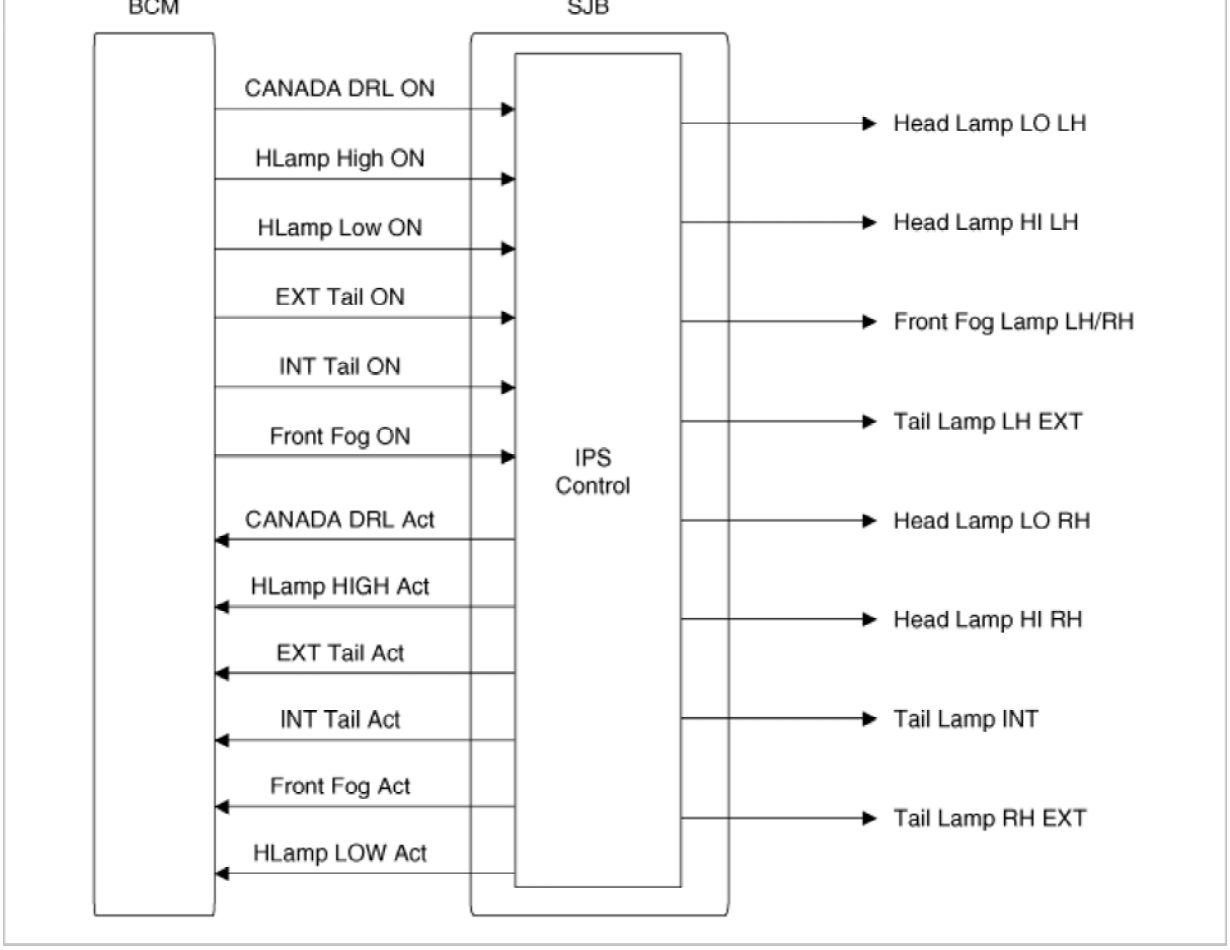


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SJB
Cluster
Brake Fluid SW
Parking Brake SW
Brake Fluid SW Signal
Park Brake SW
INPUT
MUX
Park Brake SW
BCM
Drive Seat Belt SW
(Normal Close)
RL DR SW


SJB
Cluster
IGN1
Reverse LP
Inhibitor Reverse
Signal (CAN)
(AT Only)
Switch
Input
Control

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

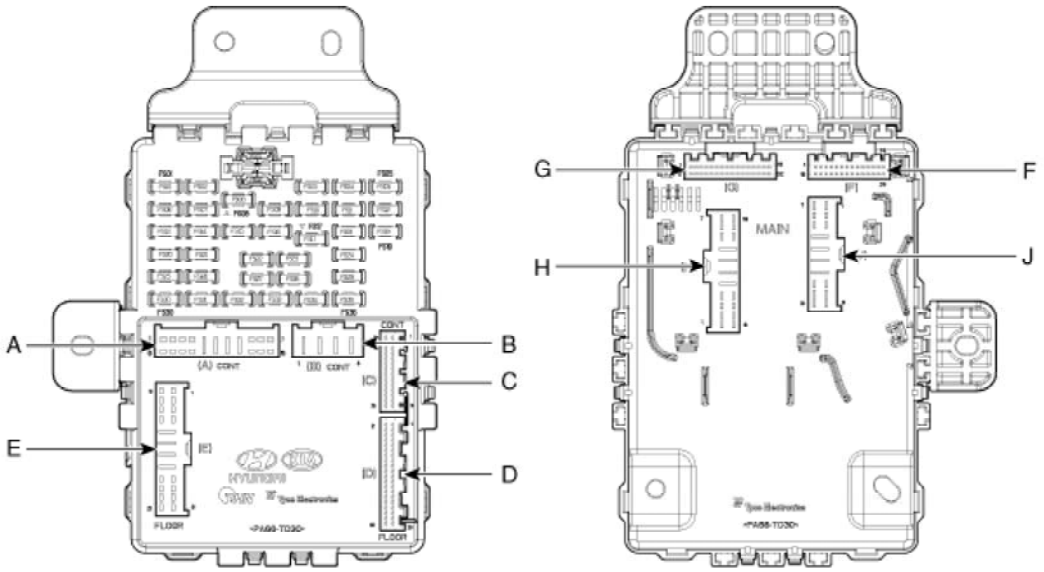
Inspection

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?
   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.

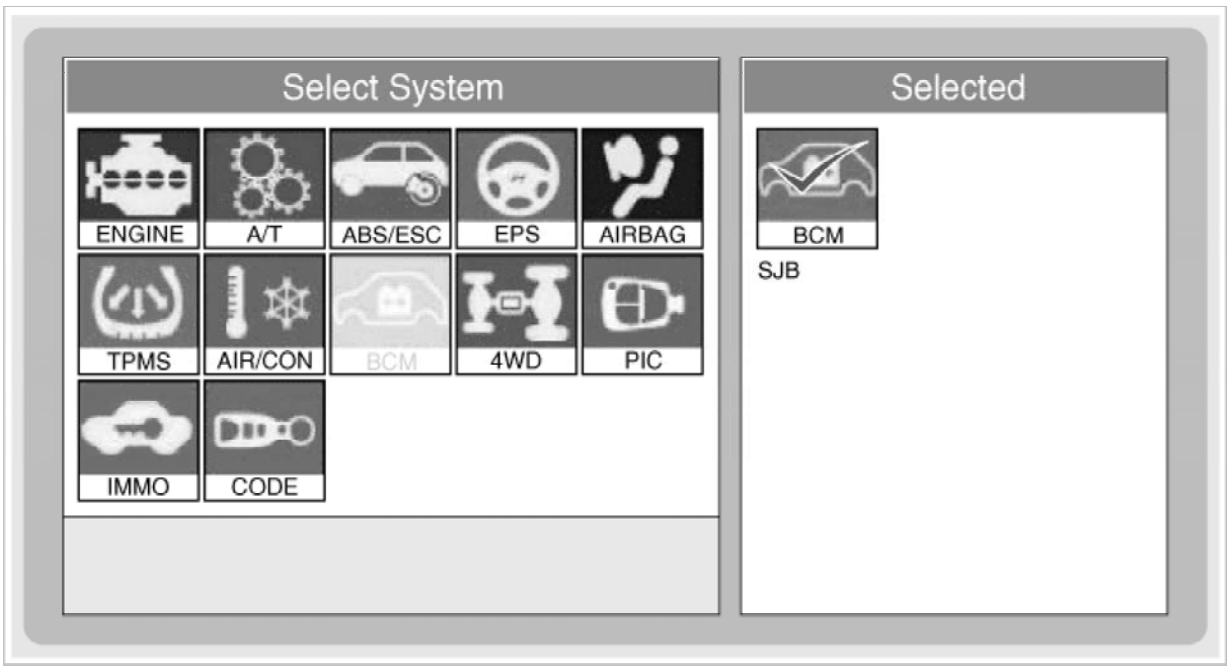
SJB Connectors

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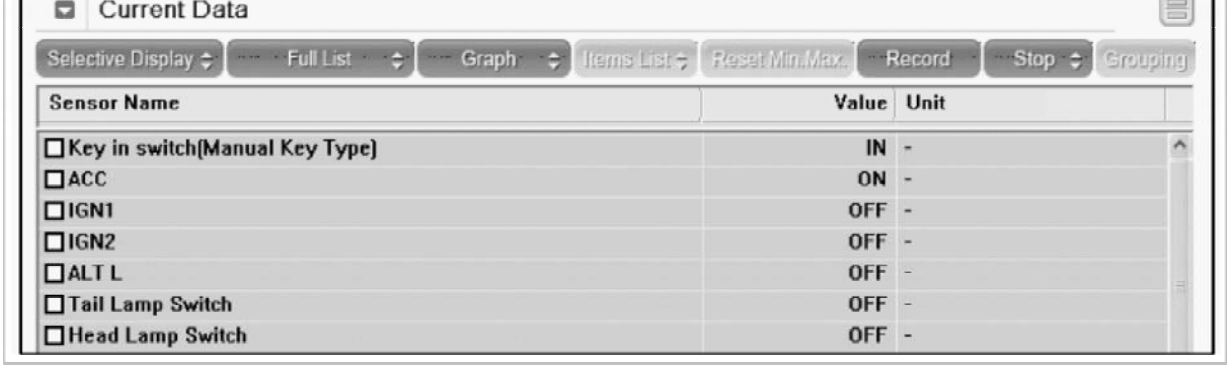
Inspection

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.

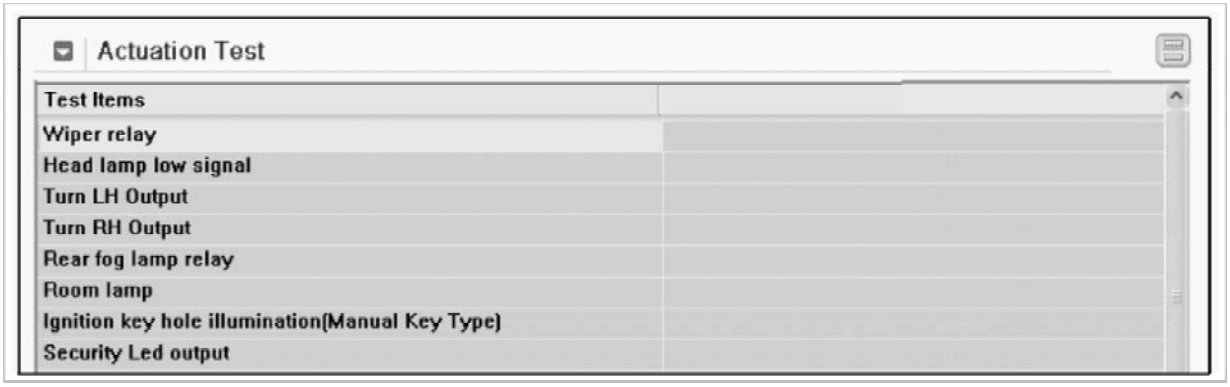


3. To consult the present input/out value of SJB, "Current DATA". It provides information of SJB input/output conditions.

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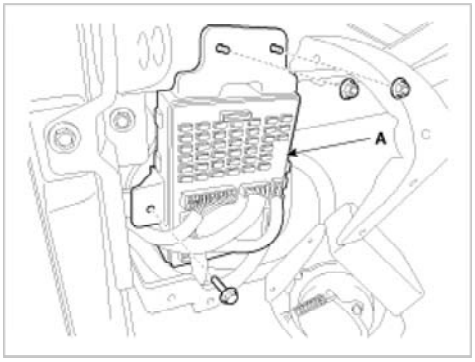


4. To perform functional test on SJB outputs, select "Actuation Test"



Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
3. Remove the SJB (A) (Smart Junction Box) after removing bolt, nuts and connectors.



Installation

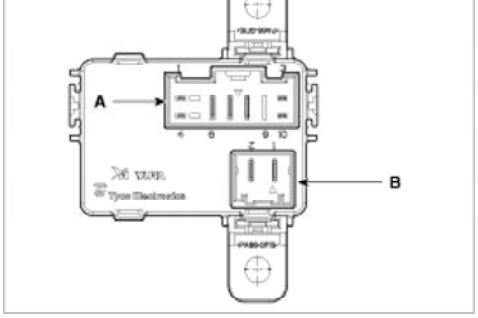
1. Install SJB (Smart Junction Box).
2. Connect the SJB connectors.
3. Install the crash pad lower panel.

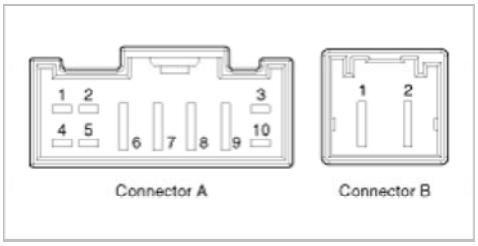
Body Electrical System > Fuses And Relays > PDM Relay Box > Description and Operation

Description

The PDM relay is united with IG1, IG2 and ACC relays and installed beside the assist instrument panel.

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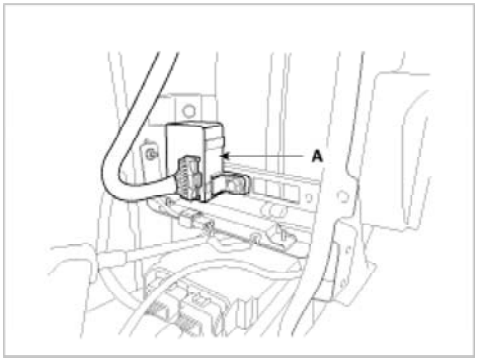




Body Electrical System > Fuses And Relays > PDM Relay Box > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front seat heater switch.
   (Refer to BE group - "Seat heater switch")
3. Remove the PDM relay box (A) after loosening the screws (2EA) and desconnecting the connector.



IG2 Relay

Check for continuity between the terminals.

1. There should be continuity between the No.1 in the B and No.2 in the B terminals when power and ground are connected to the No.3 in the A and No.4 terminals in the B terminals.
2. There should be no continuity between the No.1 in the B and No.2 terminals in the B terminals when power is disconnected.

IG1 Relay

Check for continuity between the terminals.

1. There should be continuity between the No.7 in the A and No.8 in the A terminals when power and ground are connected to the No.3 in the A and No.10 terminals in the A terminals.
2. There should be no continuity between the No.7 in the A and No.8 terminals in the A terminals when power is disconnected.

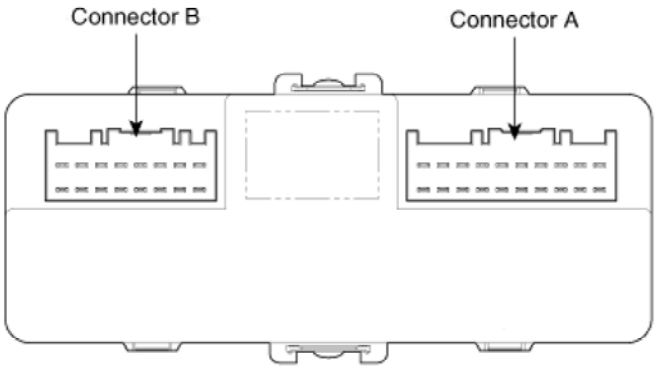
ACC Relays

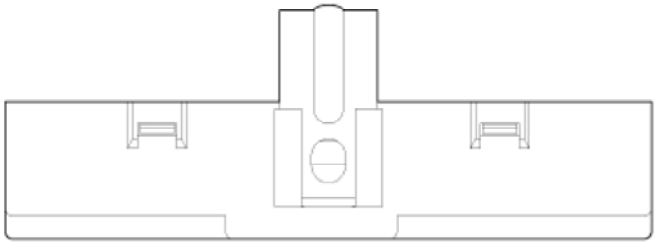
Check for continuity between the terminals.

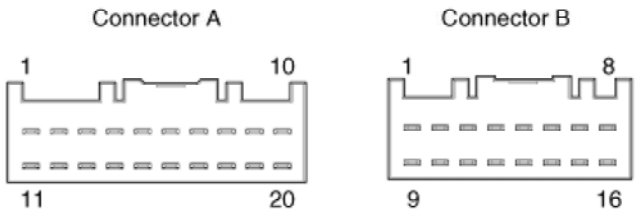
1. There should be continuity between the No.7 in the A and No.6 in the A terminals when power and ground are connected to the No.1 in the A and No.3 terminals in the A terminals.
2. There should be no continuity between the No.7 in the A and No.6 terminals in the A terminals when power is disconnected.

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

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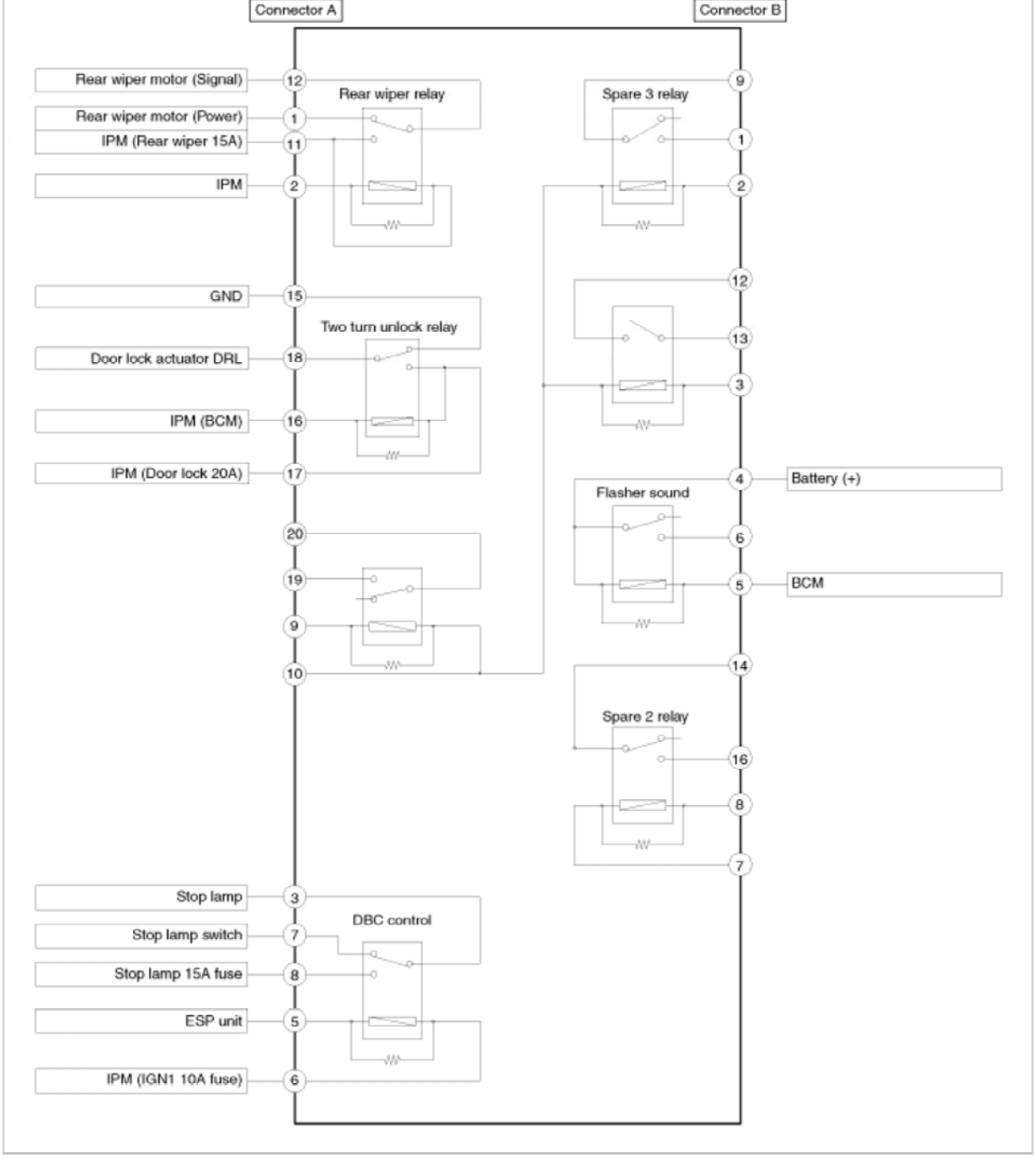




Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Schematic Diagrams

Schematic Diagram

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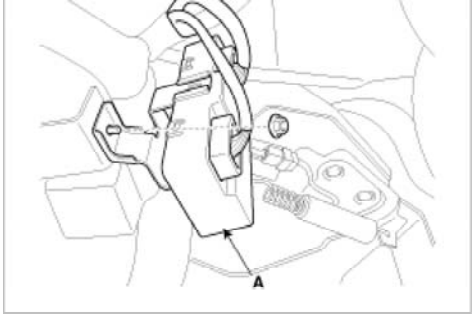


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Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Description and Operation

Description

The ICM relay is united with rear wiper relay, seat heater relay (rear) and flasher sound relay which installed inside the lower crash pad.



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

Inspection

Rear Wiper Relay

Check for continuity between the terminals.

1. There should be continuity between the No.11 in the A and No.12 in the A terminals when power and ground are connected to the No.2 in the A and No.11 in the A terminals.
2. There should be no continuity between the No.11 in the A and No.12 in the A terminals when power is disconnected.

Flasher Sound Relay

Check for continuity between the terminals.

1. There should be continuity between the No.4 in the B and No.6 in the B terminals when power and ground are connected to the No.4 in the B and No.5 in the B terminals.
2. There should be no continuity between the No.4 in the B and No.6 in the B terminals in the A terminals when power is disconnected.

DBC Relay

Check for continuity between the terminals.

1. There should be continuity between the No.3 in the A and No.8 in the A terminals when power and ground are connected to the No.5 in the A and No.6 in the A terminals.
2. There should be no continuity between the No.3 in the A and No.8 in the A terminals when power is disconnected.

Two Turn Unlock Relay

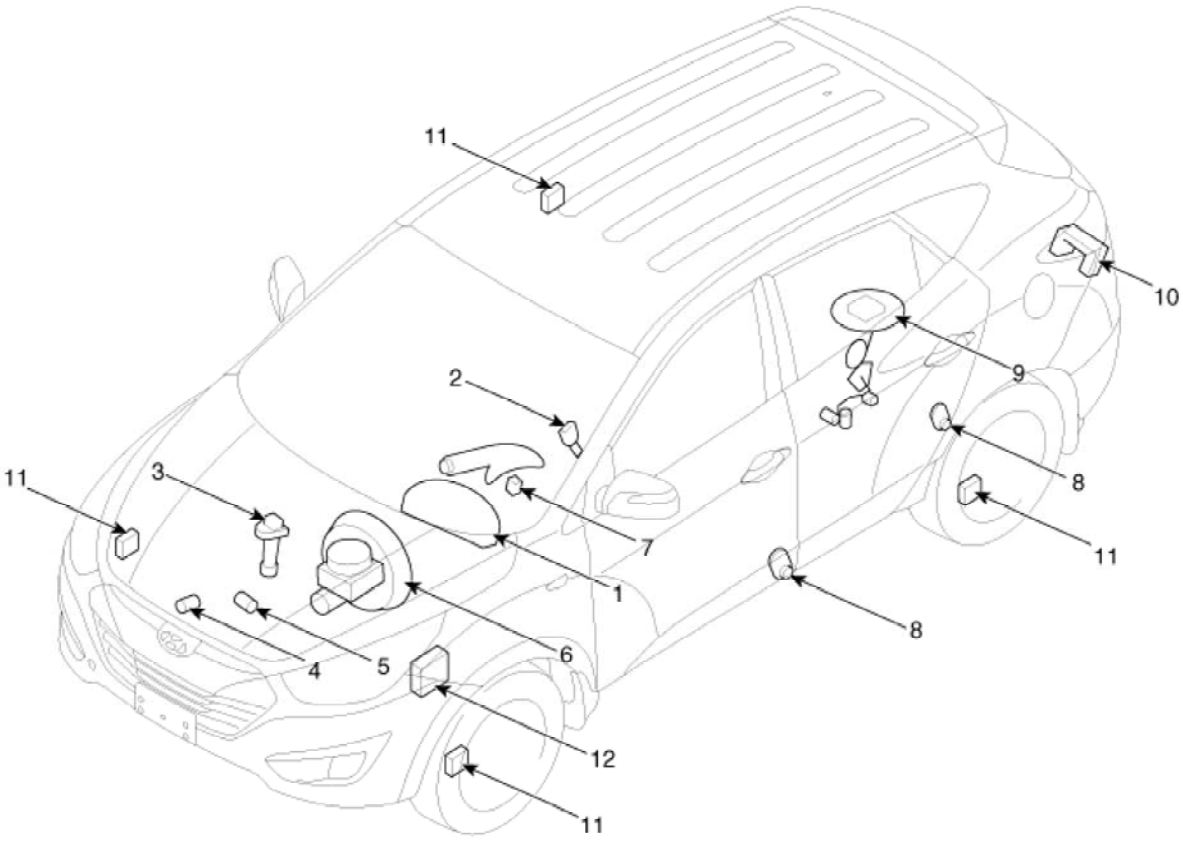
Check for continuity between the terminals.

1. There should be continuity between the No.17 in the A and No.18 in the A terminals when power and ground are connected to the No.16 in the A and No.17 in the A terminals.
2. There should be continuity between the No.15 in the A and No.18 in the A terminals when power is disconnected.

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

Component Location

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

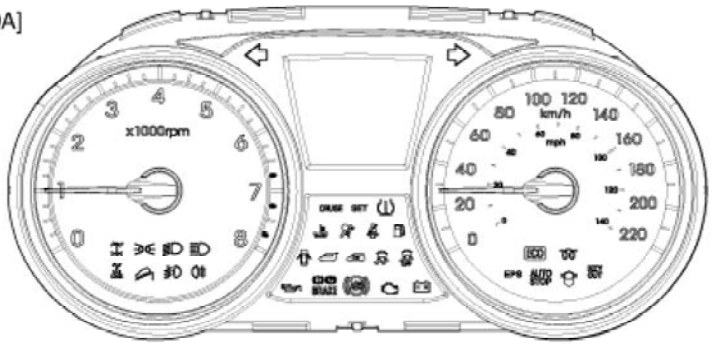
Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

Components

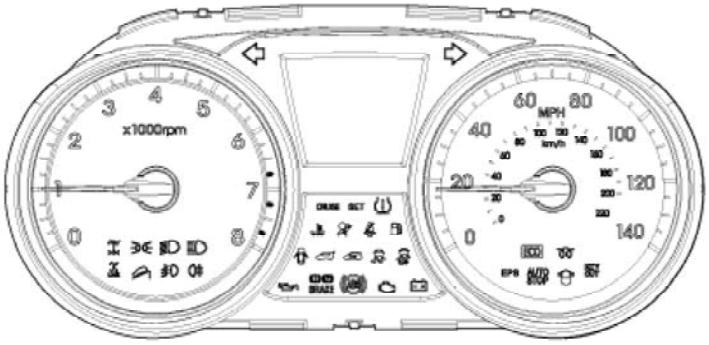
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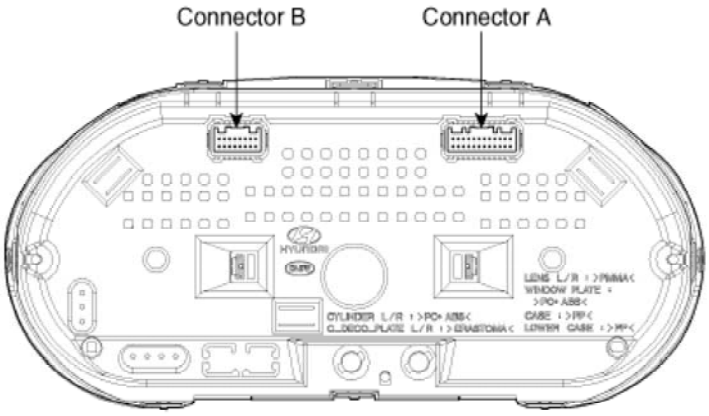
[Conventional type]

[CANADA]

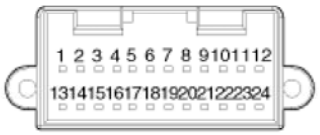


[USA]

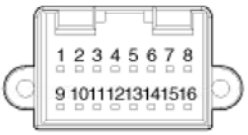




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Connector A



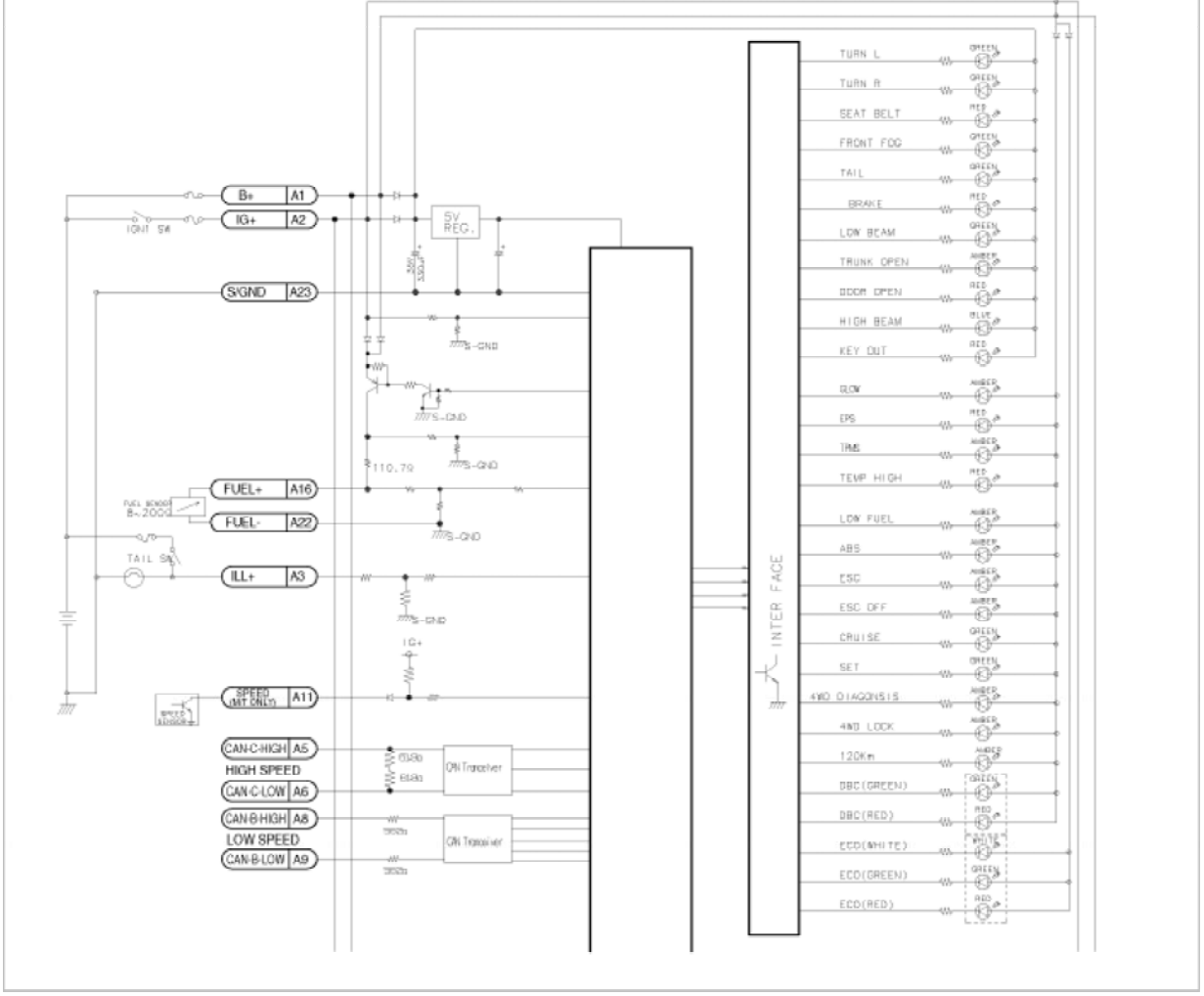
Connector B

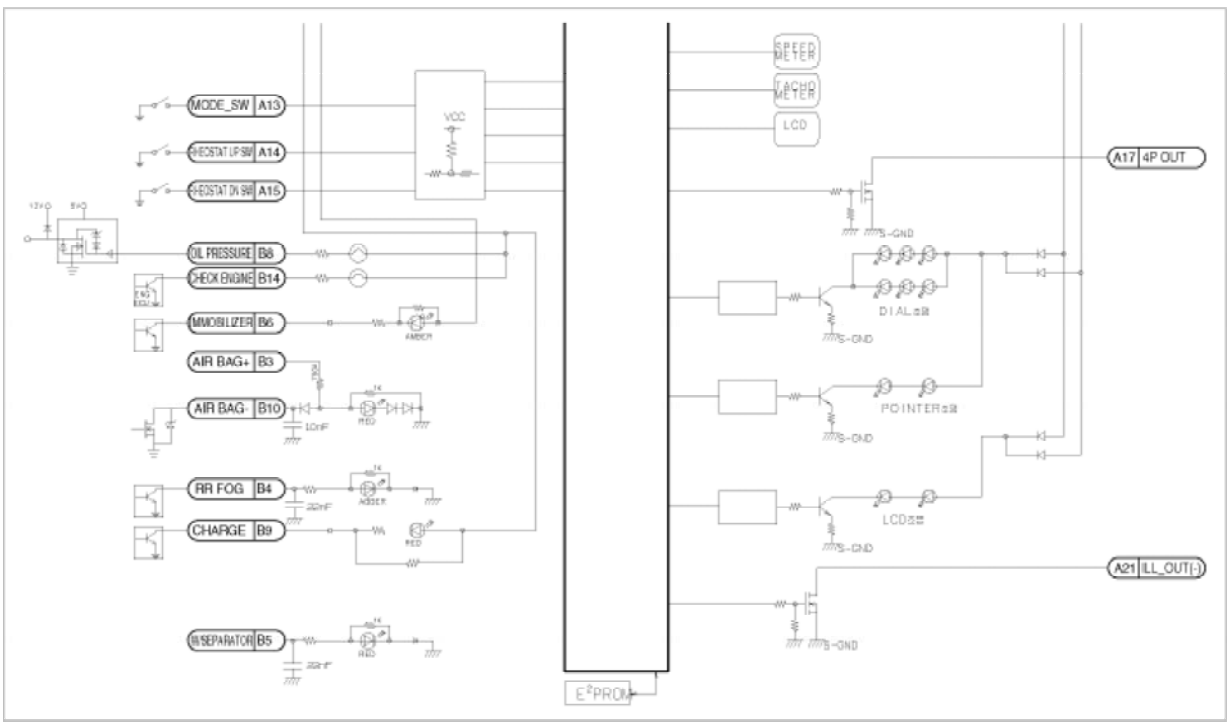
Pin	Connector A	Pin	Connector B
1	Battery (+)	1	-
2	IGN (+)	2	-
3	Illustration (+)	3	Airbag (+)
4	-	4	-
5	C-CAN High	5	Water separator
6	C-CAN Low	6	Immobilizer
7	-	7	-
8	B-CAN High	8	Oil Pressure
9	B-CAN Low	9	Charge
10	-	10	Airbag (-)
11	Speed input (MT)	11	-
12	-	12	-
13	Mode switch	13	-
14	Rheostat UP switch	14	Check engine
15	Rheostat DOWN switch	15	-
16	Fuel signal	16	-
17	Speed 4P out (AT)		
18	-		
19	-		
20	-		
21	Illustration (-) output		
22	Fuel GND		
23	Signal GND		
24	-		

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

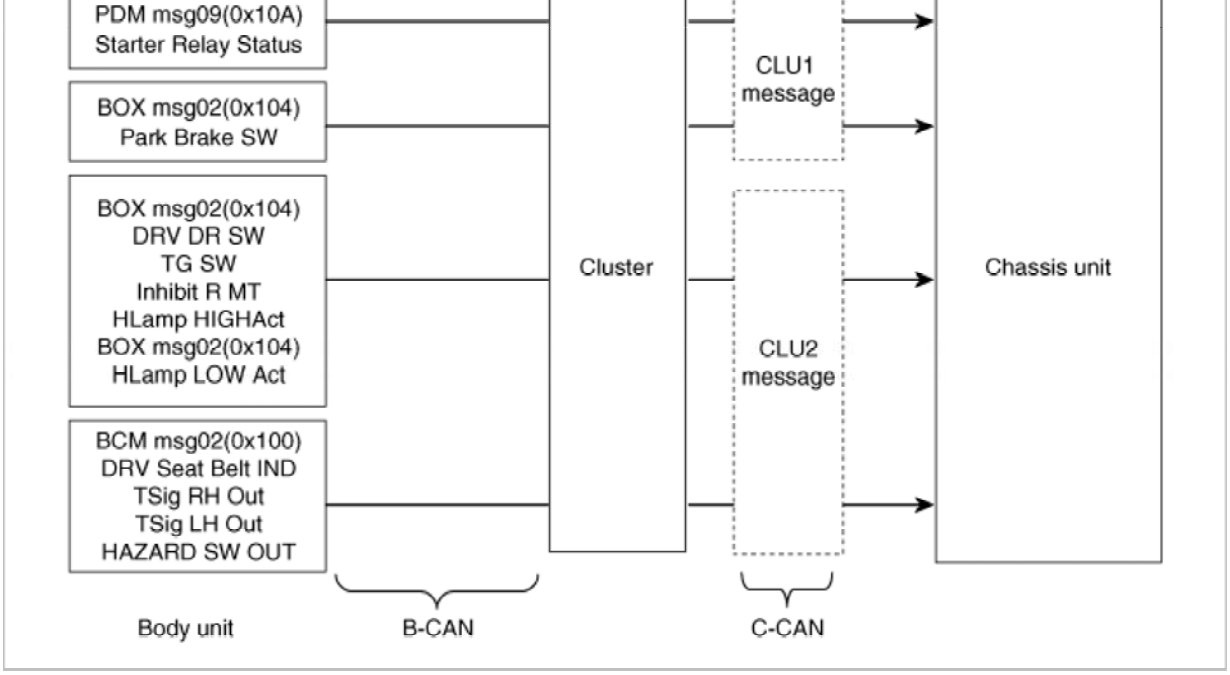
Circuit Diagram





Massage Flow Diagram

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

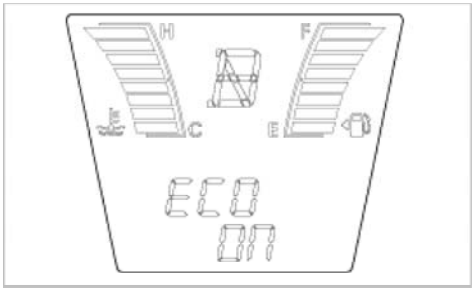
Description

ECO driving system

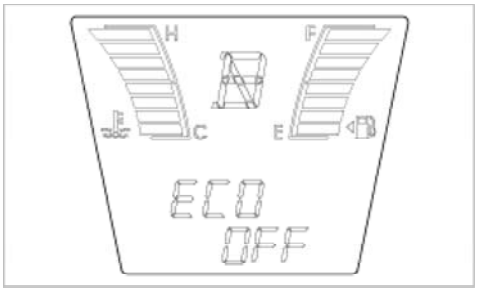
This system is designed to encourage eco-driving by providing real-time feedback to the driver.
The ECO indicator light assists you to drive in the most economical way.
The green indicator comes on when you drive with high fuel efficiency.
The fuel efficiency depends on driver's driving habit and road condition.
The system stops operation when the transaxle is in the P,R,N position or sports mode, or instantaneous fuel consumption mode is selected.

ECO indicator ON/OFF

1. ECO indicator system stops operation when instantaneous fuel consumption mode is selected.
2. ECO indicator light is always OFF when driver select the "ECO OFF" mode pushing the "Trip" button.
   A. Set the main LCD display to "ECO ON" pushing "Trip" button as below picture.



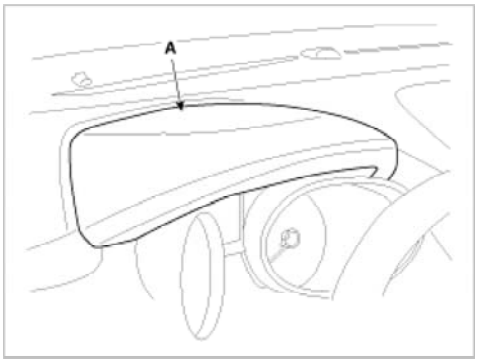
   B. And then set the "ECO OFF" pushing "Trip" button more than 1 second as below picture.
   In this option, ECO indicator light does not operate any trip mode.



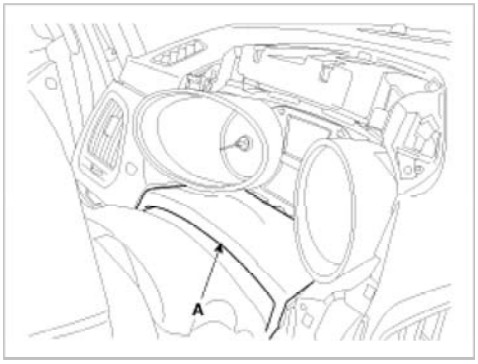
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Removal

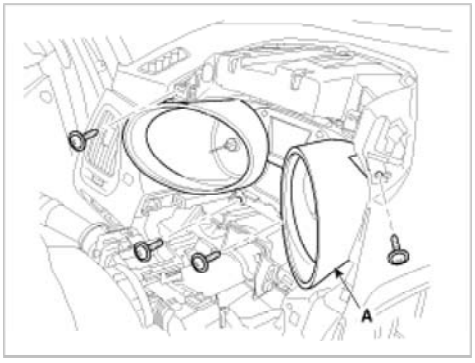
1. Disconnect the negative (-) battery terminal.
2. Remove the cluster fascia panel (A).



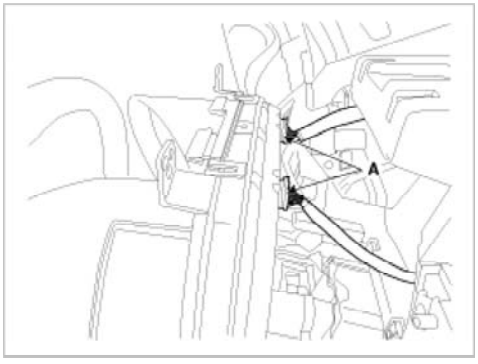
3. Remove the cluster fascia lower panel (A).



4. Remove the cluster fascia (A) from the housing after loosening 4 screws.



5. Disconnect the cluster fascia connecters (A) and then remove the cluster.



Installation

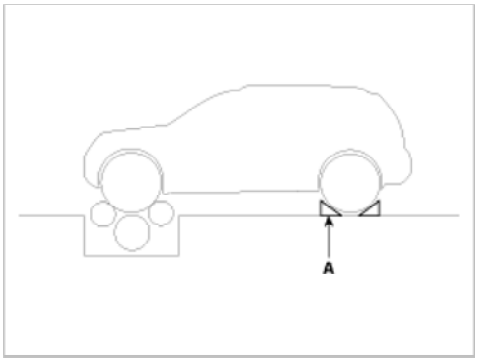
1. Connect the cluster connector.
2. Install the cluster assembly.

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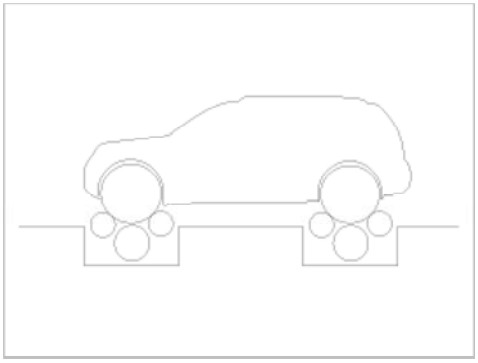
Speedometer

1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks (A) as appropriate.

[2WD]



[4WD]



3. Check if the speedometer indicator range is within the standard values.

> CAUTION
>
> Do not operate the clutch suddenly or increase/ decrease speed rapidly while testing.

> NOTE
>
> Tire wear and tire over or under inflation will increase the indication error.

[CANADA - km/h]

Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	+3.0 0	+3.0 0	+3.4 0	+3.8 0	+4.1 0	+4.9 0
Velocity (km/h)	140	160	180	200	220	-
Tolerance (km/h)	+5.2 0	+5.7 0	+6.2 0	+6.5 0	+6.7 0	-

[USA - MPH]

Velocity (MPH)	10	20	40	60
Tolerance (MPH)	+2.3 0	+2.4 0	+2.5 0	+2.6 0
Velocity	80	100	120	140

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Tolerance (MPH)	+2.7 0	+2.8 0	+2.9 0	+3.0 0

Tachometer

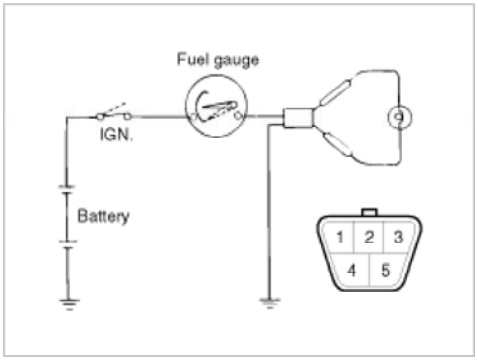
1. Connect the scan tool to the diagnostic link connector or install a tachometer.
2. With the engine started, compare the readings of the tester with that of the tachometer. Replace the tachometer if the tolerance is exceeded.

> CAUTION
>
> 1) Reversing the connections of the tachometer will damage the transistor and diodes inside.
> 2) When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution (rpm)	Tolerance (rpm)
	Max 8000rpm
	Gasoline
1,000	±100
2,000	±125
3,000	±150
4,000	±150
5,000	±150
6,000	±180
7,000	±210
8,000	±240

Fuel Gauge

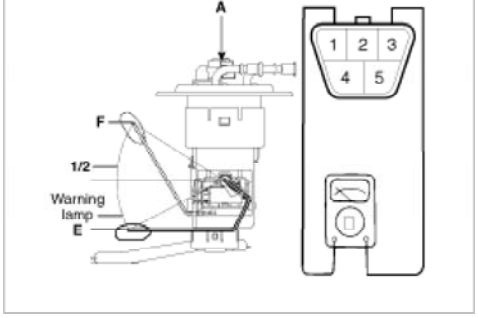
1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 wattages, 12V test bulb to terminals 1 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



Fuel Gauge Sender

1. Using an ohmmeter, measure the resistance between terminals 1 and 3 of sender connector (A) at each float level.

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2. Also check that the resistance changes smoothly when the float is moved from "E" to "F".

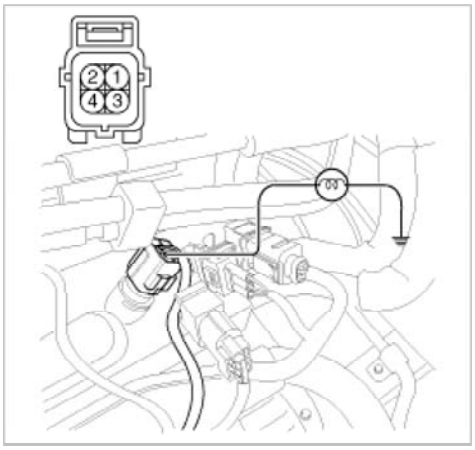
Position	Liter (ℓ)	U.S.gal.	Resistance (Ω)
E	6.5	1.71	184 ± 2Ω
Warning lamp ON	8.5	2.23	170 ± 2Ω
1/2	28.8	7.6	66 ± 2Ω
F	50	13.2	15 ± 2Ω

3. If the height resistance is unsatisfied, replace the fuel sender as an assembly.

> CAUTION
>
> After completing this test, wipe the sender dry and reinstall it in the fuel tank.

Engine Coolant Temperature Gauge

1. Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
2. Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
3. Connect a 12V, 3.4 wattages test bulb between the harness side connector No.2 and ground.
4. Turn the ignition switch ON.
5. Verify that the test bulb flashes and that the indicator moves to HOT.
   If operation is not as specified, replace the engine coolant temperature gauge. Then recheck the system.



Engine Coolant Temperature Sender

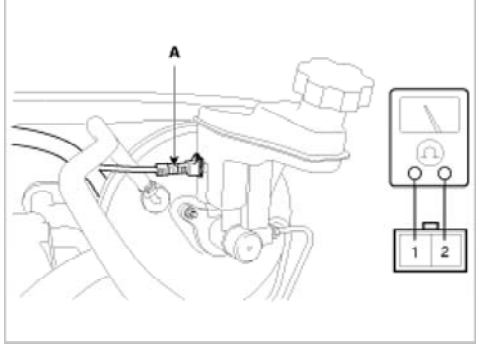
1. Using an ohmmeter, measure the resistance between the terminal 2 and ground.
2. If the resistance value is not as shown in the table, replace the temperature sender.

Temperature [°F(°C)]	131(55)	160(71)	230(110)	257(125)
Gauge Segment	SEG1	SEG3	SEG4	SEG7

Brake Fluid Level Warning Switch

1. Remove the connector (A) from the switch located at the brake fluid reservoir.

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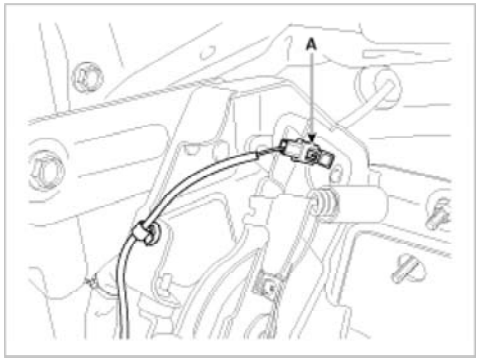
Brake Fluid Level Warning Lamp

1. Ignition "ON".
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

Parking Brake Switch

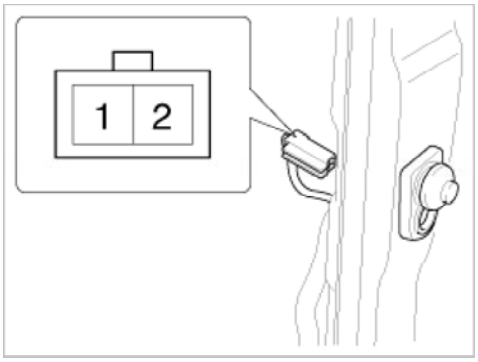
The parking brake switch is a pull type. It is located at the side of the parking brake lever.

1. Check that there is continuity between the terminal and switch body with the switch (A) ON.
2. Check that there is no continuity between the terminal and switch body with the switch OFF.
   If continuity is not as specified, replace the switch or inspect its ground connection.



Door Switch

Remove the door switch and check for continuity between the terminals.



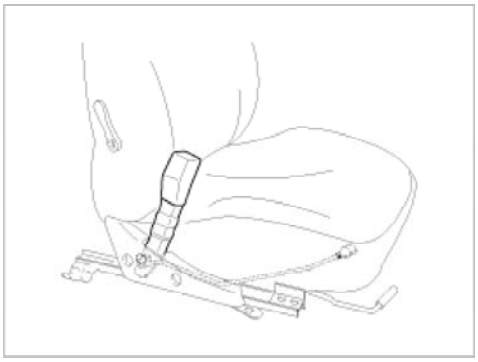
Terminal / Position	1	2	GND
Free(Door open)	○	○	○
Push(Door close)			

Seat Belt Switch

1. Remove the connector from the switch.
2. Check for continuity between terminals.

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Fastened	Non-conductive (∞Ω)
Not fastened	Conductive (Ω)



Seat Belt Warning Lamp

With the ignition switch turned ON, verify that the lamp glows.

Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

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

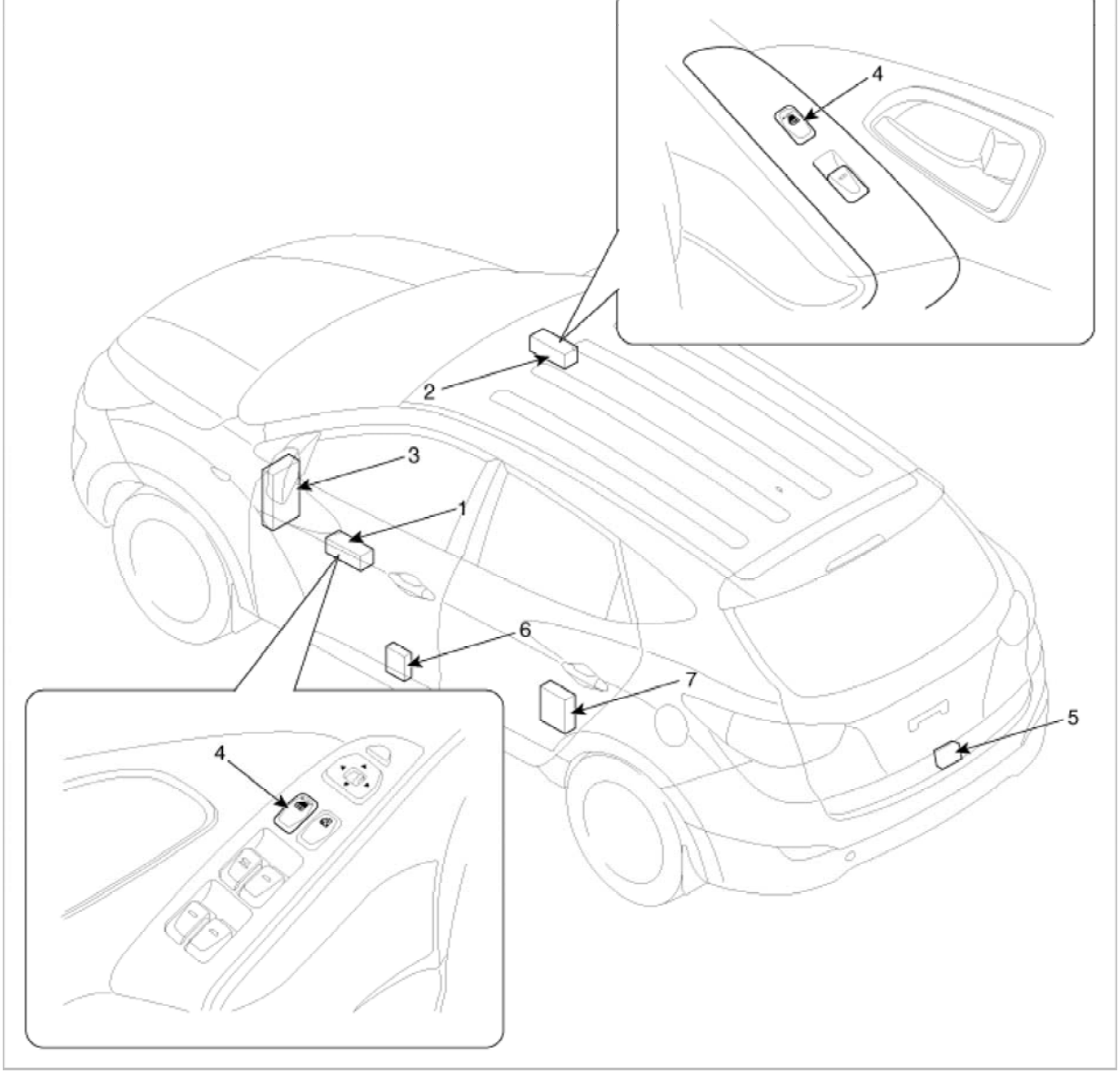
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	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Brake fluid level warning switch faulty	Check switch
	Parking brake switch 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

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1. Driver power window switch 2. Assist power window switch 3. SJB (Smart Junction Box) 4. Door lock switch	5. Tailgate lock actuator & switch 6. Front door lock actuator & switch 7. Rear door lock actuator & switch

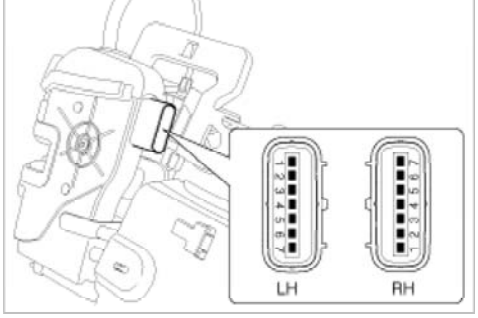
Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

Inspection

Front Door Lock Actuator

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors from the actuator.

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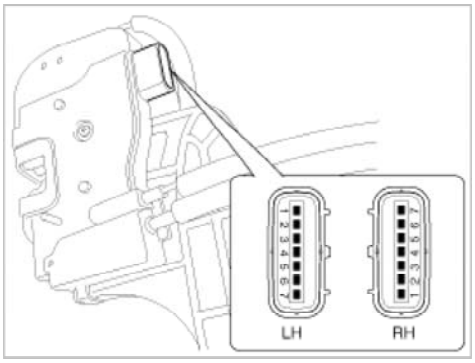
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock]

Position \ Terminal		2	1
Front left	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕
Position \ Terminal		7	6
Front right	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖

Rear Door Lock Actuator

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
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.

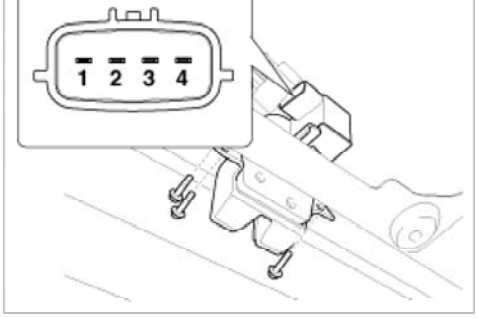
[Central Lock]

Position \ Terminal		2	1
Rear left	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕
Position \ Terminal		7	6
Rear right	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖

Tailgate Lock Actuator Inspection

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

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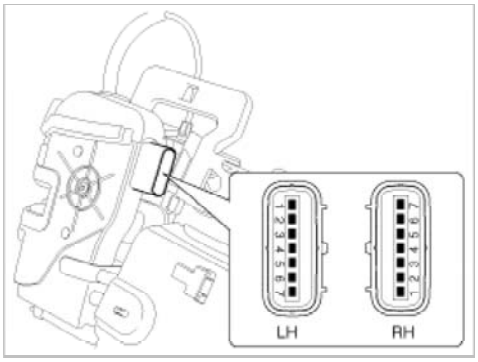


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	3	4
Unlock	⊕	⊖

Front Door Lock Switch

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors from the actuator.



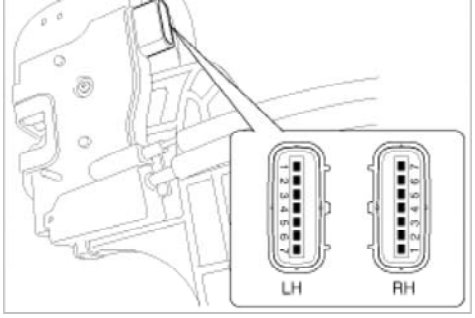
4. Check for continuity between the terminals in each switch position when inserting the key into the door according to the table.

Position \ Terminal		5	6	3	4
Front left	C/Unlock	○—○			
	Counter-clock wise	○——		——○	
	Clock wise	○——		——	——○
Position \ Terminal		**3**	**2**	**5**	**4**
Front right	C/Unlock	○—○			
	Clock wise	○——		——○	
	Counter-clock wise	○——		——	——○

Rear Door Lock Switch

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
3. Disconnect the connectors from the actuator.

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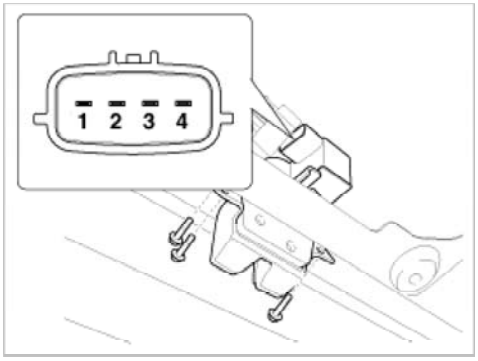


4. Check for continuity between the terminals in each switch position according to the table.

Position		Terminal	5	6
Central Door Lock	Rear Left	Lock		
		Unlock	○——	——○
Position		Terminal	2	3
Central Door Lock	Rear Right	Lock		
		Unlock	○——	——○

Tailgate Switch

1. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
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	3	4
Lock			
Unlock		○——	——○

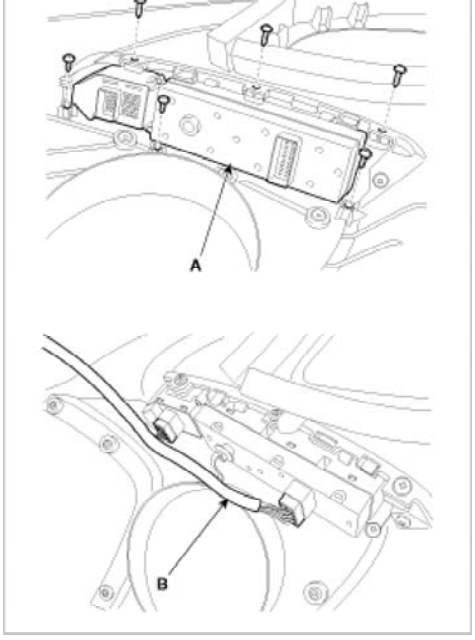
Body Electrical System > Power Door Locks > Power Door Lock Switch > Repair procedures

Removal

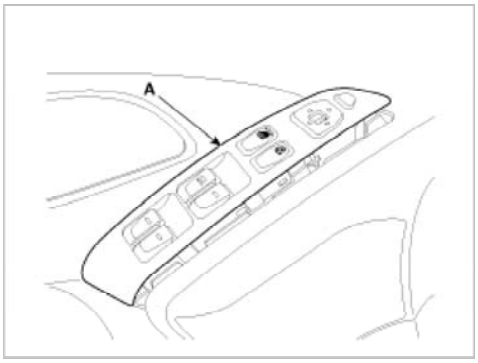
Driver Power Window Switch

1. Disconnect the negative battery terminal.
2. Remove the front door trim.
   (Refer to the BD group - "Front door")
3. Remove the screws from power window switch (A) and connectors (B).

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4. Remove the driver power window switch (A) from front door trim.

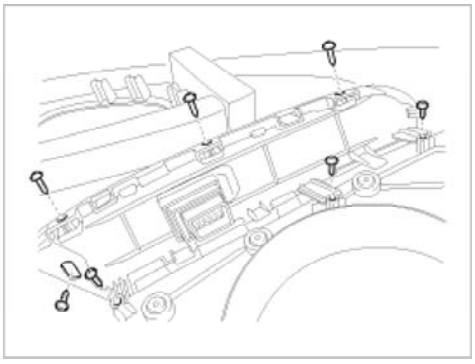


NOTE

Be careful not to damage the hook when removing the switch module.

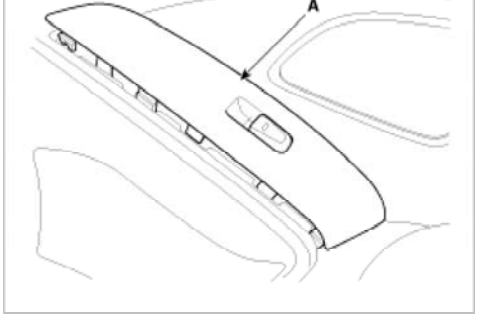
Assist Power Window Switch

1. Disconnect the negative battery terminal.
2. Remove the front door trim.
   (Refer to the BD group - "Front door")
3. Remove the power window switch (A) from front door trim.



4. Remove the power window switch (A) from front door trim.

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NOTE

Be careful not to damage the hook when removing the switch module.

Installation

Driver Power Window Switch

1. Install the driver door module and connectors.
2. Install the front door trim.

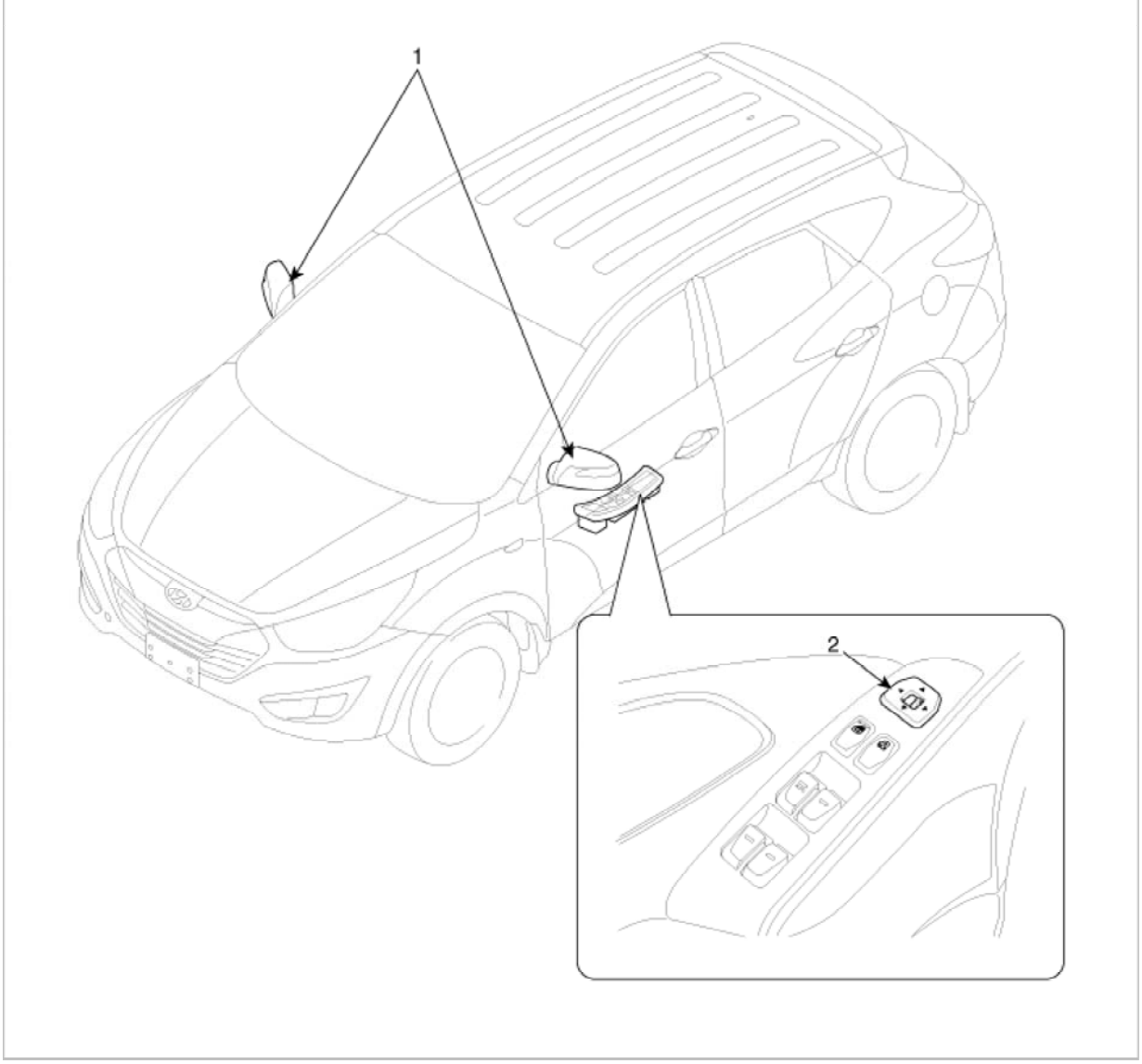
Assist Power Window Switch

1. Install the assist door module and connectors.
2. Install the front door trim.

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

Component Location

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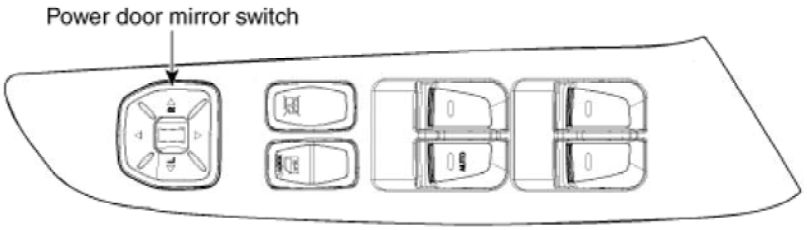


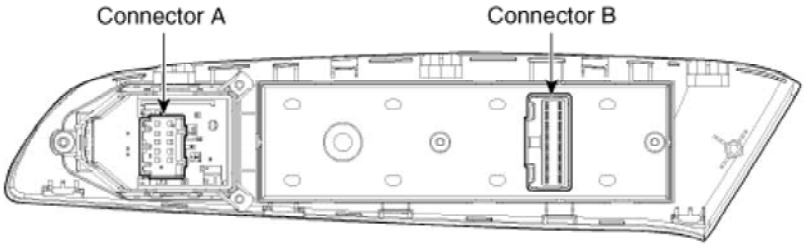
1. Power door mirror	2. Power door mirror switch

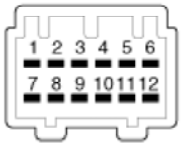
Body Electrical System > Power Door Mirrors > Power Door Mirror Switch > Schematic Diagrams

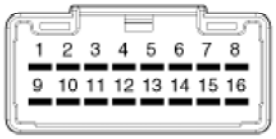
Circuit Diagram

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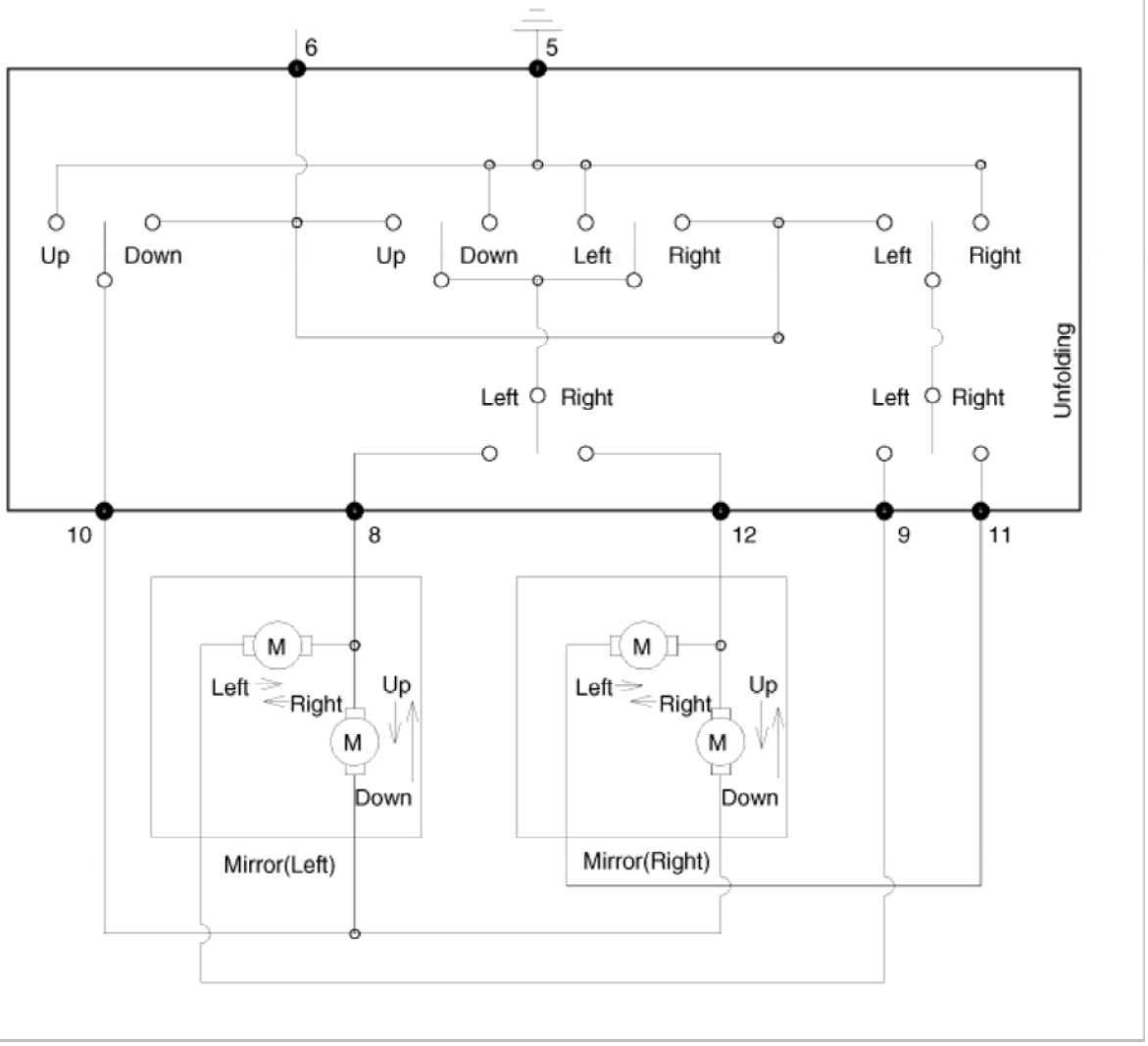






Pin	Connector A	Pin	Connector B
1	-	1	Assist window switch up
2	-	2	Assist window switch down
3	-	3	Illumination
4	-	4	-
5	GND	5	Door unlock
6	ACC	6	Driver switch Auto
7	-	7	Driver window switch up
8	Driver door mirror motor (vertical)	8	Driver window switch down
9	Driver door mirror motor (horizontal)	9	Battery (+) R
10	Common	10	Rear right window switch up
11	Assist door mirror motor (horizontal)	11	Rear right window switch down
12	Assist door mirror motor (vertical)	12	GND
		13	Door lock
		14	Rear left window switch up
		15	Rear left window switch down
		16	Battery (+) L

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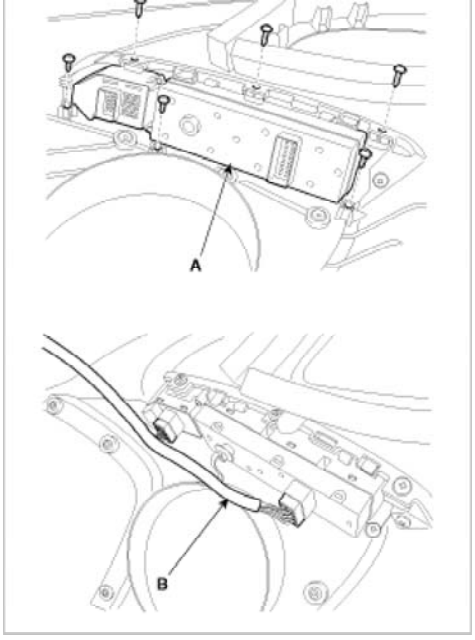
Body Electrical System > Power Door Mirrors > Power Door Mirror Switch > Repair procedures

Removal

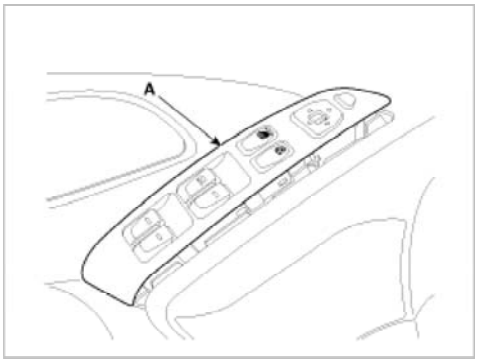
Driver Door Mirror Switch

1. Disconnect the negative battery terminal.
2. Remove the front door trim.
   (Refer to the BD group - "Front door")
3. Remove the screws from power window switch (A) and connectors (B).

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4. Remove the driver power window switch (A) from front door trim.



NOTE

Be careful not to damage the hook when removing the switch module.

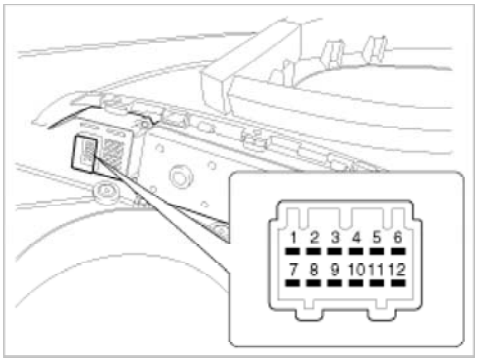
Installation

Driver Door Mirror Switch

1. Install the driver power window switch and connectors.
2. Install the front door trim.

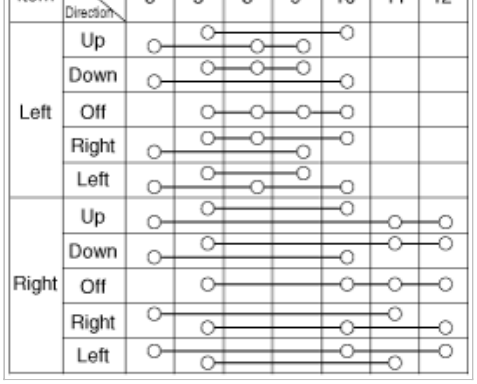
Inspection

1. Remove the front door trim and power door mirror switch module (A).



2. Check for the continuity between terminals of power door mirror switch according to the table.

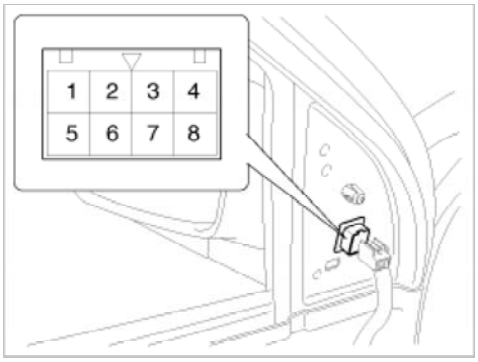
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Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door delta cover.
   (Refer to the BD group - "Front door")
3. Disconnect the connector from the door mirror.
4. Verify that the mirror operates properly as shown in the table.



Position \ Terminal		3 (L)	1 (L)	3 (R)	1 (R)	2	B+	GND
LH	Up	○				○	○	○
	Down		○			○	○	○
	OFF	○	○				○	
	Right		○			○	○	○
	Left	○				○	○	○
RH	Up			○	○	○	○	○
	Down			○	○	○	○	○
	OFF			○	○		○	
	Right			○	○	○	○	○
	Left			○	○	○	○	○

Mirror Heater

Position \ Terminal	8	7
Heater	⊕	⊖

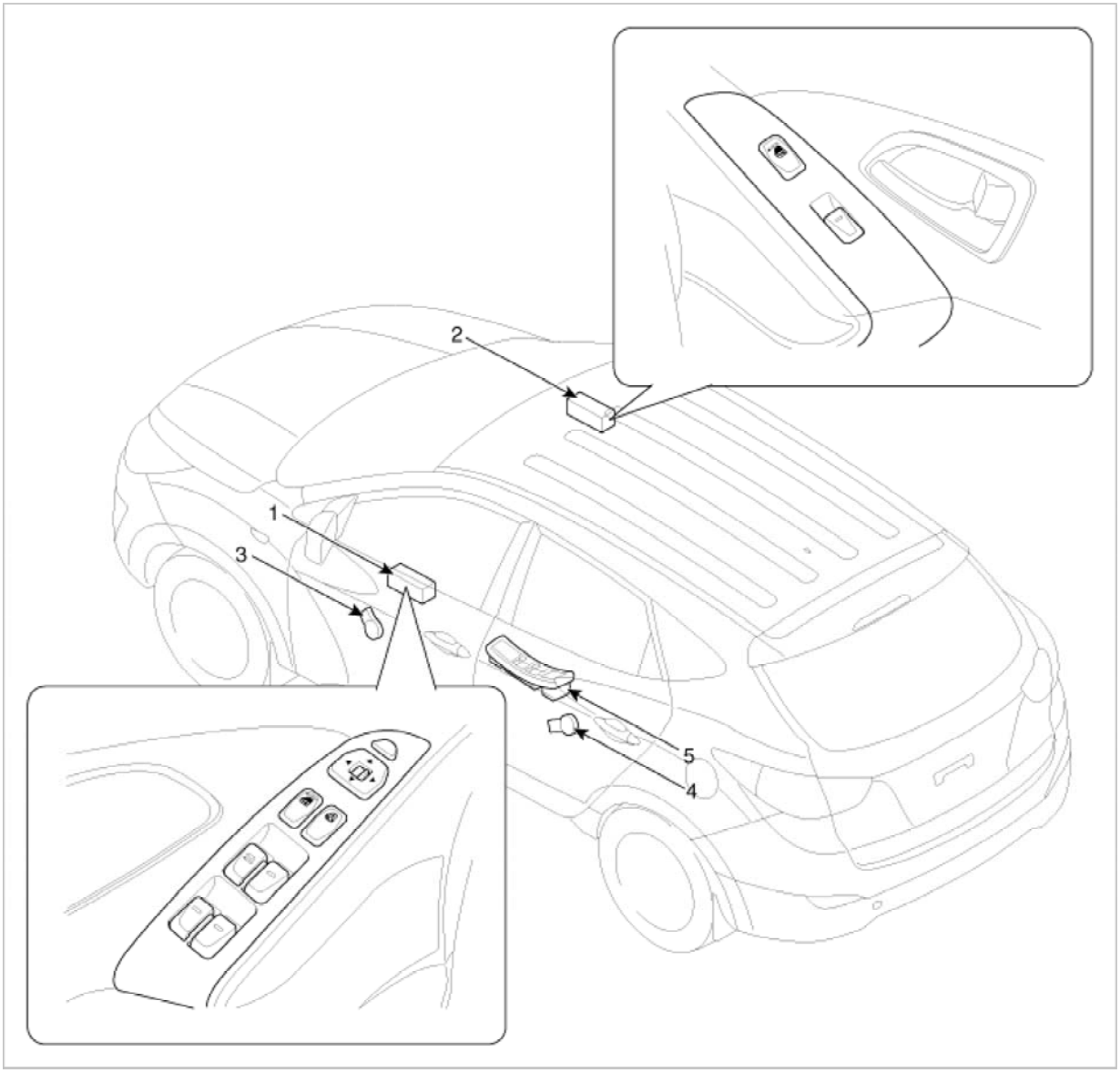
Turn Signal Lamp

Position \ Terminal	4	7
Side repeater	⊕	⊖

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Body Electrical System > Power Windows > Components and Components Location

Component Location



1. Driver power window main switch 2. Passenger window switch 3. Front window motor	4. Rear window motor 5. Rear window switch

Body Electrical System > Power Windows > Description and Operation

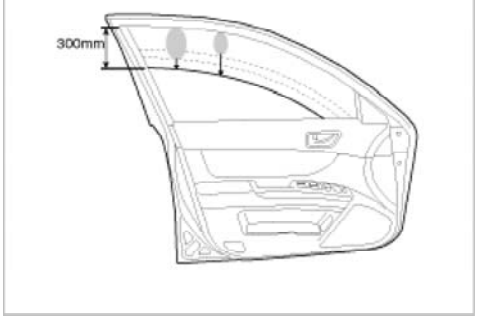
Operation

Function Of Safety Power Window

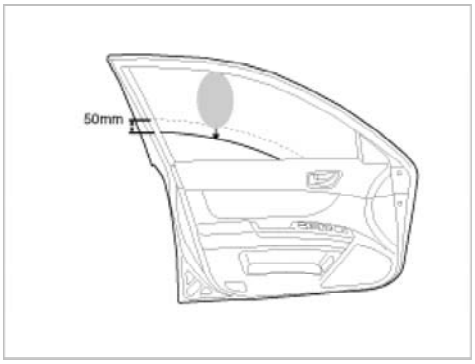
When all door (Front, Rear) power window auto-up switch is operated, safety function is activated.

1. Safety function condition
   When detect the force of 100N 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.

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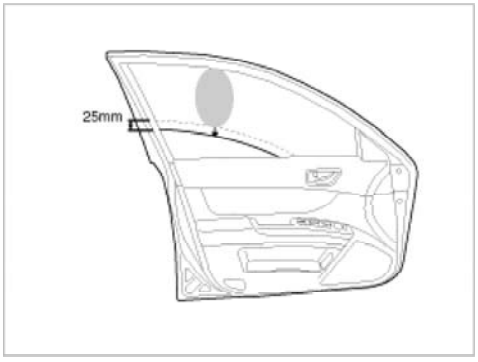


B. When detect the jamming over the 250mm from top of the door.
→ Window is reversed until 50mm from jamming position.
→ Window is reversed 50mm or bottom position in case of 50mm reversing distance.



C. When detect the jamming over 300mm from top of the door.
→ Window stops at reverse point.

3. Length of window reversing (holding the auto-up switch)
A. When detect the jamming during holding the auto-up switch.
→ Window is reversed 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 detect the jamming during holding the auto-up switch again.
→ Window is reversed until 25mm from jamming position.
D. 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. Position counter and position initialization
(1) Position counter
Window position counting is implemented by use of one Hall Effect sensor (HEF) connected to timer capture unit of the Controller with a resolution of 180° electrical.
Even the battery was separated from the car, it must keep the window position information.

(2) Position initialization
For position initialization, position counter detect the upper mechanical stop and lower mechanical Position. Motor control unit (MCU) allow only Manual mode activity (without ASD Anti-Squeeze Detection algorithm) feature) before to be

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Initialization means the condition to move the window system with full anti-pinch function and related functions by detecting the window travel distance (Upper/Lower mechanical limits).

Conditions for initialization are

A. de-initialized position counter

B. Power window switch Up activated

C. block condition detected
(no motor movement of more than 1 count during 1sec/ SW dependent)

Switch action with De-initialized condition :

A. Up direction : Manual & Auto P/WDW sw input → manual mode;

B. Down direction : Manual P/WDW sw input → manual mode, + Auto s/w input → auto mode

(3) Re-initialization

During re-initialization, position counter is set to "zero" at upper block position to compensate counting errors by software, mechanical tolerances or physics. Conditions for re-initialization are

A. initialized position counter.

B. window at upper block position (capture range EEPROM programmable)

C. block condition detected
(no motor movement of more than 1 count during 1 sec/ SW dependent)

(4) De-initialization

The system initialization/calibration will be lost in the following cases:

A. After parameter modification via diagnostic

B. Wrong EEPROM checksum at ECU wake-up or power-on

C. Movement outside predefined window stroke (above learned top position, below predefined bottom position)

D. De-initialization after a defined number (EEPROM) of reversals without re-initialization in the upper seal (activation /de-activation controlled by EEPROM value). A window down movement or switching off the window lifter permission resets the reversal counter value(activation by EEPROM bit).

E. De-initialization after a defined number of movements (EEPROM) without re-initialization in the upper seal (activation /de-activation controlled by EEPROM value)

F. Special de-initialization procedure :
The special window lifter de-initialization procedure works as follows:
- System is initialized
- Move window below soft-stop position (position EEPROM adjustable)
- Press MANU-down switch and keep it pressed
- Apply permission signal (serial-link = PIN 6) ON → OFF → ON within 2 seconds (time EEPROM adjustable)

(5) Soft stop function

In order to reduce noise and mechanical stress, the window movement is stopped under control of the ECU before the bottom position is reached.

The clearance is 0 / +10 mm (at 11.5 V to 14.5 V).

To activate the soft bottom stop function, the top reference position and bottom reference position have to be initialized. Therefore, the window is lifted into the top position until the block condition is detected. This position is taken as top reference position.

Afterwards, the window is moved to the bottom position until the block condition is detected (mechanical stop). This position is taken as bottom reference position.

The bottom reference position is re-initialized :

A. When window is operated down starting from soft stop position

B. Every "9" stops at soft stop position.

(6) Thermal protection

Thermal protection by software module is implemented to prevent from destruction of motor during overload condition. Motor temperature is estimated by integrating squared motor current as an estimate for heating power integral. When estimated motor temperature exceeds EEPROM programmable upper limit, motor is deactivated for fixed delay time (default value = 30 sec.)

Thermal shutdown during a window operation will not interrupt the operation due to safety reasons.

(7) Operation time limiter

Maximal operation time of power window motor is limited to 15 sec (EEPROM programmable).

(8) Continuous reverse

Current Number of Continuous reverse of window is 5. With the below condition, this counter Will be initialized.

A. IG OFF

B. DOWN signal ON

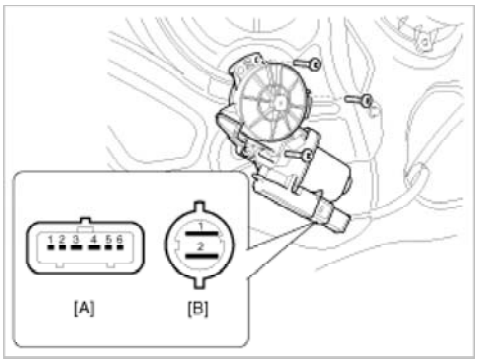
C. WINDOW CLOSE

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Inspection

Front Power Window Motor

1. Remove (-) negative battery terminal.
2. Remove the front door trim.
   (Refer to the BD group - "Front door")
3. Disconnect the connector 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.

[Standard]

Position \ Terminal			1	2
Left	UP	Counter-clockwise	⊕	⊖
	DOWN	Clockwise	⊖	⊕
Right	UP	Clockwise	⊕	⊖
	DOWN	Counter-clockwise	⊖	⊕

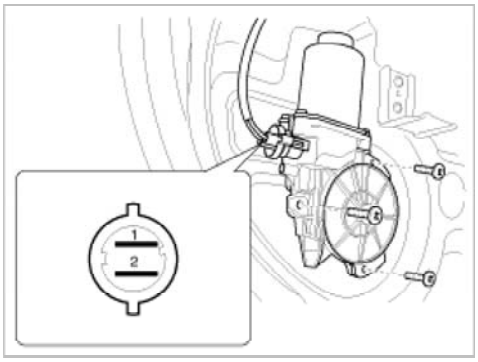
5. Connect the terminal No. 2 and No. 3 to battery voltage (12V) and check that the motor operates smoothly when connecting the terminals below.

[Safety]

Position \ Terminal		2	3	1
Left	UP	○	○	
	DOWN		○	○
Right	UP	○	○	
	DOWN		○	○

Rear Power Window Motor

1. Remove (-) negative battery terminal.
2. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
3. Disconnect the connector from the motor.



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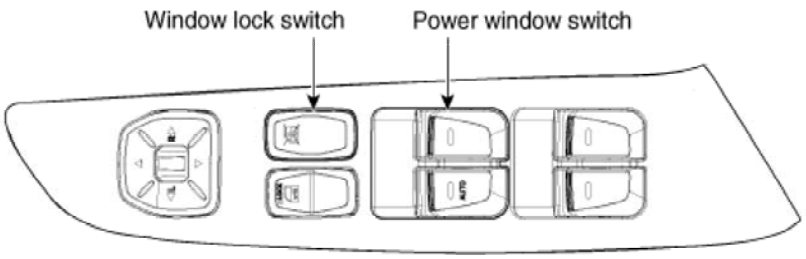
polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

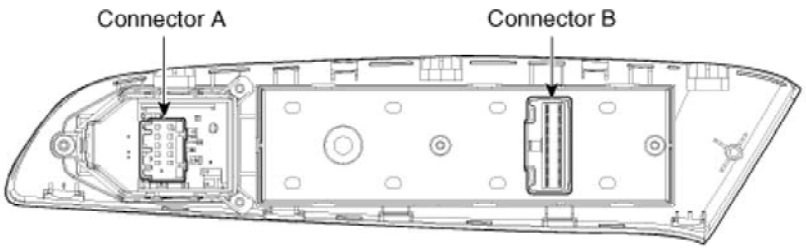
Position			Terminal 1	Terminal 2
Left	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖
Right	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖

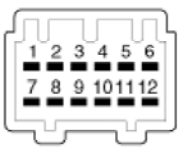
Body Electrical System > Power Windows > Power Window Switch > Components and Components Location

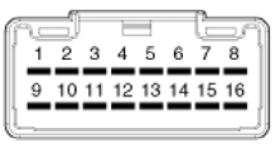
Components

Power Window Main Switch





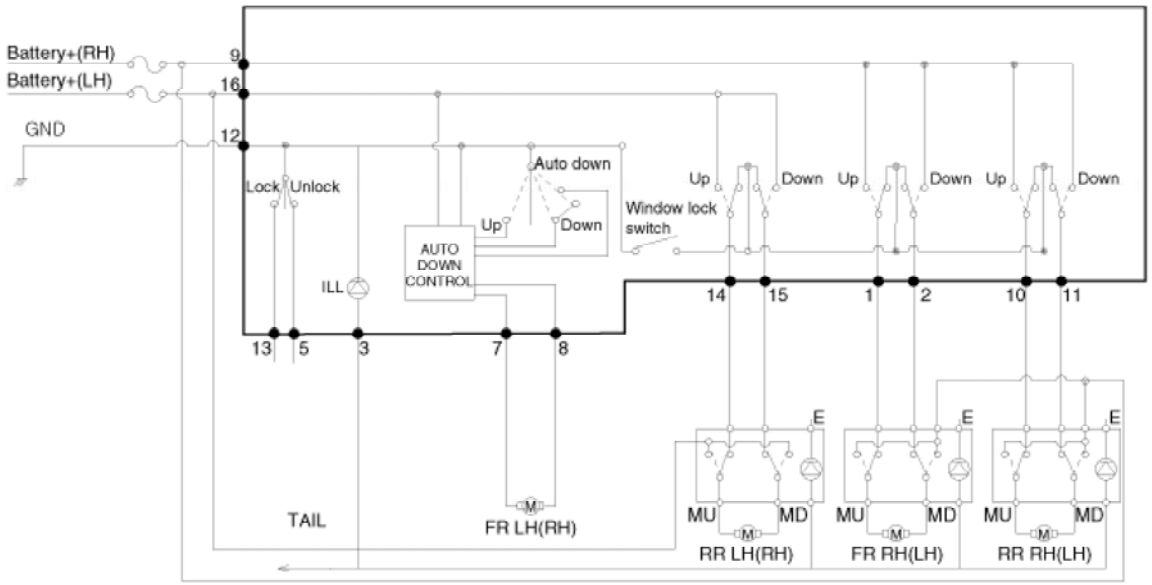




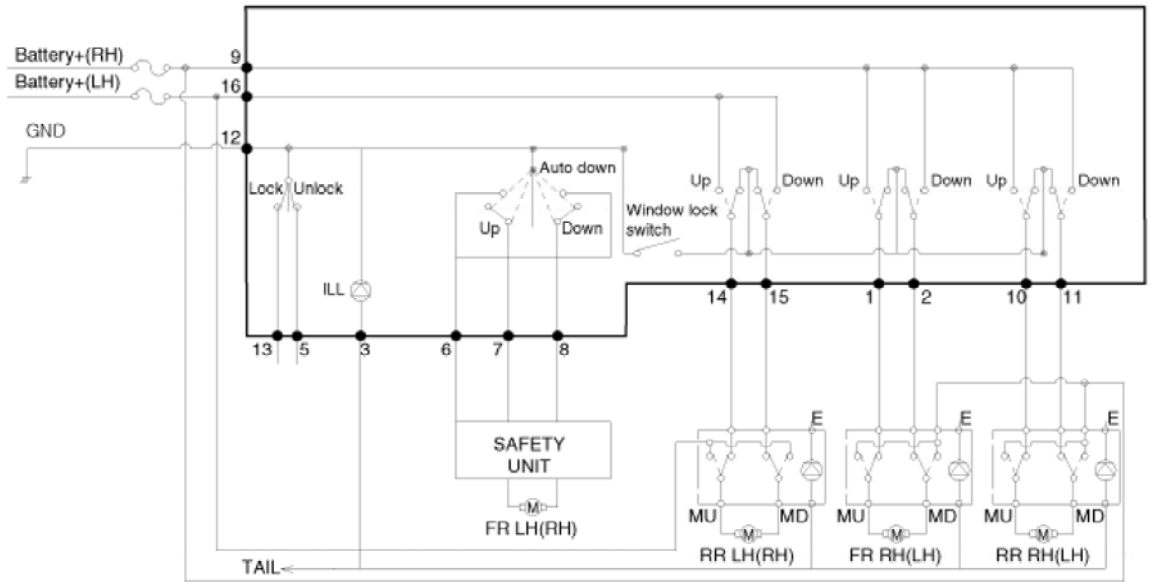
Pin	Connector A	Pin	Connector B
1	-	1	Assist window switch up
2	-	2	Assist window switch down
3	-	3	Illumination
4	-	4	-
5	GND	5	Door unlock
6	ACC	6	Driver switch Auto
7	-	7	Driver window switch up
8	Driver door mirror motor (vertical)	8	Driver window switch down
9	Driver door mirror motor (horizontal)	9	Battery (+) R
10	Common	10	Rear right window switch up
11	Assist door mirror motor (horizontal)	11	Rear right window switch down
12	Assist door mirror motor (vertical)	12	GND
		13	Door lock
		14	Rear left window switch up
		15	Rear left window switch down
		16	Battery (+) L

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[Auto Down]



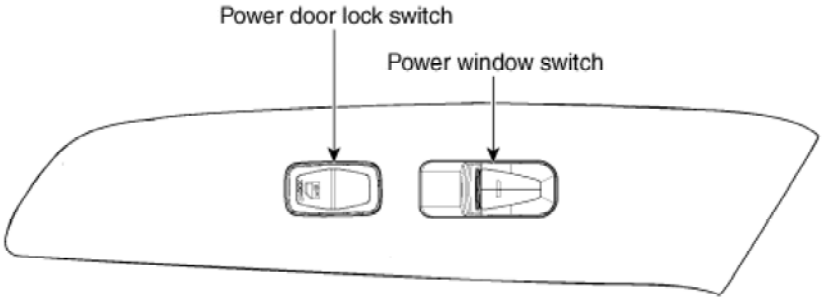
[Driver Safety]

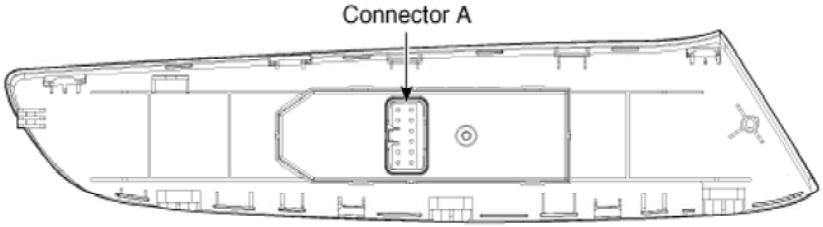


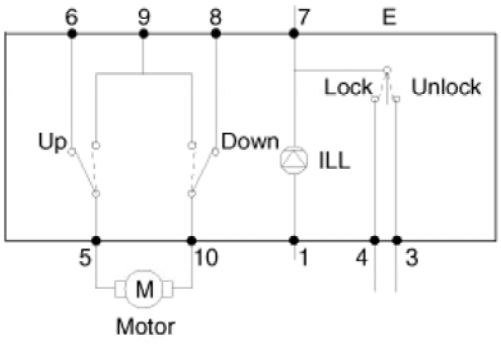
Passenger Power Window Switch

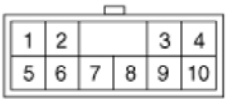
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[Power Window Lock]





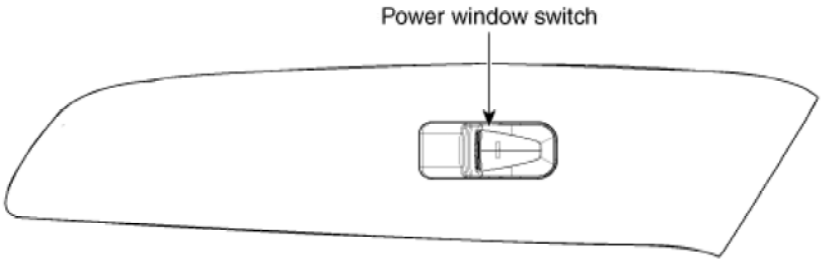


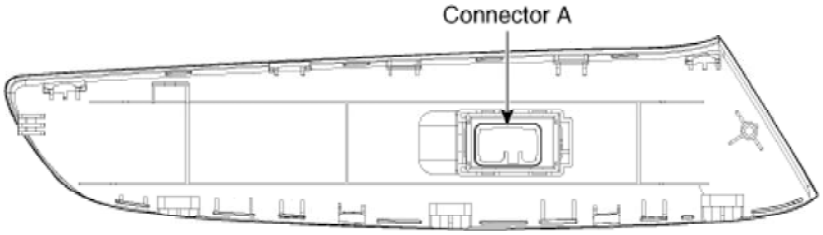


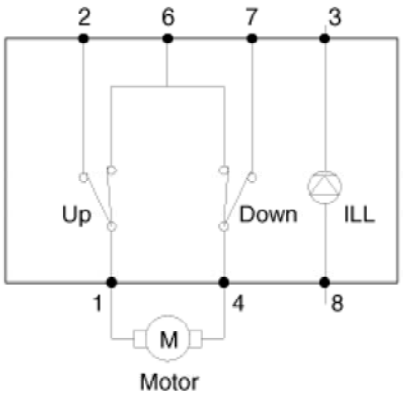
Pin	Connector A
1	Tail lamp
2	-
3	Door unlock
4	Door lock
5	Power window motor up
6	Power window switch up
7	GND
8	Power window switch down
9	Battery (+)
10	Power window motor down

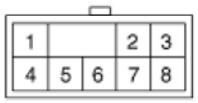
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[Power Window Only]







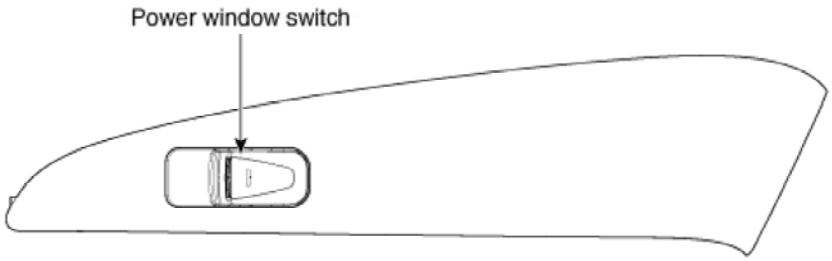


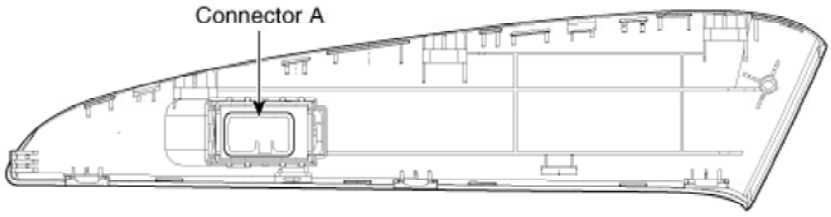
Pin	Connector A
1	Power window motor up
2	Power window switch up
3	GND
4	Power window motor down
5	-
6	Battery (+)
7	Power window switch down
8	Tail lamp

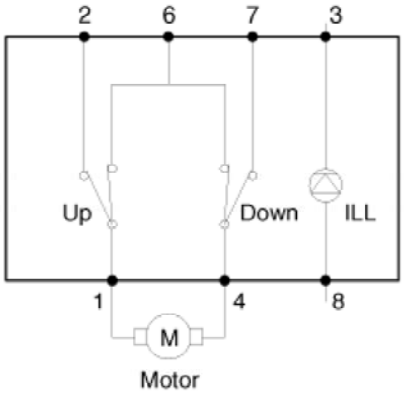
Rear Power Window Switch

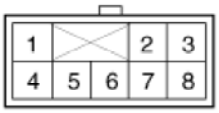
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[Power Window]









Pin	Connector A
1	Power window motor up
2	Power window switch up
3	GND
4	Power window motor down
5	Battery (+)
6	-
7	Power window switch down
8	Tail lamp

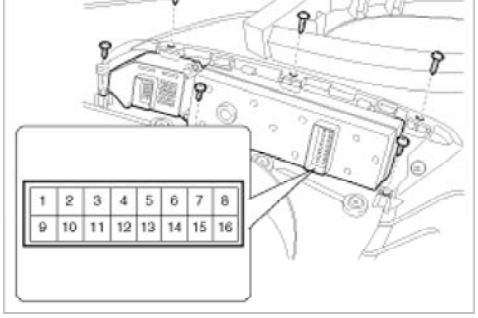
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Body Electrical System > Power Windows > Power Window Switch > Repair procedures

Inspection

Main Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch.
   (Refer to the BD group - "Front door")
3. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.



Position \ Terminal	5	12	13
Lock		○—○	○—○
Unlock	○—○		

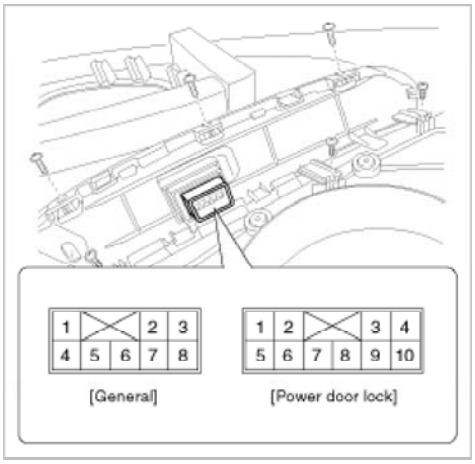
[Driver Auto Up/Down]

Position \ Terminal	Front left				Front right			
	12	7	8	6	9	1	2	12
Up	○—○				○—○		○—○	
Auto up	○—○			○				
	○							
Off						○—○	○—○	
Down	○—○		○		○—○			
						○	○—○	
Auto down	○—○		○					
	○			○				

Position \ Terminal	Rear left				Rear right			
	16	14	15	12	9	10	11	12
Up	○—○		○—○		○—○		○—○	
Off		○—○	○—○			○—○	○—○	
Down	○—○		○		○—○			
		○—○		○		○—○		○

Passenger Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch.
   (Refer to the BD group - "Front door")
3. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

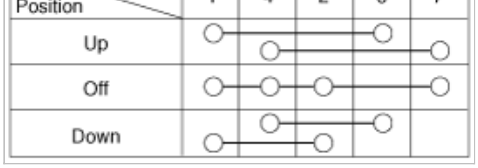


[Power Door Lock]

Position \ Terminal	5	10	6	9	8
Up	○	○		○	
					○
Off	○	○	○		○
Down		○		○	
	○		○		

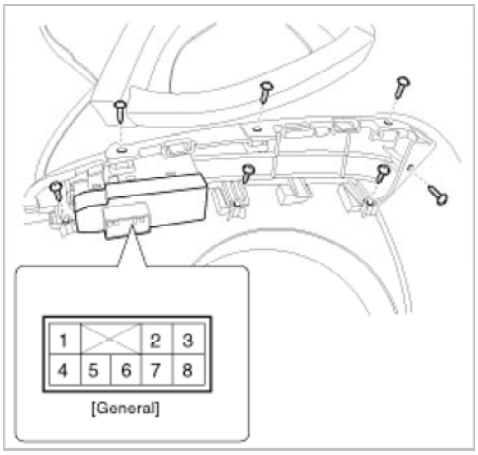
[General]

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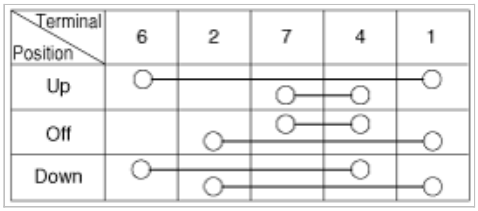
Rear Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
3. Remove the rear power window switch module (A).



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.

[General]

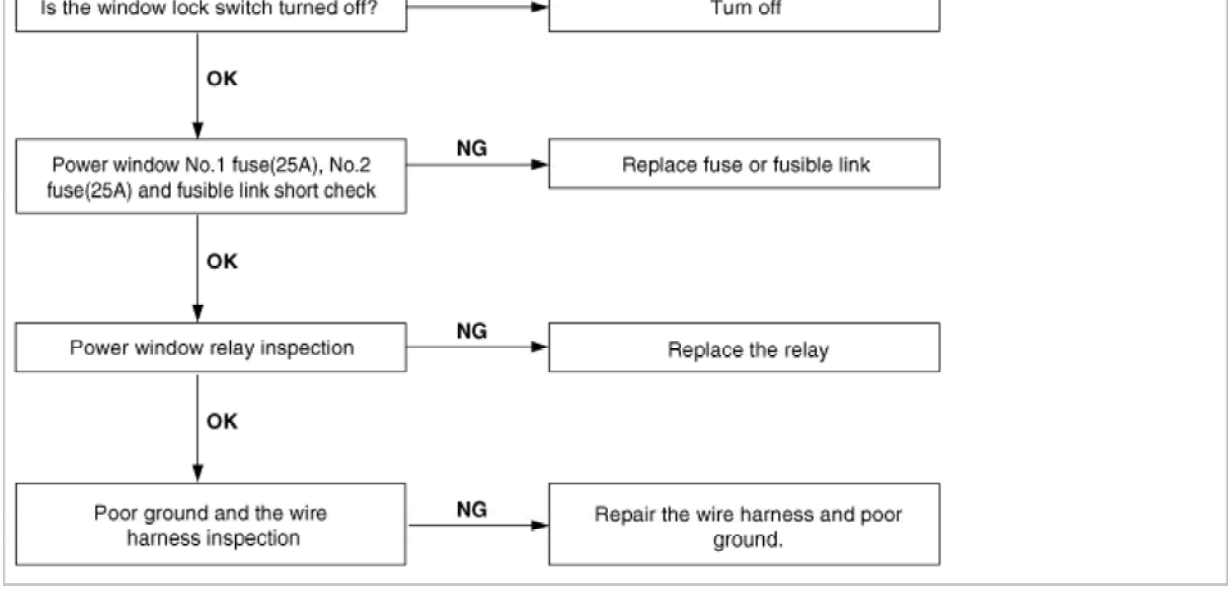


Body Electrical System > Power Windows > Troubleshooting

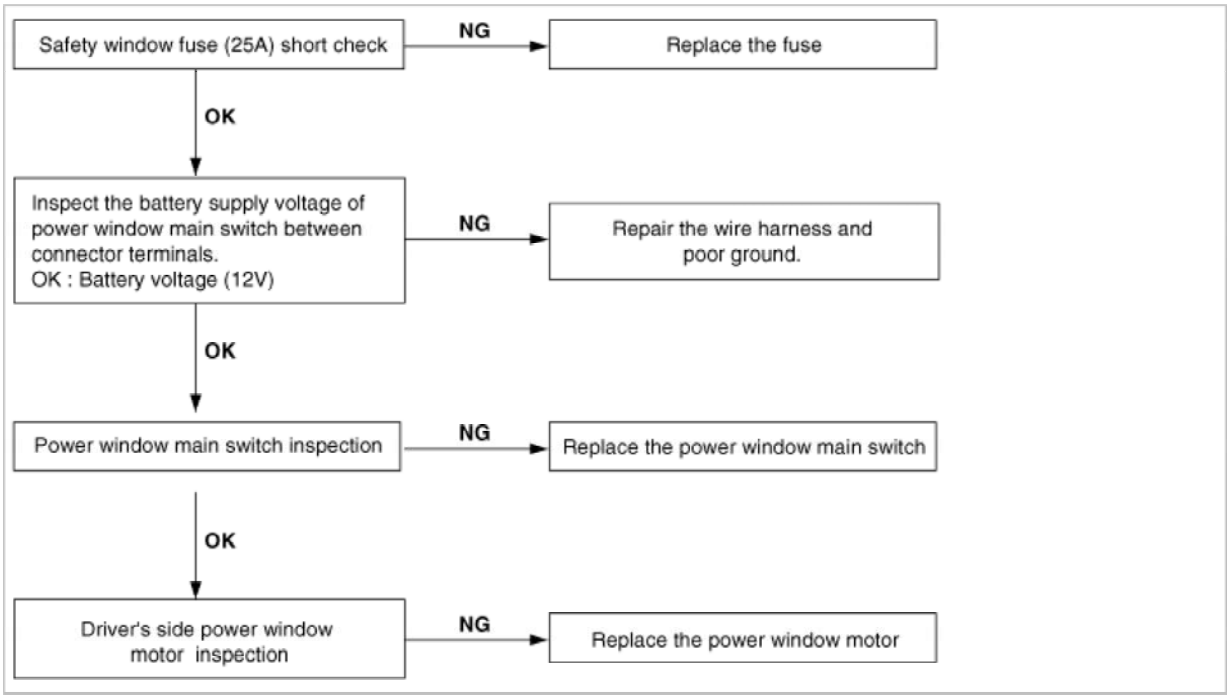
Troubleshooting

1. No windows operate from the main switch on the driver's door.

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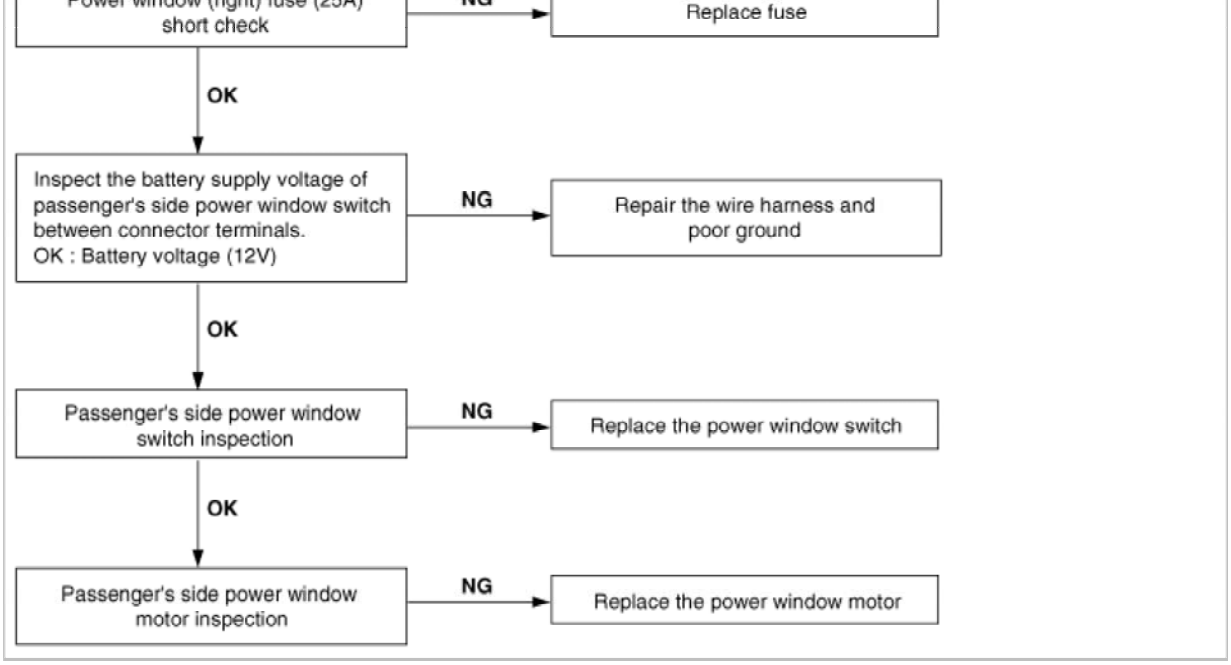


2. Driver's side window does not operate.



3. Passenger's side window does not operate.

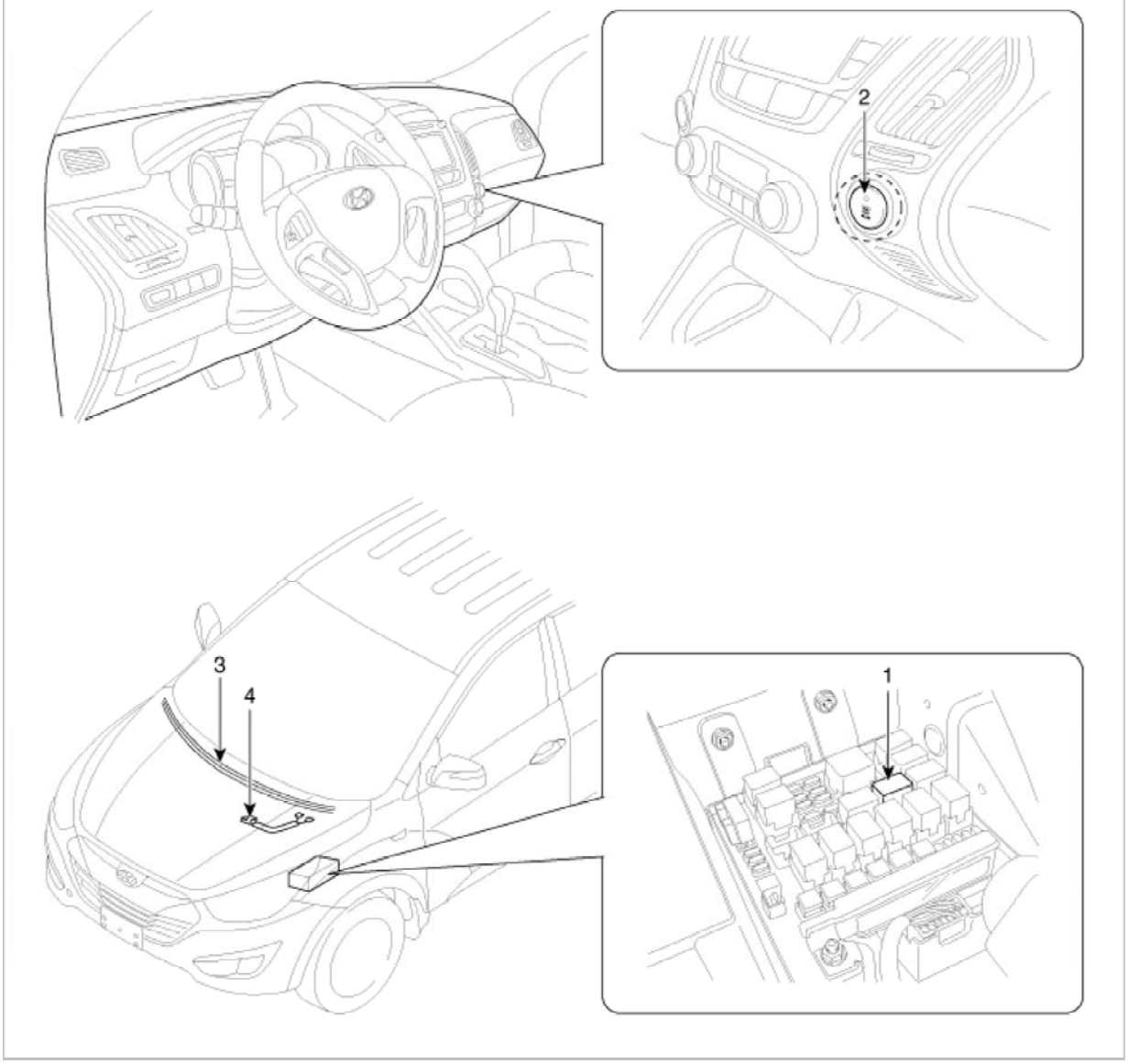
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Body Electrical System > Windshield Deicer > Components and Components Location

Component Location

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※ Button start type : Front windshield deicer, Rear glass defogger and outside mirror heater functions are joined together one switch.
※ General key type : Front windshield deicer switch is located in left air vent separately.

1. Windshield deicer relay 2. Windshield deicer switch	3. Windshield deicer 4. Deicer connector

Body Electrical System > Windshield Deicer > Description and Operation

Description

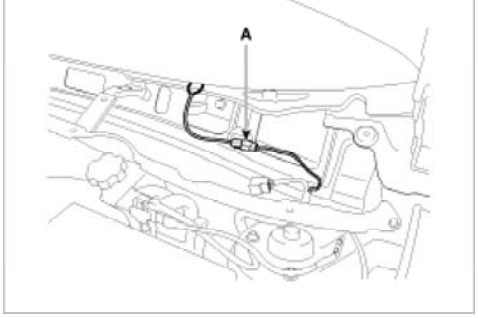
Windshield deicer system prevent windshield wiper from freezing in the winter season. It consists of deicer in the lower part of windshield, switch and relay. Body control module receives an input signal from the deicer switch, then controls relay.
Since the generator "L" is switched ON, if the deicer switch is ON, then deicer output is ON for 20 minutes.

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

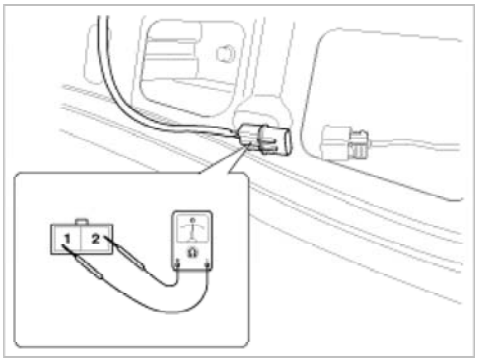
Inspection

1. Remove the cowl top cover.
   (Refer to the wiper)
2. Disconnect the windshield deicer connector (A) from the wiper motor linkage.

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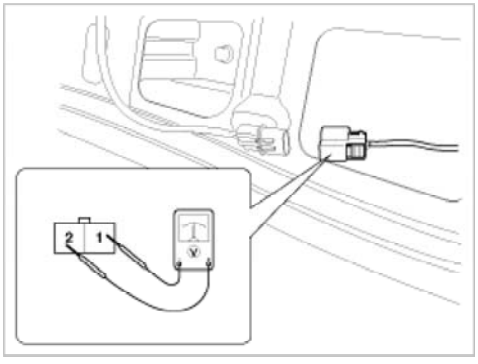


3. Check for continuity between the terminals of deicer lines.



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

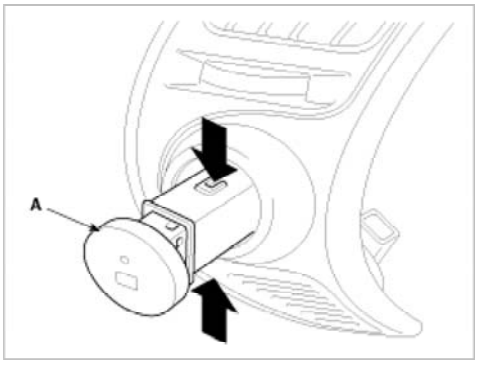
OK : approx. Battery voltage



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

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the right air vent.
   (Refer to the BD group - "Crash pad")
3. Remove the windshield deicer switch (A).



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NOTE

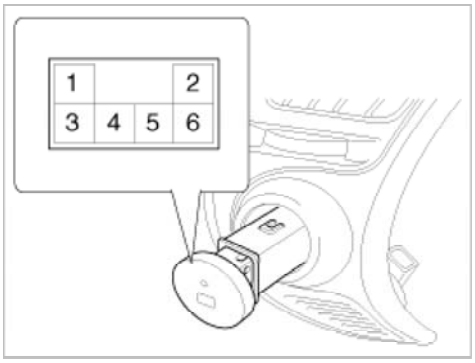
Take care not to damage the hook when removing the windshield deicer switch.

Installation

1. Install the windshield deicer switch.
2. Install the right air vent.

Inspection

1. Using an ohmmeter, inspect the continuity between the terminals after removing the switch.

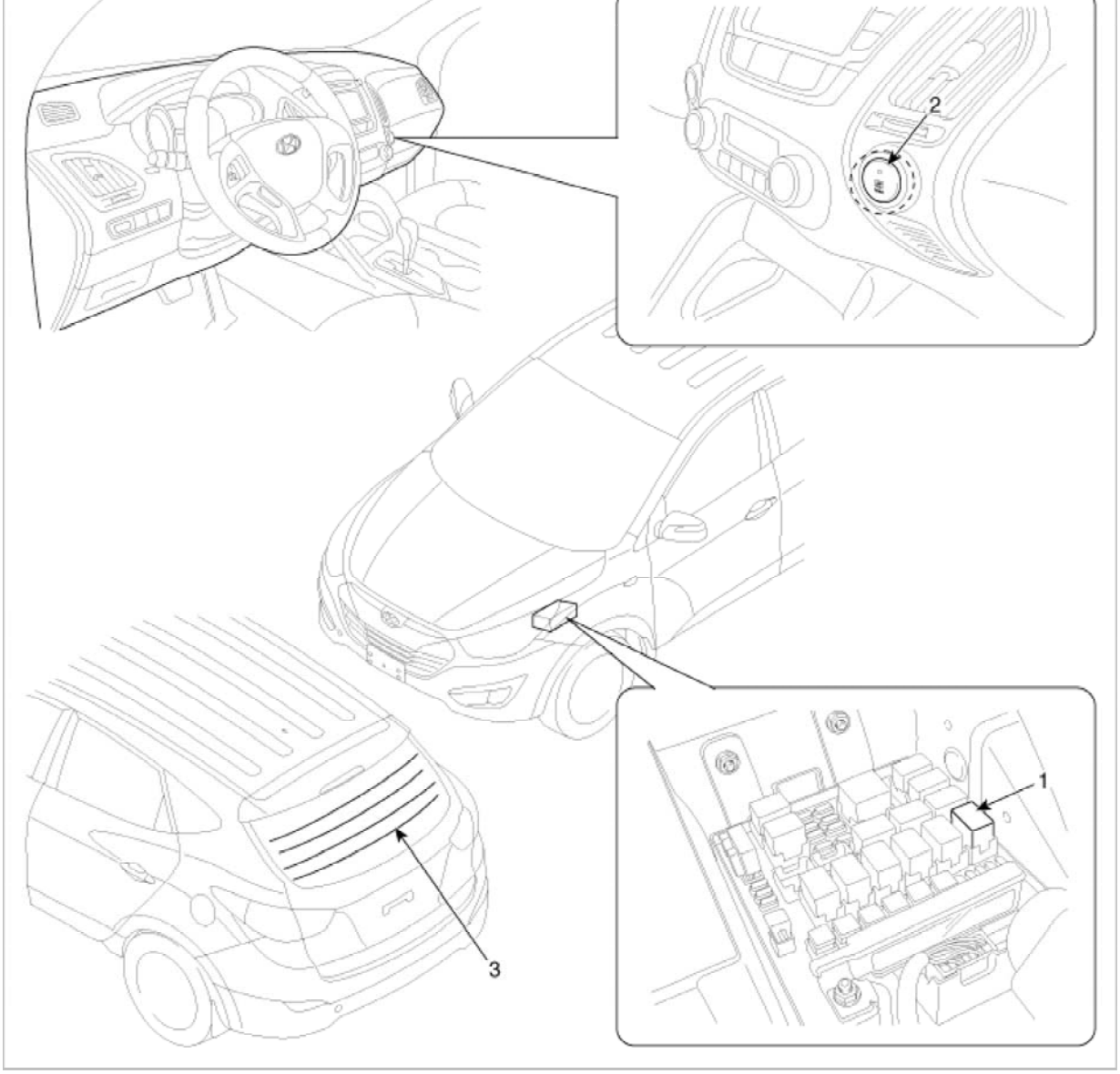


Position / Pin	ON	OFF	Remarks
4	○		
5	○		
6	○—W—⊽		Indicator(+)
2	○——⊽		GND
3	○——△		Illumination(-)
1	○—W—△		Illumination(+)

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

Component Location

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1. Rear glass defogger relay 2. Rear glass defogger switch	3. Rear glass defogger

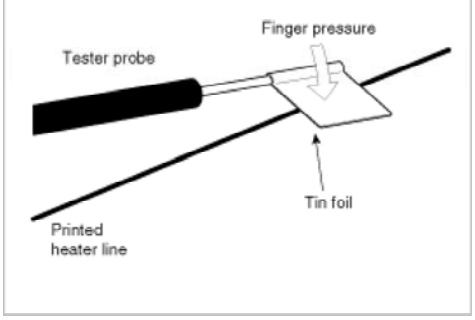
Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Printed Heater > Repair procedures

Inspection

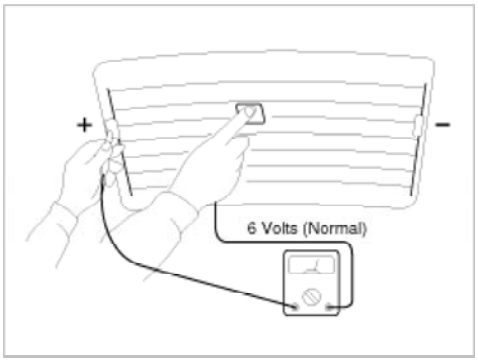
CAUTION

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.

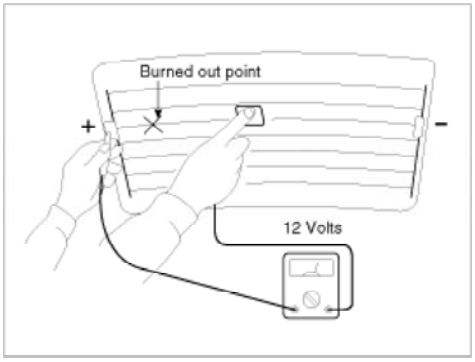
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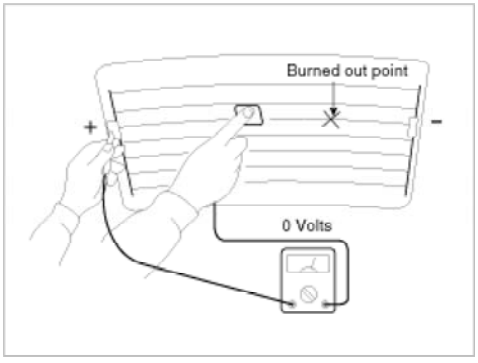
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



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

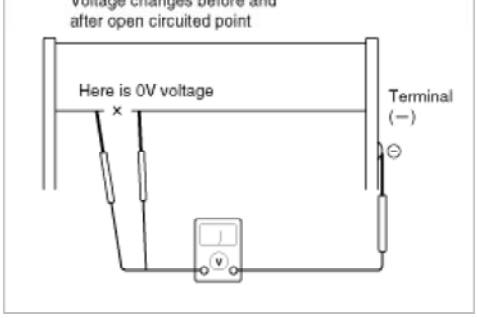


3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.

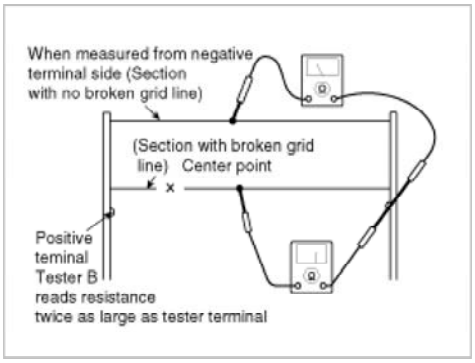


4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.

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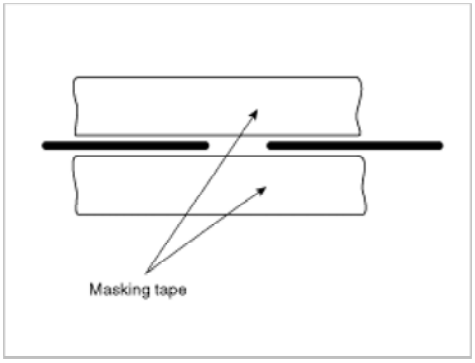
5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice as that in other sections. In the affected section,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

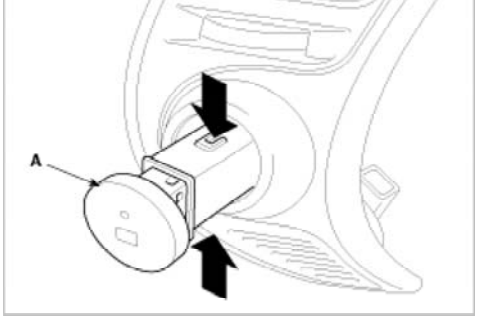


Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Switch > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the right air vent.
   (Refer to BD group - "Crash pad")
3. Remove the rear glass defogger switch (A).

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NOTE

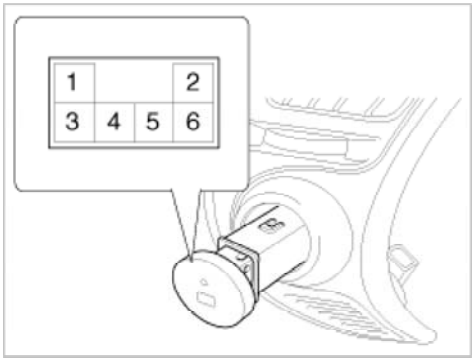
Take care not to damage the hook when removing the rear glass defogger switch.

Installation

1. Install the rear glass defogger switch.
2. Install the right air vent.

Inspection

1. Using an ohmmeter, inspect the continuity between the terminals after removing the switch.

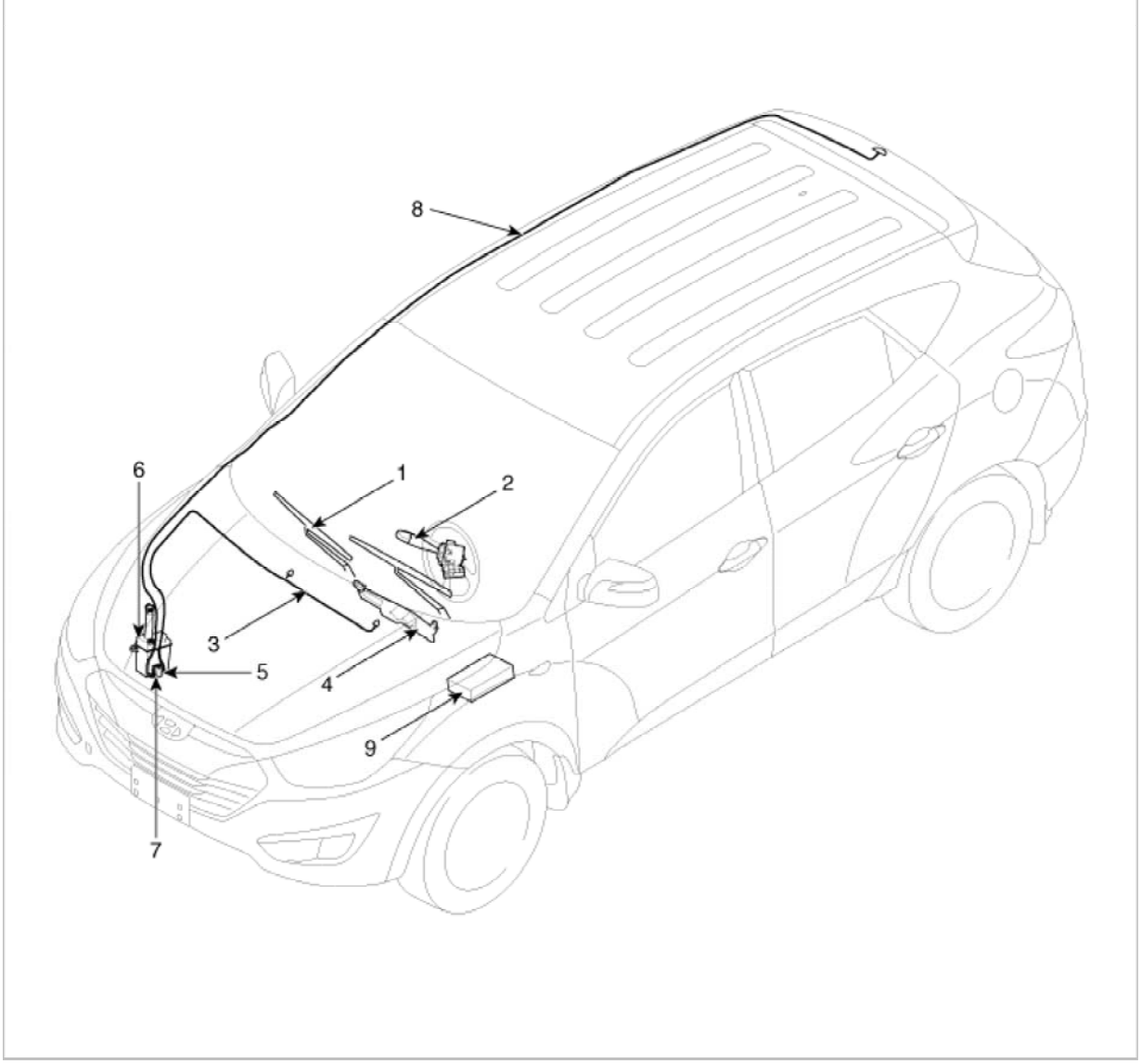


Position / Pin	ON	OFF	Remarks
4			
5			
6			Indicator(+)
2			GND
3			Illumination(-)
1			Illumination(+)

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

Component Location

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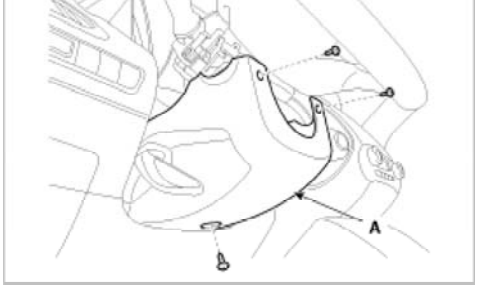
1. Windshield wiper arm & blade	6. Washer reservoir
2. Wiper & washer switch	7. Washer motor (Rear)
3. Windshield washer hose	8. Rear washer hose & nozzle (Nozzle is built-in HMSL)
4. Windshield wiper motor & linkage	9. Front wiper relay (Engine room relay box)
5. Washer motor (Front)	

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 removing 3 screws.

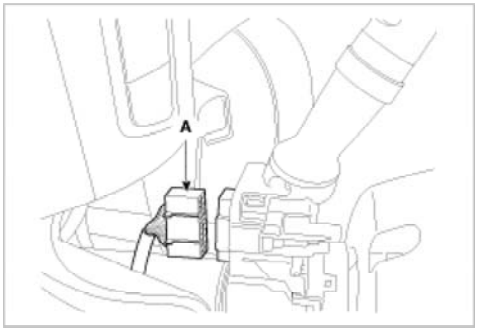
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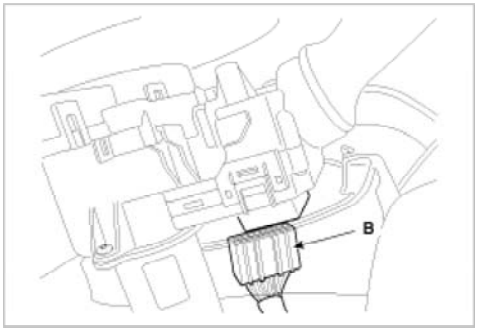


NOTE

Take care not to damage and scratch the shrouds and its related parts.
Take care not to damage the hook when removing the upper and lower shrouds.

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

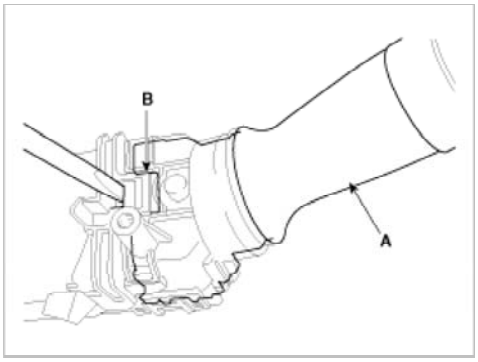




4. Remove the wiper switch (A) by pushing the lock pin (B).

NOTE

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

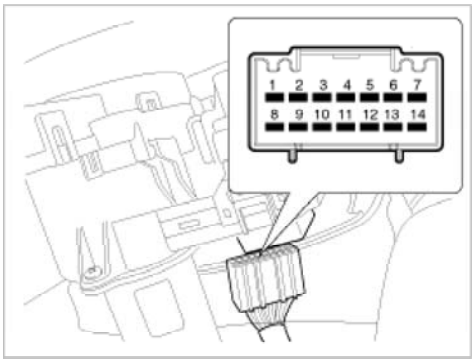


Installation

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

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



Wiper Switch

Terminal / Position	3	9	2	8	10	1	4	5
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○	○		○	○
LOW	○		○	○	○			
HI		○	○	○	○			

Washer Switch

Terminal / Position	10	11
OFF		
ON	○	○

Rear Wiper Switch

Terminal / Position	12	6	7
INT	○	○	○
OFF			
ON	○	○	

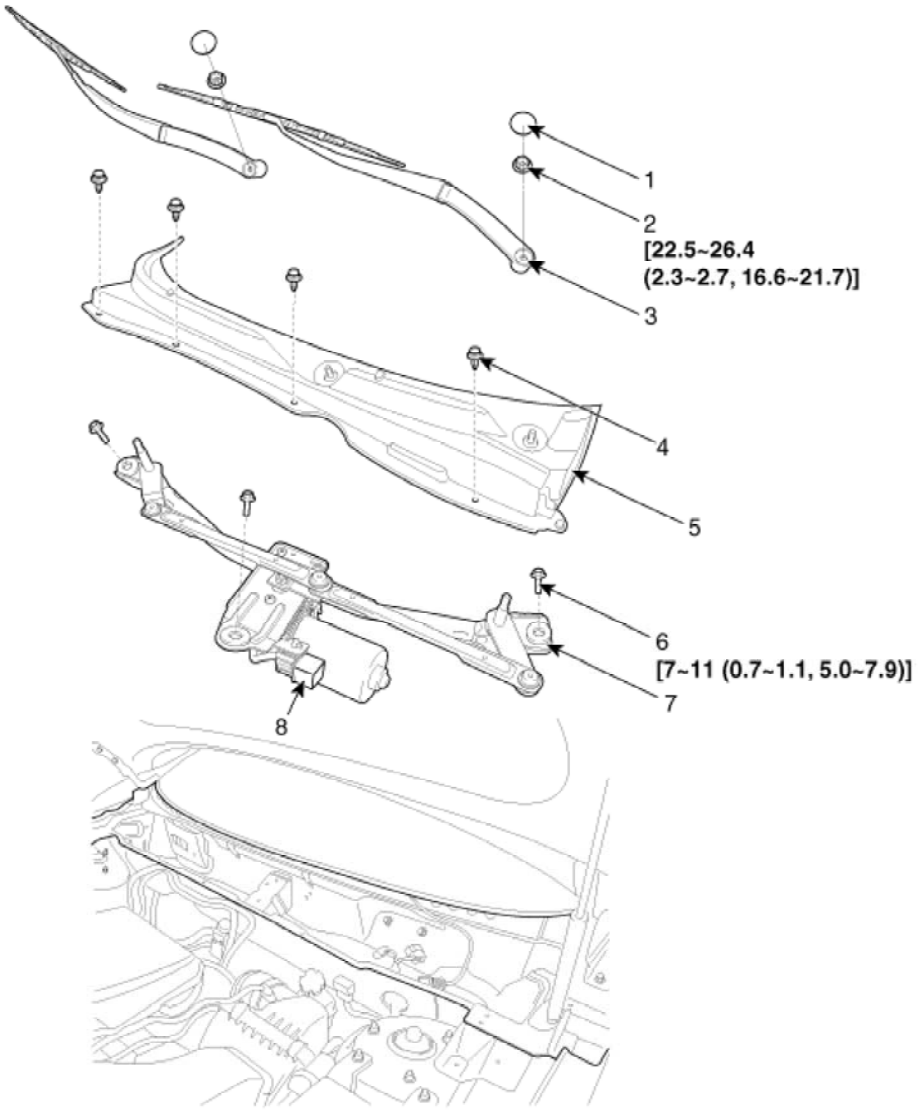
Rear Washer Switch

Terminal / Position	12	13
OFF		
ON	○	○

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

Component Location

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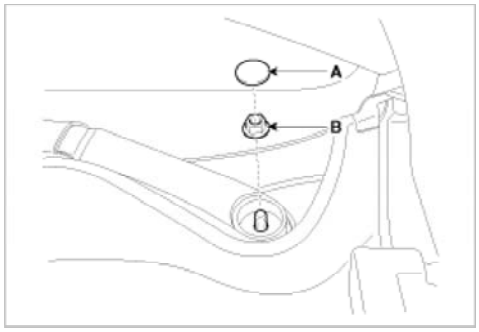
Torque : N.m (kgf.m, lbf.ft)

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

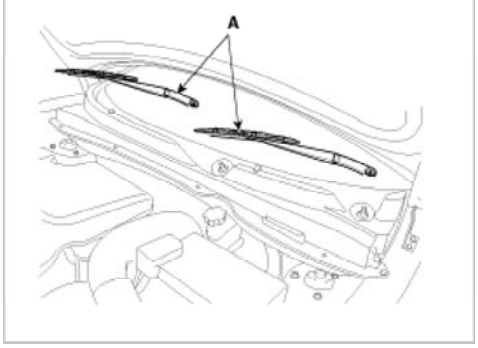
Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

Removal

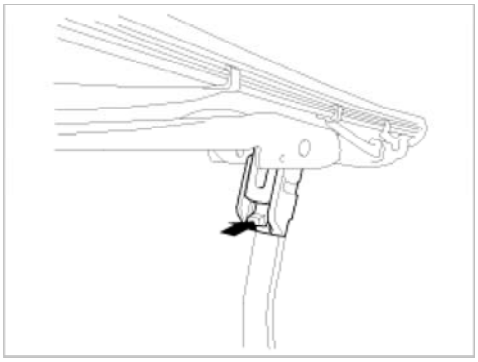
1. Remove the windshield wiper arm and blade after removing a nut (B) and wiper cap (A).



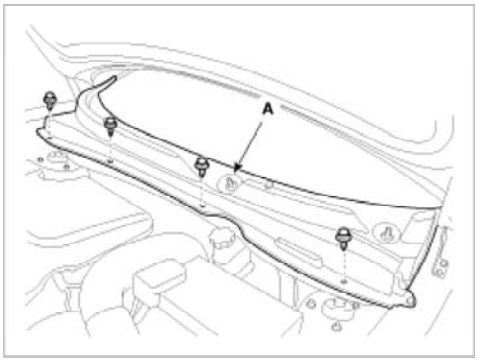
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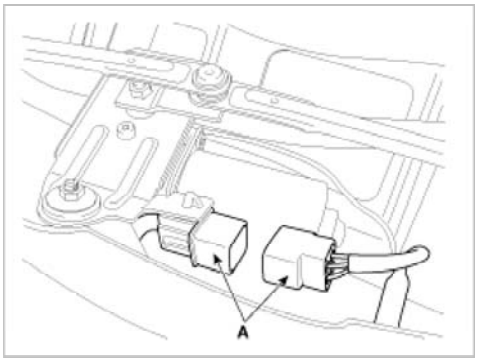
3. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius of wiper arm.



4. Remove the weather strip and the cowl top cover (A) after removing retainers.

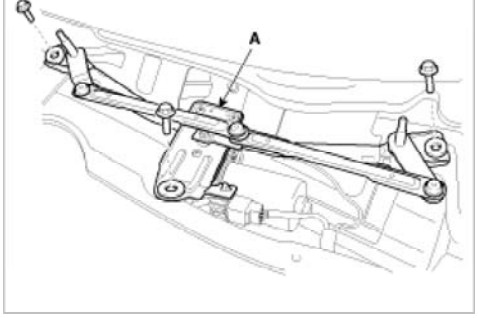


5. Disconnect the wiper motor connector (A) from the wiper motor & linkage assembly.

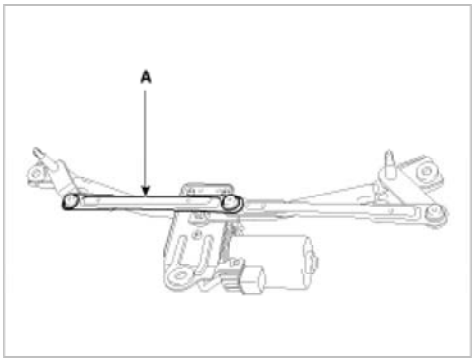


6. Remove the windshield wiper motor and linkage assembly (A) after removing 3 bolts.

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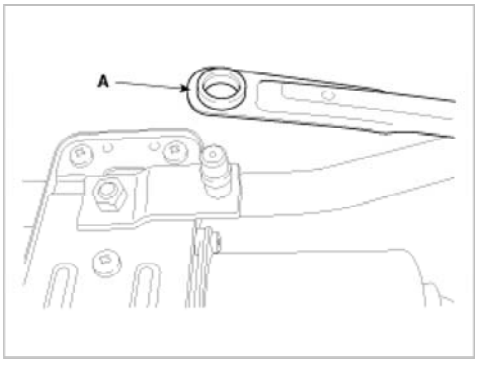
7. Hold the wiper motor crank arm and remove the upper linkage (A) from the wiper motor crank arm.



CAUTION

Before remove the wiper motor and linkage assembly, make sure that the linkage is stopped at automatic 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.
Put the matchmark on the wiper motor and linkage assembly.
Be careful not to bend the linkage.

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

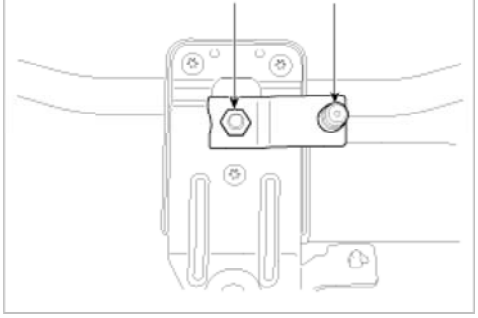


CAUTION

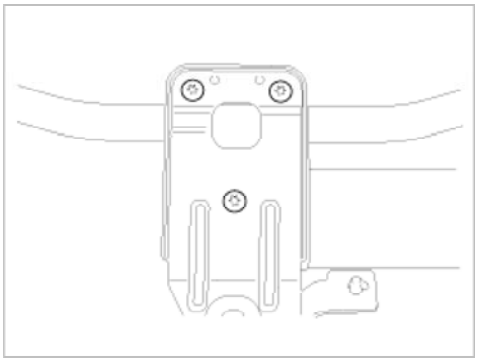
To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.
Be careful not to bend the linkage.

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

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10. Remove the wiper motor after loosening the 3 screws.



Installation

CAUTION

Do not allow the wiper arm to fall against the windshield, since it may chip or crack the windshield.

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

Torque :
12.7-17.6Nm (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 using match mark.

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.

Torque :
7-11Nm (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.

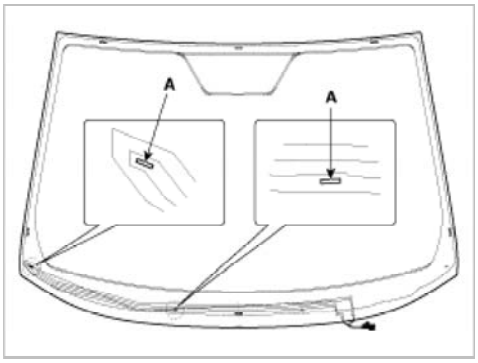
Torque :
22.5~26.4 Nm (2.3~2.7 kgf.m, 16.6~21.7 lbf.ft)

NOTE

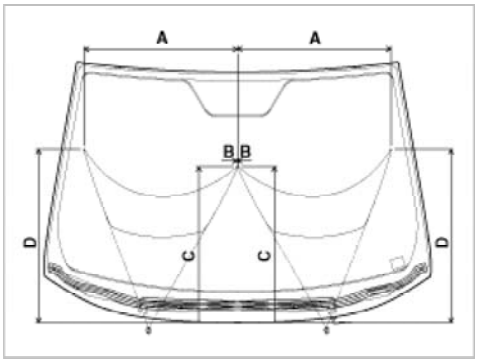
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If necessary, adjust the wiper arm and blade.

7. Install the wiper arm and blade to the specified position (A).



8. Set the cowl top cover on the specified spray position.

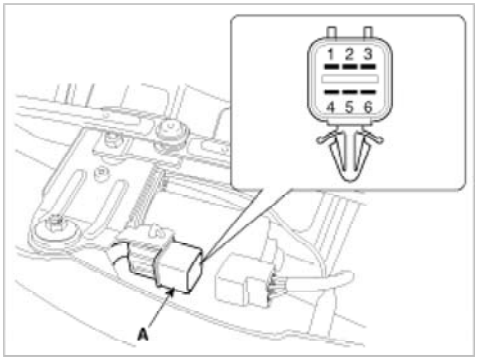


Specified position	Distance (in)	Distance (mm)
A	18.2	577
B	0.9	2
C	23.5	588.5
D	23.4	654

Inspection

Speed Operation Check

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



No	Description	No	Description
1	Low	4	GND
2	High	5	P (Parking)
3	Battery (+)	6	-

2. Attach the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 4.

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Terminal / Position	5	3	2	1
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 thotoughlly with clean water.

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

Inspection

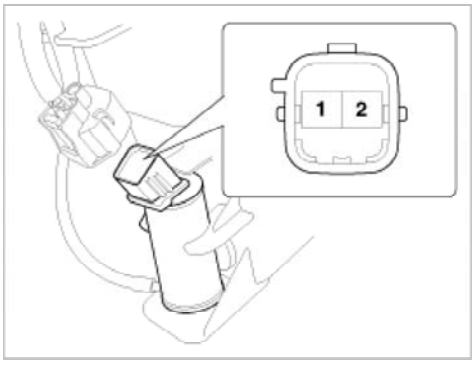
Front Washer Motor

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

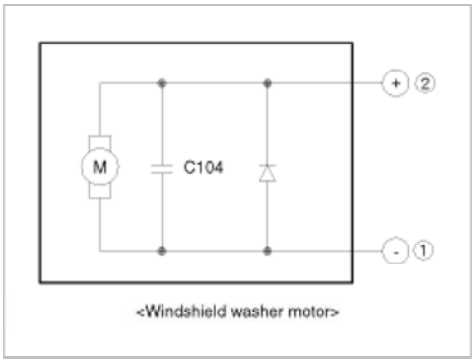
NOTE

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 1 and negative (-) battery cables to terminal 2 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.



No	Description	No	Description
1	Ground	2	Windshield washer (+)



<Windshield washer motor>

Removal

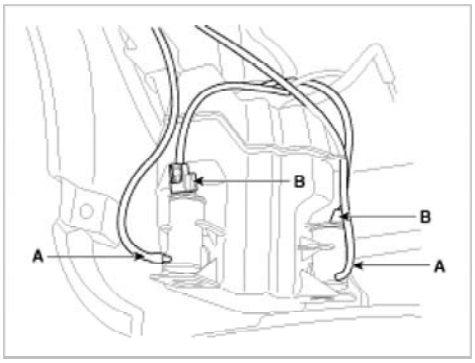
CAUTION

- When servicing the washer pump, be careful not to damage the washer pump seal.

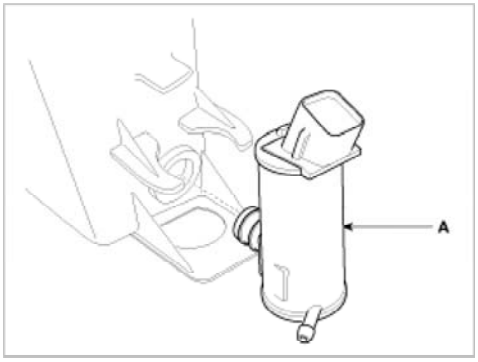
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Failure to do so could result in premature pump failure.

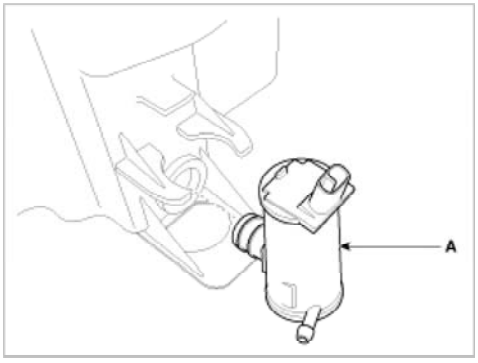
1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover.
   (Refer to the BD group - "Front bumper")
3. Remove the washer hose (A) and disconnect the washer motor connector (B).



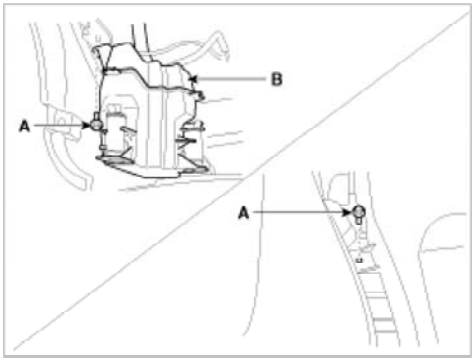
4. Remove the front washer motor (A).



5. Remove the rear washer motor (A).



6. Remove the washer reservoir (B) after removing bolts (A).



Installation

1. Reassemble the washer reservoir.

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NOTE

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

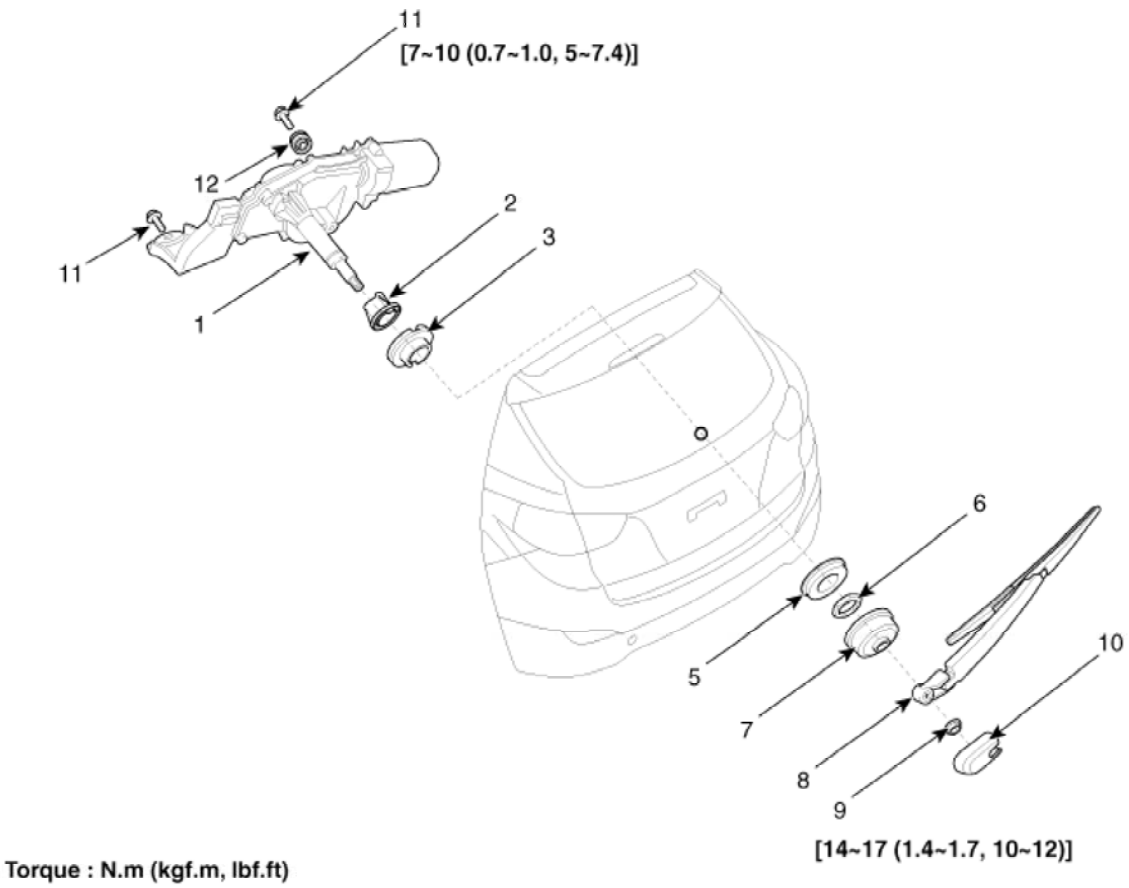
2. Connect the washer motor connectors and washer hoses.
3. Install the front and rear washer motor.
4. Install the front and rear washer nozzle.

Tightening torque (Bolt) :
3 ~ 5 Nm (0.3 ~ 0.5 kgf.m, 2.2 ~4.2 lbf.ft)

5. Install the front bumper cover.

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

Component Location



1. Rear wiper motor assembly	7. Cover
2. Motor support	8. Rear wiper arm & blade
3. Rubber pad	9. Rear wiper arm nut
4. Tailgate glass hole	10. Head cap
5. Pad cap	11. Rear wiper motor bolt
6. HEX nut	12. Bushing

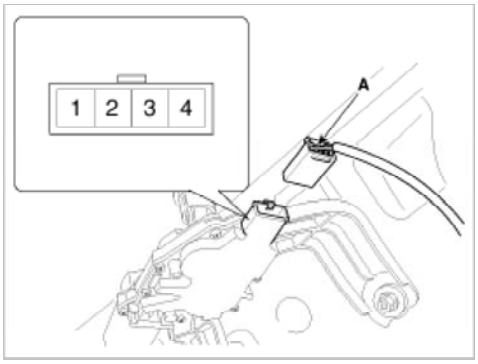
Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

Inspection

Rear Wiper Motor

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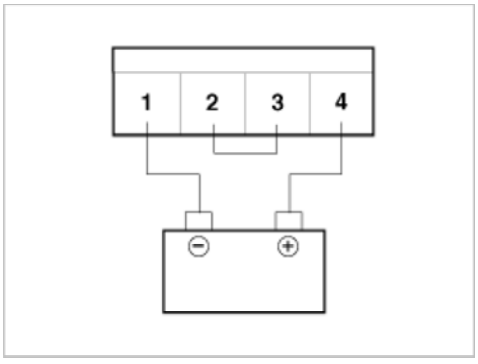
2. Connect battery positive (+) and negative (-) cables to terminals 2 and 1 respectively.
3. Check that the motor operates normally. Replace the motor if it operates abnormally.



No	Description	No	Description
1	GND	3	Parking
2	Switch	4	IGN(+)

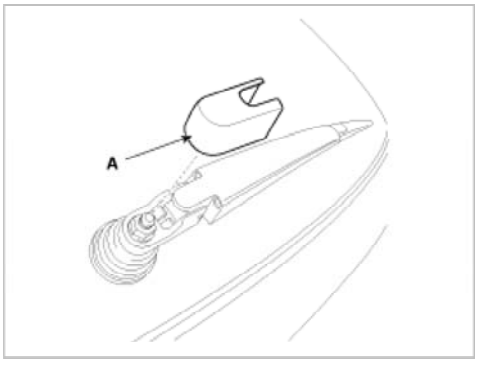
Automatic Stop Operation Check

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 2.
3. Connect terminals 2 and 3.
4. Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 1.
5. Check that the motor stops running at the off position.



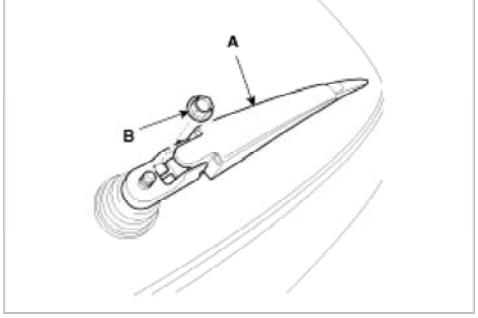
Removal

1. Detach the rear wiper head cap (A).

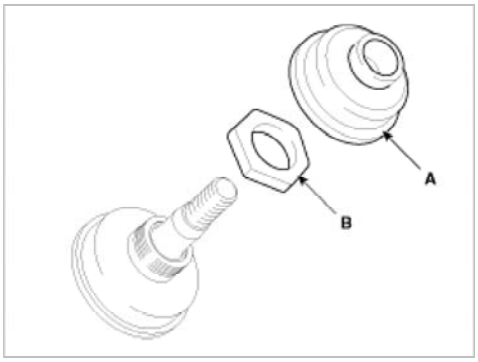


2. Remove the rear wiper arm & blade (A) after removing rear wiper arm nut (B).

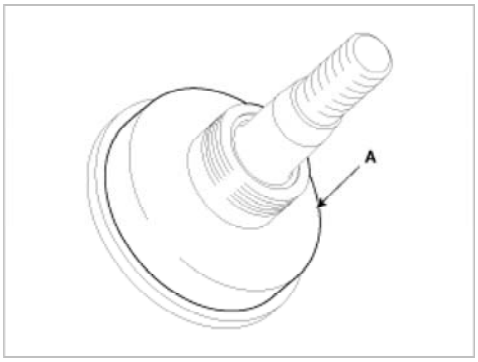
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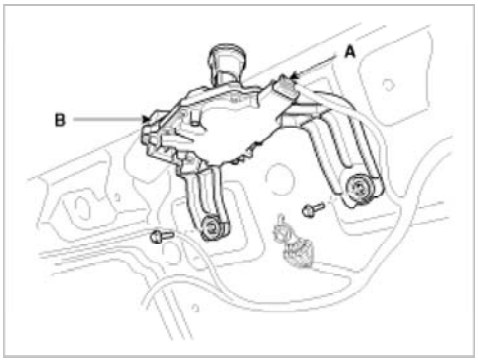
3. Remove the rear wiper cover (A) and HEX nut (B).



4. Remove the pad cap (A).



5. Open the tailgate then remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
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 :
7~10 Nm (0.7~1.0 kgf.m, 5~7.4 lbf.ft)

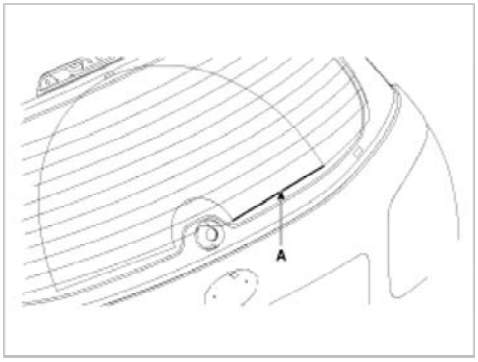
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Do not reuse the rubber pad if it is dameged.

2. Install the tailgate trim.
   (Refer to the BD group - "Tailgate")
3. Insert the pad cap and HEX nut.

Tightening torque :
4~7 Nm (0.4~0.7 kgf.m, 2.9~5.0 lbf.ft)

4. Install the rear wiper arm and blade to align with black lowest rear defogger line (A).



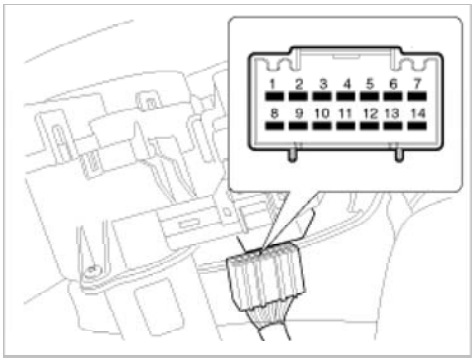
5. Install the rear wiper arm and rear wiper nut.

Tightening torque Nut :
14~17 Nm (1.4~1.7 kgf.m, 10~12 lbf.ft)

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

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.



Rear Wiper Switch

Terminal / Position	12	6	7
INT	○		○
OFF			
ON	○	○	

Rear Washer Switch

Terminal / Position	12	13
OFF		
ON	○	○

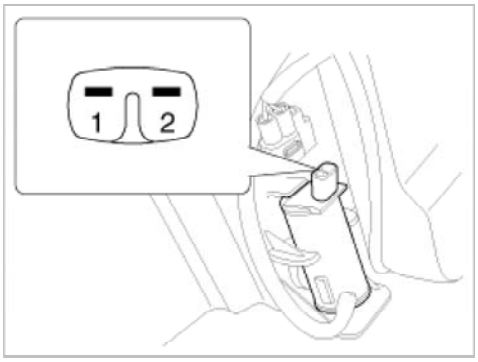
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Inspection

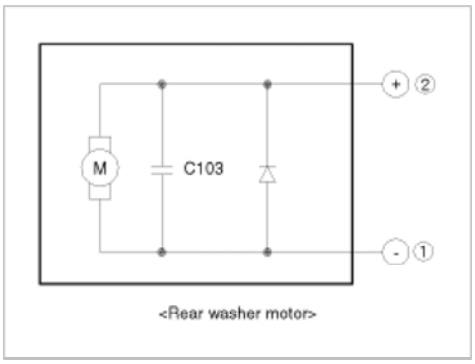
1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.

> 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 the BD group - "Front bumper")
3. Connect positive (+) and negative (-) battery cables to terminals 2 and 1 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	No	Description
1	GND	2	Washer (+)



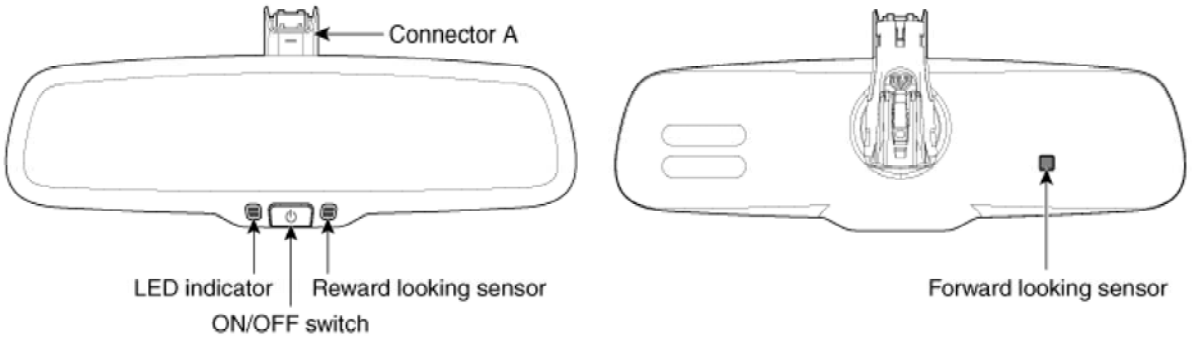
<Rear washer motor>

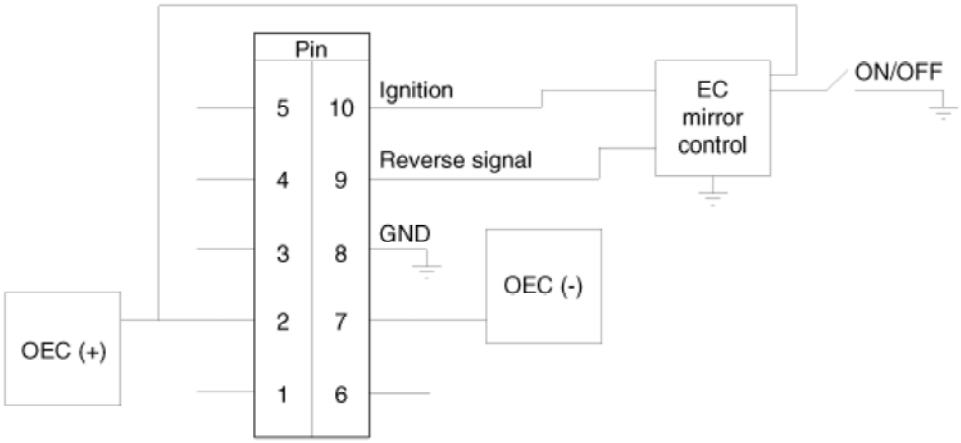
Body Electrical System > Electro chromic Inside Rear View Mirror > Components and Components Location

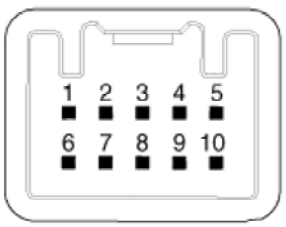
Components Location

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[ECM]



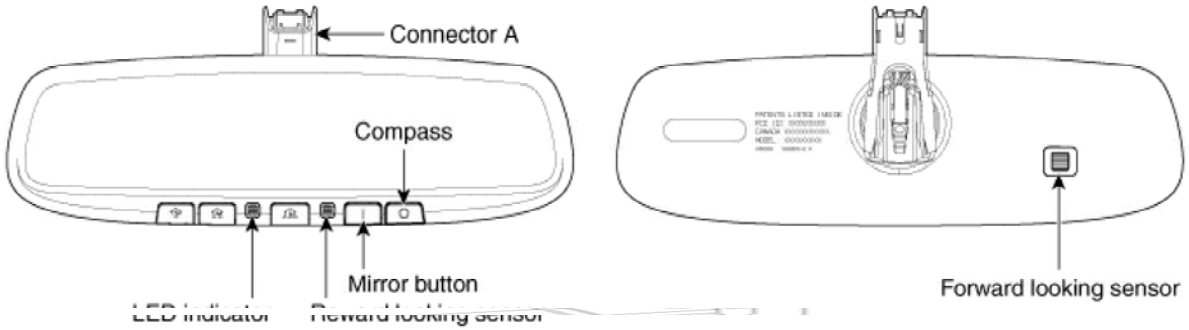


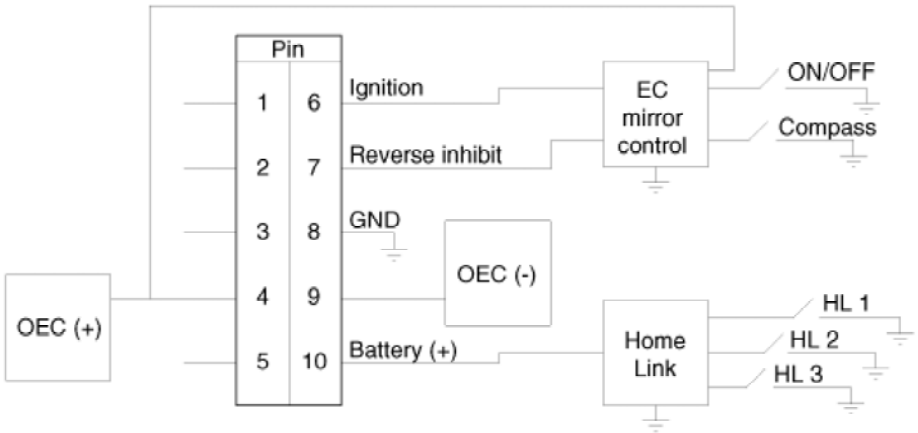


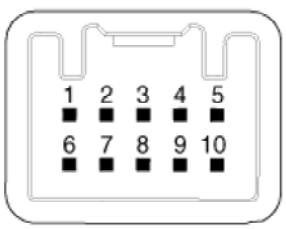
Pin	Description
1	-
2	-
3	-
4	-
5	-
6	-
7	-
8	GND
9	Reverse signal
10	IGN (+)

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[ECM + Home Link + Compass]



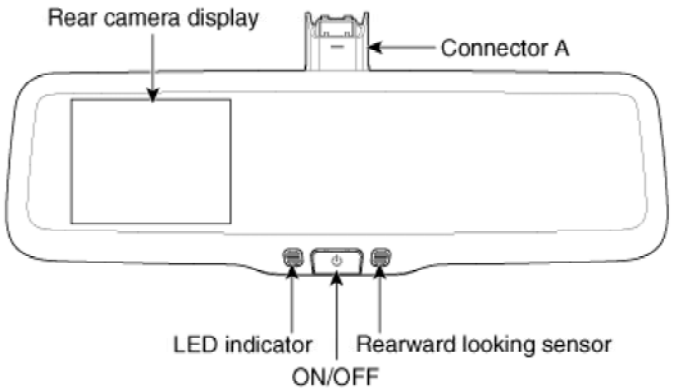


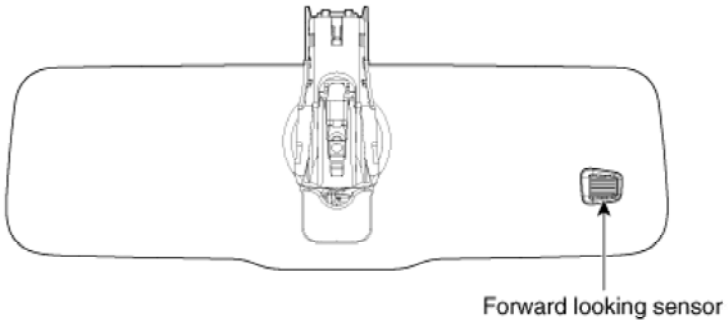


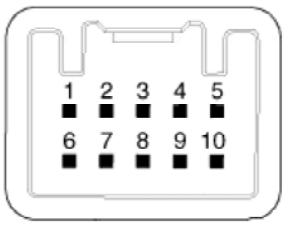
Pin	Description
1	-
2	-
3	-
4	-
5	-
6	Battery (+)
7	-
8	GND
9	Reverse signal
10	IGN (+)

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[Reverse Display]







Pin	Description
1	Camera power (-)
2	-
3	Camera power (+)
4	Video (+)
5	Video (-)
6	-
7	-
8	GND
9	Reverse signal
10	IGN (+)

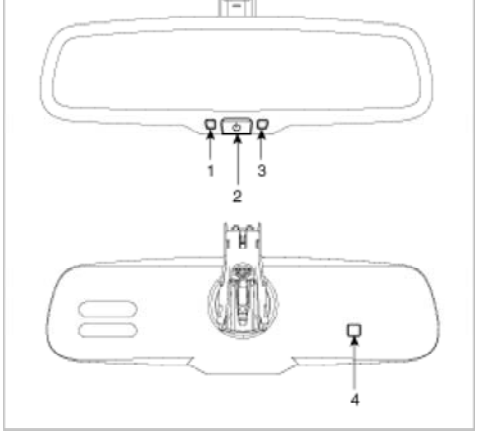
Body Electrical System > Electro chromic Inside Rear View Mirror > Description and Operation

Description

The ECM (Electro Chromatic inside rear view Mirror) is for dimming the reflecting light from a vehicle behind at night, in order the user not to be dazzled by the light. The forward facing sensor detects brightness of the surroundings, while the rearward looking sensor the strength of the reflecting light so that adjusts the reflexibility of the mirror in the range of 7~85%. But, 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 facing sensor

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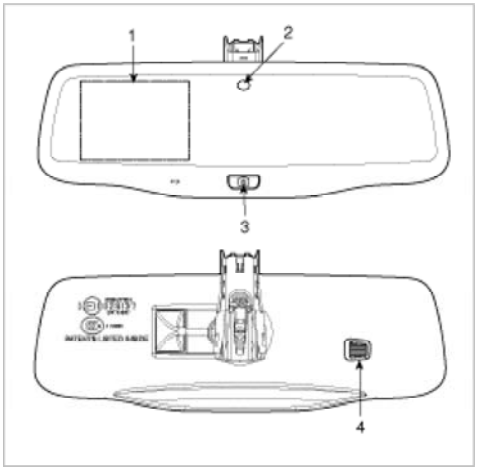
Reverse Display Room Mirror

Description

The back view camera system, located on the tailgate, provides a video image (which appears in the rear view mirror) of the area behind the vehicle. It adds assistance to the driver while reversing or reverse parking the vehicle.

To use the back view camera system, place the transmission in R (Reverse); an image will display on the left portion of the rear view mirror. The area displayed on the screen may vary according to the vehicle orientation and/or road condition.

1. Rear camera display
2. Rearward looking sensor
3. Power button
4. Forward facing sensor



Use the side mirrors and back view mirror to get better coverage on both sides and rear of the vehicle. When shifting out of reverse and into any other gear, the image will remain on for a few seconds before it shuts off to assist in parking or trailer hookup.

The camera lens for the back view camera system is located on the tailgate, near the tailgate handle. Keep the lens clean so the video image remains clear and undistorted. Clean the lens with a soft, lint-free cloth and non-abrasive cleaner.

NOTE

If the back view camera system image is not clear or seems distorted, it may be covered with water droplets, snow, mud or any other substance. If this occurs, clean the camera lens before using the reverse camera system.

WARNING

The back view camera system is a reverse aid supplement device that still requires the driver to use it in conjunction with the back view mirror and the side mirrors for maximum coverage.

WARNING

Objects that are close to either corner of the bumper or under the bumper, might not be seen on the screen due to the limited coverage of the back view camera system.

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Backup as slow as possible since higher speeds might limit your reaction time to stop the vehicle.

WARNING

Do not use the back view camera system with the tailgate open.

If the back end of the vehicle is hit or damaged, then check with your authorized dealer to have your rear video system checked for proper coverage and operation.

Nighttime and dark area use

At night time or in dark areas, the back view camera system relies on the reverse lamp lighting to produce an image. Therefore it is necessary that both reverse lamps are operating in order to get a clear image in the dark. If either of the lamps are not operating, stop using the back view camera system, at least in the dark, until the lamp(s) are replaced and functioning.

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.

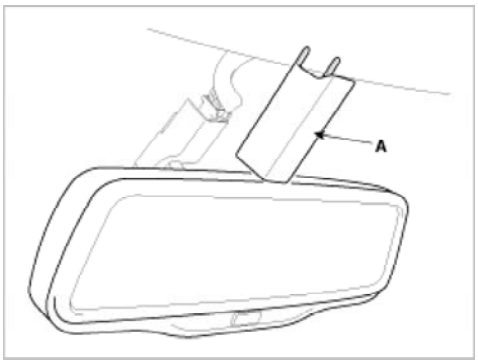
NOTE

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.

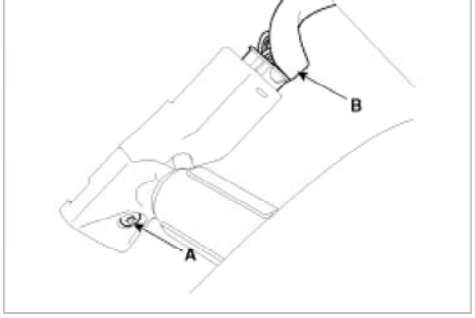
Removal

1. Remove the mirror wiring cover (A).



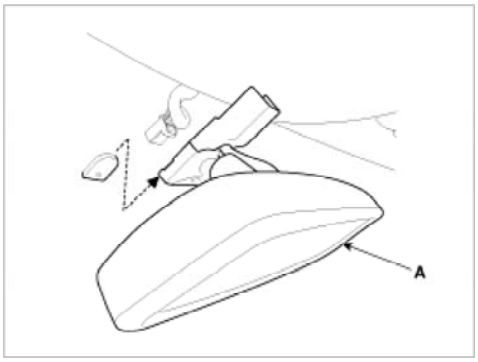
2. Remove the mirror mounting screw (A) and connector (B).

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3. Remove the mirror (A) pulling up in the arrow direction.

> NOTE
>
> Make sure not to damage the mounting bracket when removing the mirror.



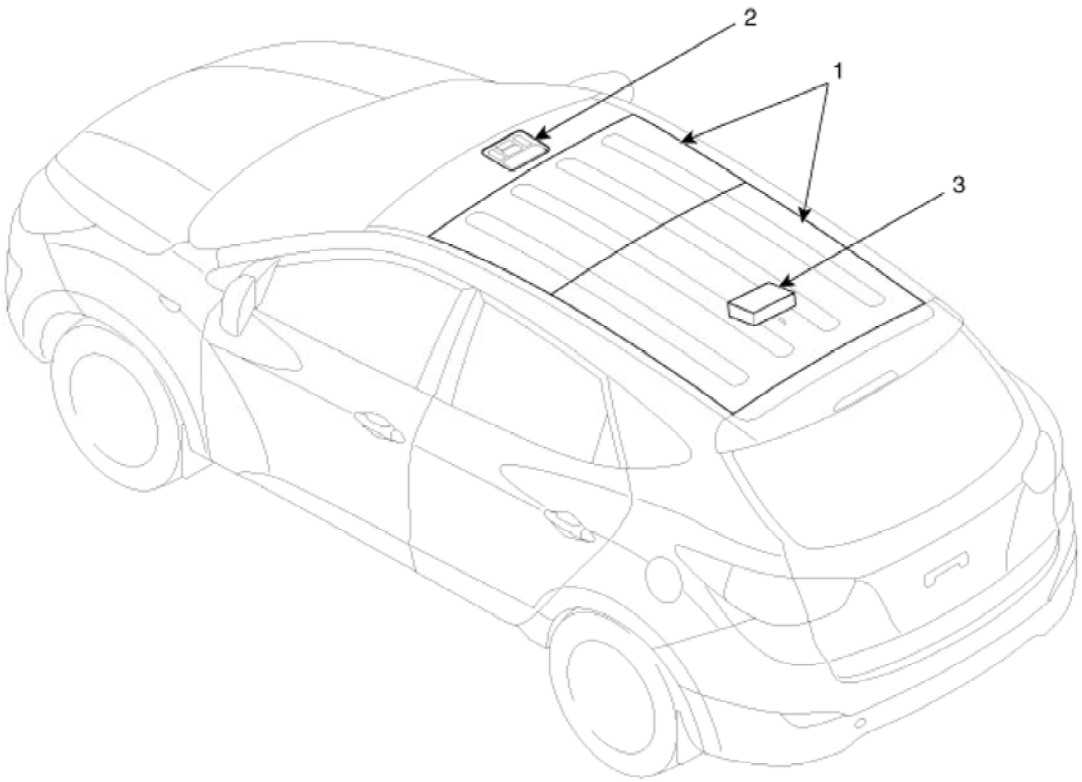
Installation

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 > Panoramaroof > Components and Components Location

Component Location

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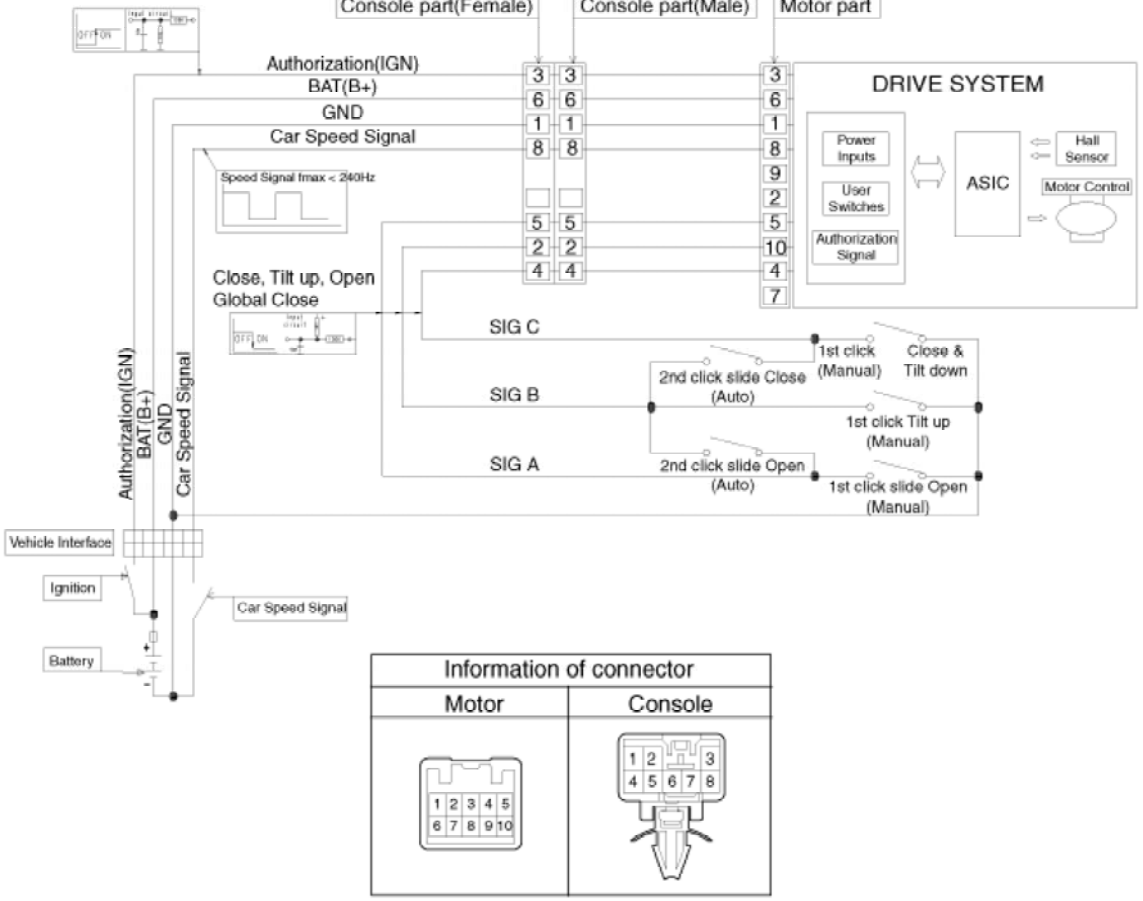


1. Panoramaroof 2. Panoramaroof switch	3. Panoramaroof motor & controller

Body Electrical System > Panoramaroof > Schematic Diagrams

Circuit Diagram

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Information of connector		
No	Motor	Console
1	GND	GND
2	-	SIG B
3	IG2	IG2
4	SIG C	SIG C
5	SIG A	SIG A
6	B+	B+
7	-	-
8	Car speed	Car speed
9	-	
10	SIG B	

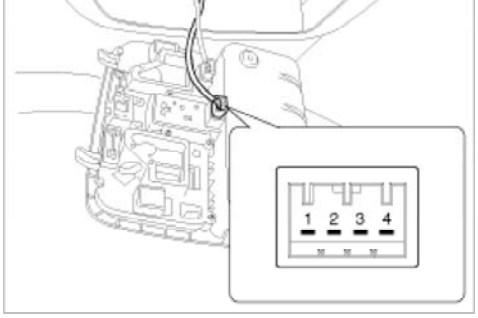
Logic table				
Function		SIG A	SIG B	SIG C
Slide open	MANUAL	ON	OFF	OFF
	AUTO	ON	ON	OFF
Slide close	MANUAL	OFF	OFF	ON
	AUTO	OFF	ON	ON
Tilt up	MANUAL	OFF	ON	OFF
Tilt down	MANUAL	OFF	OFF	ON

Body Electrical System > Panoramaroof > Panoramaroof Switch > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp assembly.
   (Refer to the BD group - "Roof trim")
3. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.

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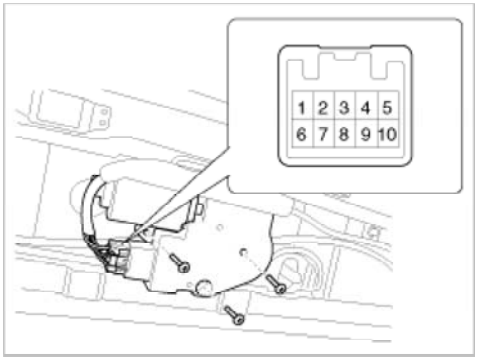


Position \ Terminal	1	2	3	4
Manual close	○		○	
Manual open			○	○
Auto open		○	○	○
Manual tilt down	○		○	
Manual tilt up		○	○	
Auto close	○	○	○	

Body Electrical System > Panoramaroof > Panoramaroof Motor > Repair procedures

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim.
   (Refer to the BD group - "Roof trim")
3. Remove the panoramaroof motor (A) after disconnecting the connector (10 Pin).



4. Ground the terminals as below table, and check that the panoramaroof unit operates as below table.

Position \ Terminal	6	4	5	10
Manual OPEN	⊕		⊖	
Auto OPEN	⊕		⊖	⊖
Manual CLOSE, Manual tilt DOWN	⊕	⊖		
Auto CLOSE	⊕	⊖		⊖
Manual tilt UP	⊕			⊖

5. Make these input tests at the motor connector of panoramaroof harness
   if any test indicates a problem, find and correct the cause, then recheck the system.
   If all the input tests prove OK, the sunroof motor must be faulty; replace it.

Terminal	Test condition	Test : Desired result
3	IG2 ON	Check for voltage to ground : There should be battery voltage
1	Under all conditions	Check for continuity to ground : There should be continuity.

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6	Under all conditions	There should be battery voltage.

6. Make these input tests at the console connector of panoramaroof harness
   if any test indicates a problem, find and correct the cause, then recheck the system.
   If all the input tests prove OK, the sunroof motor must be faulty; replace it.

Terminal	Test condition	Test : Desired result
3	IG2 ON	Check for voltage to ground :
		There should be battery voltage
1	Under all conditions	Check for continuity to ground :
		There should be continuity.
2	Under all conditions	Check for voltage to ground :
		There should be battery voltage.

Resetting The Panoramaroof

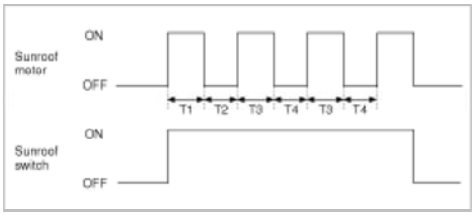
Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the Panoramaroof, you have to reset your Panoramaroof system as follows :

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 until the sunroof do as follows;
   A. Tilt → Slide Open → Slide 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 > Lighting System > Specifications

Specifications

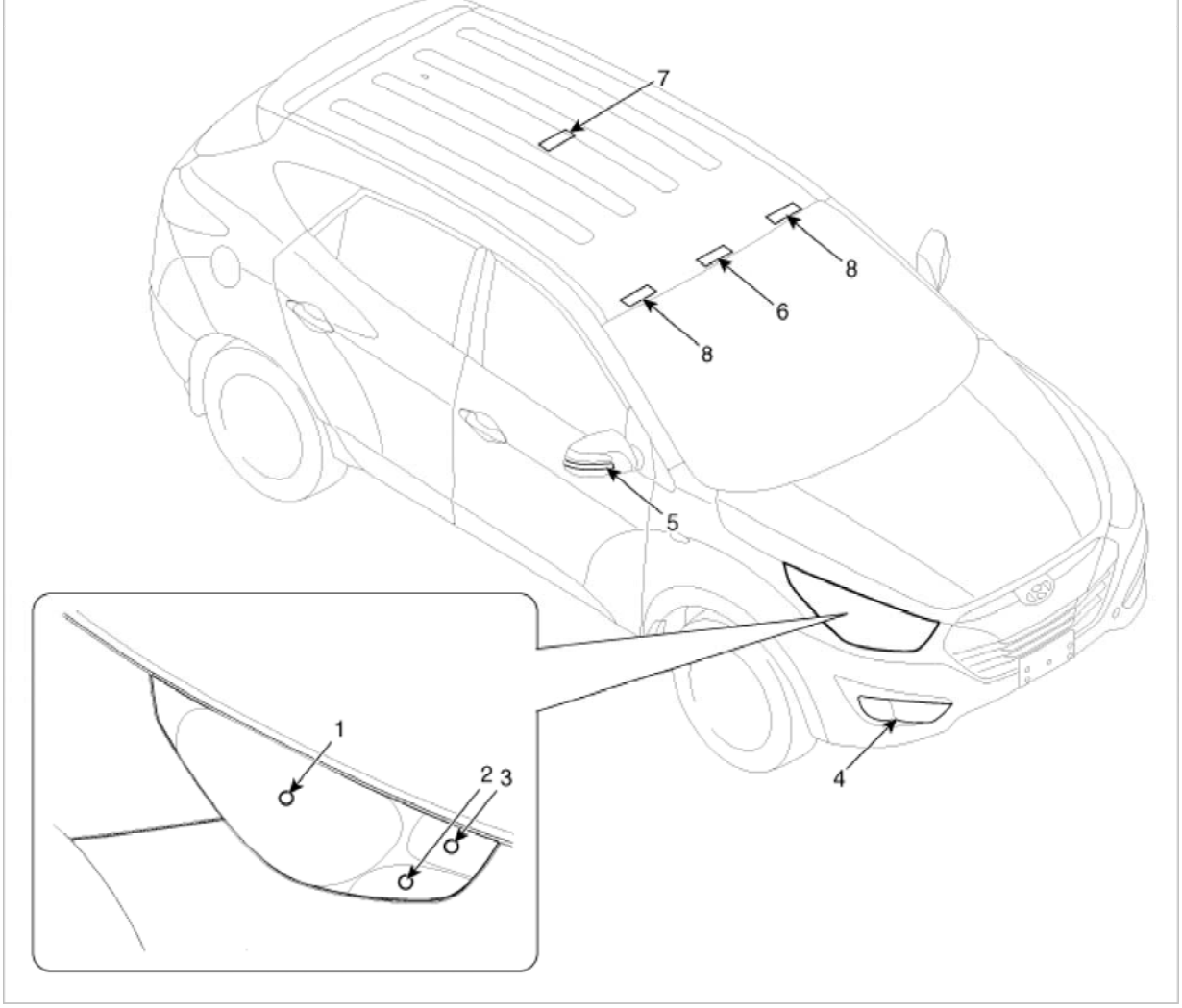
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Front	Head lamp (High/Low)	60/55
	Front turn signal lamp	23
	Front position lamp	5
	Front fog lamp	27
	Turn signal lamp (Door mirror)	LED
Rear	Rear stop lamp (Outside)	28
	Rear turn signal (Outside)	27
	Tail lamp/Side marker (Outside)	8/5
	Tail lamp (Inside)	28
	Back up lamp (Inside)	16
	License plate lamp	5
	High mounted stop lamp	LED
Room	Room lamp	10
	Overhead console lamp	10 x 2
	Luggage room lamp	5
	Vanity lamp	5

Body Electrical System > Lighting System > Components and Components Location

Component Location (1)

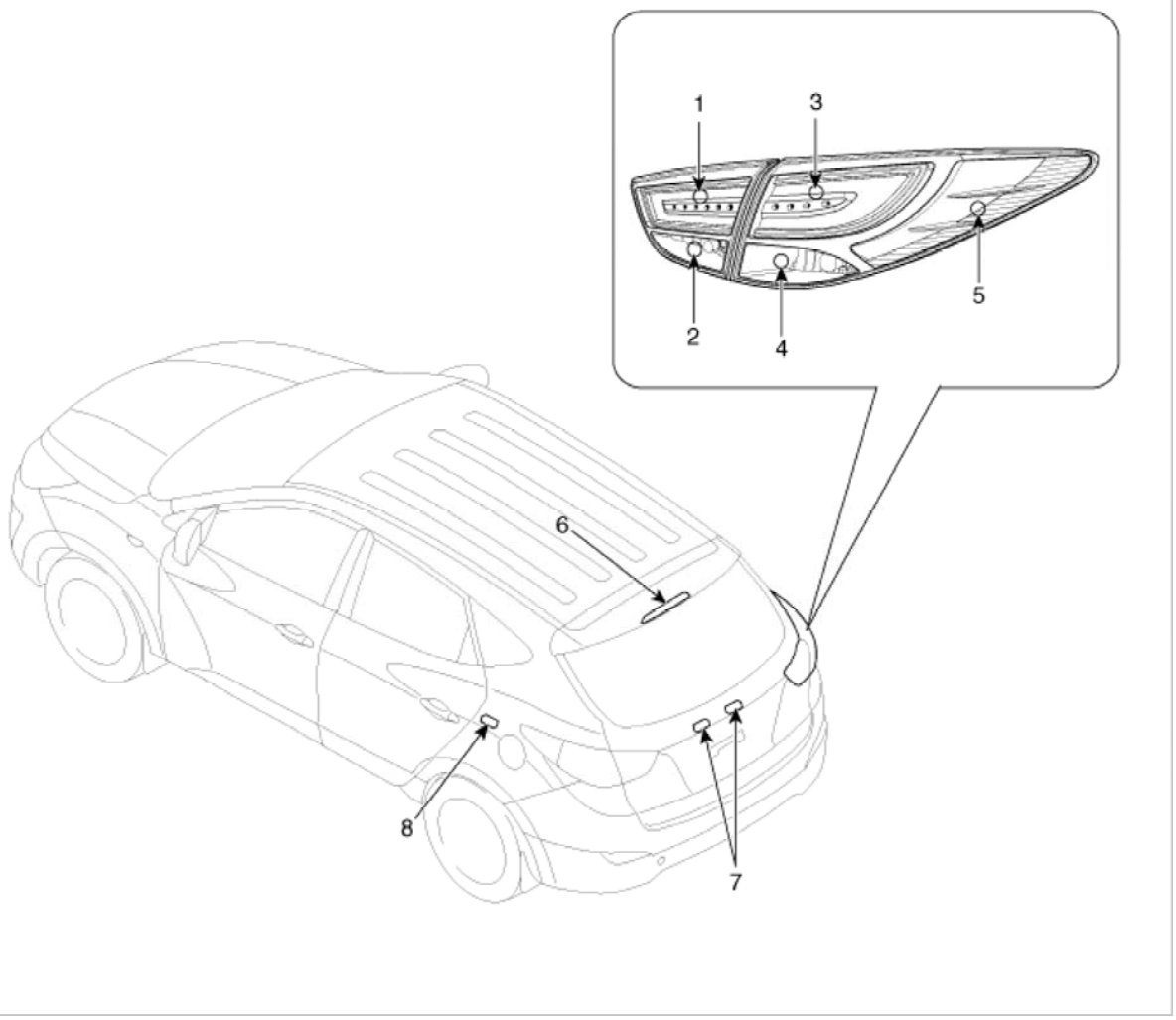
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1. Head lamp (High/Low) 2. Position lamp 3. Front turn signal lamp 4. Front fog lamp	5. Door mirror turn signal lamp 6. Overhead console lamp 7. Room lamp 8. Vanity lamp

Component Location (2)

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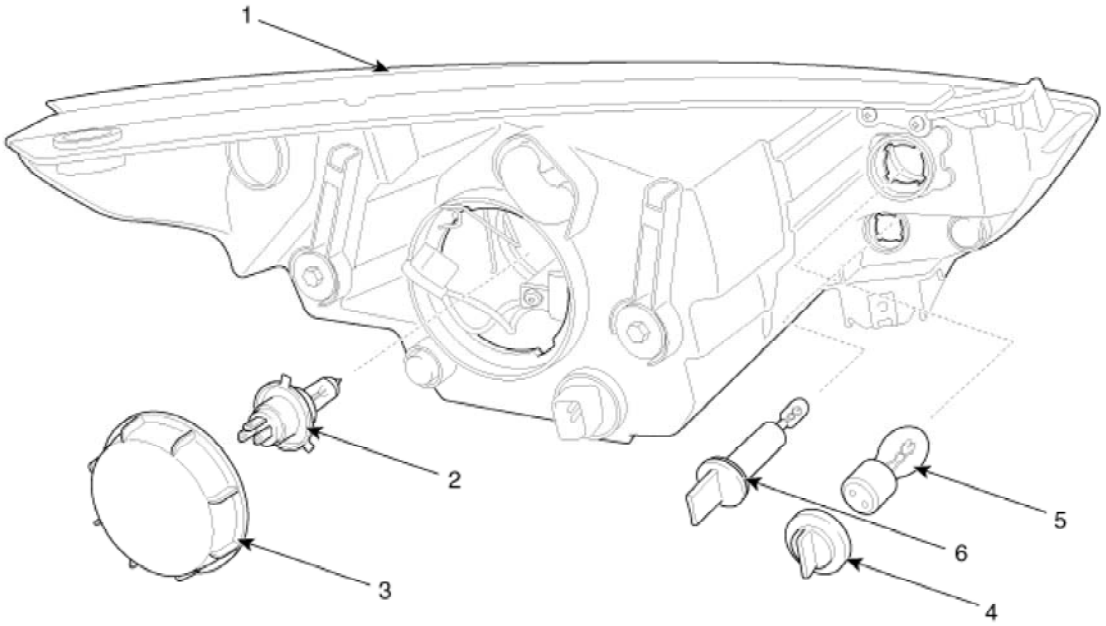


1. Tail lamp	5. Side marker
2. Back up lamp	6. High mounted stop lamp
3. Tail/Stop lamp	7. License plate lamp
4. Turn signal lamp	8. Luggage lamp

Body Electrical System > Lighting System > Head Lamps > Components and Components Location

Component

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1. Head lamp assembly lens and housing 2. Head lamp high/low bulb 3. Dust cover	4. Trun signal lamp socket 5. Turn signal lamp bulb 6. Position lamp bulb & socket

Body Electrical System > Lighting System > Head Lamps > Repair procedures

Removal

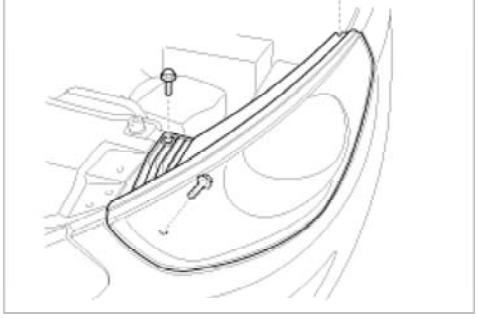
CAUTION

Head lamps become very hot during use; do not touch them or any attaching hardware immediately after they have been turned off.

NOTE

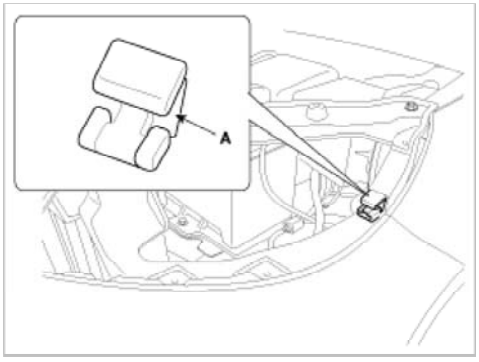
The headlamp bulb should not be removed from the headlamp assembly until just before a new bulb is installed.
Removing bulb for an extended period of time may affect headlamp bulb performance.
Contaminants may enter the headlamp assembly where they can settle on the lens and reflector.
Never turn on the head lamps with the bulb removed from the headlamp assembly.

1. Disconnect the negative (-) battery terminal.
2. Loosen the mounting bolts (3EA) of head lamp.

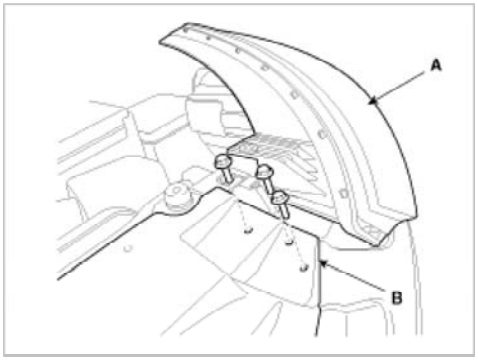


NOTE

Take care that retaining clip (A) is not to be damaged.



3. Remove the head lamp (A) after loosening the nuts of interfered radiator upper cover (B).



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

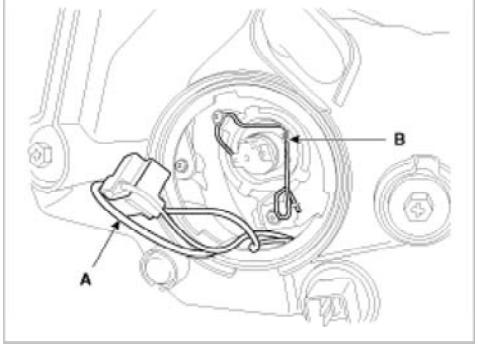
CAUTION

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 lamp assembly
4. Remove the dust cover.

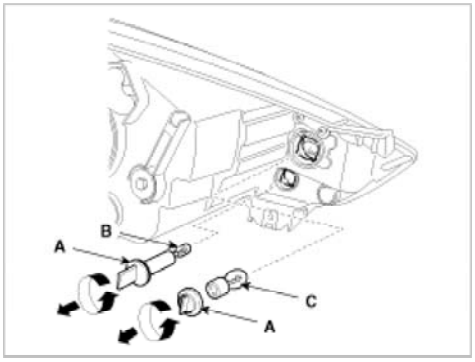
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6. Remove the bulb clip (B) and bulb from the lamp assembly.
7. Installation is the reverse of removal.

Turn Signal Lamp & Position Lamp

1. Turn the head lamp switch off.
2. Remove the lamp assembly.
3. Turn the bulb socket (A) counterclockwise to remove the turn signal bulb (B) and position bulb (C).



Adjustment

Head Lamp Aiming Instructions

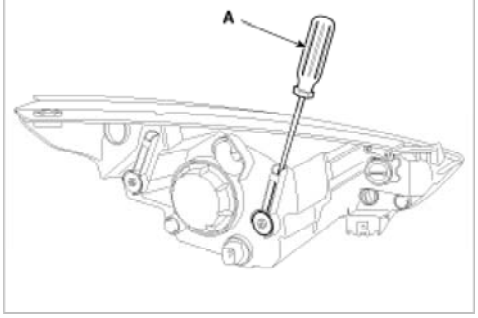
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

> 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 :

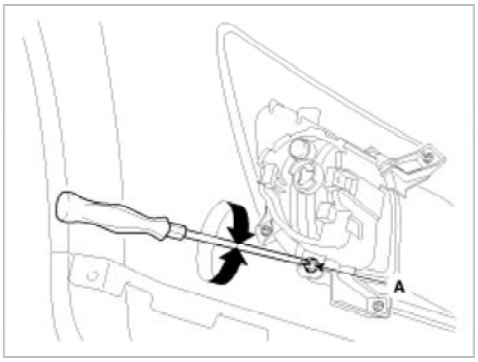
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing 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. Make vertical (A) adjustments to the lower beam using the adjusting wheel.

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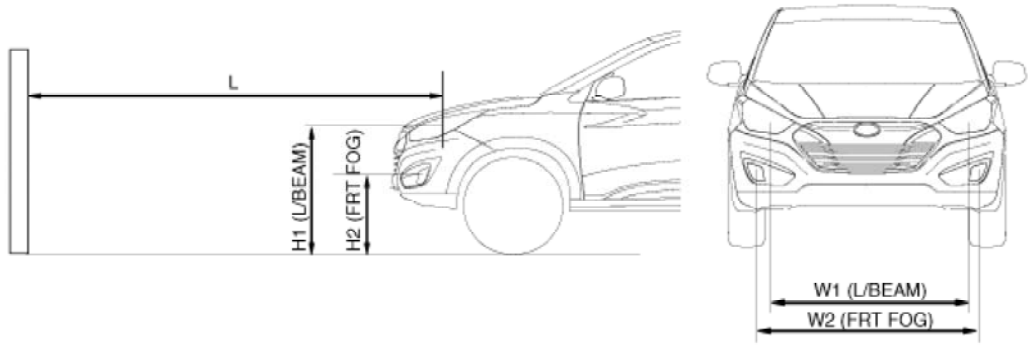


Front Fog Lamp Aiming

The front fog lamps should be aimed as the same manner of the head lamps aiming.
With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting gear (A).



Head Lamp And Fog Lamp Aiming Point



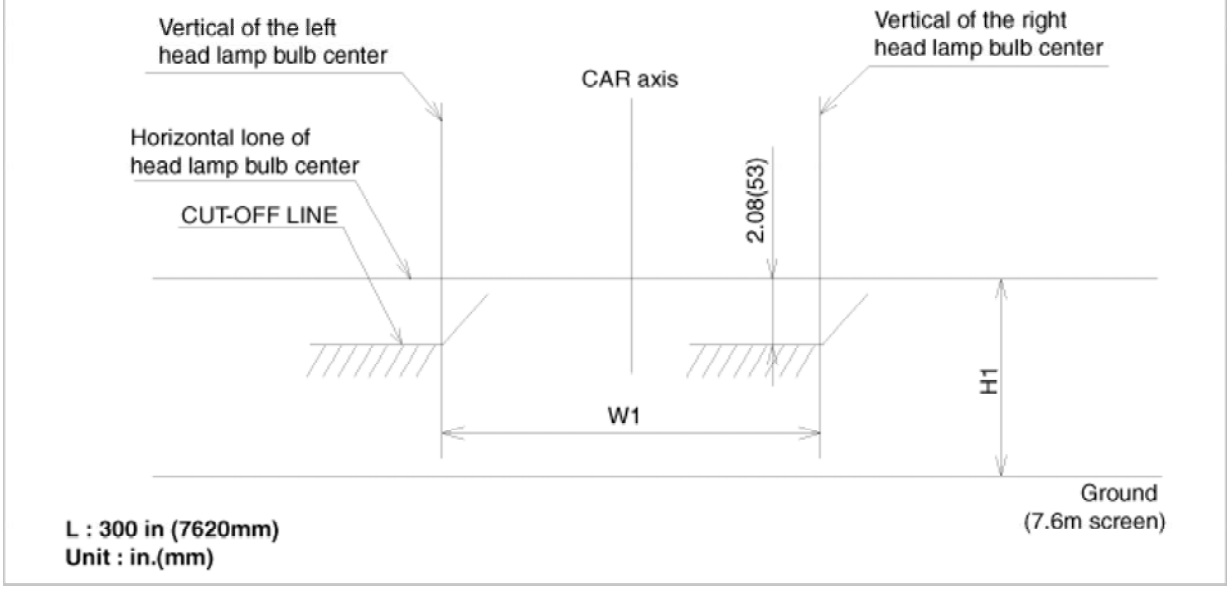
H1 : Height between the head lamp bulb center and ground (High/Low beam)
H2 : Height between the fog lamp bulb center and ground
W1 : Distance between the two head lamp bulbs centers (High/Low beam)
W2 : Distance between the two fog lamp bulbs centers
L : Distance between the head lamp bulb center and screen

Unit : in (mm)

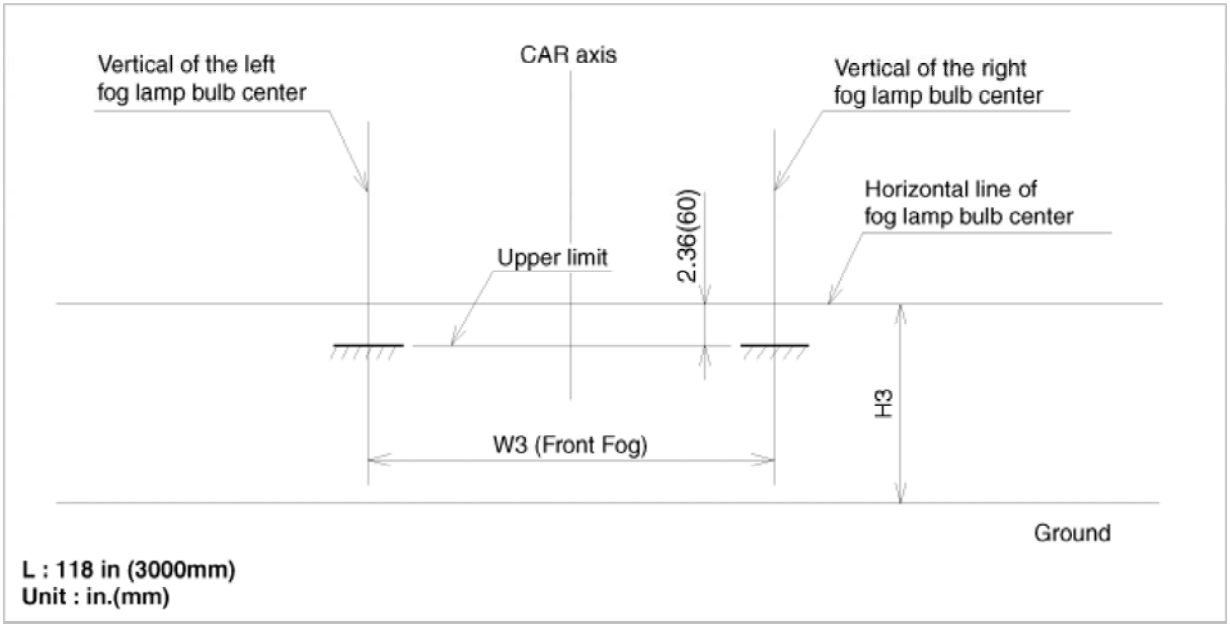
Vehicle condition	H1	H2	W1	W2	L
Without driver	35.2(894)	21.2(539)	55.4(1,408)	57.2(1,454)	118(3,000)
With driver	35.0(889)	21.0(534)			

1. General Type (VOL)
   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.

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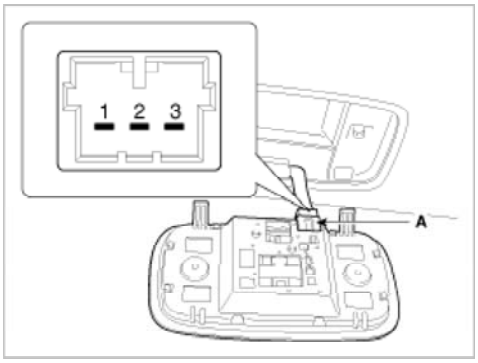
2. Turn the front fog lamp on with driver seated in the vehicle.
   The cut-off line should be projected in the allowable range shown in the picture.



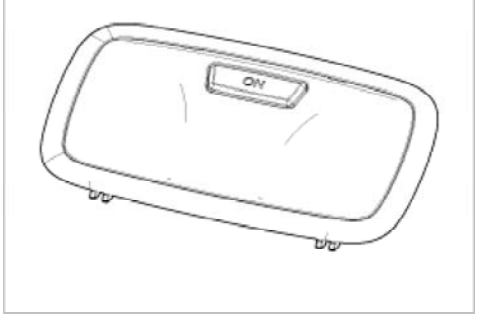
Body Electrical System > Lighting System > Room Lamp > Repair procedures

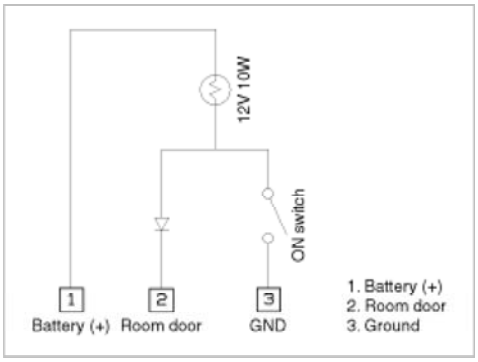
Inspection

1. Remove the room lamp assembly connector (A) then check for continuity between terminals.



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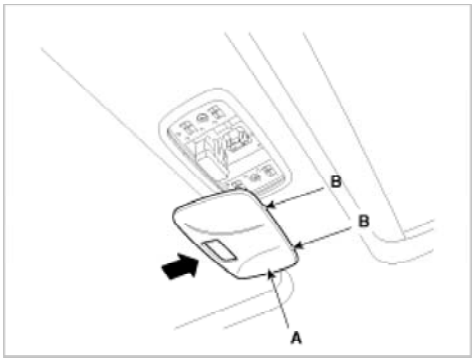




Terminal / Position	1	3
ON	○	○
OFF		

Removal

1. Disconnect the negative (-) battery terminal.
2. Detach the lamp lens (A) from the room lamp with a flat-tip screwdriver.



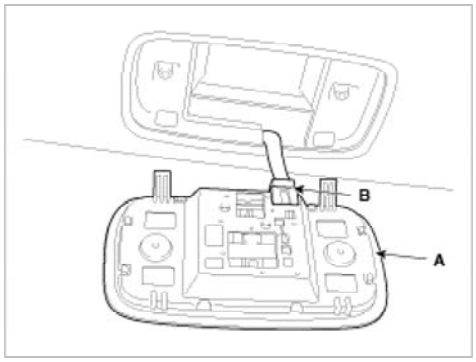
> **NOTE**
>
> Push the lens as shown arrow direction.
> Take care not to damage the part (B).

3. Loosen the fixing screw (2EA).

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4. Remove the room lamp assembly (A) after disconnecting the connector (B).



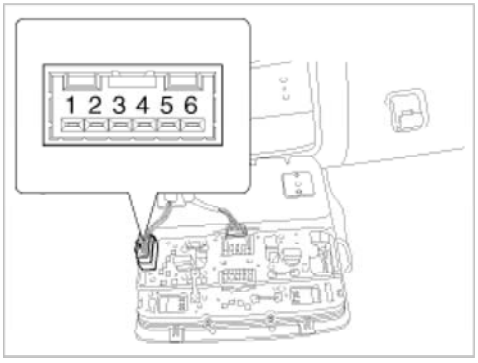
Installation

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

Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.



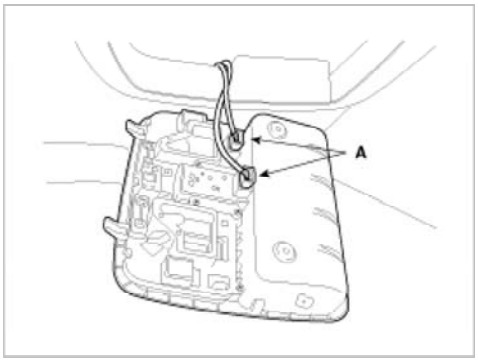
Item / Position / Terminal	Map lamp switch			
	Left		Right	
	ON	OFF	ON	OFF
1	○		○	
5	○		○	

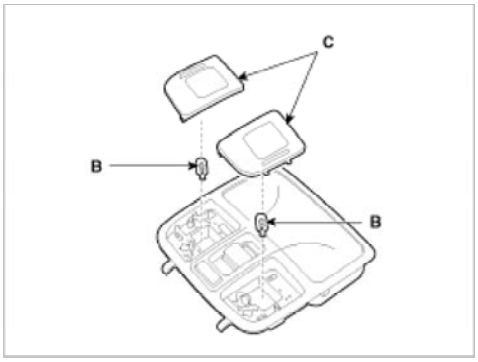
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp assembly.

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3. Remove the overhead console bulb (B) after disconnecting the panoramaroof switch connector and lamp connector (A).





4. When replacing the bulb only, release the lens (C) cover from the roof without removing the overhead console lamp assembly.

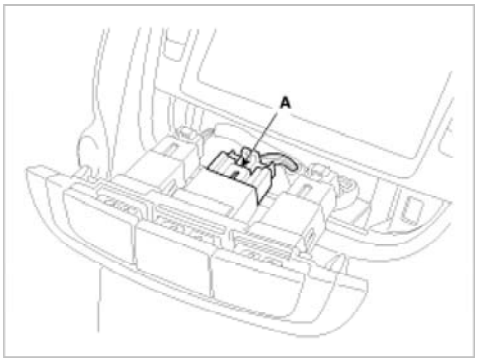
Installation

1. Install the bulbs and connect the connectors.
2. Install the overhead console lamp assembly.

Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

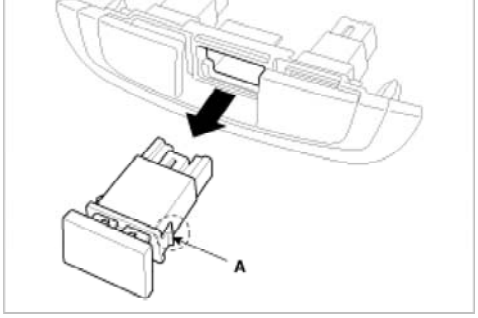
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the hazard lamp switch assembly.
   (Refer to the BE group - "Audio head unit")
3. Disconnect the hazard lamp switch connector (A).



4. If the hazard lamp switch is not as specified, replace it carefully and take care not to damage the hook (A).

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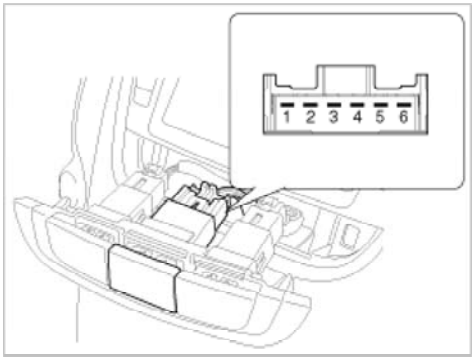


Installation

1. Connect the hazard switch connector.
2. Install the hazard switch assembly.

Inspection

1. Operate the switch and check for continuity between terminals with an ohmmeter.



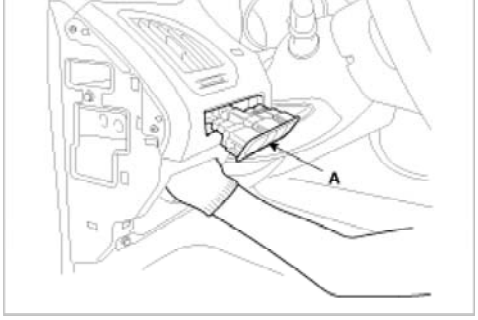
Terminal / Position	OFF	ON	Remark
1			Illumination(+)
2			Illumination(-)
3			
4			
5			
6			

Body Electrical System > Lighting System > Rheostat > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
3. Remove the crash pad side switch assembly (A) as shown below picture.

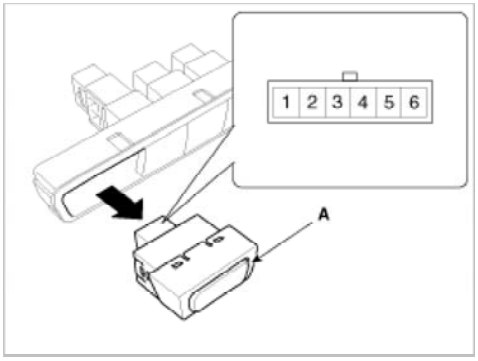
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NOTE

Put on gloves to protect your hands.

4. Remove the rheostat switch (A) after disconnecting the connectors.



NOTE

Take care not to damage the hook when removing the rheostat switch.

5. Operate the switch and check for continuity between terminals with an ohmmeter.

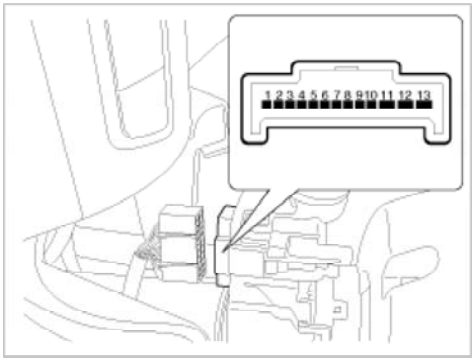
Terminal / Position	UP(+)	DOWN(-)	Description
1		○	Down
2	○	○	GND
5	○		Up
3	○	○	Illumination (-)
4	○ ~	○	Illumination (+)

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.

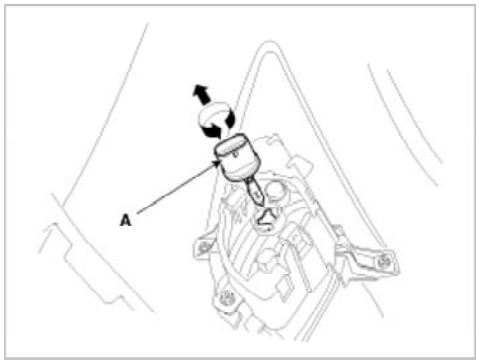


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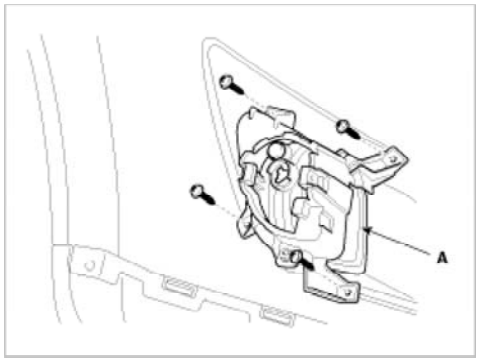
Position	5	6
ON	○	○
OFF		

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper.
   (Refer to the BD group - "Front bumper")
3. Remove the front fog lamp (A) by turning in the counterclockwise direction after disconnecting the connector.



4. Remove the front fog lamp (A) after loosening the screws.



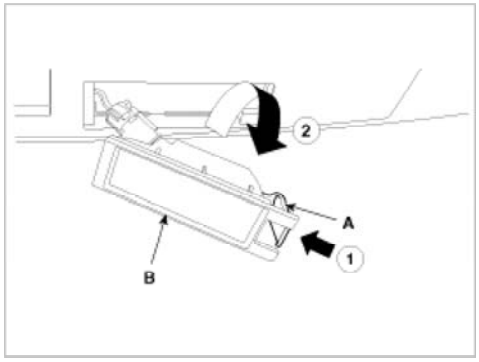
Installation

1. Install the front fog lamp bulb.
2. Connect the front fog lamp connector.
3. Install the front bumper.

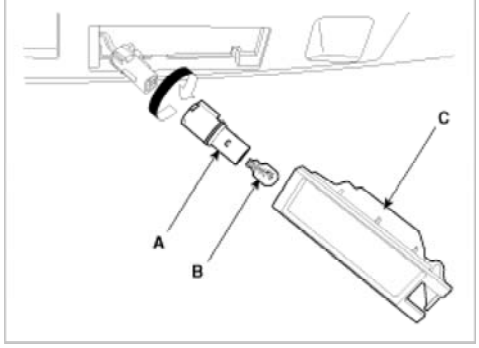
Body Electrical System > Lighting System > License Lamps > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the license lamp lens (B) by pressing the clip (A).



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Installation

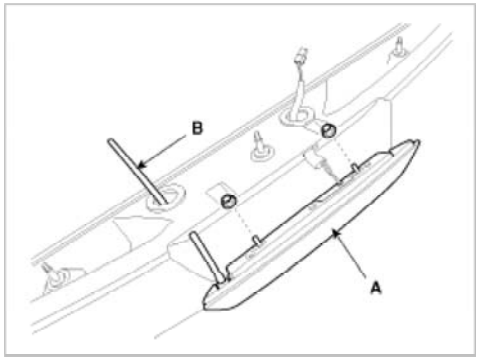
1. Install the bulb.
2. Install the license lamp lens.

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 tailgate trim.
   (Refer to the BD group - "Tailgate")
3. Remove the spoiler.
   (Refer to the BD group - "Tailgate")
4. Remove the high mounted stop lamp assembly (A) after loosening the nuts and washer nozzle (B).



Installation

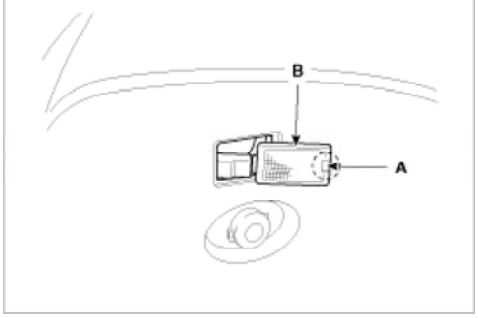
1. Install the high mounted stop lamp and washer nozzle.
2. Install the spoiler and tailgate trim.

Body Electrical System > Lighting System > Luggage Room Lamp > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage room lamp (B) when prying the hole (A) with a flat-up screwdriver

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3. Remove the luggage room lamp bulb in case of necessity

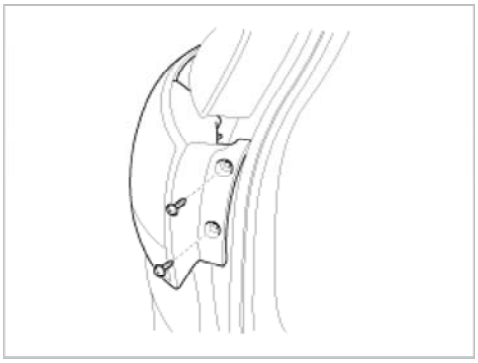
Installation

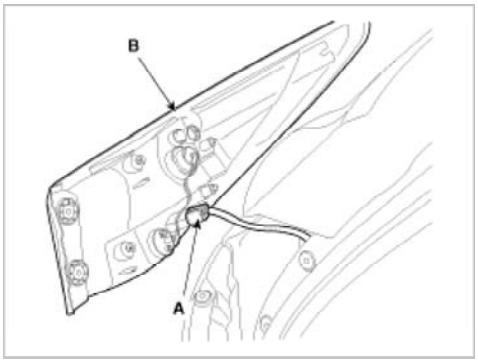
1. Replace the lamp bulb.
2. Install the luggage room lamp assembly after connecting the lamp connector.

Body Electrical System > Lighting System > Rear combination lamp > Repair procedures

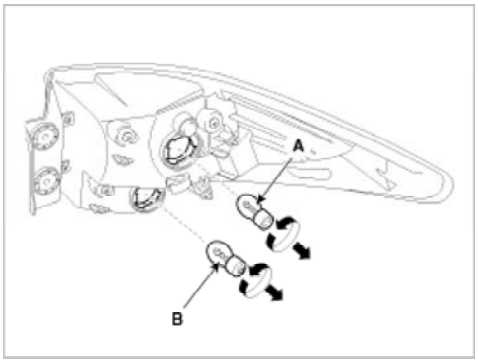
Removal

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).

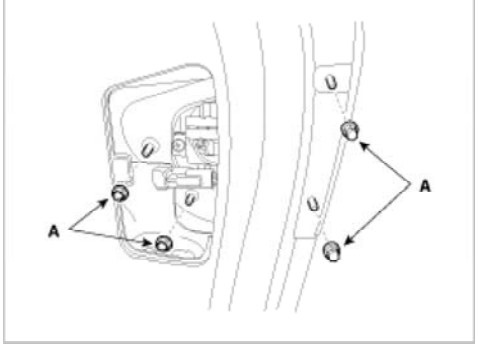




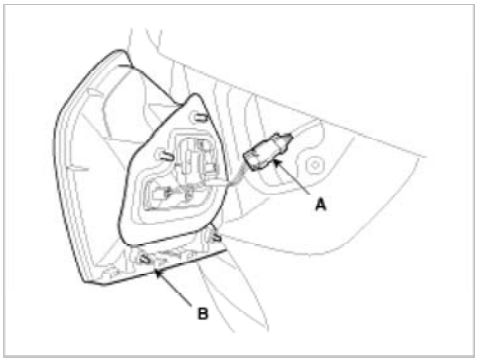
3. Turn the socket counterclockwise to remove the tail/stop lamp bulb (A) and turn signal lamp bulb (B).



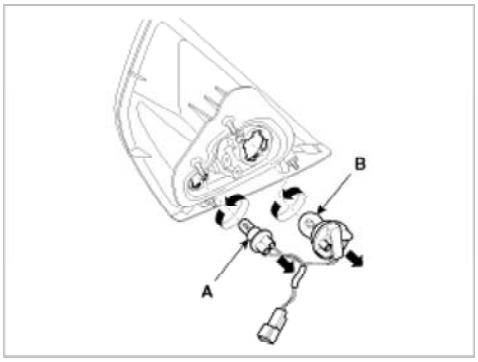
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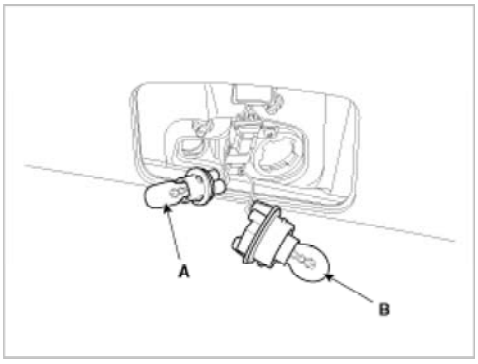
5. Remove the tailgate lamp (B) after disconnecting the connector (A).



6. Turn the socket counterclockwise to remove the back up lamp bulb (A) and tail lamp bulb (B).



7. If the bulbs should be only replaced without removing lamp assembly, replace the back up lamp bulb (A) and tail lamp bulb (B) after removing the tailgate lamp cover inside trunk.



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

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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
Turn signal lamps do not light	Bulb burned out	Replace bulb
	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

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	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
Rear fog lamps do not light	Rear fog lamp fuse (15A) blown	Check for short and replace fuse
	Rear fog lamp fuse (15A) blown	Check for short and replace fuse
	Rear fog lamp switch faulty	Check switch
	Rear fog lamp relay faulty	Check relay
	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
Trunk room lamp does not light	Bulb burned out	Replace bulb
	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

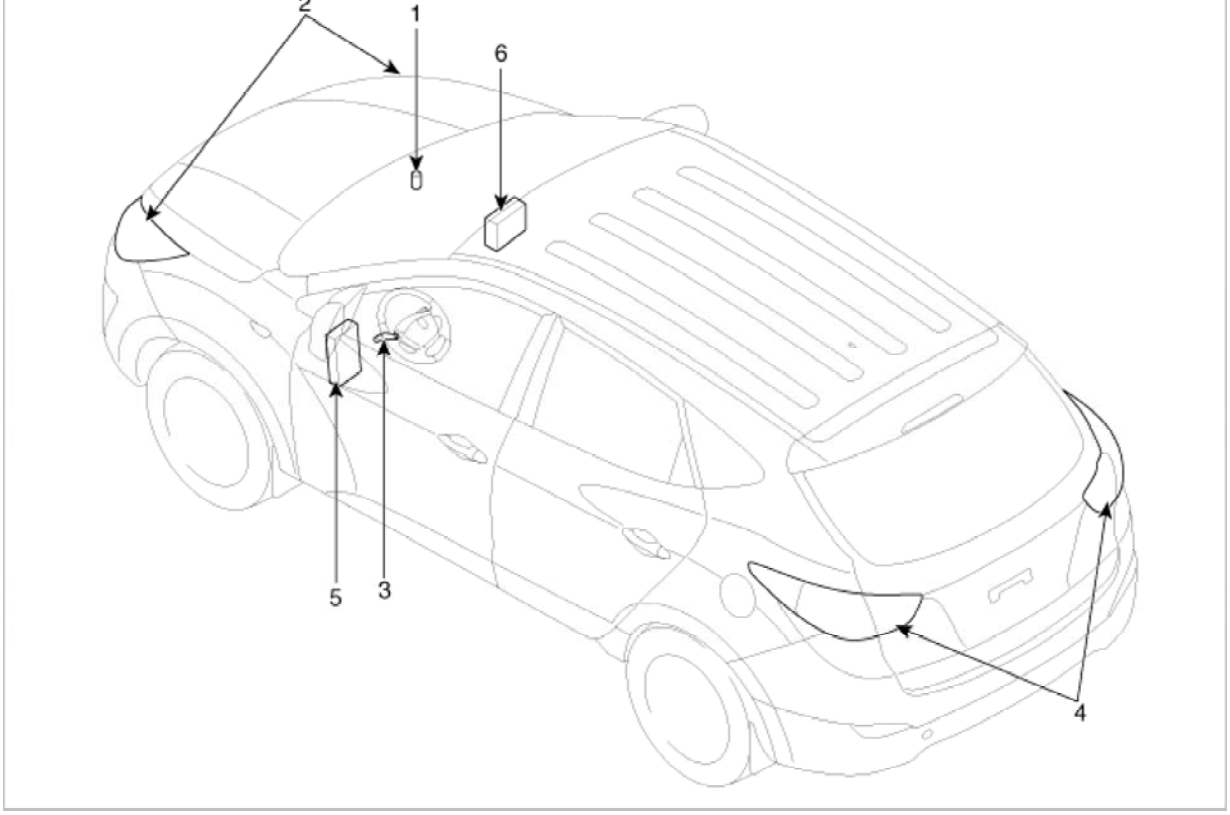
Specifications

Items		Specifications
Rated voltage		5V
Load		Max. 1mA
Detection illuminations	Tail lamp	ON : 1.0 ± 0.10 (V) OFF : 2.3 ± 0.20 (V)
	Head lamp	ON : 1.0 ± 0.10 (V) OFF : 2.3 ± 0.20 (V)

Body Electrical System > Auto Lighting Control System > Components and Components Location

Component Location

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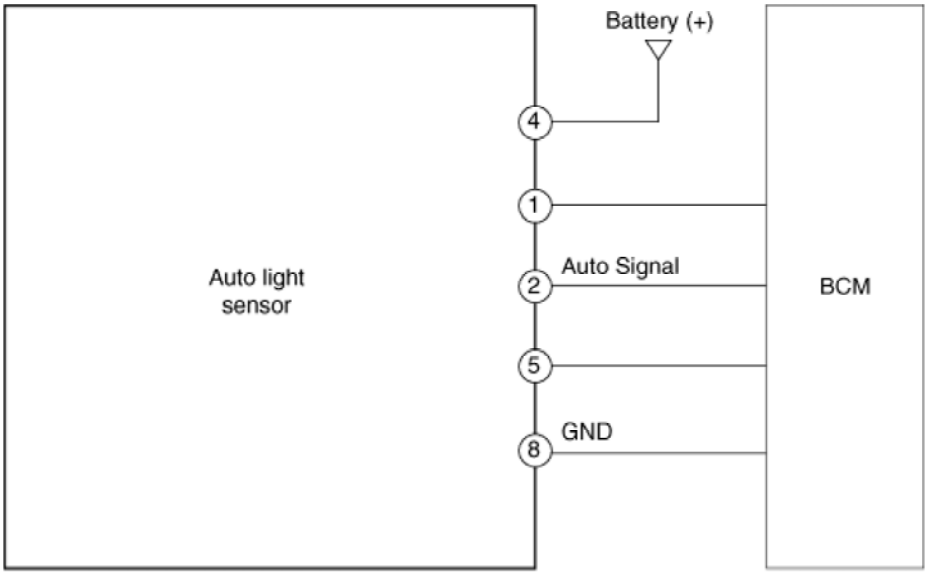


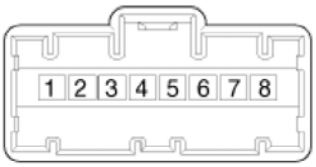
1. Auto light sensor 2. Head lamps 3. Lighting switch (Auto)	4. Tail lamps 5. SJB (Smart Junction Box) 6. BCM (Body Control Module)

Body Electrical System > Auto Lighting Control System > Schematic Diagrams

Circuit Diagram

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[Auto light sensor connector]

No	Description
1	Auto light signal
2	Auto light GND
3	Photo signal (R)
4	LED power (B+)
5	LED GND (BCM)
6	Photo signal (L)
7	Photo power
8	Auto light power

Body Electrical System > Auto Lighting Control System > Description and Operation

Description

This function describes the following features

- Input detection by Auto Light Sensor.
- Generate Auto Light Out Status data.
- Send Auto Light Out Status.
- Tail Lamp Control by Auto light Mode.
- Head Lamp Low Control by Auto light Mode.
- AV Tail Control by Auto Light sensor level.

• Auto Light Mode State Diagram is based on Auto Light Sensor's level.

• Power condition of Auto Light Action

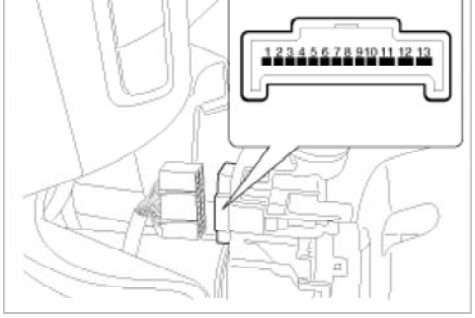
- When ACC, IGN, START terminal states, Auto Light Sensor operates.

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.

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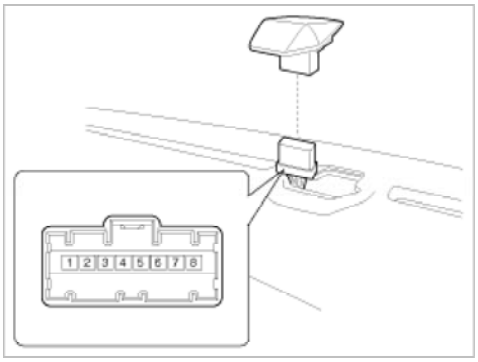
Terminal / Position	2	4	3	1
OFF				
I	○			○
II	○	○		○
AUTO			○	○

Body Electrical System > Auto Lighting Control System > Auto Light Sensor > Repair procedures

Inspection

In the state of IGN1 ON, when 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.
The auto light control doesn't work if the pin sunlight supply (5V regulated power from Ignition 1 power to sunlight sensor) is in short circuit with the ground.
If IGN1 ON, The IPM 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.

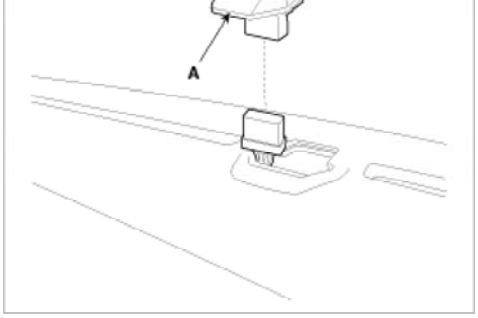
	Tail lamp	Head lamp
ON	1.0 ± 0.10V	
OFF	2.3 ± 0.20V	



Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the photo & auto light sensor (A) from crash pad upper side by using a flat-up screwdriver.

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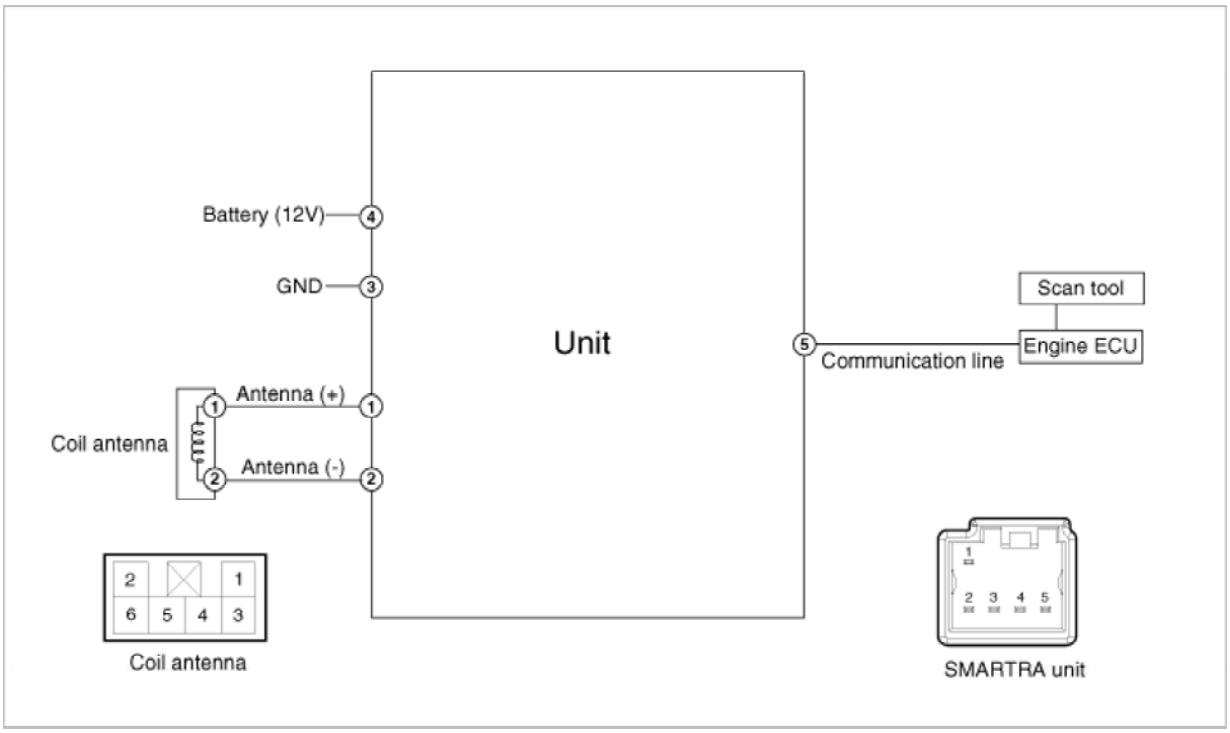
3. Remove the auto light connector.

Installation

1. Reconnect the auto light connector.
2. Install the auto light sensor.

Body Electrical System > Immobilizer System > Schematic Diagrams

Circuit Diagram



Body Electrical System > Immobilizer System > Description and Operation

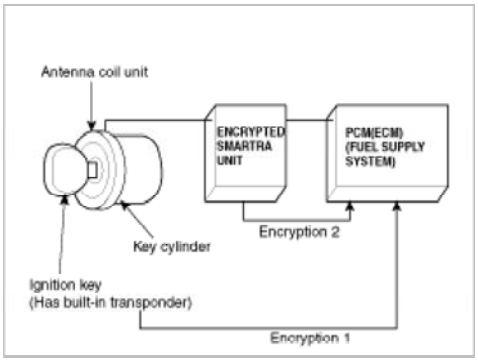
Description

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. Encrypted SMARTRA type immobilizer
   A. The SMARTRA system consists of a passive challenge - response (mutual authentication)transponder located in the ignition key, an antenna coil, an encoded SMARTRA unit, an indicator light and the PCM(ECM).
   B. The SMARTRA communicates to the PCM(ECM) (Engine Control Module) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the SMARTRA.
   C. When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the SMARTRA unit to the PCM(ECM).
   D. If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the

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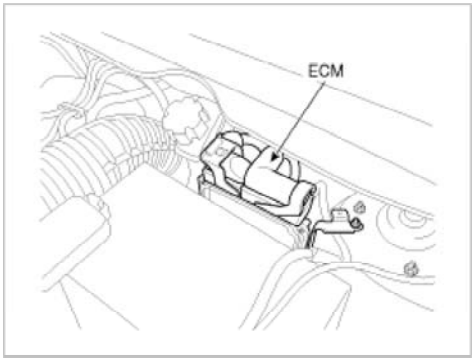
E. If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue turning off until the ignition switch is turned OFF.
F. If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
G. The immobilizer system can store up to eight key codes.
H. If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



Components Operations

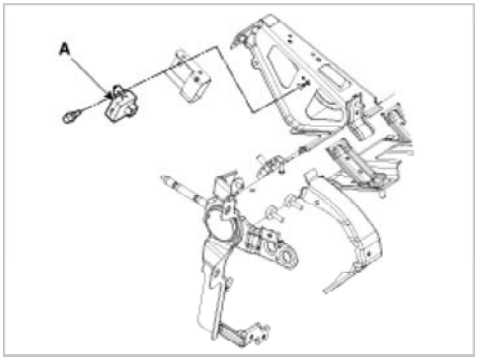
PCM (Power Train Control Module)

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 Randorn Number) value between EMS and encrypted smartra unit is checked and the validity of coded key is decided by EMS.



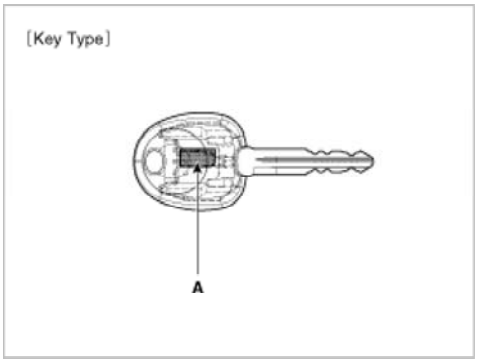
ENCRYPTED SMARTRA unit (A)

The SMARTRA carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The SMARTRA 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 SMARTRA 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 SMARTRA 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.



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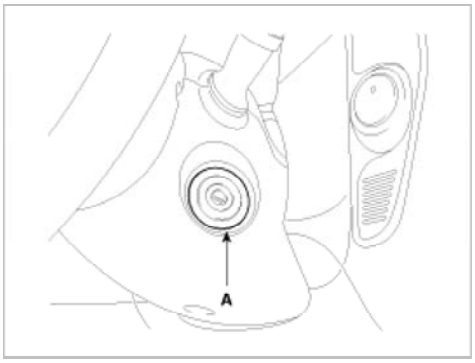
The transponder (A) has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.



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 SMARTRA.
  It is located directly in front of the steering handle lock.



Body Electrical System > Immobilizer System > Repair procedures

Replacement

Problems And Replacement Parts:

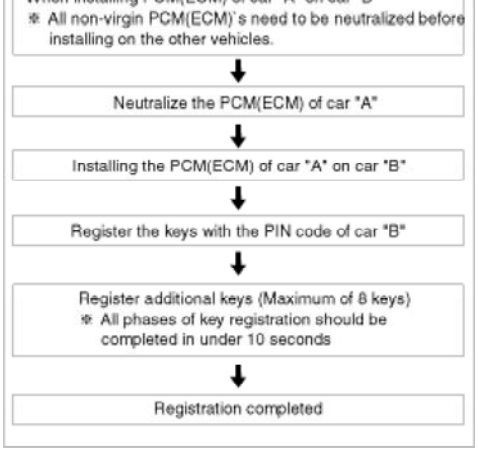
Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

Replacement Of Ecm And Smartra

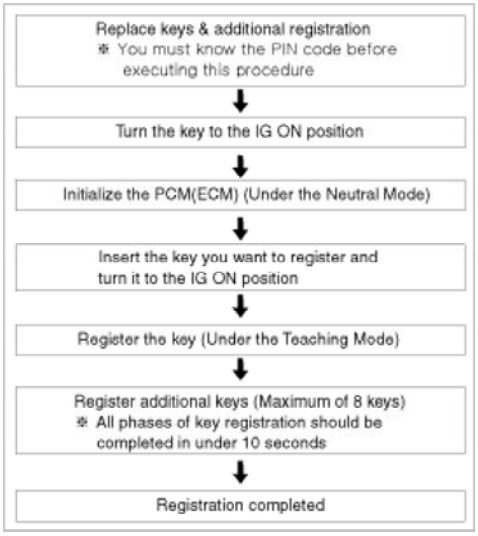
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching procedure). The vehicle specific data have to be left unchanged due to the unique 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))

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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

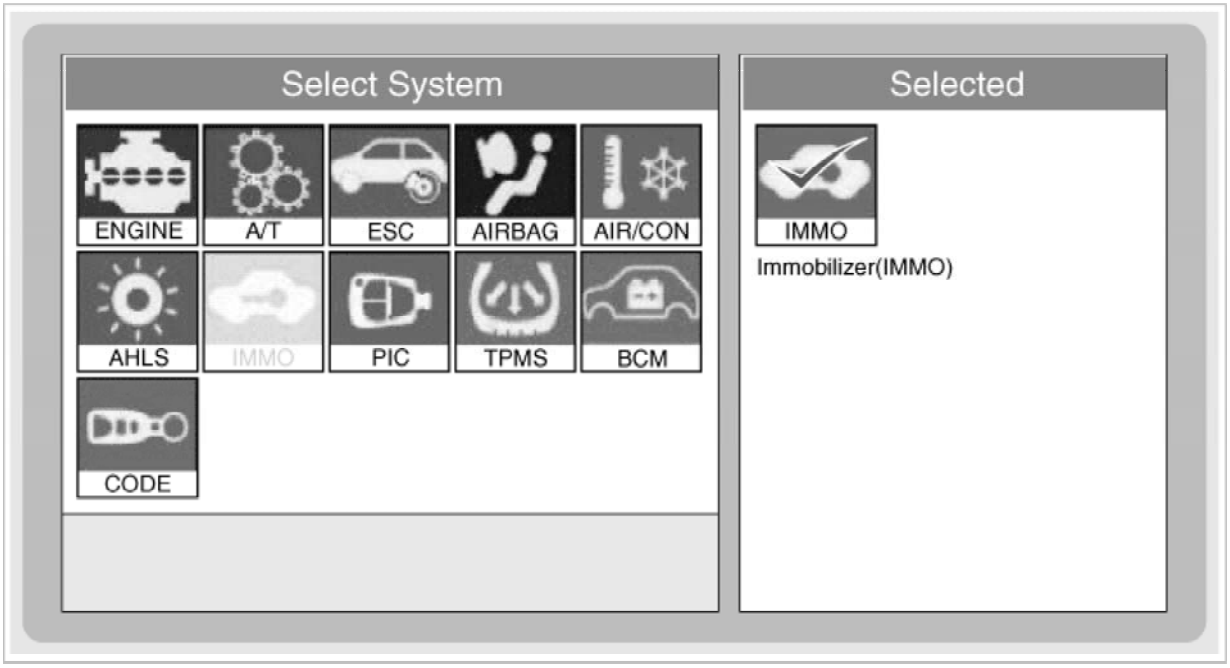
The PCM(ECM) can be set to the "neutral" status by a tester.
A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) 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

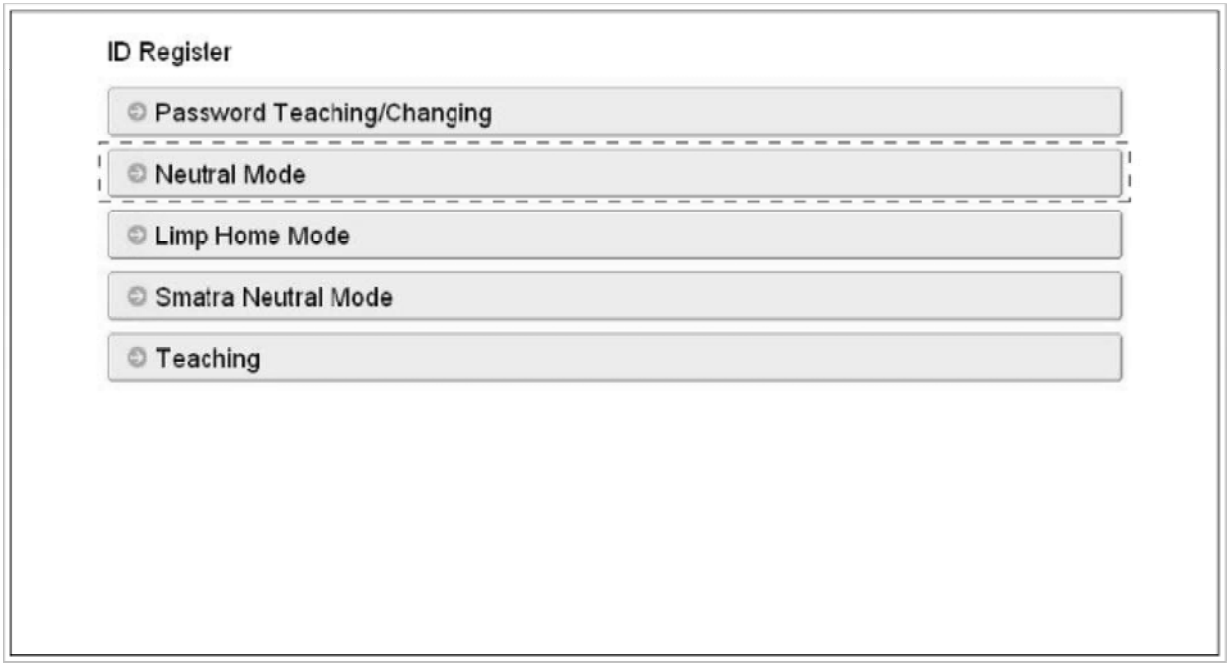
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NOTE

- 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





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[Neutral Mode]

Input PIN code and press [OK] button.

Ok Cancel

Neutral Mode



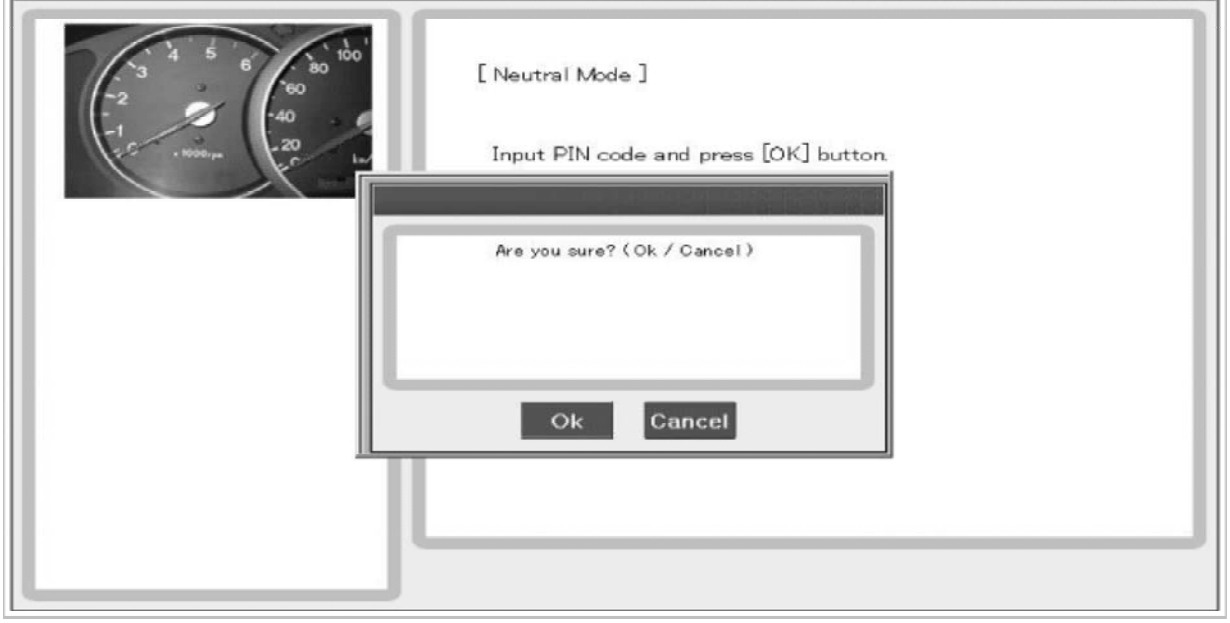
[Neutral Mode]

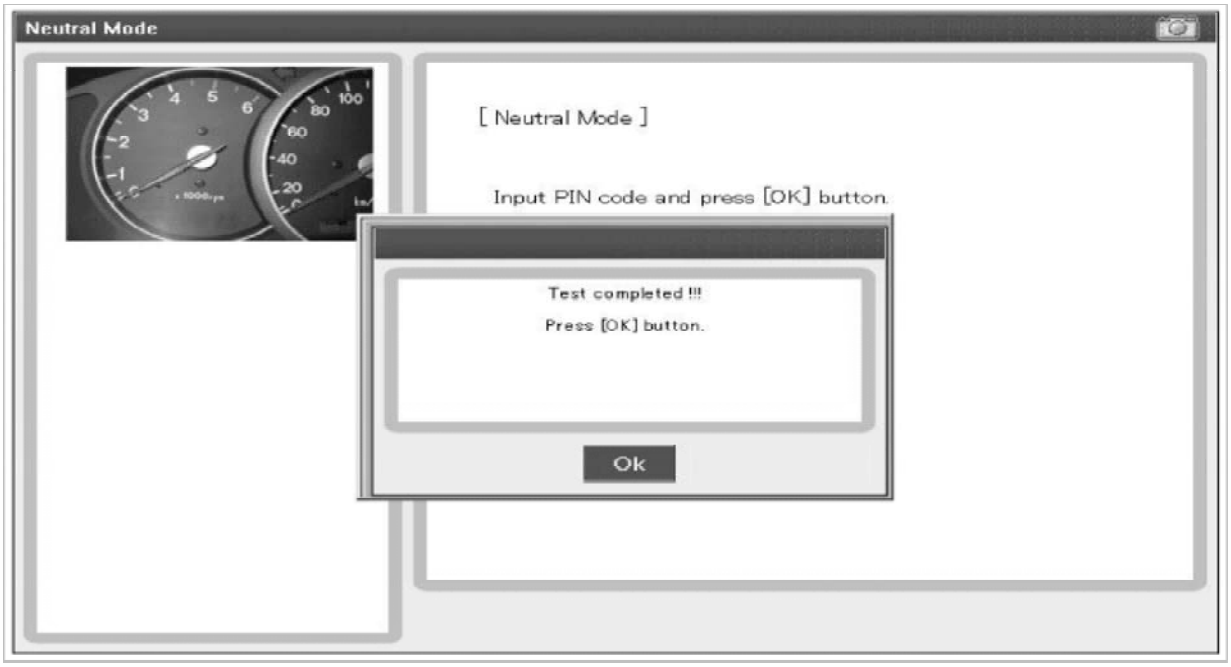
Input PIN code and press [OK] button.

0 9 8 7 6 5

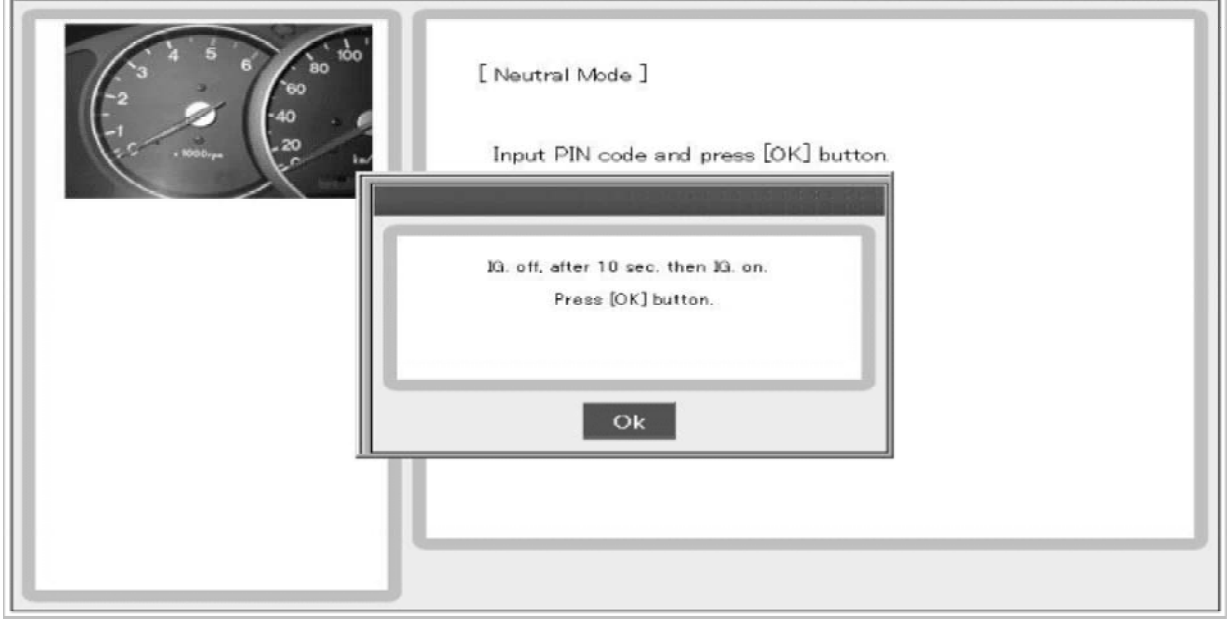
Ok Cancel

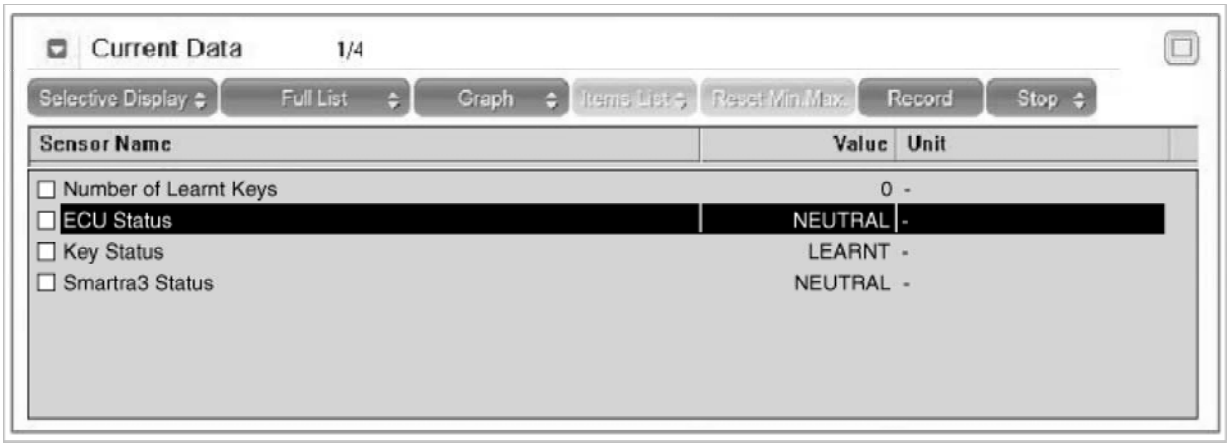
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[Neutral Mode]
Input PIN code and press [OK] button.
Are you sure? (Ok / Cancel)
Ok
Cancel


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok

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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

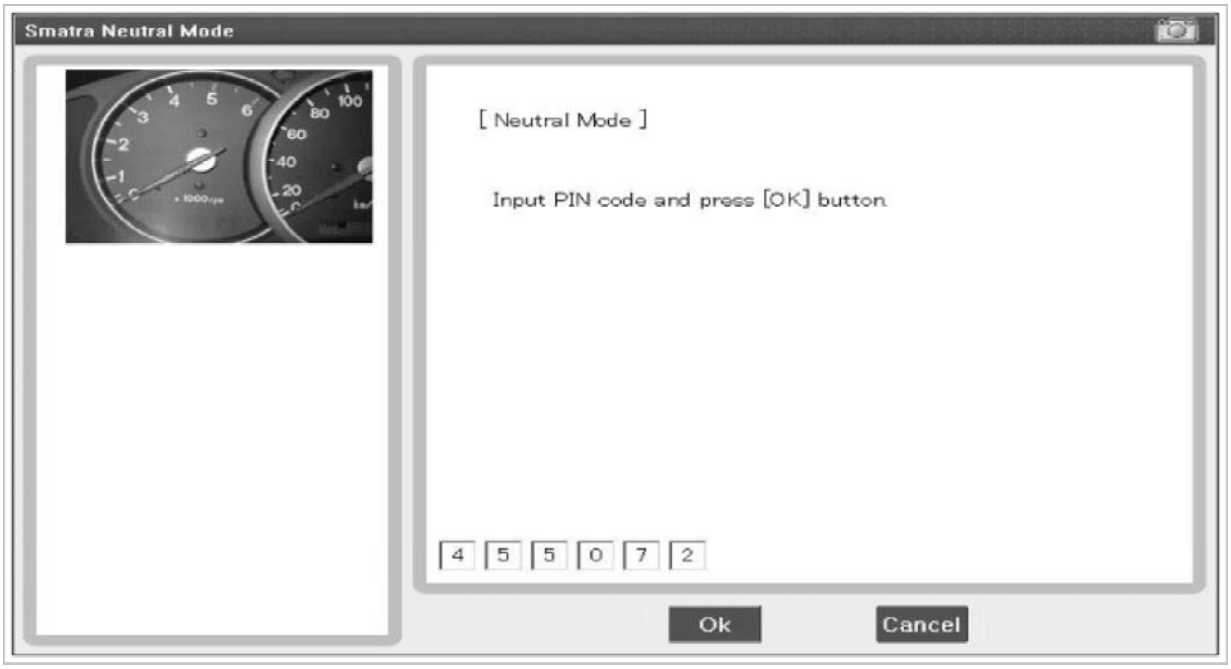
- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learnt"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

Function / SMARTRA	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	Yes (EMS learnt)	No	Yes	No

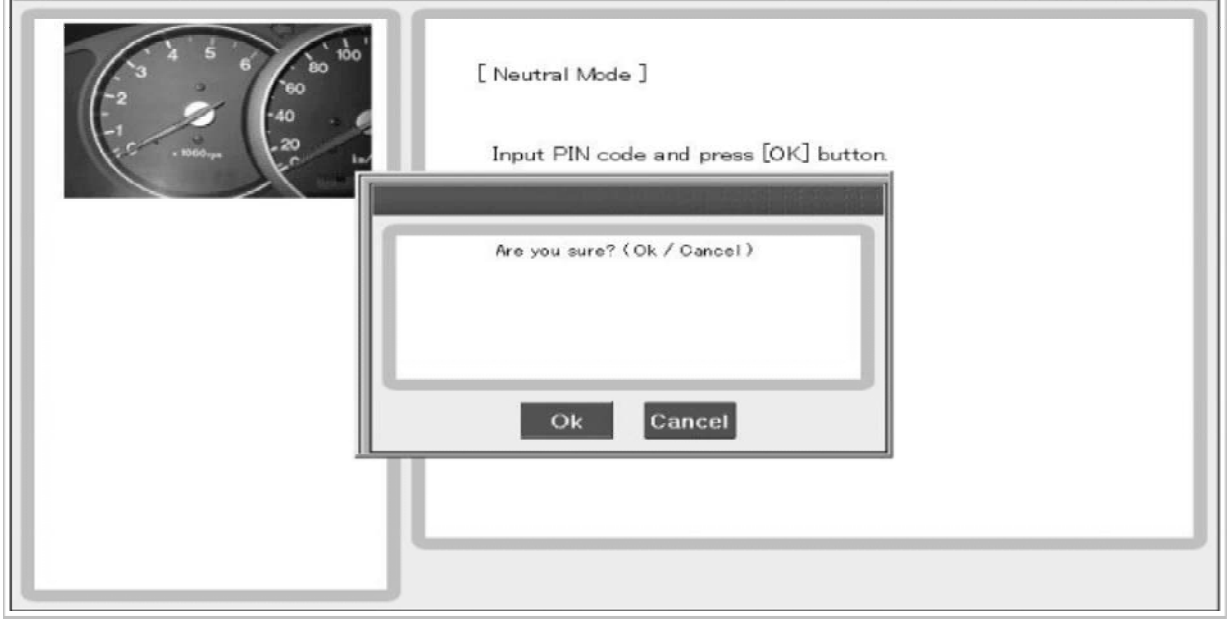
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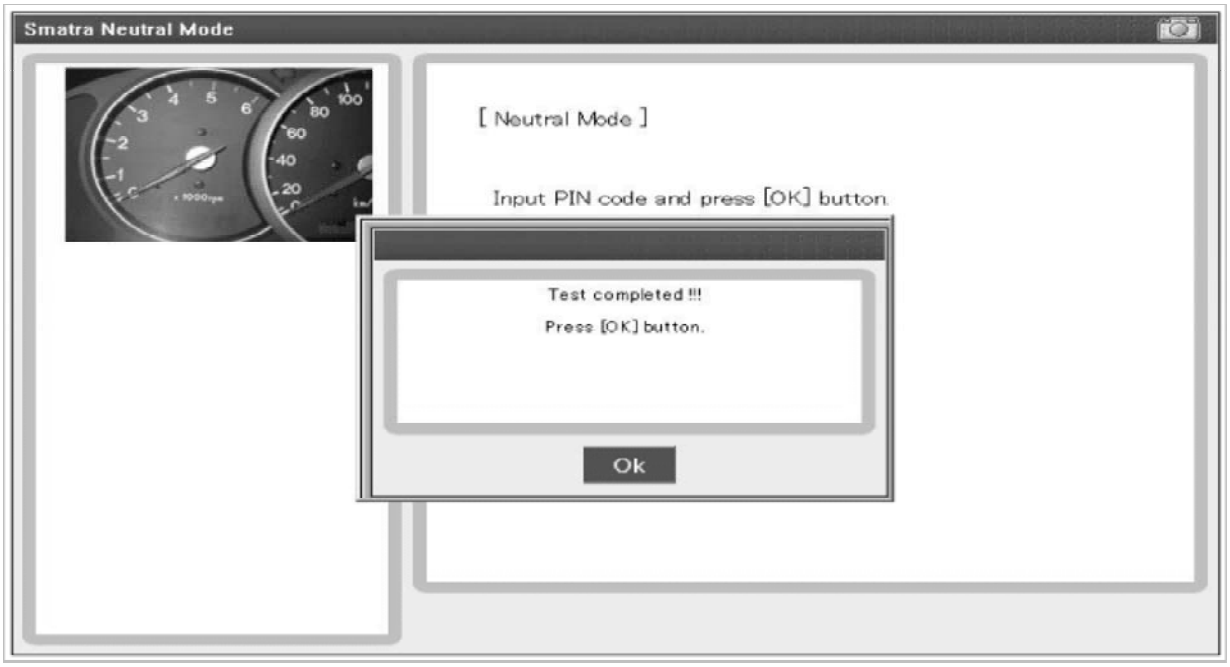
ID Register

- Password Teaching/Changing
- Neutral Mode
- Limp Home Mode
- Smatra Neutral Mode
- Teaching

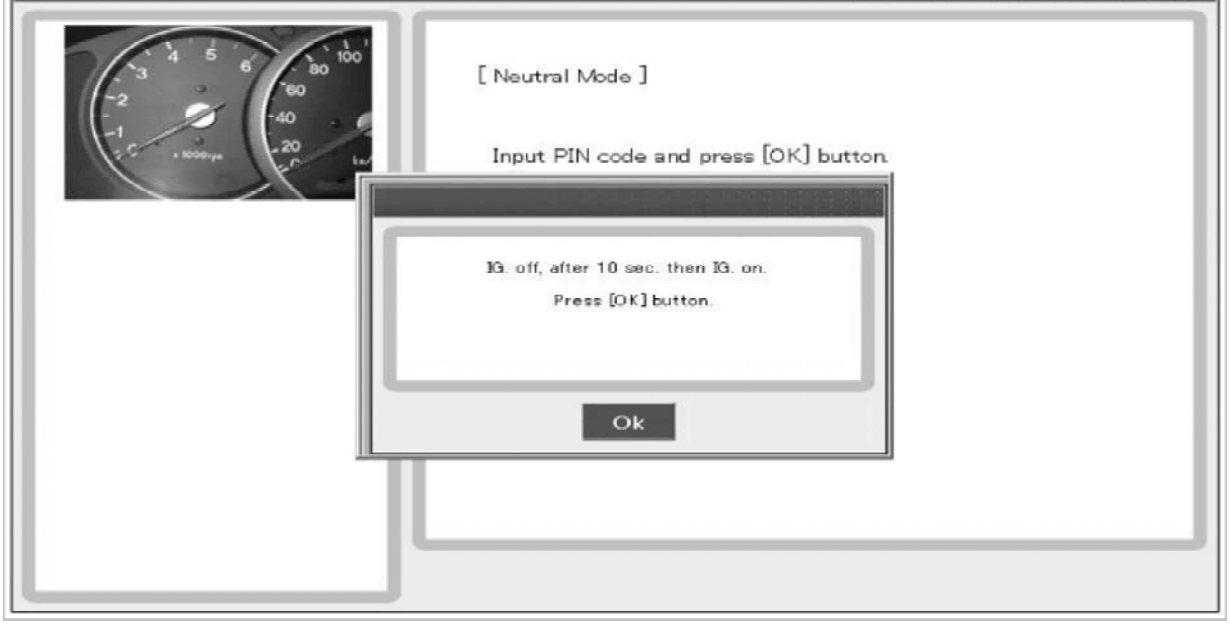


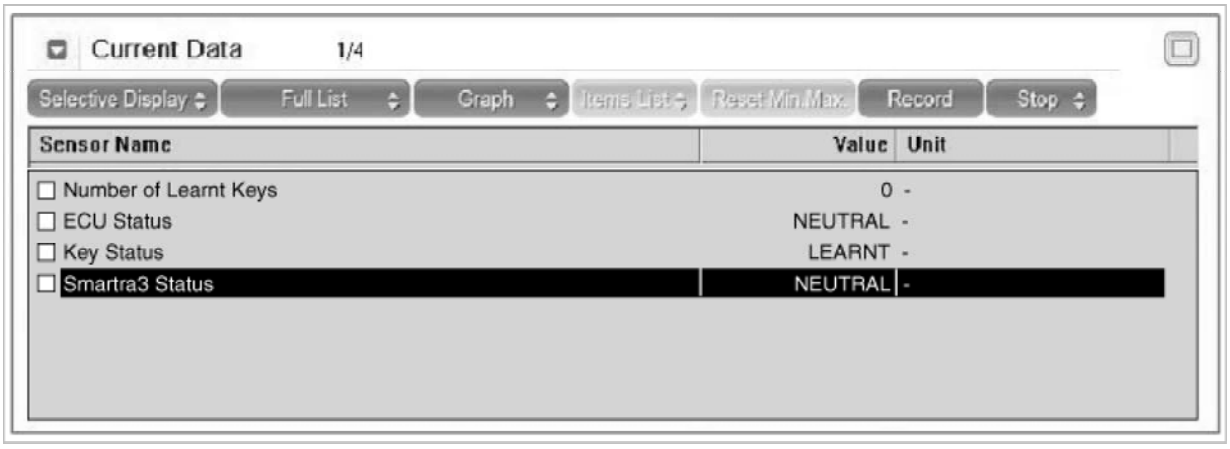
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[Neutral Mode]
Input PIN code and press [OK] button.
Are you sure? (Ok / Cancel)
Ok
Cancel


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok

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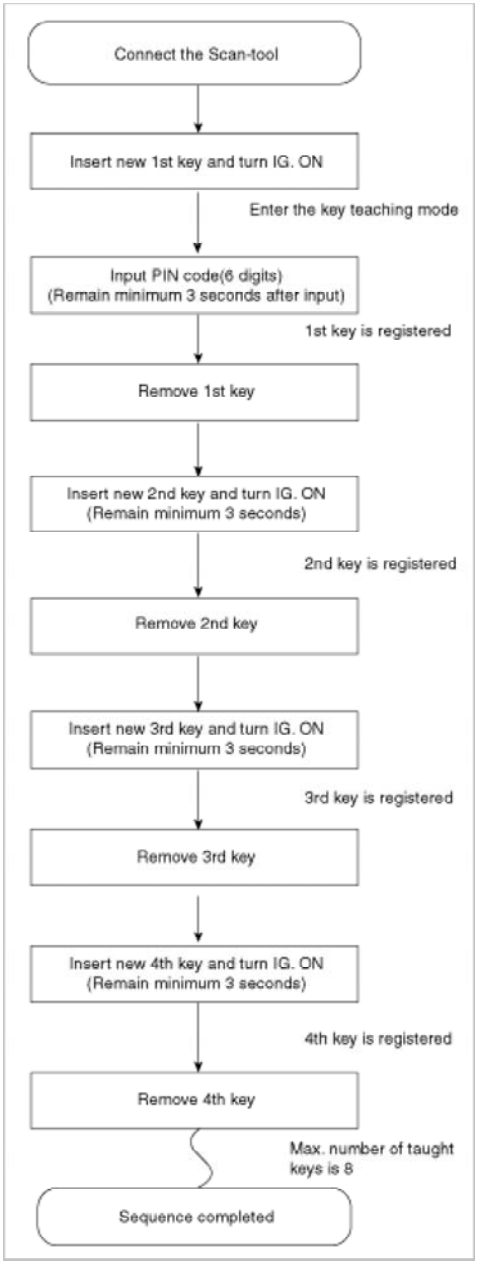


Teaching Procedures

1. Key Teaching Procedure
   Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehicle owner.
   The procedure starts with an 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 proceed.
   If incorrect vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the request of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation. After 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 the 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 recognized by 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 can be 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 invalid.
   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 fault code is stored.
   If the PCM(ECM) status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at PCM(ECM).

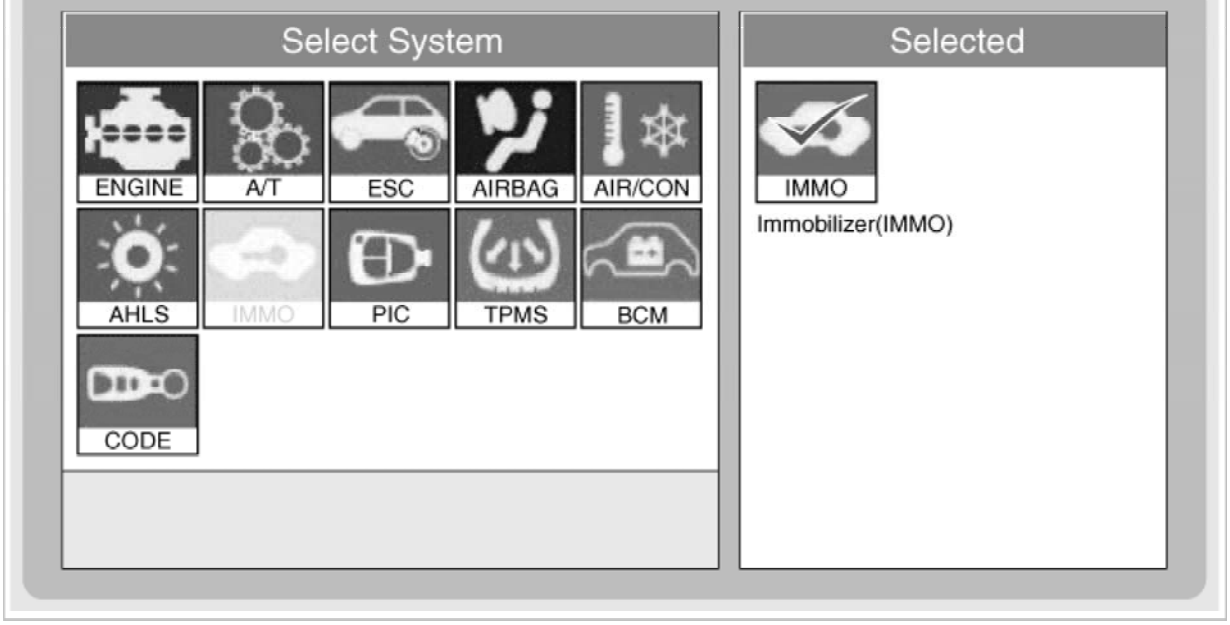
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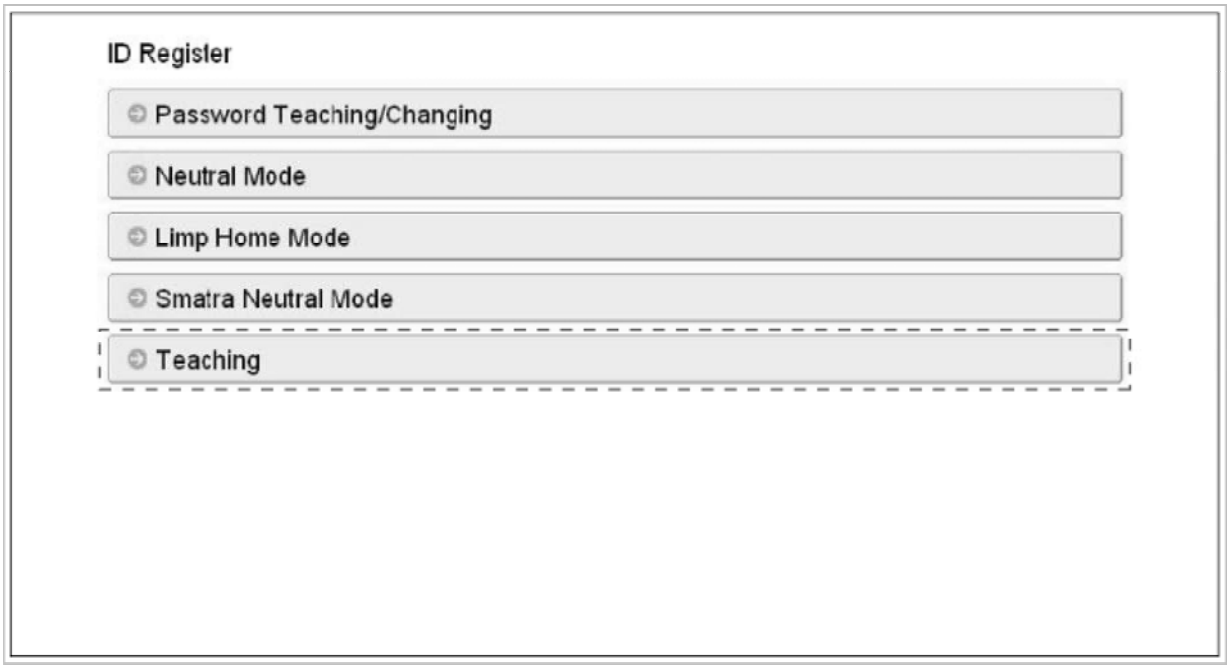
When teaching the 1st key, Smartra regists at the same time.



(1) PCM(ECM) learnt status.

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Select System
ENGINE
A/T
ESC
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

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[Teaching]

Status : NEUTRAL

Input PIN code and press [OK] button.

4 5 5 0 7 2

Ok Cancel

Teaching



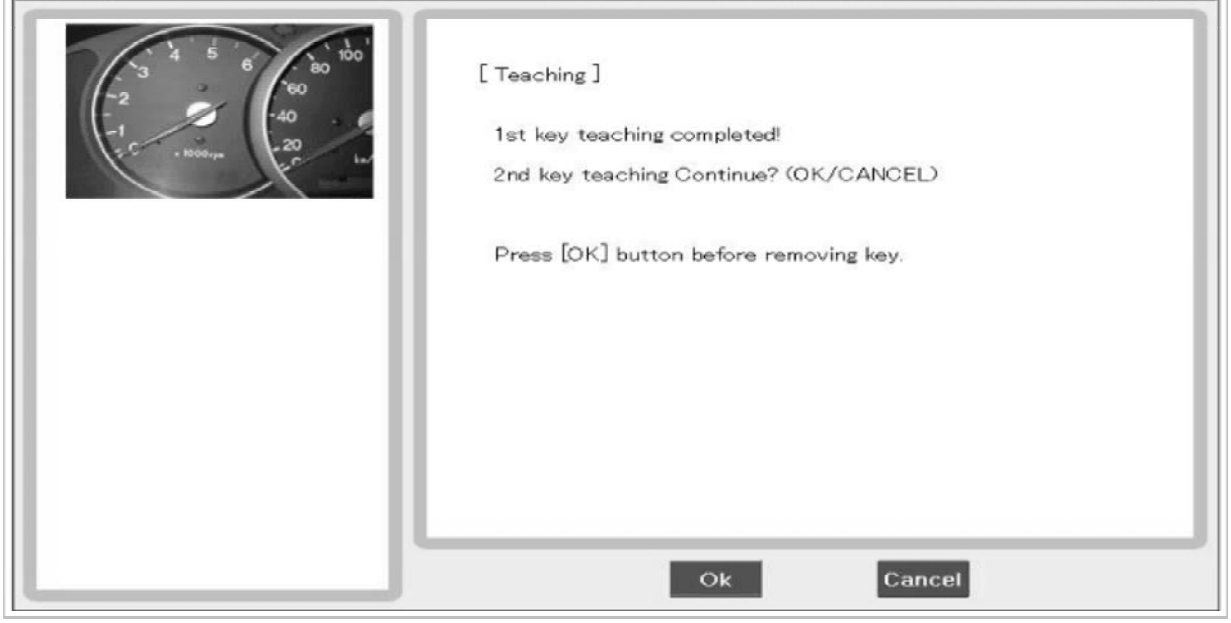
[Teaching]

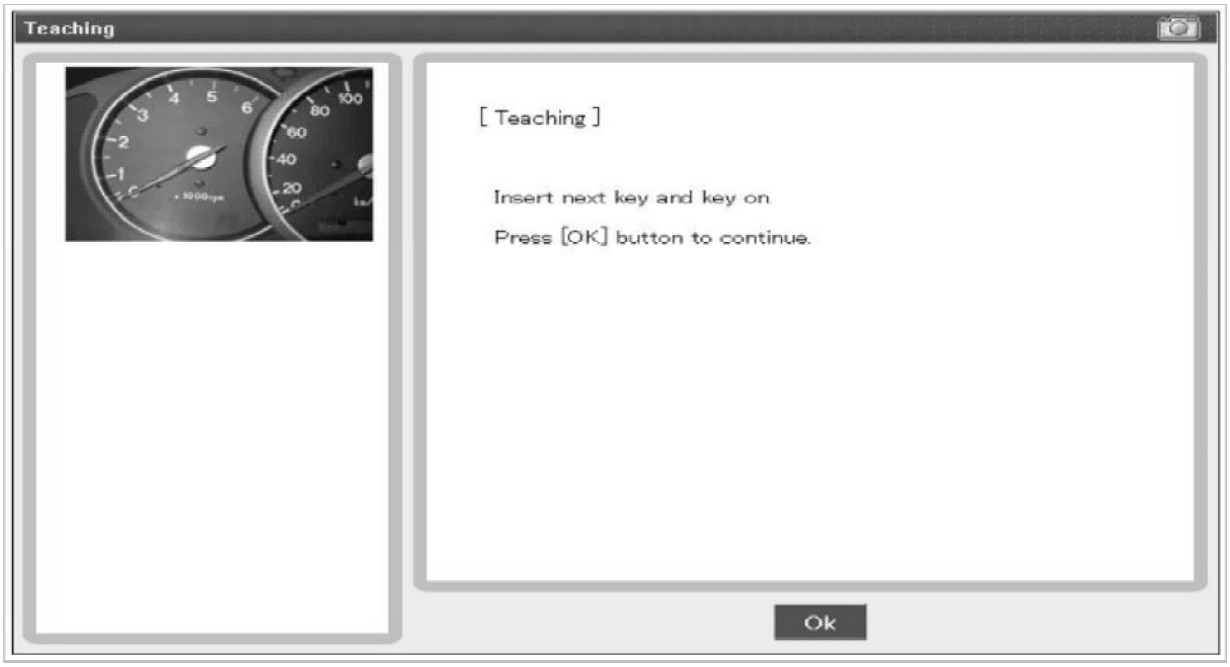
1st key teaching

Continue? (OK/CANCEL)

Ok Cancel

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[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

mcx30.com



[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

mcx30.com



[Teaching]

3rd key teaching completed!

4th key teaching Continue? (OK/CANCEL)

Press [OK] button before removing key.

Ok Cancel

Teaching



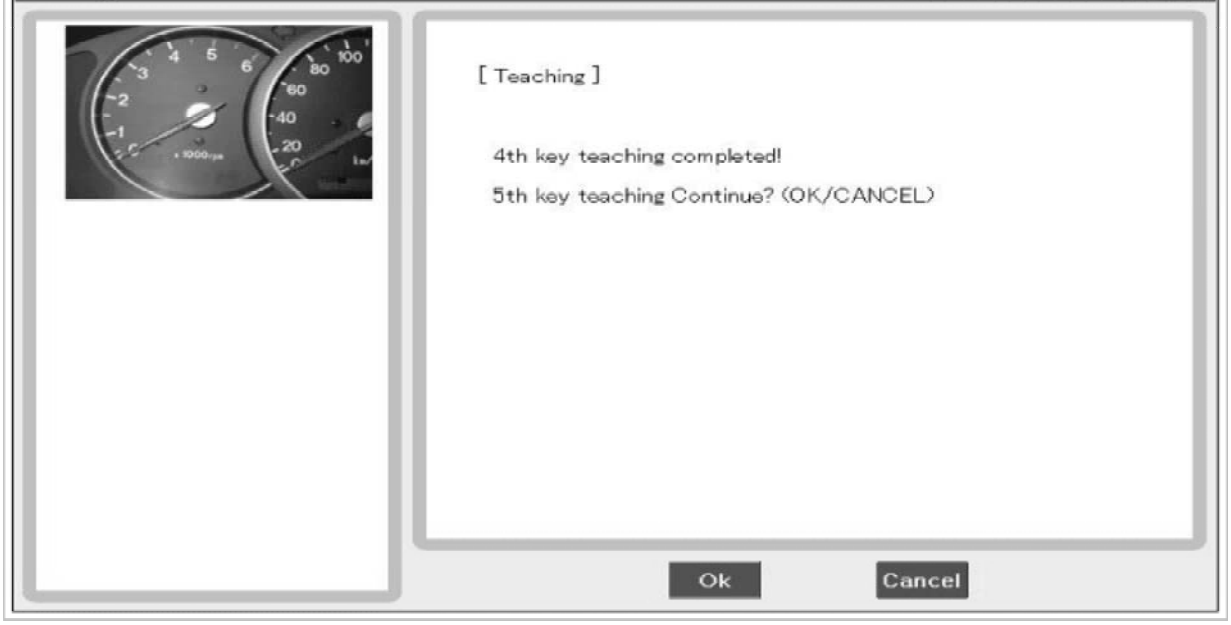
[Teaching]

Insert next key and key on.

Press [OK] button to continue.

Ok

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(2) PCM(ECM) virgin status.
After replacing new "PCM(ECM)" scan tool displays that PCM(ECM) is virgin status in Key Teaching mode.
"VIRGIN" status means that PCM(ECM) has not matched any PIN code before.

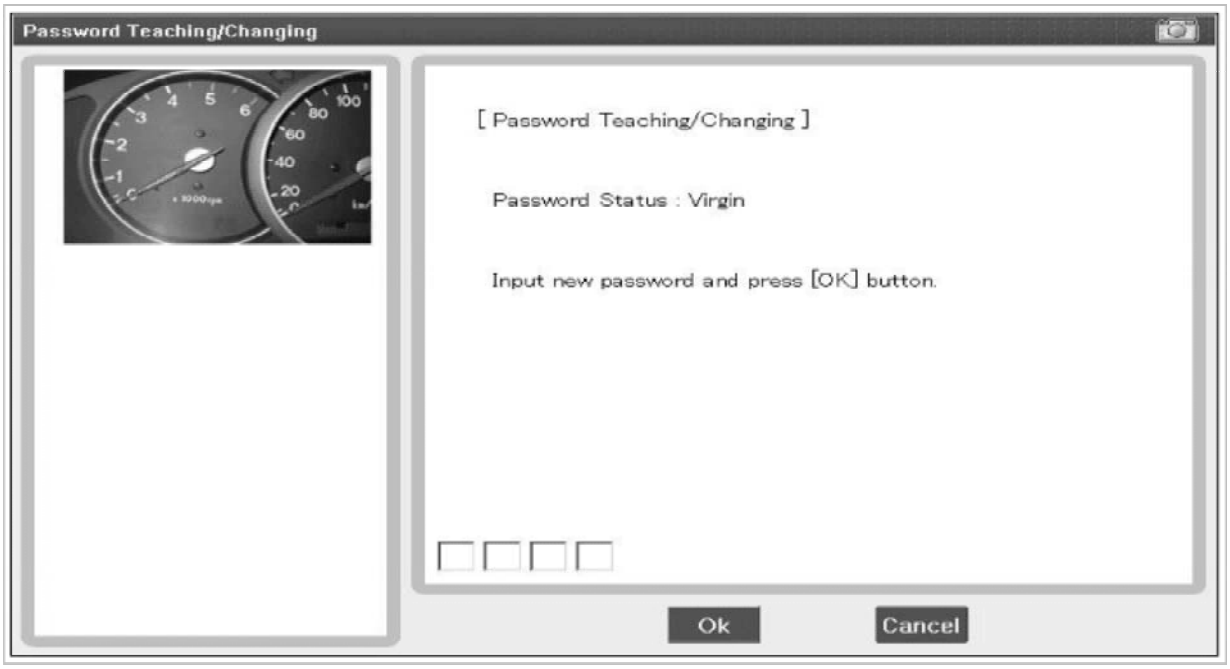
Password Teaching/changing

1. 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 with four digits.
   The user password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to an 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 tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the PCM(ECM) requests the new user password. The status remains "learnt" and the new user password will be valid for the next limp home mode.
   If wrong user passwords or wrong vehicle specific data have been sent to the PCM(ECM) three times continuously or intermittently, the PCM(ECM) will reject the request to change the password for one hour. This time cannot be reduced by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hour.
2. User password teaching

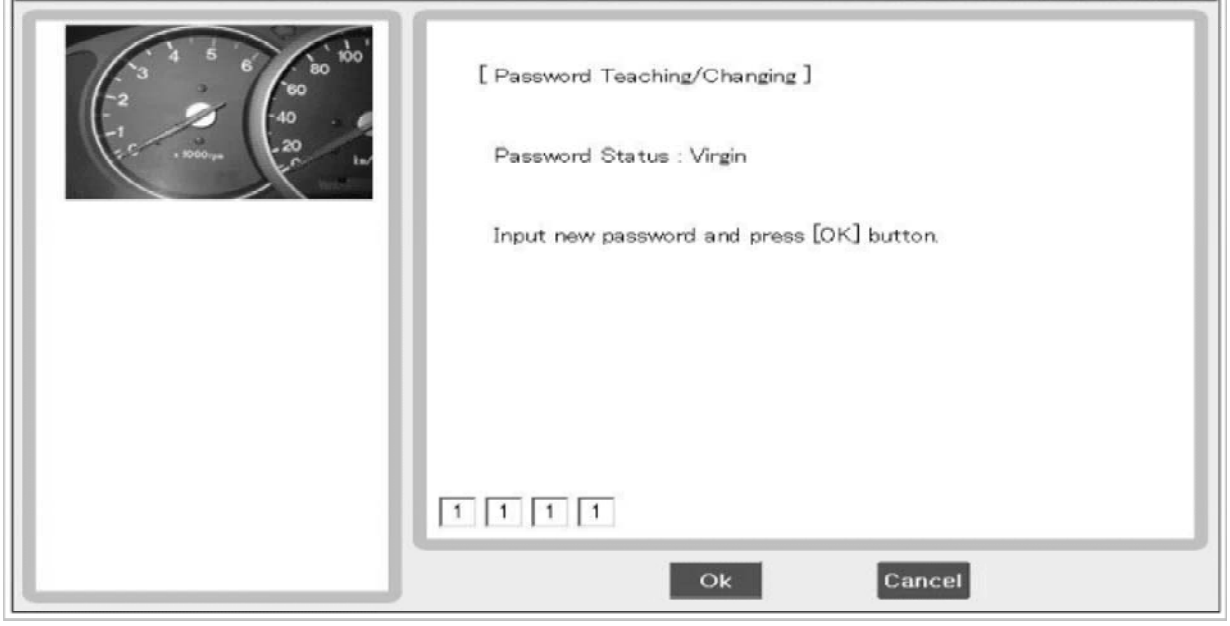
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ID Register

- Password Teaching/Changing
- Neutral Mode
- Limp Home Mode
- Smatra Neutral Mode
- Teaching

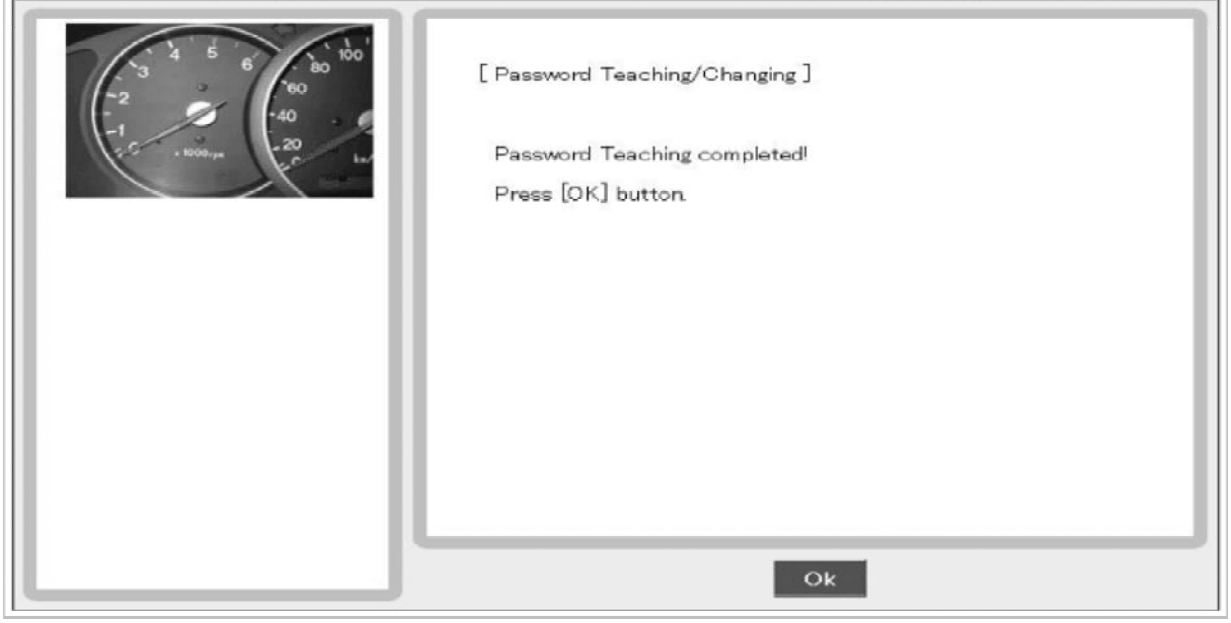


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[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button.
1 1 1 1
Ok
Cancel

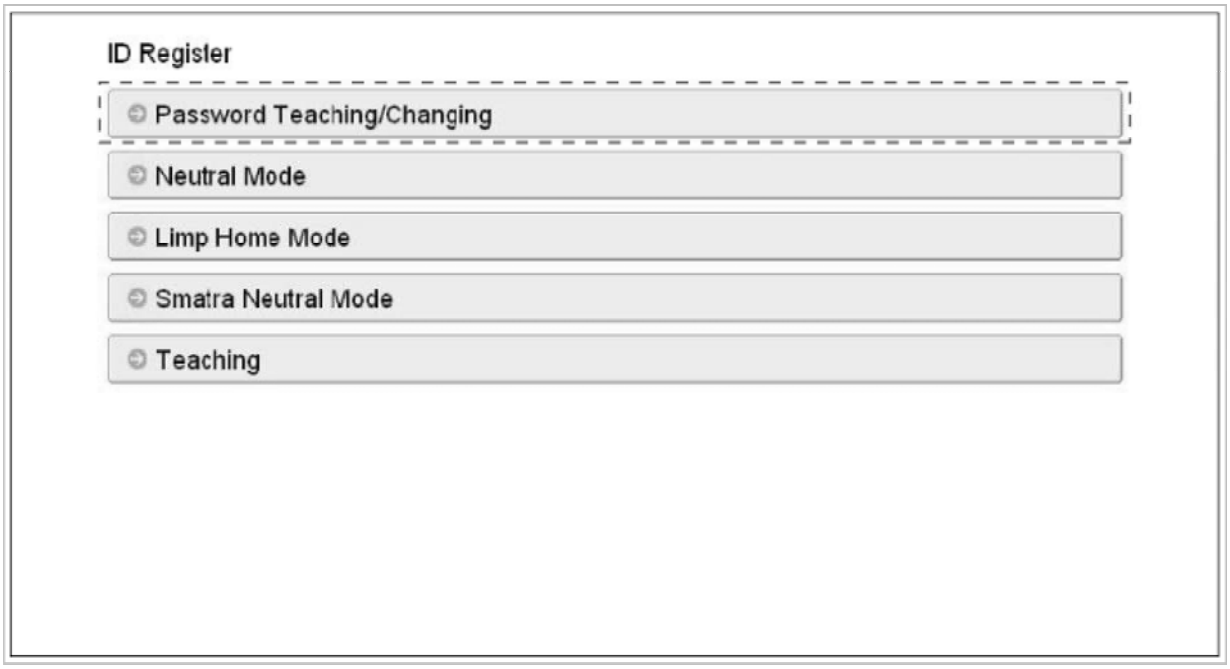

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Are you sure? (Ok/Cancel)
[Condition : IG. On, ENG. Off]
Ok
Cancel

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※ In case of putting wrong password, retry from first step after 10 seconds.

3. User password changing



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[Password Teaching/Changing]

Password Status : Learnt

Input old password and press [OK] button.

[ ][ ][ ][ ]

Ok Cancel

Password Teaching/Changing



[Password Teaching/Changing]

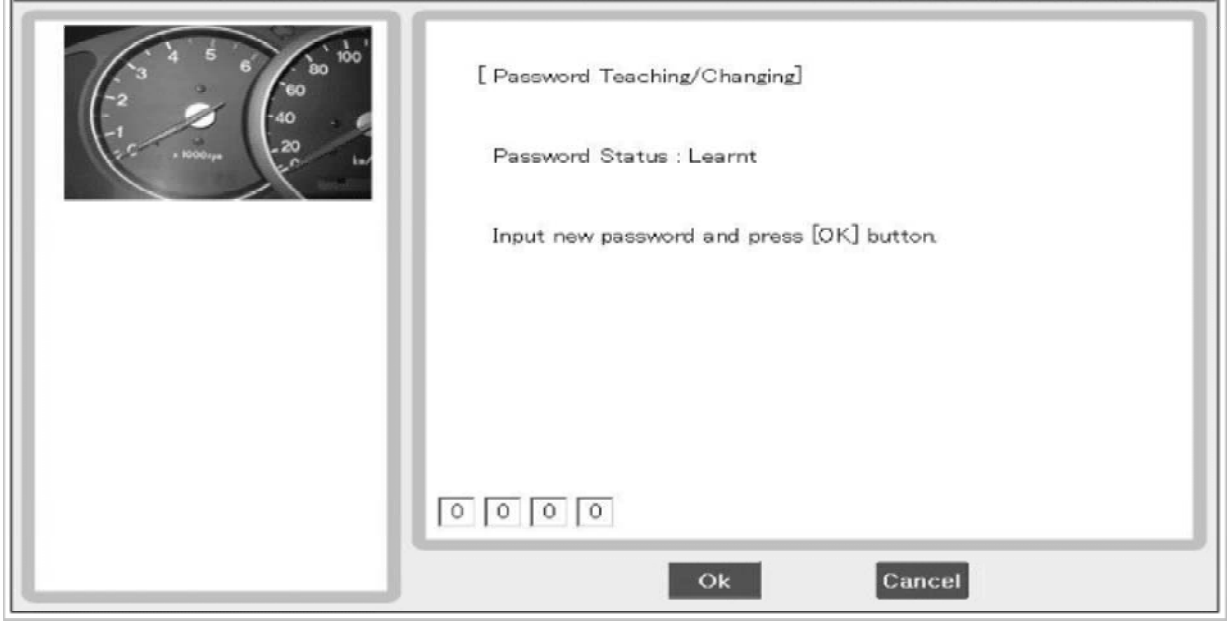
Password Status : Learnt

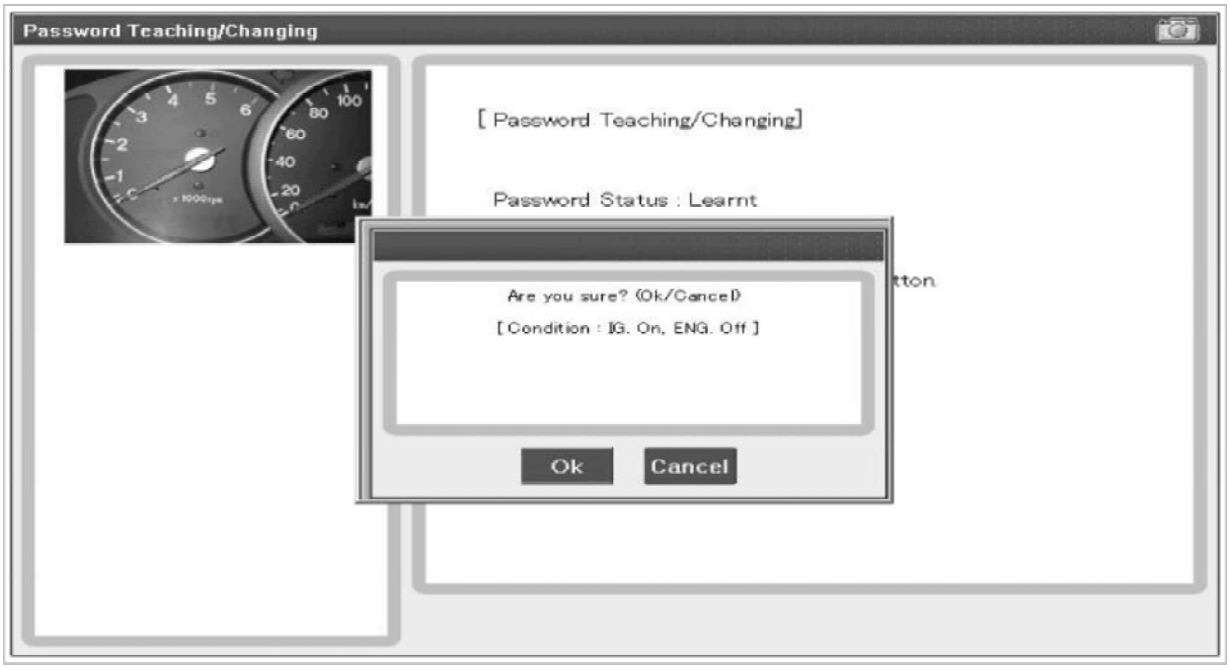
Input old password and press [OK] button.

[1][1][1][1]

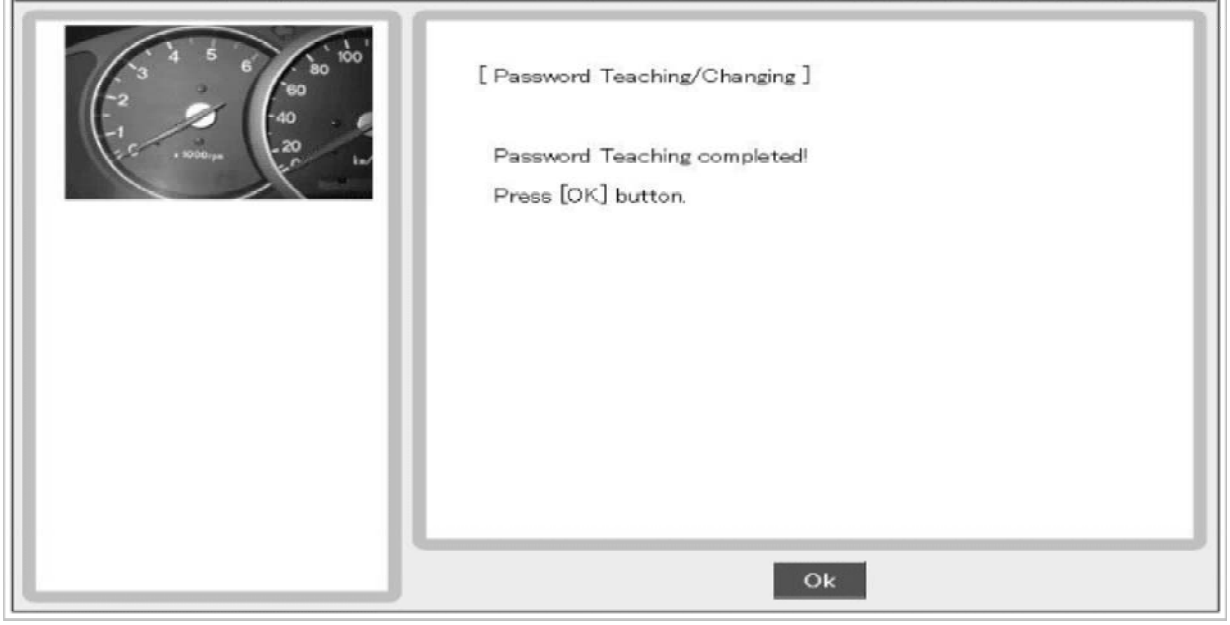
Ok Cancel

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[Password Teaching/Changing]
Password Status : Learnt
Input new password and press [OK] button
0 0 0 0
Ok
Cancel

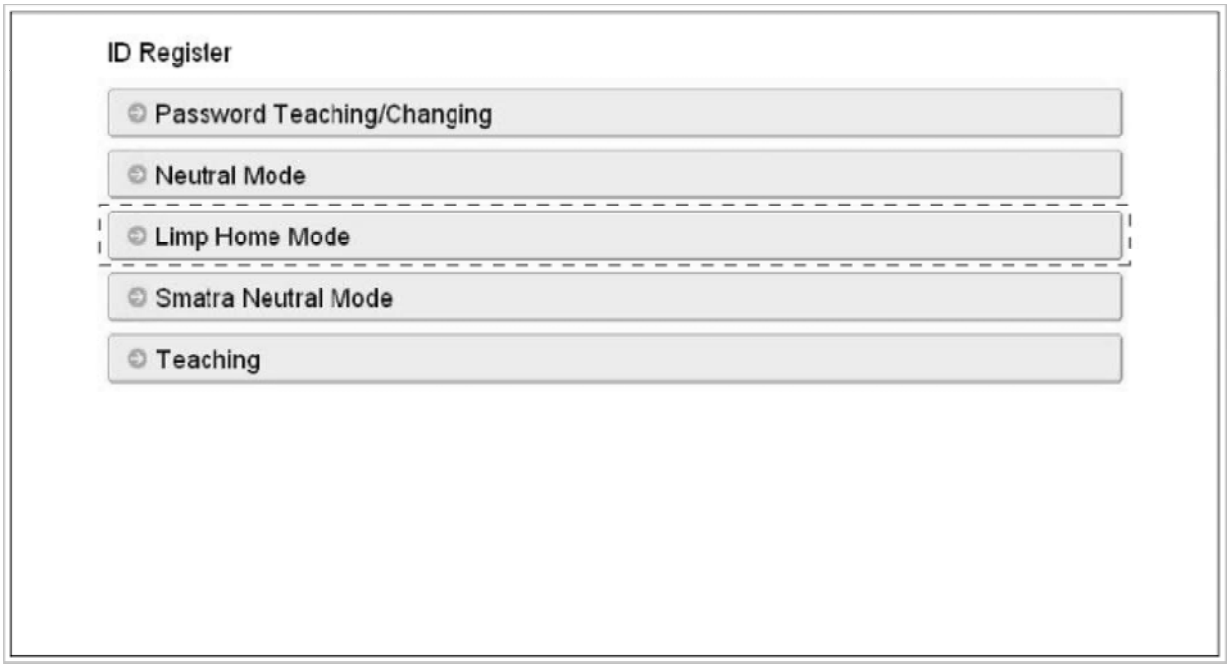

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Learnt
Are you sure? (Ok/Cancel)
[Condition : IG. On, ENG. Off]
Ok
Cancel

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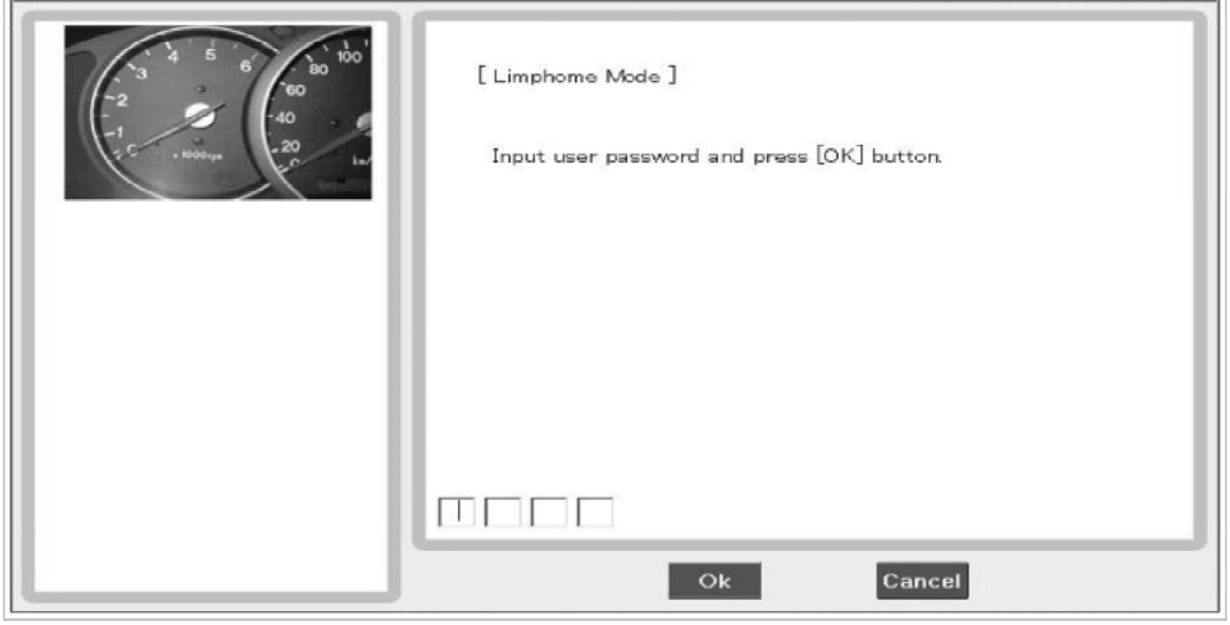


Limp Home Function

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 station.
   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 correct, 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. Disconnecting 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.

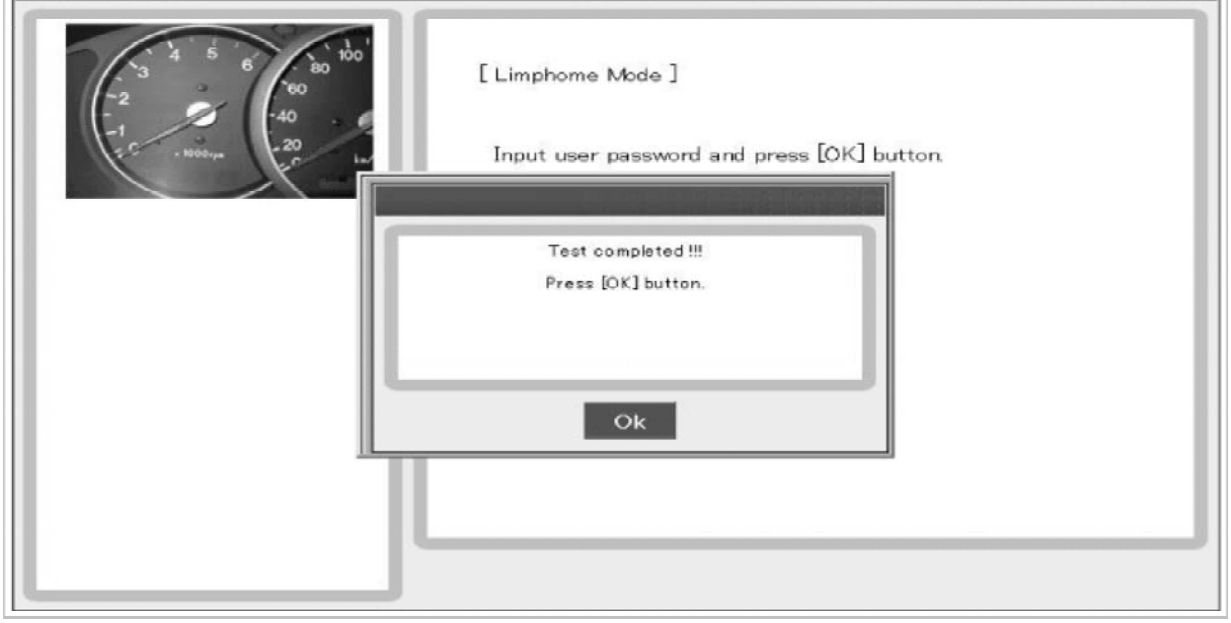


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[Limphome Mode]
Input user password and press [OK] button.
Ok
Cancel

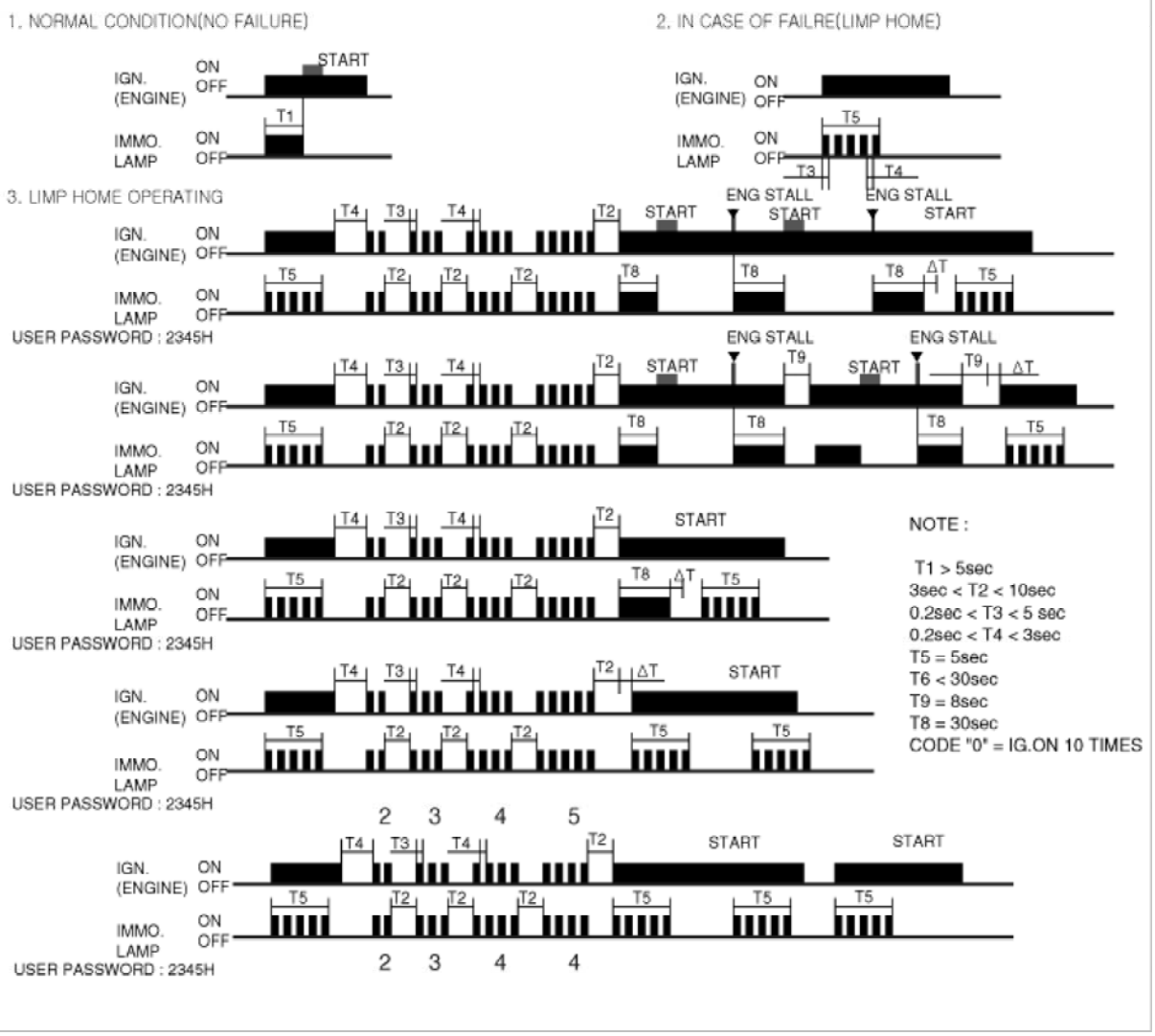

Limp Home Mode
[Limphome Mode]
Input user password and press [OK] button.
0 0 0 0
Ok
Cancel

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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.

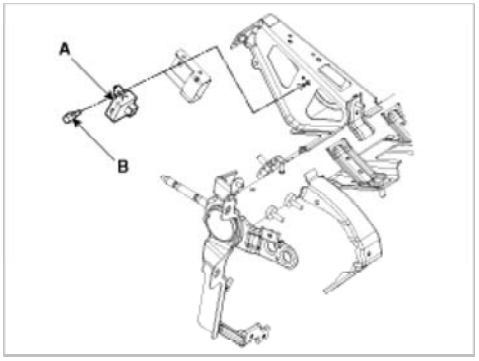
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Body Electrical System > Immobilizer System > Immobilizer Control Unit > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
3. Remove the steering column assembly.
   (Refer to the ST group - "steering column & shaft")
4. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) after loosening a shear bolt (B).



NOTE

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Installation

1. Install the immobilizer control unit after connecting the unit connector.
2. Install the steering column assembly.

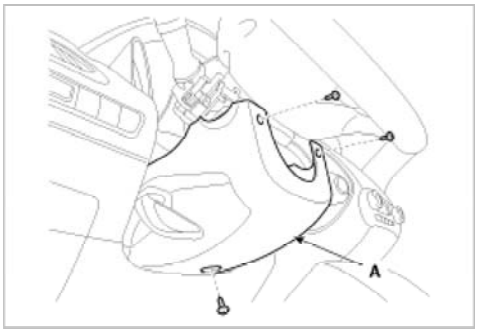
> NOTE
>
> Do not reuse the shear bolt.
> When install the new shear bolt to the immobilizer unit, tighten the shear bolt until its head is cut off.

3. Install the crash pad lower panel.

Body Electrical System > Immobilizer System > Antenna Coil > Repair procedures

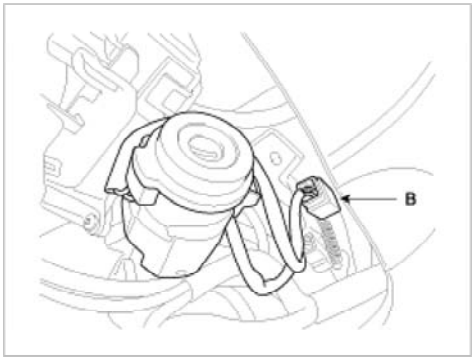
Removal

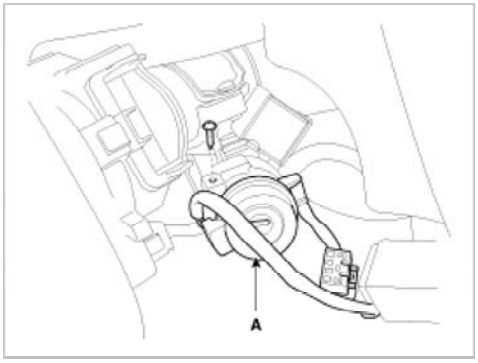
1. Disconnect the negative (-) battery terminal.
2. Remove the steering column upper and lower shrouds (A).



> NOTE
>
> Take care not to damage and scratch the shrouds and its related parts.
> Take care not to damage the hook when removing the upper and lower shrouds.

3. Disconnect the 6P connector (B) of the coil antenna and then remove the coil antenna (A) after loosening the screw.





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1. Install the coil antenna and connect the 6P connector.
2. Install the steering column upper and lower shrouds.

Body Electrical System > Immobilizer System > Troubleshooting

Diagnosis Of Immobilizer Faults

- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.
- Data (stored in the ECM related to the immobilizer function.

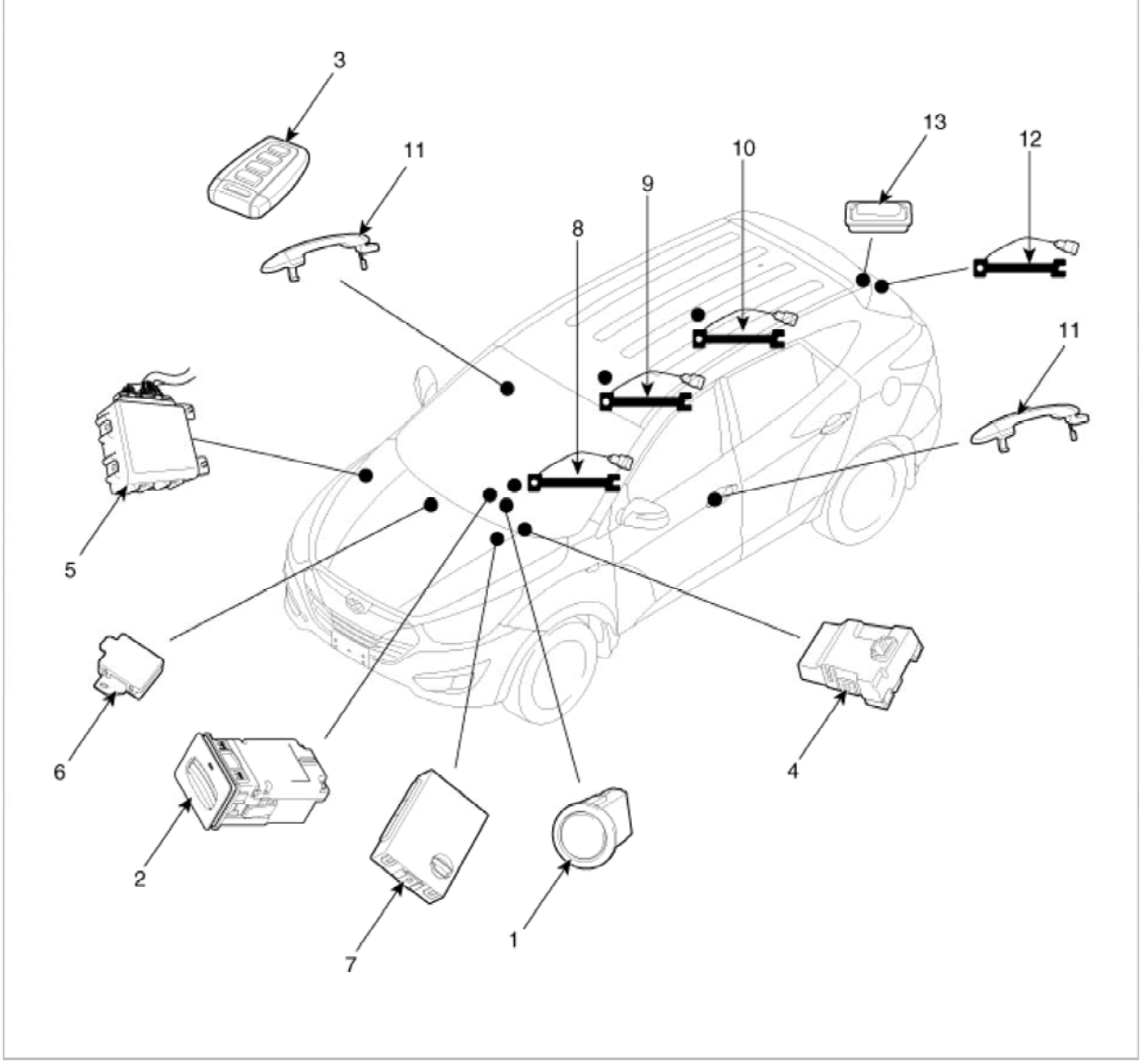
The following table shows the assignment of immobilizer related faults to each type:

Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1. Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1. Transponder not in password mode 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Transponder programming error	P1675 (Transponder programming error)
SMARTRA fault	1. Invalid message from SMARTRA to PCM(ECM)	P1676 (SMARTRA message error)
SMARTRA fault	1. Virgin SMARTRA at learnt EMS 2. Neutral SMARTRA at learnt EMS 3. Incorrect the Authentication of EMS and SMARTRA 4. Locking of SMARTRA	P169A (SMARTRA Authentication fail)
SMARTRA fault	1. No response from SMARTRA 2. Antenna coil error 3. Communication line error (Open/Short etc.) 4. Invalid message from SMARTRA to PCM(ECM)	P1690 (SMARTRA no response)
Antenna coil fault	1. Antenna coil open/short circuit	P1691 (Antenna coil error)
Immobilizer indicator lamp fault	1. Immobilizer indicator lamp error (Cluster)	P1692 (Immobilizer lamp error)
Transponder key fault	1. Corrupted data from transponder 2. More than one transponder in the magnetic field (Antenna coil) 3. No transponder (Key without transponder) in the magnetic field (Antenna coil)	P1693 (Transponder no response error/invalid response)
PCM(ECM) fault	1. Request from PCM(ECM) is invalid (Protocol layer violation- Invalid request, check sum error etc.)	P1694 (PCM(ECM) message error)
PCM(ECM) internal permanent memory (EEPROM) fault	1. PCM(ECM) internal permanent memory (EEPROM) fault 2. Invalid write operation to permanent memory (EEPROM)	P1695 (PCM(ECM) memory error)
Invalid key fault	1. Virgin transponder at PCM(ECM) status "Learnt" Learnt (Invalid) Transponder at PCM(ECM) status "Learnt"(Authentication fail)	P1696 (Authentication fail)
Hi-Scan fault	1. Hi-Scan message error	P1697
Locked by timer	1. Exceeding the maximum limit of Twice IGN ON (≥ 32 times)	P1699 (Twice IG ON over trial)

Body Electrical System > Button Engine Start System > Components and Components Location

Component Location

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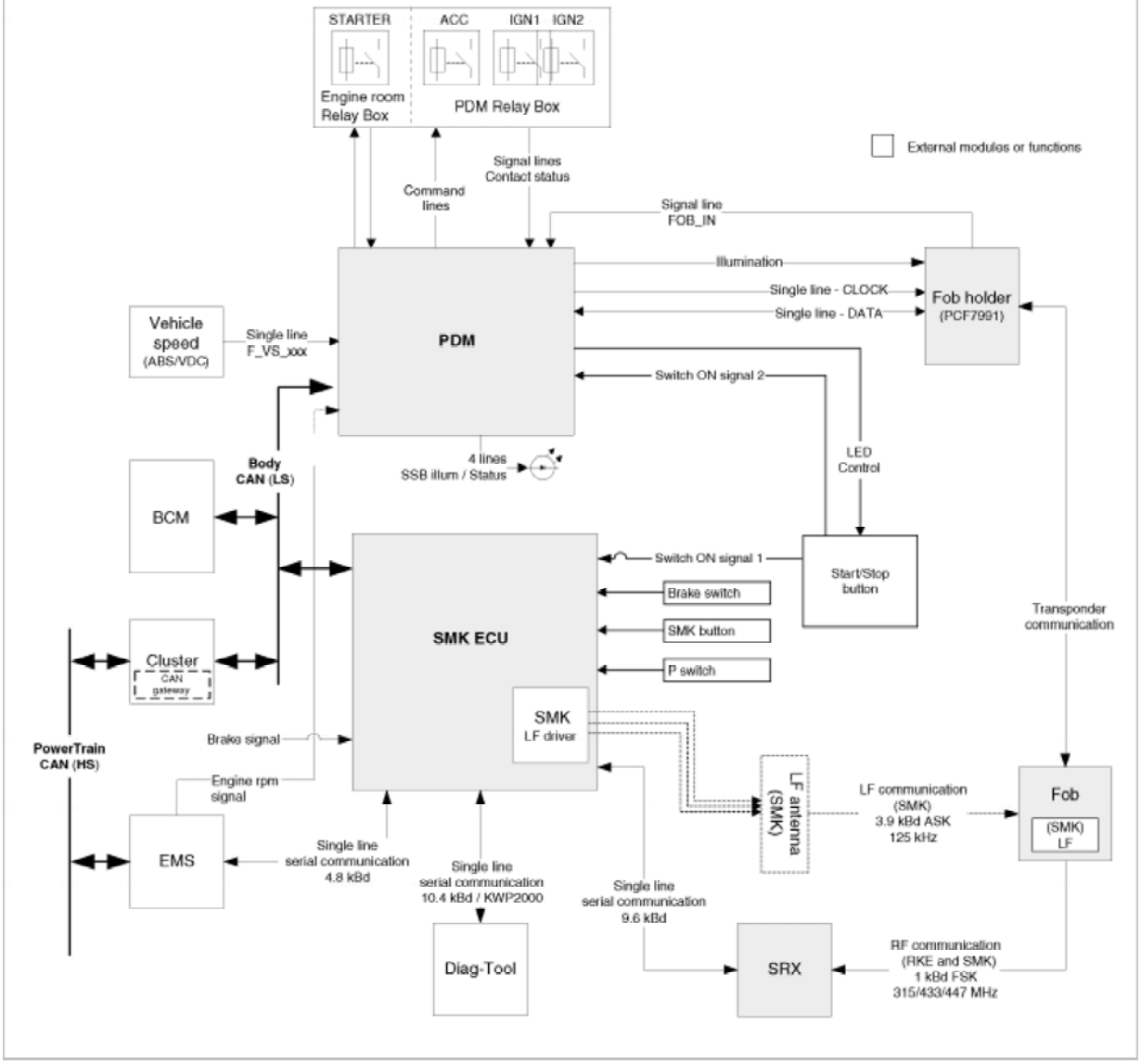


1. Start Stop Button (SSB)	8. Interior antenna 1
2. FOB key holder	9. Interior antenna 2
3. FOB key	10. Interior antenna 3
4. PDM (Power Distribution Module)	11. Door handle & door antenna
5. Smart key unit	12. Bumper antenna
6. RF receiver	13. Tailgate switch
7. BCM (Body Control Module)	

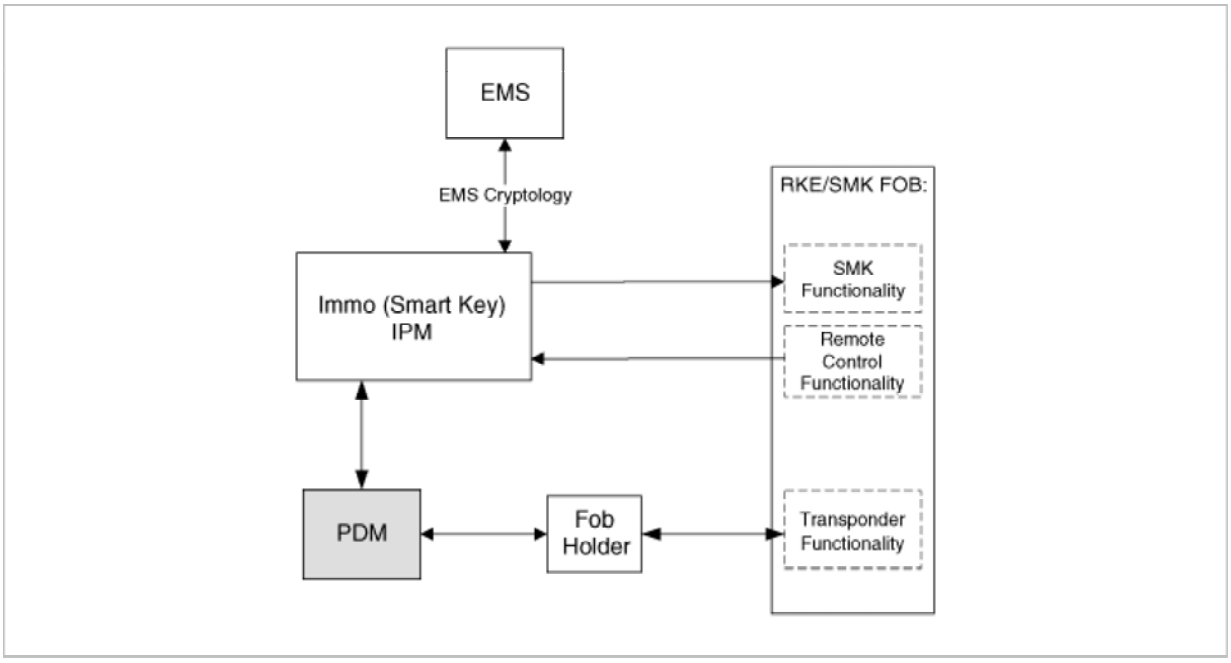
Body Electrical System > Button Engine Start System > Schematic Diagrams

Circuit Diagram (1)

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Circuit Diagram (2)



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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 .

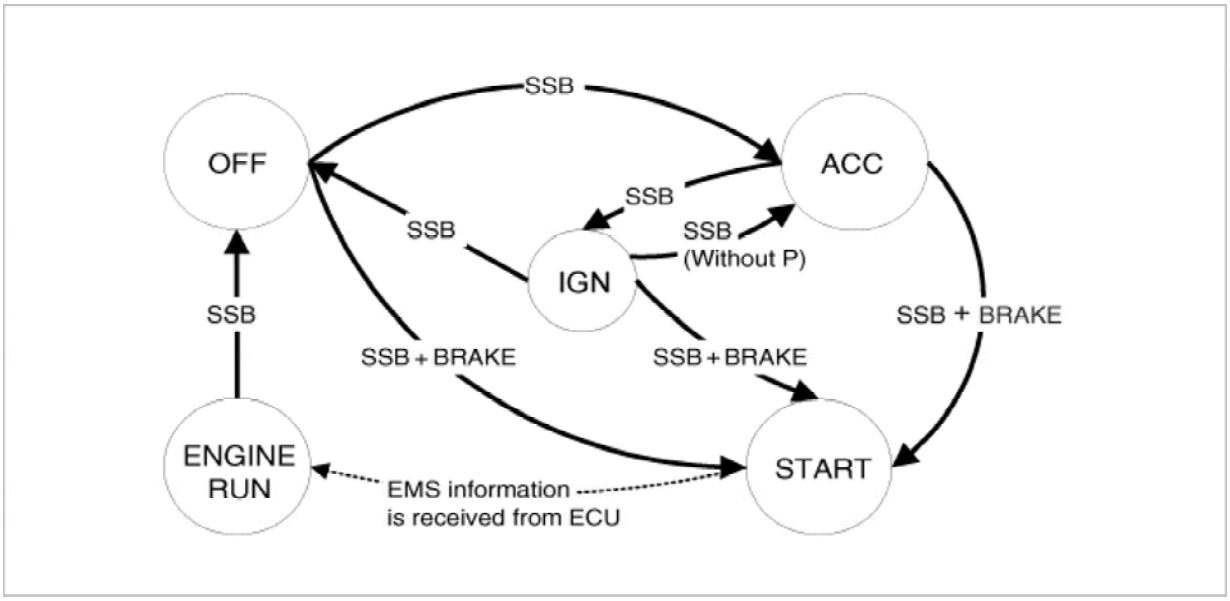
The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in separated system.

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 and PDM.
- Display status by LED Lamp ON/OFF. (Amber or Green)

Indicator ON/OFF Condition At Ignition Key Off Condition

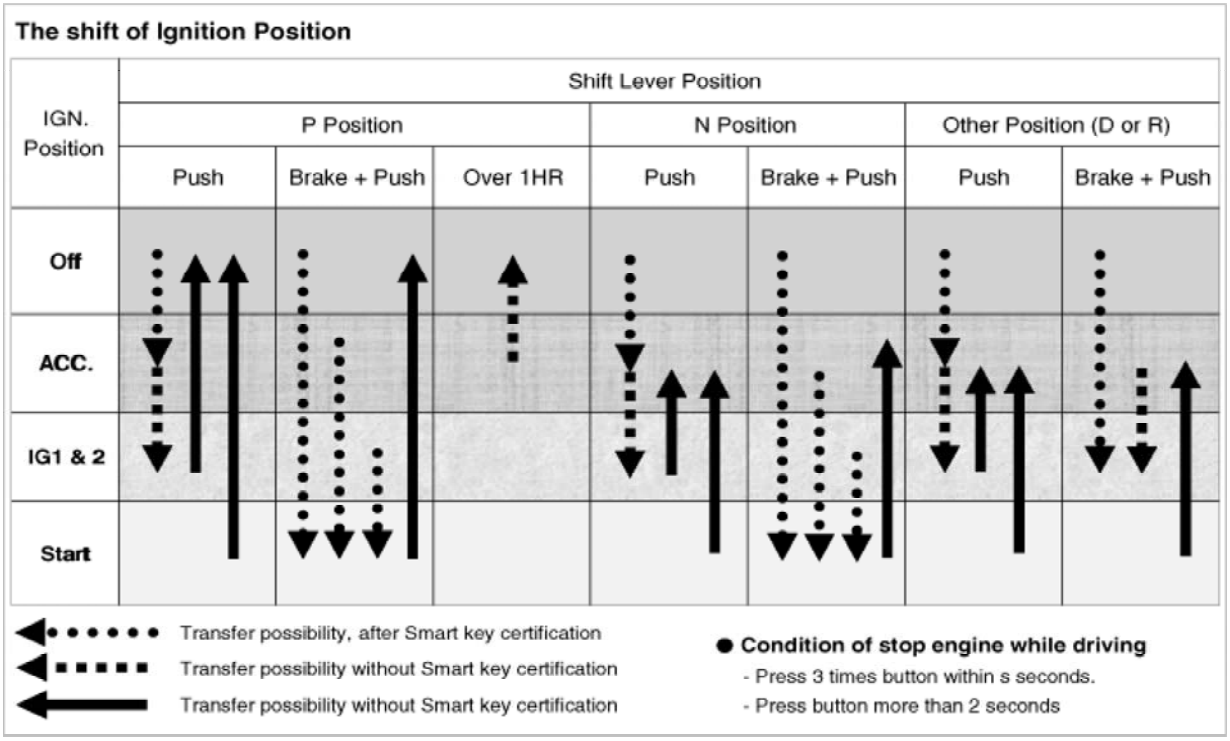
No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF

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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	LED OFF
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



Wireless Communication

Electromagnetic waves are used to exchange information between the vehicle and the FOB. Two types of RKE Key can supplement the BES system:

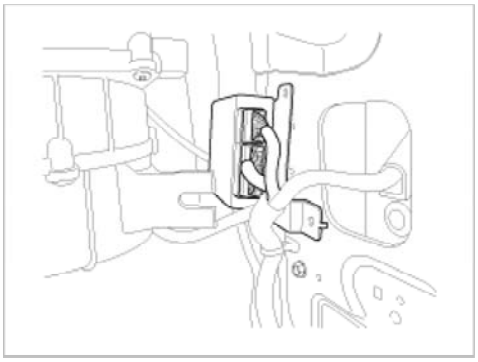
- Non-PIC RKE
- SMART KEY FOB

Currently the BES system comprises with SMART KEY FOB always.

The transmitter, receiver and antennas required for the communication between the fob and the vehicle will differ depending on functionalities and regional areas.

The RKE and SMART KEY functions are in separated documents. Refer to Smart key system for more detailed information about SMART KEY function.

Smart Key

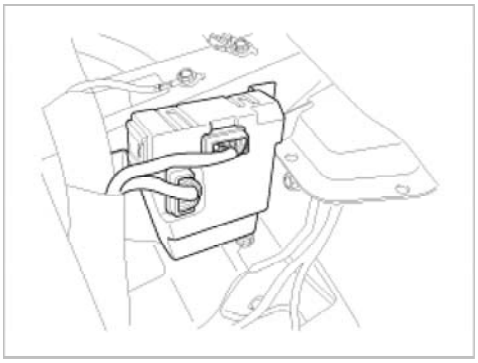


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- "Start Stop Button (SSB) monitoring",
- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication),
- "System 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.

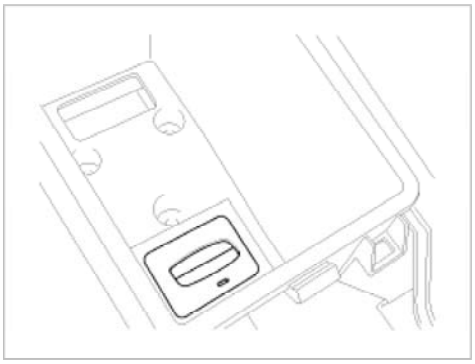
PDM (Power Distribution Module)



The PDM 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 PDM 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 PDM.
The PDM 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 PDM 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 PDM is diagnosed through theSMK MUT service, using the CAN network.
The main functions of the PDM are:

- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/VDC ECU.
- Control of SSB LEDs (illumination, clamp state) and FOB HOLDER illumination.
- Control of the base station located in fob holder 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

Fob Holder

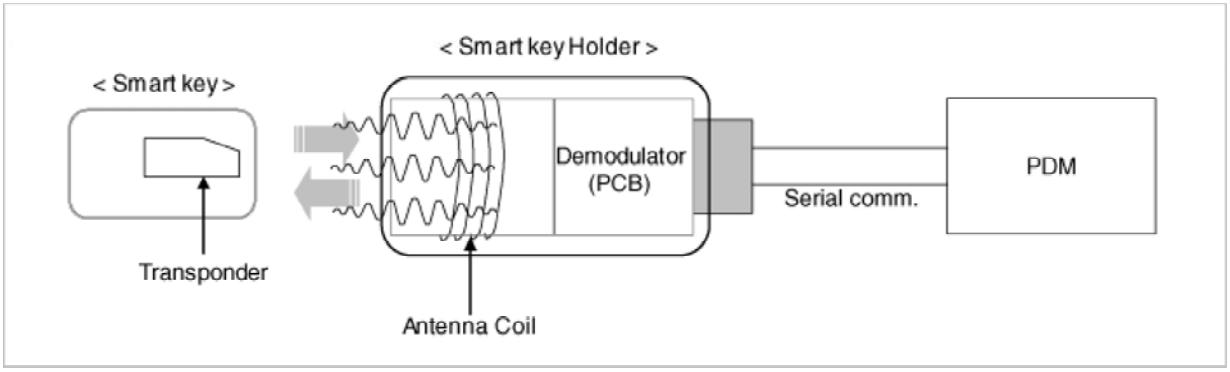


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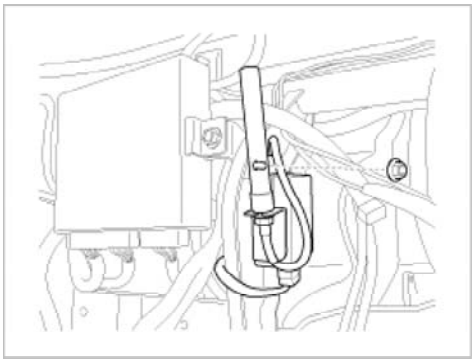
The Fob holder module integrates a slot where to insert the fob. The fob is maintained in position with a push-push mechanical locking (not electrically driven) and a signal (FOB IN) is sent back to the PDM as soon as its insertion is detected.
The power supply of the fob holder is active only if a communication is initiated by the PDM.
The insertion of the fob into the holder and the communication with the transponder should be possible regardless of the insertion direction of fob to the holder (buttons facing up or bottom).
A lighting device is also integrated for illumination of the Fob Holder and it is driven directly by the PDM,
The main functions of the Fob holder are:

- Transponder base station
- Fob mechanical lock
- Illumination

Transponder



External Receiver(SRX)



The data transmitted by the RKE or Smart key Fob is received by an external RF receiver called as SRX. This receiver will be same as that one for the SMK applications, with respect to electronics, housing, connector and software.
This receiver is connected to the SMK via a serial communication line.

Terminal And Starter Relays

Relays will be used to switch the terminals ACC / IGN1 / IGN2. Those normally-open relays will be driven by the PDM and located either in the passenger or engine compartment depending on the vehicle architecture.
Only one relay coil is connected to the terminal outputs of the PDM.
Those relays should integrate a resistor connected in parallel to the coil in order to reduce the transients during commutation.

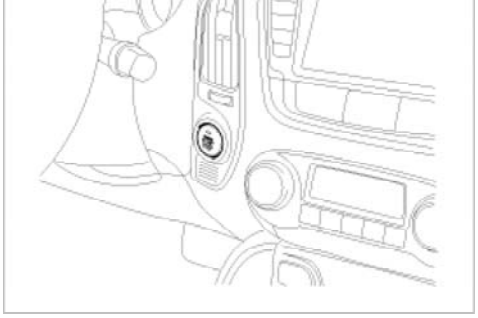
Start/Stop Button (SSB)

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.
Two (2) LED colors are located in the center of the button to display of the status of the system. Another illumination LED is also integrated into the SSB for the lighting of the "Engine Start/Stop" characters.

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Bes 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 :

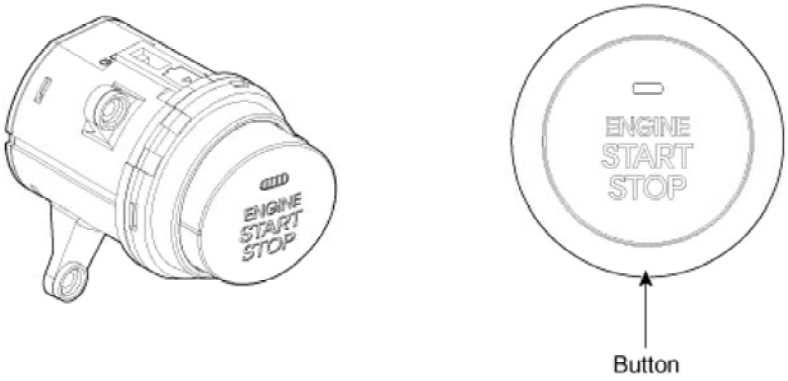
System State	Terminal Status	Engine status
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation see Chap 6.2.1 for details	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running
		(means "self-running")

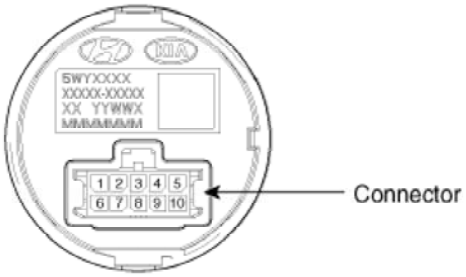
Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch. The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

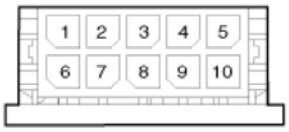
Body Electrical System > Button Engine Start System > Start/Stop Button > Components and Components Location

Component

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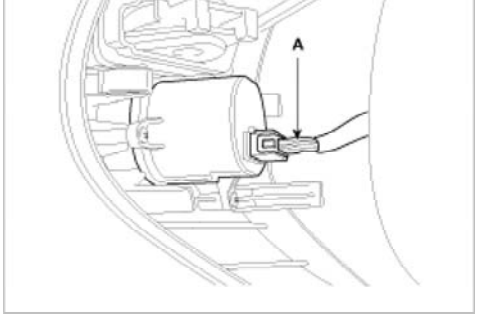
Connector (10 pins)			
Pin No.	Description	Pin No.	Description
1	Start Stop button switch1(PDM)	6	Battery
2	Battery illumination	7	Start Stop button switch2 (SMK)
3	Start Stop button LED (PDM)	8	Start Stop button LED (PDM)
4	PDM Driver P start stop button illumination	9	Rheostat
5	Start stop button illumination power (PDM)	10	-

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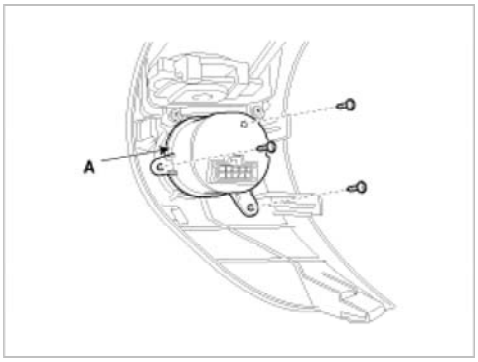
Body Electrical System > Button Engine Start System > Start/Stop Button > Repair procedures

Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the left air vent.
   (Refer to the BD group - "Crash pad")
3. Disconnect the connector (A).



4. Remove the start/stop button (A) after loosening the mounting screws.



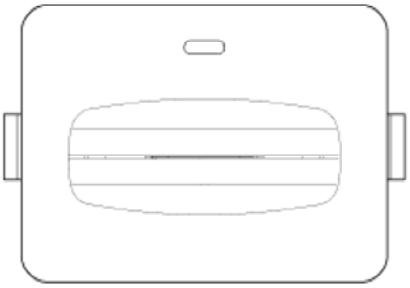
Installation

1. Install the start/stop button.
2. Install the left air vent.

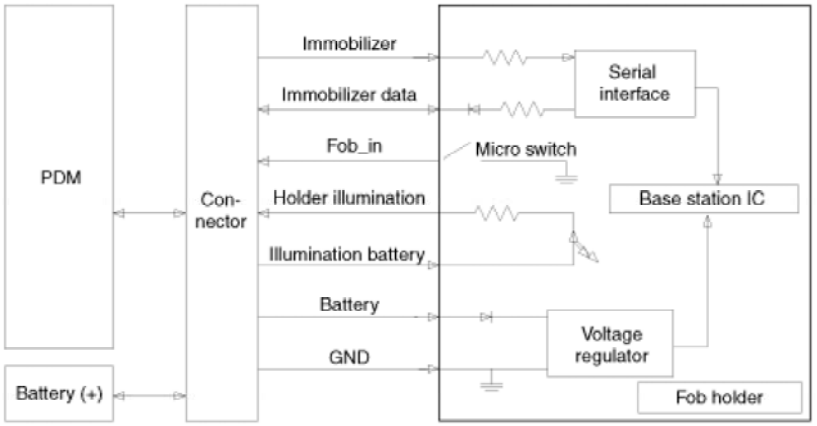
Body Electrical System > Button Engine Start System > Fob Holder > Components and Components Location

Component

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Connector (10 pins)			
Pin No.	Description	Pin No.	Description
1	-	6	Battery
2	Immobilizer clock	7	Immobilizer data
3	Holder illumination(PDM)	8	Illumination battery
4	-	9	Fob in (PDM)
5	GND	10	-

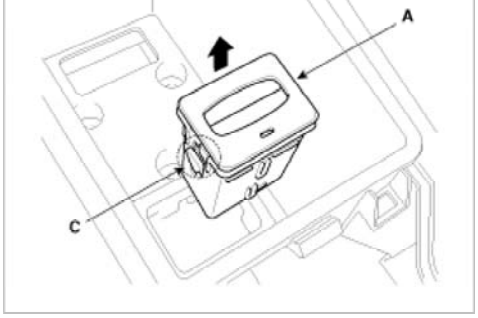


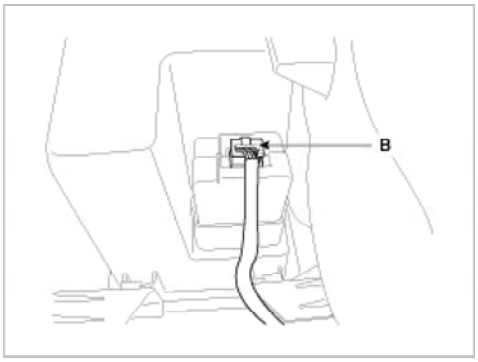
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Body Electrical System > Button Engine Start System > Fob Holder > Repair procedures

Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the floor console.
   (Refer to the BD group - "Console")
3. Disconnect the connector (B), then remove the fob holder assembly (A) after releasing the hook (C).





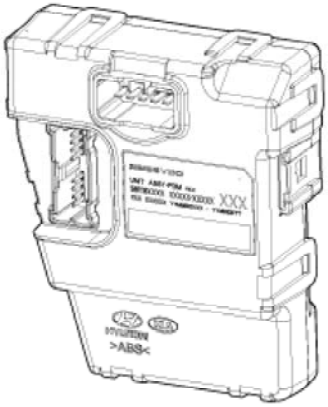
Installation

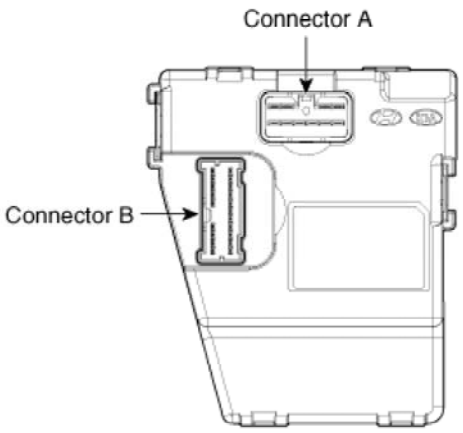
1. Install the fob holder assembly.
2. Install the floor console.
3. Install the negative(-) battery terminal.

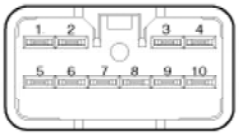
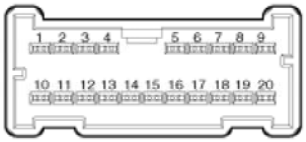
Body Electrical System > Button Engine Start System > PDM(Power Distribution Module) > Components and Components Location

Component

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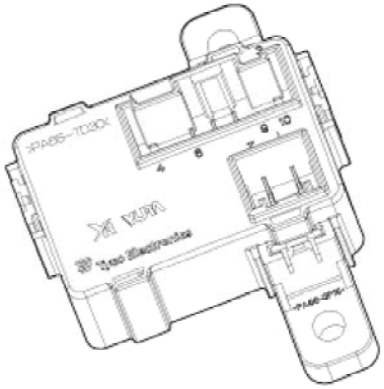


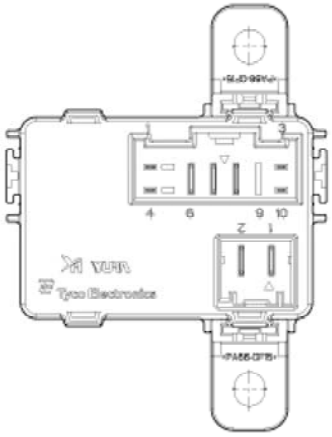


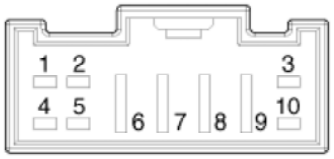
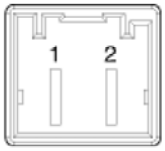
		
Pin No.	Connector A (10 pin)	Connector B (20 pin)
1	Power ground 1	IGN2
2	Power ground 2	Immobilizer clock
3	-	Immobilizer data
4	ESCL battery	ACC
5	ESCL ground	-
6	Starter relay	SSB switch1
7	IGN1 relay	SSB illumination ground
8	IGN2 relay	SSB LED green
9	ACC relay	IGN1
10	Battery load	CAN L
11		CAN H
12		Fob in
13		ESCL unlock
14		Vehicle speed/ ABS
15		Start feedback
16		RPM
17		SSB LED amber
18		SSB illumination power
19		Holder illumination
20		CPU battery

PDM(Power Distribution Module) Relay Box

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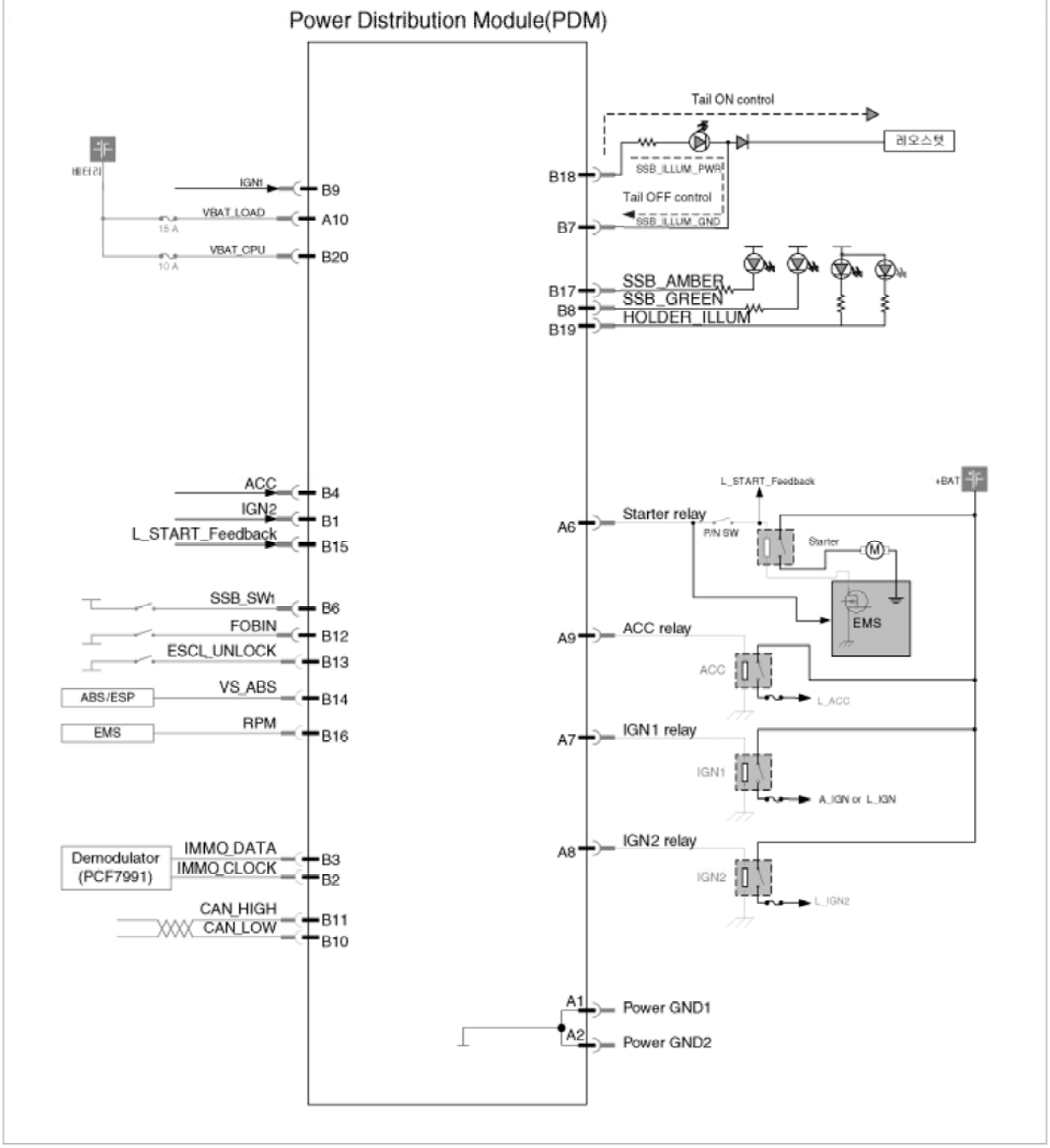


Connector		
Pin No.	Connector A (10 pin)	Connector B (20 pin)
1	PDM	IGN-2
2	-	Battery (IGN-2)
3	Ground	
4	PDM	
5	-	
6	ACC	
7	Battery (IGN-1)	
8	IGN-1	
9	-	
10	PDM	

Body Electrical System > Button Engine Start System > PDM(Power Distribution Module) > Schematic Diagrams

System circuit diagram

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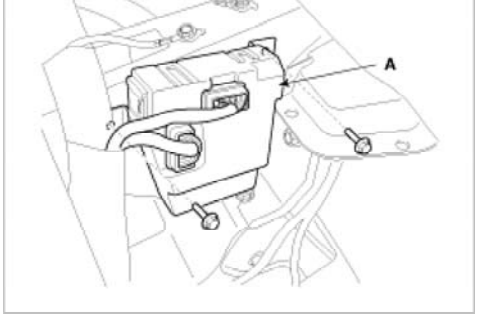
Body Electrical System > Button Engine Start System > PDM(Power Distribution Module) > Repair procedures

Removal

PDM(Power Distribution Module)

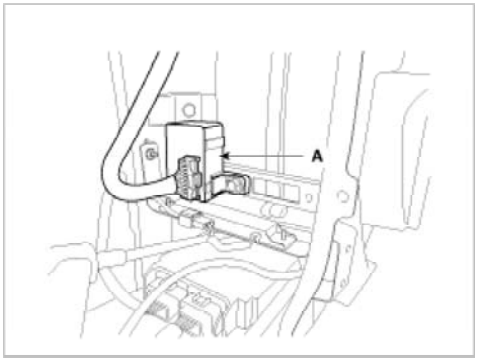
1. Disconnect the negative(-) battery terminal.
2. Remove the main crash pad.
   (Refer to the BD group - "Crash pad")
3. Remove the power distribution module (A) after loosening bolts (2EA).

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PDM(Power Distribution Module) Relay

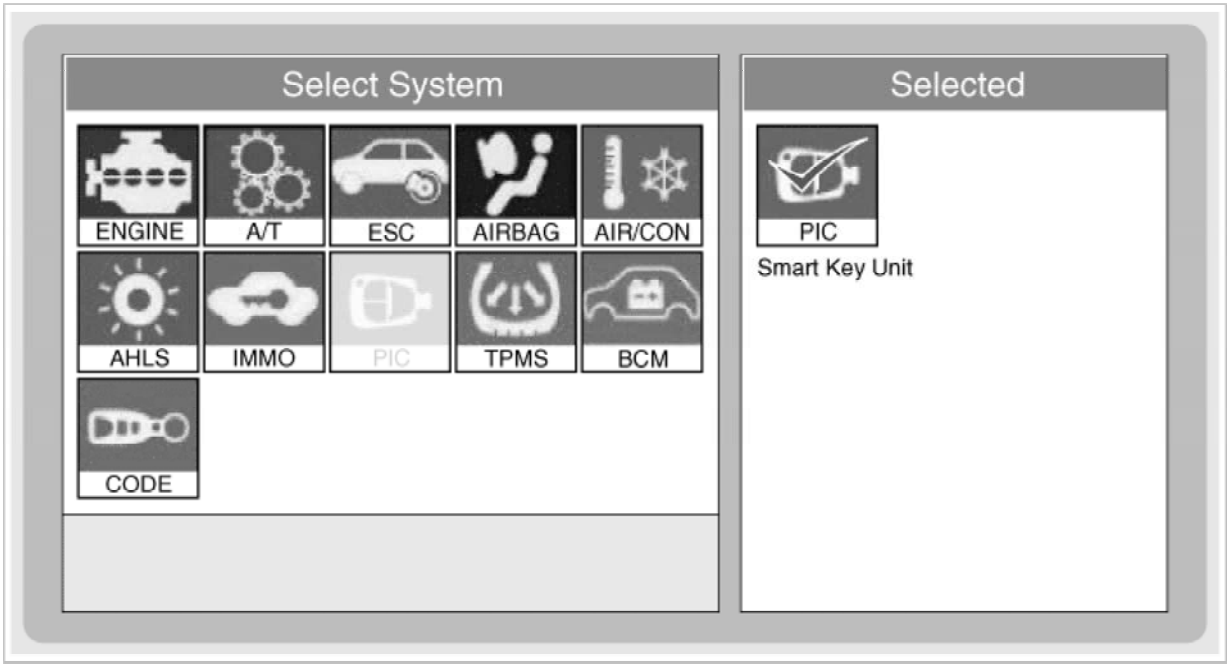
1. Remove the negative(-) battery terminal.
2. Remove the front seat heater switch module.
   (Refer to BE group - "Seat electrical")
3. After removing the bolts (2EA) and connector, remove PDM relay box (A).



Inspection

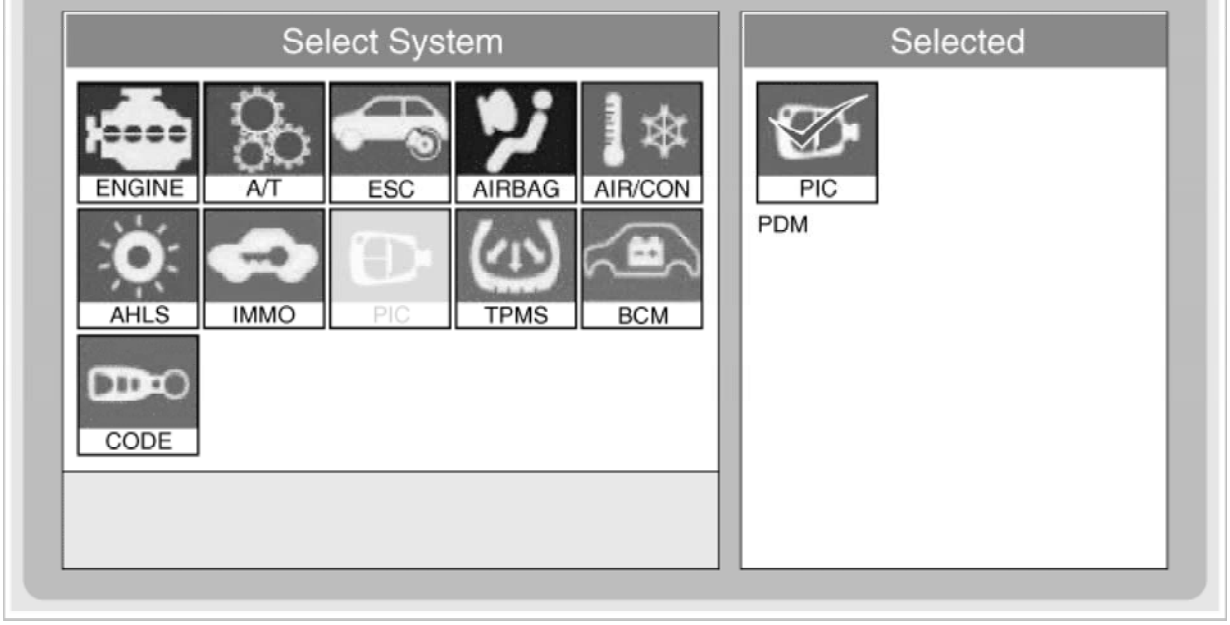
PDM Diagnosis With GDS

1. It will be able to diagnose defects of Smart key with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and "Smart key system(Button start)" menu if you want to check PDM.

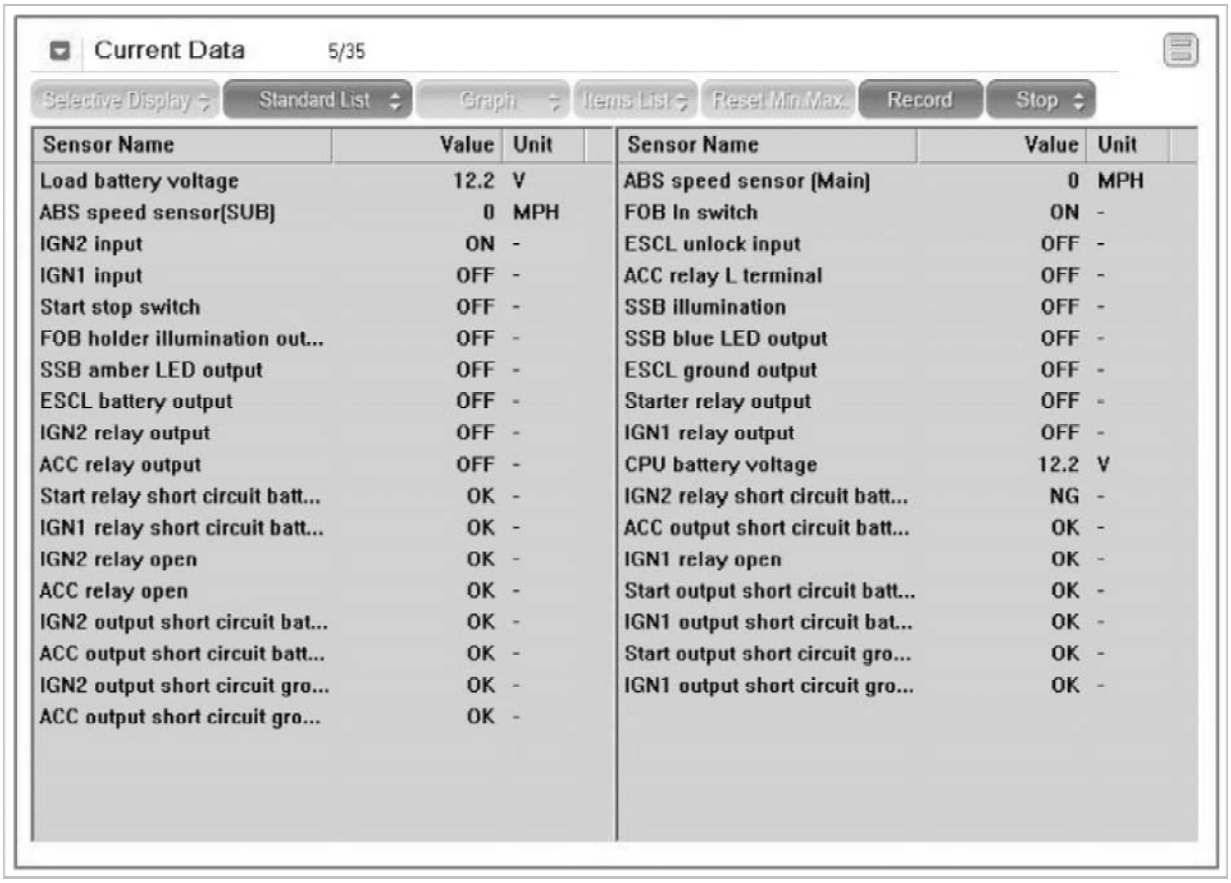


3. Select "PDM" in the manu.

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4. Select "Current Data", if you want to check current data of PDM.
   It provides the input/output status of each module.



Sensor Name	Value	Unit	Sensor Name	Value	Unit
Load battery voltage	12.2	V	ABS speed sensor (Main)	0	MPH
ABS speed sensor(SUB)	0	MPH	FOB In switch	ON	-
IGN2 input	ON	-	ESCL unlock input	OFF	-
IGN1 input	OFF	-	ACC relay L terminal	OFF	-
Start stop switch	OFF	-	SSB illumination	OFF	-
FOB holder illumination out...	OFF	-	SSB blue LED output	OFF	-
SSB amber LED output	OFF	-	ESCL ground output	OFF	-
ESCL battery output	OFF	-	Starter relay output	OFF	-
IGN2 relay output	OFF	-	IGN1 relay output	OFF	-
ACC relay output	OFF	-	CPU battery voltage	12.2	V
Start relay short circuit batt...	OK	-	IGN2 relay short circuit batt...	NG	-
IGN1 relay short circuit batt...	OK	-	ACC output short circuit batt...	OK	-
IGN2 relay open	OK	-	IGN1 relay open	OK	-
ACC relay open	OK	-	Start output short circuit batt...	OK	-
IGN2 output short circuit bat...	OK	-	IGN1 output short circuit bat...	OK	-
ACC output short circuit batt...	OK	-	Start output short circuit gro...	OK	-
IGN2 output short circuit gro...	OK	-	IGN1 output short circuit gro...	OK	-
ACC output short circuit gro...	OK	-			

5. If you want to check PDM data operation forcefully, select "Actuation test".

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Installation

PDM(Power Distribution Module)

1. Install the power distribution module.
2. Install the main crash pad.
3. Install the negative(-) battery terminal.

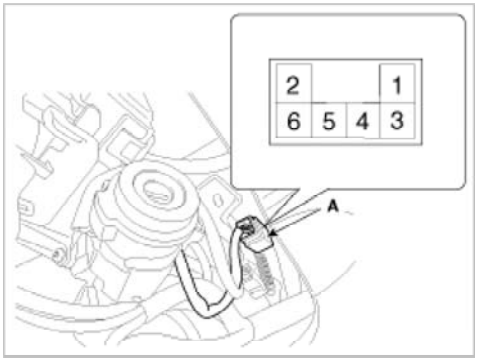
PDM(Power Distribution Module) Relay

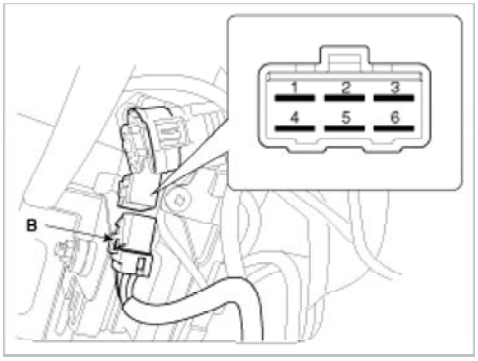
1. Install the power distribution module relay box.
2. Install the front seat heater switch assembly.
3. Install the negative(-) battery terminal.

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.





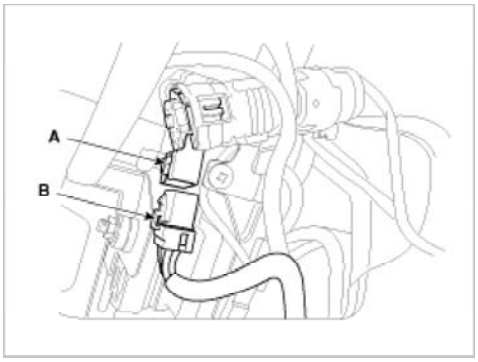
2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

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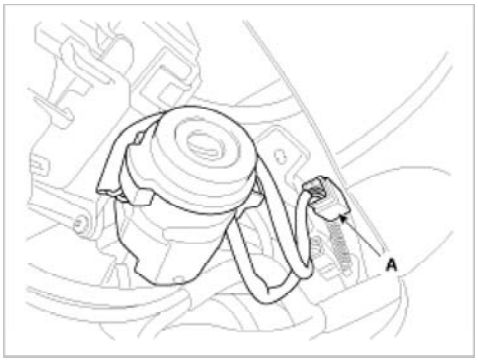
Position	Key	Ignition switch (B)						Steering		Key warning switch (A)		Key illumination(A)	
		5 (B1)	6 (ACC)	4 (IG1)	1 (B2)	2 (IG2)	3 (ST)	Travel	Travel	3	4	5	6
Lock	Removal							Lock					
	Insert							Lock	Unlock				
ACC		○—○						Unlock					
ON		○—○—○			○—○					○—○			
Start		○———○			○—○—○								

Removal

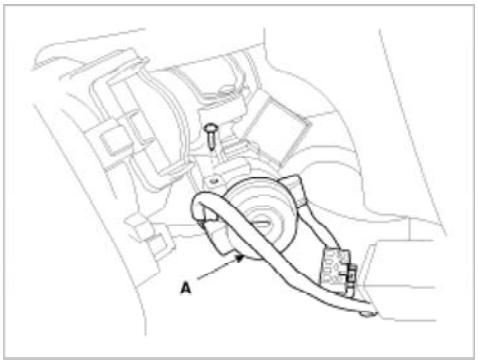
1. Disconnect the negative (-) battery terminal.
2. Remove the steering column upper and lower shrouds.
   (Refer to the ST group - "Steering column")
3. Remove the ignition switch (A) after disconnecting the 6P connector (B).



4. Remove the key warning and immobilizer connector (A).

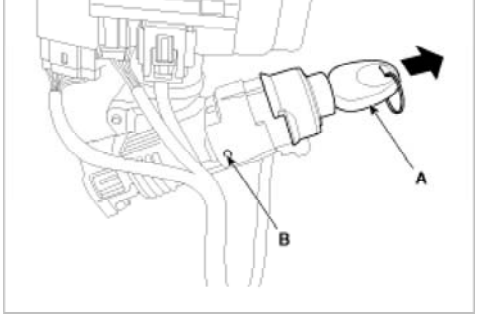


5. Remove the key illumination lens (A).



6. If it is necessary to remove the key lock cylinder (A), remove the key lock cylinder after pushing lock pin (B) with key ACC.

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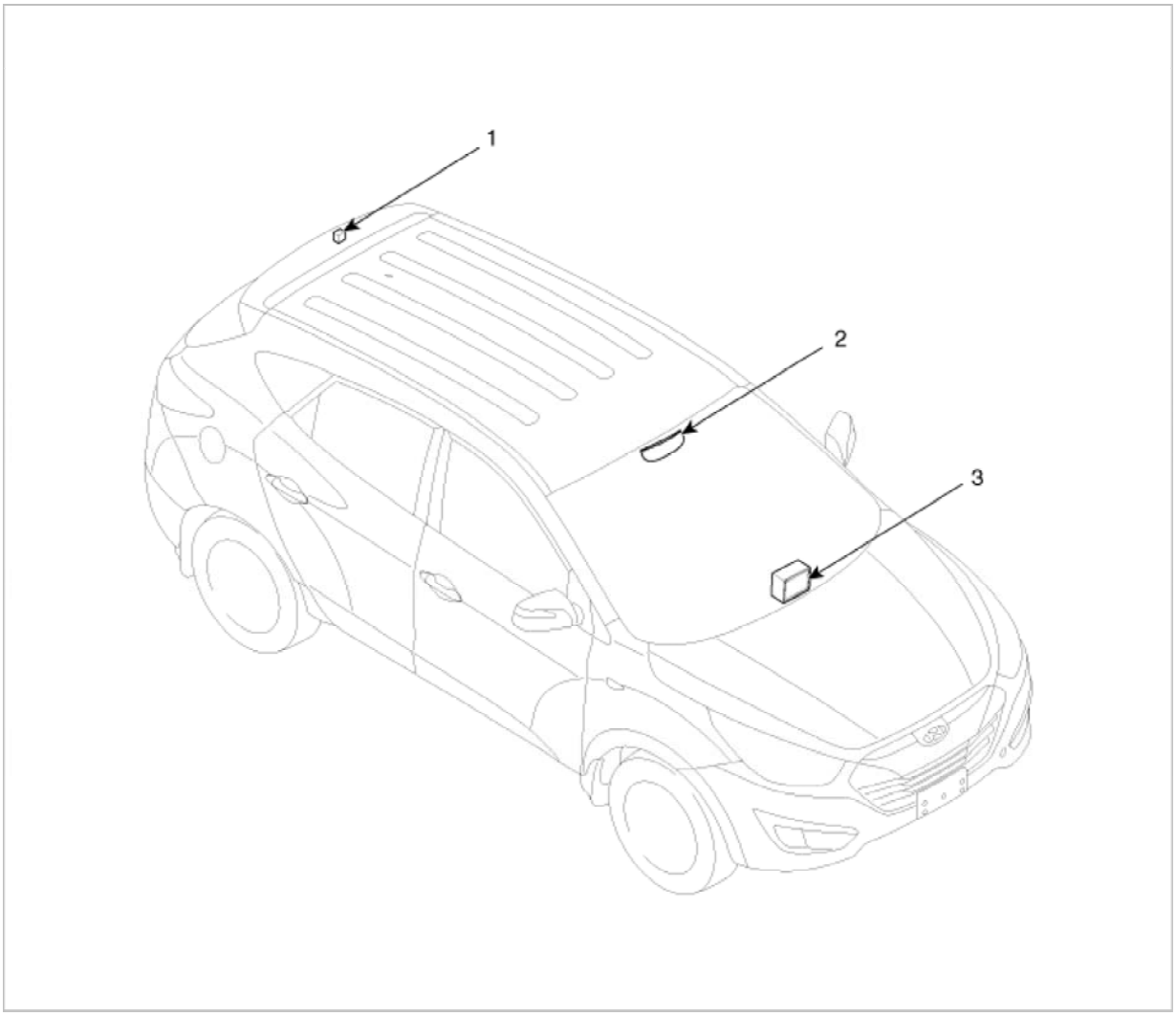


Installation

1. Install the key lock cylinder.
2. Install the illumination bulb, lens and cover.
3. Install the key warning and immobilizer connector.
4. Install the ignition switch.
5. Install the steering column shrouds and crash pad lower panel.

Body Electrical System > Back View Camera System > Components and Components Location

Component Location

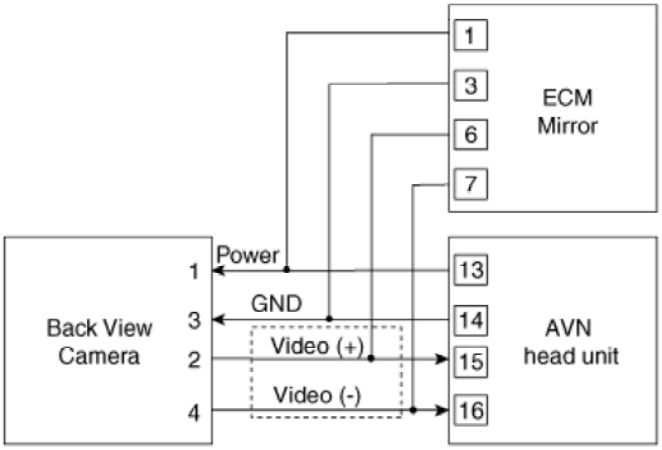


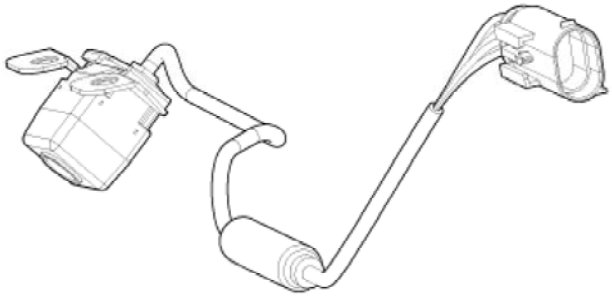
1. Back view camera 2. ECM mirror	3. AVN head unit

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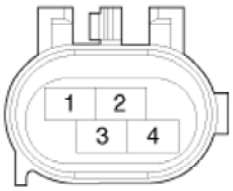
Body Electrical System > Back View Camera System > Schematic Diagrams

Circuit Diagram





Back View Camera Connector



Pin No.	Description
1	Power
2	Video (+)
3	Ground
4	Video (-)

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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 ECM (Reverse Display Room Mirror) mirror or AVN head unit while backing-up.

WARNING

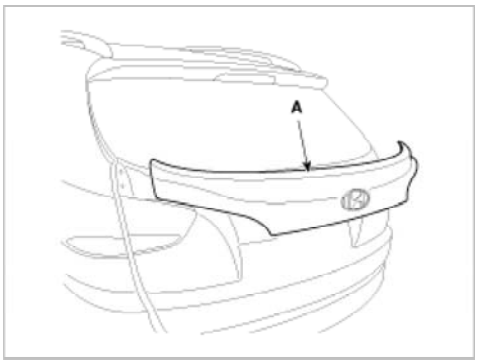
This system is a supplementary function only. It is the responsibility of the driver or always check the inside/ outside rearview

camera.

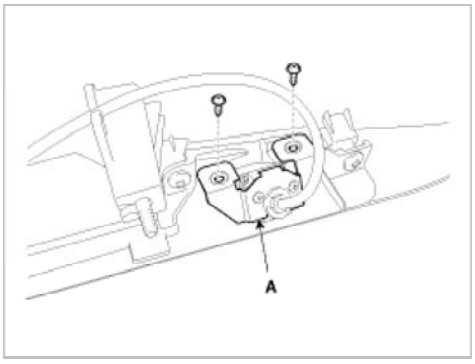
Body Electrical System > Back View Camera System > Repair procedures

Removal

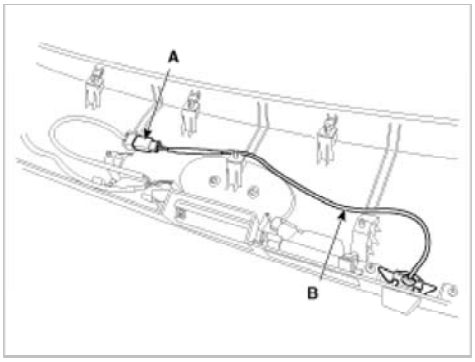
1. Remove the tailgate trim in the trunk after removing the screws and clips.
   (Refer to the BD group - "Tailgate")
2. Remove the tailgate garnish (A) after disconnecting the connector and removing the nuts.



3. Remove the back view camera (A) after loosening the screws (2EA).



4. Disconnect the connector (A), and then remove the back view camera module (B).



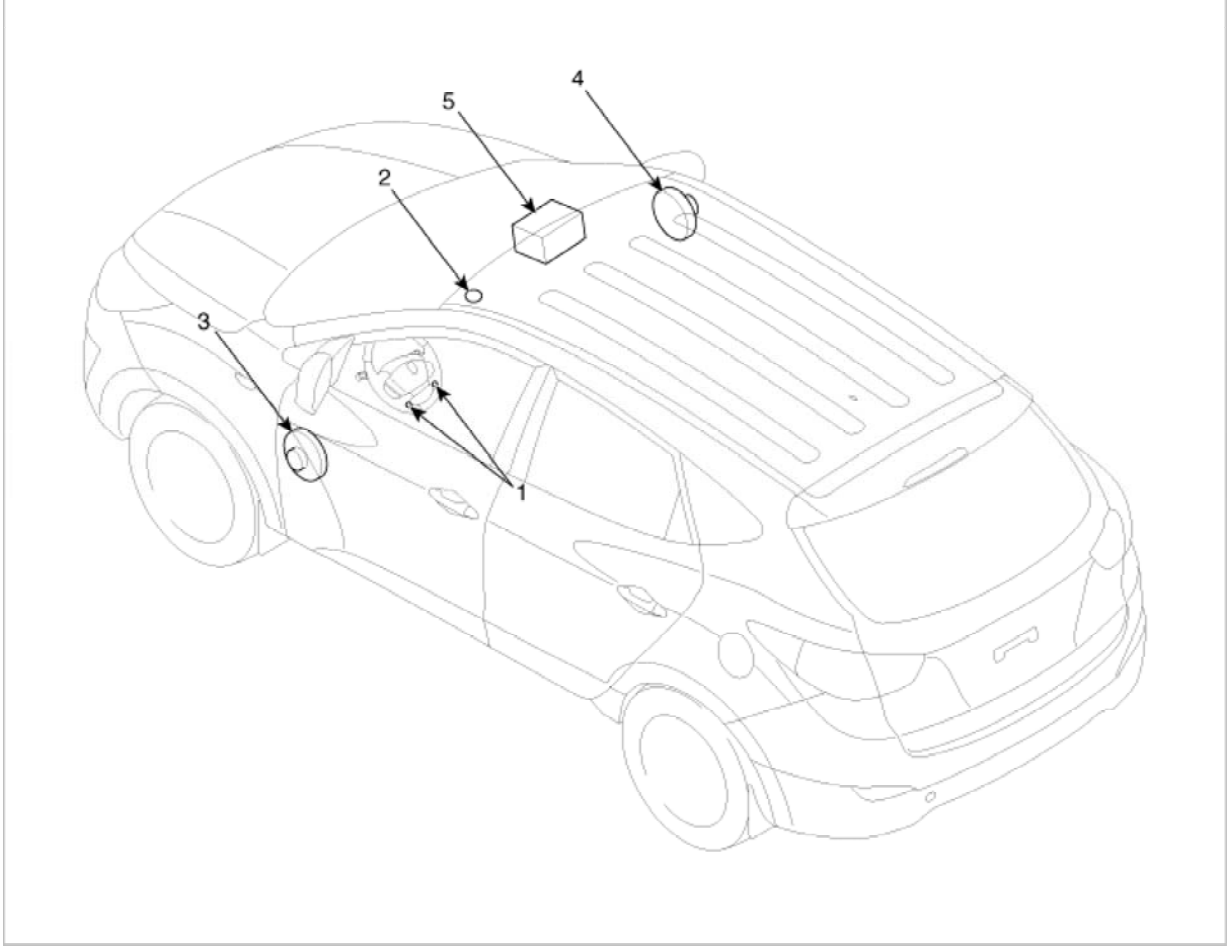
Installation

1. Install the back view camera.
2. Install the tailgate garnish and triPm.

Body Electrical System > Hands Free System > Components and Components Location

Components

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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

Bluetooth Audio System

Bluetooth

You can use a Bluetooth device in your car to make a hands-free phone call or to stream music onto your in-car speakers (via this Head Unit). This Head Unit supports HFP, A2DP and AVRCP connection.

Advanced Audio Distribution Profile (A2DP)

This profile defines how high quality audio(stereo or mono) can be streamed from one device to another over a Bluetooth connection. For example: music streamed from a mobile phone to a wireless headset or caraudio.

Audio/Video Remote Control Profile (AVRCP)

This profile is designed to provide a standard interface to control TVs, Hi-fi equipment,etc. to allow a single remote control (or other device) to control all of the A/V equipment to which a user has access. It may be used inconcert with A2DP or VDP.

Hands-Free Profile (HFP)

This is commonly used to allow car handsfree kits to communicate with mobile phones in the car.

Notes for mobile phones

Some functions (e.g. starting of speech recognition) are not supported by all mobile phones. We cannot guarantee that all functions described will be supported by all mobile phones with Bluetooth.

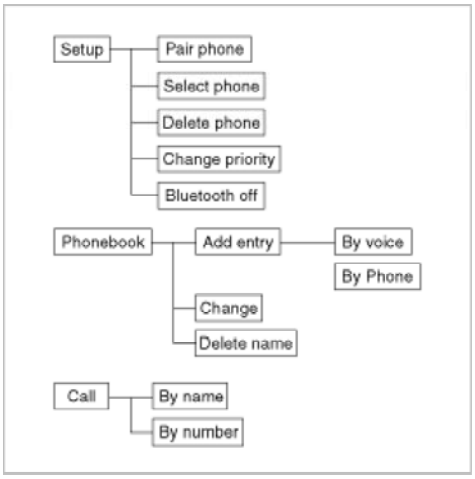
New device

This function allows you to add a new phone to the Head Units Bluetooth Device List. Maximum of 5 devices can be added to the list. If the list is full, the oldest device will be replaced by the newly added Bluetooth device, based on last pairing date.

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- The voice recognition engine containedin the Bluetooth System can be activatedin the following conditions :
  - Button Activation
  The voice recognition system will beactive when the button is pressed and after the sound of a Beep.
  - Active Listening
  The voice recognition system will beactive for a period of time when the Voice Recognition system has askedfor a customer response.
- The system can recognize single digits from zero to nine while number greaterthan ten will not be recognized.
- If the command is not recognized, the system will announce "Pardon" or Noinput voice signal from microphone. (Noresponse)
- The system shall cancel voice recogntionmode in following cases : When pressing the button and saying cancel following the beep. When not making a call and pressing the button. When voice recognition has failed 3 consecutive times.
- At any time if you say "help", the system will announce what commands are available.

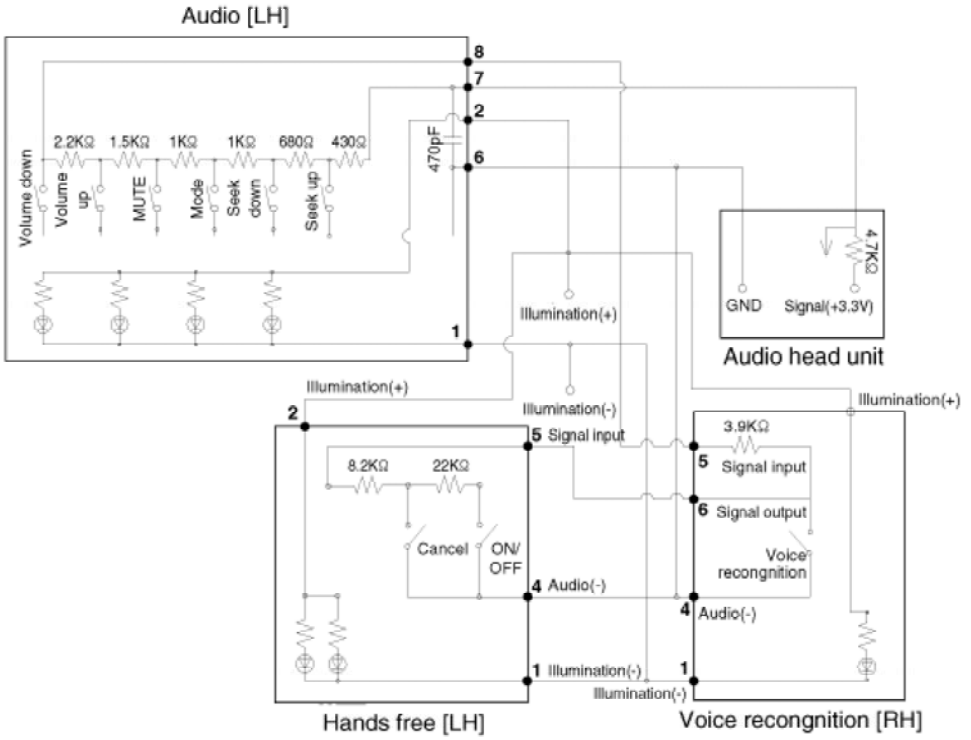
Menu tree



Body Electrical System > Hands Free System > Hands Free Switch > Components and Components Location

Component Location

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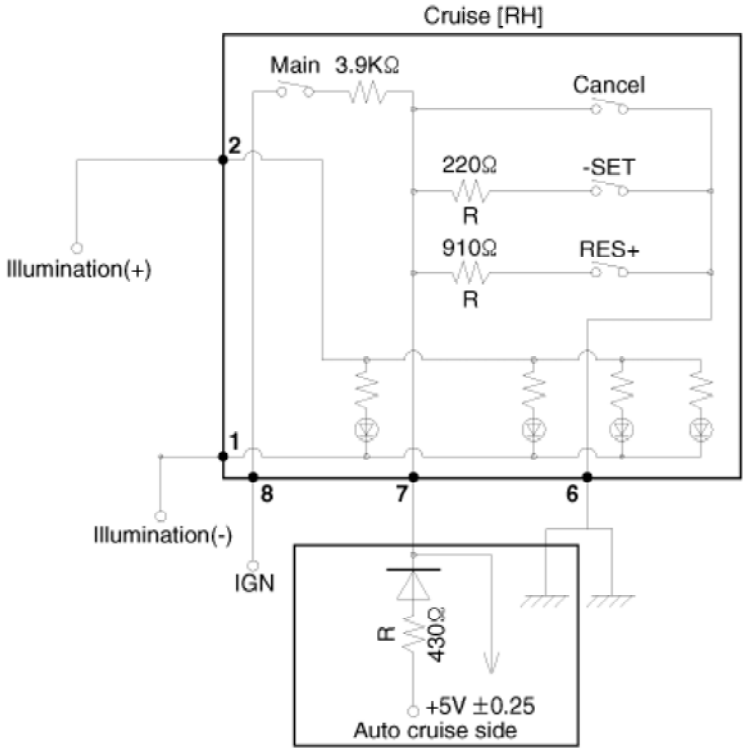




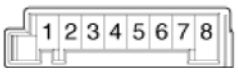
Audio [LH]		Hands free [LH], Voice recongnition [RH]	
1 2 3 4 5 6 7 8		1 2 3 4 5 6	
No.	Description	No.	Description
1	Illumination (-)	1	Illumination (-)
2	Illumination (+)	2	Illumination (+)
3	-	3	-
4	-	4	Audio (-)
5	-	5	Signal input
6	Audio (-)	6	Signal output (Voice recongnition)
7	Audio (+)		
8	Signal output		



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Cruise [RH]



No.	Description
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	ACC (-)
7	ACC (+)
8	ACC ON/OFF



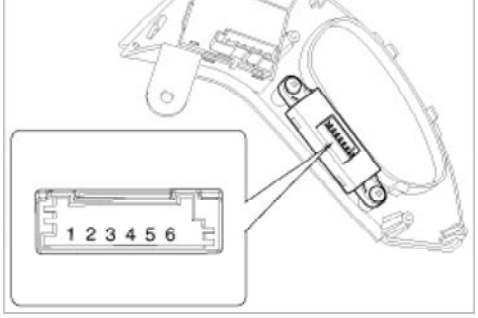
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Body Electrical System > Hands Free System > Hands Free Switch > Repair procedures

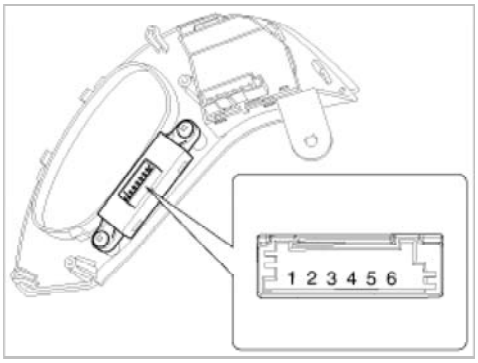
Inspection

1. Check the handsfree remote control switch for resistance between No.4 and No.5 terminals in each switch position.

[Call + Hang Up]



[Voice]



[Call + Hang Up]

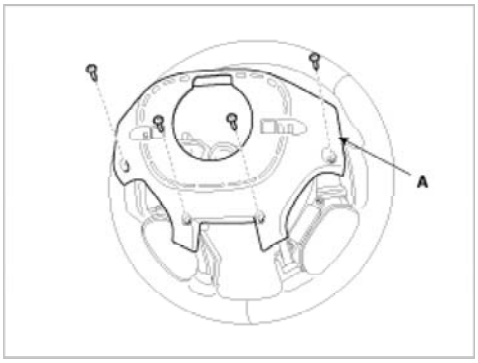
Switch	Connector terminal	Resistance (±5%)	Output voltage (±0.16V)
Call	4-5 (Left)	40.91 kΩ	2.96V
Hang up	4-5 (Left)	18.91 kΩ	2.64V

[Voice]

Switch	Connector terminal	Resistance (±5%)	Output voltage (±0.22V)
Voice	4-5 (Right)	10.71 kΩ	2.29V

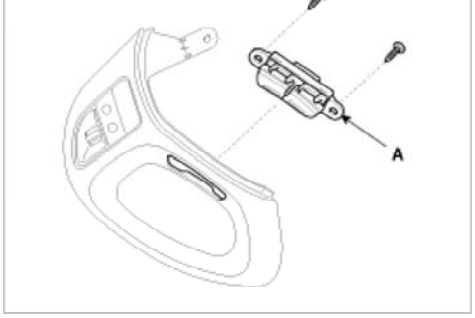
Removal

1. Remove the driver airbag module.
   (Refer to the RT group - "Airbag module")
2. Remove the steering wheel.
   (Refer to the ST group - "Steering column and shaft")
3. Remove the steering wheel rear cover (A) after loosening the screws.



4. Remove the handsfree remote switch (A) after loosening the screws.

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Installation

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

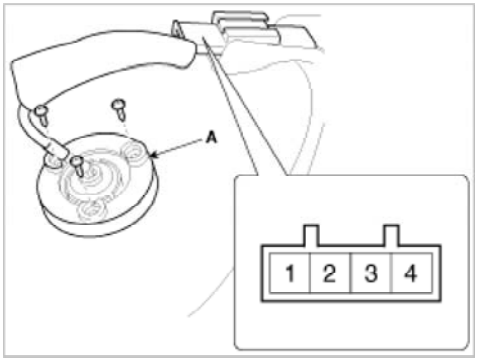
> NOTE
>
> Make sure that the switch connector is plugged in properly.

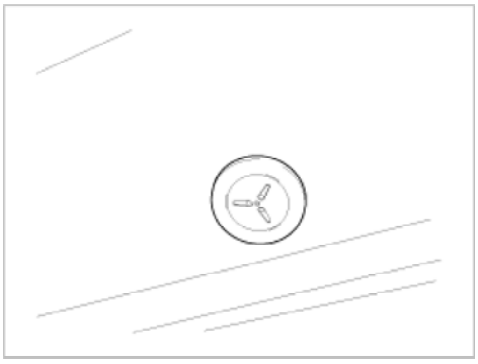
4. Install the driver airbag module.

Body Electrical System > Hands Free System > Hands Free Mic > Repair procedures

Inspection

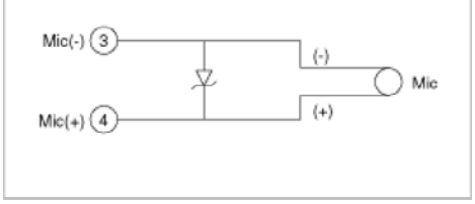
1. Disconnect the negative(-) battery terminal.
2. Remove the roof trim.
   (Refer to the BD group - "Roof trim")
3. Remove the hands free mic (A) after loosening the connector and screws (3EA) from loof top.





4. Check the continuity of Mic between terminals.

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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

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