

## VELOSTER(FS) > 2013 > G 1.6 T-GDI > Body Electrical System

### Body Electrical System > General Information > General Information

#### General Troubleshooting Information

##### Before Troubleshooting

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

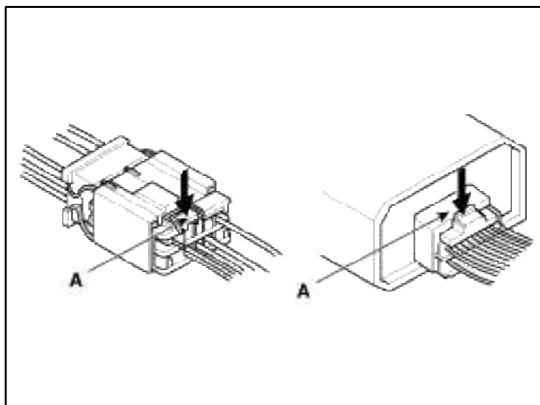
#### NOTE

- 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.

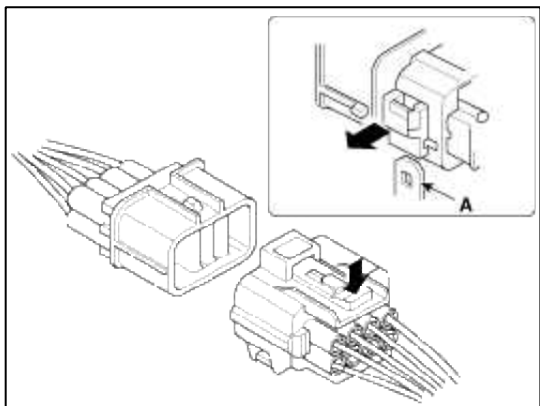
3. Check the alternator belt tension.

##### 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).

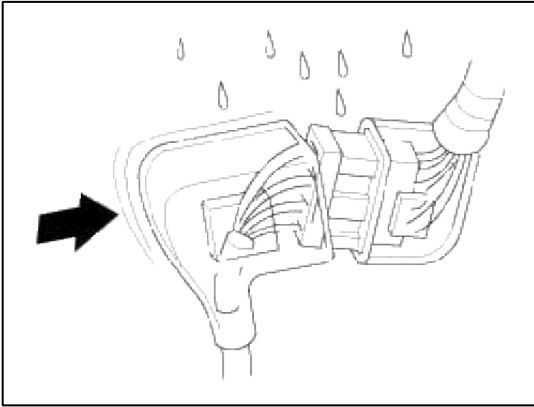


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

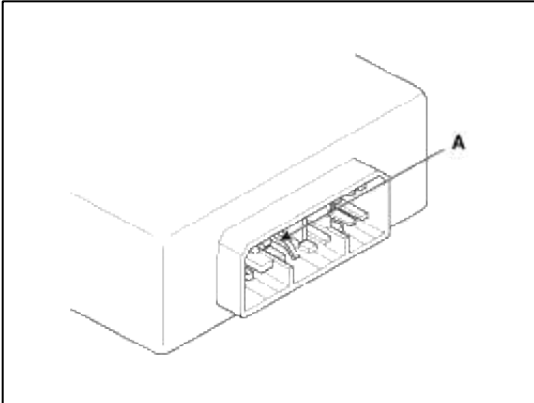


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.

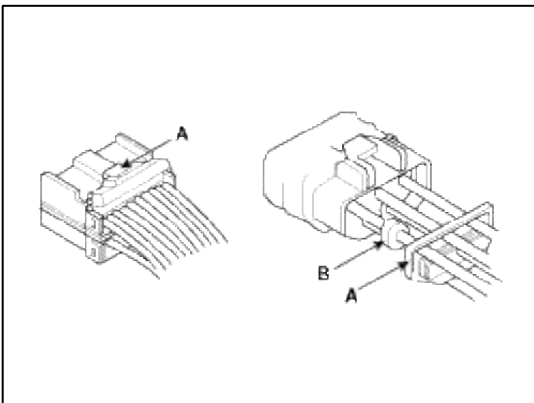
7. Always reinstall plastic covers.



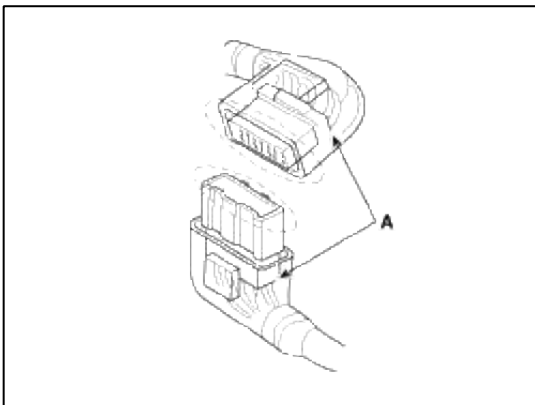
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



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

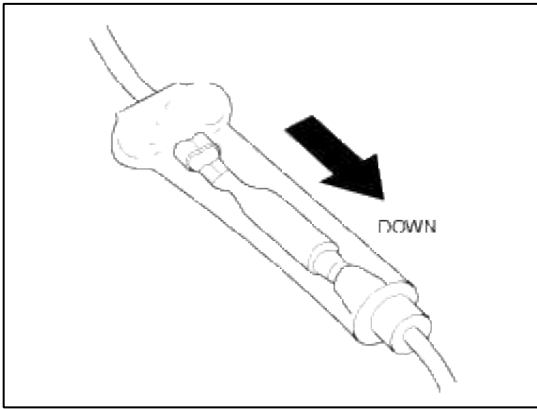


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



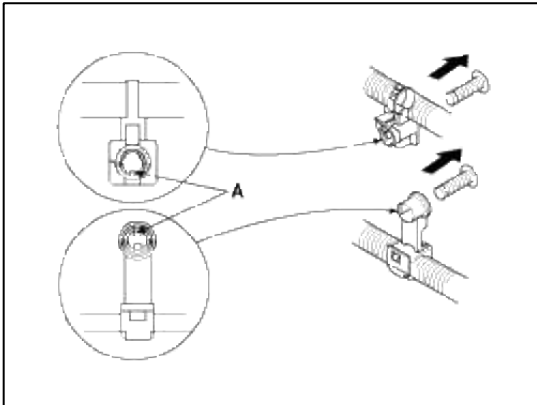
11. Insert the connector all the way and make sure it is securely locked.

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

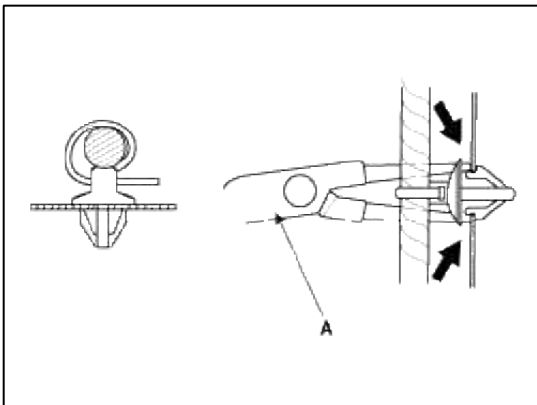


### Handling Wires And Harnesses

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

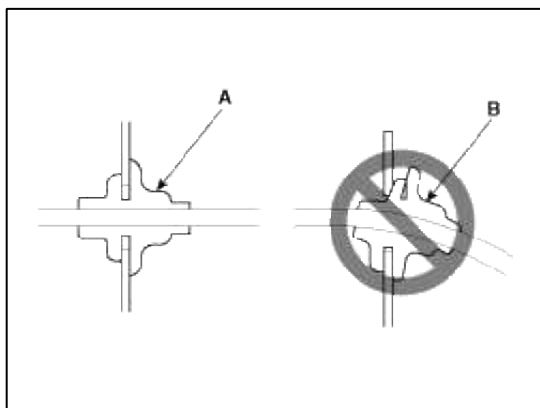


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



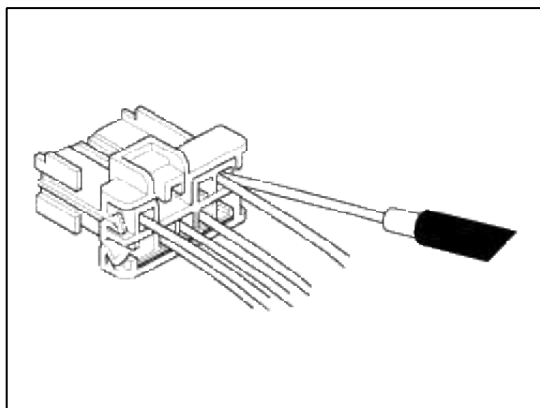
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.

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

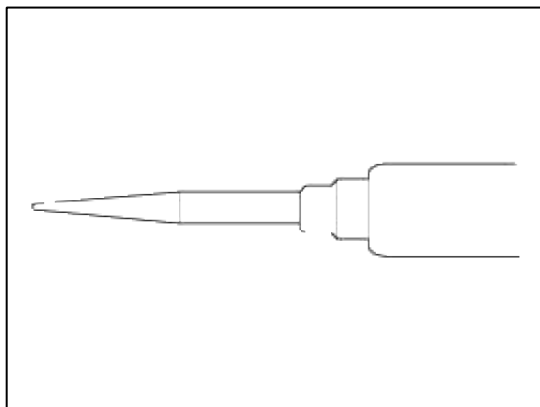


#### Testing And Repairs

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



5. Use a remover tool with a tapered tip.



Refer to the user's guide in the wiring repair kit II (Pub. No. : 0K000 003 A05)

#### 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 in 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
Power window	<p>Whenever the window cannot be properly closed or opened. Whenever the battery is discharged or the related fuse is replaced or reinstalled, reset the power window system according to the procedure below.</p> <ol style="list-style-type: none"> <li>1. Turn the ignition switch to the ON position.</li> <li>2. Push up the power window switch until the window glass is entirely up and then push up continuously for about 1 sec.</li> </ol>
Sunroof	<p>Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the sunroof, you have to reset your sunroof system as follows :</p> <ol style="list-style-type: none"> <li>1. Turn the ignition key to the ON position and then close the sunroof completely.</li> <li>2. Release the sunroof control lever.</li> <li>3. Press and hold the CLOSE button for more than 10 seconds until the sunroof closed and it has moved slightly.</li> <li>4. Release the sunroof control lever.</li> <li>5. Press and hold the CLOSE button once again within 3 seconds until the sunroof does as follows; <ol style="list-style-type: none"> <li>A. Tilt → Slide Open → Slide Close</li> </ol> Then release the lever.</li> <li>6. Reset procedure of sunroof system is finished.</li> </ol>
Trip computer	<p>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.</p>
Clock	<p>When the battery is disconnected and reconnected, the clock becomes initialized. So, the clock should be reset. (Refer to the owner's manual)</p>
Audio	<p>When the battery is disconnected and reconnected, the customer's radio stations become initialized. So, you need to record the customer's radio preset stations prior to service, and after service, set the customer's radio preset stations into the audio.</p>
Heater & Air Conditioner	<p>When the battery is disconnected and reconnected, the heater and A/C become initialized. So, heater and A/C should be reset.</p>

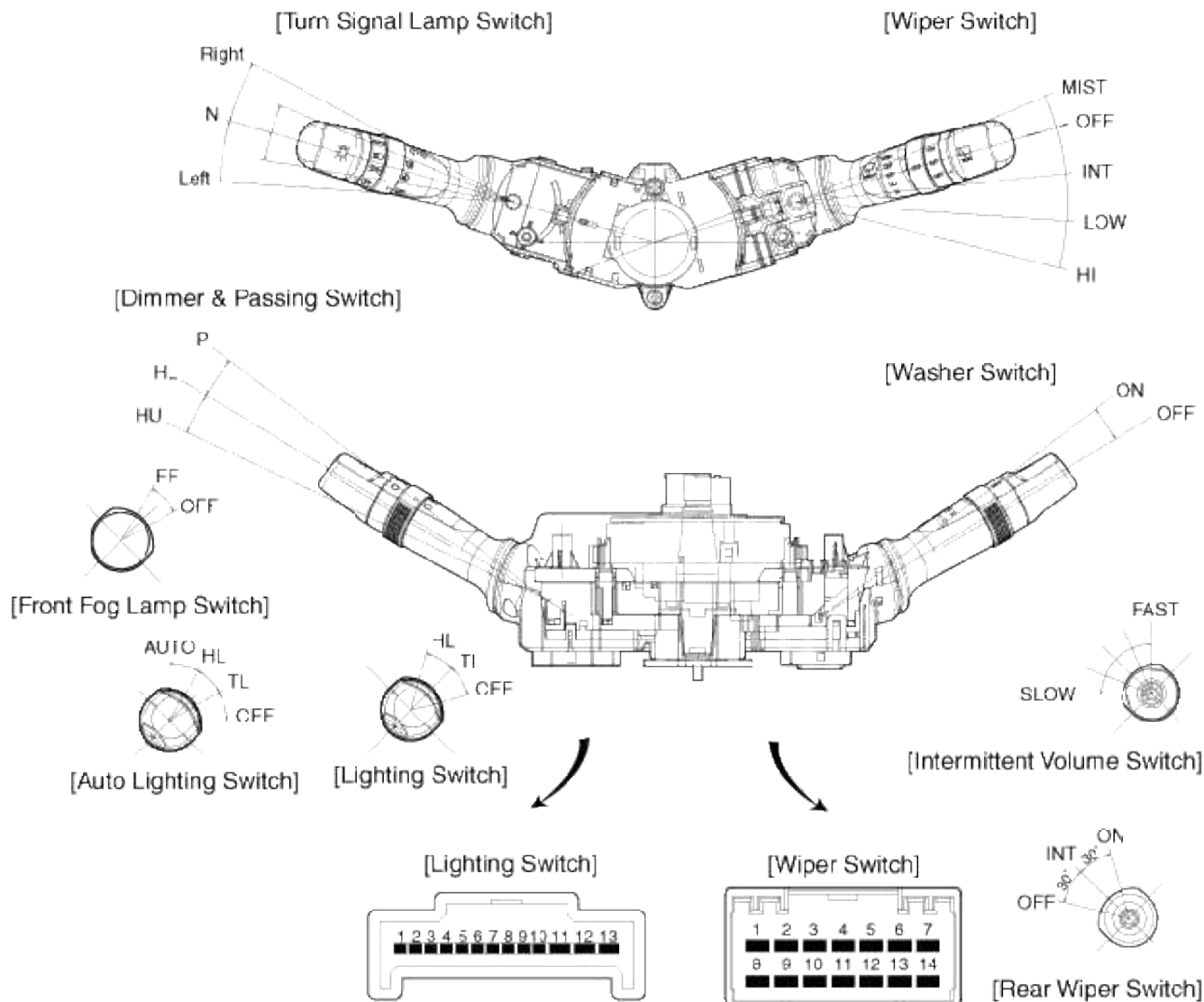
**Body Electrical System > General Information > Special Service Tools**
**Special Service Tools**

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

**Body Electrical System > Multifunction switch > Specifications**
**Specifications**

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-30°C ~ +80°C (-22 ~ +176°F)
Rated load	Dimmer & passing switch	High : 1.0A (Relay load) Low : 1.0A (Relay load) Passing : 1.0A (Relay load)
	Lighting switch	Lighting : 1.0A (Relay load)
	Turn signal & lane change switch	6.6 ± 0.5A (Lamp load)
	Fog lamp switch(Front & Rear)	1.0A (Relay load)
	Wiper & mist switch	Low, High : 4.0A (Motor load) Intermittent : 0.22 ± 0.05A (Relay load) Lock : Max. 28A (Motor load) Mist : 4.0A (Motor load)
	Washer switch(Front & Rear)	4A (Motor load)
	Rear Wiper	0.2A (Relay load)

**Body Electrical System > Multifunction switch > Components and Components Location**
**Components(1)**



Connector name	No	Descripton	Connector name	No	RH SIDE
Lighting (13 pin) -LH side	1	Lighting switch ground	Washer & Wiper (14 pin) -RH side	1	MIST switch
	2	Tail lamp switch		2	Wiper parking
	3	Auto light switch		3	Wiper low speed
	4	Head lamp switch		4	-
	5	Fog switch base		5	Rear washer switch
	6	Front fog switch		6	IGN2-Rear wiper & washer
	7	-		7	INT rear wiper switch
	8	Head lamp low beam		8	Intermittent wiper switch
	9	Head lamp high beam		9	Wiper high speed
	10	Dimmer switch base		10	ING2-Front washer & wiper
	11	Turn signal left		11	Wahser switch

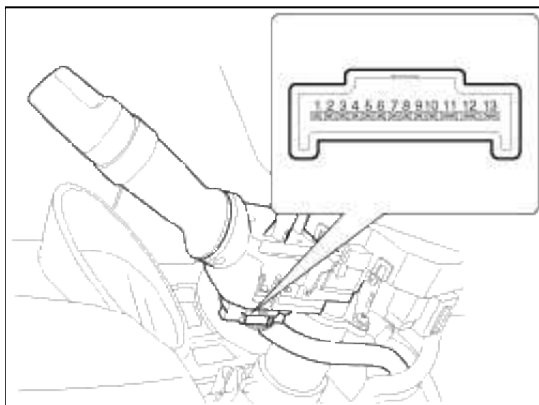
12	Turn signal base	12	Intermittent volume base
13	Turn signal right	13	Intermittent time
		14	Rear wiper switch

### Body Electrical System > Multifunction switch > Repair procedures

#### Inspection

##### Lighting Switch Inspection

With the multifunction 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	1	2	4	3
OFF				
Tail	○	○		
H/l amp	○	○	○	
AUTO	○			○

#### Lighting Switch

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

#### Dimmer And Passing Switch

Terminal Position	10	8	9	1
HU	○		○	
HL	○	○		
P	○		○	○

HU : Head lamp high beam

HL : Head lamp low beam

P : Head lamp passing switch

## Turn Signal Switch

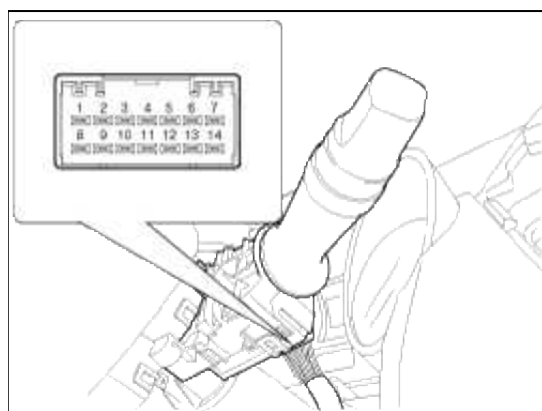
Terminal		12	11	13
Hazard switch	Turn signal switch			
OFF	L	○	○	
	N			
	R	○		○

## Fog Lamp Switch

Terminal		5	6
Position			
OFF			
Front		○	○

## Wiper And Washer Switch Inspection

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



## Wiper Switch

Terminal		3	9	2	8	10	1	12	13
Position									
MIST		○	○			○	○		
OFF		○	○						
INT		○	○		○	○		○	○
LOW		○				○			
HI			○	○					

## Washer Switch

Terminal		11	10
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 "BCM".

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

**Current Data**

Standard Display ▾ Full List ▾ Graph ▾ Items List ▾ Reset Min.Max. Record Stop ▾

Sensor Name	Value	Unit
<input type="checkbox"/> Key in switch(Manual Key Type)	OUT	-
<input type="checkbox"/> ACC	ON	-
<input type="checkbox"/> IGN1	ON	-
<input type="checkbox"/> IGN2	ON	-
<input type="checkbox"/> Tail Lamp Switch	OFF	-
<input type="checkbox"/> Head Lamp Switch	OFF	-
<input type="checkbox"/> Auto Light Switch	OFF	-
<input type="checkbox"/> Head Lamp High Switch	OFF	-
<input type="checkbox"/> Front Fog Switch	OFF	-
<input type="checkbox"/> Washer Switch	OFF	-
<input type="checkbox"/> INT Switch	OFF	-

4. To perform compulsory operation on BCM input factors, select "ACTUATION TEST".

**Actuation Test**

Test Items
Wiper relay
Room lamp
Foot lamp
Ignition key hole illumination(Manual Key Type)
Security LED Output
Assist seat belt indicator
Key Interlock Solenoid(Manual Key Type)

● Duration      ● Conditions      ● Result

0.7S Once

IG. ON

Success

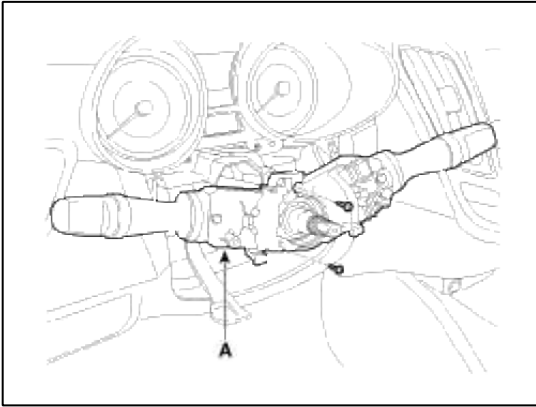
Start

Stop

#### Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.  
(Refer to the ST group - "Steering column & shaft")
3. Remove the steering column upper and lower shrouds.
4. Remove the clock spring.
5. Disconnect the lighting switch connector and wiper & washer switch connector.

6. Remove the multifunction switch assembly(A) with loosening 2 screws.



7. If it is necessary to remove. The wiper & washer switch only, release the lock of wiper switch using tool without removing the steering wheel and the clock spring.

#### Installation

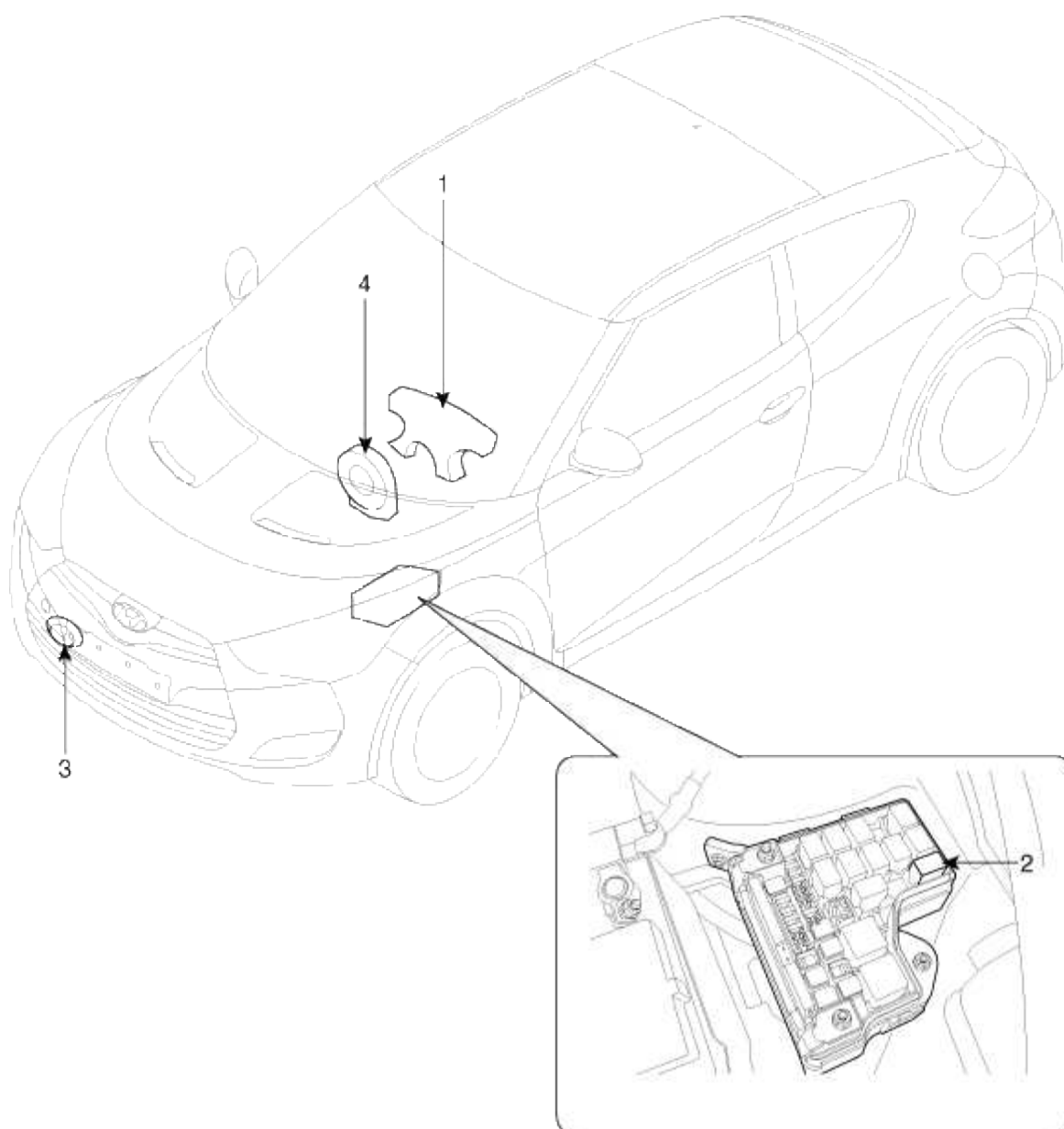
1. Install the multifunction switch.
2. Install the clock spring.
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.

#### NOTE

Make sure the multifunction switch connectors are plugged in properly.

### Body Electrical System > Horn > Components and Components Location

#### Component Location



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

### Body Electrical System > Horn > Repair procedures

#### Inspection

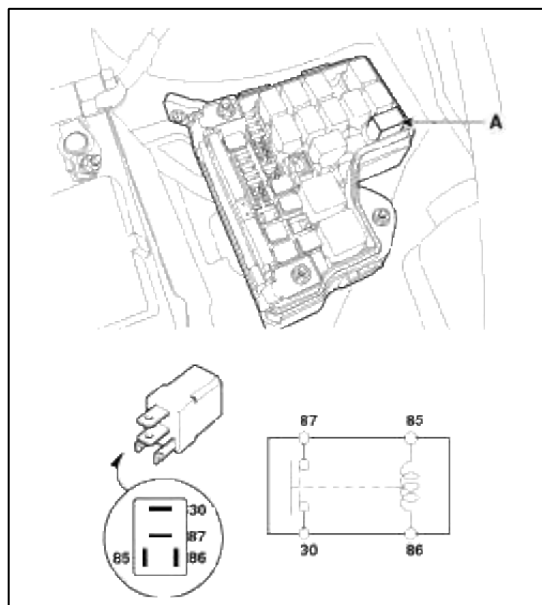
Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal. The horn should make a sound. If the horn fails to make a sound, replace it.

#### 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.



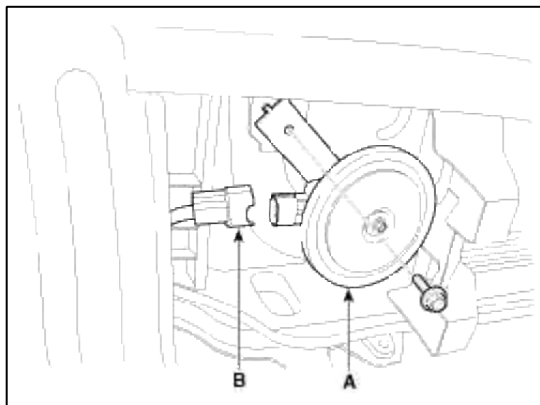
3. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.



Terminal Position	30	87	85	86
Disconnected			○	○
Connected	○	○	○	+

## Removal

1. Remove the mounting bolt and disconnect the horn connector (B), then remove the horn (A).



## Installation

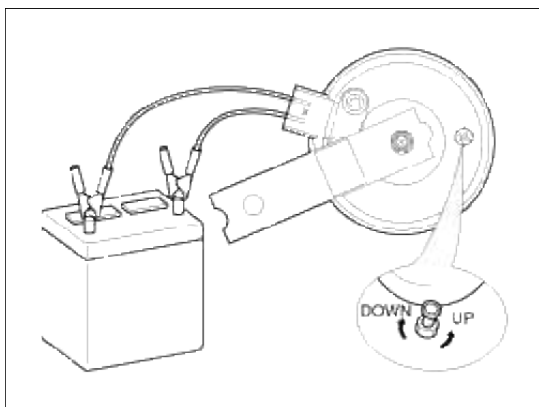
1. Connect the horn connector, then reassemble the horn.

## Adjustment

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

### NOTE

After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



## Body Electrical System > AVN System > Specifications

### Specifications

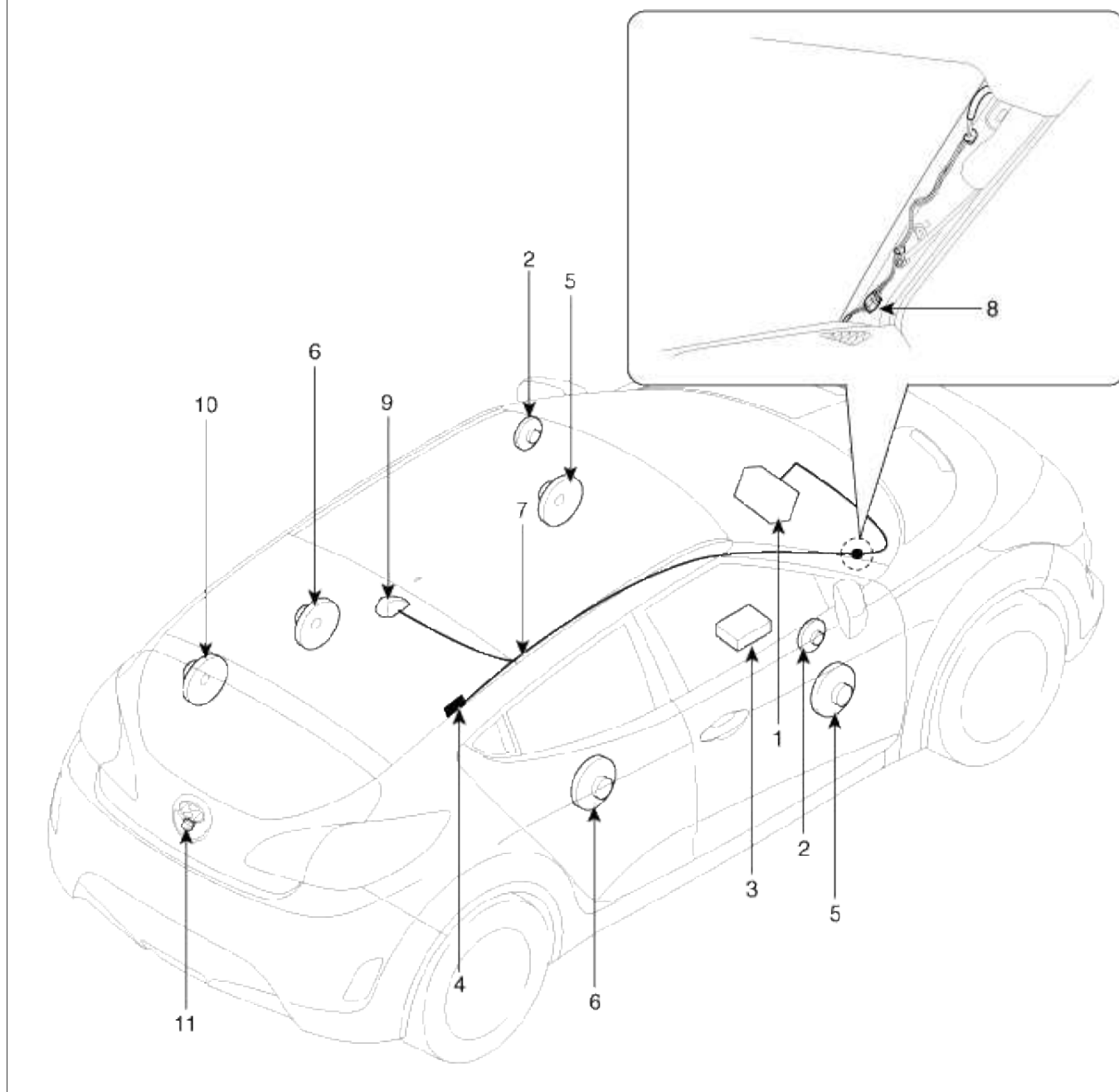
Item	Specification
Power source	DC 14.4V (-) ground
Frequency range	FM : 87.5 ~ 107.9 MHz / 200 kHz AM : 530 ~ 1710 kHz / 10 kHz
Tuning type	PLL SYNTHESIZED TUNING
Antenna	80 pF 75 Ohm
Dark current	MAX 4mA (Head unit only)
S/N	FM : MIN 50 dB AM : MIN 40 dB

### Display System

Input signal	Digital RGB
Size	7 inch

## Body Electrical System > AVN System > Components and Components Location

### Components Location



1. AVN (A/V & Navigation head unit)

2. Midrange speaker

3. External amplifier

4. Glass antenna amplifier (Radio)

5. Front door speaker

6. Rear door speaker

7. Antenna feeder cable

8. Antenna cable connector

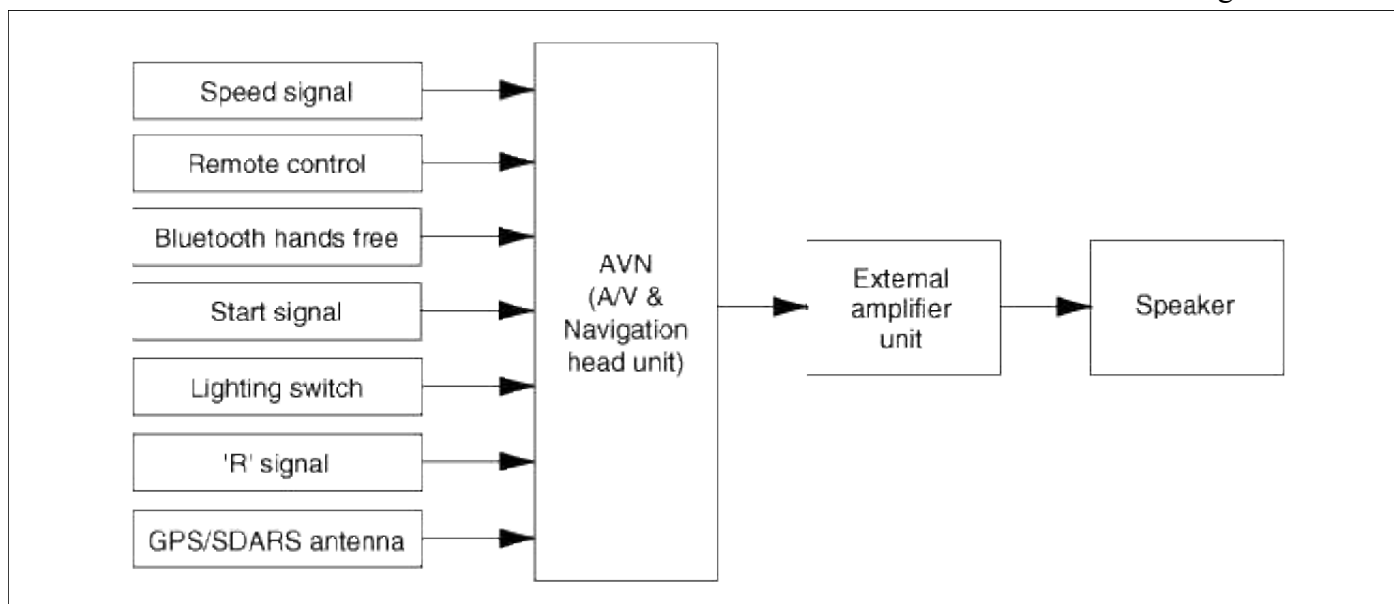
9. Roof antenna (GPS)

10. Woofer speaker

11. Back view camera

## Body Electrical System > AVN System > Schematic Diagrams

### System Block Diagram



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

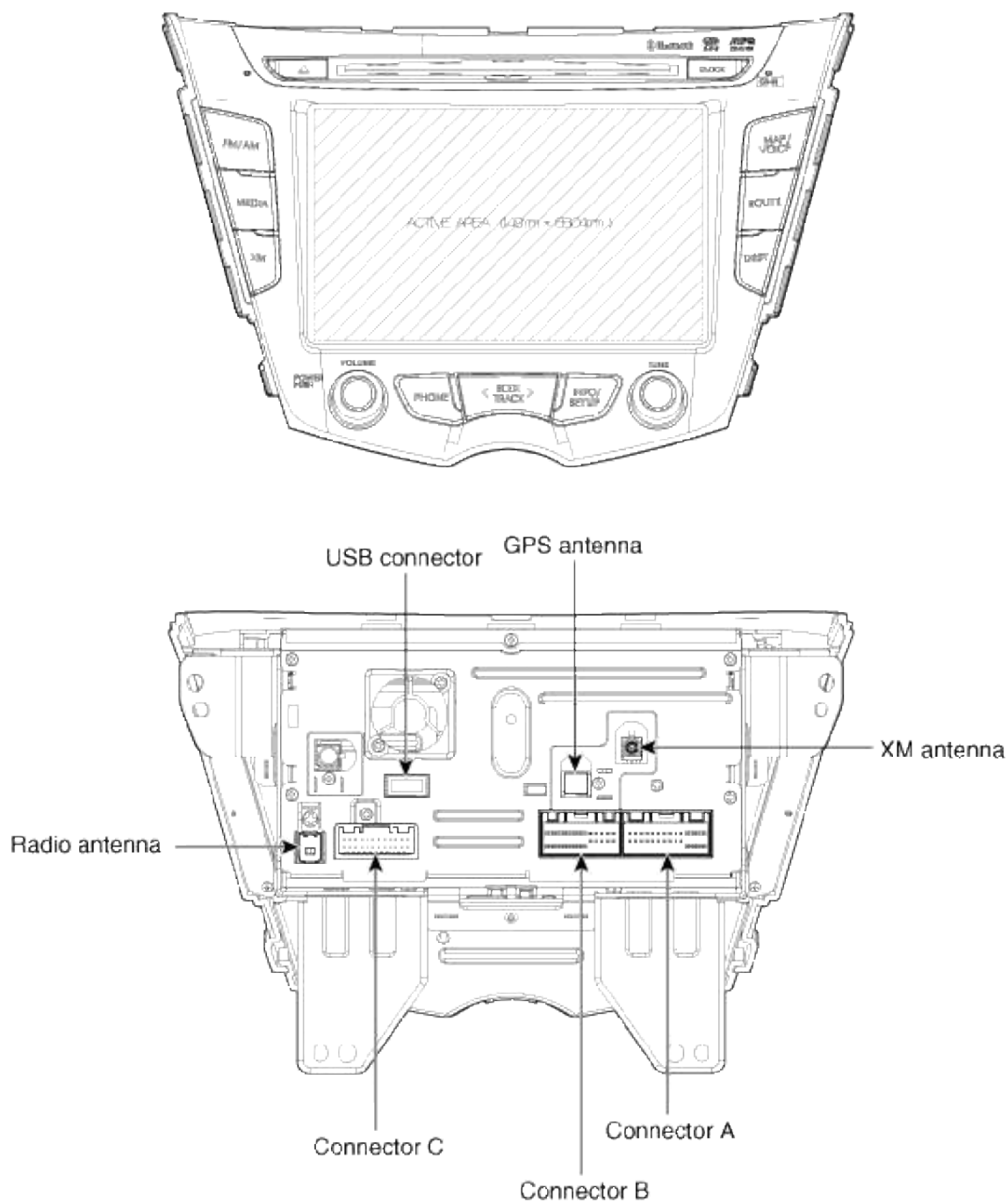
#### Route Re-calculation

The following phenomena may occur after conducting route recalculation.

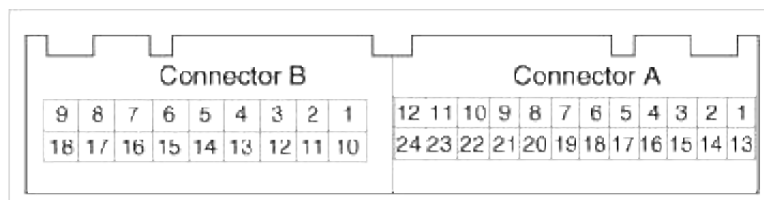
- Guidance may be given to a position differing from the current position when turning at an intersection.
- Route recalculation may take a longer period of time when driving under high speeds.
- A route guidance signaling for a U-Turn in a No U-Turn location may occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc).
- Guidance may be given to a position removed from the actual destination 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 > AVN Head Unit > Components and Components Location

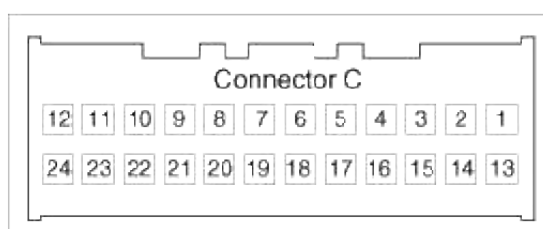
#### Components



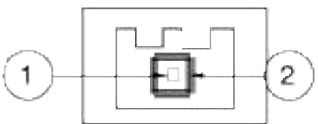
### AVN (A/V & Navigation) Head Unit Connector





Pin No.	Connector A	Connector B
1	Battery B+	Navigation_Voice +
2	ACC	Navigation_Voice -
3	AUX_L	Reverse
4	AUX_Ground	SPDIF +
5	AUX_R	SPDIF_Ground
6	Illumination +	Front left -
7	Illumination -	Front right +
8	Steering key	Front right -
9	-	Front left +
10	Door	Speed
11	MM_CAN0_H	AUX_CVBS_IN
12	Body_CAN_H	AUX_Vground
13	Ground	SPDIF -
14	Ground	Ambient
15	Mic -	Rear left -
16	Mic +	Rear left +
17	AUX_Detent	Rear right -
18	ALT_IN	Rear right +
19	Remote_antenna	
20	KEY_Ground	
21	Parking	
22	Auto light	
23	MM_CAN0_L	
24	Body_CAN_L	




Pin No.	Connector C	Pin No.	Connector C
1	Camera_CVBS	13	Camera_Vground
2	-	14	-
3	Camera B+	15	Camera_Pground
4	-	16	-
5	-	17	-
6	-	18	-
7	Audio +	19	Audio -
8	-	20	-
9	-	21	-
10	-	22	-
11	-	23	-
12	-	24	-

Radio antenna	No.	Description	No.	Description
	1	FM/AM	2	Ground

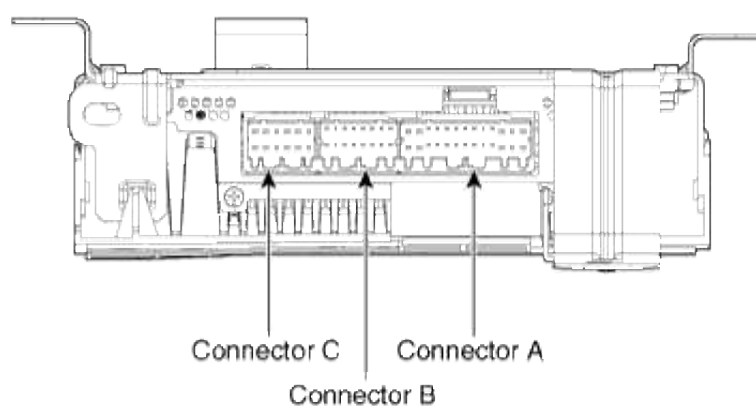
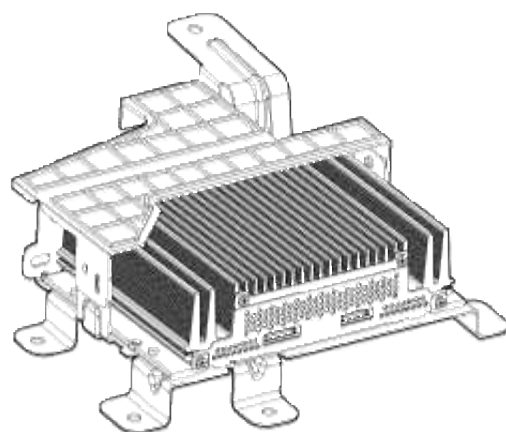
USB connector	No.	Description	No.	Description
	1	USB Ground	3	USB D (-)
	2	USB D (+)	4	USB VCC

GPS antenna


XM antenna


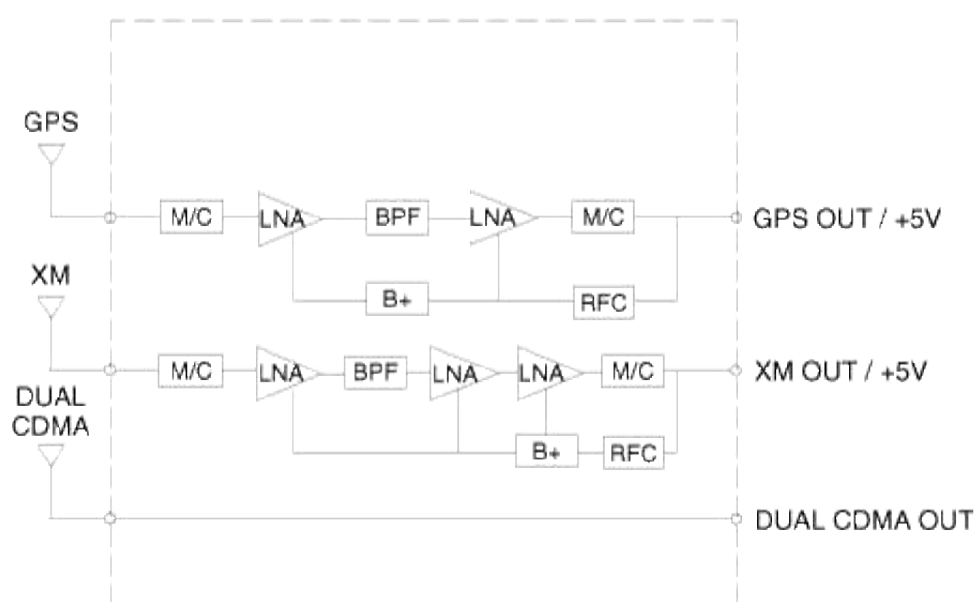
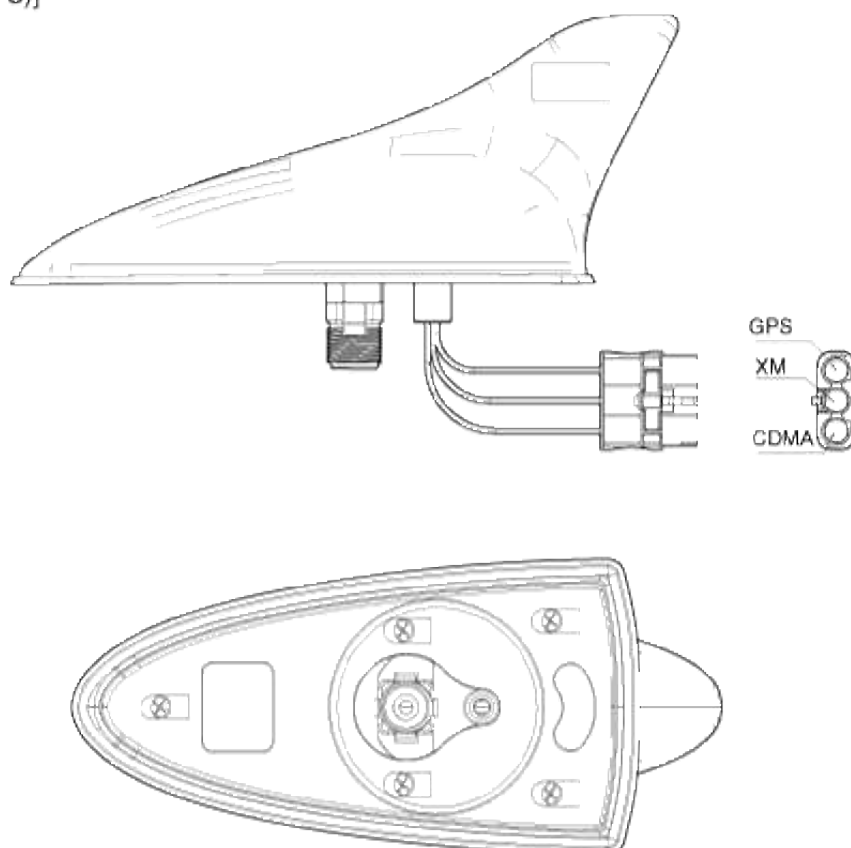


## [External Amplifier]



No.	Connector A (26Pin)	Connector B (16Pin)	Connector C (12Pin)
1	B+	-	Rear right door (+)
2	B+	-	Rear left door (+)
3	B+	-	Front right midrange (+)
4	-	-	Front left midrange (+)
5	CAN +	-	Front right door (+)
6	CAN -	-	Front left door (+)
7	ACC	CF +	Rear right door (-)
8	-	-	Rear left door (-)
9	-	-	Front right midrange (-)
10	-	-	Front left midrange (-)
11	Navigation +	-	Front right door (-)
12	Switch2 +	-	Front left door (-)
13	Switch1 +	-	
14	Ground	-	
15	Ground	CF -	
16	Ground	-	
17	-		
18	SPDIF +		
19	SPDIF -		
20	-		
21	-		
22	-		
23	-		
24	Navigation -		
25	Switch2 -		
26	Switch1 -		

[Roof antenna(GPS)]



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

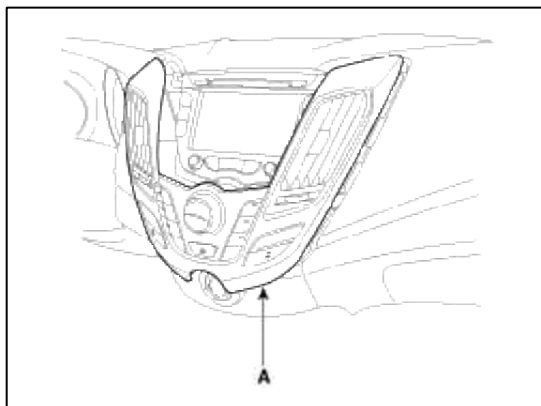
Removal

AVN Head Unit

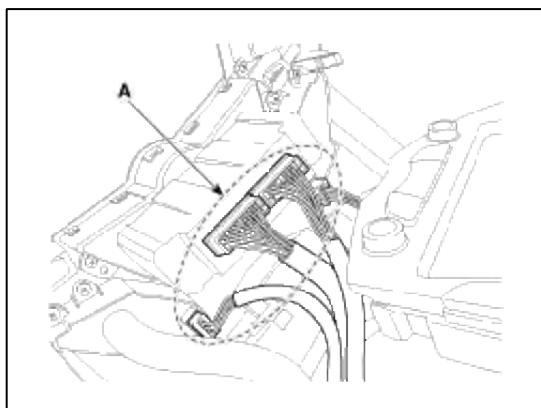
**NOTE**

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

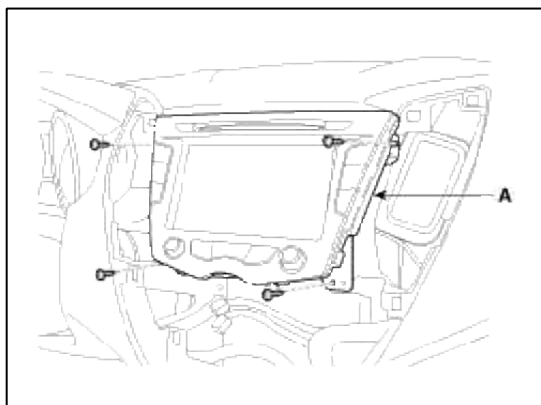
1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel (A).



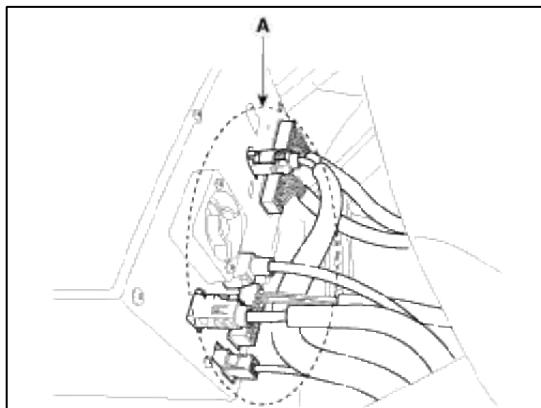
3. Disconnect the connectors (A) from center fascia panel.



4. Remove the AVN head unit assembly (A), after loosening the 4 screws.



5. Disconnect the AVN head unit connectors and antenna cables (A), then remove the AVN head unit.

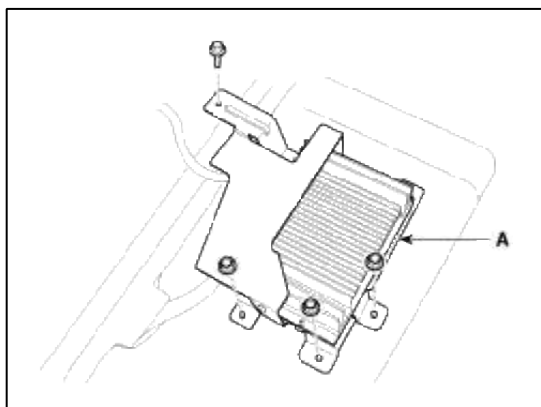


#### NOTE

If the CD does not eject, do not attempt to remove it because the audio unit may be damaged. Contact an authorized hyundai dealership for assistance.

#### External Amplifier

1. Remove the assistant seat.  
(Refer to the BD group - "Seat - Front seat")
2. Disconnect the external amplifier connector.
3. Loosen a bolt and 3 nuts, then remove the external amplifier (A).



#### Installation

##### AVN Head Unit

1. Connect the AVN head unit connectors and cables.
2. Install the AVN head unit.
3. Install the center fascia upper panel.
4. Connect the negative (-) battery terminal.

#### NOTE

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

#### External Amplifier

1. Connect the connector and install the external amplifier.
2. Install the assistant seat.

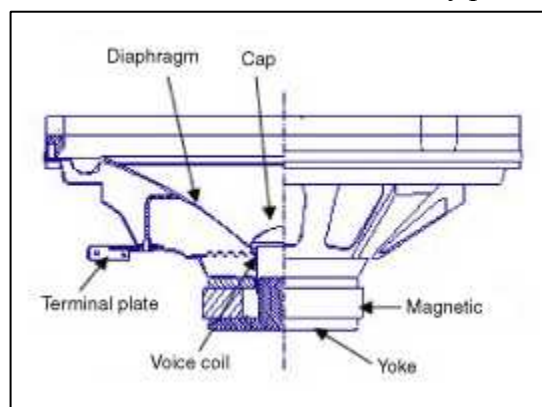
### Body Electrical System > AVN System > Speakers > Repair procedures

#### Inspection

## 1. Troubleshooting for Speaker

### (1) Basic inspection of speaker

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



### (2) Case Troubleshooting

No.	Case	Inspection/Remedy
1	Trembling sound	<ol style="list-style-type: none"> <li>1. Before replacing the speaker, inspect that the mounting screw is installed normally.</li> <li>2. After re-installing the speaker, verify that no trembling sound is heard.</li> <li>3. When hearing a trembling sound again, replace the speaker with new one.</li> </ol>
2	Noise	<ol style="list-style-type: none"> <li>1. Check if the wiring connector is connected normally. If not, reconnect the wiring connector.</li> <li>2. In case of radio static, check if there is a noise from CD.</li> <li>3. If a noise is heard with the radio and CD on, replace the speaker with new one.</li> </ol> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE</b></p> <p>In case there is only radio static, this causes from poor radio reception. Thus the speaker needs no repair and replacement.</p> </div>
3	Speaker inoperative	<p>Inspection of the wiring connection between the battery and the speaker</p> <ol style="list-style-type: none"> <li>1. Before replacing the speaker, inspect the wiring connection between the battery and the speaker is normal.</li> <li>2. Check the supply power to the speaker and the resistance, then inspect the sound quality. <ul style="list-style-type: none"> <li>■ Specified impedance : 2 ~ 4Ω</li> </ul> </li> </ol> <div style="text-align: center; margin: 10px 0;"> <p>The diagram shows a speaker with two wires connected to a multimeter. The multimeter is set to measure resistance, indicated by the Ω symbol on the display.</p> </div> <ol style="list-style-type: none"> <li>3. If the speaker works poorly, replace it with new one.</li> </ol>

**CAUTION**

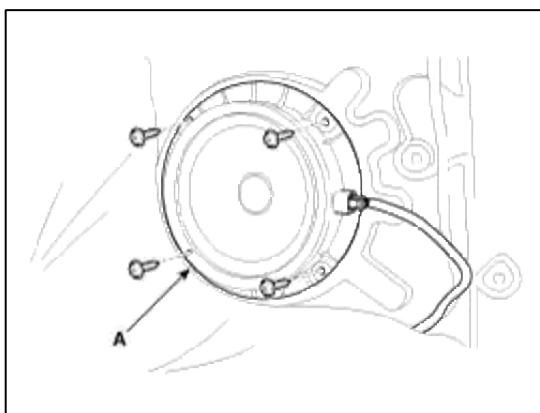
When handling the speakers:

- Do not damage the speaker with impact, like dropping or throwing it.
- Be careful not to drop water and oil on the speakers.
- Caution during handling of speaker because the material of diaphragm is paper which is easily torn by impact or external force.
- Modifying the audio system may cause damage to the speakers. If this is the case, the speakers are not covered by the manufacturer's warranty.

## Removal

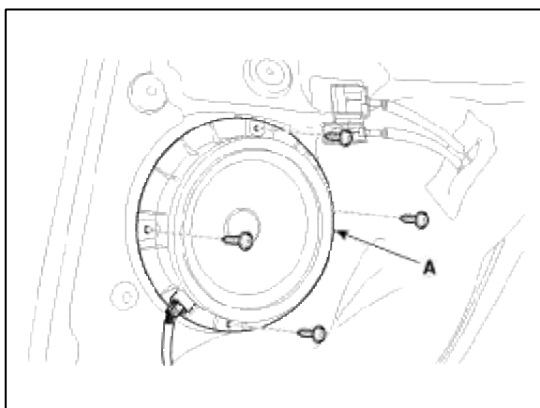
### Front Speaker

1. Remove the front door trim panel and speaker connector.  
(Refer to the BD group - "Front door")
2. Remove the front speaker (A) after loosening 4 rivets.



### Rear Speaker (Right)

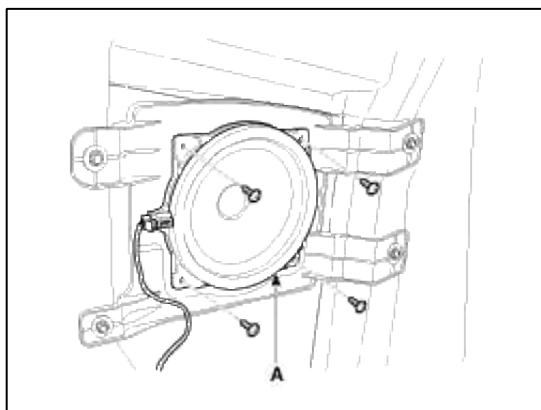
1. Remove the rear door trim panel and speaker connector.  
(Refer to the BD group - "Interior trim")
2. Remove the rear speaker (A) after removing 4 rivets.



### Rear Speaker (Left)

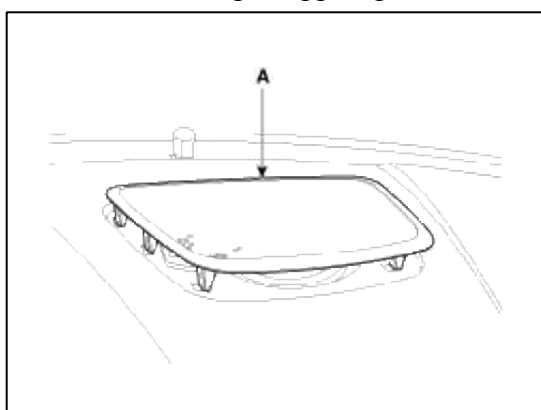
1. Remove the rear door trim panel and speaker connector.  
(Refer to the BD group - "Interior trim")

2. Remove the rear speaker (A) after removing 4 bolts.

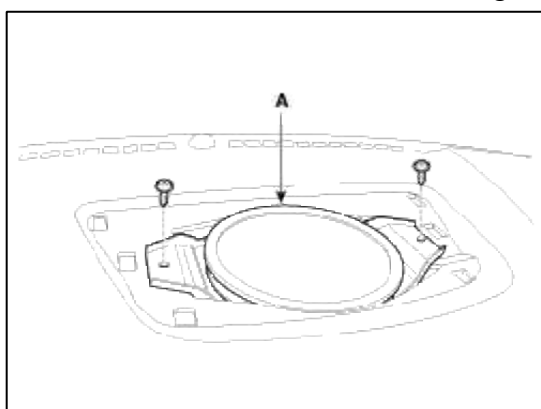


### Center Speaker

1. Remove the crash pad upper speaker cover (A).

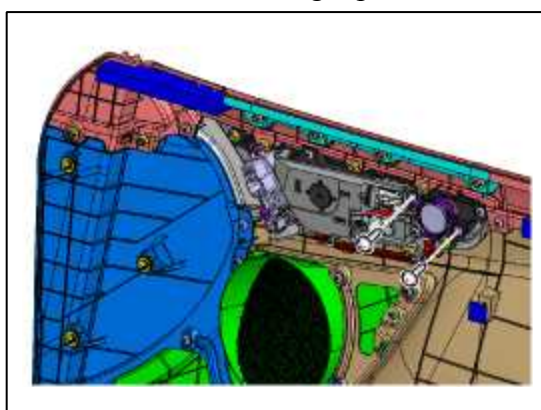


2. Disconnect the connector, after loosening 2 screws then remove the center speaker (A).



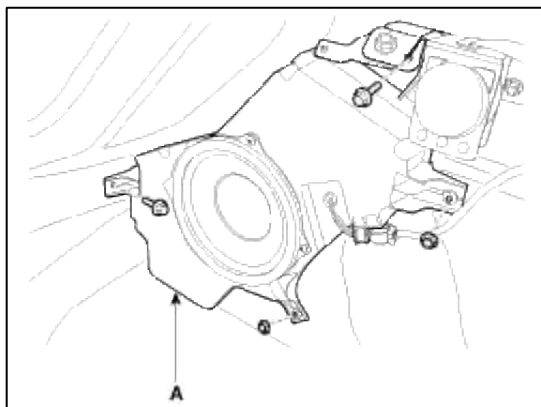
### Midrange Speaker

1. Remove the front door trim panel and speaker connector.  
(Refer to the BD group - "Front door")
2. Remove the front midrange speaker, after loosening 2 screws.



### Subwoofer Speaker

1. Remove the rear fillar trim panel and speaker connector.  
(Refer to the BD group - "Interior trim")
2. Remove the subwoofer speaker (A), after loosening 2 bolts and 2 nuts.



### Installation

#### Front Speaker

1. Install the front speaker.
2. Install the rivets and connect the connector.
3. Install the front door trim panel.

#### Rear Speaker (Right)

1. Install the rear speaker.
2. Install the rivets and connect the connector.
3. Install the door trim panel.

#### Rear Speaker (Left)

1. Install the rear speaker after connecting the connector.
2. Install the door trim panel.

#### Center Speaker

1. Install the center speaker after connecting the connector.
2. Install the center speaker cover.

#### Midrange Speaker

1. Install the midrange speaker after connecting the connector.
2. Install the front door trim panel.

#### Subwoofer Speaker

1. Install the subwoofer speaker after connecting the connector.
2. Install the rear fillar trim panel.

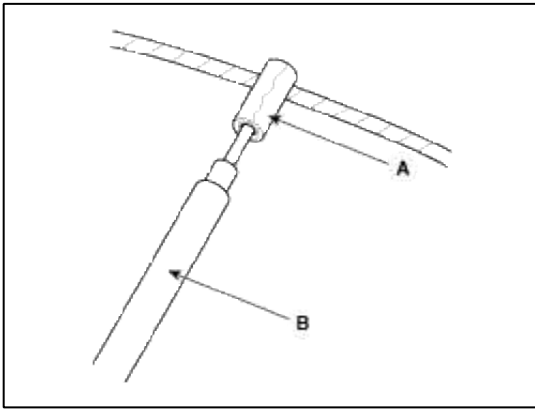
### Body Electrical System > AVN System > Antenna > Repair procedures

#### Inspection

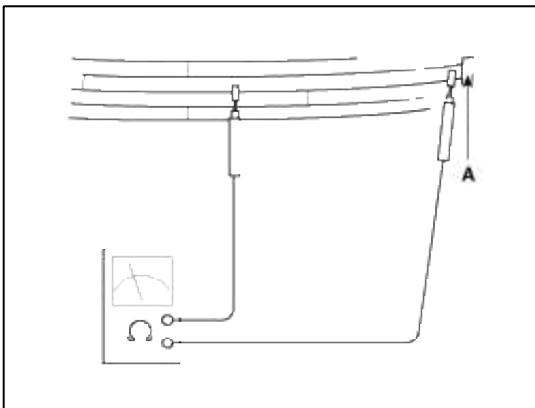
#### Glass Antenna Test



1. Wrap aluminum foil (A) around the tip of the tester probe (B) as shown.



2. Touch one tester probe to the glass antenna terminal (A) and move the other tester probe along the antenna wires to check that continuity exists.

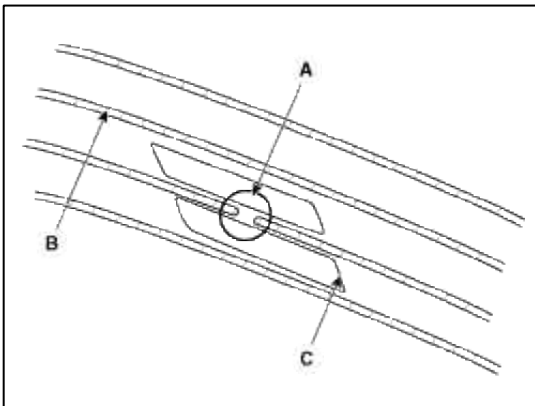


### Glass Antenna Repair

#### NOTE

To make an effective repair, the broken section must be no longer than one inch.

1. Lightly rub the area around the broken section (A) with fine steel wool, and then clean it with alcohol.

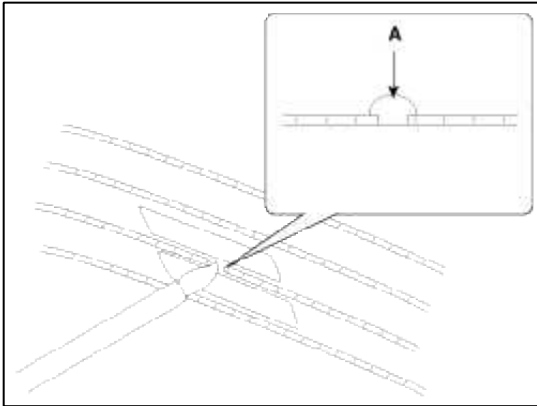


2. Carefully mask above and below the broken portion of the glass antenna wire (B) with cellophane tape (C).

3. Using a small brush, apply a heavy coat of silver conductive paint (A) extending about 1/8" on both sides of the break. Allow 30 minutes to dry.

**NOTE**

Thoroughly mix the paint before use.



4. Check for continuity in the repaired wire.
5. Apply a second coat of paint in the same way. Let it dry three hours before removing the tape.

**Glass Antenna Circuit Inspection**

1. Remove the right side rear quarter trim.

Then disconnect the antenna feeder cable (A) from the glass antenna amp.

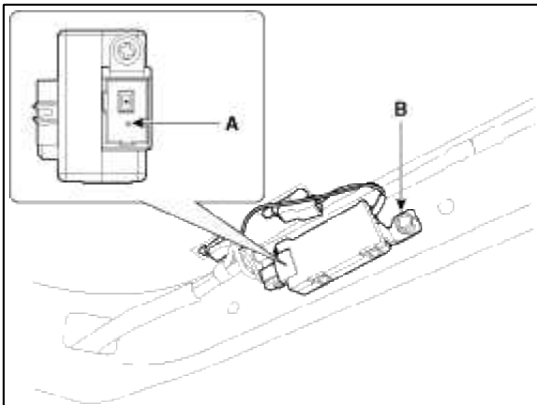
2. Turn the radio ON.

Measure the voltage between the harness side feeder cable (A) and body ground (B).

---

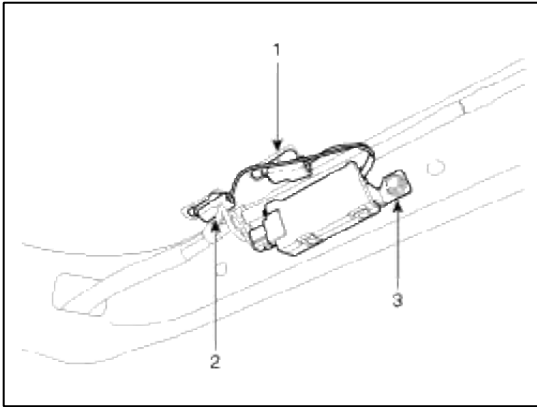
**OK :** approximately 12V (ACC+)

---



3. Check for FM wire resistance between terminals of No.1 and 3

1. FM antenna grid terminal
2. AM antenna grid terminal
3. Body ground.



**Standard value :** 80~120K $\Omega$

**Short :** Approx. 0 $\Omega$

**Open :**  $\infty \Omega$

4. Check for AM wire resistance between terminals of No.2 and 3.

**Standard value :** 120~170K $\Omega$

**Short :** Approx. 0 $\Omega$

**Open :**  $\infty \Omega$

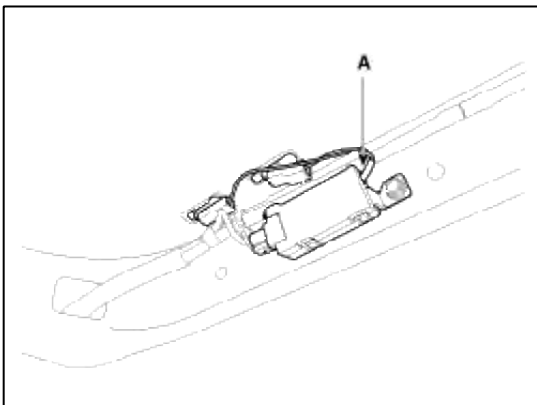
5. Check the grid lines for continuity.

6. When a poor radio reception is not repaired through the above inspection methods, replace the amp.

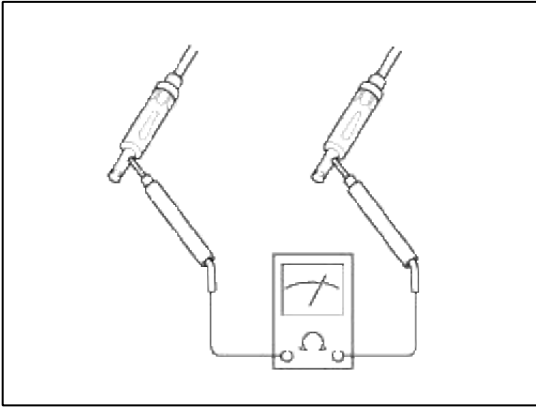
If the radio reception is still poor, check the radio cable for short and radio head unit for failure.

Antenna Cable

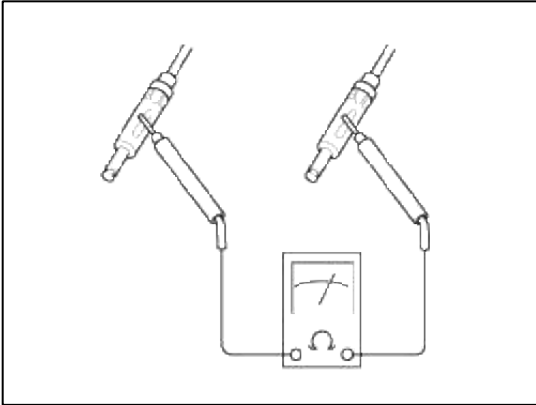
1. Remove the antenna jack (A) from the AVN unit and antenna.



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

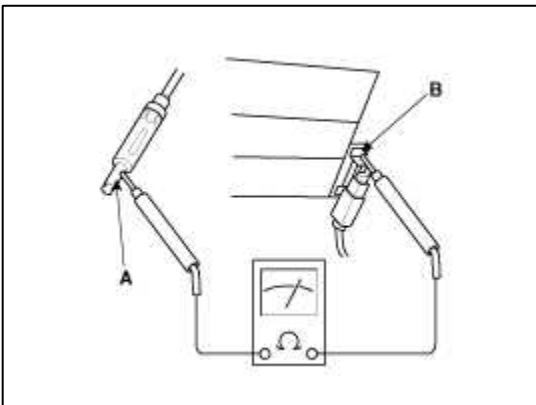


3. Check for continuity between the outer poles of antenna cable. There should be continuity.



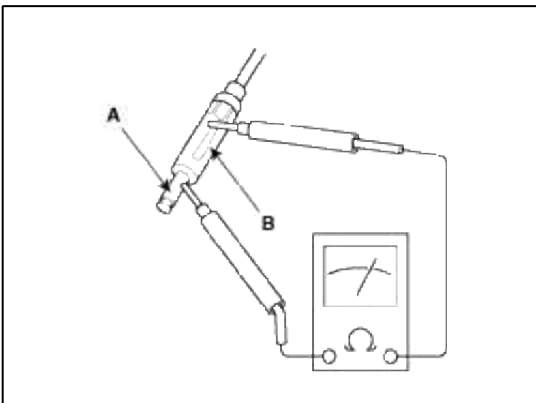
4. If there is no continuity, replace the antenna cable.

5. Check for continuity between the center pole (A) and window antenna pole (B). There should be continuity.



6. If there is not continuity, replace the external amplifier.

7. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.



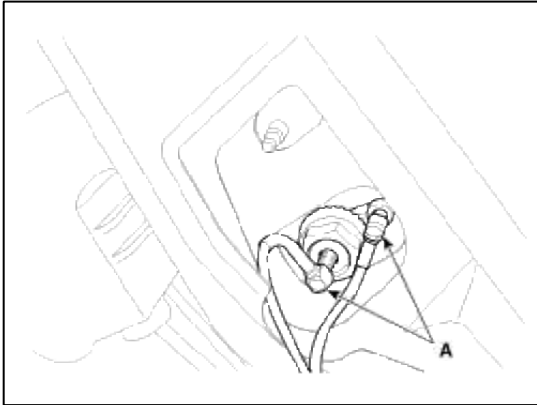
8. If there is continuity, replace the antenna cable.

## Body Electrical System > AVN System > GPS Antenna > Repair procedures

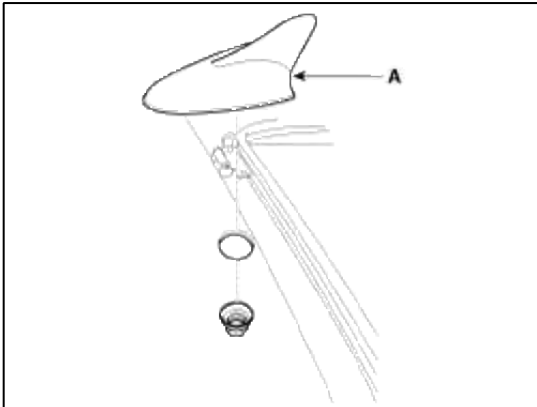
### Removal

#### Roof Antenna (GPS)

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



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



### Installation

#### Roof Antenna (GPS)

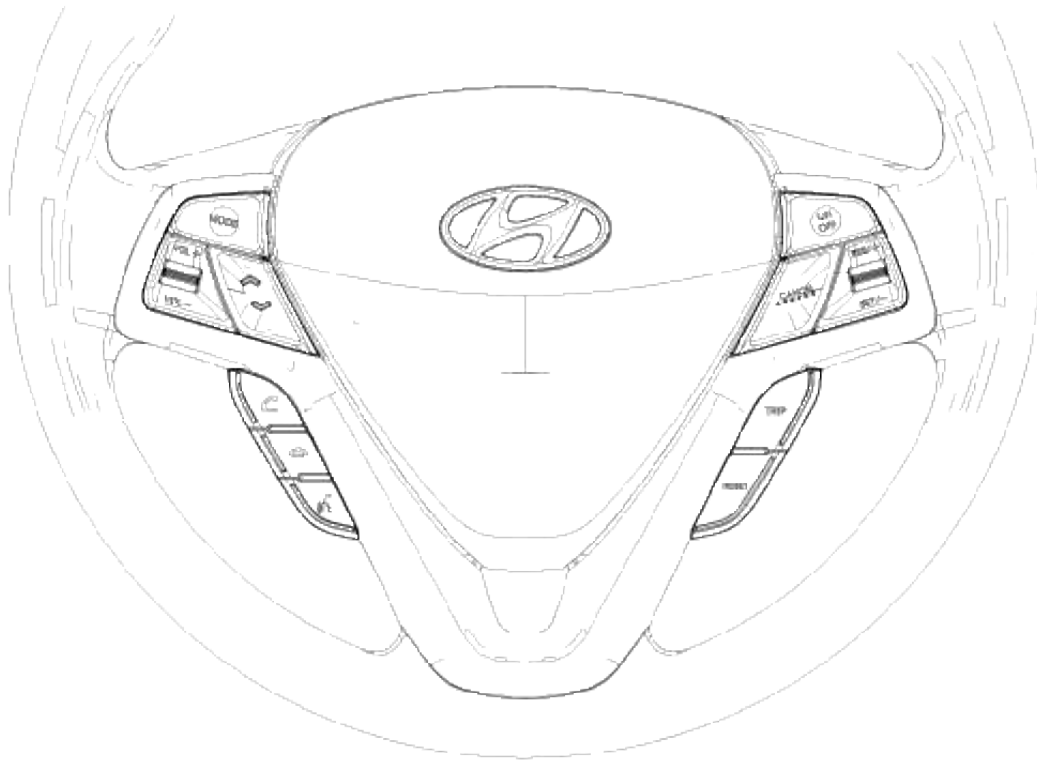
1. Install the roof antenna.
2. Connect the GPS cable.
3. Install the nut.
4. Install the rear roof trim.

#### NOTE

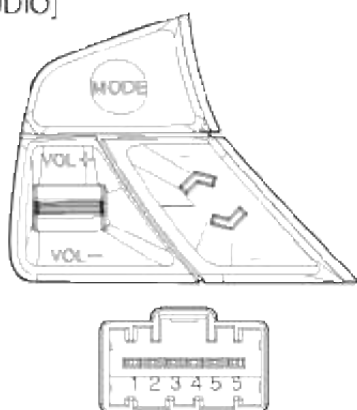
- Make sure that the cables and connectors are plugged in properly.
- Check the AVN system.

## Body Electrical System > AVN System > AVN Remote Control > Schematic Diagrams

### Circuit Diagram

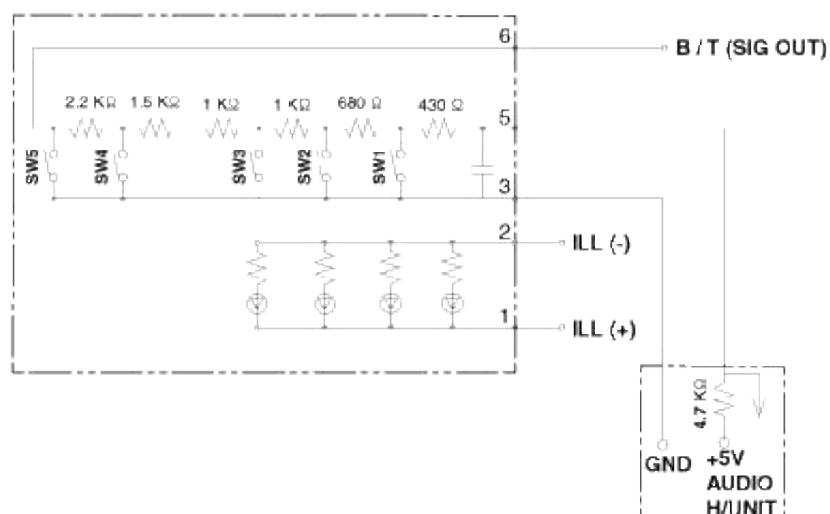


## [AUDIO]

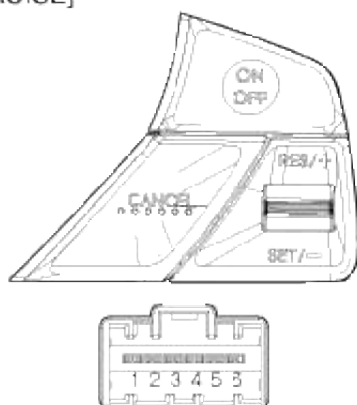


NO.	Description
1	Illumination (-)
2	Illumination (+)
3	Audio head unit (Ground)
4	-
5	Audio head unit (Signal IN)
6	Bluetooth (Signal OUT)

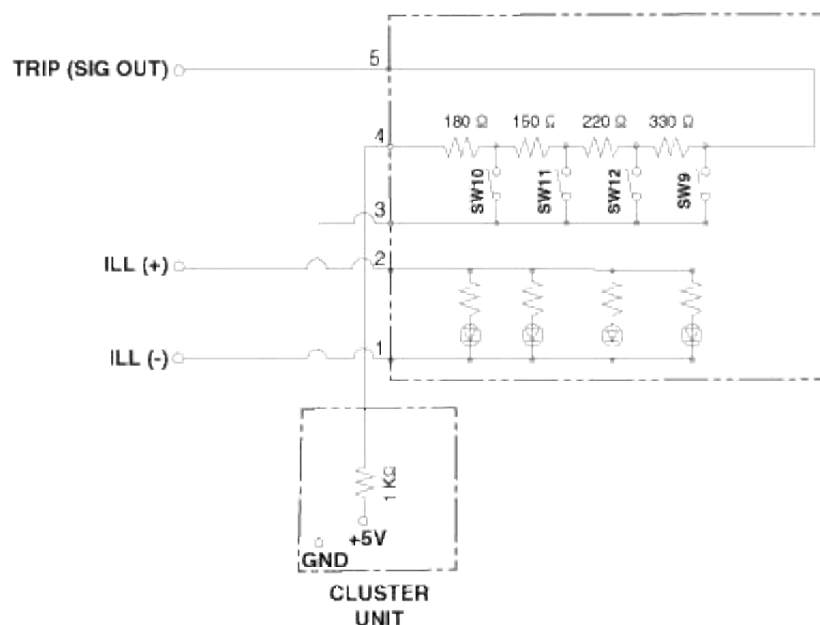
## LH (AUDIO)



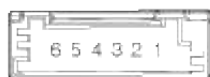
## [CRUISE]



NO.	Description
1	Illumination (-)
2	Illumination (+)
3	Trip (-)
4	Trip (-)
5	Trip (Signal OUT)
6	-

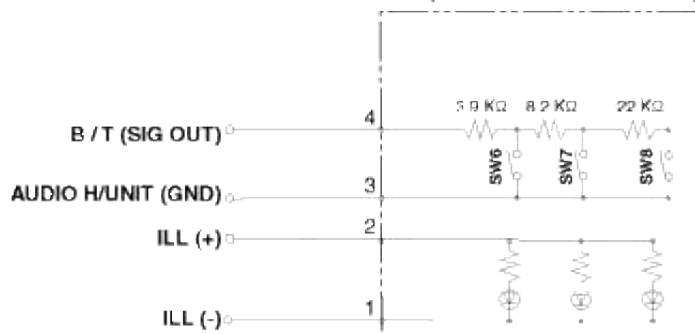


## [BULETOOTH+VOICE]

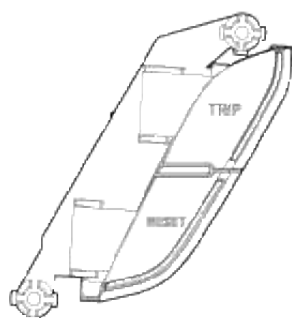


NO.	Description
1	Illumination (-)
2	Illumination (+)
3	Audio head unit (Ground)
4	Bluetooth (Signal IN)
5	Audio head unit (Signal IN)
6	Bluetooth (Signal OUT)

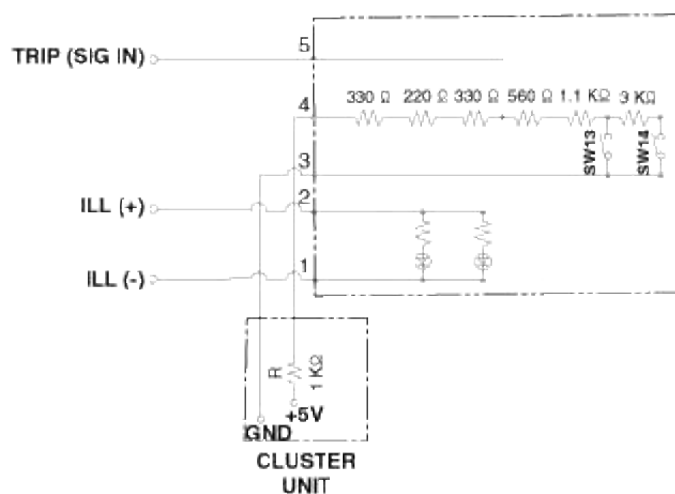
## LH (BULETOOTH+VOICE)



## [TRIP+RESET]



NO.	Description
1	Illumination (-)
2	Illumination (+)
3	Trip (-)
4	Trip (+)
5	Trip (Signal IN)
6	-



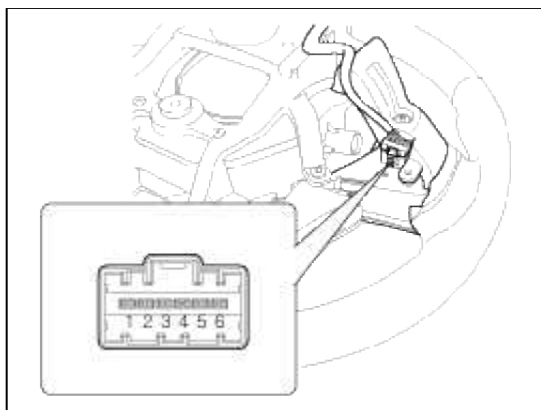
## Body Electrical System &gt; AVN System &gt; AVN Remote Control &gt; Repair procedures

## Inspection

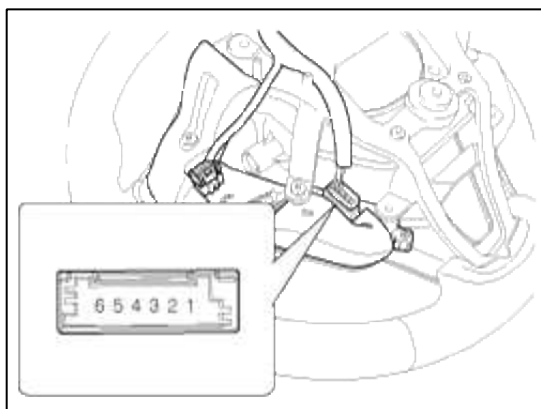
1. Check the audio remote control switch (A) for resistance between connector terminals in each switch position.

## [LH-AUDIO]





[RH-TRIP]



[Audio]

Switch	Connector terminal	Resistance (±5%)
Seek up	3-5	430 Ω
Seek down	3-5	1.11 kΩ
Mode	3-5	2.11 kΩ
Volume up	3-5	4.61 kΩ
Volume down	3-5	6.81 kΩ

[Cruise]

Switch	Connector terminal	Resistance (±5%)
ON/ OFF	3-4	880 Ω
Cancle	3-4	180 Ω
SET -	3-4	330 Ω
SET +	3-4	550 Ω

[Bluetooth + Voice]

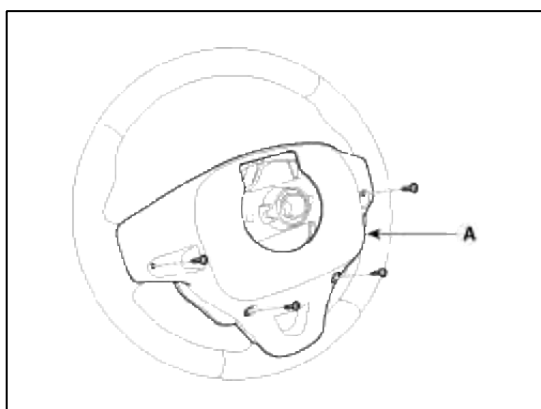
Switch	Connector terminal	Resistance (±5%)
Voice	3-4	10.71 kΩ
End of call	3-4	18.91 kΩ
Send	3-4	40.91 kΩ

**[Trip + Reset]**

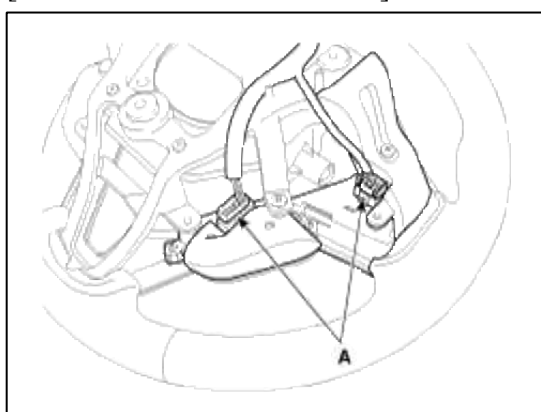
Switch	Connector terminal	Resistance (±5%)
Trip	3-4	2.54 kΩ
Reset	3-4	5.54 kΩ

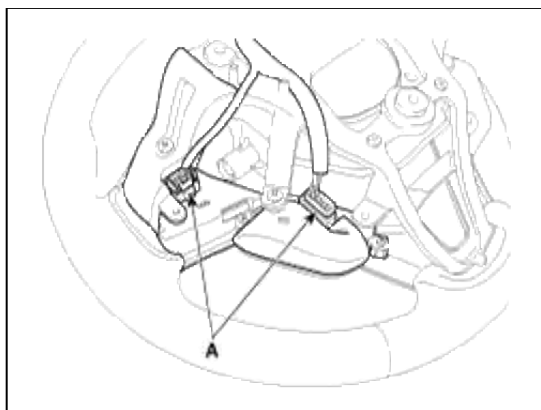
**Removal**

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.  
(Refer to the RT group - "Driver airbag module and clock spring")
3. Remove the steering wheel.  
(Refer to the ST group - "Steering column & shaft")
4. Remove the steering wheel cover (A) after loosening 4 screws.

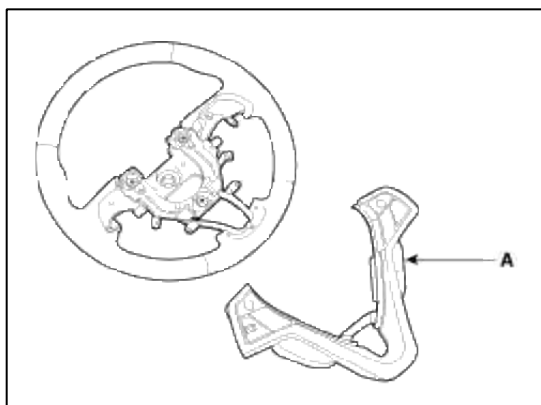


5. Remove the steering wheel remote control switches connectors.

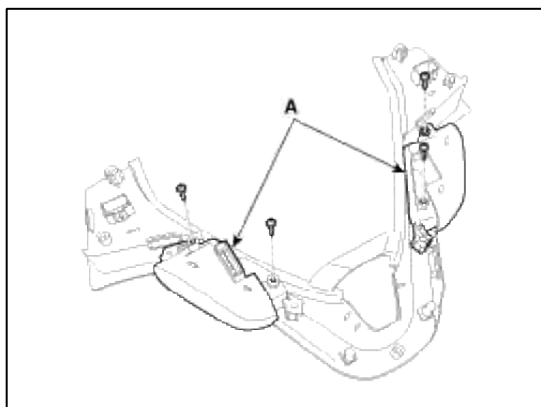
**[LH-Audio/ Bluetooth + Voice]****[RH-Cruise/ Trip + Reset]**



6. Remove the wiring and loosen 5 screws.
7. Remove the steering wheel remote control switch assembly (A).



8. Remove the bluetooth switch and the trip switch (A) after loosening the screws.



#### Installation

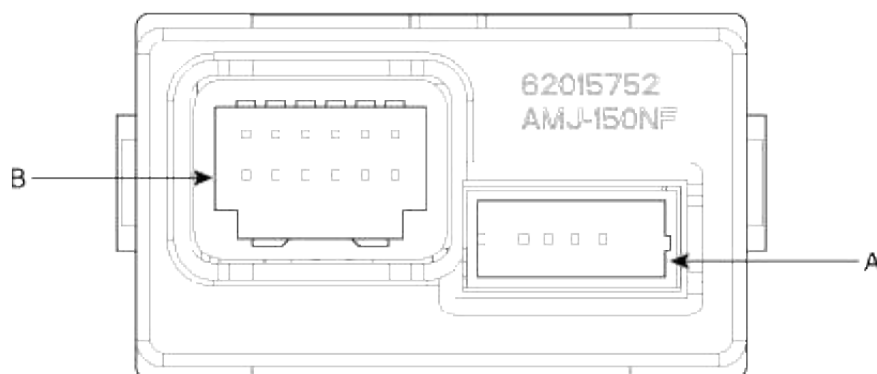
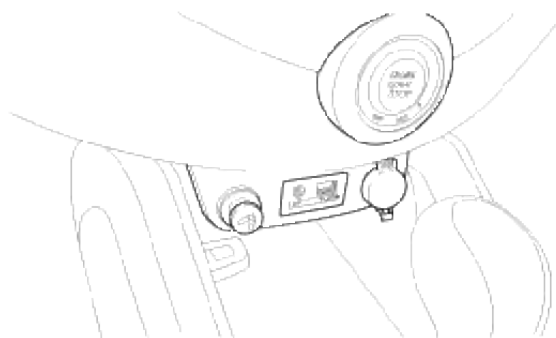
1. Install the steering wheel remote control switch.
2. Install the steering wheel cover.
3. Install the steering wheel.
4. Install the driver airbag module.

#### NOTE

Make sure the audio remote control switch and the airbag module connectors are plugged in properly.

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

#### Circuit Diagram



Connector A	Pin No.	Description
	1	USB/IPOD VOD
	2	USB_D (-)
	3	USB_D (+)
	4	USB/IPOD Ground

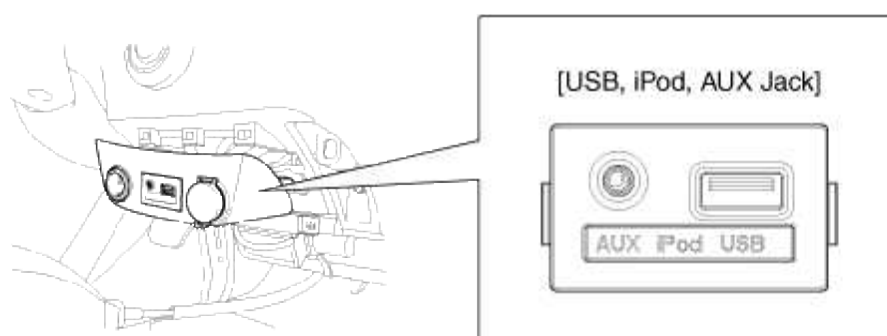
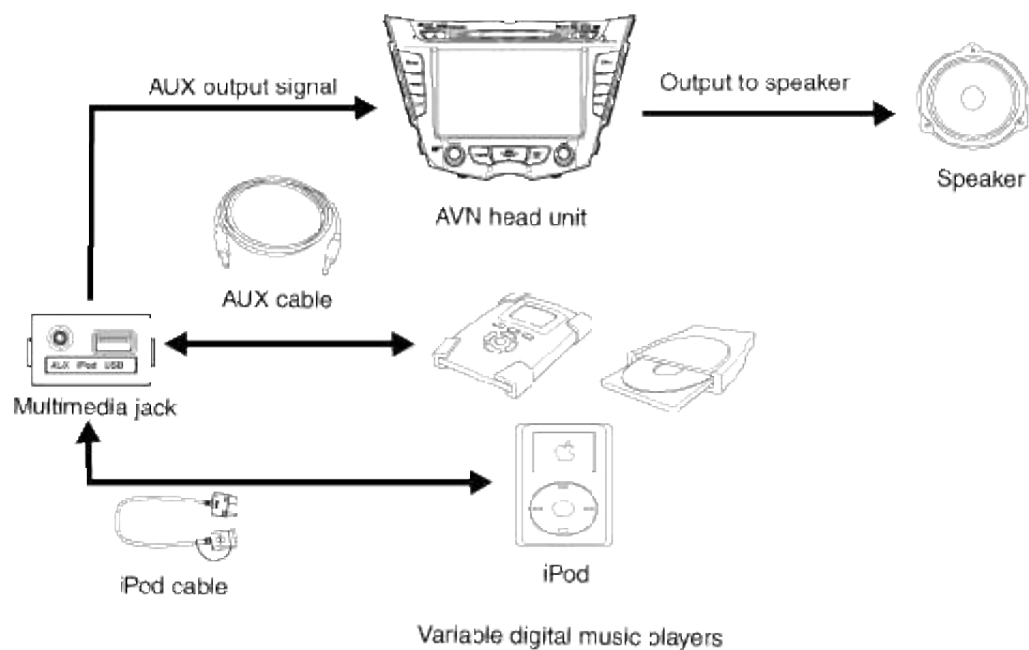
Connector B	Pin No.	Description
	1	AUX L
	2	AUX R
	3	AUX Detent
	4	AUX Video
	5	-
	6	Illumination (+)
	7	S_Ground
	8	Shield_A_Ground
	9	-
	10	AUX V Ground
	11	-
	12	Ground

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

#### Description

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

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

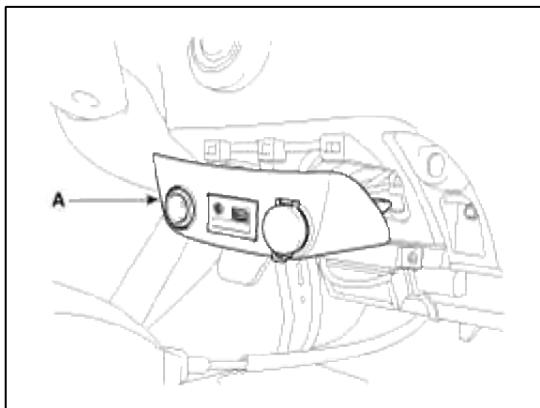


## Body Electrical System > AVN System > Multimedia Jack > Repair procedures

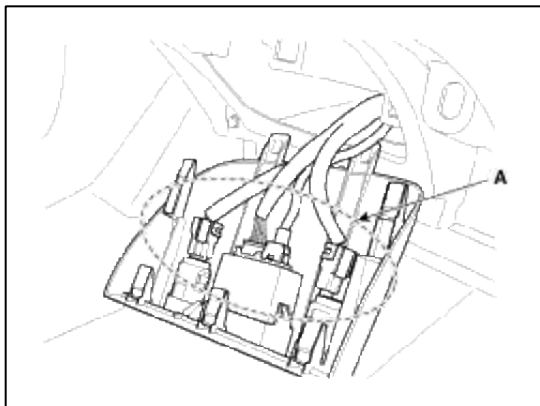
### Removal

1. Remove the floor console assembly.  
(Refer to the BD group - "Console")

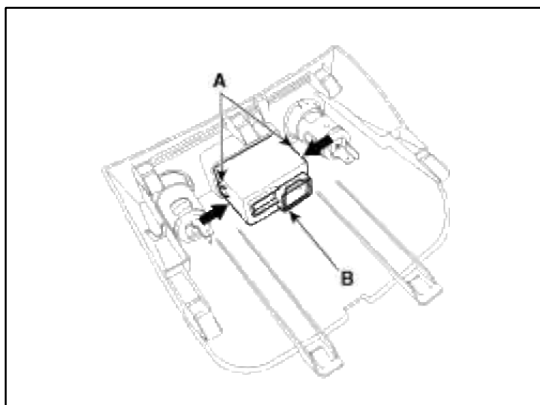
2. Remove the multimedia jack assembly (A).



3. Disconnect the multimedia jack connector (A).



4. Remove the multimedia jack (B) after releasing the fixed hooks (A).



#### Installation

1. Install the multimedia jack.
2. Install the floor console assembly.

#### NOTE

Make sure the multimedia connector and the console upper cover 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 device, try the suggestions listed below.

3. If the problems persist, contact your point of purchase or the nearest service center.

Problem	Function
There are small red, blue, or green dots on the screen	Because the LCD is manufactured with technology requiring high point density, a pixel deficiency or lighting may occur within 0.01% of total pixels.
The sound or image is not working	<ul style="list-style-type: none"> <li>• Has the switch for the vehicle been turned to [ACC] or [ON]?</li> <li>• Has the SYSTEM been turned OFF?</li> </ul>
The video is being displayed but sound is not working	<ul style="list-style-type: none"> <li>• Has the volume been set to a low level?</li> <li>• Has the volume been set on mute?</li> </ul>
When the power is turned on, the corners of the screen are dark	<ul style="list-style-type: none"> <li>• The display looking somewhat darker after prolonged periods of use is a normal phenomenon with LCD panels. It is not a malfunction.</li> <li>• If the screen is very dark, contact your point of purchase or the nearest service center.</li> </ul>
Sound is working from only one speaker	<ul style="list-style-type: none"> <li>• Is the position of FAL/BAL sound controls or volume adjusted to only one side?</li> </ul>
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	<p>The TTS(Text To Speech) engine speaks the street name based off of the phonetic spelling.</p> <p>This will continuously be update with the map database.</p>

### Troubleshooting

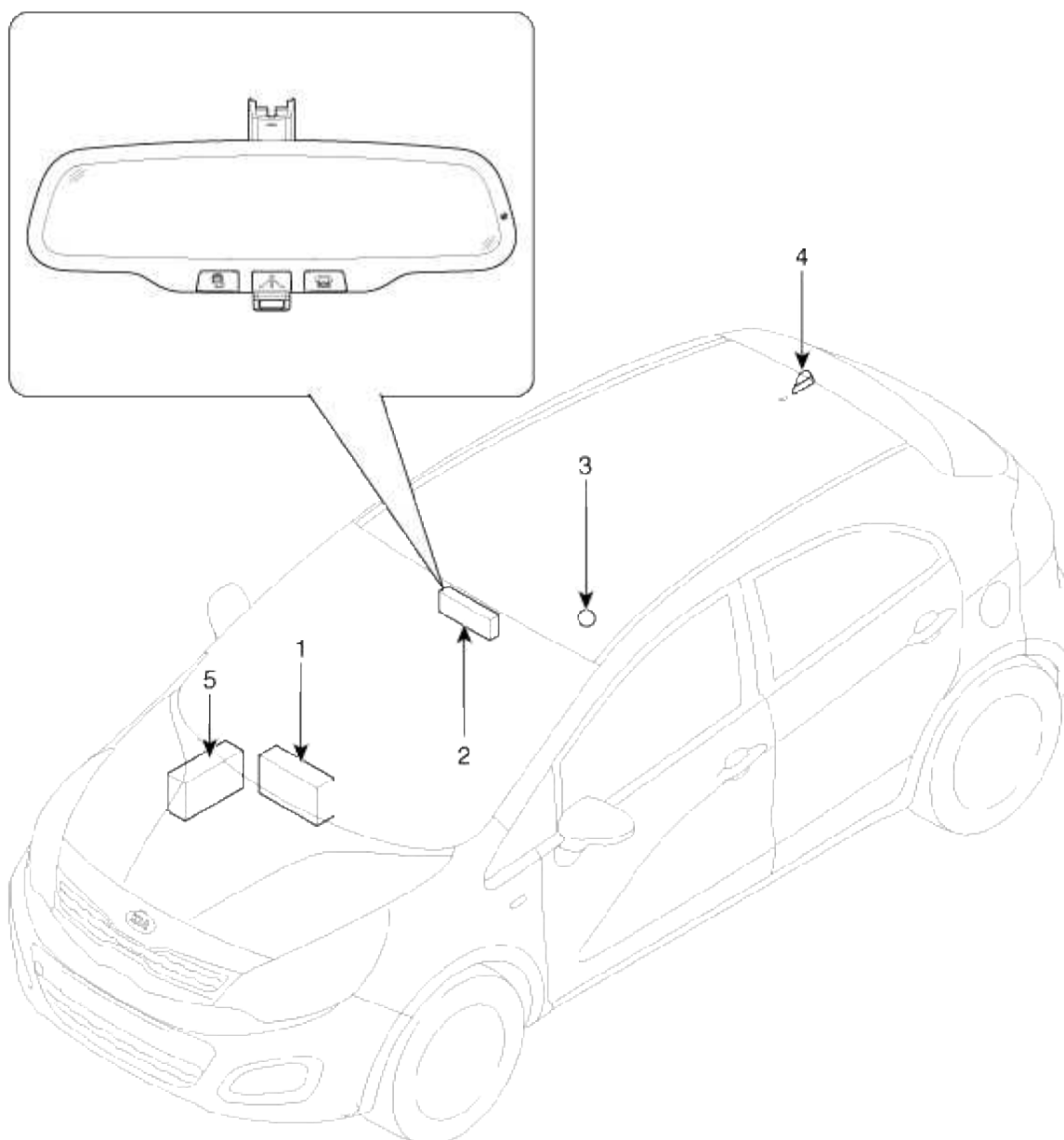
Problem	Possible Cause	Solution
The power does not turn on.	The fuse is disconnected.	Replace with a suitable fuse. If the fuse is disconnected again, please contact your point of purchase or service center.
	Device is not properly connected.	Check to see that the device has been properly connected.
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	<ul style="list-style-type: none"> <li>• The volume level is set the</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust the volume level.</li> </ul>

work.	<p>lowest level.</p> <ul style="list-style-type: none"> <li>• The connector is not properly connected.</li> <li>• The device is currently fast-forwarding, rewinding, scanning, or playing in slow mode.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the connection state.</li> <li>• The sound will not work when the device is fast-forwarding, rewinding, scanning, or playing in slow mode.</li> </ul>
The sound or video quality is low.	<ul style="list-style-type: none"> <li>• The DISC is dirty or scratched.</li> <li>• Vibration is occurring from the position in which the conversion switch has been installed.</li> <li>• The color and tone quality of the image is low.</li> </ul>	<ul style="list-style-type: none"> <li>• Wipe off water or dirt from the DISC. Do not use a disc which has been scratched.</li> <li>• 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.</li> <li>• Aging of the video display and deterioration in performance may cause certain quality degradations.</li> </ul>
The USB does not work.	<ul style="list-style-type: none"> <li>• USB memory is damaged.</li> <li>• USB memory has been contaminated.</li> <li>• A separately purchased USB HUB is being used.</li> <li>• A USB extension cable is being used.</li> <li>• A USB which is not a Metal Cover Type USB Memory is being used.</li> <li>• A HDD type, CF, SD Memory is being used.</li> <li>• There are no music files which can be played.</li> </ul>	<ul style="list-style-type: none"> <li>• Please use after formatting the USB into FAT 12/16/32 format.</li> <li>• Remove any foreign substances on the contact surface of the USB memory and multimedia terminal.</li> <li>• Directly connect the USB memory with the multimedia terminal on the vehicle.</li> <li>• Directly connect the USB memory with the multimedia terminal on the vehicle.</li> <li>• Use a standard USB memory.</li> <li>• Use a standard USB memory.</li> <li>• Only MP3, WMA file formats are supported. Please use only the supported music file formats.</li> </ul>
The iPod is not recognized even though it has been connected.	<ul style="list-style-type: none"> <li>• There are no titles which can be played.</li> <li>• The iPod firmware version has not been properly updated.</li> <li>• The iPod device does not recognize downloads.</li> </ul>	<ul style="list-style-type: none"> <li>• Use iTunes to download and save MP3 files into the iPod.</li> <li>• Use iTunes to update the firmware version and reconnect the iPod with the device.</li> <li>• Reset the iPod and reconnect with the device.</li> </ul>

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

### Components





- |   |  |
|---|--|
| 1. AVN<br>2. Rear Mirror Switch (Blue Link button, Center button, SOS button)<br>3. Mic | 4. Roof Antenna (GPS+CDMA)<br>5. Telematics unit (TMU) |
|---|--|



### Body Electrical System > MTS System > Description and Operation

#### Description

#### Mobile Telematics System (MTS)

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

Hyundai Motor plans to achieve this by realizing a terminal platform flexible to changes in IT technology,

cooperating with global IT companies, creating an eco-system and providing the latest contents & services based on an open environment.

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

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

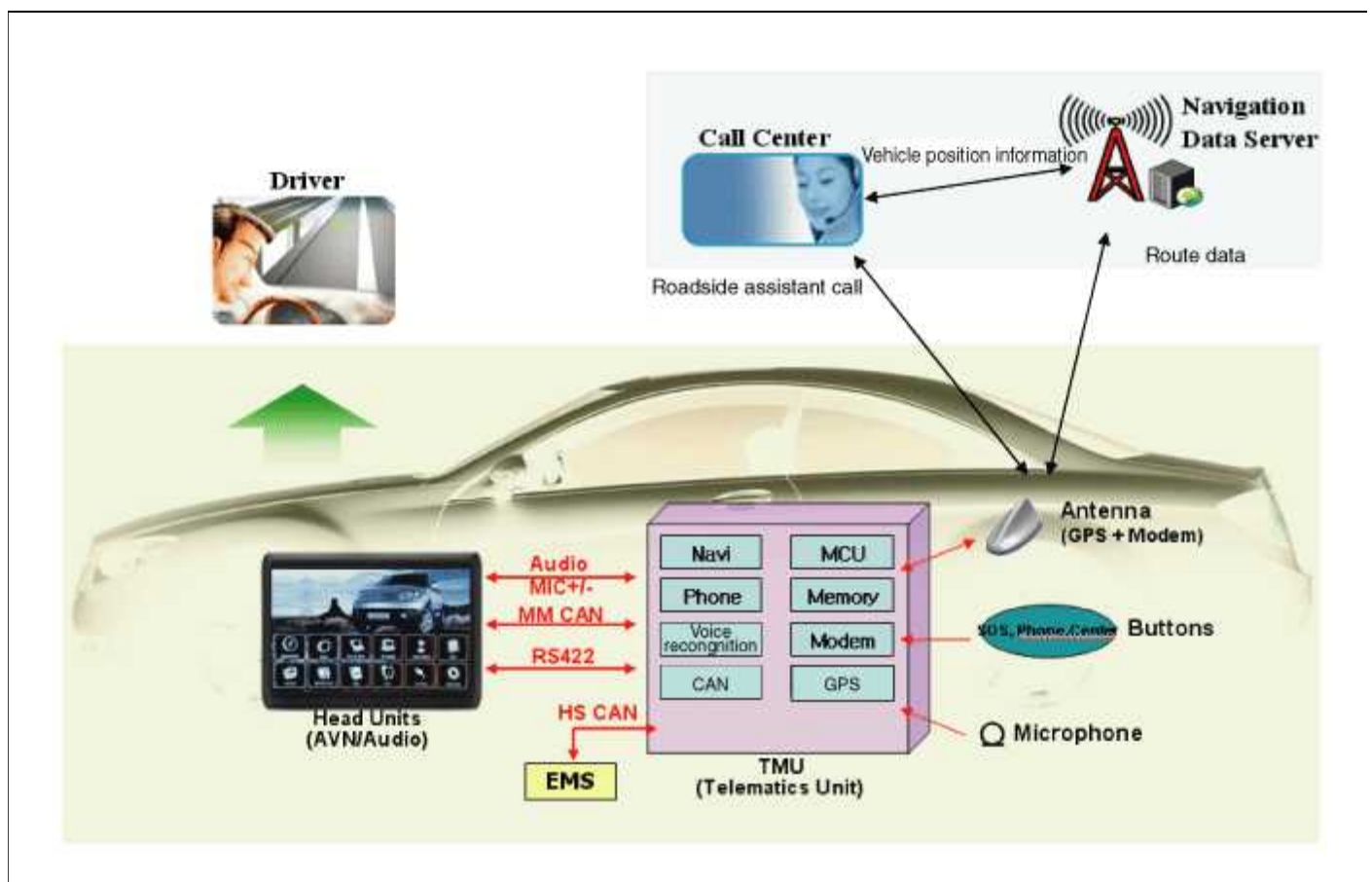
With Blue Link you get...

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

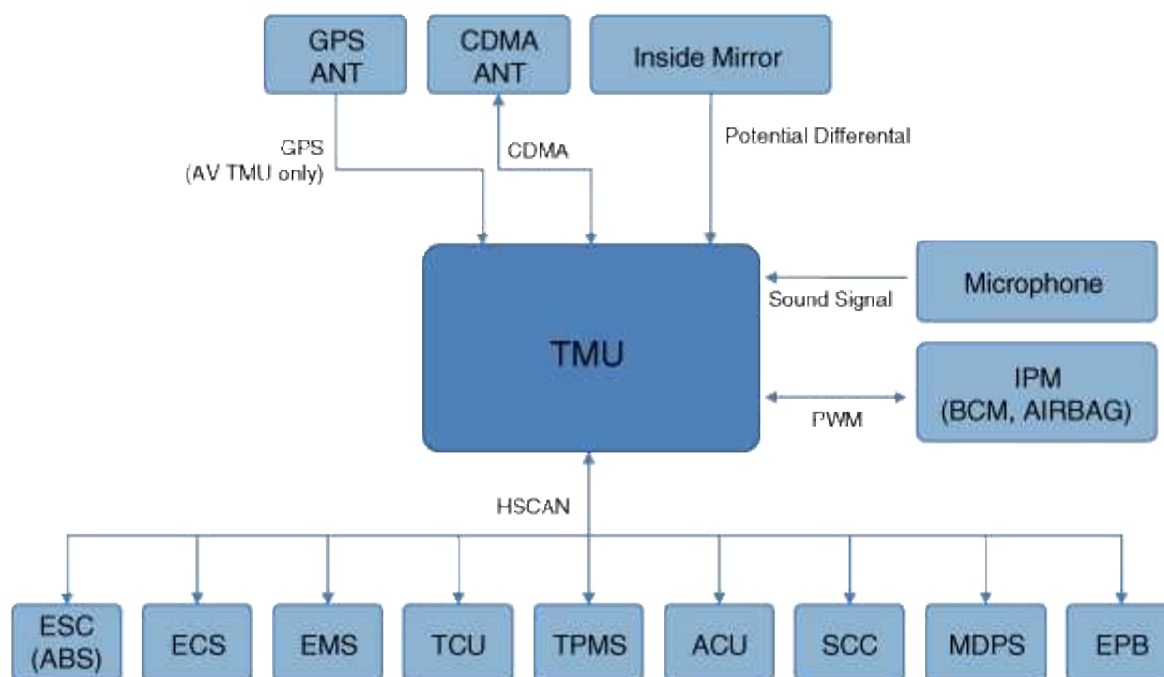
#### Main Features

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

#### Block Diagram



#### System Components



## Using procedures

### 1. Enrolling in Blue Link

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

#### NOTE

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

### 2. Subscribe the Blue Link Packages

Blue Link services come in three groupings, or packages:

Assurance	<ul style="list-style-type: none"> <li>• Automatic Collision Notification and Assistance</li> <li>• SOS Emergency Assist</li> <li>• Enhanced Roadside Assist</li> <li>• Monthly Vehicle Report</li> </ul>		
Essentials	<ul style="list-style-type: none"> <li>• Convenience:               <ul style="list-style-type: none"> <li>– Remote Door Lock</li> <li>– Remote Door Unlock</li> <li>– Remote Horn/Lights</li> <li>– Remote Vehicle Start*</li> <li>– Quick Tips</li> <li>– Location Sharing</li> <li>– Voice Text Messaging</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle Self Diagnostics:               <ul style="list-style-type: none"> <li>– Automatic Diagnostics Trouble Code Notification</li> <li>– Maintenance Alert</li> <li>– Recall Advisor</li> <li>– Service Link</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Safeguard:               <ul style="list-style-type: none"> <li>– Stolen Vehicle Recovery</li> <li>– Stolen Vehicle Slowdown</li> <li>– Vehicle Immobilization</li> <li>– Valet Alert</li> <li>– Panic Notification</li> <li>– Alarm Notification</li> <li>– Geo-Fence</li> <li>– Speed Alert</li> <li>– Curfew Alert</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• Point of Interest Search by Advanced Voice Recognition</li> <li>• Point of Interest Web Search &amp; Download</li> </ul>		

Guidance	<ul style="list-style-type: none"> <li>• Turn-by-Turn Navigation**</li> <li>• Daily Route Guidance with Traffic Conditions</li> <li>• Traffic</li> <li>• Gas Station Locations &amp; Gas Prices</li> <li>• Eco-Coach</li> <li>• Restaurant Ratings &amp; Locations</li> <li>• Weather</li> </ul>
----------	--

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

- A. Assurance
- B. Assurance + Essentials
- C. Assurance + Essentials + Guidance

### 3. Setting Blue Link preferences

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

#### NOTE

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

### 4. Accessing Blue Link preferences

#### (1) Smart Phone Mobile Application

You can download the Blue Link mobile app to your compatible smart phone.

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

#### (2) In-car Application

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

#### NOTE

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

#### (3) Web Application

Many Blue Link features can be customized, activated, or accessed at [www.MyHyundai.com](http://www.MyHyundai.com).

This is your important link to getting the most out of your Blue Link system.

#### NOTE

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

### Service List

## 1. Safety and Security

Service Name	Service Trigger
- Auto Crash Notification	When an accident occurred and airbag deployed, ACN notification will be triggered automatically.
- SOS – Emergency Assistance	It will be triggered by manually pressing the SOS button on the inside mirror. It will connect you to emergency assistance helper.
- Alarm/Panic Notification	when the vehicle alarm system is activated, it will be automatically triggered and inform to owner. If the customer push the panic button of key FOB near the vehicle, it will be triggered and notify that driver or vehicle occupant may be in danger
- Enhanced roadside	Push the Interactive Voice Recognition (IVR) button on the inside mirror and ask to operator about the help.
- Speed Alert	Customer can setup notification limit of vehicle speed on the web or by asking operator using IVR call.
- Remote Door Control – Lock	Customer can ask Remote Door Lock service by using the Smart Phone application or on the web(CWP) or asking to operator by IVR call.
- Remote Door Control – Unlock	Customer can ask Remote Door Unlock service by using the Smart Phone application or on the web(CWP) or asking to operator by IVR call.
- Remote Horn and Lights	Customer can ask Horn&Light or Light Only services by using the Smart Phone application or on the web(CWP) or asking to operator by IVR call.
- Stolen Vehicle Recovery	This service can be triggered on request by police only
- Vehicle Immobilization/Slowdown	This service can be triggered on request by police only
- Curfew Alert	The customer can setup notification time interval that vehicle being used on the web or by asking operator using IVR call.
- Vehicle Remote Start	The customer can ask remote start service by using the Smart Phone application or on the web(CWP) or asking to operator by IVR call. (Automatic transmission & Button start only)

## 2. Voice Recognition Module (VRM)

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

### 3. Geographic Information System (GIS)

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

- POI Searching by IVR (TMU and Phone)	POI download can be requested via IVR call.
- Location Sharing	For this service, the customer should pre-registration friend information on the web. When your friend ask inform hi's/she's location to you, it can will be download by a kinds of POI.

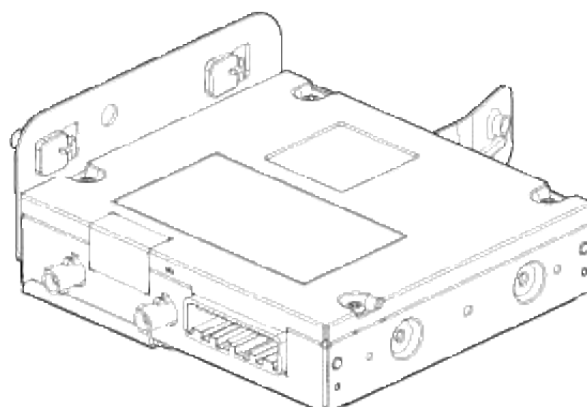
#### 4. Operator Service & ETC

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

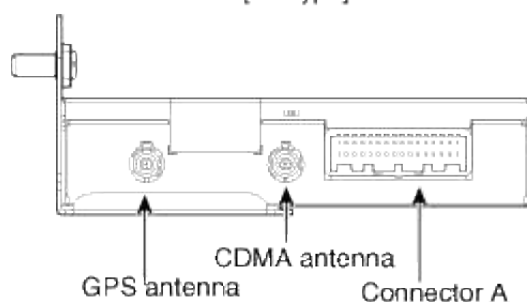
Service Name	Service Trigger
- Voice Text Messaging	
- Provisioning	
- TMU Disable Mode	"blueLink not active. Please call xxx-xxx-xxxx" will be showing when any button pushed after disable the telematics services.
- TMU Swap	The Proper TMU (TeleMatics Unit) should be installed on the vehicle. "Incorrect Telematics Unit Contact Dealer" will be showing if incorrect TMU is installed.

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

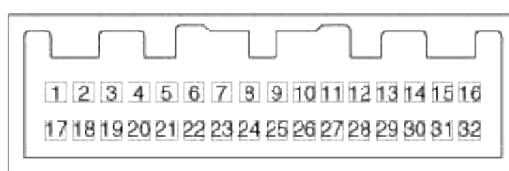
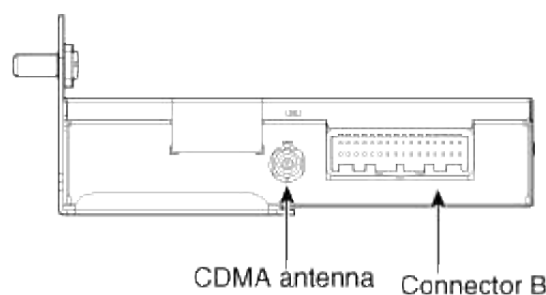
#### Component



[AV type]



[AVN type]



GPS antenna



CDMA antenna



Connector A				Connector B			
Pin No.	Description	Pin No.	Description	Pin No.	Description	Pin No.	Description
1	Ground	17	-	1	Ground	17	-
2	Ground	18	V_battery	2	Ground	18	V_battery
3	Reverse (Audio)	19	Ignition 1	3	-	19	Ignition 1
4	Keypad_GND	20	ACC	4	Keypad_GND	20	ACC
5	MIC output -	21	Airbag input	5	MIC output -	21	Airbag input
6	MIC output +	22	Keypad input	6	MIC output +	22	Keypad input
7	BCM Tx	23	BCM Rx	7	BCM Tx	23	BCM Rx
8	-	24	MIC shield	8	RS422 Shield GND	24	MIC shield
9	-	25	-	9	RS422_Rx -	25	RS422_Tx -
10	-	26	-	10	RS422_Rx +	26	RS422_Tx -
11	-	27	-	11	-	27	-
12	HSCAN -	28	MIC input +	12	HSCAN -	28	MIC input +
13	HSCAN +	29	MIC input -	13	HSCAN +	29	MIC input -
14	-	30	-	14	-	30	-
15	Audio output -	31	MMCAN -	15	Audio output -	31	MMCAN -
16	Audio output +	32	MMCAN +	16	Audio output +	32	MMCAN +

## Body Electrical System > MTS System > Telematics Unit (TMU) > Repair procedures

### Removal

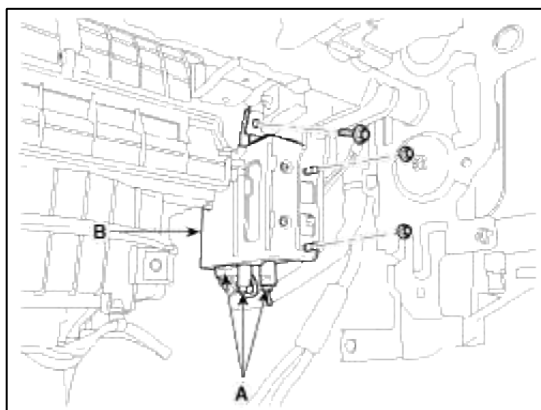
#### NOTE

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

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.  
(Refer to the BD group "Interior - Crash pad")



3. Disconnect the connectors (A) and loosen the bolt (1EA) and the nuts (2EA), then remove the Telematics unit (B).



#### Installation

1. Install the Telematics unit.
2. Install the glove box housing.
3. Connect the negative (-) battery terminal.

#### Inspection

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

#### NOTE

After replacing the AVN, the TMU automatically read the Vehicle Identity Number (VIN) and send it to Blue Link service center.

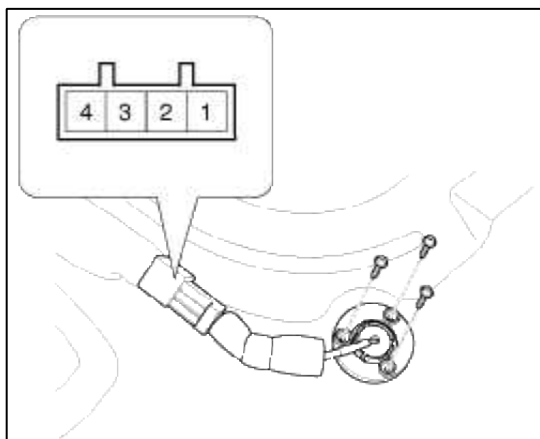
In this reason, technician have to test that Blue Link connect normally.

### Body Electrical System > MTS System > Mic > Repair procedures

#### Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the roof trim.  
(Refer to the BD group - "Roof trim")

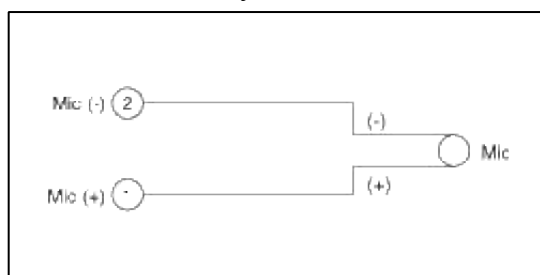
3. Remove the handsfree mic (A) after disconnect the connector from roof top.



**CAUTION**

Be careful not to damage the roof trim when removing the hands free mic.

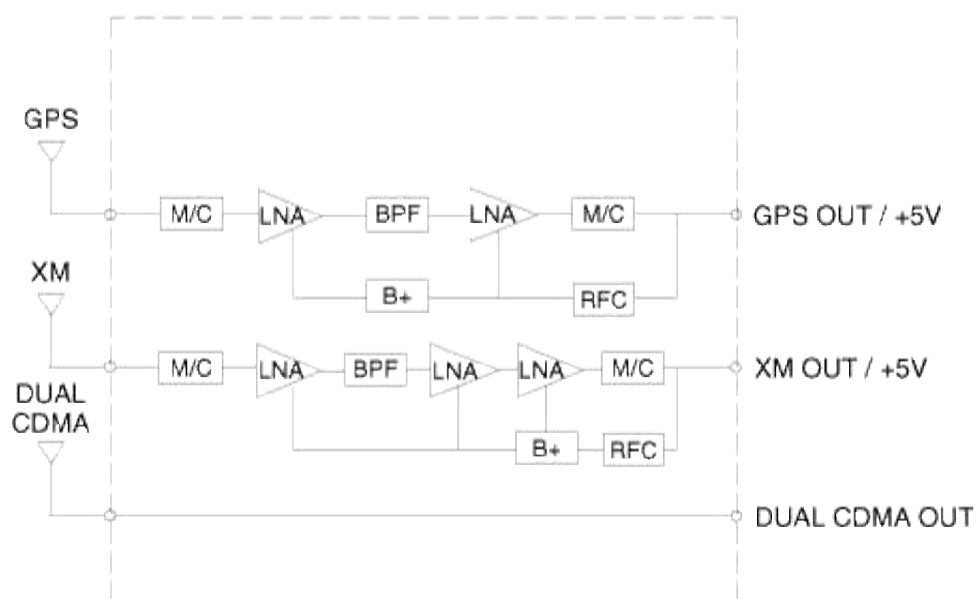
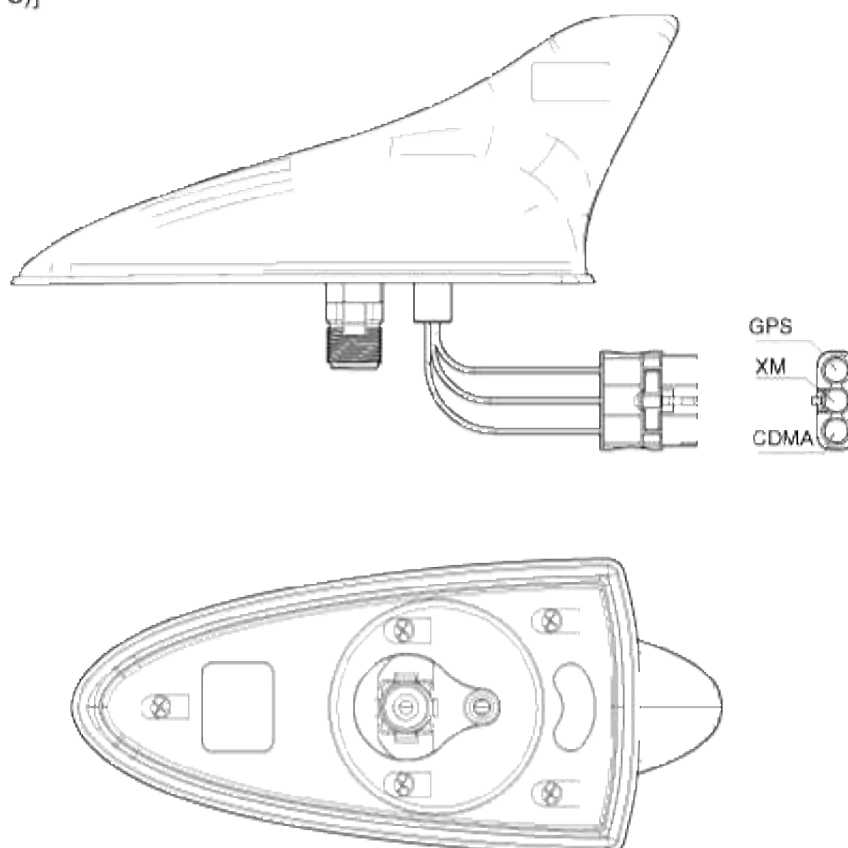
4. Check the continuity of Mic between terminals.



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

**Components**

[Roof antenna(GPS)]



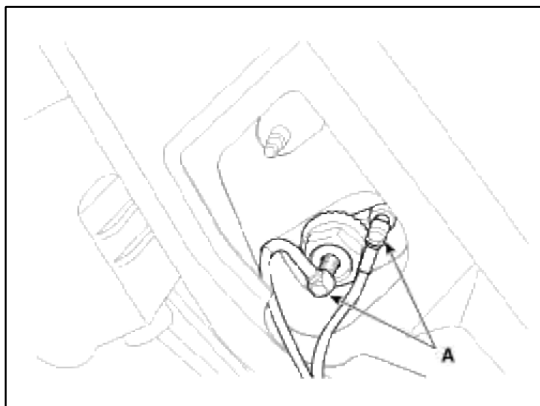
## Body Electrical System > MTS System > MTS Antenna > Repair procedures

### Removal

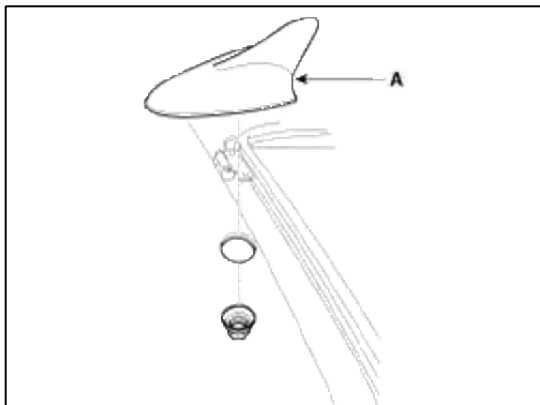
#### Roof Antenna (GPS)

1. Remove the rear roof trim.  
(Refer to the BD group - "Roof trim")

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



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



#### Installation

##### Roof Antenna (GPS)

1. Install the roof antenna.
2. Connect the GPS cable.
3. Install the nut.
4. Install the rear roof trim.

#### NOTE

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

### Body Electrical System > Smart key System > Specifications

#### Specification

##### Smart Key Unit

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-22°F ~ 167°F)
Load	Max. 5mA (When welcome light function off)

##### Smart Key FOB

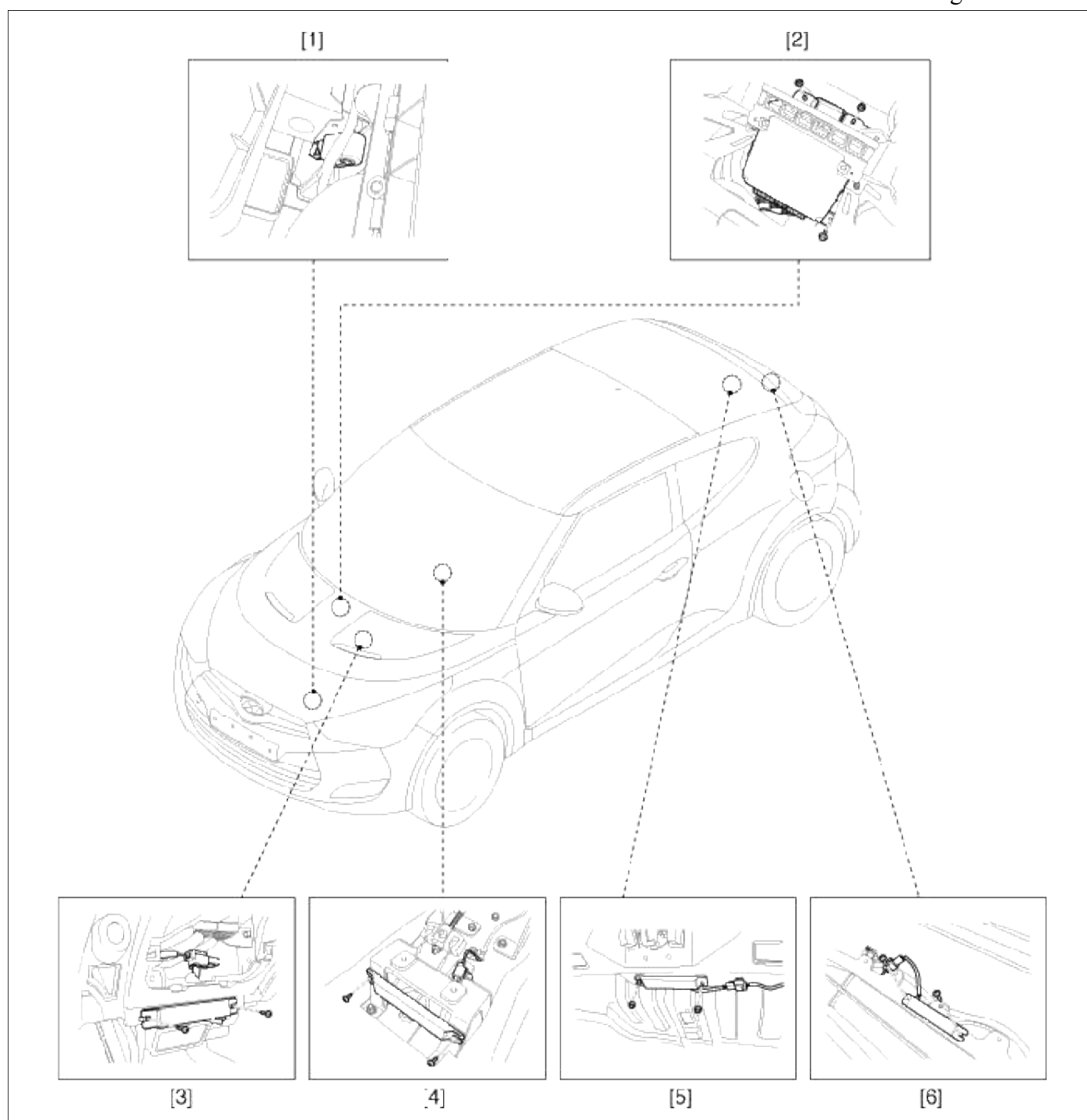
Items	Specification
Battery	Lithium battery 3V 1EA
Distance	30m from vehicle, RF : 30m, Passive(LF) : 0.7m
Battery life	More than 2years (10 times / a day)
Push buttons	4 (Door lock / unlock, Trunk lid, Panic)
Frequency(Rx)	125 kHz
Frequency(Tx)	315 MHz
Numbers	2EA

#### Antenna

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

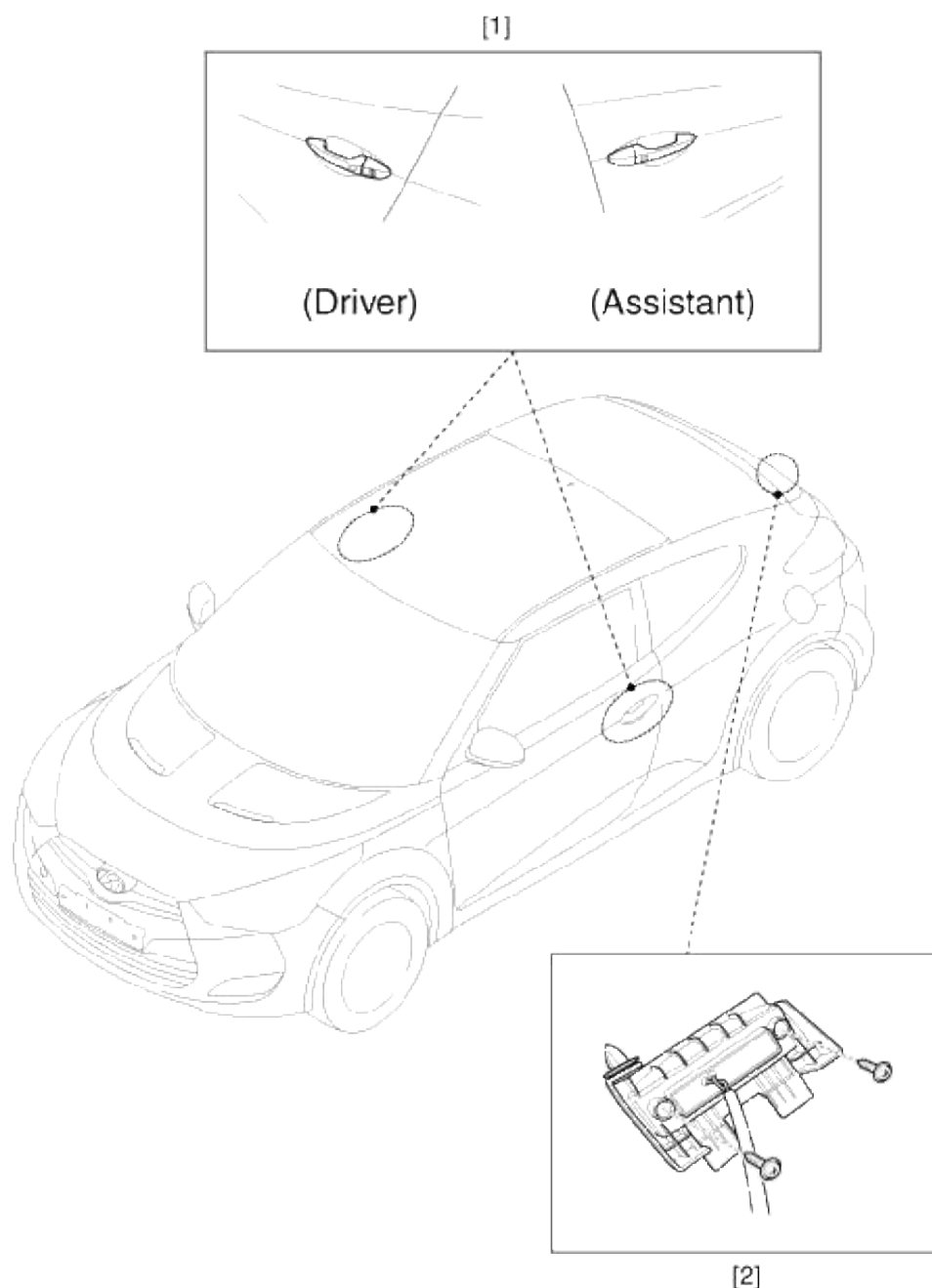
#### Body Electrical System > Smart key System > Components and Components Location

##### Component Location (1)



1. Buzzer	4. Interior antenna 2
2. Smart key unit	5. Trunk antenna
3. Interior antenna 1	6. Bumper antenna

### Component Location (2)



- |                        |                          |
|------------------------|--------------------------|
| 1. Door outside handle | 2. Trunk lid open 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
- Passive access trunk via the trunk lid switch at the trunk
- Passive locking via tailgate
- Max. 2 fobs can be handled by the system
- Immobilizer backup antenna driver integrated into SSB for TP authentication (i.e. limp home mode)
- Communication with engine management system
- Communication with SRX
- LF-RF communication

#### 1. Passive unlock

The system allows the user to access (unlock) the vehicle without performing any actions with the SMART KEY FOB. This feature could be different depending on platform as follows:

A. Pressing Push button in door handle

#### 2. Passive locking

The system allows the user to lock the vehicle by pushing a button on door handle with the SMART KEY FOB.

#### 3. Button start

The system allows to switch the power modes (Off, Accessory, Ignition), as well as to start and stop the vehicle's engine without performing any actions with the SMART KEY FOB. See Button Engine Start system specification.

#### 4. LIMP HOME Mode

Additionally, the system offers so called "limp home mode", which is the user can operate all vehicle functions by pushing the key into the SSB.

#### Smart Key ECU (SMK ECU)

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

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

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

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

The main functional blocks of the SMK ECU are:

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

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



## Smart Key FOB

The system supports up to 2 SMART KEY FOBs.

The main functions of the SMART KEY FOB are:

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

### NOTE

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

## Antennas

### 1. Emitting LF Antennas:

Inductive antennas in and at the vehicle are used to transform the current, driven by the SMK ECU antenna driver, into a 125 kHz magnetic field, which is the carrier for the SMART KEY challenge.

Three antennas cover the vehicle's exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors; one antenna in the rear bumper covers the area around the trunk.

Two antennas cover the vehicle's exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors.

Up to three antennas cover the vehicle's interior and the trunk interior: two in the passenger compartment and one in the trunk.

### 2. Bidirectional Immobilizer Antenna (for Limp Home):

The Immobilizer Backup Antenna is used for sending and receiving data: it emits a magnetic field (125 - 135 kHz challenge) and receives changes in the field strength (response of Transponder).

## Door Handle

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

## Push Button

The push button in door handle serves as a trigger to indicate the user's intent to unlock or lock the vehicle.

The push buttons are installed at front doors, integrated into the door handles.

Another button is installed at the trunk lid.

## Operation

### Passive Functions

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

### Operating Range

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

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

### Passive Access (Passive Entry)

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

### Passive Locking (Exit)

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

- At least one door is unlocked and two\_steps timer is not running or
  - Two\_steps timer is running and one of the push button except Front Left side is triggered
- indicates the operator's intent to lock the vehicle and thus triggers the system for a lock.

#### Passive Open Tailgate

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

#### 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 (TBD) 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

SMK searches valid TP

If no fob or no TP has been found, no action is required.

If any valid fob or valid TP has been found, SMK unlocks the vehicle by sending a CAN Key Reminder unlock message with the fob number.

If any valid fob has been found, SMK unlocks the vehicle by sending a CAN/LIN Key Reminder unlock message with the fob number.

#### Smart Key Reminder 2

##### 1. Preconditions:

All terminals OFF & any door (including trunk) open & no FOB-IN & no locking status (checked by SMK periodically every 100ms, as long as CAN/LIN active)

##### 2. Vehicle action:

Closing last door or trunk with knobs locked state, or with a locking in progress

## 3. SMK actions:

Before elapsing 500ms after the closing if all doors are locked then:

## A. IF NO FOB-IN ACTIVE

SMK performs a search for the fobs in the interior of the vehicle.

The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication)

## B. IF FOB-IN ACTIVE

SMK searches valid TP

If no fob has been found, no action is required.

If any valid fob or valid TP has been found, SMK sends unlock command via CAN and activates ext. buzzer warning.

If any valid fob has been found, SMK sends unlock command via CAN/LIN and activates ext. buzzer warning.

## Smart Key Door Lock Warning

## Door Lock Warning 1

## 1. Preconditions:

While (at least one door knob is unlocked) & (ACC ON or IGN ON) & (No FOB-IN) :

A. (All doors are closed) & (trunk closed)

## 2. Event:

A. User presses the push button in door handle or trunk

## 3. SMK actions:

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

## Door Lock Warning 2

## 1. Preconditions:

Same as passive locking precondition but with at least one door open.

## 2. Event:

User presses the door handle Push button .

## 3. SMK actions:

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

If no fob has been found, no action is required.

If the preconditions are no longer valid during buzzer active time (3 seconds), the SMK ECU stops the buzzer immediately.

## Door Lock Warning 3

## 1. Preconditions:

Same as passive locking precondition

## 2. User action:

A. User presses the door handle Push button

## 3. SMK ECU actions:

A. If ATWS(Anti Theft Warning System) is in DISARM status, SMK ECU performs a search for the fob inside of the vehicle (use "Door Lock Warning 3" scenario)

If no fob has been found, the passive locking is performed.

If any valid fob has been found, SMK ECU activates the external buzzer.

If the activity timer elapsed or ACC ON or IGN1 ON or NOT All door closed or FOB-IN, the SMK ECU stops the buzzer immediately.

After searching of inside fob, SMK ECU also performs a search for fobs outside of the vehicle.

## Smart Key Lamp Warning

### 1. SMK actions:

As long as the preconditions are valid, the SMK ECU performs a periodical search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication); periodical means, the search is done every 3 seconds.

If no fob has been found, the SMK ECU starts Key out indicator lamp activation as all preconditions are valid and will perform another search 3 seconds later.

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

### Failsafe Functions (Backup For Limp Home)

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

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

### User Information Functions

### ID OUT Warning

#### 1. Preconditions:

A. (ACC or IGN1) & (any door open or trunk open)

#### 2. Event:

The last opened door is closed

#### 3. SMK action:

SMK searches for a SMART KEY FOB in the interior.

A. If no valid SMART KEY FOB is found, the SMK activates external buzzer and also sends ID OUT warning via CAN (exterior buzzer warning and internal buzzer warning).

B. If a door is opened and closed again during terminals on and inside valid fob, SMK re-enables the authentication and stops the warning. If the terminal is in ACC, SMK shall turn on immobilizer lamp.

#### NOTE

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

### Immobilizer Lamp

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

### Fob Battery Low Voltage Detection

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

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

### Learning Description

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

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

### Learning MODE

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

Prior to start learning service, 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 the set of keys, or to register additional keys for an existing system. That means the system already has been learnt with certain PIN Code. The PIN Code is fixed for the life time of the vehicle, therefore the same PIN Code must be used in this mode. Otherwise learning will be failed

### Teaching MODE Procedure Description (Step By Step)

Objective: Key teaching procedure at service station

Initial state:

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

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

Inspection

Self Diagnosis With GDS

Smart key system defects can be quickly diagnosed with the GDS. The GDS operates actuator quickly to monitor, input/output value and self diagnosis.

The following three features are major concerns in SMART KEY system.

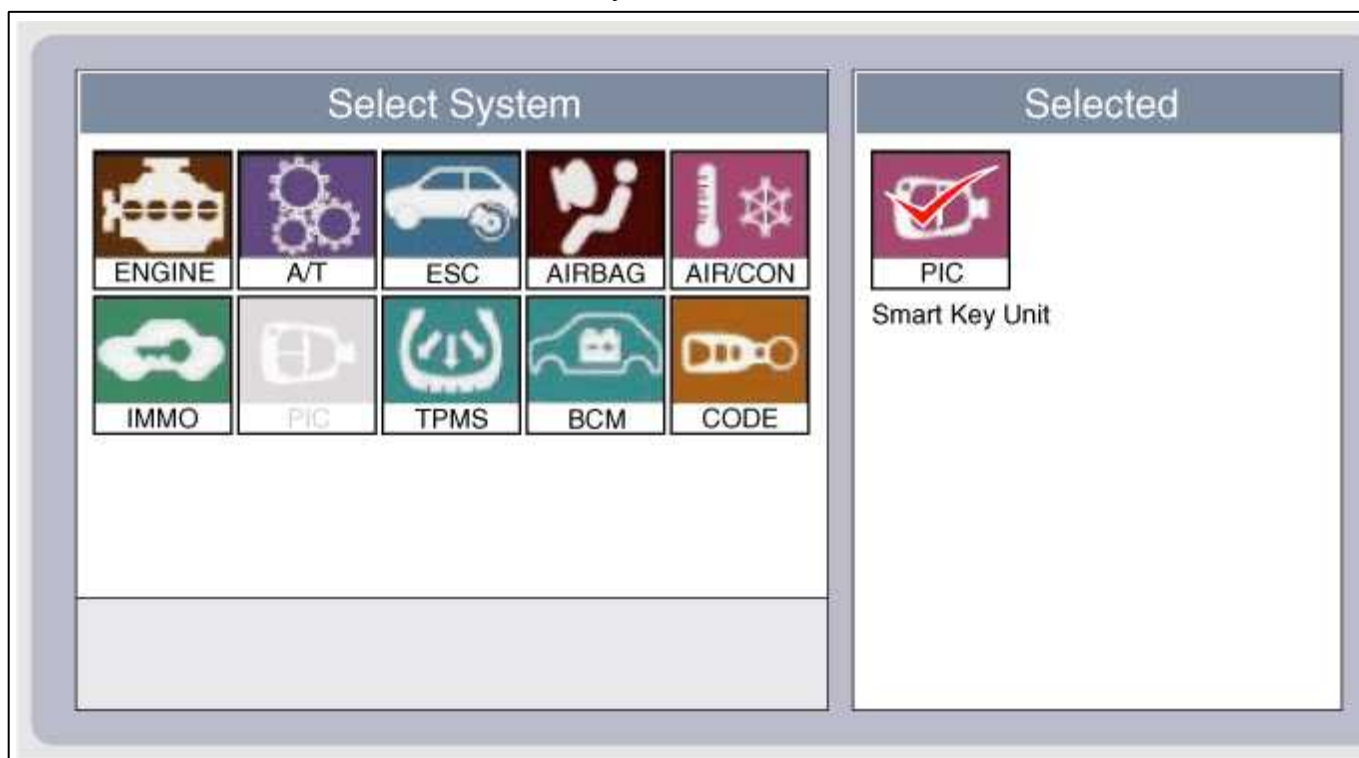
1. Concerns in SMART KEY unit input.
2. Concerns in SMART KEY unit.
3. Concerns in SMART KEY unit output.

The following three diagnostic solutions are the main solution process to a majority of concerns.

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

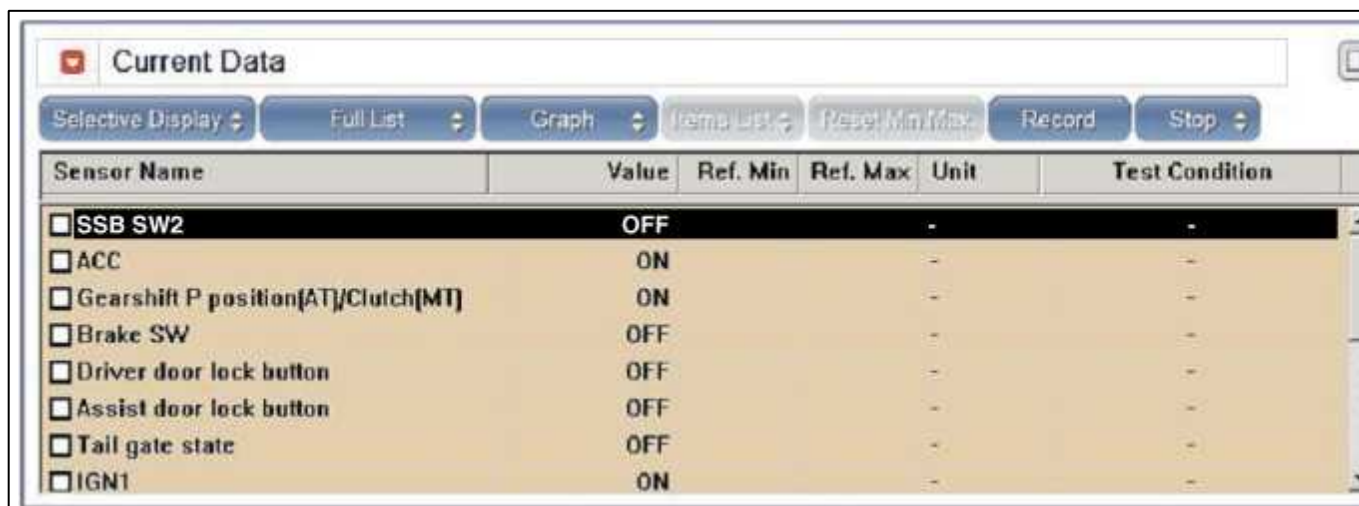
Switch Diagnosis

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.
2. Select the vehicle model and then SMART KEY system.



3. Select the "SMART KEY unit".

4. After IG ON, select the "Current data".



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

Display	Description
FL Toggle switch	ON : Push button is ON in the driver door handle.
FR Toggle switch	ON : Push button is ON in the assist door handle.
Trunk switch	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 switch	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".

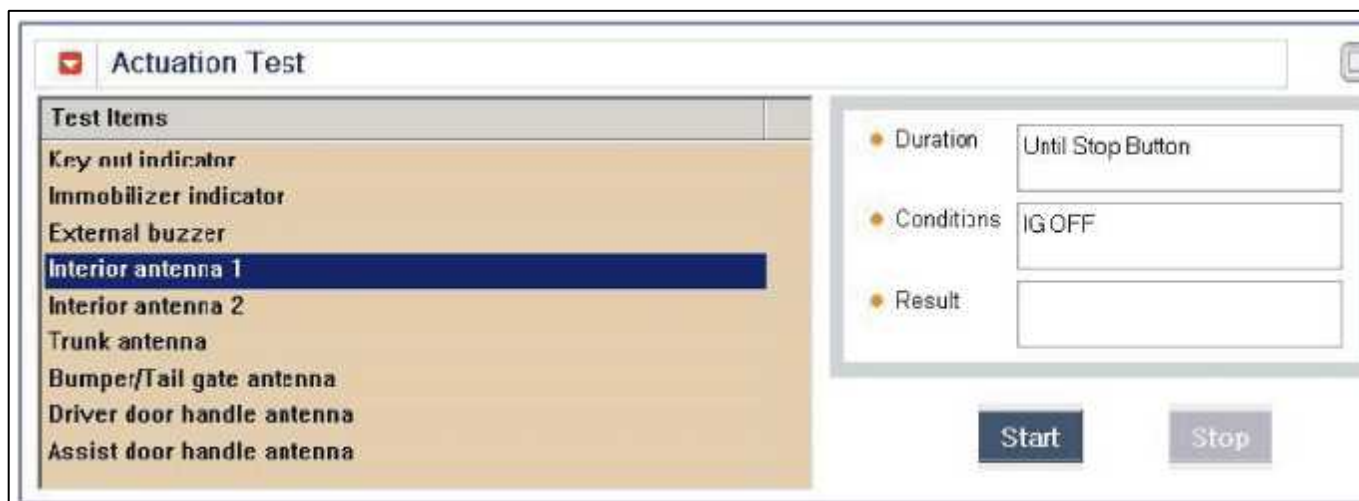


#### Antenna Actuation Diagnosis

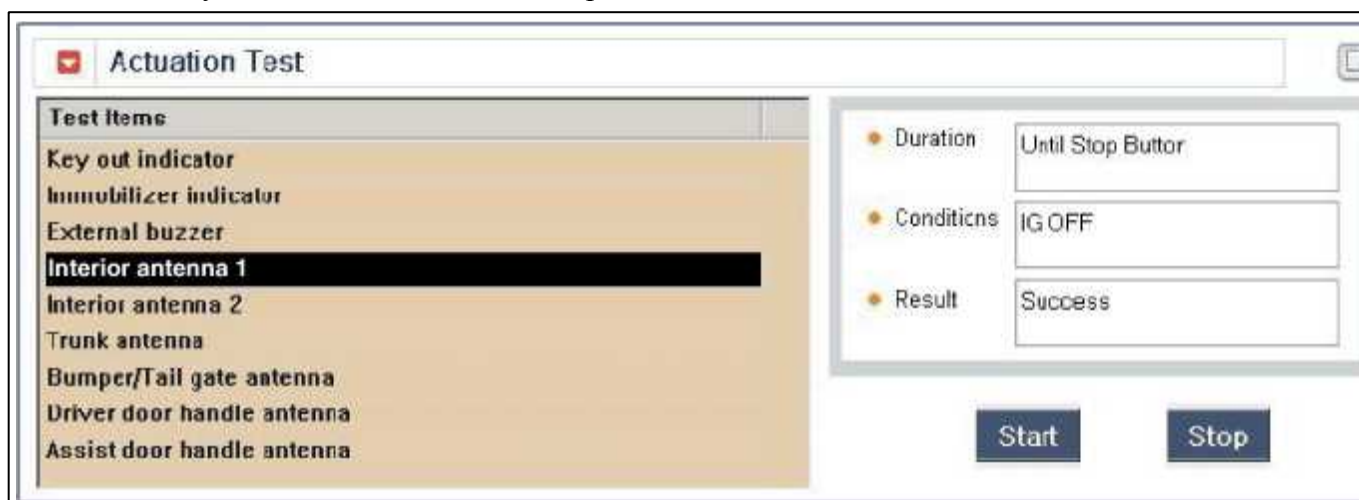
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.



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/Antenna
- E. DRV\_DR Antenna
- F. AST\_DR Antenna

Antenna Status Check

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

2. Select the "Antenna Status Check".

ID Resister


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

Inspection/ Test

- ☐ Serial Communication Line Check
- ☒ Antenna Status Check

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

Antenna Status Check



The screenshot shows a software window titled "Antenna Status Check". On the left, there is a tree view with a folder icon and the text "Antenna Status Check". Below it, several items are listed: "Interior Antenna 1", "Interior Antenna 2", "Trunk Antenna", "Bumper Antenna", "Driver Door Handle", and "Passenger Door Handle". Above the list is a small image of a car's interior door handle. On the right side of the window, the text "[ Antenna Status Check ]" is displayed, followed by the instruction "If you're ready, select the left side menu.". At the bottom right, there is a "Cancel" button.

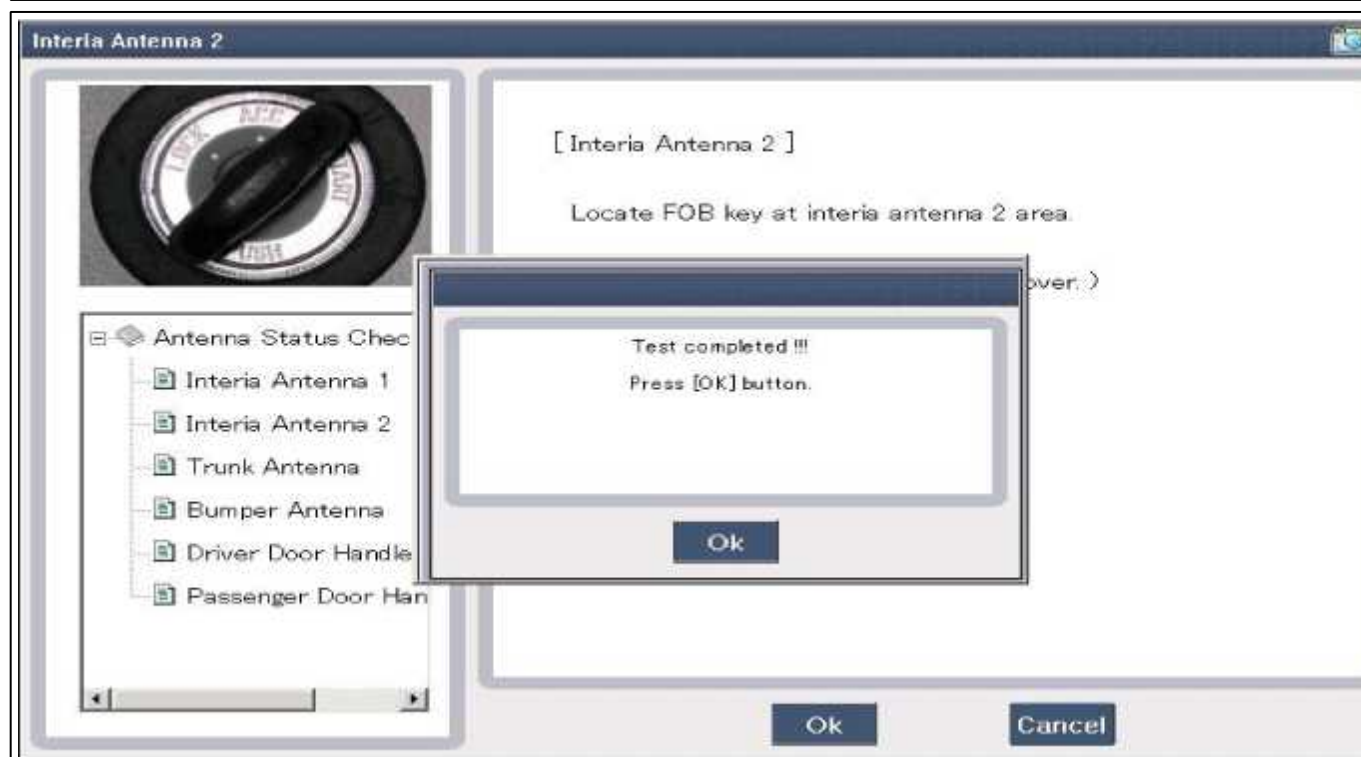
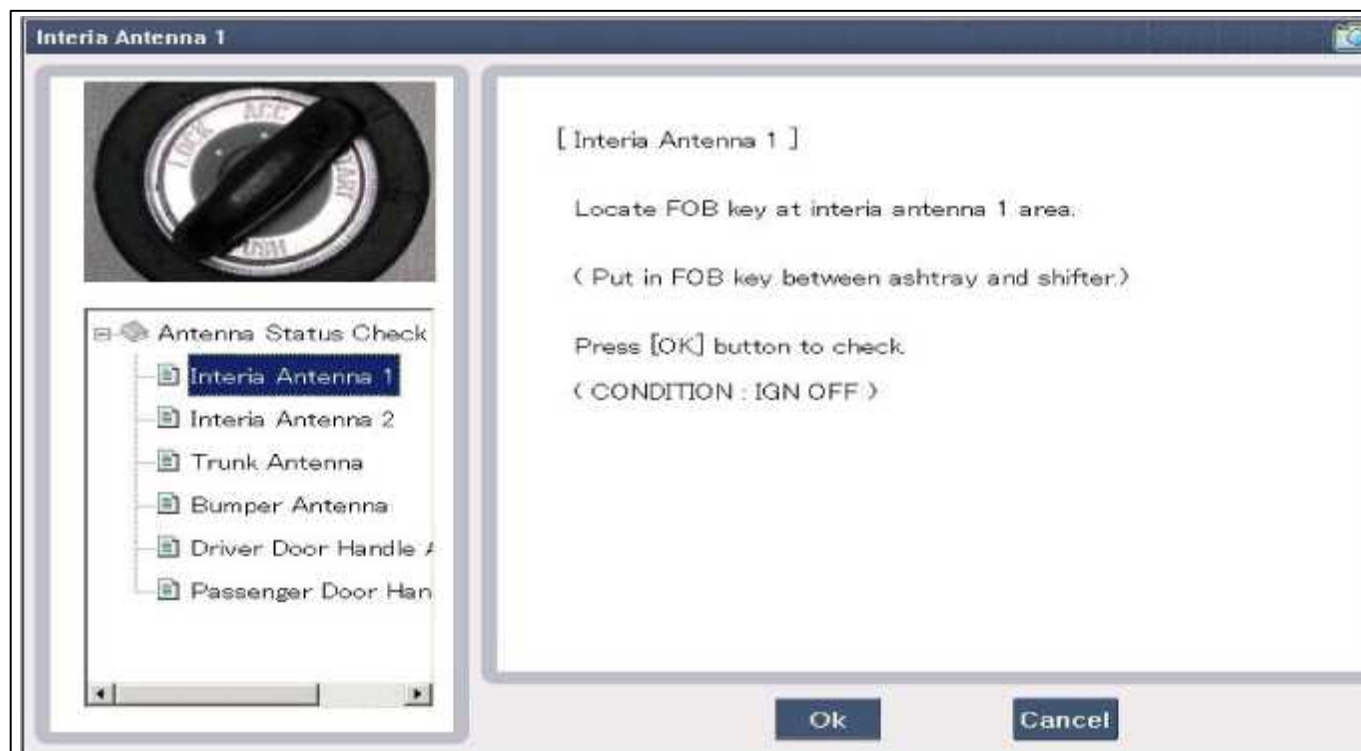
[ Antenna Status Check ]

If you're ready, select the left side menu.

Cancel



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



5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.

6. Antenna status

- A. INTERIOR Antenna 1
- B. INTERIOR Antenna 2
- C. Trunk antenna
- D. BUMPER/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".

ID Resister


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

Inspection/ Test

- ☒ Serial Communication Line Check
- ☐ Antenna Status Check

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

Receiver Communication Line Check



[ Receiver Communication Line Check ]

Press [OK] button to check.

( CONDITION : FOB KEY OUT & IGN OFF )

Serial Communication Line Check

- ☒ Receiver Communication Line Check
- ☐ ESCL Communication Line Check

Ok Cancel

4. Check the serial communication line with a GDS.

5. If the smart key runs normal, the communication of smart key unit, exterior receiver are normal.

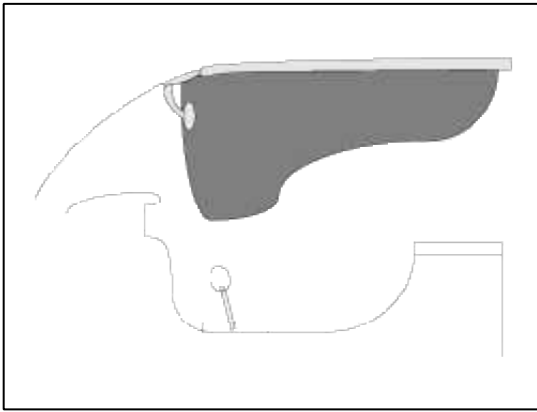
6. If the smart key runs abnormal, check the following items.

A. Disconnection or no response of the exterior receiver communication line.

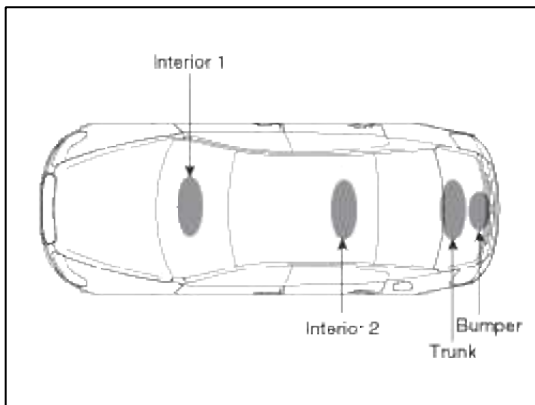
B. The exterior receiver communication line disconnection and ground connection.

Interior Antenna Actuation Check

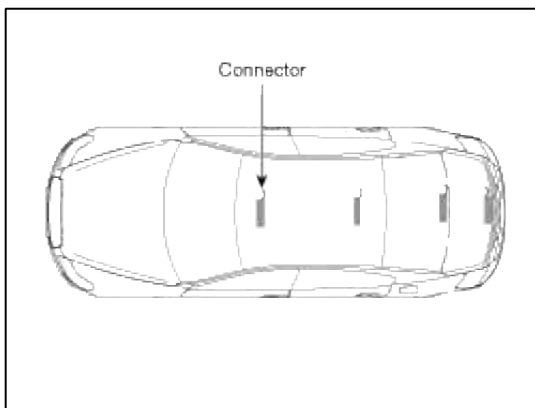
1. Place the smart key in the following shade area and check the IG ON.



2. If the ignition is ON, the antenna runs normal.
3. Check the interior antenna ignition mode.
4. Place 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".

#### ID Resister

System Identification

Neutralization Mode

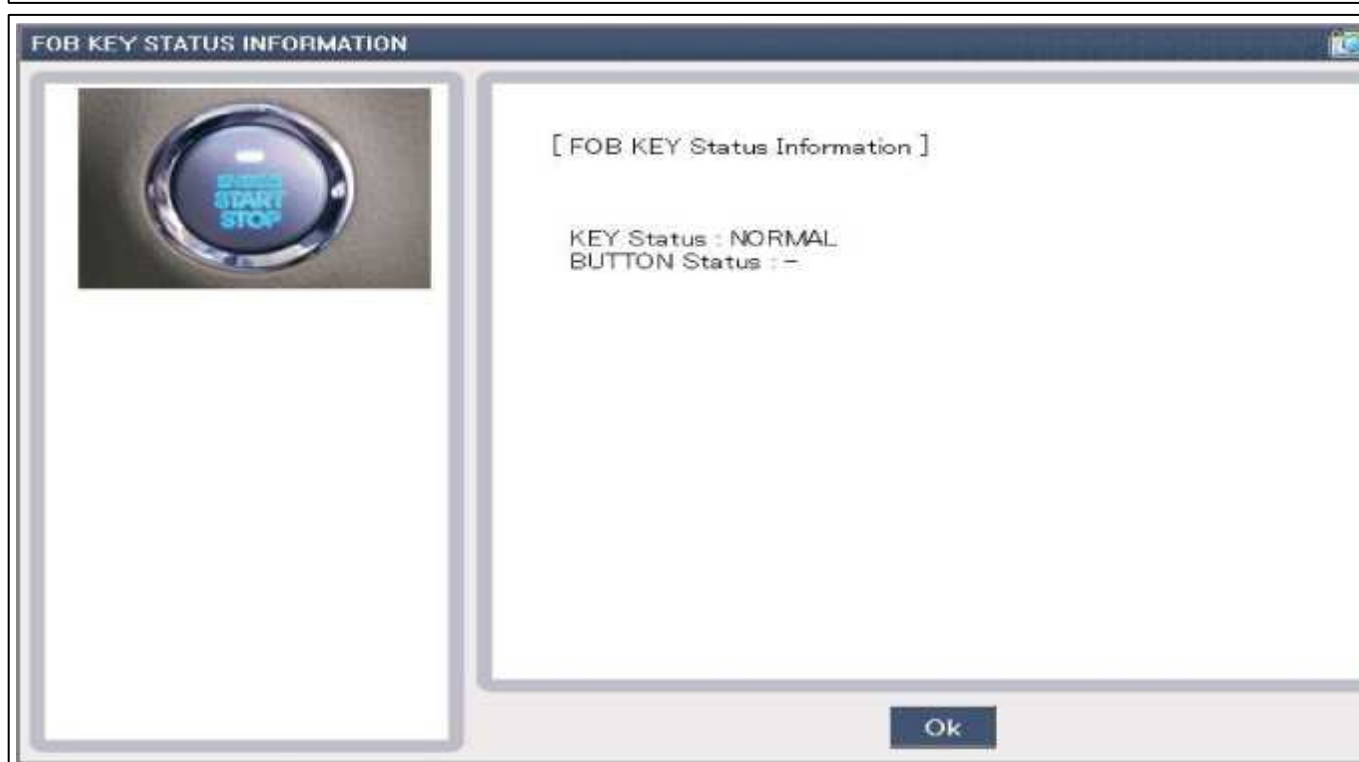
SMK STATUS INFORMATION

FOB KEY STATUS INFORMATION

#### Inspection/ Test

Serial Communication Line Check

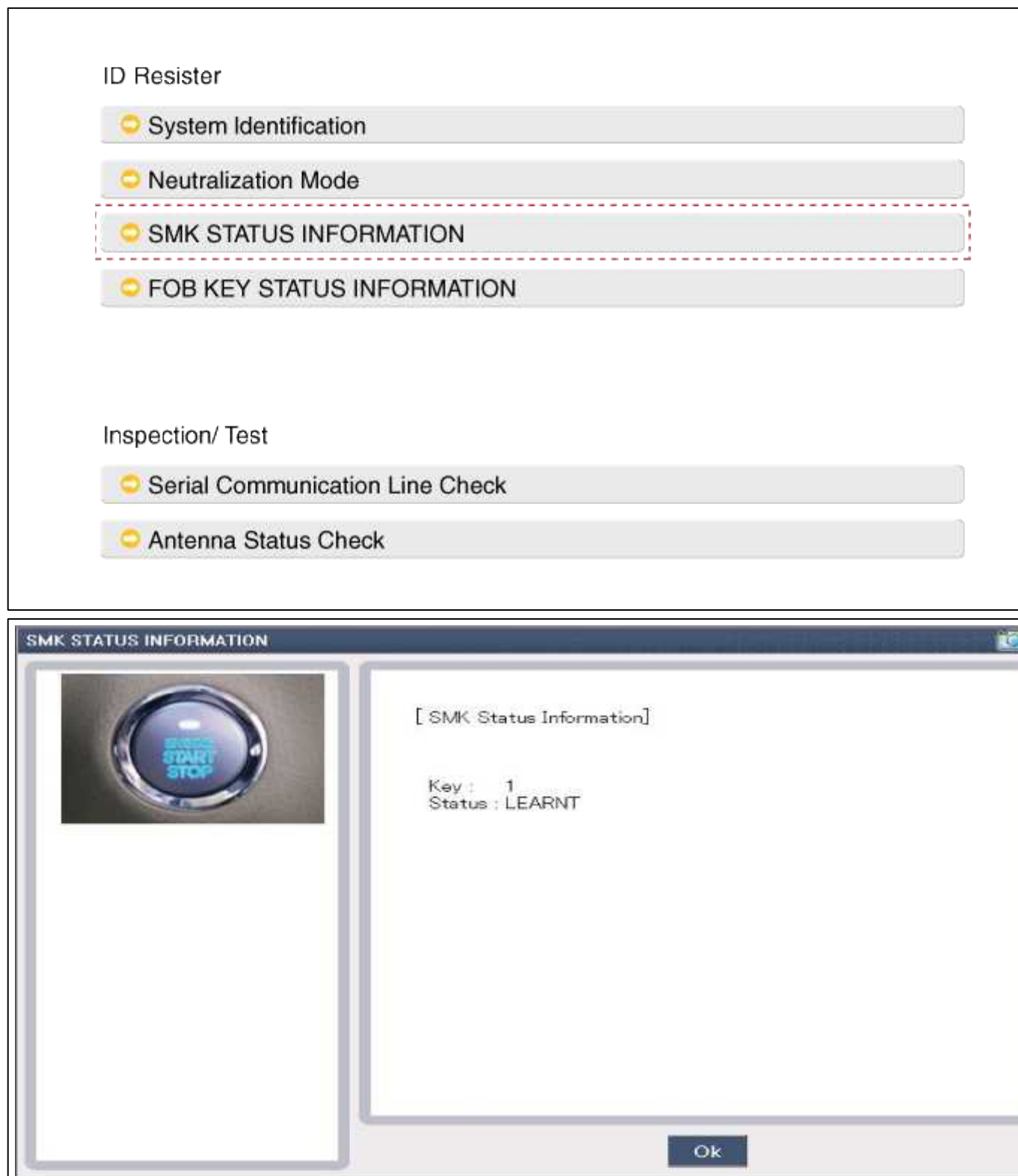
Antenna Status Check



#### Smart Key Status Check

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



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



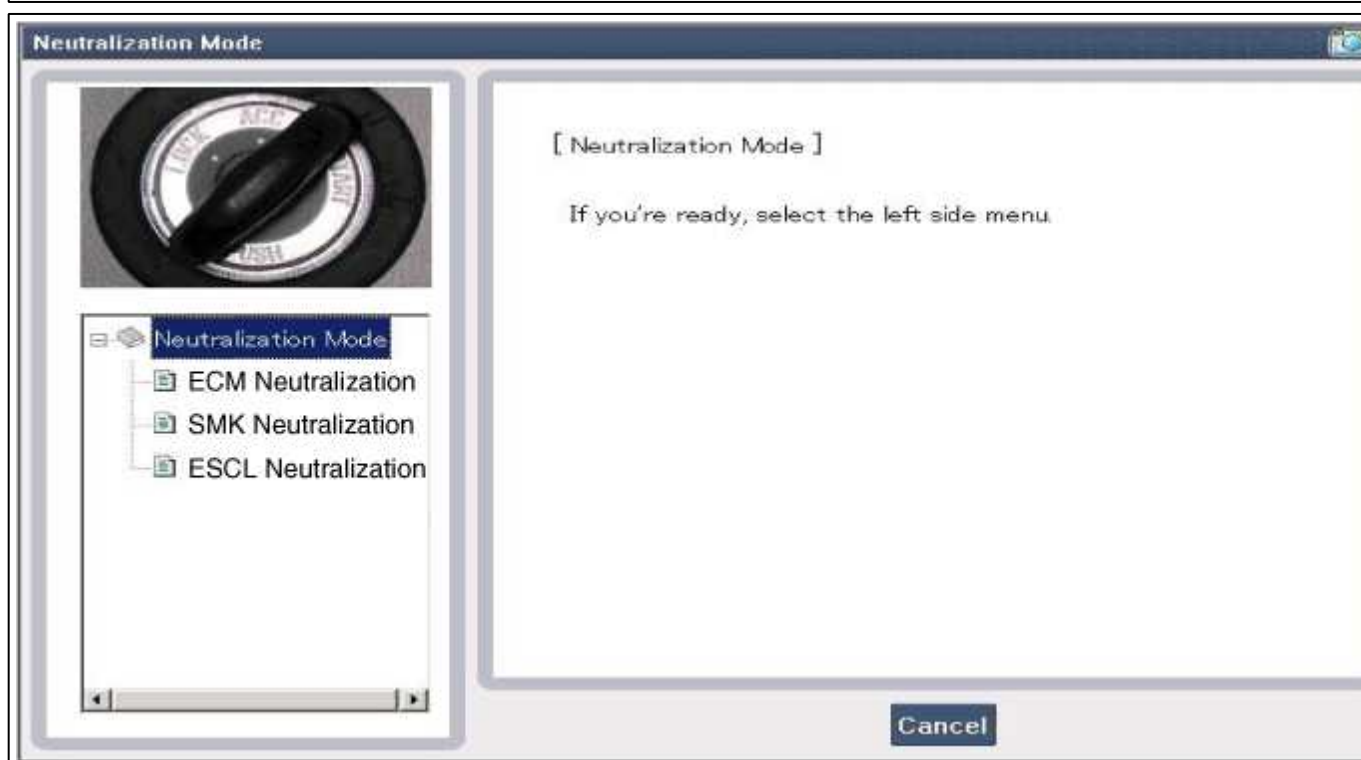
#### Neutralization Status Check

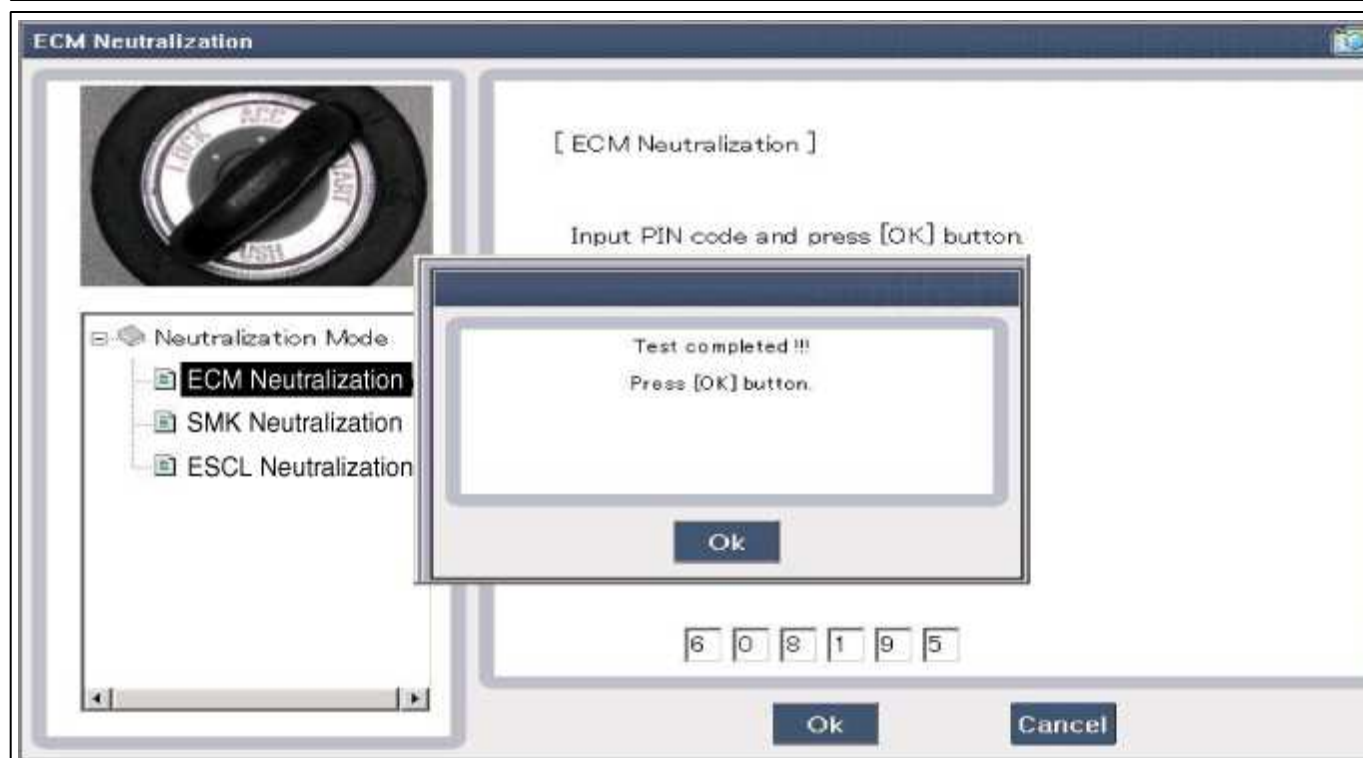
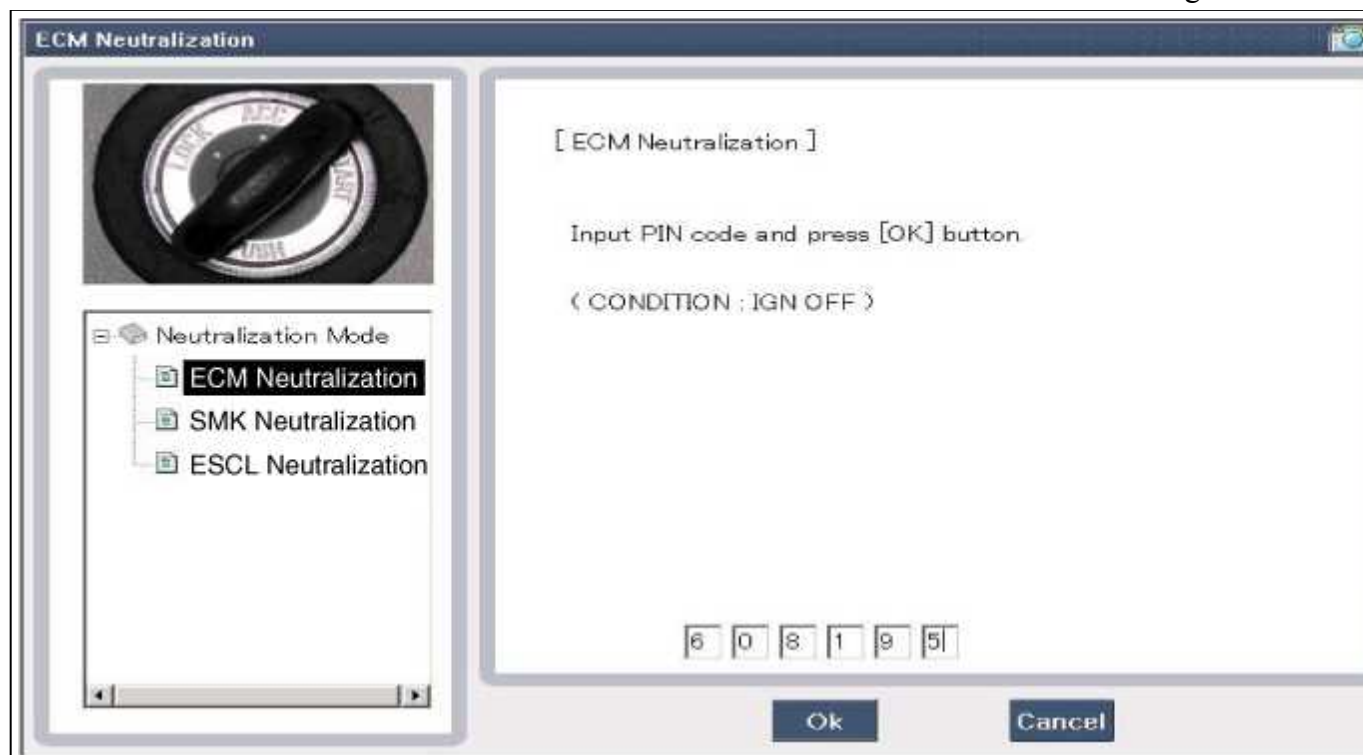
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "Neutralization mode".

## ID Resister

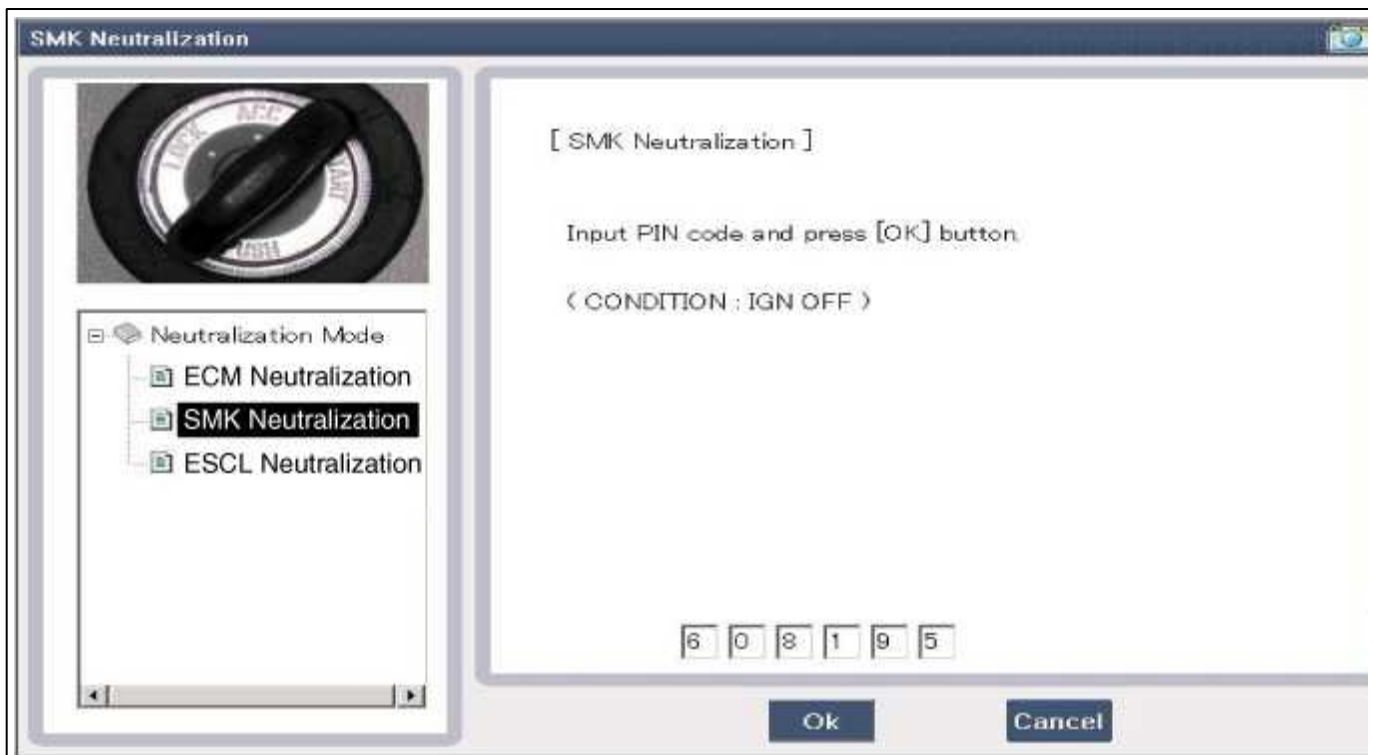
 System Identification Neutralization Mode SMK STATUS INFORMATION FOB KEY STATUS INFORMATION

## Inspection/ Test

 Serial Communication Line Check Antenna Status Check











### Input Switch List

No	Item name	Unit
1	SSB switch2	-
2	ACC	-
3	IGN1	-
4	Gear 'P' Position	-
5	Brake switch	-
6	FL Door Lock Button	-
7	FR Door Lock Button	-
8	Trunk Lid switch	-
9	Battery Voltage	-
10	Alternator Voltage	-
11	KEY out Indicator Lamp	-
12	Immobilizer Lamp	-
13	External Buzzer	-

### Actuator List

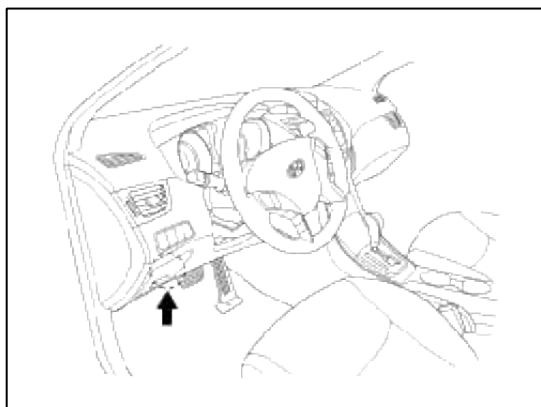
No.	Item name	Condition
1	Immo.indicator Lamp	Ignition switch ON Engine off
2	External Buzzer	Ignition switch ON Engine off
3	Interior Antenna 1 Active	Ignition switch ON Engine off
4	Interior Antenna 2 Active	Ignition switch ON Engine off
5	Trunk Antenna Active	Ignition switch ON Engine off
6	Bumper Antenna Active	Ignition switch ON Engine off
7	DRV DR Antenna Active	Ignition switch ON Engine off
8	AST DR Antenna Active	Ignition switch ON Engine off

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

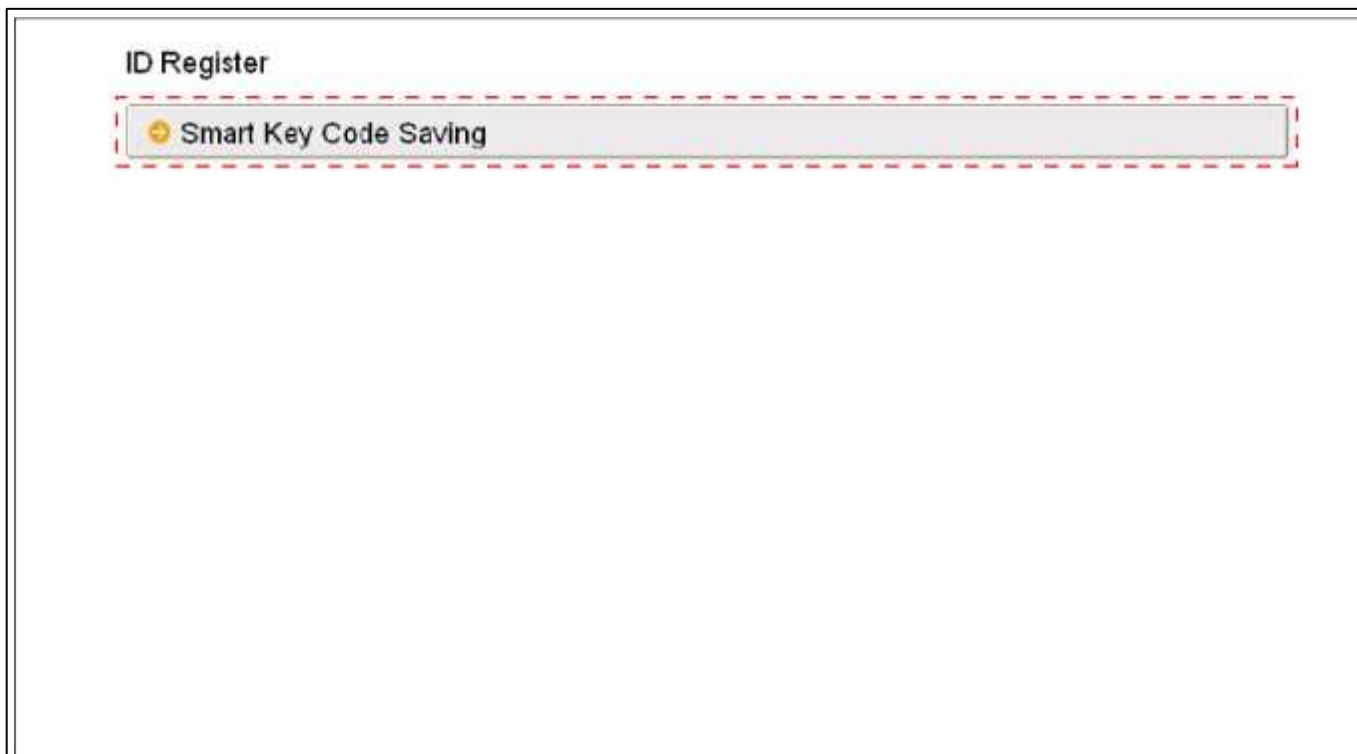
#### Smart Key

#### Smart Key Code Saving

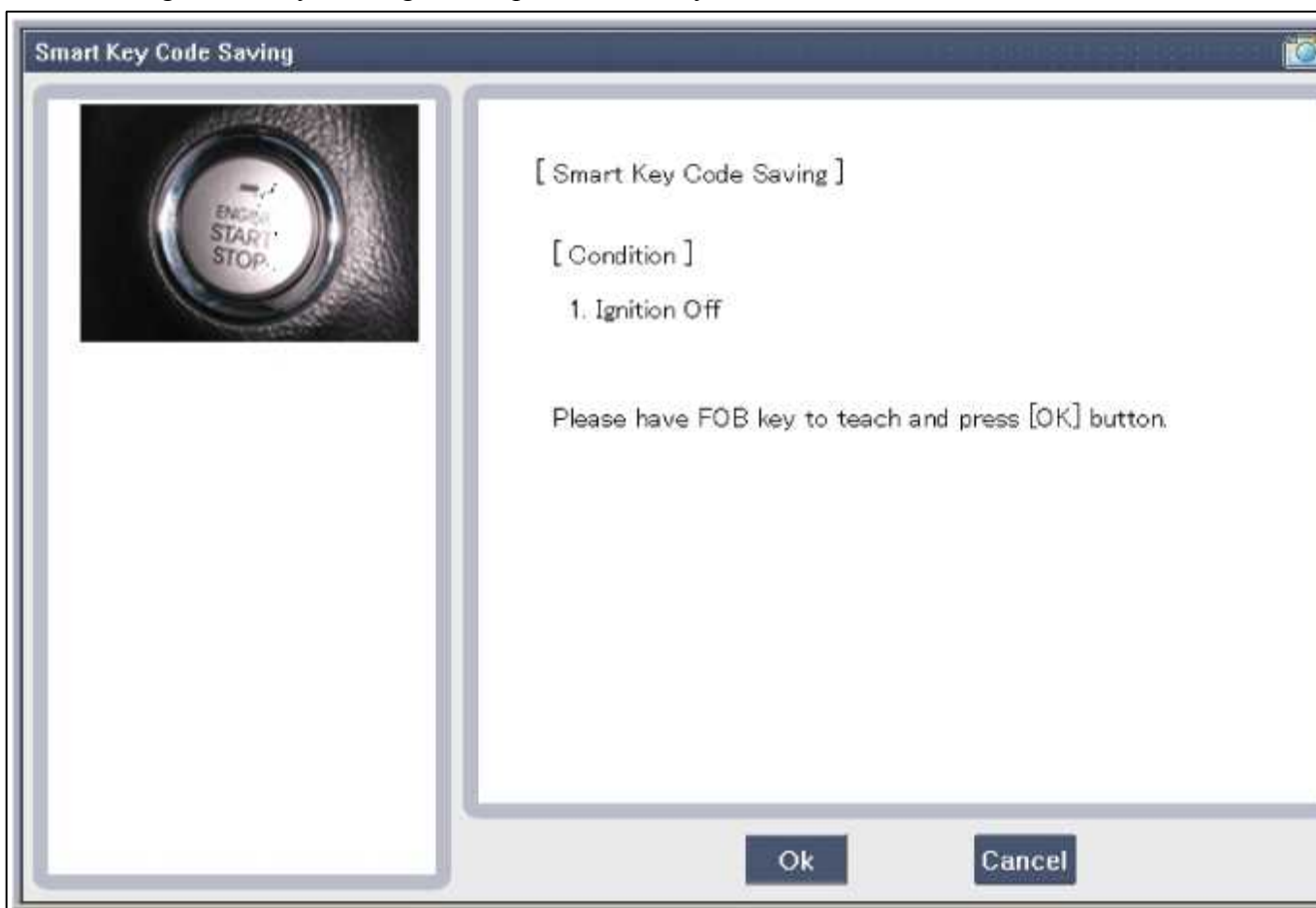
1. Connect the DLC cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.



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

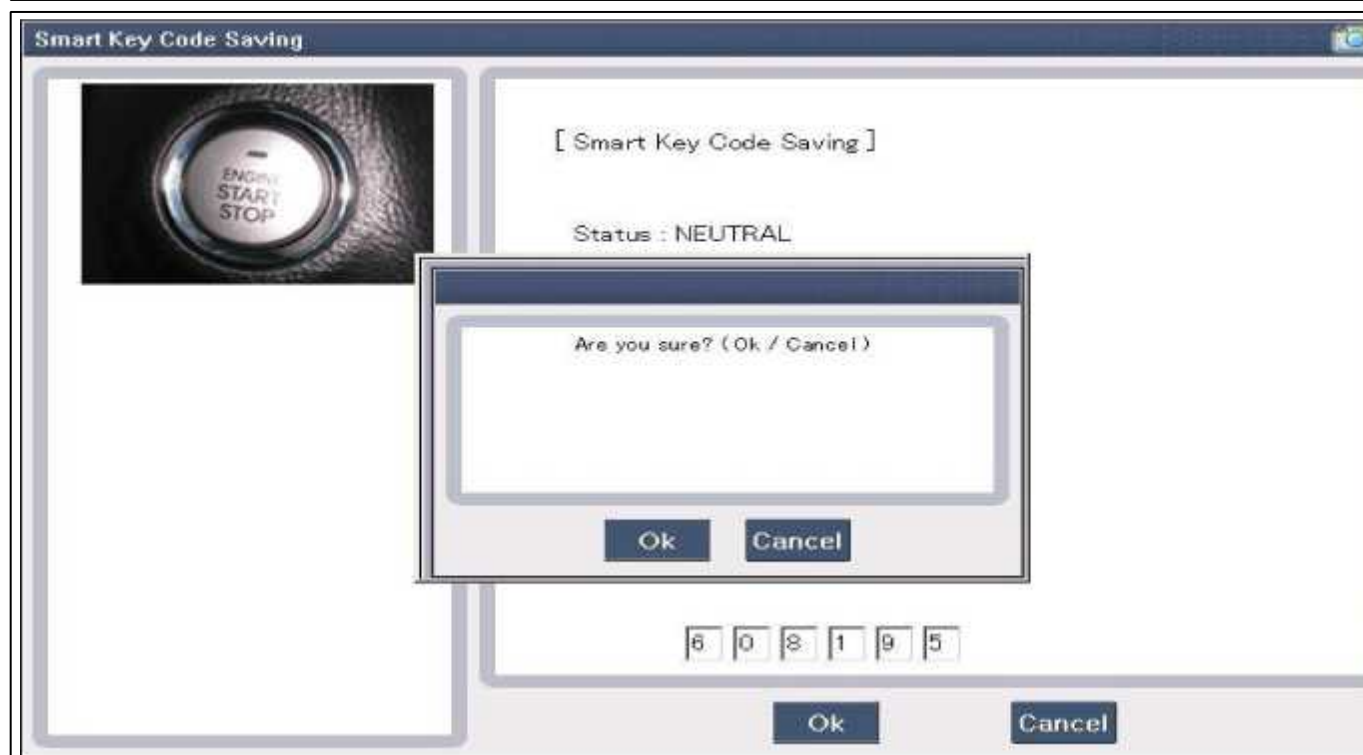
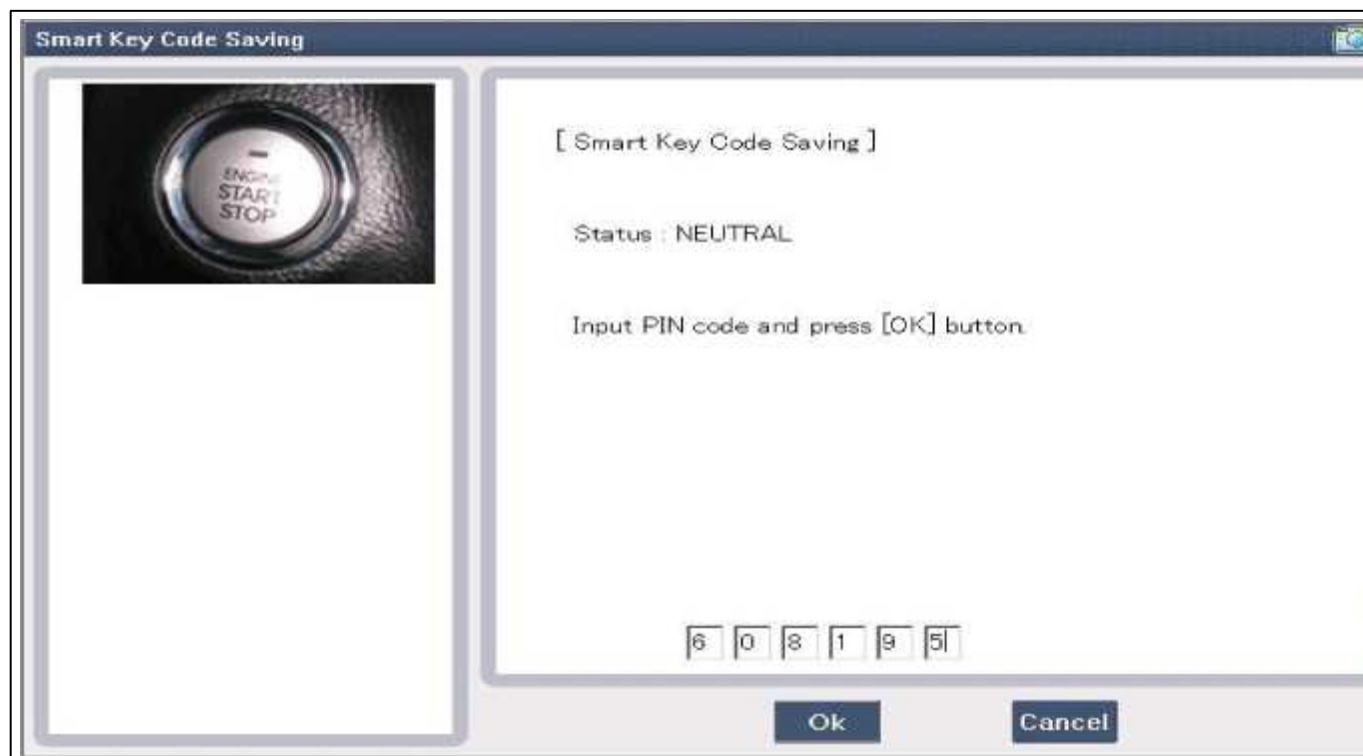


3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

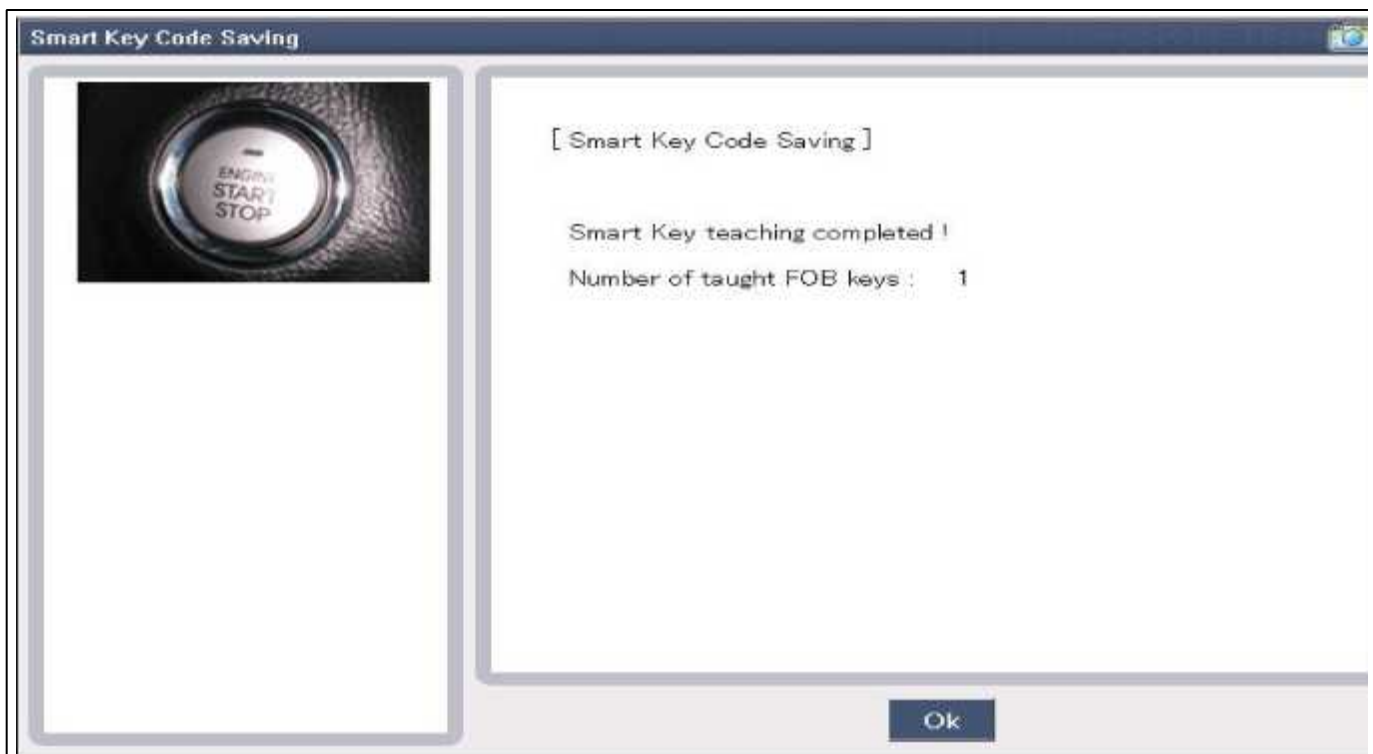
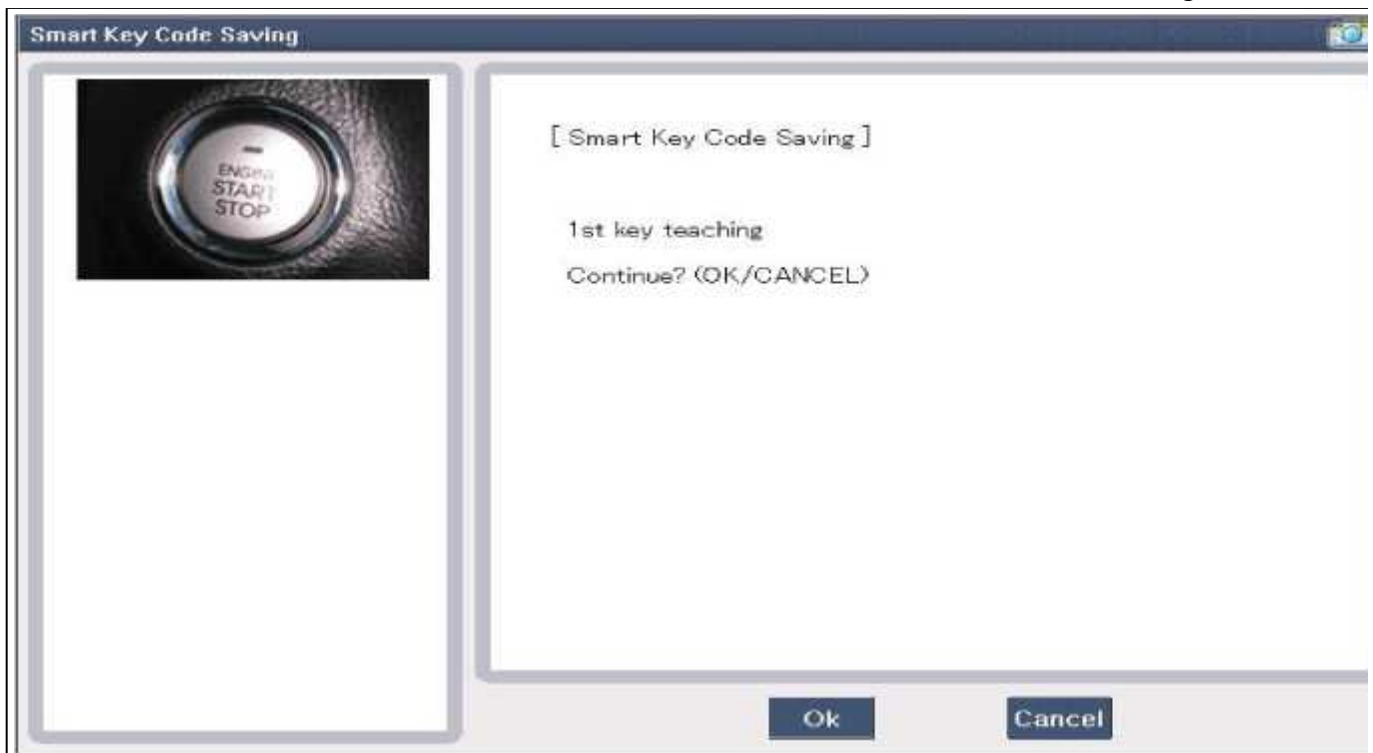


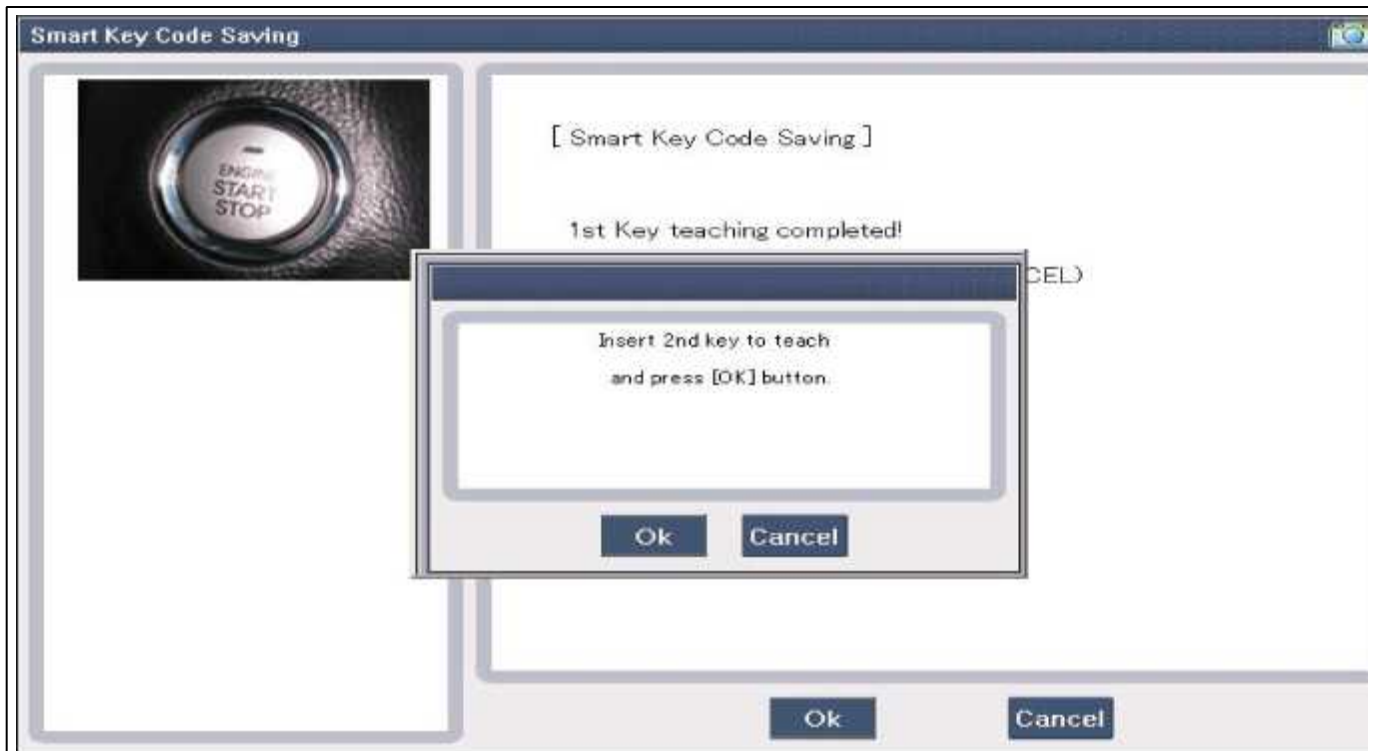
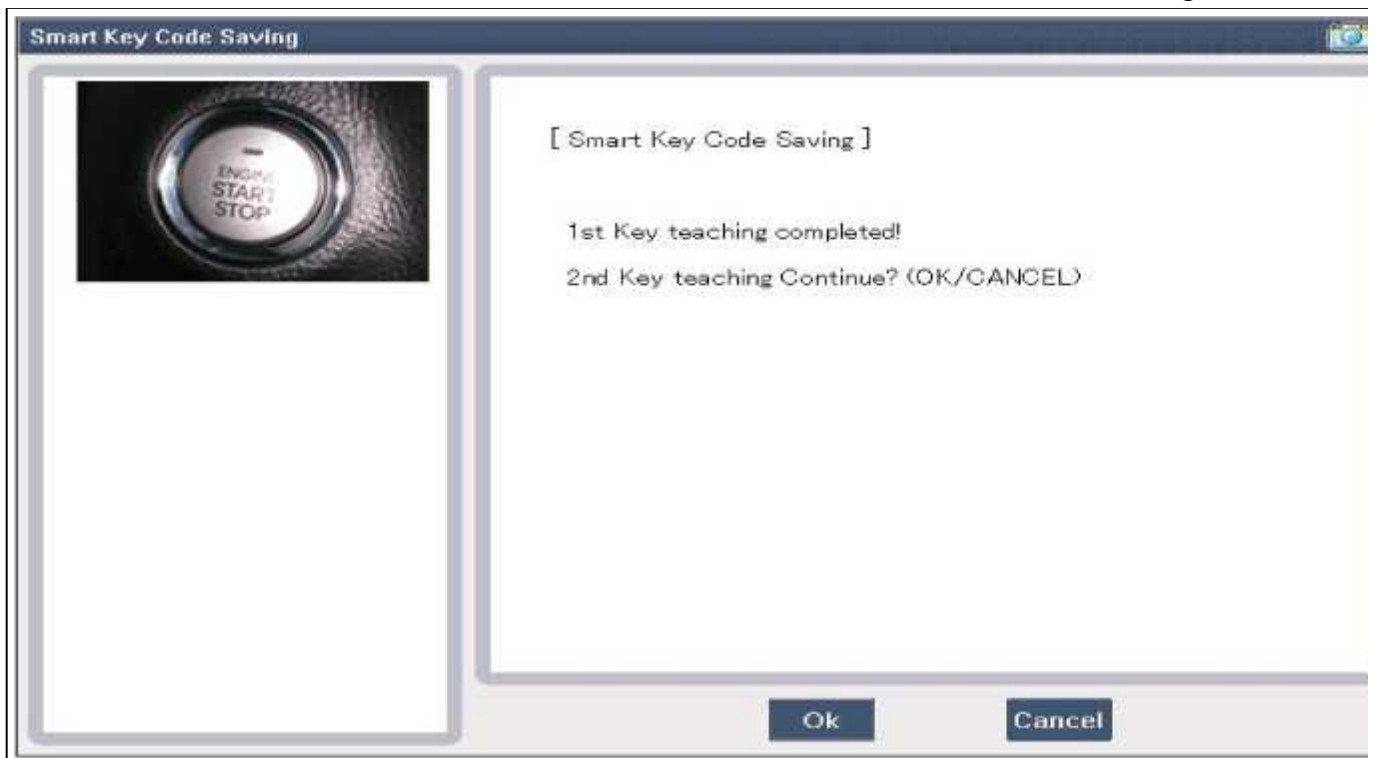
4. After pushing the SSB with the teaching key, press "OK" button.

5. Input the "Pin code" for first key teaching.

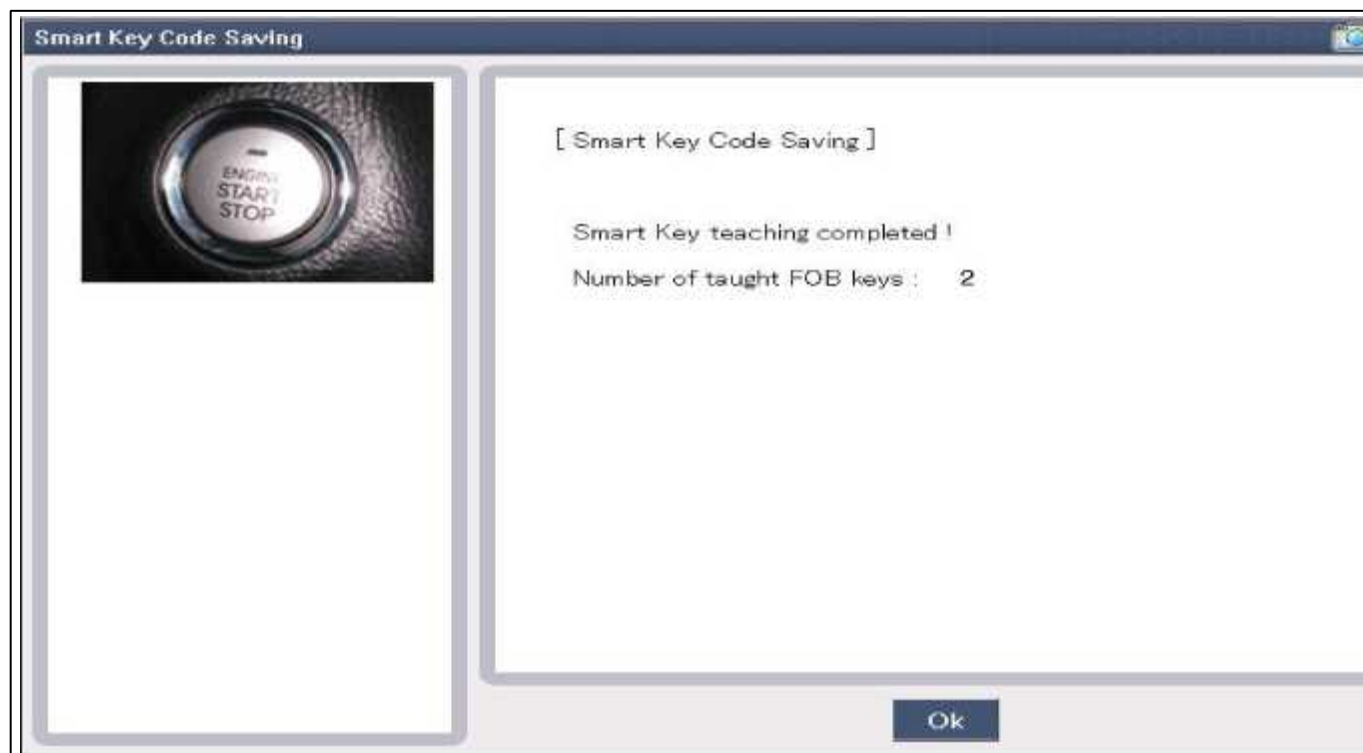


6. Confirm the message "First key teaching completed".





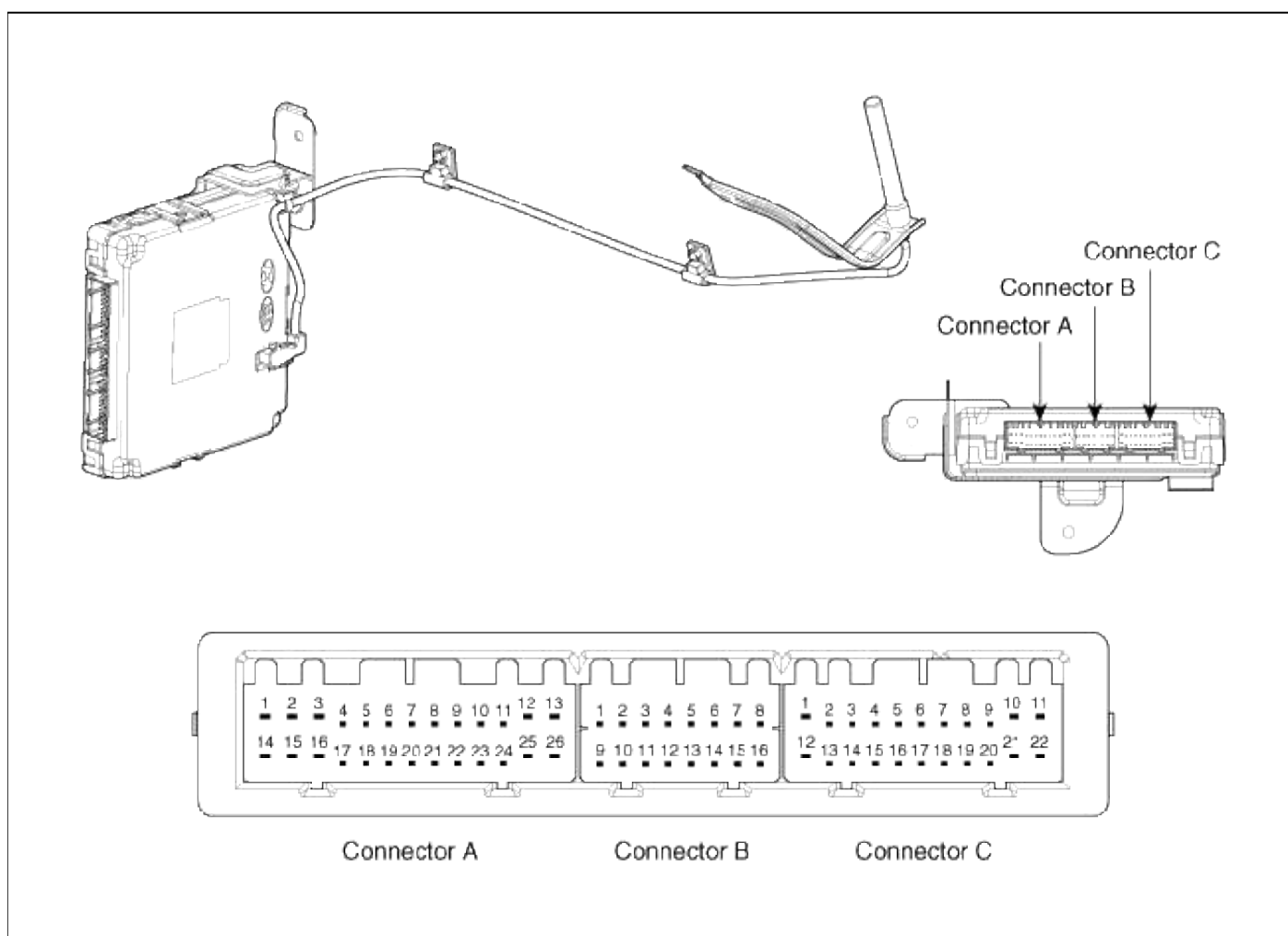
7. Confirm the message "Second key teaching completed".



8. 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**

Component (1)



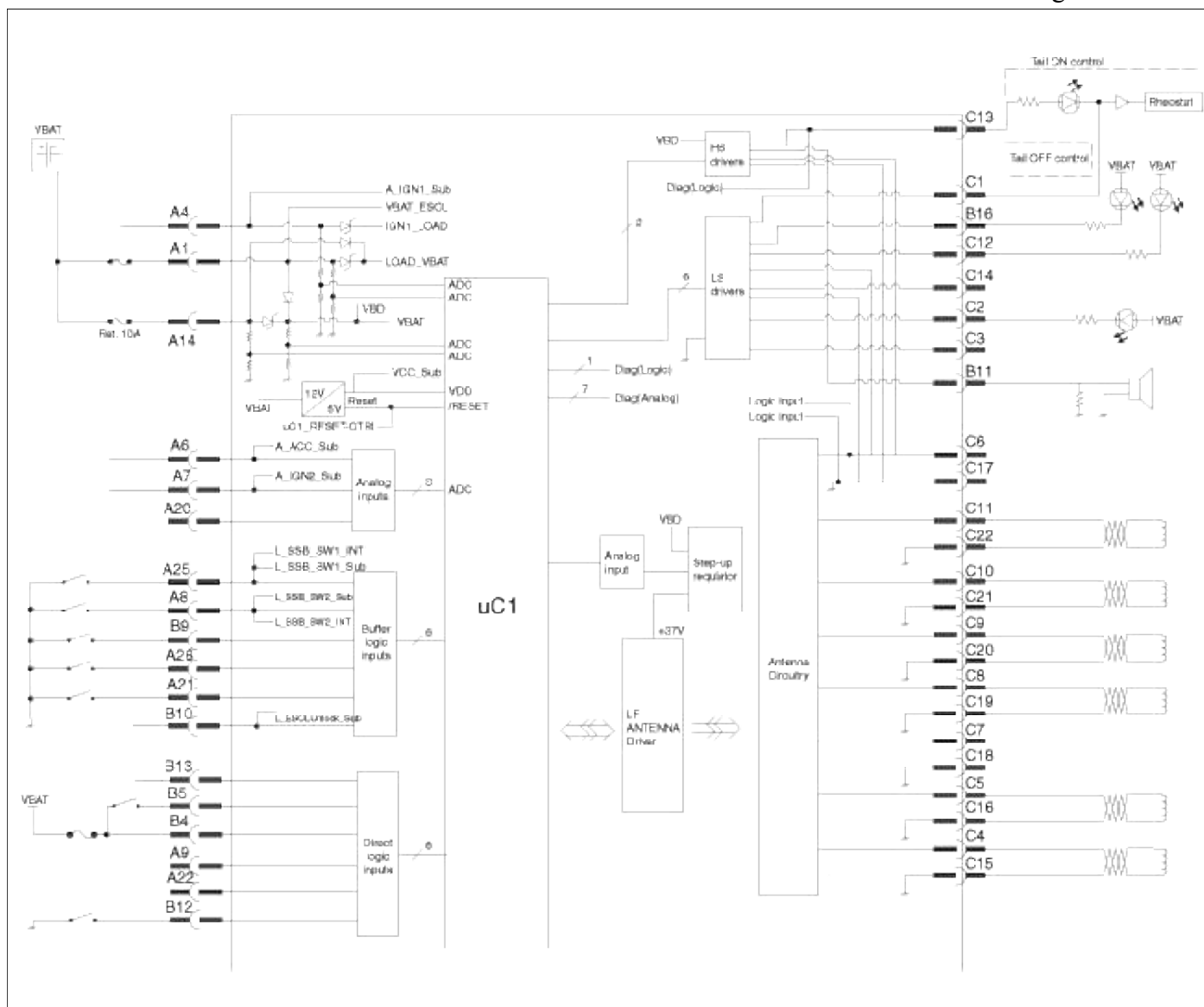
**Connector Pin Information**

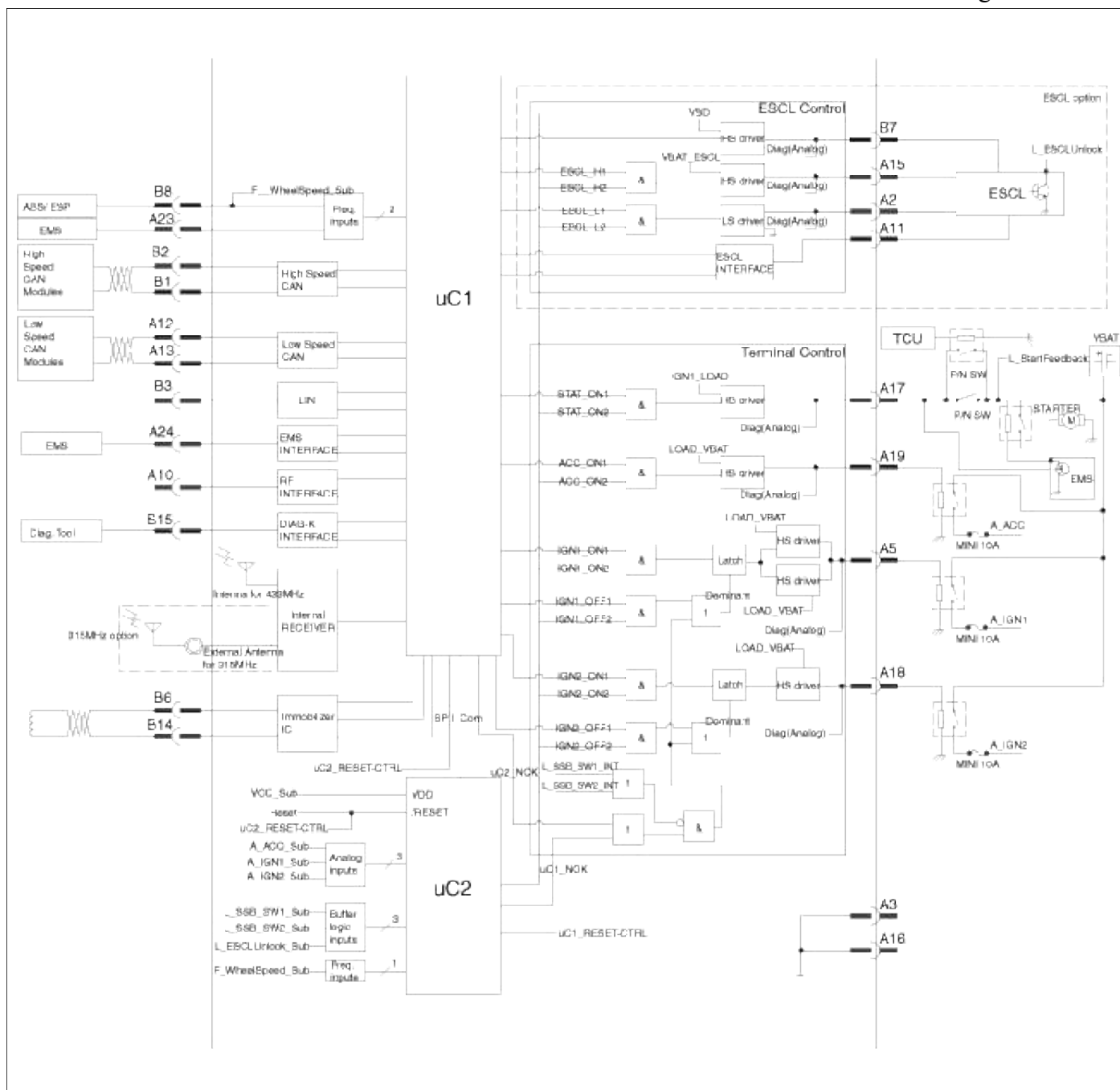
No.	Connector A(26 pins)	No.	Connector B(16 pins)	No.	Connector C(22 pins)
1	Battery power load	1	CAN L	1	Start/Stop button switch ILL
2	-	2	CAN H	2	Immobilizer IND
3	Power ground 1	3	-	3	Start/Stop button LED OFF
4	IGN 1	4	Stop lamp fuse	4	Interior antenna #2 power
5	IGN 1 relay	5	Brake switch	5	Interior antenna #1 power
6	ACC	6	Immobilizer antenna power	6	-
7	IGN 2	7	-	7	-
8	Start/Stop button switch 2	8	Wheel speed	8	Trunk antenna power
9	-	9	Driver toggle button	9	Bumper antenna power
10	-	10	-	10	Assistant antenna power
11	ESCL COM	11	External buzzer	11	Driver antenna power
12	CAN H	12	P position / Clutch switch	12	SSB LED IGN
13	CAN L	13	Start feedback	13	SSB illumination power
14	Battery CPU	14	Immobilizer antenna ground	14	-
15	-	15	Diagnostic - K	15	Interior antenna #2 ground
16	Power ground 2	16	Start/Stop button switch LED	16	Interior antenna #1 ground
17	Starter relay			17	-
18	IGN 2 relay			18	-
19	ACC relay			19	Trunk antenna ground
20	-			20	Bumper antenna ground
21	Trunk lid switch			21	Assistant antenna ground
22	-			22	Driver antenna ground
23	RPM				
24	EMS COM				
25	Start/Stop button switch 1				
26	Assistant toggle button				

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

## Circuit Diagram







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

## Inspection

## Smart Key Unit

- Refer to the BE group - inspection / self diagnosis with GDS.

## Smart Key Switch

- Refer to the BE group - inspection / self diagnosis with GDS.

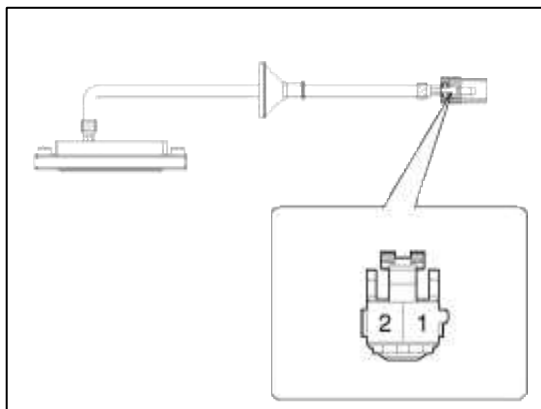
## Antenna

- Refer to the BE group - inspection / self diagnosis with GDS.

## Tailgate Switch

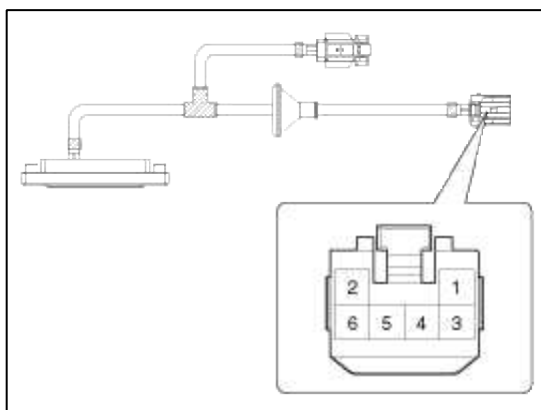
1. Check for continuity between the Trunk lid open switch terminals.

[with Back View Camera]



1. Ground
2. Tailgate switch

[without Back View Camera]



1. Ground (Tailgate)
  2. Tailgate switch
  3. Ground (Back View Camera)
  4. Power
  5. V-OUT
  6. V-GND
2. If continuity is not specified, inspect the switch

Terminal Position	1	2
OFF		
ON	○	○

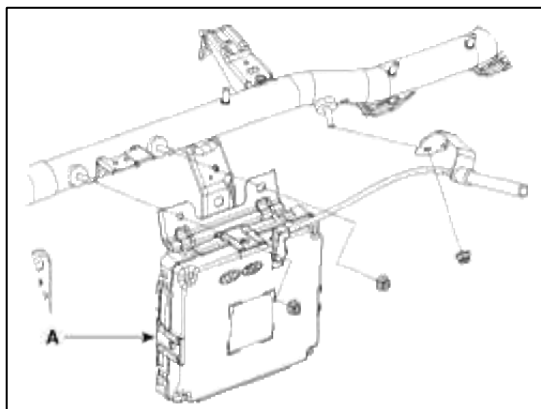
## Removal

### Smart key unit

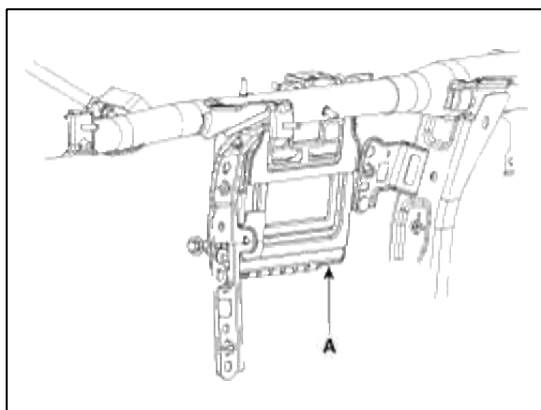
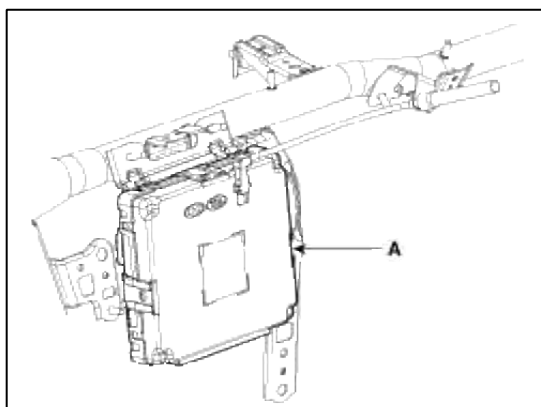
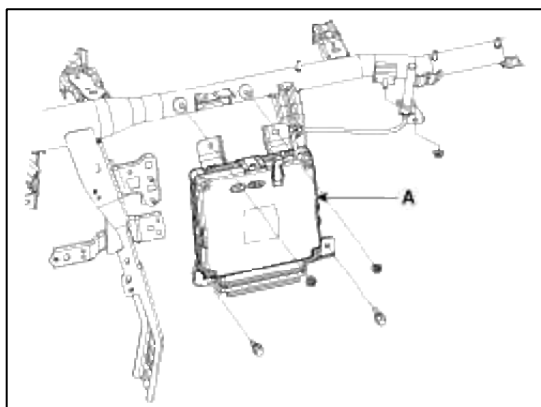
1. Disconnect the negative(-) battery terminal.
2. Remove the AVN head unit.  
(Refer to the BE group - "AVN system - AVN Head Unit")

3. Remove the smart key unit(A) with loosening bolt and nut, then disconnect the connector.

[USA]



[CANADA]



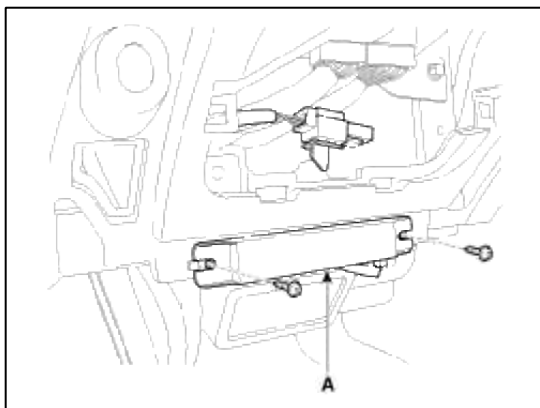
Interior #1 antenna

**NOTE**

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

1. Disconnect the negative(-) battery terminal.

2. Remove the console.  
(Refer to the BD group - "Console")
3. Remove the multimedia jack.
4. Disconnect the connector, then remove the interior #1 antenna(A) after loosening 2 screws.

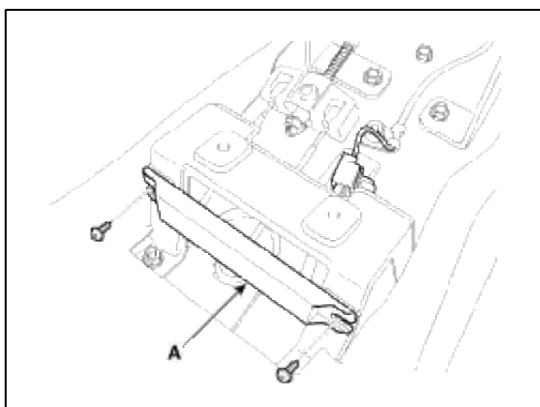


Interior #2 antenna

**NOTE**

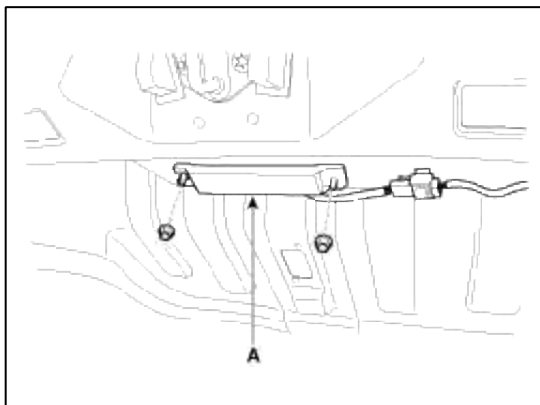
Take care not to scratch the crash pad and related parts.

1. Disconnect the negative(-) battery terminal.
2. Remove the console.  
(Refer to the BD group - "Console")
3. Disconnect the connector, then remove the interior #2 antenna(A) after loosening 2 screws.



Trunk antenna

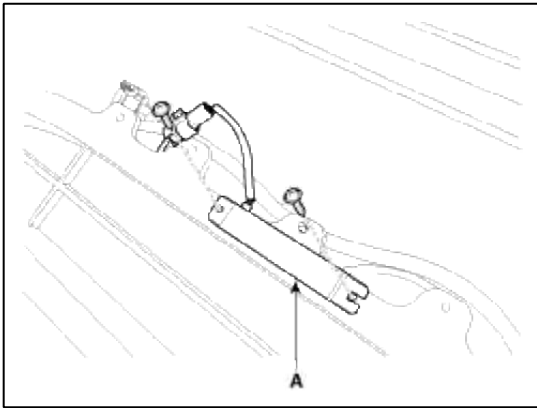
1. Disconnect the negative(-) battery terminal.
2. Remove the trunk transverse trim.  
(Refer to the BD group - "Interior trim")
3. Disconnect the connector, then remove the trunk antenna(A) after loosening 2 nuts.



Exterior Bumper Antenna

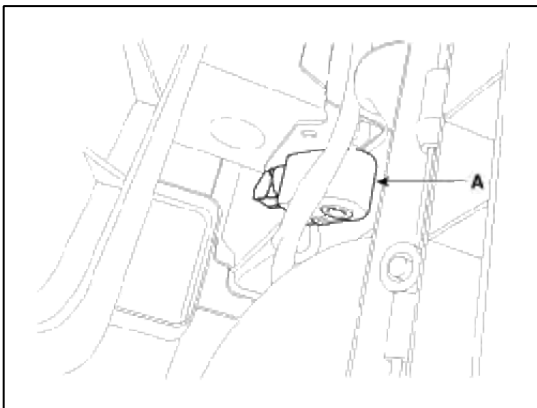
1. Disconnect the negative(-) battery terminal.

2. Remove the rear bumper.  
(Refer to the BD group - "Rear bumper")
3. Disconnect the connector, then remove the rear bumper antenna(A) after loosening 2 screws.



#### Buzzer

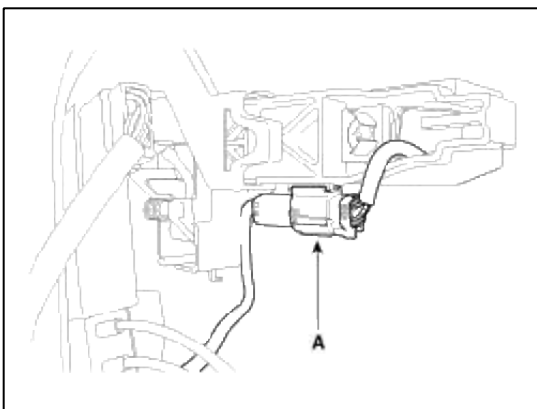
1. Disconnect the negative(-) battery terminal.
2. Remove the air duct.
3. Remove the buzzer(A) after disconnecting the connector.



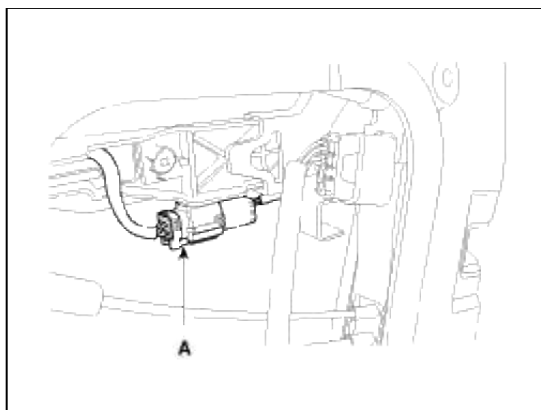
#### Door outside handle

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

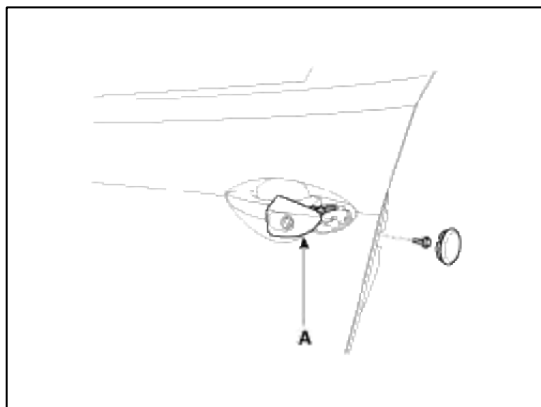
#### [Driver]



#### [Assistant]

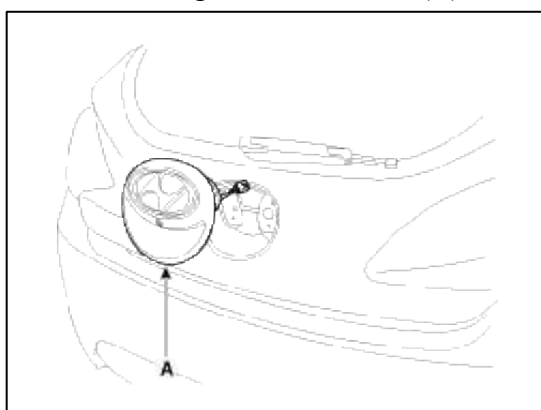


4. Remove the outside handle cover(A) after loosening the mounting bolt.

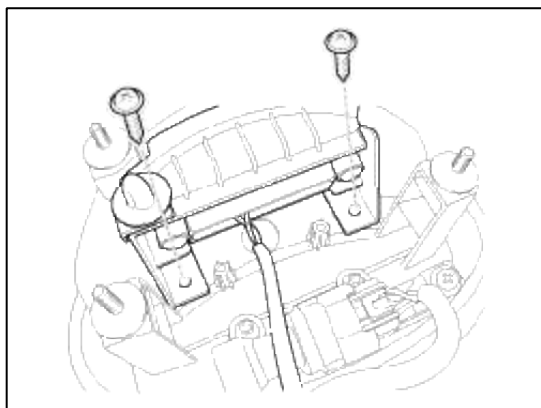


#### Tailgate switch

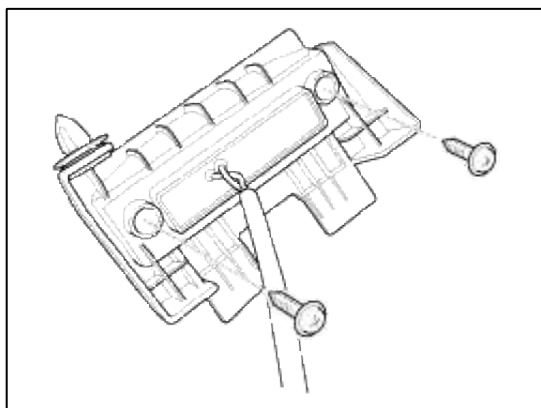
1. Disconnect the negative(-) battery terminal.
2. Remove the tailgate outside handle(A) after loosening the mounting nut(3EA).



3. Remove the tailgate switch assembly after loosening the screw(2EA).



4. Remove the tailgate switch after loosening the screw(2EA).



## Installation

### Smart Key Unit

1. Install the smart key unit.
2. Connect the connector and install the smart key unit.
3. Install the AVN head unit.
4. Install the negative (-) battery terminal and check the smart key system.

### Interior #1 Antenna

1. Install the interior #1 antenna.
2. Install the multimedia jack and the console.
3. Install the negative (-) battery terminal and check the smart key system.

### Interior #2 Antenna

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

### Trunk Antenna

1. Install the trunk antenna.
2. Install the trunk transverse trim.
3. Install the negative (-) battery terminal and check the smart key system.

### Exterior Bumper Antenna

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

### Buzzer

1. Install the buzzer.
2. Install the air duct.
3. Install the negative (-) battery terminal and check the smart key system.

### Door Outside Handle

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

### Tailgate switch

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

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

### Specification

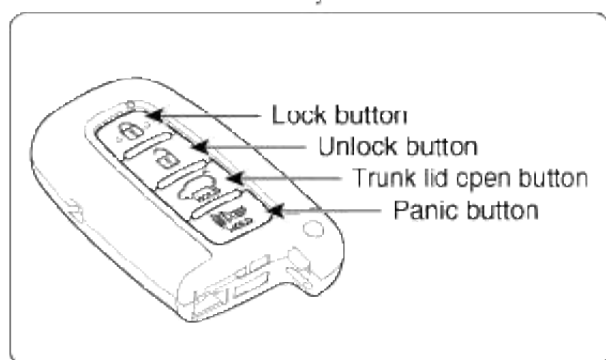


Item	Description
Power source	3V
Operating temperature	-20°C ~ +60°C
RF Modulation	FSK
LF Modulation	ASK
RF frequency	315MHz
Battery	1EA (CR2032)
Transmissible distance	10m or more
Life of battery	2years or more(at 20 times per day)
Button number	3
Function	Door lock
	Door unlock
	Trunk lid open

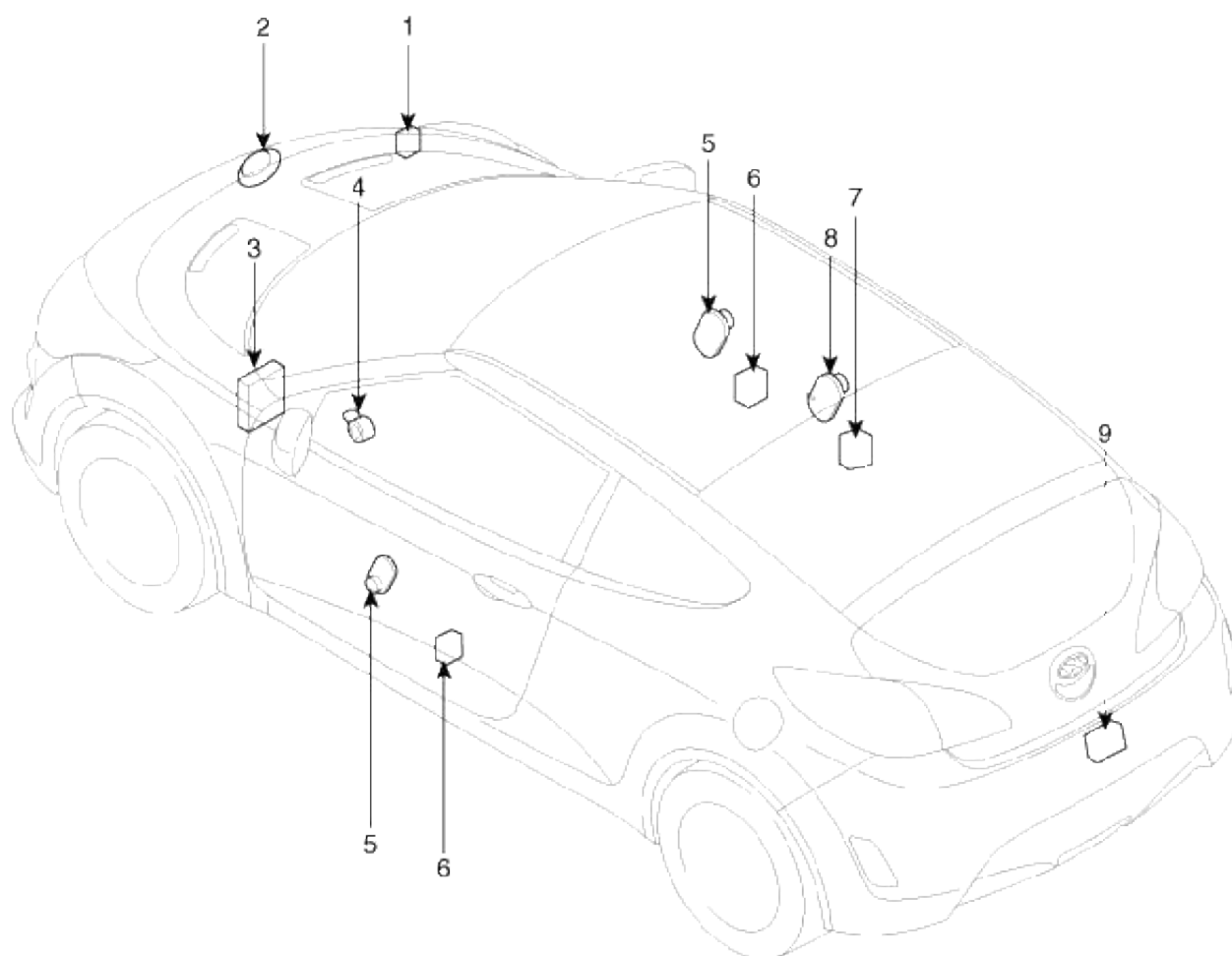
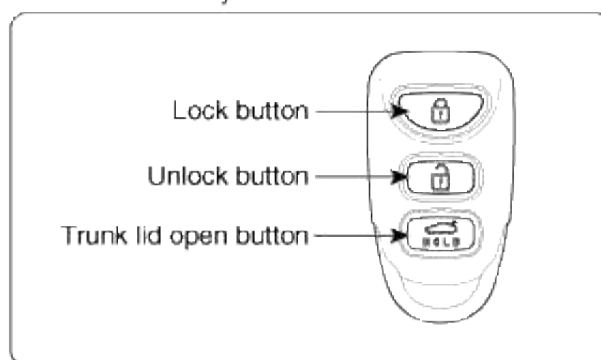
### Body Electrical System > Keyless Entry And Burglar Alarm > Components and Components Location

#### Component Location

Smart Key Transmitter



Keyless Transmitter



- |                             |                                      |
|-----------------------------|--------------------------------------|
| 1. Hood switch              | 6. Front door lock actuator & switch |
| 2. Burglar horn             |                                      |
| 3. IPM (BCM) and RF antenna | 7. Rear door lock actuator & switch  |
| 4. Key warning switch       |                                      |
| 5. Front door switch        | 8. Rear door switch                  |
|                             | 9. Tailgate switch                   |

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

### Description

#### Burglar Alarm System

The burglar alarm system is armed automatically after the doors, hood, and trunk lid are closed and locked with keyless transmitter.

The system is set off when any of these things occur:

- A door is forced open.
- A door is unlocked without using the transmitter & key.
- The trunk lid is opened without using the key.
- The hood is opened.
- The engine starter circuit and battery circuit are bypassed by breaking the ignition switch.

When the system is set off, the alarm (horn) sounds and the hazard lamp flash for about two minutes or until the system is disarmed by unlocking the transmitter.

For the system to arm, the ignition switch must be off and the key removed. Then, the body control module must receive signals that the doors, hood, and trunk lid are closed and locked. When everything is closed and locked, none of the control unit inputs are grounded.

The door switches, hood switch and trunk lid switch are all close and lock the doors with the remote transmitter and then the system arms after 30 second.

If anything is opened or improperly unlocked after the system is armed, the body control module gets a ground signal from that switch, and the system is set off.

If one of the switches is misadjusted or there is a short in the system, the system will not arm. As long as the body control module continues to get a ground signal, it thinks the vehicle is not closed or locked and will not arm.

The receiver is integrated in the body control module.

#### Keyless Entry System

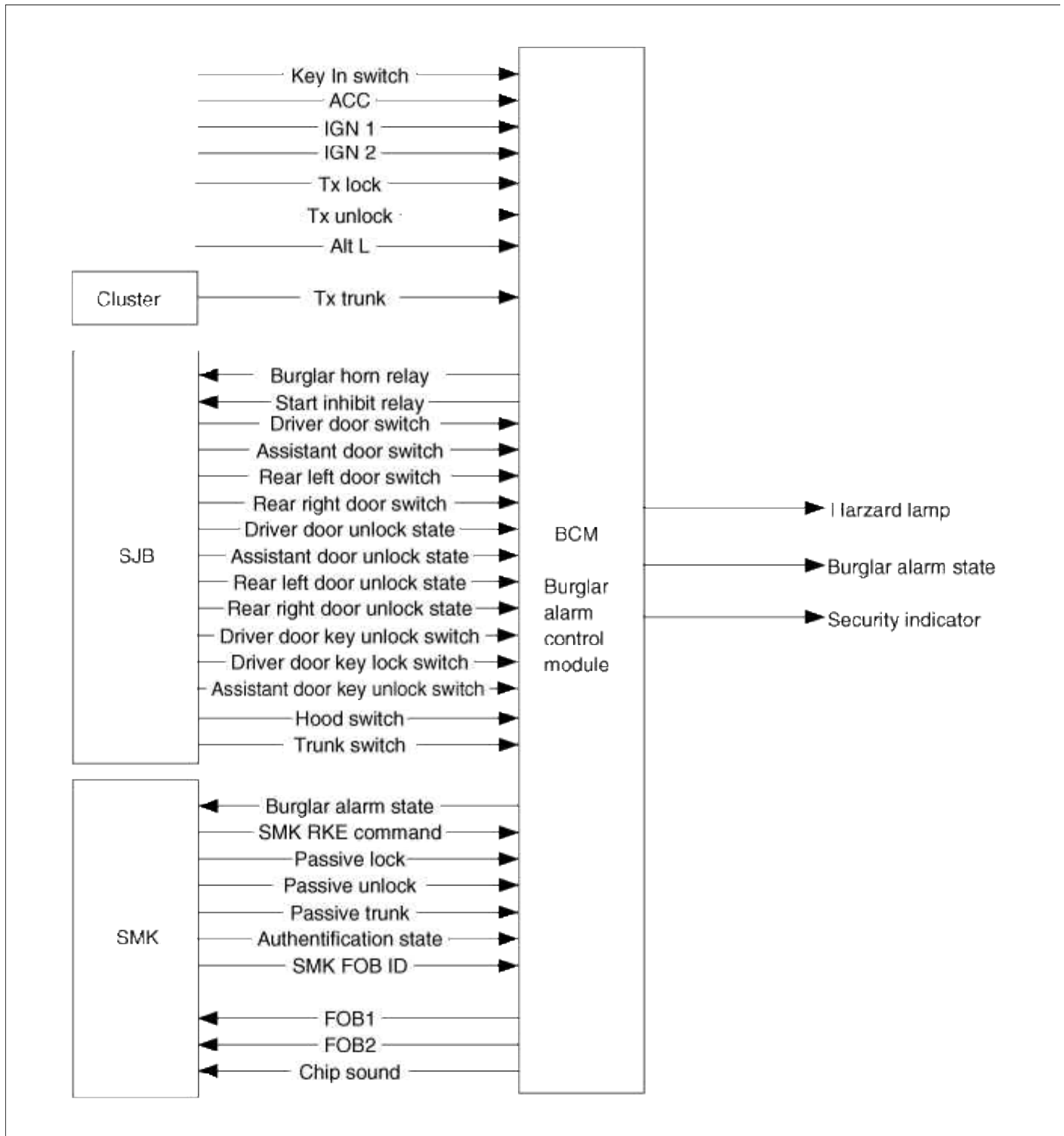
The burglar alarm system is integrated with the keyless entry system. The keyless entry system allows you to lock and unlock the vehicle with the remote transmitter. When you push the lock button, all doors lock. When you push the unlock button all doors unlock.

The room lamp, if its switch is in the center position, will come on when you press the unlock button. If you do not open a door, the light will go off in about 30 seconds, the doors will automatically relock, and the burglar alarm system will rearm. If you relock the doors with the remote transmitter within 30 seconds, the light will go off immediately.

You cannot lock or unlock the doors with the remote transmitter if the key is in the ignition switch.

The system will signal you when the doors lock and unlock by flashing the hazard lamp once when they lock, and twice when they unlock.

#### Data Flow



### Overview Description

1. According to various input signals there are a variety of changing conditions that perform many functions.

- A. ARM
- B. ARM WAIT
- C. AUTO lock TIMER1
- D. AUTO lock TIMER2
- E. ARM HOLD
- F. REARM
- G. ALARM
- H. PREARM
- I. DISARM

Condition 1 : At least one entrance opened

(4Door Not Close=ON) or (Trunk Open Switch=ON) or (Hood Switch=ON)

Condition 2 : All doors closed, but HOOD or TRUNK open

(4Door Not Close=OFF) & (Trunk Open Switch=ON) or (Hood Switch=ON)

Condition 3 : Close the 4DOOR with DOOR lock

(4Doors Locked) & (4Door Not Close ON→OFF)

Condition 2 & 3 : Close the 4DOOR with lock with HOOD or TRUNK OPEN

(4Doors Locked) & (4Door Not Close ON→OFF) & (Trunk Open Switch=ON) or (Hood Switch=ON)

All entrances closed : 4DOOR Switch & HOOD Switch & TRUNK OPEN Switch is CLOSE

LOCK : Lock command by Tx

UNLOCK : Unlock command by Tx

LOCK : Driver key lock switch is ON

UNLOCK : Driver key unlock switch is ON

TRUNK : TRUNK OPEN signal or TRUNK or RKE TRUNK command by Tx

IGN KEY ON : KEY IN Switch = ON & IGN1 = ON & IGN2 =ON

IGN KEY OUT : KEY IN Switch = OFF & IGN1 = OFF & IGN2 =OFF

KEY IN : KEY IN Switch = ON

KEY IN 1 : KEY IN Switch = ON or IGN1 = ON or IGN2 = ON

H1 : Hazard Time is one-time(lock) 1sec on

H2 : Hazard Time is two-time(unlock) 0.5sec/on, 0.5sec/off

AUTO LOCK TIMER1 : 30sec

AUTO LOCK TIMER2 : 30sec

ARM WAIT TIMER : 30sec

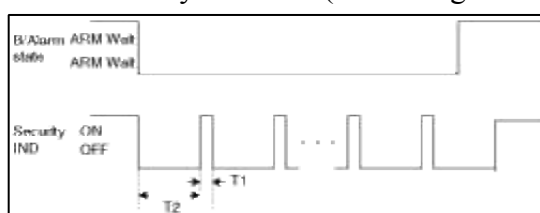
TRUNK TIMER : 30sec

TRUNK MARK : Default value is clear

LOCK CONFIRM CHECK : 0.2 ~ 5sec

#### Security Indicator Control

1. Key In switch ON or ACC ON1 ON or IGN1 ON or IGN2 ON or FOB IN is LED OFF.
2. IGN KEY OUT entry in the ARM WAIT mode, the Infinite On control of the ARM WAIT mode, the other will control the BLINKING.
3. BLINKING cycle is 2.3s.(ON during 0.3s / OFF during 2.0s)



T1 : 0.3sec, T2 : 2sec

#### Functions

## DISARM

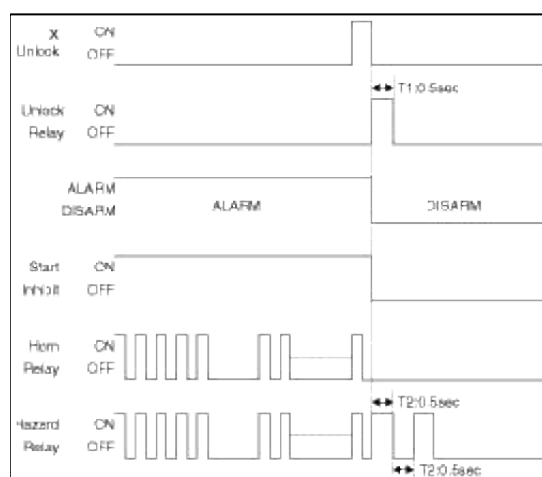
## Condition 1

State	Description
Initial Condition	<b>ALARM</b>
Event	- IGN KEY ON during 30sec or ALT "L" on
	NON SMK SPEC : - Any door open & TX unlock - TX Trunk - TX Lock & Lock confirm Failed
	SMK SPEC : - Any door open & RKE CMD Unlock/ Passive Access Unlock 1 - RKE trunk 1 - TP AUTH 1/ PIC AUTH 1 - RKE CMD Lock/ Passive Access Lock 1 & Lock confirm Failed
	Mechanical Key Option Enable : - Unlock - lock & Lock confirm Failed
Action	The state goes to <b>DISARM</b> state - Horn Relay, Hazard Relay, Start inhibit OFF - TX Unlock, RKE CMD Unlock, Passive Access Unlock 1 -> Unlock relay on for 0.5sec -> Hazard relay on (TWICE)

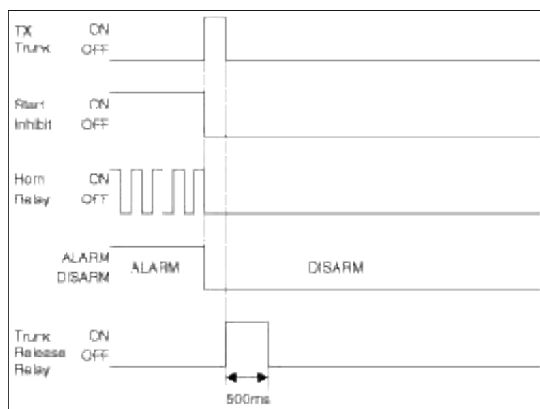
Lock failure : Lock attempts within 5 seconds after the Unlock door maintain at least one if

RKE CMD = Unlock : RKE CMD = Unlock & Fob1 or Unlock & Fob2

RKE CMD = Lock : RKE CMD = Lock & Fob1 or Lock & Fob2



T1 : 0.5s, T2 : 0.5s +-0.1s

**Condition 2**

State	Description
Initial Condition	<b>DISARM</b> state & (IGN KEY OUT) & Any Door open
Event	NON SMK spec : - Any door open & TX UNLOCK
	SMK spec : - Any door open & RKE CMD=2 / Passive Access Unlock 1 / SMK RKE CMD=3 - C_Authstate=2
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	<b>ARM WAIT</b> state
Event	- Any door open or Hood switch OPEN or Trunk switch OPEN - Any door is unlocked - Key In switch ON
	SMK spec : C_Authstate=2
	Mechanical Key OPTION Enable : UNLOCK
Action	The state goes to <b>DISARM</b> state

**Condition 4**

State	Description
Initial Condition	<b>AUTOLOCK TIMER1 STATE</b>
Event	<ul style="list-style-type: none"> <li>- Any door open or Hood switch OPEN or Trunk switch OPEN</li> <li>- Key In switch ON</li> <li>- AUTO LOCK &amp; Lock confirmation failure</li> </ul>
	NON SMK spec : <ul style="list-style-type: none"> <li>- AUTO LOCK &amp; Lock confirmation failure</li> </ul>
	SMK spec : <ul style="list-style-type: none"> <li>- RKE CMD LOCK / Passive Access Lock 1&amp; Lock confirmation failure</li> <li>- C_Authstate=2</li> </ul>
	Mechanical Key option Enable : <ul style="list-style-type: none"> <li>- LOCK &amp; Lock confirmation failure</li> </ul>
Action	The state goes to <b>DISARM</b> state

**Condition 5**

State	Description
Initial Condition	<b>AUTOLOCK TIMER2 STATE</b>
Event	<ul style="list-style-type: none"> <li>- Any door open</li> <li>- Key In switch ON</li> <li>- AUTO LOCK &amp; Lock confirmation failure</li> <li>- Hood switch Open and Memory Hood was Close</li> <li>- Trunk switch Open and Memory Trunk was Close</li> </ul>
	NON SMK spec : <ul style="list-style-type: none"> <li>- TX LOCK&amp; Lock confirmation failure</li> </ul>
	SMK spec : <ul style="list-style-type: none"> <li>- RKE CMD=LOCK/ Passive Access Lock 1&amp; Lock confirmation failure</li> <li>- C_Authstate=2</li> </ul>
	Mechanical Key option Enable : LOCK & Lock confirmation failure
Action	The state goes to <b>DISARM</b> state

**Condition 6**



State	Description
Initial Condition	<b>ARM STATE</b>
Event	- IGN KEY ON
	SMK spec : - C_Authstate=2
	Mechanical Key option Enable : - UNLOCK
Action	The state goes to <b>DISARM</b> state

**Condition 7**

State	Description
Initial Condition	<b>REARM</b> state
Event	- IGN KEY ON during 30sec or ALT”L” on
	NON SMK spec : - TX LOCK& Lock confirmation failure - TX TRUNK
	SMK spec : - C_Authstate=2 - RKE CMD LOCK / Passive Access Lock 1 & Lock confirmation failure - SMKRKECMD=3
	Mechanical Key option Enable : - UNLOCK - LOCK & Lock confirmation failure
Action	The state goes to <b>DISARM</b> state Start inhibit OFF

**Condition 8**

State	Description
Initial Condition	<b>PREARM</b> state
Event	<ul style="list-style-type: none"> <li>- Key In switch ON</li> <li>- All entrance closed &amp; Any Door is unlocked</li> <li>- Any Door open &amp; Tx Unlock</li> </ul>
	NON SMK : - Any door open & TX UNLOCK
	SMK : - C_Authstate=2 - Any door open & RKE CMD UNLOCK/ Passive Access Unlock 1
	Mechanical Key option Enable : - UNLOCK
Action	The state goes to <b>DISARM</b> state - TX UNLOCK, RKE CMD UNLOCK, Passive Access Unlock 1 -> Hazard relay for 0.5s ON/OFF(twice)

**Condition 9**

State	Description
Initial Condition	<b>ARMHOLD</b>
Event	- IGN KEY ON
	SMK : - C_Authstate=2
	Mechanical Key option Enable : - UNLOCK
Action	The state goes to <b>DISARM</b> state

**ARM****Condition 1**

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

**Condition 2**

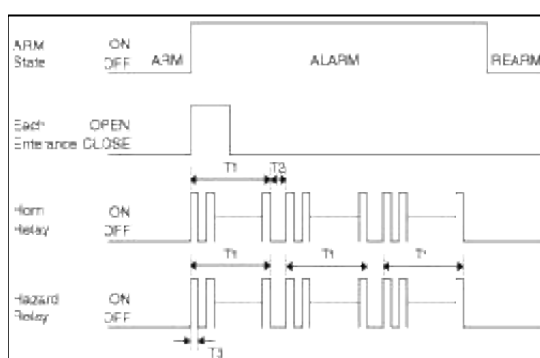
State	Description
Initial Condition	<b>ARM WAIT</b> state
Event	- After ARM WAIT TIMER finished
Action	The state goes to <b>ARM</b> state

**Condition 3**

State	Description
Initial Condition	<b>ARMHOLD</b> state
Event	Trunk close for at least Trunk Release Time Out(default 30sec) in ARMWAIT state
Action	The state goes to <b>ARM</b> state

**ALARM****Condition 1**

State	Description
Initial Condition	<b>ARM</b> state
Event	Any door open or Hood switch open or Trunk switch open
Action	The state goes to <b>ALARM</b> state - Engine Start Inhibit is ON - The horn is ON one time for 27sec( $\pm 2$ sec) and OFF two times for 10sec( $\pm 1$ sec) - The hazard is ON also (During Horn is ON)



T1 : 27s( $\pm 2$ sec), T2 : 10s( $\pm 2$ sec), T3 : 0.5s  $\pm$  0.1sec

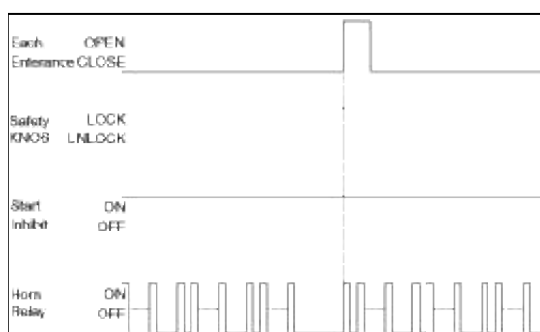
Note : Horn Output : Period : 1sec(Can be calibrated Horn Period), 50% Duty

**Condition 2**

State	Description
Initial Condition	<b>REARM</b> state
Event	Any door open or Hood switch OPEN or Trunk switch OPEN
Action	The state goes to <b>ALARM</b> state The horn is ON one time for 27sec( $\pm 2$ sec) and OFF two times for 10sec( $\pm 1$ sec) The hazard is ON also (During Horn is ON)

**Condition 3**

State	Description
Initial Condition	<b>ARMHOLD</b> state
Event	Any door open or Hood switch OPEN
Action	The state goes to <b>ALARM</b> state The horn is ON one time for 27sec( $\pm 2$ sec) and OFF two times for 10sec( $\pm 1$ sec) The hazard is ON also (During Horn is ON).

**ARM WAIT MODE****Condition 1**

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

**Condition 2**

State	Description
Initial Condition	<b>DISARM</b> state & IGN KEY OUT & All entrances closed(DOORS, HOOD and TRUNK)
Event	NON SMK : - Tx Lock & locked confirmed
	SMK spec : - RKE CMD LOCK / Passive Access Lock 1 & locked confirmed
	Mechanical Key option Enable : - LOCK & locked confirmed - DOOR LOCK state : Any door open → All door closed
Action	- The state goes to <b>ARMWAIT</b> State - Start ARM WAIT TIMER - Hazard relay 1Time on(1sec)

**Condition 3**

State	Description
Initial Condition	<b>ALARM</b> state & All entrances closed(DOORS, HOOD and TRUNK)
Event	NON SMK : - Tx Lock & locked confirmed
	SMK spec : - RKE CMD LOCK / Passive Access Lock 1 & locked confirmed
	Mechanical Key option Enable : - LOCK & locked confirmed
Action	- The state goes to <b>ARMWAIT</b> State - Horn relay, Start inhibit relay OFF - Hazard relay 1Time on(1sec) (LOCK : Except) - Start ARMWAIT TIMER

**Condition 4**

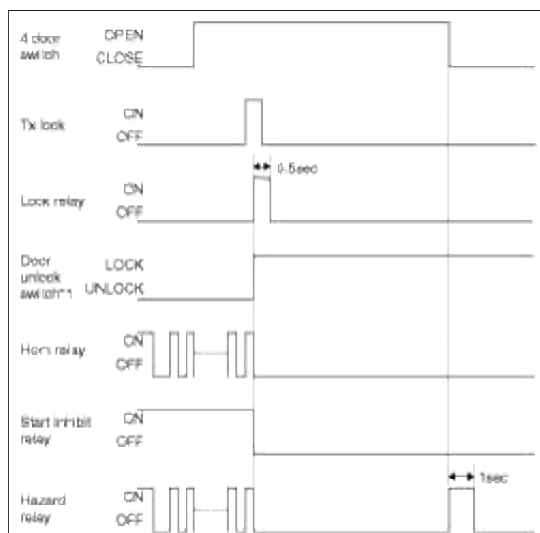
State	Description
Initial Condition	<b>AUTOLOCK TIMER1</b> state
Event	AUTOLOCK & locked confirmed
	NON SMK : - Tx Lock & locked confirmed
	SMK : - RKE CMD LOCK / Passive Access Lock 1 & locked confirmed
	Mechanical Key option Enable : LOCK & locked confirmed
Action	<ul style="list-style-type: none"> <li>- The state goes to <b>ARMWAIT</b> State</li> <li>- Hazard relay 1Time on(1sec)</li> <li>- Start ARMWAIT TIMER</li> </ul>

**Condition 5**

State	Description
Initial Condition	<b>PREARM</b> state
Event	All door closed and (Trunk switch CLOSE & TRUNK MARK CLEAR) & Hood switch CLOSE & DOOR LOCK
Action	<ul style="list-style-type: none"> <li>- The state goes to <b>ARMWAIT</b> State</li> <li>- Hazard relay 1Time on(1sec)</li> <li>- Start ARMWAIT TIMER</li> </ul>

**Condition 6**

State	Description
Initial Condition	<b>REARM</b> state
Event	NON SMK : - TX LOCK & locked confirmed
	SMK : - RKE CMD LOCK/ Passive Access Lock 1 & locked confirmed
	Mechanical Key option Enable : - LOCK & locked confirmed
Action	<ul style="list-style-type: none"> <li>- The state goes to <b>ARMWAIT</b> State</li> <li>- Hazard relay 1Time on(1sec) (LOCK : Except)</li> <li>- Start Inhibit relay OFF</li> <li>- Start ARMWAIT TIMER</li> </ul>



\*1 : Lock : Driver Door Unlock Switch or Assist Door Unlock Switch or Rear Right Driver Unlock Switch = LOCK

Unlock : Driver Door Unlock Switch or Assist Door Unlock Switch or Rear Right Driver Unlock Switch = UNLOCK

#### REARM MODE

##### Condition 1

State	Description
Initial Condition	<b>ALARM</b> state
Event	All doors closed and trunk switch close, hood switch close state, and ALARM PATTERN finished
Action	The state goes to <b>REARM</b> state

#### AUTO LOCK TIMER1 MODE

##### Condition 1

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

##### Condition 2

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

**Condition 3**

State	Description
Initial Condition	<b>ARM WAIT</b> state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK / Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to AUTO LOCK TIMER1 state</li> <li>- Start AUTO LOCK TIMER1</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> </ul>

**Condition 4**

State	Description
Initial Condition	<b>DISARM</b> state & All entrances closed(DOORS, Hood SW & Trunk SW) & IGN KEY OUT
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK/ Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to <b>AUTO LOCK TIMER1</b> state</li> <li>- Start AUTO LOCK TIMER1</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> </ul>

**Condition 5**



State	Description
Initial Condition	<b>ALARM</b> state & All door closed and Trunk switch CLOSE, Hood switch CLOSE
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK / Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to AUTO LOCK TIMER1 state</li> <li>- Start AUTO LOCK TIMER1</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> <li>- Start inhibit relay off /Horn relay off</li> </ul>

**Condition 6**

State	Description
Initial Condition	<b>REARM</b> state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK/ Passive Access Unlock 1
Action	The state goes to <b>AUTO LOCK TIMER1</b> state <ul style="list-style-type: none"> <li>- Start AUTO LOCK TIMER1</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> <li>- Start inhibit relay off</li> </ul>

## AUTO LOCK TIMER2 MODE

**Condition 1**

State	Description
Initial Condition	<b>AUTO-LOCK TIMER2</b> state
Event	Finished AUTO LOCK TIMER2
	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK/ Passive Access Unlock 1
Action	No change state
	CASE1: AUTO LOCK TIMER2 finished AUTOLOCK
	CASE2: TX UNLOCK, RKE CMD UNLOCK, Passive Access Unlock 1 <ul style="list-style-type: none"> <li>- Start AUTOL OCK TIMER2</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> </ul>

**Condition 2**

State	Description
Initial Condition	<b>DISARM</b> state & IGN KEY OUT & (Trunk switch OPEN or Hood switch OPEN) state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK/ Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to AUTOLOCKTIMER2 state</li> <li>- Start AUTOLOCKTIMER2</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> <li>- Memo Hood/Trunk state</li> </ul>

**Condition 3**

State	Description
Initial Condition	<b>ALARM</b> state & All door closed & (Trunk switch OPEN or Hood switch OPEN) state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK / Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to AUTO LOCK TIMER2 state</li> <li>- Horn relay, Start inhibit relay OFF</li> <li>- Start AUTO LOCK TIMER2</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> <li>- Memo Hood/Trunk state</li> </ul>

**Condition 4**

State	Description
Initial Condition	<b>PREARM</b> state & All door closed & (Trunk switch OPEN or Hood switch OPEN)state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK / Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to AUTO LOCK TIMER2 state</li> <li>- Start AUTO LOCK TIMER2</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> <li>- Memo Hood/Trunk state</li> </ul>

**Condition 5**

State	Description
Initial Condition	<b>ARMHOLD</b> state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD UNLOCK / Passive Access Unlock 1
Action	<ul style="list-style-type: none"> <li>- The state goes to <b>AUTO LOCK TIMER2</b> state</li> <li>- Start AUTO LOCK TIMER2</li> <li>- Hazard relay Twice on(0.5s ON/0.5s OFF)</li> <li>- Memo Hood/Trunk state</li> </ul>

## PREARM MODE

**Condition 1**

State	Description
Initial Condition	<b>AUTO-LOCK TIMER2</b> 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 : LOCK & locked confirmed
Action	The state goes to <b>PREARM</b> state

**Condition 2**

State	Description
Initial Condition	<b>DISARM</b> state & IGN KEY OUT
Event	NON SMK : <ul style="list-style-type: none"> <li>- Any door open or Hood SW OPEN or Trunk SW OPEN state &amp; locked confirmed</li> </ul>
	SMK : <ul style="list-style-type: none"> <li>- Any door open or Hood SW OPEN or Trunk SW OPEN state RKE CMD LOCK / Passive Access Lock 1 &amp; locked confirmed</li> </ul>
	Mechanical Key option Enable : 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 <b>PREARM</b> state

**Condition 3**

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

**Condition 4**

State	Description
Initial Condition	<b>ARMHOLD</b> state
Event	NON SMK : TX LOCK & locked confirmed
	SMK : RKE CMD LOCK/ Passive Access Lock 1& locked confirmed
	Mechanical Key option Enable : LOCK locked confirmed
Action	The state goes to <b>PREARM</b> state

**Condition 5**

State	Description
Initial Condition	<b>ARMWAIT</b> state
Event	NON SMK : TX TRUNK
	SMK : RKE TRUNK 1
Action	The state goes to <b>PREARM</b> state Start TRUNK TIMER TRUNK MARK Set

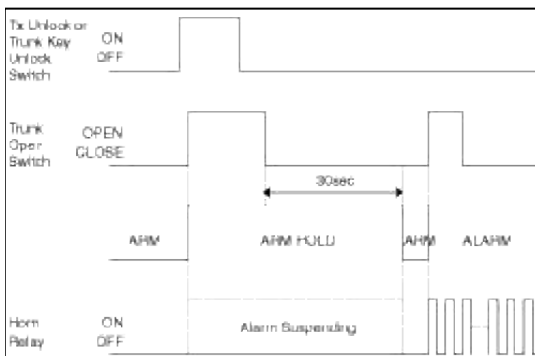
**Condition 6**

State	Description
Initial Condition	<b>PREARM</b> state
Event	Trunk switch OPEN Trunk TimeR expired(Trunk Release Time Out: 30s)
Action	No state change CASE Trunk switch OPEN : Stop to Trunk Timer. TRUNK MARK Clear CASE TRUNK TIMER expired : TRUNK MARK Clear

## ARMHOLD MODE

### Condition 1

State	Description
Initial Condition	<b>ARM</b> state
Event	NON SMK : TX Trunk SMK : RKE Trunk 1
Action	The state goes to <b>ARMHOLD</b> state

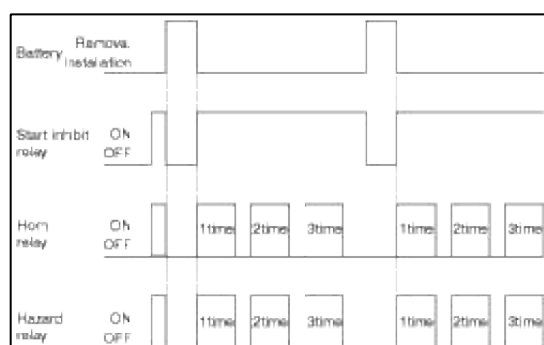


## RESET

1. In case of taking the BATTERY out during the ALARM state

#### Condition

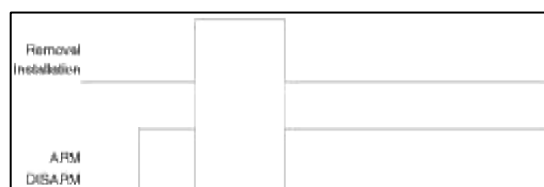
State	Description
Initial Condition	<b>ALARM, REARM</b> state
Event	Taking the battery out
Action	Start INH relay ON and Horn relay twice The state goes to <b>ALARM</b> mode



2. In case of taking the BATTERY out during ARM

#### Condition

State	Description
Initial Condition	ARM state
Event	Taking the battery out
Action	The state goes to ARM mode



3. In case of taking the BATTERY out during the ARMHOLD state

#### Condition

State	Description
Initial Condition	<b>Except ARM, ALARM, REARM, ARMHOLD</b> state
Event	Taking the battery out
Action	The state goes to <b>DISARM</b> mode

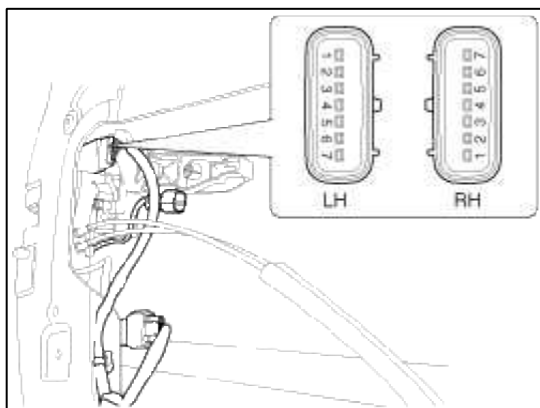
### Body Electrical System > Keyless Entry And Burglar Alarm > Repair procedures

#### Inspection

#### Front Door Lock Actuator Inspection

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

2. Remove the front door module.
3. Disconnect the 7P connector from the actuator.

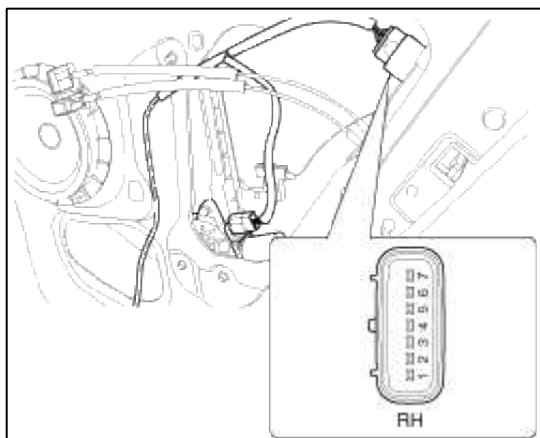


4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal		2	1
Position	Lock	⊖	⊕
	Unlock	⊕	⊖
Terminal		6	7
Position	Lock	⊕	⊖
	Unlock	⊖	⊕

#### Rear Door Lock Actuator Inspection

1. Remove the rear door trim.  
(Refer to the BD group - "Rear door")
2. Remove the rear door module.
3. Disconnect the 7P connector from the actuator.



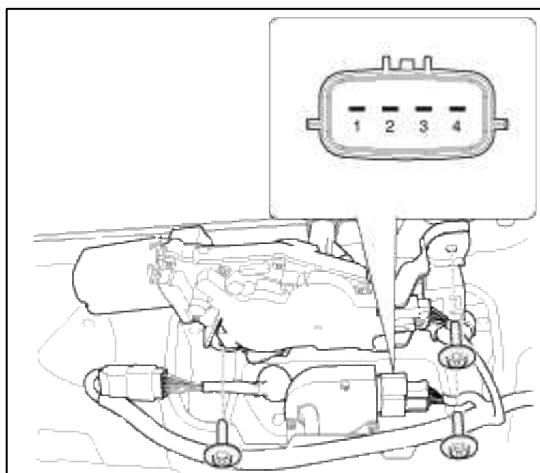
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal		6	7
Position	Lock	⊕	⊖
	Unlock	⊖	⊕

#### Tailgate Release Actuator Inspection

1. Remove the tailgate trim panel.  
(Refer to the BD group - "Tailgate")

2. Disconnect the 4P connector from the actuator.

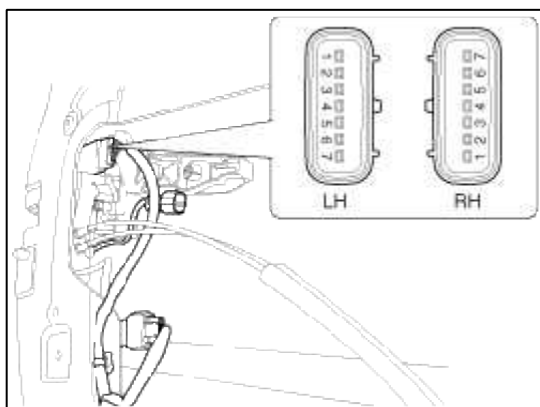


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	1	2
Lock release(Open)	⊖	⊕

#### Front Door Lock Switch Inspection

1. Remove the front door trim panel.  
(Refer to the BD group - "Front door")
2. Remove the front door module.
3. Disconnect the 7P connector 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.

Terminal		3	4	5
Position	Front left		○ — ○	
	Counter-clockwise	○ —		○
Front right	Clockwise	○ —		○
	Counter-clockwise	○ —	○	

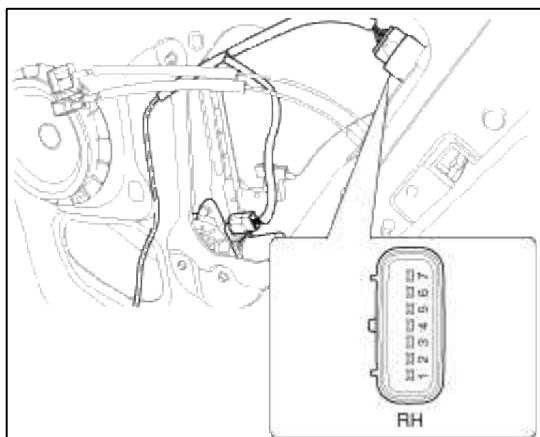
Terminal		6	5
Position	Front left	○ —	○
Terminal		2	3
Position	Front right	○ —	○

#### Rear Door Lock Switch Inspection

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



2. Remove the rear door module.
3. Disconnect the 7P connector from the actuator.

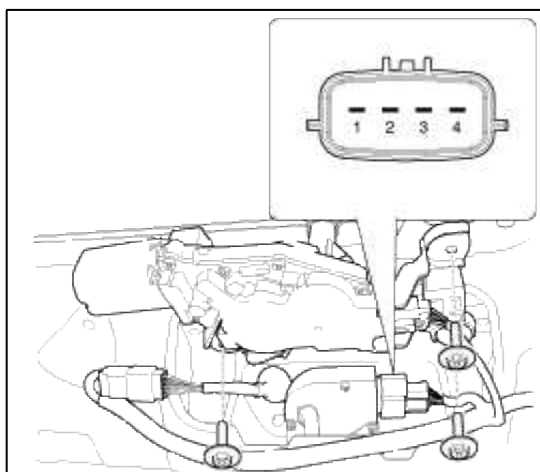


4. Check for continuity between the terminals in each switch position according to the table.

Terminal		2	3
Position			
Rear right	Open	○	○

#### Tailgate Open Switch Inspection

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

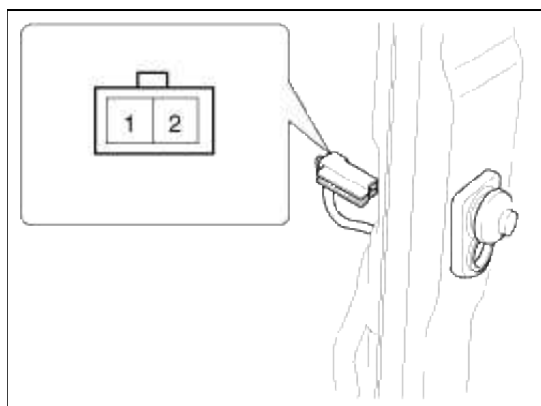


3. Check for continuity between the terminals in each switch position according to the table.

Terminal		3	4
Position			
Open		○	○
Close		-	-

#### Door Switch Inspection

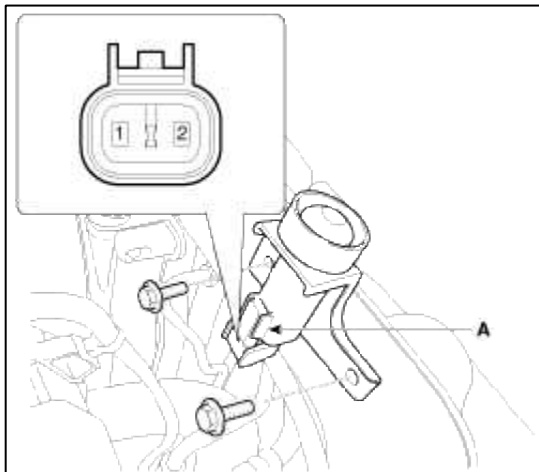
Remove the door switch and check for continuity between the terminals.



Terminal Position	1	2	Body (Ground)
Door open (Free)	○	○	○
Door close (Push)			

### Hood Switch Inspection

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

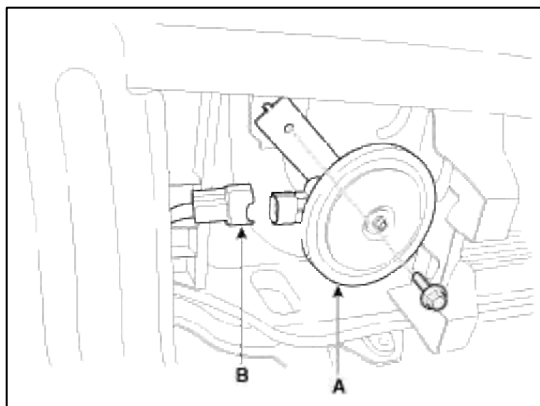


2. Check for continuity between the terminals and ground according to the table.

Terminal Position	1	2
Hood open (Free)	○	○
Hood close (Push)		

### Burglar Horn Inspection

1. Remove the burglar horn (A) after removing 1 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 > Repair procedures

### Inspection

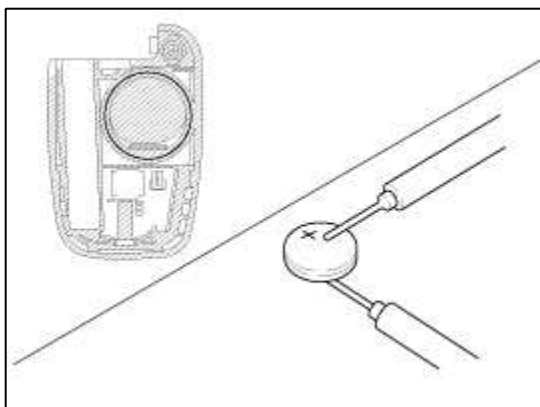
1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.

2. Remove the battery (A) and check voltage if the red light doesn't flicker.

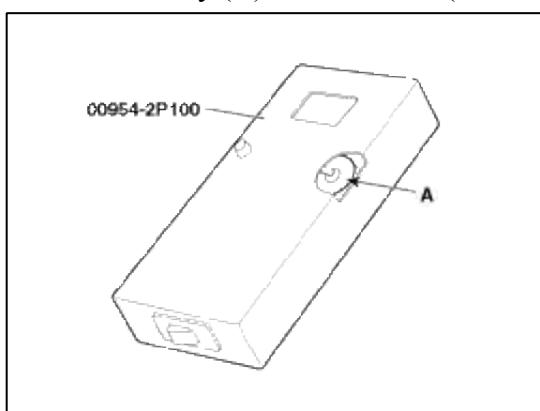
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**Standard voltage : 3V**

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



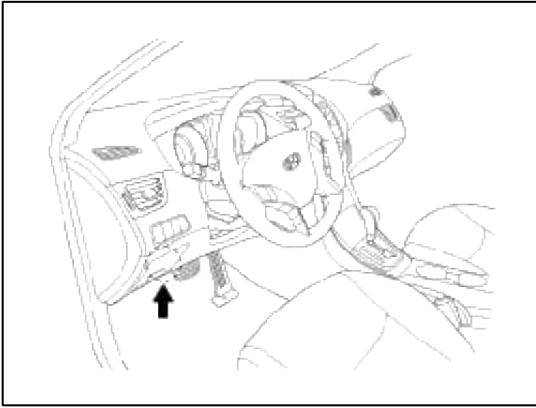
4. Push the test button and If "0.00" is displayed on screen, it means that the battery voltage is 2V or less.
5. If "L" is displayed on screen, it means that the battery is low power and it needs to replace.
6. To prevent the discharge of electricity, turn the tester power off.
7. Replace the transmitter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

**WARNING**

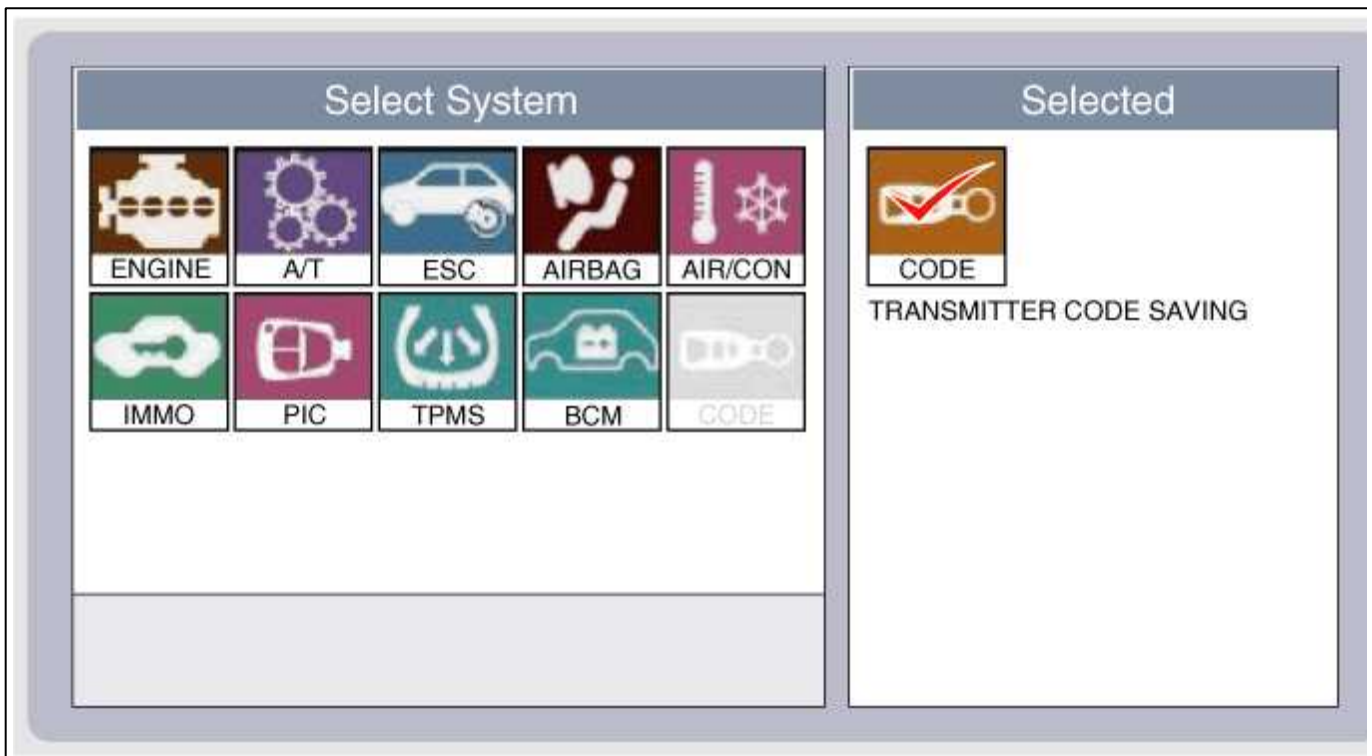
An inappropriately disposed battery can be harmful to the environment and human health.  
Dispose the battery according to your local law(s) or regulation.

Transmitter Code Registration (Using GDS)

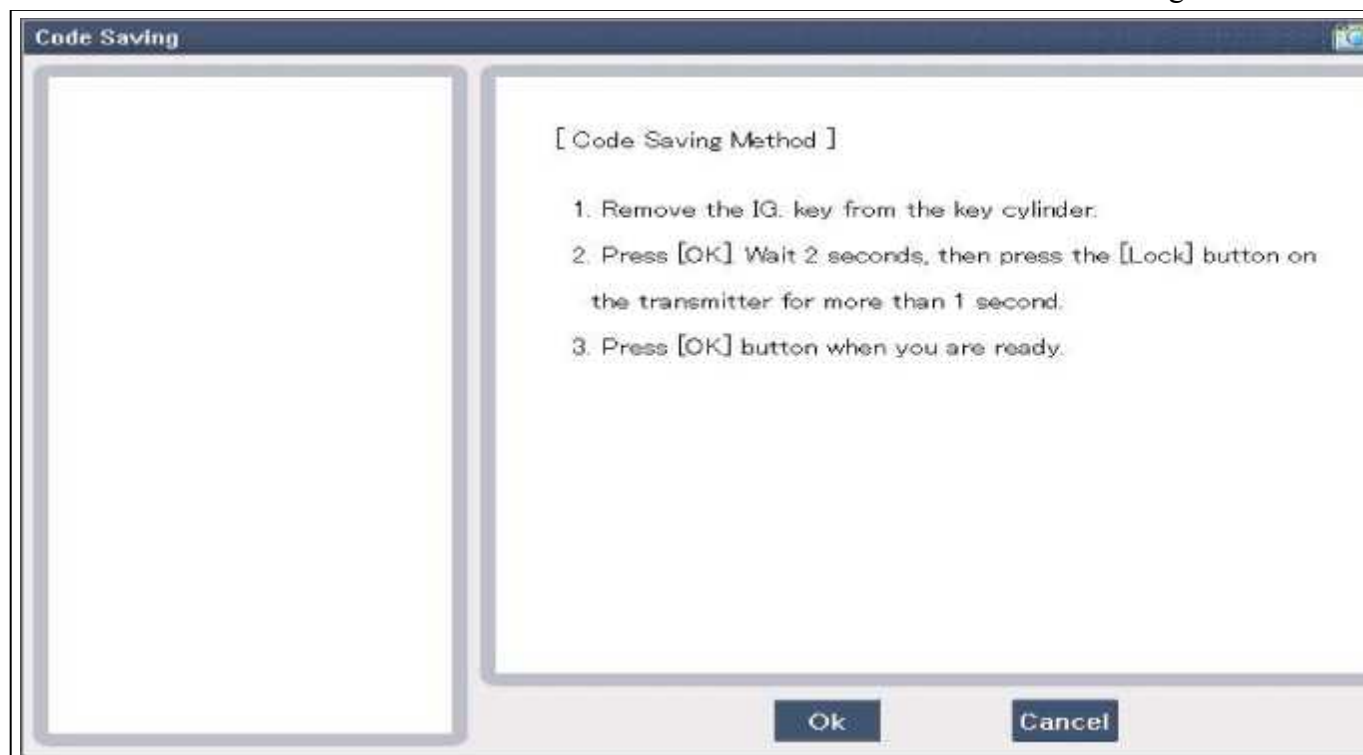
1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.



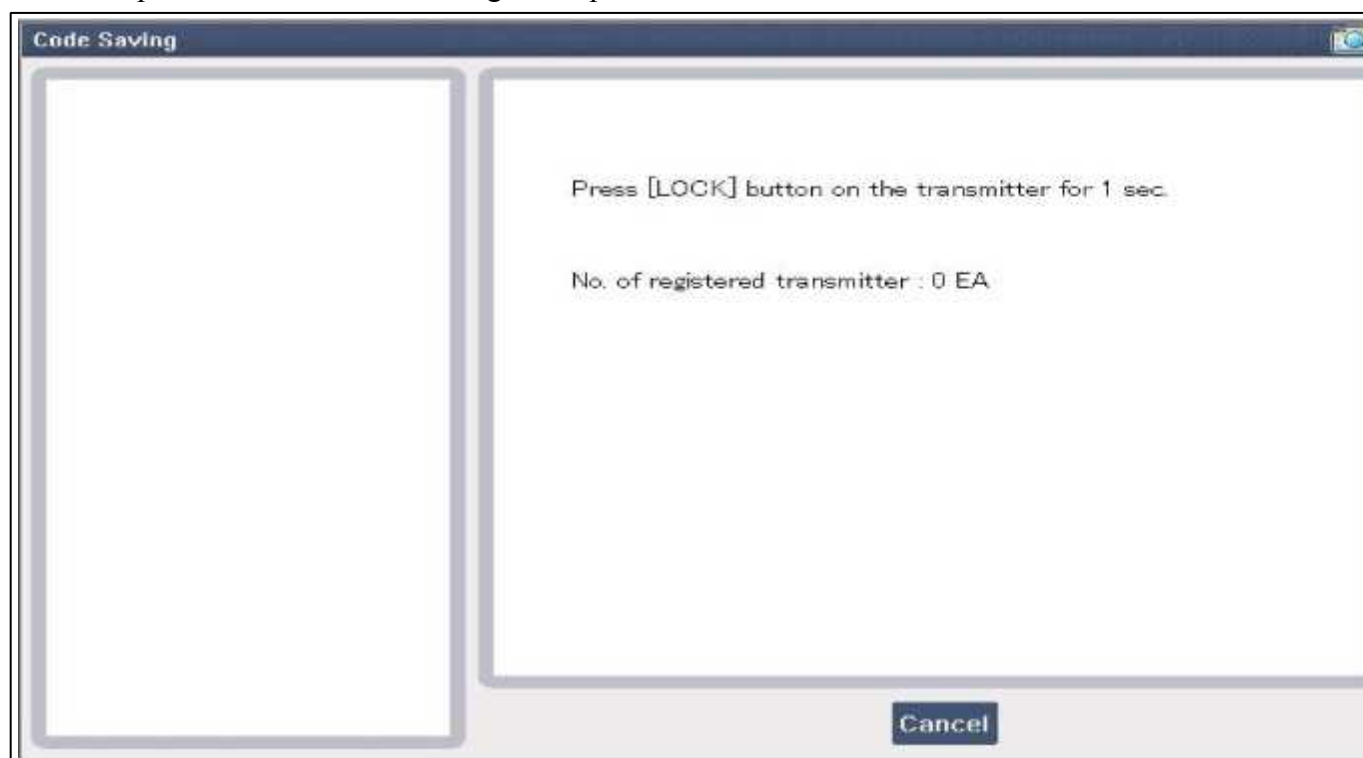
2. Select the vehicle model and then select "CODE SAVING"

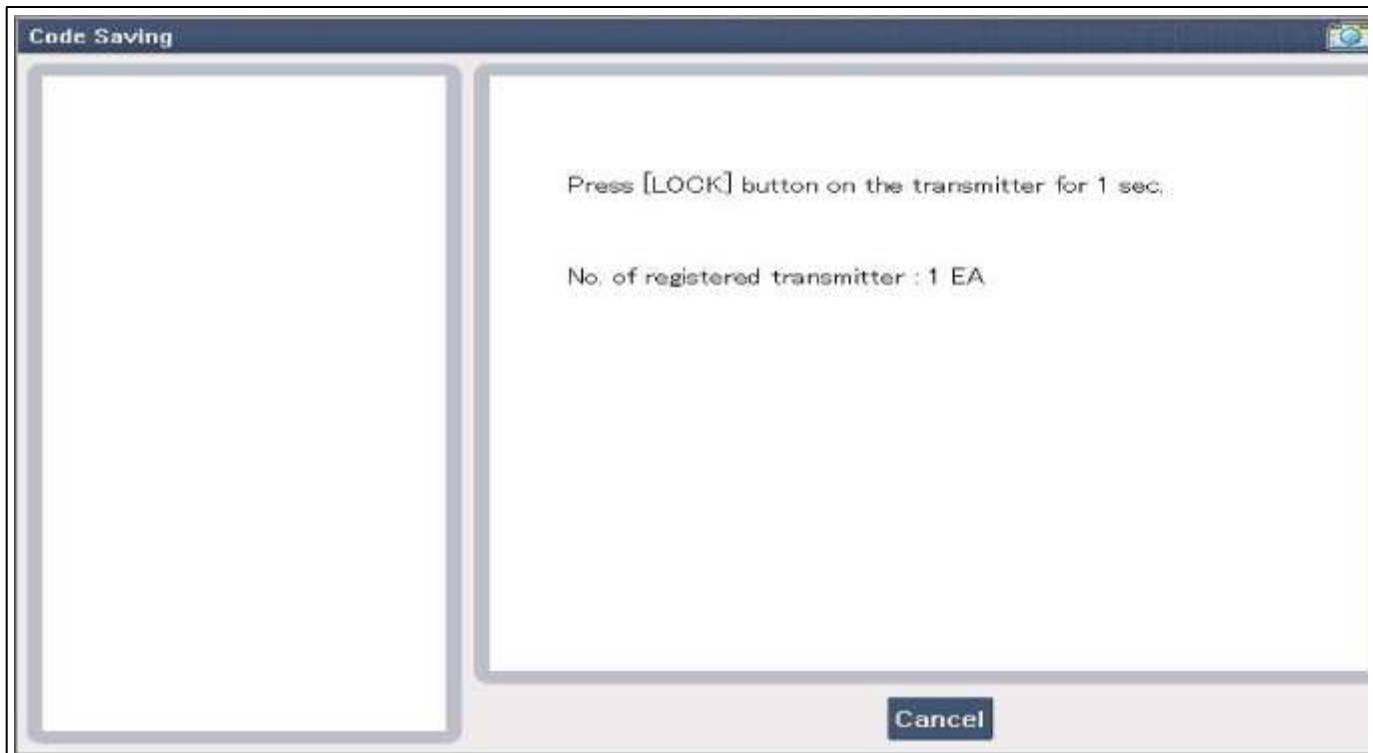
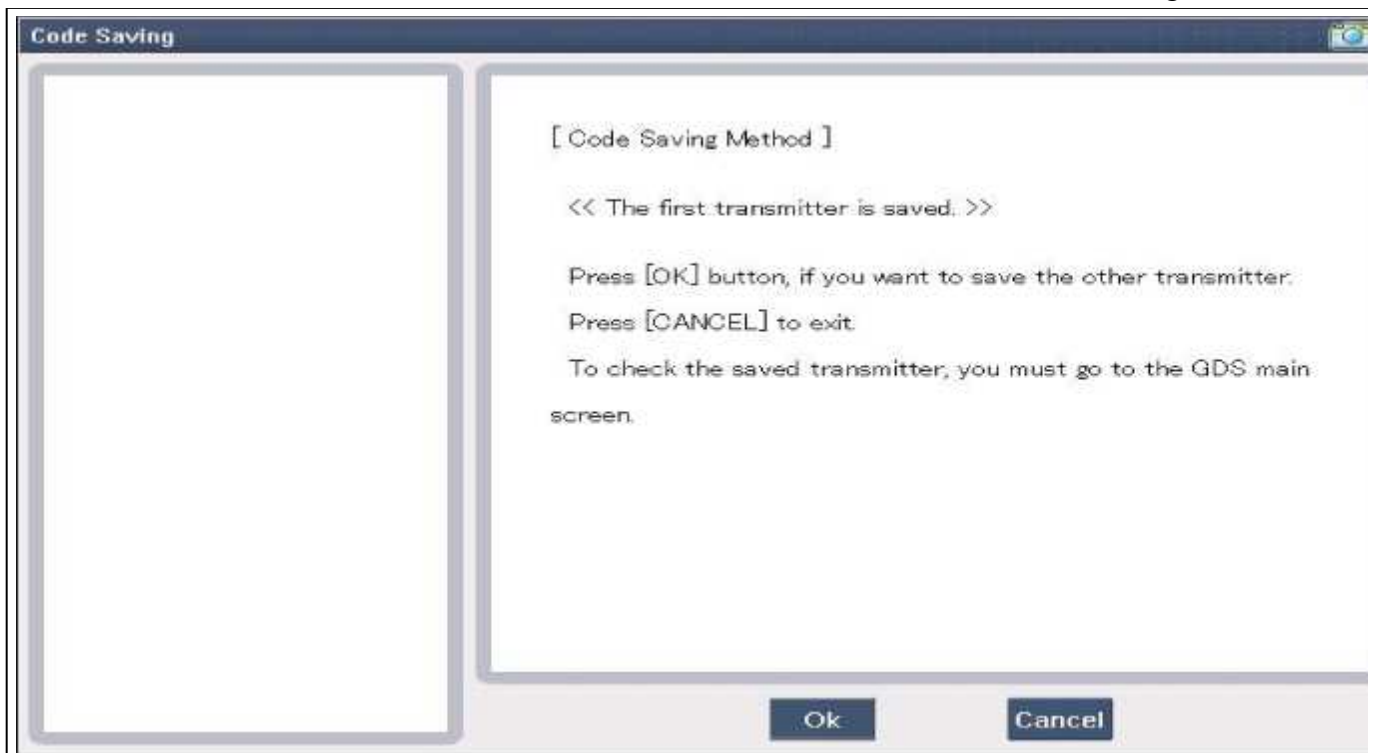


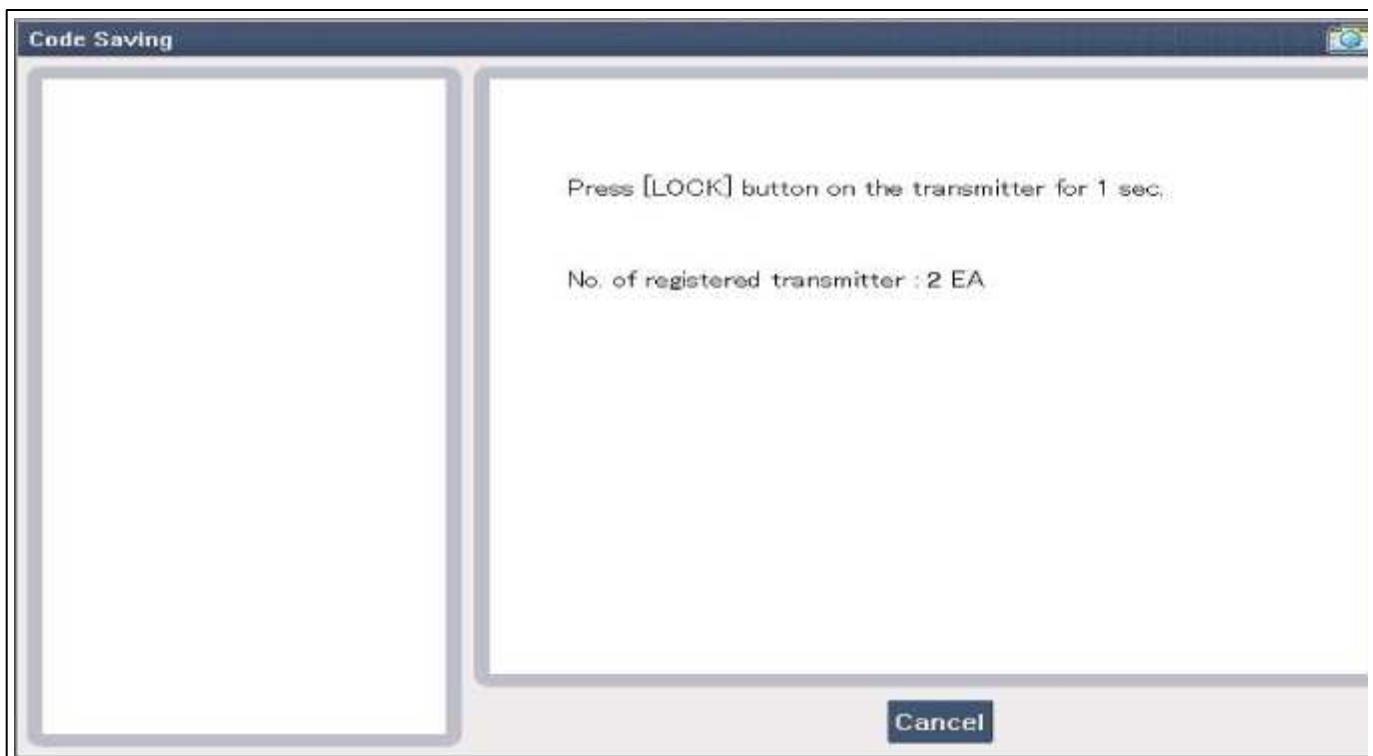
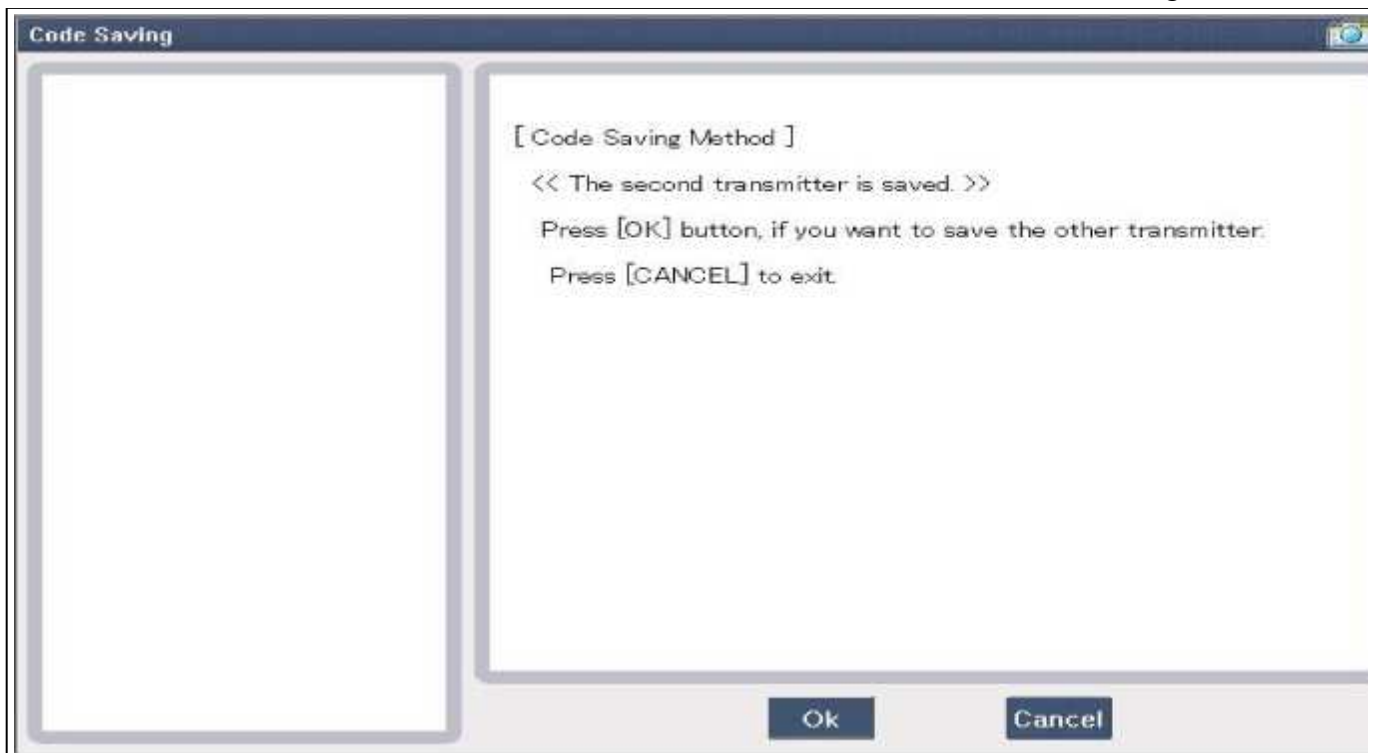
3. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.

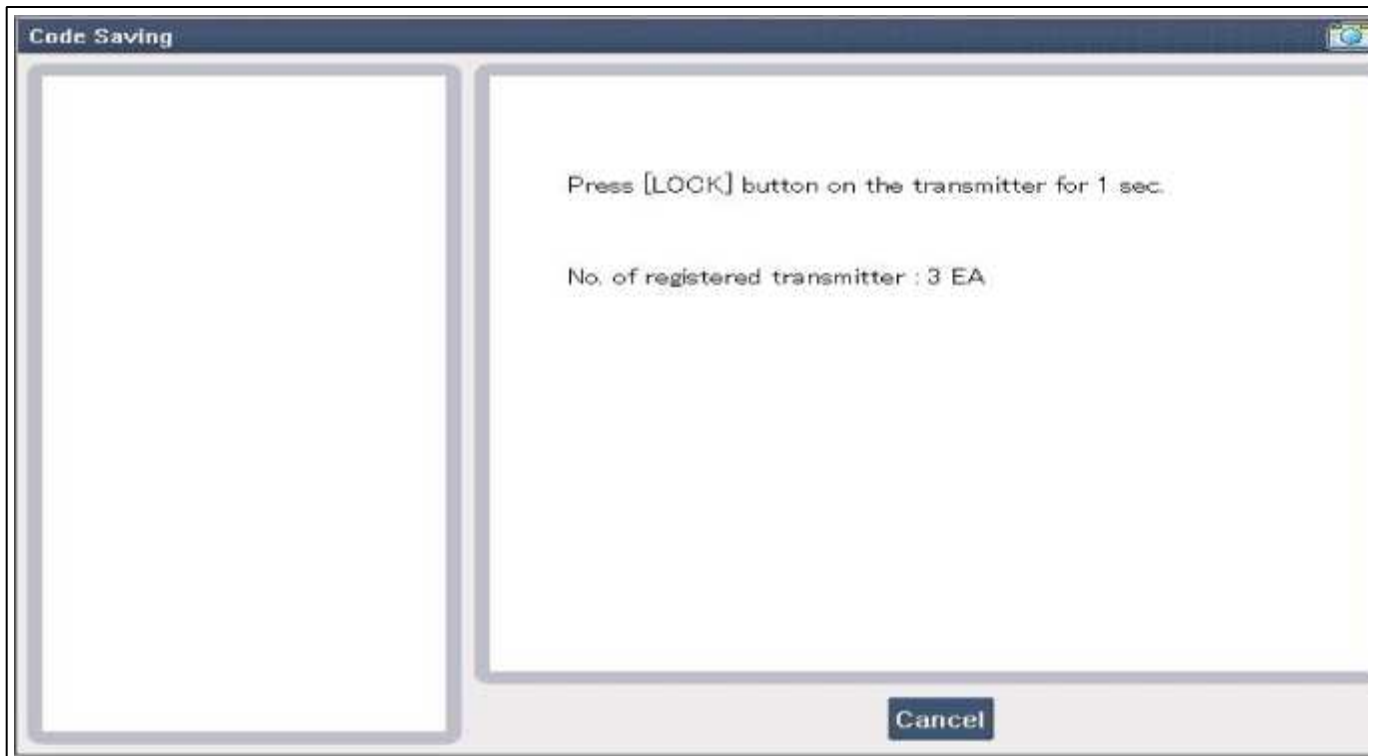
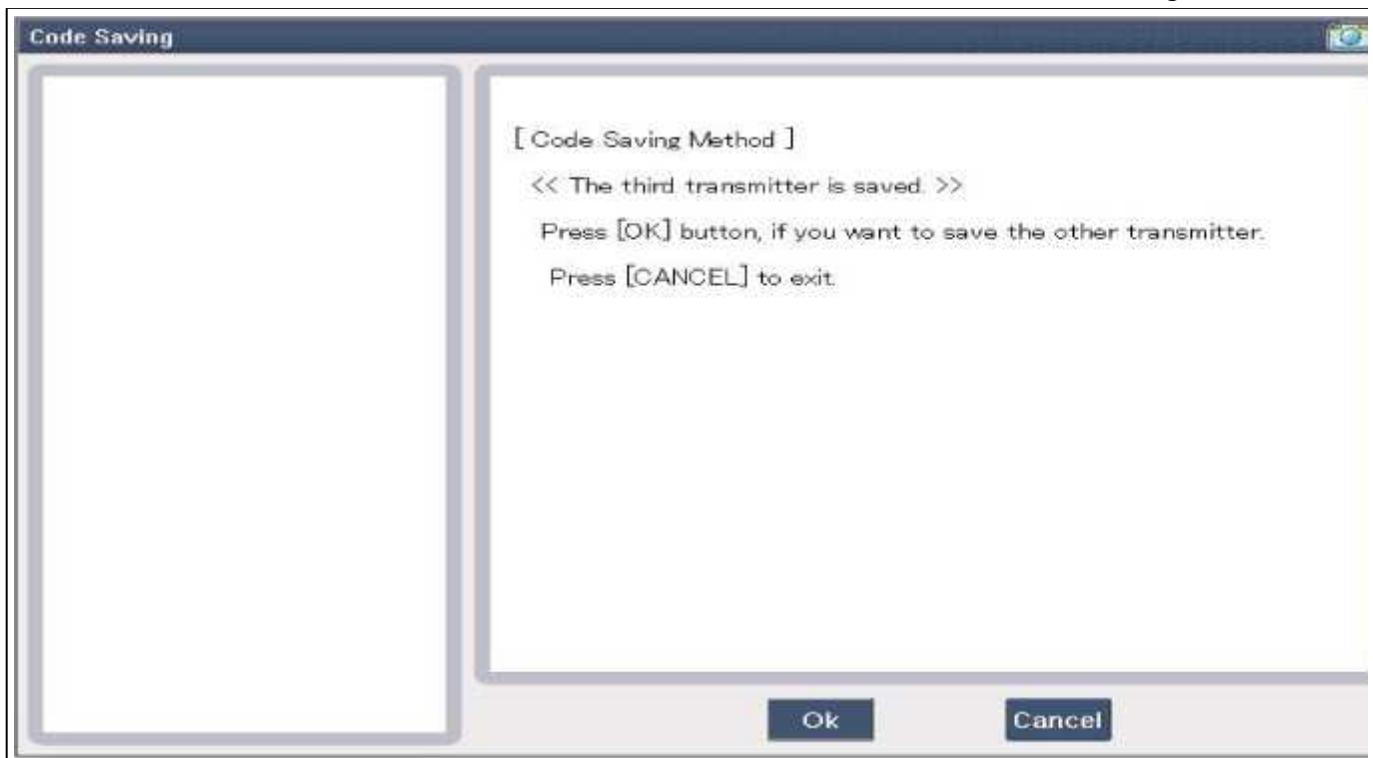


4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow steps 1 to 4 and then code saving is completed.

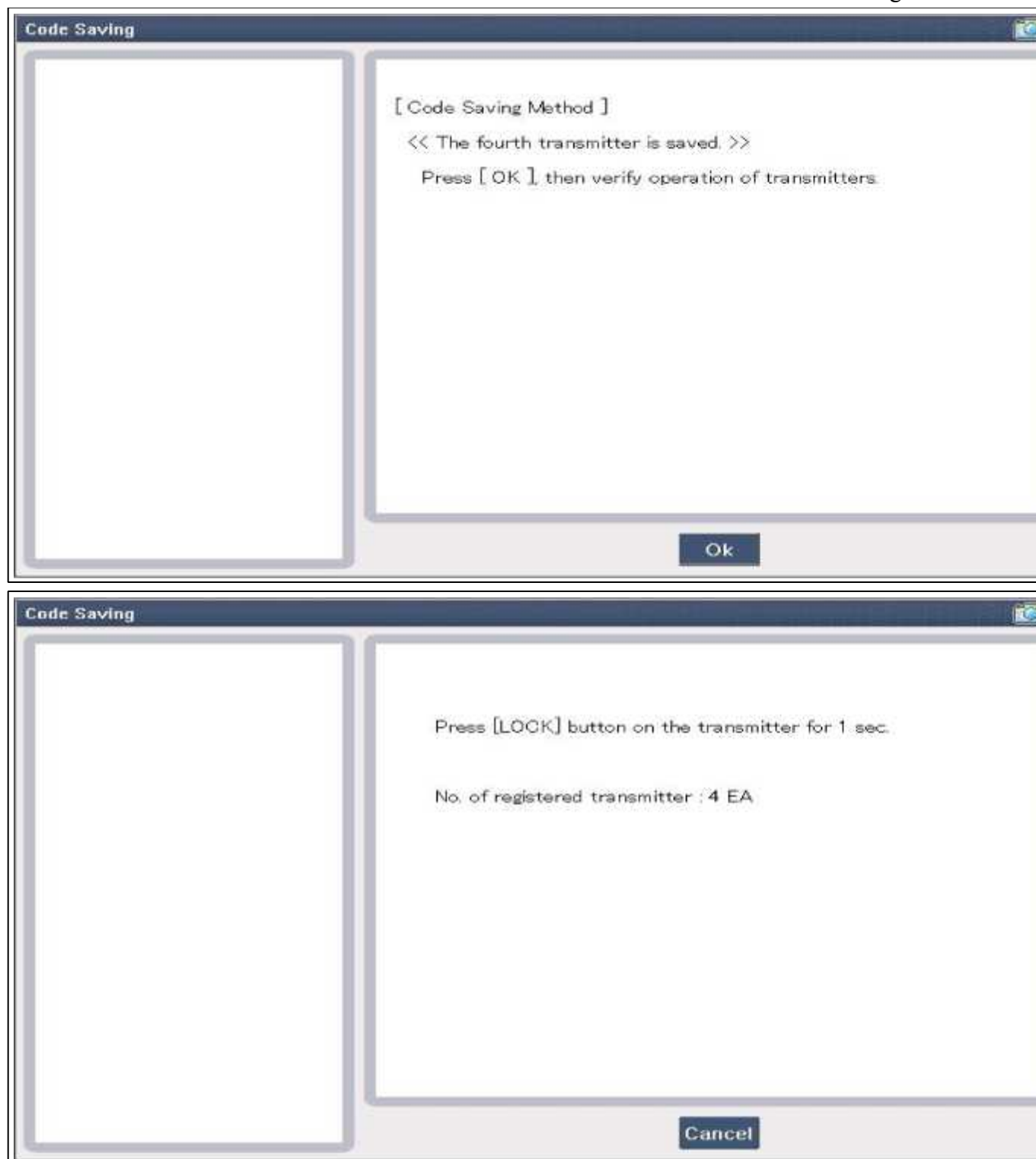












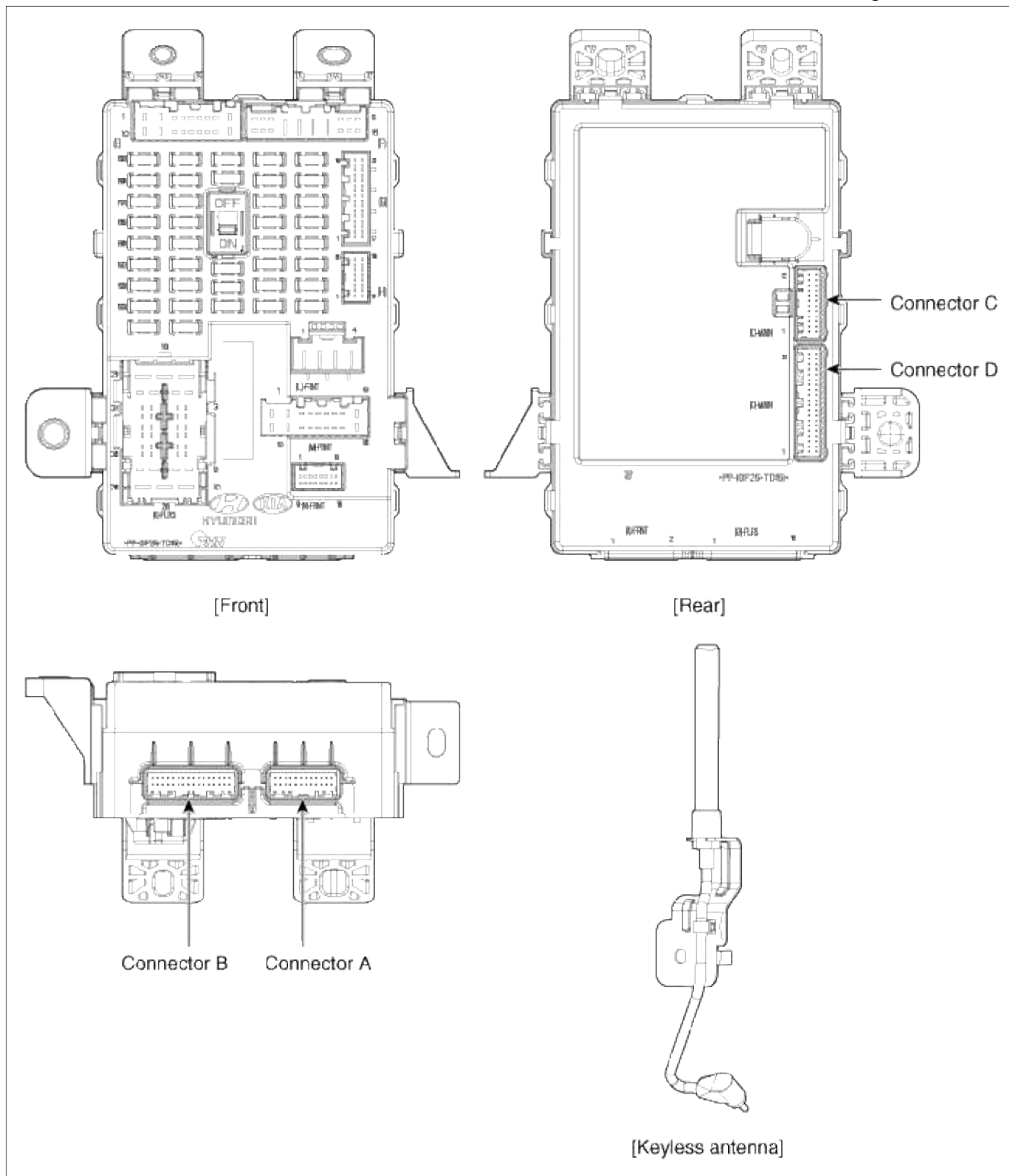
**Body Electrical System > BCM (Body Control Module) > IPM (Intelligent integrated Platform Module) > Specifications**

Specifications


Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F~167°F(-30°C~ 75°C)
Dark current	BCM & Receiver : 5.0mA or less BCM : 4mA or less

**Body Electrical System > BCM (Body Control Module) > IPM (Intelligent integrated Platform Module) > Components and Components Location**

Components



Internal Buzzer : Rear parking assist system buzzer

	Connector A	Connector B	Connector c	Connector D
No.				
1	-	Assit door unlock switch	Power GND 1	Key sol
2	-	Driver door unlock switch	Power GND 2	Autolight switch
3	-	Door key lock switch	Rear wahser switch	Key IN
4	-	Driver key unlock switch	Front wiper mist switch	RPAS on switch
5	-	Tailgate open switch	CAN H	Key interlock switch
6	Front fog relay	Rear right door unlock switch	CAN L	Driver door unlock relay
7	Rear defogger relay	Power window door lock switch	Rear defogger switch	-
8	-	Assit key unlock switch	Turn signal LH switch	-
9	-	Assit seat belt switch	Hazard switch	-
10	Front wiper relay	Driver seat belt switch	Tailgate release switch	-
11	Reserved output 2	Power window door unlock switch	Tail lamp switch	-
12	Hood switch	-	Turn signal RH switch	AV tail lamp
13	ATM sol	-	Vehicle info	-
14	-	-	Front wiper INT switch	-
15	-	MT "R"	Rear Wiper INT switch	Lead lamp low signal
16	-	Reserved Input 1	Rear wiper mist switch	DRL(EC) relay
17	-	Assit door switch	Front wiper INT volume	-
18	-	Driver door switch	Front washer switch	Autolight power
19	-	Rear right door switch	TMU req	Autolight sensor
20	Reserved input 2	Rear left door switch	Burglar horn relay	K Line communication
21	Brake switch	RPAS	Head lamp high switch	Tailgate lamp
22	-	Safety power window enable	Crash unlock	RPAS buzzer
23	-	Reserved output 1	Front fog switch	Room lamp
24	-	Rear fog relay	Head lamp low switch	Rear fog switch
25		Rear wiper relay		CAN DRL option
26		-		-
27		-		Reserved input 3
28		-		-
29		-		RPAS off IND
30		-		-
31		Rear left door unlock switch		Assit seat belt IND
32		Side airbag option		Reserved output 3
33				-
34				-
35				-
36				-
37				-
38				-
39				-
40				Autolight ground

## Signal Characteristics

Symbol	Name
L_	Logic input
A_	Analog input
O_	Logic output
C_	CAN signal
S_	Seiral communication
P_	PW signal and frequency signal
D_	Data signal
V_	Power and ground supply
b_	Internal variable
B_	Body

### BCM (IPM) Inputs Description and Characteristics

Function	Input Name	State	Voltage level	
			Low level	High level
Analog input	V_B+	8V ~ 16V		
	A_AutoLightSnsr	0V ~ 5V		
	A_FrontWiperIntVolume	0V ~ 5V		
	A_IGN 1	OPEN/ON	4V or less	7V or more
	A_IGN2	OPEN/ON	4V or less	7V or more
	A_ACC	OPEN/ON	7.1V or less	7.8V or more
Logic input	L_FrontWiperMistSW	OPEN/ON	2.5V or less	8V or more
	L_FrontWiperIntSW	OPEN/ON	2.5V or less	8V or more
	L_FrontWasherSW	OPEN/ON	2.5V or less	8V or more
	L_RearWiperOnSW	OPEN/ON	2.5V or less	8V or more
	L_RearWiperIntT	OPEN/ON	2.5V or less	8V or more
	L_RearWasherSW	OPEN/ON	2.5V or less	8V or more
	L_BrakeSW	OPEN/ON	2.5V or less	8V or more
	L_KeyIn	OPEN/ON	2.5V or less	6V or more
	L_AutoLightSW	OPEN/ON	2.5V or less	6V or more
	L_DRVDRSW	OPEN/ON	2.5V or less	6V or more
	L_ASTDRSW	OPEN/ON	2.5V or less	6V or more
	L_RLDRSW(Reserved)	OPEN/ON	2.5V or less	6V or more
	L_RRDRSW	OPEN/ON	2.5V or less	6V or more
	L_DRVDRUnlockSW	OPEN/ON	2.5V or less	6V or more

	L_ASTDRUnlockSW	OPEN/ON	2.5V or less	6V or more
	L_RLDRUnlockSW(Reserved)	OPEN/ON	2.5V or less	6V or more
	L_RRDRUnlockSW	OPEN/ON	2.5V or less	6V or more
	L_TailgateOpenSW	OPEN/ON	2.5V or less	6V or more
	L_HoodSW	OPEN/ON	2.5V or less	6V or more
	L_DoorKeyLockSW	OPEN/ON	2.5V or less	6V or more
	L_DRVKeyUnlockSW	OPEN/ON	2.5V or less	6V or more
	L_ASTKeyUnlockSW	OPEN/ON	2.5V or less	6V or more
	L_TailgateReleaseSW	OPEN/ON	2.5V or less	6V or more
	L_PwdwDoorLockSW	OPEN/ON	2.5V or less	6V or more
	L_PwdwDoorUnlockSW	OPEN/ON	2.5V or less	6V or more
	L_RRDefogger SW	OPEN/ON	2.5V or less	6V or more
	L_RPASOffSW	OPEN/ON	2.5V or less	6V or more
Logic input	L_KeyInterlockSW	OPEN/ON	2.5V or less	6V or more
	L_DRVSeatBeltSW	OPEN/ON	2.5V or less	6V or more
	L_ASTSeatBeltSW	OPEN/ON	2.5V or less	6V or more
	L_HazardSW	OPEN/ON	2.5V or less	6V or more
	L_TsigLHSW	OPEN/ON	2.5V or less	6V or more
	L_TsigRHSW	OPEN/ON	2.5V or less	6V or more
	L_TailSW	OPEN/ON	2.5V or less	6V or more
	L_HeadLampLowSW	OPEN/ON	2.5V or less	6V or more
	L_HeadLampHighSW	OPEN/ON	2.5V or less	6V or more
	L_FronFSogSW	OPEN/ON	2.5V or less	6V or more
	L_RearFogSW	OPEN/ON	2.5V or less	6V or more
	L_CANDRLOptSW	OPEN/ON	2.5V or less	6V or more
	L_SAB OPT	OPEN/ON	2.5V or less	6V or more
	L_MTSRx	OPEN/ON	2.5V or less	6V or more
	L_MT "R"	OPEN/ON	2.5V or less	8V or more
	L_ModeSW	OPEN/ON	2.5V or less	6V or more
	L_ReservedInput1	OPEN/ON	2.5V or less	6V or more
	L_ReservedInput2	OPEN/ON	2.5V or less	6V or more
	L_ReservedInput3	OPEN/ON	2.5V or less	6V or more
Frequency	P_CrashUnlock		PWM(Low)	VBD
Communication	LIN_RPAS		LIN	IGN
	K_LINE		DIAG	B+
	CAN_H		Low CAN	B+

	CAN_L		Low CAN	B+
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**BCM (IPM) Outputs Description and Characteristics**

Pin description	State	capacity	Power source
O_FrontWiperRLY	FRONT WIPER RELAY output	DC 12V 200mA(inductive load)	IGN2
O_RearWiperRLY	REAR WIPER RELAY output	DC 12V 200mA(inductive load)	IGN2
O_PwdwRLY	POWER WINDOW RELAY output	DC 12V 200mA(inductive load)	B+
O_SafetyPdwEnable	SAFETY POWER WINDOW ENABLE output	-	B+
O_CtrDRLockRLY	C/DOOR LOCK RELAY output	DC 12V 200mA(inductive load)	B+
O_CtrDRUnlockRLY	C/DOOR UNLOCK RELAY output	DC 12V 200mA(inductive load)	B+
O_DRVDRUnlockRLY	DRIVER DOOR UNLOCK RELAY output	DC 12V 200mA(inductive load)	B+
O_TailgateReleaseRLY	TRUNK RELEASE RELAY output	DC 12V 200mA(inductive load)	B+
O_StartInhibitionRLY	O_START INHIBIT RELAY output	DC 12V 200mA(inductive load)	ST
O_BurglarHornRLY	BURGLAR ALARM HORN RELAY output	DC 12V 200mA(inductive load)	B+
O_MTSTx (DoorUnlockSignal)	MTSTx output	-	B+
O_ASTSeatBeltIND	ASSIST SEAT BELT INDICATOR output	-	IGN1
O_RPASOffIND	RPAS operating INDICATOR output	-	IGN1
O_RPASBuzzer	EXTERNAL BUZZER output		IGN1
O_TurnSigFL	LH Front Turn Signal Lampoutput	DC 12V 27W LAMP	B+
O_TurnSigRL	LH Rear Turn Signal Lampoutput	DC 12V 27W LAMP	B+
O_TurnSigFR	RH Front Turn Signal Lampoutput	DC 12V 27W LAMP	B+
O_TurnSigRR	RH Rear Turn Signal Lampoutput	DC 12V 27W LAMP	B+
O_AVTail	AV TAIL output signal		B+
O_RearFogRLY	REAR FOG LAMP RELAY output	DC 12V 200mA(inductive load)	B+
O_TailLampRLY	TAIL LAMP LAMP RELAY output	DC 12V 200mA(inductive load)	B+

O_FronFSogRLY	FRONT FOG LAMP RELAY output	DC 12V 200mA(inductive load)	B+
O_HeadLampLowLH	HEAD LAMP LOW LH output	DC 12V 55W LAMP	B+
O_HeadLampLowRH	HEAD LAMP LOW RH output	DC 12V 55W LAMP	B+
O_HeadLampHighLH	HEAD LAMP HIGH LH output	DC 12V 55W LAMP	B+
O_HeadLampHighRH	HEAD LAMP HIGH RH output	DC 12V 55W LAMP	B+
O_HeadLampLowSignal	HEAD LAMP LOW Signal output to MF SW		
O_DRL(EC)RLY	DRL RLY(Europe) output	DC 12V 200mA(inductive load)	B+
O_RoomLamp	ROOM LAMP output	DC 12V 30W LAMP(10W*3)	B+
O_RRDefoggerRLY	REAR DEFOGGER RELAY output	DC 12V 200mA(inductive load)	B+
O_KeySol	KEY INTERLOCK SOLENOID output	DC 12V 1A (inductive load)	B+
O_ATMSol	ATM SHIFT SOLENOID output	DC 12V 200mA (inductive load)	B+
O_SoundRelayCtrl	Sound Relay control	DC 12V 200mA(inductive load)	B+
O_ReservedOutput1	Reserved output		
O_ReservedOutput2	Reserved output		
O_ReservedOutput3	Reserved output		
O_IOD_RLY	DART CURRNET AUTO SHUT OFF IPS ON/OFF control	DC 12V 200mA(inductive load)	B+

### BCM (IPM) Input Signal Specification

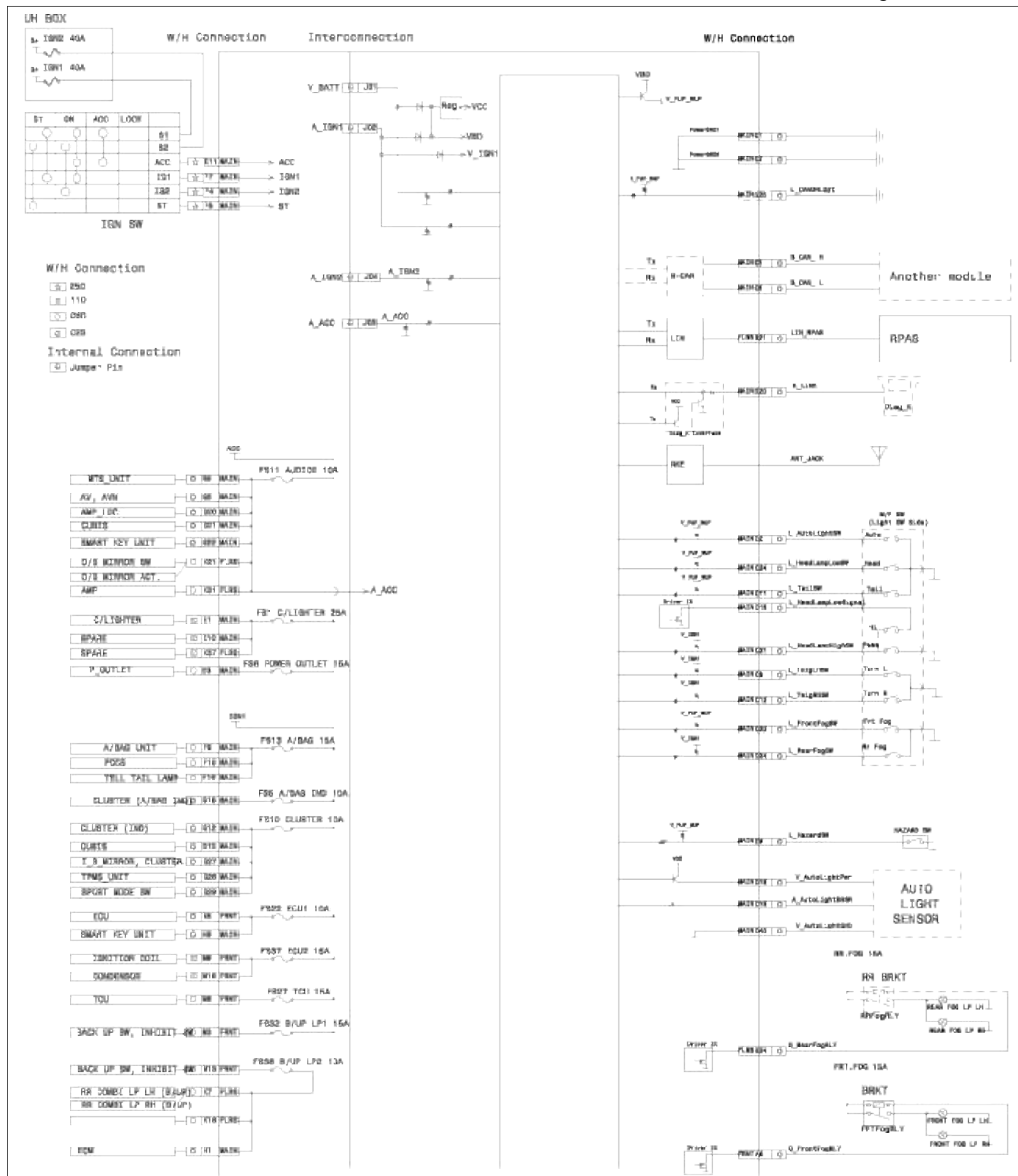
No	Signal Name	Description	ON/OFF LEVEL(V)	Remark
A01	L_B+	ON = BAT	9V~16V	
A02	L_IGN1	ON = BAT (IGN KEY=ON or Start Position)	7V or more/4V or less	
A03	L_IGN2	ON = BAT (IGN KEY=ON	7V or more/4V or less	
A04	L_Brake SW	ON = GND	7V or more/4V or less	
A05	L_MIST SW	ON = BAT	7V or more/4V or less	
A06	L_CRASH UNLOCK INPUT(PWM)	-	-	PWM

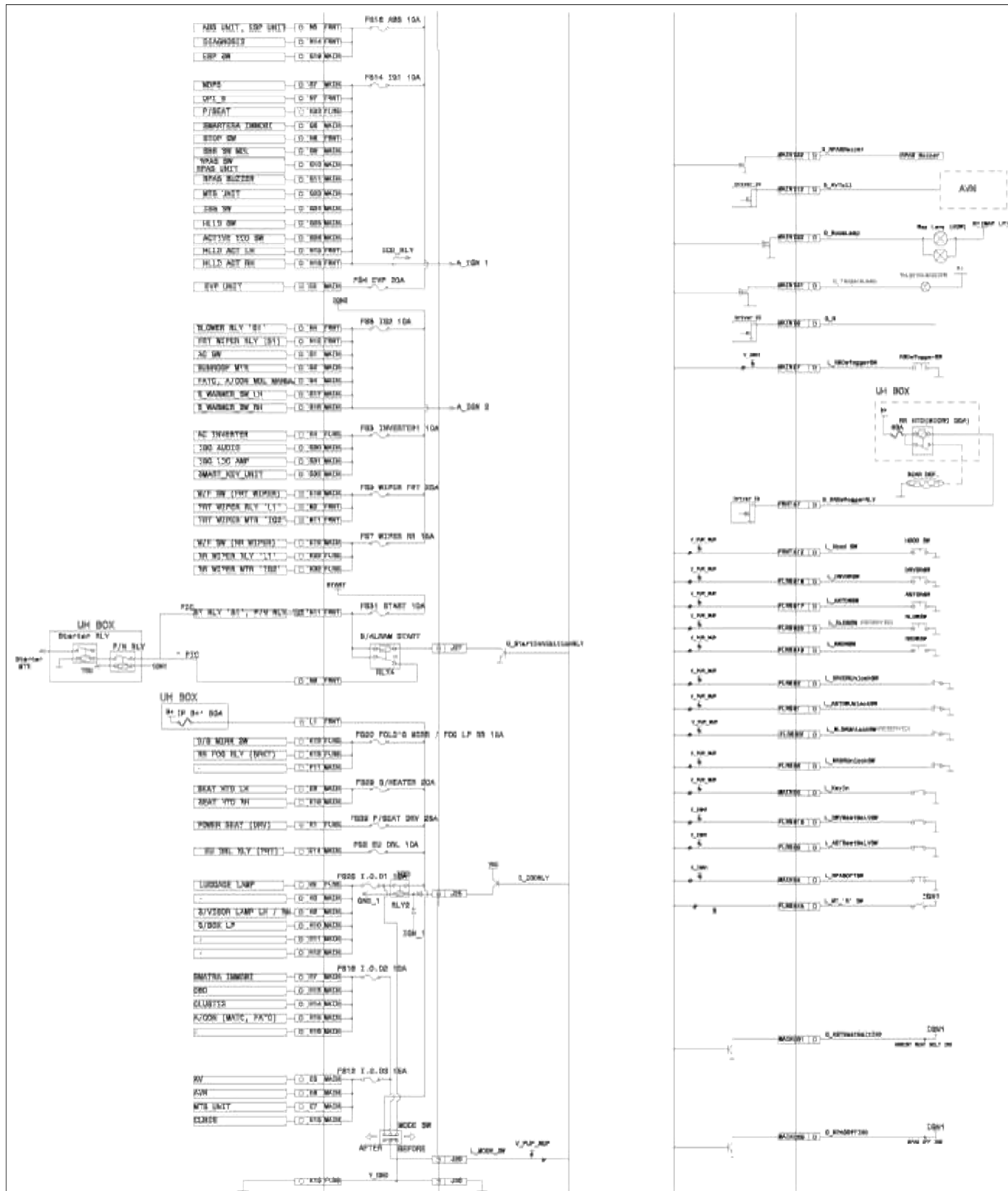


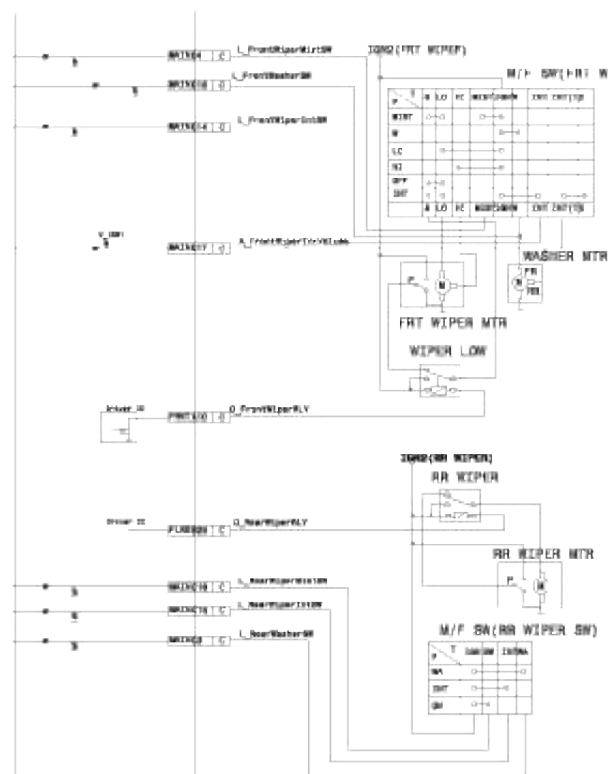
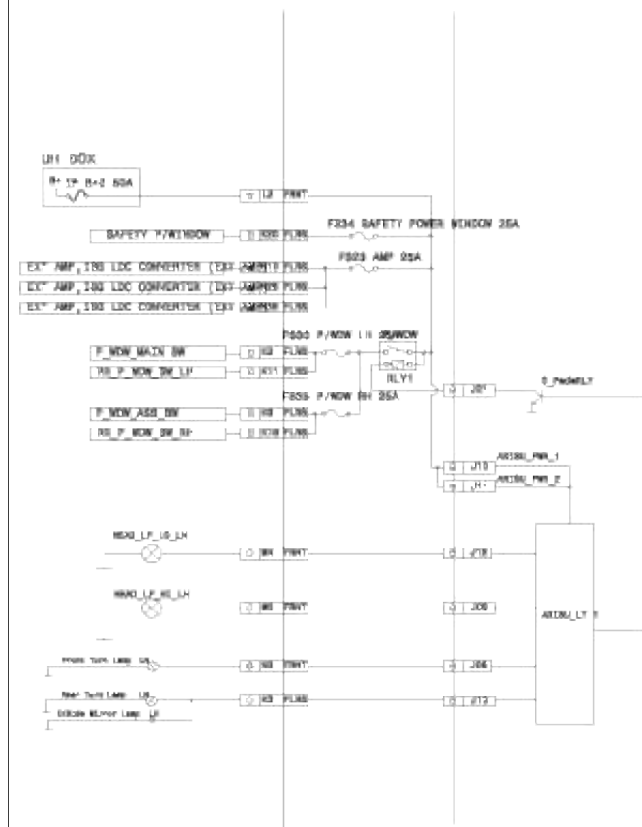
A07	L_HeadLamp LOW SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	
A08	L_HeadLamp HIGH SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	
A13	L_ACC	ON = BAT	7V or more/4V or less	
A16	L_INH'R' SW	ON = BAT	7V or more/4V or less	
A17	L_WASHER SW	ON = BAT	7V or more/4V or less	
A18	L_WIPER INT SW	ON = BAT	7V or more/4V or less	
A20	A_Wiper Int Volume	-	-	A/D
A21	L_KEY IN SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	
A22	L_TAIL LAMP SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	
A23	L_KEY INTER LOCK SW	ON = OPEN	2V or less/OPEN (Reference value:4V or more)	
B01	LIN (RPAS)	-	-	Communication
B03	L_FRONT FOG Lamp SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	
B04	L_SIDE AIR OPT	ON = GND	2V or less/OPEN (Reference value:4V or more)	
B08	CAN(HIGH)	-		Communication
B09	CAN(LOW)	-		Communication
B11	A_AUTO LIGHT SIGNAL	-	-	A/D
B13	L_AUTO LIGHT SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	
B14	DIAGNOSIS (K-Line)	-	-	Communication
B15	L_DEFOGGER SW	ON = GND	2V or less/OPEN (Reference value:4V or more)	

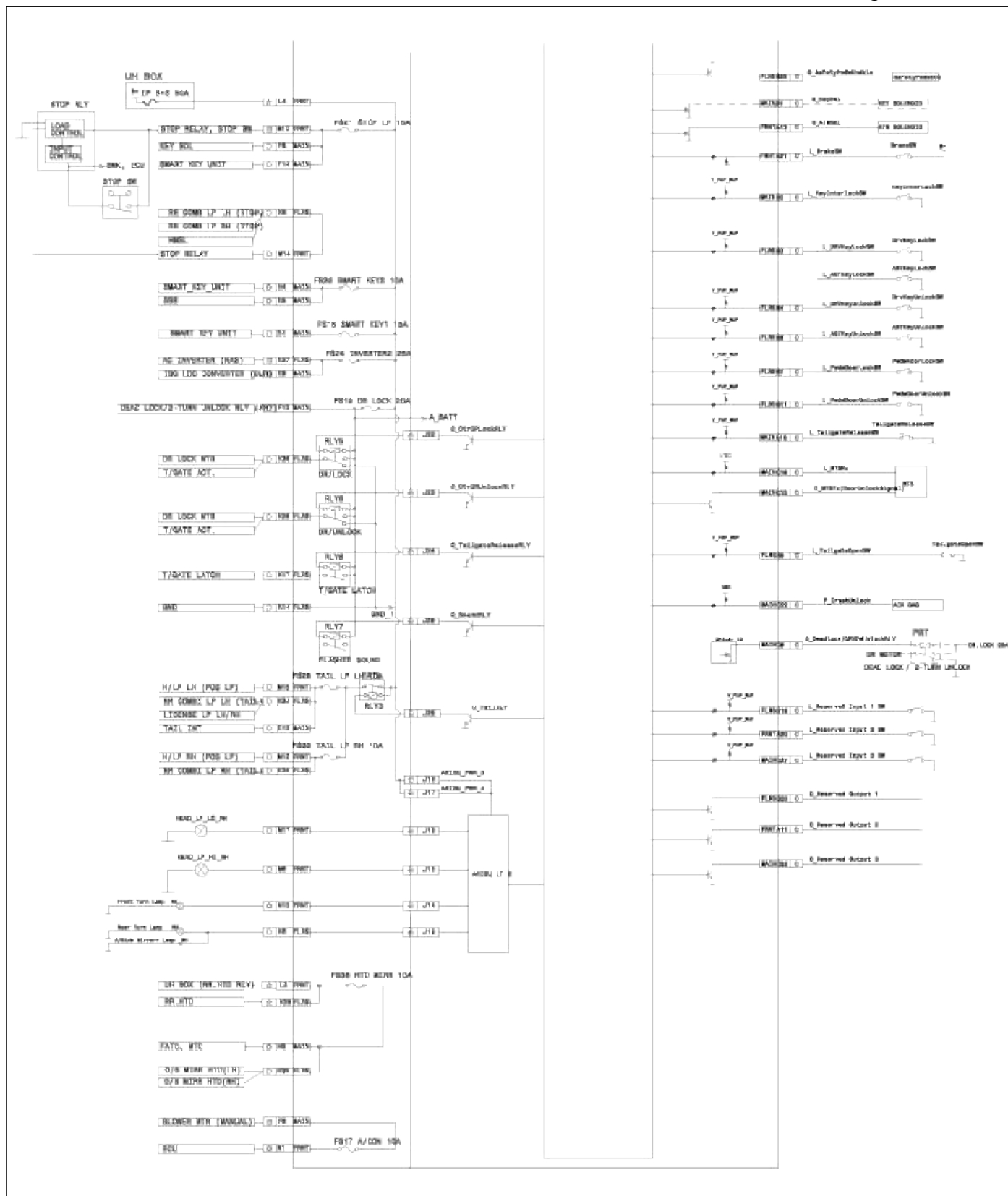
**Body Electrical System > BCM (Body Control Module) > IPM (Intelligent integrated Platform Module) > Schematic Diagrams**

Circuit Diagram









## Body Electrical System > BCM (Body Control Module) > IPM (Intelligent integrated Platform Module) > Description and Operation

### Description

#### IPM Overview

The Body Control Module (IPM-Intelligent integrated Platform Module) supplies vehicle occupants with visual and audible information and it controls various vehicle functions.

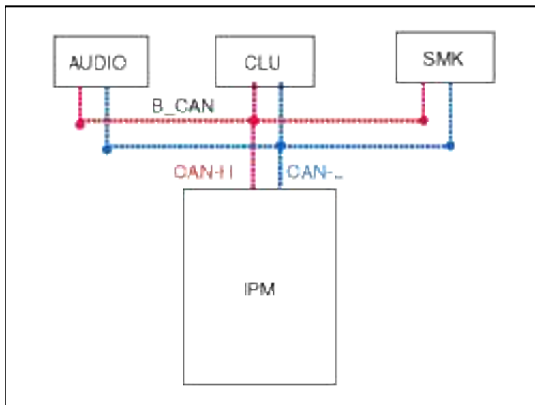
To provide and receive information, the module is interfaced to the vehicle's CAN bus communications network.

toms048@gmail.com

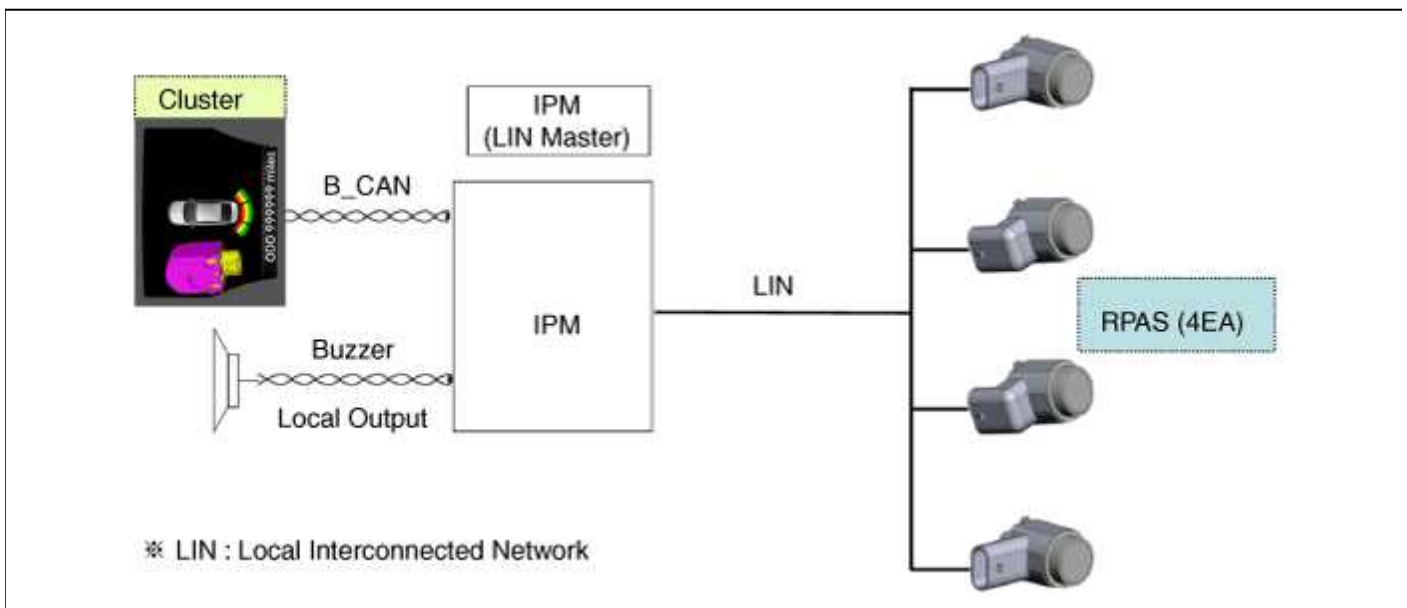
The IPM provides the following features :

- Wiper & Washer control
- Lamp control
- Buzzer control
- Timer control
- Door lock/ unlock control
- Tailgate release control
- Turn hazard control
- RKE control
- Panic alarm flashing control

#### CAN Communication Network



#### LIN Communication Network



#### Functions

1. Wiper control
  - A. Front Wiper Mist Control Function
  - B. Front Wiper Intermittent Control Function
  - C. Front Wiper Washer Control Function
  - D. Front Wiper Washer Control Function
  - E. Rear Wiper On Switch Control
  - F. Rear Washer Wiper Control
  - G. Rear Wiper Intermittent Control
2. Lamp control
  - A. Tail Lamp by Switch Control Function
  - B. Tail Lamp by Auto Light Control Function
  - C. Tail Lamp by Escort Control Function
  - D. Tail Lamp by Welcome Control Function
  - E. Tail Lamp Autocut Control Function
  - F. Output control of Tail Lamp
  - G. Head Lamp Low by Switch Control Function
  - H. Head Lamp Low by Escort Control Function
  - I. Head Lamp Low by Welcome Control Function
  - J. Head Lamp Low by Auto Light Control Function
  - K. Head Lamp High by Switch Control Function
  - L. Head Lamp High and Low by Passing Switch Control Function
  - M. Output Control of Head Lamp Low
  - N. Output Control of Head Lamp High
  - O. Output Control of Head Lamp High Indicator
  - P. EC DRL Lamp Function
  - Q. Tail Lamp Control by Auto light Mode Control Function
  - R. Head Lamp Low Control by Auto light Mode Control Function
  - S. AV Tail Control by Auto Light sensor level Control Function
  - T. Front Fog Lamp by Switch Control Function
  - U. Rear Fog Lamp by Switch Control Function
  - V. Room Lamp On / Off / Decaying Control Function
  - W. Tail Gate Lamp On / Off Control Function
3. Buzzer control
  - A. Internal Buzzer Control Function
  - B. SBW/ SBR Function
  - C. Key Reminder warning(Key Operated Warning) Control Function
  - D. RKE Teaching Sound Function
  - E. SMK System warning Control Function
4. Timer control
  - A. Rear Defogger Control Function
  - B. Power Window Main Timer Control Function

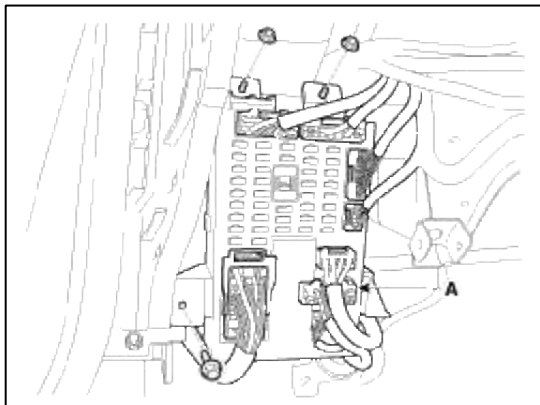
5. Door lock/ unlock control
  - A. Central Door Lock/Unlock Switch Control Function
  - B. Control Door Lock/Unlock Mechanical Key(Door Key) Control Function
  - C. Doors Lock/Unlock by RKE
  - D. Doors Lock/Unlock by SMK
  - E. Doors Relock by ATWS Function
  - F. Doors Lock/Unlock by Auto Door
  - G. Doors Unlock by Crash
  - H. Doors Unlock by Key Reminder
  - I. Dead lock/unlock Function
  - J. Doors Unlock by MTS
  - K. RKE Door Lock/Unlocking Function
  - L. Burglar Alarm Relock Door Lock Control Function
  - M. SMK Door Lock/Unlocking Function
  - N. Central Door Lock/Unlock Button Control Function
  - O. Crash Unlock Control Function
  - P. Door Lock by Shift-Lever
  - Q. Door Lock by Vehicle Speed
  - R. Door Unlock by Shift-Lever
  - S. Door Unlock by Key Off
  - T. Key Reminder Unlock Function
  - U. Dead Lock/Unlock Function
  - V. Central Unlocking by EC Unlock Control Function
  - W. Priority of Door Lock System
  - X. Shift Lever MT Option Function
6. Tailgate release control
7. Turn hazard control
  - A. Hazard Control Function
  - B. Turn Signal Control Function
  - C. Flasher Failure Control Function
  - D. Burglar Alarm Function
  - E. Panic Flashing Control Function
  - F. Tailgate Flashing Control Function
  - G. RKE Two Turn Unlock Set/Reset Flashing Control Function
  - H. Emergency Stop Release Flasher Function
  - I. Flasher Function Priority Control Function
8. RKE control
  - A. RF Communication Function
  - B. RKE (Transmitter) Function
  - C. Two Turn Unlock RKE Set/Reset
  - D. Receiver & IPM Control Function
  - E. IPM RF Control Function
  - F. RKE Teaching
  - G. RKE Resynchronization
9. Panic alarm flashing control
10. Uesr option
  - A. Auto Door Lock/Unlock, Two turn unlock, Horn answer back, Head lamp escort, Auto triple turn



## Body Electrical System > BCM (Body Control Module) > IPM (Intelligent integrated Platform Module) > Repair procedures

### Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel. (Refer to the BD group - "Crash pad")
3. Disconnect the IPM connectors, loosening the nut (2EA) and the bolt (1EA), then remove the IPM.



4. The installation is the reverse order of removal.

### IPM Diagnosis with GDS

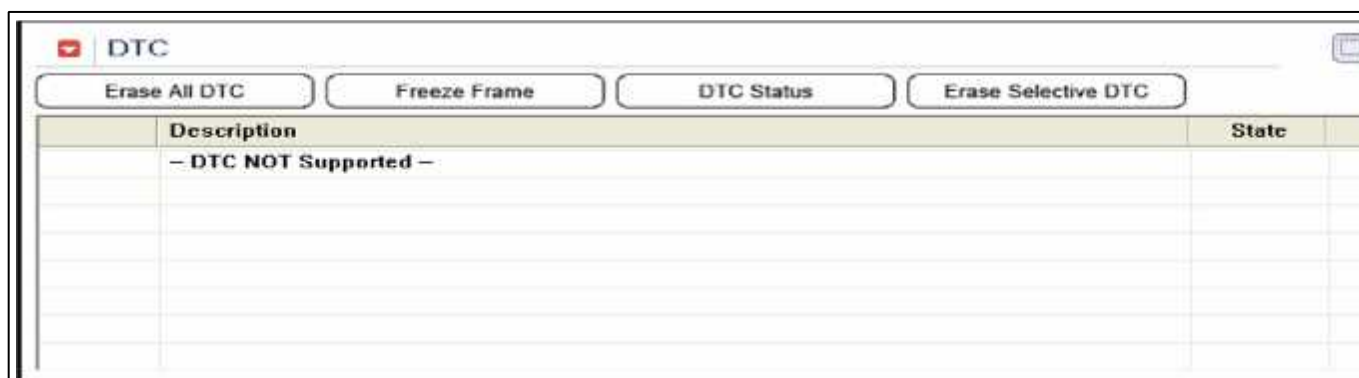
1. It will be able to diagnose defects of IPM with GDS quickly. GDS can operate actuator manually, input/output value monitoring and self diagnosis.
2. Select model and "IPM".
3. Select the module to check.
4. Select "Input/output monitoring", if you will check current data of body network system. It provides input/output status of each module.

Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop		
Sensor Name	Value	Unit
<input type="checkbox"/> Parking brake switch	PARK	-
<input type="checkbox"/> DRL option Line	NONE	-
<input type="checkbox"/> HID option line	NONE	-
<input type="checkbox"/> Rain sensor option line	RAIN	-
<input type="checkbox"/> NAS Option Line	OFF	-
<input type="checkbox"/> Tail Lamp LH Output	OFF	-
<input type="checkbox"/> Tail Lamp RH Output	OFF	-
<input type="checkbox"/> Tail lamp interior output	OFF	-
<input type="checkbox"/> Head lamp low LH output	OFF	-
<input type="checkbox"/> Head lamp low RH output	OFF	-
<input type="checkbox"/> Head Lamp High LH Output	OFF	-
<input type="checkbox"/> Head Lamp High RH Output	OFF	-
<input type="checkbox"/> Front Fog Output	OFF	-
<input type="checkbox"/> Rear fog relay	OFF	-
<input type="checkbox"/> Defogger / Deicer Relay	OFF	-
<input type="checkbox"/> Burglar horn relay	OFF	-
<input type="checkbox"/> Horn relay	OFF	-
<input type="checkbox"/> Trunk release relay	OFF	-
<input type="checkbox"/> Int Volume	2.25	V
<input type="checkbox"/> Auto light sensor	1.88	V
<input type="checkbox"/> Interior Mood lamp output	OFF	-

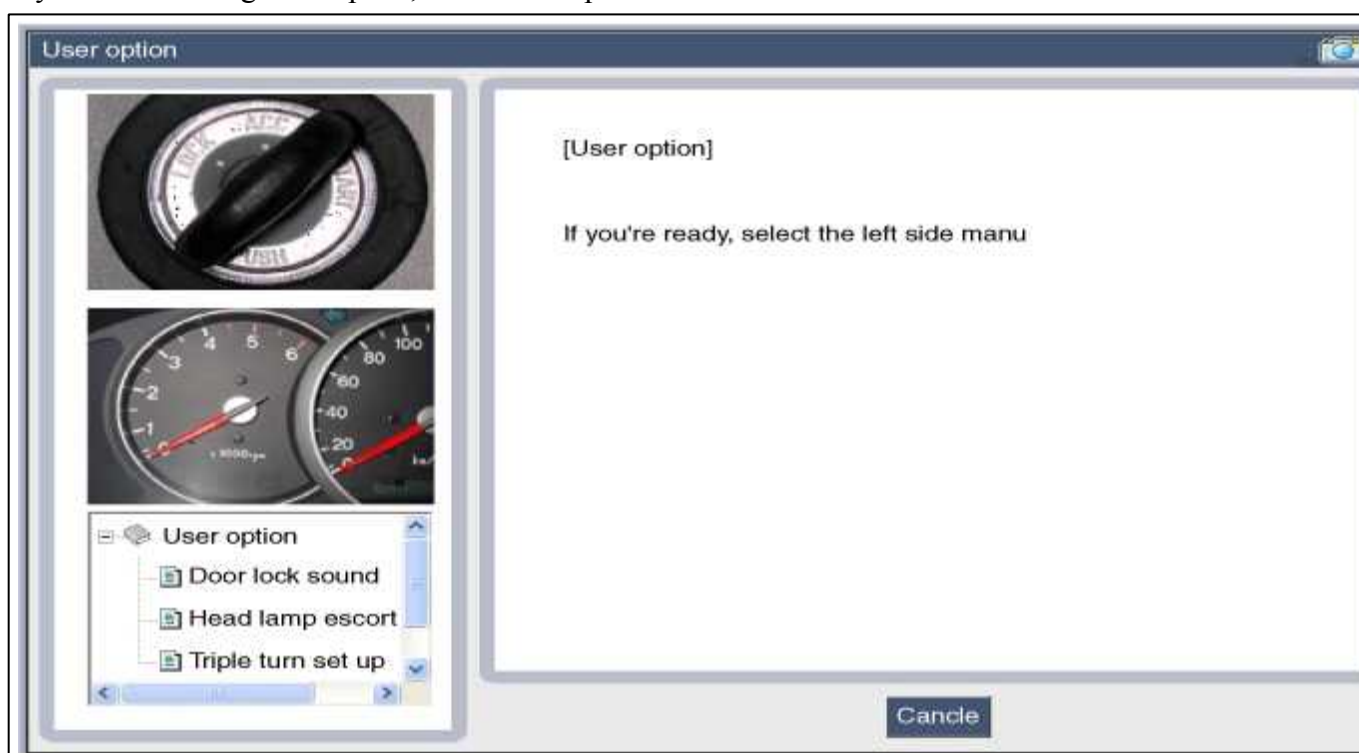
5. If you will check each module data operation manually, select "Actuation test".

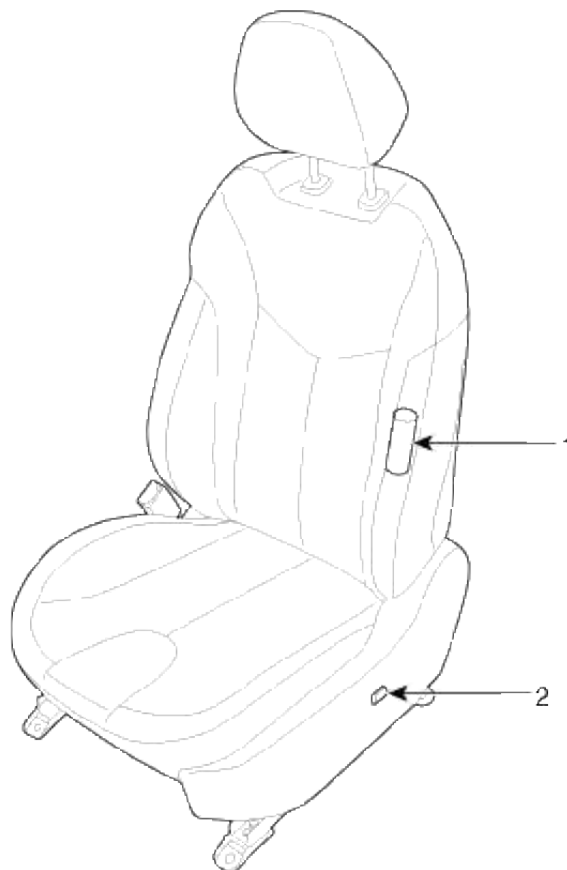


6. To check the DTC of the each module, select "DIAGNOSTIC TROUBLE CODES".



7. If you want to change user option, select "user option".

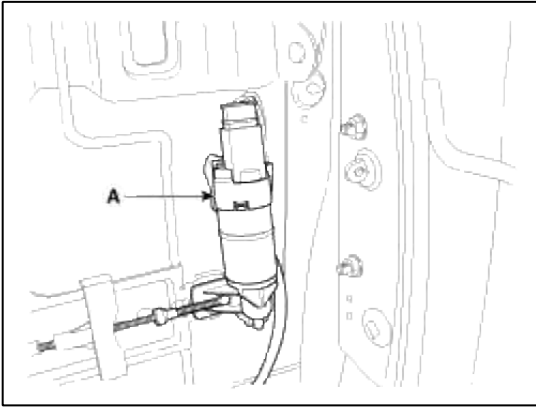


**Body Electrical System > Seat Electrical > Components and Components Location****Components**

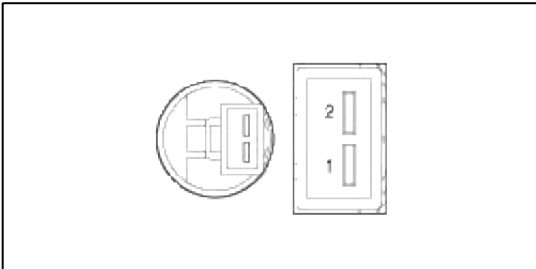
1. Lumbar support motor

2. Lumbar support  
switch**Body Electrical System > Seat Electrical > Power Seat Motor > Repair procedures****Inspection****Power seat motor**

1. Remove the seat and Lumbar support motor (A) connectors.



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

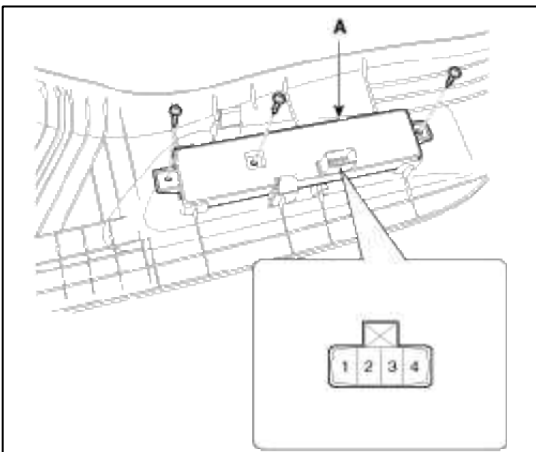


Position	Terminal	+	-
Lumbar support	Front	1	2
	Rear	2	1












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

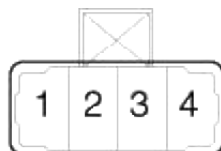
#### Inspection

1. With the lumbar support switch (A) in each position, make sure that continuity exists between the terminals below. continuity is not as specified, replace the lumbar support switch.



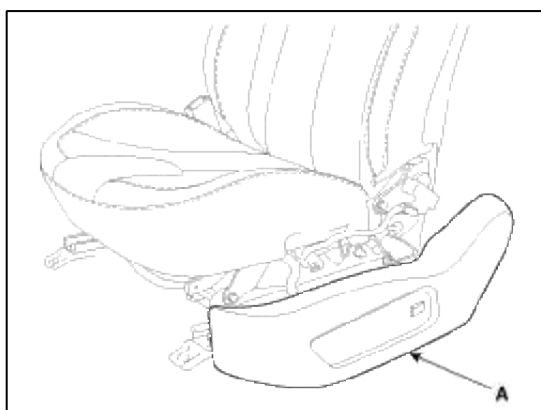
## Driver Lumber Switch

	Lumber switch			Remark
	Rear	Neutral	Front	
1				
2				
3				
4				

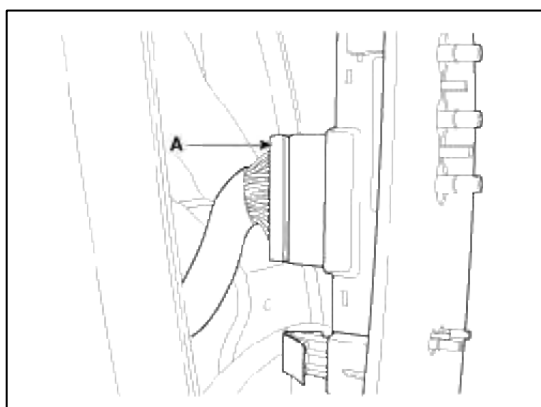


## Removal

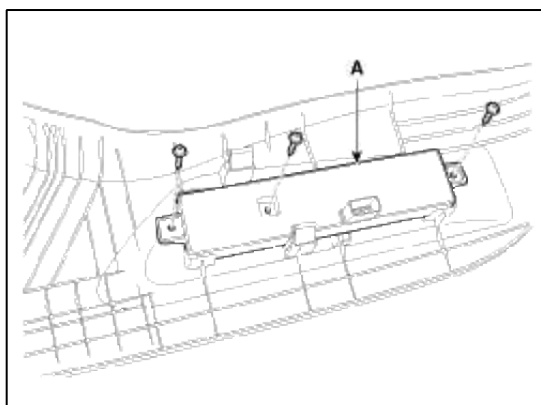
1. Disconnect the negative (-) battery terminal.
  2. Remove the seat side cover (A).
- (Refer to the BD group - "Front seat")



3. Remove the power seat control switch connector.



4. Remove the power seat control switch(A) after loosening the mounting screw.



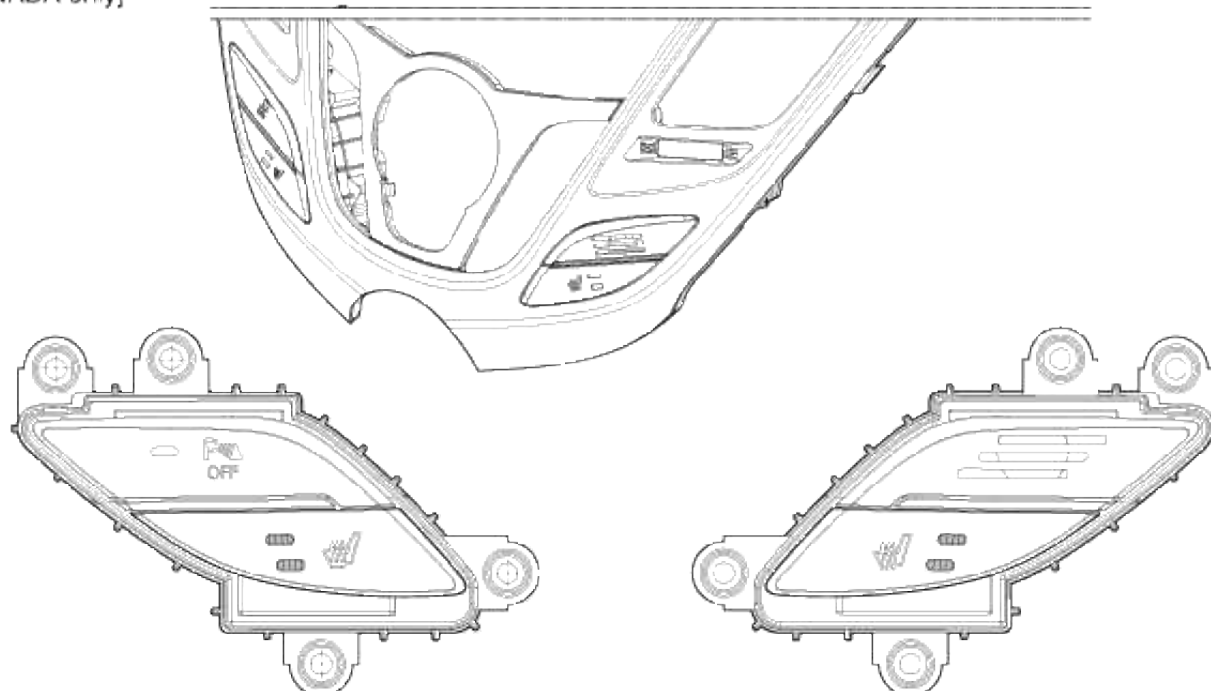
## Installation

1. Connect the connector and install the power seat control switch.
2. Install the seat cover.

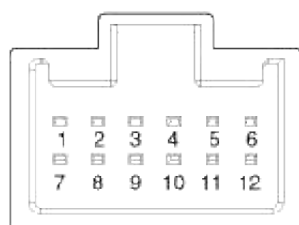
### Body Electrical System > Seat Electrical > Seat Heater Switch > Schematic Diagrams

#### Circuit Diagram

[CANADA only]

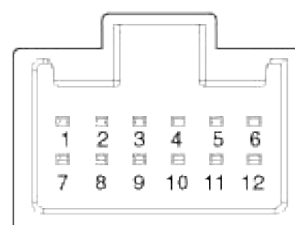


[Driver seat heater]



Pin No.	Description
1	IGN
2	Heater mode
3	High heater indicator
4	Low heater indicator
5	ILL +
6	ILL -
7	-
8	-
9	-
10	-
11	-
12	-

[Assist seat heater]

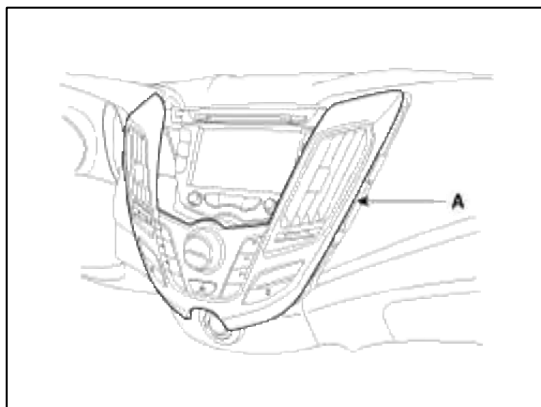


Pin No.	Description
1	IGN
2	Heater mode
3	High heater indicator
4	Low heater indicator
5	ILL +
6	ILL -
7	-
8	-
9	-
10	-
11	-
12	-

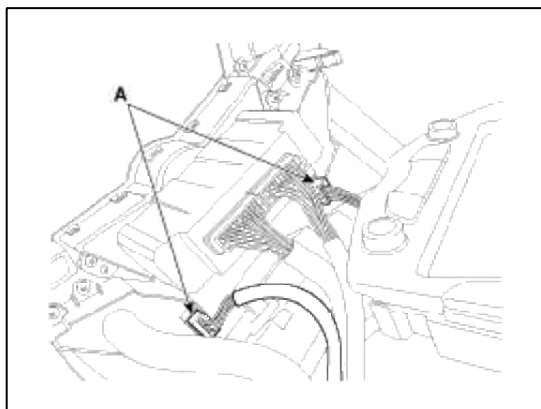
## Body Electrical System > Seat Electrical > Seat Heater Switch > Repair procedures

### Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center fascia panel (A).



3. Remove the driver and the assist seat heater switch connector, after loosening 4 screws.



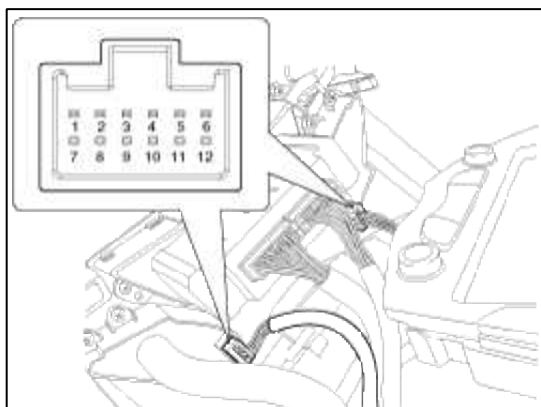
### Installation

1. Install the driver and the assist seat heater switch connector.
2. Install the crash pad center fascia panel.
3. Connect the battery (-) terminal.

### Inspection

#### Rear seat heater switch

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center fascia panel.
3. Disconnect the driver and the assist seat heater switch connector.



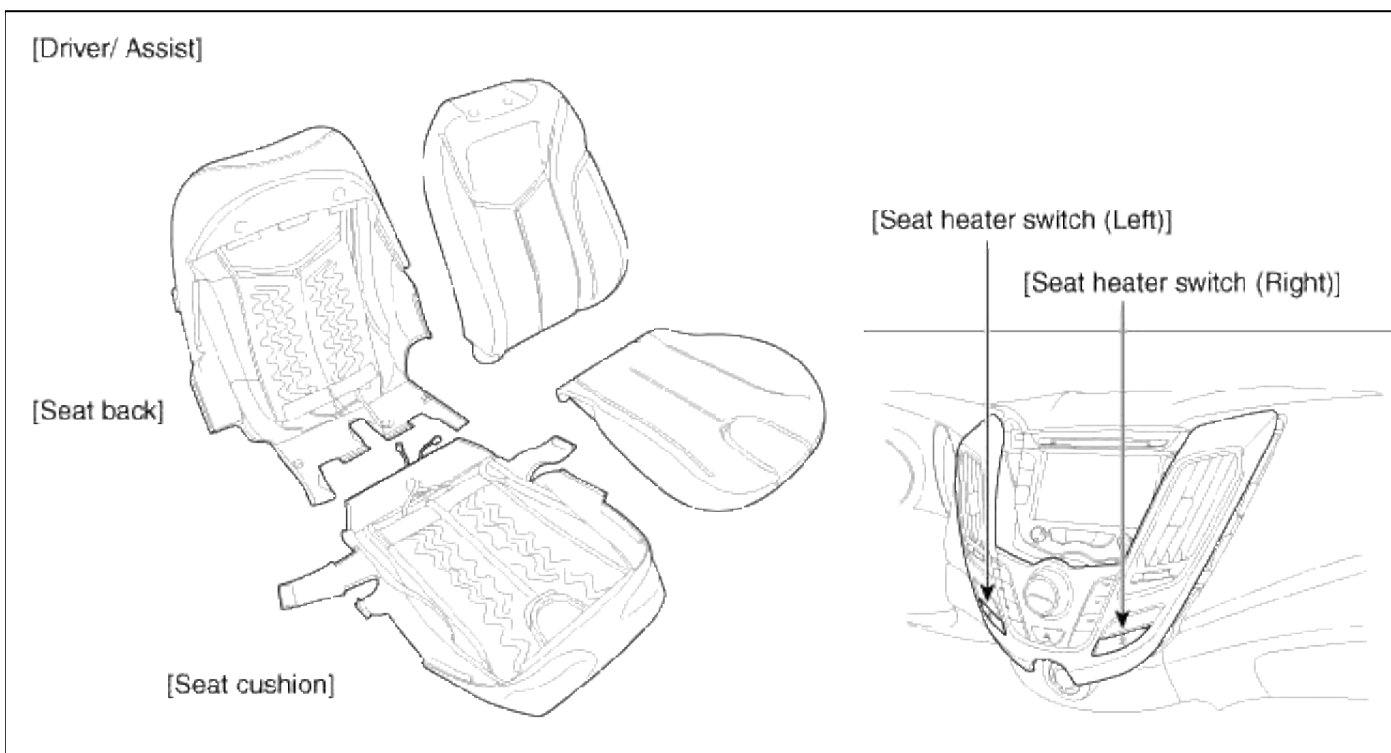
4. Turn rear seat heater switch ON and check that continuity exists between the terminals.

Terminal \ Position	Driver	Remarks
1		ING
2		Heater mode
3		Heater (High)
4		Heater (Low)
5		ILL (-)
6		ILL (+)

5. If there is no continuity, replace the seat heater switch.

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

### Component Location

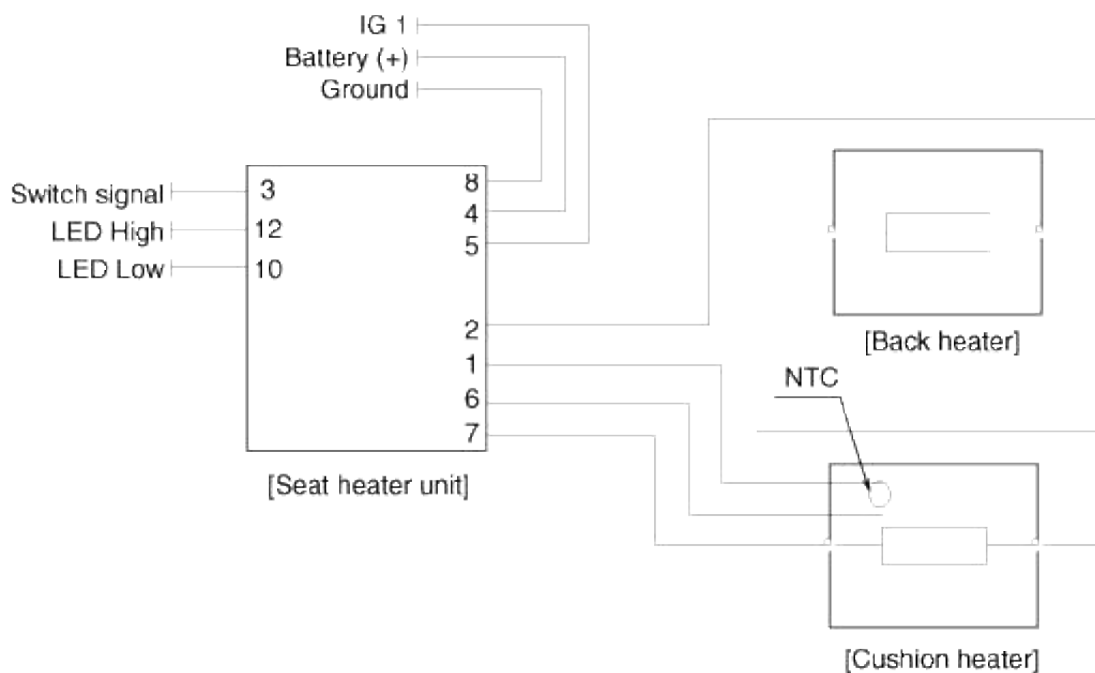


## Body Electrical System > Seat Electrical > Seat Heater > Schematic Diagrams

### Circuit Diagram



[Front seat cushion/back]



[Unit connector]

The diagram shows a rectangular connector with 12 pins. The pins are arranged in two rows of six. The top row is labeled 1, 2, 3, 4, 5 from left to right. The bottom row is labeled 6, 7, 8, 9, 10, 11, 12 from left to right. There are two small rectangular tabs on the left side of the connector, one near pin 1 and one near pin 6. There are also two small rectangular tabs on the right side of the connector, one near pin 5 and one near pin 12.

No.	Description	No.	Description
1	NTC (+)	7	Seat heater (-)
2	Seat heater (+)	8	Ground
3	Switch signal	9	-
4	Battery (+)	10	LED Low
5	IGN1	11	-
6	NTC (-)	12	LED High

[Cushion heater]

No.	Description	
1	High	
2	Low	
3	Back	

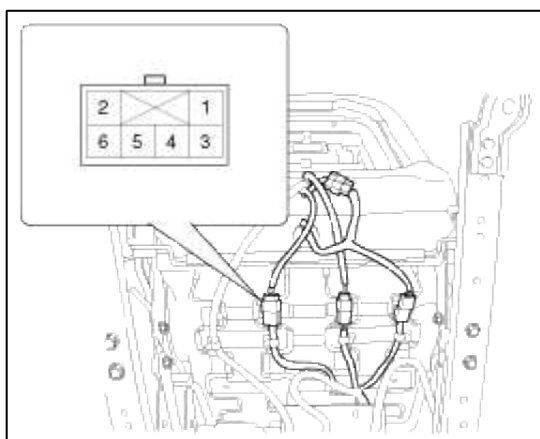
## Body Electrical System > Seat Electrical > Seat Heater > Repair procedures

Inspection

First Seat Heater

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

[Cushion]



No.	Description	No.	Description
1	-	4	NTC-
2	-	5	NTC+
3	Heater(-)	6	Heater(+)

#### Standard value (Fabric / Leather)

**Cushion :**  $1.18 \Omega \pm 10\%$

**Back:**  $1.13 \Omega \pm 10\%$

**Set :**  $2.31 \Omega \pm 10\%$

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

#### Standard value (Fabric / Leather)

**Cushion :**

High :  $42 \pm 2^{\circ}\text{C}(107.6 \pm 35.6^{\circ}\text{F})$  / LOW :  $39 \pm 2^{\circ}\text{C}(102.2 \pm 35.6^{\circ}\text{F})$

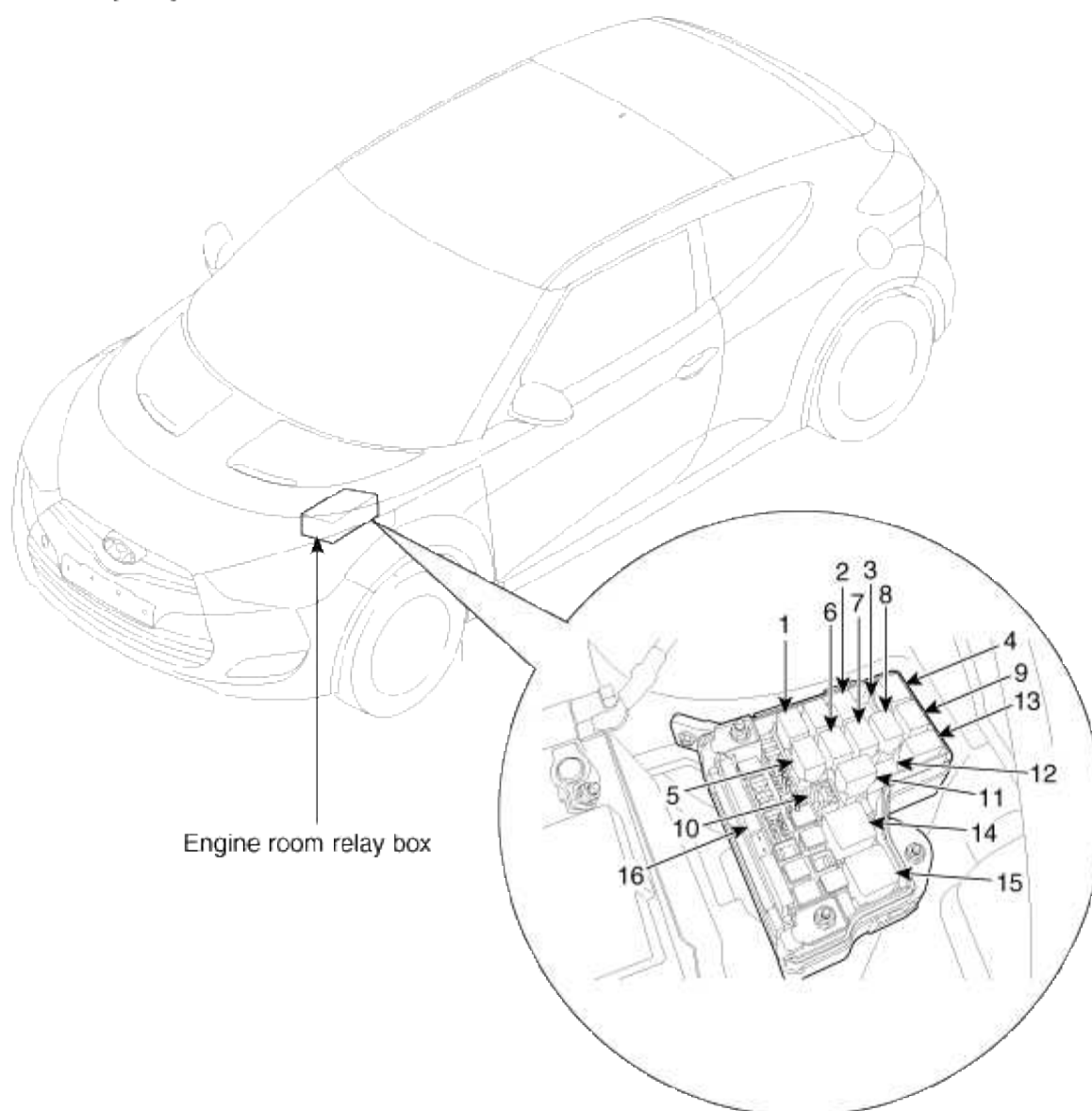
**Back :**

High :  $52 \pm 2^{\circ}\text{C}(125.6 \pm 35.6^{\circ}\text{F})$  / LOW :  $46 \pm 2^{\circ}\text{C}(114.8 \pm 35.6^{\circ}\text{F})$

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

#### Component Location

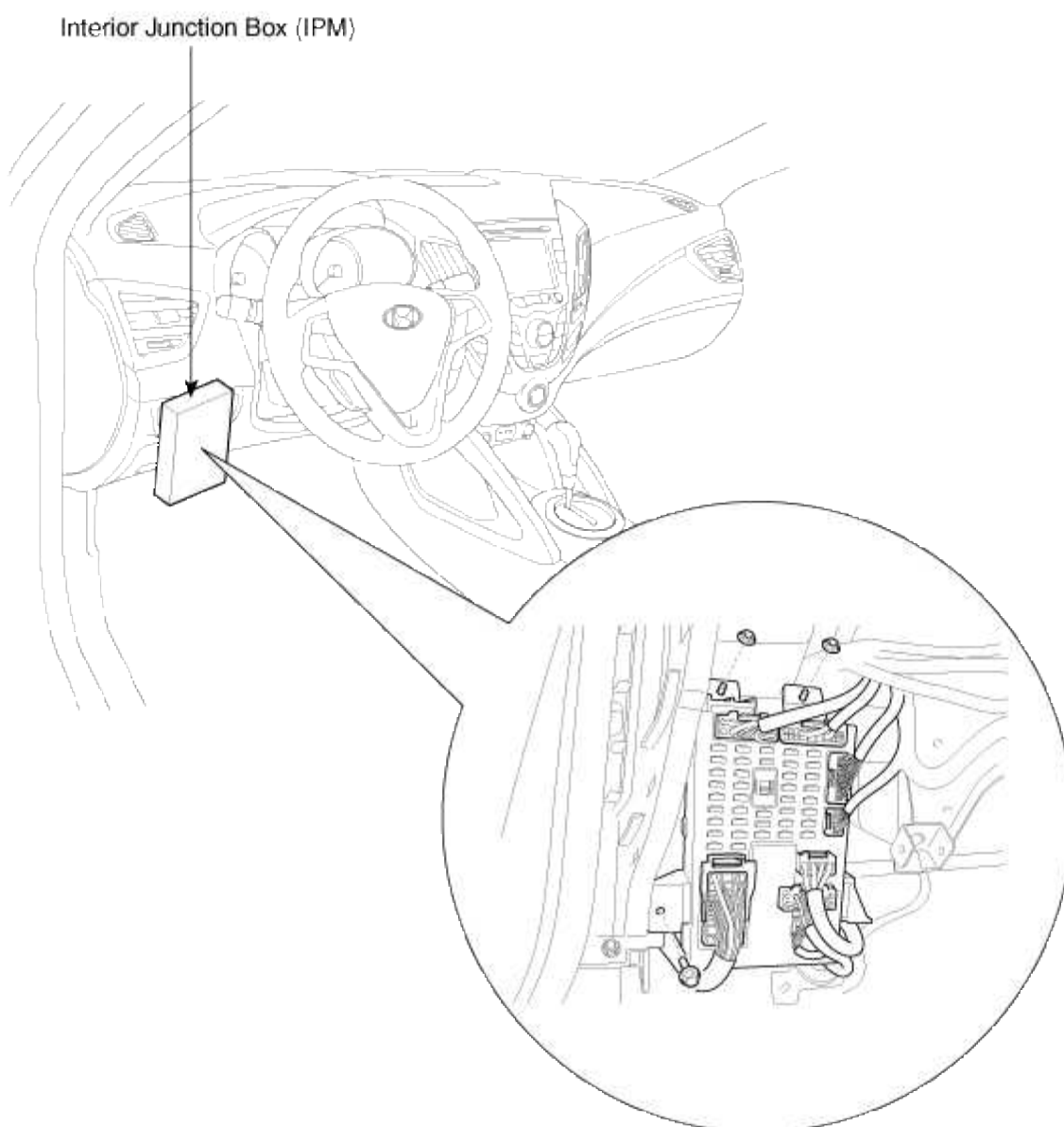
[Engine room relay box]



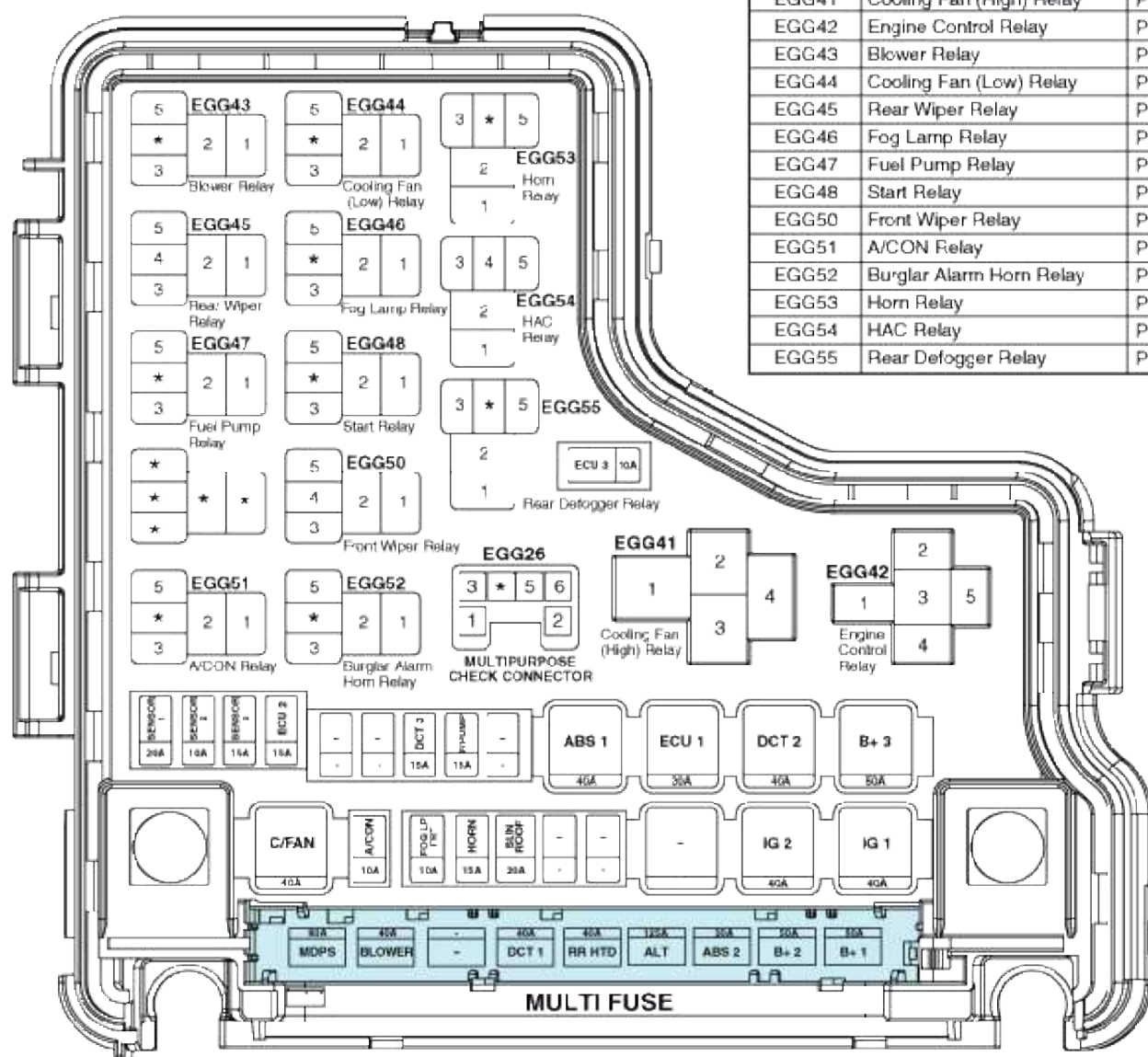
Engine room relay box

1. A/C relay	7. Starter relay	12. Hill start assist relay
2. Fuel pump relay	8. Front fog rlay	13. Horn relay
3. Rear wiper relay	9. Cooling fan relay (LOW)	14. Cooling fan relay (HI)
4. Blower relay	10. Multi purpose check connector	15. Engine control relay
5. Buglar alarm horn realy	11. Rear glass defogger	16. Multi fuse
6. Front wiper relay		

## [Passenger Compartment Junction Box]

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

## Components



Relay NO.	Relay Name	Relay Type
EGG41	Cooling Fan (High) Relay	Plug MINI
EGG42	Engine Control Relay	Plug MINI
EGG43	Blower Relay	Plug MICRO
EGG44	Cooling Fan (Low) Relay	Plug MICRO
EGG45	Rear Wiper Relay	Plug MICRO
EGG46	Fog Lamp Relay	Plug MICRO
EGG47	Fuel Pump Relay	Plug MICRO
EGG48	Start Relay	Plug MICRO
EGG50	Front Wiper Relay	Plug MICRO
EGG51	A/CON Relay	Plug MICRO
EGG52	Burglar Alarm Horn Relay	Plug MICRO
EGG53	Horn Relay	Plug MICRO
EGG54	HAC Relay	Plug MICRO
EGG55	Rear Defogger Relay	Plug MICRO

※ USE THE DESIGNATED FUSE AND RELAY ONLY

**Circuit (E/R Fuse & Relay Box)**

	Fuse Name	(A)	Circuit Protected
MULTI FUSE	MDPS	80A	EPS Control Module
	BLOWER	40A	E/R Fuse & Relay Box (Blower Relay)
	DCT 1	40A	TCM
	RR HTD	40A	E/R Fuse & Relay Box (Rear Defogger Relay)
	ALT	125A	E/R Fuse & Relay Box (Multi Fuse - DCT 1, MDPS, RR HTD, BLOWER), Alternator
	ABS 2	30A	Multipurpose Check Connector, ESC Module
	B+ 2	50A	Smart Junction Box (Power Window Relay, IPS Control Module (ARISU LT), Fuse - SAFETY POWER WINDOW, AMP)
FUSE	B+ 1	50A	Leak Current Autocut Device (Room Lamp Relay, Leak Current Autocut Switch, Fuse - INTERIOR LAMP, MULTIMEDIA, MEMORY ), Fuse - S/HEATER
	C/FAN	40A	E/R Fuse & Relay Box (Cooling Fan (High) Relay, Cooling Fan (Low) Relay)
	A/CON	10A	E/R Fuse & Relay Box (A/CON Relay)
	FOG LP FRT	10A	E/R Fuse & Relay Box (Fog Lamp Relay)
	HORN	15A	E/R Fuse & Relay Box (Burglar Alarm Horn Relay, Horn Relay)
	SUNROOF	20A	Panorama Sunroof Motor
	IG 2	40A	Ignition Switch, PDM Relay Box (IG 2 Relay), E/R Fuse & Relay Box (Start Relay)
	IG 1	40A	Ignition Switch, PDM Relay Box (IG 1 Relay, ACC Relay)
	SENSOR 1	20A	ECM
	SENSOR 2	10A	Oil Control Valve #1 (Intake)/#2 (Exhaust), Purge Control Solenoid Valve, Variable Intake Solenoid Valve, Canister Close Valve, E/R Fuse & Relay Box (A/CON Relay), Cooling Fan (High) Relay, Cooling Fan (Low) Relay
	SENSOR 3	15A	ECM Oxygen Sensor (Up)/(Down), E/R Fuse & Relay Box (HAC Relay)
	ECU 2	15A	ECM
	DCT 3	15A	TCM
	F/PUMP	15A	E/R Fuse & Relay Box (Fuel Pump Relay)
	ABS 1	40A	ESC Module
	ECU 1	30A	E/R Fuse & Relay Box (Engine Control Relay, Fuse - ECU 2, ECU 3)
	DCT 2	40A	TCM
	B+ 3	30A	Smart Junction Box (Tail Lamp Relay, IPS Control Module (ARISU LT), Fuse - STOP LP, SMART KEY 1/2, INVERTER 2, DR LOCK )
	ECU 3	10A	Sport Mode Switch

**※ USE THE DESIGNATED FUSE AND RELAY ONLY**

**Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures**
**Inspection**
**Power Relay Test (Type A)**
**NOTE**

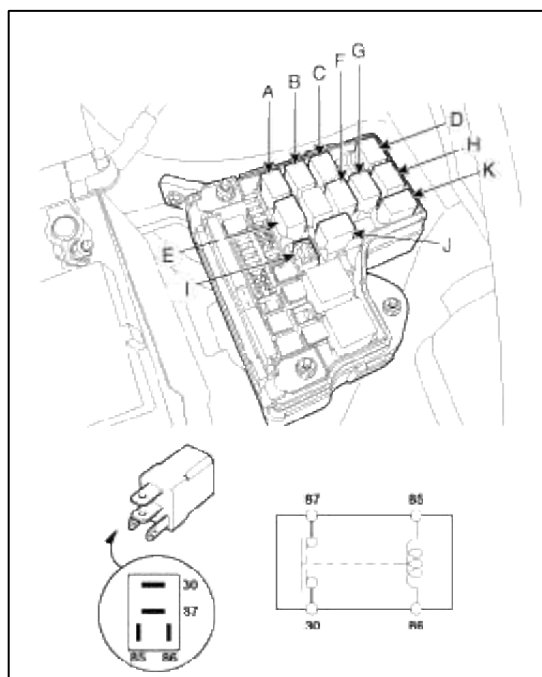
- Do not use pliers.
- Pliers will damage the relays, which could cause the engine to stall or not start.
- Carefully remove the relay using the relay puller.

Check for continuity between the terminals.

A : A/C relay	F : Front fog relay
B : Fuel pump relay	G : Cooling fan relay (LOW)
C : Blower relay	H : Multi purpose check connector
D : Burglar alarm horn relay	I : Rear glass defogger
E : Starter relay	J : Horn 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	30	87	85	86
Power				
Disconnected			○ — ○	
Connected	○ — ○		○ — ○	+

### Power Relay Test (Type B)

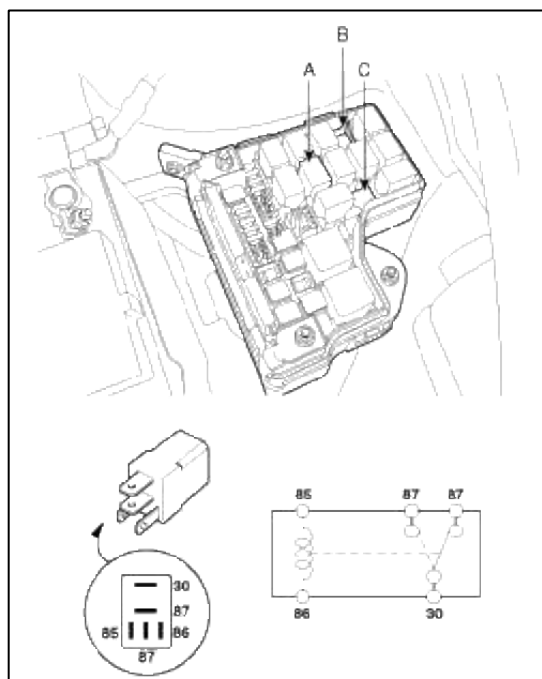
Check for continuity between the terminals.

A : Front wiper relay

B : Rear wiper relay

C : Hill start assist 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.



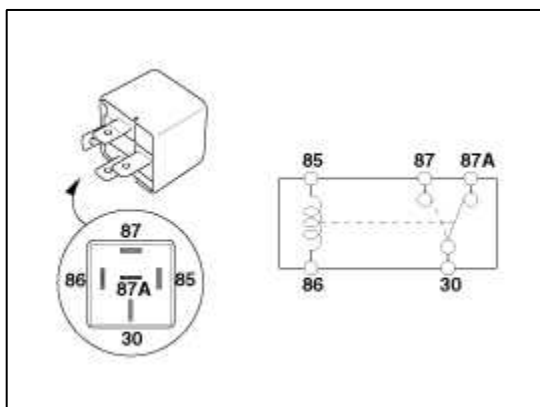
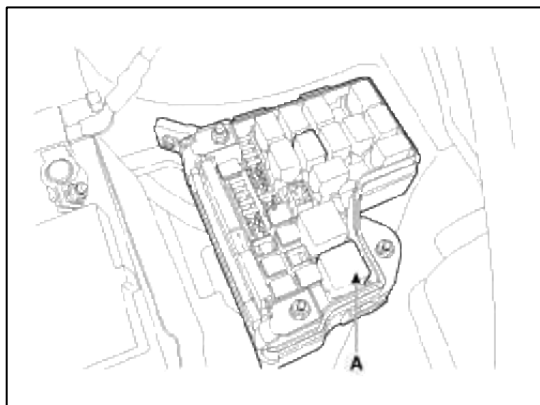
Terminal Power	85	86	30	87	87
Disconnected			○		○
Connected	⊖	⊕	○	○	

### Power Relay Test (Type C)

Check for continuity between the terminals.

A : Engine control 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	○	○	⊖	⊕

### Fuse Inspection

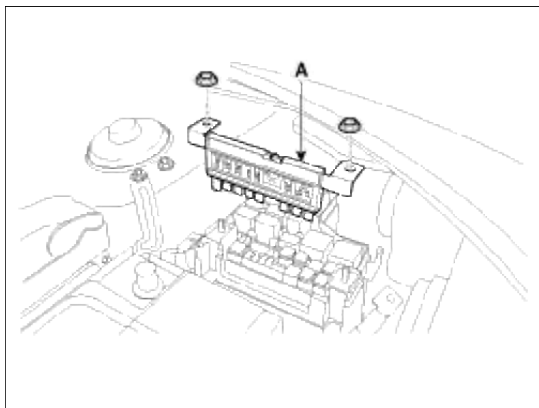
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuits correct?
3. Are there any blown fuses?

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.

### Multi Fuse

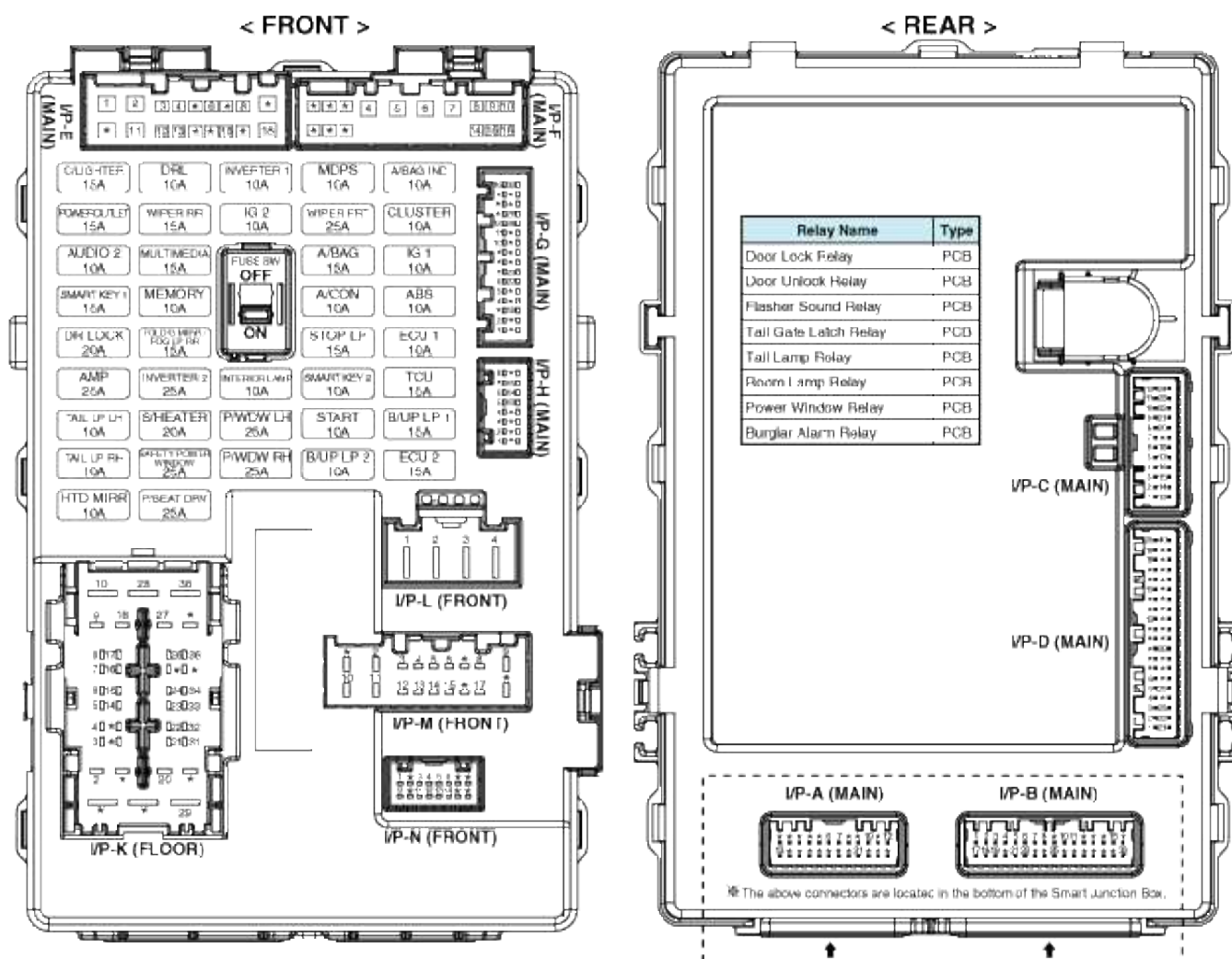
Multi Fuse is for optimizing the engine room package.



**NOTE**

- Multi fuse(A) is needed to replace entirely when there is damage to only one fuse.
- When replacing the multi fuse, refer to the "Engine compartment - component location" diagram exactly.
- Use the multi fuse capacities for each circuits correctly.

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



**※ USE THE DESIGNATED FUSE AND RELAY ONLY**

**Circuit (Smart Junction Box)**

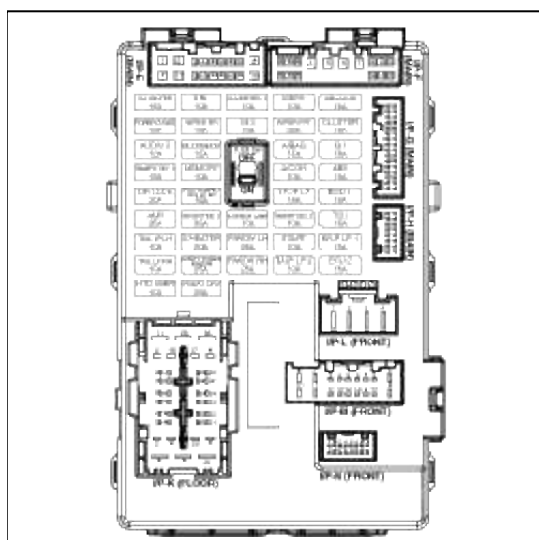
Fuse Name	(A)	Circuit Protected	Fuse Name	(A)	Circuit Protected
CUGHTER	15A	Cigarette Lighter	STOP LP	15A	Stop Lamp Switch, Key Solenoid, Stop Signal, Relay, Smart Key Control Module
DRL	10A	Not Used	ECU 1	10A	Immobilizer Module, Smart Key Control Module, ECM, Stop Lamp Switch
INVERTER 1	10A	Smart Key Control Module, A/C Inverter Module	AMP	25A	AMP
MDPS	10A	EPS Control Module	INVERTER 2	25A	A/C Inverter Module
ABAG IND	10A	Instrument Cluster (Air Bag IND.)	INTERIOR LAMP	10A	Luggage Room Lamp, Map Lamp, Room Lamp, Vanity Lamp LH/RH, Overhead Console Lamp
POWER OUTLET	15A	Power Outlet	SMART KEY 2	10A	Smart Key Control Module, Immobilizer Module, Start Stop Button Switch
WIPER RR	15A	Rear Wiper Relay, Rear Wiper Motor, Multifunction Switch	TCU	15A	TCM
IG 2	10A	E/R Fuse & Relay Box (Front Wiper Relay, Blower Relay), Crash Pad Switch, Panorama Sunroof Motor, A/C Control Module, IPS Control Module			
WIPER FLT	25A	Multifunction Switch, Front Wiper Motor, E/R Fuse & Relay Box (Front Wiper Relay)	TAIL L P L H	10A	Rear Combination Lamp LH, License Lamp L-RH, Shift Lever Indicator, Instrument Cluster, Multifunction Switch, Passenger Power Window Switch, Front Window Main Switch, AUX & USB Jack, Inside Mirror, A/C Control Module, ESC Off Switch, A/V & Navigation Head Unit, Crash Pad Switch, Driver/Passenger Seat Warmer Switch, Head Lamp LH
CLUSTER	10A	Instrument Cluster, Tire Pressure Monitoring Module, Sport Mode Switch, Shift Lever Indicator	SEATER	20A	Driver/Passenger Seat Warmer
AUDIO 2	10A	Power Outside Mirror Switch, AMP, A/V & Navigation Head Unit, MTS Module, Smart Key Control Module, IPS Control Module	PWOW LH	25A	Power Window Main Switch
MULTIMEDIA	15A	A/V & Navigation Head Unit, MTS Module	START	10A	Burglar Alarm Relay, Transaxle Range Switch, Smart Key Control Module, ECM, TCM, E/R Fuse & Relay Box (Start Relay)
ABAG	15A	Passenger Occupant Detection Sensor, SRS Control Module, Tailgate	BUP LP 1	15A	Back-Up Lamp Switch, Transaxle Range Switch
IG 1	10A	Rear Parking Assist Sensor LH/RH, Rear Parking Assist Sensor Center LH/RH, Rear Parking Assist Buzzer, IPS Control Module, MTS Module, Driver/Passenger Seat Warmer, Driver/Passenger Seat Warmer Switch	TAIL LP RH	10A	Head Lamp RH, Rear Combination Lamp RH
SMART KEY 1	15A	Smart Key Control Module	SAFETY POWER WINDOW	25A	Driver Safety Power Window Module
MEMORY	10A	Data Link Connector, Instrument Cluster, A/C Control Module	PWOW RH	25A	Power Window Main Switch, Passenger Power Window Switch, Rear Power Window Switch RH
A/CON	10A	ECM, Blower Motor, A/C Control Module	BUP LP 2	10A	A/V & Navigation Head Unit, Transaxle Range Switch, MTS Module, TCM, Back-Up Lamp Switch, Rear Combination Lamp LH/RH
ABS	10A	ESC Module, ESC Off Switch, E/R Fuse & Relay Box (HAC Relay, Multipurpose Check Connector)	ECU 2	15A	Condenser, Ignition Coil #1/#2/#3/#4
DR LOCK	20A	Door Lock Relay, Door Unlock Relay, Flasher Sound Relay, Tail Gate Latch Relay, Two Turn Unlock Relay, IPS Control Module	HTD MIRR	10A	ECM, A/C Control Module, Driver/Passenger Power Outside Mirror
FOLDG MIRR/ FOG L P RR	15A	Not Used	P/SEAT DRV	25A	Not Used

✱ USE THE DESIGNATED FUSE AND RELAY ONLY

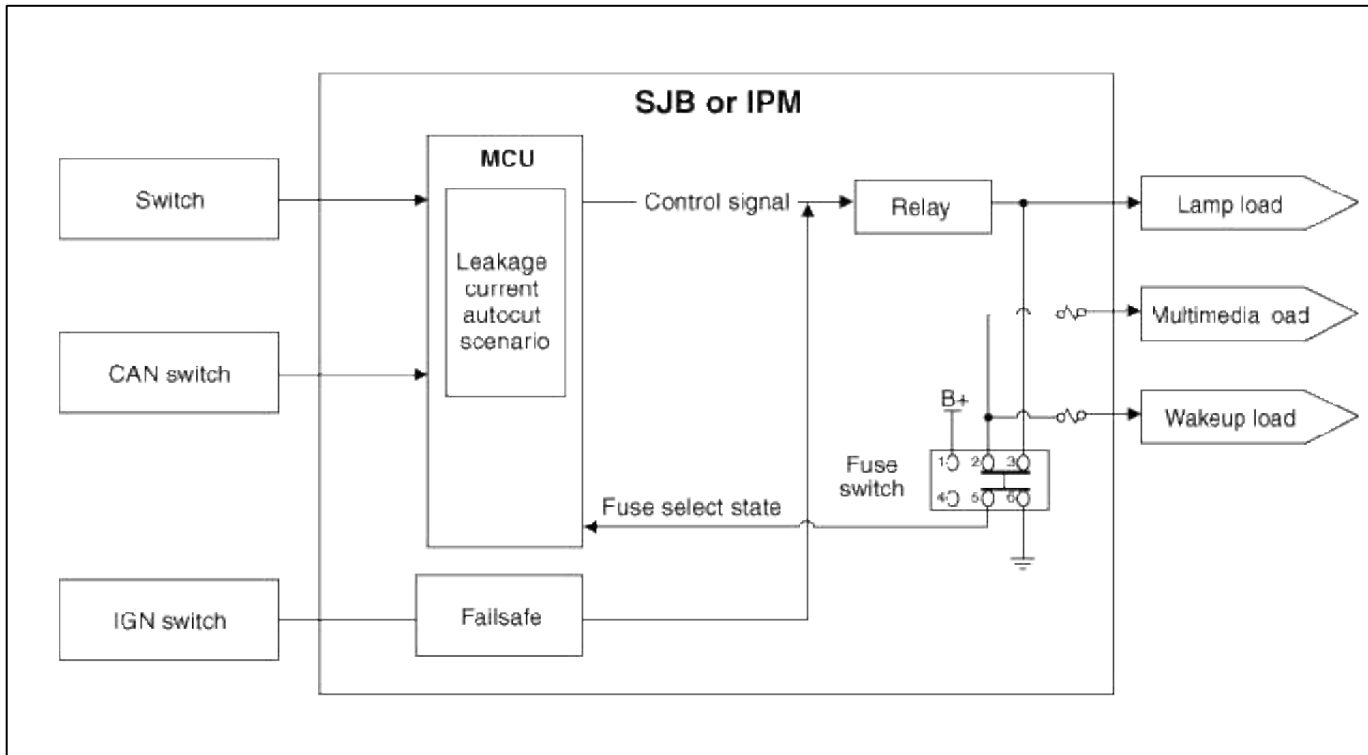
## Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Description and Operation

### Description

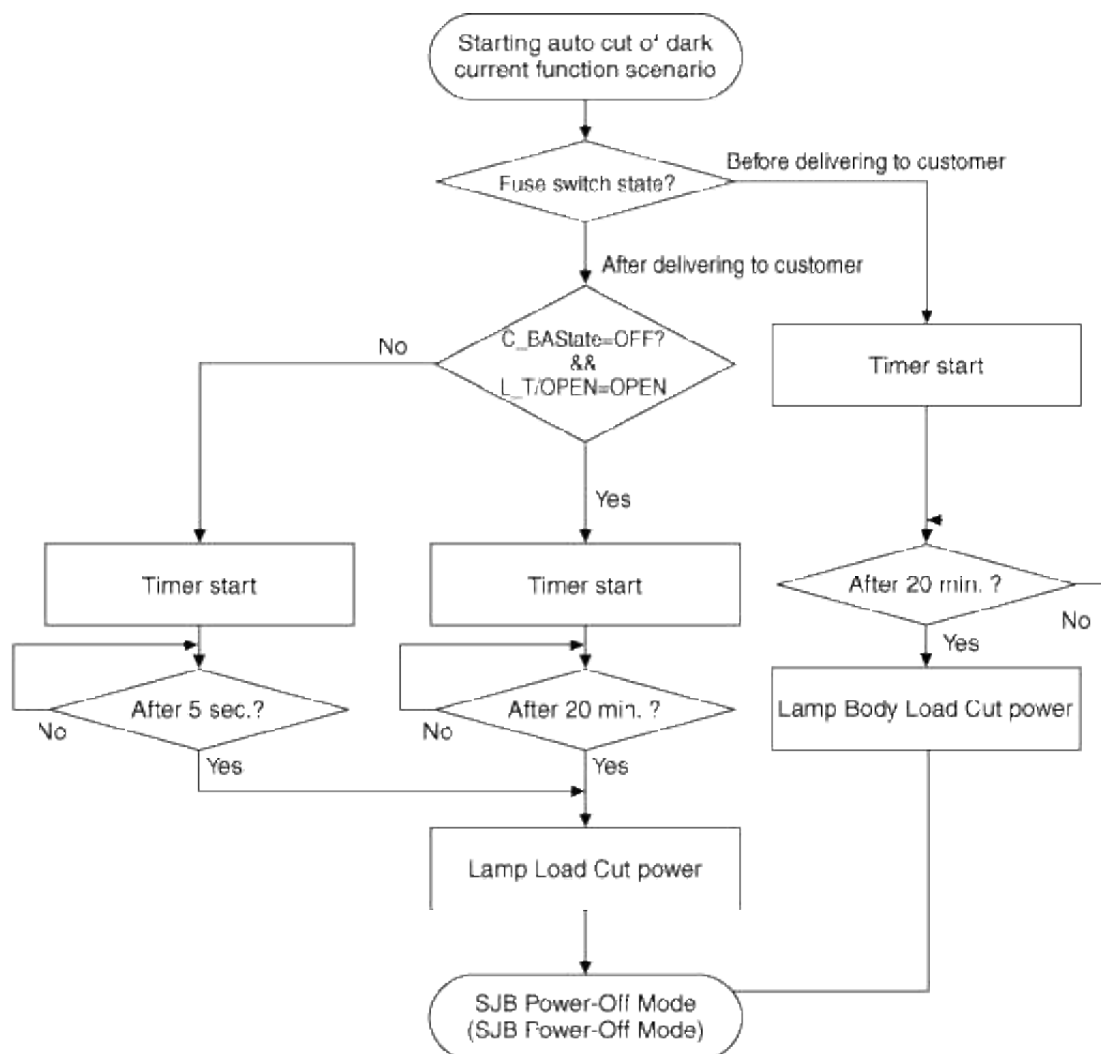
Auto cut system of dark current

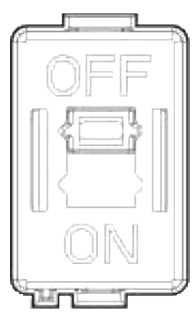


1. Description : It cuts automatically power to be provided with load for reducing unnecessary dark current according to vehicle state.

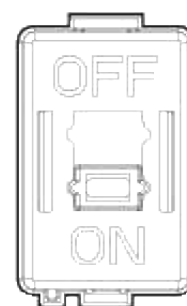


2. SJB had 3 modes, "Normal Mode", "Sleep Mode", "Power Off Mode". Auto cut of dark current practice in "Sleep Mode".
- A. "Sleep" condition : IG OFF, constant input switch, CAN network doesn't activate.
  - B. "Sleep" resolutive condition : Any switch inputs, CAN network activates, KEY ON, IGN ON
 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



Before delivering to customer	Fuse switch OFF
<ul style="list-style-type: none"> <li>•All door close &amp; RKE door lock or Constant switch state (Auto cut of dark current scenario starts.)</li> <li>-After "sleep" state is for 20 min.</li> <li>-SJB power down(SJB dark current : 200 <math>\mu</math>A) and cutting power of Lamp/Body Load/Wake up</li> </ul>	
After delivering to customer	Fuse switch ON

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



#### 4. Problem when fuse switch setting is wrong

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

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

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

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

#### Fuse Inspection

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

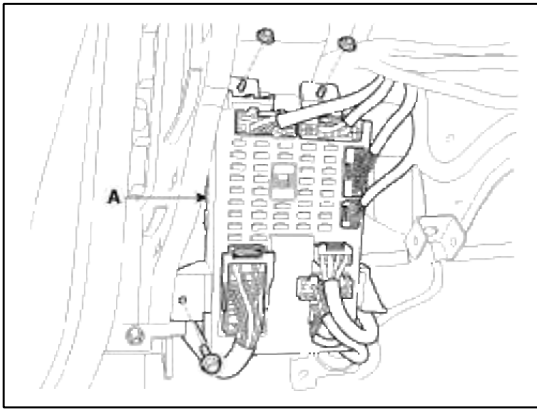
If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

#### Removal

##### Passenger Compartment Junction Box (IPM)

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel.  
(Refer to the BD group - "Crash pad")

3. Disconnect the connectors from the fuse side of the passenger compartment junction box (A).



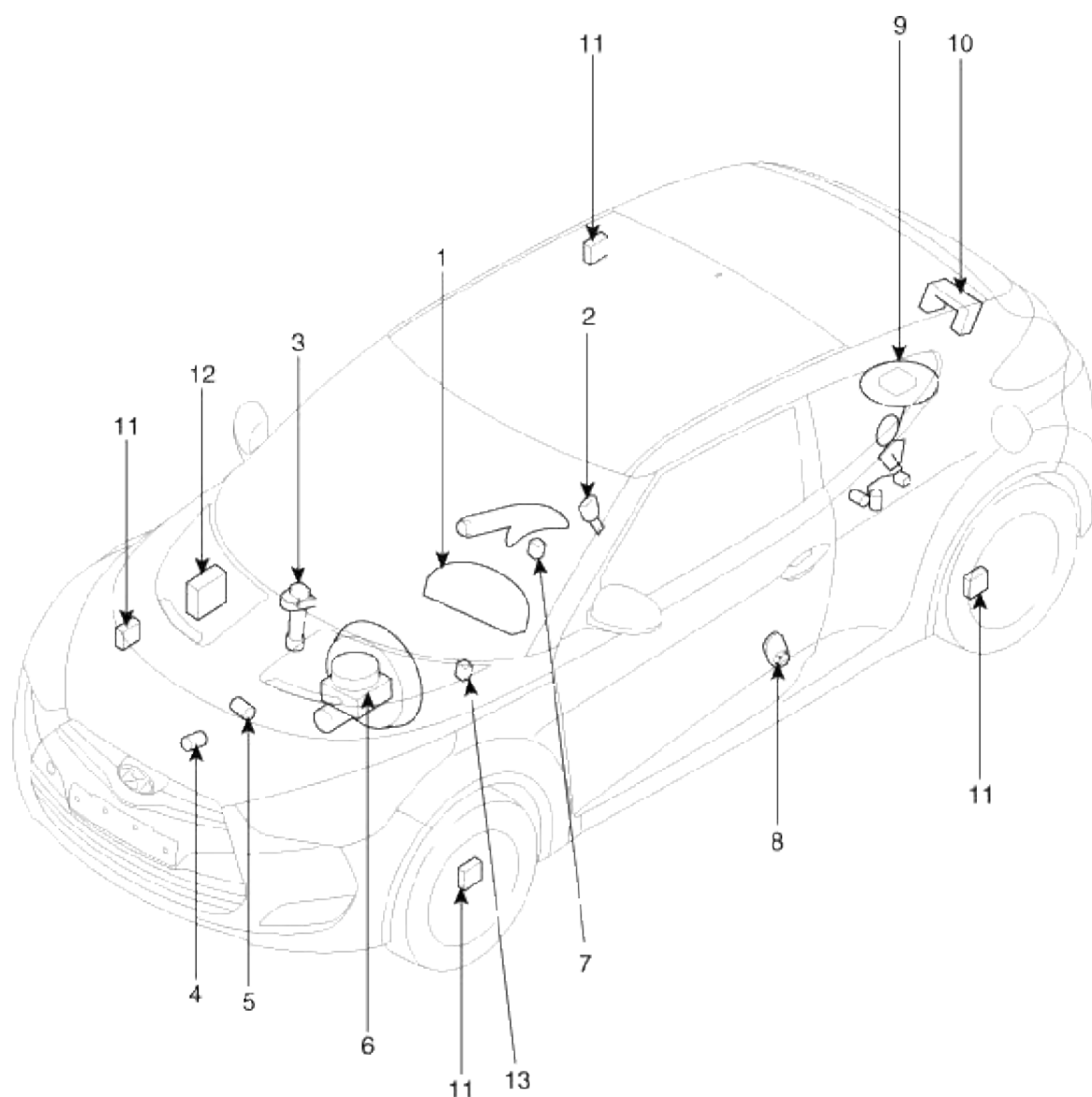
4. Remove the passenger compartment junction box after loosening the mounting nuts (2EA) and bolt.
5. Disconnect the connectors and the cables from the back side of the passenger compartment junction box.

#### Installation

1. Install the connectors and the cables from the back side of the passenger compartment junction box.
2. Install the crash pad lower panel.
3. Check that all system operates normally.

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

#### Component Location



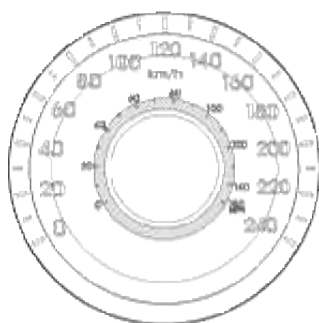
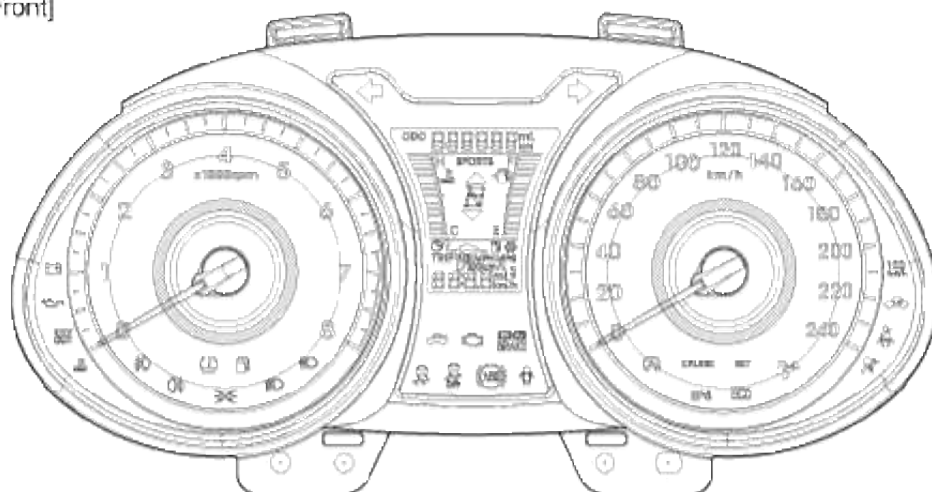
1. Instrument cluster assembly	8. Door switch
2. Seat belt switch	9. Fuel gauge sender
3. Vehicle speed sensor	10. Tailgate switch
4. Engine coolant temperature sender	11. Wheel speed sensor
5. Oil pressure switches	12. ABS ECU
6. Brake fluid level warning switch	13. Active ECO switch
7. Parking brake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

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

#### Components



[Front]

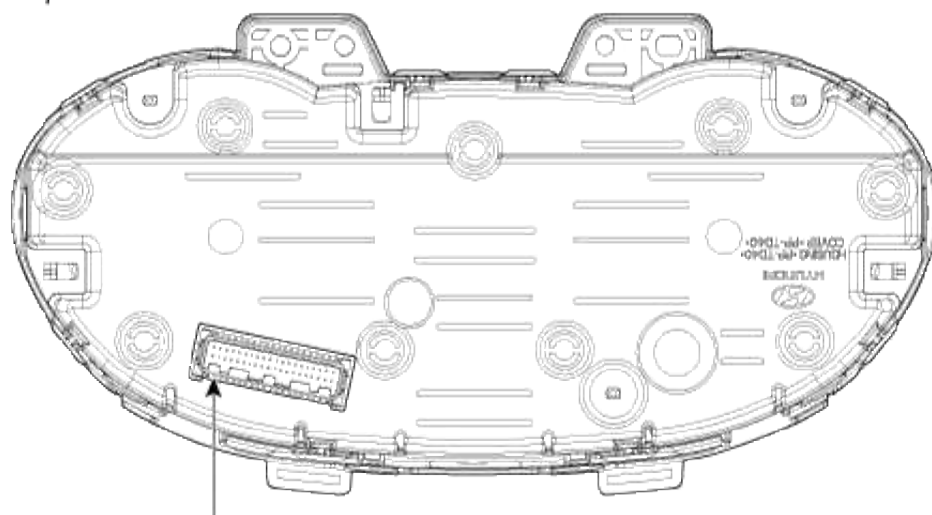


[USA]

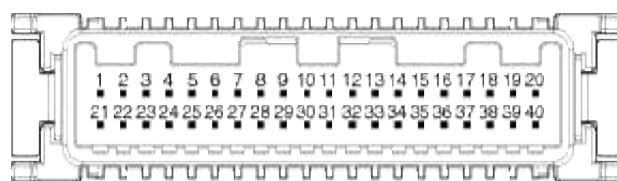


[CANADA]

[Rear]



Connector A

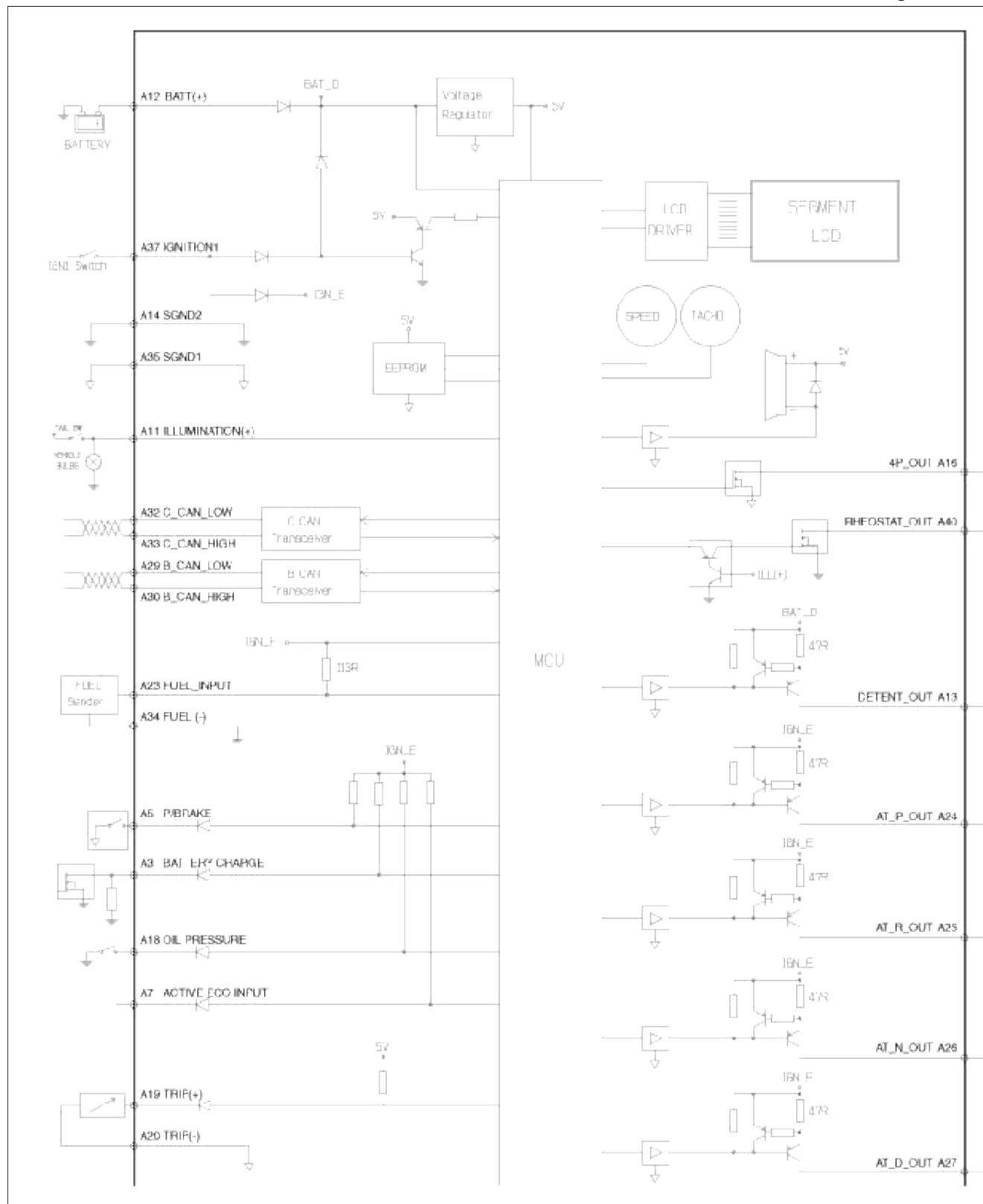


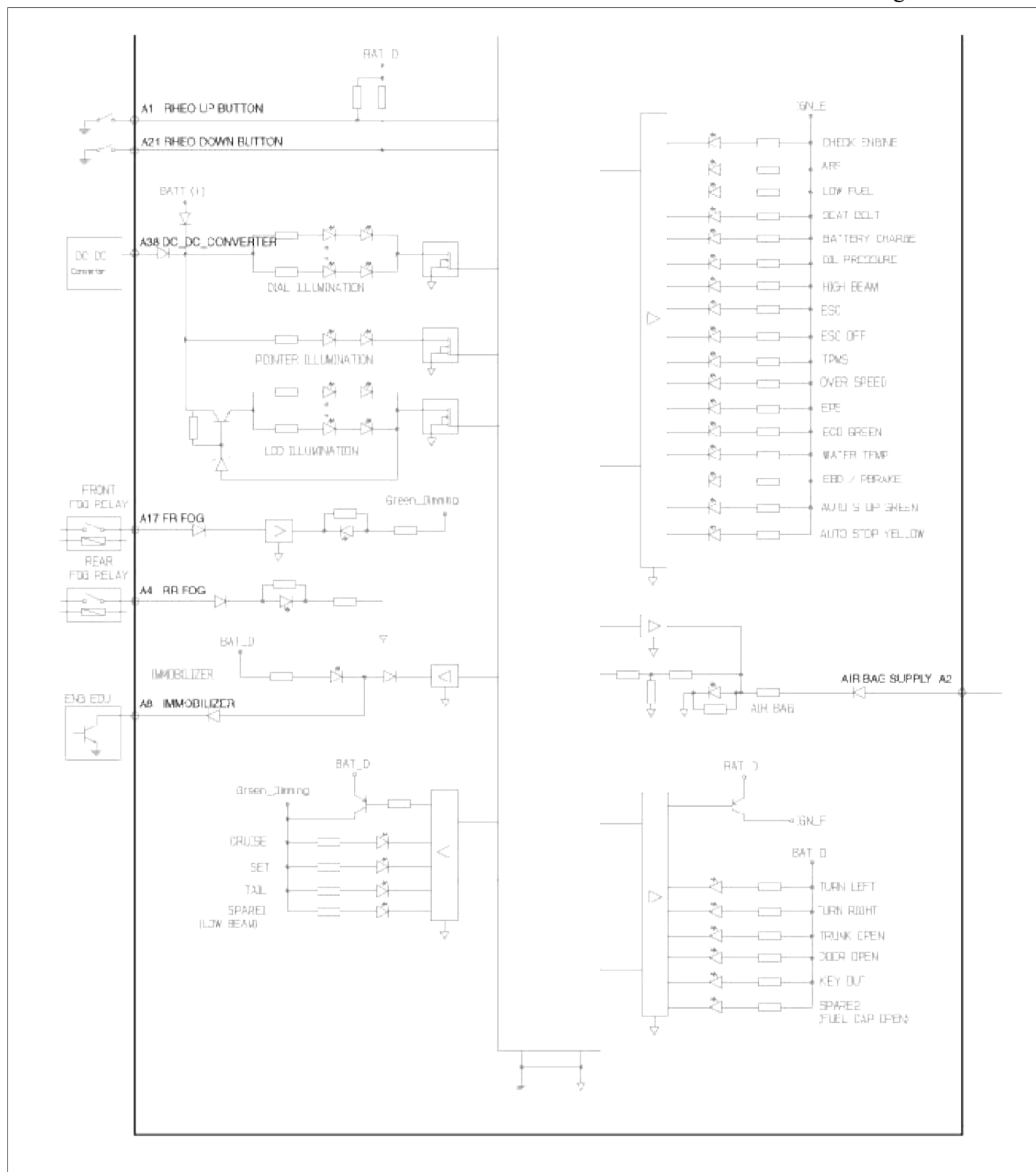
Connector A

Pin No.	Description	Pin No.	Description
1	Rheostat up button	21	Rheostat down button
2	Air bag supply	22	BAT (+)
3	Battery charge	23	Fuel input
4	Rear fog	24	AT P OUT
5	Parking brake	25	AT R OUT
6	-	26	AT N OUT
7	Active ECO input	27	AT D OUT
8	Immobilizer	28	-
9	-	29	B_CAN_LOW
10	OAT input	30	B_CAN_HIGH
11	Illumination (+)	31	-
12	-	32	C_CAN_LOW
13	Detent out	33	C_CAN_HIGH
14	SGND 2	34	Fuel (-)
15	-	35	SGND 1
16	4P OUT	36	-
17	Front fog	37	Ignition
18	Oil pressure	38	DC DC converter
19	Trip (+)	39	-
20	Trip (-)	40	Rheostat out

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

#### Circuit Diagram





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

### Inspection

#### Speedometer

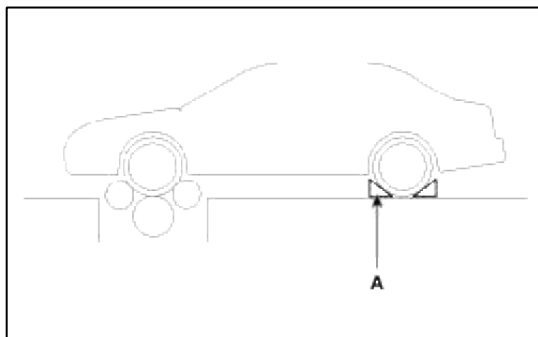
1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks (A) as appropriate.
3. Check if the speedometer indicator range is within the standard values.

**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.



[km/h]

Velocity ( /h)	Tolerance ( /h)
20	+ 3.5 + 0.5
40	+ 4.0 + 1.0
60	+ 4.7 + 1.7
80	+ 5.5 + 2.5
100	+ 6.0 + 3.0
120	+ 6.5 + 3.5
140	+ 7.5 + 4.5
160	+ 8.5 + 5.5
180	+ 10.0 + 6.5
200	+ 11.0 + 7.5
220	+ 12.0 + 8.5
240	+ 13.0 + 9.5

[mph]

Velocity (mph)	Tolerance (mph)
20	+ 2.5 + 0.5
40	+ 2.5 + 0.5
60	+ 3.5 + 1.5
80	+ 3.5 + 1.5
100	+ 5.0 + 3.0
120	+ 7.2 + 4.8
140	+ 8.2 + 5.8
150	+ 9.2 + 6.8

#### Tachometer

1. Connect the GDS 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

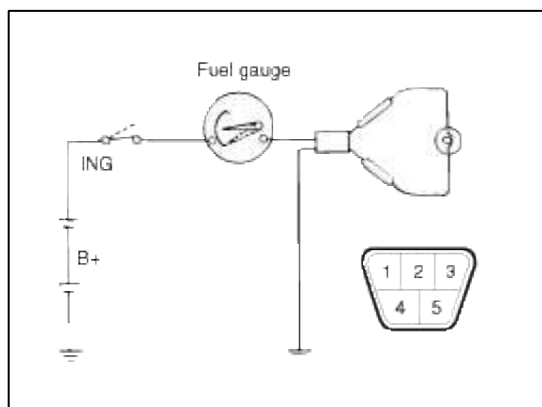
1. Reversing the connections of the tachometer will damage the transistor and diodes inside.
2. When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

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

#### Fuel Gauge

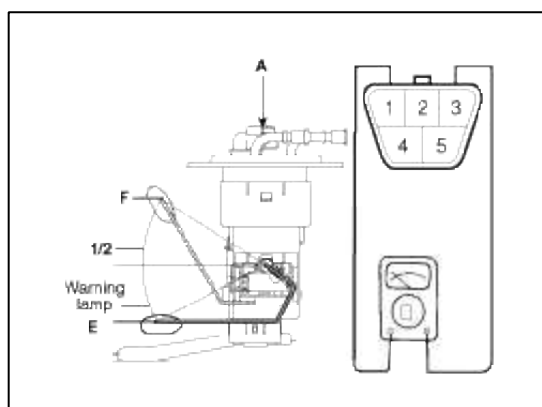
1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 watt, 12V test bulb to terminals 1 and 3 on the wire harness side connector.

3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



### Main Fuel Gauge Sender

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



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

Segment	Position	Resistance ( $\Omega$ )
12	Sender (F)	$15 \pm 2$
6	1/2	$66.2 \pm 2$
1	Warning lamp	$156 \pm 2$
1	Sender (E)	$200 \pm 3$

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

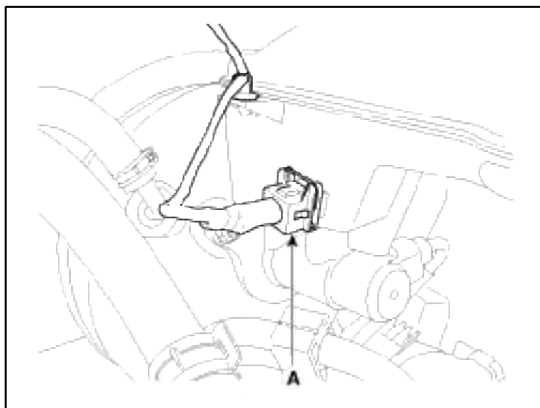
### CAUTION

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

### Brake Fluid Level Warning Switch

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

2. Verify that continuity exists between switch terminals 1 and 2 while pressing the switch (float) down with a rod.



3. If continuity is not as specified, replace the brake fluid level warning switch.

#### Brake Fluid Level Warning Lamp

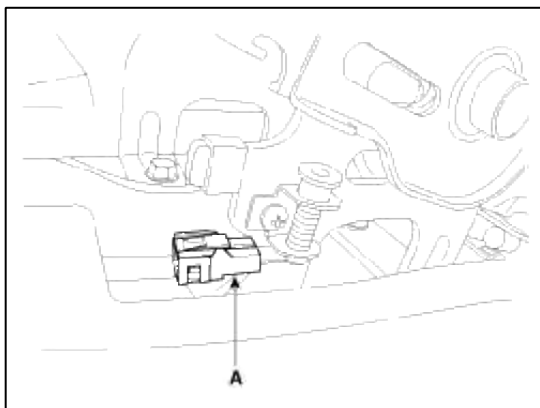
1. Ignition "ON"
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

#### Parking Brake Switch

The parking brake switch (A) is a pulling type. It is located under the parking brake lever. To adjust, move the switch mount up and down with the parking brake lever released all the way.

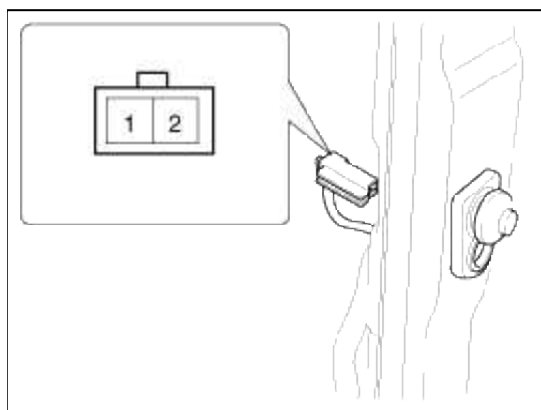
1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
2. Check that there is no continuity between the terminal and switch body with the switch OFF (Lever is released).

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.



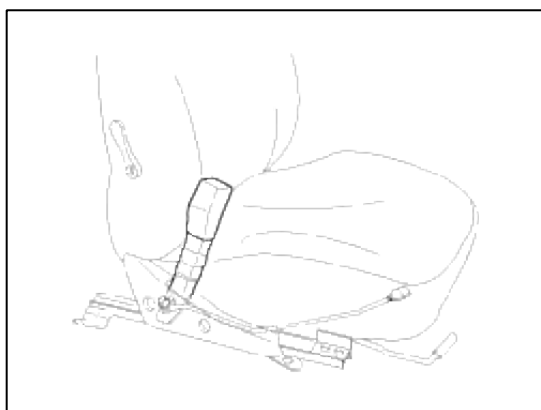


Terminal Position	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

### Seat Belt Switch

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

Seat belt condition	Continuity
Fastened	Non-conductive ( $\infty\Omega$ )
Not fastened	Conductive ( $\Omega$ )



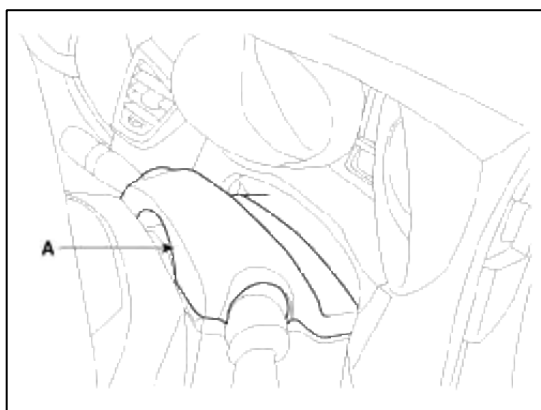
### Seat Belt Warning Lamp

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

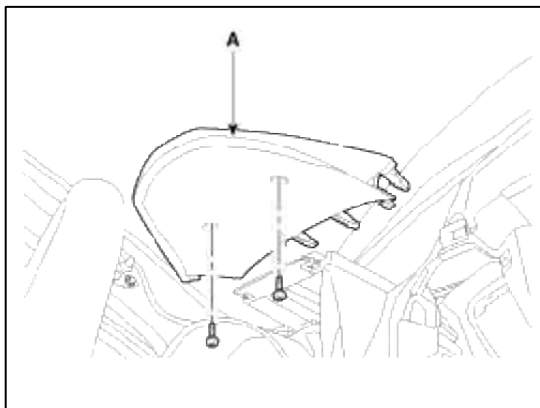
Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

### Removal

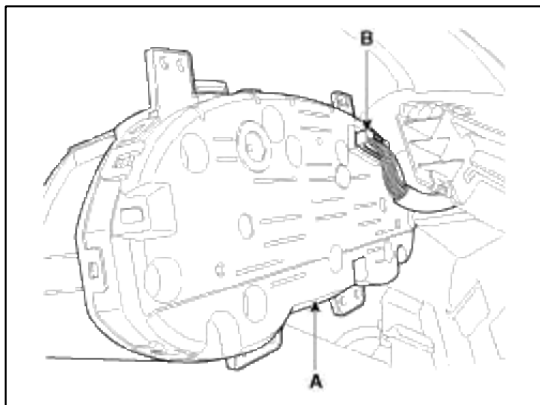
1. Disconnect the negative (-) battery terminal.
2. Remove the upper shroud(A) with moving down the steering wheel.



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



4. Remove the cluster(A) after loosening 4 screws and disconnecting a connector(B).



#### Installation

1. Install the cluster to the crash pad.
2. Install the upper shroud.
3. Install the cluster fascia upper panel.

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

#### Active ECO System

1. Active ECO System

While the general eco system encourages the driver to drive efficiently by displaying ECO lights on the dashboard, the active ECO system controls the transmission forcibly to achieve fuel efficiency. The driver can activate the active ECO button on the steering wheel to engage this mode. If the active ECO is selected, then the engine and transmission are controlled with priority placed on fuel efficiency. It achieves even greater fuel economy than the conventional system. The active ECO system may not engage under certain conditions. (e.g., when driving up an incline or before the engine is warmed up). If active ECO is not selected, then the general ECO System can be selected and engaged.

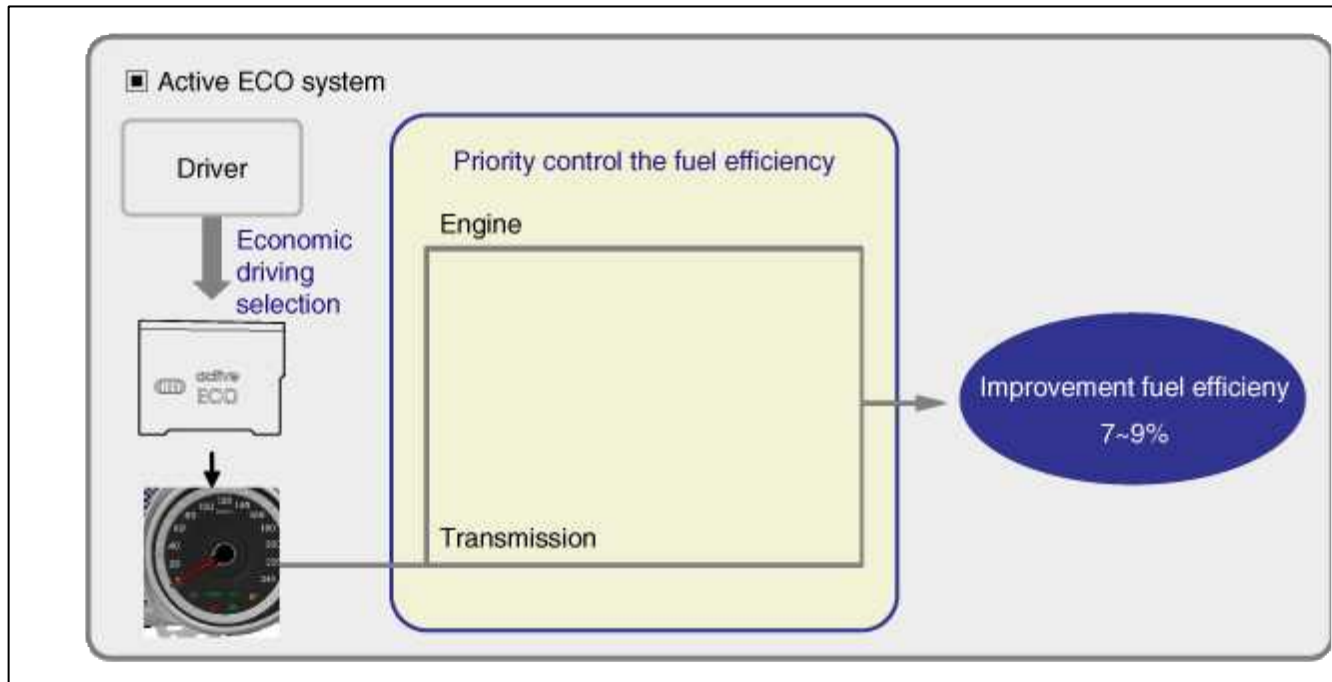
## 2. Active ECO Features

### A. Engine control

- Minimizes fuel consumption caused by unnecessary acceleration:  
Limits engine torque during acceleration (disengages limit control when starting to move or accelerating suddenly ensure trouble-free performance).

### B. Transmission control

- Lowers the up shift vehicle speed: Lowers engine RPM when driving.
- Prevents down shift if possible: Prevents driving under high engine RPM.
- Expands the direct connection area of the torque converter.



#### NOTE

Inform the driver that the following conditions are not malfunctions.

1. The active ECO system provides improved fuel efficiency through direct control of the engine / transmission, but the actual fuel saved may be less than you expect, depending on the driving conditions and the driver's driving habits.
2. The active ECO limits acceleration on flat ground to conserve fuel, but this feature is disengaged when driving up an inclined road.
3. When a driver activates the active ECO System, the mode is maintained until the driver deactivates the system.
4. The conventional eco driving notices are not activated when active ECO is on. However, a green lamp on the dashboard is permanently on. (The constant on state of the green lamp signifies that the active ECO system is currently engaged.)

## 3. Conditions That Prevent Active ECO System Engagement

- (1) Active ECO is not active when the coolant temperature falls below the preset level.
- (2) Active ECO is not active if the APS opening is maintained for longer than the preset limit.
- (3) Active ECO is not active if the check engine lamp is blinking.
- (4) Active ECO is not active if a CAN error message occurs.
- (5) Active ECO is not active if a deactivate signal is triggered by the TCU.
- (6) Active ECO is not active if VDC is engaged.
- (7) Active ECO is not active if pattern is switched to other than the normal or active ECO transmission pattern.

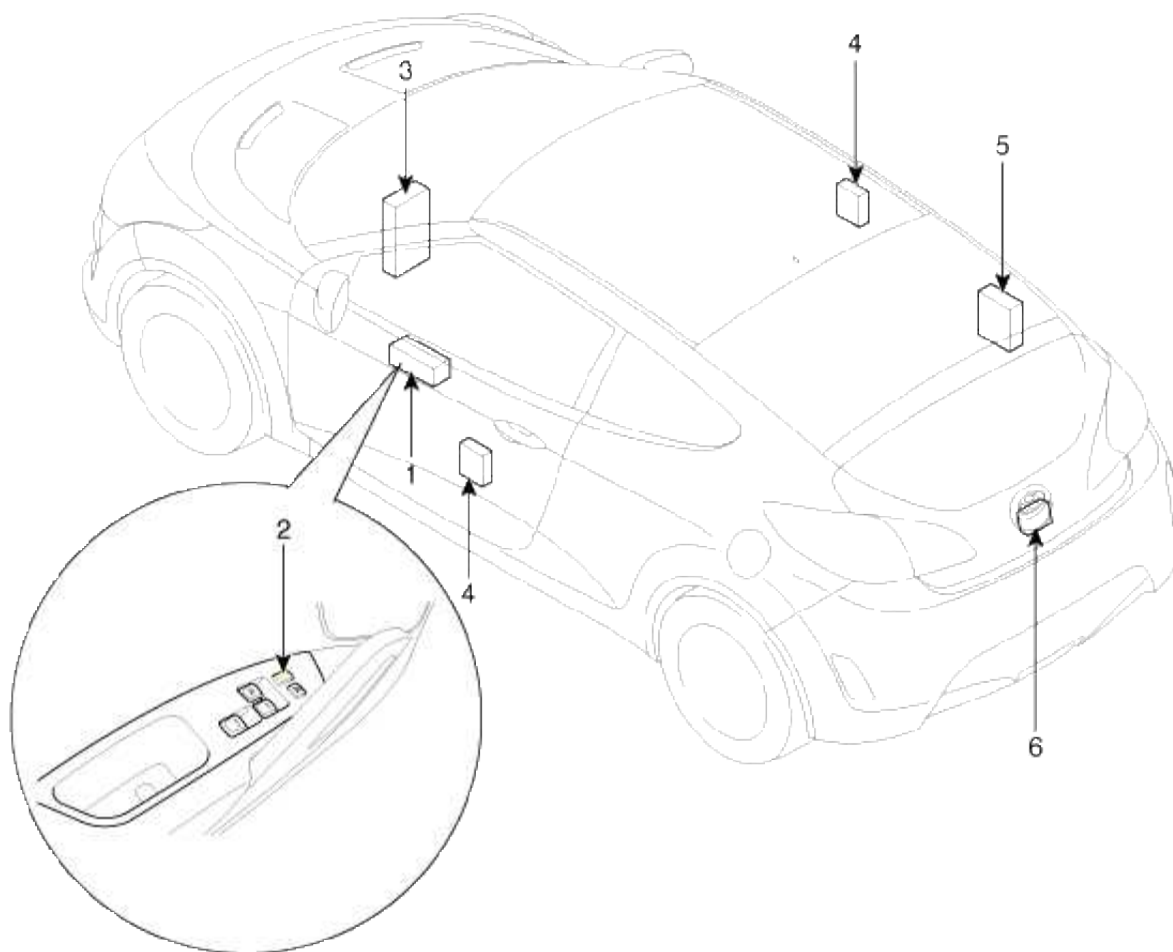
**Body Electrical System > Indicators And Gauges > Troubleshooting**
**Troubleshooting**

Symptom	Possible cause	Remedy
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	CAN line faulty	Check the EMS
	Tachometer faulty	Check tachometer
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Fuel gauge faulty	Check gauge
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Low fuel warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	CAN line faulty	Check the EMS
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Brake fluid level warning switch faulty	Check switch
	Parking brake switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

	CAN line faulty	Check the TCS/ABS (EBD) Check the Smart Junction Box(SJB) (Parking brake/Brake oil switch)
Open door warning lamp and trunk warning lamp do not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	CAN line faulty	Check the Smart Junction Box(SJB)
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Speedometer does not operate	Vehicle speed sensor faulty	Check the vehicle speed sensor (M/T)
	CAN line faulty	Check the EMS (A/T)
Seat belt warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	CAN line faulty	Check the BCM
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

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

#### Component Location



1. Driver power window switch	4. Front door lock actuator
2. Door lock switch	5. Rear door lock actuator
3. IPM	6. Tailgate open actuator

IPM : Intelligent integrated Platform Module

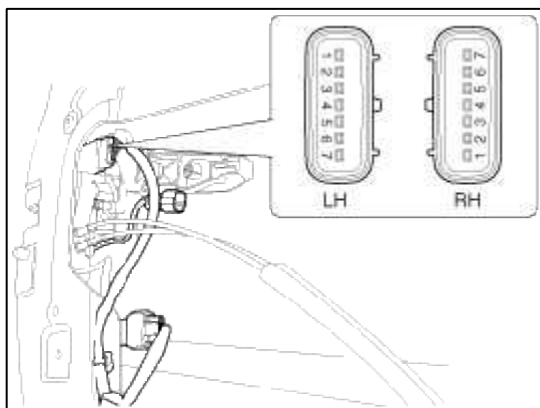
### Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

#### Inspection

##### Front Door Lock Actuator Inspection

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

3. Disconnect the 7P connector from the actuator.

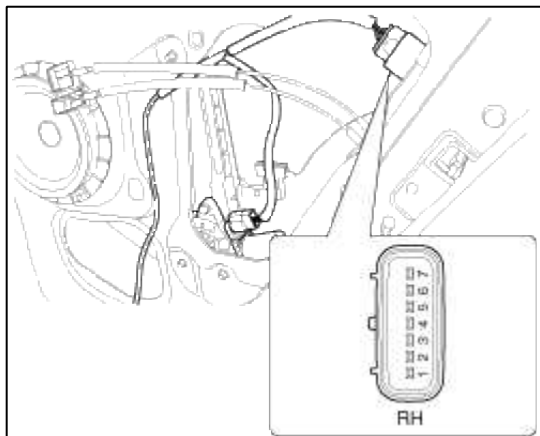


4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal		2	1
Position	Lock	⊕	⊖
	Unlock	⊖	⊕
Terminal		6	7
Position	Lock	⊕	⊖
	Unlock	⊖	⊕

#### Rear Door Lock Actuator Inspection

1. Remove the rear door trim.  
(Refer to the BD group - "Rear door")
2. Remove the rear door module.
3. Disconnect the 7P connector from the actuator.



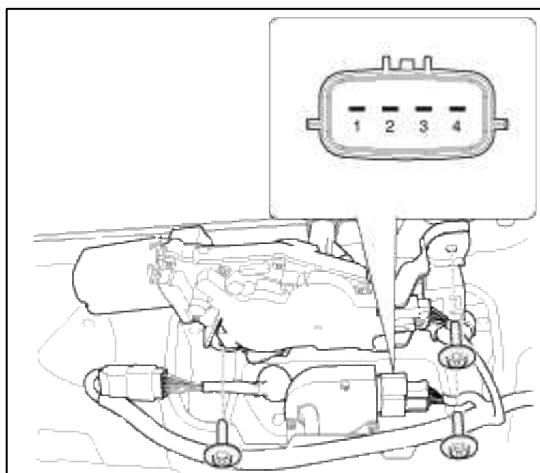
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal		6	7
Position	Lock	⊕	⊖
	Unlock	⊖	⊕

#### Tailgate Release Actuator Inspection

1. Remove the tailgate trim panel.  
(Refer to the BD group - "Tailgate")

2. Disconnect the 4P connector from the actuator.

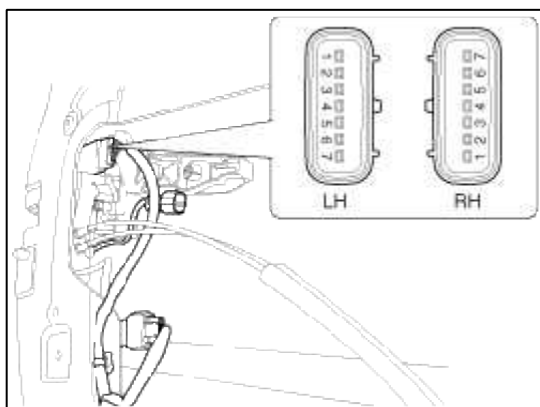


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	1	2
Lock release(Open)	⊖	⊕

#### Front Door Lock Switch Inspection

1. Remove the front door trim panel.  
(Refer to the BD group - "Front door")
2. Remove the front door module.
3. Disconnect the 7P connector 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.

Terminal		3	4	5
Position	Front left		○ — ○	
	Counter-clockwise	○ —		○
Front right	Clockwise	○ —		○
	Counter-clockwise	○ — ○		

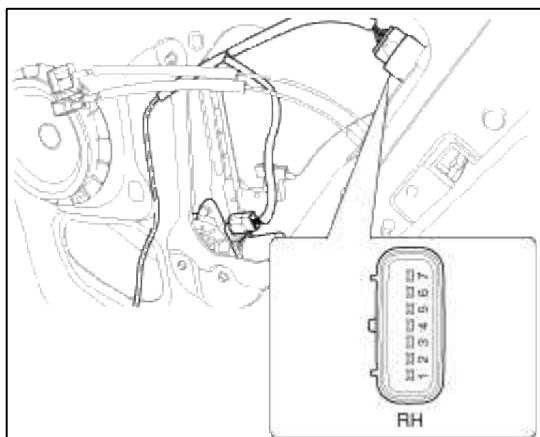
Terminal		6	5
Position	Front left	○ —	○
Terminal		2	3
Position	Front right	○ —	○

#### Rear Door Lock Switch Inspection

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



2. Remove the rear door module.
3. Disconnect the 7P connector from the actuator.

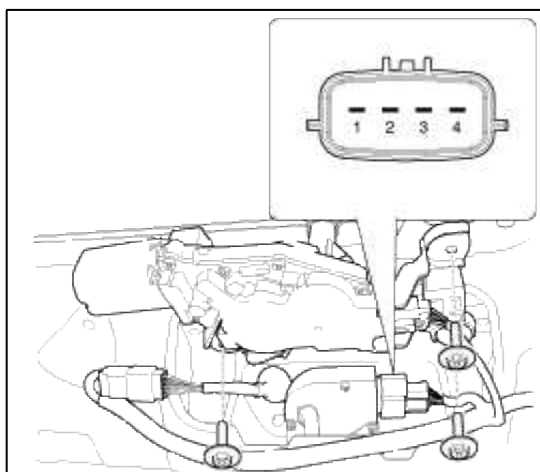


4. Check for continuity between the terminals in each switch position according to the table.

Terminal		2	3
Position			
Rear right	Open	○	○

#### Tailgate Open Switch Inspection

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.

Terminal		3	4
Position			
Open		○	○
Close		-	-

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

#### Inspection

#### Diagnosis With GDS

1. It will be able to diagnose defects of power door lock with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and "BCM".
3. Select the "SJB" to check.

4. Select "Current data", if you will check current data of power door lock system. It provides input/output status of SJB.

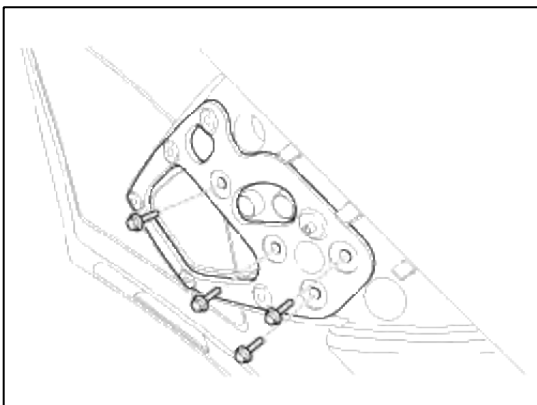
Current Data 50/106		
Selective Display ▾ Full List ▾ Graph ▾ Items List ▾ Reset Min/Max Record Stop ▾ Grouping		
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Driver Door Actuator Position Switch	Lock	-
<input type="checkbox"/> Door lock relay	OFF	-
<input type="checkbox"/> Door unlock relay	OFF	-
<input type="checkbox"/> 2-Turn unlock(D/Lock) relay	OFF	-
<input type="checkbox"/> Tailgate unlock relay	OFF	-
<input type="checkbox"/> Washer Switch	OFF	-
<input type="checkbox"/> INT Switch	OFF	-
<input type="checkbox"/> Defogger SW	OFF	-

5. To check the power door lock operation manually, select "Actuation test".

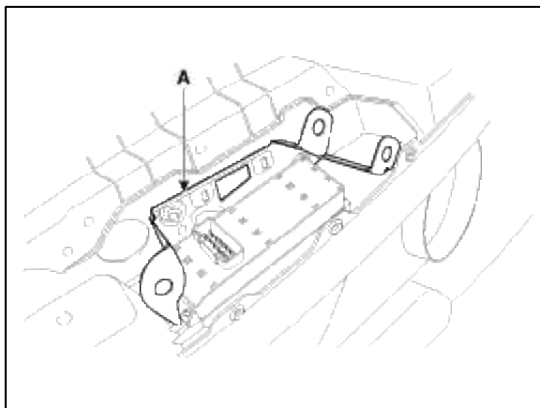
Actuation Test	
<b>Test Items</b> Head Lamp Low Relay Head Lamp High Relay Front Fog Lamp Burglar horn relay Tailgate/Trunk Release Relay Starter inhibit relay Rear defogger relay Front deicer relay <b>Central Door Lock Relay</b> Central Door Unlock Relay	• Duration: Until Stop Button • Conditions: IG. ON • Result: Success <div> <div>Start</div> <div>Stop</div> </div>

### Removal

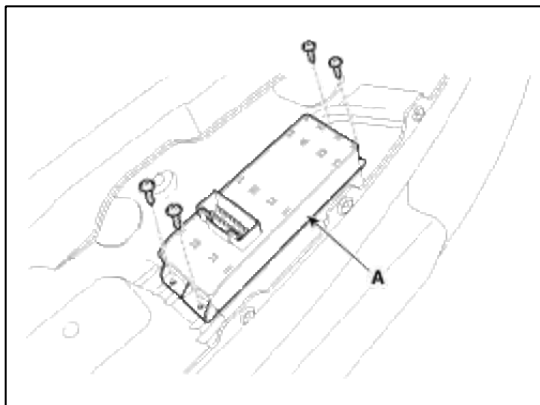
1. Disconnect the negative(-) battery terminal.
2. Remove the front door trim.  
(Refer to the BD group - "Front door")
3. Remove the grip holder cover, after loosening the screw (4EA).



4. Remove the grip holder cover bracket.



5. Remove the power window switch (A), after loosening the bolts (4EA).

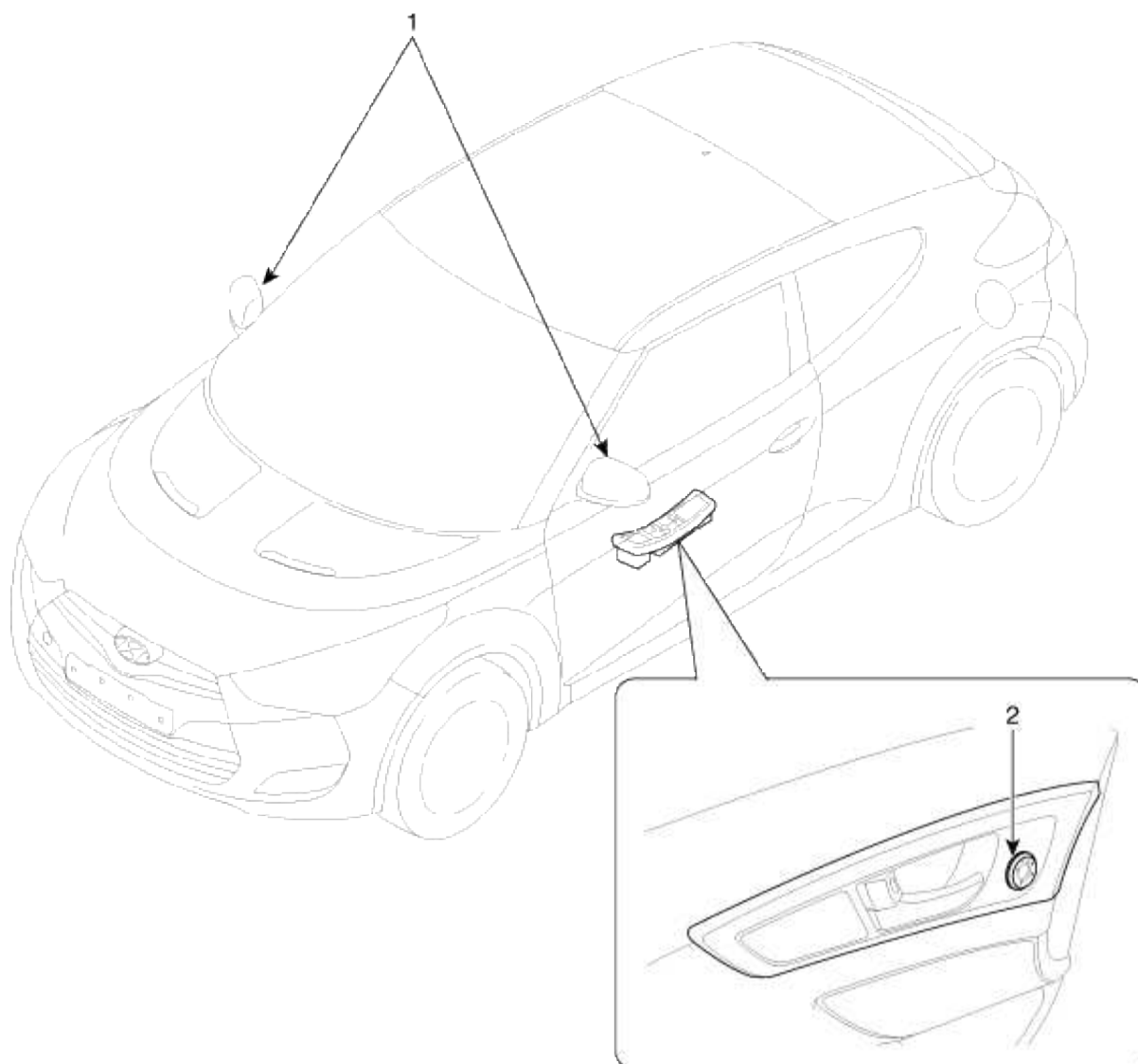


#### Installation

1. Install the power window switch.
2. Install the grip holder cover.
3. Connect the connector and install the front door trim panel.

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

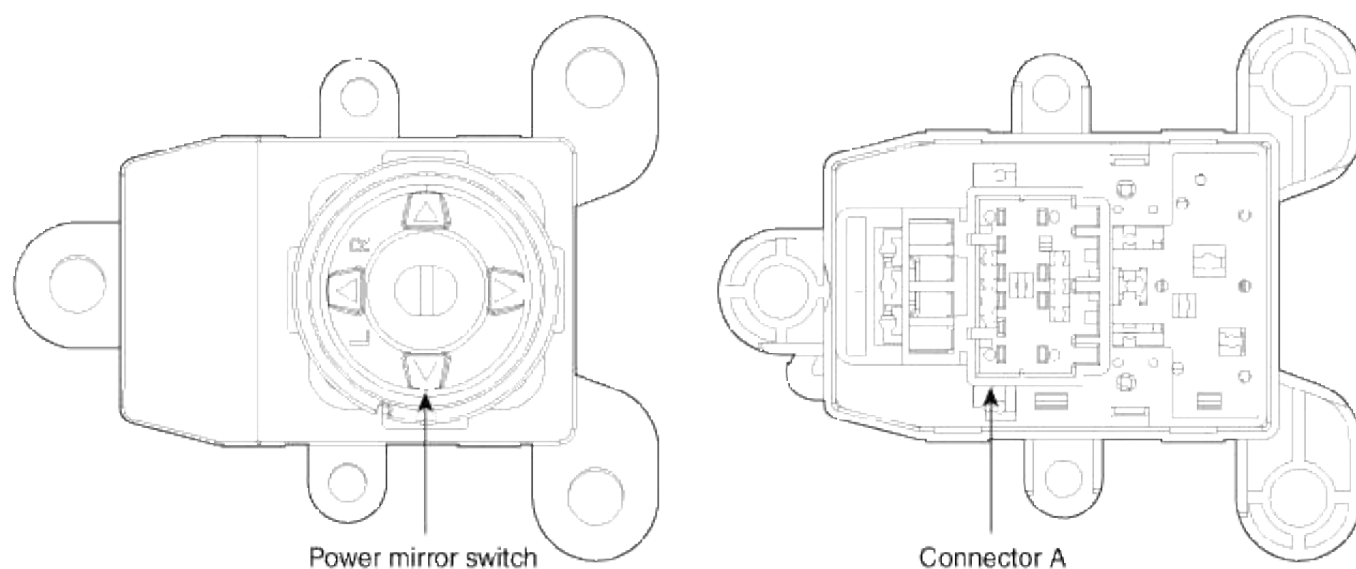
#### Components

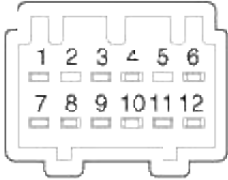


1. Power door mirror	2. Power door mirror switch
----------------------	-----------------------------

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

Circuit configuration

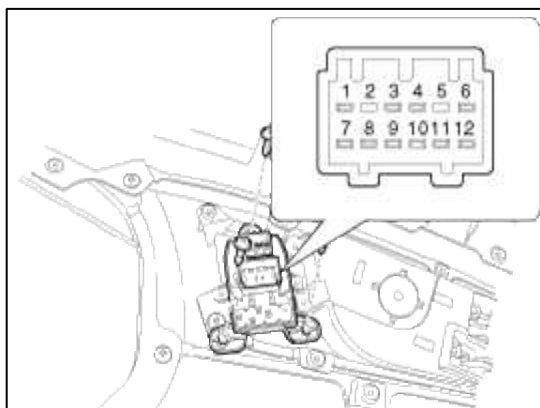


	
Pin No.	Connector A
1	Passenger mirror horizontal motor
2	-
3	Passenger mirror vertical motor
4	Driver mirror vertical motor
5	-
6	Driver mirror horizontal motor
7	ACC (mirror)
8	-
9	-
10	Ground
11	Battery
12	Common terminal

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

### Inspection

1. Disconnect the power door mirror switch module connector from front door trim panel.



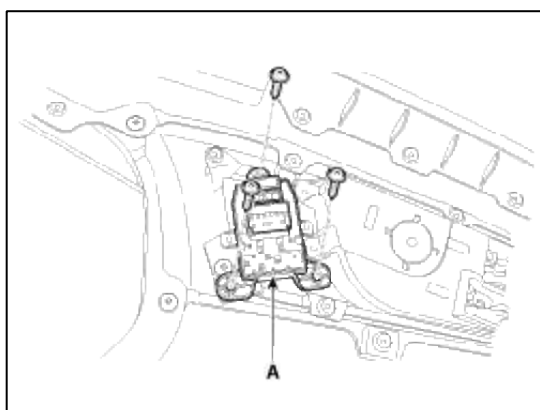
2. Check for the continuity between terminals of power door mirror switch according to the table.

[Power Mirror Switch]

Item	Terminal	4	6	3	1	12	7	10
	Direction							
Left	UP	○	○			○	○	○
	DOWN	○	○			○	○	○
	OFF	○	○			○	○	○
	LEFT	○				○	○	○
	RIGHT	○				○	○	○
Right	UP			○	○	○	○	○
	DOWN			○	○	○	○	○
	OFF			○	○	○	○	○
	LEFT			○	○	○	○	○
	RIGHT			○	○	○	○	○

## Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the front door trim panel.  
(Refer to the BD group - "Front door")
3. Disconnect the power door mirror switch connector(A) from the door trim panel.
4. Remove the power door mirror switch(A), after loosening the screw (3EA).



### NOTE

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

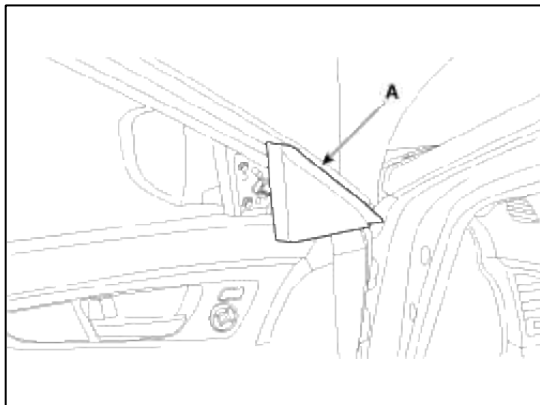
## Installation

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

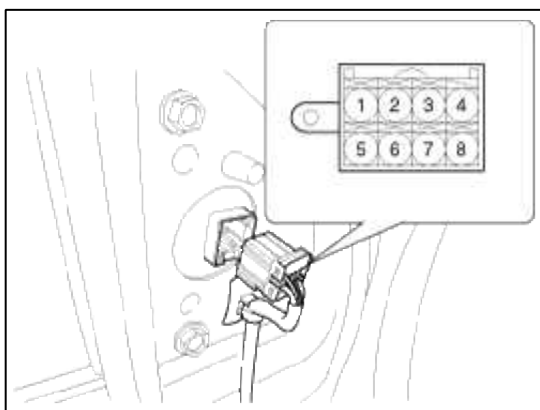
## Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

### Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the delta cover(A).



3. Disconnect the connector from the mirror.
4. Verify that the mirror operates properly as shown in the table.



	Direction	8	7	8	7	6	B+	Ground
		VL	HL	VR	HR	C		
Left	UP	●	○			○	○	○
	DOWN	○	●			○	○	○
	OFF	○	○	○	○	○	○	○
	RIGHT	○	○	○	○	○	○	○
Right	LEFT	○	○	○	○	○	○	○
	UP			○	○	○	○	○
	DOWN			○	○	○	○	○
	OFF			○	○	○	○	○
	RIGHT			○	○	○	○	○
	LEFT			○	○	○	○	○

### Mirror Heater Inspection

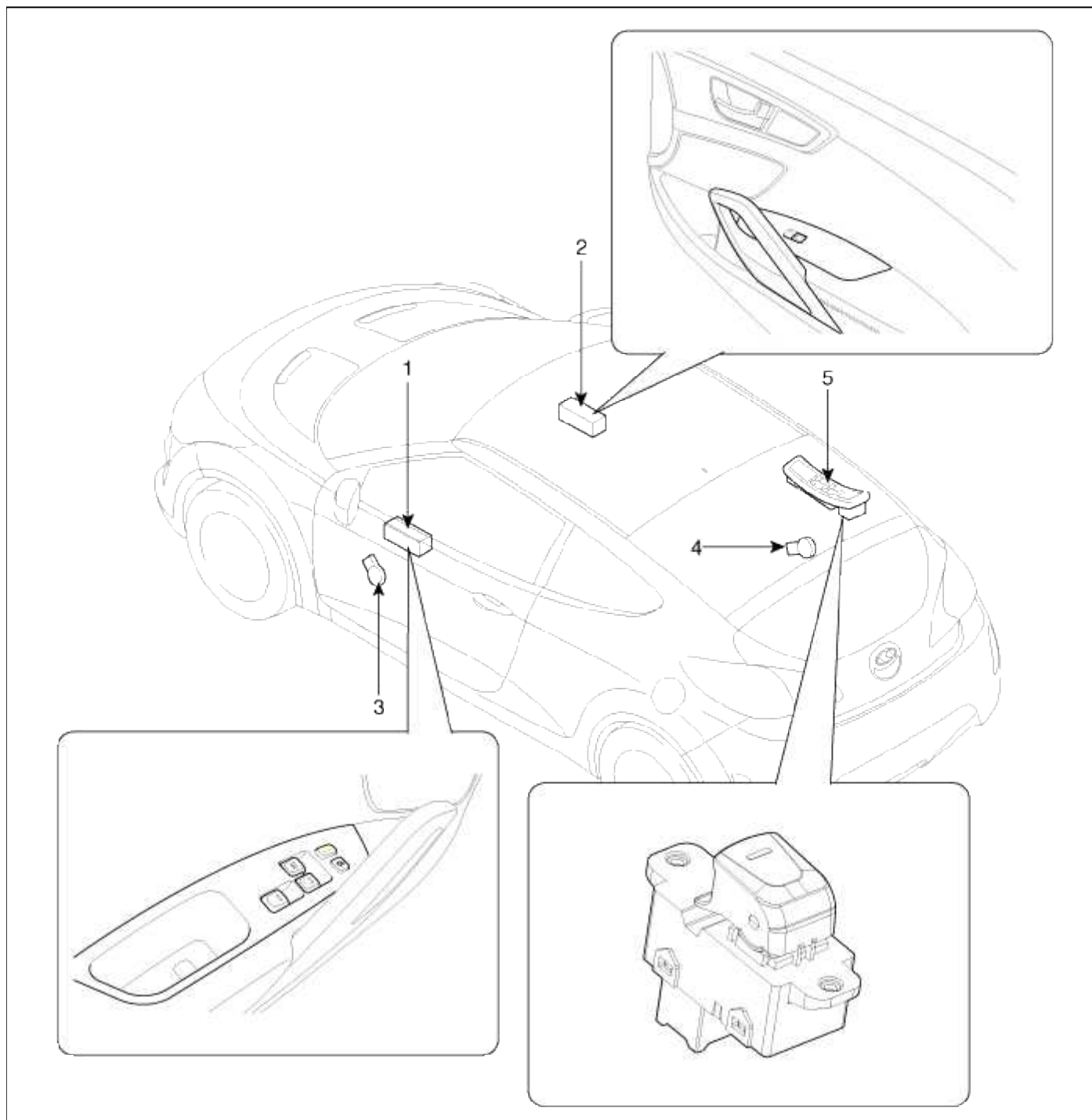
Terminal Position	1	2
Heater	+	-

Turn signal lamp inspection

Terminal Position	5	2
Turn signal	+	-

## Body Electrical System > Power Windows > Components and Components Location

### Component Location





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

## 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.

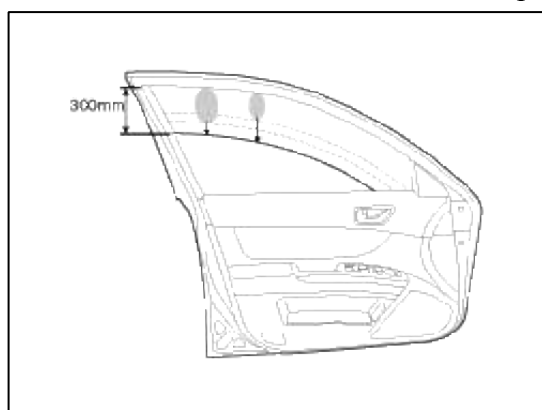
#### 1. Safety function condition

When detects the force of 100N during the window rising, window is reversed.

#### 2. Length of window reversing (except holding the auto-up switch)

A. When detects the jamming during the 4mm ~ 250mm from top of the door.

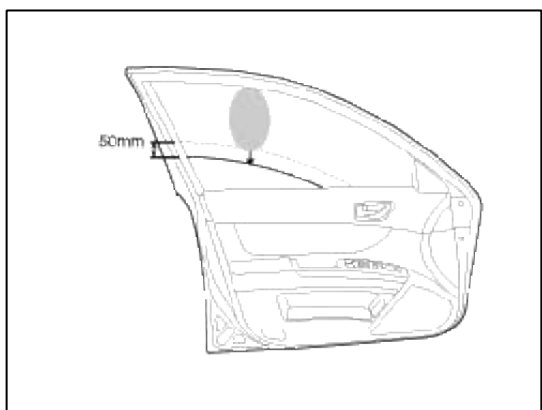
→ Window is reversed to 300mm from top of the door.



B. When detect the jamming over the 250mm from top of the door.

→ Window is reversed to 50mm from jamming position.

→ Window is reversed 50mm or bottom position in case of 50mm reversing distance.

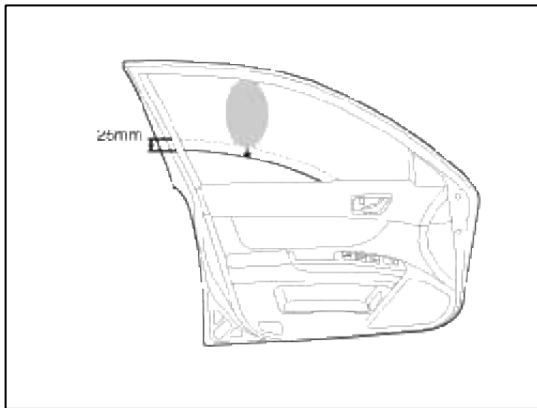


C. When detect the jamming over 300mm from top of the door.

→ Window stops at jamming 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 to 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 to 25mm from jamming position.
- D. When holding the auto-up switch after 5 seconds from above condition.  
→ Window is reverse to 25mm from jamming position.



### 4. Safety function is not available area

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

#### Normalization (Teaching)

After power on reset or error detection, the motor has to be normalized at the fully closed position.

How to be normalized:

- Move the window upwards into the fully closed position. As the window reaches the fully closed position, hold the power window switch in auto for  $T \geq 0.2$  seconds.
- If the block is recognized, the system state turns to normalized.

#### Recall And Storing The Normalization (teaching) Information

ECU records the normalization information into the specified location in Flash ROM. (as long as Flash ROM page is valid)

- Stroing conditions : Entering to sleep mode after valid switch input. Entering to low voltage(7.5V) after valid switch input.
- Recall conditions : Engine=ON or Power ON reset

#### Denormalization (Memory reset)

Under conditions below, ECU turns to denormalized status. After denormalization, auto up and safety function shall not be operated. In order to make these function active again, ECU should go through the normalization process.

- Denormalization conditions :
  1. Continuous 15 times reverses
  2. Power off during motor operation
  3. Driver side door opened and window glass is at the bottom (hard stop position) with IGN on, IGN off → within 2 sec, IGN on → Press Manual Down switch 3 times within 5 sec → De-normalization

Door and Glass status	IGN status	Input time	IGN status	Switch input status			Switch input times	Normalization status
				Re-input time	IGN status	Switch input		
Driver side door opened, Window glass is bottom with IGN on (Hard stop)	IGN Off	$T \leq 2$ sec	IGN On	$T \leq 5$ sec	IGN On	Press and release Manual down switch	3 times	De-normalization

### Window Position Control

To detect the window position and direction of motor rotation, hall sensors are employed. ECU recognizes the fully closed position of the window and sets this relative window position value as "0". When the window goes downwards, based on the information from the hall sensor, the relative position value increments. On the contrary, when the window goes upwards, it decrements.

### 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.

### Operation Time Limiter

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

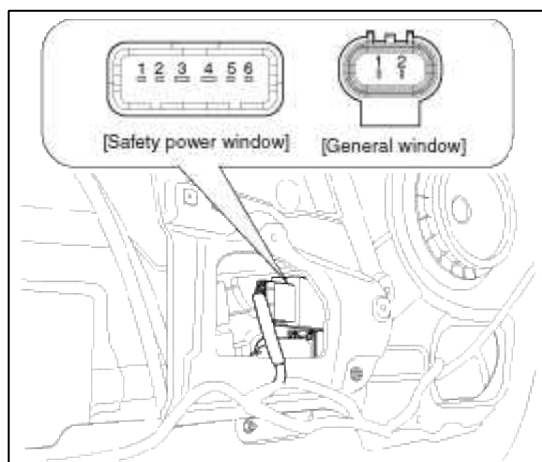
## Body Electrical System > Power Windows > Power Window Motor > Schematic Diagrams

### Circuit Diagram

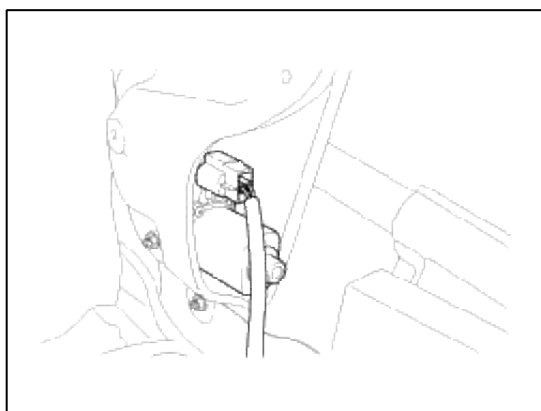
## Front Power Window Motor Inspection

2. Disconnect the connector from the motor.

[Driver]



[Assistant]



3. Connect the motor terminals No.2 and No.3 directly to battery voltage (12V) and connect the motor terminal No.4 to ground (0V).

Check that the motor operates smoothly.

If the operation is abnormal, replace the motor.

[Safety Power Window]

Terminal Position		1	4	6
LH	UP	○	○	
	DOWN		○	○
RH	UP	○	○	
	DOWN		○	○

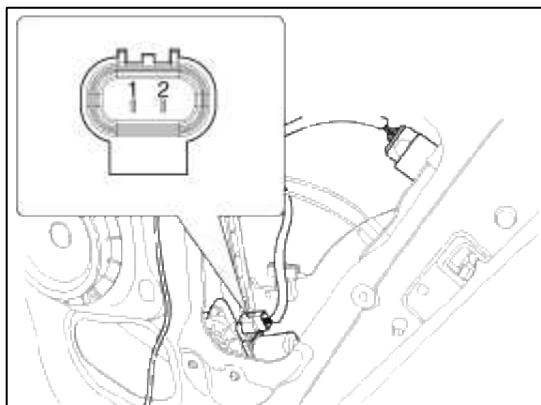
4. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

[General Window]

Position		Terminal	() : RHD	
			2(1)	1(2)
LH	UP	Clockwise (Counter clockwise)	⊕	⊖
	DOWN	Counter clockwise (Clockwise)	⊖	⊕
RH	UP	Clockwise (Counter clockwise)	⊖	⊕
	DOWN	Counter clockwise (Clockwise)	⊕	⊖

Rear Power Window Motor Inspection

1. Remove the rear door trim panel.  
(Refer to the BD group - "Rear door")
2. Disconnect the 2P connector from the motor.



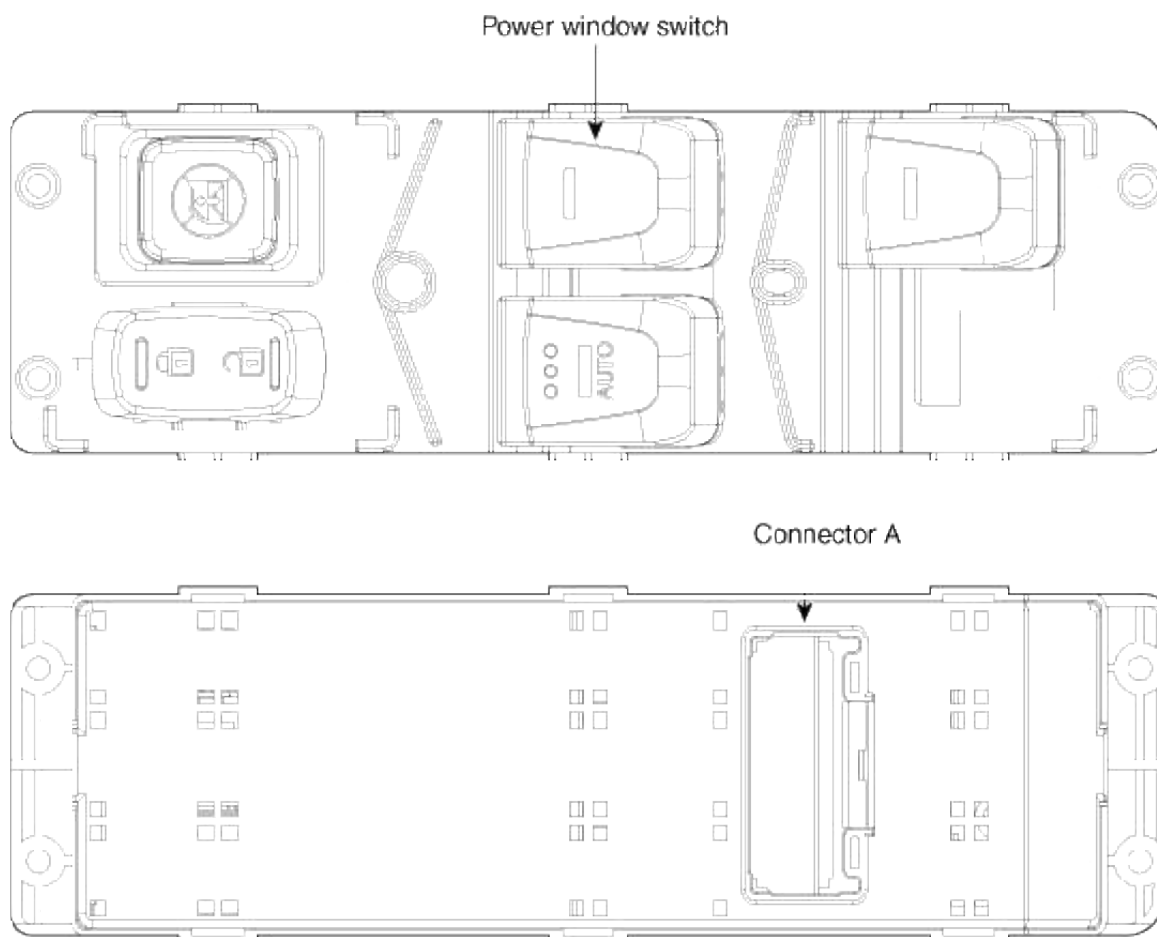
3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.


Position		Terminal	1	2
RH (L-H)	UP	Counter clockwise (Clockwise)	⊖	⊕
	DOWN	Clockwise (Counter clockwise)	⊕	⊖

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

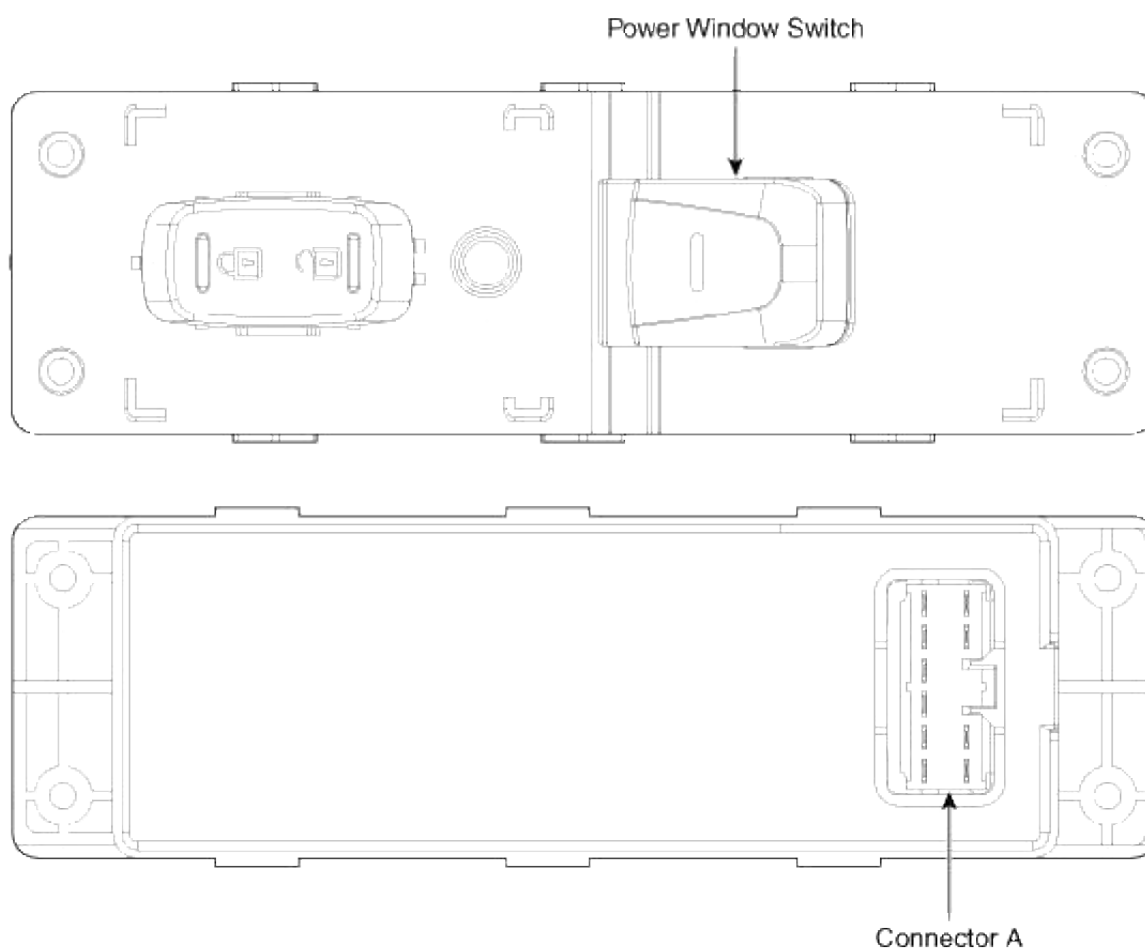
Circuit Diagram

Driver Power Window Switch

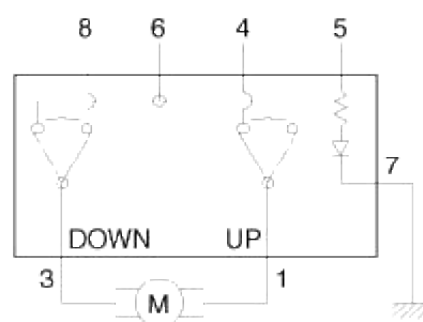


Pin No.			Pin No.	Description
1	Door lock		9	Front left window up
2	Door unlock		10	Front left window down
3	Rear left window down		11	Auto
4	Tail		12	B- (LH)
5	-		13	B+ (RH)
6	Rear left window up		14	Front right window down
7	Rear right window down		15	Ground
8	Rear right window up		16	Front right window up

Passenger power window switch

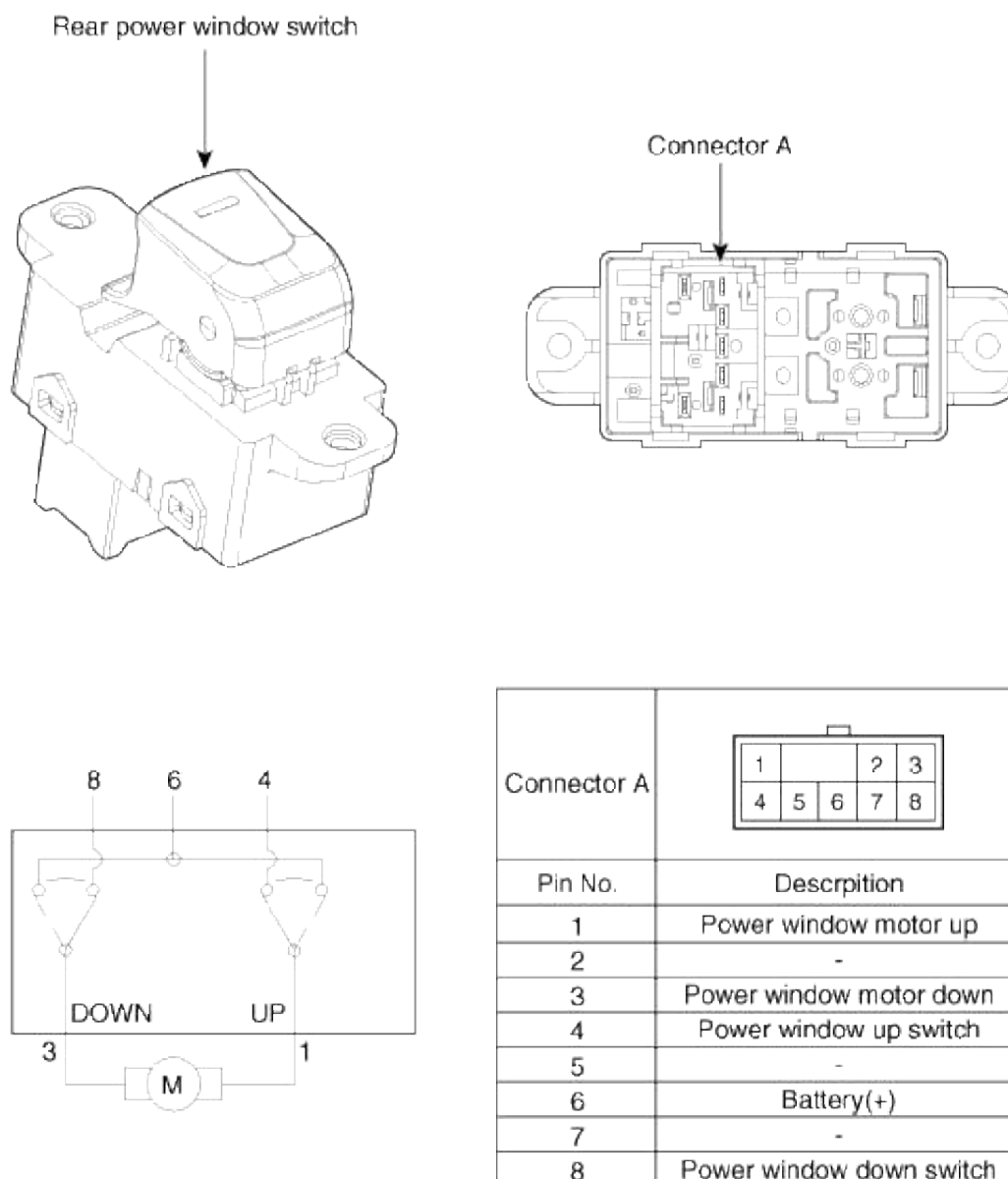


Pin No.	Connector A		Description
	1	2	
1	4	5	Power window motor up
2	6	7	-
3	8		Power window motor down
4			Power window up switch
5			Tail
6			Battery(+)
7			Ground
8			Power window down switch



Rear power window switch





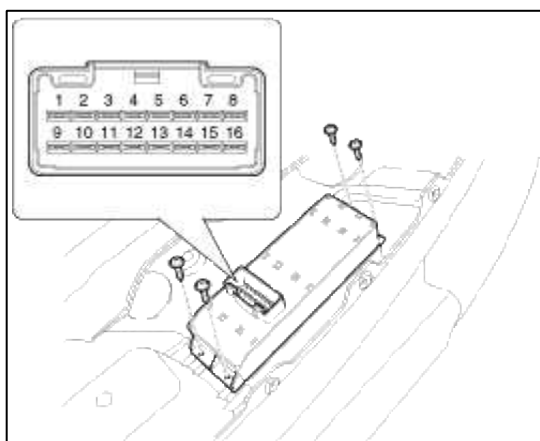
### Body Electrical System > Power Windows > Power Window Switch > Repair procedures

#### Inspection

##### Power Window Main Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel.  
(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.



Terminal Position	1	2	15
Lock	○	—	○
Unlock		○	○

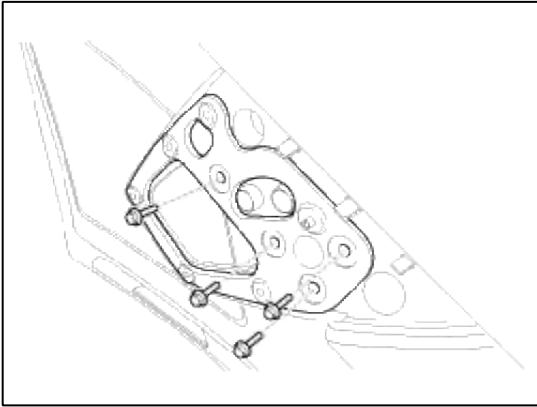
[Auto Down]

Terminal Position	Front left				Front right			
	15	9	10	11	13	16	14	15
UP	○	○			○	○	○	○
OFF						○	○	○
DOWN	○	—	○		○	○	○	○
AUTO DOWN	○			○				
Terminal Position					Rear right			
					13	6	3	15
UP					○	○	○	○
OFF						○	○	○
DOWN					○	○	○	○

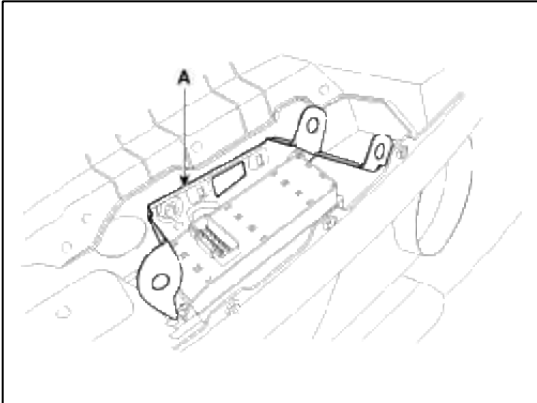
[Safety Up/Down]

Terminal Position	Front left				Front right			
	15	9	10	11	13	16	14	15
UP	○	○			○	○	○	○
AUTO UP	○	○	—	○				
OFF						○	○	○
DOWN	○	—	○		○	○	○	○
AUTO DOWN	○	○	○	○				
Terminal Position					Rear right			
					13	6	3	15
UP					○	○	○	○
OFF						○	○	○
DOWN					○	○	○	○

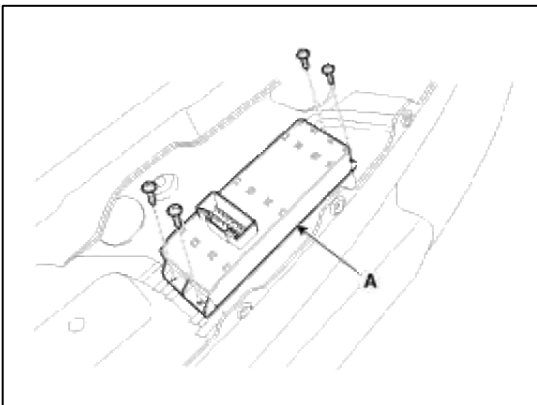
4. Remove the grip holder cover after loosening 4 bolts.



5. Remove the grip holder bracket (A).

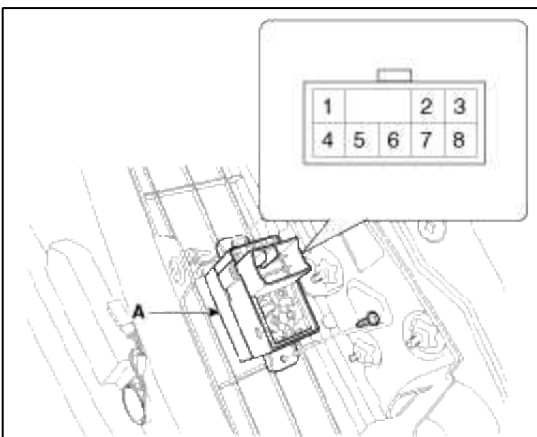


6. Remove the power window switch module (A) after loosening 4 screws.



#### Passenger Power Window Switch Inspection

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



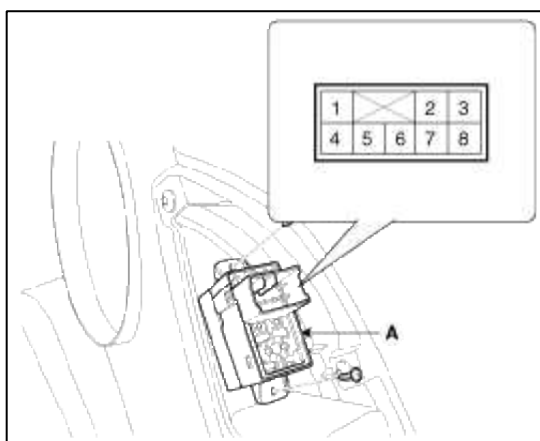
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Terminal Position	6	4	8	3	1
UP	○		○	○	○
OFF		○	○	○	○
DOWN	○	○		○	○

5. Remove the power window switch after loosening 2 screws.

#### Rear Power Window Switch Inspection

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



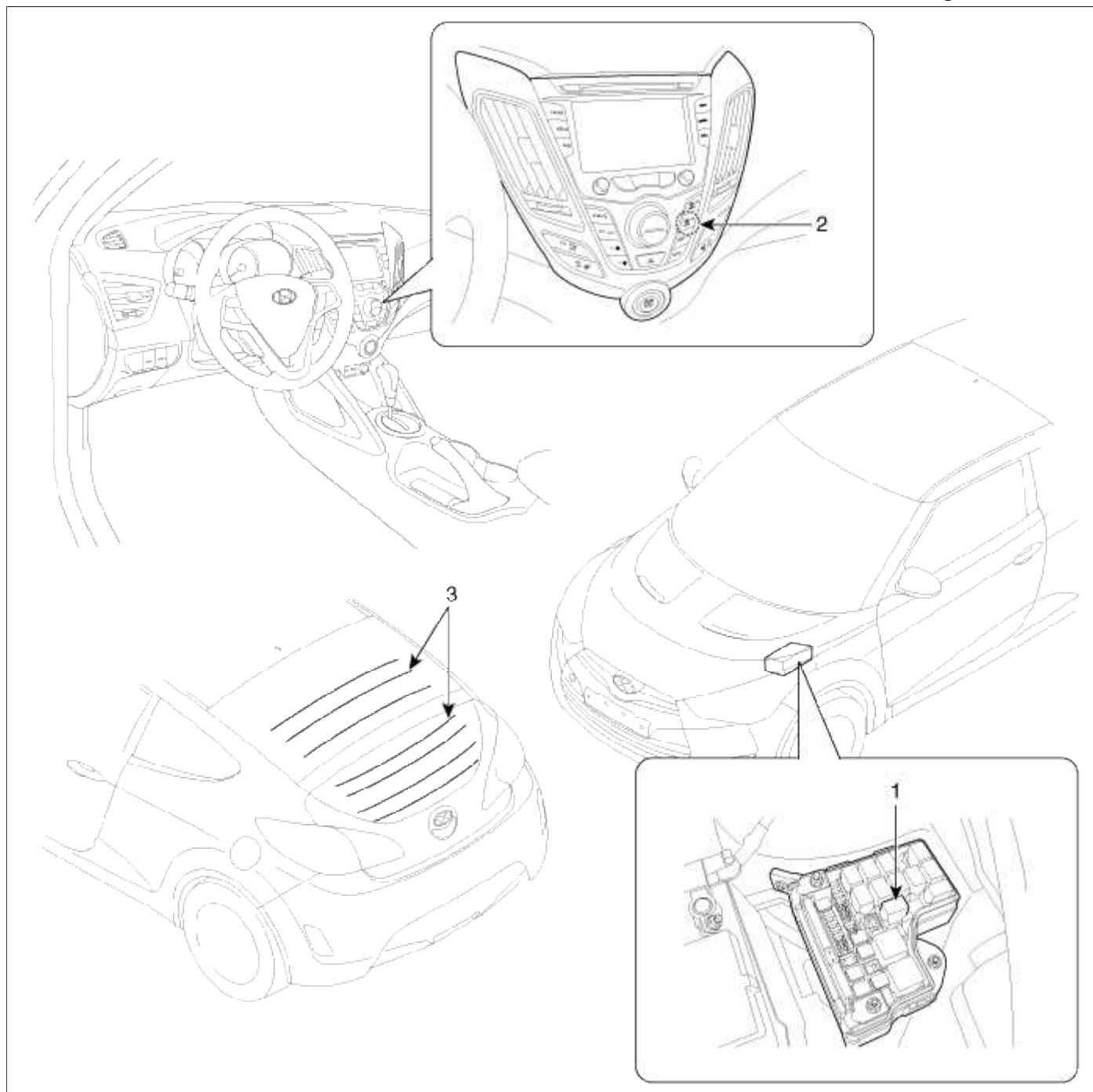
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Terminal Position	6	4	8	3	1
UP	○		○	○	○
OFF		○	○	○	○
DOWN	○	○		○	○

5. Remove the power window switch after loosening 2 screws.

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

#### Component Location



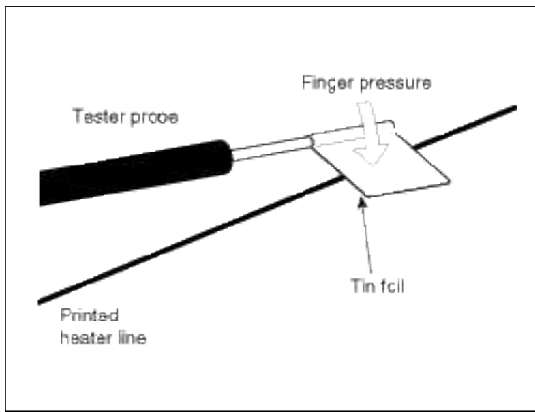
- |  |                        |
|--|------------------------|
| 1. Rear glass defogger relay (Engine room relay box) | 3. Rear glass defogger |
| 2. Rear glass defogger switch (A/C controller)       |                        |

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

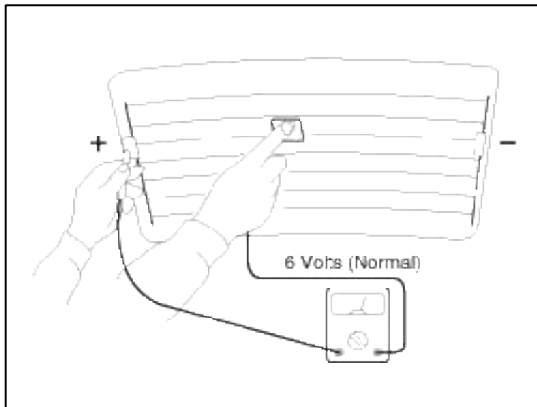
#### Inspection

##### CAUTION

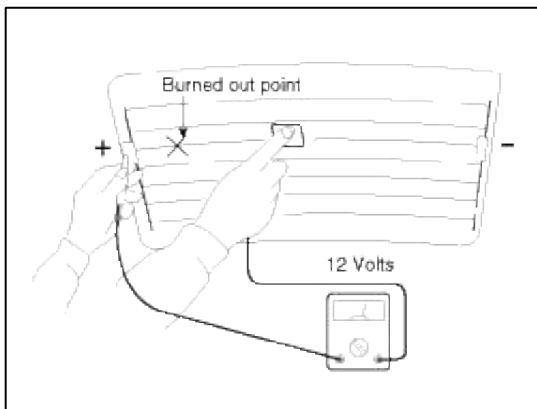
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.



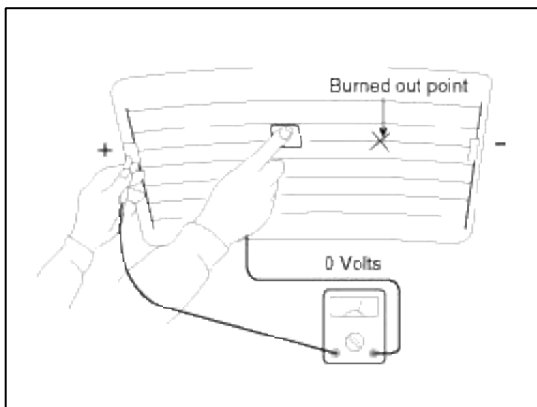
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



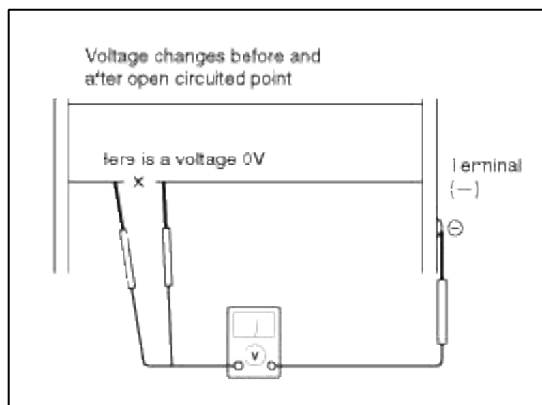
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.



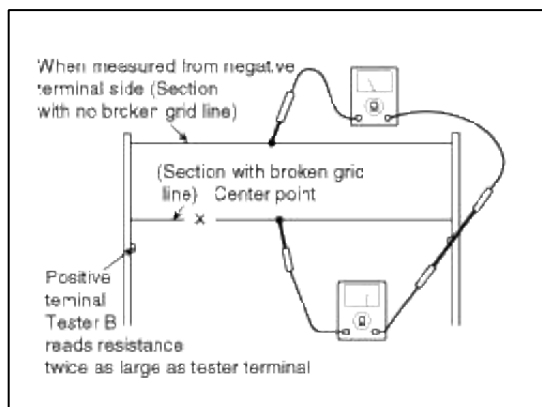
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.



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



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



6. If the heat line fails, replace the rear glass.  
(Refer to the BD group - "Interior - Tailgate glass")

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

#### Inspection

1. The rear glass defogger switch inputs can be checked using the GDS.
2. To check the input value of rear glass defogger switch, select option "Body Control Module".
3. To consult the present input/output value of BCM, "Current DATA". It provides information of BCM input/output conditions of smart junction box.

Current Data 21/42		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop		
Sensor Name	Value	Unit
<input type="checkbox"/> Rear defogger relay	OFF	-
<input type="checkbox"/> Burglar Alarm Horn Relay	OFF	-
<input type="checkbox"/> Start Inhibitor Relay	OFF	-
<input type="checkbox"/> Tailgate/Trunk Release Relay	OFF	-
<input type="checkbox"/> Central door lock switch	OFF	-
<input type="checkbox"/> Power Window Relay	ON	-

4. To check the input value of rear glass defogger switch in force mode, select option "Actuation Test of smart junction box".

**Actuation Test**

Test Items	
Rear defogger relay	
Front deicer relay	
Central Door Lock Relay	
Central Door Unlock Relay	
Power window relay	
Turn Left Signal	
Turn Right Signal	
Flasher Sound Relay[Option]	

● Duration  
 Until Stop Button

● Conditions  
 IG, ON

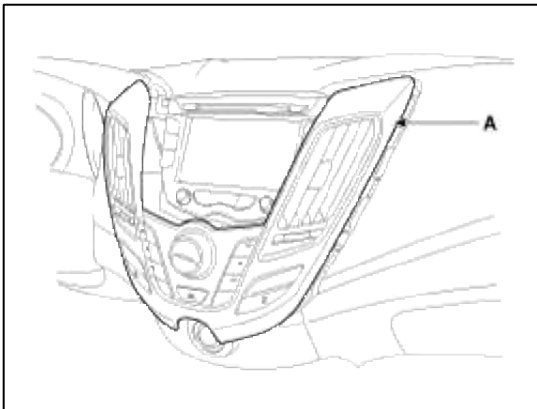
● Result  
 Success

Start

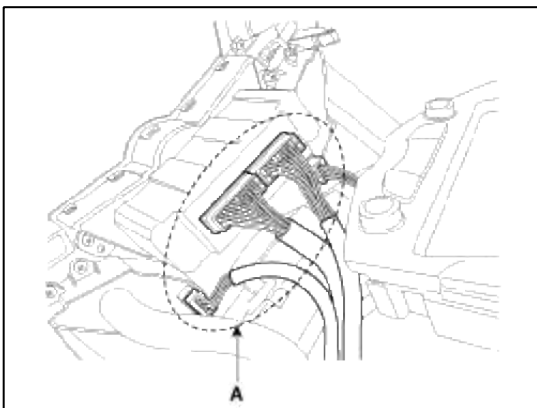
Stop

## Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the center fascia panel assembly (A).  
(Refer to the Body group - "Crash pad")

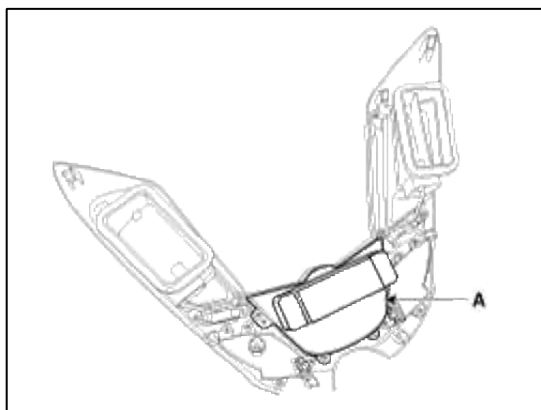


3. Remove the center fascia panel connector (A).





4. Remove the heater and air conditioner controller (A), after loosening the screw (4EA).

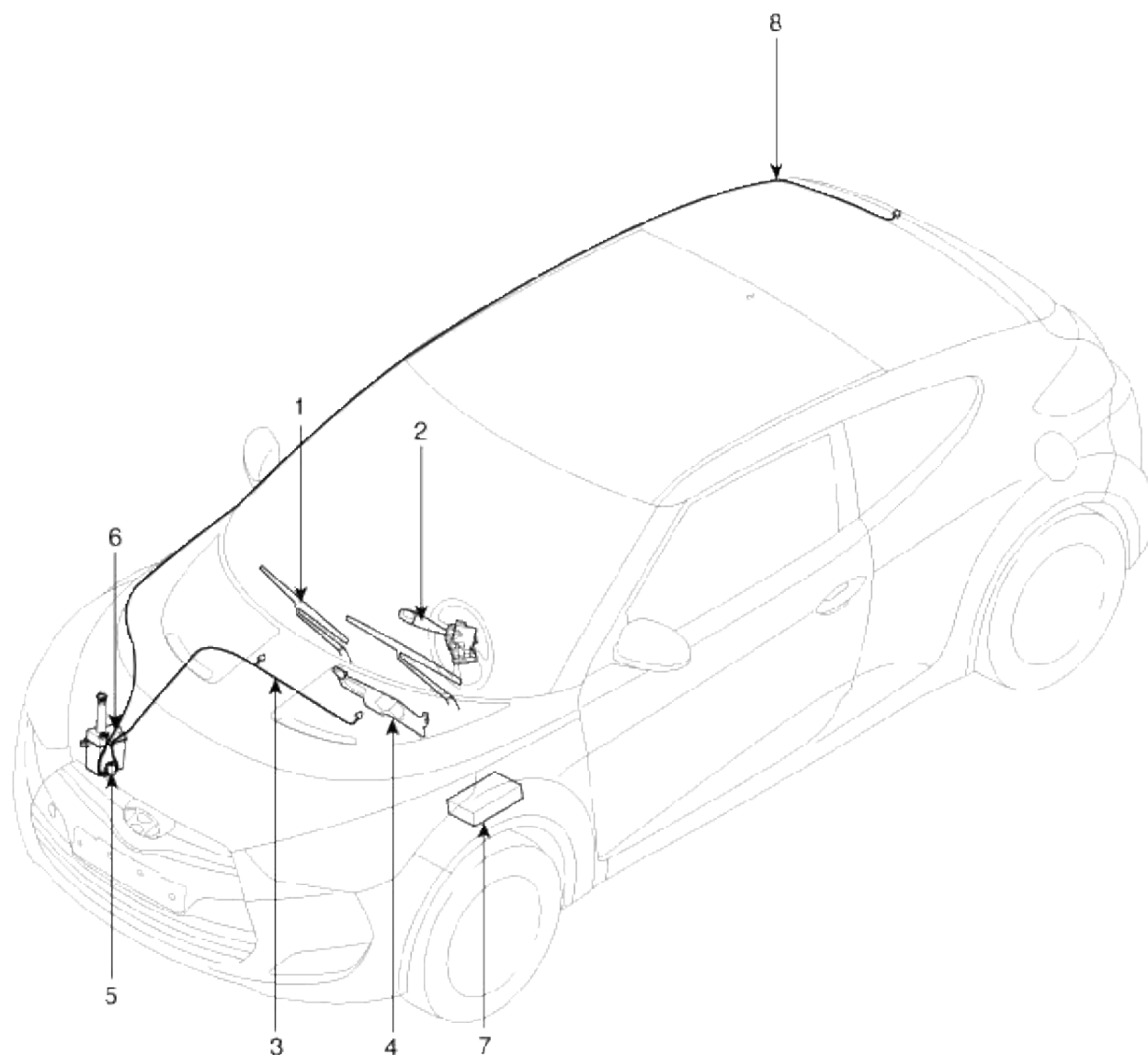


#### Installation

1. Install the heater and air conditioner controller to the center fascia panel.
2. Install the center fascia panel assembly.

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

#### Component Location

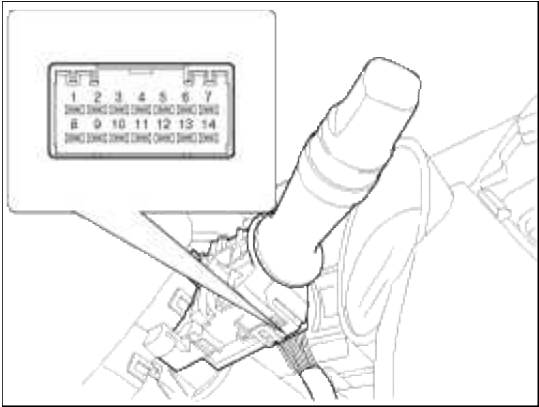


- |                                     |  |
|-------------------------------------|--|
| 1. Windshield wiper arm & blade     | 5. Washer motor                        |
| 2. Wiper & washer switch            | 6. Washer reservoir                    |
| 3. Windshield washer hose           | 7. Wiper relay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

### Body Electrical System > Windshield Wiper/Washer > Windshield Wiper-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.



Wiper Switch

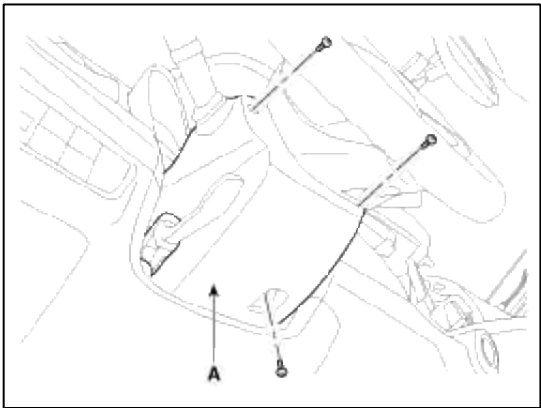
Terminal Position	3	9	2	8	10	1	12	13
MIST								
OFF								
INT								
LOW								
III								

Washer Switch

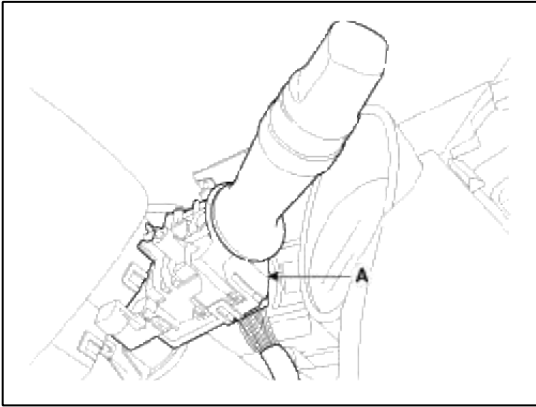
Terminal Position	11	10
OFF		
ON		

Removal

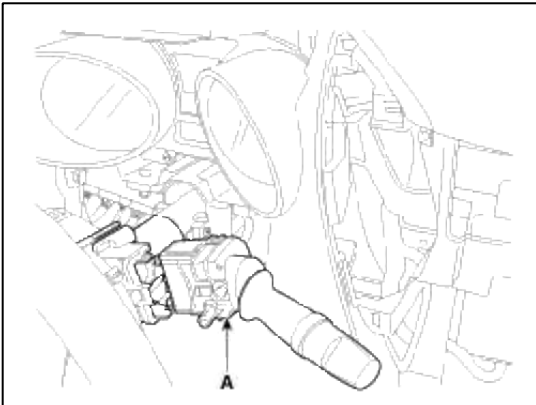
1. Remove the steering column upper and lower shrouds (A) after removing 3 screws.



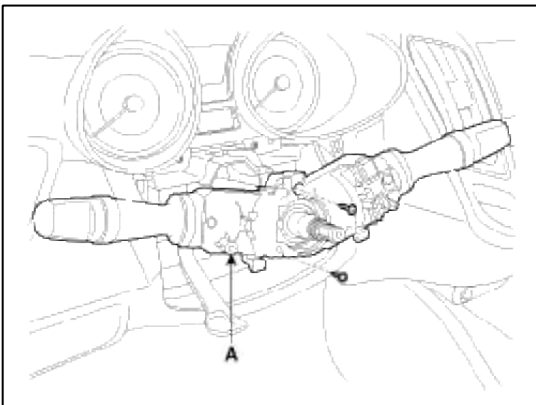
2. Disconnect the connector(A).



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



4. Remove the steering wheel.  
(Refer to the ST group - "Steering column and shaft")
5. Remove the clock spring.  
(Refer to the RT group - "Airbag module")
6. Remove the multifunction switch assembly(A) with 2 screws.

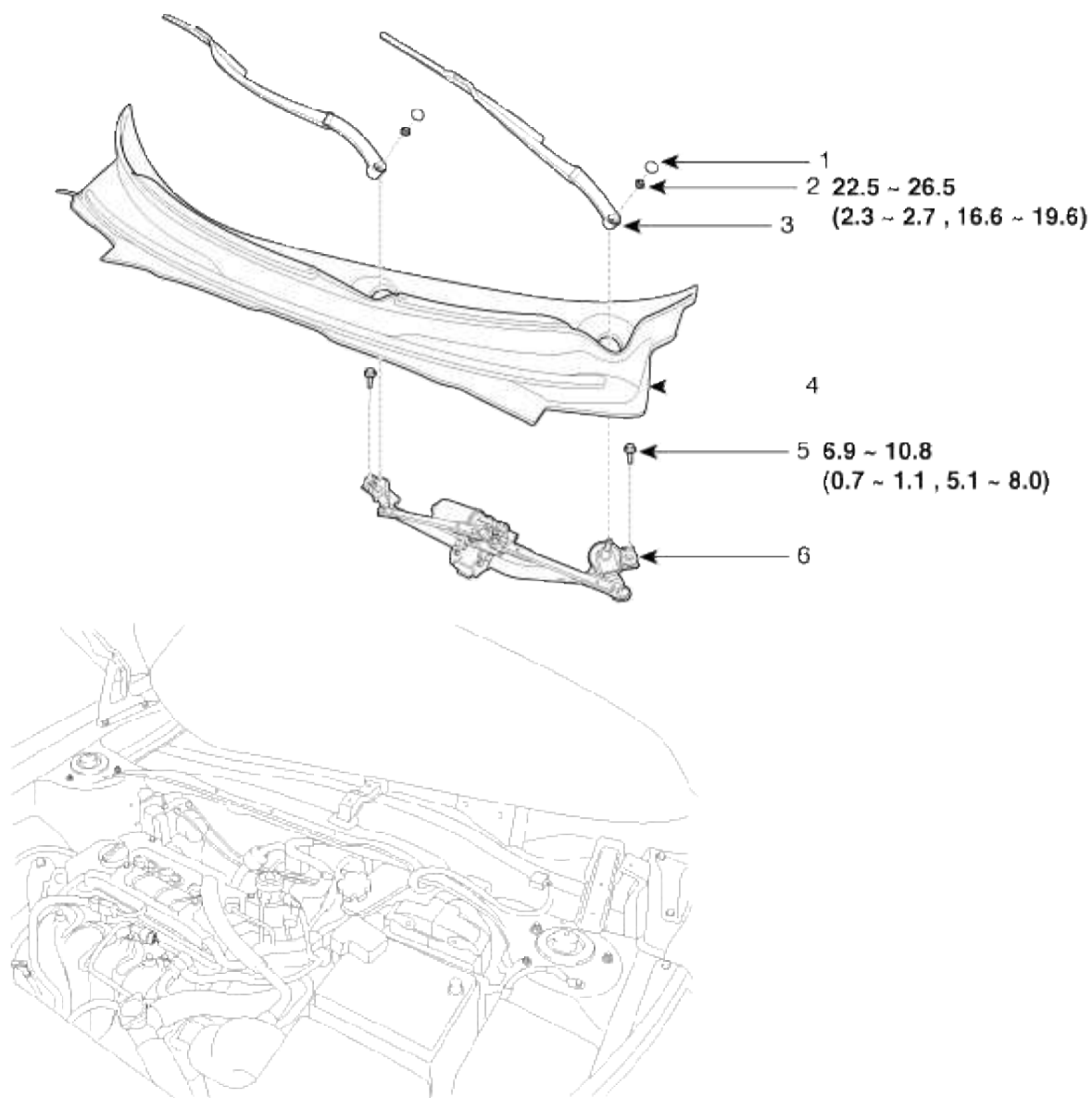


#### Installation

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

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

#### Component Location

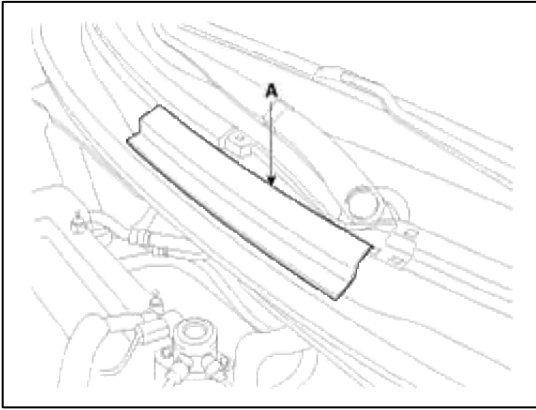


1. Cap	4. Cowl top cover
2. Nut	5. Bolt
3. Wiper arm & blade	6. Wiper motor & linkage assembly

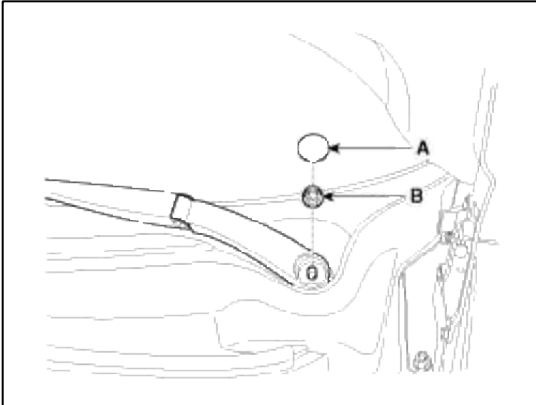
### Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

#### Removal

1. Remove the passenger cowl top cover (A) to remove passenger wiper blade.

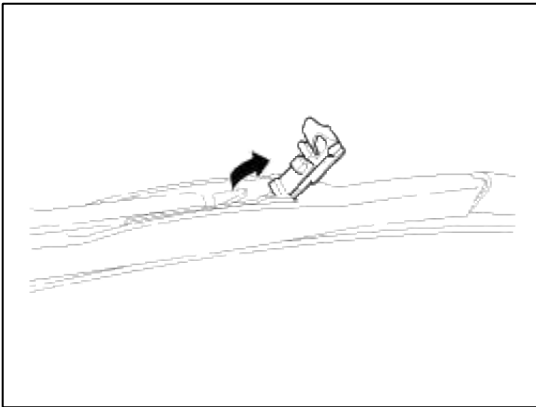


2. Loosen the windshield wiper arm nut (B) after removing a wiper cap (A).

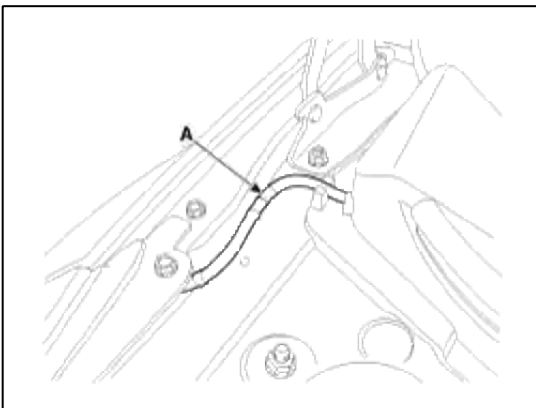


3. Remove the windshield wiper arm and blade.

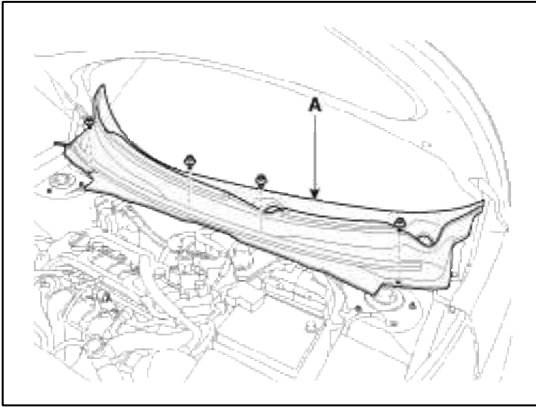
4. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius of wiper arm.



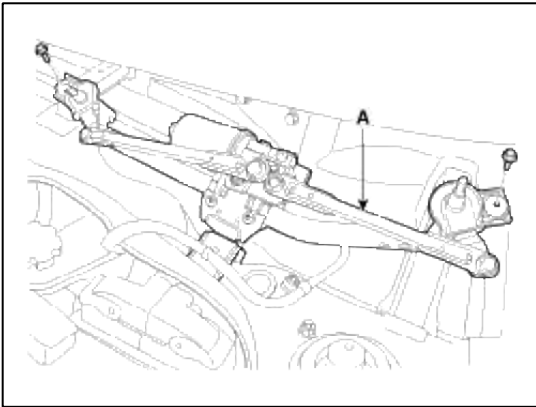
5. Disconnect the washer hose (A) connected to cowl top cover.



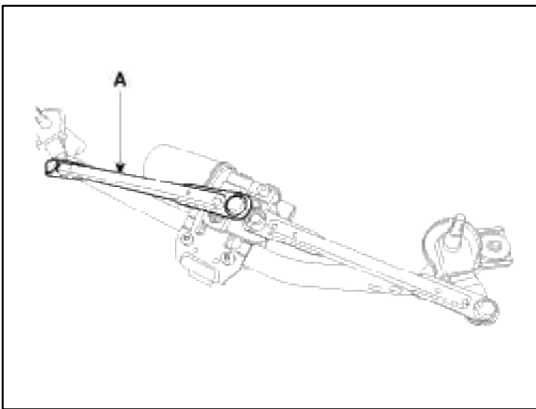
6. Remove the weather strip and the cowl top cover (A) after removing 4 rivets.



7. Disconnect the wiper motor connector from the wiper motor & linkage assembly.  
 8. Remove the windshield wiper motor and linkage assembly (A) after removing 2 bolts.



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



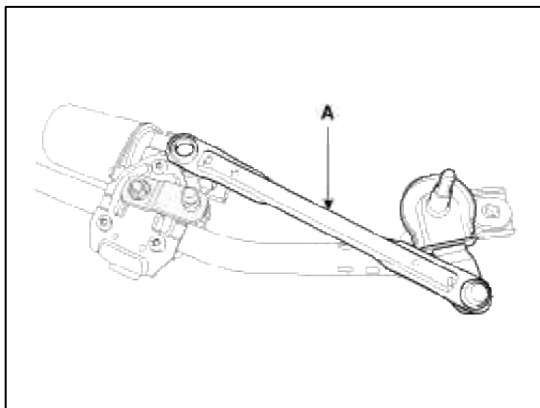
#### CAUTION

Before removing the wiper motor and linkage assembly, make sure that the linkage is stopped at auto stop position.

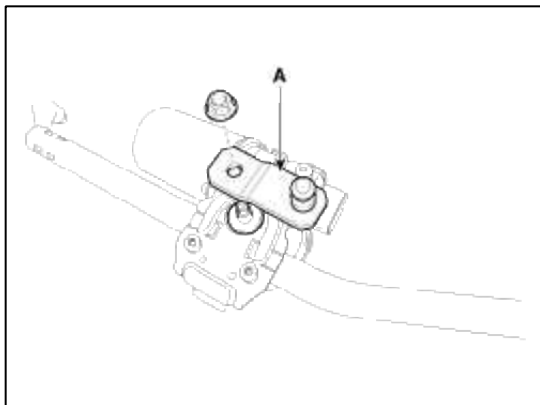
To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.

Be careful not to bend the linkage.

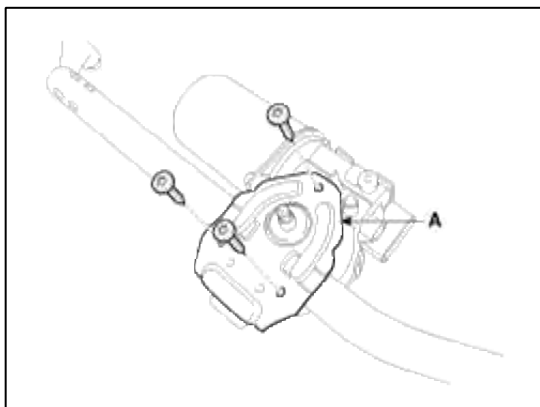
10. Remove the lower linkage (A) from the wiper motor crank arm.



11. Remove the wiper motor crank arm (A), after loosening the nut.



12. Remove the wiper motor(A), after loosening 3 bolts.



#### Installation

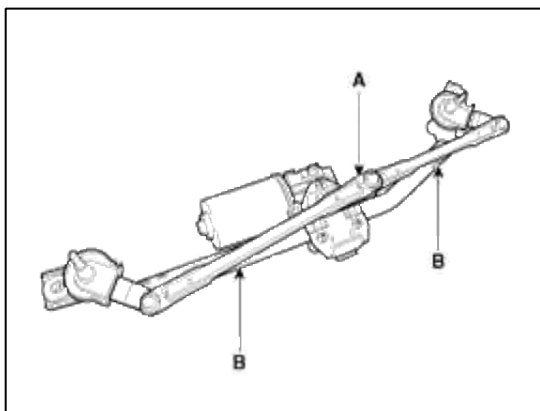
1. Install the wiper motor.
2. Install the crank arm.



## 3. Install the linkage to the wiper motor crank arm.

**CAUTION**

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



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

**Tightening torque:**

6.9 ~ 10.8Nm (0.7 ~ 1.1, kgf.m, 5.1 ~ 8.0 lb-ft)

## 5. Install the cowl top cover.

## 6. Install the windshield wiper arm and blade.

**Tightening torque:**

22.5 ~ 26.5 Nm (2.3 ~ 2.7 kgf.m, 16.6 ~ 19.6 lb-ft)

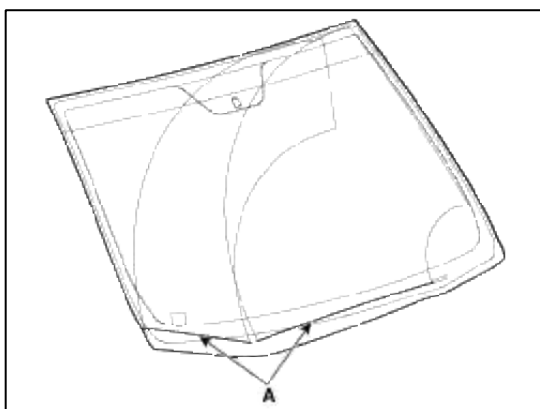
**NOTE**

- The windshield wiper motor must be cycled to make sure that it is in the auto stop position.

If necessary, adjust the wiper arm and blade.

## 7. Install the wiper arm and blade to the auto stop position.

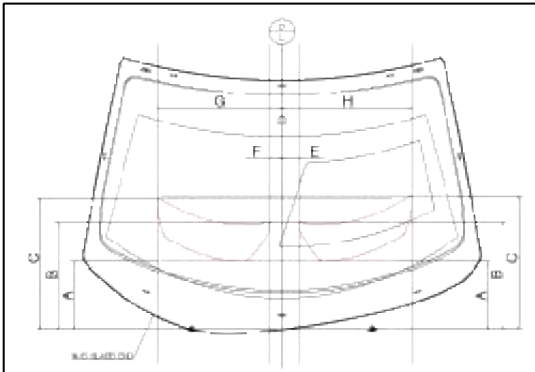
A : Auto stop position (Blade)



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

**NOTE**

- When you turn on the washer, confirm 50% or more of washer fluid lands within the spray area.
- If the spray area is not within the standard positions, adjust the nozzle(s).

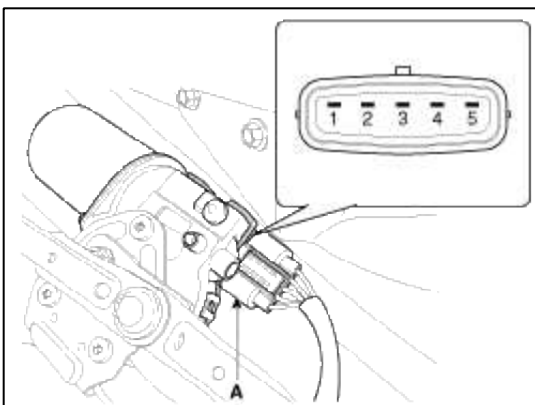


Specified position	Distance (in)	Distance (mm)
A	9.88	251
B	15.51	394
C	18.94	481
D	19.33	491
E	2.48	63
F	1.67	42.5
G	18.09	459.5
H	18.82	478

### Inspection

#### Speed Operation Check

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



Pin No.	Description
1	Ground
2	Parking
3	Battery
4	Low
5	High

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

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

**CAUTION**

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

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

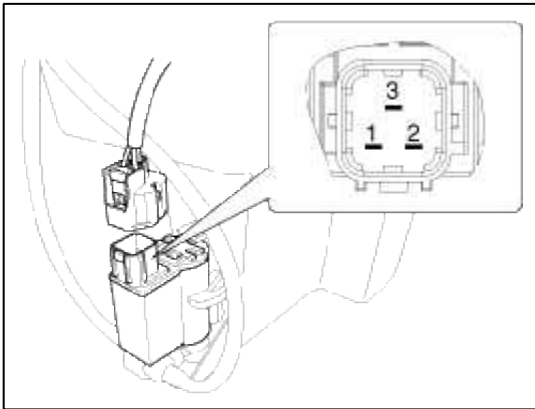
1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.

**NOTE**

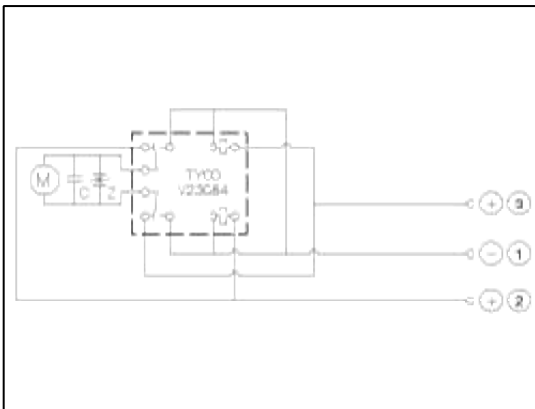
Before filling the reservoir tank with water, check the filter for foreign material or contamination. if necessary, clean the filter.

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.



Pin No.	Description
1	Ground
2	Front windshield washer (+)
3	Rear windshield washer (+)

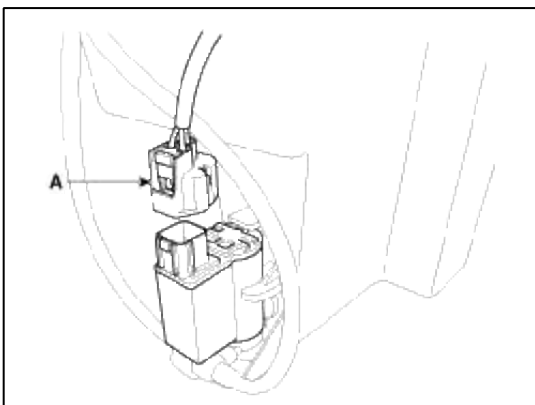


## Removal

### CAUTION

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

1. Disconnect the negative (-) battery terminal.
2. Remove the front right tire and the wheel cover.
3. Remove the washer hose and disconnect the washer motor connector (A).



4. Remove the washer reservoir after removing 2 bolts (A).



#### Installation

1. Install the washer reservoir.

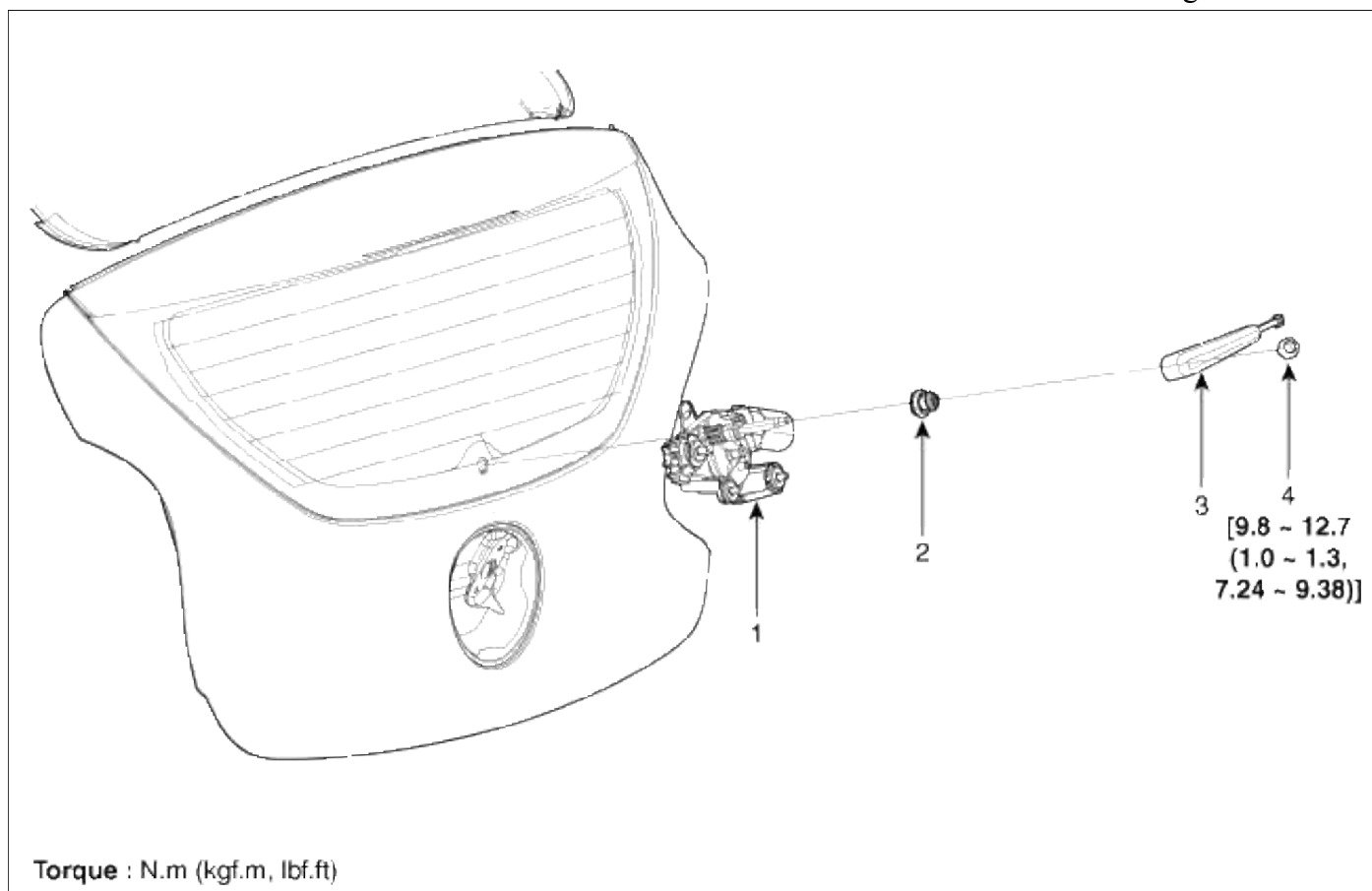
##### NOTE

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

2. Install the washer motor.
3. Install the washer hose.
4. Connect the washer motor connector.
5. Install the tire and the wheel cover.
6. Check the washer motor operation.

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

##### Component Location



1. Rear wiper motor assembly	3. Rear wiper arm & blade
2. Rear wiper motor grommet	4. Nut

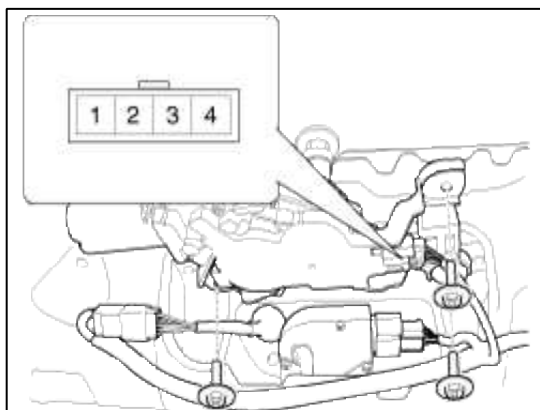
### Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

#### Inspection

#### Rear Wiper Motor

1. Remove the connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 3 and 4 respectively.

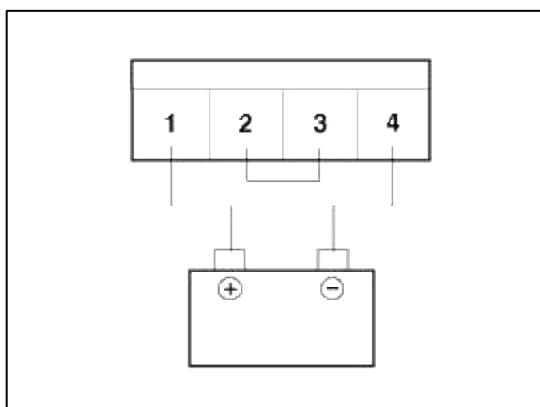
3. Check that the motor operates normally. Replace the motor if it operates abnormally.



No	Description	No	Description
1	Battery	3	Switch
2	Parking	4	Ground

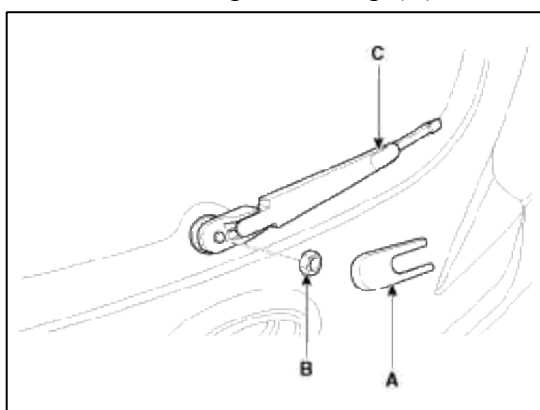
#### Automatic Stop Operation Check

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

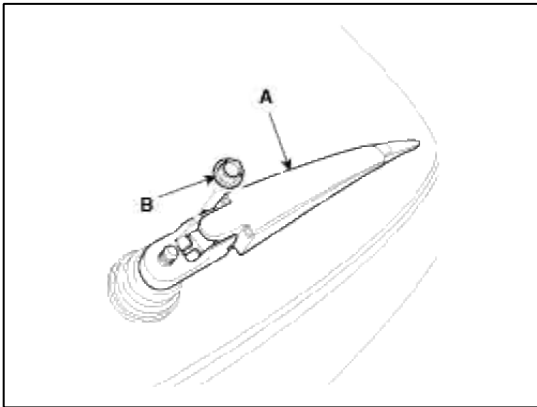


#### Removal

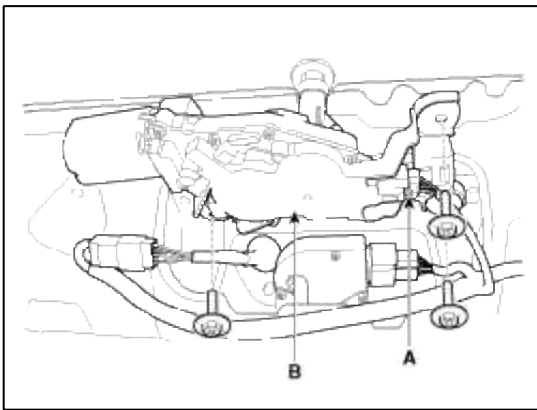
1. Detach the rear wiper head cap (A).



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



3. Remove the rear wiper grommet.
4. Open the tailgate then remove the tailgate trim.  
(Refer to the BD group - "Tailgate")
5. Disconnect the rear wiper motor connector (A) then remove the rear wiper motor (B) after loosening bolts (3EA).



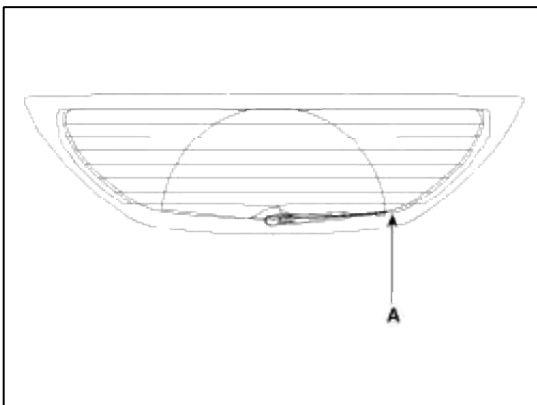
#### Installation

1. Install the rear wiper motor assembly and the grommet.

#### NOTE

Do not reuse the rubber pad if it is damaged.

2. Install the tailgate trim.  
(Refer to the BD group - "Tailgate")
3. Set the rear wiper blade and to the lowest defogger heat line and tailgate glass.
4. Set the rear washer nozzle on the specified spray position.





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

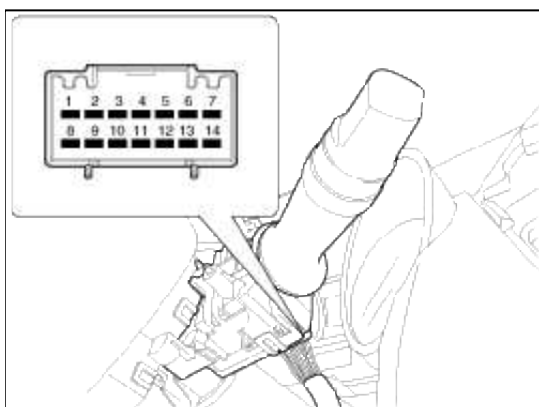
### Tightening torque Nut :

9.8 ~ 12.7 N.m (1.0 ~ 1.3 kgf.m, 7.24 ~ 9.38 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 washer switch.



### Rear Wiper Switch

Terminal Position	6	7	14
OFF			
INT	○	○	
ON	○	○	○

### Rear Washer Switch

Terminal Position	6	5
OFF		
ON	○	○

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

### Inspection

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

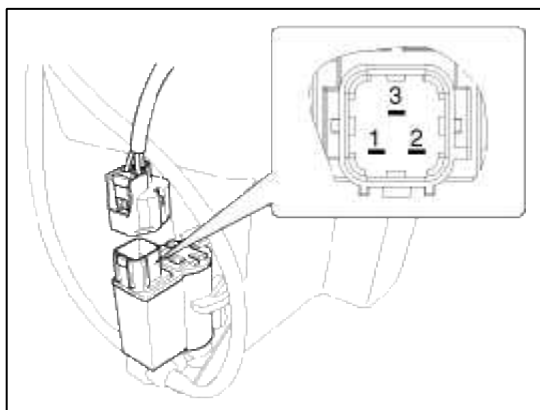
#### NOTE

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

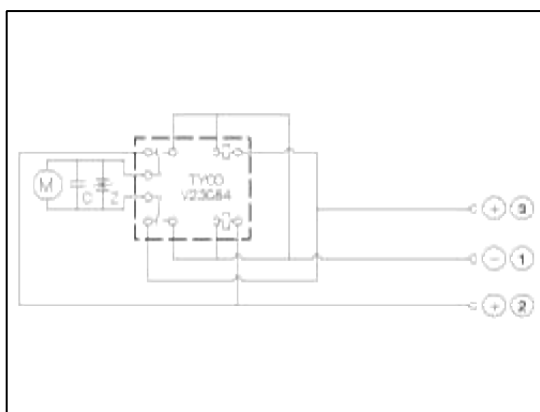
2. Connect positive (+) and negative (-) battery cables to terminals 3 and 2 respectively.

3. Check that the motor operates normally and the washer motor runs and water sprays from the rear nozzle.

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

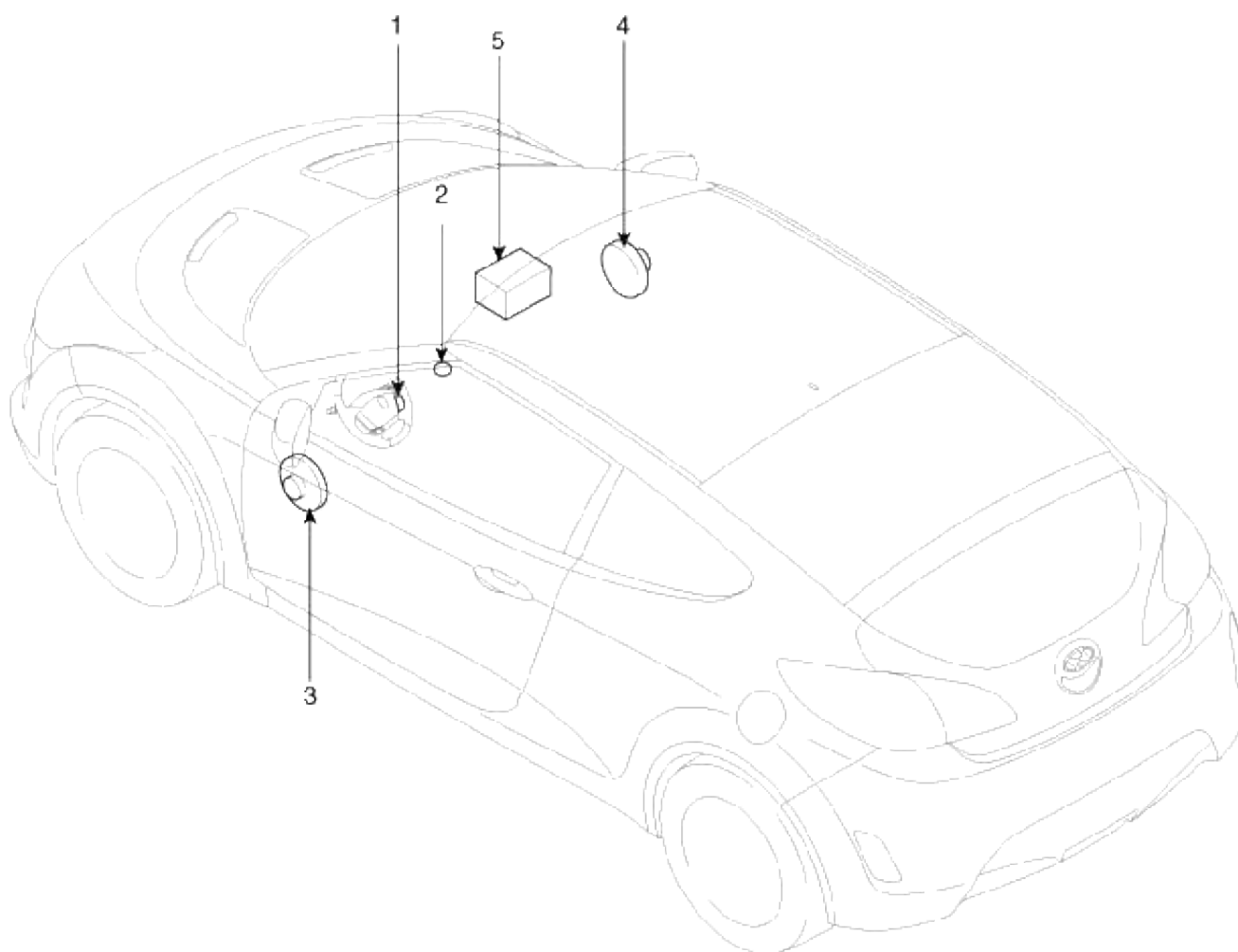


Pin No.	Description
1	Ground
2	Front windshield washer (+)
3	Rear windshield washer (+)



## Body Electrical System > Hands Free System > Components and Components Location

### Components



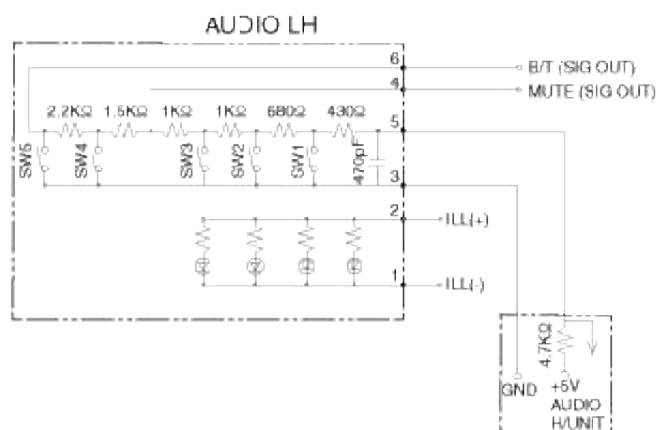
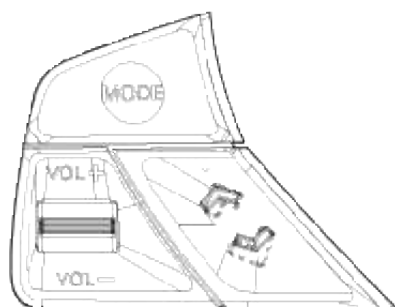
- |                           |   |
|---------------------------|---|
| 1. Hands free call switch | 4. Front right speaker                  |
| 2. Mic                    | 5. Audio head unit (hands free control) |
| 3. Front left speaker     |   |

There is no hands free jack. This system supports Bluetooth(wireless system).

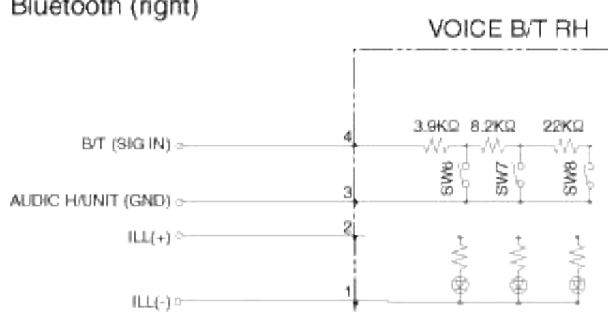
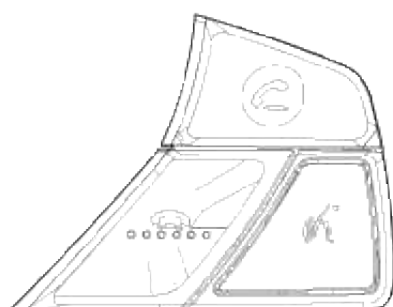
#### Body Electrical System > Hands Free System > Hands Free Switch > Schematic Diagrams

##### Circuit Diagram

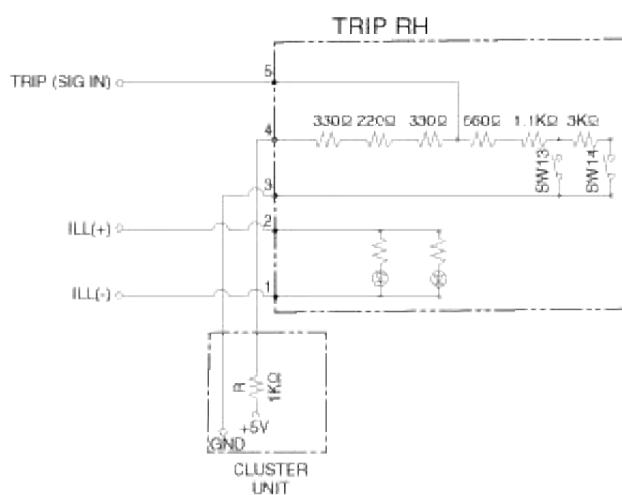
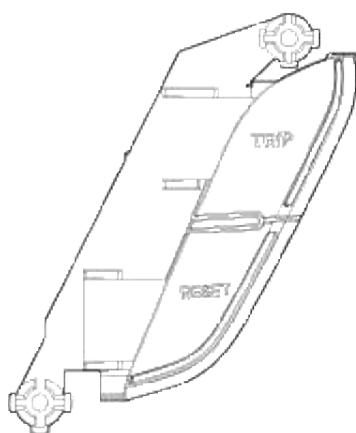
## Audio (left)

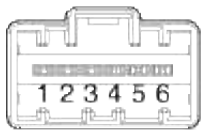
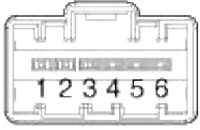


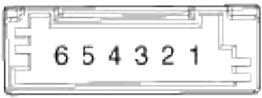
## Bluetooth (right)



## Trip (right)



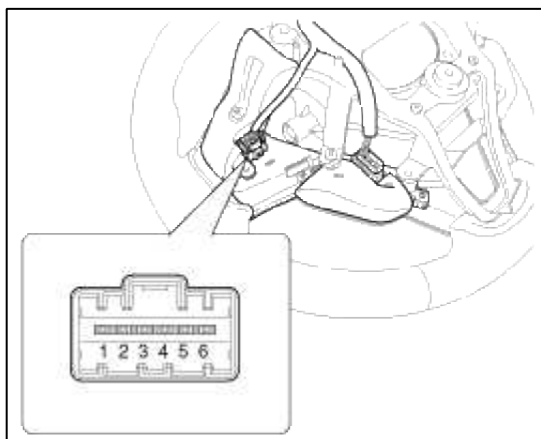
Audio connector(LH)		Bluetooth connector(RH)	
			
Pin	Description	Pin	Description
1	Illumination(-)	1	Illumination(-)
2	Illumination(+)	2	Illumination(+)
3	Audio(-)	3	Audio(-)
4	-	4	B/T(signal IN)
5	Audio(signal IN)	5	-
6	B/T(signal OUT)	6	-

Trip connector(RH)	
	
Pin	Description
1	Illumination(-)
2	Illumination(+)
3	Trip(-)
4	Trip(+)
5	Trip(Signal IN)
6	-

### Body Electrical System > Hands Free System > Hands Free Switch > Repair procedures

Inspection

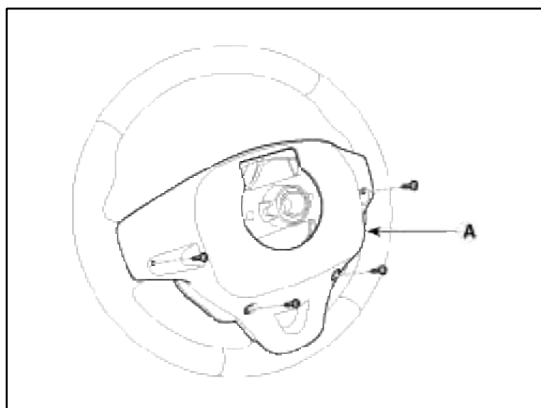
1. Check the hands free remote control switch for resistance between terminals in each switch position.



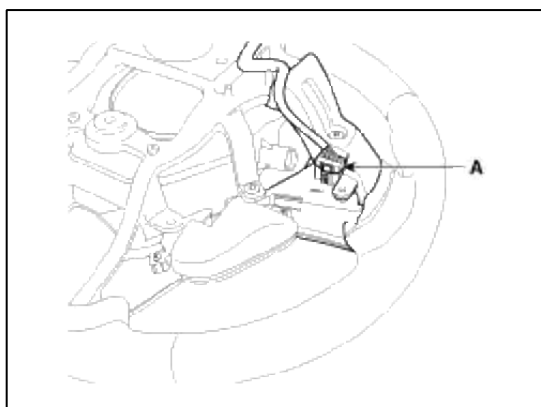
Switch	Connector terminal	Resistance (±5%)
Voice	3 - 4	10.71 kΩ
End of call	3 - 4	18.91 kΩ
Send	3 - 4	40.91 kΩ

#### Removal

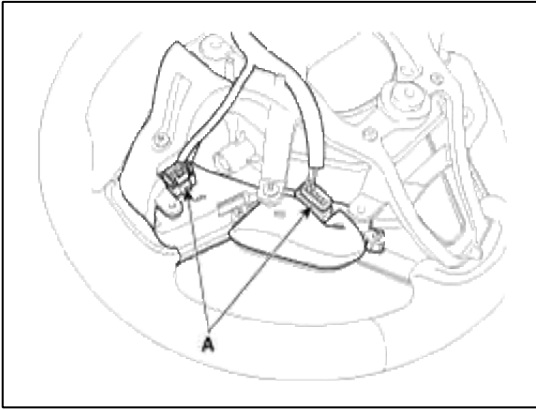
1. Disconnect the negative(-) battery terminal.
2. Remove the driver airbag module.  
(Refer to the RT group - "Driver airbag(DAB) and clock spring")
3. Remove the steering wheel.  
(Refer to the ST group - "Steering column and shaft")
4. Remove the cover(A) after loosening screws.



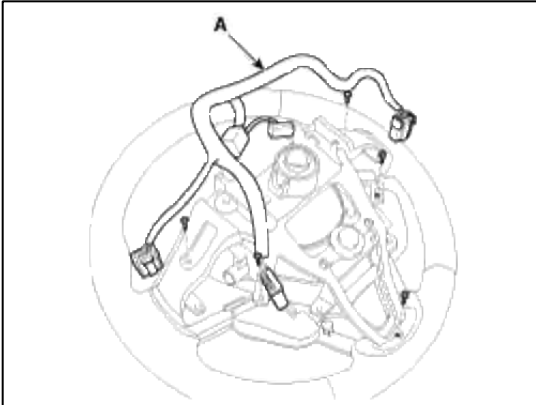
5. Disconnect the left audio switch (A).



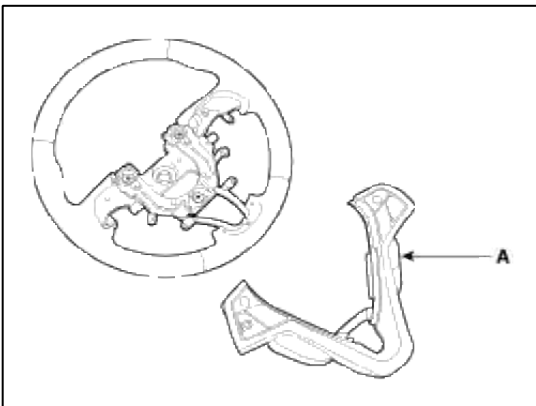
6. Disconnect the right hands free switch and trip switch (A).



7. Remove the wiring (A) then loosening 5 screws.



8. Remove the steering wheel remote control switches assembly (A).



#### Installation

1. Install the hands free switch to the steering wheel.
2. Install the steering wheel cover.
3. Install the steering wheel.
4. Reassemble the driver airbag module.

#### NOTE

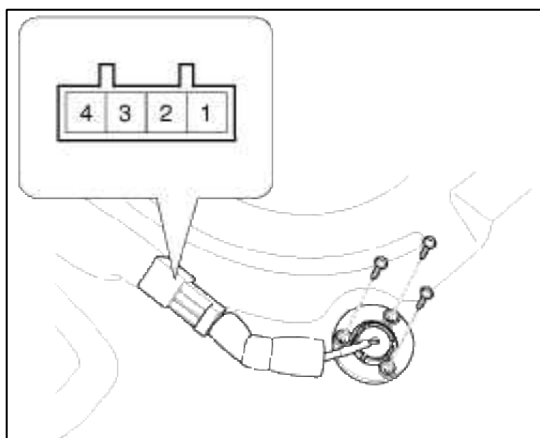
Make sure the hands free remote control switch and the airbag module connectors are plugged in properly.

#### Body Electrical System > Hands Free System > Hands Free Mic > Repair procedures

#### Inspection

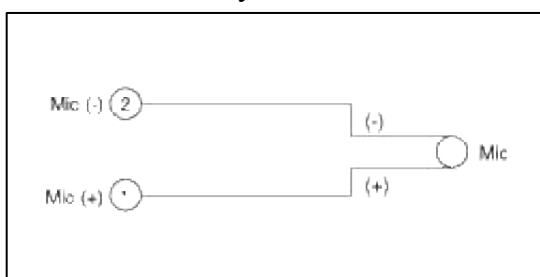
1. Disconnect the negative(-) battery terminal.

2. Remove the roof trim.  
(Refer to the BD group - "Roof trim")
3. Remove the handsfree mic (A) after disconnect the connector from roof top.


**CAUTION**

Be careful not to damage the roof trim when removing the hands free mic.

4. Check the continuity of Mic between terminals.


**Body Electrical System > Hands Free System > Troubleshooting**
**Troubleshooting**

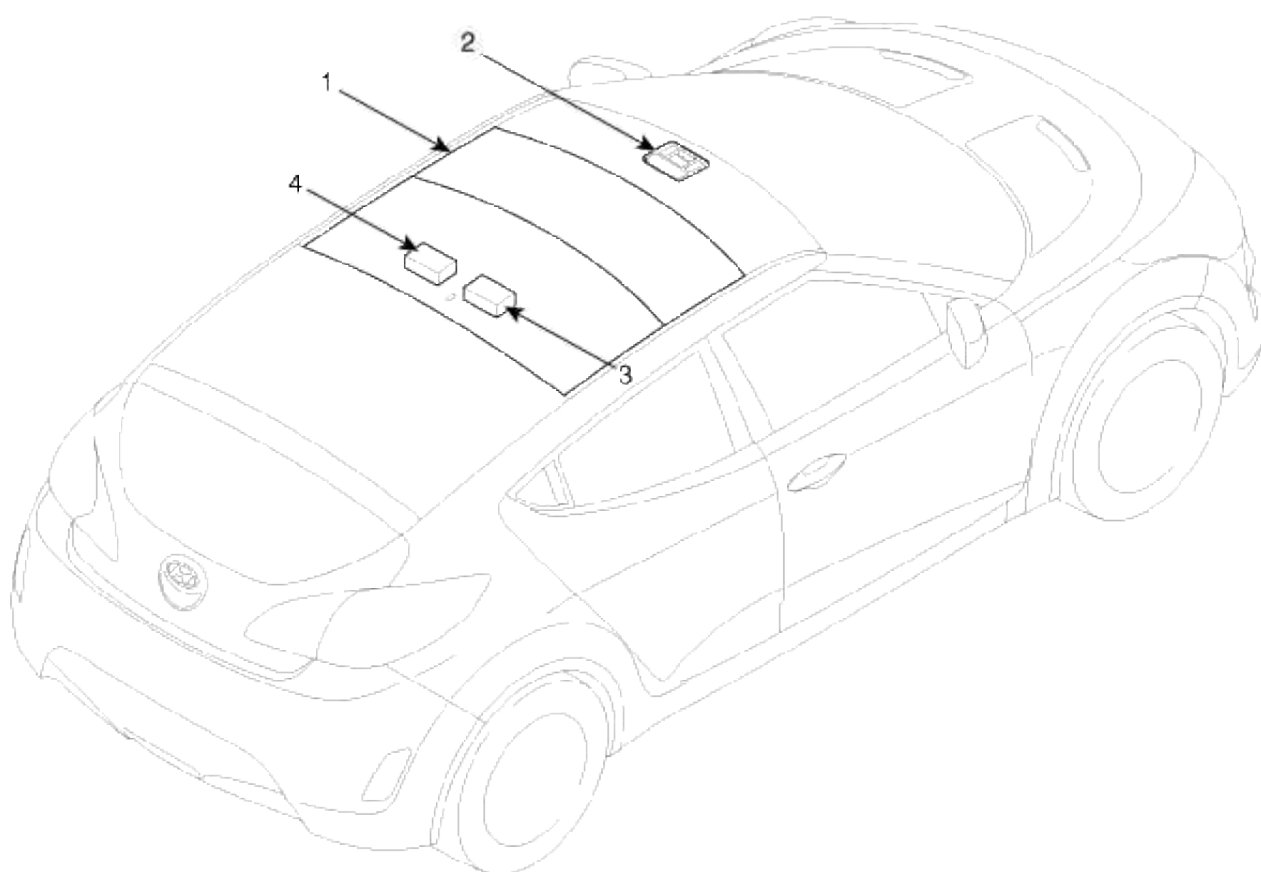
Problem	Possible cause	Solution
Not pairing	Bluetooth device of Car is not discoverable mode	Enter Bluetooth pairing (searching) mode
	User's phone is Bluetooth off mode	User's phone set Bluetooth on
	Making an attempt pairing others bluetooth system	Check Bluetooth device name and address (12 word) to attempt paring Ex) 000B24FFF123
	Pass key error	Input the passkey displayed on the audio screen into the phone.
	5 phones have already been registered.	Delete paired phone list
	Bluetooth system cannot communicate with the phone.	Refer to IOP sheet IOP : Inter-operability
Not connection	User's phone or Bluetooth device of Car does not register Bluetooth device to connect	Retry pairing



	Bluetooth system cannot communicate with the phone.	Wait 1 minute then Retry connection or phone power off/on. Refer to IOP sheet
Not redial	User phone system issue	Push the Send button 2 times
Not accept call	User phone system issue	Refer to IOP sheet
Not dialing	User's phone playing other menu (internet, mp3, game, etc..)	Stop other menu then set normal mode
	Bluetooth system cannot communicate with the phone	Refer to IOP sheet

### Body Electrical System > Panoramaroof > Components and Components Location

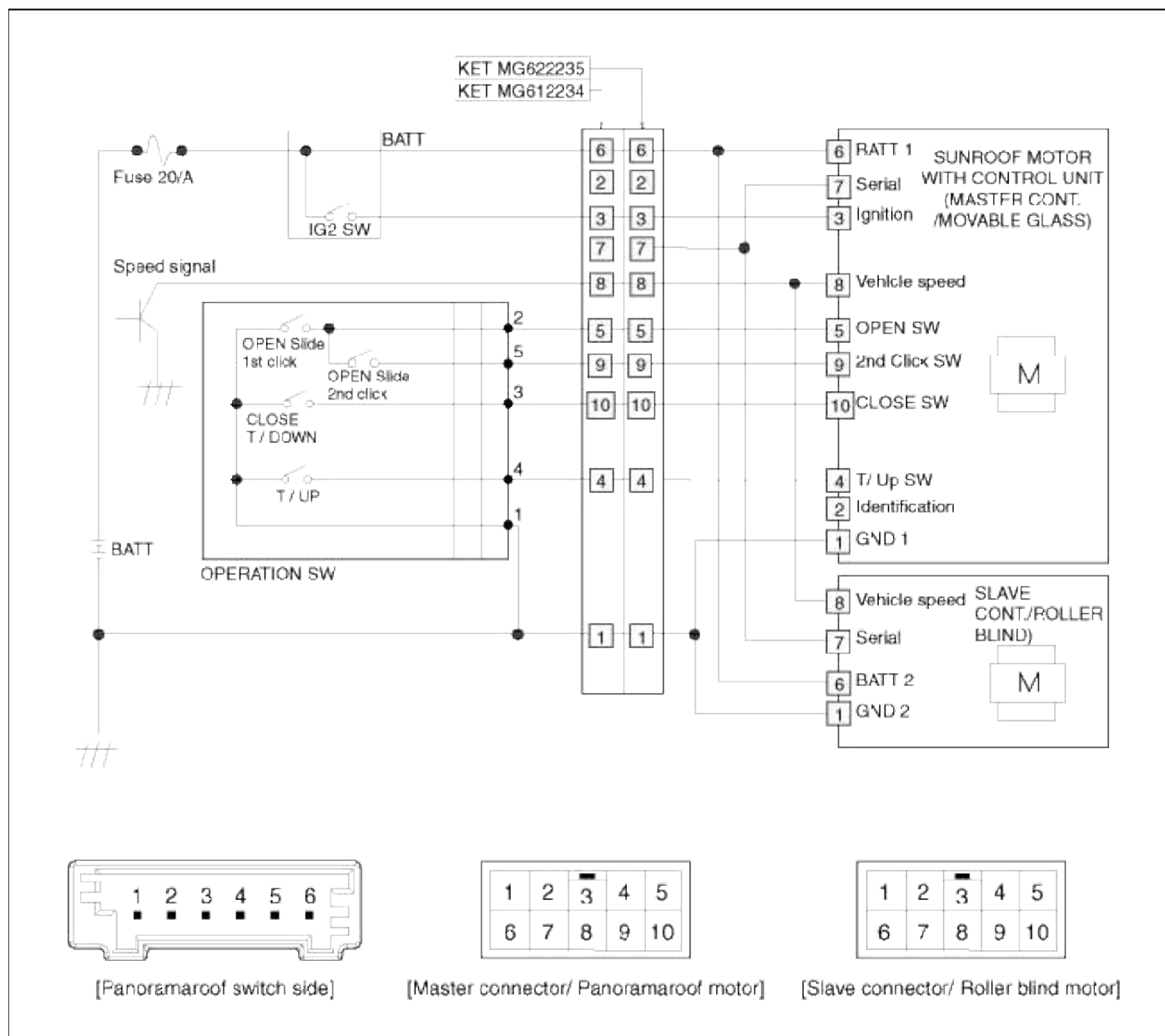
#### Component Location



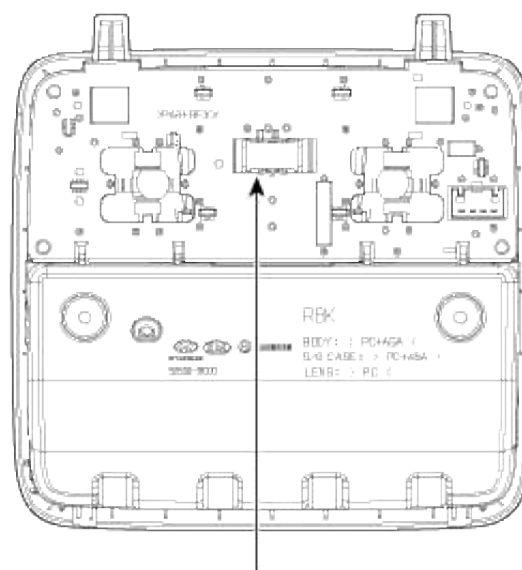
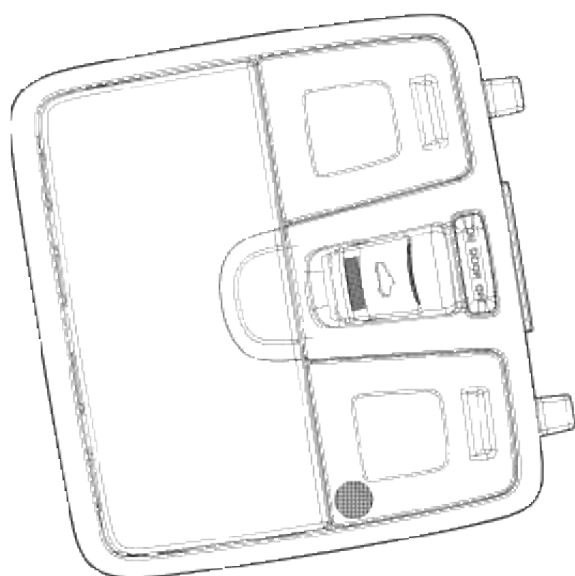
- |                        |  |
|------------------------|--|
| 1. Panoramaroof        | 3. Panoramaroof motor & controller       |
| 2. Panoramaroof switch | 4. Roller blind motor & slave controller |

## Body Electrical System > Panoramaroof > Schematic Diagrams

### Circuit Diagram



[Panoramaroof switch]



Panoramaroof switch



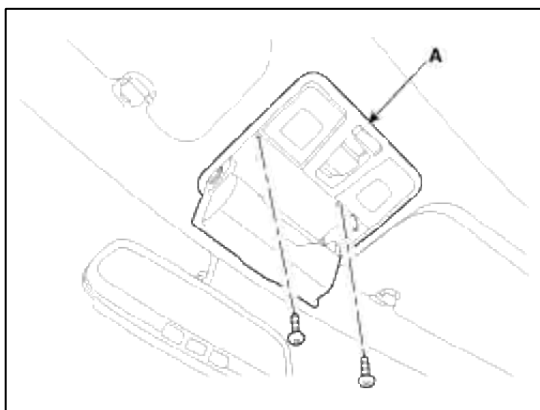
Pin No.	Description
1	Ground
2	Signal A
3	Signal B
4	Signal C
5	Signal D
6	-

### Body Electrical System > Panoramaroof > Panoramaroof Switch > Repair procedures

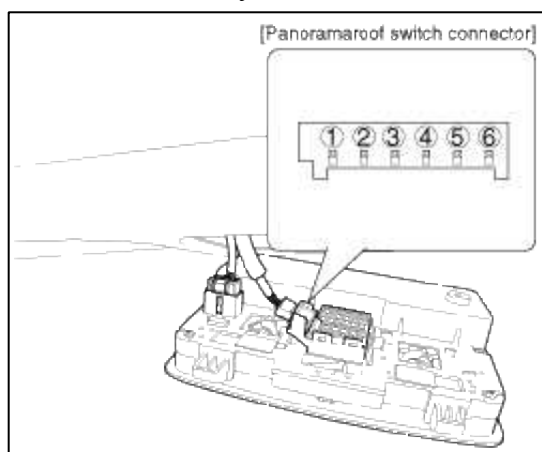
#### Inspection

1. Disconnect the negative (-) battery terminal.

2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console. Disconnect the switch connector (6P) and then remove the overhead console lamp.



3. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch



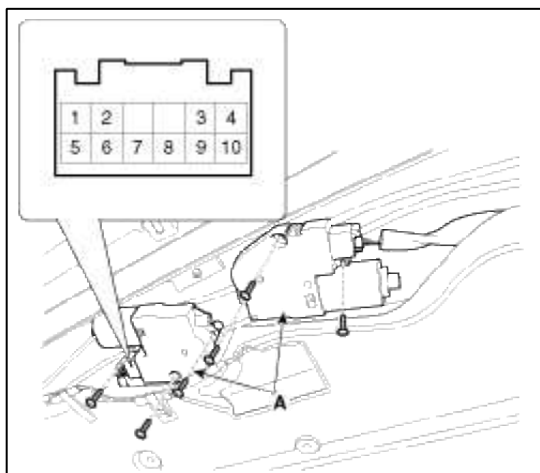
Position \ Terminal	1	2	3	4	5
Auto open (Shade)	○	○			
Auto open (Glass, Shade)	○	○	—	○	
Tilt up	○	—	○		
Tilt down	○	—	○		
Auto close (Glass or shade)	○	—	○		

### Body Electrical System > Panoramaroof > Panoramaroof Motor > Repair procedures

#### Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim.  
(Refer to the BD group - "Roof trim")

### 3. Disconnect the panoramaroof motor (A) connector.



### 4. Ground the terminals as below table, and check that the panoramaroof unit operates.

#### NOTE

- When inspecting the panoramaroof motor operation, panoramaroof motor and roller blind motor always should be connected.

Terminal	3	5	10	4	9
Position					
Auto open (Shade)	⊕	⊖			
Auto open (Glass, Shade)	⊕	⊖			⊖
Tilt up	⊕			⊖	
Tilt down	⊕		⊖		
Auto close (Glass or shade)	⊕		⊖		

### 5. Make these input tests at the connector. 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.
6	Under all conditions	Check for voltage to ground: There should be battery voltage.

### 6. Ground the terminal as below table, and check the roller blind motor operates.

Terminal	6	1
Position		
Motor	⊕	⊖

### 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 sunroof system as follows :

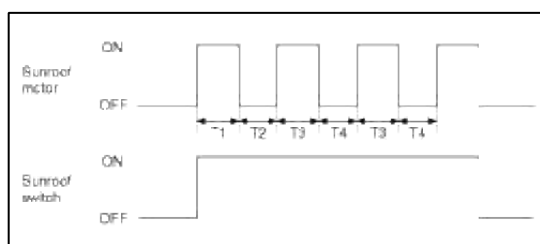
1. Turn the ignition key to the ON position and then close the panoramaroof completely.
2. Release the panoramaroof control lever.

3. Press and hold the CLOSE button for more than 10 seconds until the panoramaroof closed and it has moved slightly.
4. Release the panoramaroof control lever.
5. Press and hold the CLOSE button once again within 5 seconds until the panoramaroof do as follows;
  - A. Tilt → Slide Open → Slide Close
 Then release the lever.
6. Reset procedure of panorama system is finished.

#### Protecting Motor From Overheating

In order to protect the panoramaroof motor from overheating from continuous motor operation, the panoramaroof ECU controls the Run-time and Cool-time of the motor as follows:

1. The panoramaroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st run-time( $120 \pm 10\text{sec.}$ ).
3. The continuous operation of motor stops after the 1st Run-time( $120 \pm 10\text{sec.}$ ).
4. Then Motor is not operated for the 1st Cool-time( $18 \pm 2\text{sec.}$ ).
5. Motor is operated for the 2nd Run-time( $10 \pm 2\text{sec.}$ ) at the continued motor operation after 1st Cool-time( $18 \pm 2\text{sec.}$ )
6. The continuous operation of motor stops operating after the 2nd Run-time( $10 \pm 2\text{sec.}$ )
7. Motor is not operated for the 2nd Cool-time( $18 \pm 2\text{sec.}$ ).
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 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 :  $120 \pm 10 \text{ sec.}$ , T2 :  $18 \pm 2 \text{ sec.}$ ,  
 T3 :  $10 \pm 2 \text{ sec.}$ , T4 :  $18 \pm 2 \text{ sec.}$

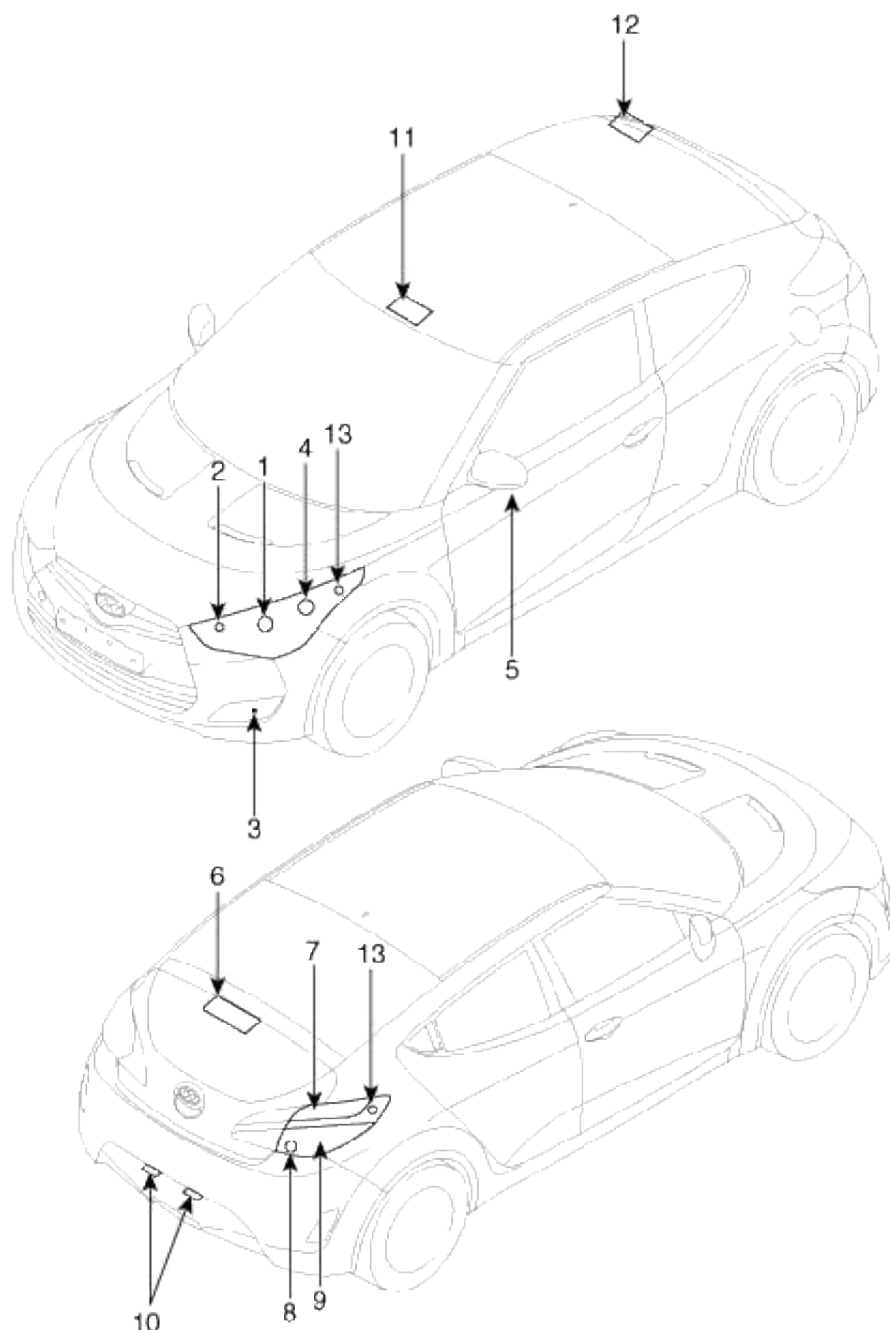
### Body Electrical System > Lighting System > Specifications

#### Specification

Item		Bulb capacity(W)	Lamp type
Front	Head lamp(High)	55	H7LL
	Head lamp(low)	55	H7HPLL / H11B
	Turn signal lamp	28	PY21W
	Fog lamp	27	GE881
	Position lamp	LED	LED
Turn signal lamp(Door mirror)		LED	LED
Rear	Stop lamp / tail lamp	21 / 5	LED
	Turn signal lamp	21	PY21W
	Backup lamp	16	W16W
	License lamp	5	W5W
	High mounted stop lamp	LED	LED
Interior	Overhead console lamp	8	FESTOON 8W
	Rear room lamp	8	FESTOON 8W
	Luggage lamp	5	FESTOON 5W

**Body Electrical System > Lighting System > Components and Components Location**

Component Location



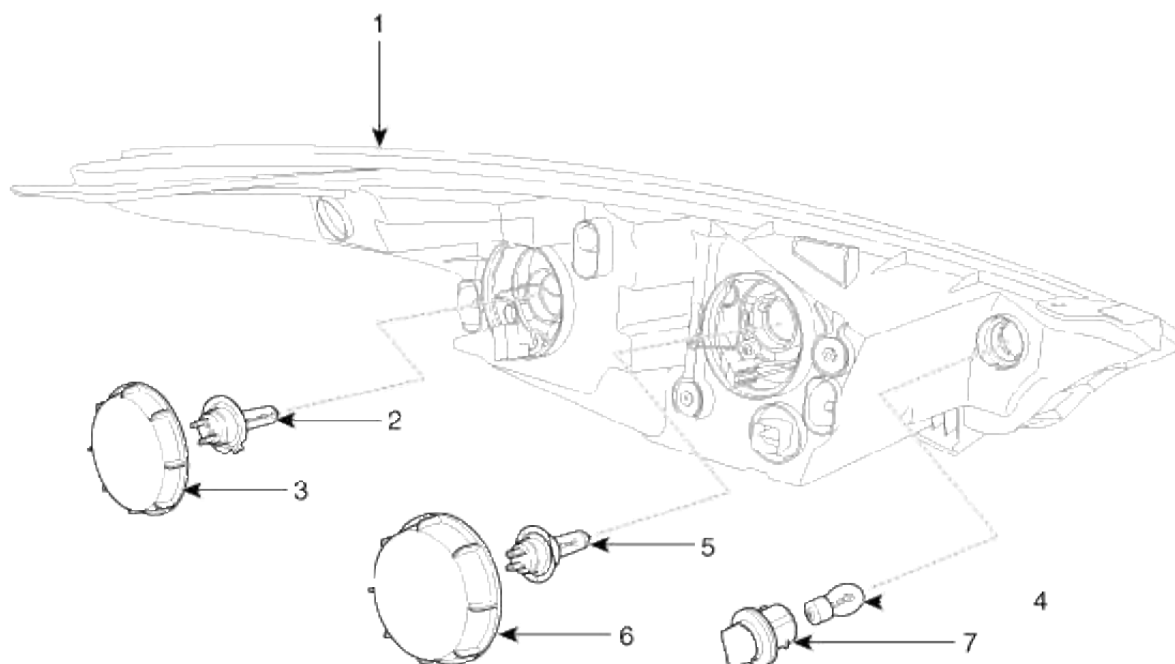
1. Head lamp (High)	8. Backup lamp
2. Turn signal lamp	9. Turn signal lamp
3. Front fog lamp	10. License lamp
4. Head lamp(Low)/ position lamp	11. Overhead lamp
5. Turn signal lamp (Door mirror)	12. Luggage lamp
6. High mounted stop lamp	13. Side marker lamp
7. Tali/ stop lamp	

#### Body Electrical System > Lighting System > Head Lamps > Components and Components Location

Component



[General]



- |                                      |                            |
|--------------------------------------|----------------------------|
| 1. Head lamp assembly lens & housing | 5. Head lamp (High) lamp   |
| 2. Head lamp (Low) lamp              | 6. Dust cover (High)       |
| 3. Dust cover (Low)                  | 7. Turn signal lamp socket |
| 4. Turn signal lamp                  |                            |

### Body Electrical System > Lighting System > Head Lamps > Repair procedures

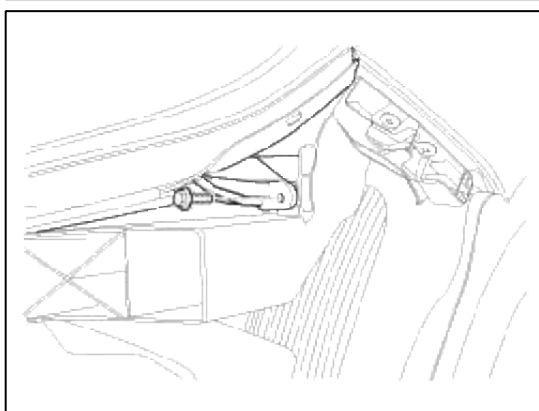
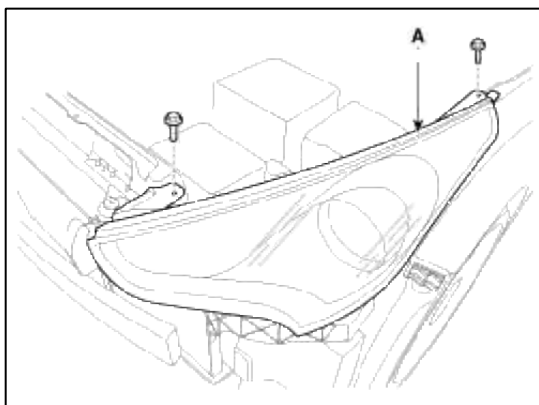
#### Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper.  
(Refer to the BD group - "Front bumper")

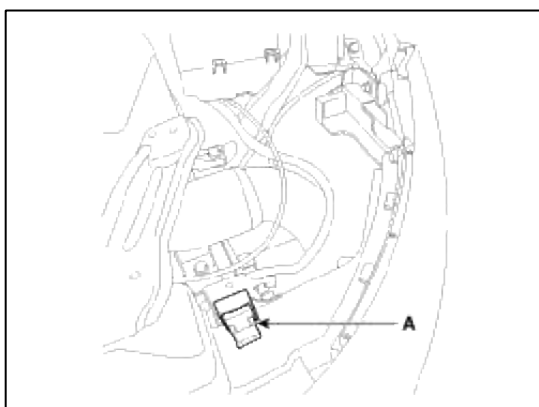
3. Loosening the head lamp mounting bolts (3EA) and disconnect the head lamp connector (B).  
Then, remove the head lamp assembly (A).

**NOTE**

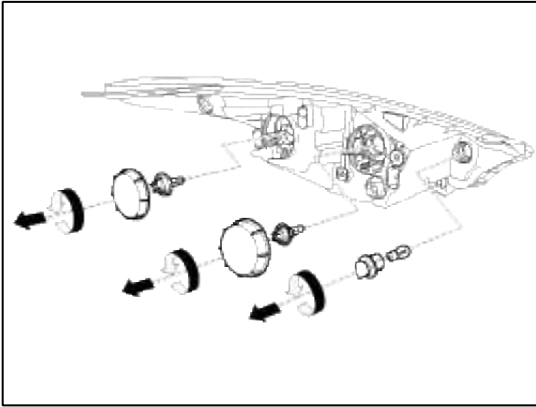
- Take care not to scratch the head lamp lens or fender.

**NOTE**

Take care that holding clip (A) is not to be damaged.

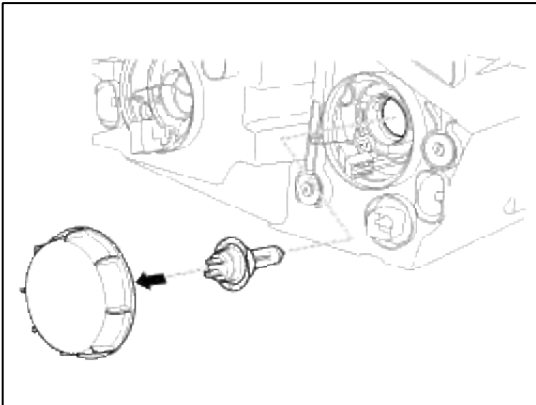


4. Remove the dust caps from the head lamp assembly after turning in the counter clock-wise direction.



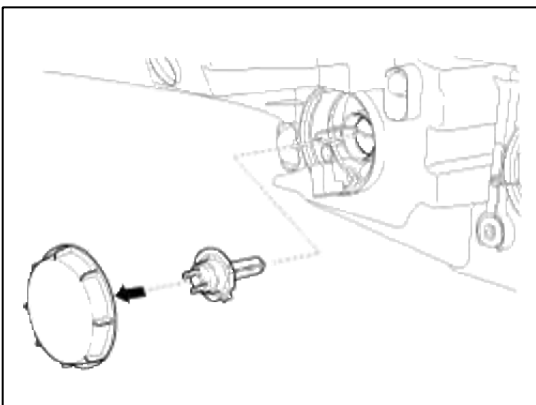
#### Headlamp(low) bulb

1. Turn off the lamp power.
2. Disconnect the connector.
3. Remove the dust cover.
4. Disconnect the connector.
5. Remove the head lamp low bulb.



#### Head lamp(High) bulb

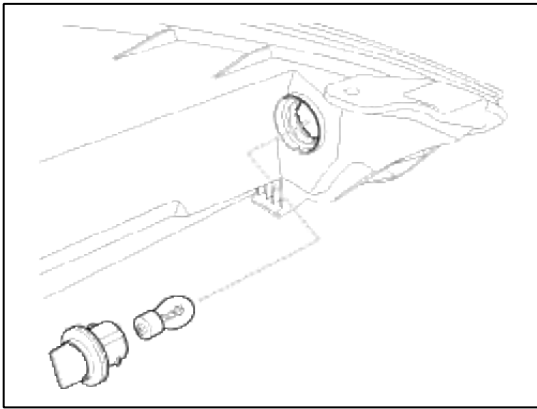
1. Turn off the lamp power.
2. Remove the dust cover.
3. Disconnect the connector.
4. Remove the head lamp low bulb.



#### Turn signal lamp

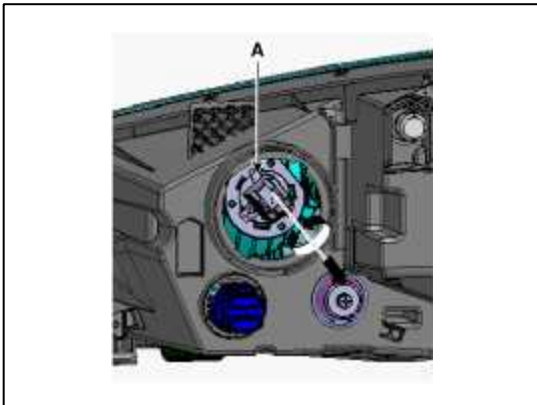
1. Turn off the lamp power.

2. Remove the socket and bulb(A) of turn signal lamp.



### Installation

1. Turn the bulb (A) counterclockwise, after connecting the connector and the bulb.



2. Install the dust cover.
3. Install the head lamp assembly.

### 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

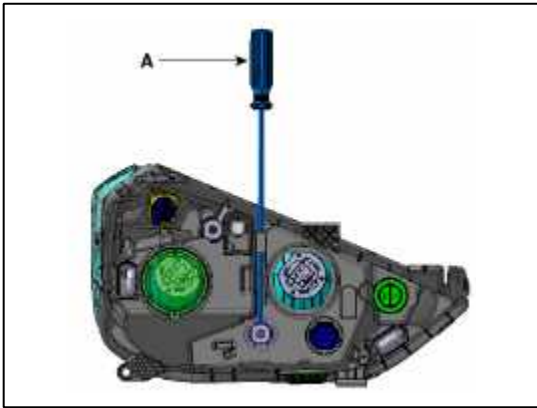
If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

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) on the screen.

4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the vertical lines.

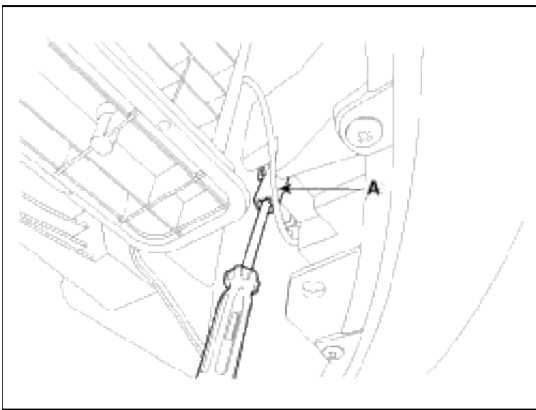
A : Vertical(Low)



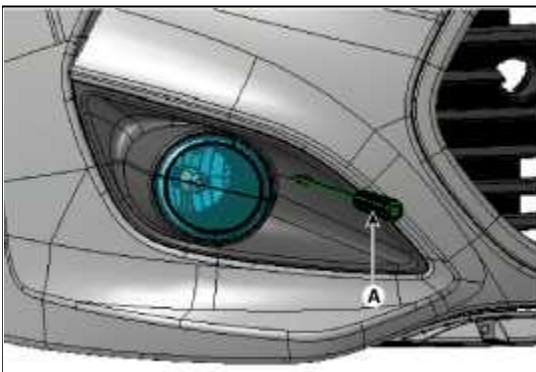
#### Front Fog Lamp Aiming

The front fog lamps should be aimed in the same manner of the head lamps aiming.

With the front fog lamps and battery in normal condition, aim the front fog lamps by turning the adjusting screw (A) with a driver.

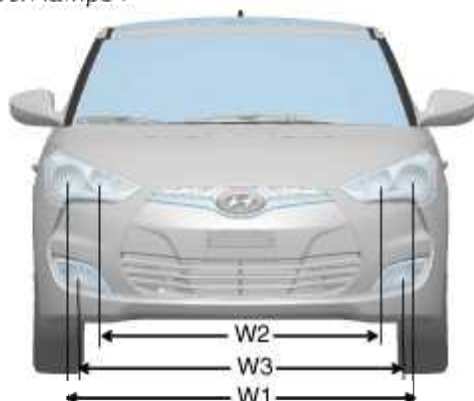


[Turbo GDI]

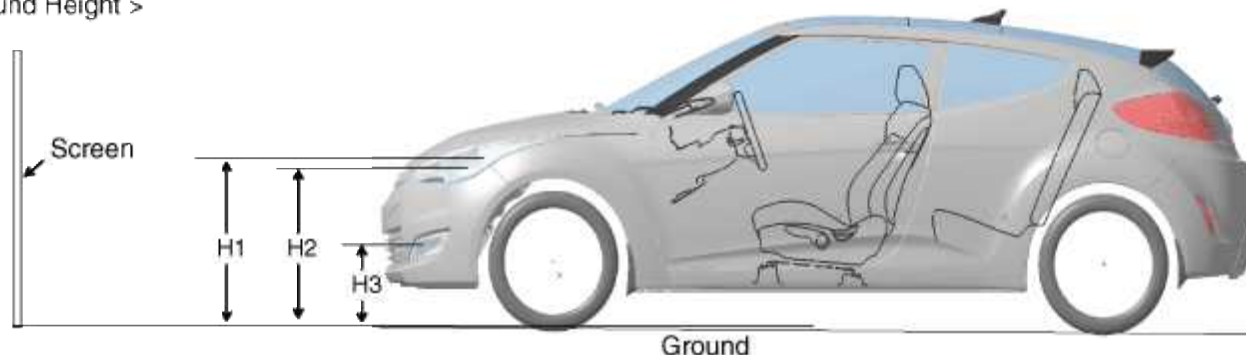


#### Head Lamp And Fog Lamp Aiming Point

&lt; Distance between lamps &gt;



&lt; Ground Height &gt;



H1 : Height between the head lamp bulb center and ground (Low beam)

H2 : Height between the head lamp bulb center and ground (High beam)

H3 : Height between the fog lamp bulb center and ground

W1 : Distance between the two head lamp bulbs centers (Low beam)

W2 : Distance between the two head lamp bulbs centers (High beam)

W3 : Distance between the two fog lamp bulbs centers

L : Distance between the head lamp bulb center and screen

Unit : in(mm)

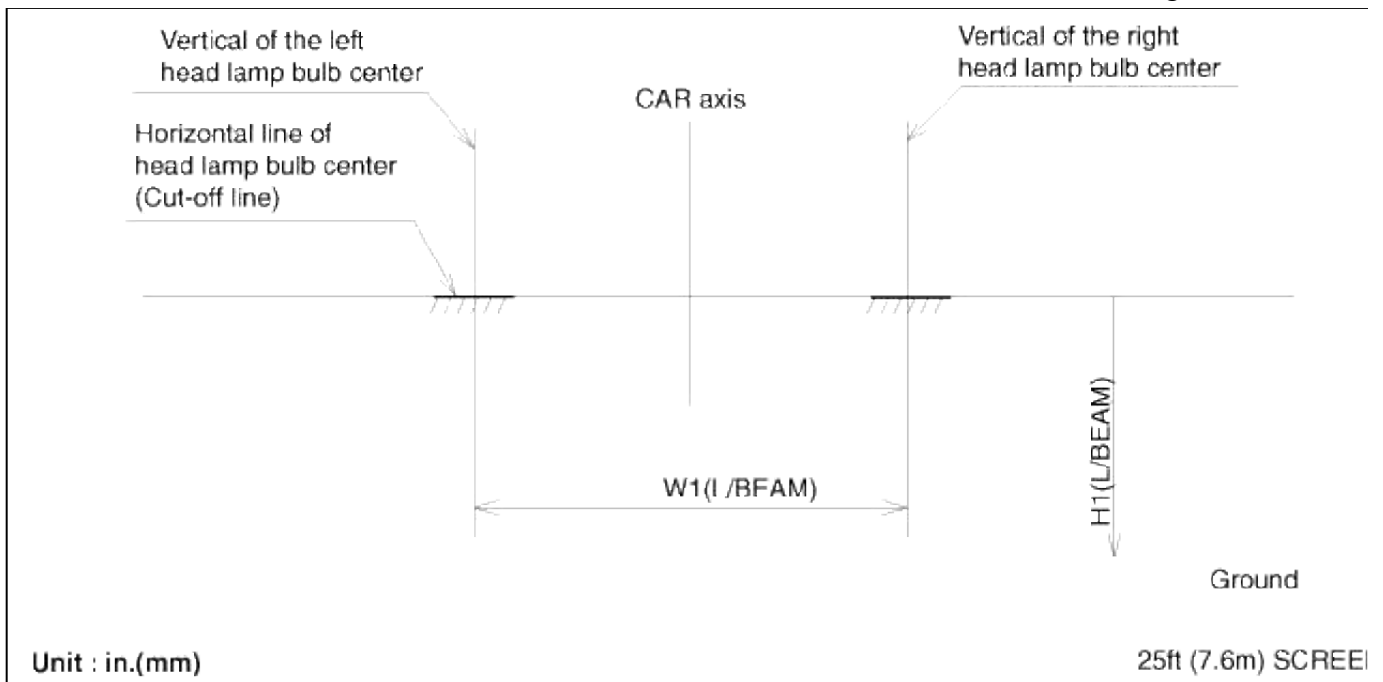
Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	28.9(733)	28.7(729)	14.4(366)	58.1(1476)	47.1(1196)	54.6(1386)	Refer to aiming condition
With driver	28.6(726)	28.4(722)	14.1(359)				

## 1. Head Lamp (Low beam)

A. Turn the low beam on without driver aboard.

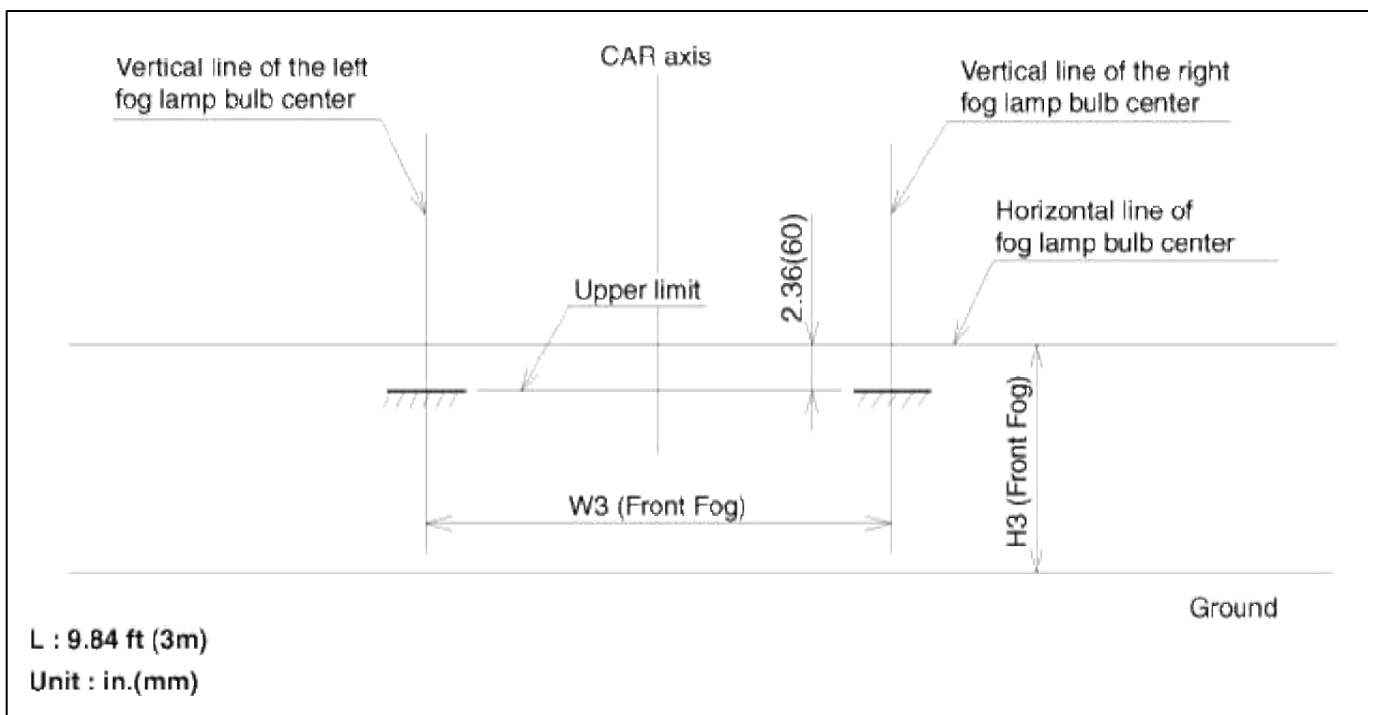
B. The cut-off line should be projected in the cut-off line shown in the picture.

C. If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.



2. Turn the front fog lamp on without the driver aboard.

The cut-off line should be projected in the allowable range (shaded region)

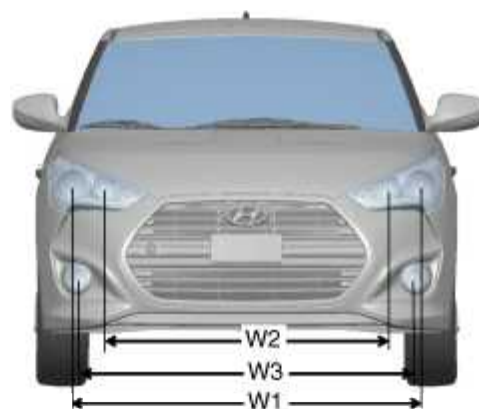
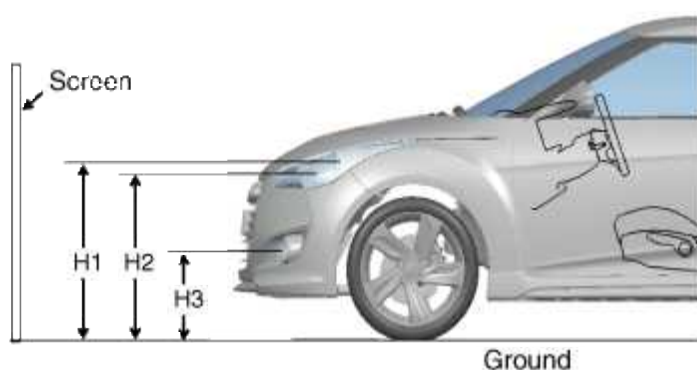


Head Lamp And Fog Lamp Aiming Point [Turbo GDI]

[Turbo GDI]

&lt; Ground Height &gt;

&lt; Distance between lamps &gt;



- H1 : Height between the head lamp bulb center and ground (Low beam)  
 H2 : Height between the head lamp bulb center and ground (High beam)  
 H3 : Height between the fog lamp bulb center and ground  
 W1 : Distance between the two head lamp bulbs centers (Low beam)  
 W2 : Distance between the two head lamp bulbs centers (High beam)  
 W3 : Distance between the two fog lamp bulbs centers  
 L : Distance between the head lamp bulb center and screen

[Turbo GDI]

Unit : in(mm)

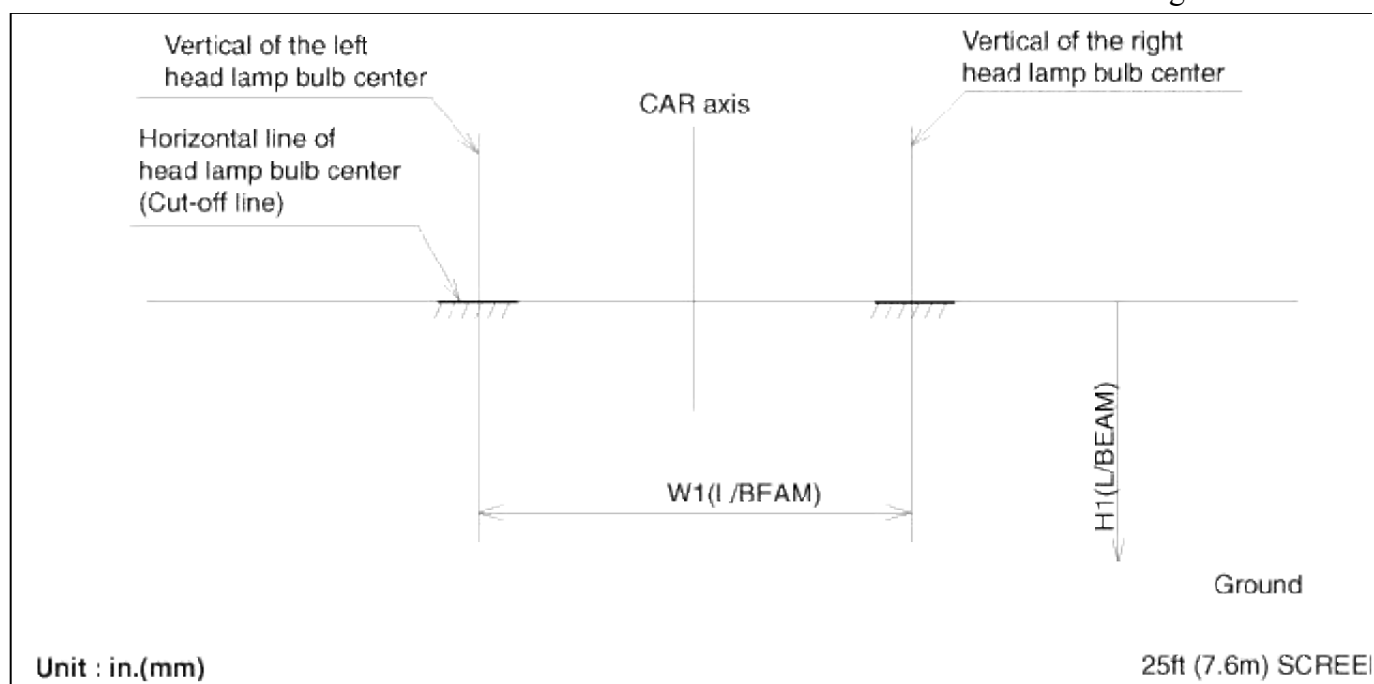
Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	28.7(730)	28.6(728)	14.8(376)	58.1(1476)	47.1(1196)	56.2(1429)	Refer to aiming condition
With driver	28.4(723)	28.3(721)	14.4(366)				

## 1. Head Lamp (Low beam)

- Turn the low beam on without driver aboard.
- The cut-off line should be projected in the cut-off line shown in the picture.
- If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.

[Turbo GDI]

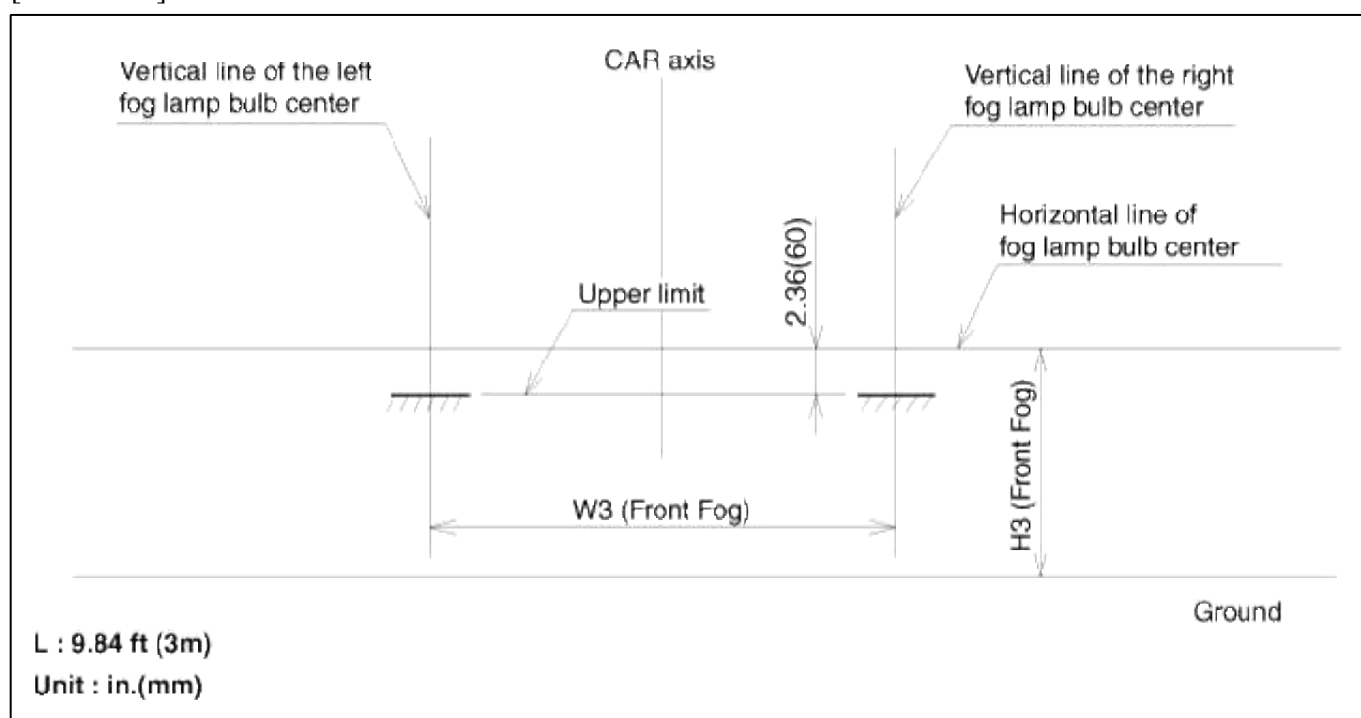




2. Turn the front fog lamp on without the driver aboard.

The cut-off line should be projected in the allowable range (shaded region)

[Turbo GDI]



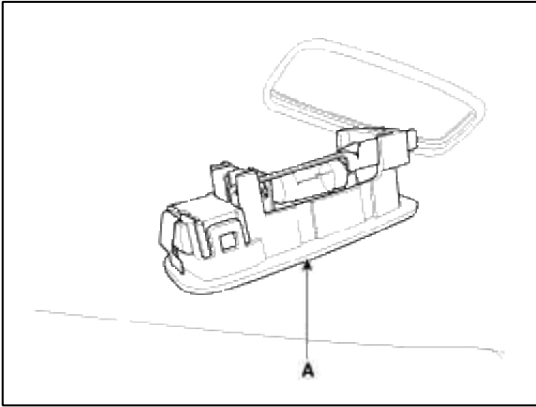
### Body Electrical System > Lighting System > Room Lamp > Repair procedures

Removal

Vanity Lamp

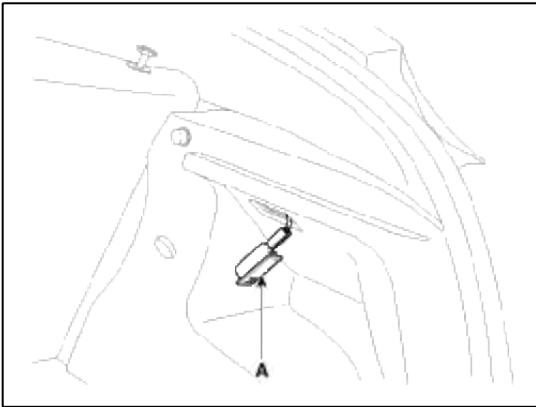
1. Disconnect the negative (-) battery terminal.

2. Remove the vanity lamp assembly after disconnecting the connector.



#### Tailgate Lamp

1. Disconnect the tailgate lamp connector and remove the tailgate lamp (A).



#### Installation

##### Vanity Lamp

1. Reconnect the vanity lamp connector.
2. Install the vanity lamp.

##### Tailgate Lamp

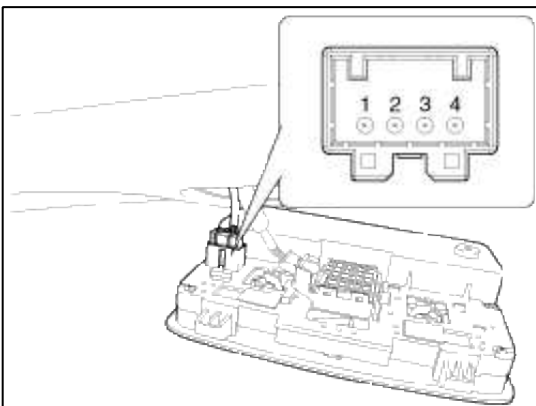
1. Reconnect the tailgate lamp connector and install the tailgate lamp.

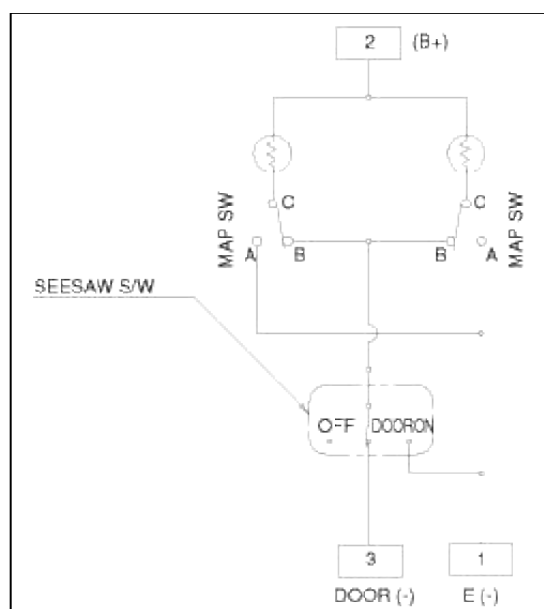
### Body Electrical System > Lighting System > Overhead Console Lamp > Repair procedures

#### Inspection

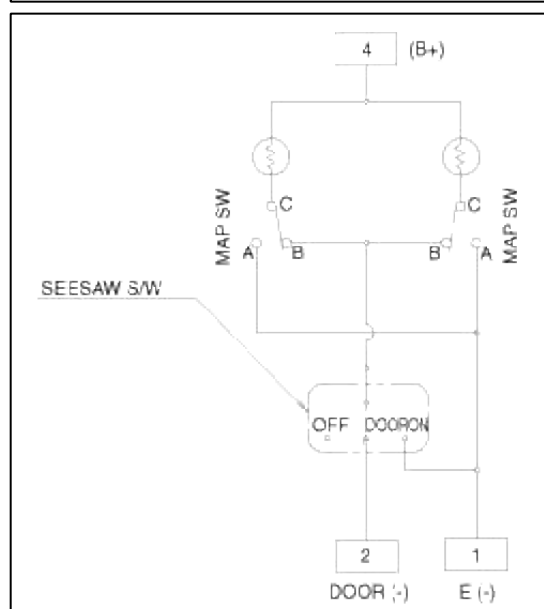
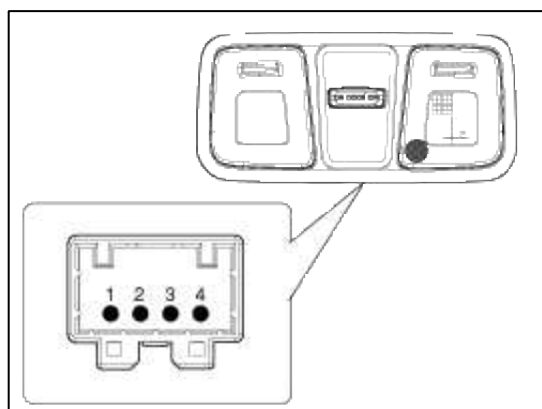
1. Remove the overhead console lamp (map lamp) assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.

[Overhead console]





[Map lamp]

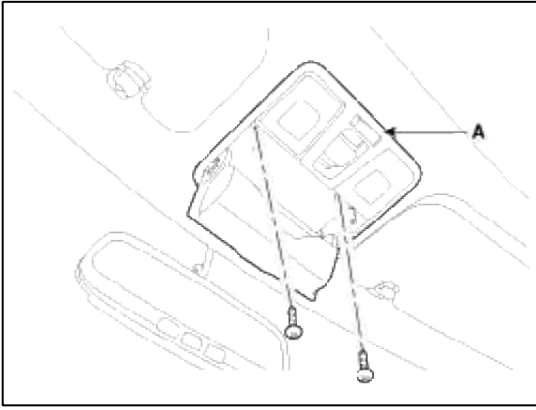


Terminal Position	1	2	4
DOOR		○	○
ON	○	○	○

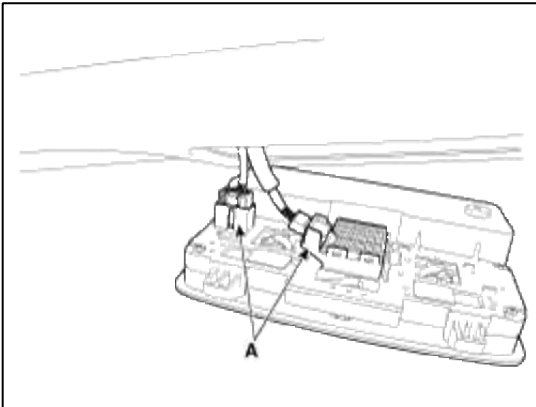
## Removal

1. Disconnect the negative (-) battery terminal.

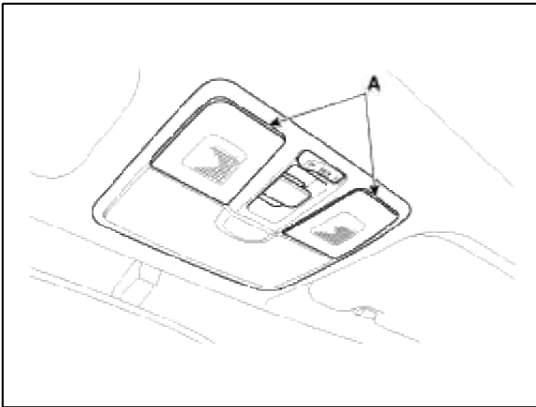
2. Loosen 2 screws holding the overhead console (A).
- Remove the overhead console (A) after loosening 2 screws.



3. Disconnect the connectors (A) of sunroof switch and lamp switch then remove the overhead console lamp assembly.



4. If necessary to replace the bulb, replace the bulb after removing the overhead console lens (A).



#### Installation

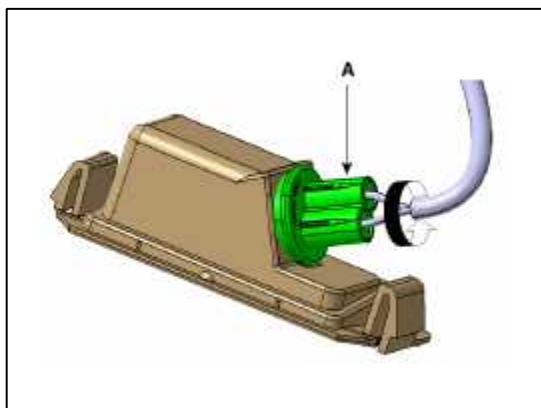
1. Install the overhead console lamp.
2. Connect the sunroof switch connector and lamp connector.
3. Install the overhead console assembly.

#### Body Electrical System > Lighting System > License Lamp > Repair procedures

#### Removal

1. Disconnect the negative(-) battery terminal.

2. Replace the bulb after turning the socket (A).



#### Installation

1. Install the bulb.
2. Install the lens and license lamp.

### Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

#### Inspection

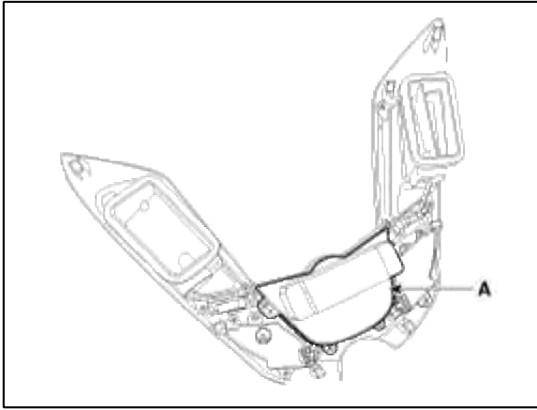
1. The GDS will be able to diagnose defects of hazard switch quickly. The GDS can operate actuator manually, input/output value monitoring and self diagnosis.
2. Select model and "BCM".
3. Select the "SJB" to check.
4. Select "Current data", if you will check current data of hazard switch. It provides input/output status of SJB.

Current Data 21/42		
<div> Standard Display ▾ Full List ▾ Graph ▾ Items List ▾ Reset Min.Max. Record Stop ▾ </div>		
Sensor Name	Value	Unit
<input type="checkbox"/> Hazard Switch	OFF	-
<input type="checkbox"/> Central door unlock switch	OFF	-
<input type="checkbox"/> Door unlock relay	OFF	-
<input type="checkbox"/> Door lock relay	OFF	-
<input type="checkbox"/> HID Option	OFF	-
<input type="checkbox"/> Static Bending Lamp LH Output	OFF	-
<input type="checkbox"/> Static Bending Lamp RH Output	OFF	-
<input type="checkbox"/> Trunk LID Outside Handle Switch	OFF	-

#### Removal

1. Disconnect the negative(-) battery terminal.

2. Remove the heater control module.  
(Refer to the HA group - "Controller")



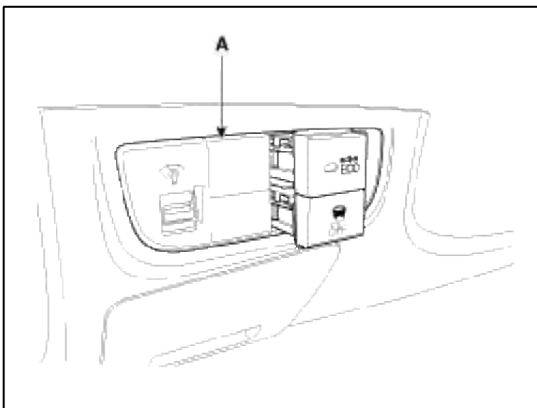
#### Installation

1. Install the heater control module.  
(Refer to the HA group - "Controller")

#### Body Electrical System > Lighting System > Rheostat > Repair procedures

#### Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower switch(A).
- (Refer to the BD group - "Crash pad")
3. Remove the crash pad side switch assembly (A).



4. The installation is the reverse of removal.

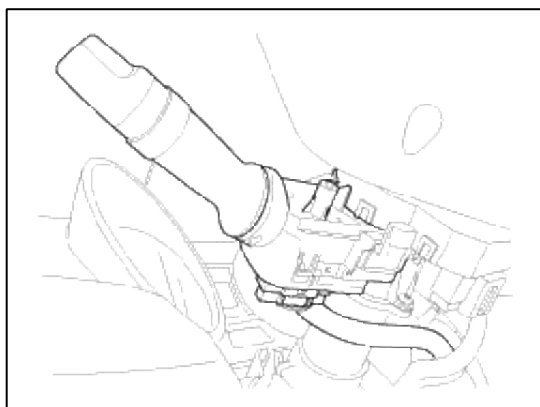
**[Crash pad side switch connector]**

Pin No.	Connector	
	LHD	RHD
1	ECO	Ignition
2	-	ESC
3	PAS	ISG indicator
4	PAS indicator	ISG
5	ISG	PAS indicator
6	ISG indicator	PAS
7	ESC	-
8	Ignition	ECO
9	Ground	Rheostat Down
10	Illumination (+)	Rheostat Up
11	-	-
12	Illumination (-)	-
13	-	Illumination (-)
14	-	-
15	Rheostat Up	Illumination (+)
16	Rheostat Down	Ground


**Body Electrical System > Lighting System > Fog Lamps > Repair procedures**

**Inspection**

1. Disconnect the negative (-) battery terminal.
2. Remove the lighting switch of the multifunction switch.  
(Refer to the "Multifunction Switch")
3. With the front fog lamp switch, make sure that continuity exists between the terminals below.  
If continuity is not as specified, replace the multifunction switch.

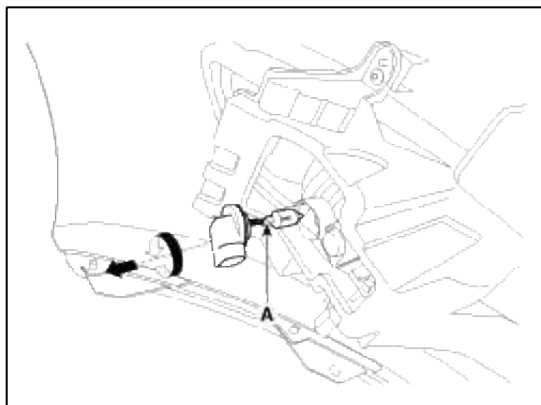


**Fog lamp switch**

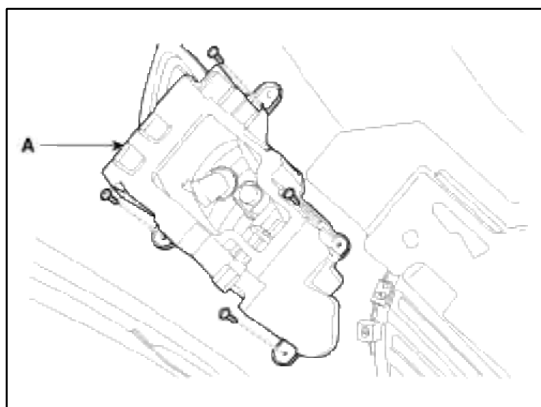
Terminal Position	5	6
OFF		
ON		

### 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 connector(A) from the front bumper.
4. Remove the front fog bulb(A) turning it in the counterclockwise direction.



5. Remove the front fog lamp assembly(A).



### Installation

1. Install the front fog bulb.
2. Reconnect the lamp connector.
3. Install the front bumper.

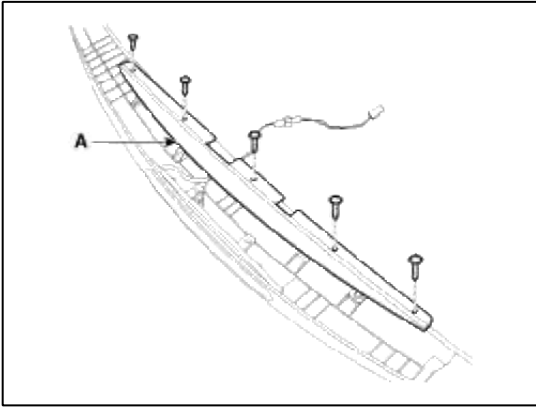
## Body Electrical System > Lighting System > High Mounted stop lamp > Repair procedures

### Removal

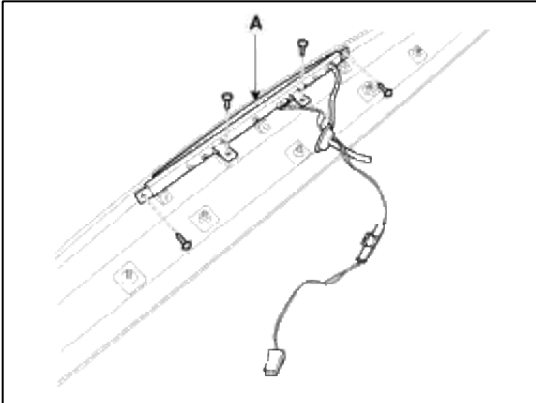
1. Disconnect the negative(-) battery terminal.
2. Remove the tailgate center trim.  
(Refer to the BD group - "Exterior - Tailgate")
3. Loosen 4 nuts and remove the rear garnish assembly after disconnecting the connector.



4. Loosen 5 screws and remove the garnish cover (A).



5. Loosen 4 screws and remove the high mounted stop lamp (A).



#### Installation

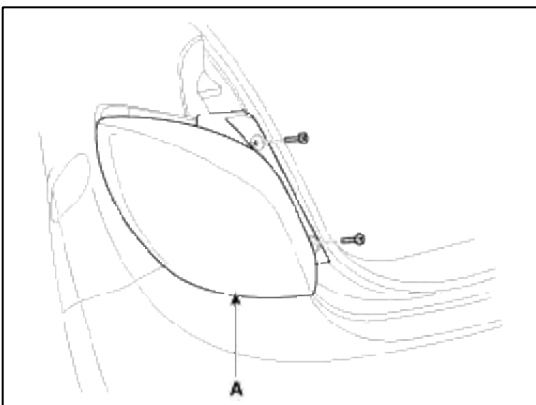
1. Install the high mounted stop lamp.
2. Install the rear garnish and the tailgate trim.

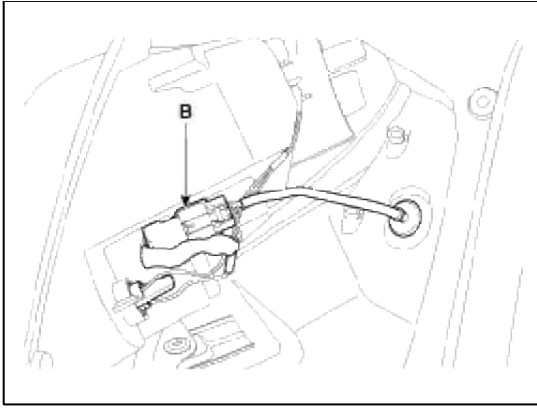
### Body Electrical System > Lighting System > Rear combination lamp > Repair procedures

#### Removal

##### Rear Combination lamp

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector (B) after loosening 2 screws, and then remove the rear combination lamp (A).





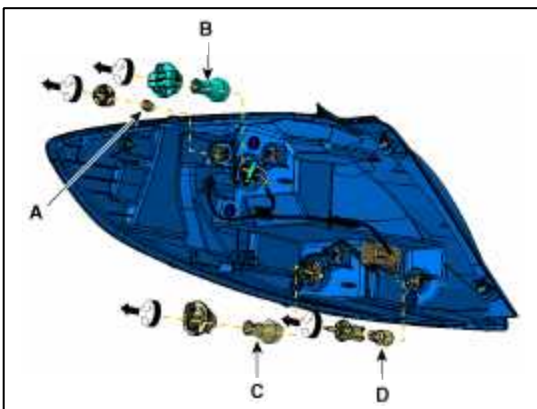
3. Remove the bulb after turning in the counterclockwise direction.

A : Side marker lamp

B : Tail lamp/ Stop lamp

C : Back up lamp

D : Turn signal lamp



#### Installation

1. Install the rear combination lamp assembly.
2. Connect the rear combination lamp assembly connector.
3. Connect the negative (-) battery terminal.

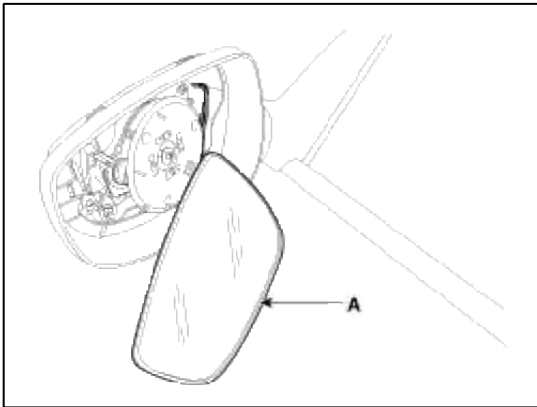
#### Body Electrical System > Lighting System > Turn Signal Lamp > Repair procedures

##### Removal

##### Door Mirror Turn Signal Lamp

1. Disconnect the negative(-) battery terminal.

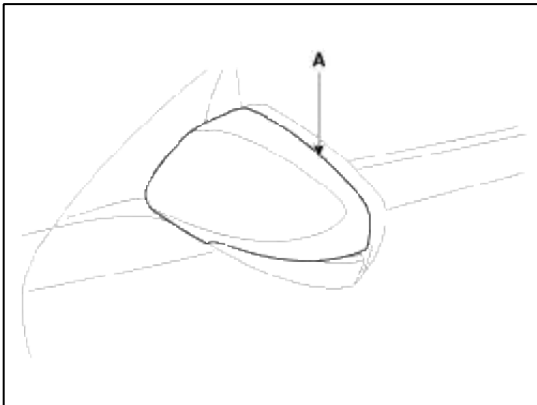
2. Remove the mirror(A) from the mirror holder.



**NOTE**

Take care not to damage the mirror cover fixing clip.

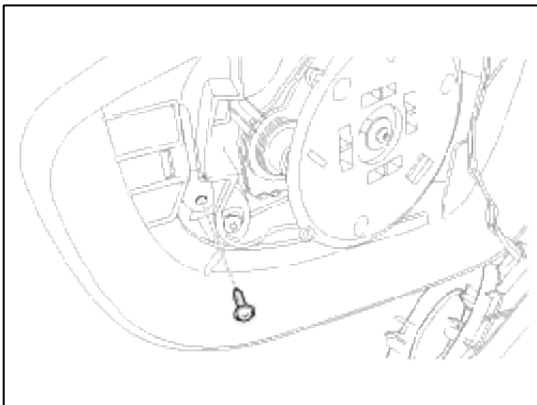
3. Loosen the fixing clip and remove the door mirror cover(A).

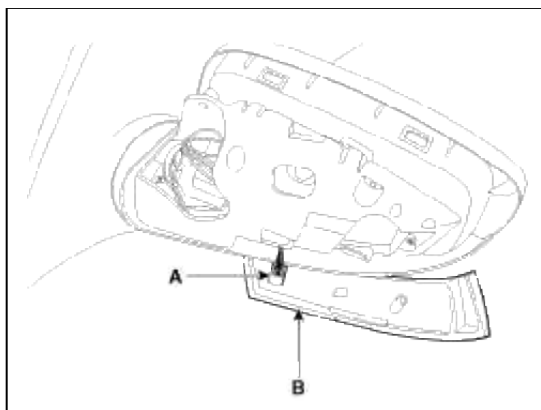


**NOTE**

Take care not to damage the mirror cover fixing clip.

4. Loosen a screw and disconnect a connector(A). Remove the door mirror turn signal lamp(B).





### Installation

#### Door Mirror Turn Signal Lamp

1. Install the door mirror turn signal lamp after connecting the connector.
2. Install the door mirror cover.
3. Connect the battery terminal (-) and check the lamp operation.

### Body Electrical System > Lighting System > Troubleshooting

#### Troubleshooting

1. The lamp switch inputs can be checked using the GDS.
2. To check the input value of lamp switch, select option "IPM".
3. To consult the present input/output 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.

Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop		
Sensor Name	Value	Unit
<input type="checkbox"/> Key in switch[Manual Key Type]	IN	-
<input type="checkbox"/> ACC	ON	-
<input type="checkbox"/> IGN1	ON	-
<input type="checkbox"/> IGN2	ON	-
<input type="checkbox"/> Tail Lamp Switch	OFF	-
<input type="checkbox"/> Head Lamp Switch	OFF	-
<input type="checkbox"/> Auto Light Switch	OFF	-
<input type="checkbox"/> Head Lamp High Switch	OFF	-
<input type="checkbox"/> Front Fog Switch	OFF	-
<input type="checkbox"/> Rear Fog Switch	OFF	-
<input type="checkbox"/> Washer Switch	OFF	-
<input type="checkbox"/> INT Switch	OFF	-
<input type="checkbox"/> Mist Switch	OFF	-
<input type="checkbox"/> Key Inter Lock Switch[Manual Key Type]	OFF	-
<input type="checkbox"/> Stop Lamp Switch[5AT Only]	OFF	-
<input type="checkbox"/> RPAS Off Switch	OFF	-
<input type="checkbox"/> Room Lamp Output	ON	-
<input type="checkbox"/> Foot Lamp Output	ON	-
<input type="checkbox"/> Ignition Key Hole Illumination[Manual Key Type]	OFF	-
<input type="checkbox"/> Auto Light Power	ON	-
<input type="checkbox"/> AV Tail Output	ON	-

4. To check the input value of lamp switch in force mode, select option "Actuation Test".

**Actuation Test**

**Test Items**

- Wiper relay
- Head lamp washer relay
- Rear fog lamp relay
- Room lamp
- Foot lamp
- Ignition key hole illumination(Manual Key Type)
- Security LED Output
- Assist seat belt indicator
- Key Interlock Solenoid(Manual Key Type)
- RPAS/R Buzzer Output(Optional)
- RPAS Switch Indicator(Optional)
- Rear Seat Belt Left Indicator
- Rear Seat Belt Center Indicator
- Rear Seat Belt Right Indicator
- Rear Seat Warmer Left(Optional)
- Rear Seat Warmer Right(Optional)

• Duration: 0.7S Once  
 • Conditions: IG. ON  
 • Result: Success

Start Stop

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	Light bulbs' wattages are smaller or larger than specified	Replace light bulbs
	Flasher unit faulty	Check flasher unit
Back up lamps do not light	Bulb burned out	Replace bulb
	Back up lamp fuse (10A) blown	Check for short and replace fuse
	Back up lamp switch (M/T) faulty	Check switch
	Transaxle range switch (A/T) faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

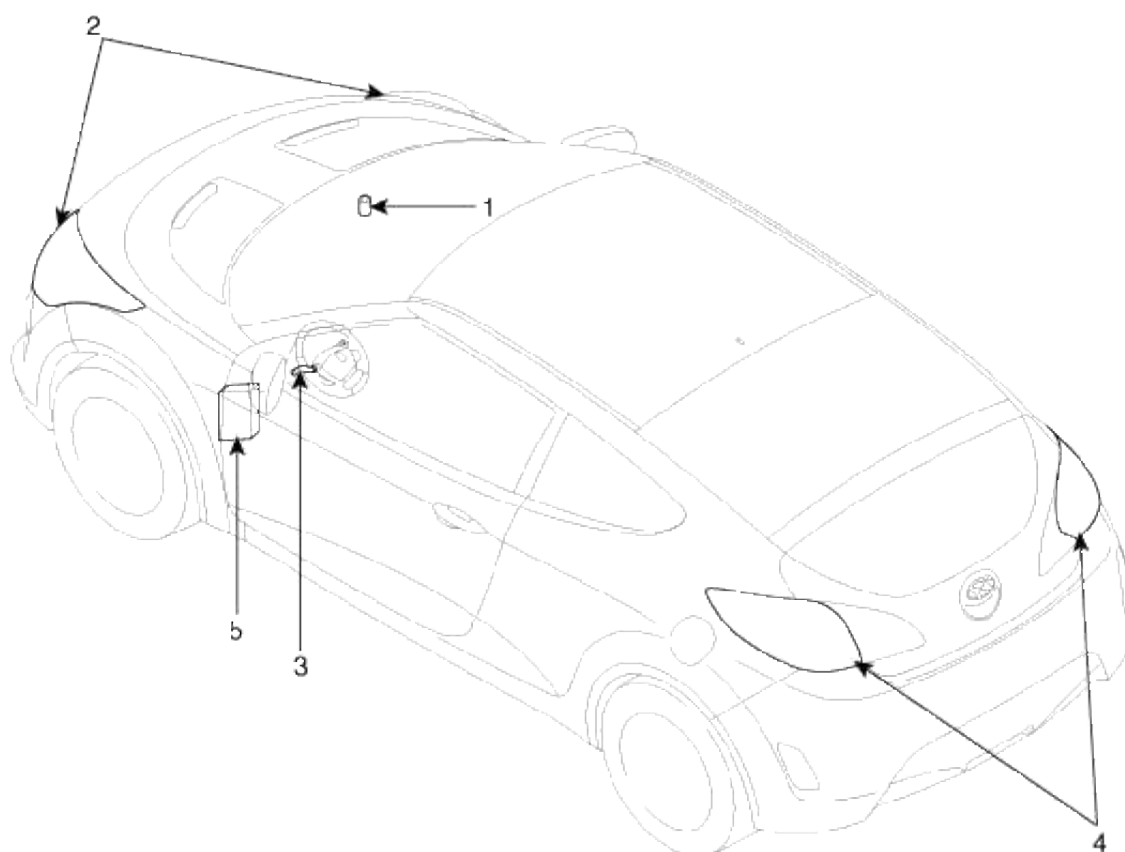
## Body Electrical System > Auto Lighting Control System > Specifications

### Specifications

Items		Specifications
Rated voltage		DC +5V
Load		Max. 1.5mA (When head lamp lighting)
Illuminations (LUX)	100	$1.89 \pm 0.42V$
	200	$3.55 \pm 0.78V$

## Body Electrical System > Auto Lighting Control System > Components and Components Location

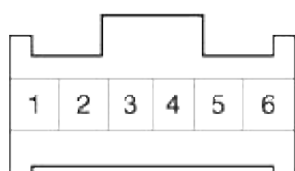
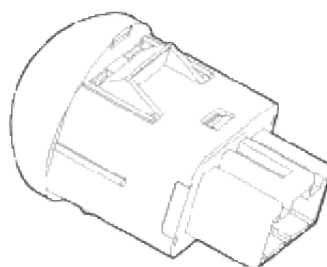
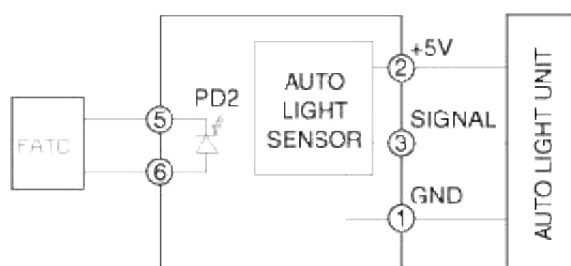
### Component Location



- |                           |                              |
|---------------------------|------------------------------|
| 1. Auto light sensor      | 4. Tail lamps                |
| 2. Head lamps             | 5. Body control module (BCM) |
| 3. Lighting switch (Auto) |                              |

## Body Electrical System > Auto Lighting Control System > Schematic Diagrams

### Circuit Diagram



[ Auto Light Connector ]

No.	Description
1	Ground
2	Power (5V)
3	Signal
4	-
5	Photo (+)
6	Photo (-)

## Body Electrical System > Auto Lighting Control System > Auto Light Sensor > Repair procedures

### Inspection

In the state of IGN1 ON, when multifunction 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 BCM monitors the range of this supply and raises up a failure as soon as the supply's voltage is out of range. Then this failure occurs and as long as this is present, the head lamp must be turned on without taking care about the sunlight level provided by the sensor.

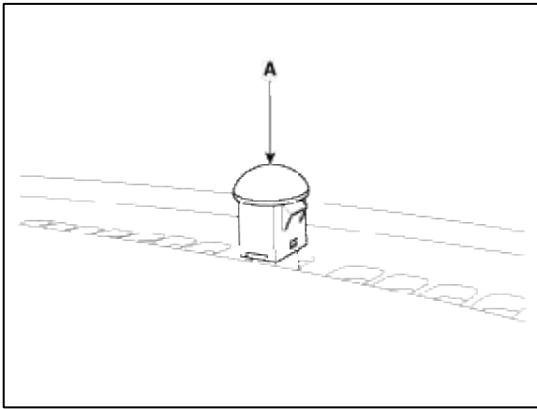
This is designed to prevent any head lamp cut off when the failure occurs during the night.

### Removal

1. Disconnect the negative (-) battery terminal.



2. Remove the auto light sensor (A) from crash pad upper side by using screw (-) driver.

**NOTE**

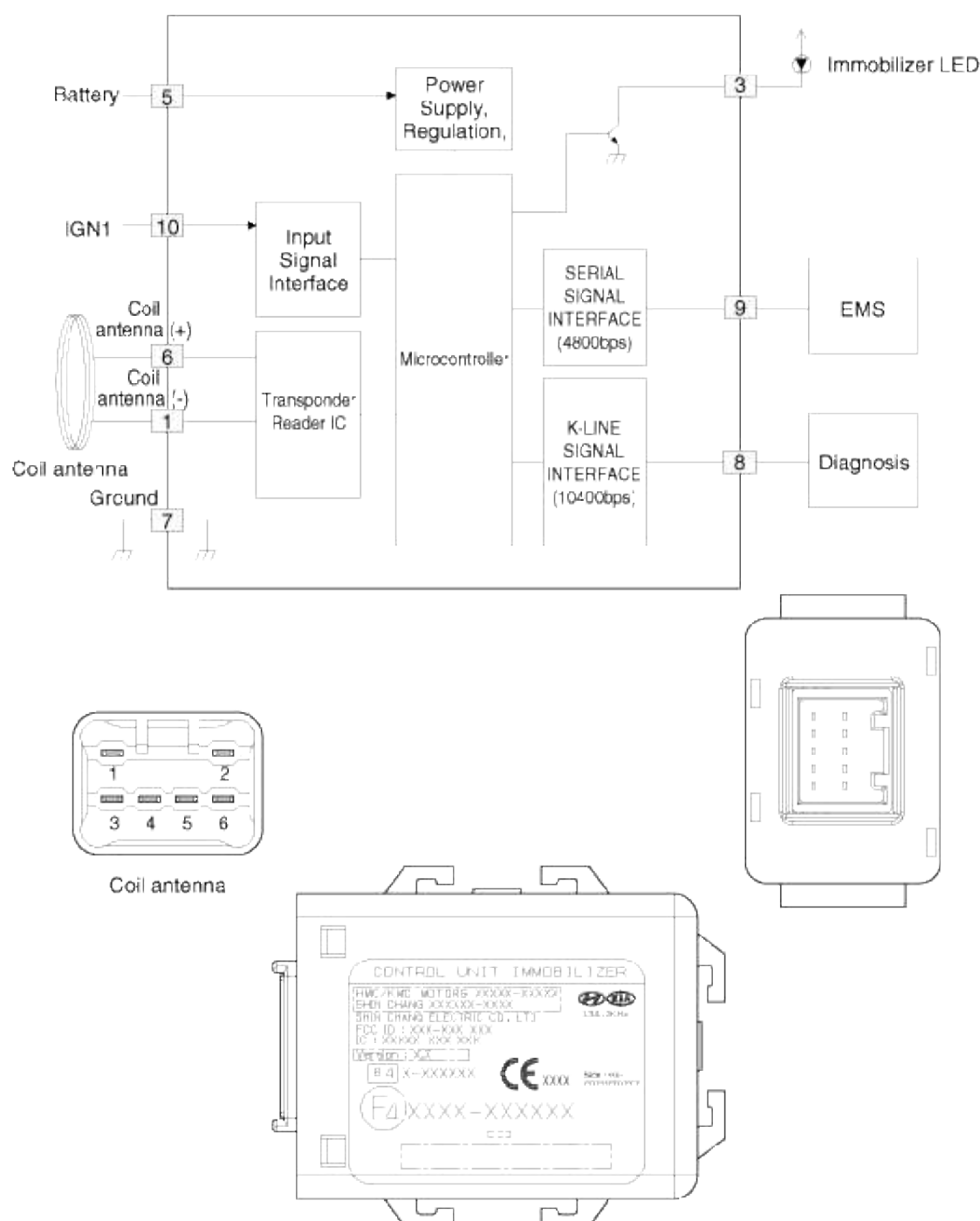
Apply the protective tapes to screw (-) driver tip.

3. Remove the auto light connector.

**Installation**

1. Reconnect the auto light connector.
2. Install the auto light sensor.

**Body Electrical System > Immobilizer System > Components and Components Location****Components**

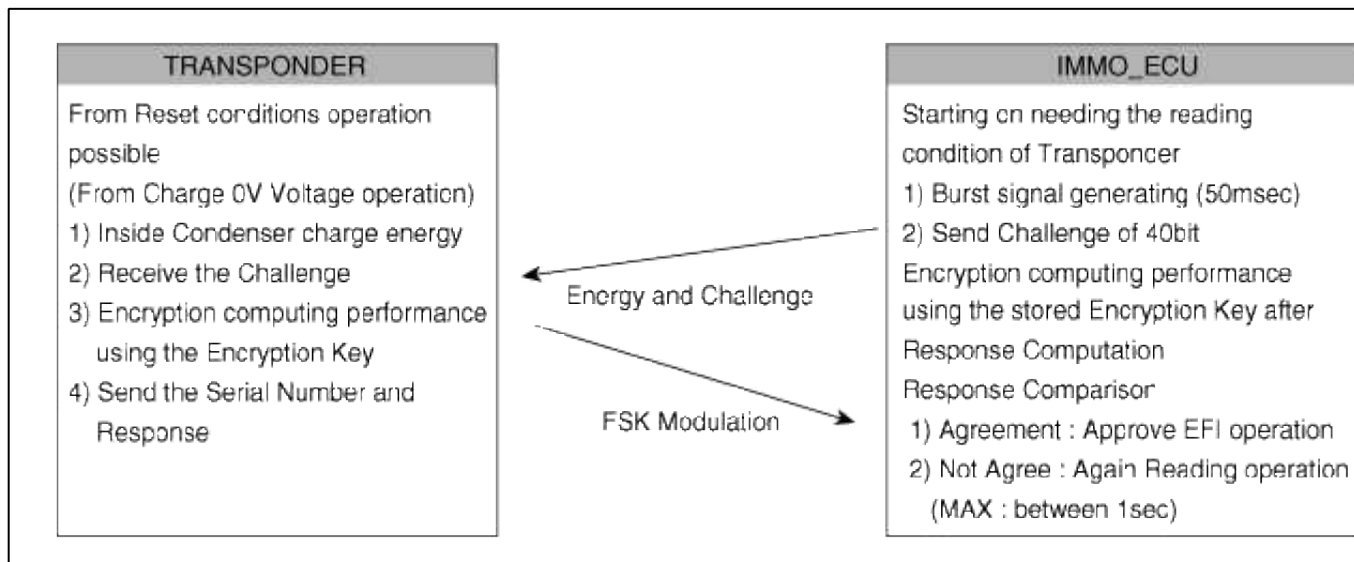


## Body Electrical System > Immobilizer System > Description and Operation

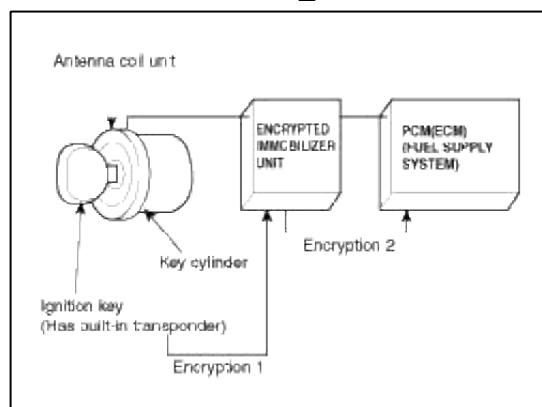
### Description

The immobilizer system will disable the vehicle unless the proper ignition key is used, in addition to the currently available anti-theft systems such as car alarms, the immobilizer system aims to drastically reduce the rate of auto theft.

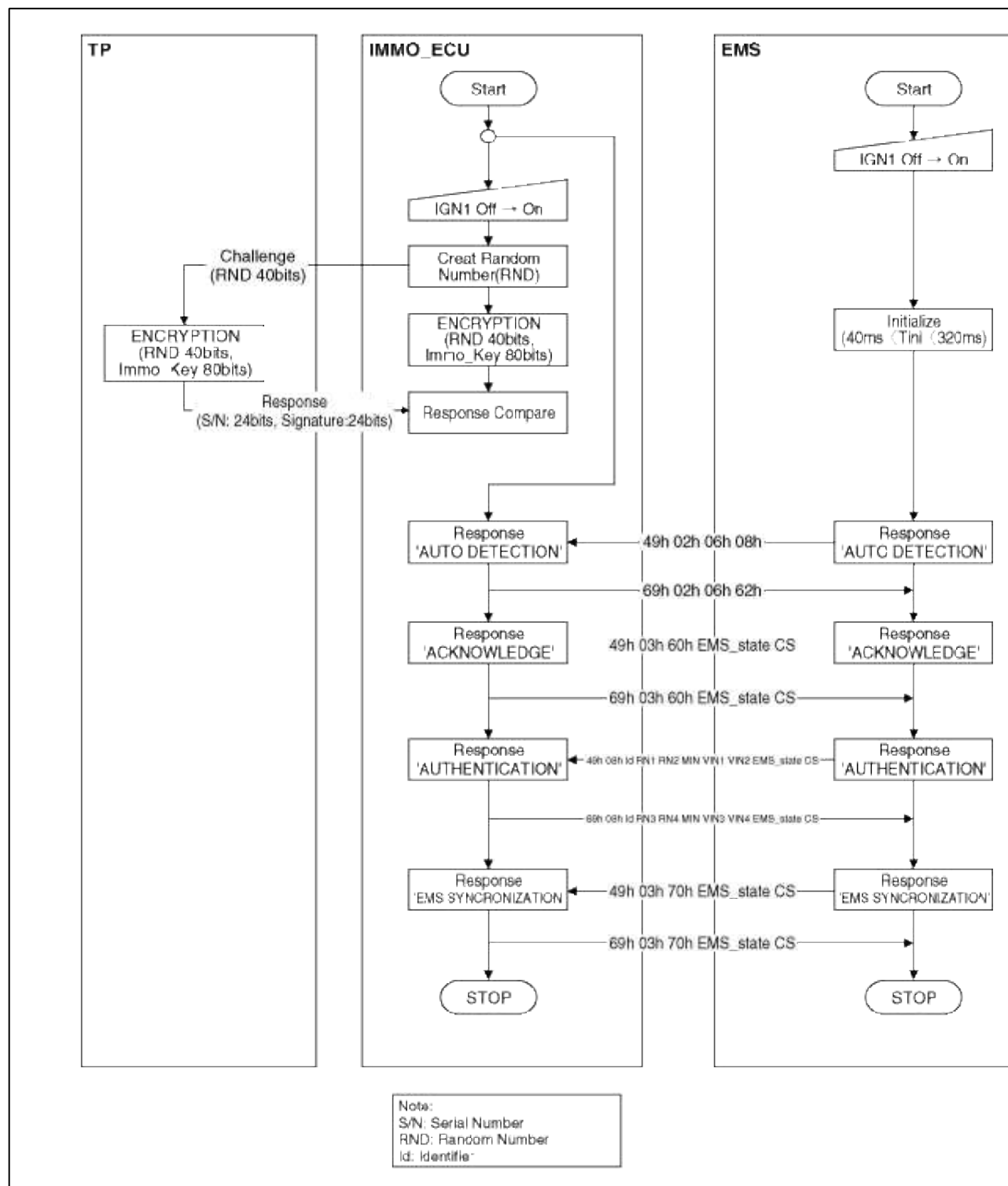
## 1. Transponder (TP) – IMMO ECU Communication

**TP Read Protocol**

- (1) IMMO\_ECU after IGN on(or CPU Reset cancellation) is sent Challenge to TP and confirmed Serial Number and Signature.
- (2) When response of input transponder is not correct, input is retry.
- (3) When response of input transponder is correct, The data that calculate Encryption operation in the EEPROM program compared with received data from TP.  
When Codes is same, input is finished.  
If the codes are not same, input are continued until when codes are same.
- (4) If IMMO\_ECU EEPROM code is not programming, when correct transponder is inputted (CRC Check OK) input is finished.
- (5) After IGN1 on(CPU Reset cancellation), IMMO\_ECU is reading the maximum 5times Transponder Code
- (6) In the IGN1 ON&EMS\_state=Lock state, when received ANKNOWLEDGE, TP is re-authenticated



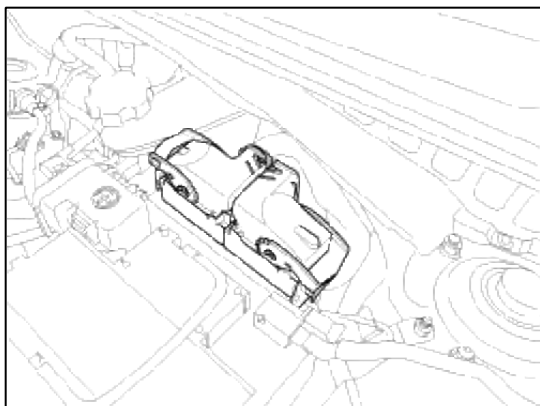
## 2. TP / IMMO ECU / EMS Authentication Flowchart



## Components Operations

## ECM (Engine Control Module)

1. The ECM(PCM) (A) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the 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 ECM.  
ERN (Encrypted Random Number) value between EMS and encrypted Immobilizer unit is checked and the validity of coded key is decided by EMS.



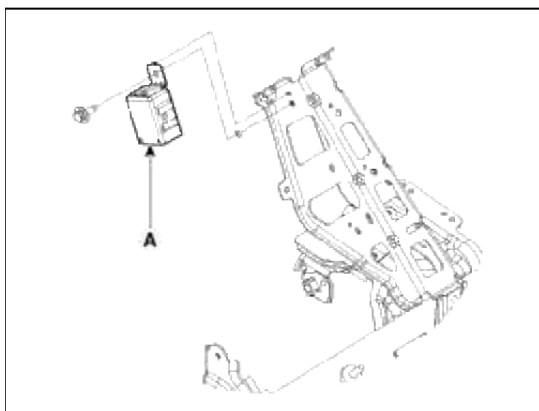
#### ENCRYPTED Immobilizer unit (A)

The Immobilizer carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The Immobilizer is mounted behind of the crash pad close to center cross bar.

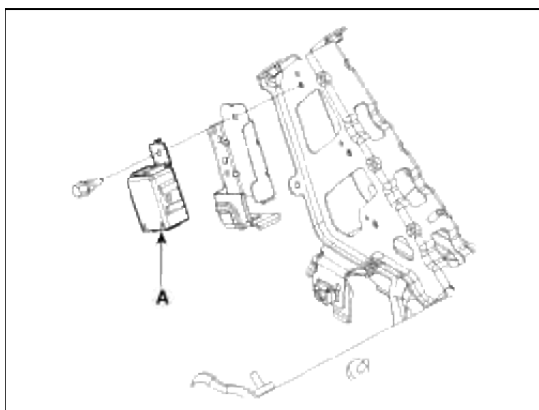
The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the Immobilizer device. And, the received messages from the PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna.

The Immobilizer does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the ECM and vice versa.

[USA]

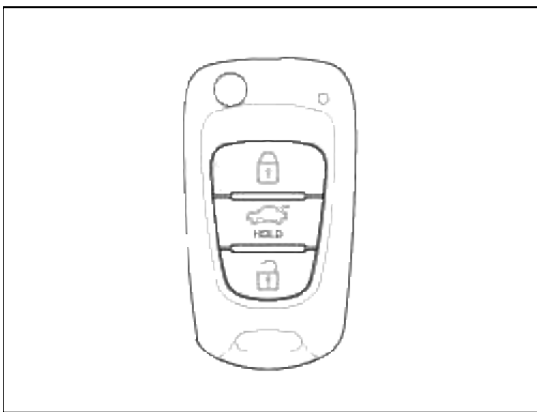
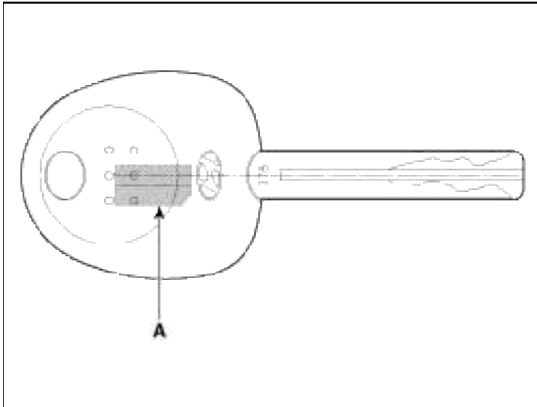


[CANADA]



## TRANSPONDER

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.

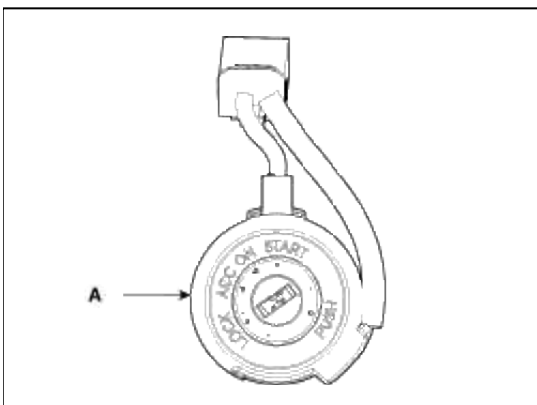


### Antenna coil

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 Immobilizer.

It is located directly on the shroud.



## Body Electrical System > Immobilizer System > Repair procedures

### Replacement

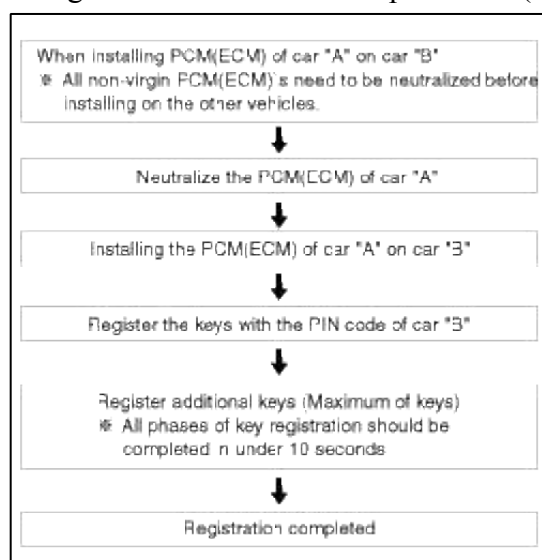
### Problems And Replacement Parts:

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	ECM	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, ECM	YES
Immobilizer unit does not work	Immobilizer unit	YES

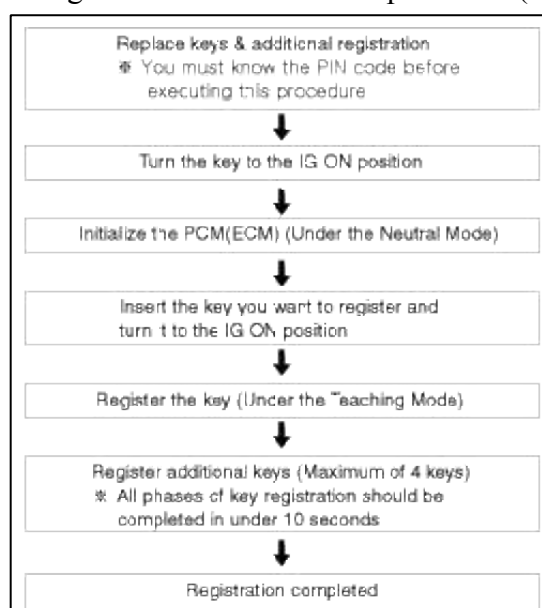
### Replacement Of Ecm And Immobilizer

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 Immobilizer, it needs teaching the Immobilizer. A new Immobilizer device replaces the old one and Immobilizer need teaching.

#### 1. Things to remember before a replacement (ECM)



#### 2. Things to remember before a replacement (Keys & Additional registration)



**NOTE**

1. When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.
2. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2.  
(Note that key #2 must be used within 10 seconds of removing key #1)
3. When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.  
The engine cannot be started even with the registered key #1.
4. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.  
Always remember the 10 seconds zone.
5. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
6. Be cautious not to overlap the transponder areas.
7. Problems can occur at key registration or vehicle starting if the transponders should overlap.

**Neutralizing Of ECM**

The ECM can be set to the "neutral" status by a tester.

A valid ignition key is inserted and after ignition on is recorded, the ECM requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the ECM is neutralized.

The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function, is accepted by the ECM.

The teaching of keys follows the procedure described for the virgin 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 ECM and Key. Ex) when lost key, Neutralize the ECM then teach keys.

(Refer to the Things to do when Key & PIN Code the ECM can be set to the "neutral" status by a scanner. If wrong vehicle specific data have been sent to immobilizer three times continuously or intermittently, the immobilizer 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 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	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
EMS Neutral	No	No	No	Yes	No





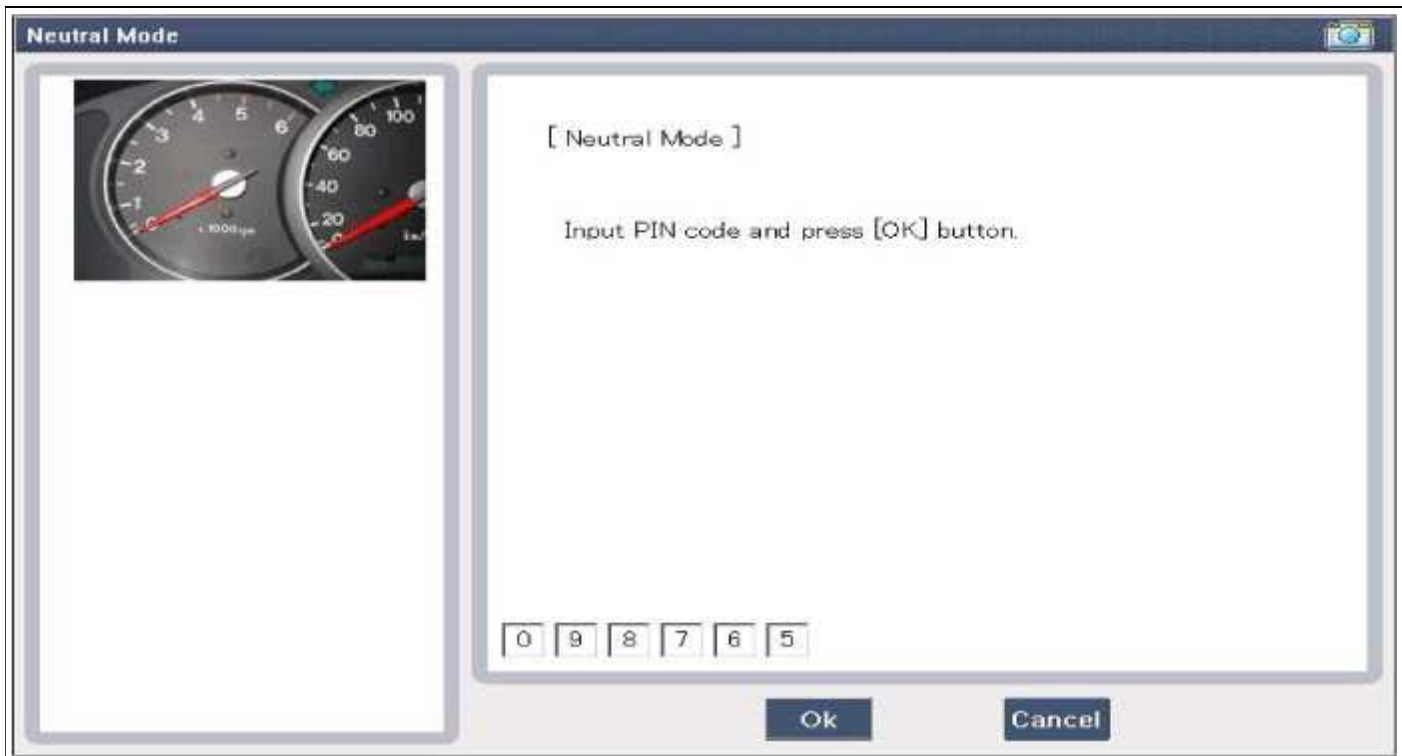
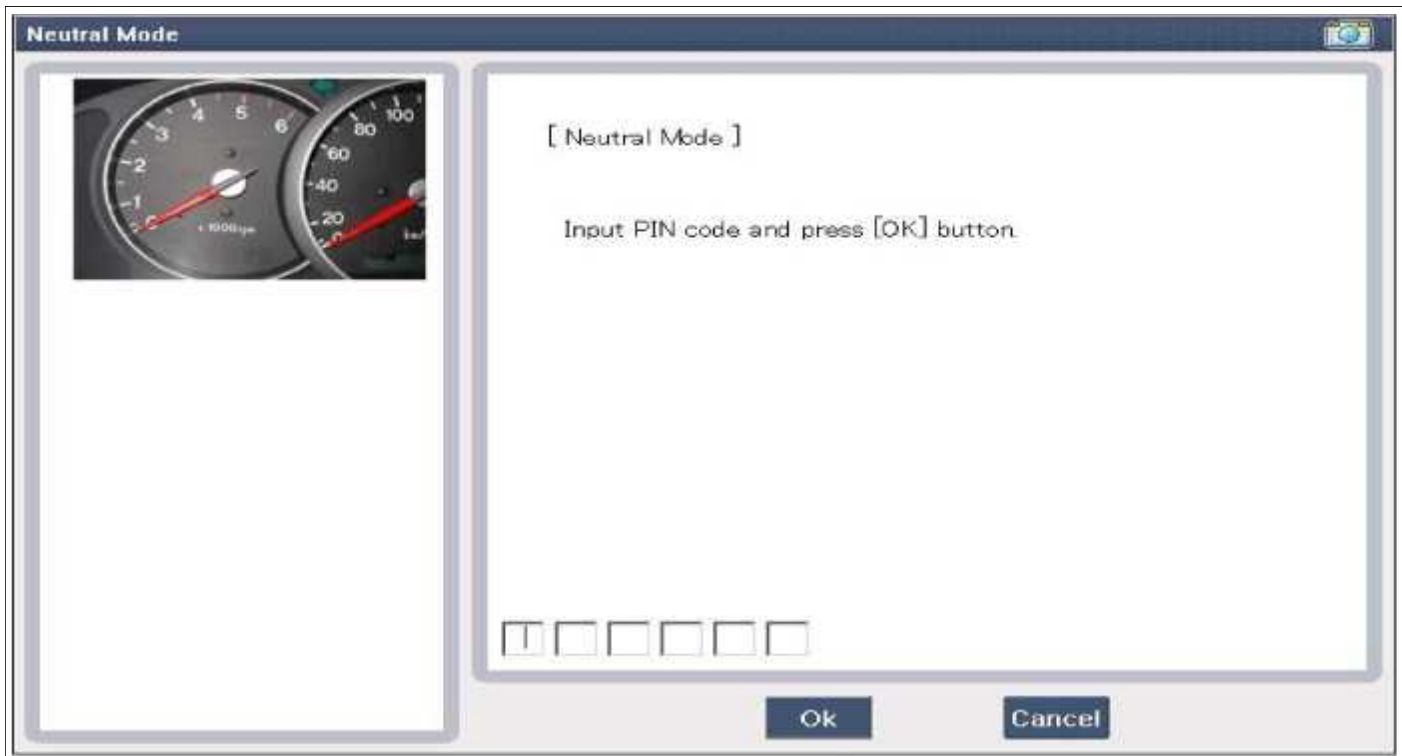
#### ID Register

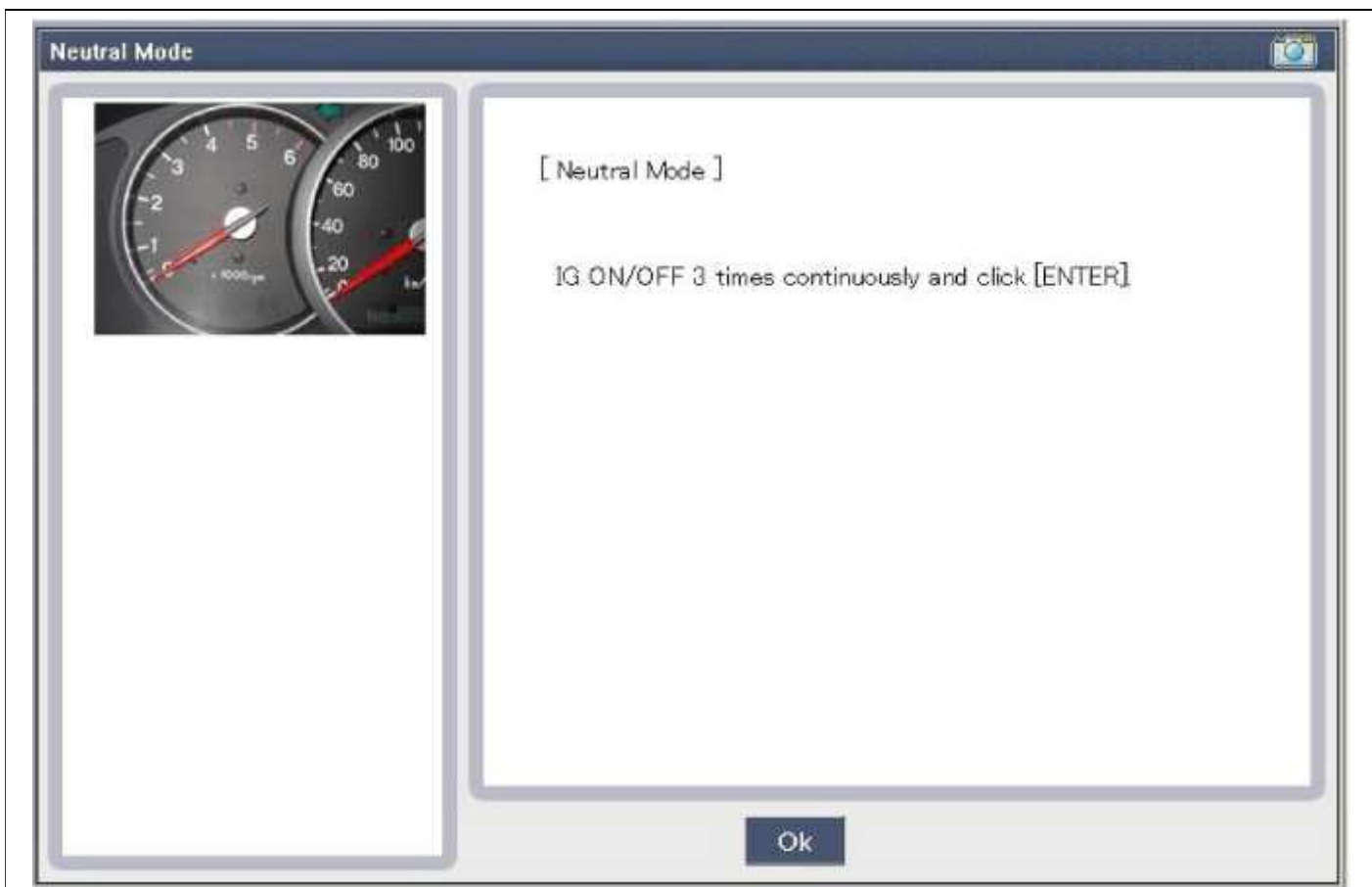
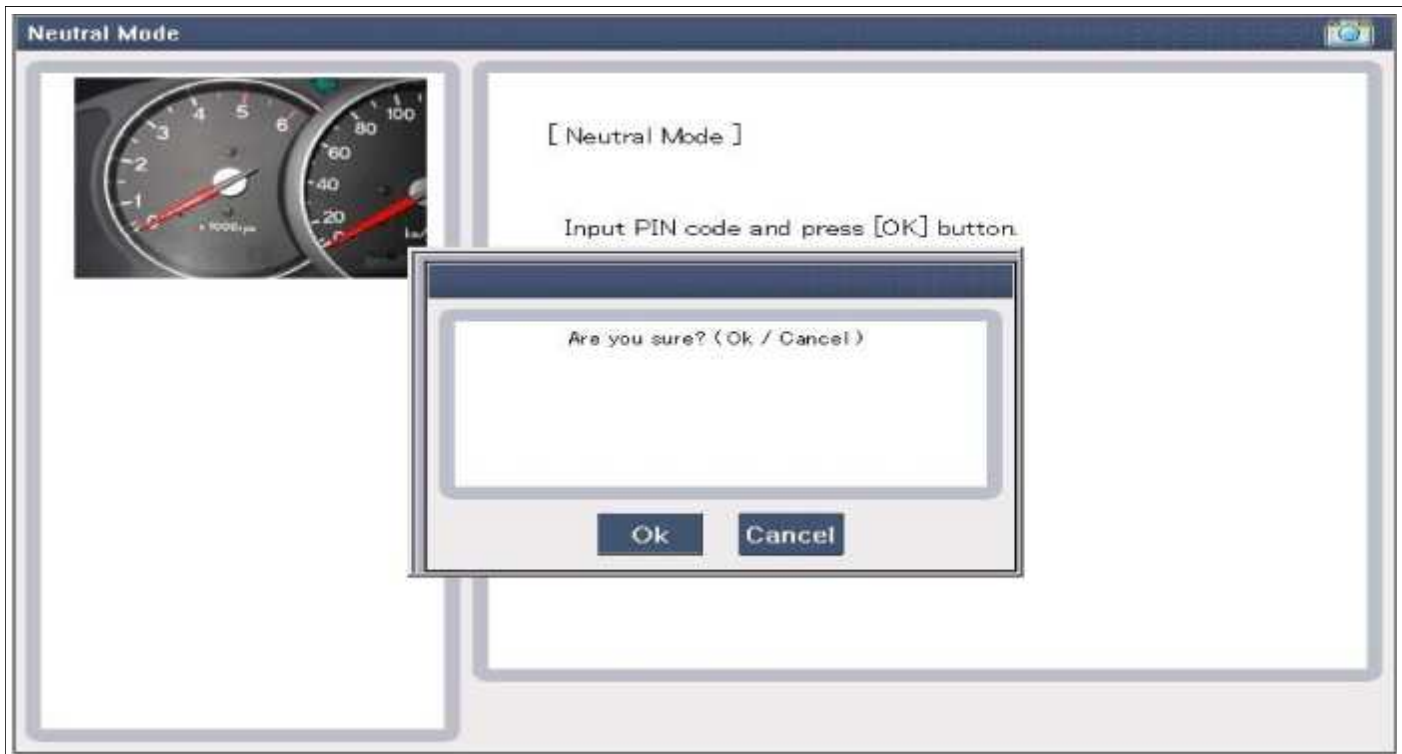
➔ Password Teaching/Changing

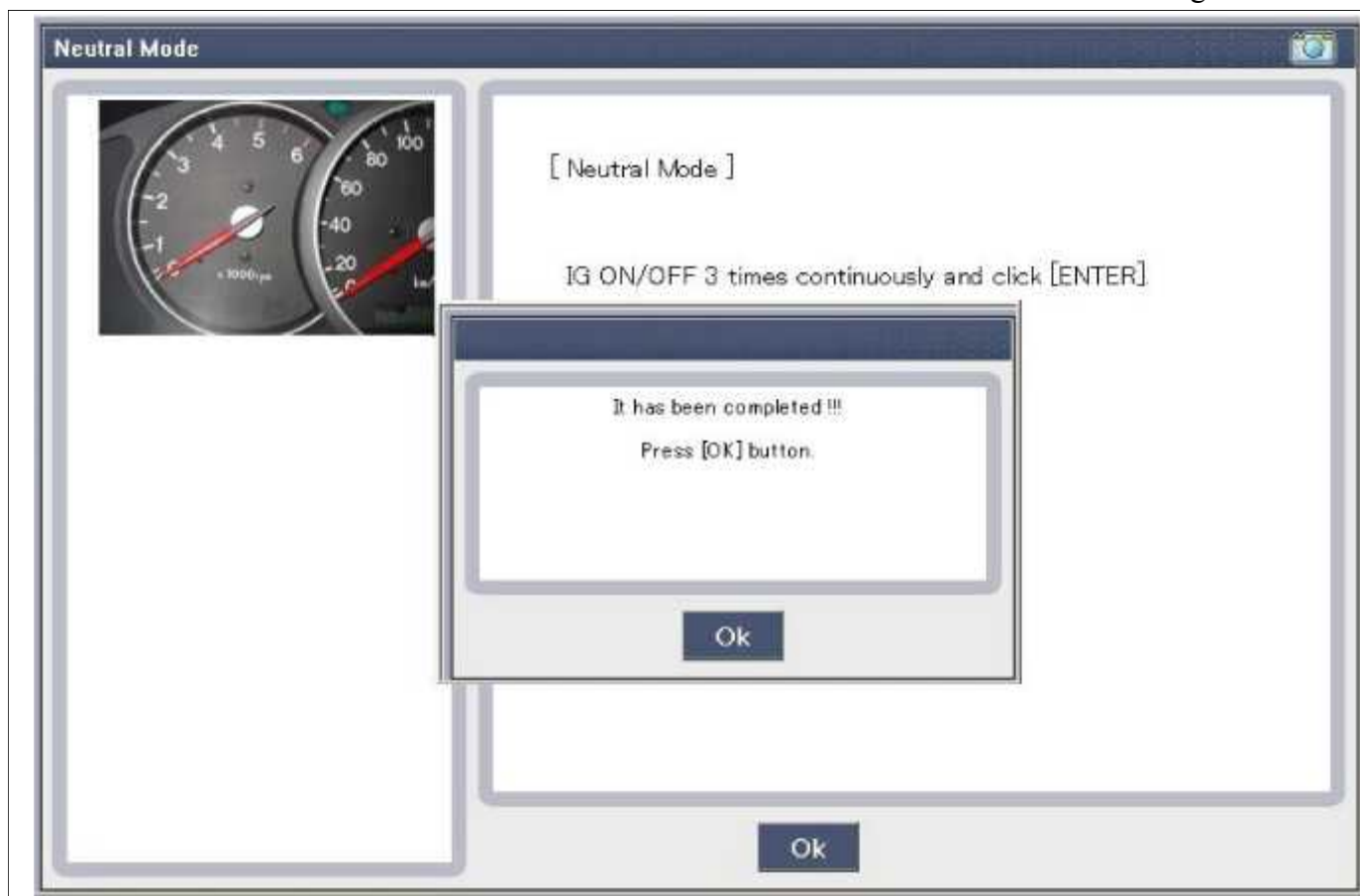
➔ Neutral Mode

➔ Limp Home Mode

➔ Teaching







Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop	VSS	
Sensor Name	Value	Unit
<input type="checkbox"/> Number of Learnt Keys	2	-
<input type="checkbox"/> ECU Status	LEARNT	-
<input type="checkbox"/> Key Status	LEARNT	-
<input type="checkbox"/> ICU Status	LEARNT	-

## Teaching Procedures

### 1. Key Teaching Procedure

Key teaching must be done after replacing a defective ECM or when providing additional keys to the vehicle owner. The procedure starts with an ECM request for vehicle specific data (PIN code: 6digits) from the tester. The "virgin" ECM stores the vehicle specific data and the key teaching can be started. The "learnt" 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 ECM three times, the 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 battery, the timer starts again for one hour.

The key teaching is done by ignition on with the key and additional tester commands. The ECM stores the relevant data in the EEPROM and in the transponder. Then the 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 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 ECM. This rejects the key and a message is sent to the tester.

The 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 ECM detects different authenticators of a transponder and an ECM, the key is considered to be invalid.

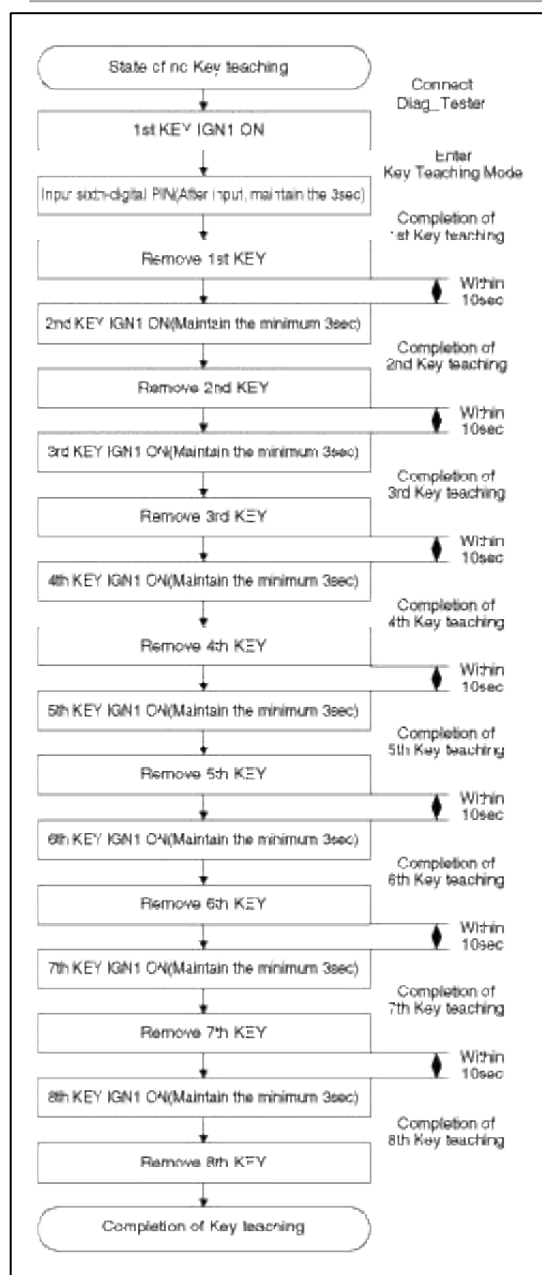
The maximum number of taught keys is 8.

If an error occurs during the Immobilizer Service Menu, the ECM status remains unchanged and a specific fault code is stored.

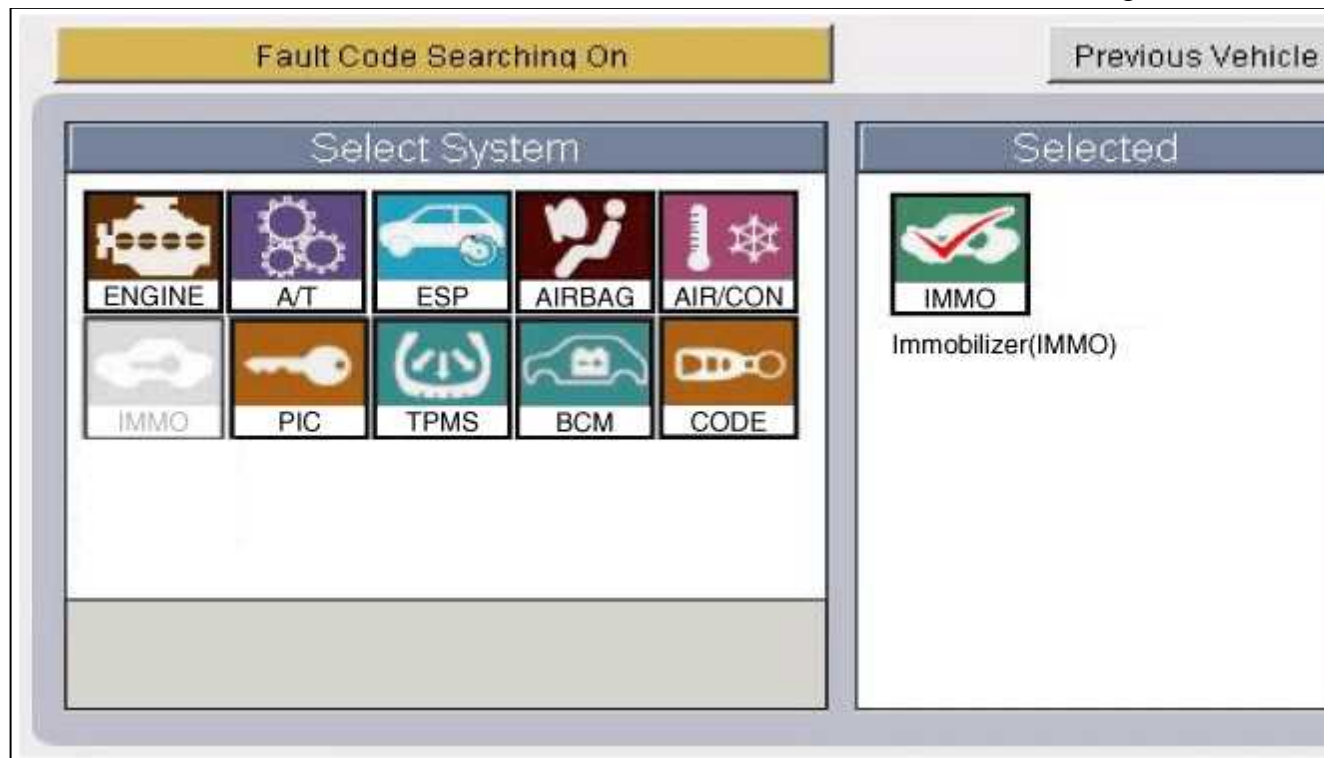
If the ECM status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at ECM.

#### NOTE

When teaching the 1st key, Immobilizer registers at the same time.



(1) ECM learnt status.



## ID Register


➔ Password Teaching/Changing

➔ Neutral Mode

➔ Limp Home Mode

➔ Teaching

**Teaching**



[ Teaching ]


Status : NEUTRAL

Input PIN code and press [OK] button

4 5 5 0 7 2

Ok Cancel

**Teaching**

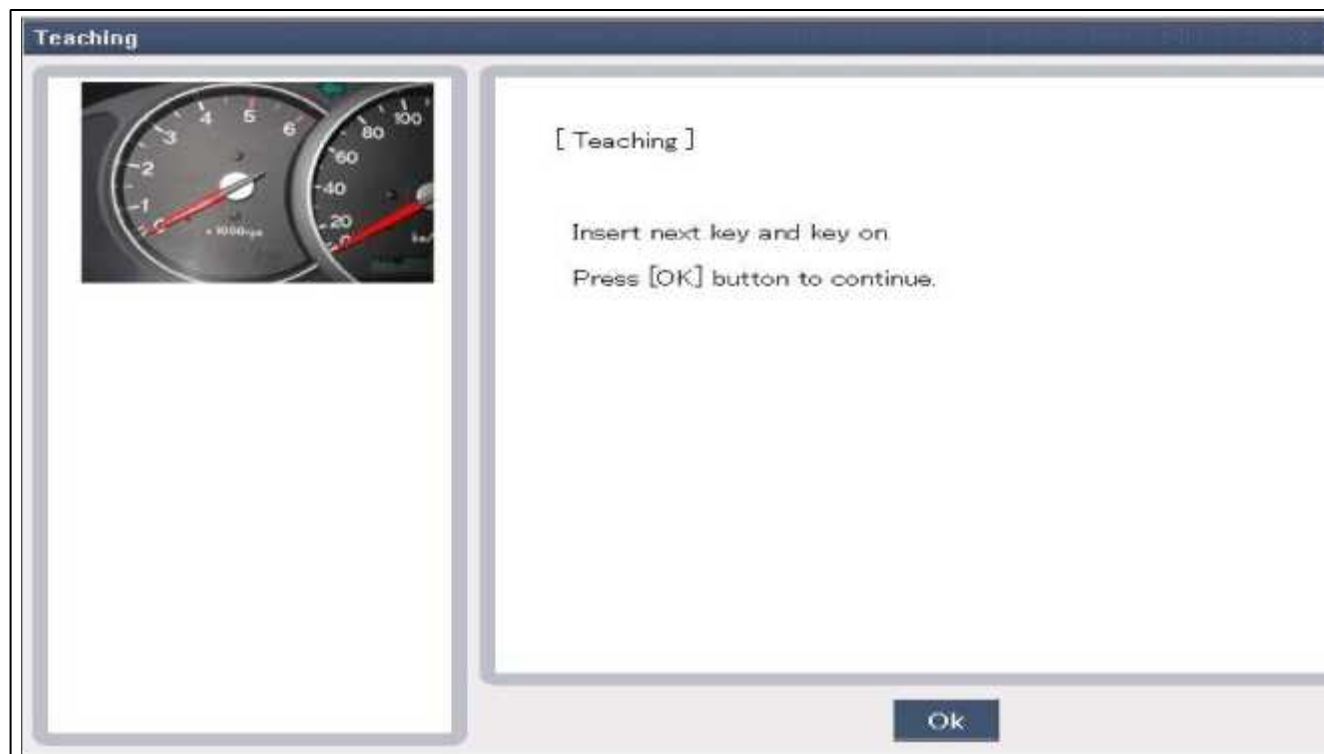
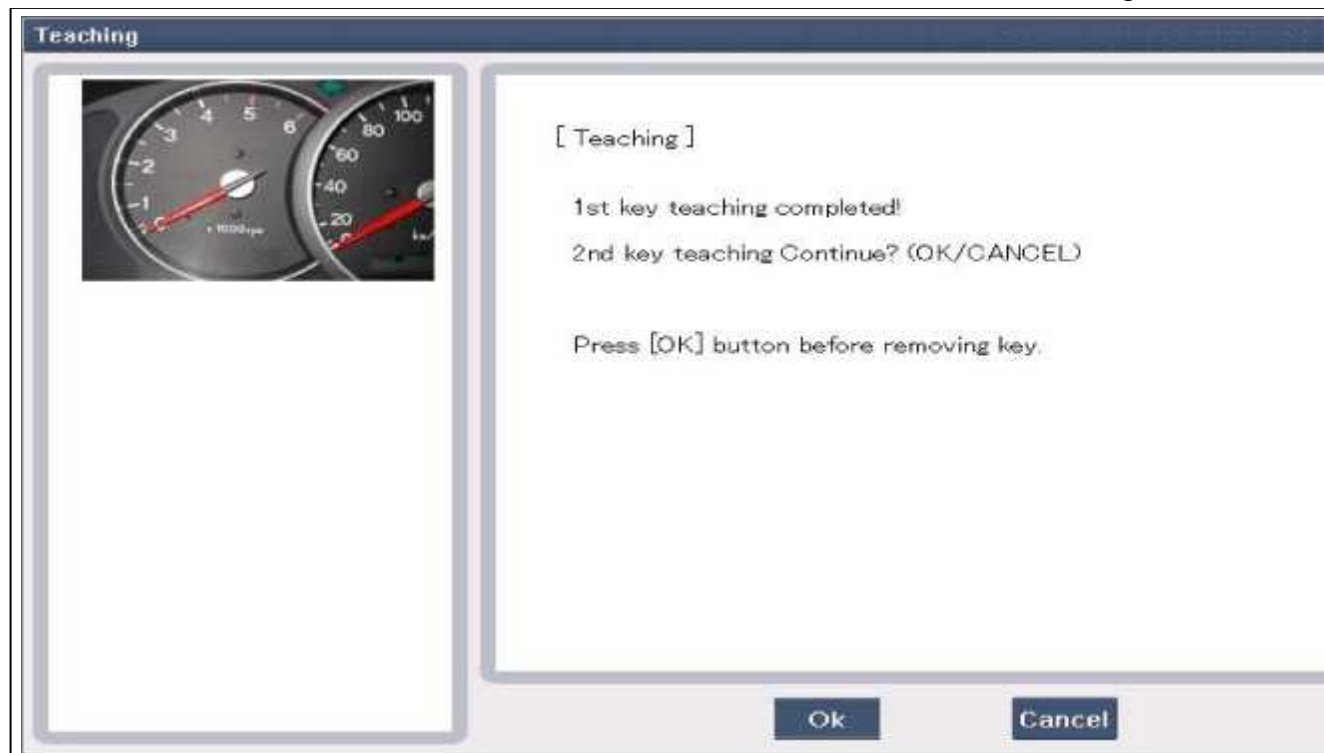


[ Teaching ]

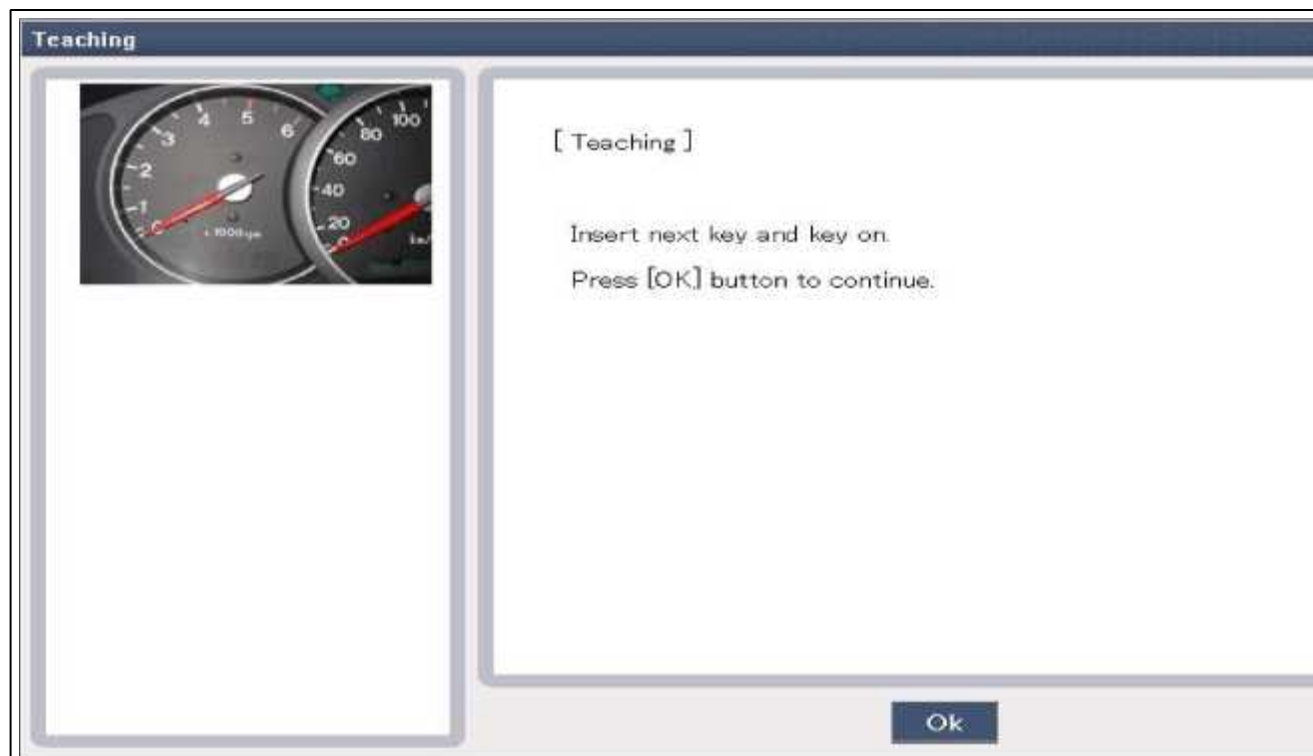
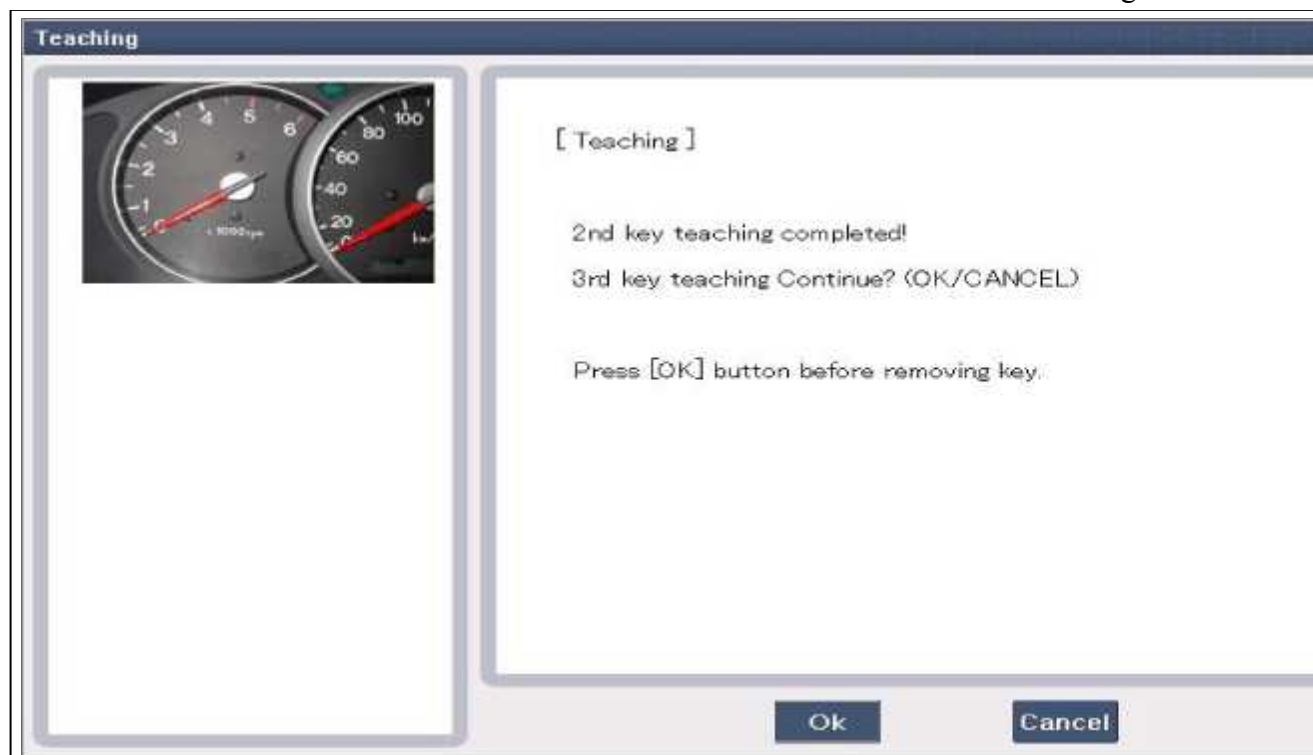
1st key teaching

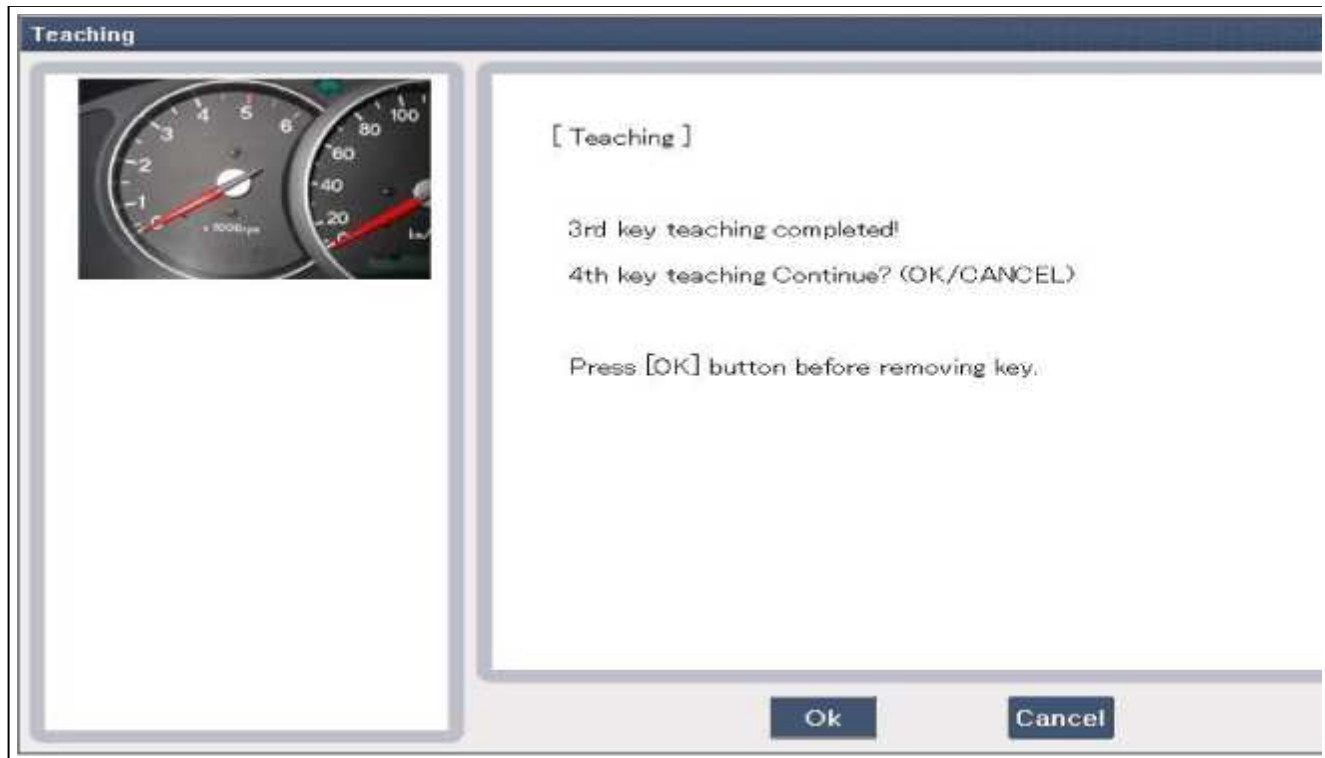
Continue? (OK/CANCEL)

Ok Cancel









## (2) ECM virgin status.

After replacing new "ECM" scan tool displays that ECM is virgin status in Key Teaching mode.

"VIRGIN" status means that 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" ECM. Before first teaching of user password to an 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"

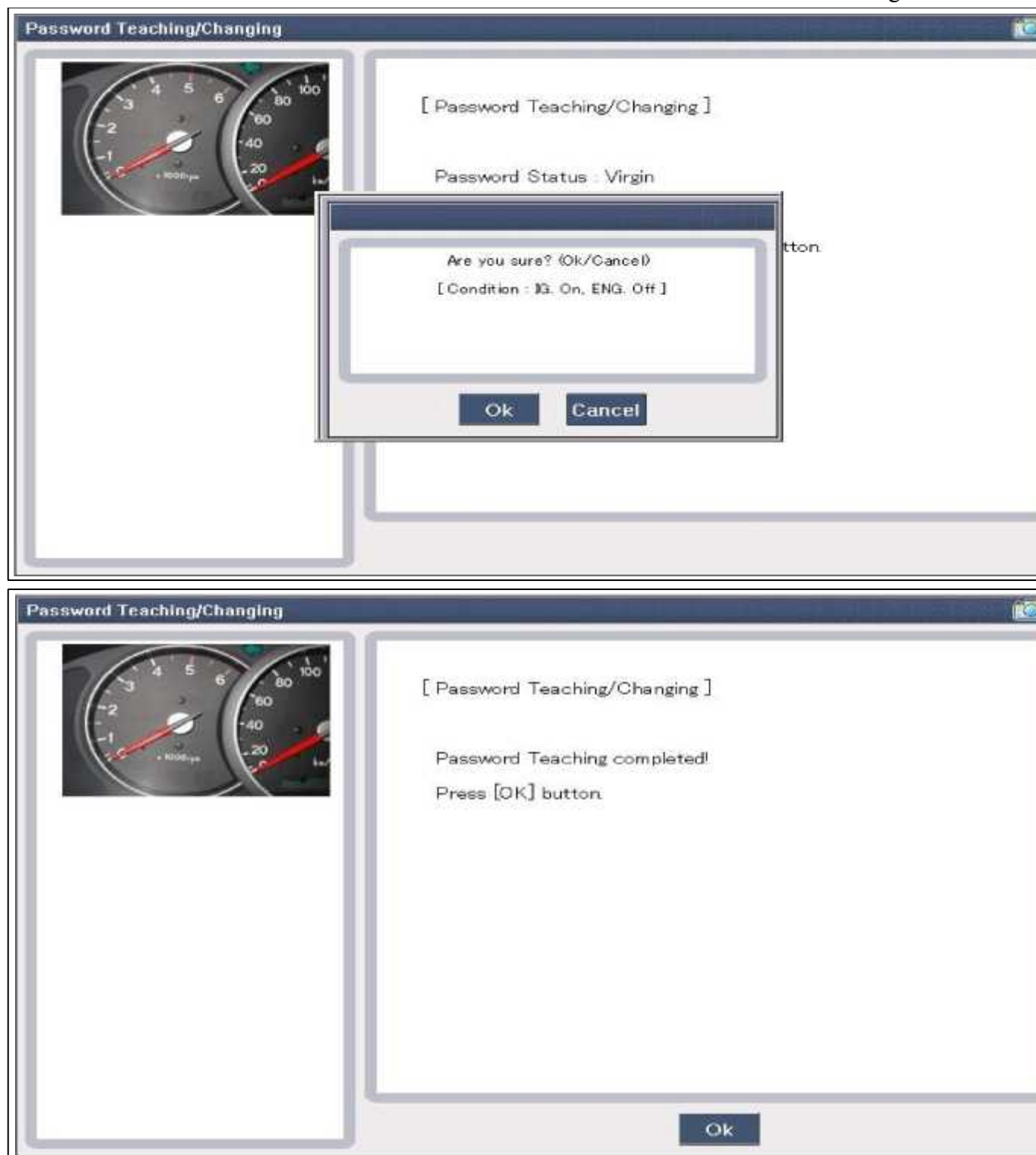
The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the ECM requests the new user password. The status remains "learnt" 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 ECM three times continuously or intermittently, the 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

## ID Register



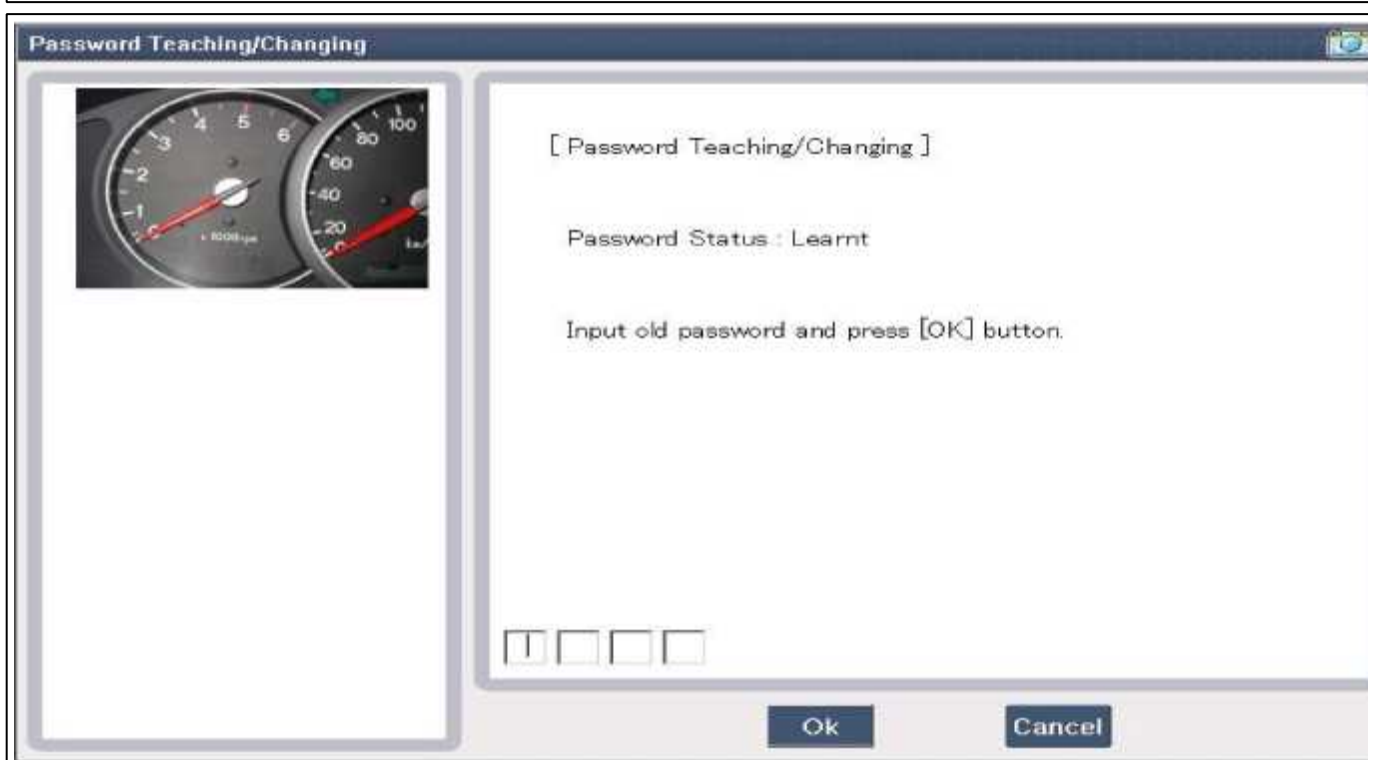
 Password Teaching/Changing Neutral Mode Limp Home Mode Teaching

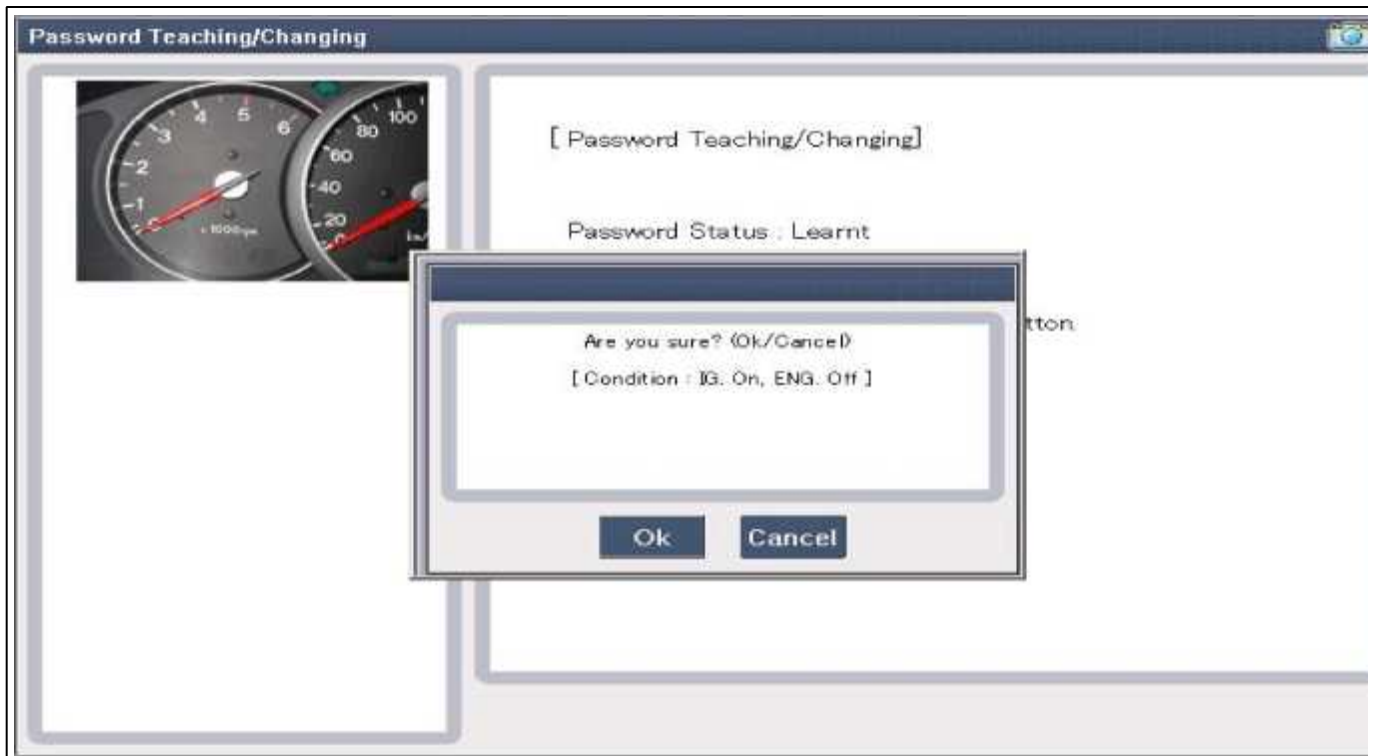
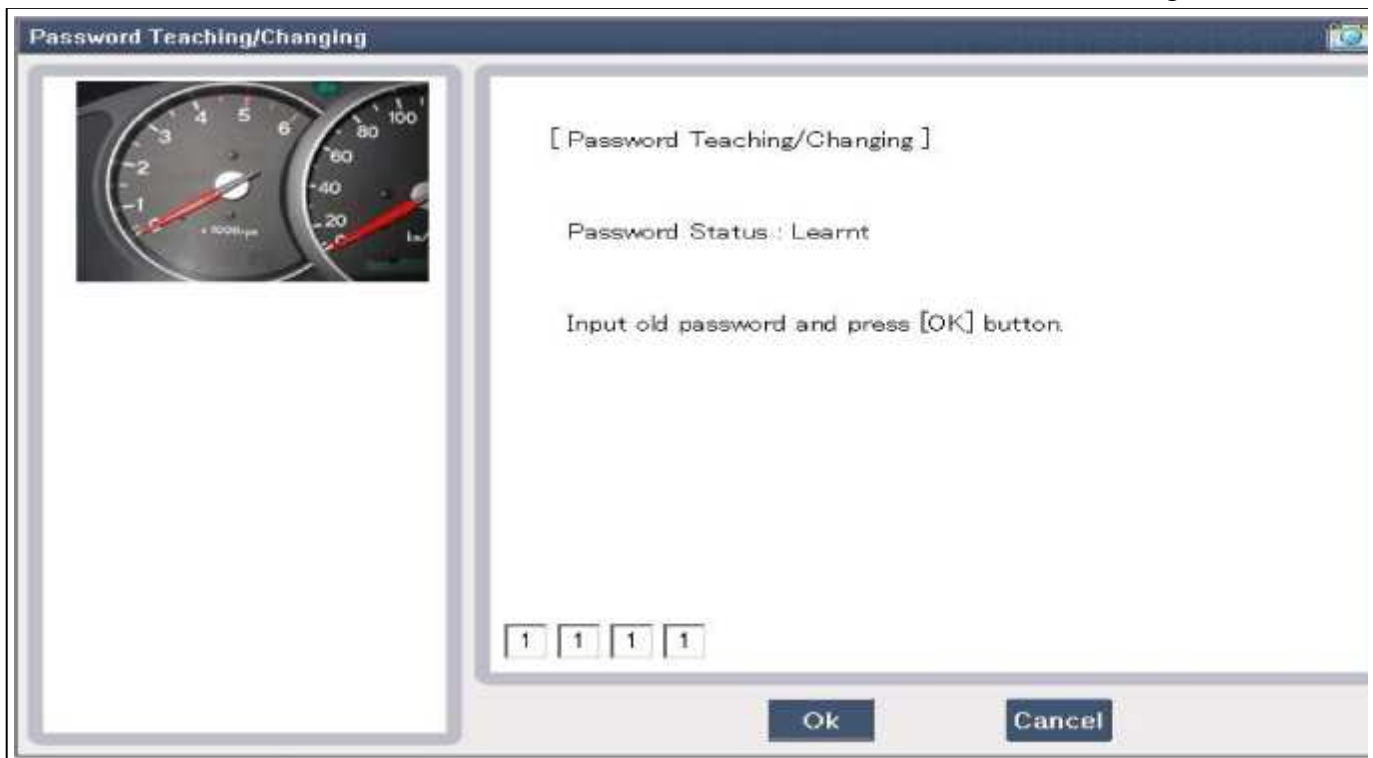


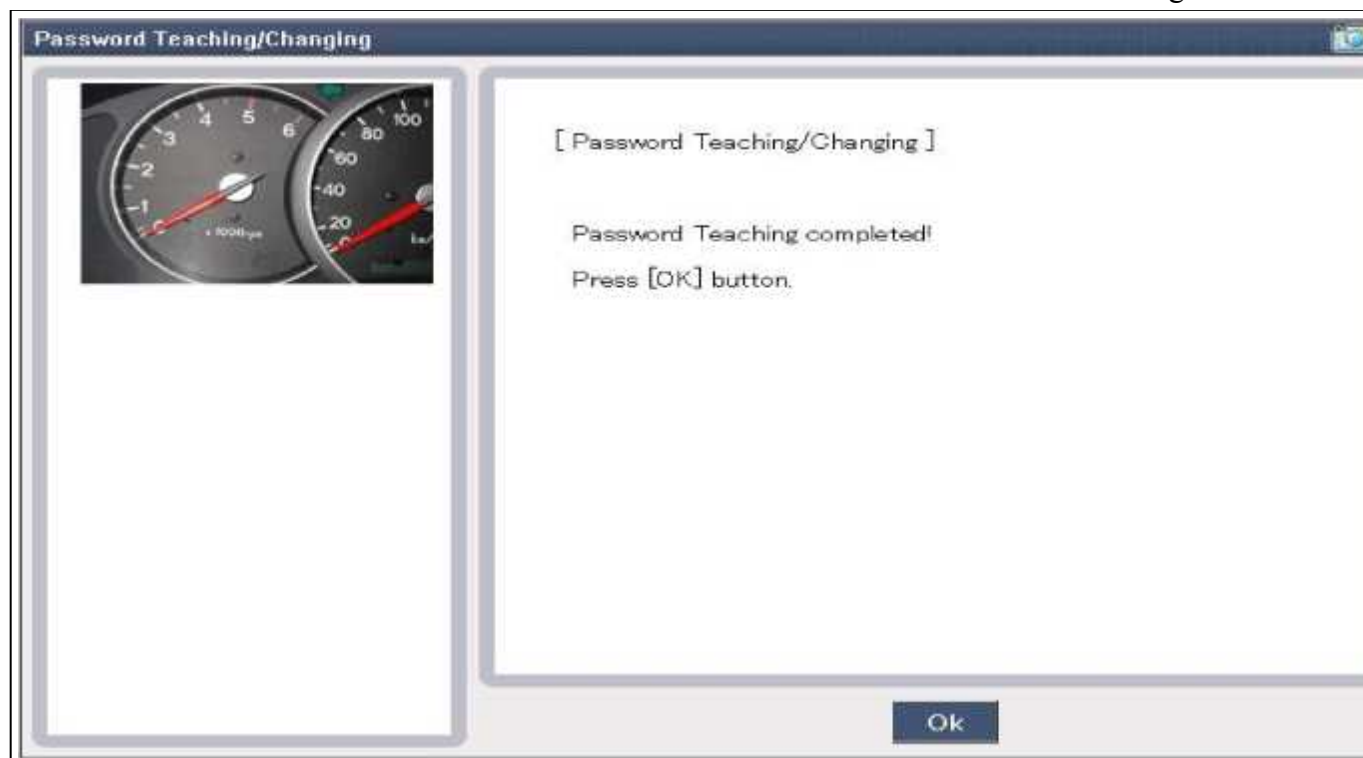
In case of putting wrong password, retry from first step after 10 seconds.

### 3. User password changing

## ID Register

 Password Teaching/Changing Neutral Mode Limp Home Mode Teaching





## Limp Home Function

### 1. Limp Home By Tester

If the ECM detects the fault of the Immobilizer or transponder, the 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 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 ECM via the special tester menu.

Only if the ECM is in status "learnt" and the user password status is "learnt" and the user password is correct, the 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 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 ECM, the timer starts again for one hour.

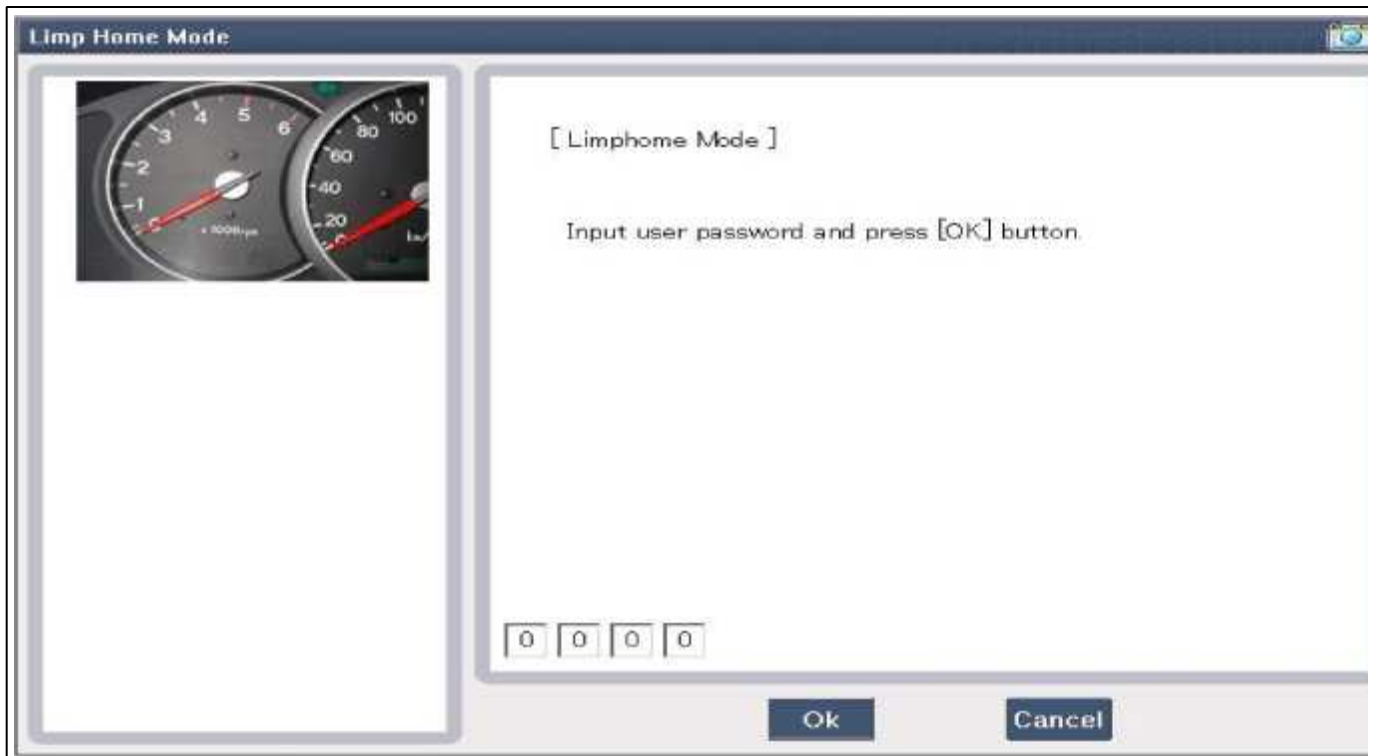
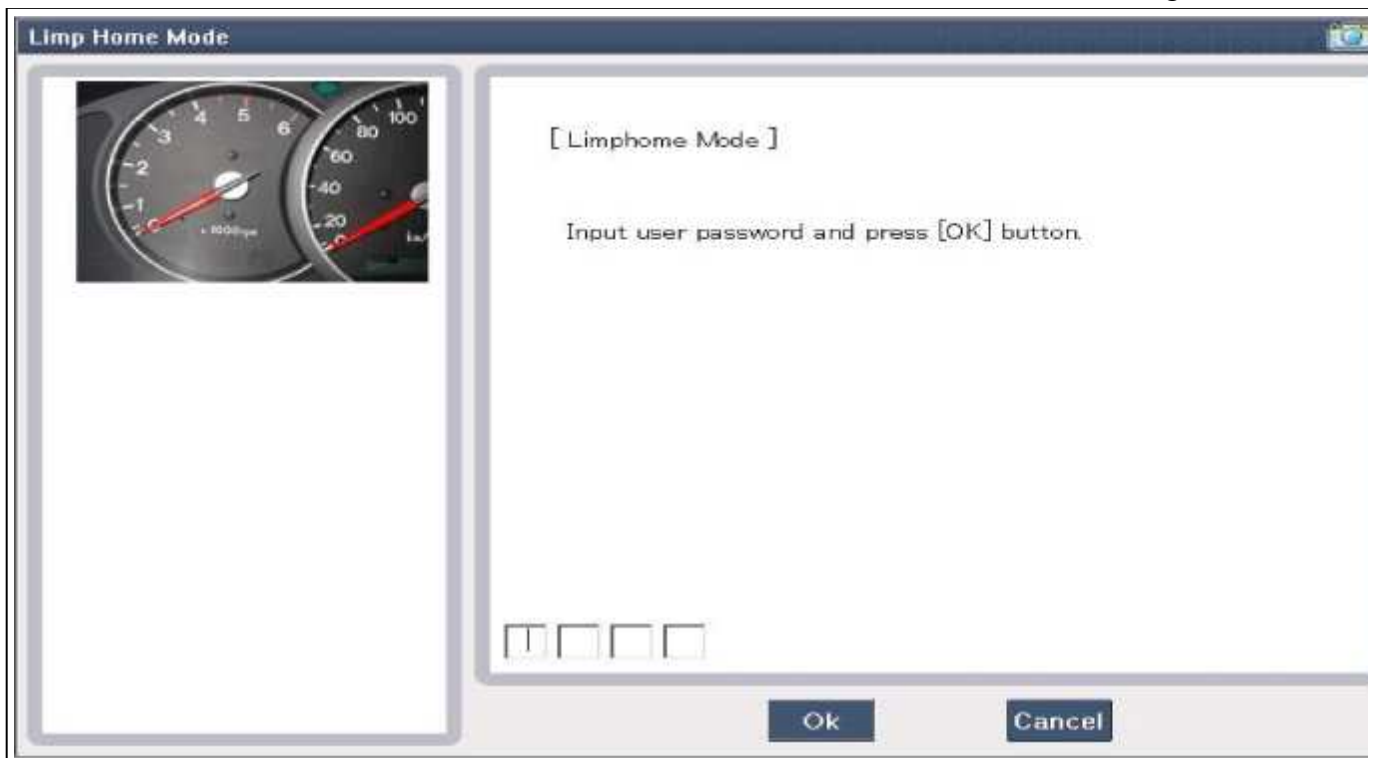
#### ID Register

➔ Password Teaching/Changing

➔ Neutral Mode

➔ Limp Home Mode

➔ Teaching







## 2. Limp Home By Ignition Key

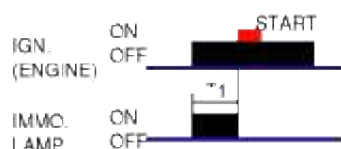
The limp home can be activated also by the ignition key. The user password can be input to the ECM by a special sequence of ignition on/off.

Only if the ECM is in status "learnt" and the user password status is "learnt" and the user password is correct, the ECM will be unlocked for a period of time (30 sec.).

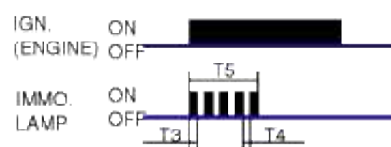
The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again.

After ignition off, the ECM is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.

## 1. NORMAL CONDITION(NO FAILURE)



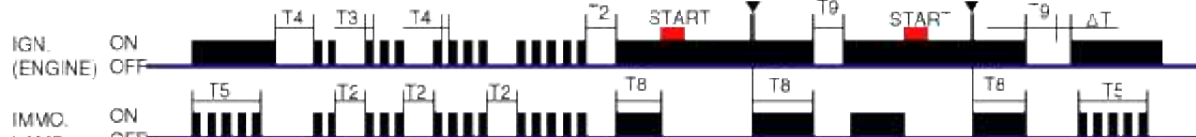
## 2. IN CASE OF FAILURE(LIMP HOME)



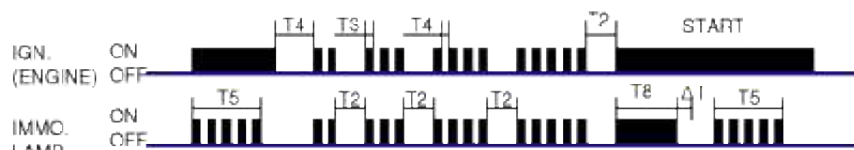
## 3. LIMP HOME OPERATING



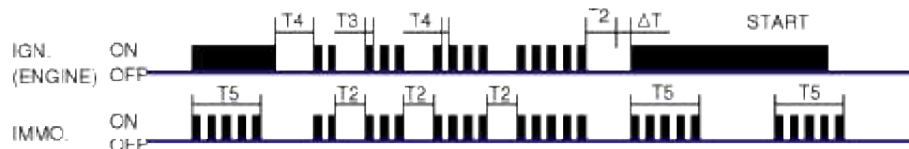
USER PASSWORD : 2345H



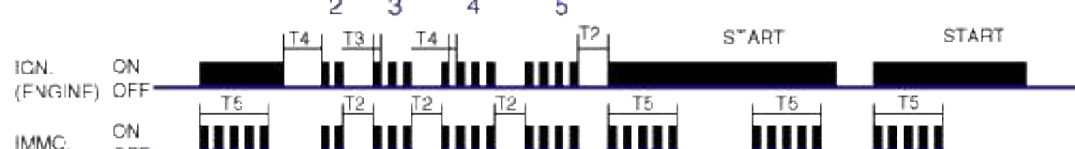
USER PASSWORD : 2345H



USER PASSWORD : 2345H



USER PASSWORD : 2345H



USER PASSWORD : 2345H

## NOTE :

- T1 > 5sec
- 3sec < T2 < 10sec
- 0.2sec < T3 < 5 sec
- 0.2sec < T4 < 3sec
- T5 = 5sec
- T6 < 30sec
- T9 = 8sec
- T8 = 30sec
- CODE '0' - IG.ON 10 TIMES

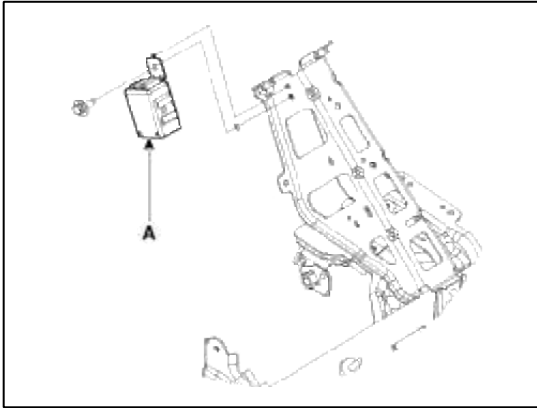
## Body Electrical System &gt; Immobilizer System &gt; Immobilizer Control Unit &gt; Repair procedures

## Removal

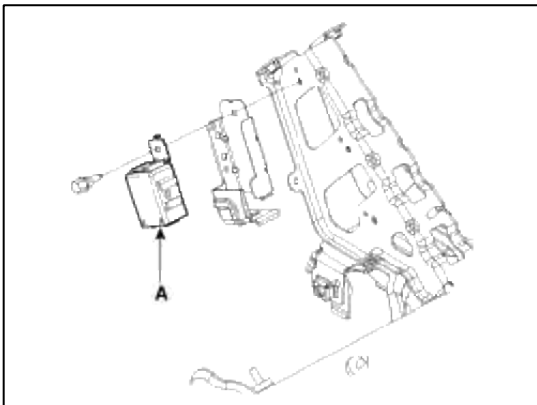
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.  
(Refer to the BD group - "Crash pad")

3. Disconnect the connector of the immobilizer unit and then remove the immobilizer unit (A) after loosening the bolt.

[USA]



[CANADA]



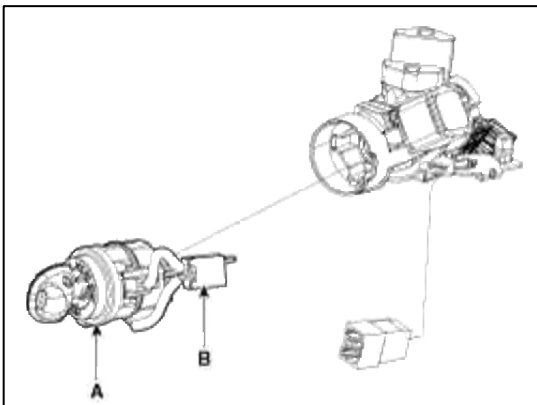
#### Installation

1. Install the immobilizer unit.
2. Connector the immobilizer unit.
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 crash pad lower panel.  
(Refer to the BD group - "Crash pad")
3. Disconnect the 6P connector (B) after loosening the screw and then remove the antenna coil (A).



#### Installation

1. Install the antenna coil.
2. Connect the antenna coil connector.
3. Install the crash pad lower panel.

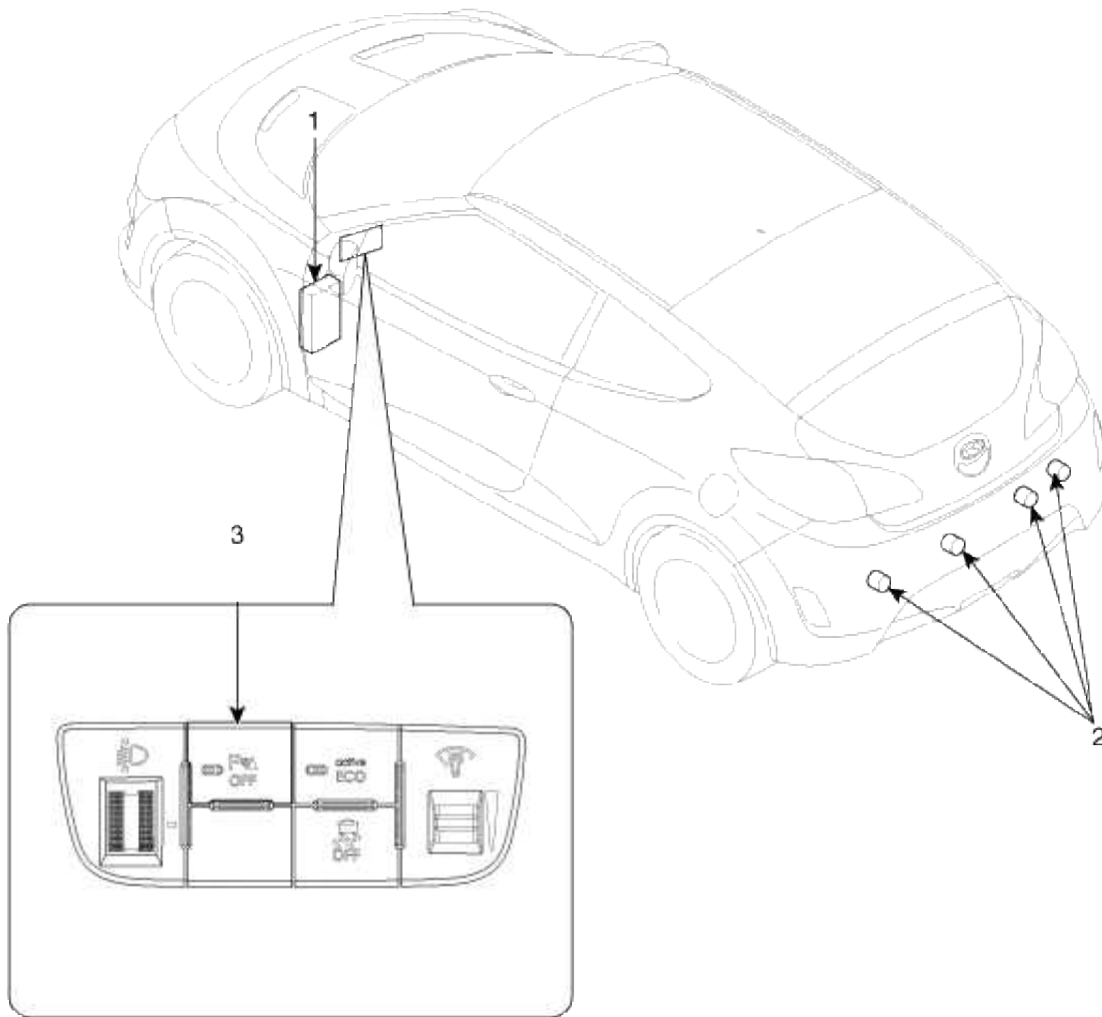
### Body Electrical System > Rear Parking Assist System > Specifications

#### Specification

Description		Specification
Ultrasonic sensor	Rated voltage	DC 12V
	Detecting range	11.8~47.2 in (300 ~ 1,200 mm)
	Operating voltage	DC 8 ~ 10 V
	Rated current	MAX. 20 mA
	Operating temperature	-22°F~+176°F(-30°C ~ +80°C)
	Preservation temperature	-40°F~+185°F(-40°C ~ +85°C)
	Frequency	48 ± 5 KHZ
	Number of sensors	4 EA (Right, Center-right, Center-left, Left)

### Body Electrical System > Rear Parking Assist System > Components and Components Location

#### Component Location



- |                      |                                     |
|----------------------|-------------------------------------|
| 1. IPM               | 3. Rear parking assist switch (OFF) |
| 2. Ultrasonic sensor |                                     |

The IPM contains the rear parking assist system function.  
Buzzer is built in IPM.

### Body Electrical System > Rear Parking Assist System > Description and Operation

#### System Overview

RPAS(Rear Parking Assist System) is an electronic driving aid device warning driver to be cautious during parking or low speed when after detecting an object on side and behind of vehicle by using the feature of ultrasonic waves. RPAS consists of four RPS sensors which detect the obstacles and transmit the result in three separate warning levels, the first, second and third to BCM by LIN communication. BCM decides the alarm level by the transmitted communication message from the slave sensors, then operate the buzzer or transmits the data for display.

The diagram illustrates the LIN network for the rear parking assist system. The BCM (LIN Master) receives a 'Rear Gear' input and outputs a LIN signal to four PAS Sensors (LIN Slaves). The sensors are: Rear Left Sensor (RL), Rear Center Left Sensor (RCL), Rear Center Right Sensor (RCR), and Rear Right Sensor (RR). Each sensor is connected to Vbat, LID3, GND, LID2, LID1, and LIN. The LIN line is also connected to IGN2 and GND. A Buzzer or Display is connected to the LIN Master.

2012-10-15

## 1. INIT mode

- (1) System initializing time is 500ms after IGN1+ R Gear.
- (2) RPAS recognizes ID and sets the sensor ID up during initialization.
- (3) RPAS activates each sensor and then executes the diagnosis after finishing initialization of BCM
- (4) RPAS Starting buzzer” is normally worked, when sensor does not send an error message and after finishing error diagnosis.
- (5) If any failure is received from the any sensors, RPAS Starting Buzzer” does not work but the failure alarm is operated for a moment.  
If you have display option, warning sign is also shown on it.
- (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.

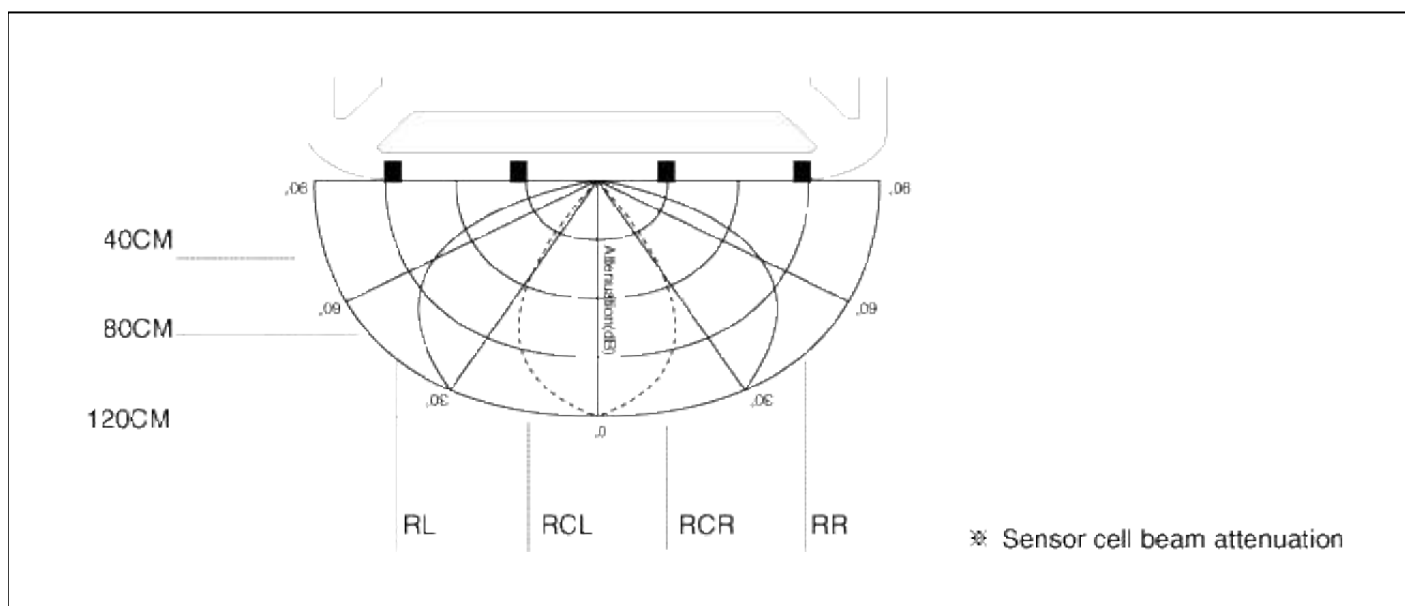
## 2. NORMAL Mode

- (1) LIN communication starts and keeps the routine after IGN1 ON+R gear
- (2) BCM send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.
- (3) After initialization, normal mode starts 100ms later after finishing alarm output.
- (4) Alarm for obstacles is divided into 3 levels.  
The first and second are intermittent sound, and the third alarms continuously
- (5) The efficient vehicle speed of RPAS operation is under 10Km/h.
- (6) Refer to ‘Digital PAS Project LIN communication’ for the more detailed communication specification.

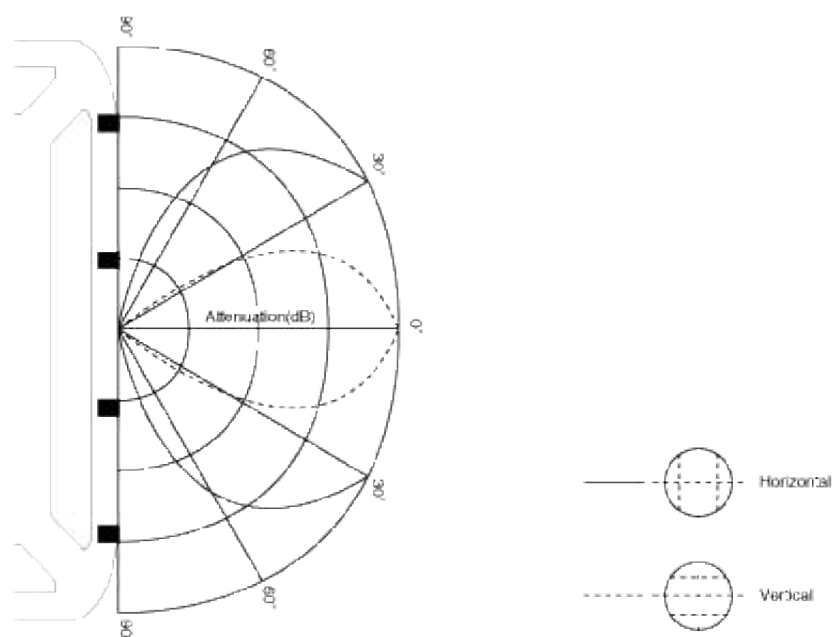
### Sensing Area

1. Measurement condition – PVC pole (diameter 75mm, length 3m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)
  - 81cm(31.9in) ~ 120cm(47.2in) :  $\pm 15\text{cm}(5.9\text{in})$
  - 41cm(16.1in) ~ 80cm(31.5in):  $\pm 15\text{cm}(5.9\text{in})$
  - Less than 40cm(15.7in) :  $\pm 10\text{cm}(3.9\text{in})$

### Horizontal Sensing Area



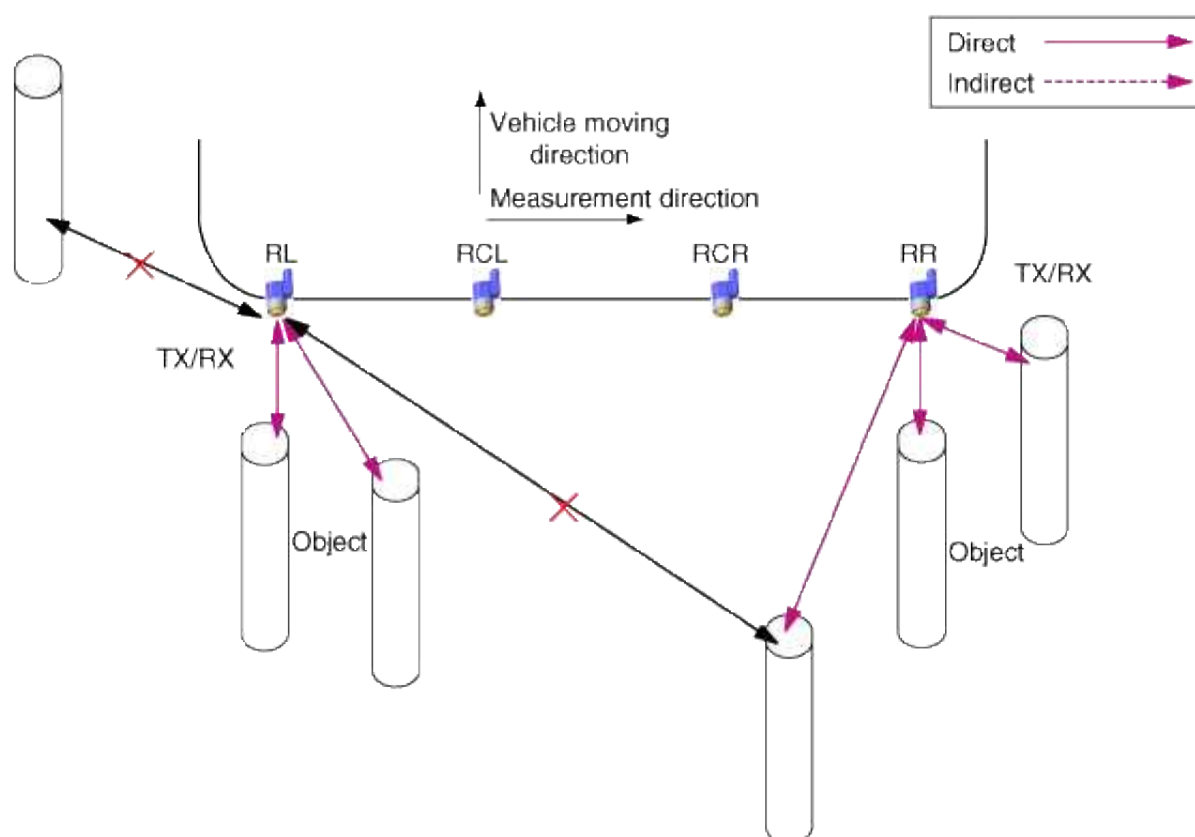
### Vertical Sensing Area



## Distance Measurement

### Direct Measurement

Transmission and Reception are executed with one sensor  
(RL, RCL, RCR, RR each sensor execution)

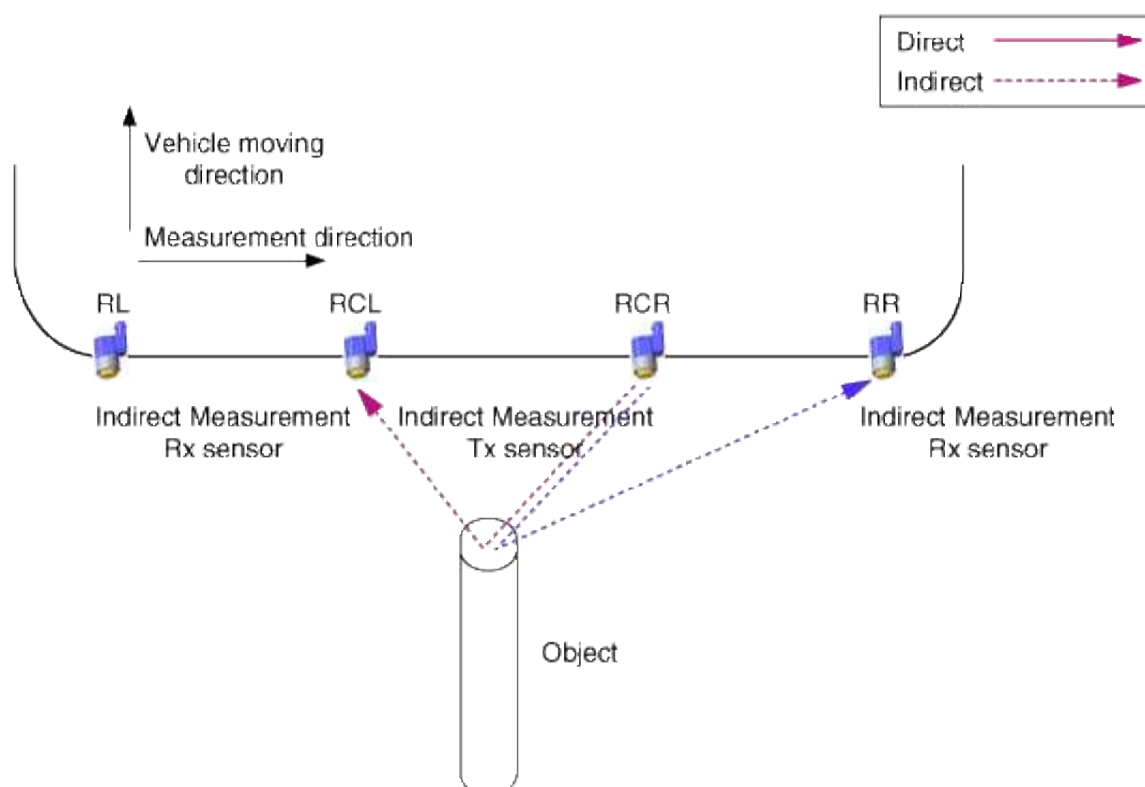


### Indirect Measurement

(RCL → RL, RCL → RCR, RCR → RCL, RCR → RR Execution in order)

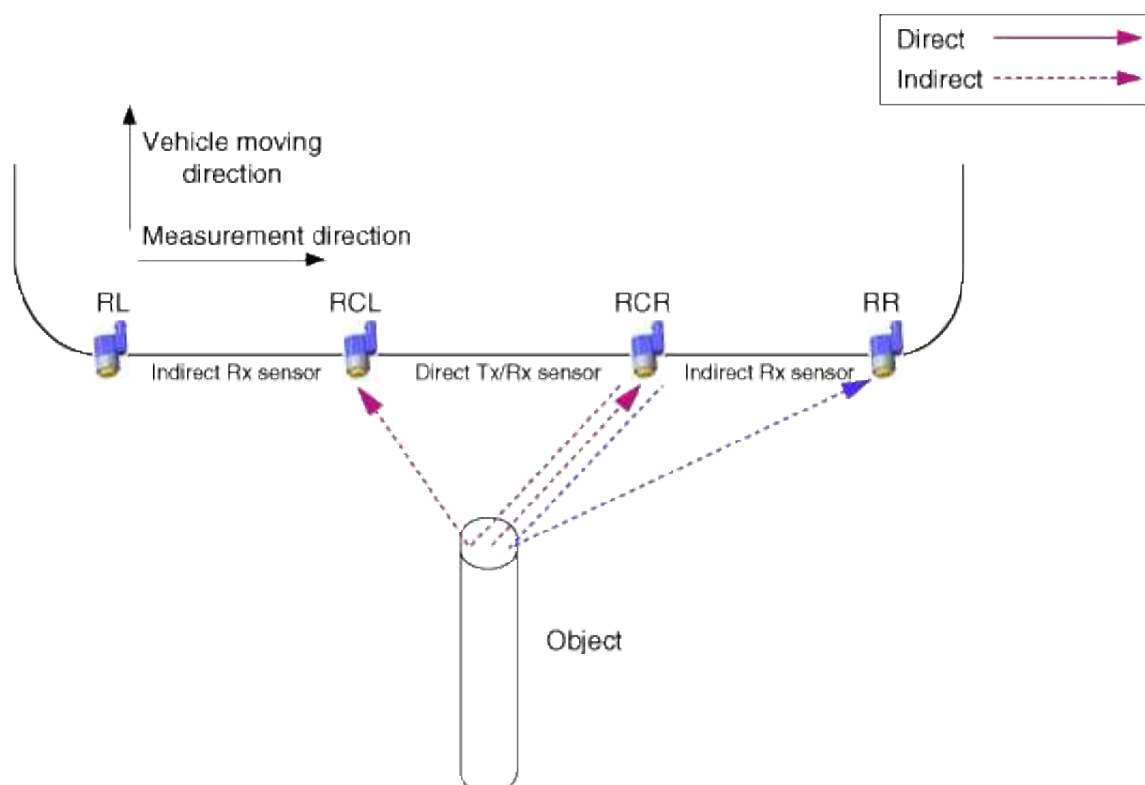
With two or three sensors, one of them sends the transmission and the others get the reception.





### Direct and Indirect Measurement at once

With two or three sensors, the one sensor performs both transmission and reception, and the others perform only reception.



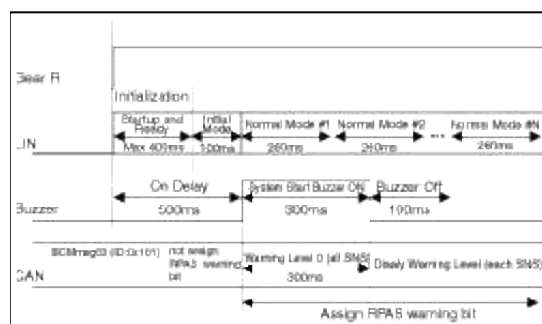
## RPAS alarm system

When the RPAS sensor detects the object, warning is operated by audible alarm device as like buzzer. RPAS sensor sends data to BCM with LIN communication and BCM implements audible warning for each RPAS SENSOR by priority. And it performs a role of gateway only when it sends visible alarm device such as Cluster.

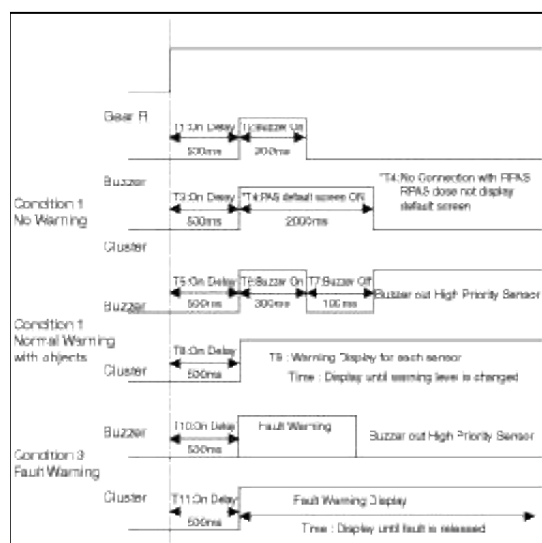
- Sensor buzzer/display information processing method of BCM In case of RL/RR sensor information, the BCM handles each sensor information directly about Display and buzzer output function. Buzzer output of CL/CR sensor, BCM handles center combination information by priority both sensor.

## System Operation Spec

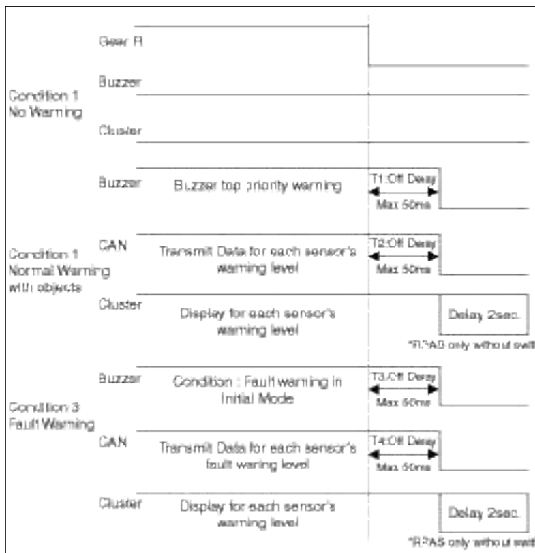
When the system has the power (after IGN ON and R gear), MICOM checks every sensor channel. In case it is not find any error, it sounds 300ms buzzer 500ms afterward. But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. Function for normal mode entrance is as below



With R Gear, system function is as below



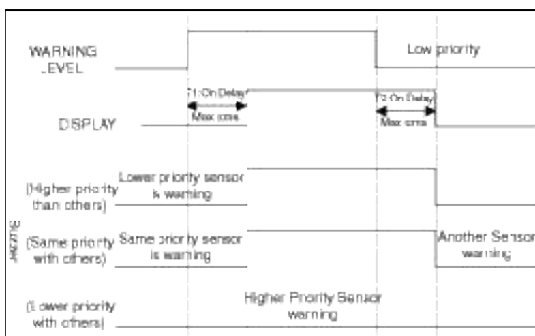
With R gear releasing, system function is as below



acceptable error range on waveform  $\pm 10\%$

Alarm Output Specification classified by distance between sensors

Condition logic according to priority of alarm level is as below. (the identical sensor)



\* $\alpha$  value definition

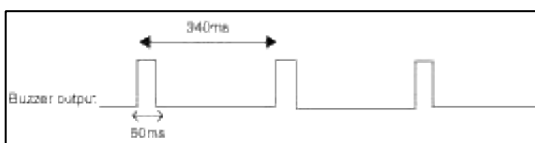
1. low priority sensor off :  $\alpha = 0\text{ms}$
2. low priority sensor is 1st warning level :  $\alpha < 340\text{ms}$
3. low priority sensor is 2nd warning level :  $\alpha < 170\text{ms}$

\* $\beta$  value definition

1. low priority sensor is 1st warning level :  $\beta = 1700\text{ms}$
2. low priority sensor is 2nd warning level :  $\beta = 1700\text{ms}$
3. low priority sensor is 3rd warning level :  $\beta = 700\text{ms}$

Alarm control by sensing distance is as below

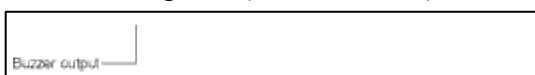
1. First warning area (81cm ~ 120cm)



2. Second warning area (41cm ~ 80cm)

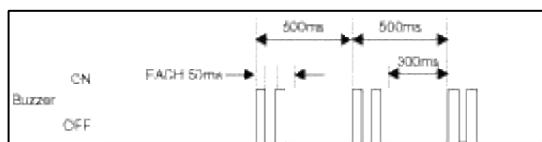


3. Third warning area (less than 40cm)



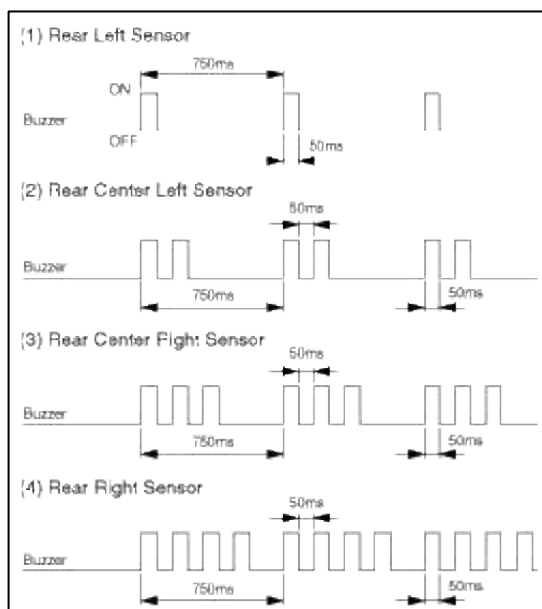
#### 4. Period of fault alarm

##### (1) With visible display



##### (2) Without visible display

When the system has error channel in initial time, sensor channel notify the location of error via hearing device. (Three times for each sensor)



#### NOTE

1. Time tolerance of the above waveform : Time  $\pm 10\%$
2. At nearer distance than 30cm, detection may not occur.
3. Alarm will be generated with vehicle reversing speed of 10km/h or less.
4. For moving target, maximum operation speed shall be target approach speed of 10km/h.
5. When the vehicle or the target is moving, sequential alarm generation or effective alarm may be failed.
6. False alarm, or failure of the alarm to trigger may occur in the following conditions.
  - Irregular road surface, gravel road, reversing toward grass.
  - Horn, motor cycle engine noise, large vehicle air brake, or other object generating ultrasonic wave is near.
  - When a wireless transmitter is used near to the sensor.
  - Dirt on the sensor.
  - Sequential alarm may not occur due to the reversing speed or the target shape.

#### Error Handling

##### LIN BUS Off error case

Section	Error recognition condition	Error releasing condition
Initial Routine	LIN BUS OFF sensing once	Error is not released in initial mode.
Normal Routine	LIN BUS OFF is sensed times in a row	The fault is released when BCM or LIN Master senses LIN BUS ON four times in a row in normal mode

Remark :

1. In fault counting, output message or signal should be transmitted as a Last Valid value.
2. Error in initial mode, fault buzzer (BCM) is operated.

#### Sensor fault (LIN Msg : 0x08)

Section	Error recognition condition	Error releasing condition
Initial Routine	Sensor fault Message sensing once	Error is not released in initial mode.
Normal Routine	Sensor fault Message sensing four times in a row	The fault is released when BCM or LIN Master senses LIN BUS ON four times in a row in normal mode

Remark :

1. In fault counting, output message or signal should be transmitted as a Last Valid value.
  2. Error in initial mode, fault buzzer (BCM) is operated.
  3. When the error occurs in direct condition, the sensors sent the same status of error for indirect condition
- Communication Standard

This section defines the communication between RPAS and BCM.

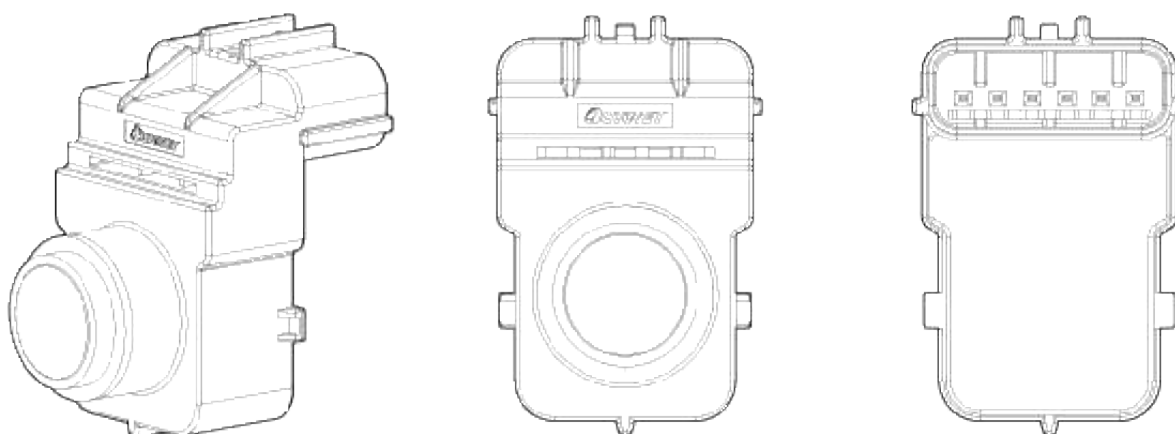
RPAS send a detecting result of object and sensor diagnosis result to BCM according to this document, and BCM takes a role to alarm.

Indicator shows the transmitted position and alarm data, in alarm case, it finds the nearest DATA and alarms the nearest DATA first.

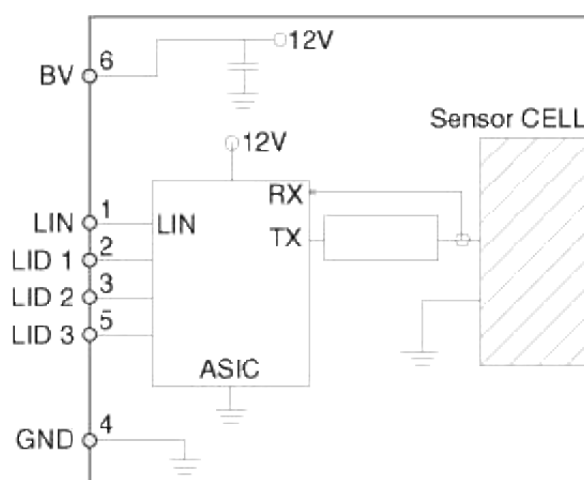
(Ex. In case, RL is first step alarm and RR is third step, RR alarm has priority.)

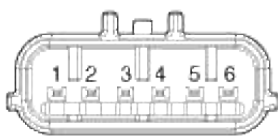
#### Body Electrical System > Rear Parking Assist System > Parking Assist Sensor > Components and Components Location

Component



Circuit Diagram



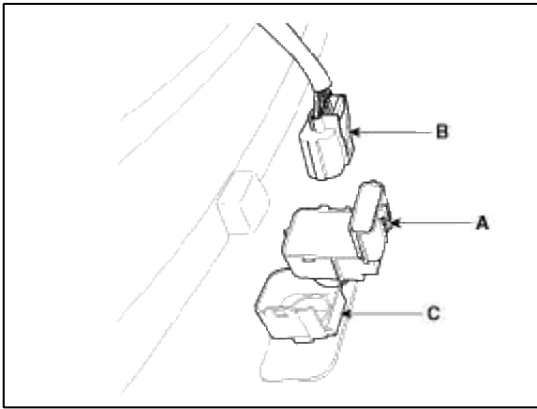
	NO	Name
	1	LIN
	2	LID 1
	3	LID 2
	4	GND
	5	LID 3
	6	B+

### Body Electrical System > Rear Parking Assist System > Parking Assist Sensor > Repair procedures

#### Removal

1. Remove the rear bumper.  
(Refer to the Body group - "Rear bumper")
2. Disconnect the connector from the rear bumper.

3. Disconnect the connector(B) from the rear ultra sensor(A).



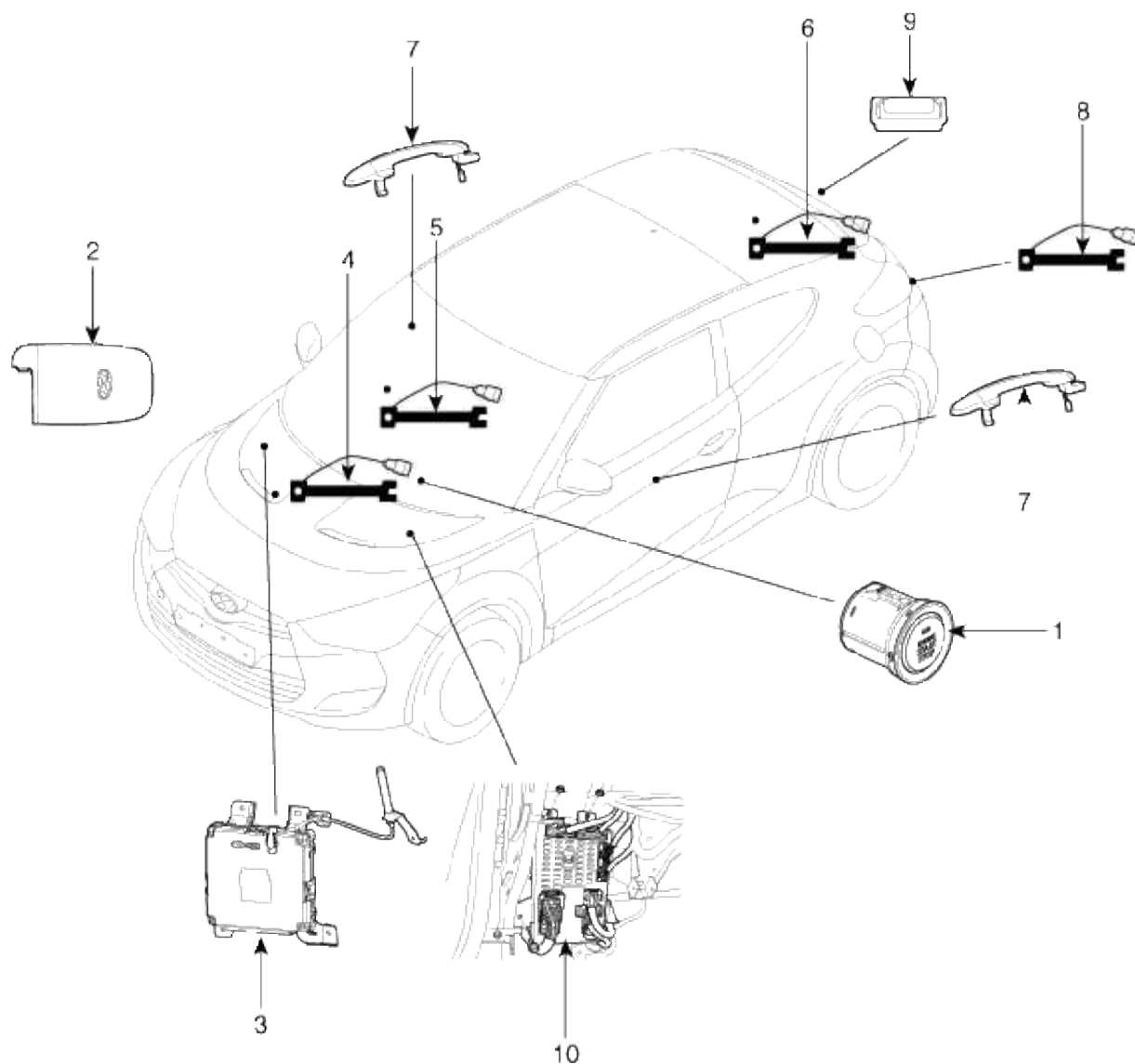
4. Pull out the sensor (A) by opening the sensor holder (C) out.

#### Installation

1. Install the rear ultra sensor after connecting the connector.
2. Install the rear bumper.

### Body Electrical System > Button Engine Start System > Components and Components Location

#### Component Location

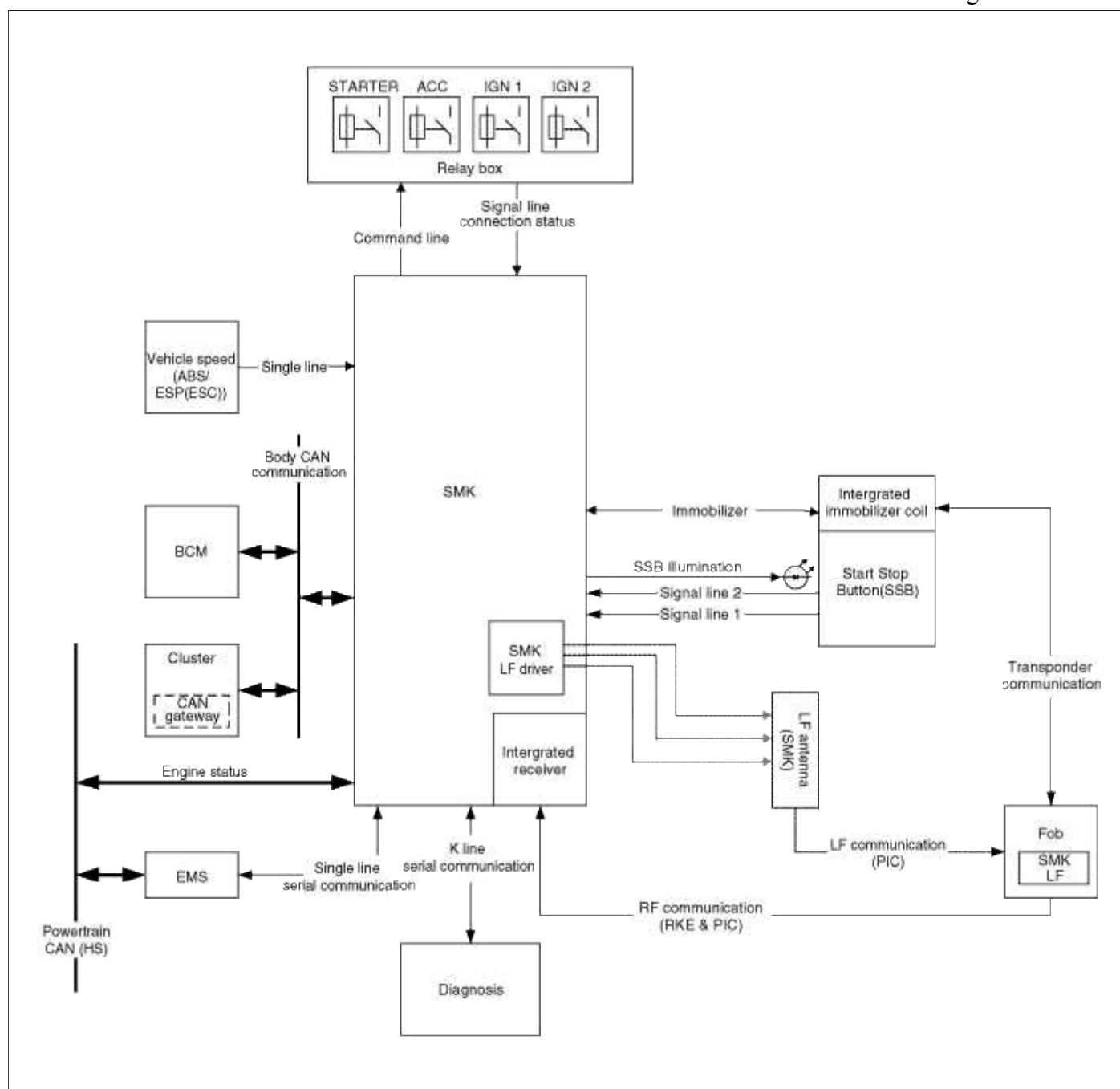


- |                           |  |
|---------------------------|--|
| 1. Start Stop Button(SSB) | 6. Tailgate antenna                              |
| 2. FOB key                | 7. Door handle & door antenna                    |
| 3. Smart key unit         | 8. Bumper antenna                                |
| 4. Interior antenna 1     | 9. Trunk lid open switch                         |
| 5. Interior antenna 2     | 10. IPM (Intelligent integrated Platform Module) |

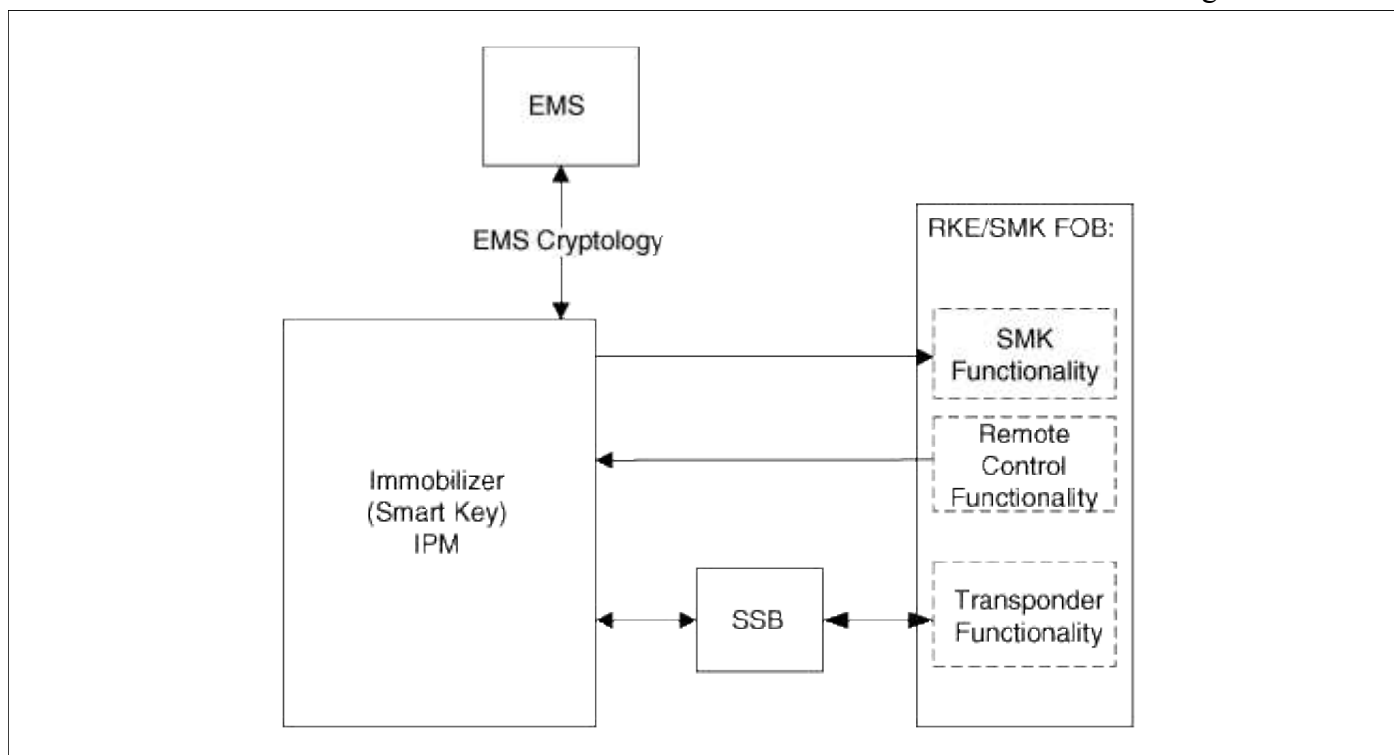
### Body Electrical System > Button Engine Start System > Schematic Diagrams

#### Circuit Diagram (1)





Circuit Diagram (2)



## Body Electrical System > Button Engine Start System > Description and Operation

### Description

#### System Overview

The System offers the following features:

- Human machine interface through a 1-stage button, for terminal switching and engine start.
- Control of external relays for ACC / IGN1 / IGN2 terminal switching and STARTER, without use of mechanical ignition switch.
- Indication of vehicle status through LED or explicit messages on display.
- Immobilizer function by LF transponder communication between fob and fob holder.
- Redundant architecture for high system dependability .
- Interface with Low Speed CAN vehicle communication network.
- Interface with LIN vehicle communication network depending on platform .

The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in separated system.

#### System Main Function

- Switching of ACC / IGN1 / IGN2 terminals.
- Control of the STARTER relay BAT line (high side) based on communication with EMS ECU.
- Management of the Immobilizer function.
- Management of BES warning function.

#### Button Engine Start System

The Button Start System allows the driver to operate the vehicle by simply pressing a button (called as SSB) instead of using a standard mechanical key.

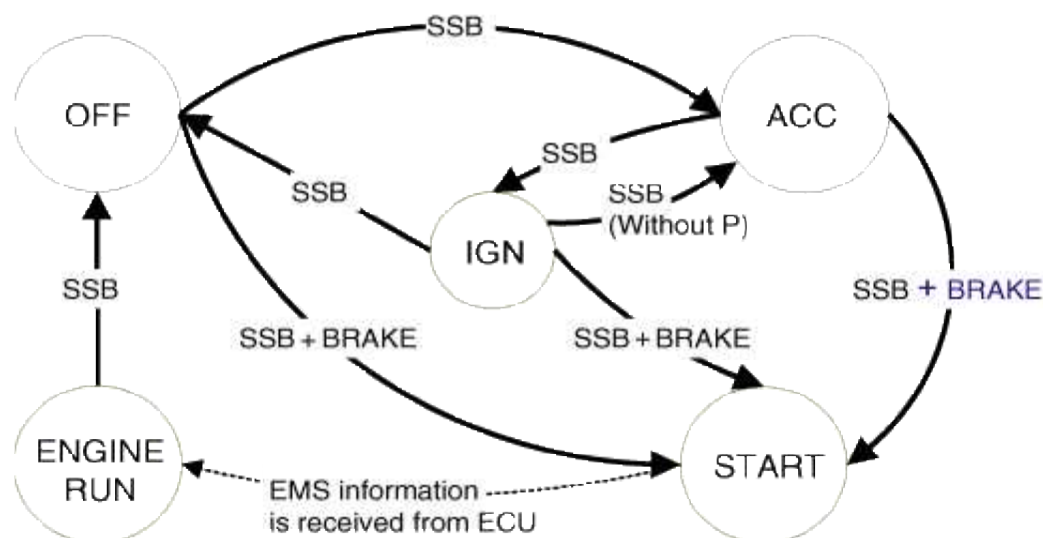
If the driver press the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the locking/unlocking of the steering column, the control of the terminal, and the cranking of the engine.

The driver can release the SSB as soon as this sequence initiated. After positive response from immobilizer interrogation, the system will activate the starter motor and communicate with the EMS to check the engine running status for starter release.

The driver will be able to stop the engine by a short push on the SSB if the vehicle is already in standstill. Emergency engine stop will be possible by a long press of the SSB or 3 consecutive presses in case the vehicle is in ENGINE RUNNING.

If the conditions for engine cranking are not satisfied while a push on the SSB is detected and a valid fob authenticated, the system will unlock the steering column and switch the terminals to IGN. Another push on the SSB will be necessary to start the engine.

In case of a vehicle equipped with SMART KEY system, fob authentication will not require any action from the driver. For limp home start or in case of vehicle without SMART KEY, the driver will have to insert the fob into the fob holder.



- Control Ignition and engine ON/OFF by Sending signal to IPM.
- Display status by LED Lamp ON/OFF. (Amber or Green)

#### Indicator ON/OFF Condition At Ignition Key Off Condition

No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

#### Indicator ON/OFF Condition According To Ignition Key's Position

No.	Ignition conditions	Start Button LED status
1	IG OFF	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

## Smart Key Unit



The SMK manages all function related to:

- "Start Stop Button (SSB) monitoring",
- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication ),
- "System consistency monitoring",
- "System diagnosis",
- Control of display message / warning buzzer .

The unit behaves as Master role in the whole system.

In case of SMART KEY application, for example “Passive Access”, “Passive Locking” and “Passive Authorization are integrated for Terminal switching Operations”.

It collects information about vehicle status from other modules (vehicle speed, alarm status, driver door open...), reads the inputs (e.g. SSB, Capacitive Sensor / Lock Button, PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates with others devices via the CAN network as well as a single line interfaces.

The diagnosis and learning of the components of the BES System are also handled by the SMK.

The SMK manages the functions related to the "terminal control" by activating external relays for ACC, IGN1 and IGN2. This unit is also responsible for the control of the STARTER relay.

The SMK is also controlling the illumination of the SSB as well as the "system status indicator", which consists of 2 LEDs of different color. The illumination of the fob holder is also managed by the SMK.

The SMK reads the inputs (Engine fob in, vehicle speed, relays contact status), controls the outputs (Engine relay output drivers), and communicates with others devices via the CAN.

The internal architecture of the SMK is defined in a way that the control of the terminal is secured even in case of failure of one of the two microcontrollers, system inconsistency or interruption of communication on the CAN network.

In case, failure of one of the two controllers, the remaining controller shall disable the starter relay. The IGN1 and IGN2 terminals relays shall be maintained in the state memorized before the failure and the driver shall be able to switch those IGN terminals off by pressing the SSB with EMERGENCY\_STOP pressing sequence. However, engine restart will not be allowed. The state of the ACC relay will depend on the type of failure.

The main functions of the SMK are:

- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/ESP ECU.
- Control of SSB LEDs (illumination, clamp state).
- Control of the base station located in SSB through direct serial interface.
- System consistency monitoring to diagnose SMK failure and to switch to relevant limp home mode.
- Providing vehicle speed information
- Start Stop Button (SSB) monitoring

- Starter power control

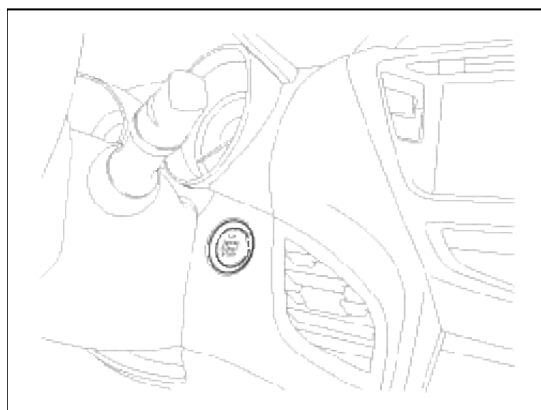
### Start/Stop Button (SSB)

A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes 'Off', 'Accessory', 'Ignition' and 'Start' by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.

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.



### BES(Button Engine Start) System State Chart

#### System STATES in LEARNT MODE

In learnt mode, the BES System can be set in 6 different states, 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 :

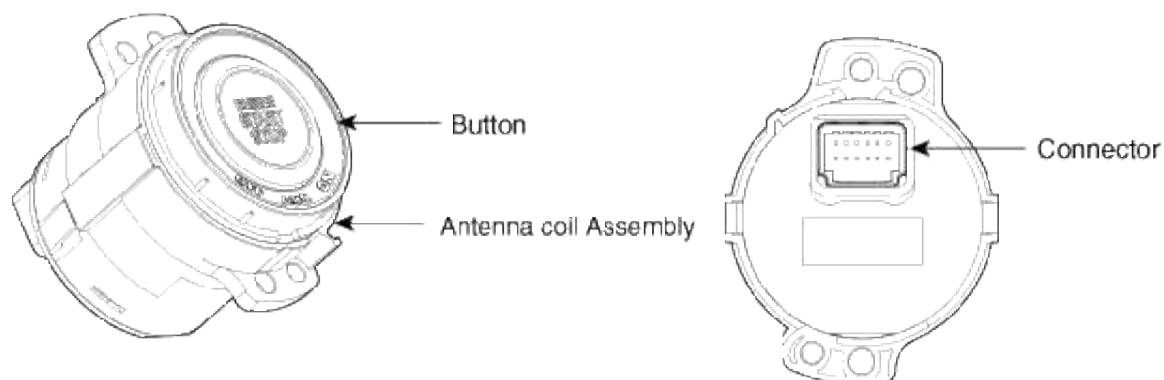
<b>System State</b>	<b>Terminal Status</b>	<b>Engine status</b>
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch.

The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

**Body Electrical System > Button Engine Start System > Start/Stop Button > Components and Components Location**

Component

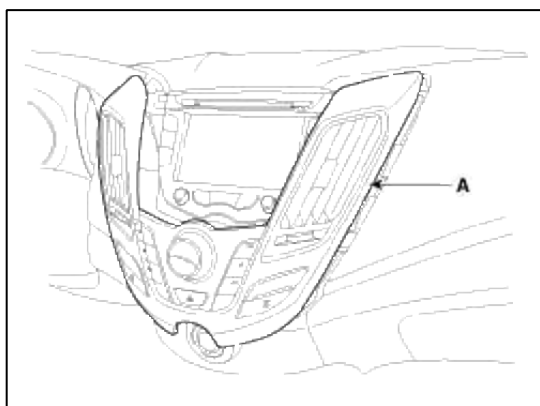


Connector (12 Pins)				
	Pin No.	Description	Pin No.	Description
	1	Start/Stop button switch 1	7	Ground
	2	LED illumination power	8	Start/Stop button switch 2
	3	LED ACC	9	LED ignition
	4	Button illumination ground	10	Rheostat
	5	Button illumination power	11	LED OFF
	6	Immobilizer power	12	Immobilizer ground

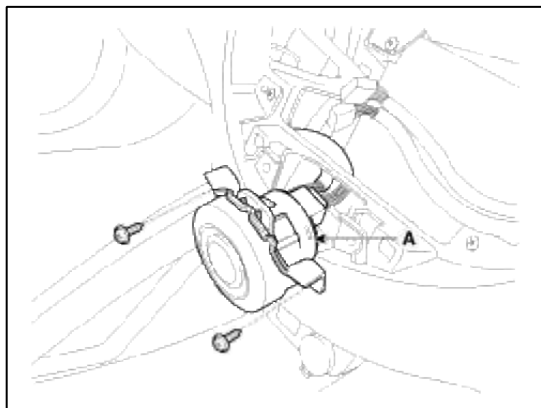
### Body Electrical System > Button Engine Start System > Start/Stop Button > Repair procedures

#### Removal

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



3. Disconnect the connector after loosening 2 screws, and then remove the start/stop button (A).



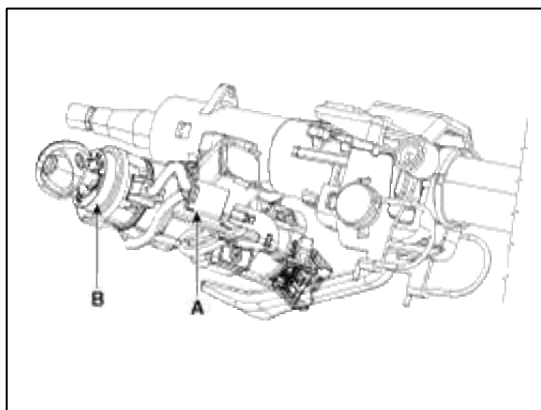
#### Installation

1. Install the start/stop button.
2. Install the center fascia panel assembly.

### Body Electrical System > Ignition Switch Assembly > Repair procedures

#### Removal

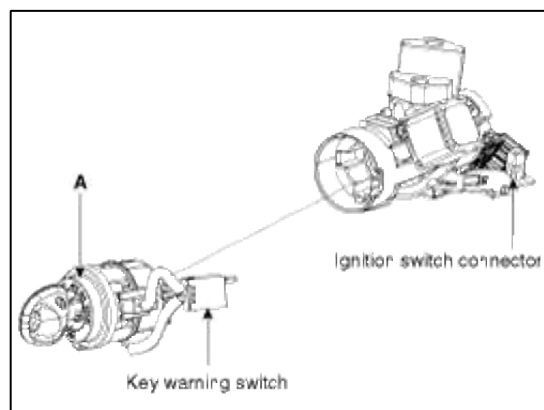
1. Disconnect the negative (-) battery terminal.
2. Remove the driver crash pad lower panel.  
(Refer to the BD group - "Crash pad")
3. Remove the steering column upper and lower shrouds.  
(Refer to the BD group - "Crash pad")
4. Remove the wiper switch.  
(Refer to the BE group - "Multifunction switch")
5. Remove the ignition switch after disconnecting the ignition switch 6P connector.
6. Remove the key warning/immobilizer connector (A).



7. After loosening the screw, remove the key warning switch (B).
8. Pushing lock pin with key ACC.



## 9. Remove the key lock cylinder (A).

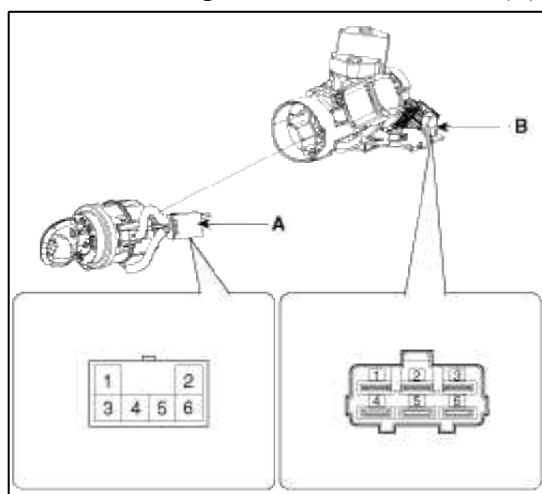


## Installation

1. Install the key lock cylinder.
2. Install the key warning switch.
3. Install the key warning/immobilizer connector.
4. Connect the ignition switch connector after Install the ignition switch.
5. Install the wiper switch.
6. Install the steering column shrouds.
7. Install the driver crash pad lower panel.

## Inspection

1. Disconnect the ignition switch connector (B) and key warning switch connector (A) from the steering column.



2. Check for continuity between the terminals.
3. If continuity is not as specified, replace the switch.

Position \ Terminal		Ignition switch (B)						Key warning switch (A)	
		5	6	4	1	2	3	5	6
LOCK	Key out (Off) removal								
	Key in (On) insert								
ACC	Key in (On) insert	●	●						
ON		●	●	●	●	●		●	●
START		●	●	●	●	●	●		

## Body Electrical System > Back view camera System > Description and Operation

### Description

Back view camera will activate when the backup light is ON with the ignition switch ON and the shift lever in the R position.

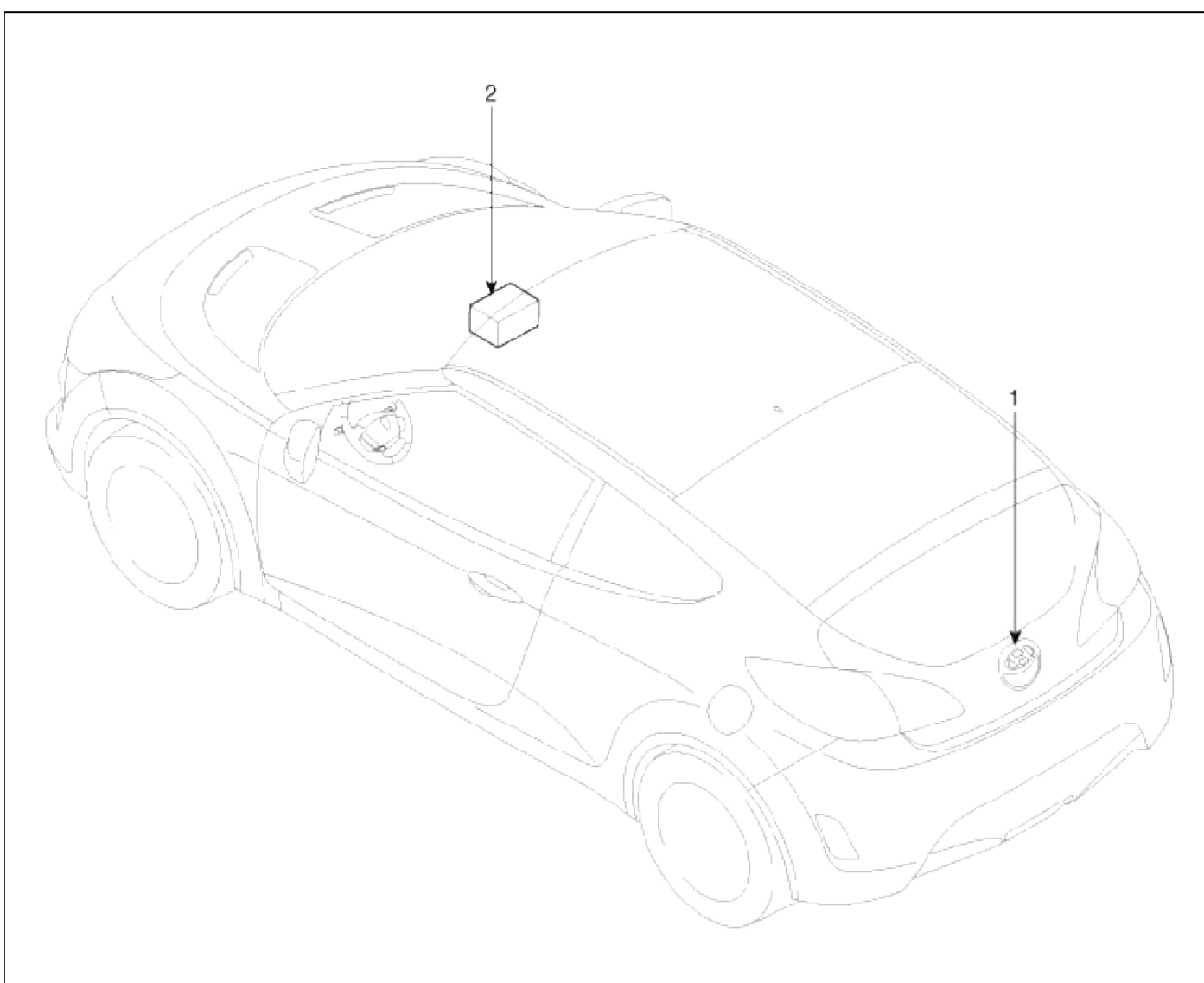
This system is a supplemental system that shows behind the vehicle through the AV monitor while backing-up.

### WARNING

This system is a supplementary function only. It is the responsibility of the driver to always check the inside/ outside rearview mirror and the area behind the vehicle before and during backing up because there are blind spots that can't be seen through the camera.

## Body Electrical System > Back view camera System > Components and Components Location

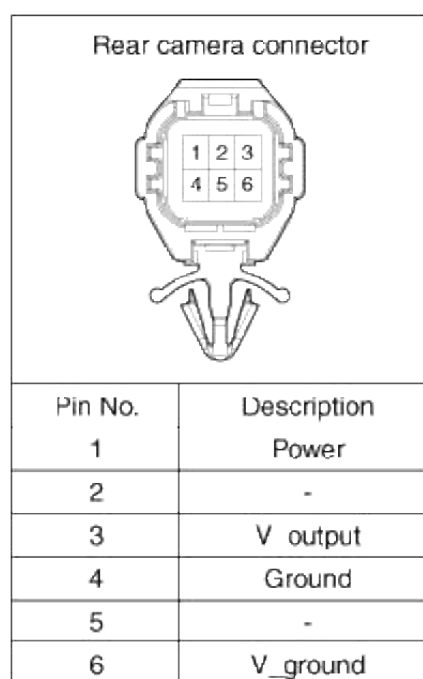
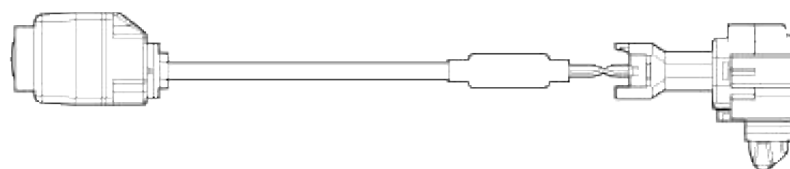
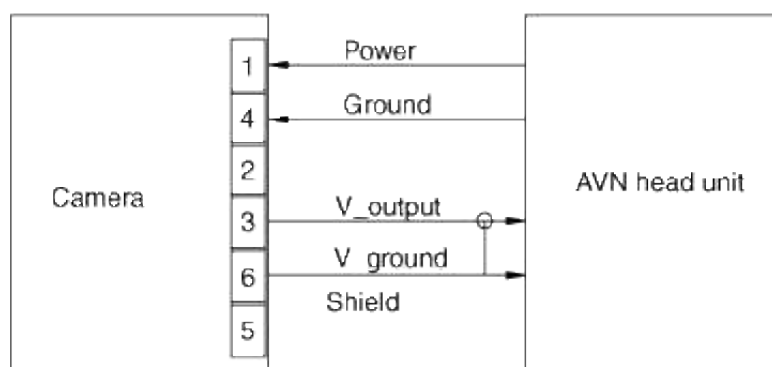
### Component Location



1. Back view camera
2. LCD monitor

## Body Electrical System > Back view camera System > Schematic Diagrams

## Circuit Diagram

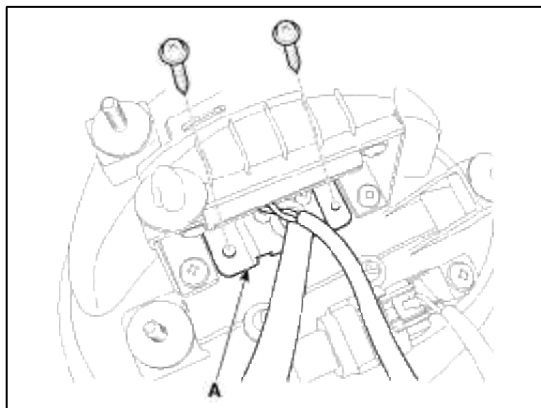

**Body Electrical System > Back view camera System > Repair procedures**

## Removal

## Back View Camera

1. Disconnect the negative(-) battery terminal.
2. Remove the tailgate outside handle assembly.  
(Refer to the BD group - "Tailgate")

3. Disconnect the rear view camera connector (A) after loosening 2 screws.



#### Installation

1. Install the tailgate outside handle assembly with the rear view camera.
2. Install the tailgate outside handle assembly.