General Troubleshooting Information

Before Troubleshooting

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

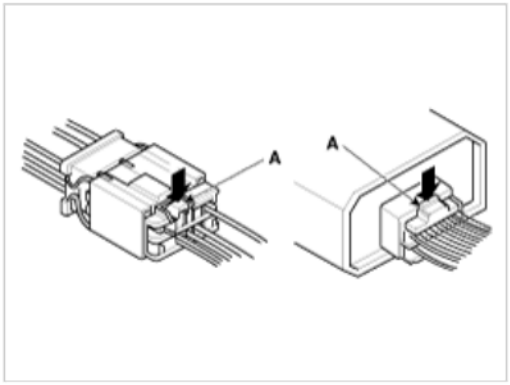
NOTICE

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

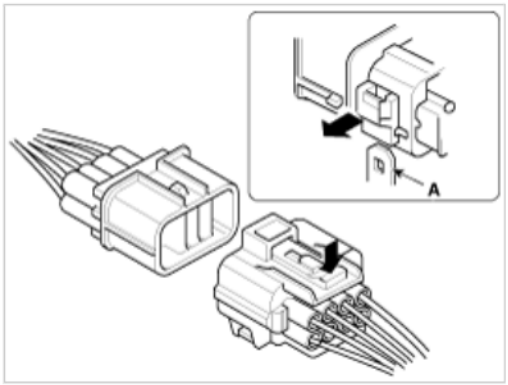
3. Check the alternator belt tension.

Handling Connectors

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

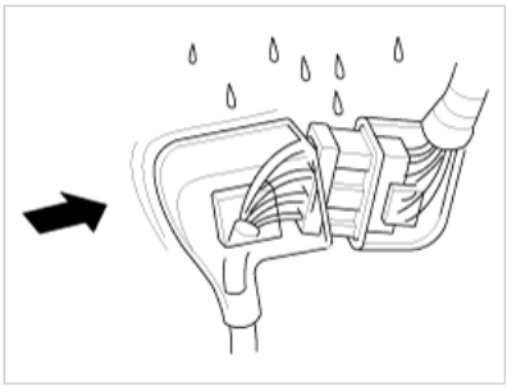


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

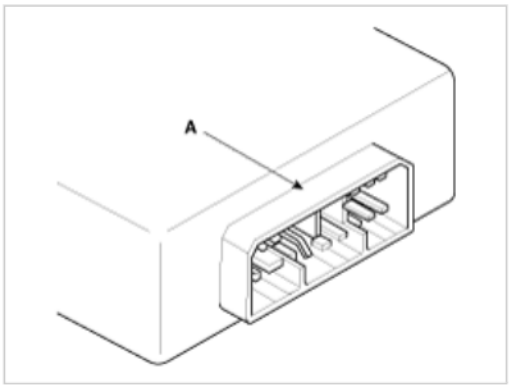


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.
7. Always reinstall plastic covers.

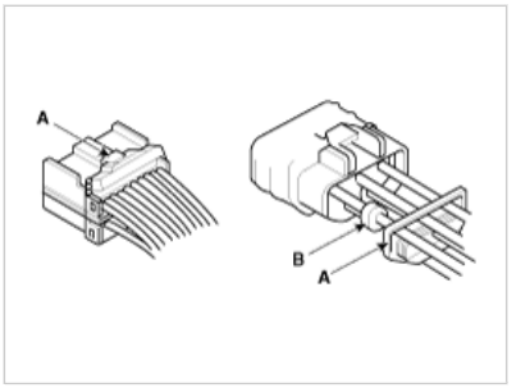
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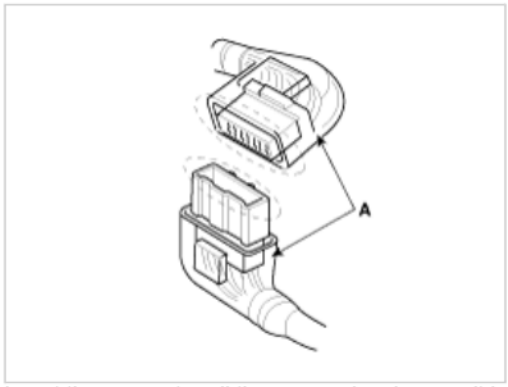
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



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

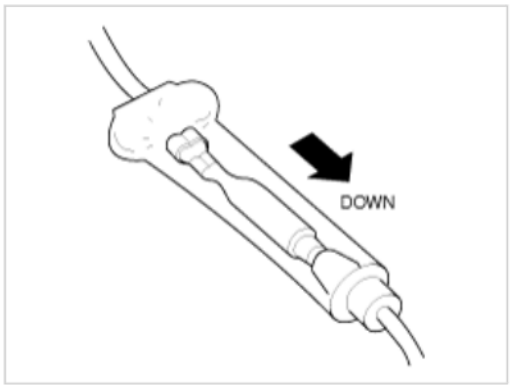


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



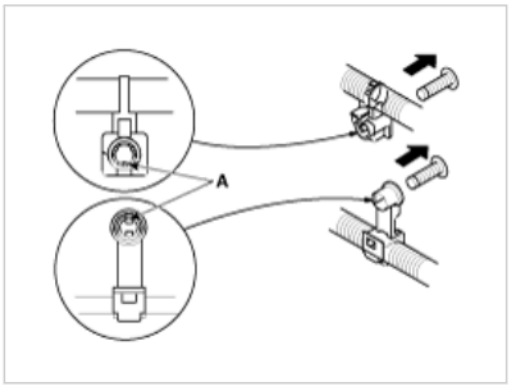
11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.

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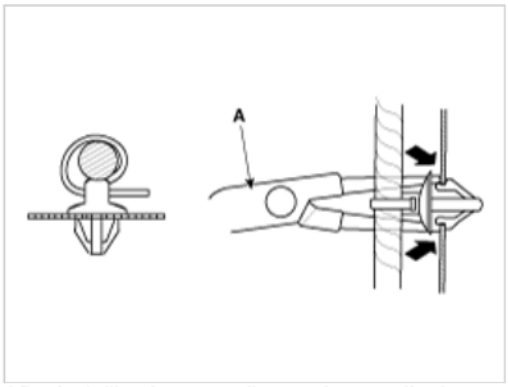


Handling Wires And Harnesses

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

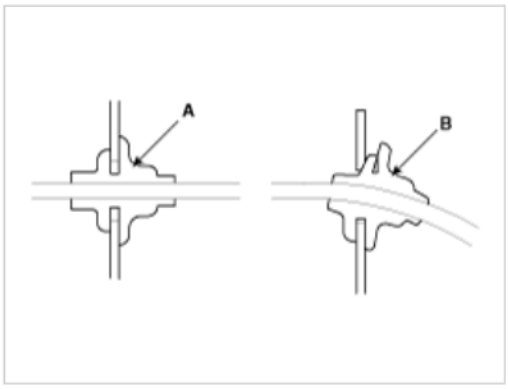


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



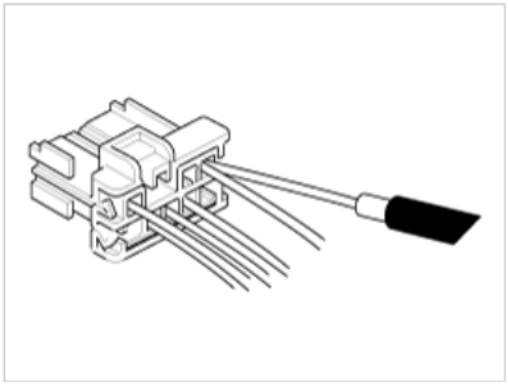
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.
6. Seat grommets in their grooves properly (A). Do not leave grommets distorted (B).

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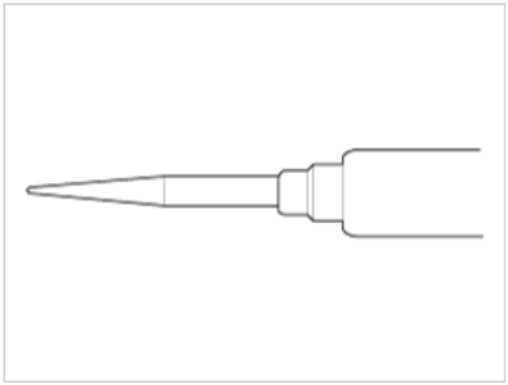


Testing And Repairs

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.

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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	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. 1. Turn the ignition switch to the ON position. 2. Push up the power window switch until the window glass is entirely down and then push up continuously for about 1 sec.
Sunroof	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 : 1. Turn the ignition key to the ON position and then close the sunroof completely. 2. Release the sunroof control lever. 3. Press and hold the CLOSE button for more than 10 seconds until the sunroof closed and it has moved slightly. 4. Release the sunroof control lever. 5. Press and hold the CLOSE button once again within 3 seconds until the sunroof does as follows; A. Tilt down → Slide Open → Slide Close Then release the lever. 6. Reset procedure of sunroof system is finished.
Trip computer	When the battery is disconnected and reconnected, the set functions of the trip computer become initialized. So, you need to explain this information to the customer.
Clock	When the battery is disconnected and reconnected, the clock becomes initialized. So, the clock should be reset. (Refer to the owner's manual)
Audio	When the battery is disconnected and reconnected, the customer's radio stations become initialized. So, you need to record the customer's radio stations prior to service, and after service, set the customer's radio stations into the audio.
Heater & Air Conditioner	When the battery is disconnected and reconnected, the heater and A/Con become initialized. So, heater and A/Con should be reset.

Special Service Tools

Tool Name / Number	Illustration	Description
RKE Battery Checker 09954-2P100		Measuring the RKE battery voltage

Specification

Audio Unit

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Item		Specification	
Model		RADIO/CD/MP3 (PA30A)	RADIO/CD/MP3 (UV02)
Power supply		DC 14.4V	
Rated Power		43W × 4 : 14.4V	
Load Impedance		4ohm × 4	
Antenna		80PF 75ohm	
Tuning type		PLL SYNTHESIZED TUNING	
Dark current		Max. 1.0mA (Head unit only)	Max. 3.0mA (Head unit only)
Frequency range / Channel space	FM	87.5~107.9 MHz / 200kHz	
	AM	530~1,710 kHz / 10kHz	

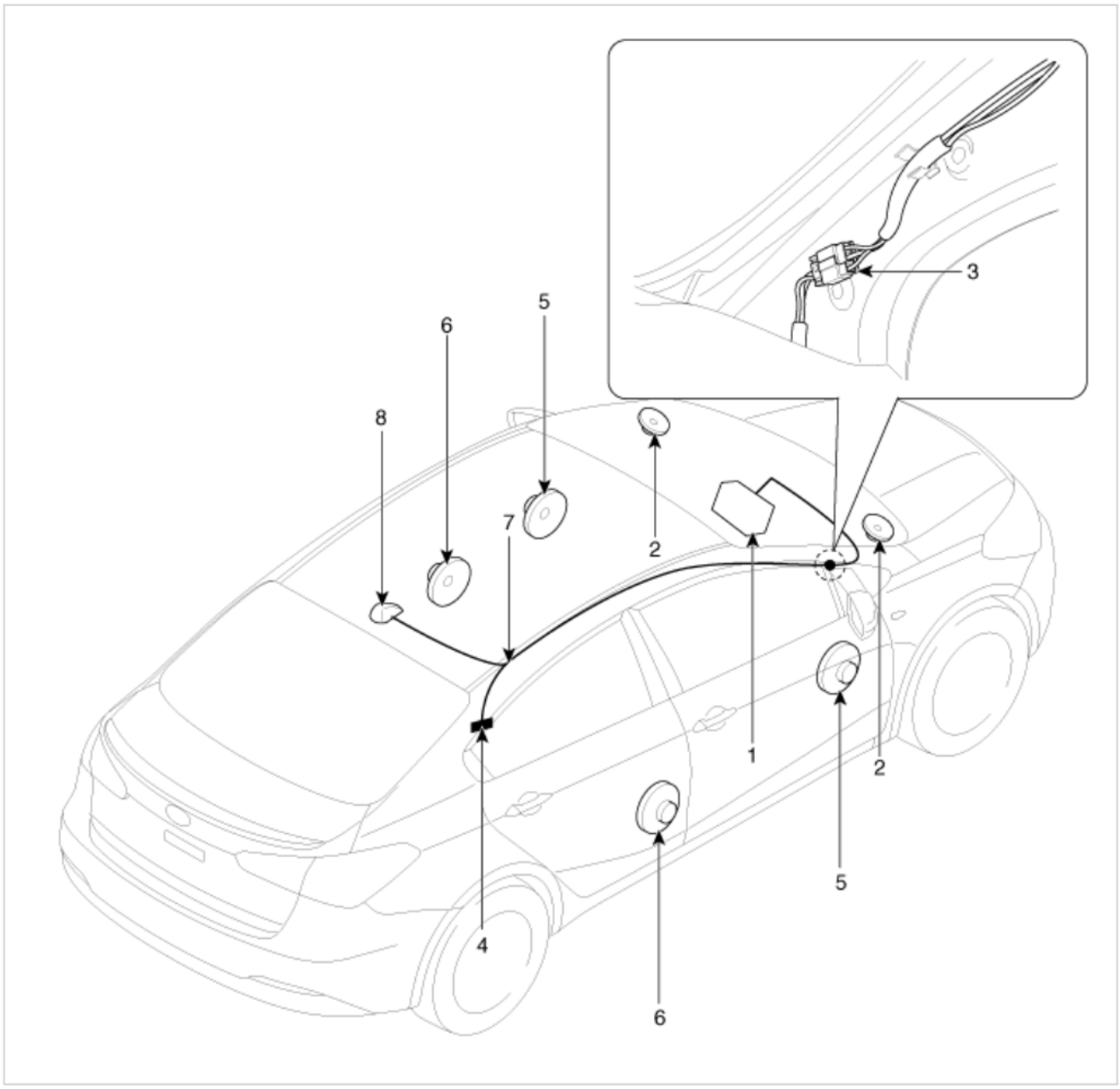
Speaker

Item		PA30A	UV02
Input Power	Front	20W (Max 40W)	
	Rear	20W (Max 40W)	
	Front Tweeter	20W (Max 40W)	
Speaker Impedance	Front	4 ± 0.6 Ω	
	Rear	4 ± 0.6 Ω	
	Front Tweeter	3.4 ± 0.5 Ω	
Speaker Number		6	

Body Electrical System

Component Location

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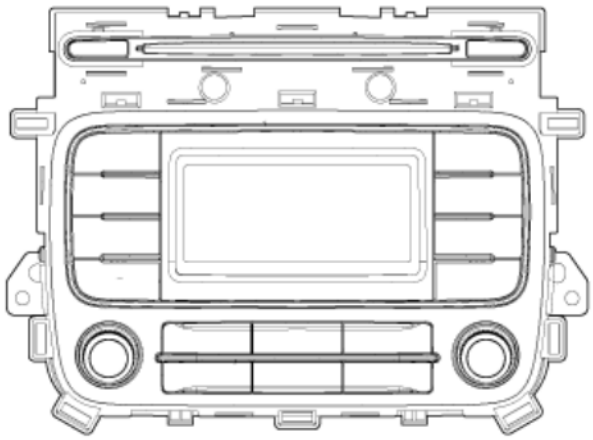
1. Audio unit	5. Front door speaker
2. Tweeter speaker	6. Rear door speaker
3. Antenna cable connector	7. Antenna feeder cable
4. Glass antenna amplifier (Radio)	8. Roof antenna

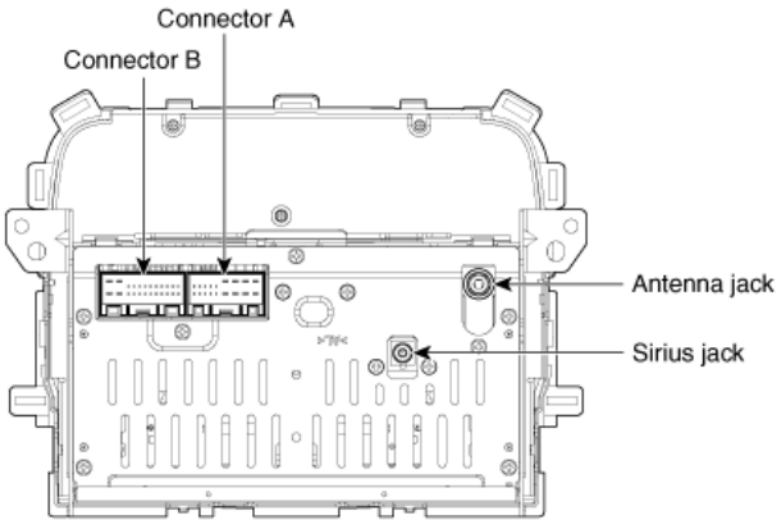
Body Electrical System

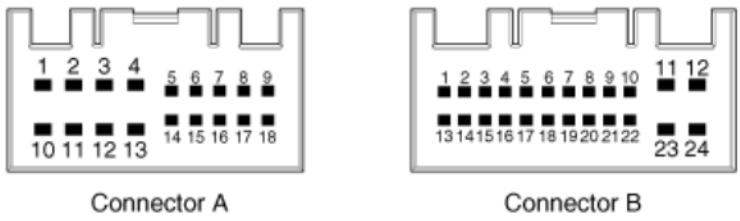
Components

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[Radio/CDP/MP3(PA30A)]







Connector Pin Information

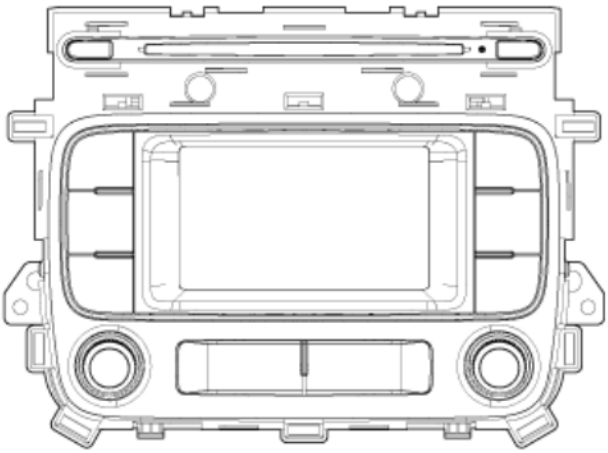
No.	Connector A	Connector B
1	Rear left speaker (+)	-
2	Front left speaker (+)	-
3	Front right speaker (+)	-
4	Rear right speaker (+)	Steering remocon
5	-	-
6	-	USB data line D (+)
7	-	USB/ iPod VDD
8	Illumination (+)	AUX R input

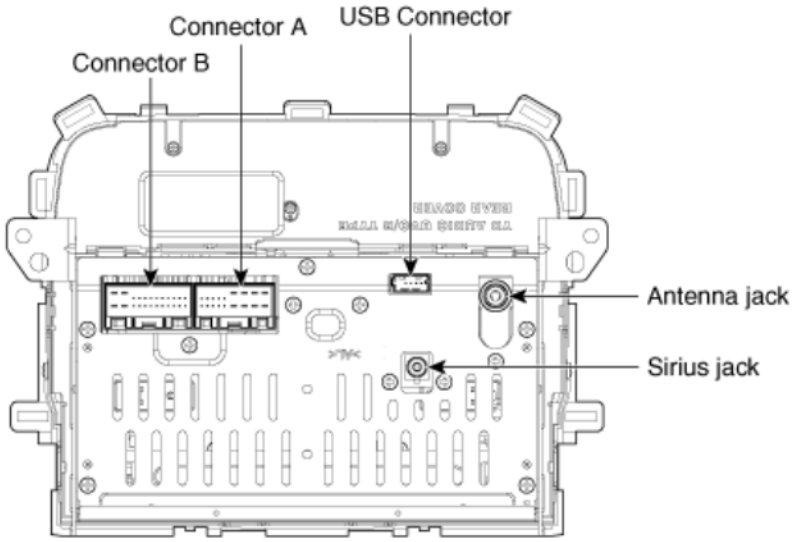
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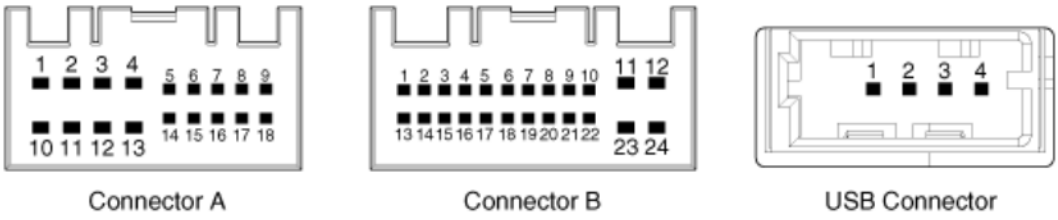
9	Detent	AUX ground
10	Rear left speaker (-)	Mic (+) (Bluetooth)
11	Front left speaker (-)	ACC
12	Front right speaker (-)	Battery (+)
13	Rear right speaker (-)	-
14	-	-
15	-	-
16	-	Vehicle speed
17	Illumination (-)	Remote control ground
18	Remote antenna	USB data line D (-)
19		USB/ iPod ground
20		AUX detect
21		AUX L input
22		Mic (-) (Bluetooth)
23		-
24		Power ground

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[Radio/CDP/MP3(UV02)]







Connector Pin Information

No.	Connector A	Connector B	USB Connector
1	Rear left speaker (+)	CAN high	USB/ iPod 5V
2	Front left speaker (+)	-	USB data (-)/ iPod Tx
3	Front right speaker (+)	-	USB data (+)/ iPod Rx
4	Rear right speaker (+)	Steering remote	USB/ iPod ground
5	-	-	
6	-	Camera video input	
7	-	Camera battery (+)	
8	Illumination (+)	AUX R Input	

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9	-	AUX ref. ground
10	Rear left speaker (-)	MIC(+) (Bluetooth)
11	Front left speaker (-)	ACC
12	Front right speaker (-)	B(+)
13	Rear right speaker (-)	CAN low
14	-	-
15	-	Auto light
16	Door unlock	Vehicle speed
17	Illumination (-)	Remote GND
18	Remote antenna	Camera video ground
19		R position
20		AUX detect
21		AUX L Input
22		MIC(-) (Bluetooth)
23		Camera power ground
24		Power GND

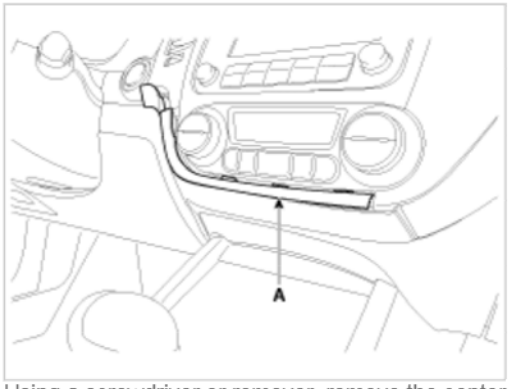
Body Electrical System

Removal

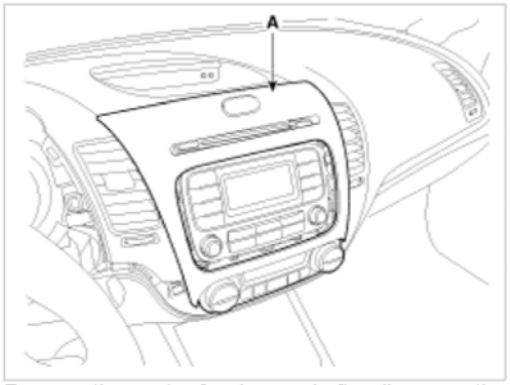
NOTICE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconncet the negative (-) battery terminal.
2. Using a screwdriver or remover, remove the center fascia garnish (A).

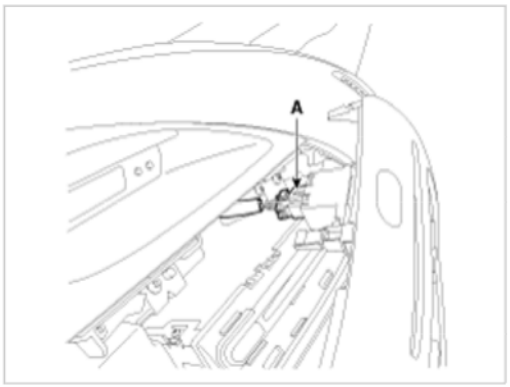


3. Using a screwdriver or remover, remove the center fascia panel (A).

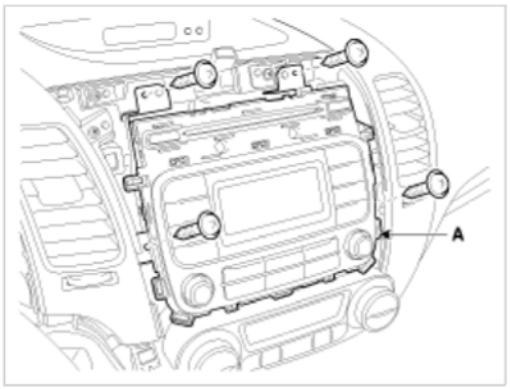


4. Remove the center fascia panel after disconnecting the hazard switch connector (A).

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5. Remove the audio head unit (A) after loosening the mounting screws (4EA).



6. Disconnect the connectors and cable (A) from the audio head unit.



NOTICE

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

Installation

1. Connect the audio unit connectors and cables.
2. Install the audio unit.
3. Install the center fascia panel.
4. Install the center fascia garnish.
5. Connect the negative (-) battery terminal.

NOTICE

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

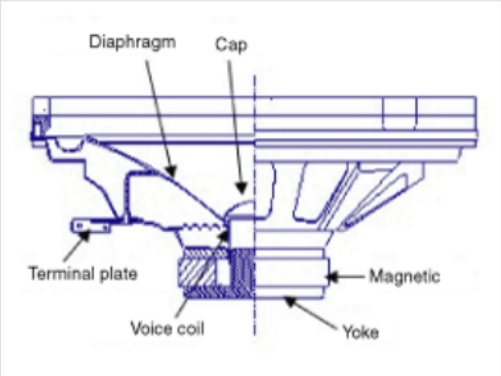
Body Electrical System

Inspection

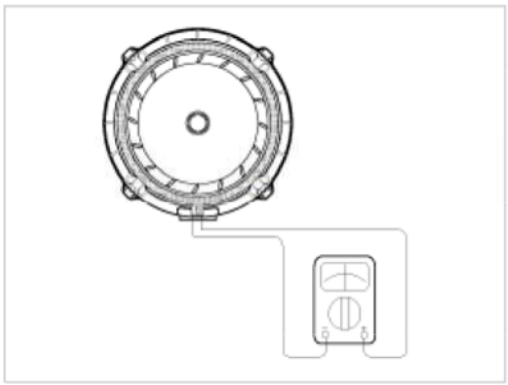
1. Troubleshooting for Speaker
   (1) Basic inspection of speaker

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



(2) Case Troubleshooting

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

⚠ CAUTION

When handling the speaker :

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

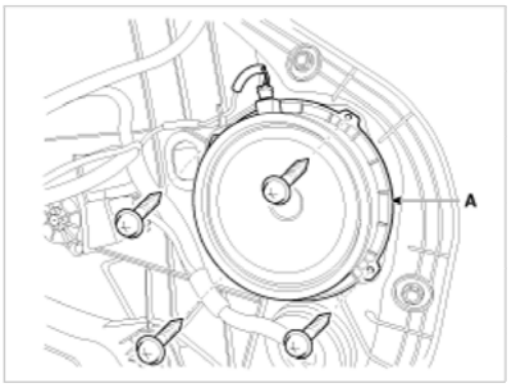
Removal

Front Speaker

1. Remove the front door trim panel and speaker connector.
   (Refer to Body - "Front Door Trim")

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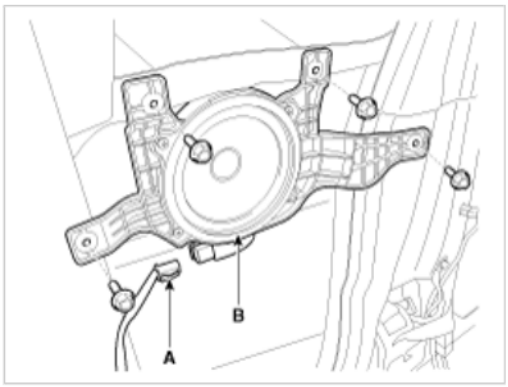
2. Remove the front speaker (A) after loosening 4 screws.



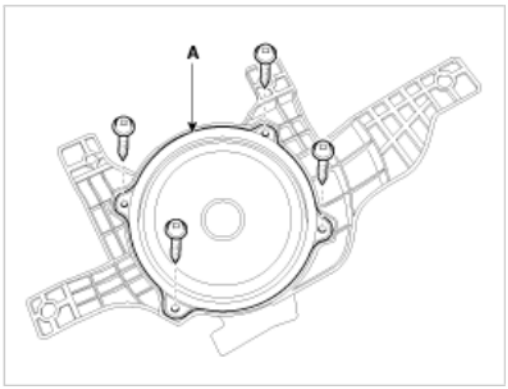
Rear Speaker

[2 Door]

1. Remove the rear door trim panel.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear speaker assembly (B) after disconnecting the connector (A).



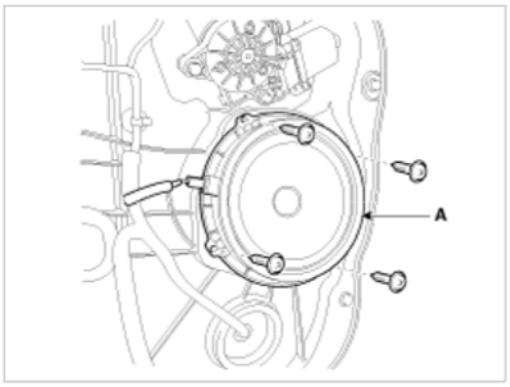
3. Remove the rear speaker (A) after loosening the mounting screws.



[4/5 Door]

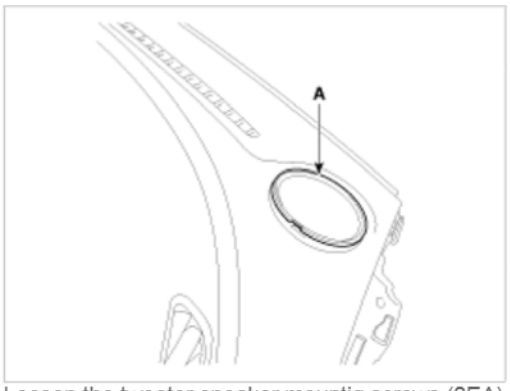
1. Remove the rear door trim panel and speaker connector.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear speaker (A) after removing 4 screws.

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Tweeter Speaker

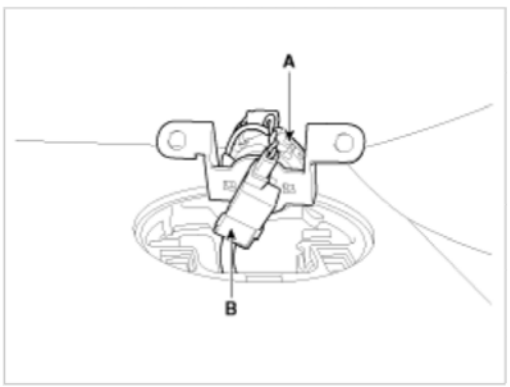
1. Remove the tweeter speaker grille (A) from the crash pad.



2. Loosen the tweeter speaker mountig screws (2EA).



3. Remove the tweeter speaekr (B) after disconnecting the connector (A).



Installation

Front Speaker

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

Rear Speaker

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

Tweeter Speaker

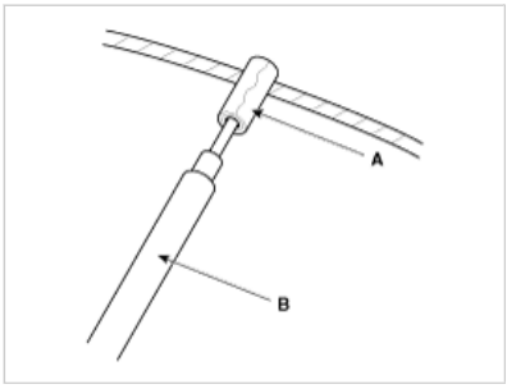
1. Connect the connector.
2. Install the tweeter speaker and tweeter speaker grille.

Body Electrical System

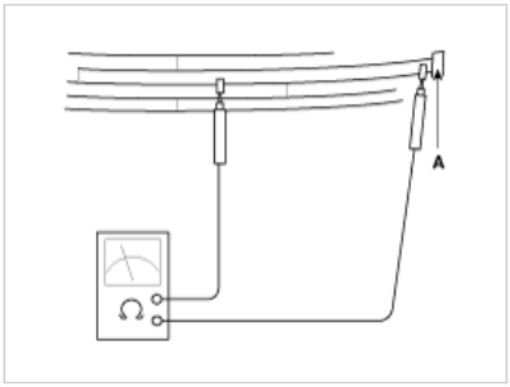
Inspection

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.



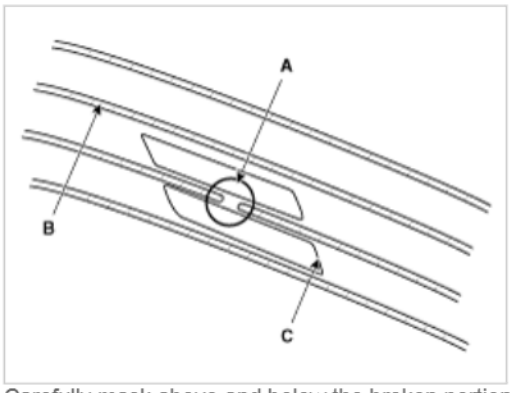
Glass Antenna Repair

NOTICE

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.

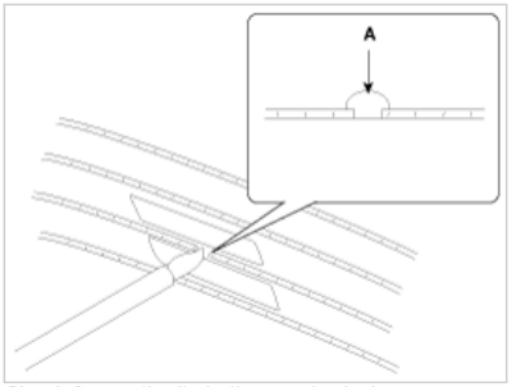
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2. Carefully mask above and below the broken portion of the glass antenna wire (B) with cellophane tape (C).
3. Using a small brush, apply a heavy coat of silver conductive paint (A) extending about 1/8″on both sides of the break. Allow 30 minutes to dry.

NOTICE

Thoroughly mix the paint before use.

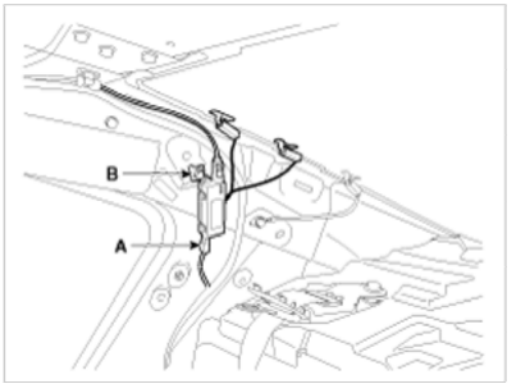


4. Check for continuity in the repaired wire.
5. Apply a second coat of paint in the same way. Let it dry three hours before removing the tape.

Glass Antenna Circuit Inspection

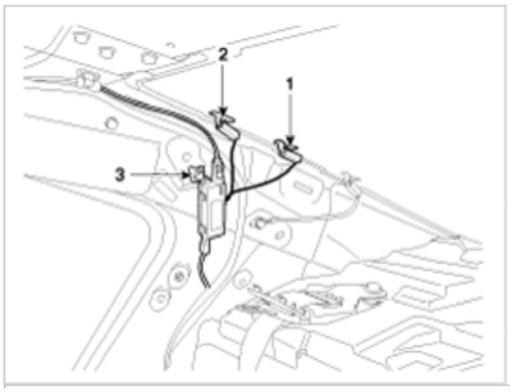
1. Remove the right side rear quarter trim.
   Then disconnect the antenna feeder cable from the glass antenna amp.
2. Turn the radio ON.
   Measure the voltage between the harness side (A) and body ground (B).

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.

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Standard value :80~120KΩ
Short : Approx. 0Ω
Open :∞ Ω

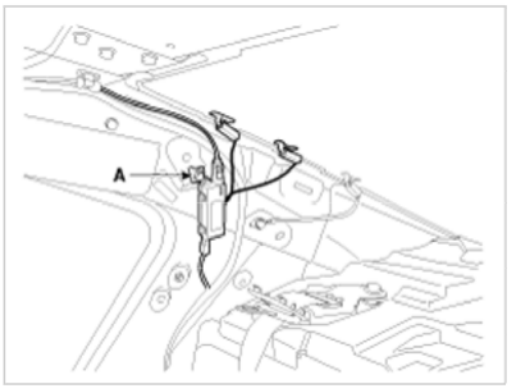
4. Check for AM wire resistance between terminals of No.2 and 3.

Standard value :120~170KΩ
Short : Approx. 0Ω
Open :∞ Ω

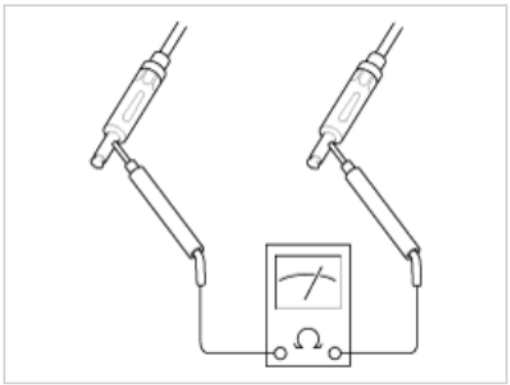
5. Check the grid lines for continuity.
6. When a poor radio reception is not repaired through the above inspection methods, replace the amp.
   If the radio reception is still poor, check the radio cable for short and radio head unit for failure.

Antenna Cable

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

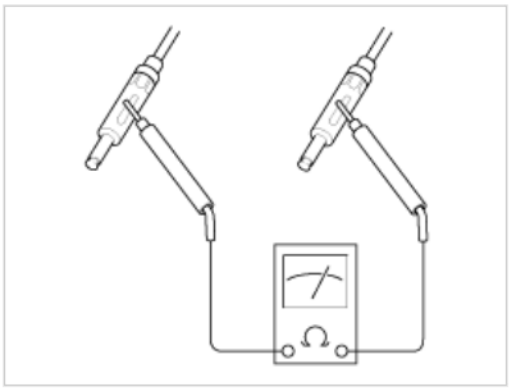


2. Check for continuity between the center poles of antenna cable.

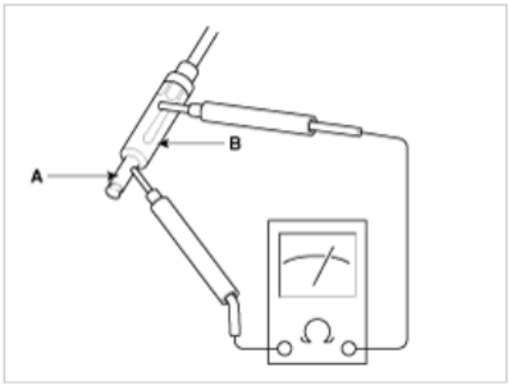


3. Check for continuity between the outer poles of antenna cable. There should be continuity.

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

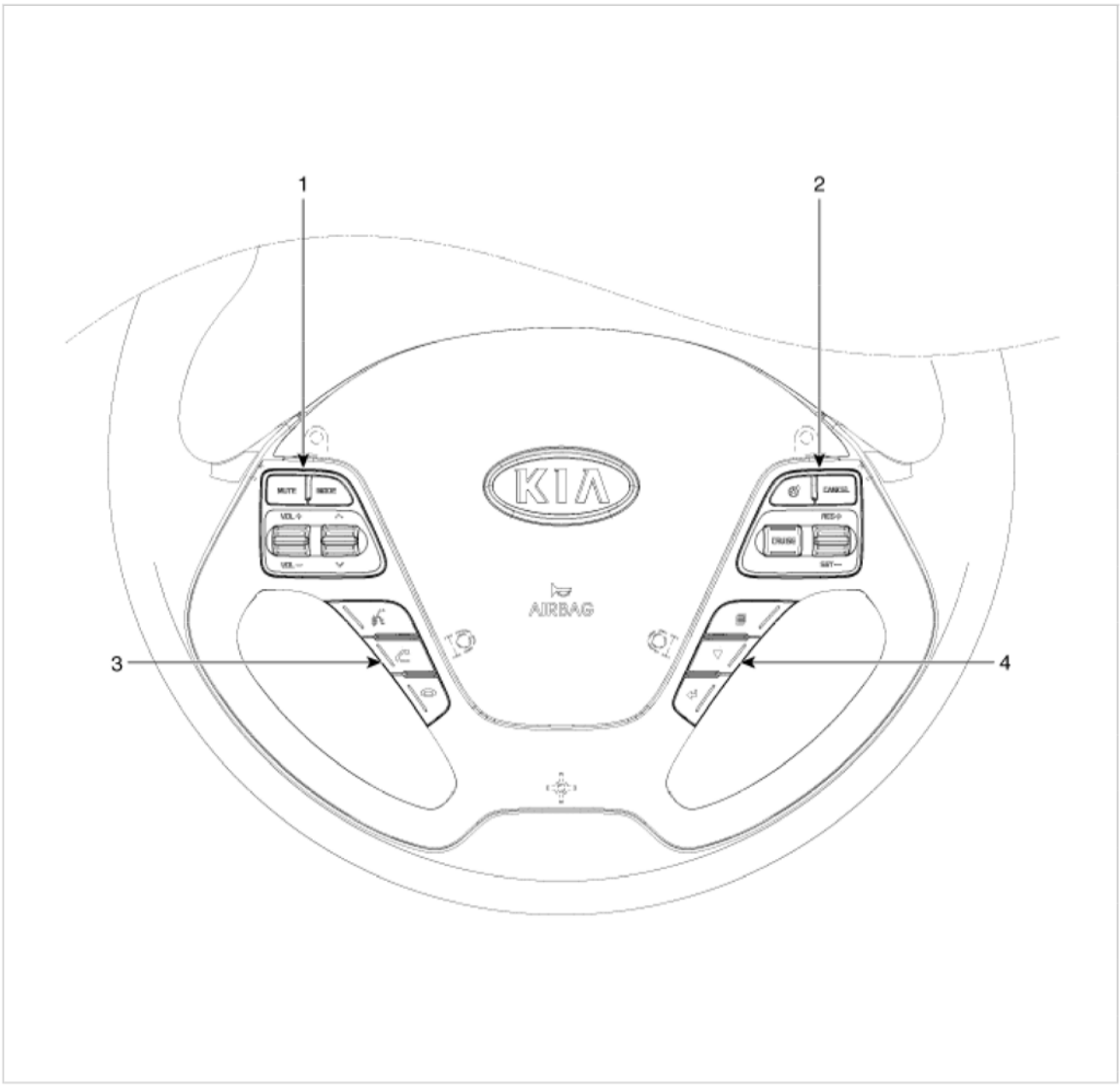


6. If there is continuity, replace the antenna cable.

Body Electrical System

Component Location

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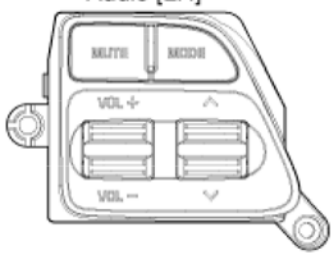
1. Remote control switch(LH)	3. Bluetooth hands free switch
2. Remote control switch(RH)	4. Trip switch

Body Electrical System

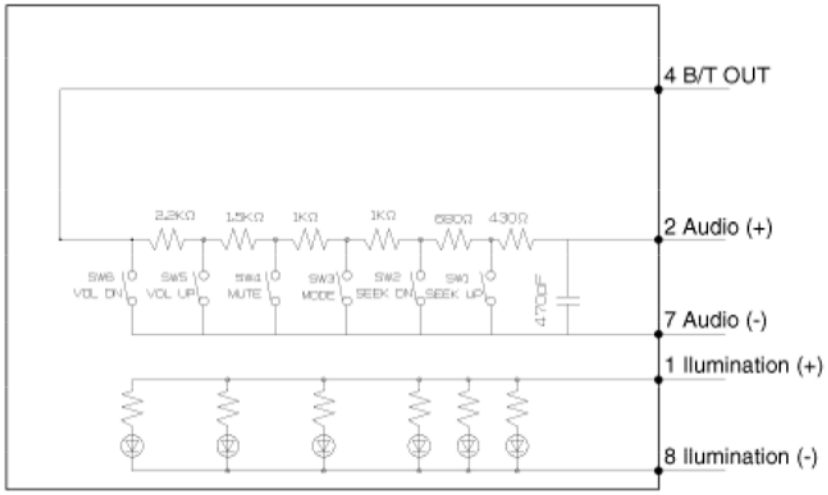
Circuit Diagram

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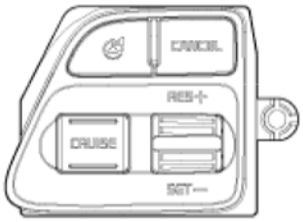
Audio [LH]



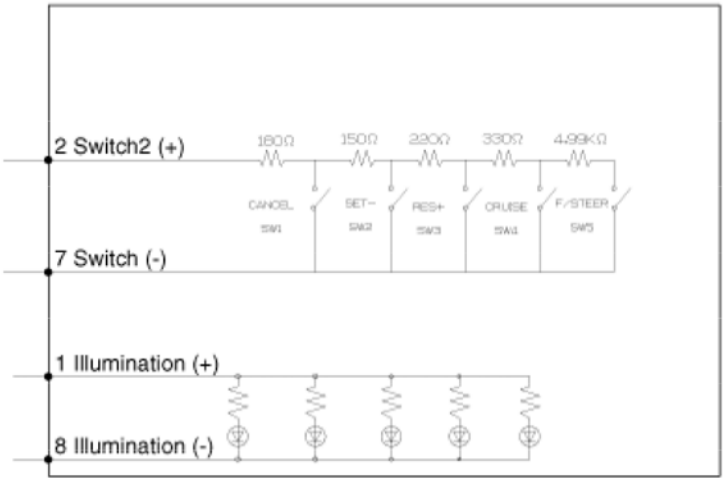
Connector	
	
No.	**Description**
1	Illumination (+)
2	Audio (+)
3	-
4	Bluetooth OUT
5	-
6	-
7	Audio (-)
8	Illumination (-)



Cruise + Flex [RH]

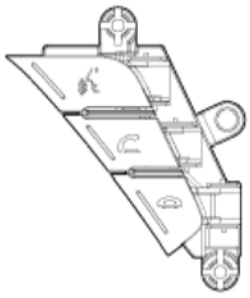


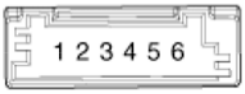
Connector	
	
No.	**Description**
1	Illumination (+)
2	Switch 2 (+)
3	-
4	-
5	-
6	-
7	Switch (-)
8	Illumination (-)

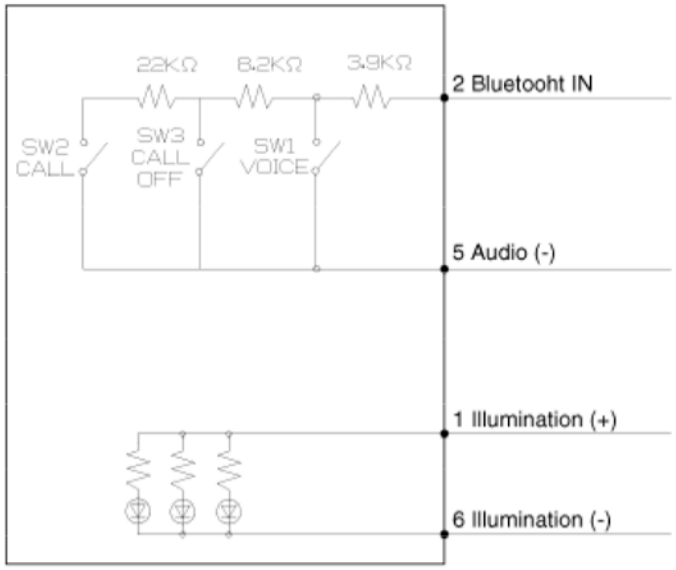


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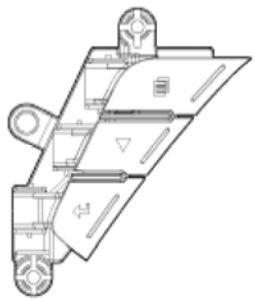
Bluetooth + Voice [LH]

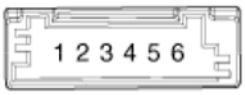


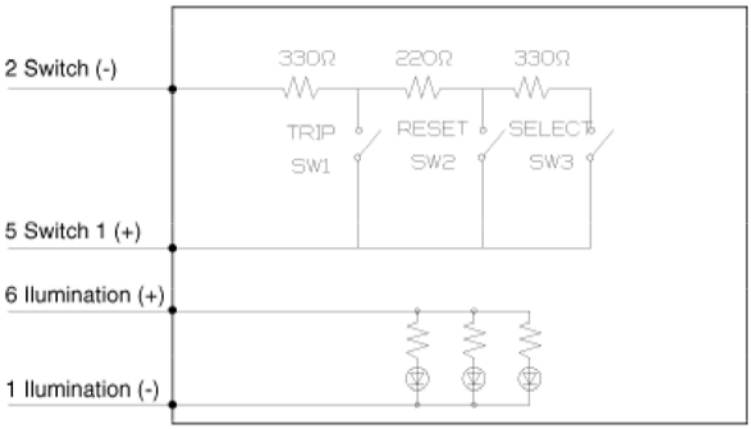
Connector	
 1 2 3 4 5 6	
No.	**Description**
1	Illumination (+)
2	Bluetooth IN
3	-
4	-
5	Audio (-)
6	Illumination (-)



Trip [RH]



Connector	
 1 2 3 4 5 6	
No.	**Description**
1	Illumination (-)
2	Switch (-)
3	-
4	-
5	Switch 1 (+)
6	Illumination (+)

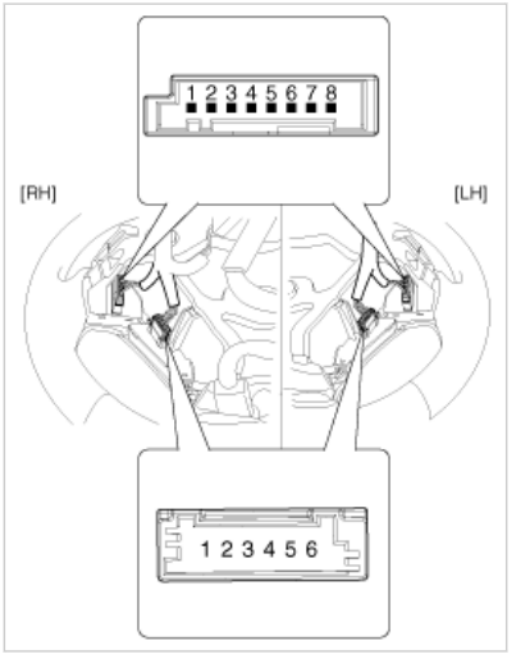


Body Electrical System

Inspection

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

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[Audio (LH)]

Switch	Connector terminal	Resistance (±5%)
Seek up	2-7	430 Ω
Seek down	2-7	1.1 kΩ
Mode	2-7	2.11 kΩ
Mute	2-7	3.11 kΩ
Volume up	2-7	4.61 kΩ
Volume down	2-7	6.81 kΩ

[Cruise + Flex (RH)]

Switch	Connector terminal	Resistance (±5%)
Cancel	2-7	180 Ω
SET	2-7	330 Ω
Resume	2-7	550 Ω
Cruise	2-7	880 Ω
Flex steer	2-7	5.54 kΩ

[Bluetooth + Voice (LH)]

Switch	Connector terminal	Resistance (±5%)
Voice	2-5	10.71 kΩ
End of call	2-5	18.91 kΩ
Call	2-5	40.91 kΩ

[Trip (RH)]

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

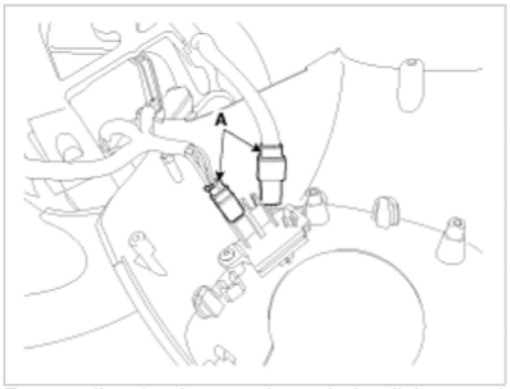
Removal

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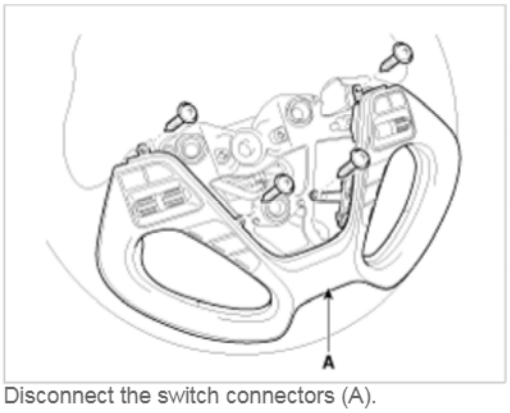
1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
3. Remove the steering wheel.
   (Refer to Steering System - "Steering Column and Shaft")
4. Remove the steering wheel cover (A) after loosening the screw.



5. Disconnect the steering heater connectors (A).

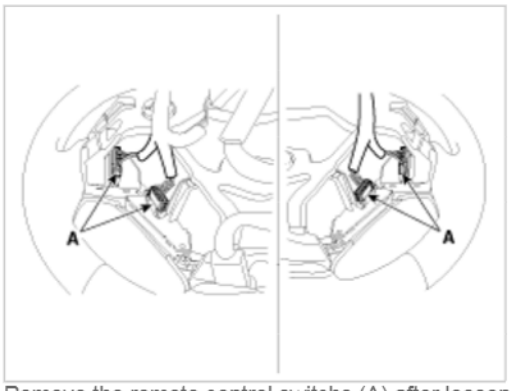


6. Remove the steering remote control switch assembly after loosening the mounting screws (4EA).

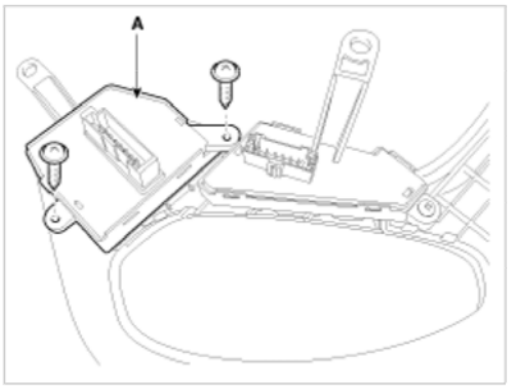


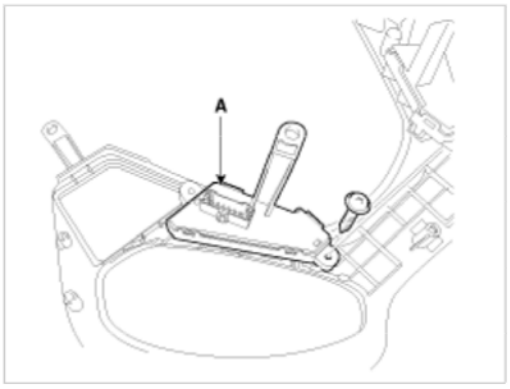
7. Disconnect the switch connectors (A).

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8. Remove the remote control switchs (A) after loosening the mounting screws.





Installation

1. Reassemble the steering wheel remote control switch after connecting the connector.
2. Reassemble the driver airbag module.

NOTICE

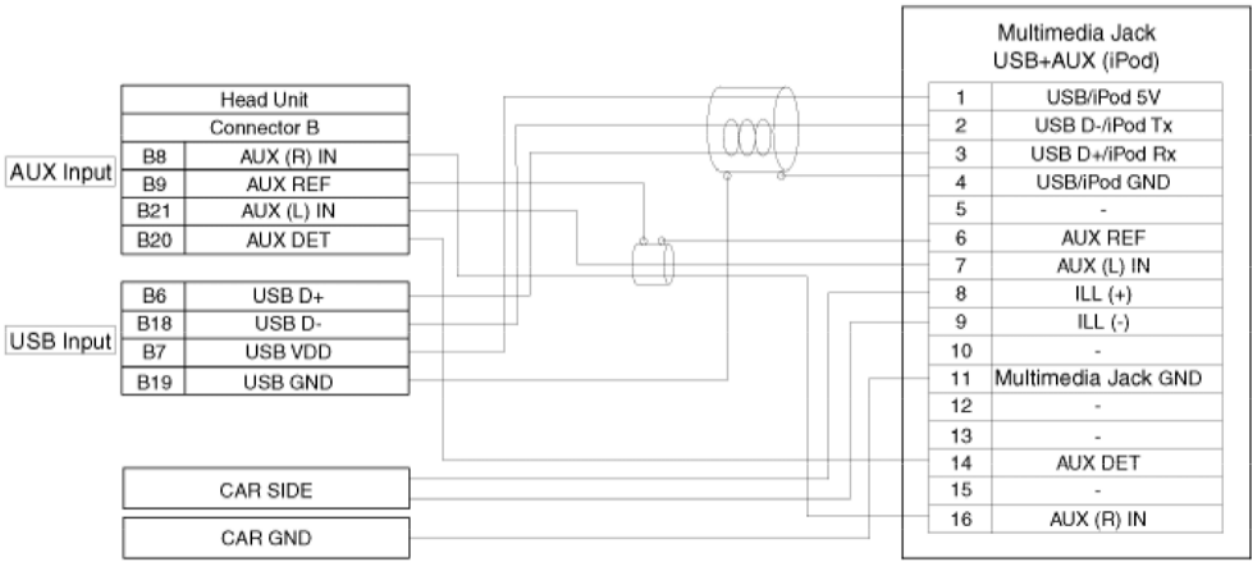
Make sure the audio remote control switch and the airbag module connectors are plugged in properly.

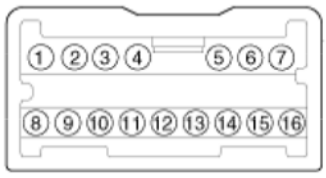
Body Electrical System

Circuit Diagram

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[AUX, USB, iPod Jack]



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

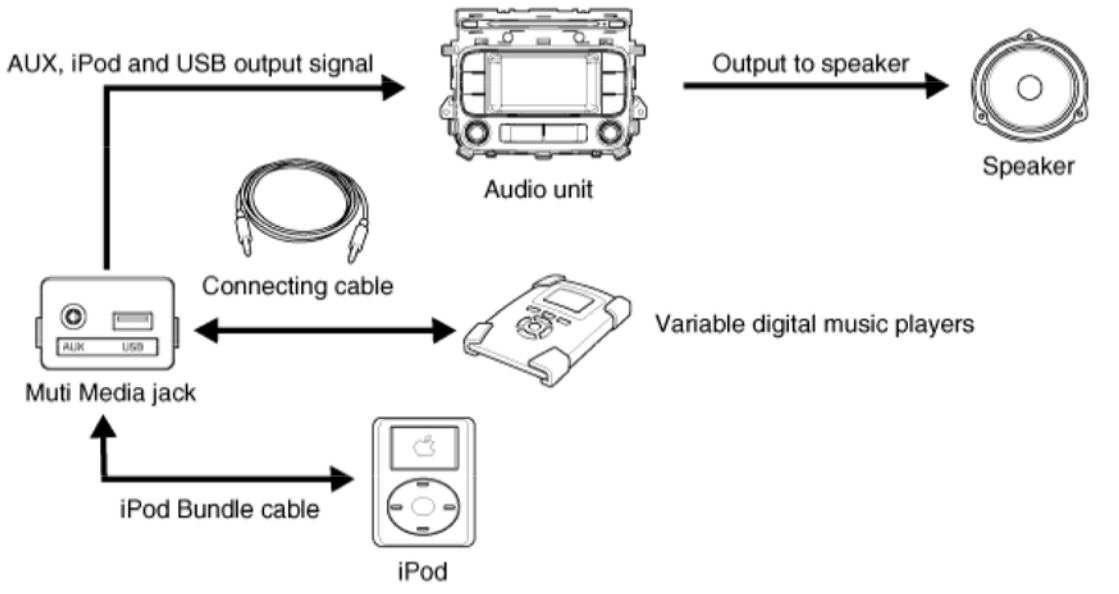
Body Electrical System

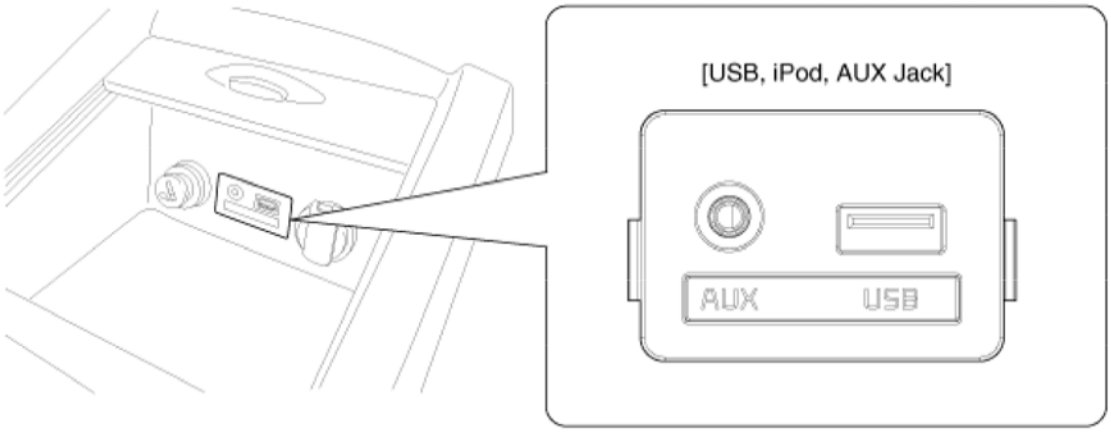
Description

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.

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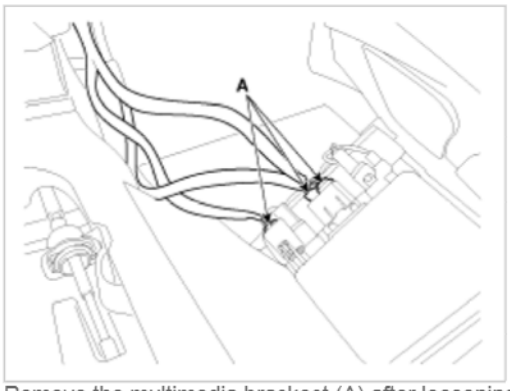


Body Electrical System

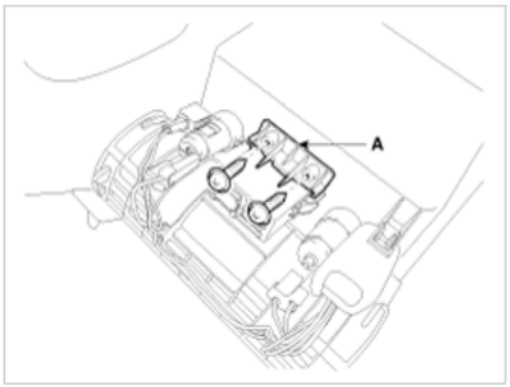
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Disconnec the connectors (A) from the floor console assembly.

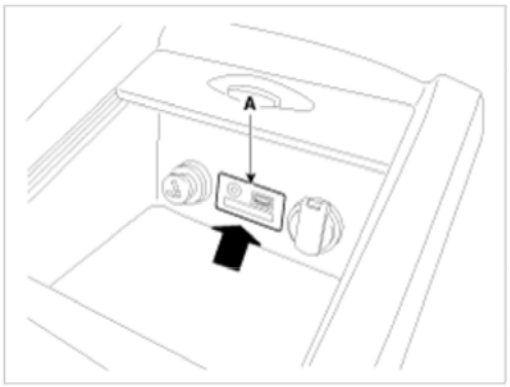
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4. Remove the multimedia brackect (A) after loosening the mounting screws (2EA).



5. Remove the multimedia jack (A) after pushing the multimedia jack in the direction of the arrow.



Installation

1. Install the multimedia jack.
2. Connect the multimedia jack connector.
3. Install the floor console assembly.

NOTICE

Make sure the multimedia connector and the floor console assembly connectors are plugged in properly.

Troubleshooting

Customer Complaint Analysis Check Sheet

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

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

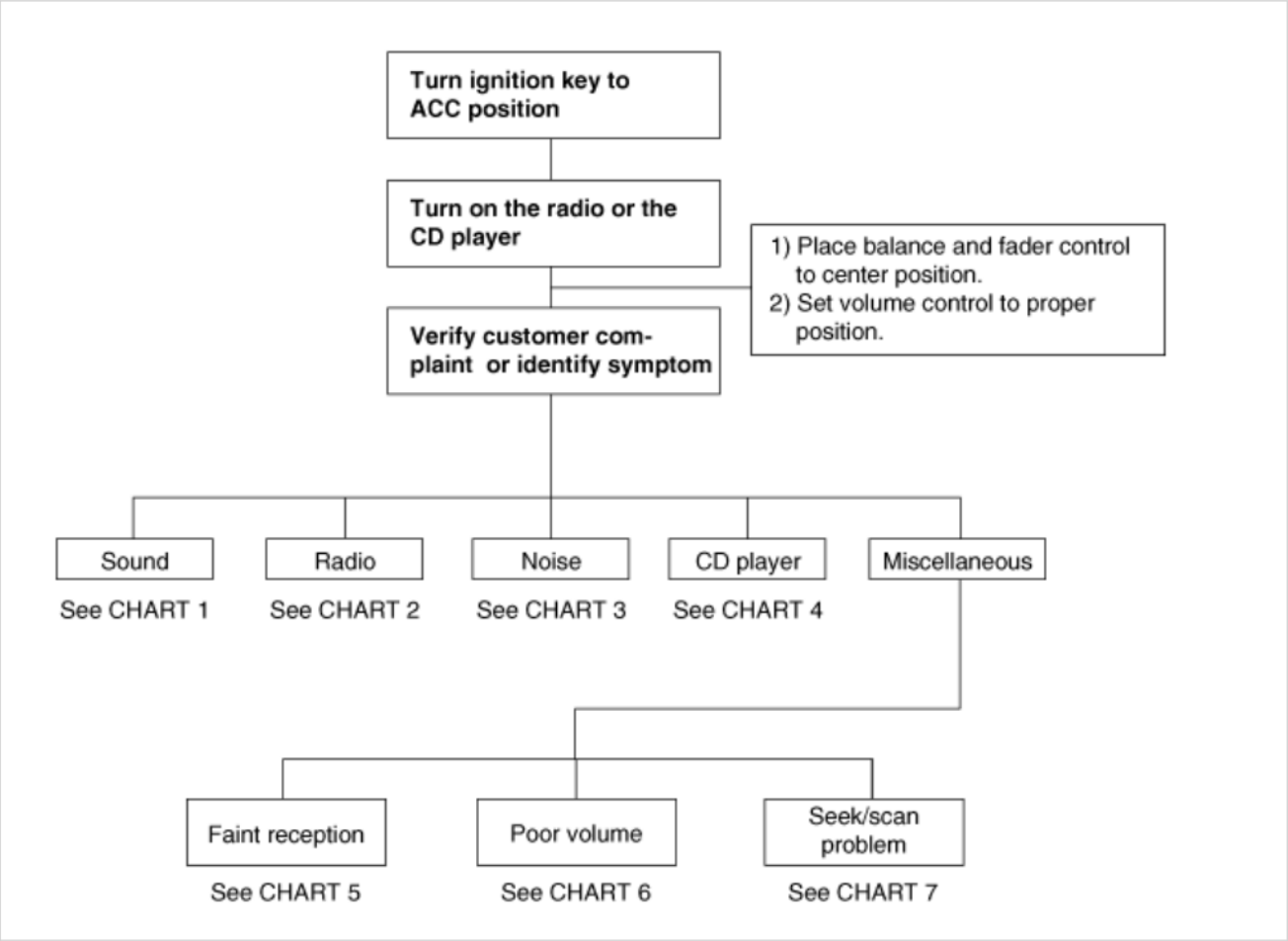
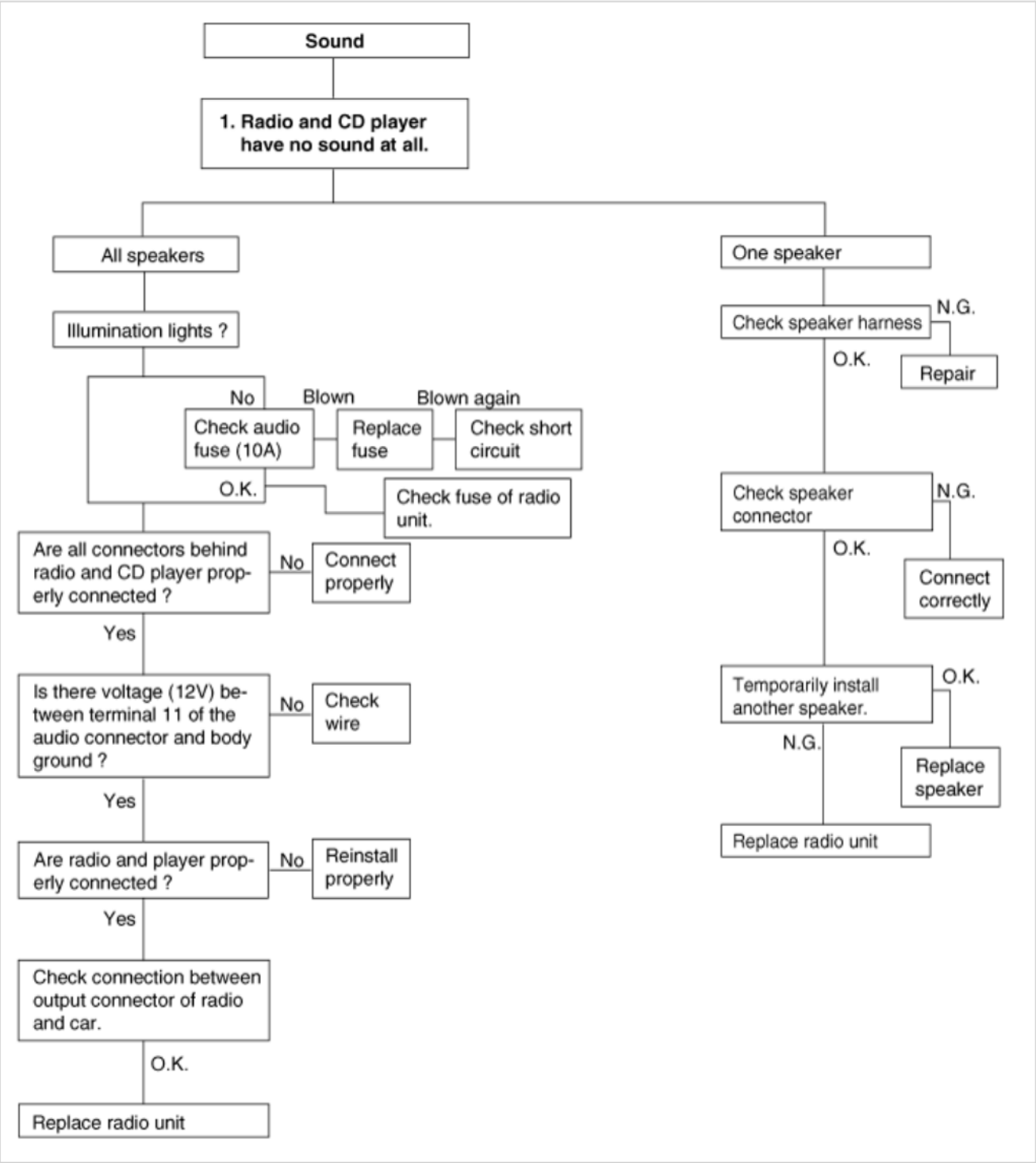


Chart 1

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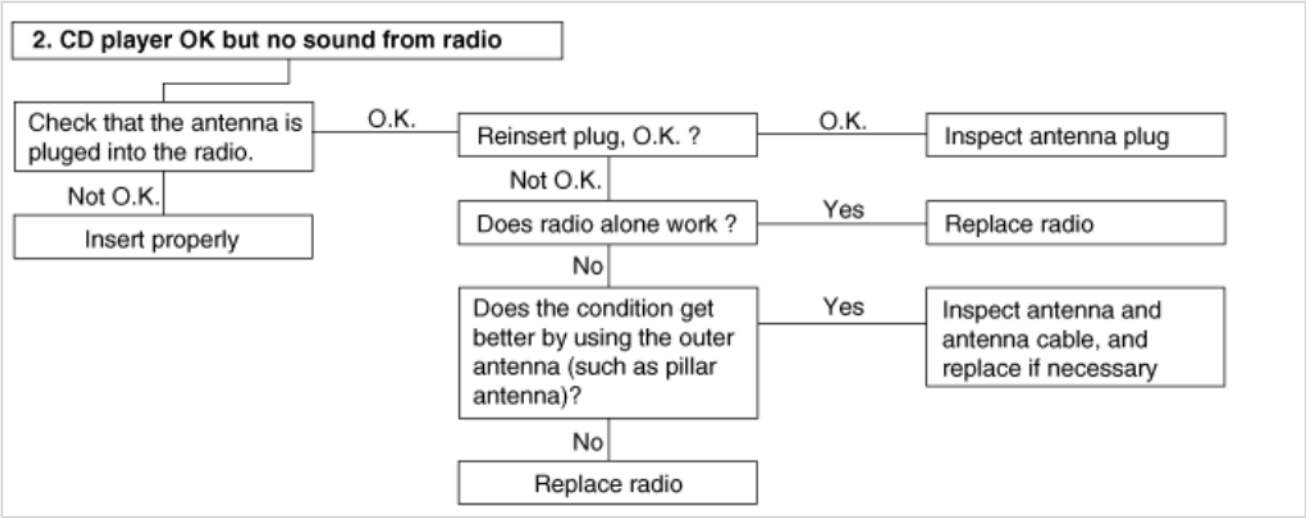


Chart 2

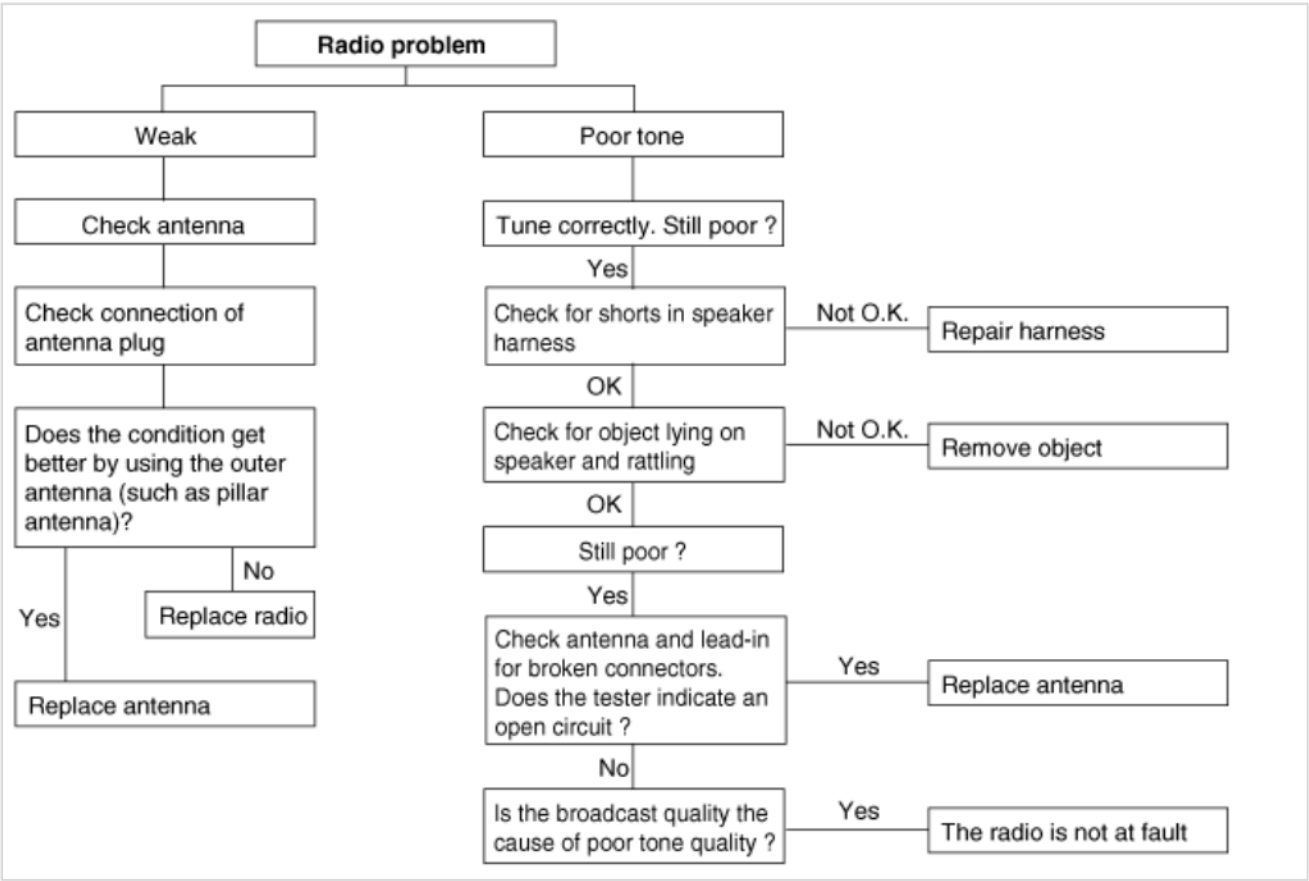


Chart 3

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1. RADIO

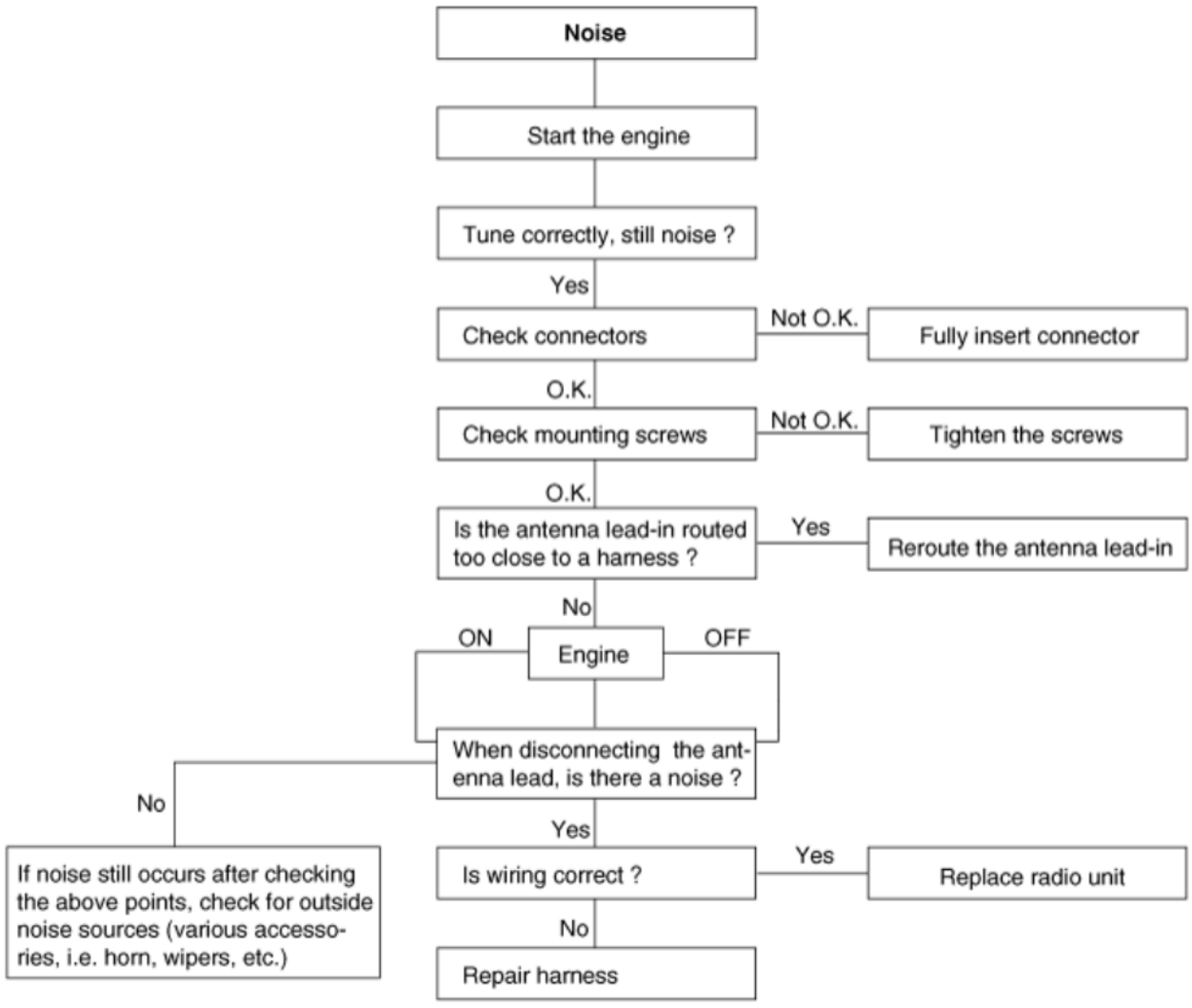
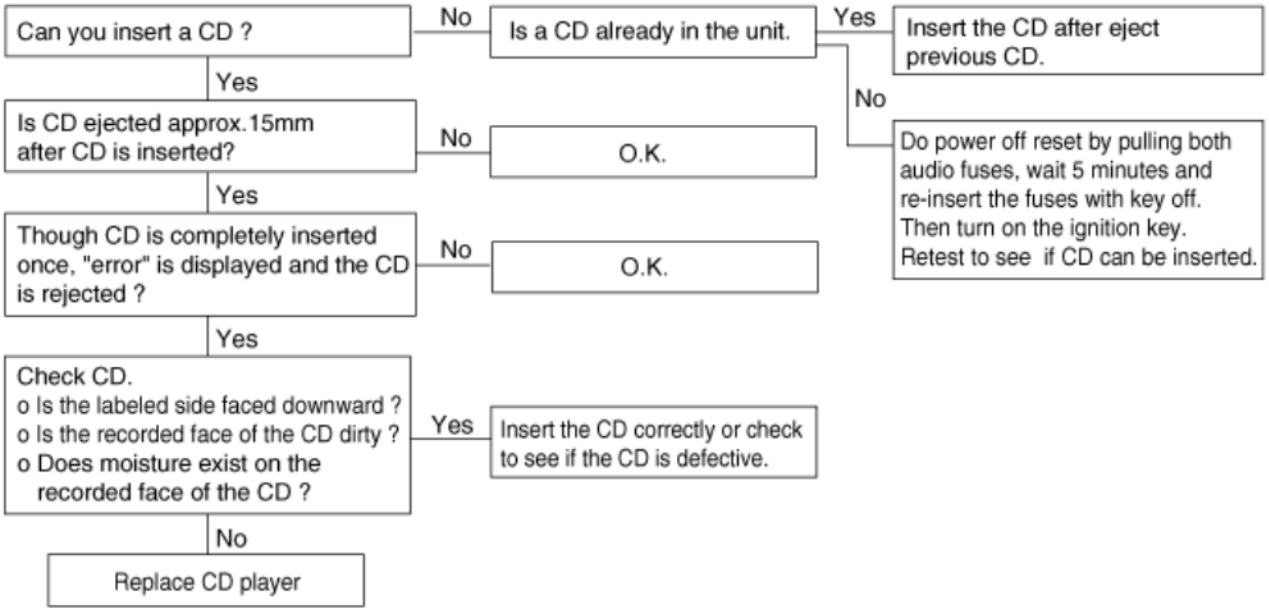


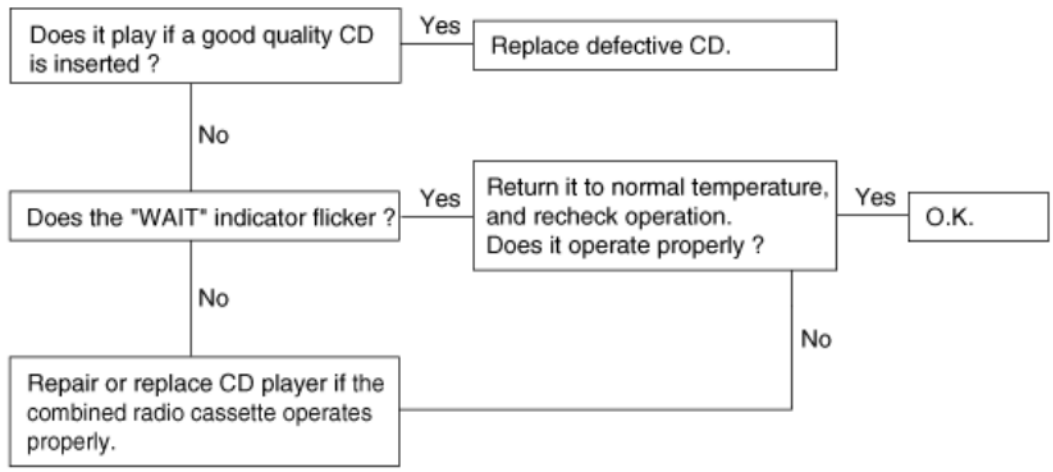
Chart 4

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1. CD WILL NOT BE ACCEPTED



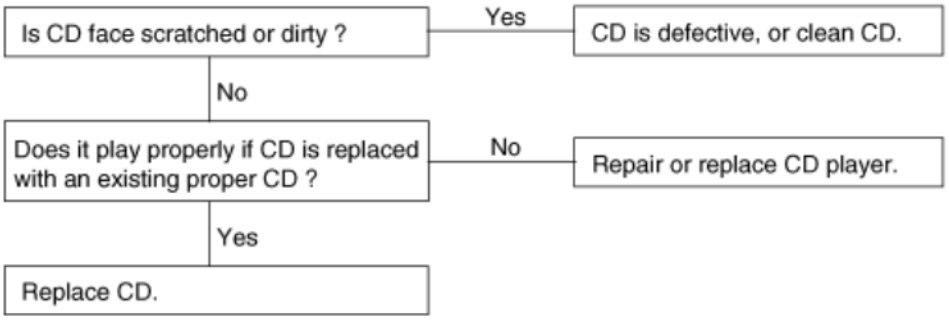
2. NO SOUND



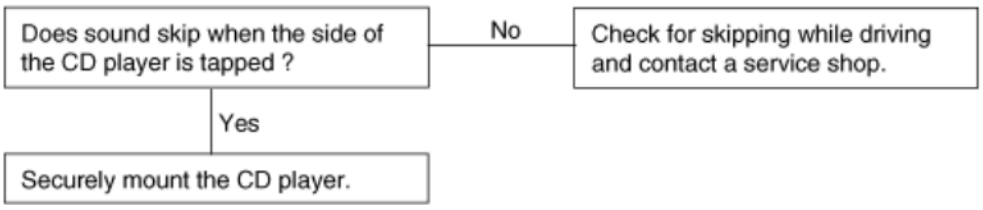
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3. CD SOUND SKIPS

1) Sound sometimes skips when parking.

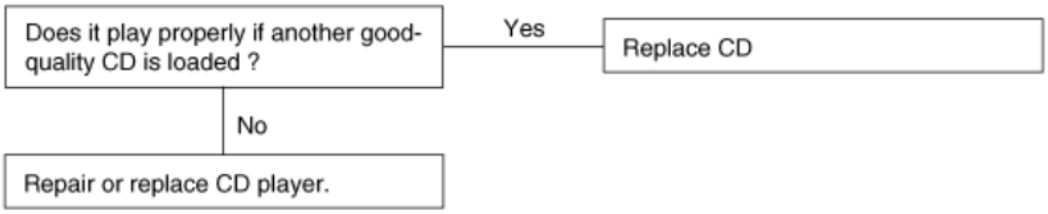


2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)

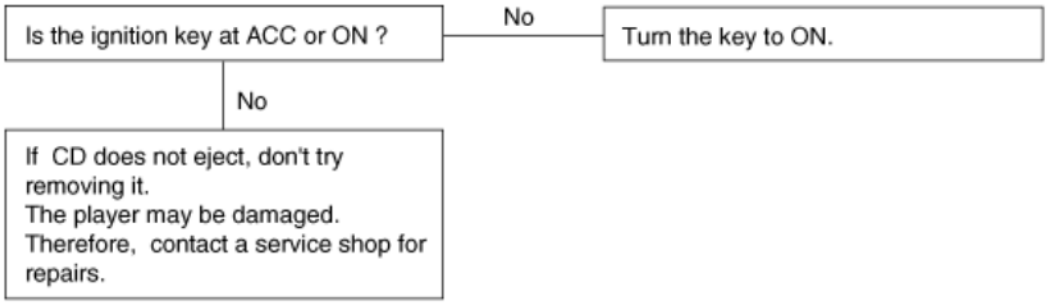


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4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT



6. NO SOUND FROM ONE SPEAKER

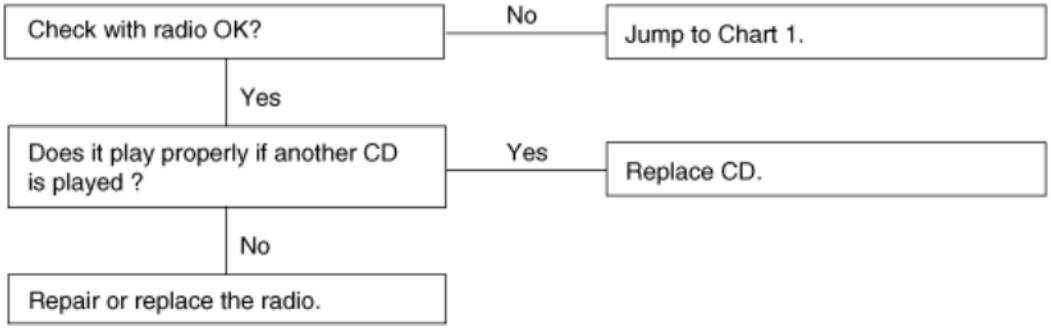


Chart 5

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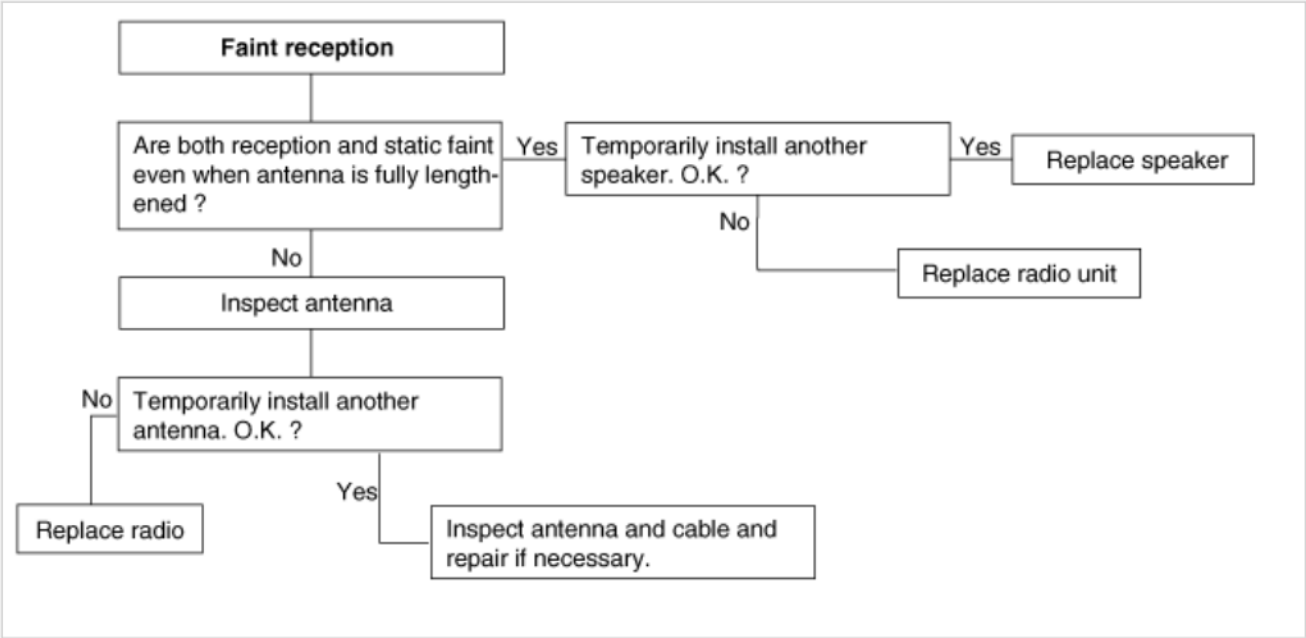


Chart 6

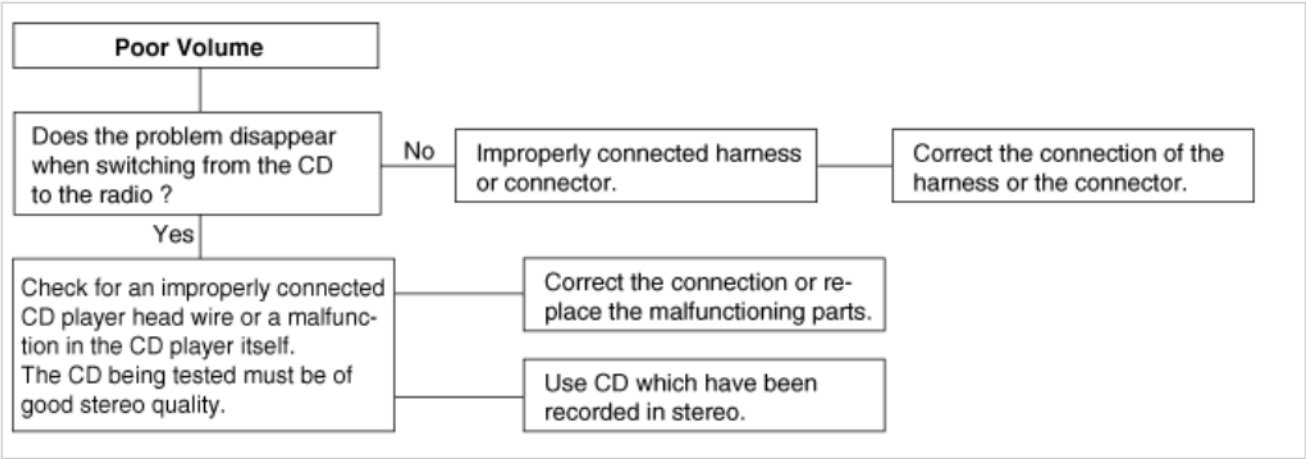
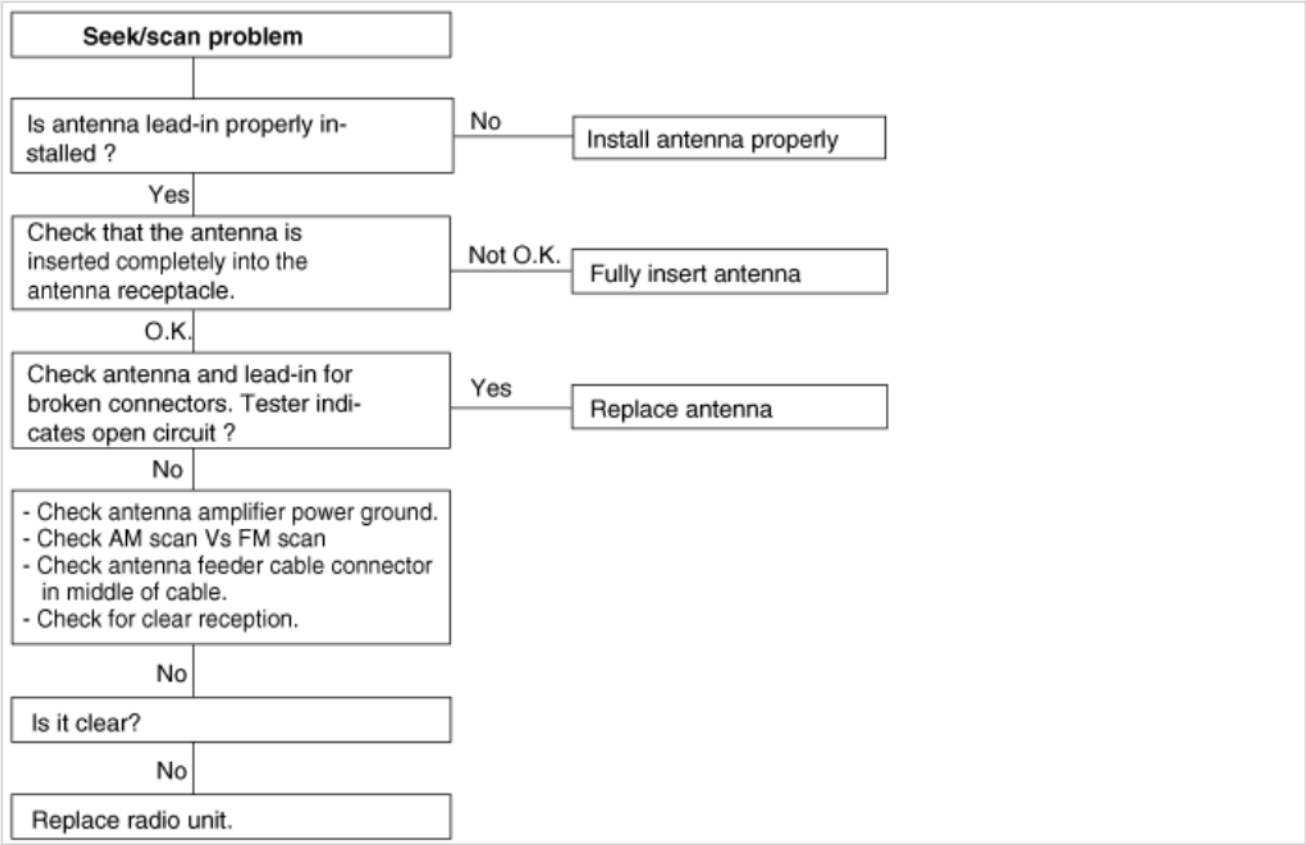


Chart 7

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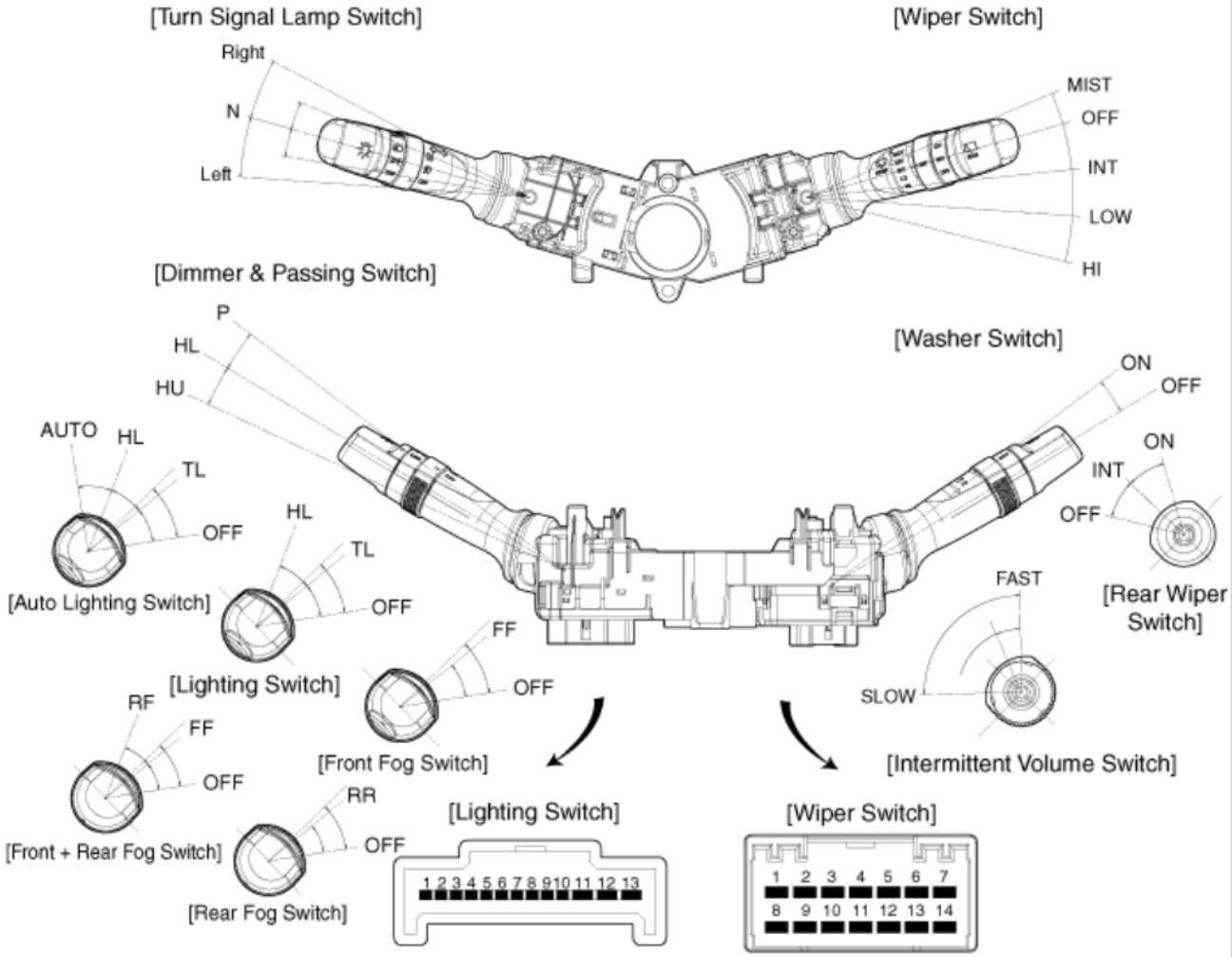


Specifications

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-30°C ~ +80°C (-22 ~ +176°F)
Rated load	Dimmer & passing switch	High : 1A (Relay load) Low : 1A (Relay load) Passing : 1A (Relay load)
	Lighting switch/ Auto lighting switch	1A (Relay load)
	Turn signal & lane change switch	6.6 ± 0.5A
	Front/Rear fog lamp switch	1A (Relay load)
	Wiper & mist switch	Low, High : 4.0A (Motor load) Intermittent : 0.22 ± 0.05A (Relay load) Lock : Max. 28A (Motor load)
	Variable intermittent volume	Max. 25mA
	Front/Rear washer switch	4A (Motor load)
	Mist	4A (Motor load)
	Rear wiper	0.2A (Relay load)

Components

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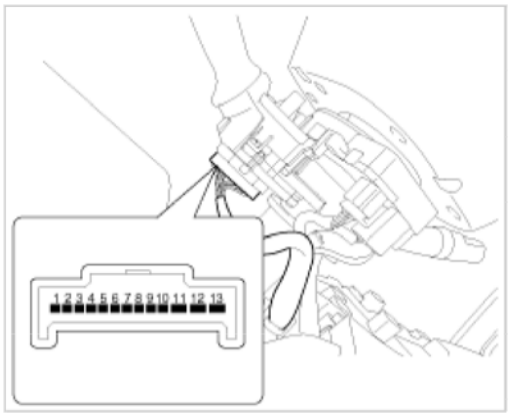
Connectorname	No.	Description	Connectorname	No.	Description
Lighting (13 pin) -LH side	1	Lighting switch ground	Wiper & Washer (14 pin) -RH side	1	Intermittent rear wiper switch
	2	Tail lamp switch		2	IGN(2)-Rear wiper & washer
	3	Auto light switch		3	Rear washer switch
	4	Head lamp switch		4	-
	5	Fog switch base		5	Wiper low speed
	6	Front fog switch		6	Wiper parking
	7	Rear fog switch		7	Mist switch
	8	Head lamp low beam		8	Rear wiper switch
	9	Head lamp high beam		9	Intermittent volume base
	10	Dimmer switch base		10	Intermittent time
	11	Turn signal left		11	Washer switch
	12	Turn signal base		12	IGN(2)-Front washer & wiper
	13	Turn signal right		13	Wiper high speed
				14	Intermittent wiper switch

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.

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Lighting Switch (Auto Light)

Terminal / Position	1	2	4	3
OFF				
Tail	○	○		
H/Lamp	○	○	○	
AUTO	○			○

Lighting Switch

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

Dimmer And Passing Switch

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

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

Turn Signal Switch

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

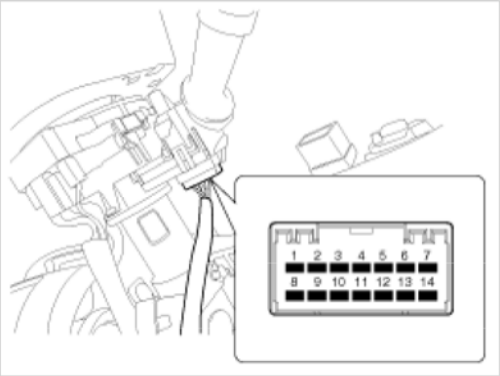
Front Fog Lamp Switch

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Terminal / Position	5	6
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 / Position	5	13	6	14	12	7	10	9
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○	○		○	○
LOW	○				○			
HI		○			○			

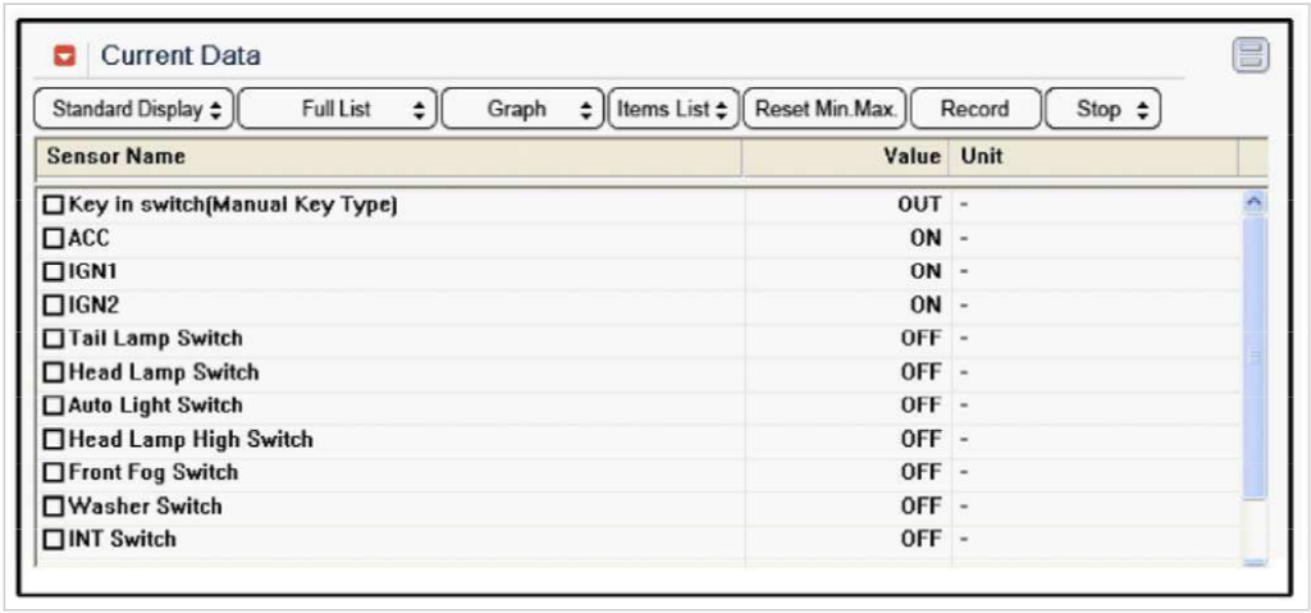
Washer Switch

Terminal / Position	11	12
OFF		
ON	○	○

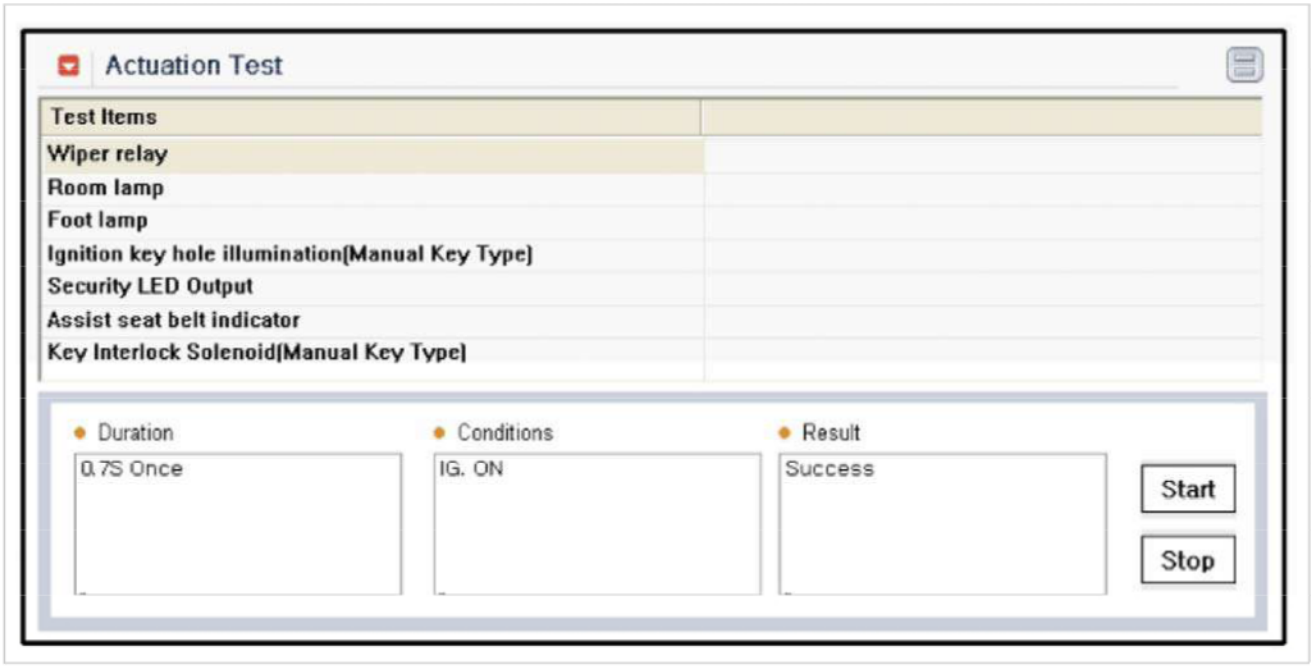
Inspection (With GDS)

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.

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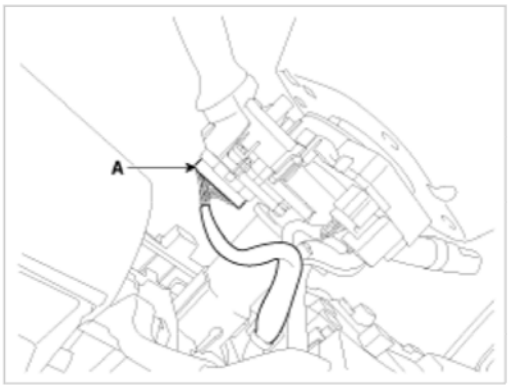
4. To perform compulsory operation on BCM input factors, select "ACTUATION TEST".

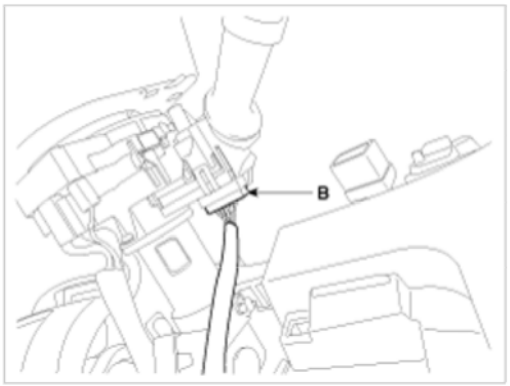


Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.
   (Refer to Steering System - "Steering Wheel")
3. Remove the steering column upper and lower shrouds.
   (Refer to Body - "Steering Column Shroud Panel")
4. Remove the clock spring.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
5. Disconnect the light switch connector (A) and the wiper switch connector (B).

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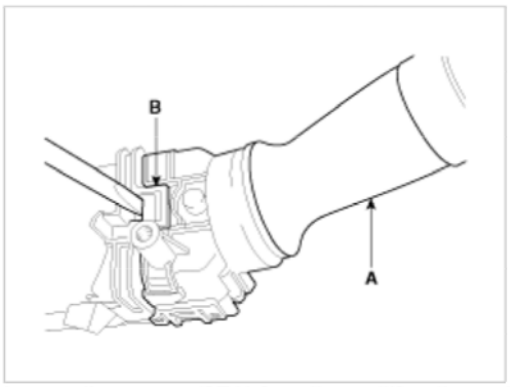




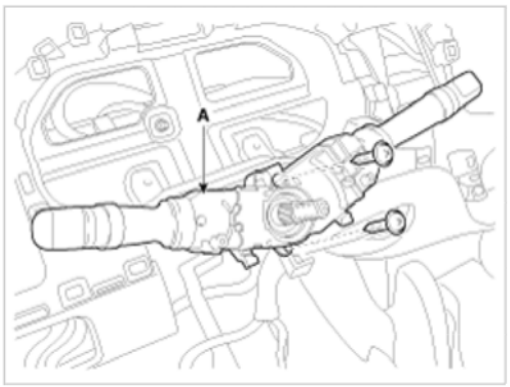
6. [RHD]Remove the wiper switch (A) by pushing the lock pin (B).

NOTICE

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



7. Loosen the screws (2EA) from the multifunction switch assembly (A).



Installation

1. Install the multifunction switch.
2. Install the clock spring.

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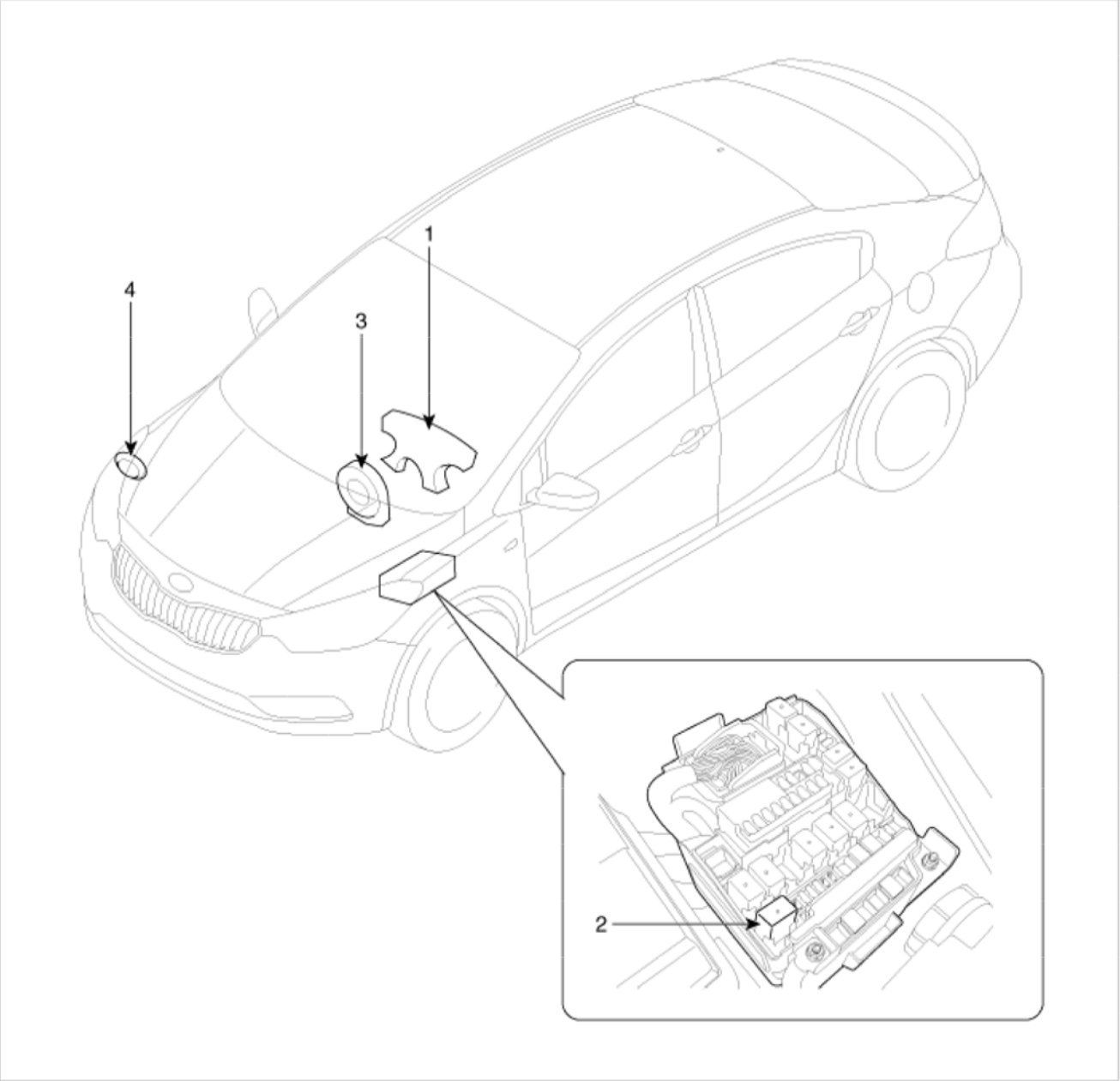
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.

NOTICE

Make sure the multifunction switch connectors are plugged in properly.

Body Electrical System

Component Location



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

Body Electrical System

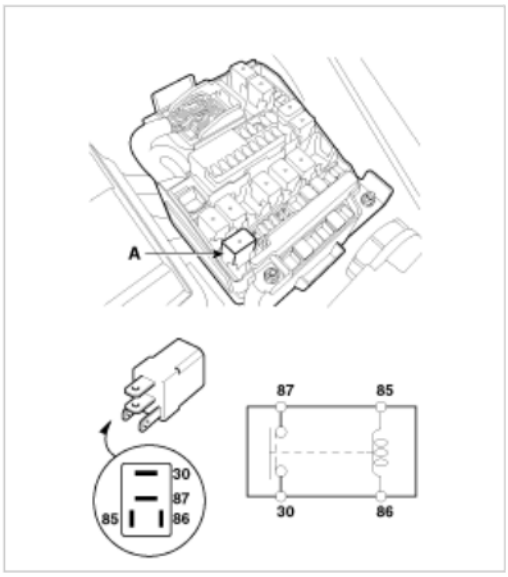
Inspection

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.

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Horn Relay Inspection

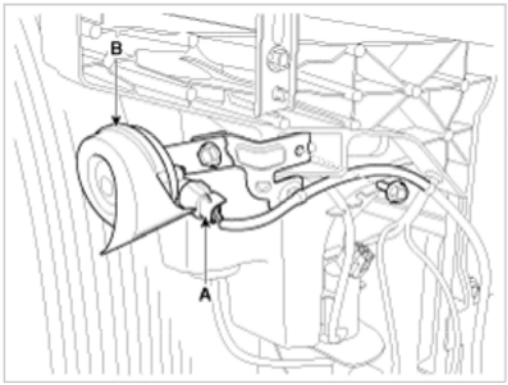
1. Remove the horn relay (A) from the engine room relay box.
2. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
3. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.



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

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover.
   (Refer to Body - "Front Bumper Cover")
3. Remove the bolt and disconnect the horn connectors, then remove the horn (A).



Installation

1. Install the horn and connect the horn connector.
2. Reassemble the front bumper cover.

Body Electrical System

Specifications

AVN Head Unit

Item	Specification
Power supply	DC 14.4V negative ground

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Load Impedance		4ohm × 4
Tuning type		PLL SYNTHESIZED TUNING
Antenna		80PF 75ohm
Dark current		Max. 2.0mA (Head unit only)
Frequency range / Channel space	FM	87.5~107.9 MHz / 200 kHz
	AM	530~1,710 kHz / 10 kHz
S/N	FM	Min. 50 dB
	AM	Min. 40 dB

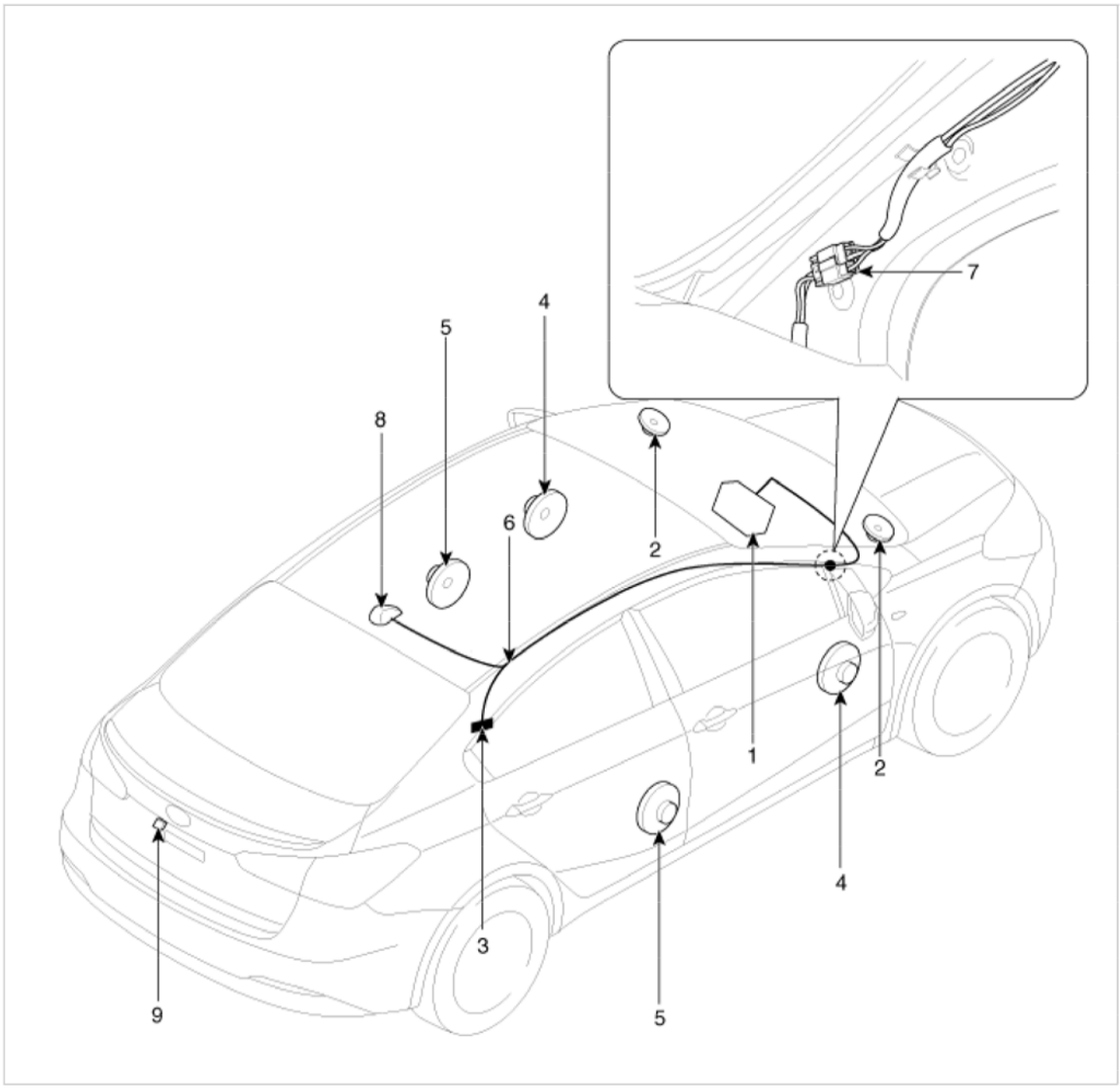
Speaker

Item		Specification
Input Power	Front	20W (Max 40W)
	Rear	20W (Max 40W)
	Front Tweeter	20W (Max 40W)
Speaker Impedance	Front	4 ± 0.6 Ω
	Rear	4 ± 0.6 Ω
	Front Tweeter	3.4 ± 0.5 Ω
Speaker Number		6

Body Electrical System

Components Location

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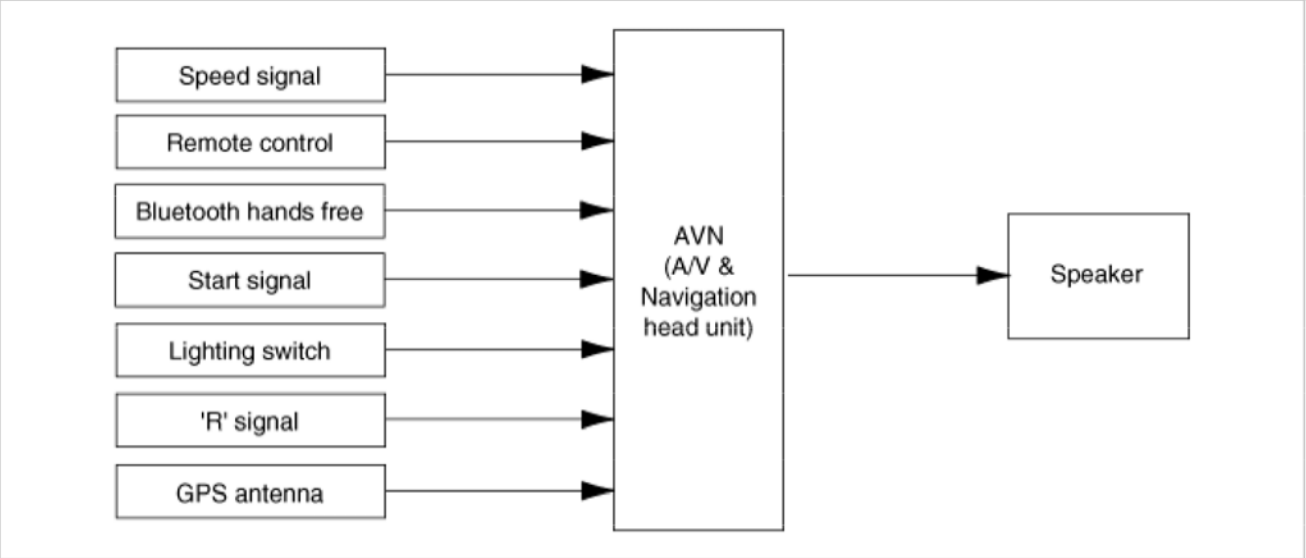


1. AVN (A/V & Navigation head unit)	6. Antenna feeder cable jiont
2. Tweeter speaker	7. Antenna cable connector
3. Glass antenna amp (Radio)	8. Roof antenna
4. Front door speaker	9. Back view camera
5. Rear door speaker	

Body Electrical System

System Block Diagram

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Body Electrical System

Description

Limitations Of The Navigation system

GPS Signal Reception State

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

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

Vehicle Position Display

1. If multipass errors occur due to reflections from buildings or related causes, the current position mark on the navigation may differ from the actual position of the vehicle.
2. The position of the vehicle on the navigation may be different from the actual position if the vehicle is under the occur, driving for a short period of time will vehicle through map matching or GPS information (several minutes may be necessary in certain cases).
   A. When driving on a Y-shaped road with a narrow angle, the current position may be displayed in the opposite direction.
   B. If the vehicle is loaded onto a car transport vehicle, the current position mark may be stalled on the last position prior to loading.
   C. When driving on a spiral-shaped road.
   D. When driving in mountain regions with sharp turns or sudden brakes.
   E. When entering a road after having been in an underground parking structure, building parking structure, or turnable with many rotations.
   F. When the tires have recently been replaced (Especially upon use of spare or studless tires)
   G. If the battery terminal is removed.
   H. When driving in city streets, the current position may be displayed on the opposite side or on an off-road position.
   I. When changing the zoom level from the maximum zoom in level to a different zoom level, the current position mark may be displayed on a different road.
   J. When driving in heavy traffic with frequent go · stops in traffic or intersections.
   K. When driving under slippery conditions, such as heavy sand, snow, etc.
   L. When driving with the tire chain in place.
   M. When using a tire with an incorrect size specification.
   N. When the tire pressure for the 4 tires are different.
   O. When the replacement tire is a worn or used tire (Especially studless tires having passed a 2nd seasons, etc.)

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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

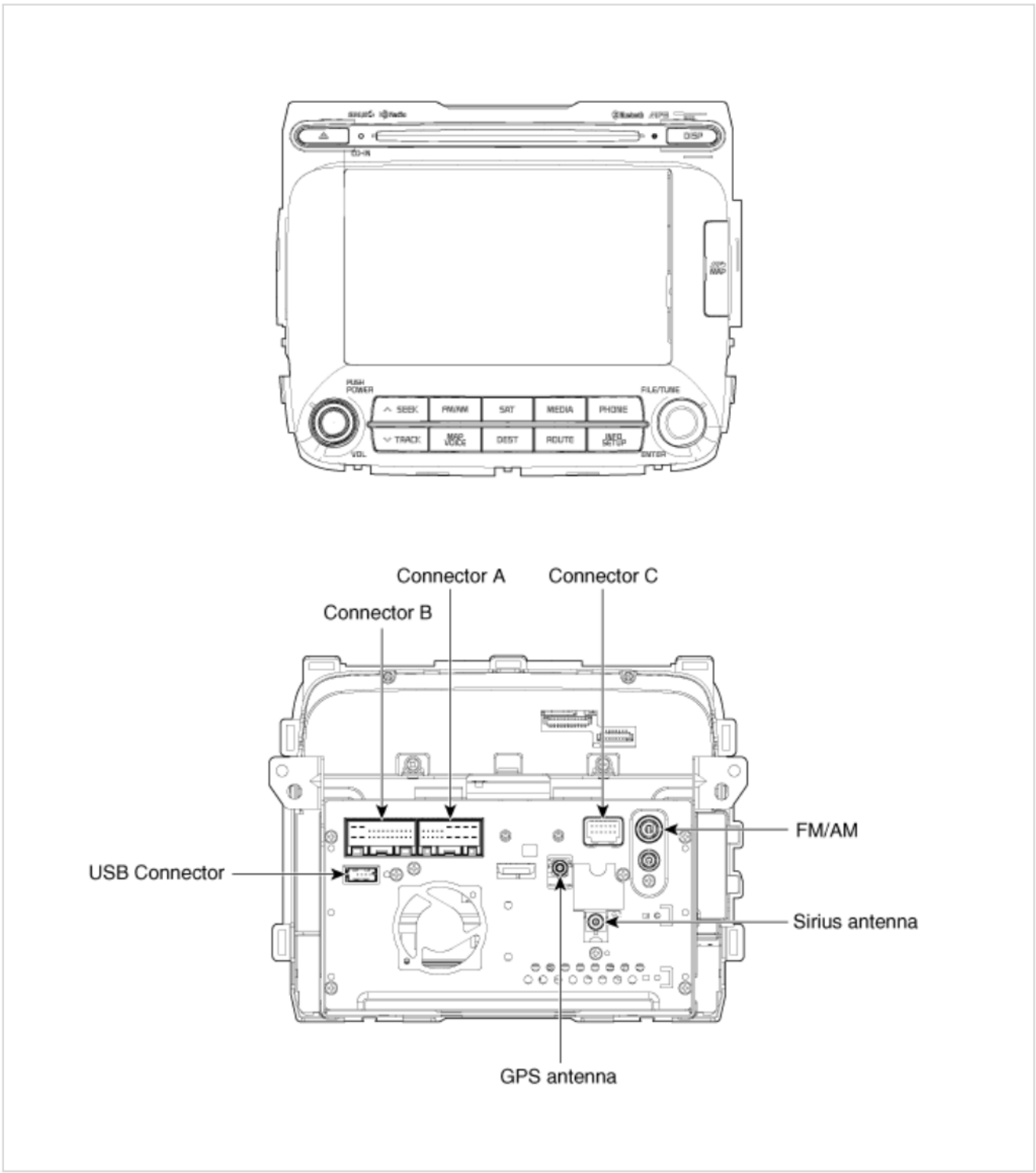
The following phenomena may occur after conducting route recalculation.

- 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

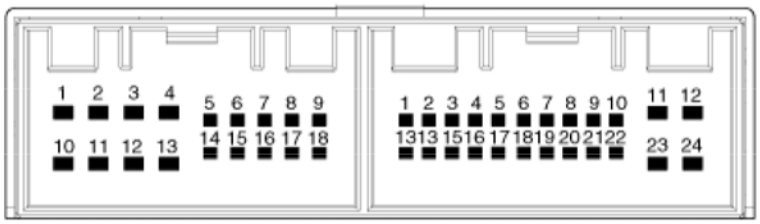
Components

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AVN Head Unit Connector (AVN)

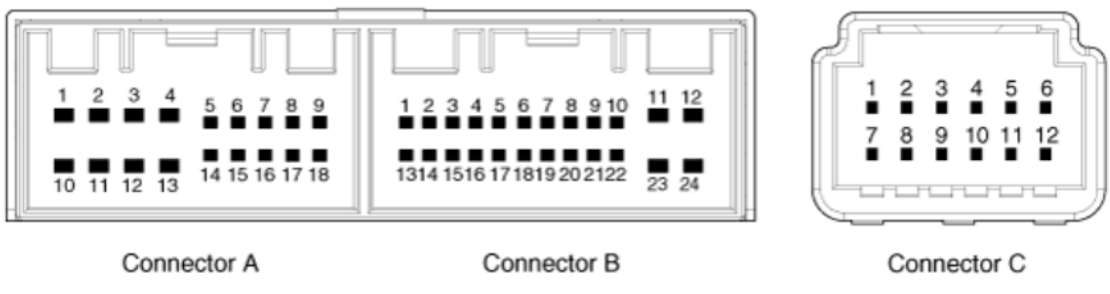
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Connector Pin Information

No.	Connector A	Connector B
1	Rear left speaker (+)	MM CAN high
2	Front left speaker (+)	Ground
3	Front right speaker (+)	Parking (M/T)
4	Rear right speaker (+)	Steering remocon
5	Back view ground	-
6	Back view power	Igntion
7	ALT L	-
8	Illumination (+)	AUX R input
9	Reverse	AUX ground
10	Rear left speaker (-)	Mic (+)
11	Front left speaker (-)	ACC
12	Front right speaker (-)	Battery (+)
13	Rear right speaker (-)	MM CAN low
14	Back view video ground	Auto light
15	Back view video	P position (A/T)
16	Door unlock	Vehicle speed
17	Illumination (-)	Remote control ground
18	Remote antenna	-
19		-
20		AUX detect
21		AUX L input
22		Mic (-)
23		Ground
24		Ground

AVN Head Unit Connector (AVN + TMU)

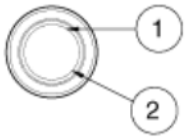


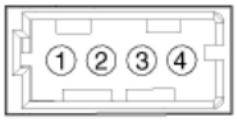
Connector Pin Information

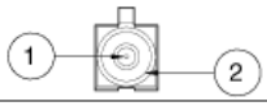
No.	Connector A	Connector B	Connector C
1	Rear left speaker (+)	MM CAN high	-

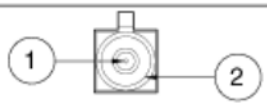
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2	Front left speaker (+)	-	-
3	Front right speaker (+)	Parking (M/T)	-
4	Rear right speaker (+)	Steering remocon	-
5	Back view ground	-	-
6	Back view power	Igntion	-
7	ALT L	-	-
8	Illumination (+)	AUX R input	-
9	Reverse	AUX ground	-
10	Rear left speaker (-)	Mic (+)	-
11	Front left speaker (-)	ACC	Door open
12	Front right speaker (-)	Battery (+)	-
13	Rear right speaker (-)	MM CAN low	
14	Back view video ground	Auto light	
15	Back view video	P position (A/T)	
16	Door unlock	Vehicle speed	
17	Illumination (-)	Remote control ground	
18	Remote antenna	-	
19		-	
20		AUX detect	
21		AUX L input	
22		Mic (-)	
23		Ground	
24		Ground	

FM/AM	No.	Description
	1	Signal
	2	Ground

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

Sirius antenna	No.	Description	No.	Description
	1	Signal	2	Ground

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

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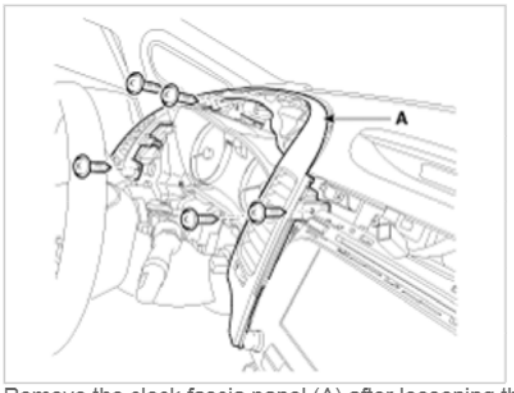
Removal

AVN Head Unit

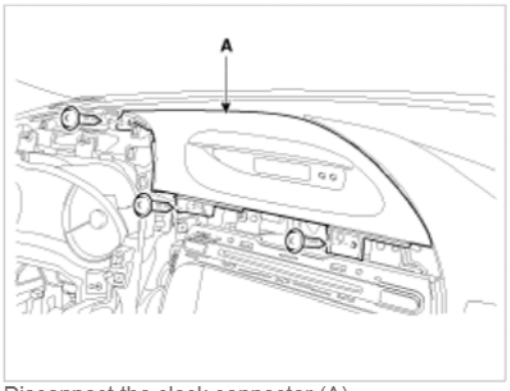
NOTICE

- 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.

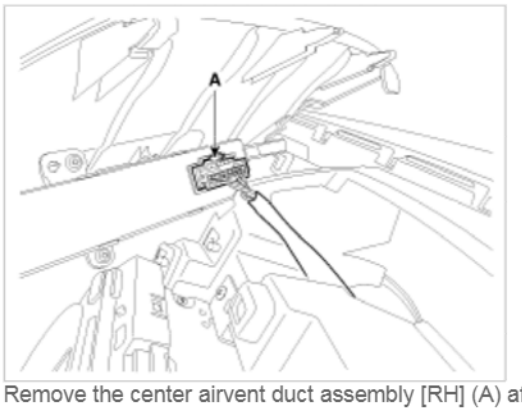
1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel.
   (Refer to Body - "Center Fascia Panel")
3. Remove the cluster fascia panel.
   (Refer to Body - "Cluster Fascia Panel")
4. Remove the driver airvent duct assembly (A) after loosening the mounting screws.



5. Remove the clock fascia panel (A) after loosening the mounting screws.

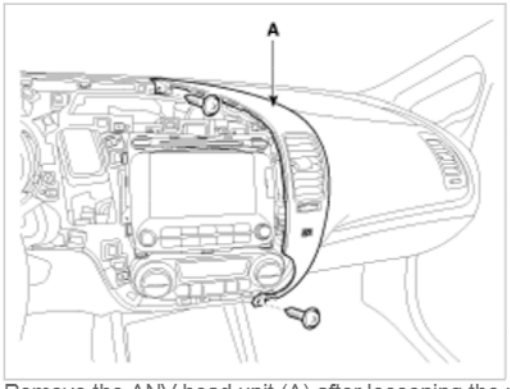


6. Disconnect the clock connector (A).

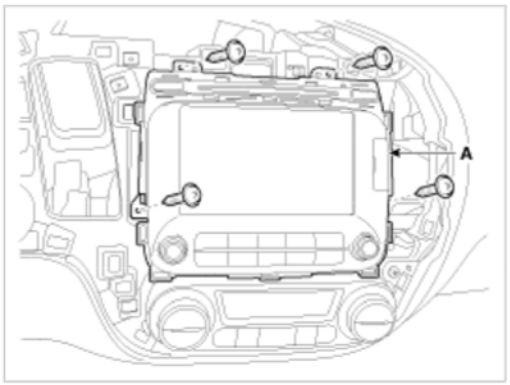


7. Remove the center airvent duct assembly [RH] (A) after loosening the mounting screews.

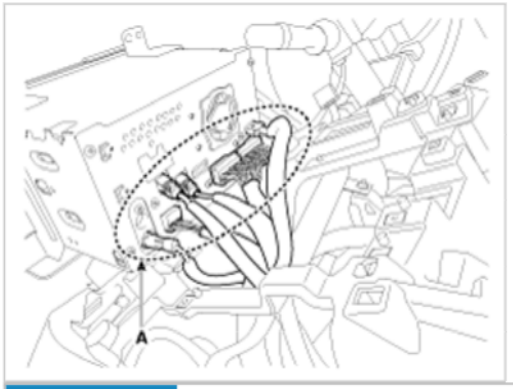
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8. Remove the ANV head unit (A) after loosening the mounting.



9. Remove the AVN head unit connectors and cables (A).



NOTICE

- If CD does not eject, don't try to remove it.
- The player may be damaged.
- Therefore, contact a service shop for repairs.

Installation

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

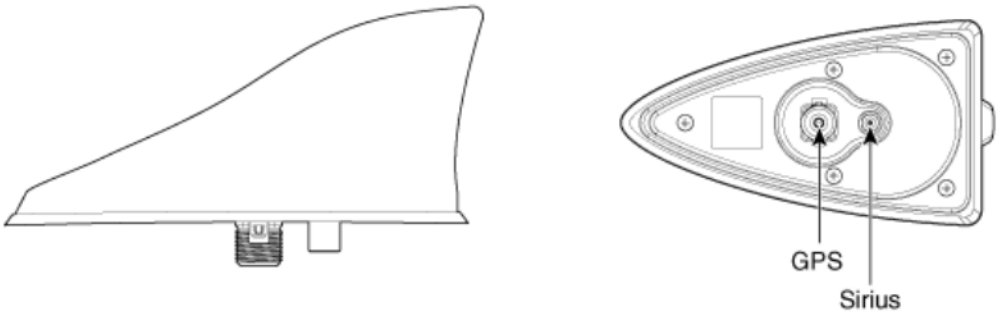
NOTICE

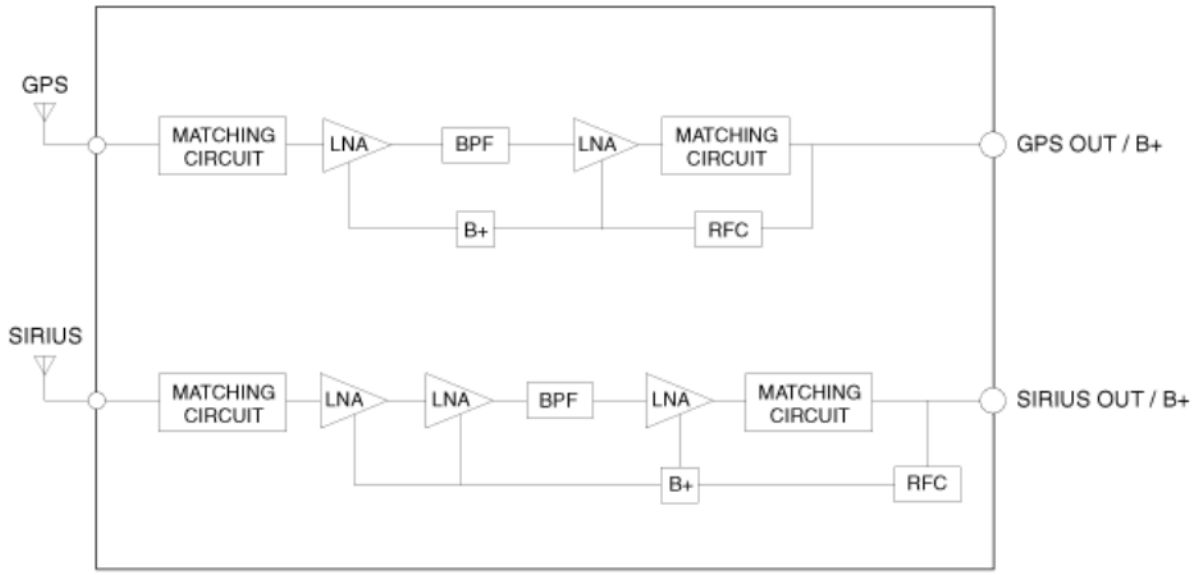
Make sure the AVN Head unit connectors are plugged in properly and the antenna cable is connected properly.

Components

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[GPS + Sirius]



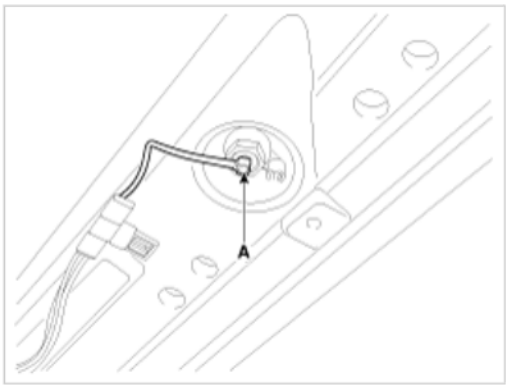


Body Electrical System

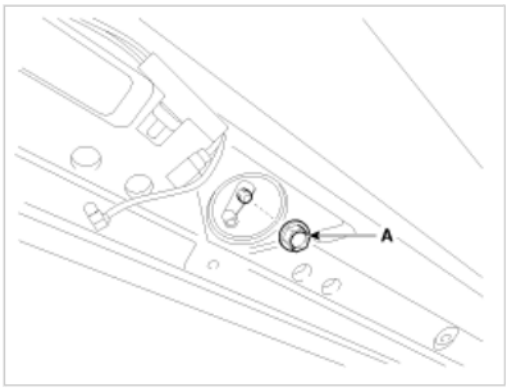
Removal

1. Remove the rear roof trim.
   (Refer to Body - "Roof Trim Assembly")
2. Disconnect roof antenna connectors (A).

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



Installation

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

NOTICE

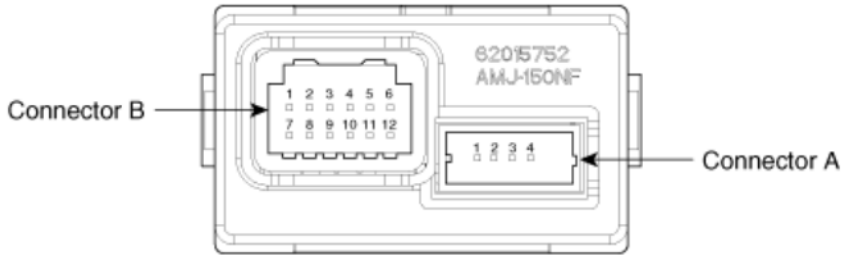
- Make sure that the cables and connectors are plugged in properly.
- Check the AVN system.

Body Electrical System

Circuit Diagram

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[AUX, USB, iPod Jack]



Connector A	No.	Description
①②③④	1	USB/iPod ground
	2	USB D(+)
	3	USB D(-)
	4	USB/iPod VCC

Connector B	No.	Description
①②③④⑤⑥ ⑦⑧⑨10 11 12	1	AUX input L
	2	AUX input R
	3	AUX detect
	4	-
	5	-
	6	Illumination (+)
	7	Signal ground
	8	-
	9	-
	10	-
	11	Illumination (-)
	12	Ground

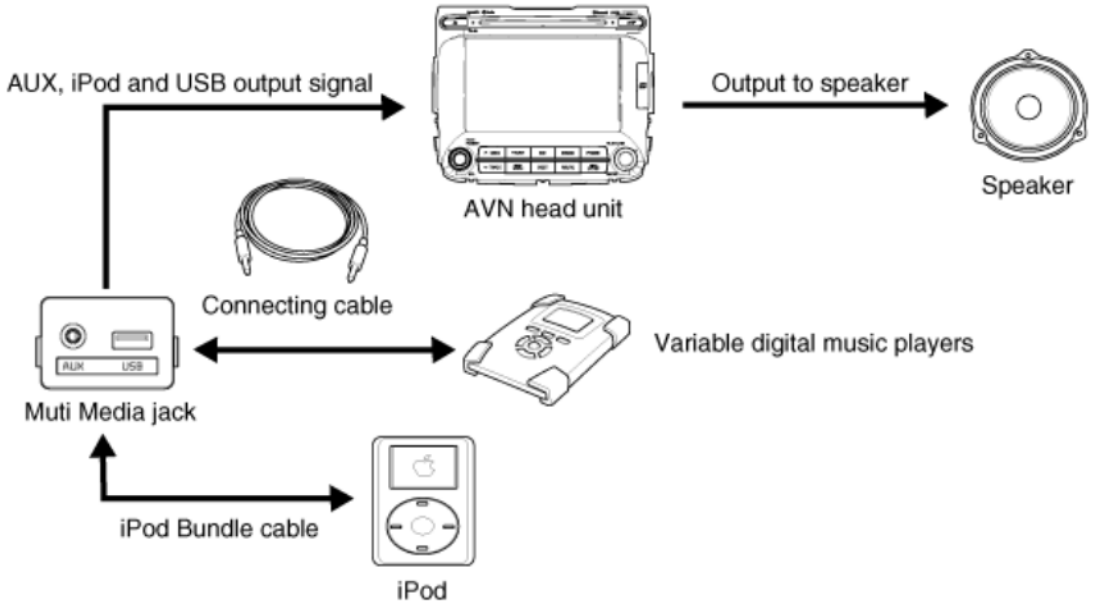
Body Electrical System

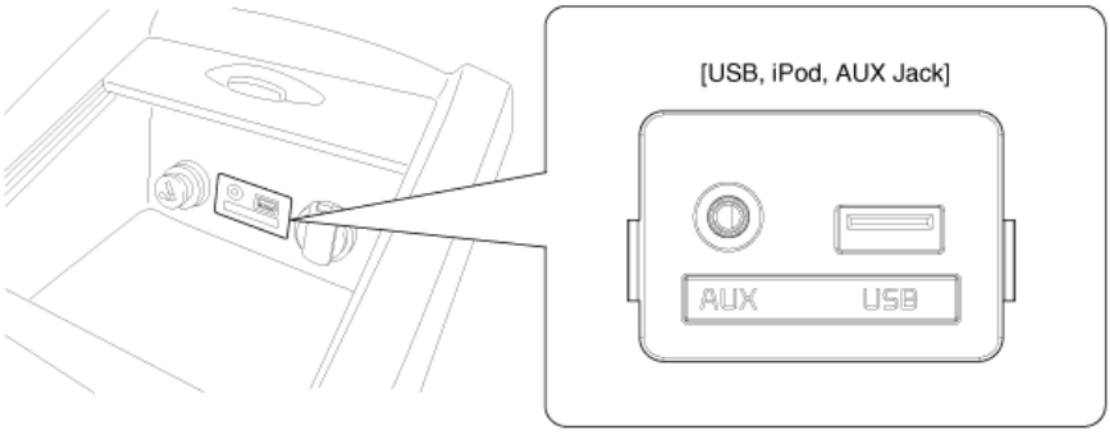
Description

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.

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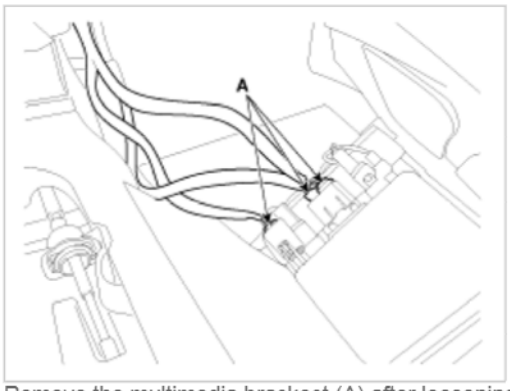


Body Electrical System

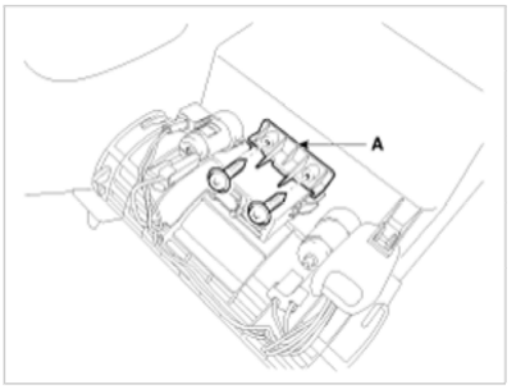
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Disconnec the connectors (A) from the floor console assembly.

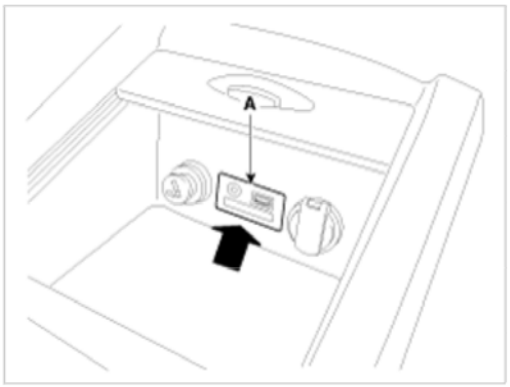
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4. Remove the multimedia brackect (A) after loosening the mounting screws (2EA).



5. Remove the multimedia jack (A) after pushing the multimedia jack in the direction of the arrow.



Installation

1. Install the multimedia jack.
2. Connect the multimedia jack connector.
3. Install the floor console assembly.

NOTICE

Make sure the multimedia connector and the floor console assembly connectors are plugged in properly.

Body Electrical System

Troubleshooting Guide

Before Thinking The Product Has Malfunctioned

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

Problem	Function
There are small red, blue, or green dots on the screen	Because the LCD is manufactured with technology requiring high point density, a pixel deficiency or lighting may occur within 0.01% of total pixels.

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

Troubleshooting

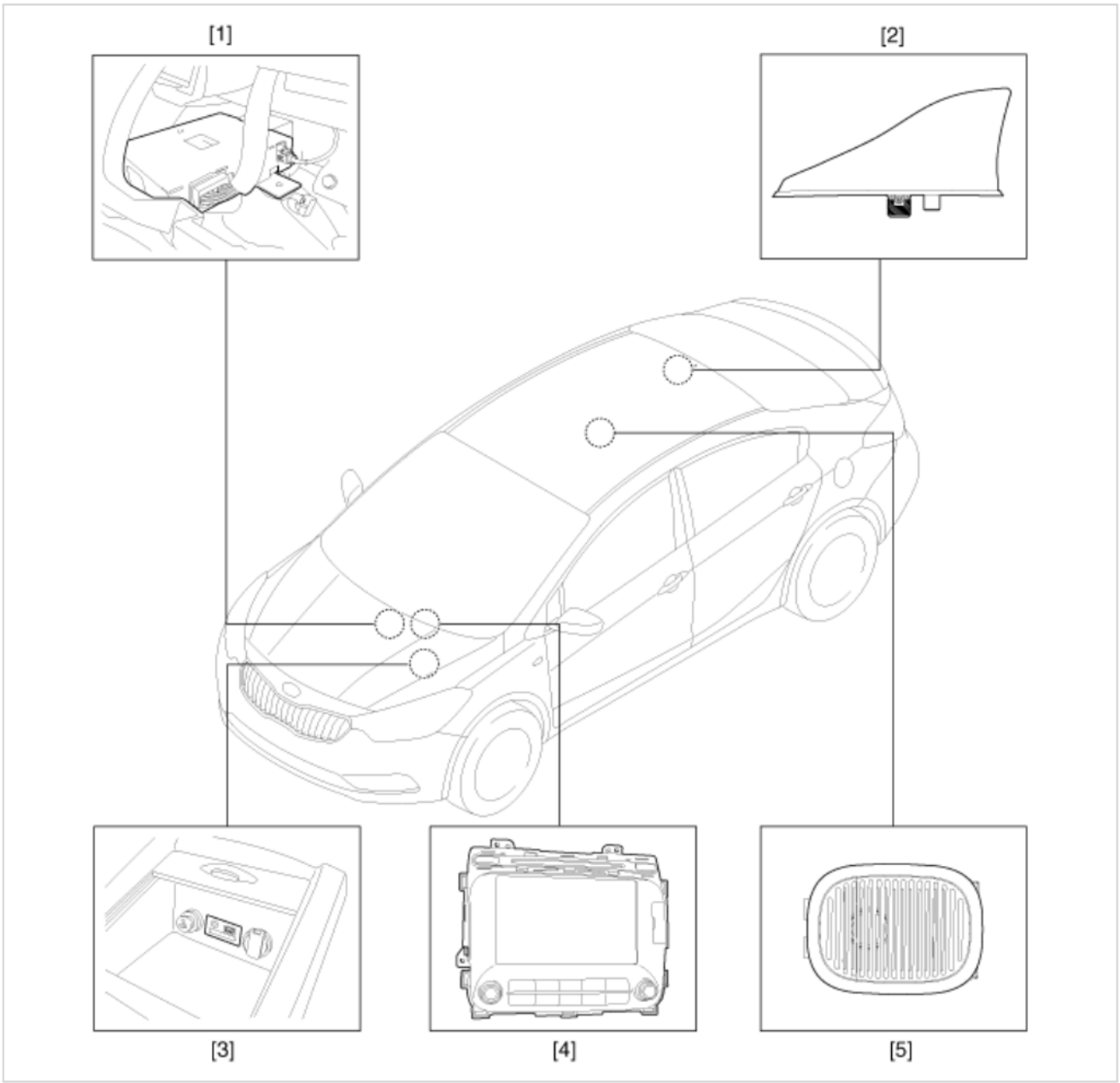
Problem	Possible Cause	Solution
The power does not turn on.	The fuse is disconnected.	Replace with a suitable fuse. If the fuse is disconnected again, please contact your point of purchase or service center.
	Device is not properly connected.	Check to see that the device has been properly connected.
The CD does not play.	The DISC has not been inserted or has been inserted upside down.	Insert the disc properly so that the sides are facing the correct direction.
	The DISC has been contaminated.	Wipe dirt dirt and other foreign substances from the DISC.
	The vehicle battery is low.	Charge the battery. If the problem persists, please contact your point of purchase or service center.
	A disc which is not supported by the device has been inserted.	Insert a disc which is supported for play by the device.
The sound does not work.	• The volume level is set the lowest level. • The connector is not properly connected. • The device is currently fast-forwarding, rewinding, scanning, or playing in slow mode.	• Adjust the volume level. • Check the connection state. • The sound will not work when the device is fast-forwarding, rewinding, scanning, or playing in slow mode.
The sound or video quality is low.	• The DISC is dirty or scrached. • Vibration is occuring from the position in which the conversion switch has been installed. • The color and tone quality of the image is low.	• Wipe off water or dirt from the DISC. Do not use a disc which has been scrached. • The sound may be short-circuited and the image distorted if the device begins to vibrate. The device will return to normal operation once the vibration has stopped. • Aging of the video display and deterioration in performance may cause certain quality degradations.
The USB does not work.	• USB memory is damaged. • USB memory has been contaminated. • A separately purchased USB HUB is being used. • A USB extension cable is being used. • A USB which is not a Metal Cover Type USB Memory is being used. • A HDD type, CF, SD Memory is being used. • There are no music files which can be played.	• Please use after formatting the USB into FAT 12/16/32 format. • Remove any foreign substances on the contact surface of the USB memory and multimedia terminal. • Directly connect the USB memory with the multimedia terminal on the vehicle. • Directly connect the USB memory with the multimedia terminal on the vehicle. • Use a standard USB memory. • Use a standard USB memory. • Only MP3, WMA file formats are supported. Please use only the supported music file formats.
The iPod is not recognized even though it has been connected.	• There are no titles which can be played. • The iPod firmware version has not been properly updated.	• Use iTunes to download and save MP3 files into the iPod. • Use iTunes to update the firmware version and reconnect the iPod with the device. • Reset the iPod and reconnect with the device.

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	• The iPod device does not recognize downloads.	

Body Electrical System

Components



1. Telematics unit (TMU)	4. AVN head unit
2. Roof Antenna (GPS)	5. Mic
3. AUX jack	

Body Electrical System

Description

The Vehicle Information System is a Telematics service that ensures comfortable and enjoyable driving by providing safety, security, and vehicle diagnostic information, with the option of using your smartphone.

NOTICE

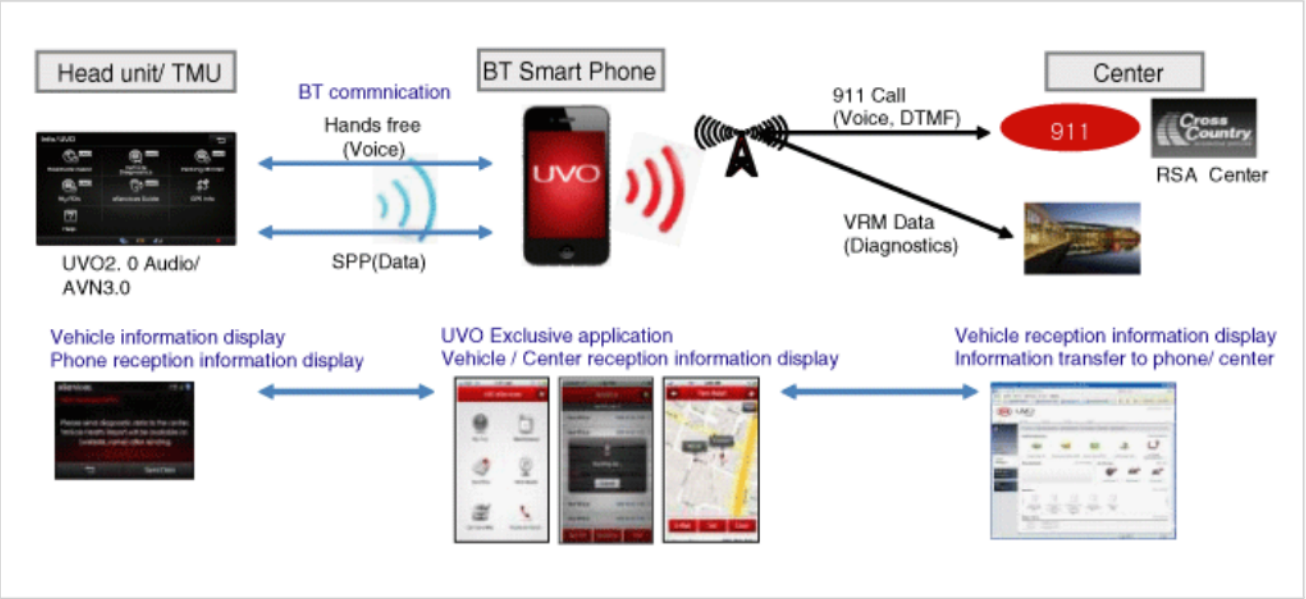
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The term "Telematics" is a combination of telecommunication and informatics. The Telematics system uses an assortment of communication devices mounted on the vehicle to analyze various vehicle and driving conditions and keep driving safe and convenient.

Main Features

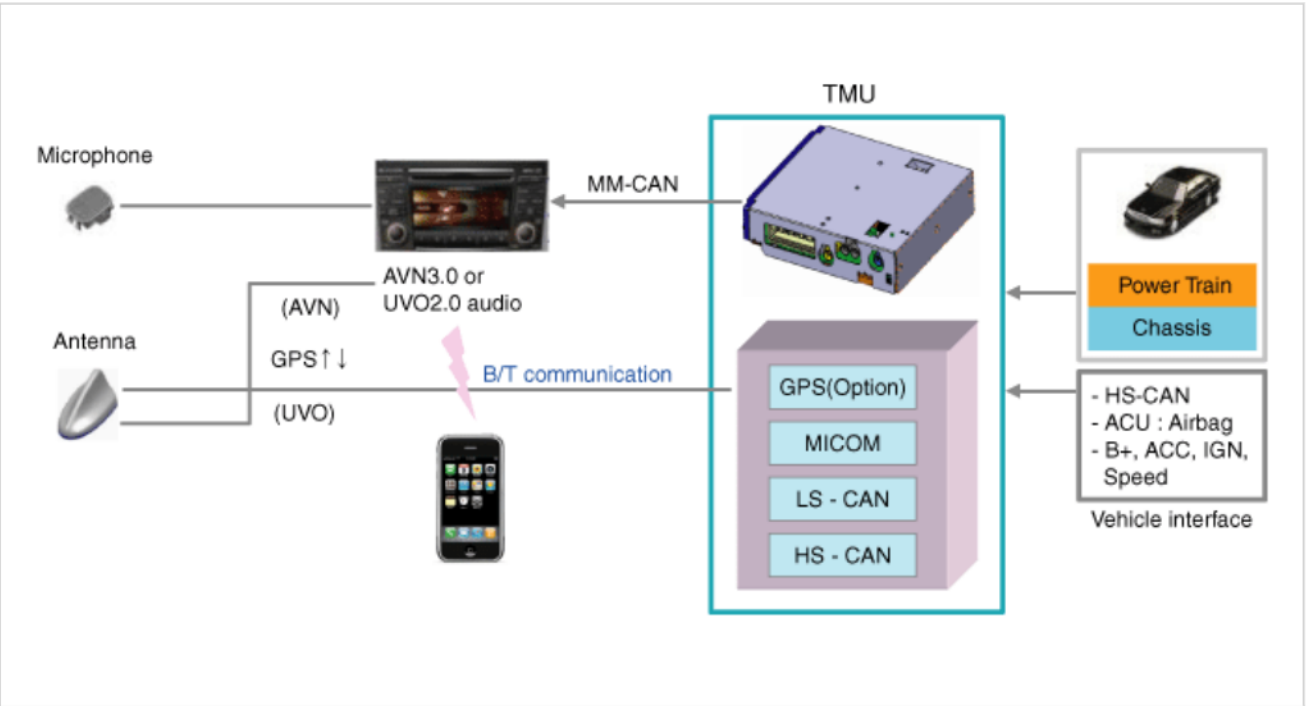
- The Telematics system's goals are safety, diagnostics, vehicle management, and driving support.
- eServices via smartphone apps
- Features bi-directional communication between UVO2.0/AVN3.0 devices and smartphones, and between smartphones and the call center. An audio/AVN head unit is provided and the system supports both smartphone-links and independent operation.

Block Diagram



※ SPP (Serial Port Protocol) : Protocol for the smartphone and data

Vehicle Components



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Service Lists

No.	Service Name	Description
1	Crash Notification Assist	The emergency call service automatically contacts the local emergency call center when the airbag is deployed.
2	Roadside Assist	The emergency dispatch service automatically contacts the KMA customer center when towing and/or fuel is needed.
3	Automatic Diagnostics	The system can automatically detect failures in PT controllers and provide tips on troubleshooting.
4	Vehicle Diagnostics	The user can perform vehicle diagnostics at any time.
5	Scheduled Diagnostics	The system informs the user of regular inspection dates and sends the inspection results to the service center.
6	eServices Guide	An automatic voice guide system provides information on various Telematics functions to the user.
7	My POIs	Send target destination information from your smartphone to the system. Your target destinations are saved at www.myuvo.com.
8	Parking Minder	Use your smartphone to find where you parked.
9	MyUVO	Use your smartphone to check your driving patterns, vehicle diagnostic results, diagnostic history, and part replacement history on the mobile website.
10	Maintenance	Use your smartphone to manage your mileage-based part replacement schedule.

TMU Dealer Engineering Mode

1. Function
   A. TMU Update : Update TMU unit using update file.
   B. TMU Factory Default : Clear TMU unit setting and TMU relative information.
      ; Registered phone info, Acitvation status, Reset password, 911 Setting default (default is "OFF"), Alert history, My POI list, Service data, Diagnostic data, Driving information
   C. TMU Version Information : Check TMU version.
2. Access Dealer Engineering Mode in Head Unit (Hidden Menu) (in the order as below)
   (1) Audio type
      A. Press SETUP key.



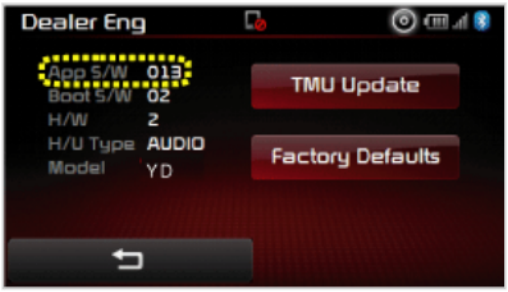
      B. Click the audio screen in order.
      ; Click ① position one time → Click ② position one time → Click ③ postion 5 times



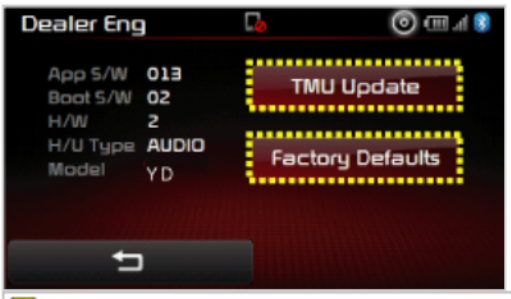
> **Information**
> IF you click other position, you should go another screen and then try again.

      C. Enter Dealer Eng Mode and check TMU veresion.

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D. Press "TMU Update" or "Factory Defaults" button on head unit.



Information

- TMU bin file should be in USB ROOT. (file name : KMA_TMU_install.inf)
  (TMU bin file name should not be changed.)
- TMU Update may take about 15 minutes.

CAUTION

- Don't touch anthing during TMU Update.
- If fail to update, please update again.

(2) AVN type

A. Press Info/SETUP( ) key.



B. Press Info/UVO key.



C. Touch the AVN screen in order.
; Click ① position one time → Click ② position one time
→ Click ① position one time → Click ② position one time
→ Click ① position one time → Click ② position one time

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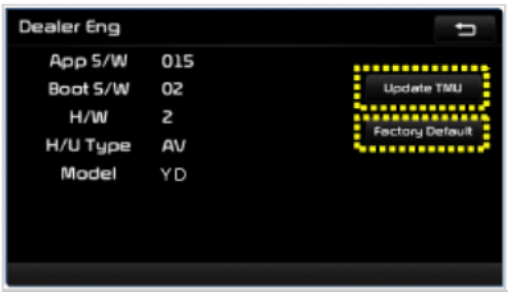
Information

IF you click other position, you should go another screen and then try again.

D. Enter Dealer Eng Mode and check TMU veresion.



E. Press "TMU Update" or "Factory Defaults" button on head unit.



Information

- TMU bin file should be in USB ROOT.
- TMU Update may take about 15 minutes.

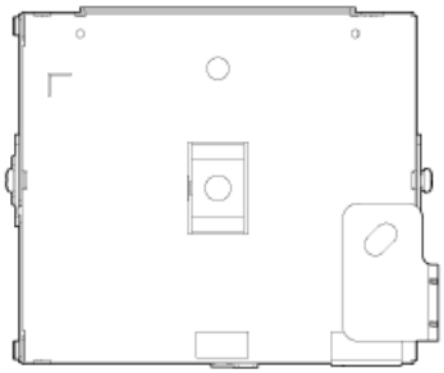
CAUTION

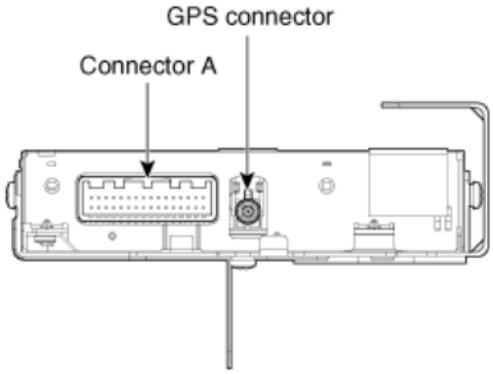
- Don't touch anthing during TMU Update.
- If fail to update, please update again.

Body Electrical System

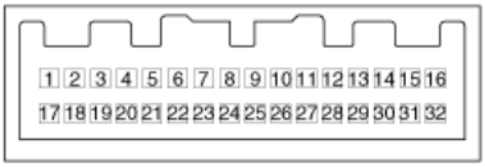
Component

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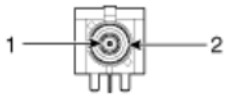


Connector A



No.	Description	No.	Description
1	Ground	17	-
2	Ground	18	V_battery 1
3	-	19	Ignition 1
4	-	20	ACC
5	-	21	Airbag
6	-	22	-
7	-	23	-
8	-	24	-
9	-	25	-
10	-	26	-
11	-	27	Speed
12	HSCAN -	28	-
13	HSCAN +	29	-
14	-	30	-
15	-	31	MMCAN -
16	-	32	MMCAN +

GPS antenna



No.	Description
1	Signal
2	Ground

Connector Pin Specification

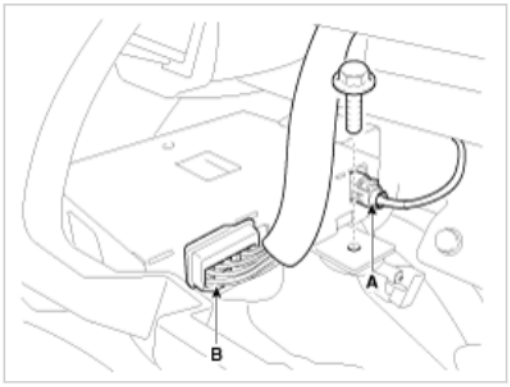
No.	Pin Name	Type	From	To	Description (Wiring Spec.)
1	GND	DC Ground	TMU	Battery	Connected to battery ground
2	GND	DC Ground	TMU	Battery	Connected to battery ground
3	-	-	-	-	-
4	-	-	-	-	-
5	-	-	-	-	-
6	-	-	-	-	-
7	-	-	-	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	-	-	-	-

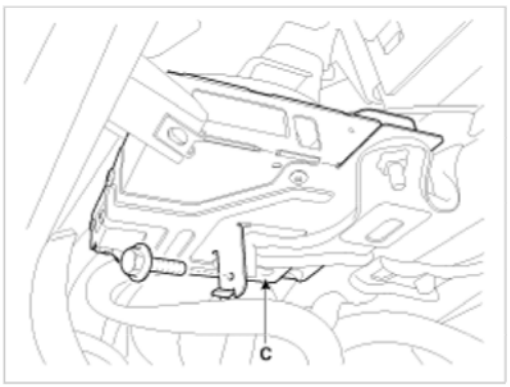
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11	-	-	-	-	-
12	HS CAN (-)	Data I/O	BUS	BUS	High Speed CAN bus low
13	HS CAN (+)	Data I/O	BUS	BUS	High Speed CAN bus high
14	-	-	-	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	V battery 1	DC Input	Battery	TMU	DC level input from battery Supply power to TMU
19	Ignition 1	Data Input	Junction Box	TMU	Vehicle Key mode status
20	ACC	Data Input	Junction Box	TMU	Vehicle Key mode status
21	Airbag	Data Input	ACU	TMU	Airbag status data from ACU
22	-	-	-	-	-
23	-	-	-	-	-
24	-	-	-	-	-
25	-	-	-	-	-
26	-	-	-	-	-
27	Speed	Data Input	-	TMU	GPS Calibration (UVO ONLY)
28	-	-	-	-	-
29	-	-	-	-	-
30	-	-	-	-	-
31	MM CAN (-)	Data I/O	BUS	BUS	Low Speed CAN bus low
32	MM CAN (+)	Data I/O	BUS	BUS	Low Speed CAN bus high

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.
   (Refer to Body - "Glove Box Housing")
3. Disconnect the cable (A) and connector (B), then remove the MTS unit (C) after loosening the mounting bolts.





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Installation

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

Inspection

1. After replacing the TMU unit, access Dealer Engineering Mode in head unit. (Refer to MTS system - "TMU Dealer Engineering Mode")
2. Check the TMU version ("App S/W") from the head unit screen.

[Audio type]



[AVN type]

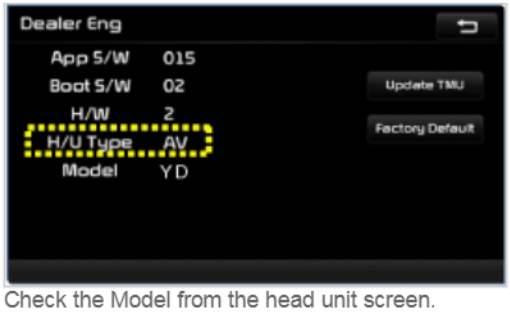


3. Check the H/U Type from the head unit screen.

[Audio type]



[AVN type]



4. Check the Model from the head unit screen.

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[Audio type]



[AVN type]



Body Electrical System

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)
Dark current	Max. 4mA (When welcome light function off)
Frequency	315 Mhz

Smart Key FOB

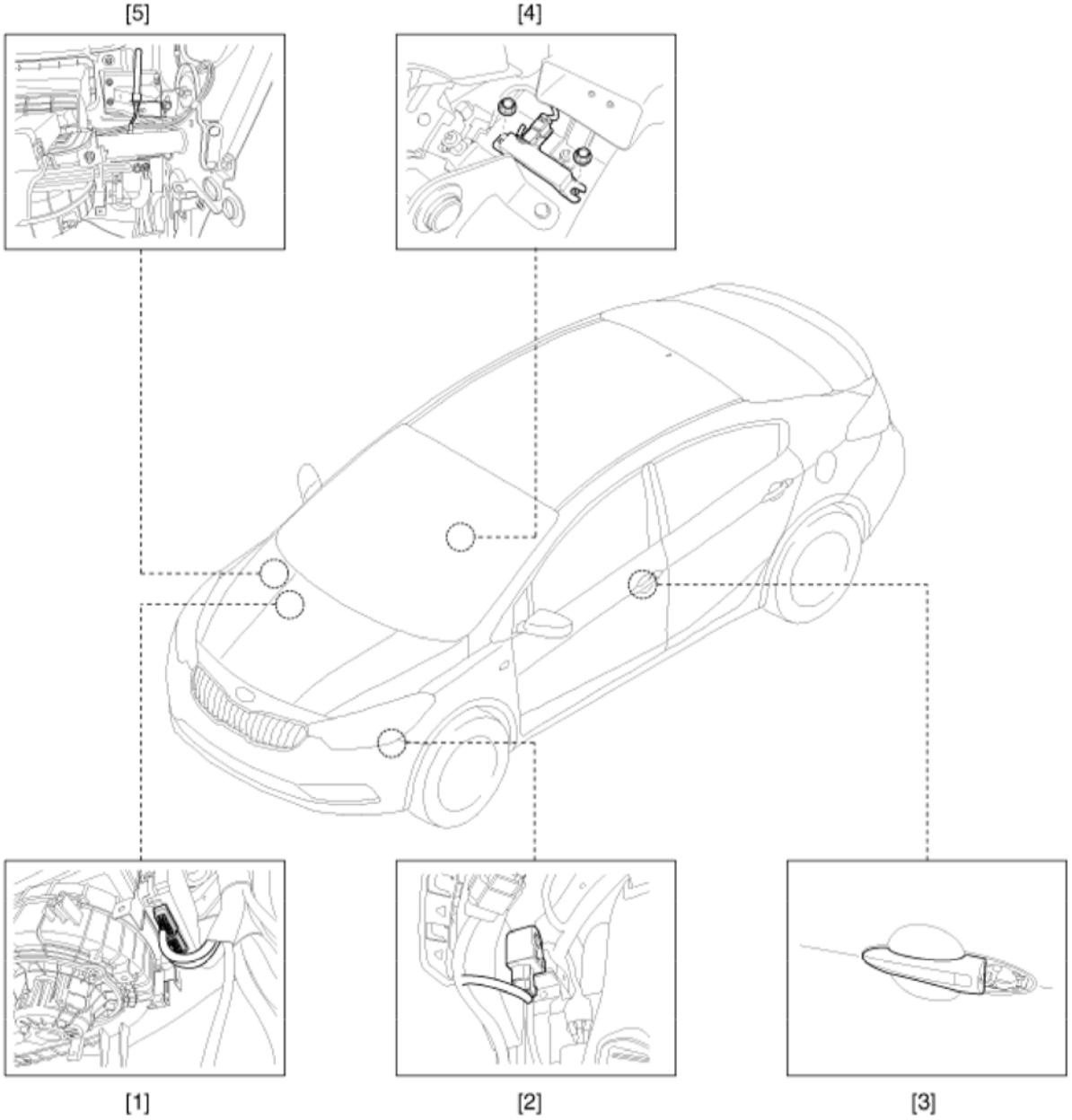
Items	Specification
Battery	Lithium battery 3V 1EA
Distance	30m
Battery life	More than 2 years **⚠WARNING** An inappropriately disposed battery can be harmful to the environment and human health. Dispose the battery according to your local law(s) or regulation.
Push buttons	3 (Door lock / unlock, Trunk lid)
Frequency(Rx)	134.2 kHz
Frequency(Tx)	314.92 MHz
Numbers	2EA

Antenna

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 80°C (-22°F ~ 176°F) (without battery)
Frequency	134.2 kHz
Numbers	Interior(1EA), Door(2EA), Trunk(1EA), Bumper(1EA)

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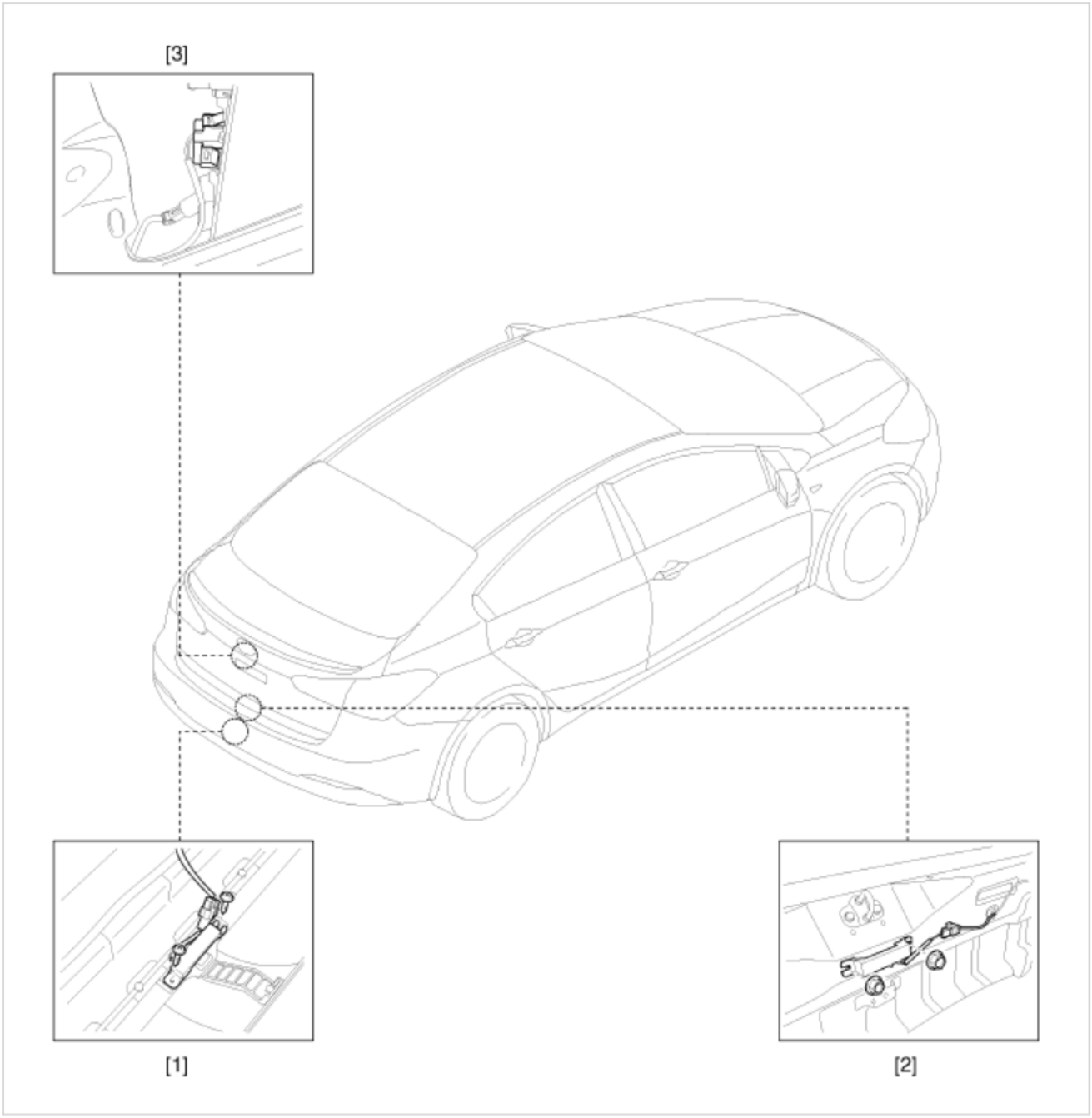
Component Location (1)



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

Component Location (2)

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1. Bumper antenna 2. Trunk antenna	3. Trunk lid open switch

Body Electrical System

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 :

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- 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 integrated into SSB for TP authentication (i.e. limp home mode)
- Communication with engine management system
- 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 (depends on the vehicle) 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 134.2 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 EMS
- Input stage
- LF antenna amplifier/driver
- CAN communication with BCM

The LF antenna amplifier/driver generates a 134.2 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 3 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.
- LED for operation feedback and battery monitoring.

NOTICE

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 134.2 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.

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Up to two antennas cover the vehicle's interior and the trunk interior: one 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 (134.2 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 134.2 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. The trunk access range is also min. 0.7m measured from the antenna position.

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:

- All door is closed and at least one door is unlocked.

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

Passive Open Trunk

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 inside 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.

NOTICE

- 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.

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:

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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.

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

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

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

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

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

Smart Key Lamp Warning

1. SMK actions:

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

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

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

Failsafe Functions (Backup For Limp Home)

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

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

User Information Functions

ID OUT Warning

1. Preconditions:
   A. (ACC or IGN1) & (any door open or trunk open)
2. Event:
   The last opened door is closed
3. SMK action:
   SMK searches for a SMART KEY FOB in the interior.
   A. If no valid SMART KEY FOB is found, the SMK activates external buzzer and also sends ID OUT warning via CAN (exterior buzzer warning and internal buzzer warning).
   B. If a door is opened and closed again during terminals on and inside valid fob, SMK re-enables the authentication and stops the warning. If the terminal is in ACC, SMK shall turn on immobilizer lamp.

NOTICE

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

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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:

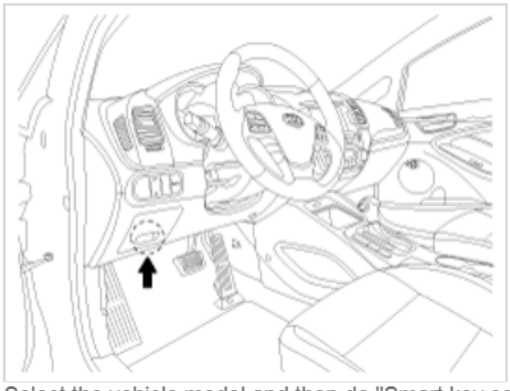
- SMK replacement: SMK is not learnt, SMART FOB are already learnt with same PIN code
- Additional or new keys teaching: SMK is already learnt with same PIN code

Body Electrical System

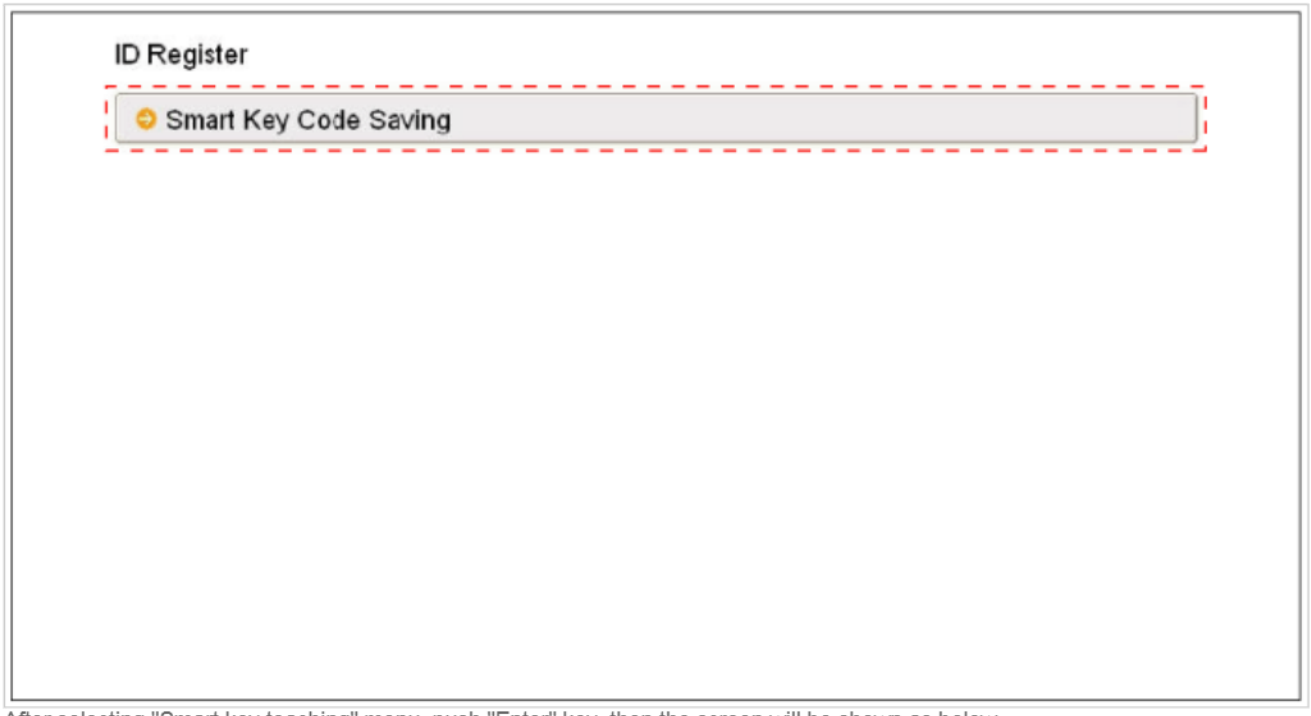
Smart Key

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.

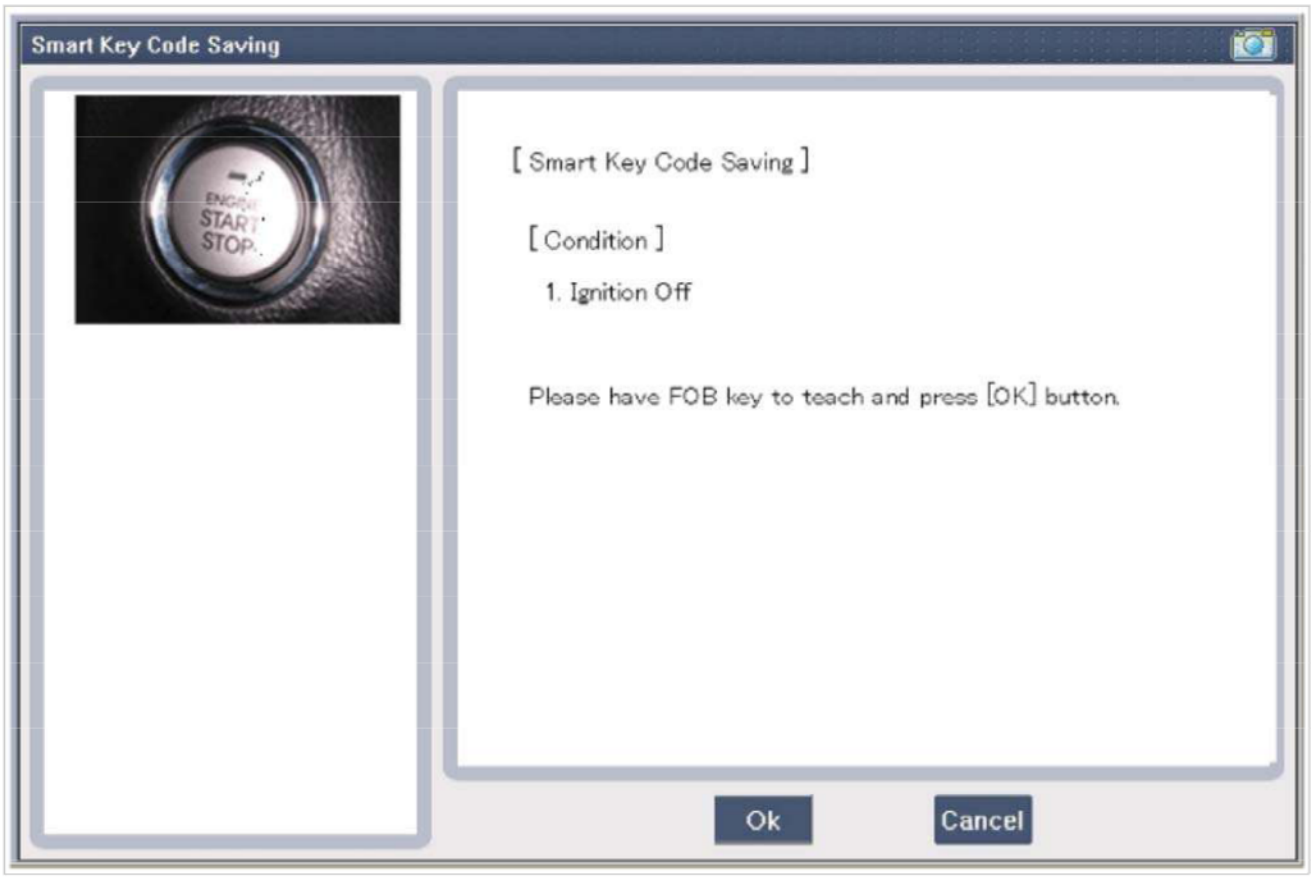


2. Select the vehicle model and then do "Smart key code saving".

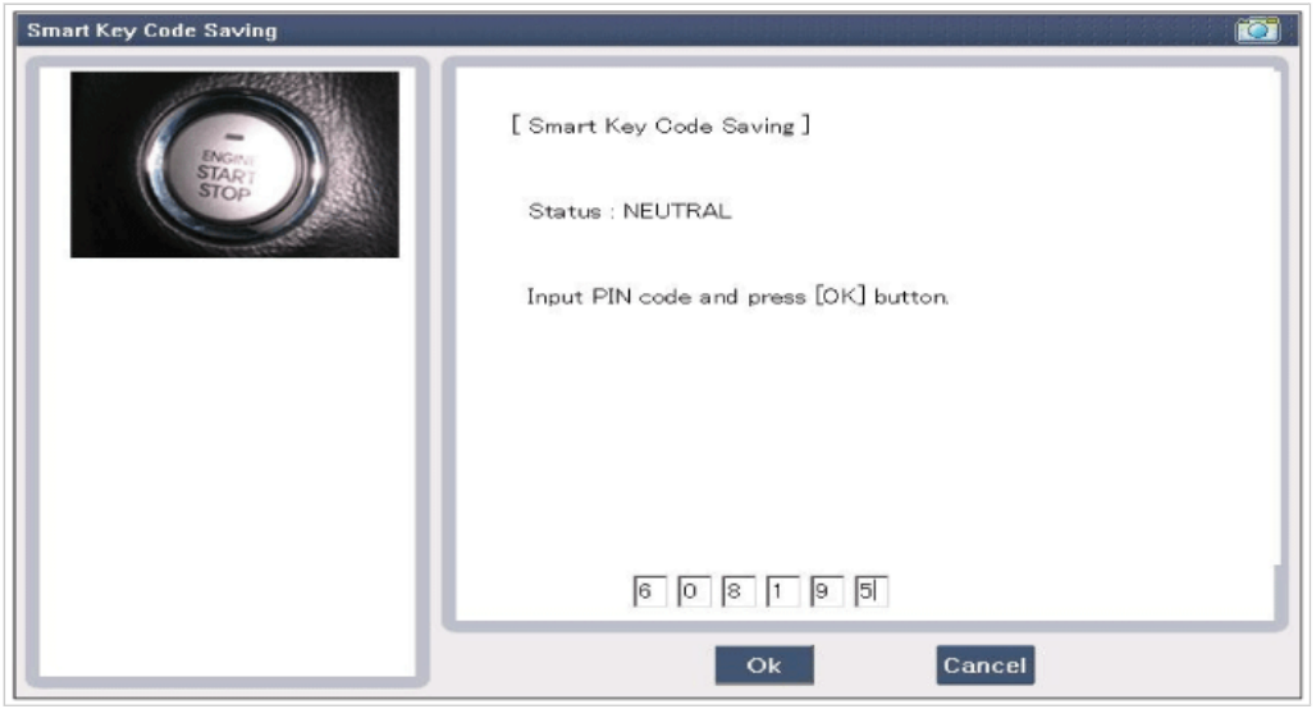


3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

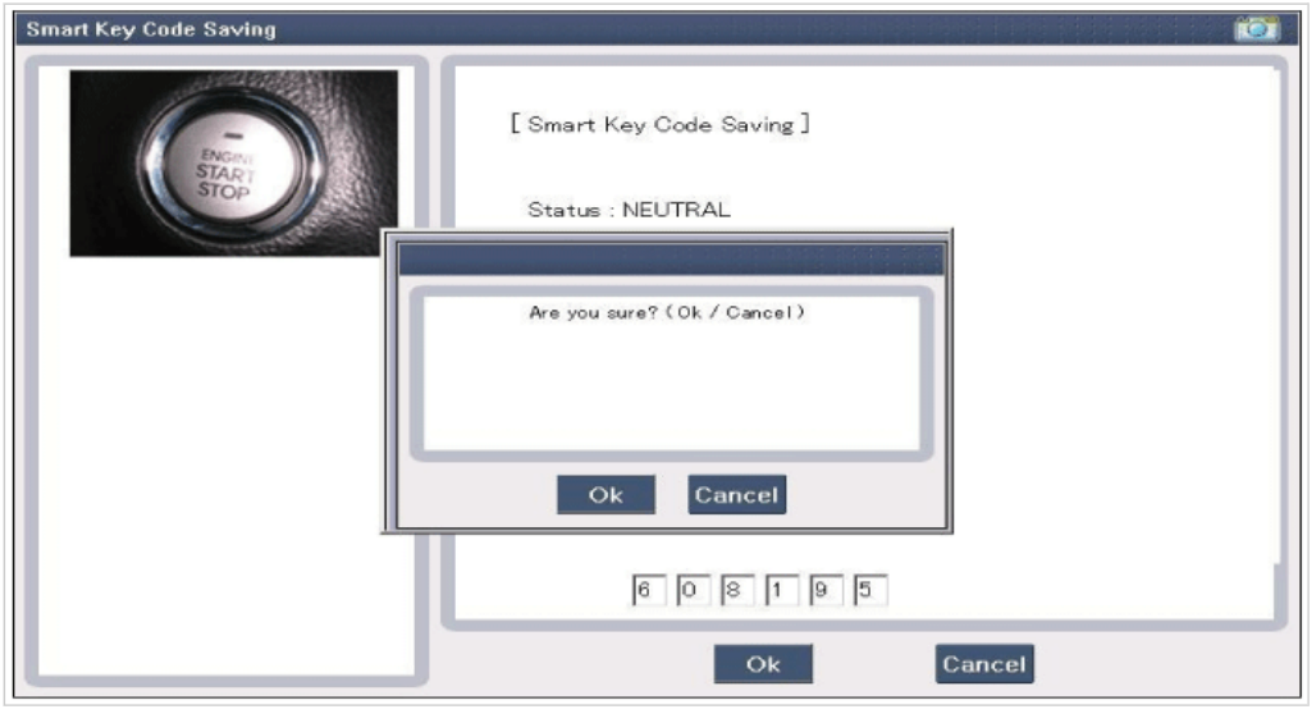
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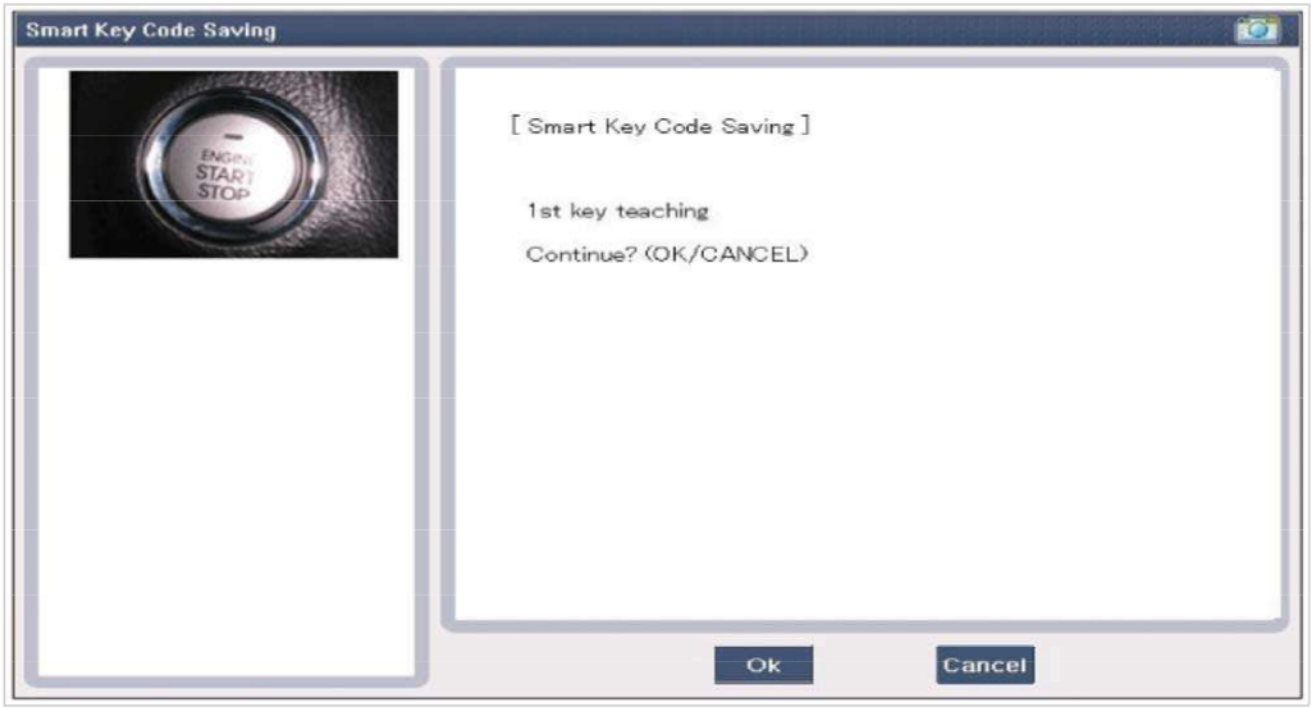
4. After pushing the SSB with the teaching key, press "OK" button.
5. Input the "Pin code" for first key teaching.



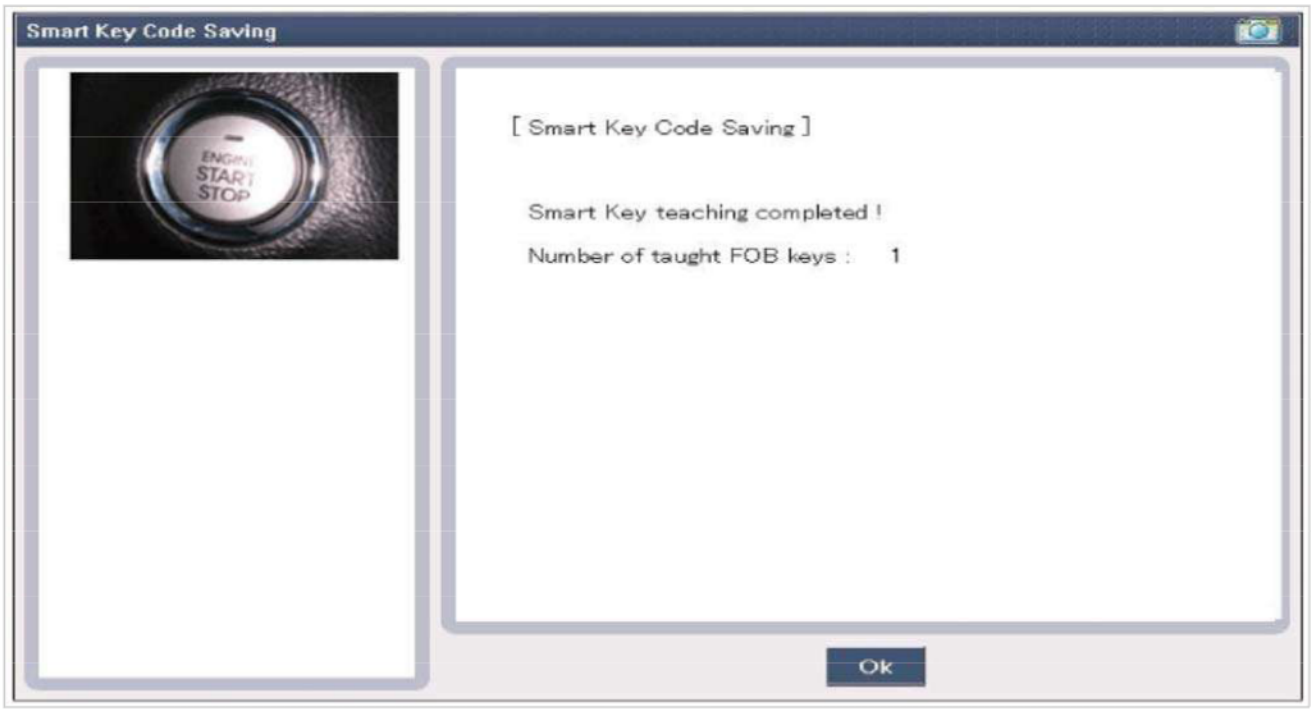
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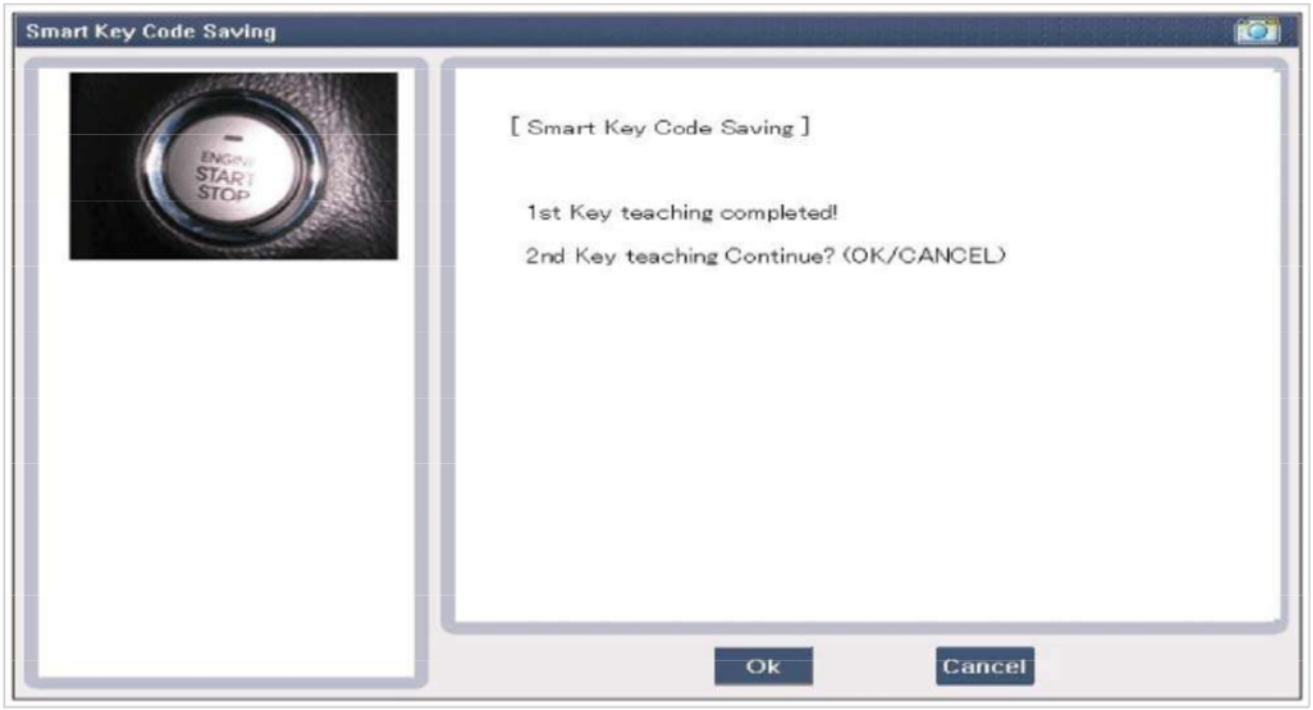


6. Confirm the message "First key teaching completed".

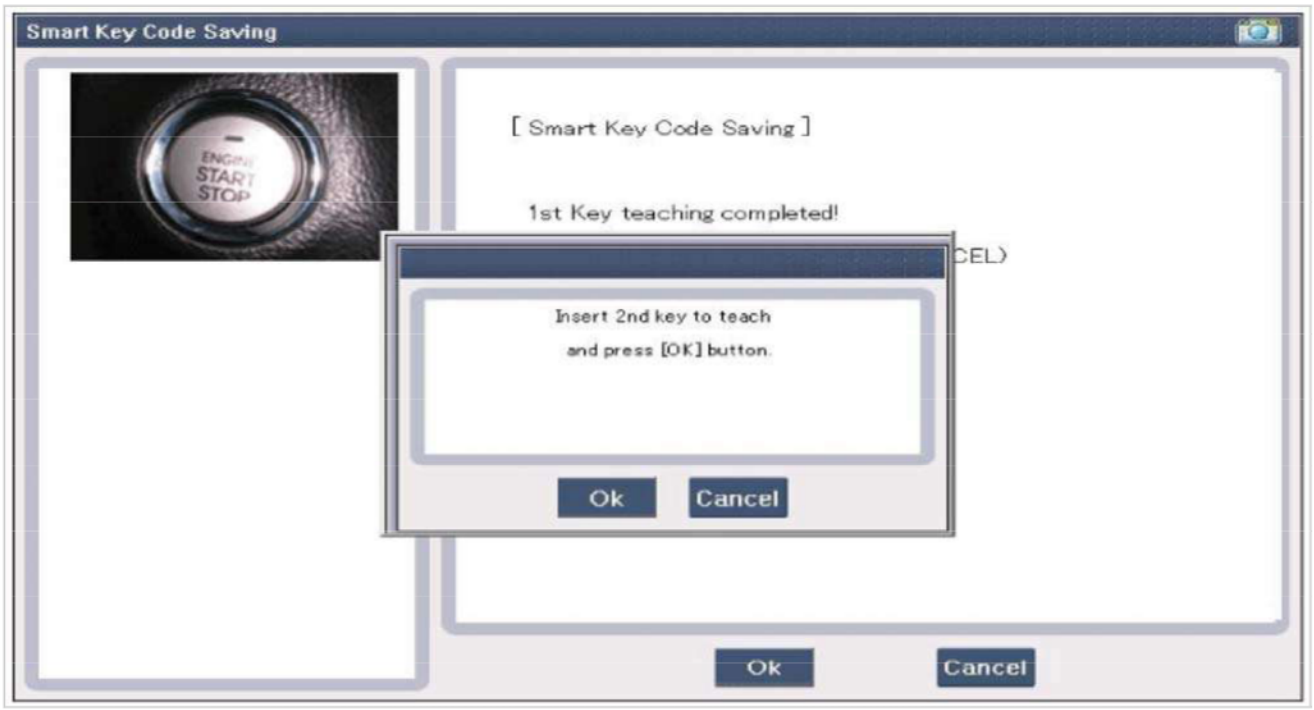


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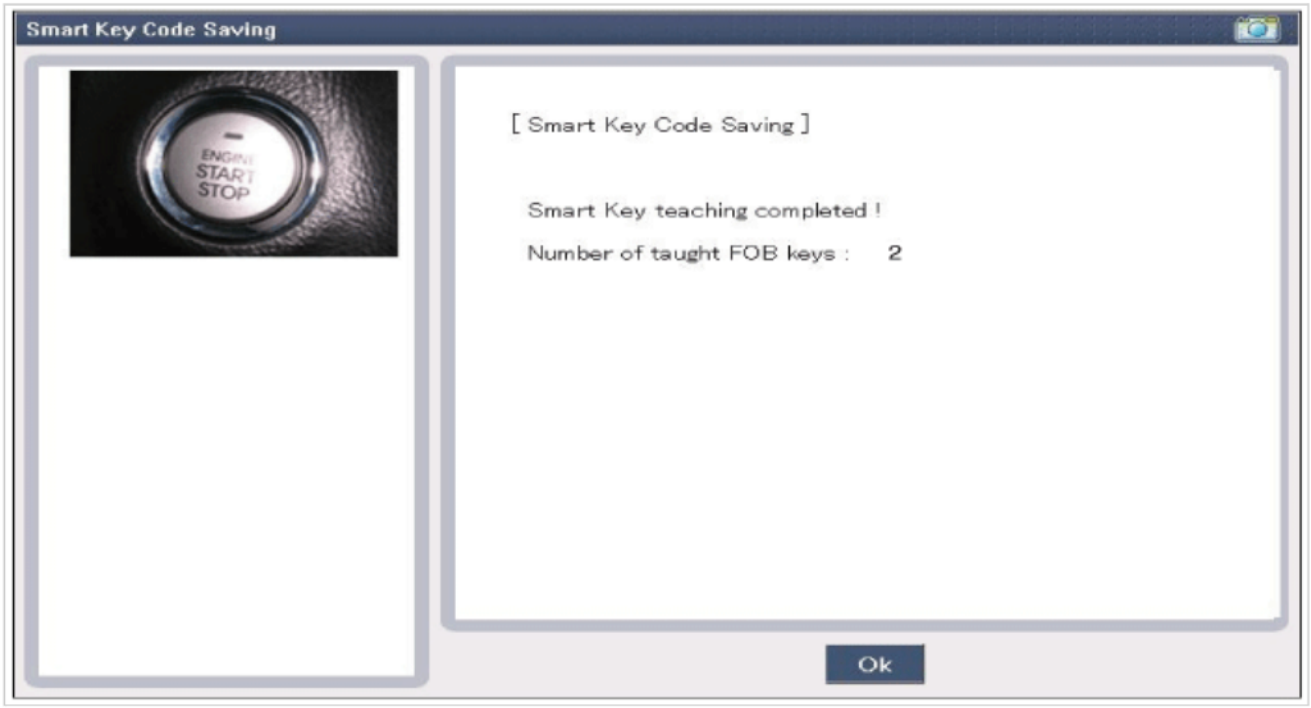




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7. Confirm the message "Second key teaching completed".

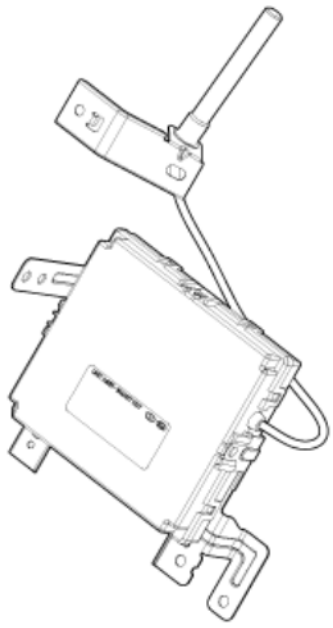


8. Then the screen will be shown as below when key teaching process is completed.

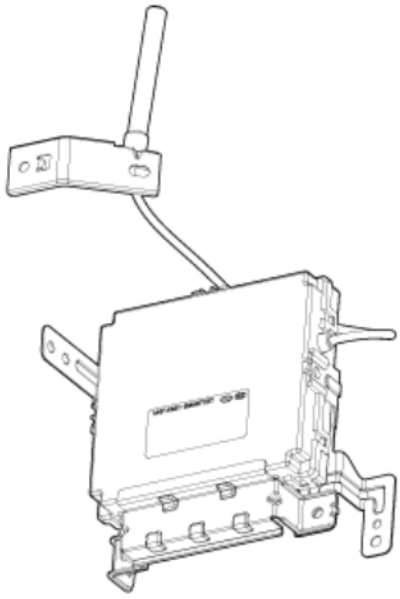
Body Electrical System

Component (1)

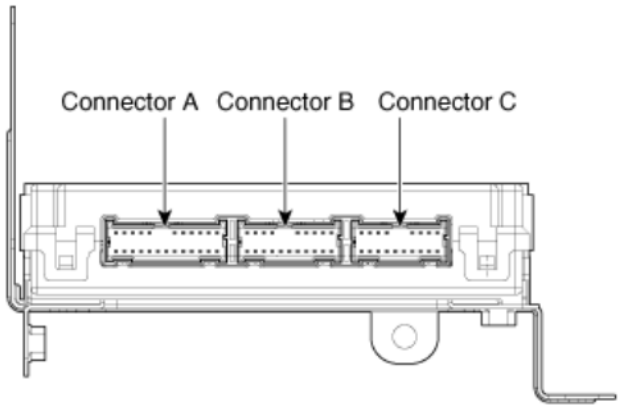
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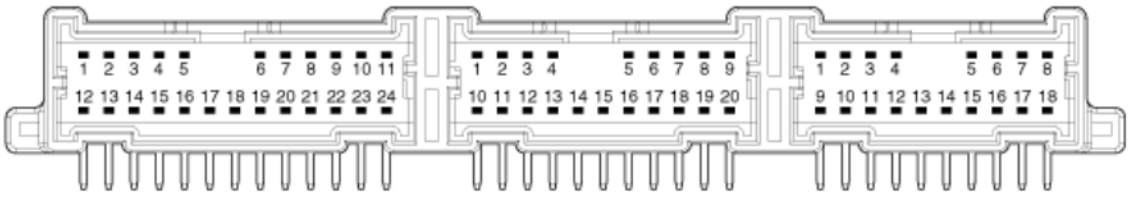


[USA]



[CANADA]





Connector A Connector B Connector C

Connector Pin Information

No.	Connector A (24 pins)	No.	Connector B (20 pins)	No.	Connector C (18 pins)
1	VBAT CPU	1	Assistant side antenna ground	1	Immobilizer antenna ground
2	VBAT Load	2	Assistant side antenna power	2	Immobilizer antenna power
3	Ignition1	3	Driver side antenna ground	3	-
4	Ignition2 relay	4	Driver side antenna power	4	-
5	Ignition1 relay	5	Wheel speed	5	SSB LED OFF
6	-	6	P position	6	SSB LED ON
7	-	7	-	7	SSB LED ACC
8	EMS COM	8	C-CAN High	8	SSB illumination power

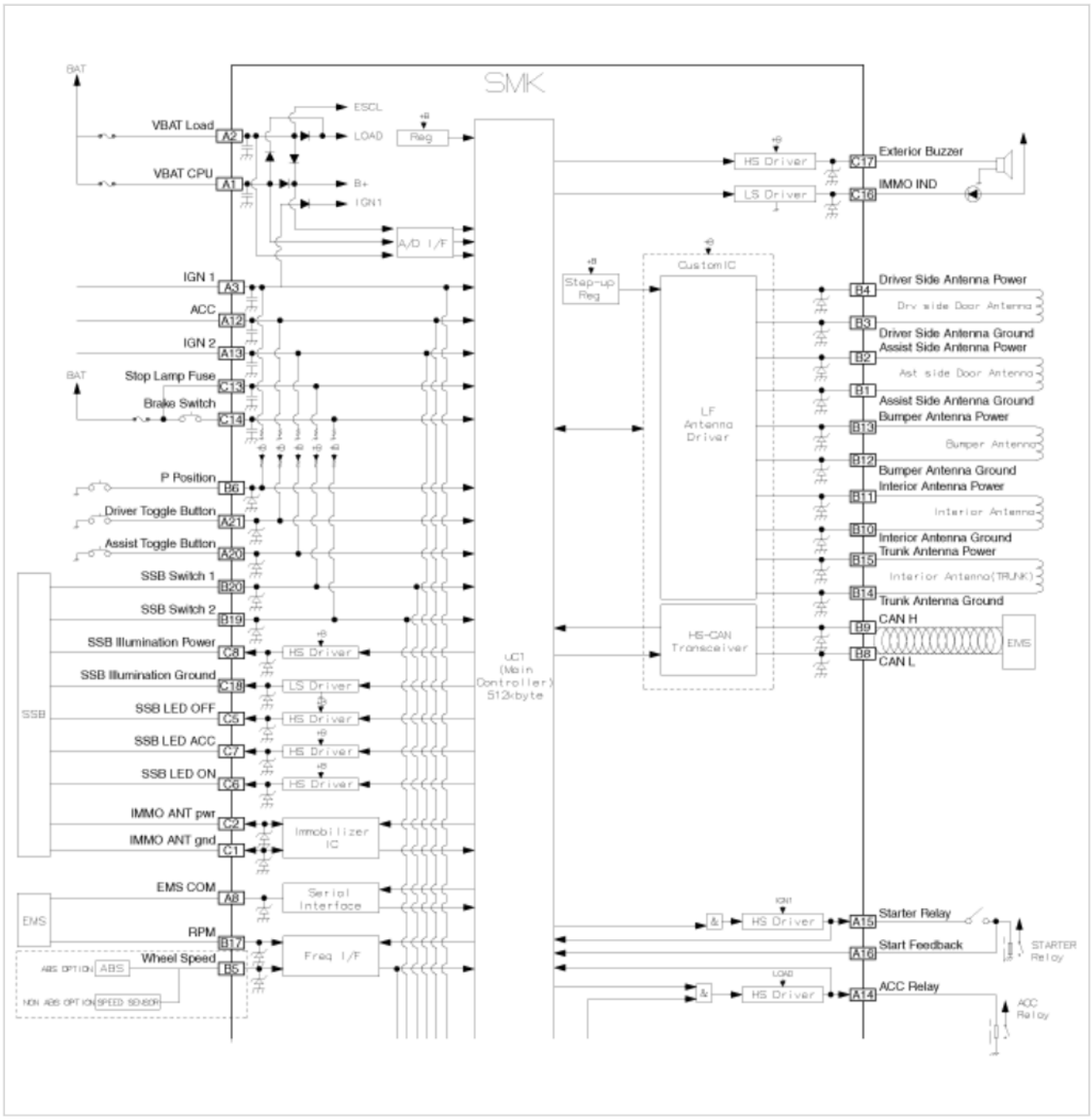
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9	-	9	C-CAN Low	9	-
10	B-CAN High	10	Interior antenna ground	10	-
11	B-CAN Low	11	Interior antenna power	11	-
12	ACC	12	Bumper antenna ground	12	-
13	Ignition2 relay	13	Bumper antenna power	13	Stop lamp fuse
14	ACC relay	14	Trunk antenna ground	14	Brake switch
15	Starter relay	15	Trunk antenna power	15	-
16	Start feedback	16	-	16	Immobilizer indicator
17	-	17	RPM	17	Exterior buzzer
18	-	18	-	18	SSB illumination ground
19	-	19	SSB switch2		
20	Assist toggle button	20	SSB switch1		
21	Driver toggle button				
22	-				
23	Power ground2				
24	Power ground1				

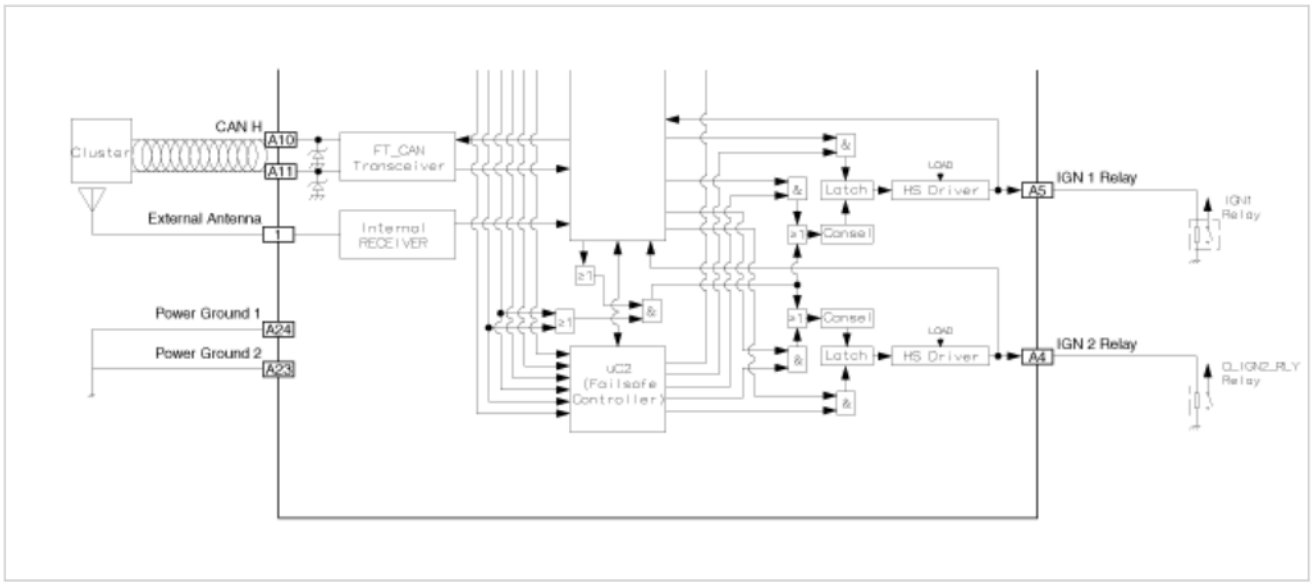
Body Electrical System

Circuit Diagram

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Body Electrical System

Inspection

Smart Key Unit

- Refer to Smart key System - "Smart key Diagnostic"

Smart Key Switch

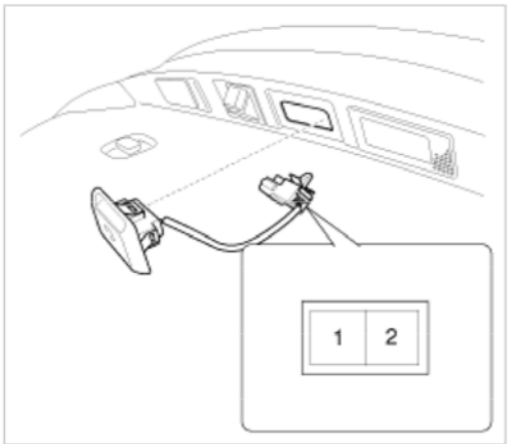
- Refer to Smart key System - "Smart key Diagnostic"

Antenna

- Refer to Smart key System - "Smart key Diagnostic"

Trunk Lid Open Switch

1. Check for continuity between teh trunk lid open switch terminal.



2. If continuity is not specified, inspect the switch.

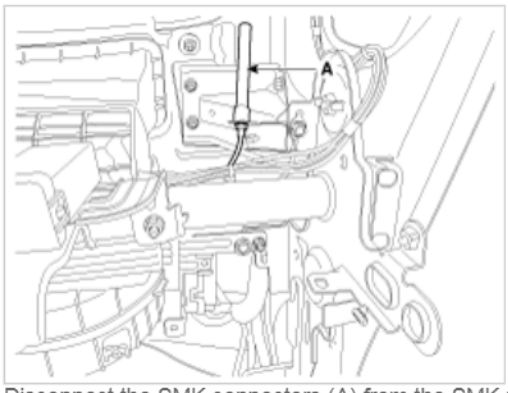
Terminal / Position	1	2
OFF		
ON	○	○

Removal

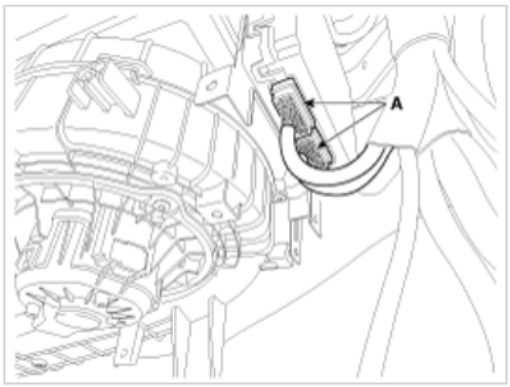
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Smart Key Unit

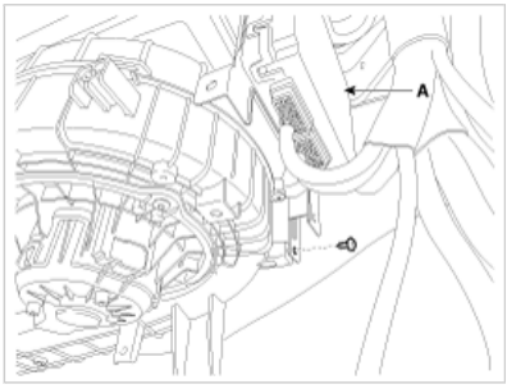
1. Disconnect the negative (-) battery terminal.
2. Remove the main crash pad assembly.
   (Refer to Body - "Main Crash Pad Assembly")
3. Remove the RF receiver (A) after loosening a nut.

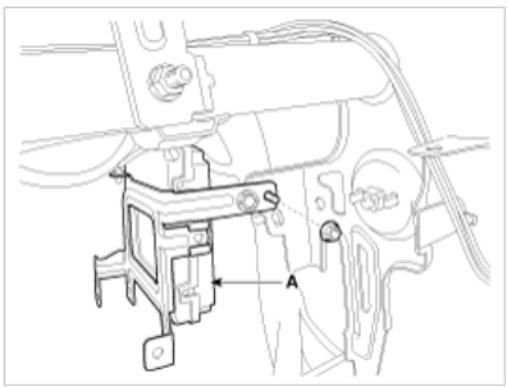


4. Disconnect the SMK connectors (A) from the SMK unit.



5. Remove the smart key unit (A) with loosening the nut and screw.





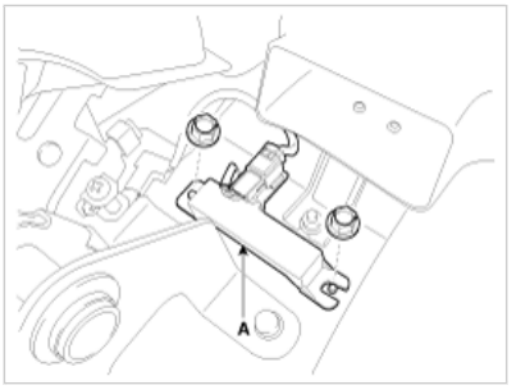
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Interior Antenna

NOTICE

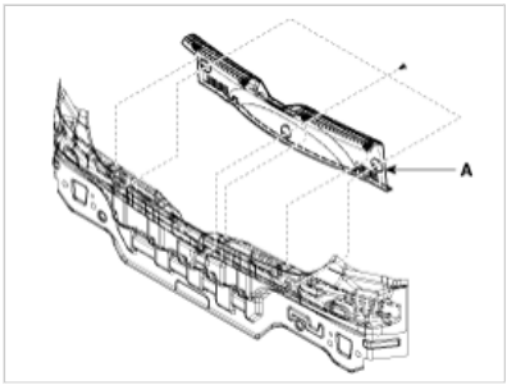
Take care not to scratch the crash pad and related parts.

1. Disconnect the negative(-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Disconnect the connector, then remove the interior antenna (A) with loosening 2 nuts.

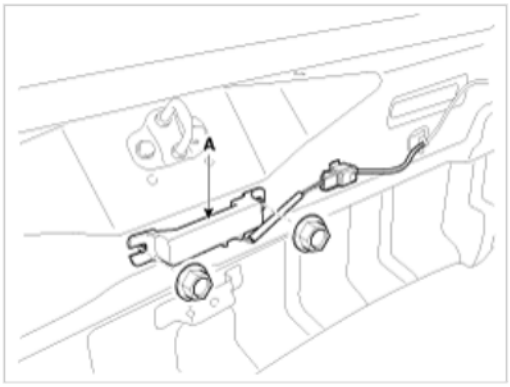


Trunk Antenna

1. Disconnect the negative(-) battery terminal.
2. Using a clip remover, detach the clips, and remove the rear transverse trim (A).



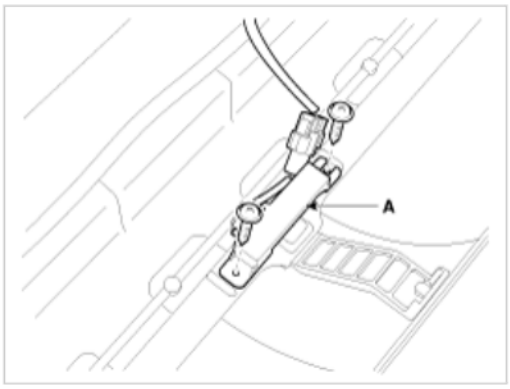
3. Disconnect the connector, then remove the trunk antenna (A) with loosening 2 nuts.



Exterior Bumper Antenna

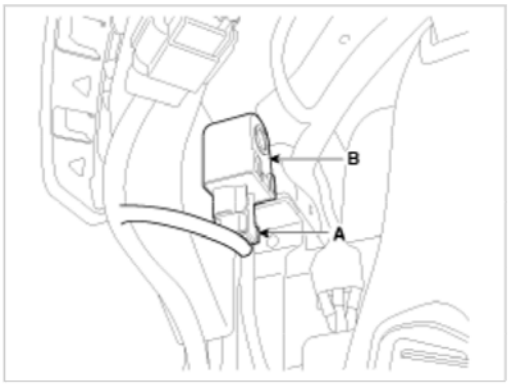
1. Disconnect the negative(-) battery terminal.
2. Remove the rear bumper cover.
   (Refer to Body - "Rear Bumper Cover")
3. Disconnect the connector, then remove the rear bumper antenna (A) with loosening 2 screws.

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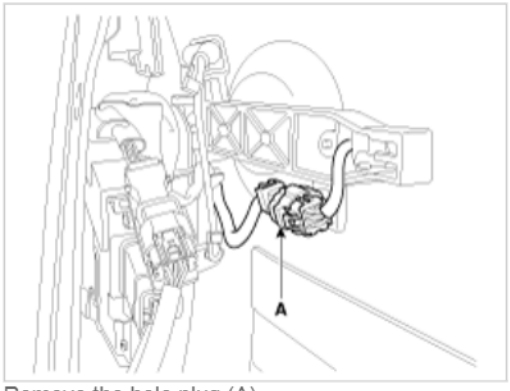
Buzzer

1. Disconnect the negative(-) battery terminal.
2. Remove the front left wheel guard.
3. Remove the buzzer (B) after disconnecting the connector (A).



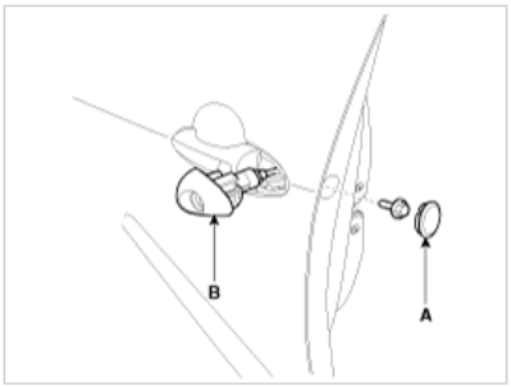
Door Outside Handle

1. Disconnect the negative (-) battery terminal.
2. Remove the front door module.
   (Refer to Front Door - "Front Door Module")
3. Disconnect the front door outside handle connector (A).

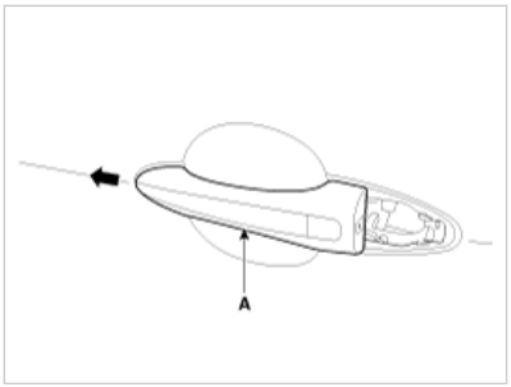


4. Remove the hole plug (A).
5. After loosening the mounting bolt, then remove the front door outside handle cover (B).

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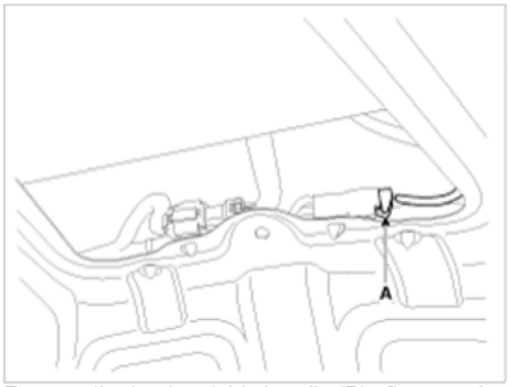


6. Remove the front door outside handle (A) by sliding it rearward.

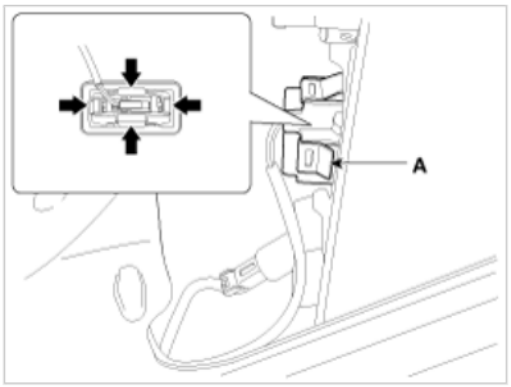


Trunk Lid Open Switch

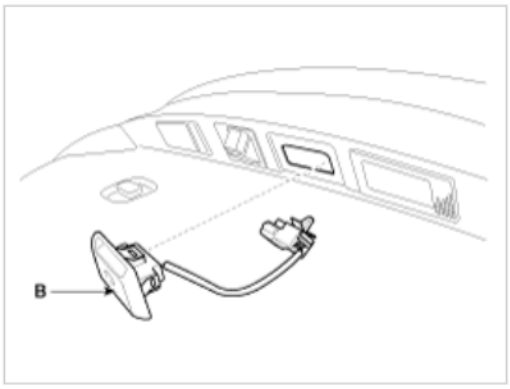
1. Disconnect the negative (-) battery terminal.
2. Remove the trunk lid trim.
   (Refer to Body - "Trunk Lid Trim")
3. Disconnect the trunk lid open switch connector (A).



4. Remove the trunk outside handle (B) after pressing the clips (A).



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Installation

Smart Key Unit

1. Install the smart key unit and RF receiver.
2. Connect the connector and install the smart key unit.
3. Install the main crash pad assembly.
4. Install the negative (-) battery terminal and check the smart key system.

Interior Antenna

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

Trunk Antenna

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

Buzzer

1. Install the buzzer.
2. Install the front left wheel guard.
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.

Trunk Lid Open Switch

1. Install the trunk lid open switch.
2. Install the trunk trim.
3. Install the negative (-) battery terminal and check the smart key system.

Inspection

Self Diagnosis With GDS

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

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

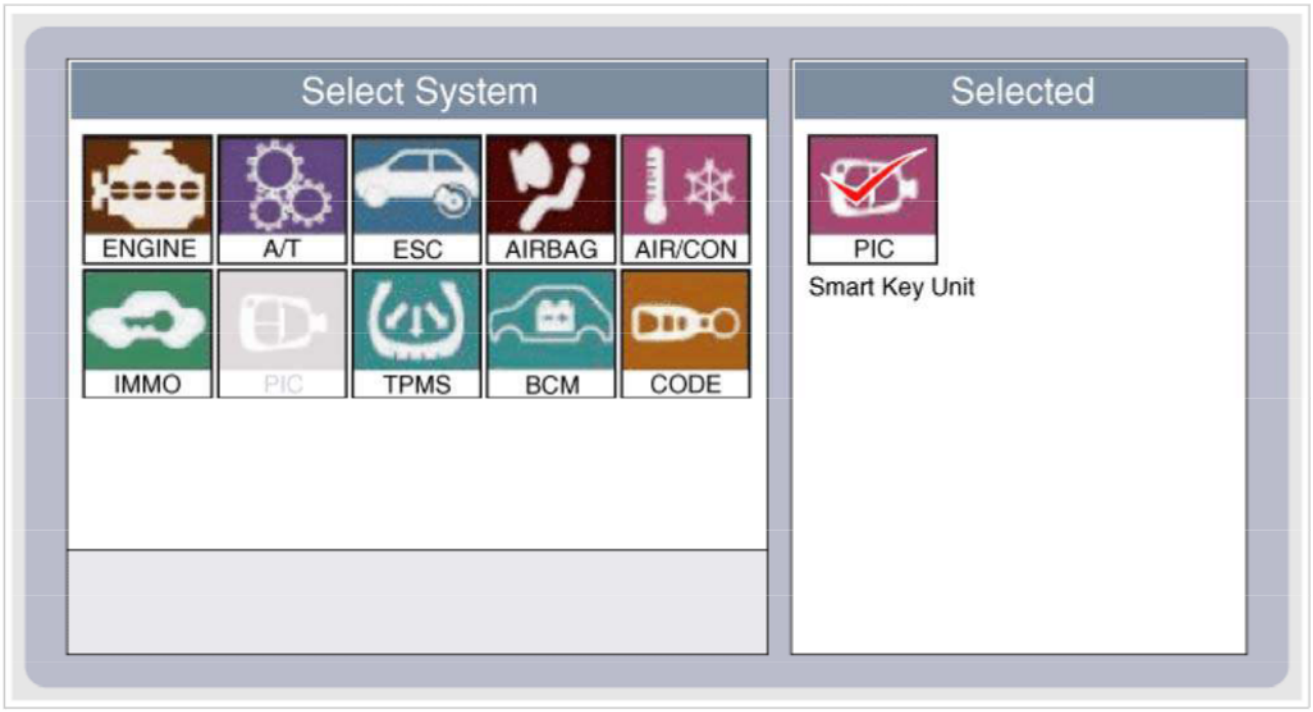
1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

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

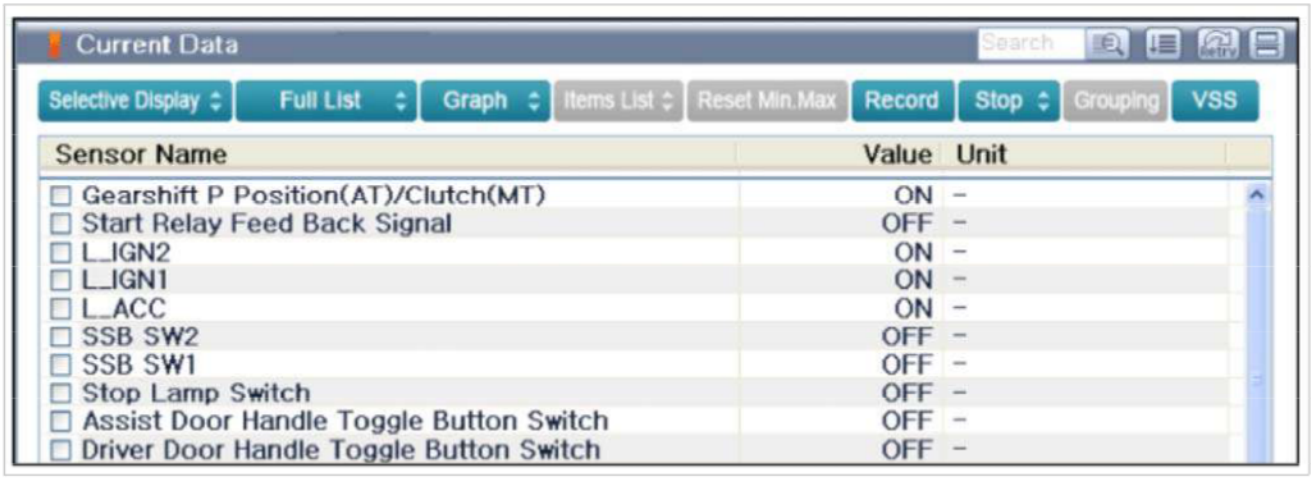
1. SMART KEY unit Input problem : switch diagnosis
2. SMART KEY unit problem : communication diagnosis
3. SMART KEY unit Output problem : antenna and switch output diagnosis

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 scanner after connecting the "current data" process.

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

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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)

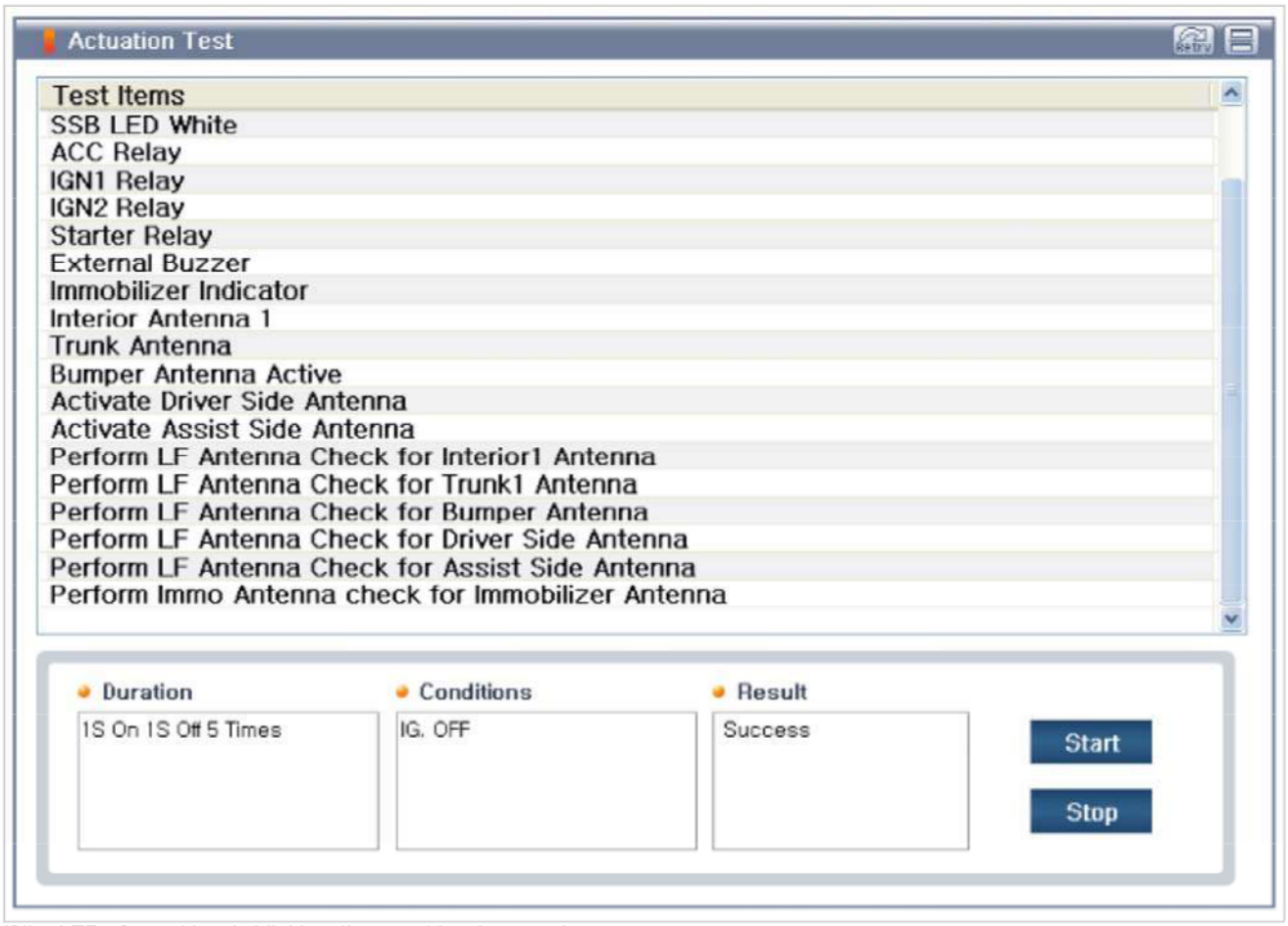
1. Communication diagnosis checks that the each linked components operates normal.
2. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
3. After IG ON, select the "DTC".



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.

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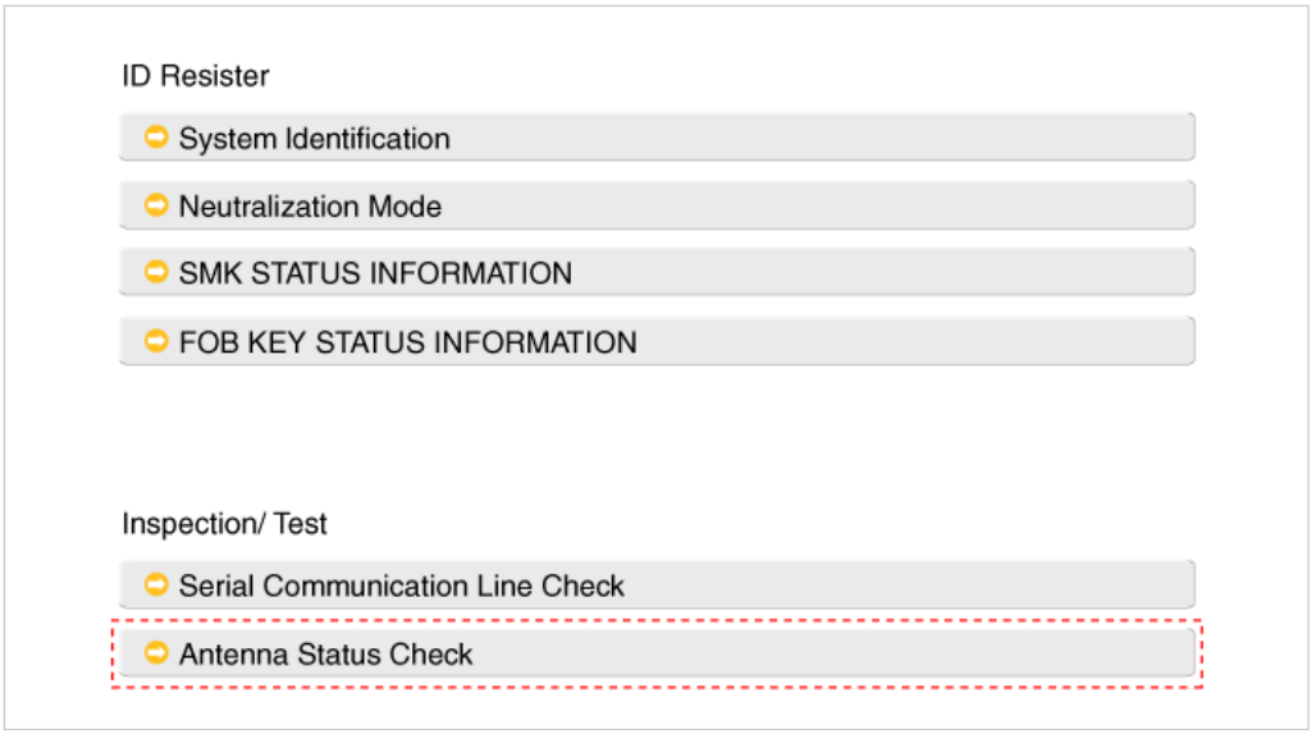


4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   A. INTERIOR Antenna
   B. Trunk antenna
   C. BUMPER/Antenna
   D. DRV_DR Antenna
   E. AST_DR Antenna

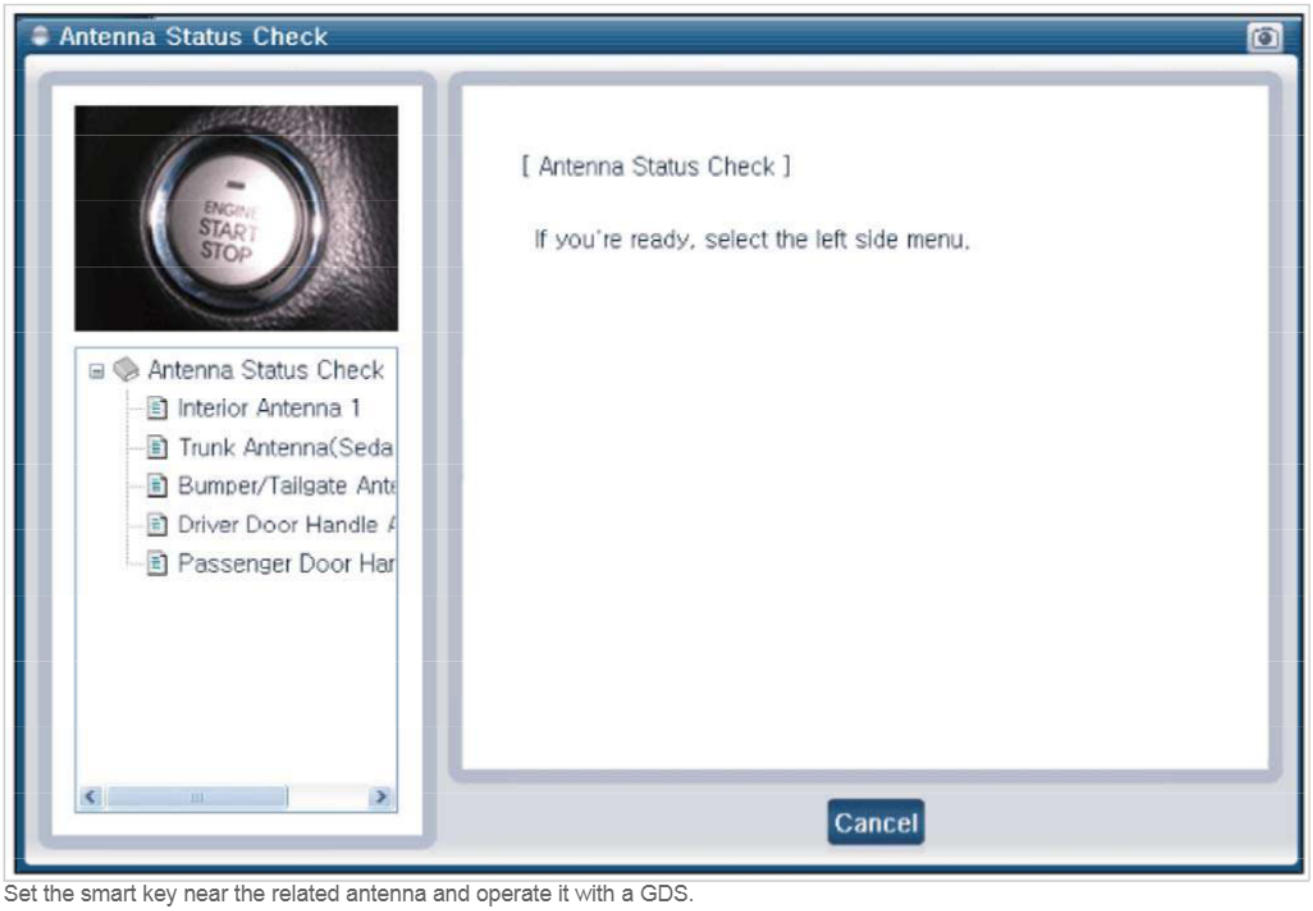
Antenna Status Check

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

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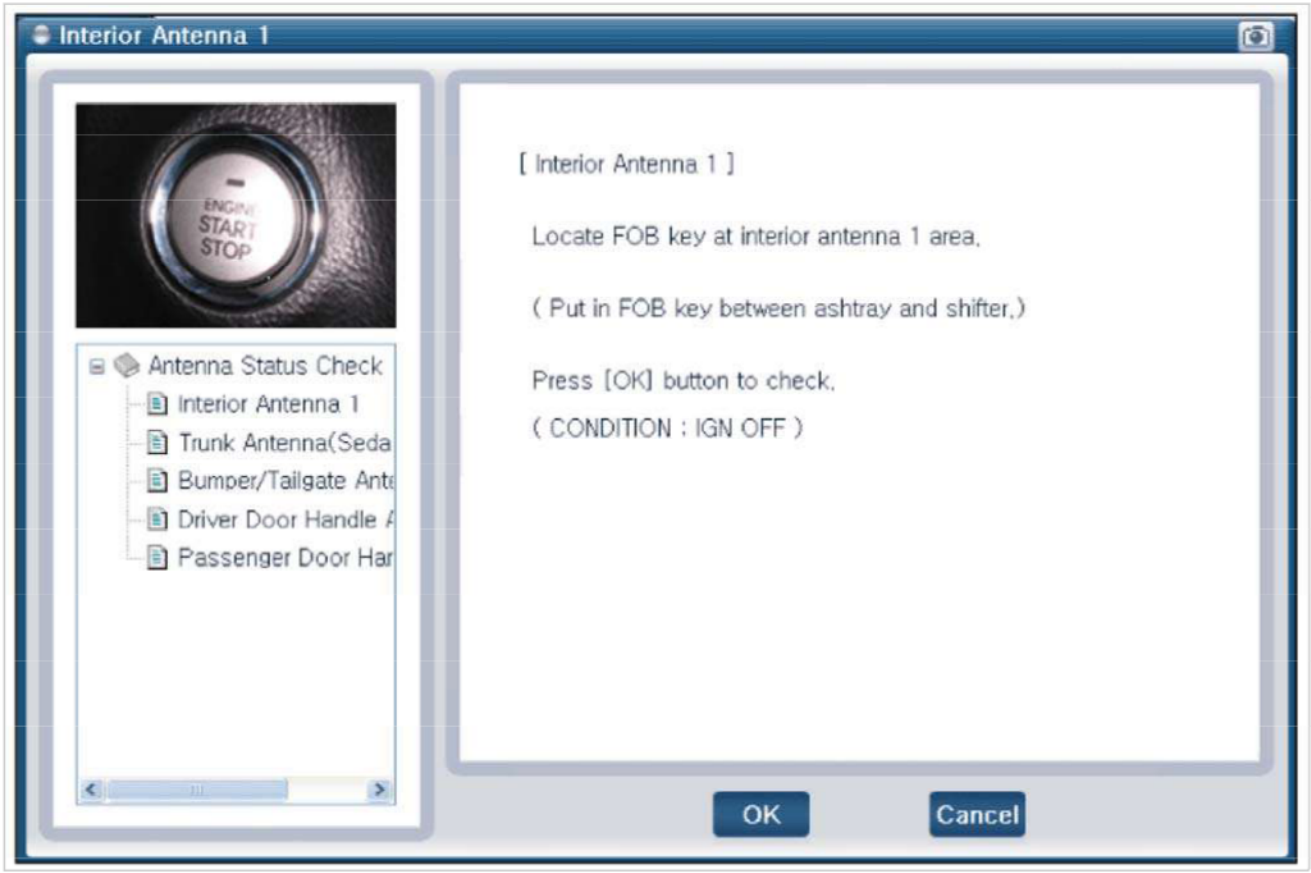


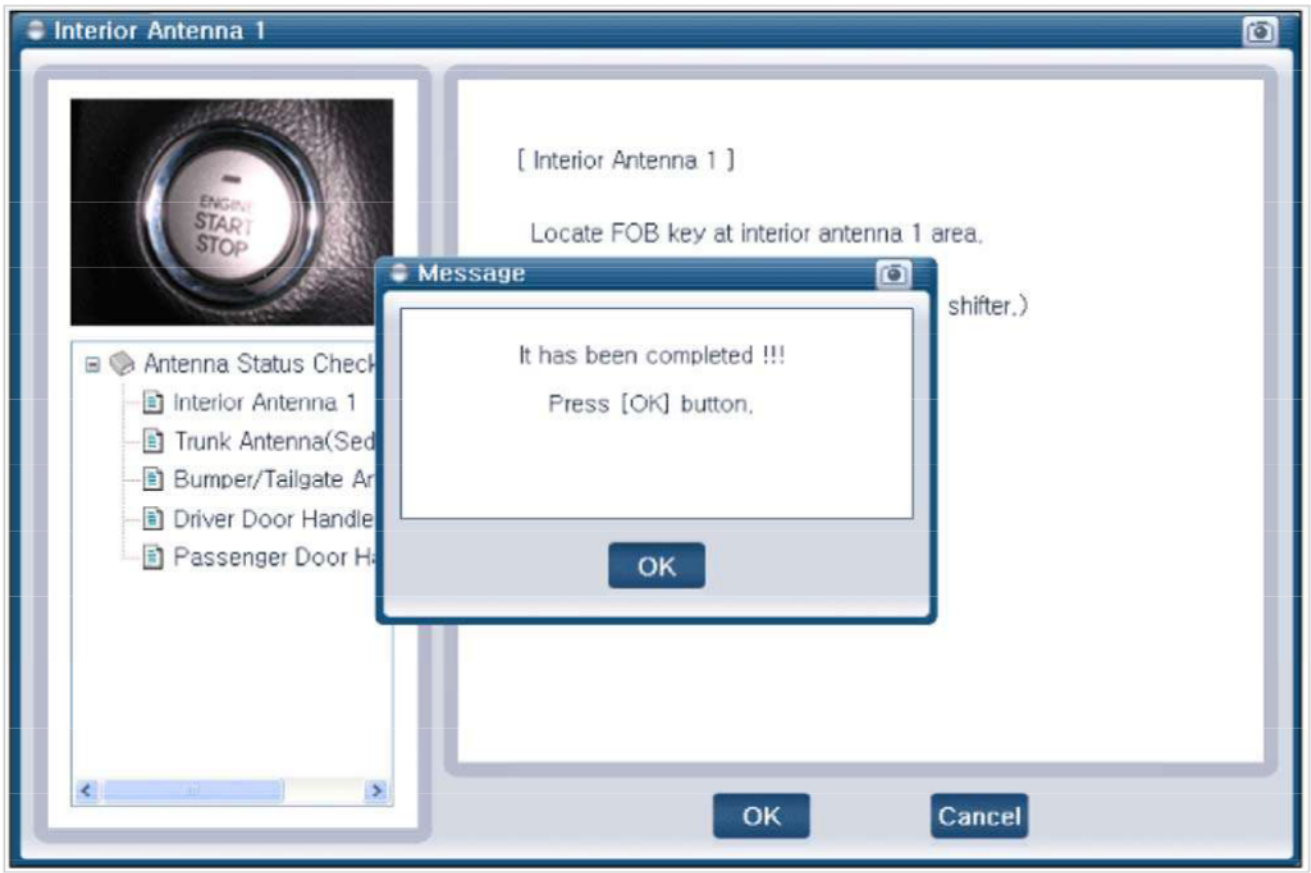
3. After IG ON, select the "Antenna Status Check".



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

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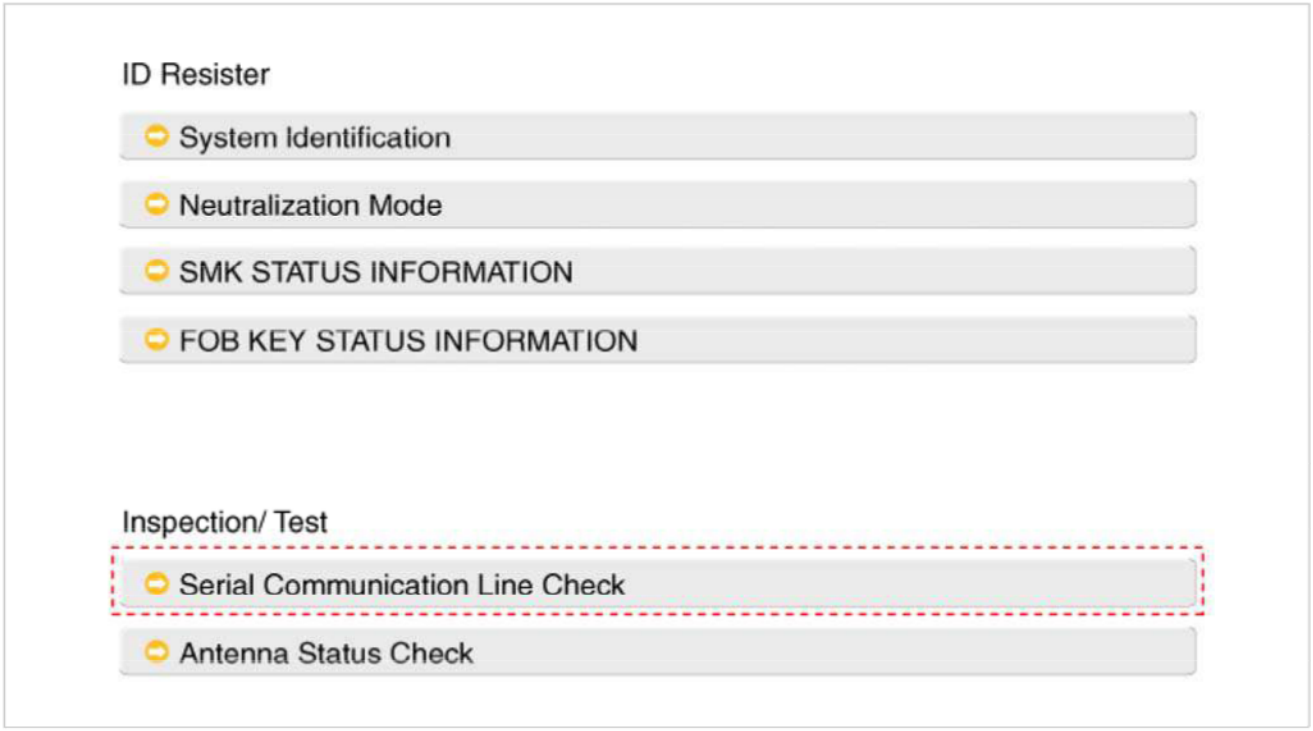
5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status

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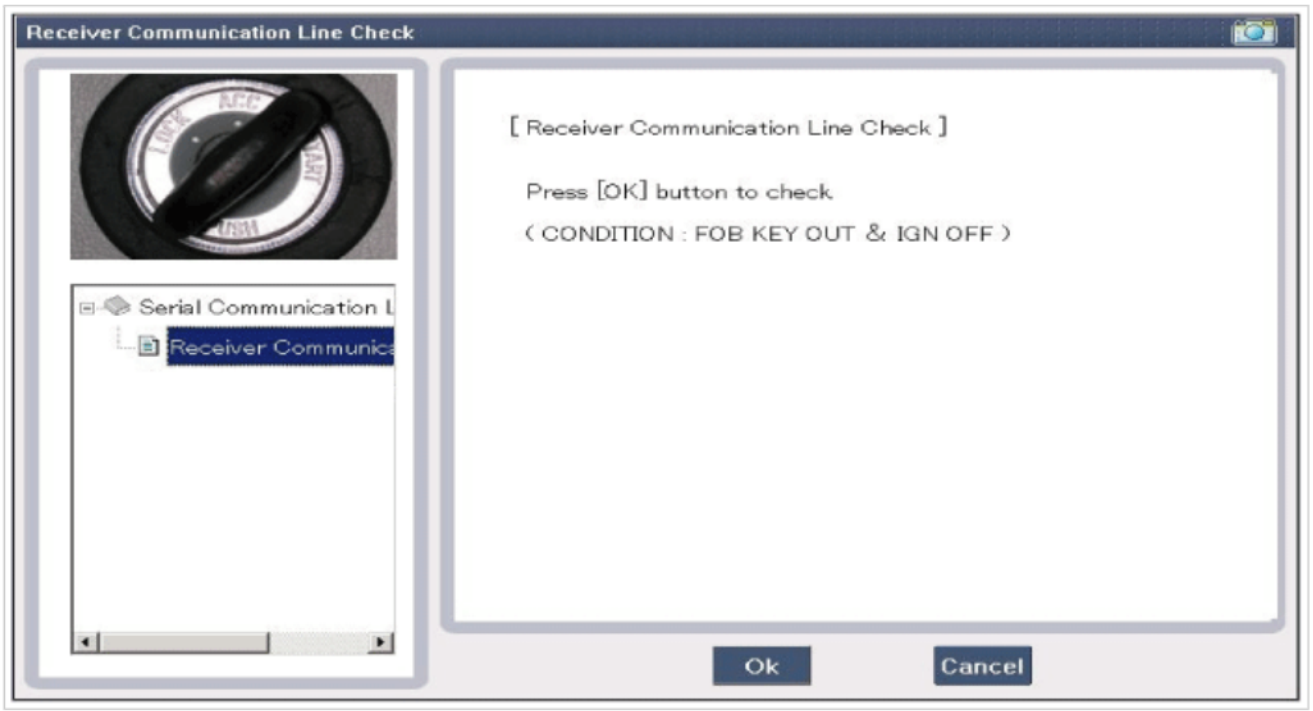
A. INTERIOR Antenna
B. Trunk antenna
C. BUMPER/Antenna
D. DRV_DR Antenna
E. AST_DR Antenna

Serial Communication Status Check

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



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



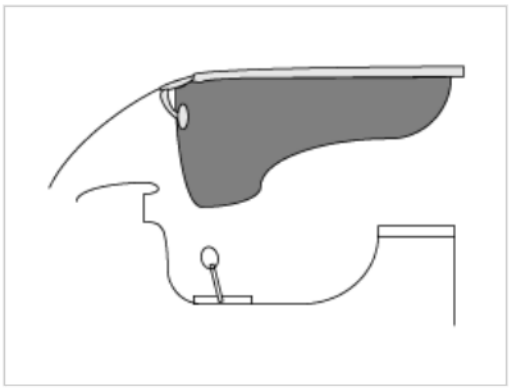
4. Check the serial communication line with a GDS.

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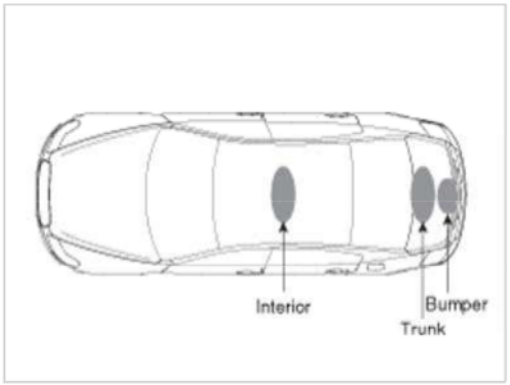
5. If the smart key runs normal, the communication of smart key unit, exterior receiver are normal.
6. If the smart key runs abnormal, check the following items.
   A. Disconnection or no response of the exterior receiver communication line.
   B. The exterior receiver communication line disconnection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

Interior Antenna Actuation Check

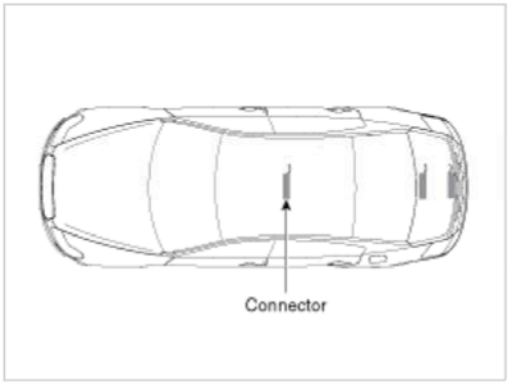
1. Set the smart key in the following shade area and check the IG ON.



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



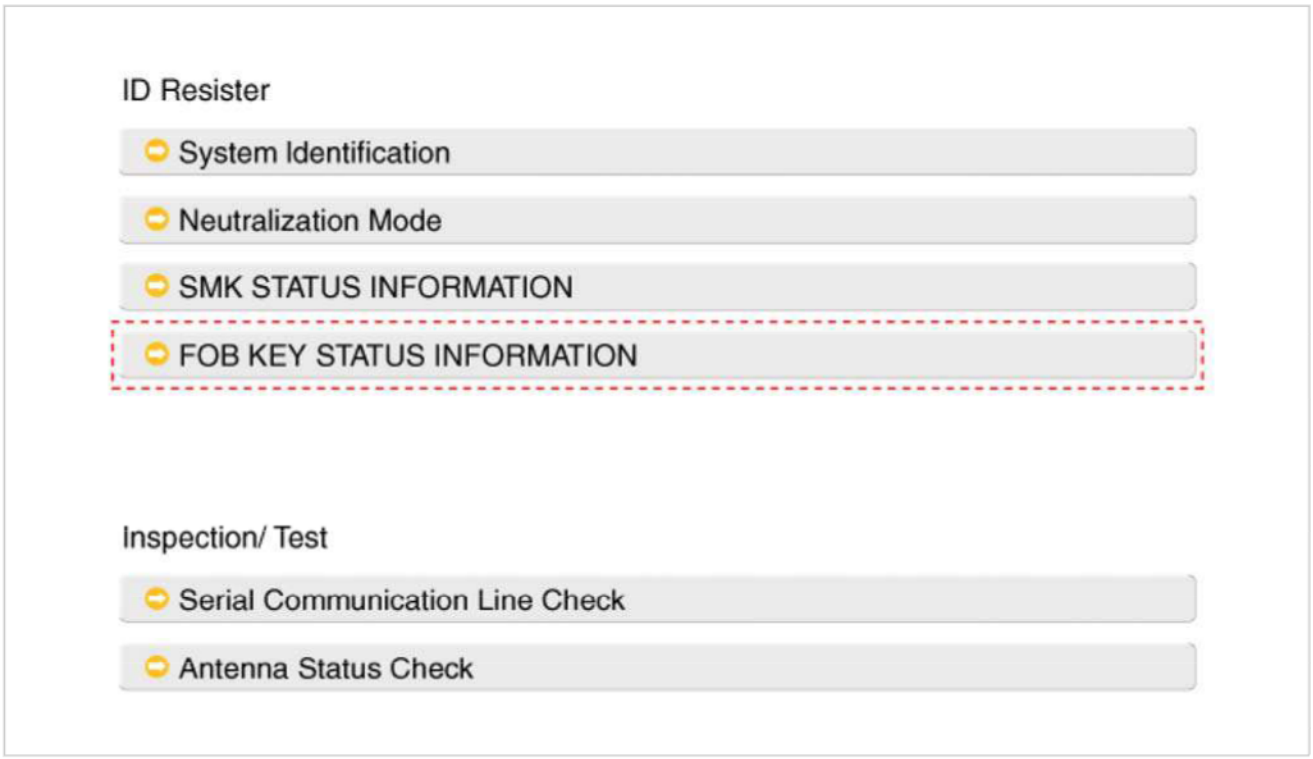
5. If the LED of smart key is not blinking, check the antenna in shade area.

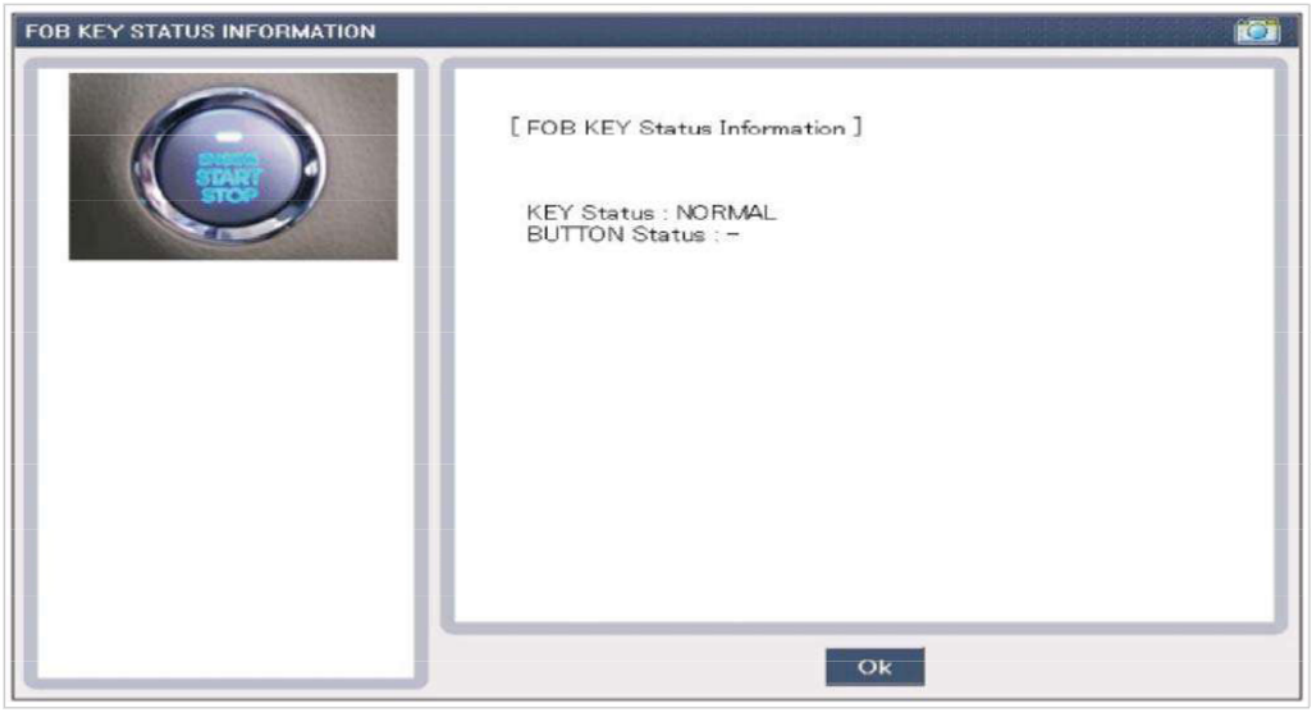


FOB Status Check

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IGN ON, select the "FOB KEY STATUS INFO".

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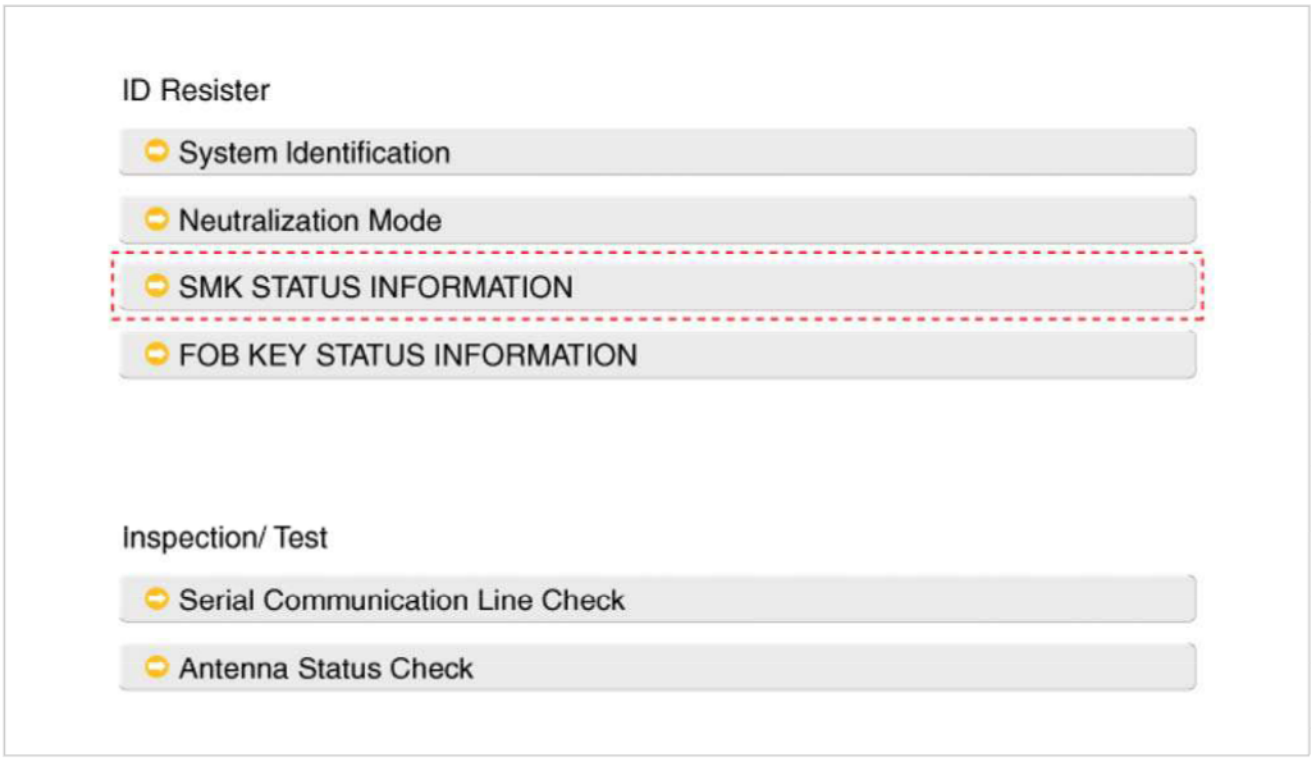


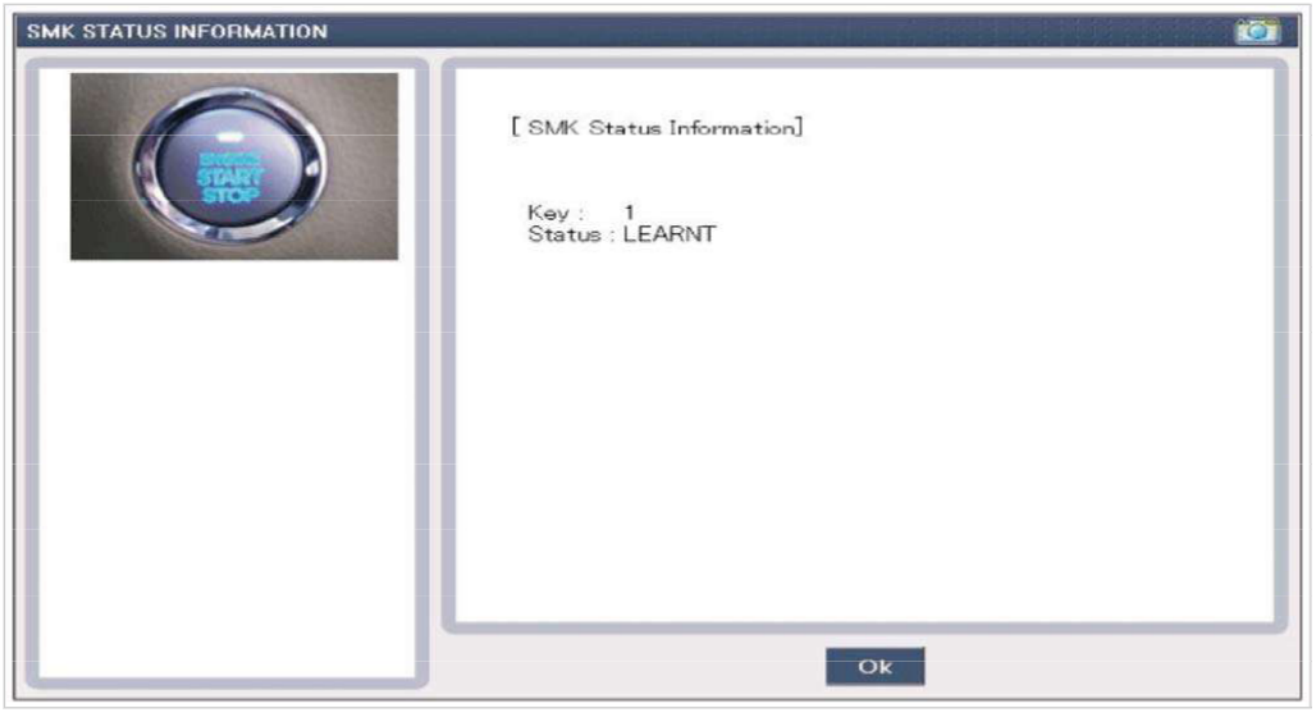


Smart Key Status Check

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

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Neutralization Status Check

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

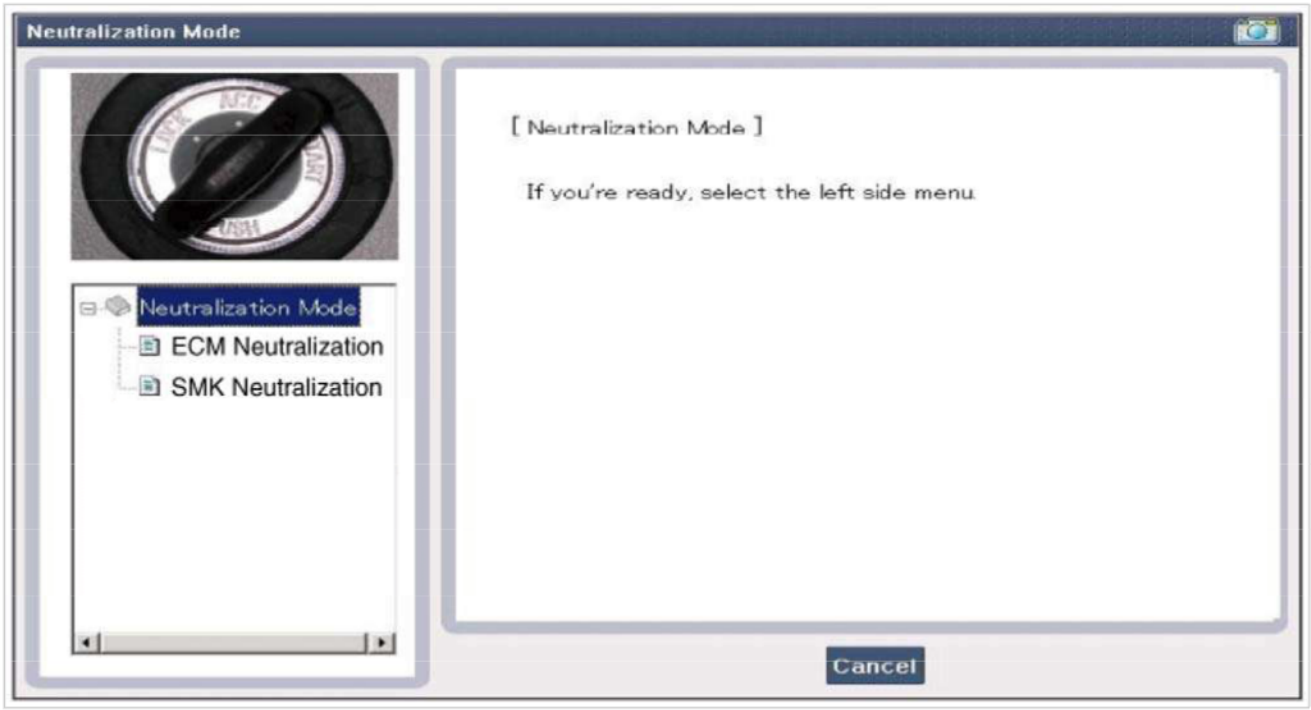
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ID Resister

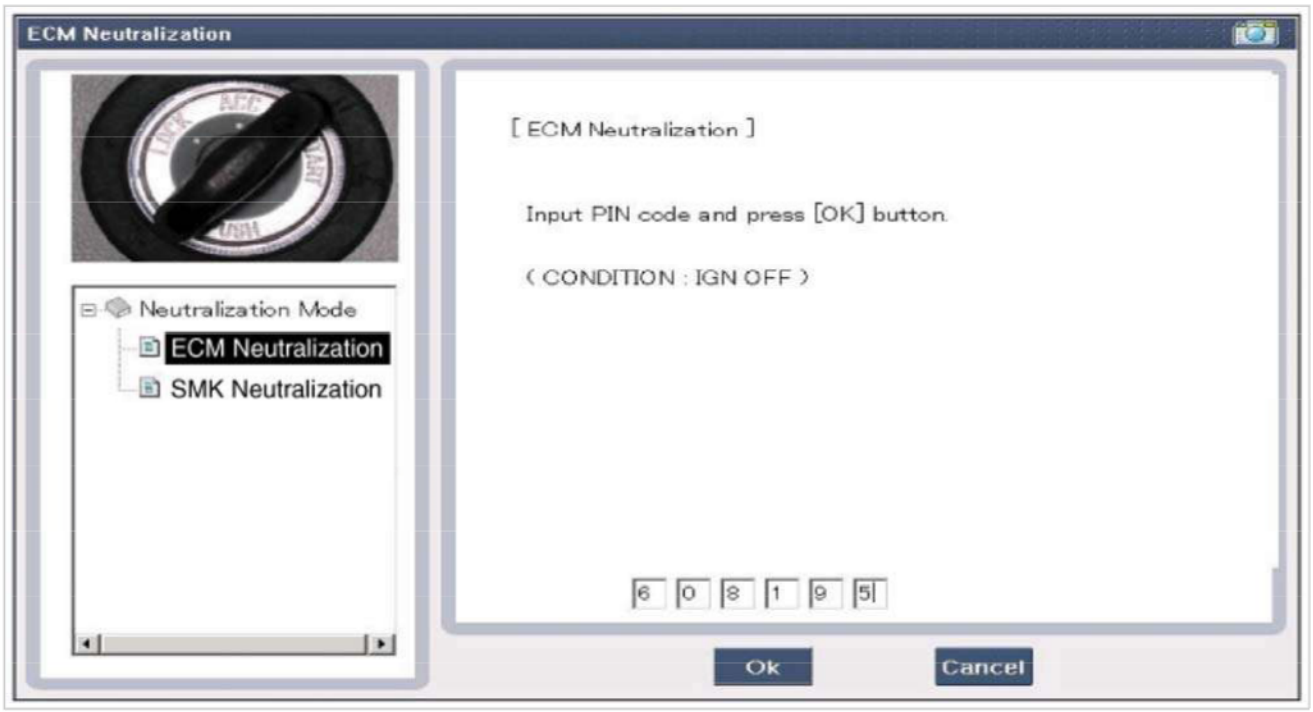
- System Identification
- Neutralization Mode
- SMK STATUS INFORMATION
- FOB KEY STATUS INFORMATION

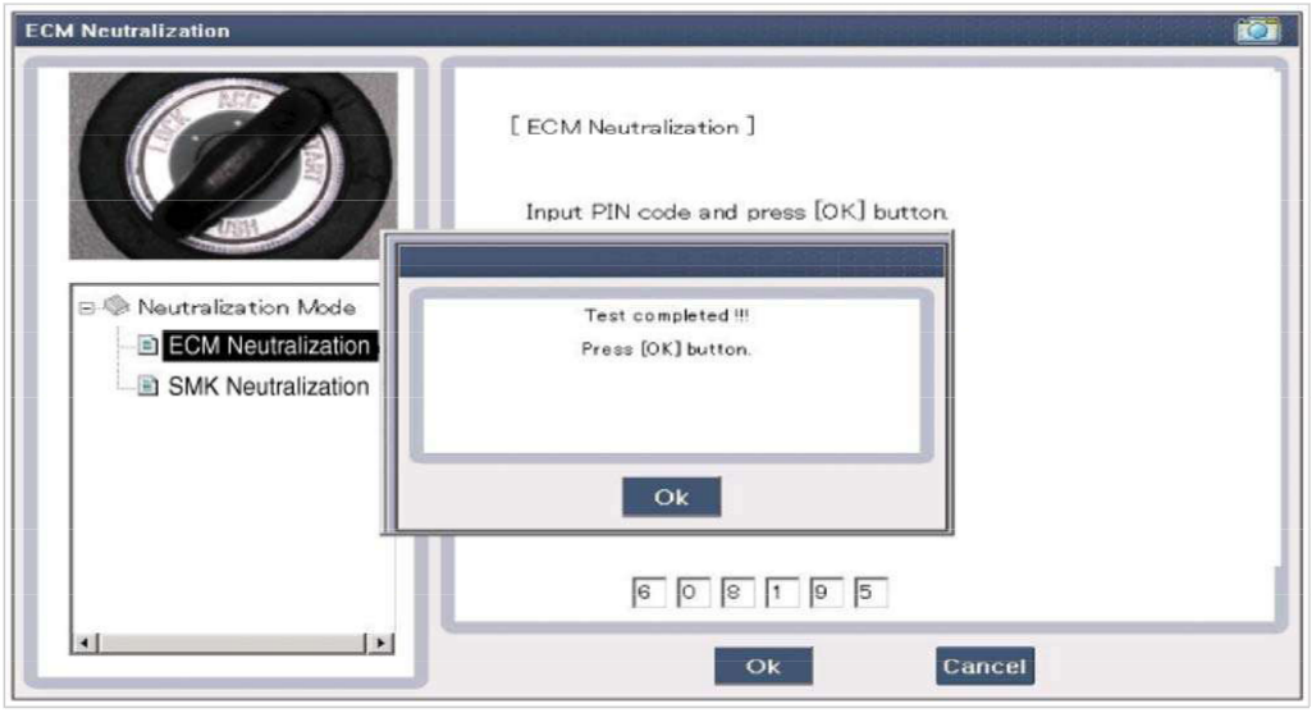
Inspection/ Test

- Serial Communication Line Check
- Antenna Status Check

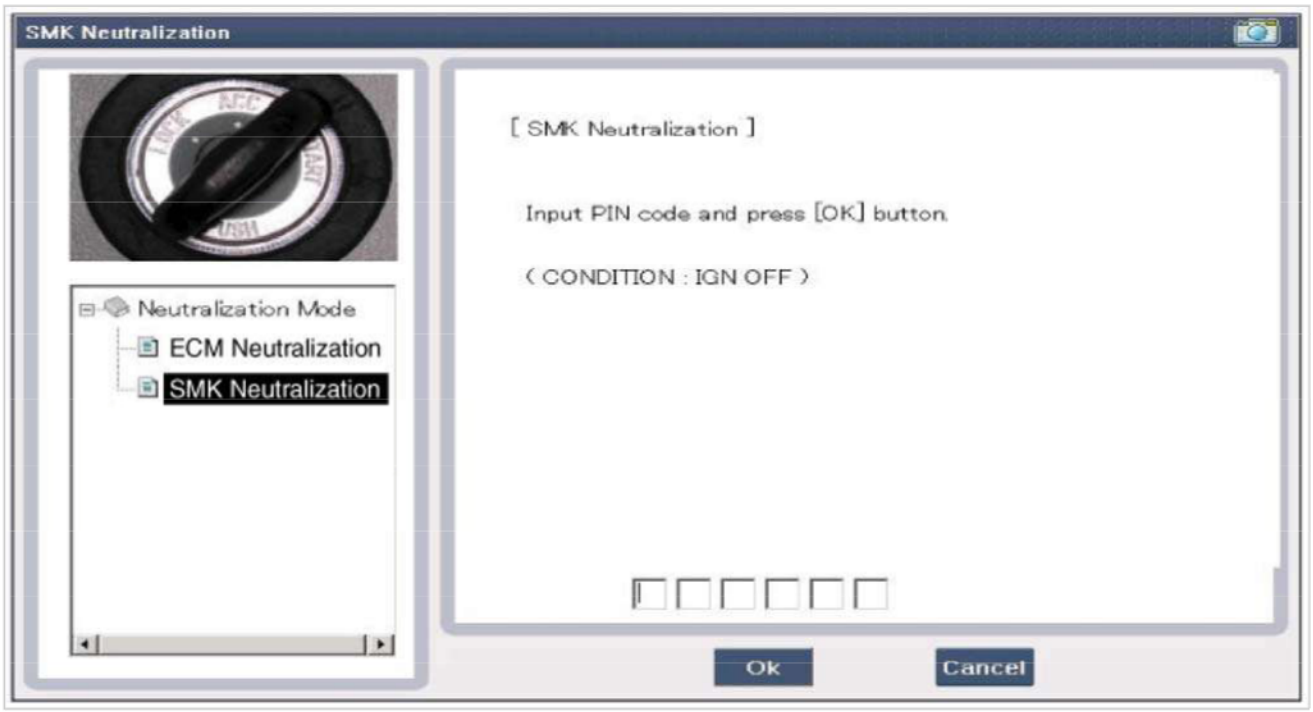


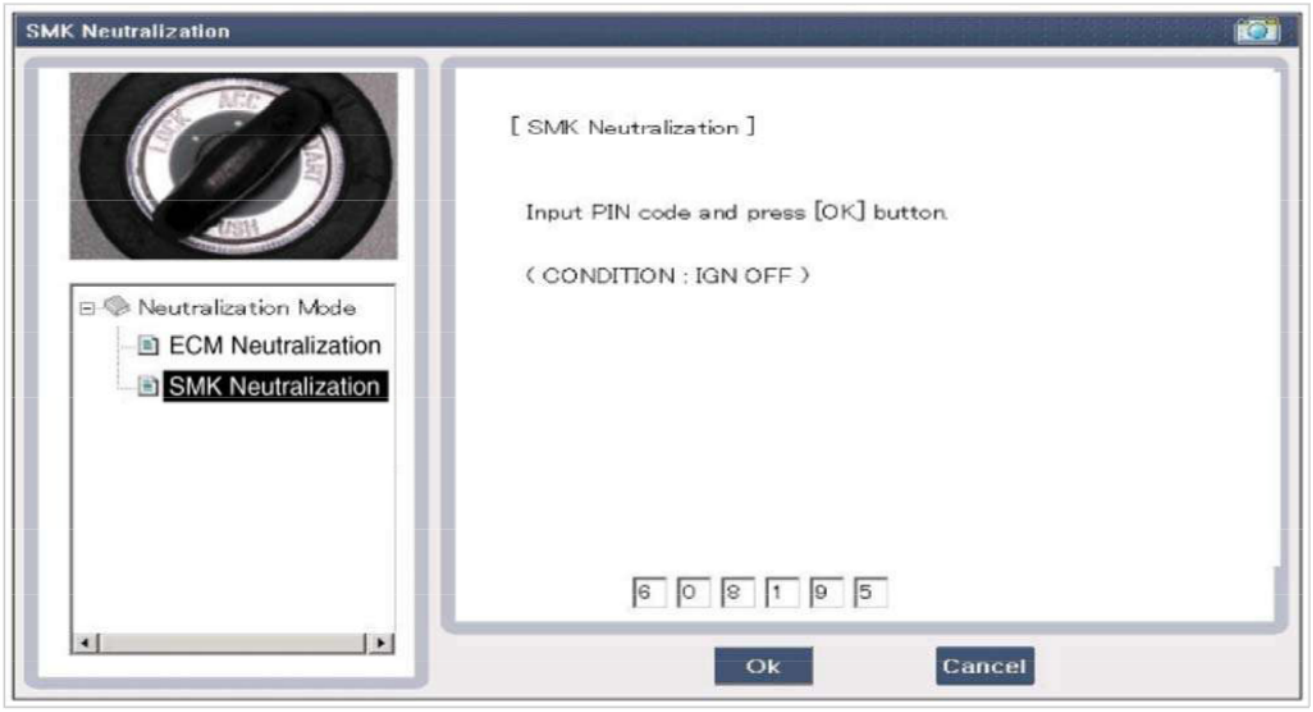
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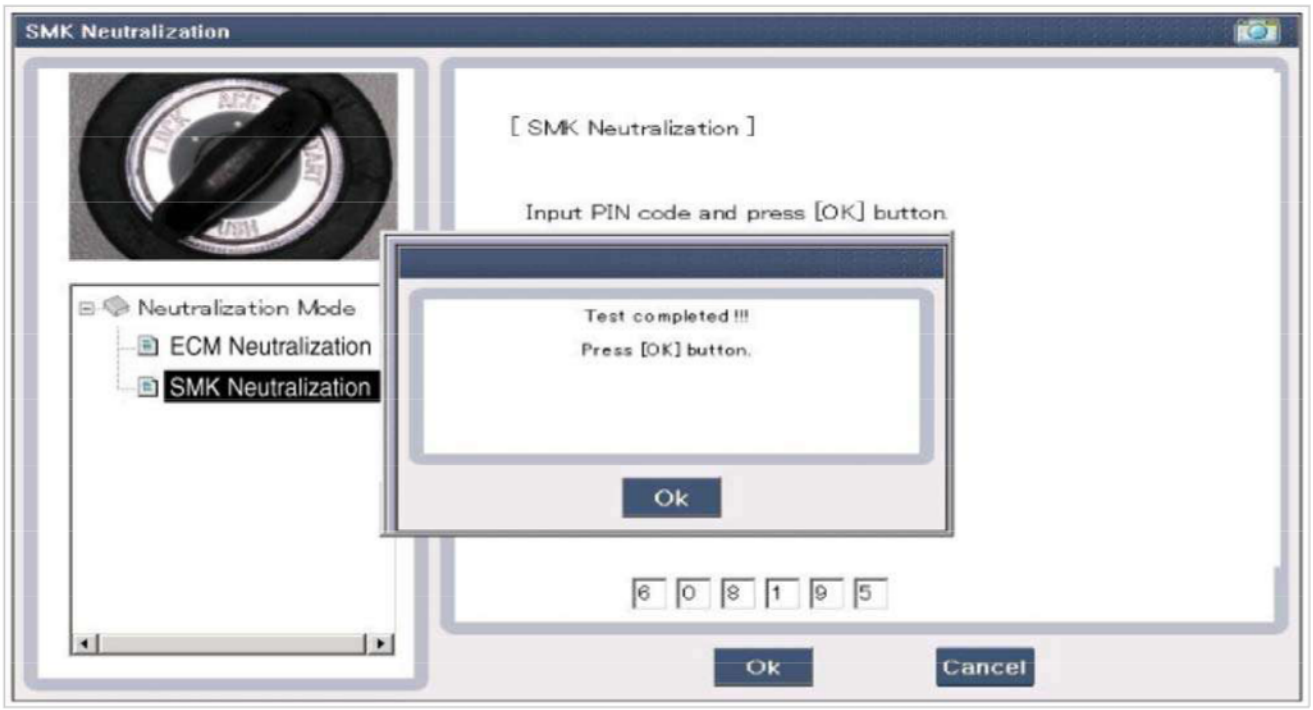


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Input Signal List

No.	Item name	Unit
1	SSB SW1	-
2	SSB SW2	-
3	ACC	-
4	IGN1	-
5	IGN2	-
6	Gear 'P' Position (A/T) Clutch SW (M/T)	-
7	Brake SW	-
8	FL Door Lock Button	-
9	FR Door Lock Button	-
10	Battery Voltage	-
11	Wheel Speed	-
12	RPM	-
13	Stop Lamp Fuse	-
14	Start Feed Back	-

Actuator List

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

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		Ignition switch ON Engine off
10	ACC/IGN1/IGN2 Relay	Ignition switch ON Engine off
11	ESCL Driver	Ignition switch ON Engine off

Body Electrical System

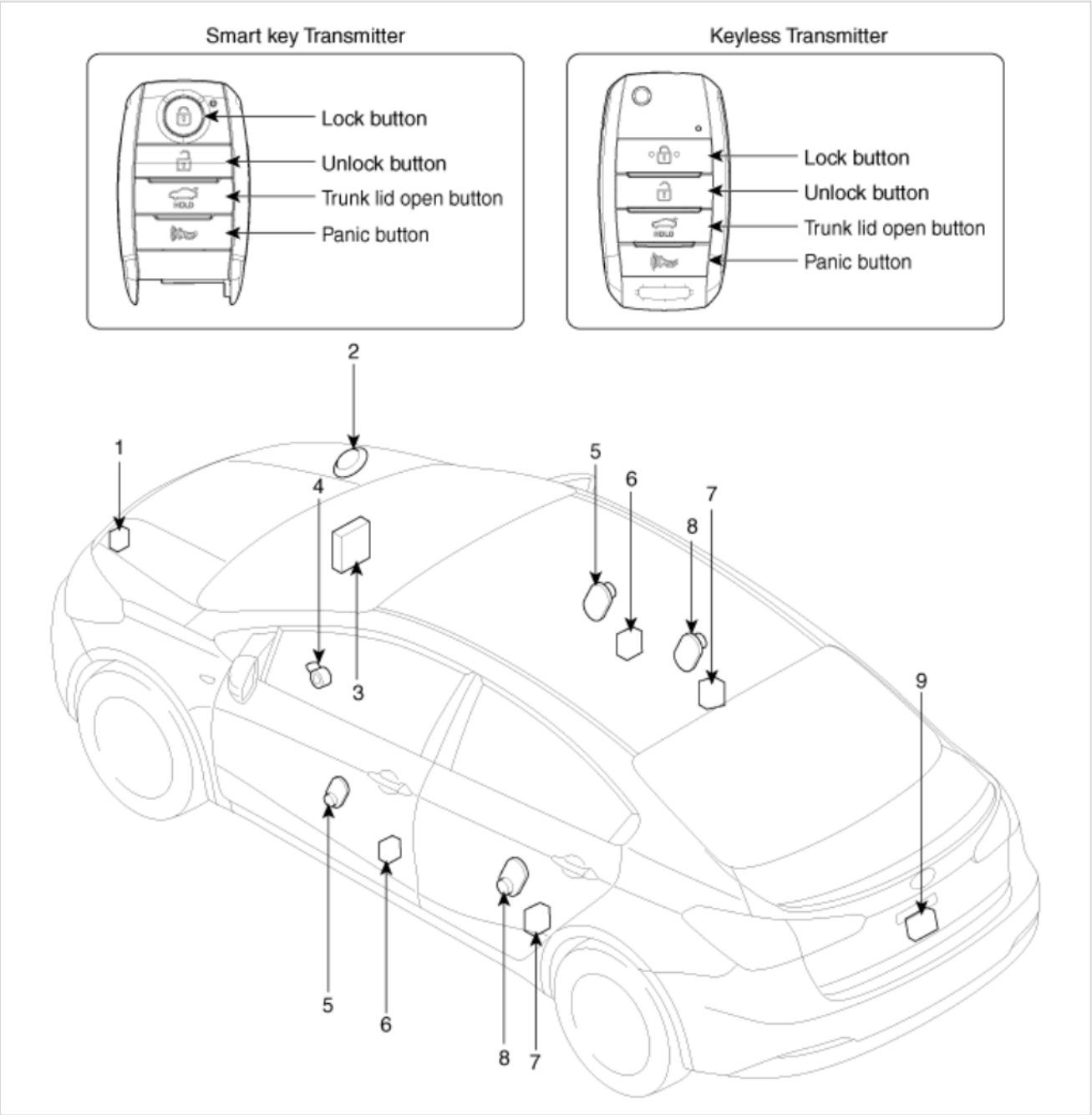
Specification

Item	Description
Power source	3V
Operating temperature	-20°C ~ +60°C (-4°F ~ 140°F)
RF Modulation	FSK
LF Modulation	ASK
RF frequency	315 MHz
Battery	CR2032
Transmissible distance	10m or more
Life of battery	2 years or more(at 20 times per day)
Button number	4
Function	Door lock
	Door unlock
	Trunk lid open
	Panic

Body Electrical System

Component Location

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

Body Electrical System

Description

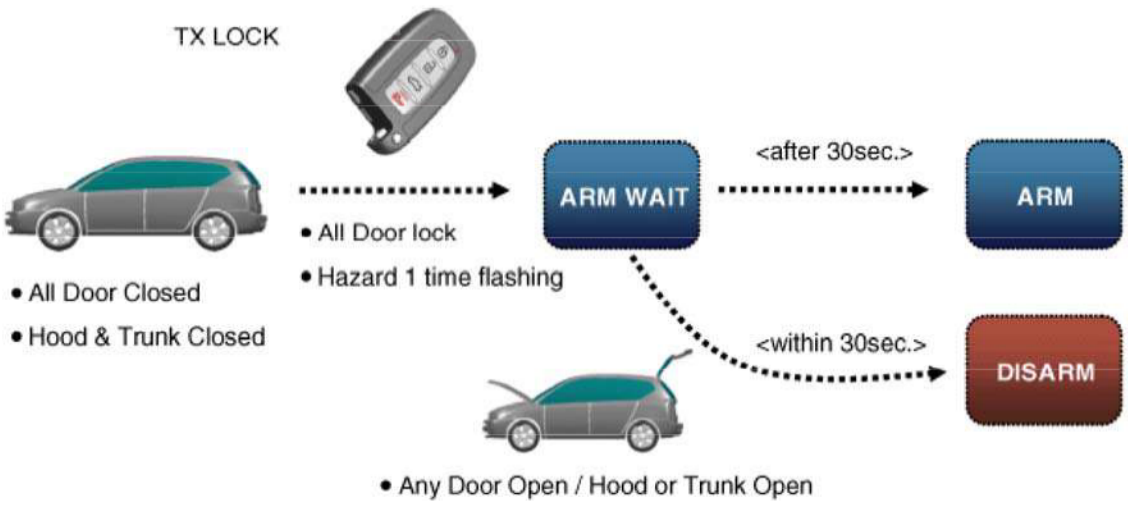
Burglar Alarm State [B/A State]

B/A State	Description
DISARM	1. In "DISARM" state, no vehicle start inhibition. So, when door, hood, or Trunk is opened, there is no alarm sound and flashing.

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	2. If the battery is disconnected while the state is not "ARM/ARMWAIT/ALARM/REARM", B/A state is set to "DISARM" state. 3. In “DISARM” state, security indicator keeps blinking.
ARMWAIT	1. In "ARMWAIT" state, when timer “30sec." is running, if this timer reaches “30sec”, state transitions to "ARM" state. 2. If the battery is disconnected while the state is "ARMWAIT", B/A state is set to "ARMWAIT" state and timer "30sec" is restarted. 3. In “ARMWAIT” state, security indicator keeps on.

[ARM WAIT Procedure]

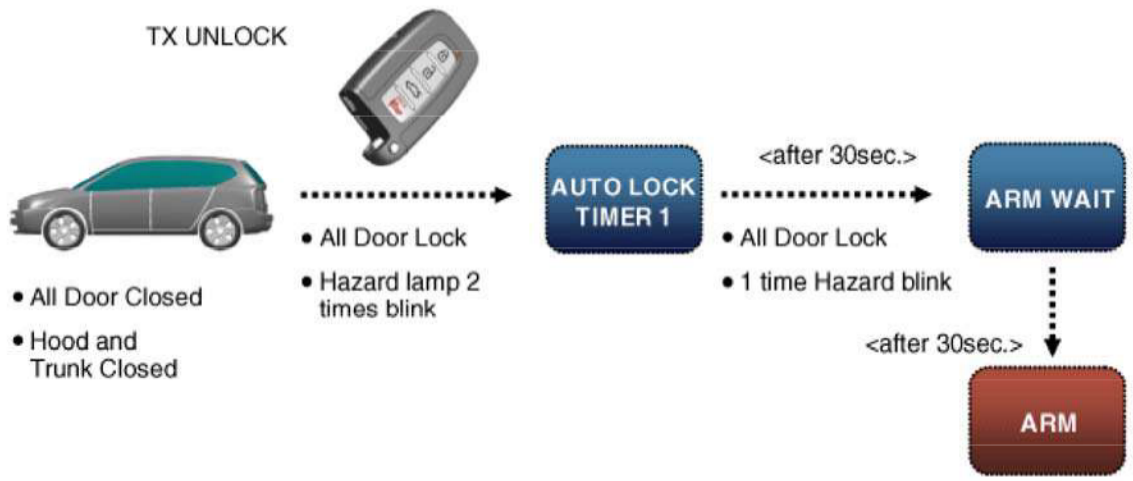


※ Remark: On Smart key system, it works the same way with passive lock

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

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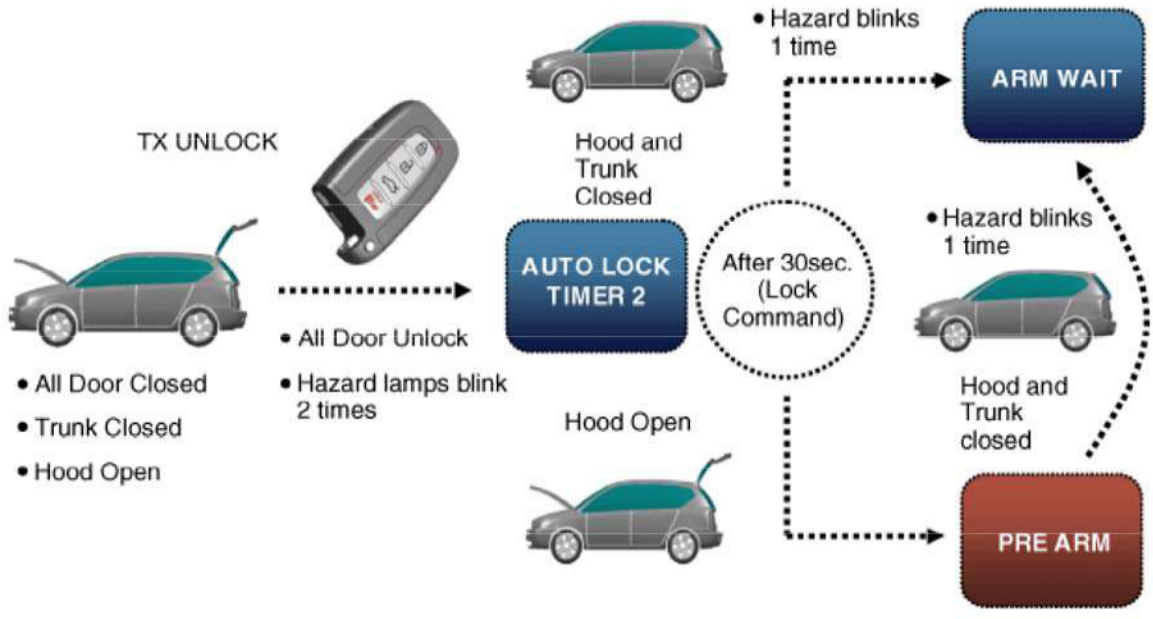
[AUTO LOCK TIMER 1 Procedure]



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

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

[AUTO LOCK TIMER 2 Procedure]



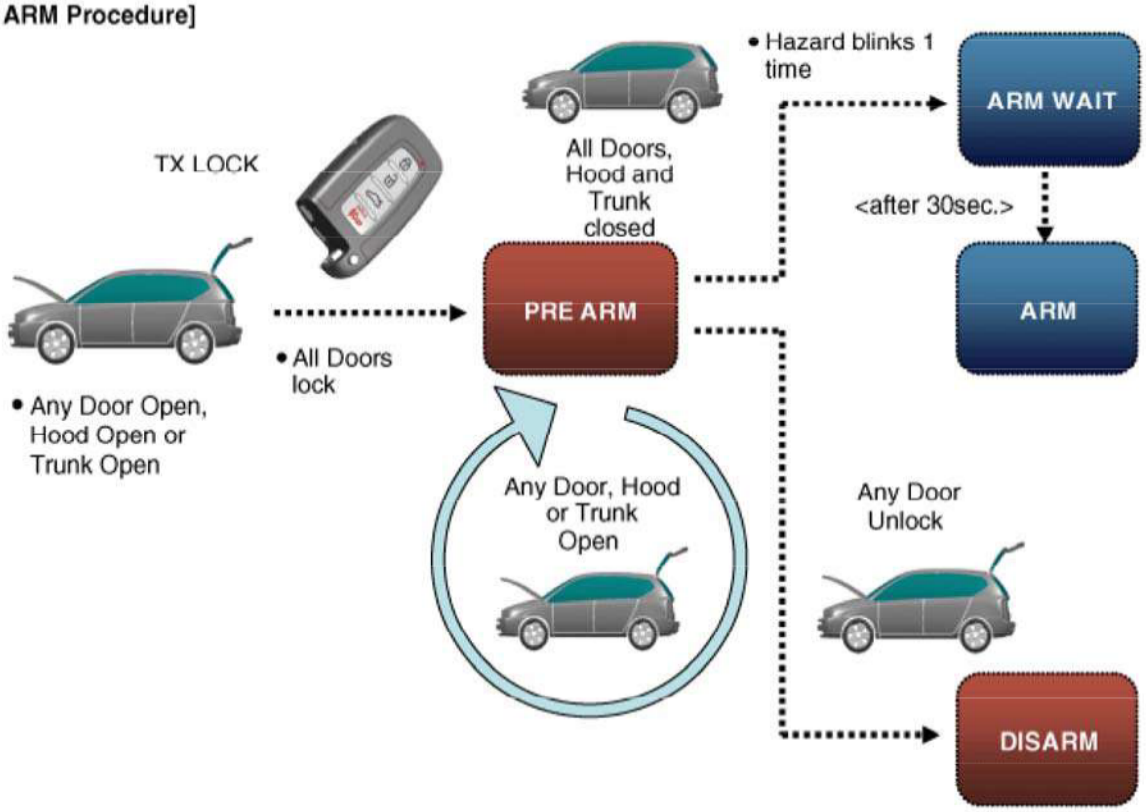
※ Remark: On Smart key system, it works the same way with passive unlock

B/A State	Description
PRE ARM	1. The "PREARM" state is when user try to change to arm but pre-condition are not satisfied (door open, trunk open, or hood open). 2. B/A state changes to “PREARM” when TX Lock command occurs with any door Open, Hood or Trunk Open.

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	3. B/A state changes to “PREARM” when “30sec.” timer expired in“AUTOLOCKTIMER2”with Hood or Trunk Open 4. The “PREAMR” state changes to “ARM” when all doors closed, All doors locked and Hood and Trunk closed. 5. The “PREAMR” state changes to “DISARM” when Any Door Unlock 6. In this state, Security indicator keeps blinking.

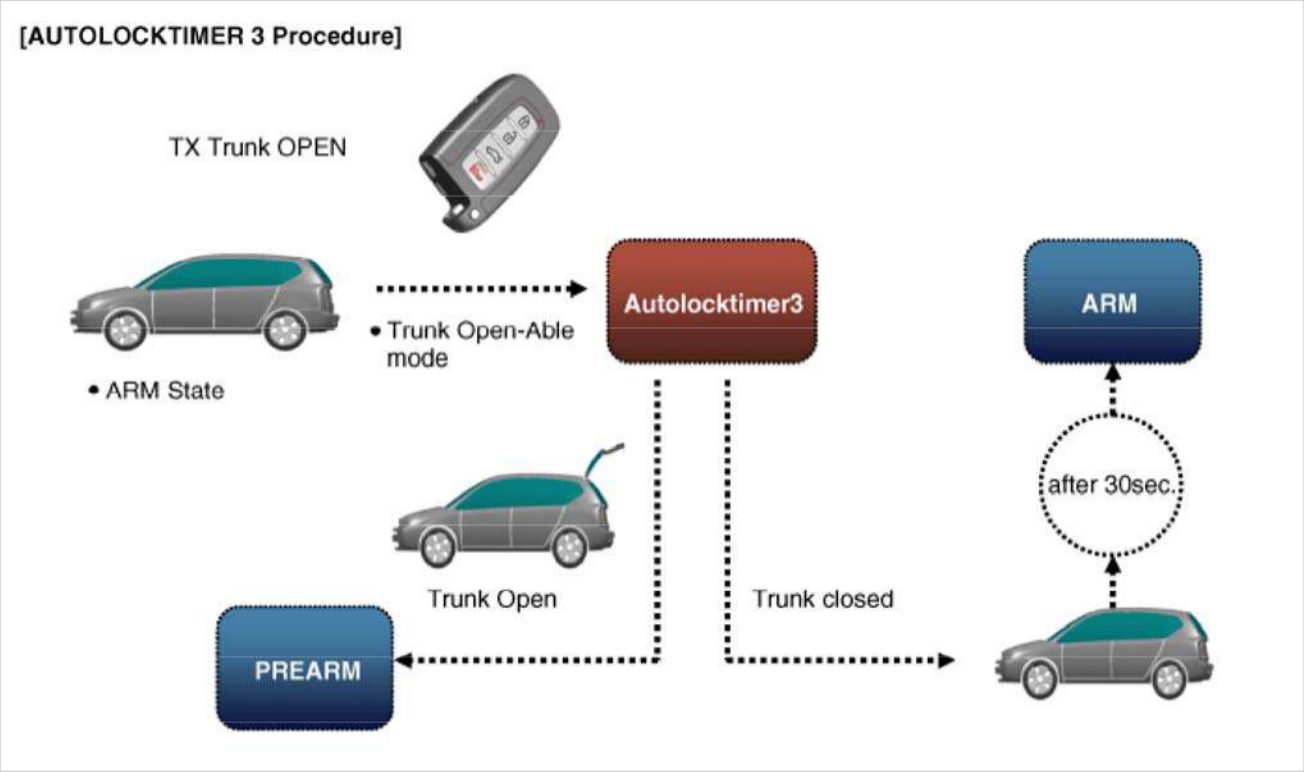
[RPE ARM Procedure]



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

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

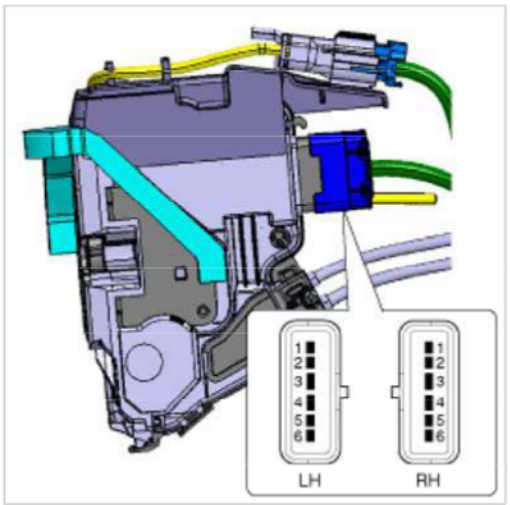
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Inspection

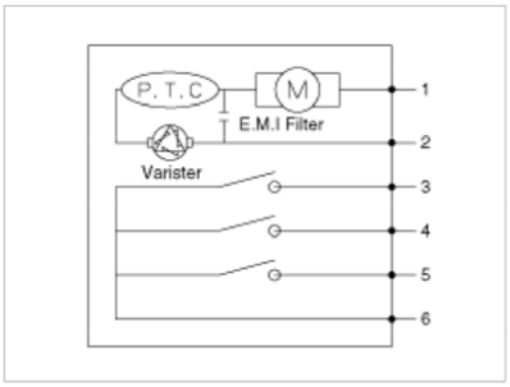
Front Door Lock Module Inspection

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

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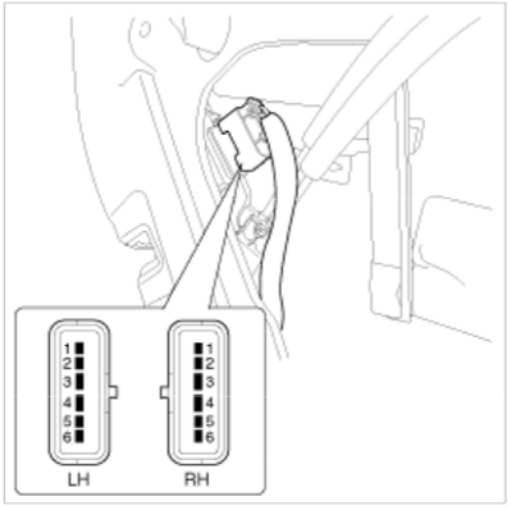


Terminal	Position	1	2
LH	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖
RH	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕

Terminal	Position	3	4	5	6
LH	Central Lock	○			○
	Central Unlock		○	○	○
RH	Central Lock	○			○
	Central Unlock		○	○	○

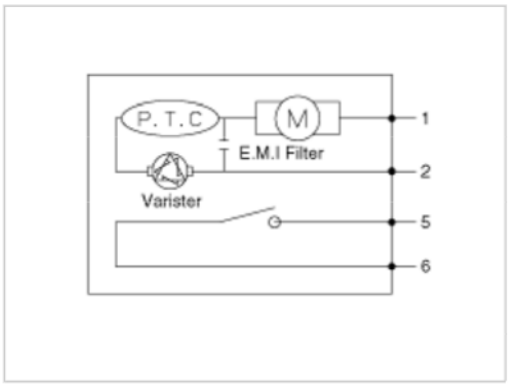
Rear Door Lock Module Inspection

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

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Terminal / Position		1	2
LH	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖
RH	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕

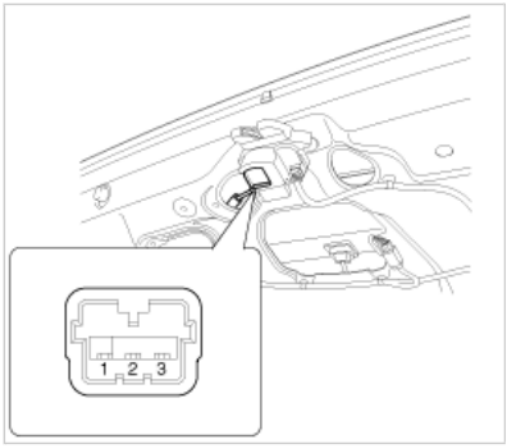
Terminal / Position		5	6
LH	Central Lock		
	Central Unlock	○———	———○
RH	Central Lock		
	Central Unlock	○———	———○

Trunk Lid / Tailgate Release Module Inspection

[2/4 Door]

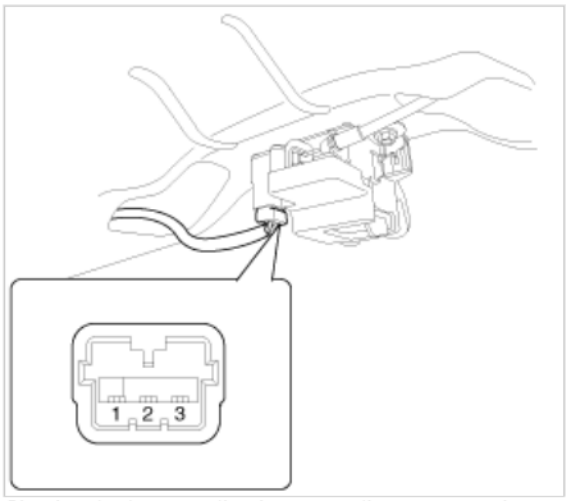
1. Remove the trunk lid trim.
   (Refer to Body - "Trunk Lid Trim")
2. Disconnect the connector from the actuator.

[2 Door]

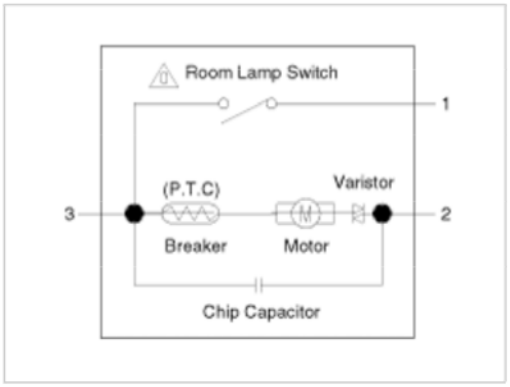


[4 Door]

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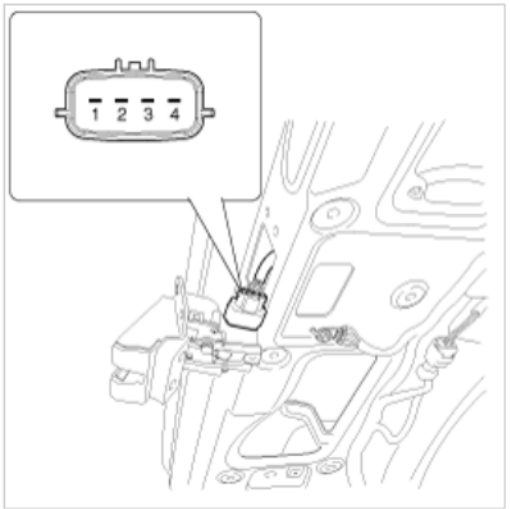
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



Terminal / Position	1	2	3
Lock release(Open)		⊕	⊖
	○	———	○

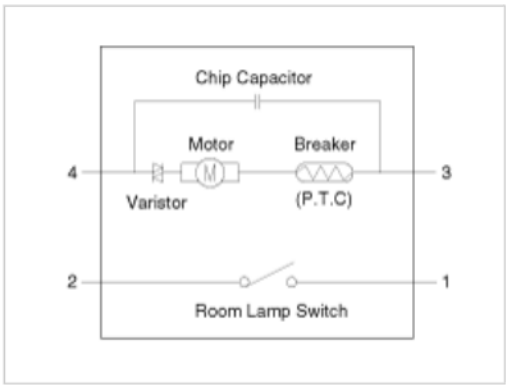
[5 Door]

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

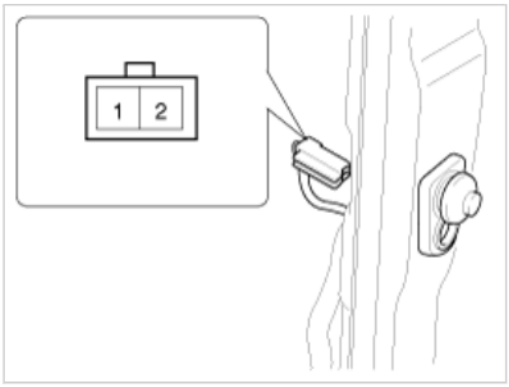
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Position \ Terminal	1	2	3	4
Lock release(Open)			⊕	⊖
	○—○			

Door Switch Inspection

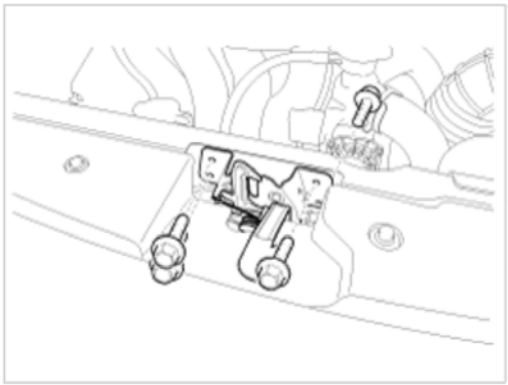
Remove the door switch and check for continuity between the terminals.



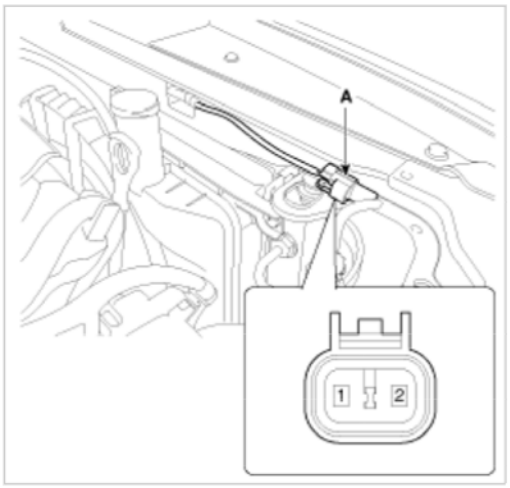
Position \ Terminal	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

Hood Switch Inspection

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



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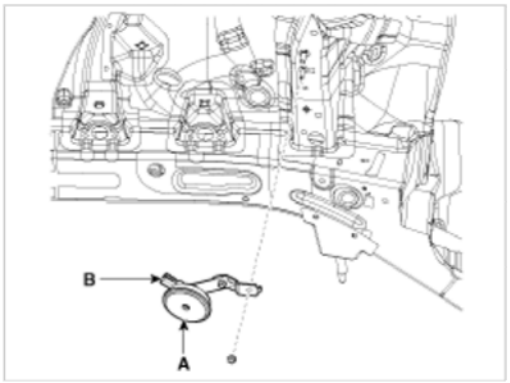


2. Check for continuity between the terminals and ground according to the table.

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

Burglar Horn Inspection

1. Remove the burglar horn (A) after removing a nut and disconnect the connector (B) 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.

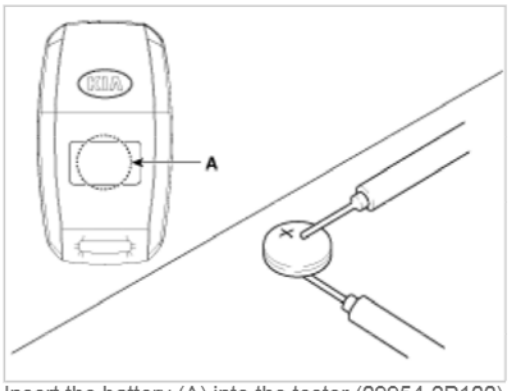
Body Electrical System

Inspection

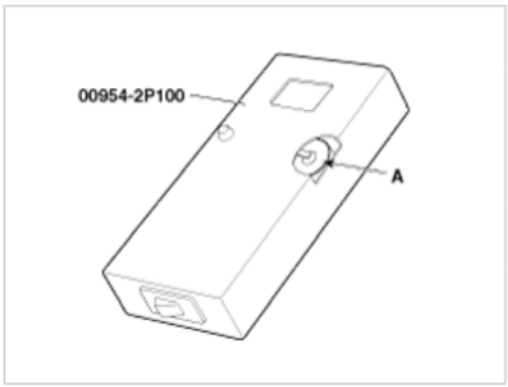
1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery (A) and check voltage if the red light doesn't flicker.

Standard voltage : 3V

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



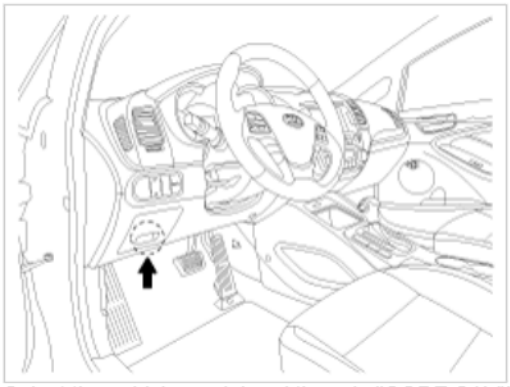
4. Push the test button and If "0.00" is displayed on screen, it means that the battery voltage is 2V or less.
5. If "L" is displayed on screen, it means that the battery is low power and it needs to replace.
6. To prevent the discharge of electricity, turn the tester power off.
7. Replace the transmitter 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.

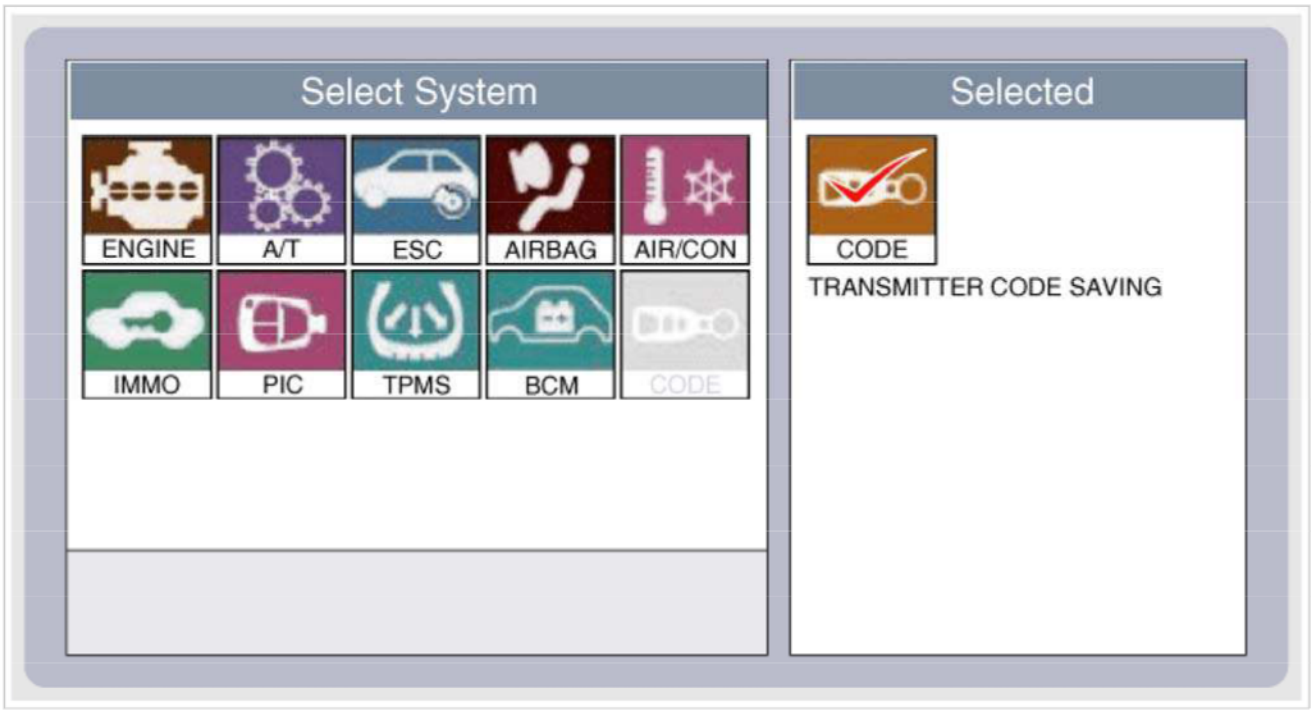
Transmitter Code Registration (Using GDS)

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.

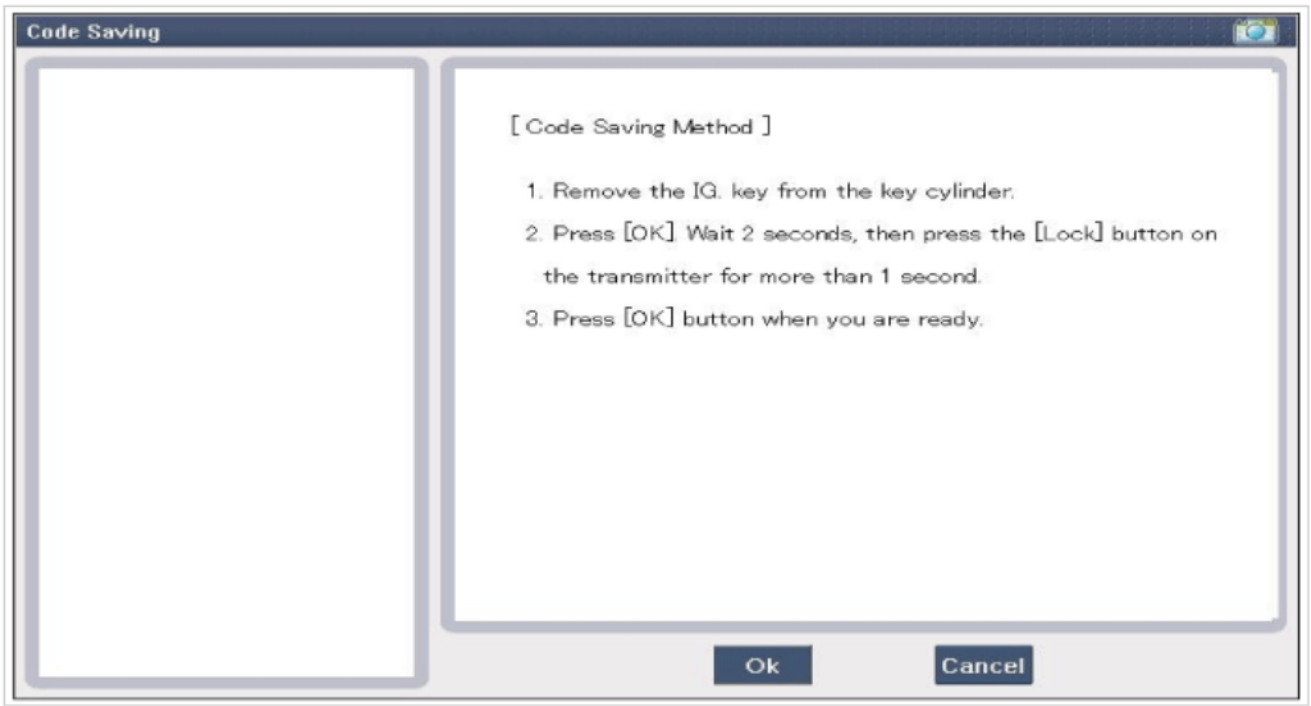


2. Select the vehicle model and then do "CODE SAVING"

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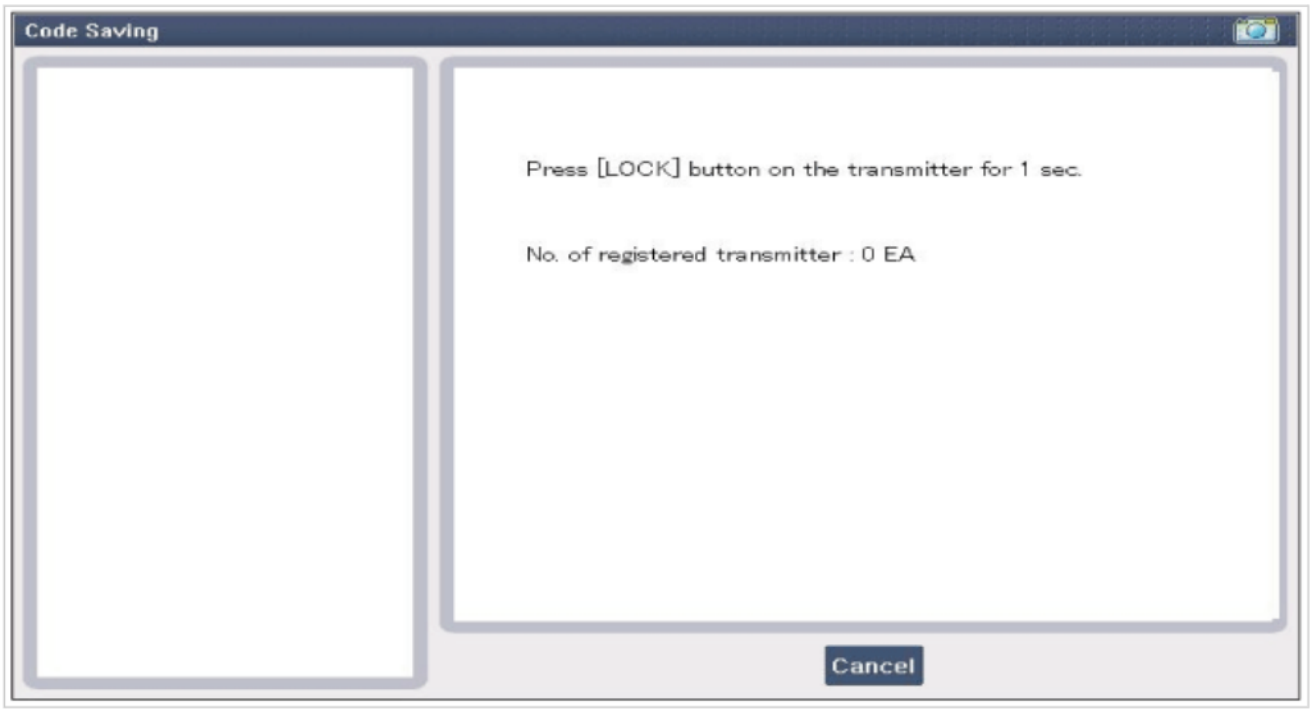


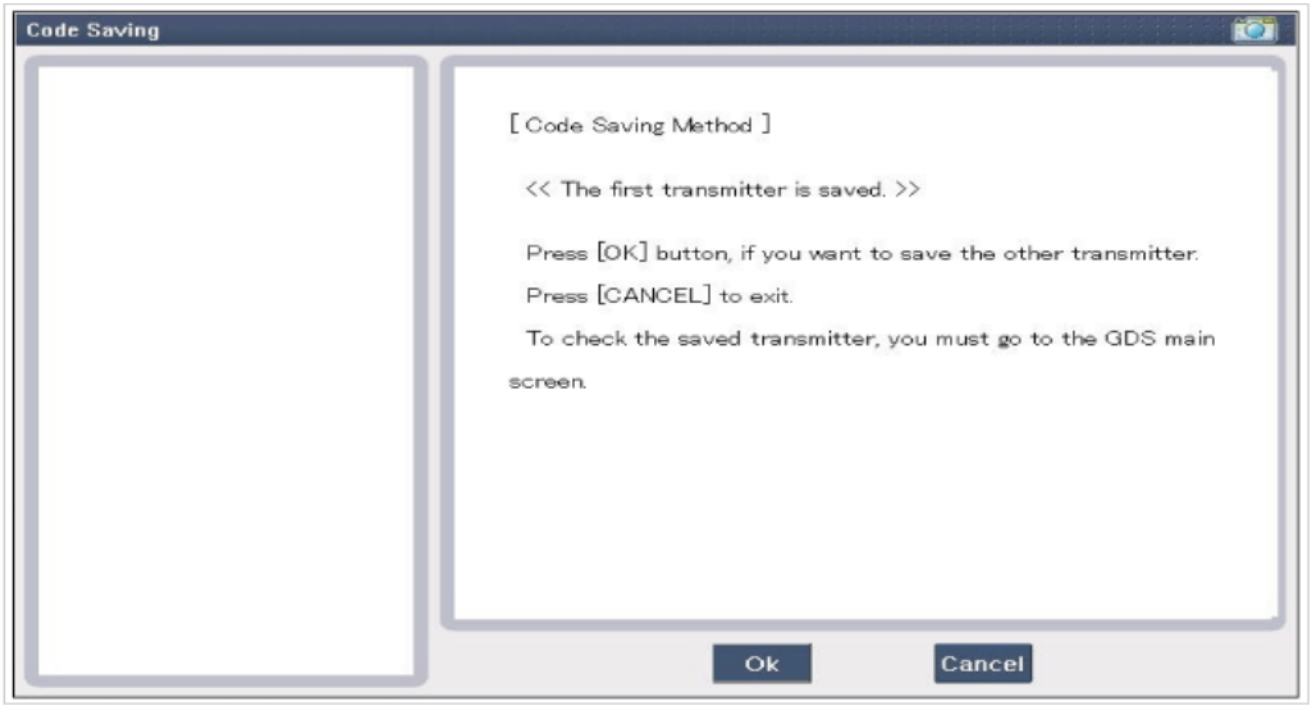
3. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.



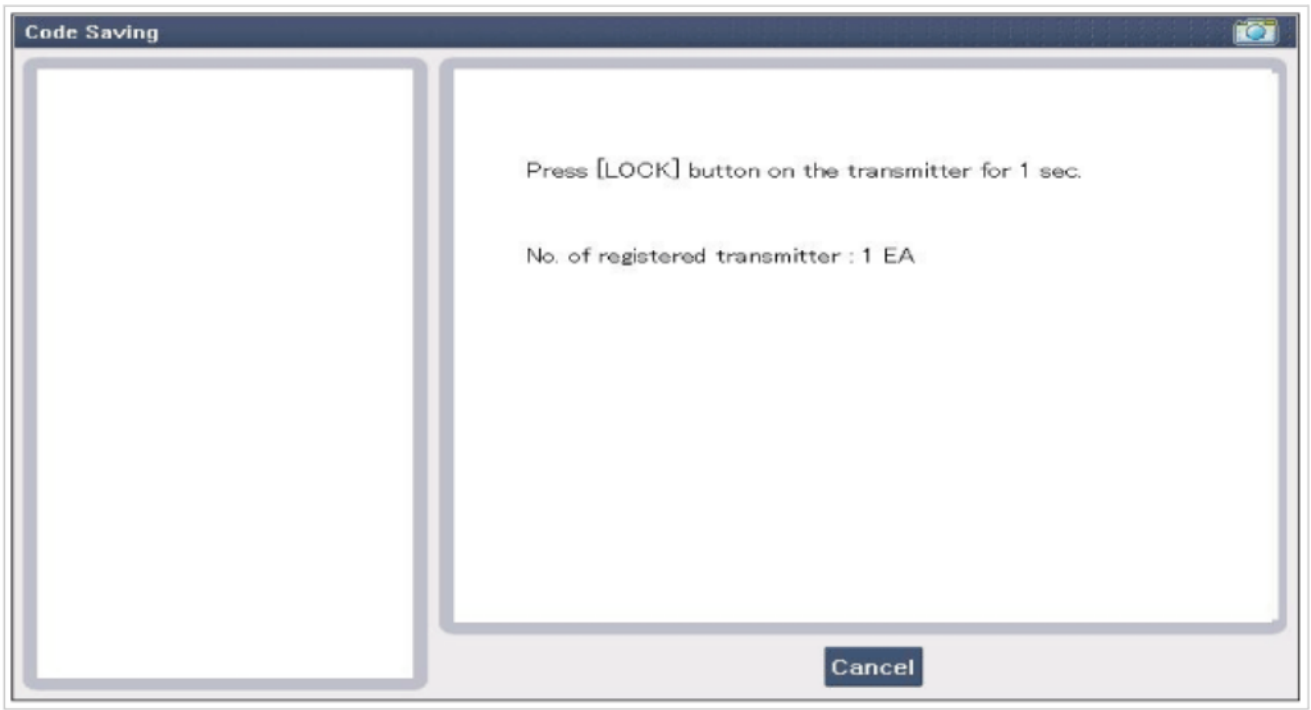
4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow steps 1 to 4 and then code saving is completed.

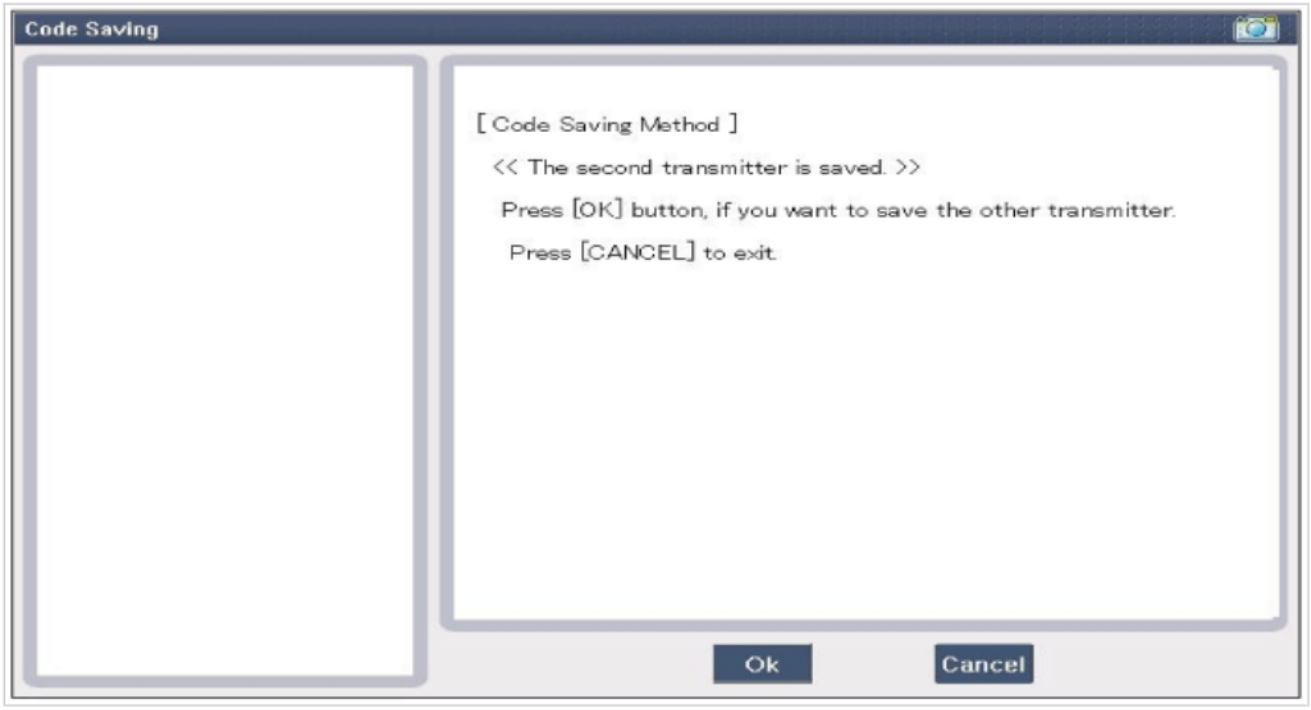
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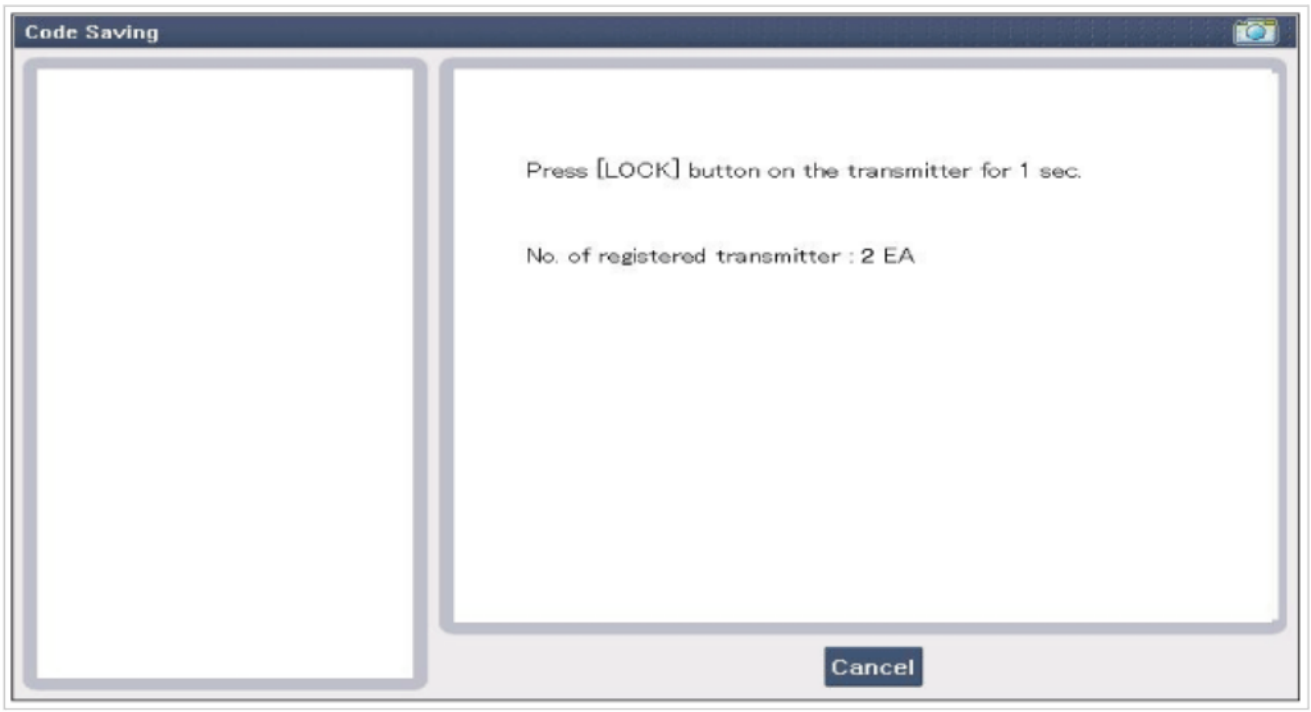


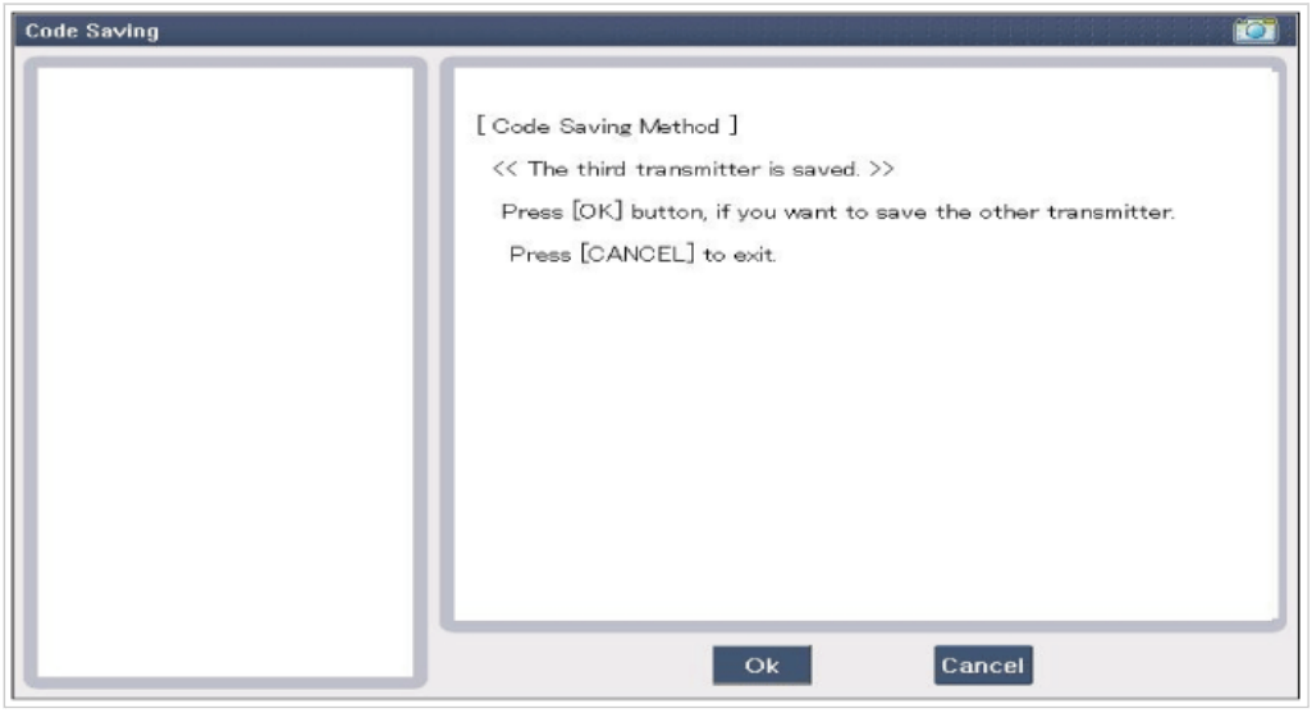
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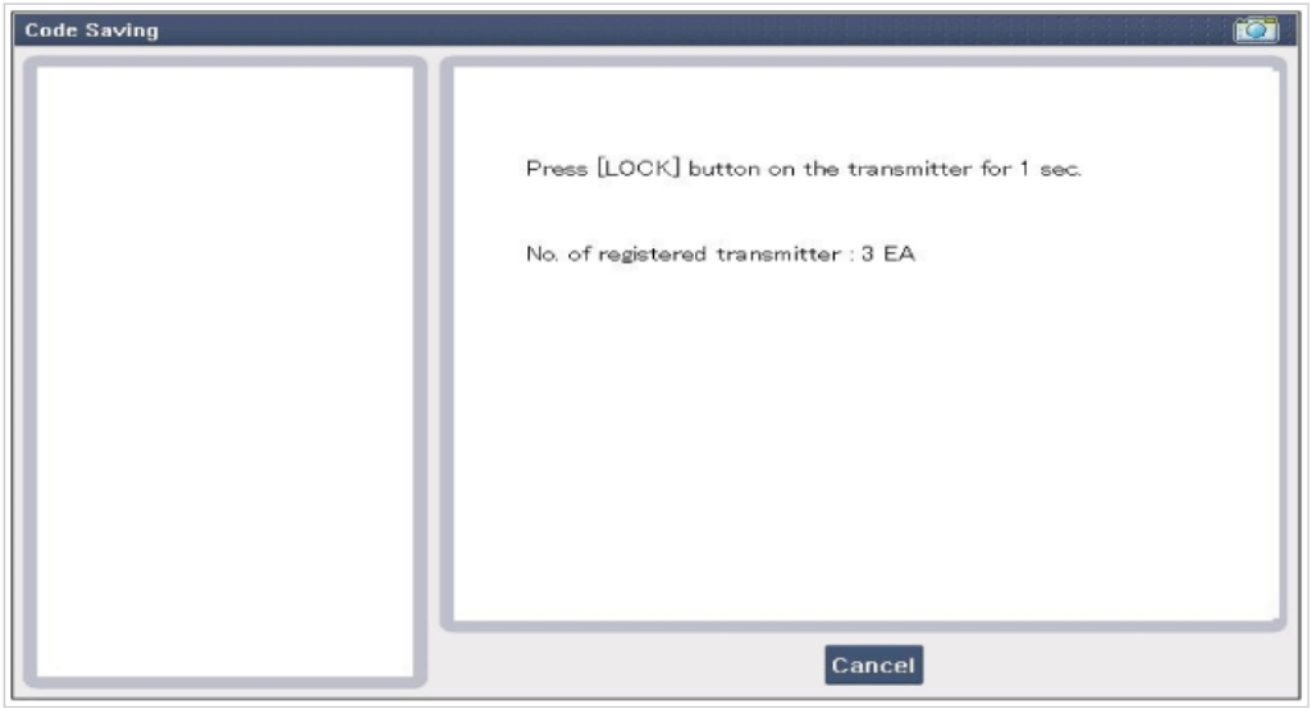


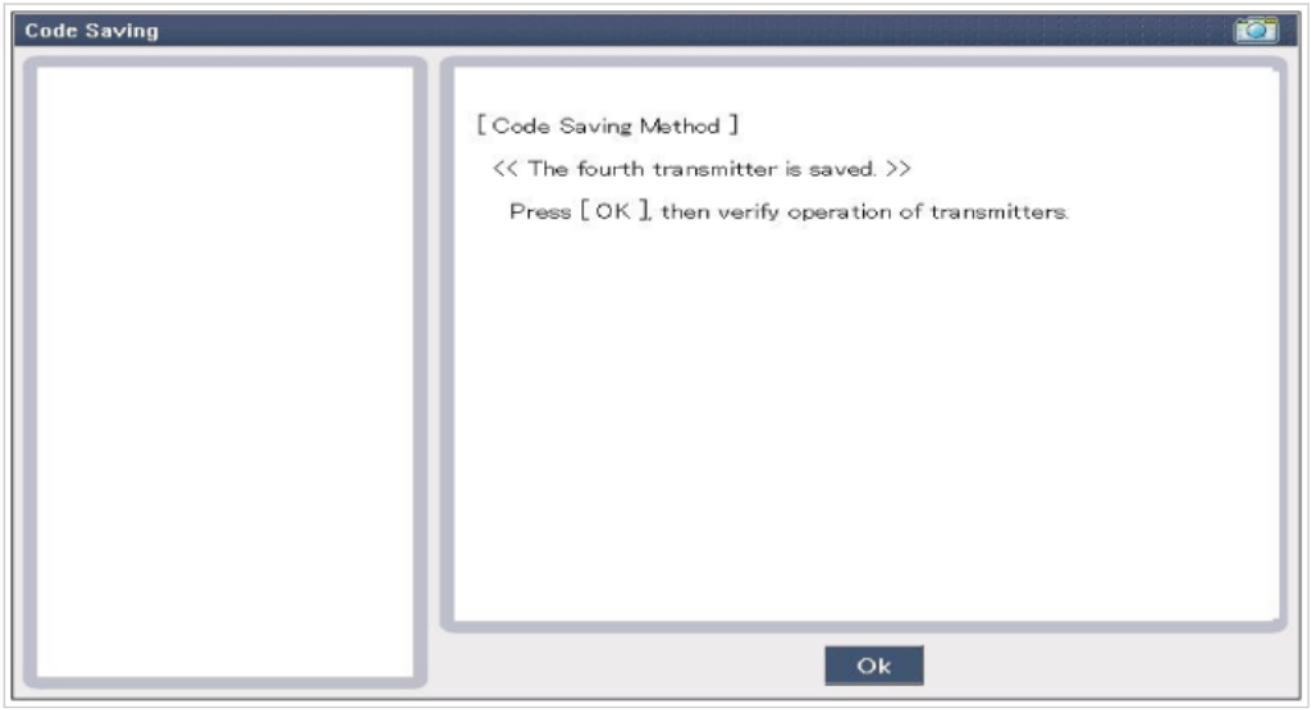
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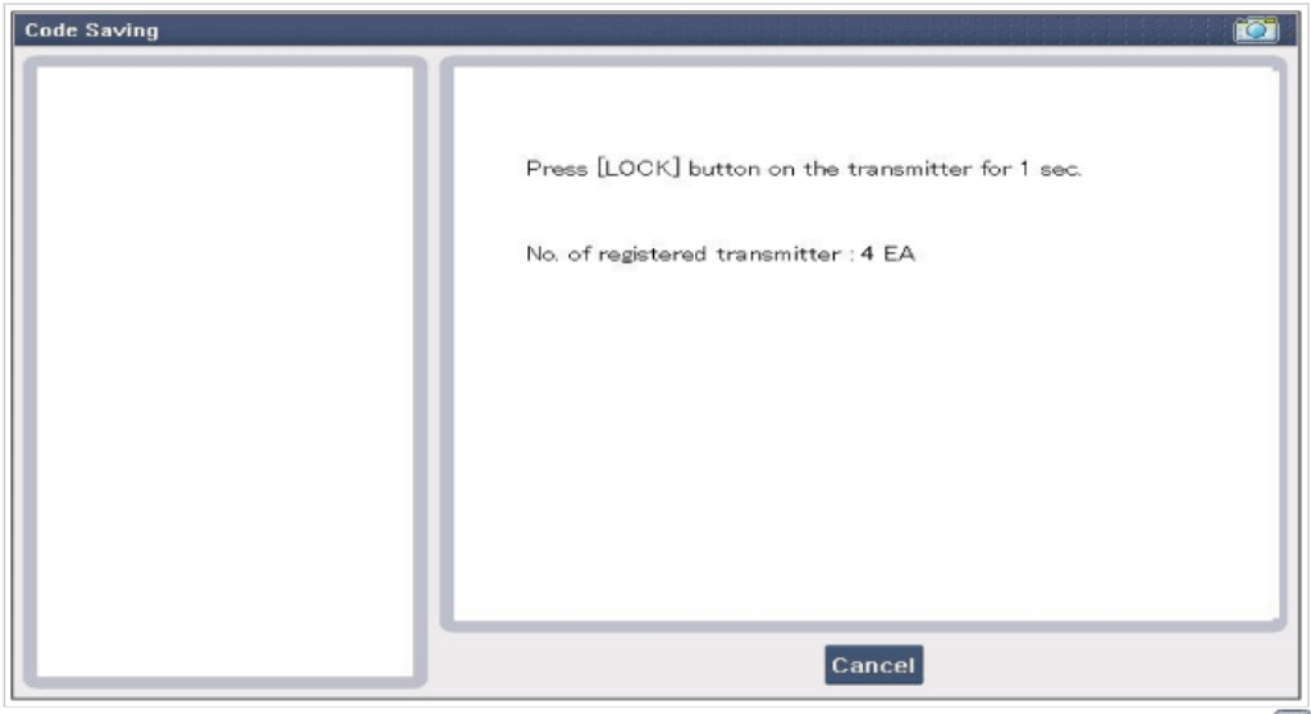


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Body Electrical System

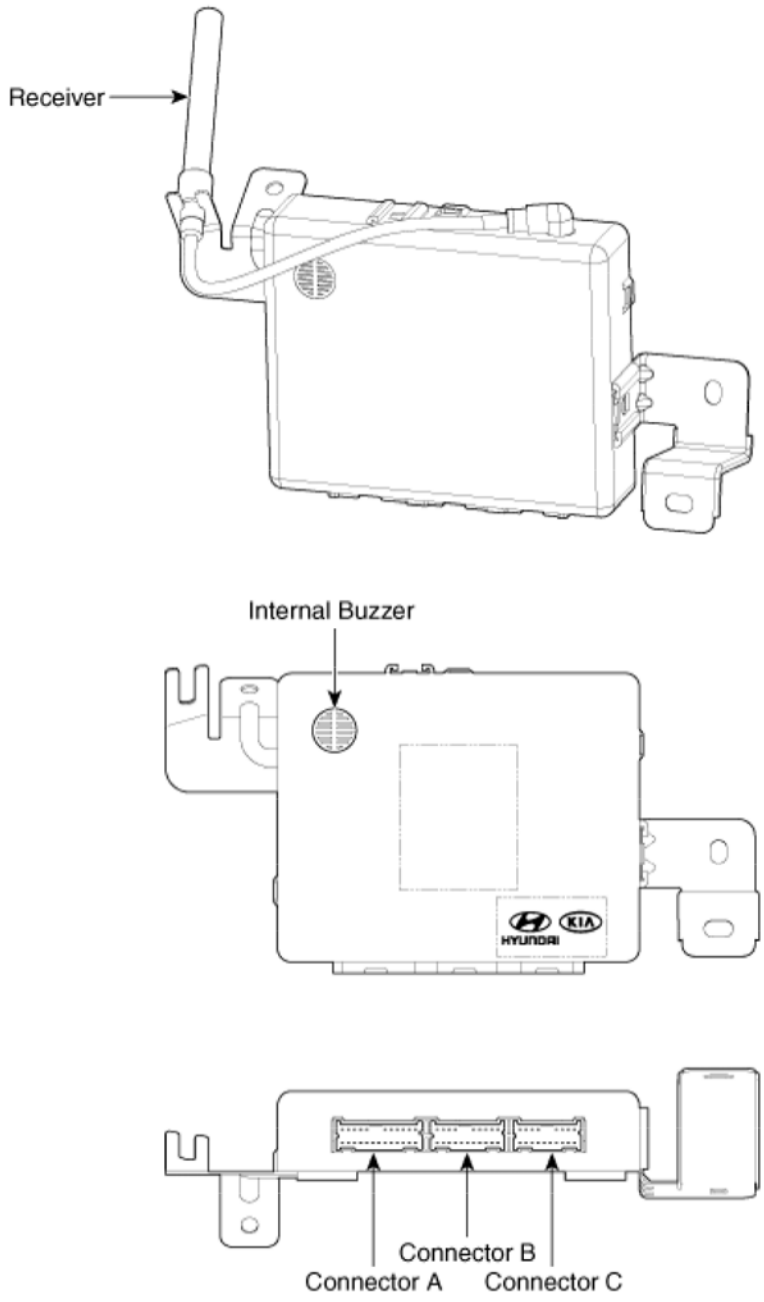
Specifications

Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F~176°F(-30°C~ 80°C)
Dark current	RKE specification : Max. 5.5mA Smart key specification : Max. 4.5mA Standard : Max 3.0mA

Body Electrical System

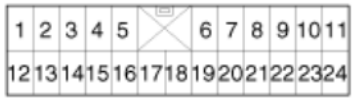
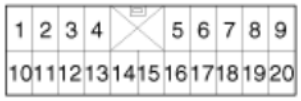
Components

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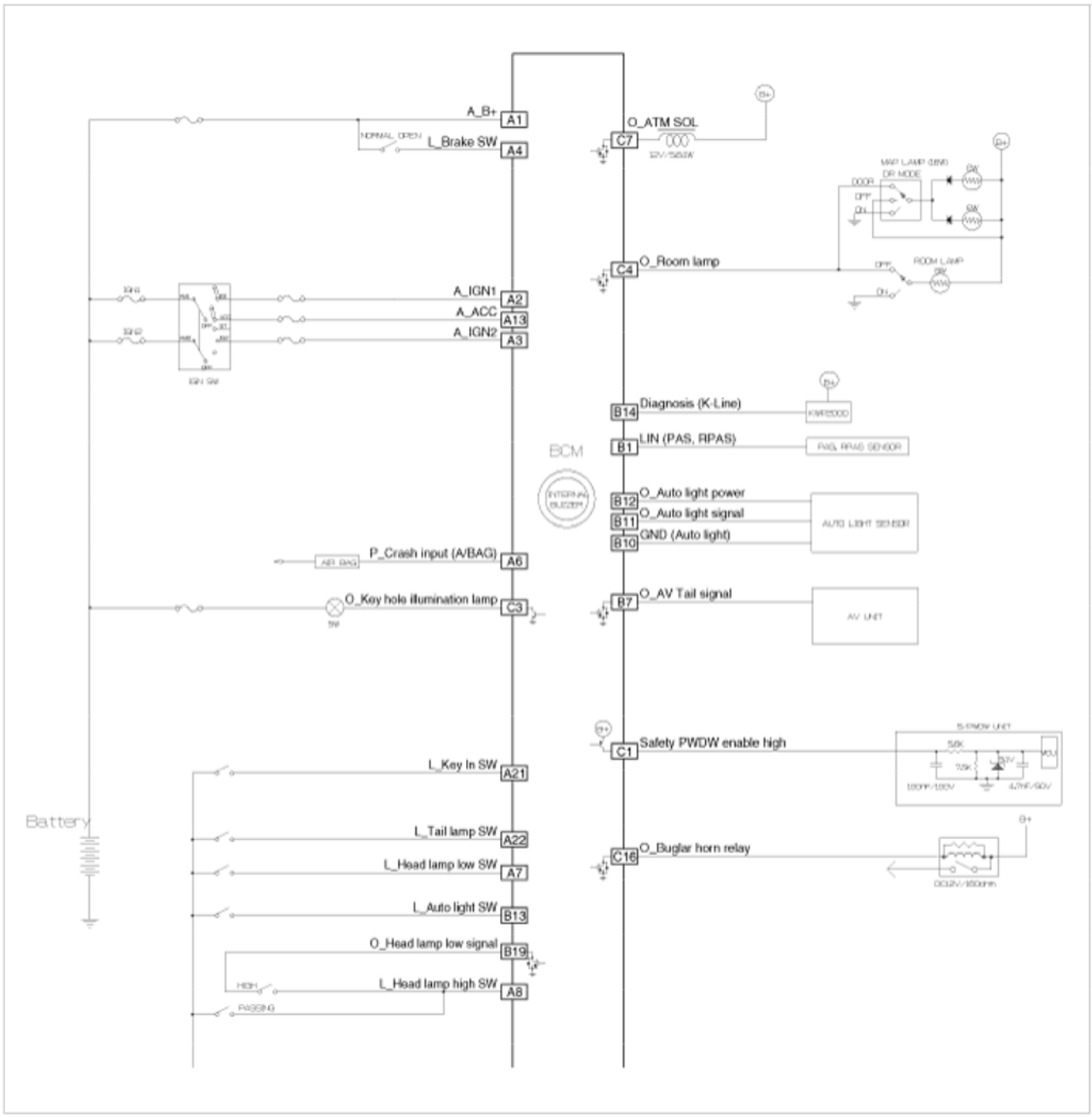
※ Internal Buzzer : Parking assist system buzzer

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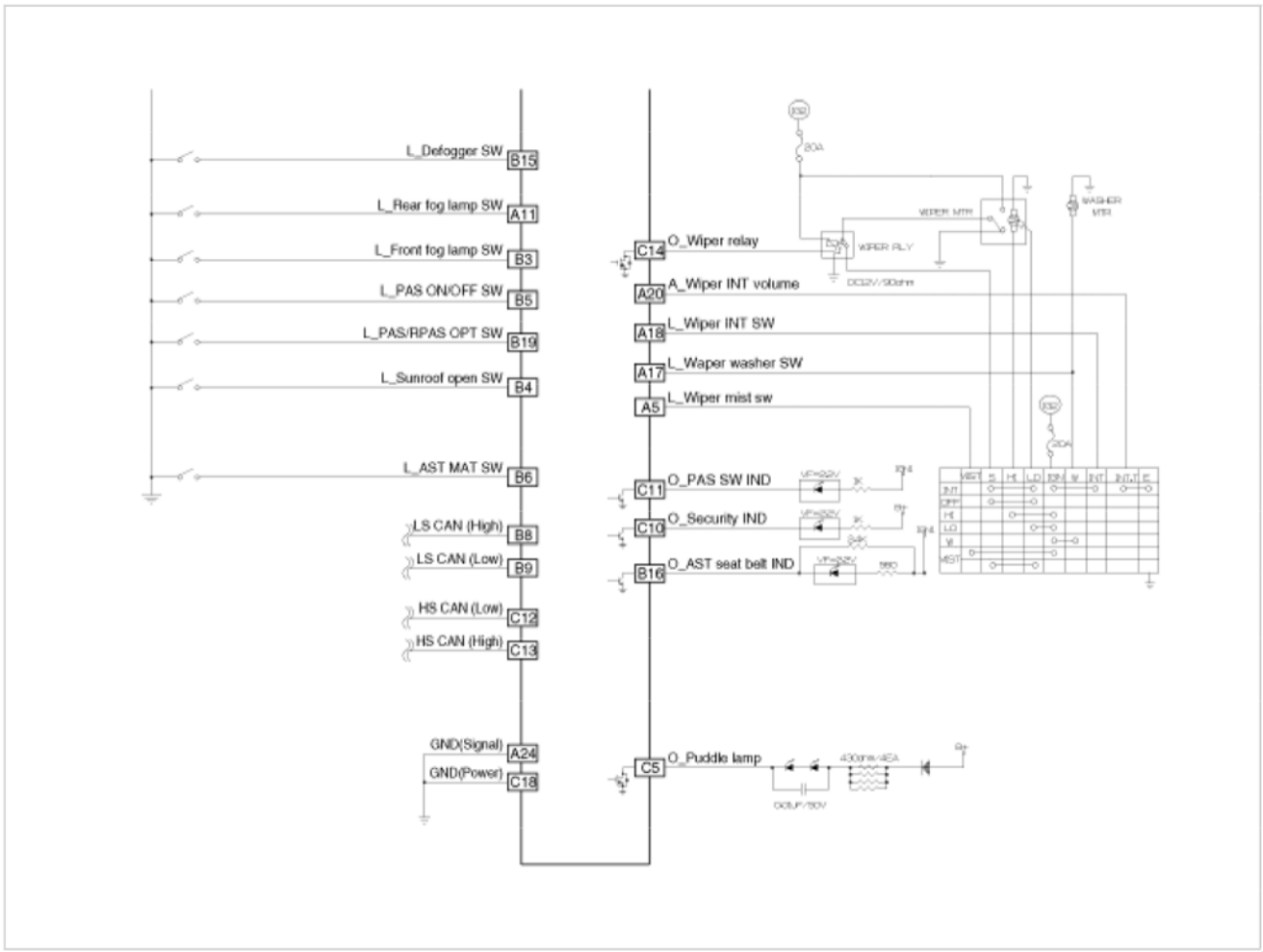
No.	Connector A	Connector B	Connector C
			
1	Battery	LIN communication(PAS, RPAS)	Safety power window Enable high
2	IGN 1	Air bag switch (option)	MTS Tx
3	IGN 2	Front fog lamp switch	Key hole illumination lamp
4	Brake switch	Sunroof open switch	Room lamp
5	Wiper mist switch	PAS ON/OFF switch	Puddle lamp
6	Crash Unlock	Assist MAT switch	Key solenoid
7	Head lamp low switch	AV TAIL	ATM solenoid
8	Head lamp high switch	LS CAN High	-
9	Rear wiper washer switch (5DR only)	LS CAN Low	-
10	Rear wiper mist switch (5DR only)	Autolight ground	Security indicator
11	Rear fog lamp switch	Autolight signal	PAS switch indicatior
12	Rear wiper INT switch (5DR only)	Autolight power	HS CAN Low
13	ACC	Autolight switch	HS CAN High
14	MTS Rx	K-LINE communication	Wiper relay
15	-	Rear glass heater switch	-
16	-	Assist seat belt indicator	Burglar horn relay
17	Wiper washer switch	Rear left seat belt indicator	Rear wiper relay (5DR only)
18	Wiper INT switch	Rear center seat belt indicator	Power ground
19	PAS/RPAS switch (option)	Head lamp low signal	
20	Wiper INT volume	Rear right seat belt indicator	
21	Key IN switch		
22	Tail lamp switch		
23	Key interlock switch		
24	Signal ground		

Circuit Diagram

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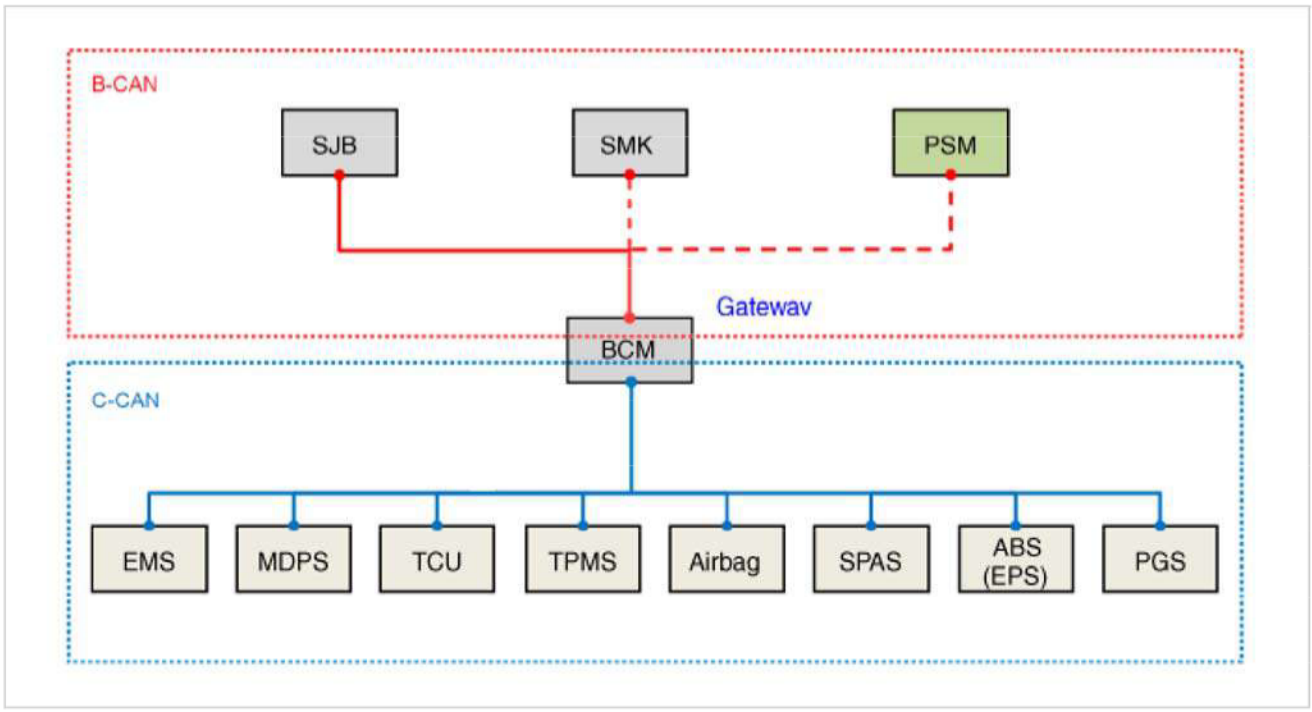


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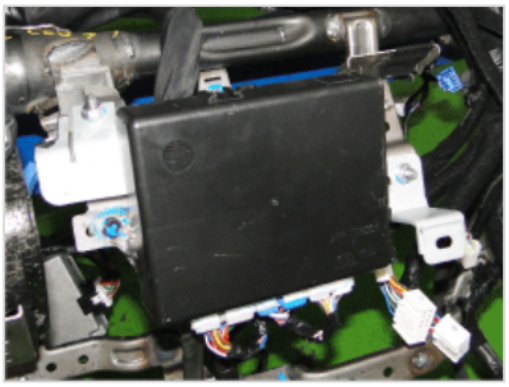


Body Electrical System

Description



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Function

Function	Description	
	Input	Output
Front Washer & Wiper	- IGN2 On & WasherS/W On and Off	- Controlling Wiper Rly for 2.5~3.8 sec.
Front INT Wiper	- IGN2 On & Front Wiper Int S/W On	- Controlling Wiper Rly On/Off with 2.2~10 sec period depending on INT_Volume (5Step)
Front MIST Wiper	- IGN2 On & Mist S/W On	- Controlling Wiper Rly On during Mist S/W On (700msec)
DRV Seatblet Reminder	- IGN On while belt off	- Seat Belt Indicator blinking and buzzer warning for 6 sec.
	- IGN On while belt on	- Seat Belt Indicator for 6 sec. and warning buzzer Off
	- IGN1 On & Drv sea belt Sw [Off→On]	- Seat Belt Indicator Off and Buzzer Off
	- IGN On & Vehicle Speed > 10km/h while belt off	- Seat Belt Indicator and warning buzzer pattern starting (PATTERN : 6sec on / 24sec off X 11times)
	- IGN On & Vehicle Speed > 5km/h while belt off	- Seat Belt Indicator blinking and buzzer warning for 6 sec.
	- Pattern starting while Vehicle Speed < 5km/h	- 6 sec. after Seat Belt Indicator Off and Buzzer Off
Key Operated Warning	- (Key In or SMK ACC) S/W On & Driver door open	- Key Operated Buzzer Warning starting
Parking Start Warning	- IGN1 On & Parking Brake S/W On & Vehicle Speed > 5km/h	- Parking Brake Buzzer Warning Starting
PAS/RPAS Warning	- Gear Position R and PAS/RPAS Sensors detecting warning	- PAS/RPAS Warning Starting according to warning level from PAS/RPAS Sensors
Power Window/ Safety Power Window	- IGN1 On	- Power Window/Safty Power Window enable all the time
	- IGN1 Off	- 30sec. After IGN 1 turned off, Power Window/ Safty Power Window disable
	- less than 30 sec. after IGN1 turned off, and Drv Door Open	- Power window/Safty Power Window disable immediately
Rear Defogger/ Front Deicer	- IGN1 On & Alternator On & Defogger S/W On	- Defogger On & Deicer On for 20 min.
Room Lamp	- Any Door Open	- Room Lamp On for 20min.
	- All Door Closed & Key [On→Off] & Any Door Unlock	- Room Lamp On for 30sec.
	- All Door Closed & Key [On→Off] & All Door Lock	- Room Lamp Off
	- Tx Unlock	- Room Lamp On for 30sec.
	- Tx Lock while Room Lamp On	- Room Lamp Off
IGN Key Holl Illumination	- IGN1 Off & Door open	- Key Illumi Lamp On for 20min.
	- IGN1 Off & Door [open→close]	- Key Illumi Lamp On for 30sec.
Key Inter Lock	- IGN1 On or ACC On & Key inter lock S/W On	- Key Solenoid On
ATM Shift Lock	- IGN1 On & Inhibit P On & Brake S/W On	- ATMSOL On
Tail Lamp	- Tail lamp S/W On	- Tail Lamp On
Tail Lamp Auto Cut	- Key In & Tail S/W On → Key Off → Drv Door Open	- Tail Lamp Off

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Auto Light	- key In & Tail S/W On → Key Off → Drv Door Open → Tail S/W [Off→On]	- Tail Lamp On
	- IGN1 On & Autolight S/W On with day light condition	- Tail lamp Off, Headlamp Off
	- IGN1 On & Autolight S/W On with night light condition	- Tail lamp On, Headlamp On
	- IGN1 on & Autolight S/W on with day light condition → night light condition	- 12sec. after sensing night light condition, Tail lamp On and Headlamp On
	- IGN1 on & Autolight S/W on with night light condition → day light condition	- 12sec. after sensing day light condition, Tail lamp Off and Headlamp Off
Head Lamp	- IGN2 On & Headlamp S/W On	- Head Lamp On
Escort	- IGN2 On, HeadLamp S/W On → IGN Off	- Head Lamp On & Tail Lamp On for 5min.
	- IGN2 On, HeadLamp S/W On → IGN Off → Driver Door Open → Drive Door Close	- Head Lamp On for 15sec, and Tail Lamp On for 15sec.
Welcome	- Headlamp S/W On & All Door Closed & All Door Locked & Key Off & TX Unlock	- Headlamp On & Tail lamp On for 15 sec.
	- Headlamp S/W On & All Door Closed & All Door Locked & Key Off & TX Unlock → TX Lock before 15 sec timer expirsed	- Headlamp Off just after TX Lock
	- Autolight S/W On & night light condition & All Door Closed & All Door Locked & Key Off & TX Unlock	- Headlamp On & Tail lamp On for 15sec.
DRL	- IGN2 On & Alternator On and DRL Option On & H/Lamp S/W Off & Front fog Off	- DRL On
	- IGN2 On & Alternator On and DRL Option On & Tail lamp S/W Off	- DRL On
	- IGN2 On & Alternator On and DRL Option On & Tail lamp S/W [Off→On]	- DRL Off
Front Fog Lamp	- Front Fog S/W On when IGN2 On & Tail lamp On	- Front Fog Lamp on
Rear Fog Lamp	- Rear Fog S/W On when IGN2 On & Tail Lamp On & Front Fog Lamp On	- Rear Fog Lamp on
	- Rear Fog S/W On when IGN2 On & Tail Lamp On & HeadLamp On	- Rear Fog Lamp on
Puddle Lamp/ Pocket Lamp	- SMK Option & Tx UnLock	- Puddle Lamp On
	- SMK Option & Tx Lock	- Puddle Lamp Off
AV Control	- Autolight sensing with day light condition	- AV Tail On
	- Autolight sensing with night light condition	- AV Tail Off
Central Lock/ Unlock	- P/WDW Lock S/W On or Tx Lock	- All Door Lock
	- P/WDW Unlock S/W On or Tx Unlock	- All Door Unlock
Key Reminder	- Key On & Driver/Assist door Open & P/WDW Lock S/W On	- All Door Unlock. If knob keeps being in lock, BCM retries unlock 3 times
	- Key On & Driver/Assist Door Open & Driver/Assist Knob changes unlock → lock	- All Door Unlock. If knob keeps being in lock, BCM retries unlock 3 times
Passive Reminder	- Passive Reminder signal received from SMK	- All Door Unlock and Buzzer warning starts
Crash Unlock	- Key On & Crash Signal received	- All Door Unlock for 5 sec.
Speed Sensing Auto door Lock	- IGN1 On & Alternator On & Any Door Unlock & Vehicle Speed >15km/h	- All Door Lock
	- IGN1 On & Alternator On & Vehicle Speed >15km/h & All Door Lock → Any Door unlock	- All Door Lock
Shift-Lever Auto door Unlock	- IGN1 On & Alternator On & Shift-Lever Position not [P] → [P]	- All Door Unlock
Key Off Auto Door Unlock	- Any Door Lock & Key [In] → [Off]	- All Door Unlock
Tail Gate Release	- All Door Unlock & Tail Gate Open S/W On	- Tailgate Release
	- Passive Tailgate signal received	- Tailgate Release
Two Turn Unlock	- Tx Unlock & Tx Unlock It Again after 4sec	- Drv Door Knob Unlock
	- Tx Unlock & Tx Unlock It Again in 4sec	- All Door Knob Unlock
Security Indicator	- Tx Lock & after 30sec (Burglar Alarm State – ARM)	- 0.32sec On / 2sec Off
Outside Mirror Auto Folding/ Unfolding	- Pwdw Mirror S/W Auto Position & Tx Unlock	- Mirror Unfold
	- Pwdw Mirror S/W Auto Position & Tx Lock	- Mirror Fold

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Sunroof Open	- SunRoof Open State → IGN Off → Drv Door Open	- SunRoof Open Warning By Cluster 7sec
Navigation Wakeup	- Key Out & Tx Unlock/Passive Unlock received	- Navigation Wakeup Signal sends - No re-send within 1 min.
Anti Theft	- All Door Closed & Key Off & Tx Lock & All Door Closed	- Armwait for 30 sec. - Arm after 30 sec. without any interrupts
	- [Arm state] Door open without Tx unlock/Passive Unlock signal	- Horn activates, Hazard lamp blinks
Panic	- Tx Panic	- Horn activates, Hazard lamp blinks
Horn Answer Back	- Tx Lock & Tx Lock It Again in 4sec	- Horn On (0.1sec)

Body Electrical System

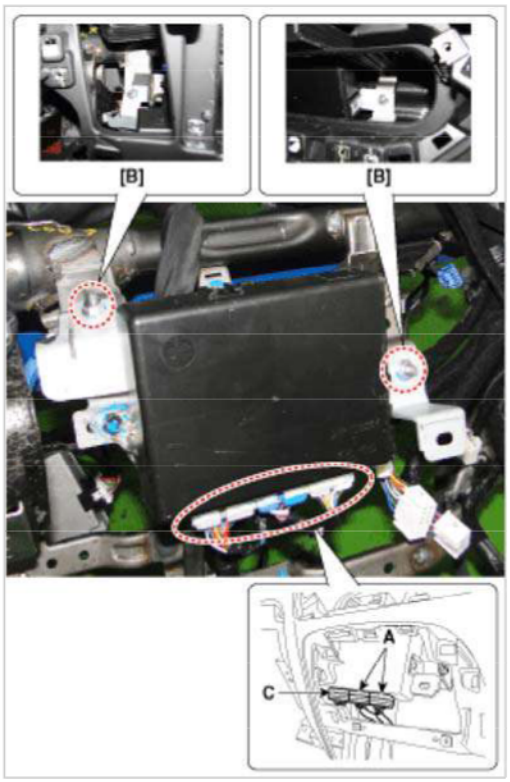
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the heater & A/C control unit.
   (Refer to Heating,Ventilation, Air Conditioning - "Heater & A/C controller unit(Manual))
   (Refer to Heating,Ventilation, Air Conditioning - "Heater & A/C controller unit(DATC))
3. Remove the floor console assembly.
4. Remove the center lower cover (A) after loosening the screws.



5. Remove the BCM unit. (in the order as below)
   (1) Disconnect the connectors (A) from the BCM unit.
   (2) Loosen the mounting nuts (B).
   (3) Remove the BCM unit (D) after disconnecting the connector (C) from the BCM unit.

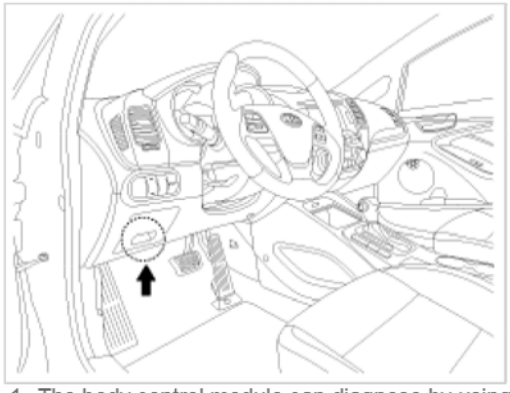
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Installation

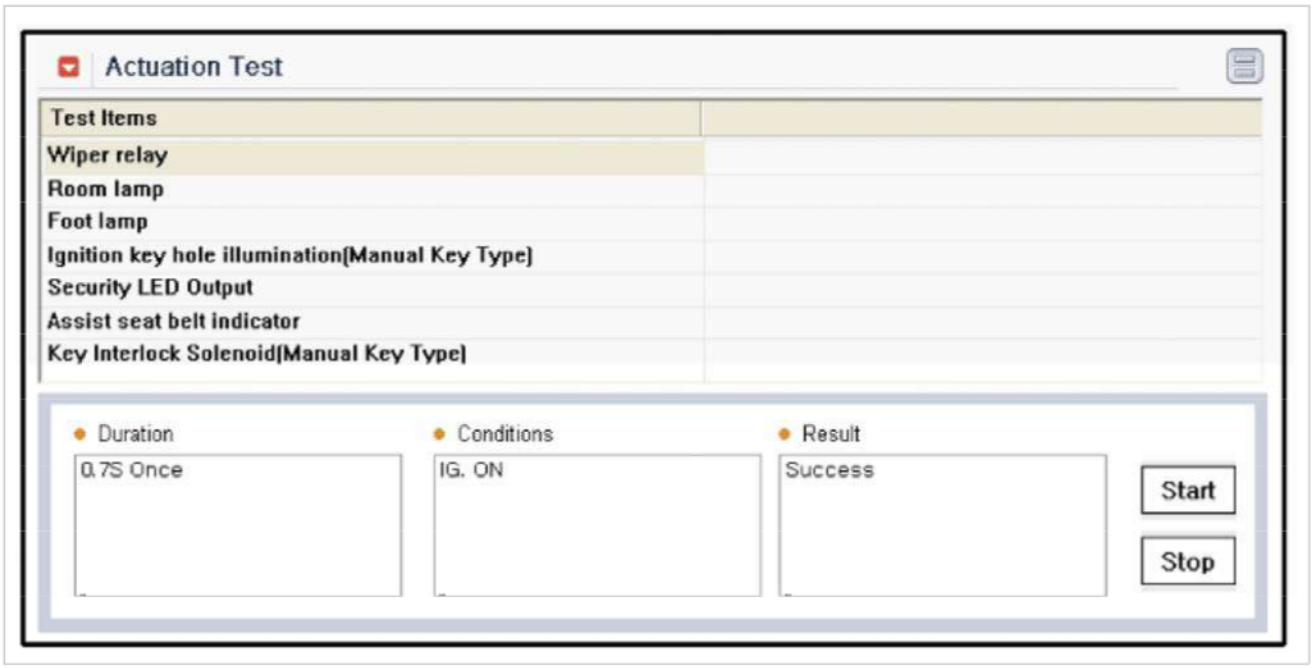
1. Install the BCM unit.
2. Install the center lower cover.
3. Install the floor console assembly.
4. Install the heater & A/C control unit.
5. Connect the negative (-) battery terminal.

BCM Diagnosis With GDS



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

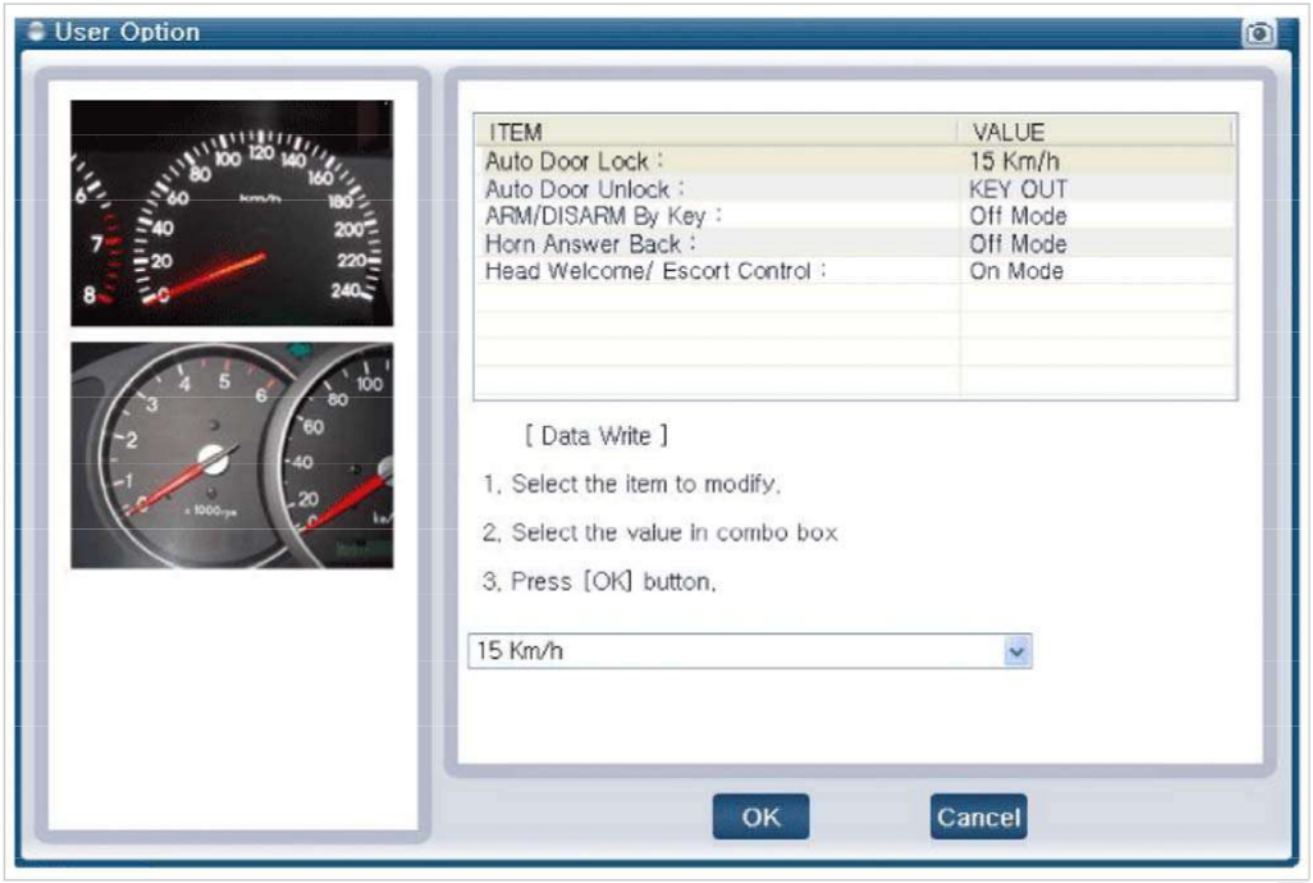
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5. If you want to change user option, select “user option”.



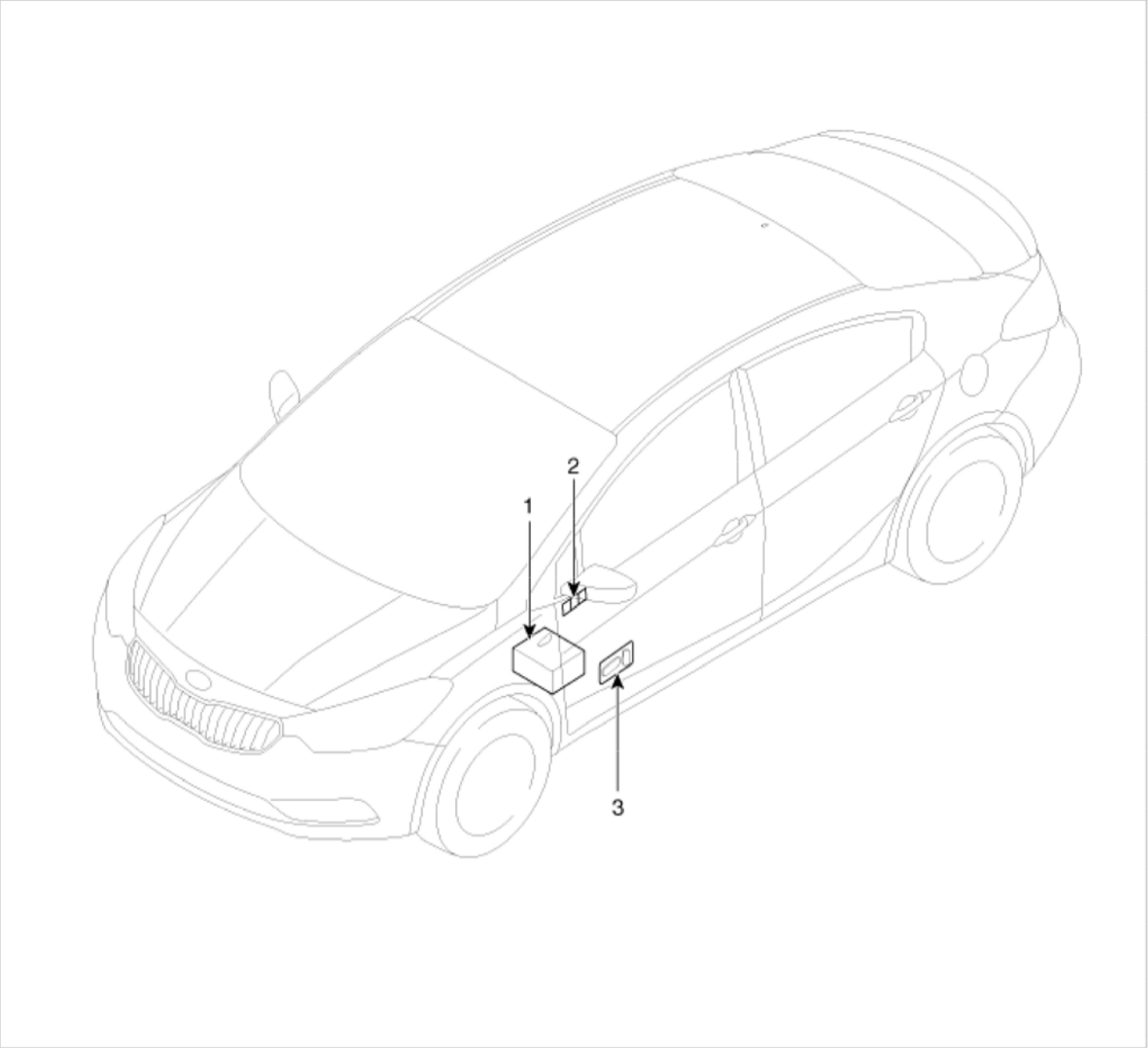
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Body Electrical System

Component Location

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1. Seat Memory Unit (IMS) 2. IMS control switch	3. IMS driver power seat control

Body Electrical System

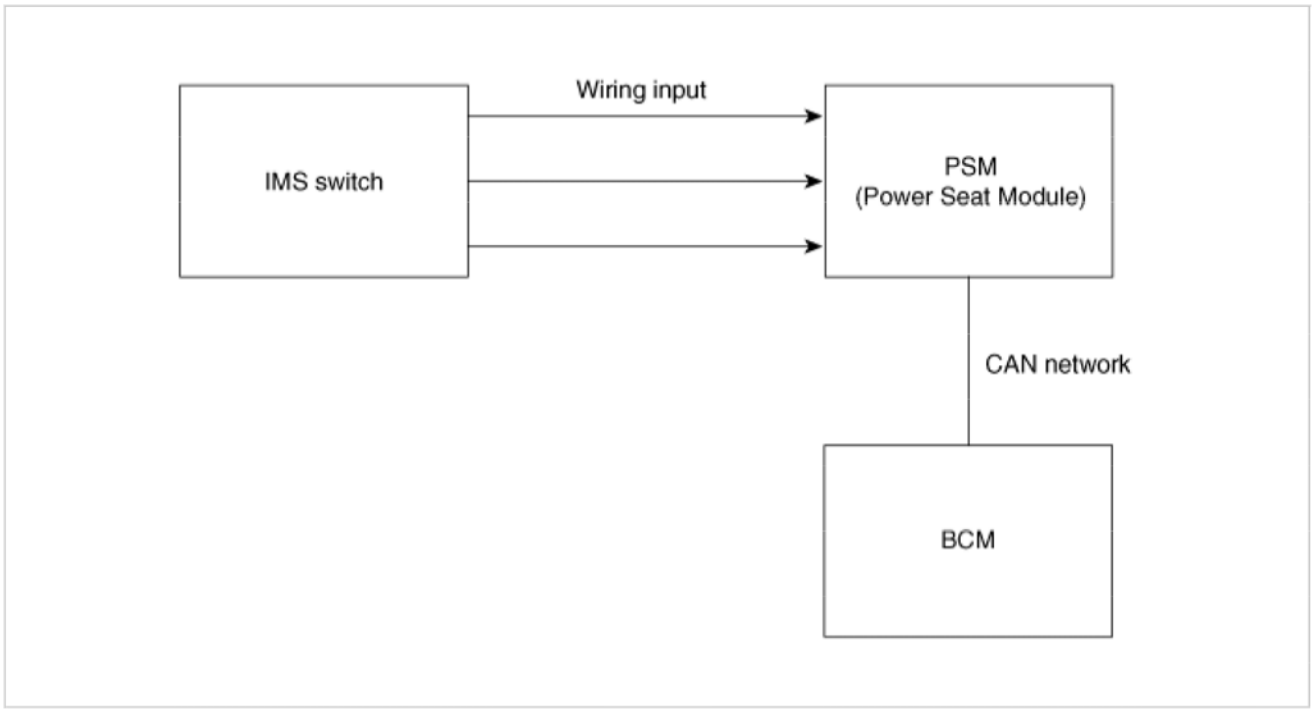
Description

System Outline

An optimal seat position set by a driver can be memorized in Power seat unit by IMS SW, which enables restoration of seat position set by the driver despite.

Playing of this function during drive is banned for safety reasons, and it has emergency stop function of restoration and gearing operation as well.

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Input Specification

1. IGN2
   IGN switch input is determined by Local switch “IGN2”.
2. SEAT MANUAL switch : SEAT Input
   (1) SLIDE Front rear / rear right manual switch
   Operating SLIDE motor of Seat either backward or forward
   (2) Recline Front rear / rear right switch
   Operating recline motor of seat either backward or forward
   (3) Front rear height UP / DOWN manual switch
   Operating Front rear height motor of SEAT either upward or downward
   (4) Rear right height UP / DOWN manual switch
   Operating rear right height motor of SEAT either upward or downward
3. SEAT position Sensor (pulse Signal)
   Sensing movement amount of Slide, Recline, Front rear height, and Rear right height motor
4. Dr Door switch
   Sensing that drive door opens
5. Speed
   This signal is received for sensing vehicle speed by BCM
6. IMS switch
   (1) SET switch
   Allowing for saving the SEAT position set by driver
   (2) 1, 2 switch
   Saving and replaying the SEAT position set by driver
7. CAN Communication LINE

Transmitting communication signals between IMS and BCM

CHATTERING Control in Input Signal

1. Input switch - 40ms delay
   SLIDE, RECLINE, Front rear height, rear right HEIGHT switch
   “P” Position switch, SPEED, KEY IN, LOCAL KEY IN switch, DR DOOR switch, IGN2 switch
2. IGN switch input is determined by Local switch “IGN2.

TIME Error

1. ±10%, for TIME without error indication
   ±50ms, for TIME not exceeding 500ms
2. Indicated time in each function does not include Time of controlling CHATTERING started from changing point of rr input.

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Operation

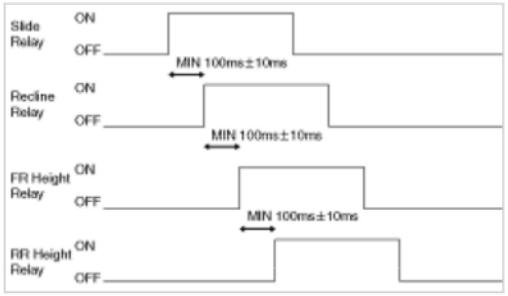
Control Specification

1. MANUAL Operation
   (1) MANUAL Seat Operation SEAT is to be operated by MANUAL switch Input of SEAT. SLIDE, RECLINE, Front rear height, and rear right height is available to operate manually with IGN2 ON regardless of ECU B+ OFF.
2. MEMORY Saving Operation
   (1) Allowing for Memory Storage
   This process is allowed in case that IGN2 switch = ON, and SPEED input is high (less than 3km/h).
   1 BUZZER output is generated from IMS by receiving the DATA, "SET = 1."
   (2) Memory Saving Operation
   When MEM_1 or MEM_2 of transmitted wining communication DATA receives the DATA ("1") by IMS switch generated from 1 or 2 switch control in memory storage permission mode above, 2 BUZZER outputs are generated and current seat position is stored. (IMS switch transmits storage command only if 1 or 2 switch input is generated within 5 seconds from SET switch OFF->ON, and the storage permission mode is cancelled if more than 5 seconds are elapsed.)
   (3) Requirements for Memory Storage
   MEMORY Storage is not allowed or cancelled in case that all of the following requirements are not met.
   A. Ignition switch is ON
   B. Vehicle speed input received from BCM is high (less than 3Km/h)
   C. Less than 5 seconds elapsed from SET switch OFF->ON (determined by IMS switch)
   (4) Memory SET is to be available for memory storage notwithstanding the number of SET times. (However, each MEMORY switch operation delivers 1 memory storage action only.)
   (5) If MEMORY command is received during operating easy access function or reproducing memory, activation is stopped, and current position is stored.
   If the command is received during operating MANUAL switch of SEAT, it will be stored where the memory command is received.

Memory Reproduction

1. Reproducing Memory
   When "1" is received by DATA PL_1 or PL_2 of LIN communication transmitted by IMS switch generated from 1 or 2 switch operation, 1 BUZZER output is generated and SEAT position is automatically controlled, moving back to where it is stored to be according to MEMORY.
2. Anti-Reproduction
   Reproducing memory is not allowed if the following condition is not met.
   IMS will reproduce memory, only if all of ① and ② are satisfied, and also either ③ or ④ is satisfied.
   ① Vehicle speed input received from BCM is high (less than 3Km/h)
   ② MANUAL switch of SEAT is not operated.
   ③ 1 and 2 switch of IMS switch is ON in case that driver door is open or within 30 seconds from driver door close.
   ④ Ignition switch is ON
3. Stopping Memory Reproduction
   Reproducing memory is stopped unless all of the following conditions are met.
   A. Vehicle speed input received from BCM is high (less than 3Km/h)
   B. Target position of motor not reached
   C. MANUAL switch of SEAT is not operated.
   BUZZER output is operated for USER to understand reproduction by other UNIT, regardless that MANUAL switch of SEAT is ON.
   D. SET switch is not operated
4. Other
   (1) If memory is not stored, Reproduction will not be activated by 1 or 2 switch and BUZZER Output is generated.
   (2) The most recently received signal will be reproduced if other DATA (reproduction command) is received during reproducing memory.
   (3) If Input of SEAT MANUAL switch is operated during reproducing seat position, the activation should be completely stopped.
   (4) If ERROR occurs during operating SEAT, memory of related motor will clear.
5. Motor Driving Control
   (1) To prevent inrush current from being duplicated during driving motor, automated control of driving motor will defer driving time for 100ms each, and the priority is as follows. SLIDE > RECLINE > Front rear height > rear right height
   (2) Driving motor is executed in the following order, in case of reproduction process, and DELAY TIME among each motor is as follows.

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TIME value of each continuous driving motor (excluding operation by MANUAL switch)

SLIDE: 20 seconds, RECLINE: 35 seconds, Front rear height: 10 seconds, rear right height: 15 seconds

(3) Motor Driving Control of Reverse Direction

If motor driving requires being in reverse direction during operating easy access function or reproduction process, driving in current direction is immediately stopped, and driving in the reverse direction will be operated following 100ms.

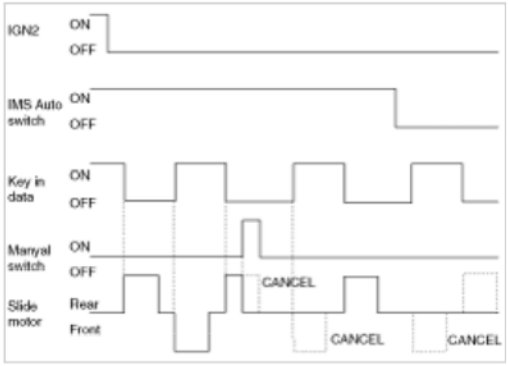
(4) If distance difference between stored position on reproduction and current position is under the rated measurement, motor is not operating regardless of receiving reproduction DATA. * SLIDE, RECLINE, Front rear height, rear right HEIGHT: 12EDGE (6PULSE)

(5) Operation is stopped in reaching target position of motor, when operating easy access function or reproduction process.

Easy access functionEasy access function

(user option - default : Operating easy access function)

1. If “SET” switch is pressed over 6 seconds, Easy access function can be set/cancelled by AUTO_SET. (2 Buzzer Outputs when setting / 1 Buzzer Output when canceling)
2. If Signal “BCM KEY IN” transmitted from BCM and signal “LOCAL KEY IN” in case that key is removed are changed from “LOW”(KEY IN) → “HIGH” (KEY OFF), KEY IN→OUT & DRIVER DOOR OPEN SEAT SLIDE is moved 50mm backward from KEY OUT position.
3. Signal “BCM KEY IN” transmitted from BCM or signal “LOCAL KEY IN” is changed from “HIGH” (KEY OFF) → “LOW” (KEY IN) by inserting KEY, it is moved to KEY OUT position.
4. Prohibiting and Stopping easy access operation.The following requirements are determined and controlled by IMS. If one of the following conditions is met during anti-operation or operation process, it is stopped.
   (1) MANUAL switch of SEAT is in operation
   (2) Reproduction command is received during easy access operation
   (3) “AUTO_SET” DATA transmitted from IMS switch has “ OFF” value.
   (If “AUTO_SET” is changed during operating, the operation is completed.)
   (4) SET message transmitted from IMS switch is “1” during easy access operation
5. If control is stopped during moving backward, the backward action is paused without moving further. When returning, it moves just as much the distance as it previously moved backwards.
6. MANUAL switch Input is operated during or after moving backward, it will move to KEY OUT position on easy access operated by KEY IN.
7. Condition to Restore Memory of riding position in a vehicle
   (1) MANUAL switch is operated in the level above Key IN
   (2) Reproducing memory is in operation



LIMIT Setting

1. LIMIT position is randomly set as following since there is no SLIDE, RECLINE, rear right height, and Front rear height LIMIT switch.
   (1) Control is immediately stopped, and the location in front of 6 pulse is set Driving LIMIT position, if more than 6PULSE is not generated for 2 seconds during initial operation by MANUAL switch or by easy access function after inserting battery.
   (LIMIT position in reverse direction is the same as above.)
   However, LIMIT position for Front rear height and rear right height is set if more than 6PULSE is not generated for a second.
   (2)

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If virtual LIMIT is set, MEMORY Reproduction is not operated off the LIMIT boundary for preventing motor damage by mechanical LOCK

(3) If PULSE is correctly input away from the LIMIT boundary by MANUAL operation or by Easy access function with the previously set LIMIT applied, LIMIT position is renewed

Detecting and Controlling ERROR

1. Detecting seat ERROR

   ERROR is controlled if the following situation occurs during easy access operation, reproduction process and operating MANUAL switch of each motor.

   (1) ERROR resulted from PULSE is not input

Direction / Item	Slide	Recline	Front Rear Height	Rear Right Height
ERROR Occurrence	Less than 6PULSE generated for 2 seconds		Less than 6PULSE generated for 1 second	
Precondition	LIMIT Setting Completed			

   Related motor output is stopped if ERROR is detected during reproduction and easy access operation

   Related motor output is stopped, if ERROR is found in MANUAL operation.

   (2) Sensor Vcc of Seat is detected as much as 40ms from less than 1V. => Return if Sensor Vcc of Seat is over 7V.

   If SEAT Sensor Vcc ERROR is detected during reproduction and easy access operation, all operating SEAT motor is stopped. (BUZZER output is not operated.)

2. ERROR Control

   If ERROR is detected as shown above, it is considered to be caused by broken HARNESS or Sensor malfunctioning, and is controlled as following.

   A. BUZZER output is operated during receiving storage and reproduction command regardless of ERROR occurrence

   B. Paused easy access operation and memory reproduction is available to be re-activated from operating MEMORY command after motor malfunctioning is repaired, and it is as following.

      (When SLIDE motor is repaired from Sensor ERROR, Easy access function is available)

      SEAT: 6PULSE is correctly input from ERROR causing motor position Sensor by operating MANUAL switch with in 2 seconds (SLIDE, RECLINE)/ 1 second(Front rear height, Rear right height).

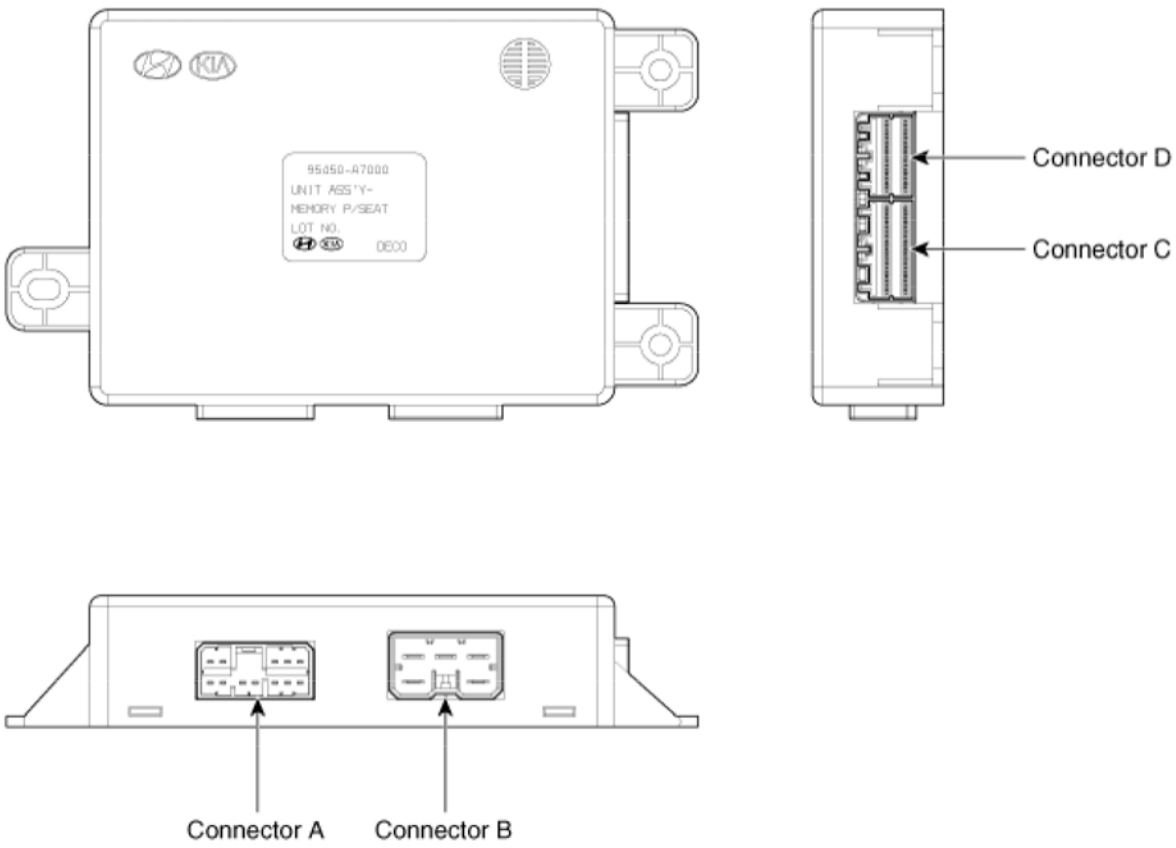
Determining Seat Position

Seat position is relatively determined rather than by absolute position.

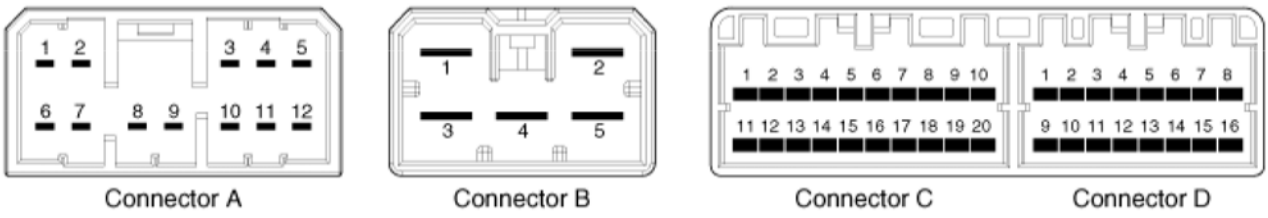
Body Electrical System

Components

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Input/Output Specification



IMS input/output pin information

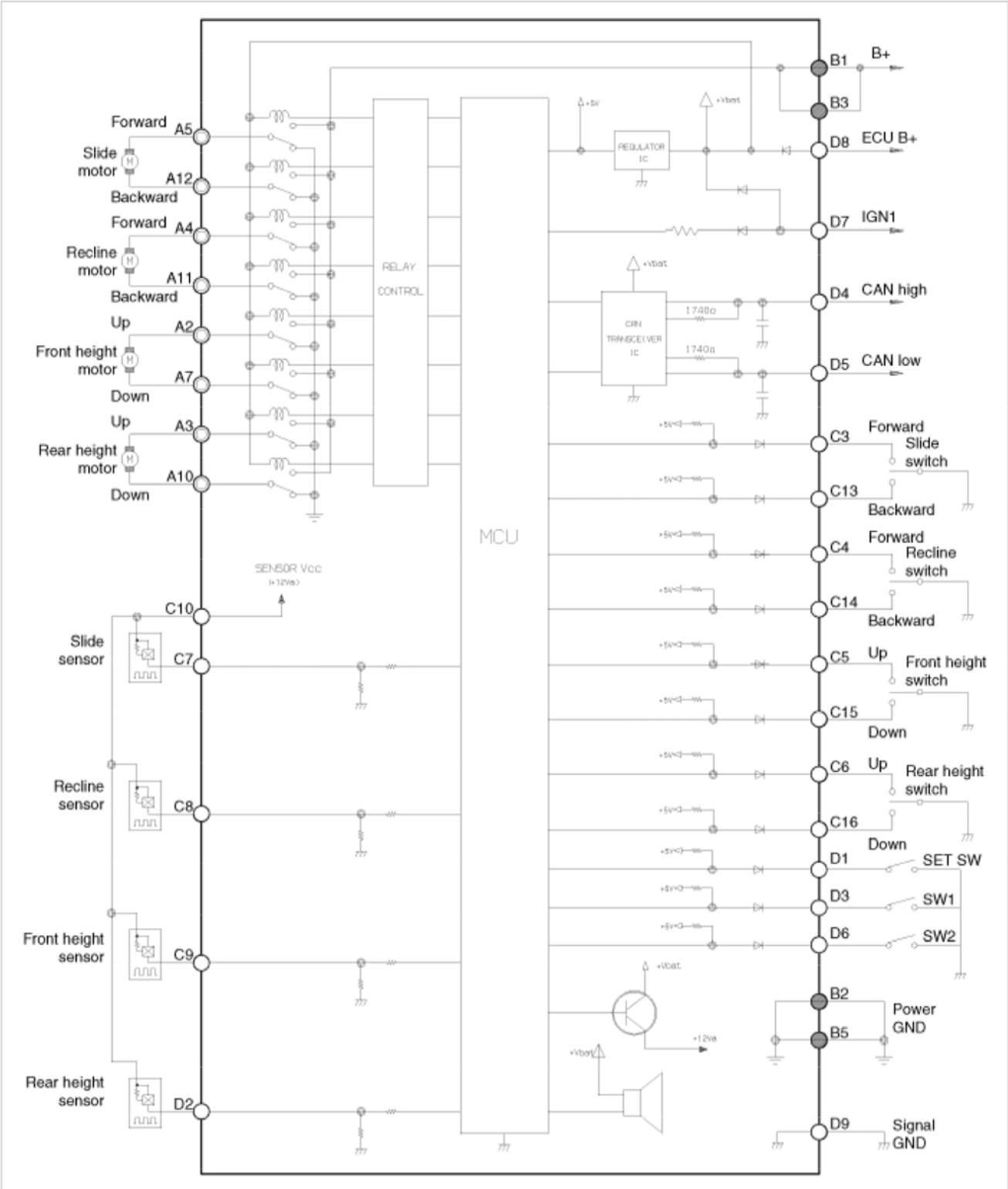
No.	Signal Name	I/O	Contents	Remark
A1	-	-	-	
A2	FRT height motor up	O	Front height motor up output	
A3	RR height motor up	O	Rear height motor up output	
A4	Recline motor FWD	O	Recline motor Forward output	
A5	Slide motor FWD	O	Slide motor Forward output	
A6	-	-	-	
A7	FRT height motor down	O	Front height motor down output	

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A8	-	-	-	
A9	-	-	-	
A10	RR height motor down	O	Rear height motor down output	
A11	Recline motor BWD	O	Recline motor backward output	
A12	Slide motor BWD	O	Slide motor backward output	
B1	B+(Power)	I	Power B+ for operating motor	
B2	GND (Power)	I	Power GND for operating motor	
B3	B+(Power)	I	Power B+ for operating motor	
B4	-	-	-	
B5	GND (Power)	I	Power GND for operating motor	
C1	-	-	-	
C2	-	-	-	
C3	Slide FWD manual switch	I	Slide forward manual switch input	On : GND
C4	Recline FWD manual switch	I	Recline forward manual switch input	On : GND
C5	FRT height up manual switch	I	Front height up manual switch input	On : GND
C6	RR height up manual switch	I	Rear height up manual switch input	On : GND
C7	Slide motor sensor	I	Slide motor sensor input	Pulse signal
C8	Recline motor sensor	I	Recline motor sensor input	Pulse signal
C9	FRT height motor sensor	I	Front height motor sensor input	Pulse signal
C10	Sensor Vcc(Seat)	O	VCC for operating sensor	5V
C11	-	-	-	
C12	-	-	-	
C13	Slide RR manual switch	I	Slide rear manual switch input	ON : GND
C14	Recline RR manual switch	I	Recline rear manual switch input	ON : GND
C15	FRT height down manual switch	I	Front height down manual switch input	ON : GND
C16	RR height down manual switch	-	Rear height down manual switch input	ON : GND
C17	-	-	-	
C18	-	-	-	
C19	-	-	-	
C20	-	-	-	
D1	SET switch	I	SET switch input	ON : GND
D2	RR height up sensor	I	Rear height up motor sensor	Pulse signal
D3	SW1 switch	I	SW1 switch input	ON : GND
D4	CAN high	I/O	CAN high BUS	
D5	CAN low	I/O	CAN low BUS	
D6	SW2 switch	I	SW2 switch input	ON : GND
D7	IGN1	I	IGN1 input	BAT
D8	B+(ECU)	I	ECU power input	BAT
D9	GND(SIGNAL)	I	Sinal ground	
D10	-	-	-	
D11	-	-	-	
D12	-	-	-	
D13	-	-	-	
D14	-	-	-	
D15	-	-	-	
D16	-	-	-	

Circuit Diagram

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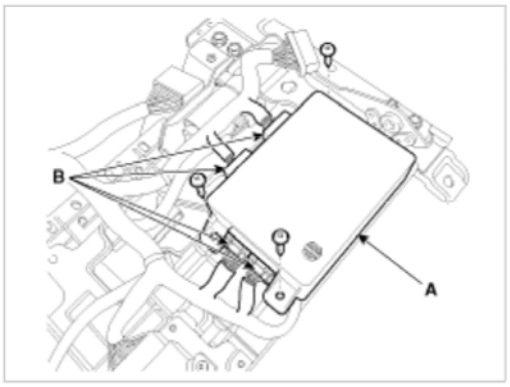


Body Electrical System

Removal

1. Remove the negative (-) battery terminal.
2. Remove the driver seat in the car.
   (Refer to Body - "Front Seat Assembly")
3. Remove the IMS module (A) after loosen the screws.
4. Disconnect the connectors (B) from the IMS module.

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Installation

1. Install the IMS module after connecting the connector.
2. Install the front seat.

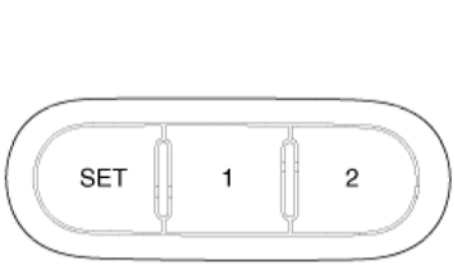
NOTICE

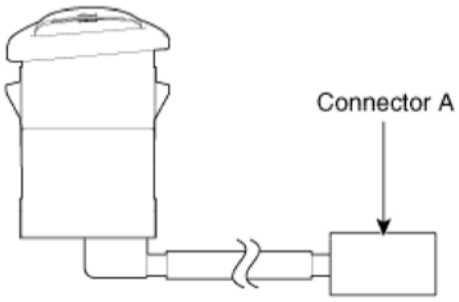
- Make sure the IMS module connectors and related connectors are plugged in properly.
- Check that IMS system operates normally.

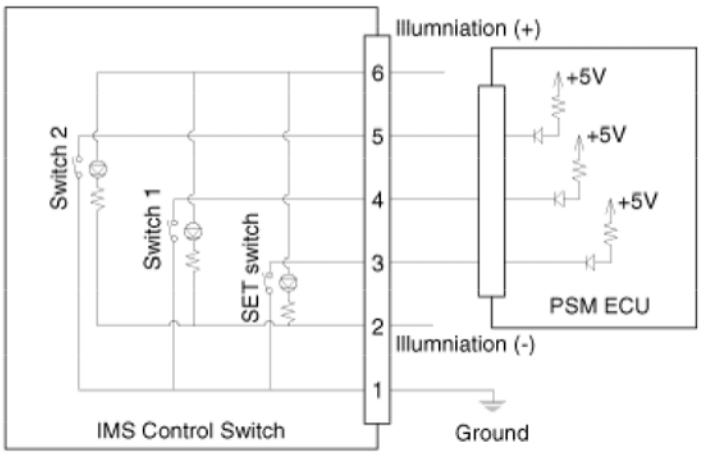
Body Electrical System

Circuit diagram

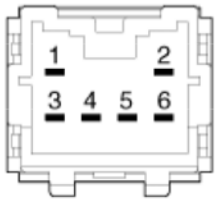
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Connector A

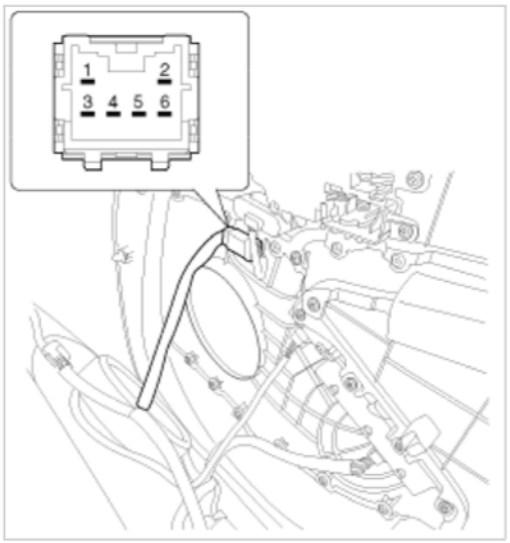


No.	Description
1	Ground
2	Illumination (-)
3	SET switch
4	Switch 1
5	Switch 2
6	Illumination (+)

Inspection

1. Disconnect the IMS control switch connector.

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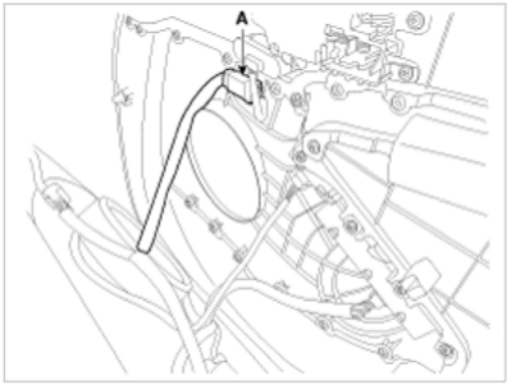


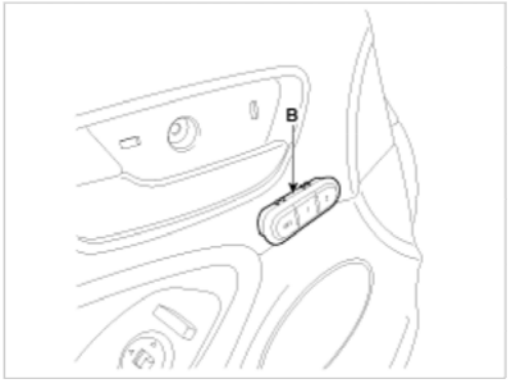
2. With the power IMS control switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the IMS control switch.

Terminal / Position	1	3	4	5
SET	○——	——○		
1	○——	——	——○	
2	○——	——	——	——○

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Remove the IMS module (B) after disconnecting the connector (A).





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Installation

NOTICE

- Make sure that the IMS control switch connectors and related connectors are plugged in properly.
- Check the IMS control switch operates normally.

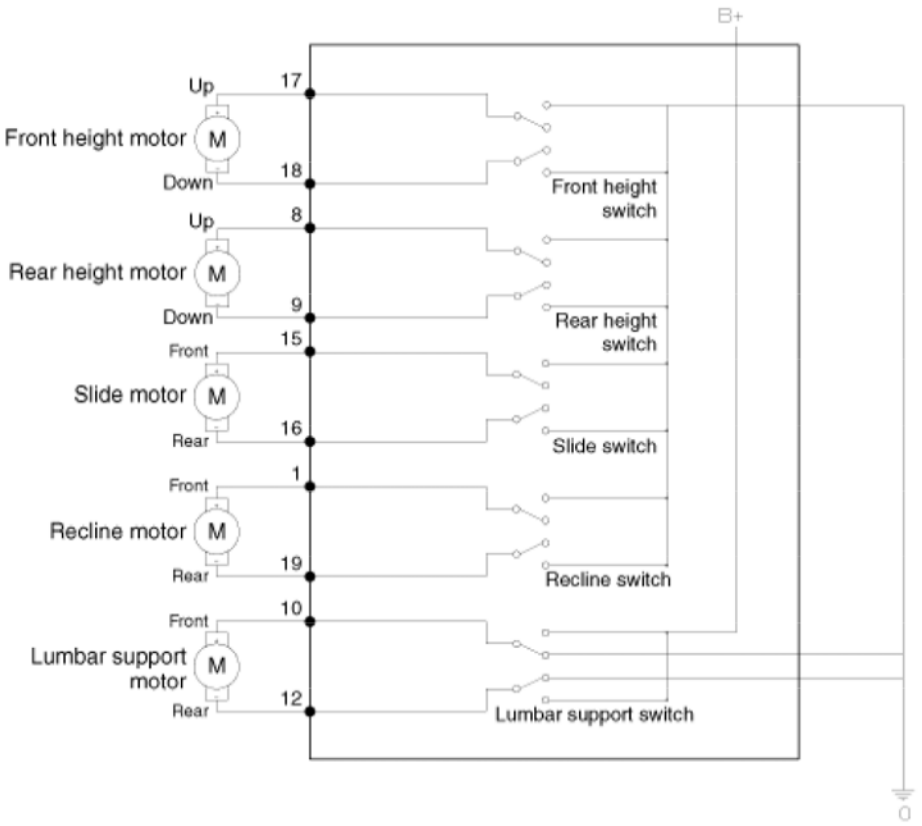
1. Connect the connectors and reassemble the IMS control switch.
2. Reassemble the front door trim.

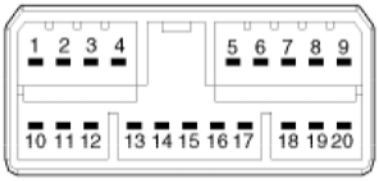
Body Electrical System

Circuit diagram

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[IMS]



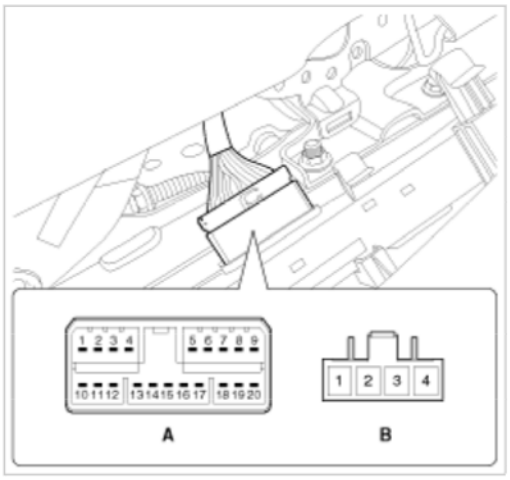


No.	Description	No.	Description
1	Recline motor (Front)	11	Lumbar support motor (Rear)
2	Lumbar support ground	12	-
3	Lumbar support ground	13	Battery (+)
4	Ground	14	-
5	-	15	Seat motor (Rear)
6	-	16	Seat motor (Front)
7	-	17	Front height motor (Up)
8	Rear height motor (Up)	18	Front height motor (Down)
9	Rear height motor (Down)	19	Recline motor (Rear)
10	Lumbar support motor (Front)	20	-

Inspection

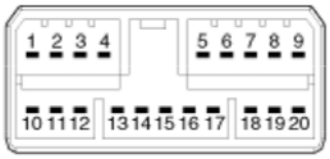
1. With the power seat switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the power seat switch.
   A : Power seat control switch
   B : Lumbar support switch

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Driver Power Seat Control Switch

	Front height control switch		Slide control switch				Rear height control switch		Rear recline control switch				Lumber support control switch			Remark
	Up	Down	N		LH		Up	Down	N		LH		N	LH		
			HEI	SEAT	Front	Rear			HEI	REC	Front	Rear	–	Front	Rear	
9								○								Rear height motor (Up)
8							○		○							Rear height motor (Down)
13			○	○	○	○			○	○				○	○	Battery ⊕
4	○	○				○	○	○	○	○						GND⊖
1											○	○				Recline motor
19										○	○					Recline motor
18		○	○							○		○				Front height motor
17	○		○													Front height motor
15				○		○										Seat motor
16				○	○											Seat motor
10													○	○		Lumbar support motor
11															○	Lumbar support motor
3													○			GND-Lumbar support
2													○			GND-Lumbar support

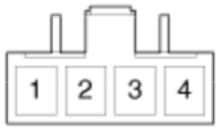


[Driver power seat control switch]

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Driver Lumber Switch

	Lumber switch			Remark
	Rear	Neutral	Front	
1	○		○	
2	○	○ ○	○	
3	○	○	○	
4	○	○		

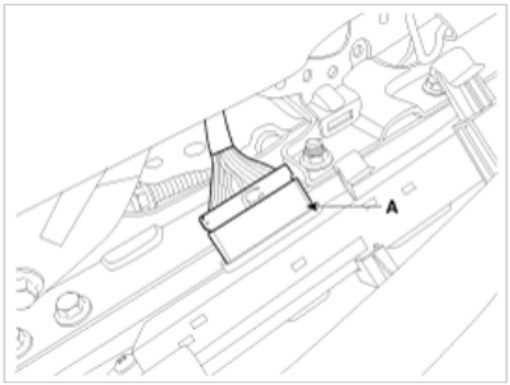


Removal

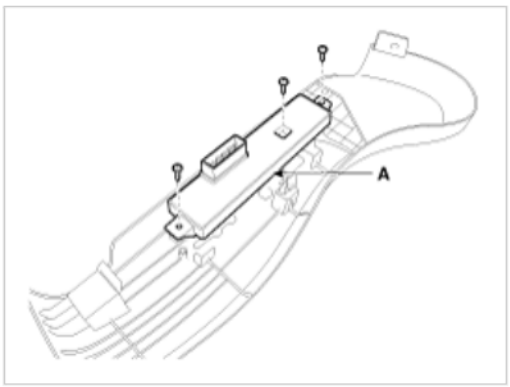
1. Disconnect the negative (-) battery terminal.
2. Remove the seat side cover (A).



3. Disconnect the power seat control switch connector (A).



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



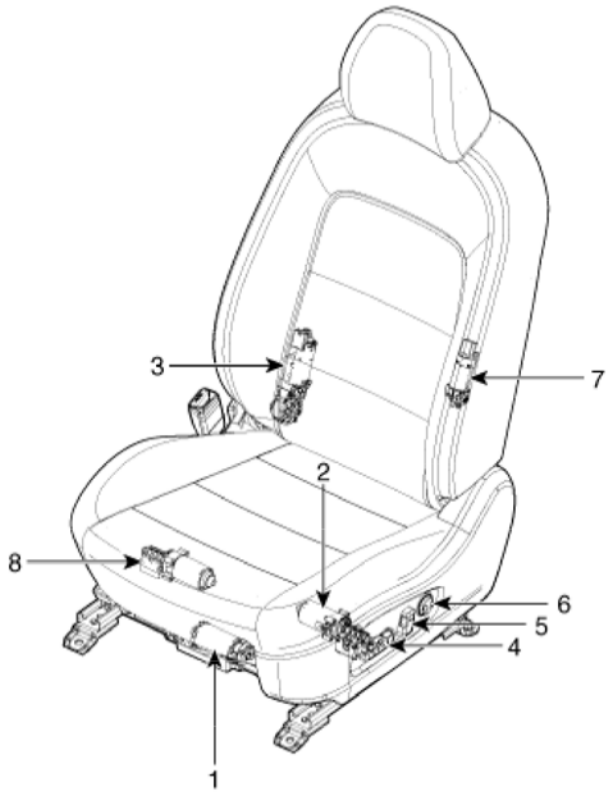
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Installation

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

Body Electrical System

Components



1. Slide motor	5. Recline control switch
2. Height motor	6. Lumbar support switch
3. Recline motor	7. Lumbar support motor
4. Power seat control switch	8. Tilt motor

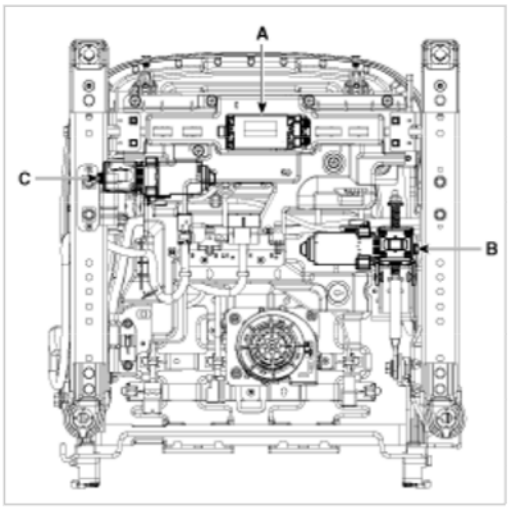
Body Electrical System

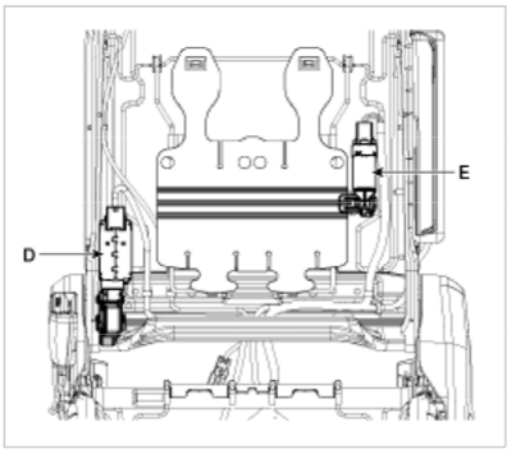
Inspection

Power Seat Motor

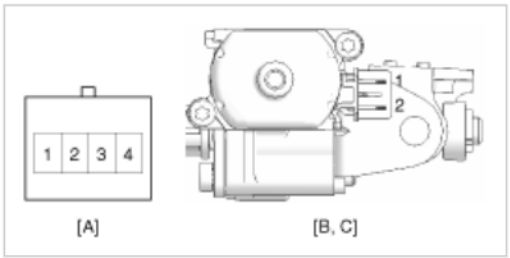
1. Remove the seat and all motor connectors.
   A : Slide motor
   B : Height motor
   C : Tilt motor
   D : Recline motor
   E : Lumbar support motor

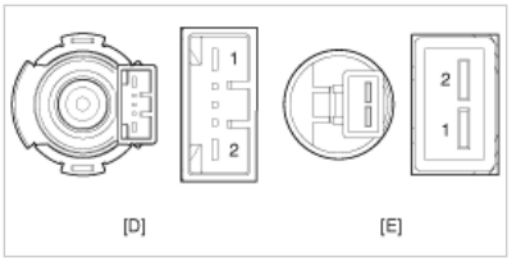
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2. With the battery connected directly to the motor terminals, check if the motors run smoothly.
3. Reverse the connections and check that the motor rotates in reverse.
4. If there is an abnormality, replace the motors.





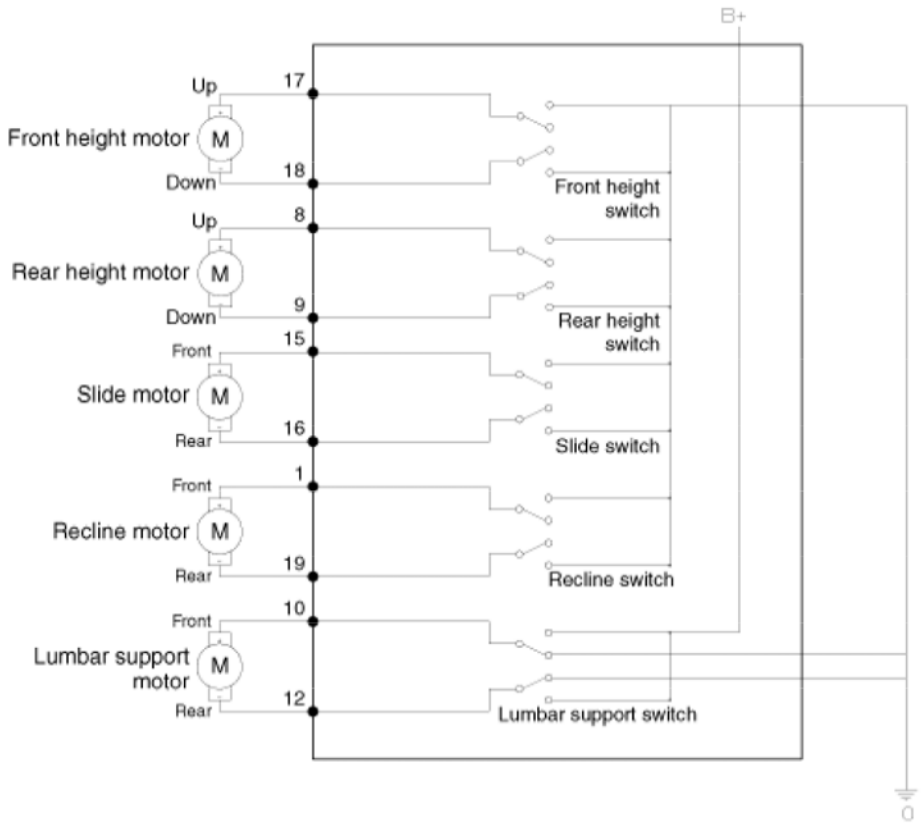
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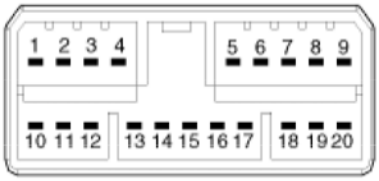
Position	Terminal	+	-
Slide motor A	Front	1	4
	Rear	4	1
Tilt motor B	Up	1	2
	Down	2	1
Height motor C	Up	1	2
	Down	2	1
Recline motor D	Front	2	1
	Rear	1	2
Lumbar support E	Front	1	2
	Rear	2	1

Circuit Diagram

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[Driver]



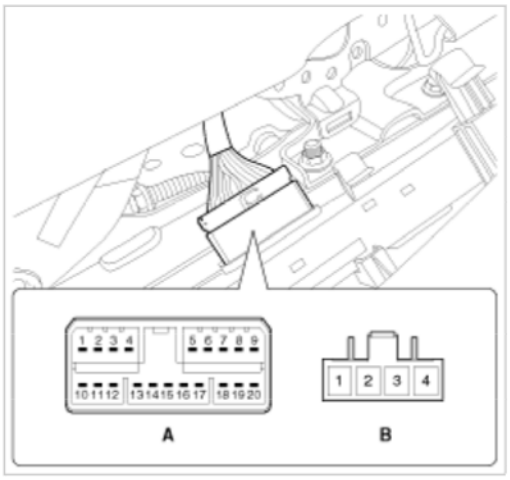


No.	Description	No.	Description
1	Recline motor (Front)	11	Lumbar support motor (Rear)
2	Lumbar support ground	12	-
3	Lumbar support ground	13	Battery (+)
4	Ground	14	-
5	-	15	Seat motor (Rear)
6	-	16	Seat motor (Front)
7	-	17	Front height motor (Up)
8	Rear height motor (Up)	18	Front height motor (Down)
9	Rear height motor (Down)	19	Recline motor (Rear)
10	Lumbar support motor (Front)	20	-

Inspection

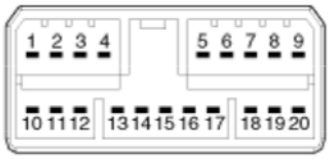
1. With the power seat switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the power seat switch.
   A : Power seat control switch
   B : Lumbar support switch

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Driver Power Seat Control Switch

	Front height control switch		Slide control switch				Rear height control switch		Rear recline control switch				Lumber support control switch			Remark
	Up	Down	N		LH		Up	Down	N		LH		N	LH		
			HEI	SEAT	Front	Rear			HEI	REC	Front	Rear	–	Front	Rear	
9								○								Rear height motor (Up)
8							○		○							Rear height motor (Down)
13			○	○	○	○			○					○	○	Battery ⊕
4	○	○				○	○	○	○	○						GND⊖
1											○	○				Recline motor
19										○	○					Recline motor
18		○	○							○		○				Front height motor
17	○			○												Front height motor
15				○		○										Seat motor
16				○	○											Seat motor
10													○	○		Lumbar support motor
11															○	Lumbar support motor
3													○			GND-Lumbar support
2													○			GND-Lumbar support

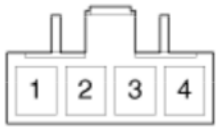


[Driver power seat control switch]

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Driver Lumber Switch

	Lumber switch			Remark
	Rear	Neutral	Front	
1	○		○	
2	○	○ ○	○	
3	○	○	○	
4	○	○		

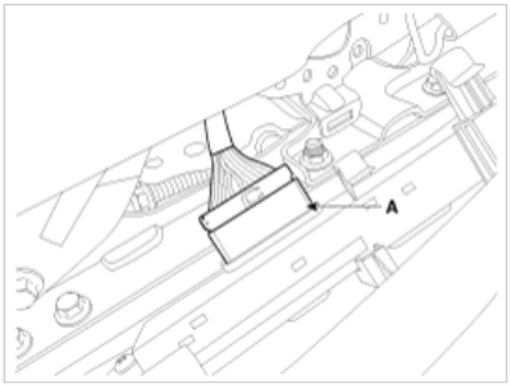


Removal

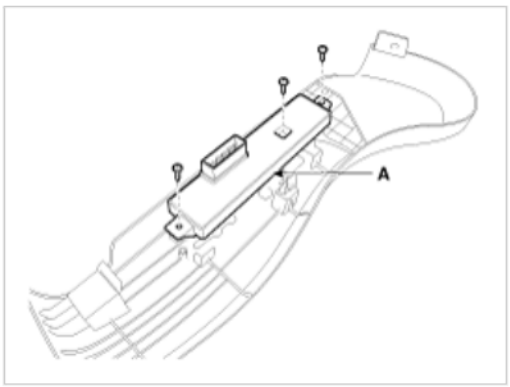
1. Disconnect the negative (-) battery terminal.
2. Remove the seat side cover (A).



3. Disconnect the power seat control switch connector (A).



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



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Installation

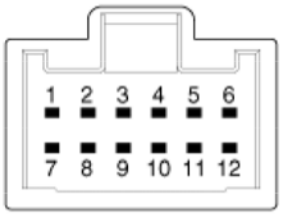
1. Connect the connector and install the power seat control switch.
2. Install the seat cover.

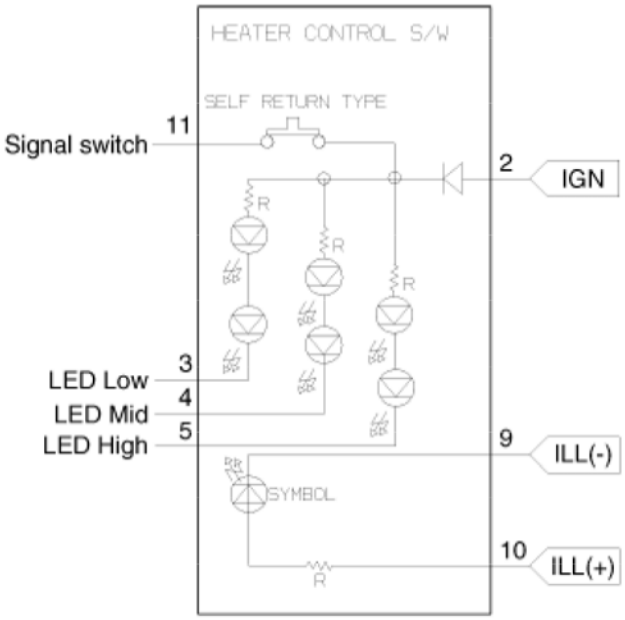
Body Electrical System

Circuit Diagram

[Heater]





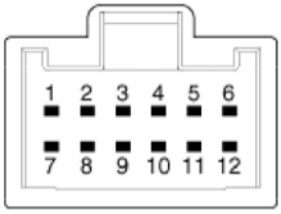


No.	Description	No.	Description
1	-	7	-
2	Ignition	8	-
3	LED Low	9	Illumination (-)
4	LED Mid	10	Illumination (+)
5	LED High	11	Signal switch
6	-	12	-

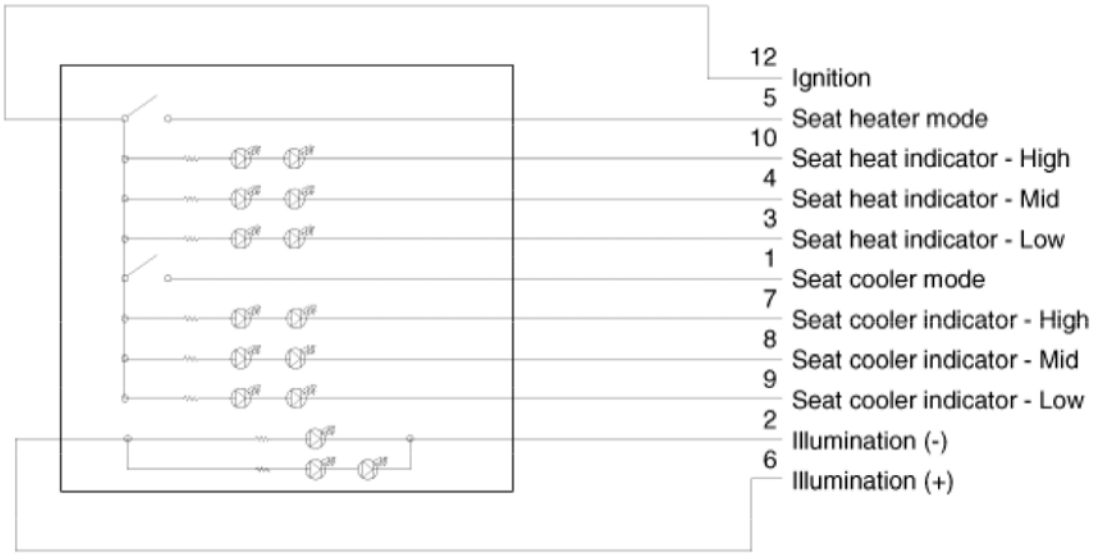
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[Heater + Ventilation]





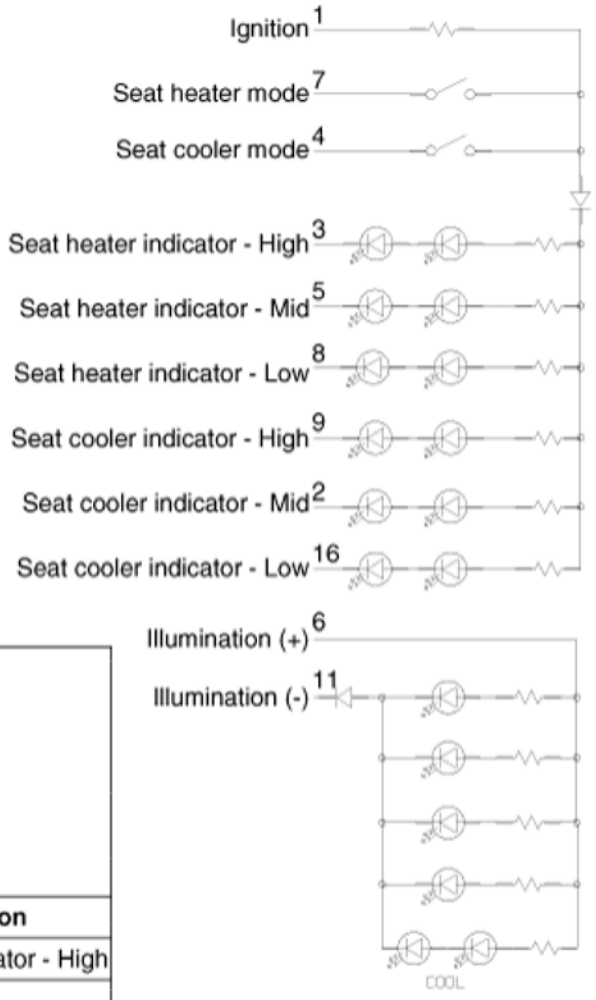
No.	Description	No.	Description
1	Seat cooler mode	7	Seat cooler indicator - High
2	Illumination (-)	8	Seat cooler indicator - Mid
3	Seat heater indicator - Low	9	Seat cooler indicator - Low
4	Seat heater indicator - Mid	10	Seat heater indicator - High
5	Seat heater mode	11	-
6	Illumination (+)	12	Ignition

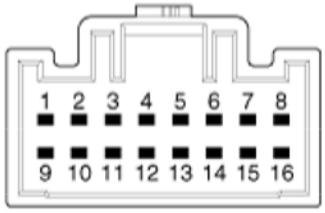


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[Heater + Ventilation + PAS + SPAS]



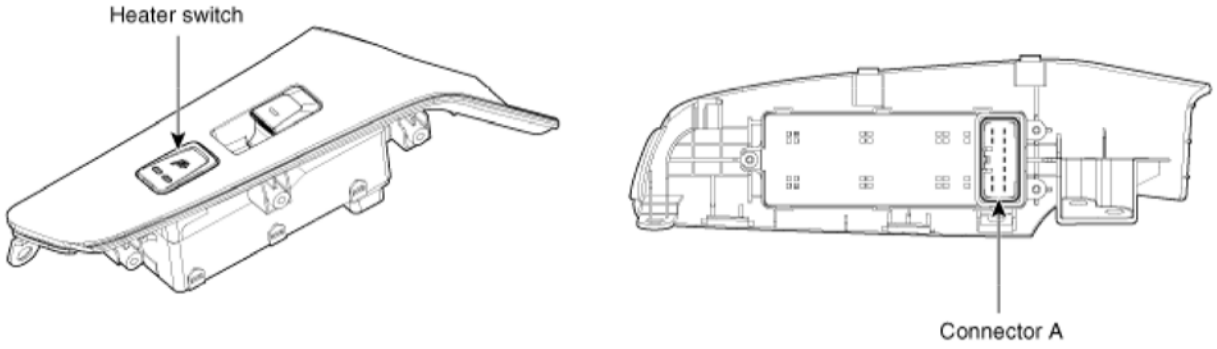


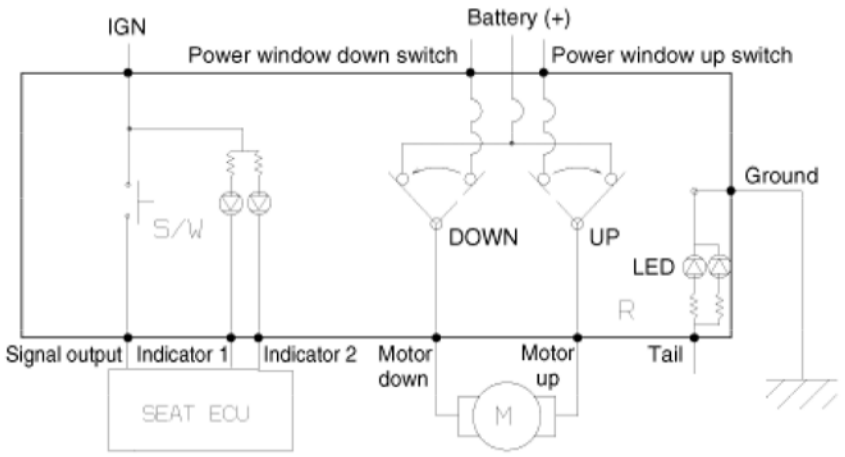


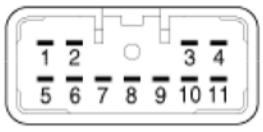
No.	Description	No.	Description
1	Ignition	9	Seat cooler indicator - High
2	Seat cooler indicator - Mid	10	SPAS
3	Seat heater indicator - High	11	Illumination (-)
4	Seat cooler mode	12	SPAS indicator
5	Seat heater indicator - Mid	13	PAS
6	Illumination (+)	14	PAS indicator
7	Seat heater mode	15	Ground
8	Seater heater indicator - Low	16	Seat cooler indicator - Low

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[Second seat]





Connector A	No.	Description	No.	Description
	1	Heater indicator 2	7	Motor up
	2	Power window up switch	8	Tail
	3	Motor down	9	Battery (+)
	4	Power window down switch	10	IGN
	5	Ground	11	Heater indicator 1
	6	Signal output		

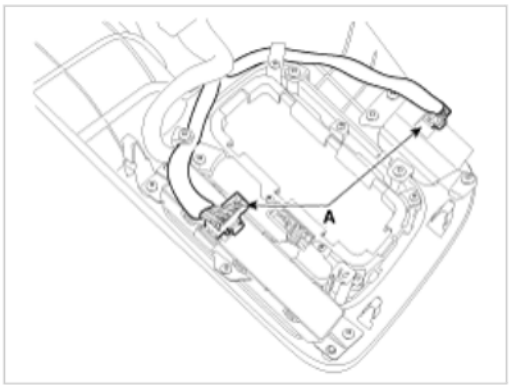
Body Electrical System

Removal

Driver/Passenger Seat

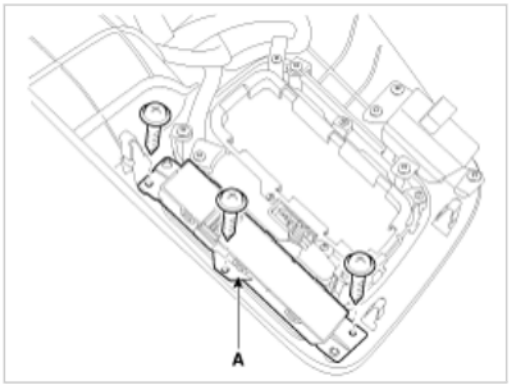
1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Disconnect the switch connectors (A).

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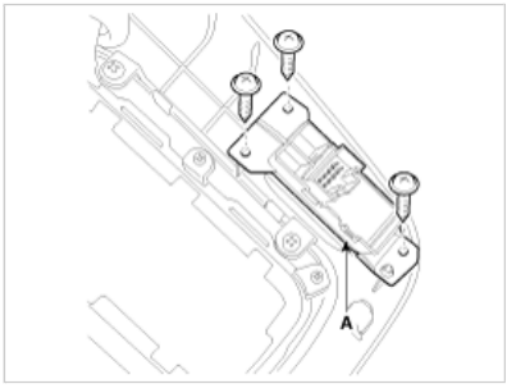


4. Remove the switchs (A) from the console upper cover.

[Driver]



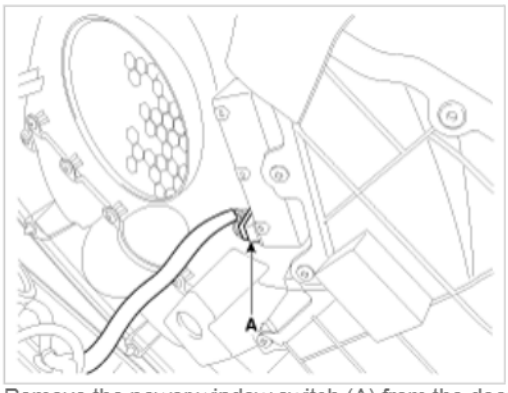
[Passenger]



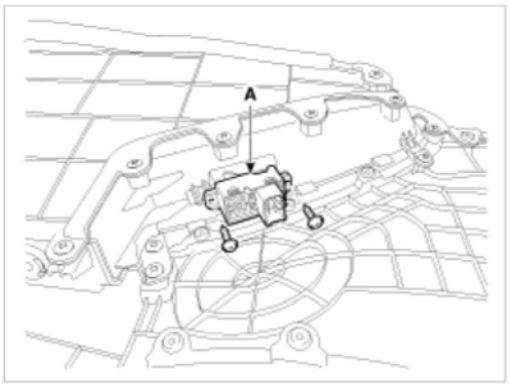
Second Seat

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim panel.
   (Refer to Body - "Rear Door Trim")
3. Disconnect the connector from the power window switch.

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4. Remove the power window switch (A) from the door trim after loosening the screws.



Installation

Driver/Passenger Seat

1. Install the switchs and connect the switch connectors.
2. Insatll the floor console assembly.
3. Connect the negative (-) battery terminal.

Second Seat

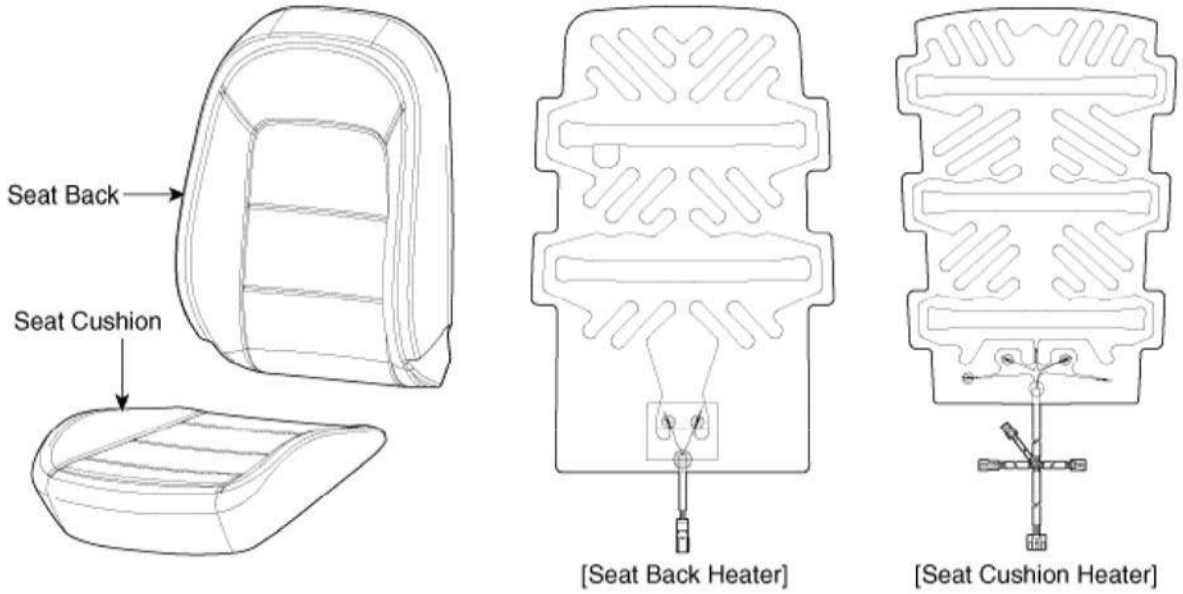
1. Install the power window switch and connect the power window switch connector.
2. Install the rear door trim panel.
3. Connect the negative (-) battery terminal.

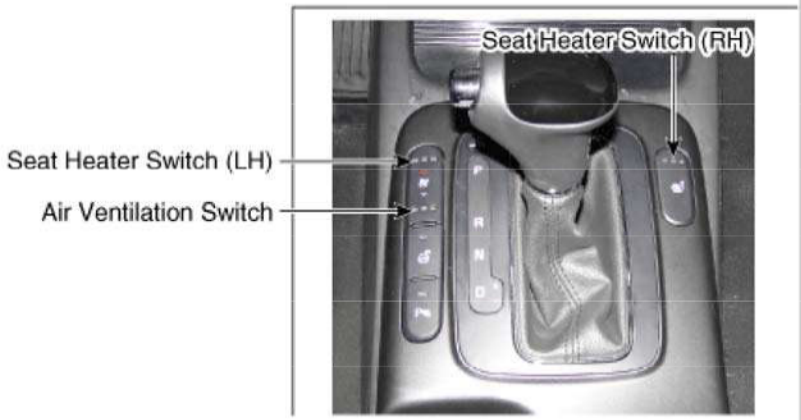
Body Electrical System

Component Location

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[Driver Only]

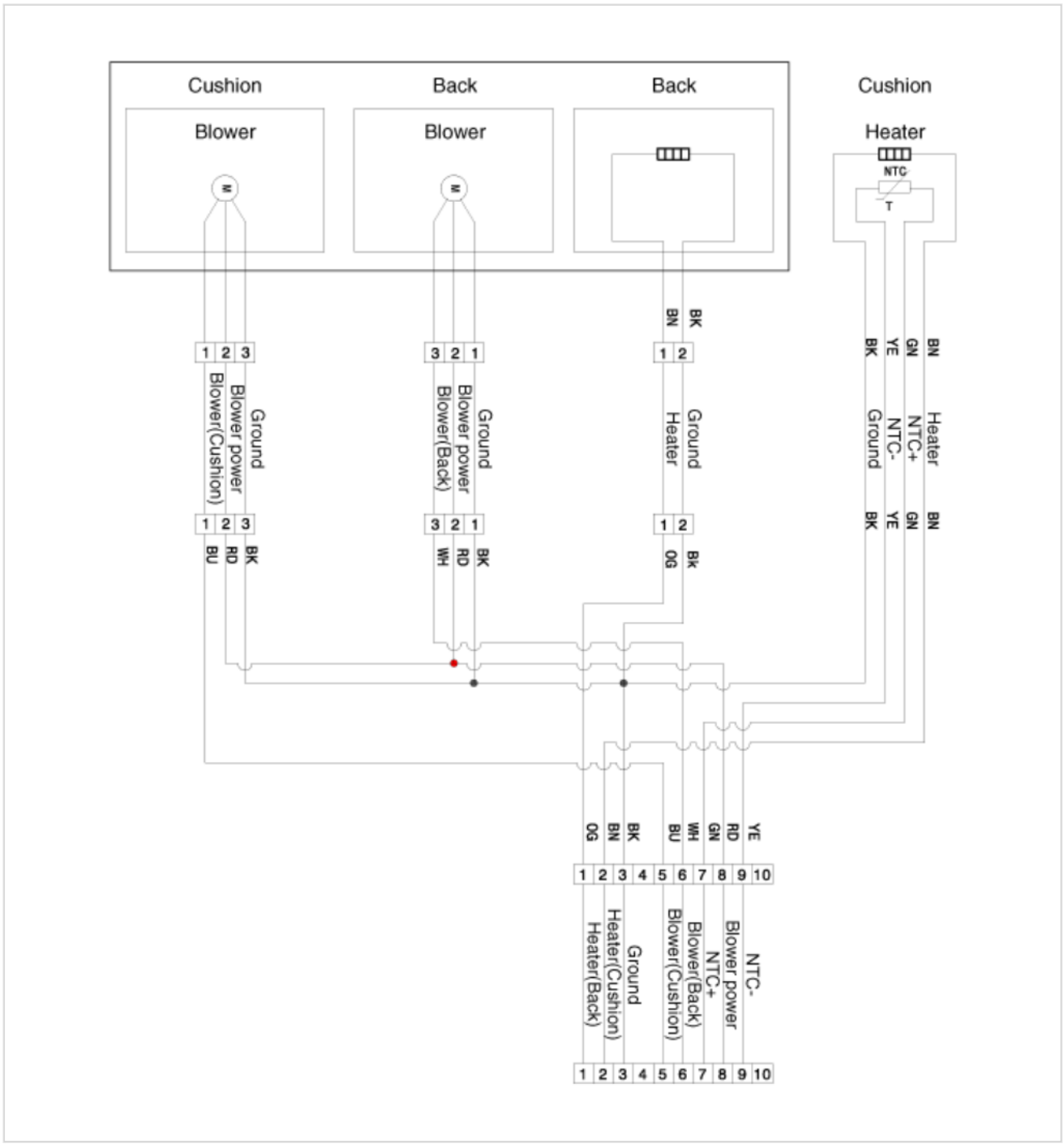




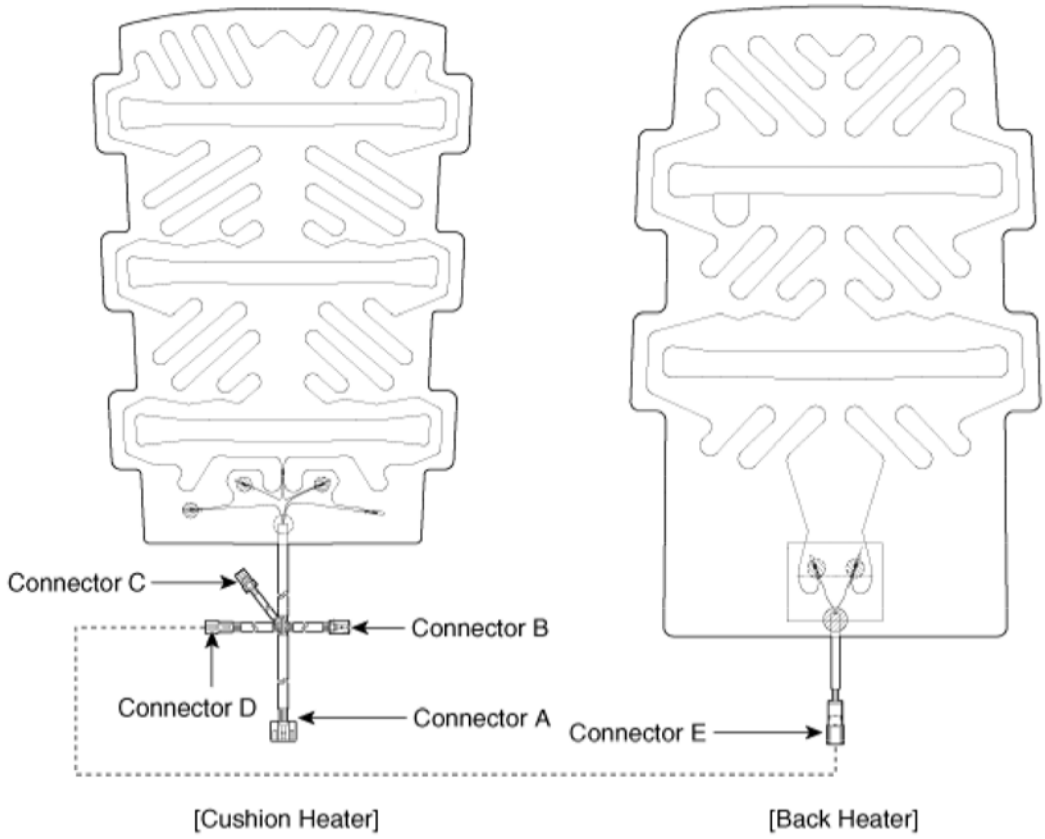
Body Electrical System

Circuit Diagram

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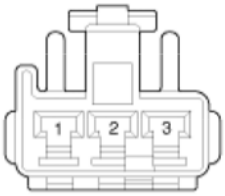


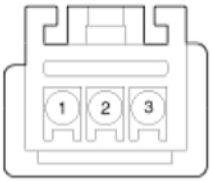
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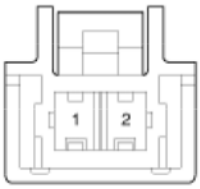


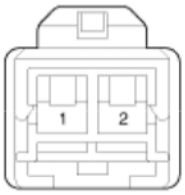
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Connector A	No.	Description	No.	Description
	1	-	6	NTC-
	2	Ground	7	Power
	3	Heater Cushion	8	NTC+
	4	Heater Back	9	Blower Back
	5	-	10	Blower Cushion

Connector B	
	
No.	**Description**
1	Ground
2	IGN
3	Blower Cushion

Connector C	
	
No.	**Description**
1	Ground
2	IGN
3	Heater Back

Connector D	
	
No.	**Description**
1	Ground
2	Heater Back

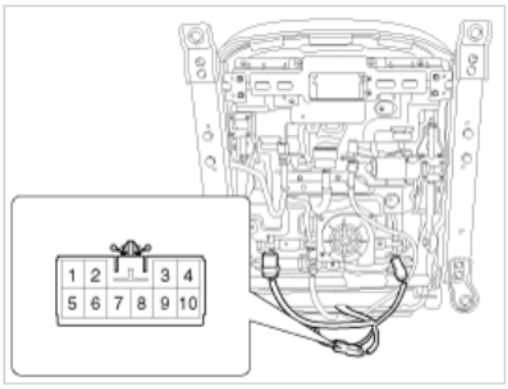
Connector E	
	
No.	**Description**
1	Heater Back
2	Ground

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Inspection

Front Seat Heater (Driver)

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



No.	Description	No.	Description
1	-	6	NTC +
2	Ground	7	Power
3	Heater cushion	8	NTC -
4	Heater back	9	Back blower
5	-	10	Cushion blower

Standard value (Fabric/ Leather)
Cushion :5.86Ω ± 10%
Back :4.19Ω ± 10%
Set :10.05Ω ± 10%

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

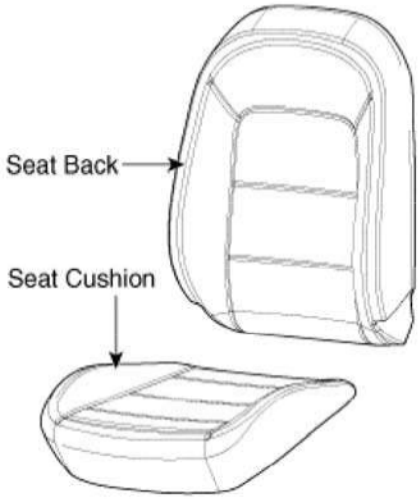
	1st	2nd	3rd
Cushion (±2°C)	36°C	39°C	42°C
Back (±2°C)	40°C	45°C	50°C

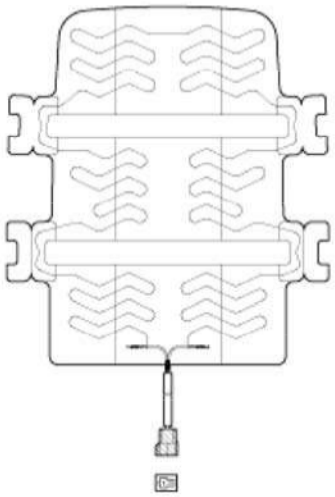
Body Electrical System

Component Location

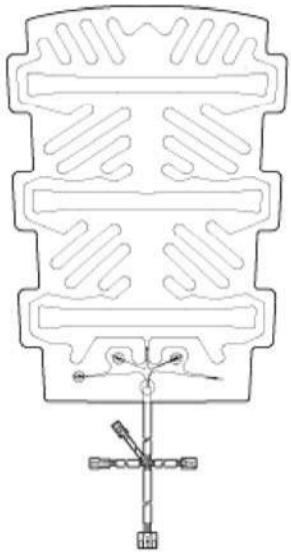
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[Driver/Passenger]

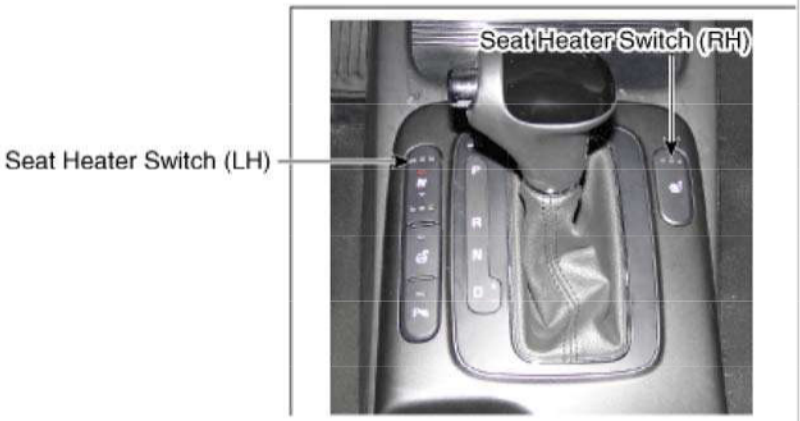




[Seat Back Heater]

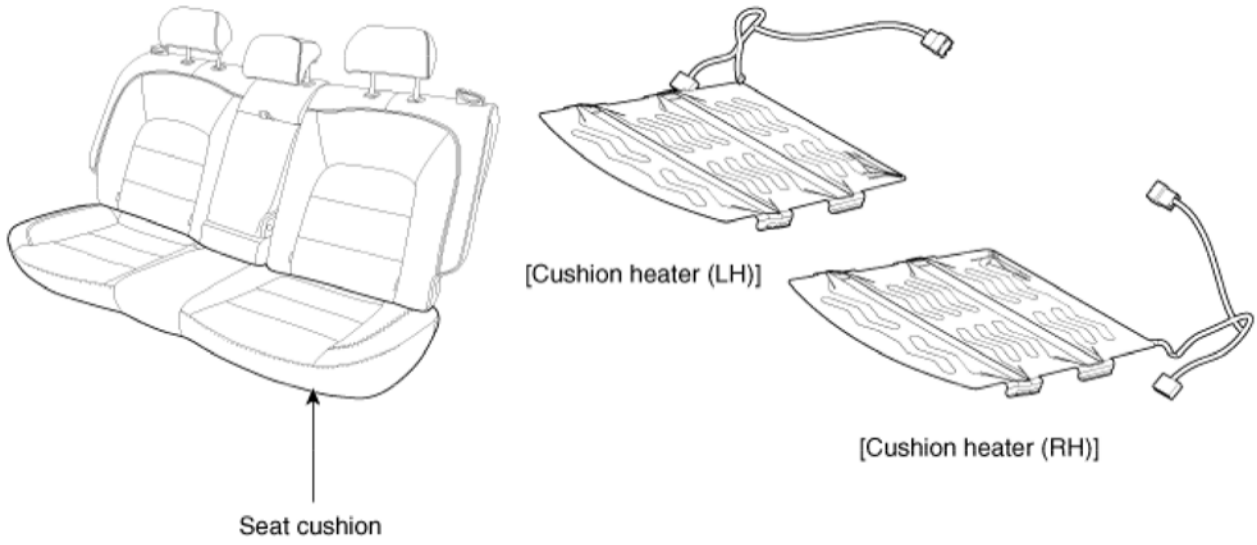


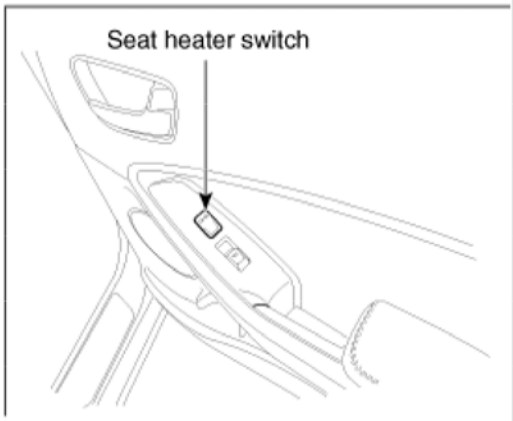
[Seat Cushion Heater]



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[Second seat]



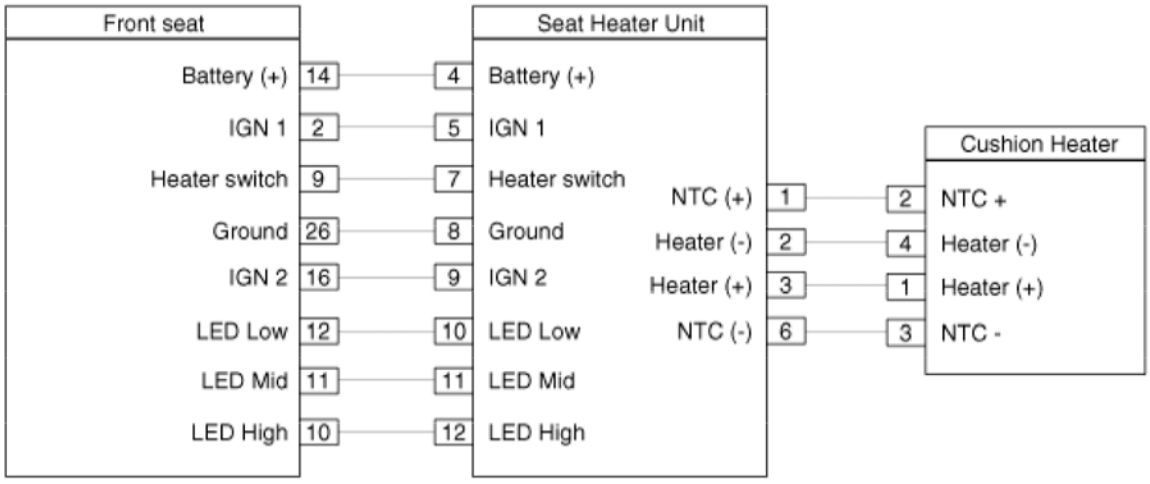


Body Electrical System

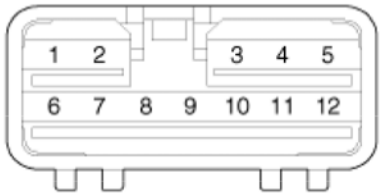
Circuit Diagram

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[Front Seat Cushion/Back]



[Seat heater unit]



No.	Description	No.	Description
1	NTC (+)	7	Heater switch
2	Heater (-)	8	Ground
3	Heater (+)	9	IG2
4	NTC (-)	10	LED Low
5	IG1	11	LED Mid
6	NTC (+)	12	LED High

※ The cushion heater and back cushion are connected with wiring.

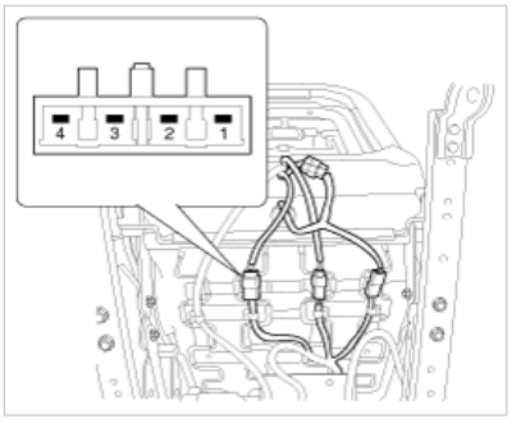
Body Electrical System

Inspection

Front Seat

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

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

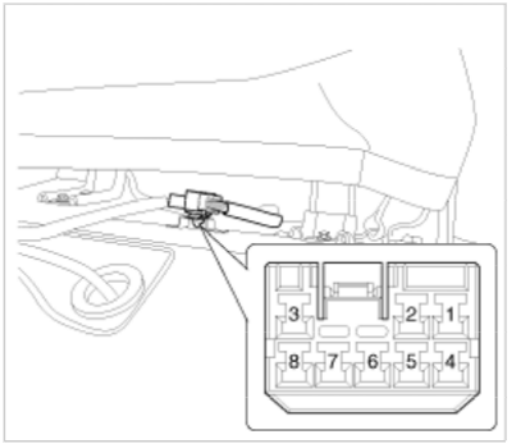
Standard value (Fabric / Leather)
Cushion :1.14 Ω ± 10%
Back:1.04 Ω ± 10%
Set :2.18 Ω ± 10%

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

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

Second Seat

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



No.	Description	No.	Description
1	Battery (+)	5	LED Low
2	IGN 1	6	Ground
3	LED High	7	Heater switch
4	IGN 2	8	-

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

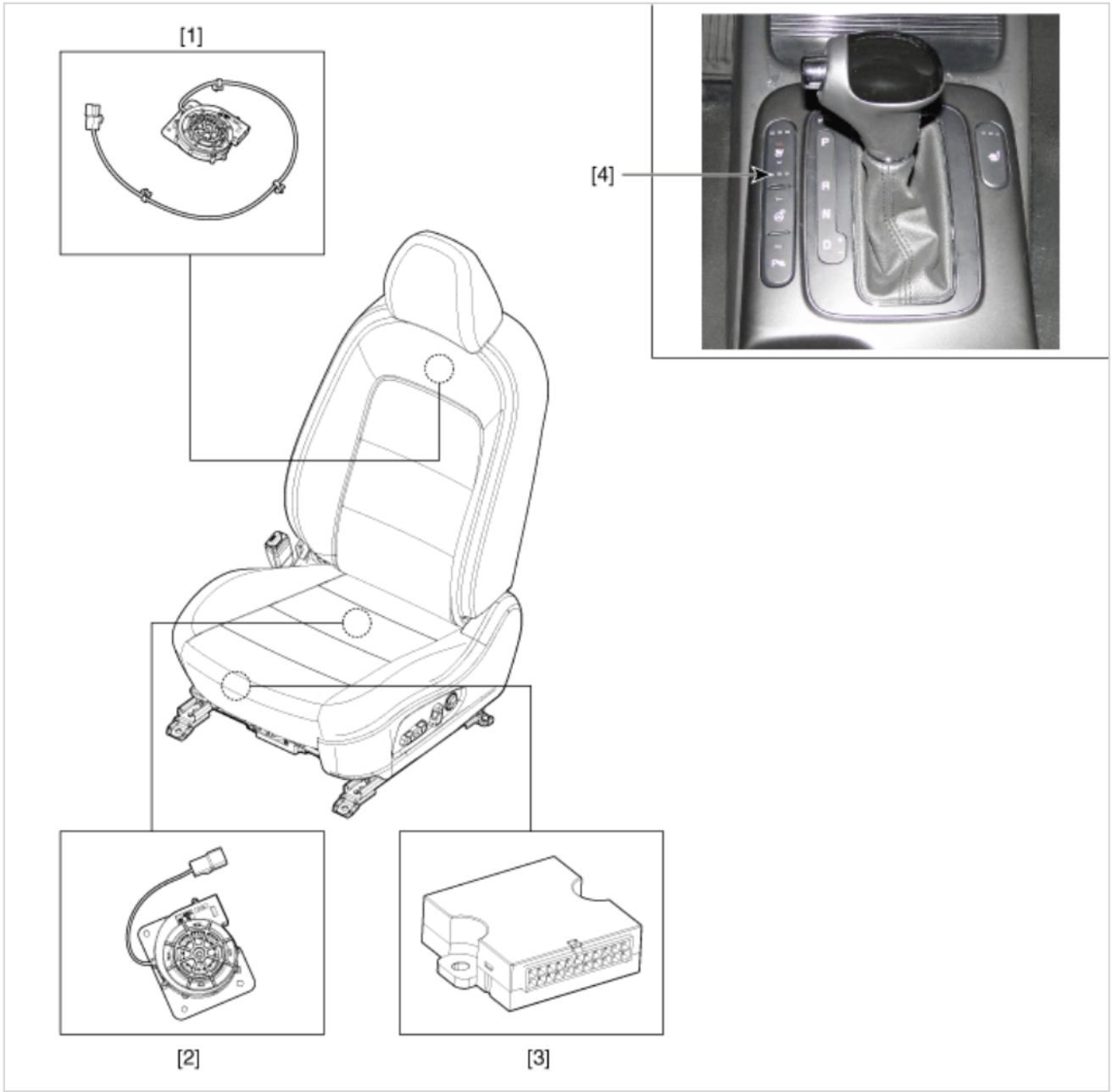
	1st	2nd
	36°C	39°C

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Cushion (±2°C)		

Body Electrical System

Components Location (1)

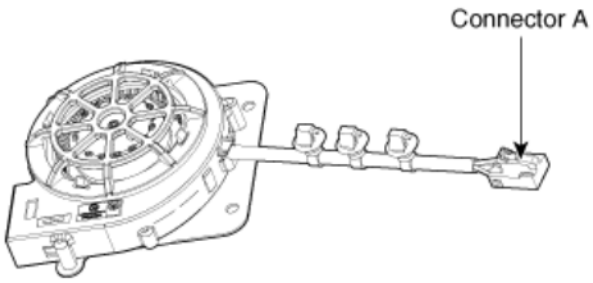


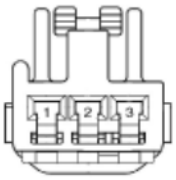
1. Seat back blower 2. Seat cushion blower	3. Air ventilation unit 4. Air ventilation switch

Components Location (2)

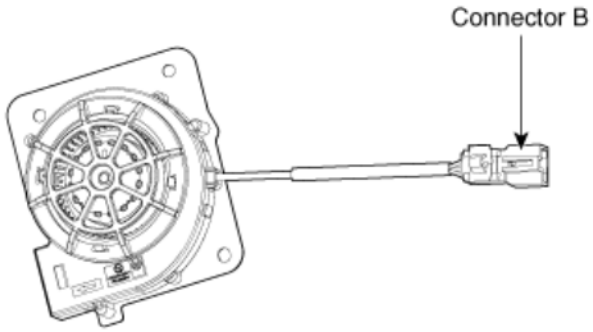
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[Seat Back Blower]



Connector A	
	
No.	**Description**
1	Ground
2	IGN
3	Blower

[Seat Cushion Blower]

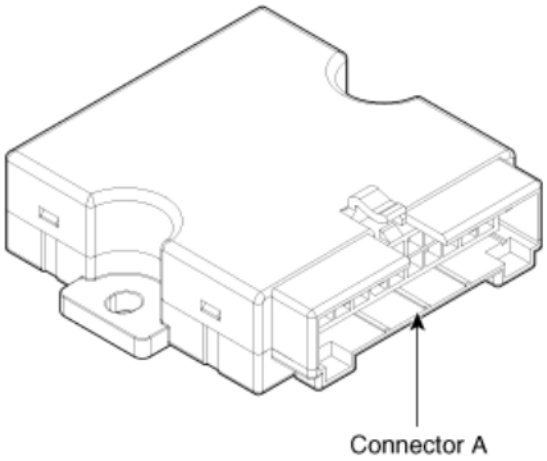


Connector B	
	
No.	**Description**
1	Blower
2	IGN
3	Ground

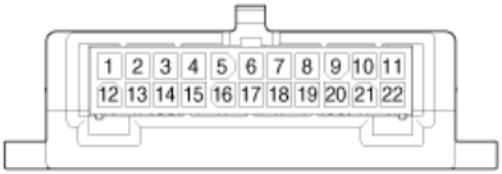
Components Location (3)

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[Air Ventilation Unit]



Connector A

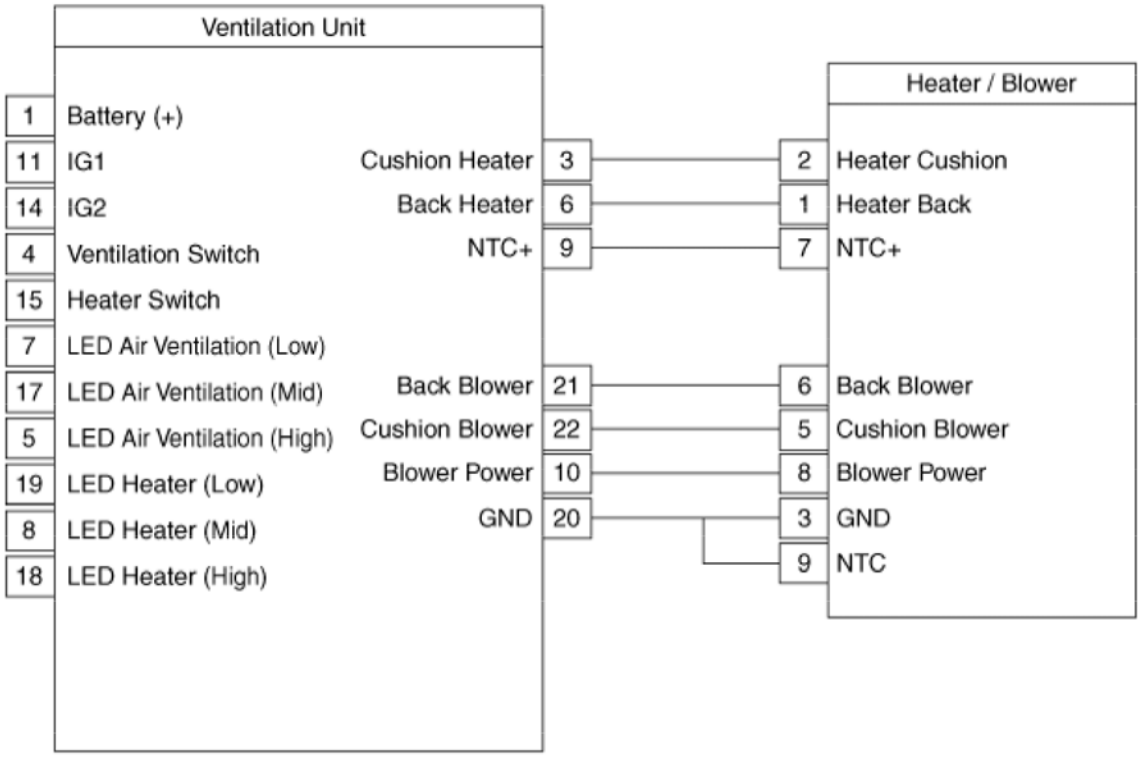


No.	Description	No.	Description
1	Battery +	12	Battery +
2	-	13	-
3	Cushion heater	14	IGN 2
4	Air ventilation switch	15	Heater switch
5	LED - Air ventilation (High)	16	-
6	Back heater	17	LED - Air ventilation (Mid)
7	LED - Air ventilation (Low)	18	LED - Heater (High)
8	LED - Heater (Mid)	19	LED - Heater (Low)
9	NTC +	20	Ground
10	Blower power	21	Back blower
11	IGN 1	22	Cushion blower

Circuit Diagram

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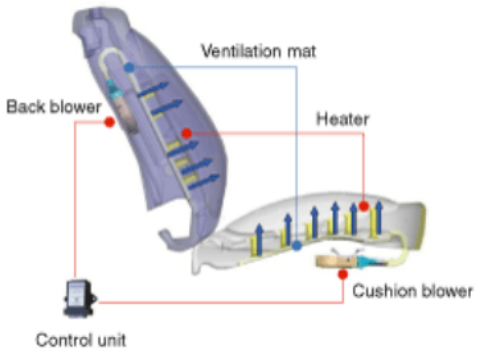
[Front Seat]



Body Electrical System

Description

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



NOTICE

1. Make sure not to spoil drink or water on the seat when equipping with ventilation system seat
2. Because of inhaling the slight air, it is difficult to feel the air strength by the sense of touch.

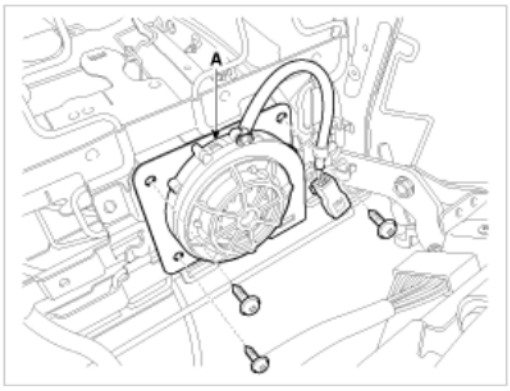
Body Electrical System

Removal

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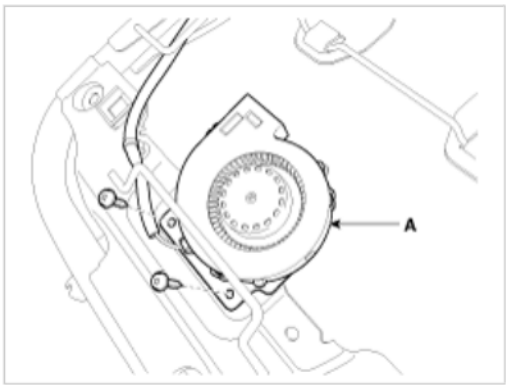
Cushion Blower

1. Remove the front seat assembly.
   (Refer to Body - "Front Seat Assembly")
2. Remove the cushion blower (A) after loosening the mounting screws (3EA) and disconnecting the blower connector.



Back Blower

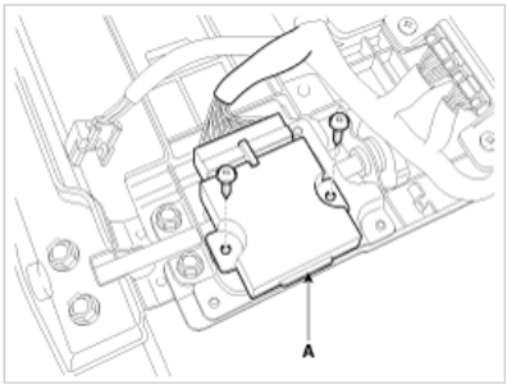
1. Remove the front seat assembly.
   (Refer to Body - "Front Seat Assembly")
2. Remove the front seat back cover.
   (Refer to Body - "Front Seat Back Cover")
3. Remove the back blower (A) after loosening the mounting screws (2EA) and disconnecting the blower connector.



Air Ventilation Unit

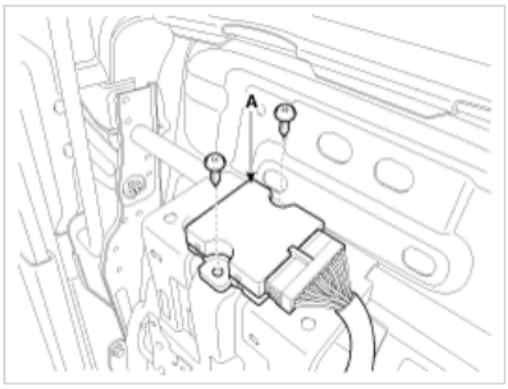
1. Remove the front seat assembly.
   (Refer to Body - "Front Seat Assembly")
2. Remove the air ventilation unit (A) after loosening the mounting screws (2EA) and disconnecting the connector.

[Driver]



[Passenger]

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Installation

Cushion Blower

1. Install the cushion blower under the bottom of the seat.
2. Install the front seat aseembly.

Back Blower

1. Install the back blower on the back of the seat back.
2. Install the front seat aseembly.

Air Ventilation Unit

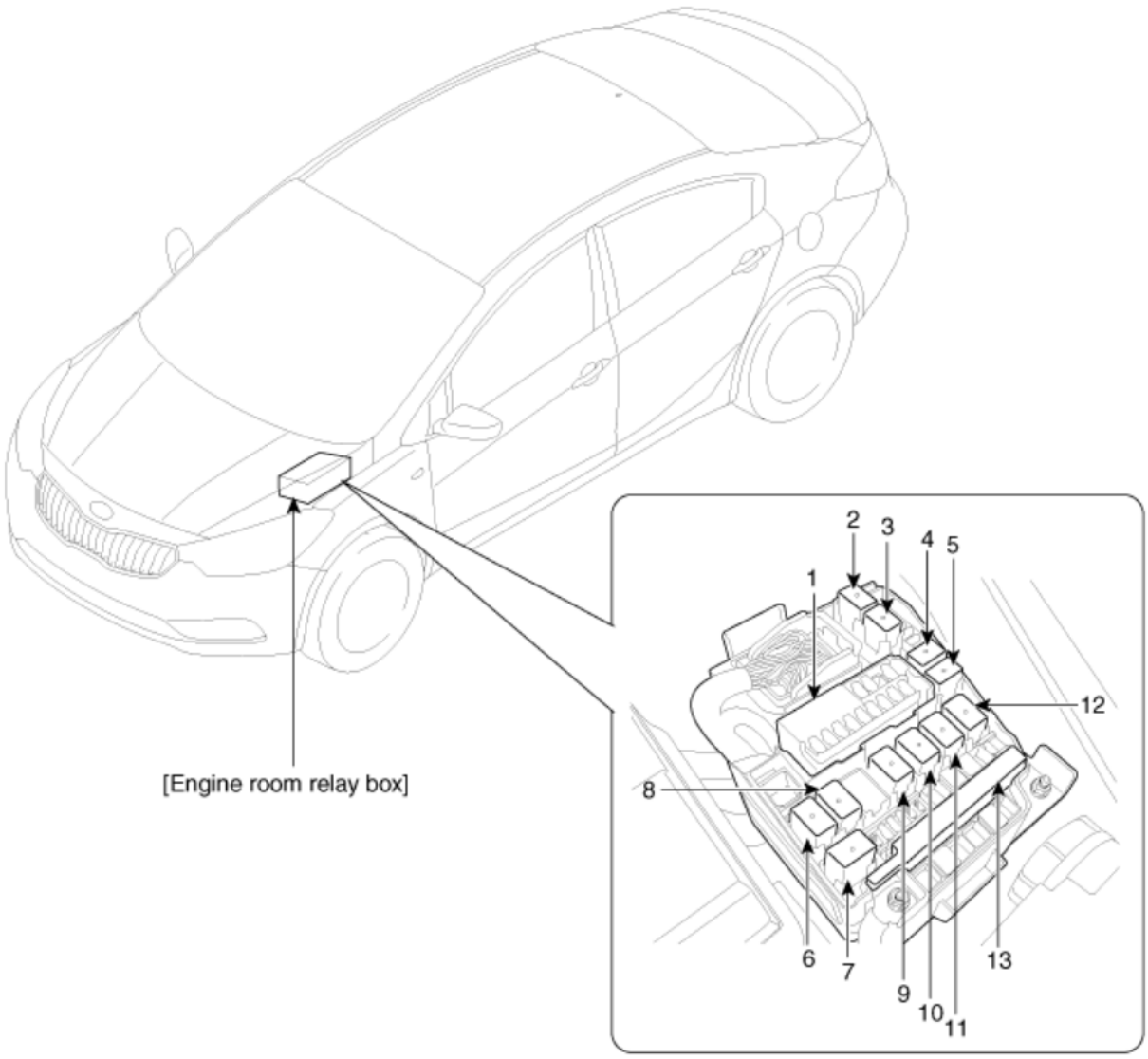
1. Install the air ventilation unit under the bottom of the seat.
2. Install the front seat aseembly.

Body Electrical System

Component Location

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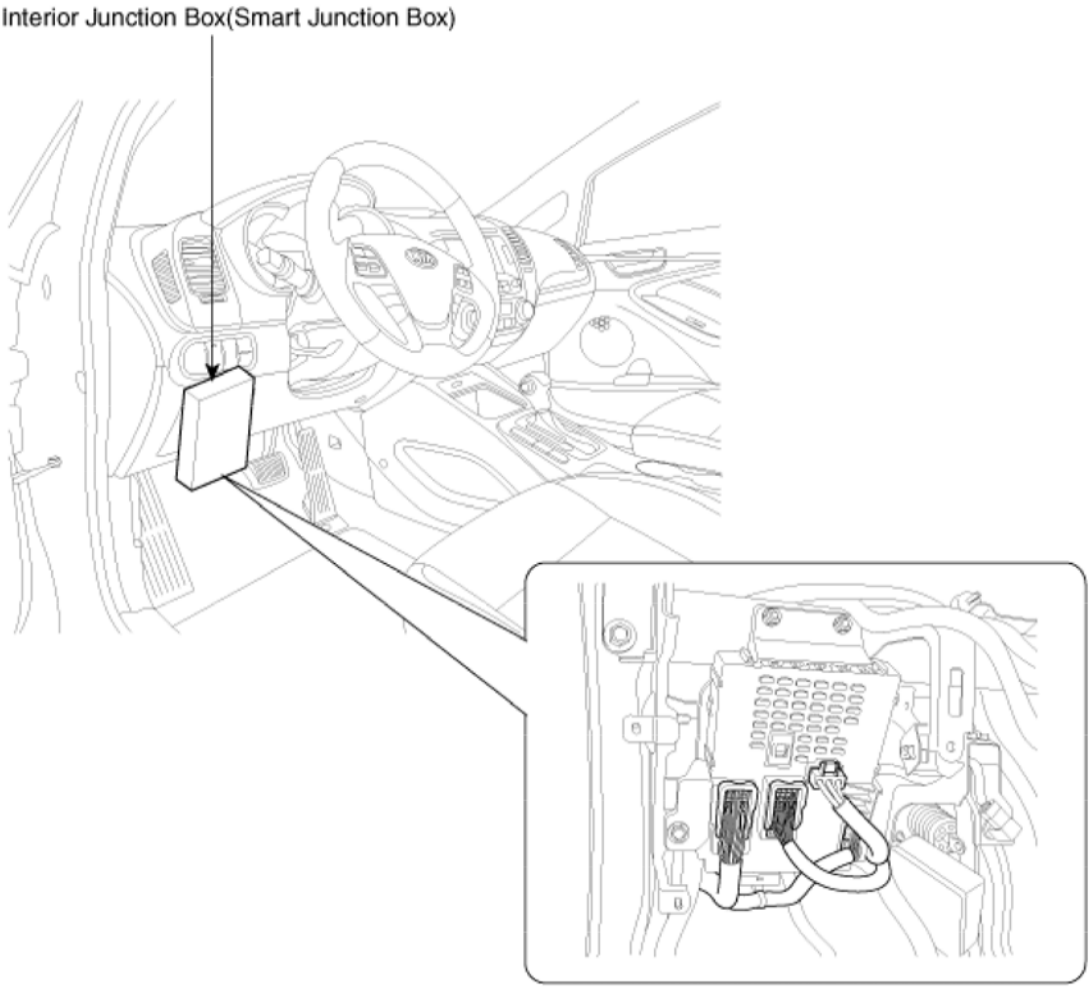
[Engine room relay box]



1. EMS box assembly (Engine control relay, Fuel pump relay, Air conditioner compressor relay)	4. SSB 4(IG2) relay 5. Blower relay 6. Rear defogger relay	9. SSB2(ACC) relay 10. Start relay 11. SSB3(IG1) relay
2. C/Fan 1 relay 3. C/Fan 2 relay	7. Horn relay 8. Wiper relay	12. PTC relay(Gasoline) 13. Multi fuse

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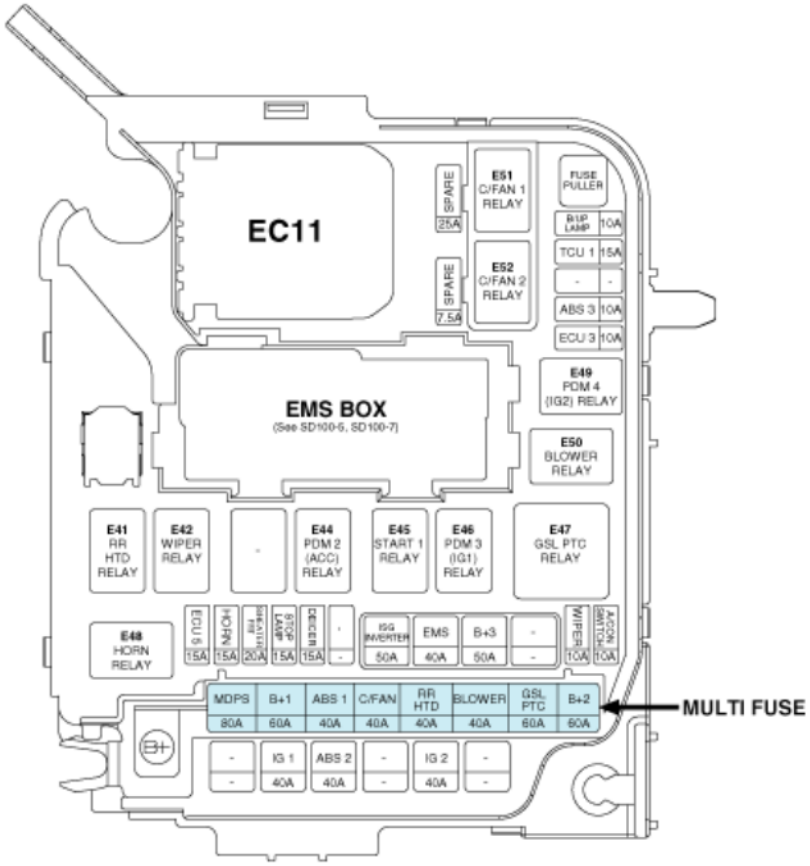
[SJB-Smart Junction Box]



Body Electrical System

Components

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Relay NO.	Relay Name	Type
E41	RR HTD RELAY	PLUG MICRO
E42	WIPER RELAY	PLUG MICRO
E44	PDM 2 (ACC) RELAY	PLUG MICRO
E45	START 1 RELAY	PLUG MICRO
E46	PDM 3 (IG1) RELAY	PLUG MICRO
E47	GSL PTC RELAY	PLUG MINI
E48	HORN RELAY	PLUG MICRO
E49	PDM 4 (IG2) RELAY	PLUG MICRO
E50	BLOWER RELAY	PLUG MICRO
E51	C/FAN 1 RELAY	PLUG MICRO
E52	C/FAN 2 RELAY	PLUG MICRO

※ USE THE DESIGNATED FUSE AND RELAY ONLY

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Circuit (E/R Fuse & Relay Box)

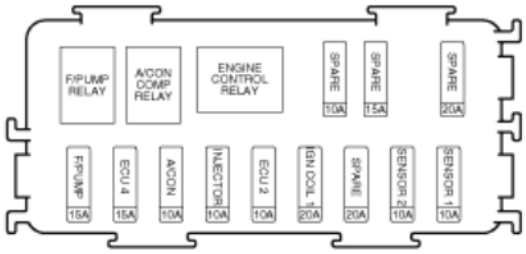
Fuse Name		(A)	Circuit Protected
MULTI FUSE	MDPS	80A	MDPS Unit
	B+1	60A	Smart Junction Box (ARISU-LT IPS 1 (4CH), Fuse - MODULE 6, MODULE 7, P/WDW LH, P/WDW RH, TRUNK)
	ABS 1	40A	ESC Module
	C/FAN	40A	C/Fan 1 Relay, C/Fan 2 Relay
	RR HTD	40A	RR HTD Relay
	BLOWER	40A	Blower Relay
	GSL PTC	60A	GSL PTC Relay
	B+2	60A	Smart Junction Box (ARISU-LT IPS 3 (4CH), ARISU-LT IPS 4 (4CH), IPS 5 (2CH), Fuse - PDM 1, P/SEAT DRV BRAKE SWITCH, S/HEATER RR)
FUSE	B/UP LAMP	10A	A/T : Electro Chromic Mirror, Audio, A/V & Navigation Head Unit, Rear Combination Lamp (In) LH/RH Smart Junction Box (IPS Control Module), M/T : Back-Up Lamp Switch
	TCU 1	15A	Transaxle Range Switch, Vehicle Speed Sensor, Oil Pump Inverter, E/R Fuse & Relay Box (Fuse - B/UP LAMP)
	ABS 3	10A	ESC Module, Yaw Rate Sensor
	ECU 3	10A	ECM/PCM
	A/CON SWITCH	10A	A/C Control Module, Blower Motor, Blower Relay, ECM/PCM, Blower Resistor
	WIPER	10A	ECM/PCM, Wiper Motor, E/R Fuse & Relay Box (Wiper Relay)
	B+3	50A	Smart Junction Box (Leak Current Autocut Device, Fuse - PDM 2, DR LOCK, SUNROOF)
	EMS	40A	EMS Box (Engine Control Relay, Fuse - ECU 4, A/CON, F/PUMP)
	ISG INVERTER	50A	Oil Pump Inverter
	DEICER	15A	ICM Relay Box (Front Deicer Relay)
	STOP LAMP	15A	Stop Signal Electronic Module
	S/HEATER FRT	20A	Driver CCS Control Module, Passenger Seat Warmer Module
	HORN	15A	Horn Relay, ICM Relay Box (Burglar Alarm Horn Relay)
	ECU 5	15A	G4NC : ECM/PCM
	IG 2	40A	W/O Smart Key : Ignition Switch, Start Relay, With Smart Key : PDM 4 (IG2) Relay, Start 1 Relay
	ABS 2	40A	ESC Module
	IG 1	40A	W/O Smart Key : Ignition Switch, With Smart Key : PDM 3 (IG1) Relay, PDM 2 (ACC) Relay

※ USE THE DESIGNATED FUSE AND RELAY ONLY

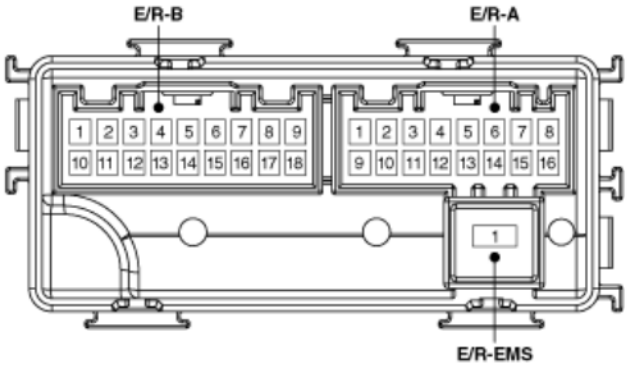
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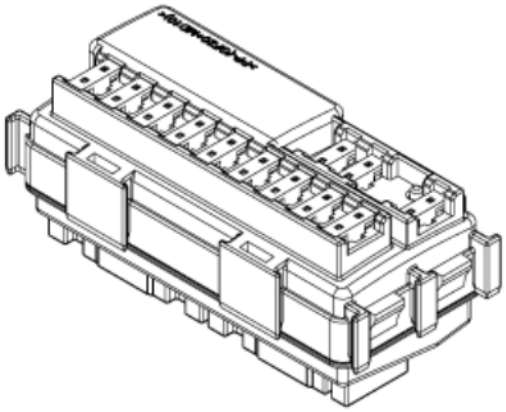
EMS Box (G4NB : NU 1.8L MPI)

<FRONT>



<REAR>





Relay Name	Type
ENGINE CONTROL RELAY	PCB
A/CON COMP RELAY	PCB
F/PUMP RELAY	PCB

※ USE THE DESIGNATED FUSE AND RELAY ONLY

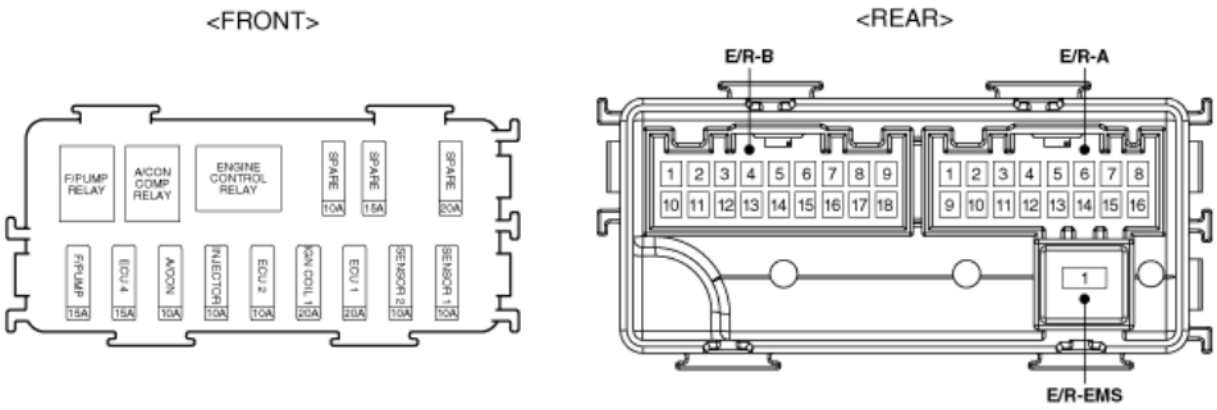
Circuit (EMS Box - G4NB : NU 1.8L MPI)

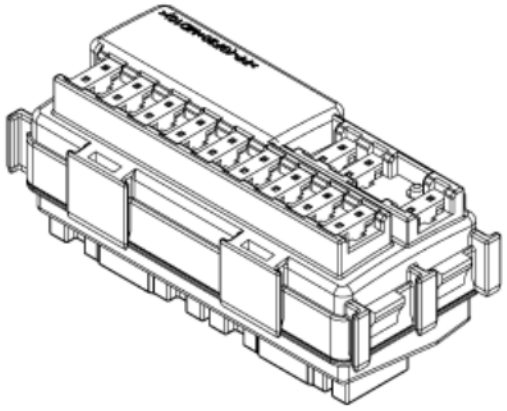
Fuse Name	(A)	Circuit Protected
F/PUMP	15A	F/Pump Relay
ECU 4	15A	ECM/PCM
A/CON	10A	A/CON COMP Relay
INJECTOR	10A	Injector #1/#2/#3/#4, F/Pump Relay, A/CON COMP Relay
ECU 2	10A	ECM/PCM
IGN COIL 1	20A	Ignition Coil #1/#2/#3/#4, Condenser
SPARE	20A	-
SENSOR 2	10A	Oxygen Sensor (Up), Oxygen Sensor (Down), Variable Intake Solenoid Valve, Oil Control Valve #1/#2 Purge Control Solenoid Valve, Canister Close Valve, E/R Fuse & Relay Box (C/Fan 1 Relay, C/Fan 2 Relay)
SENSOR 1	10A	Camshaft Position Sensor #1/#2
SPARE	10A	-
SPARE	15A	-
SPARE	20A	-

※ USE THE DESIGNATED FUSE AND RELAY ONLY

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EMS Box (G4NC : NU 2.0L GDI)





Relay Name	Type
ENGINE CONTROL RELAY	PCB
A/CON COMP RELAY	PCB
F/PUMP RELAY	PCB

※ USE THE DESIGNATED FUSE AND RELAY ONLY

Circuit (EMS Box - G4NC : NU 2.0L GDI)

Fuse Name	(A)	Circuit Protected
F/PUMP	15A	F/Pump Relay
ECU 4	15A	ECM/PCM
A/CON	10A	A/CON COMP Relay
INJECTOR	10A	F/Pump Relay, A/CON COMP Relay
ECU 2	10A	ECM/PCM
IGN COIL 1	20A	Ignition Coil #1/#2/#3/#4, Condenser
ECU 1	20A	ECM/PCM
SENSOR 2	10A	Oxygen Sensor (Up), Oxygen Sensor (Down), Variable Intake Solenoid Valve, Oil Control Valve #1/#2 Purge Control Solenoid Valve, Canister Close Valve, E/R Fuse & Relay Box (C/Fan 1 Relay, C/Fan 2 Relay)
SENSOR 1	10A	Camshaft Position Sensor #1/#2
SPARE	10A	-
SPARE	15A	-
SPARE	20A	-

※ USE THE DESIGNATED FUSE AND RELAY ONLY

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Inspection

Power Relay Test (Type A)

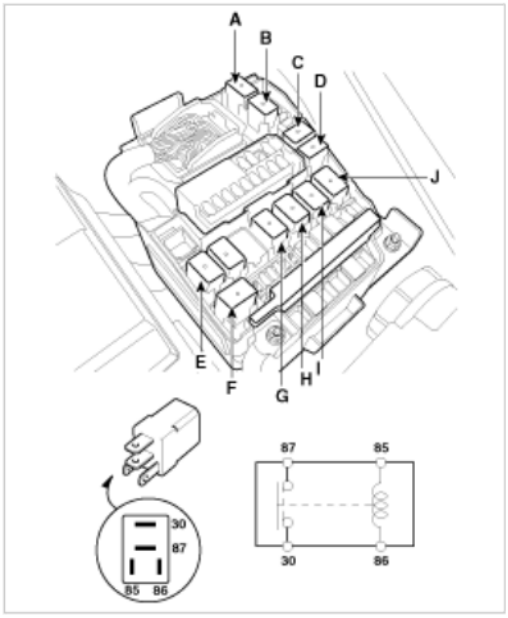
NOTICE

- 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. C/Fan 1 relay	F. Horn relay
B. C/Fan 2 relay	G. SSB2(ACC) relay
C. SSB 4(IG2) relay	H. Start 1 relay
D. Blower relay	I. SSB3(IG1) relay
E. Rear defogger relay	J. PTC relay

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



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

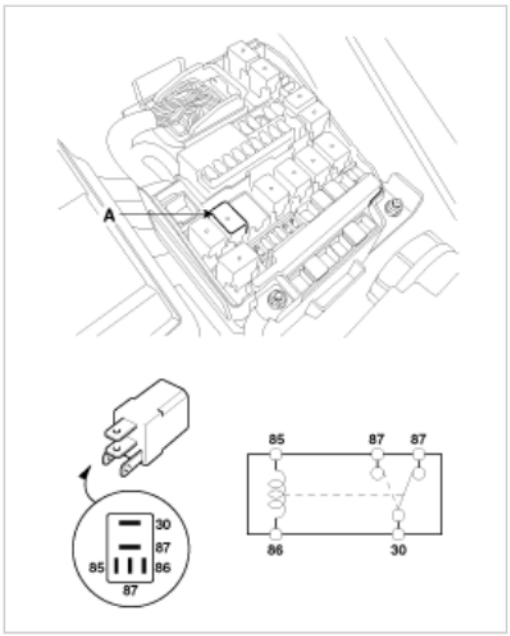
Power Relay Test (Type B)

Check for continuity between the terminals.

A : Wiper 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 continuity between the No.30 and No.87 terminals when power is disconnected.

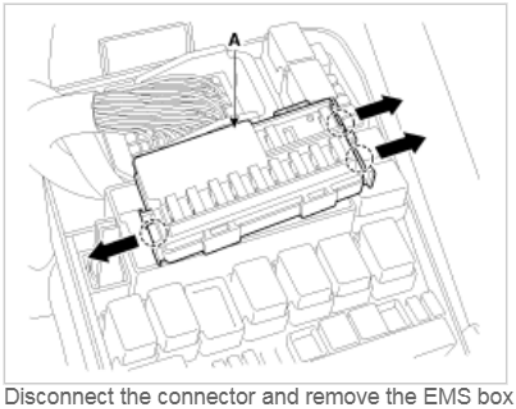
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Terminal / Power	85	86	30	87	87
Disconnected			○		○
Connected	⊖	⊕	○	○	

Replacement of EMS box

1. Disconnect the negative(-) battery terminal.
2. Push 3 hooks in the engine room relay box out to the arrow direction and put up the EMS box assembly(A).



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



Fuse Inspection

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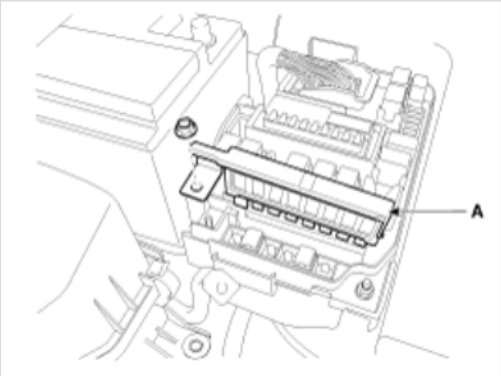
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

NOTICE

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.



NOTICE

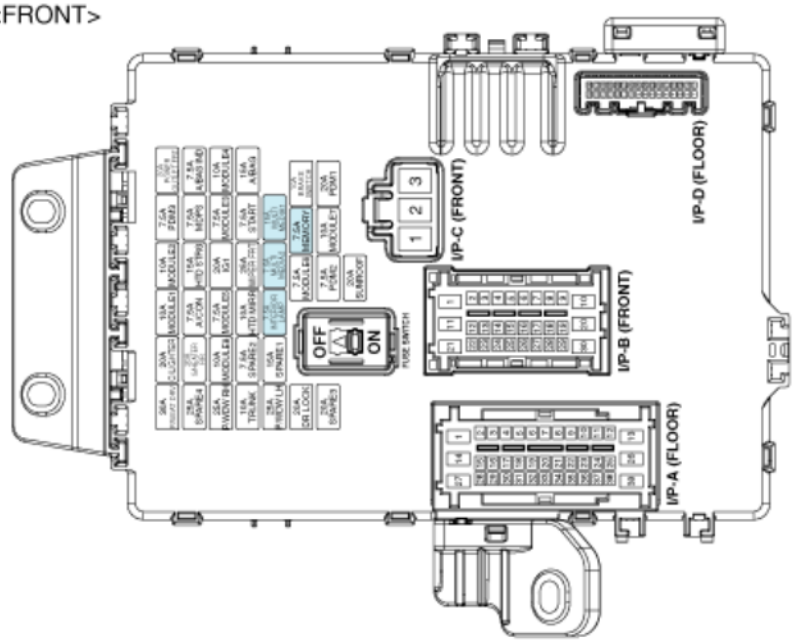
- Multi fuse has to replace entirely when there is damage to only one fuse.
- When replace the multi fuse, refer to the "Engine compartment - component location" diagram exactly.
- Use the multi fuse capacities for each circuit correctly.

Body Electrical System

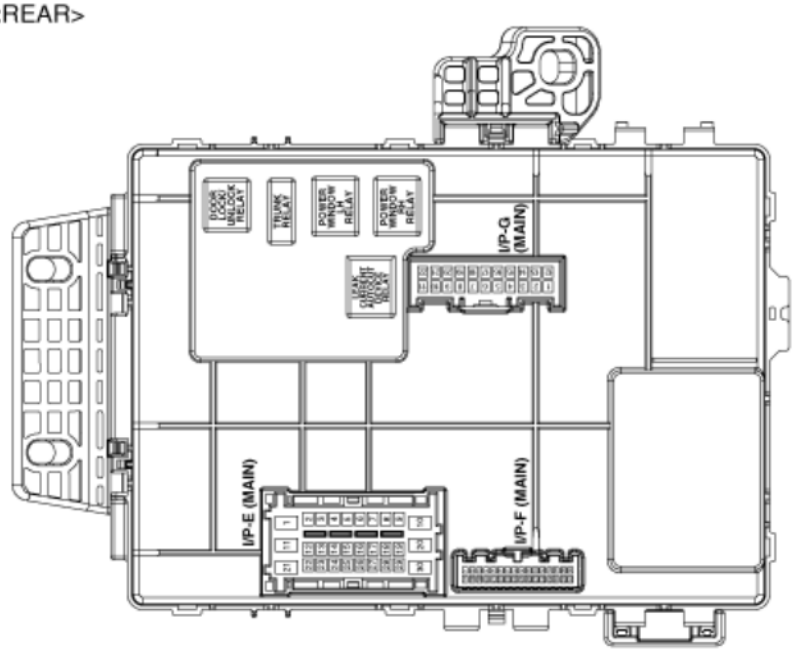
Components

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<FRONT>



<REAR>



※ USE THE DESIGNATED FUSE AND RELAY ONLY

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Circuit (Smart Junction Box)

Fuse Name	(A)	Circuit Protected
P/SEAT DRV	30A	Driver IMS Module, Driver Seat Manual Switch
SPARE 4	25A	-
P/WDW RH	25A	Smart Junction Box (Power Window RH Relay), Passenger Safety Power Window Module
TRUNK	10A	Smart Junction Box (Trunk Relay)
P/WDW LH	25A	Smart Junction Box (Power Window LH Relay), Driver Safety Power Window Module
DR LOCK	20A	Smart Junction Box (Door Lock Relay, Door Unlock Relay), ICM Relay Box (Two Turn Unlock Relay)
SPARE 3	20A	-
C/LIGHTER	20A	Cigarette Lighter & Power Outlet (Cigarette Lighter)
S/HEATER RR	20A	Rear Seat Warmser LH/RH
MODULE 8	10A	BCM, Smart Key Control Module
SPARE 2	7.5A	-
SPARE 1	15A	-
MODULE 1	10A	Smart Key Control Module, BCM, Digital Clock, Audio, A/V & Navigation Head Unit, Power Outside Mirror Switch, DC-DC Converter, MTS Module
A/CON	7.5A	A/C Control Module, Cluster Ionizer, E/R Fuse & Relay Box (Blower Relay, GSL PTC Relay)
MODULE 5	7.5A	Sunroof, Driver CCS Control Module, Passenger Seat Warmer Module, Rear Seat Warmer LH/RH
HTD MIRR	10A	ECM/PCM, A/C Control Module, Driver/Passenger Power Outside Mirror
INTERIOR LAMP	7.5A	Trunk Room Lamp, Glove Box Lamp, Vanity Lamp LH/RH, Room Lamp, Overhead Console Lamp, Ignition Key ILL. & Door Warning Switch (W/O Smart Key)
MODULE 6	7.5A	Sport Mode Switch, Key Solenoid
PDM 2	7.5A	[With Smart Key] Smart Key Control Module [W/O Smart Key] Immobilizer Module
SUNROOF	20A	Sunroof
MODULE 2	10A	Electro Chromic Mirror, Multipurpose Check Connector, A/C Control Module, Driver CCS Switch, Driver CCS Control Module, Passenger Seat Warmer Module Driver IMS Module, Passenger Seat Warmer Switch, A/V & Navigation Head Unit, DC-DC Converter, MTS Module, ATM Lever Indicator, PAS Off Switch Rear Seat Warmer LH/RH, Rear Power Window Switch LH/RH
HTD STRG	15A	Steering Wheel Heater
IG 1	20A	W/O Smart Key : E/R Fuse & Relay Box (Fuse - TCU 1, ECU 3, ABS 3)
WIPER FRT	25A	Wiper Motor, E/R Fuse & Relay Box (Wiper Relay), Multifunction Switch (Wiper)
MULTIMEDIA 2	7.5A	MTS Module
MEMORY	7.5A	Driver IMS Module, Driver Smart Key Outside Handle, Passenger Smart Key Outside Handle, BCM, Tire Pressure Monitoring Module, Auto Light & Photo Sensor Instrument Cluster, Data Link Connector, Multipurpose Check Connector, Digital Clock, A/C Control Module, Electro Chromic Mirror, Driver Power Outside Mirror Passenger Power Outside Mirror
MODULE 7	10A	ICM Relay Box (Turn Signal Lamp Sound Relay, Folding Relay, Unfolding Relay)
PDM 3	7.5A	[With Smart Key] Smart Key Control Module [W/O Smart Key] Immobilizer Module
MDPS	7.5A	MDPS Unit
MODULE 3	7.5A	Instrument Cluster
START	7.5A	[With Burglar Alarm & W/O Smart Key & W/O IMMO.] ICM Relay Box (Burglar Alarm Relay) [W/O Burglar Alarm or With Smart Key or With IMMO.] Transaxle Range Switch (A/T), E/R Fuse & Relay Box (Start 1 Relay), Smart Key Control Module, ECM
MULTIMEDIA 1	15A	Audio, A/V & Navigation Head Unit, DC-DC Converter
BRAKE SWITCH	10A	Stop Lamp Switch, Smart Key Control Module
PDM 1	20A	Smart Key Control Module
POWER OUTLET FRT	20A	Cigarette Lighter & Power Outlet (Power Outlet)
A/BAG IND	7.5A	Instrument Cluster (Air Bag IND.)
MODULE 4	10A	Crash Pad Switch, Tire Pressure Monitoring Module, Stop Lamp Switch, Digital Clock, BCM, ISG Off Switch, Rear Parking Assist Sensor LH (Out/In) Rear Parking Assist Sensor RH (Out/In), Front Parking Assist Sensor LH/RH
A/BAG	15A	SRS Control Module, Passenger Weight Classification Sensor

※ USE THE DESIGNATED FUSE AND RELAY ONLY

Body Electrical System

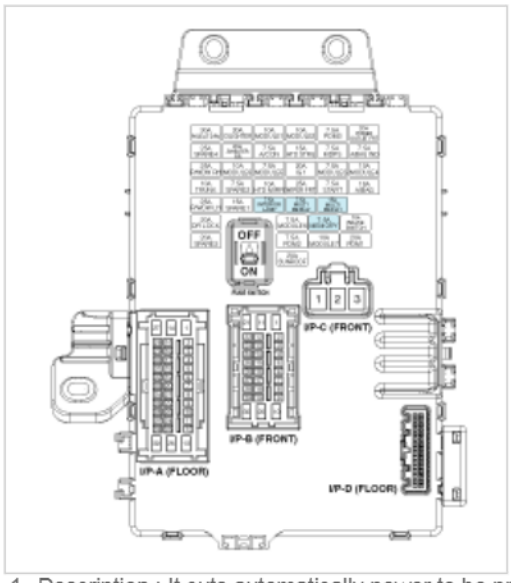
Description

Smart Junction Box(SJB)

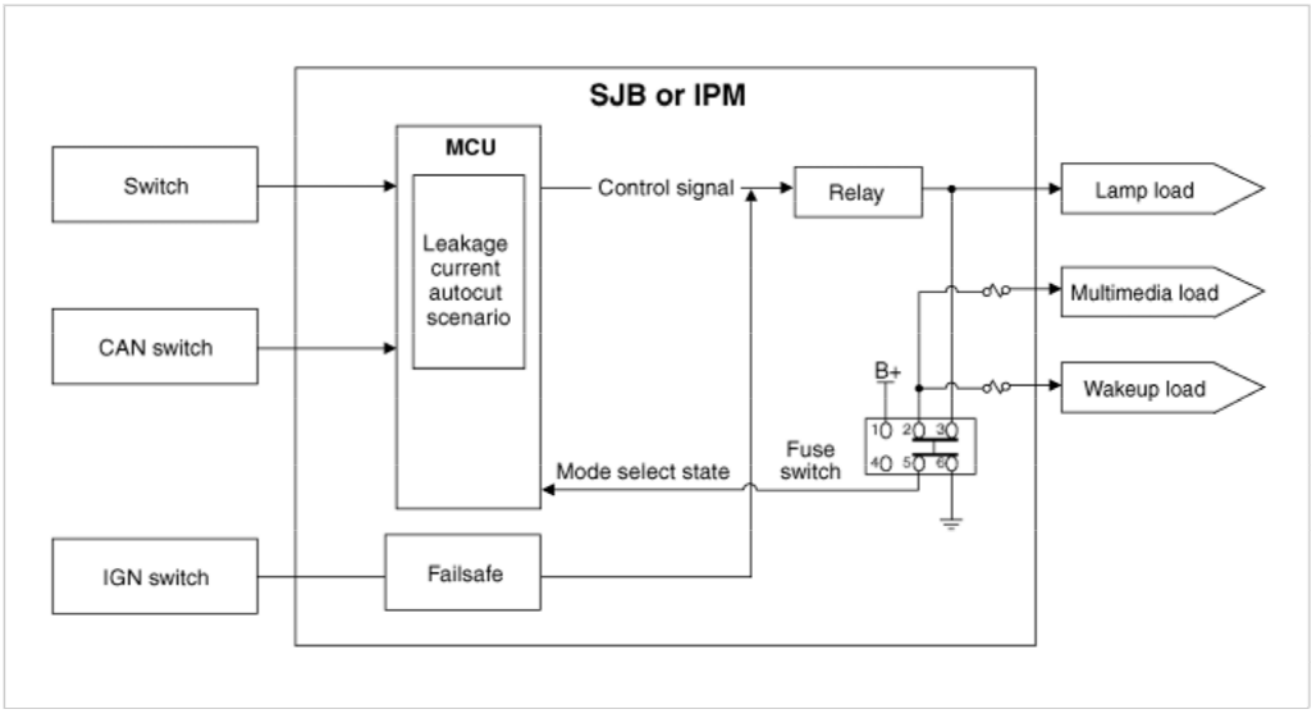
1. General function : Interior Junction Box + some functions of BCM
   It controls loads with CAN communication and IPS.
2. Main function
   A. Low speed CAN communication(100 kbps)
   B. Self diagnostics(Lamp open/short)
   C. Fail safe(When MCU/CAN is fail, Head lamp / Tail lamp directly drive)
  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

Auto cut system of dark current

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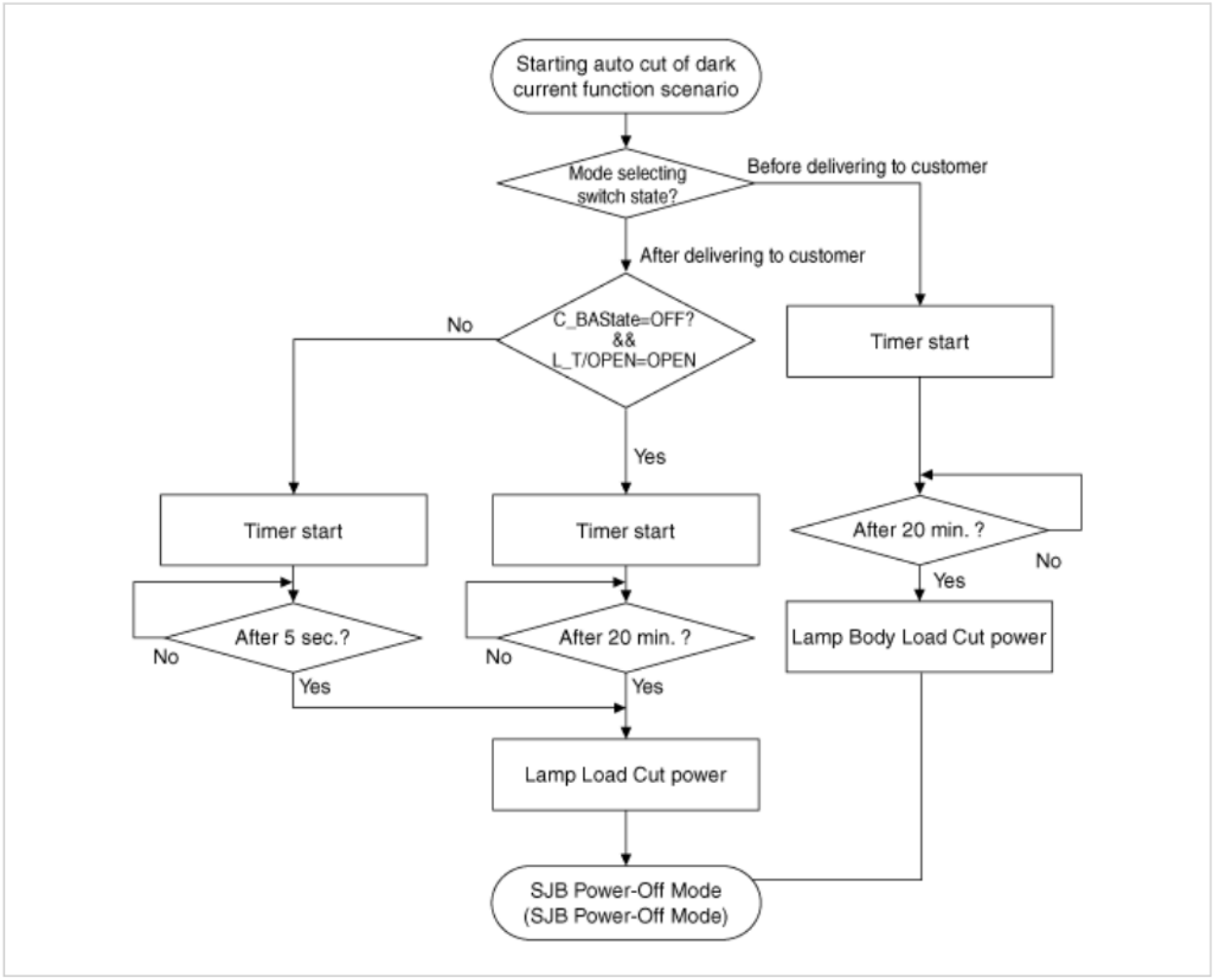


1. Description : It cuts automatically power to be provided with load for reducing useless dark current according to vehicle state.



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

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

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

Symptom	Related part
•Door lock/unlock, trunk open don't activate by RKE. (Wakeup of each module don't activate.)	BCM

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•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

Fuse Inspection

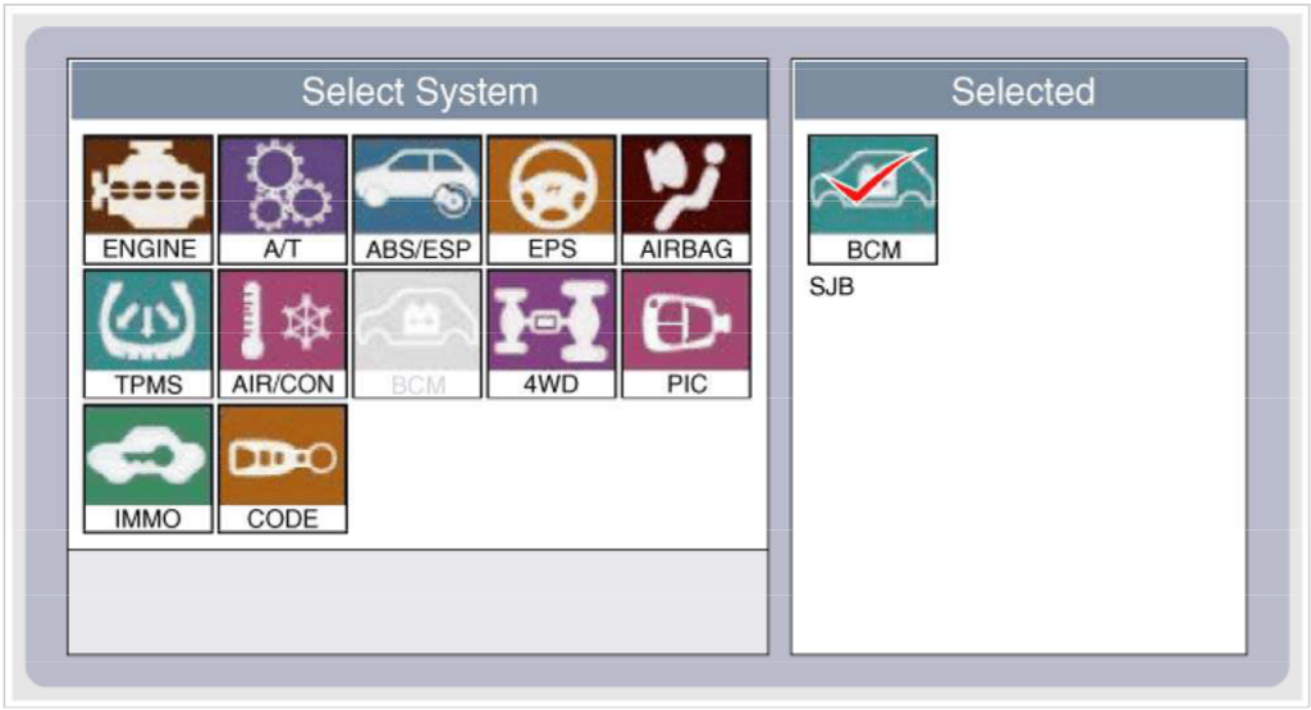
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

NOTICE

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

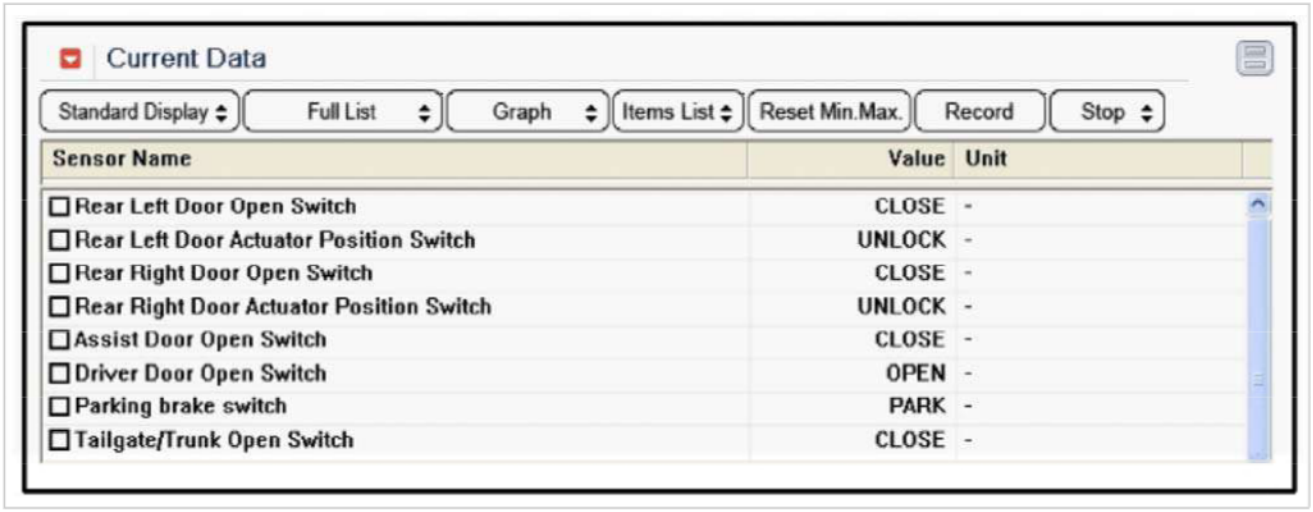
Inspection

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

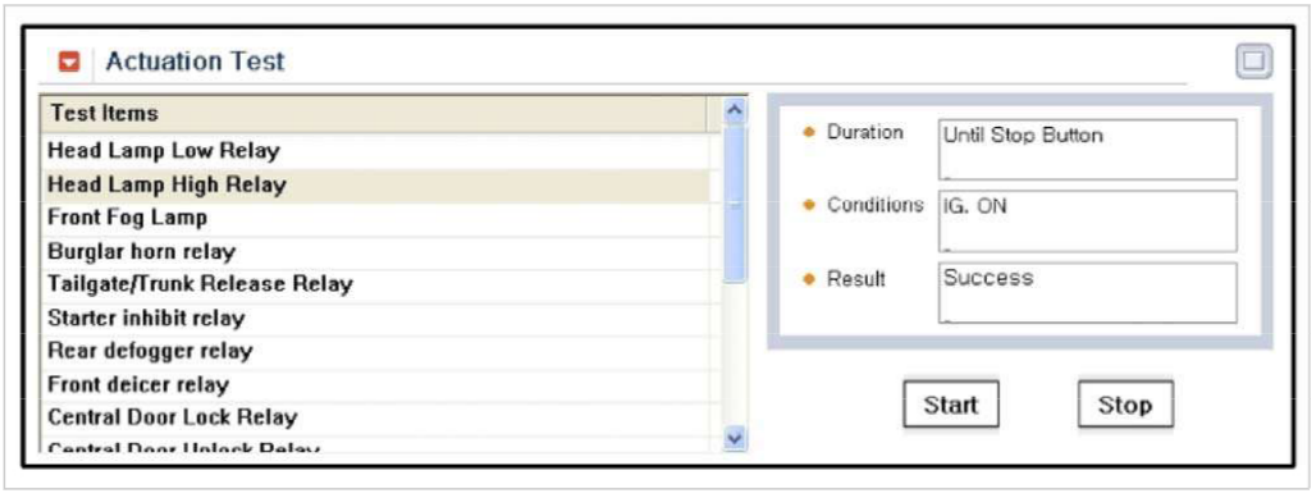


3. To consult the present input/out value of SJB, "Current DATA". It provides information of SJB input/output conditions.

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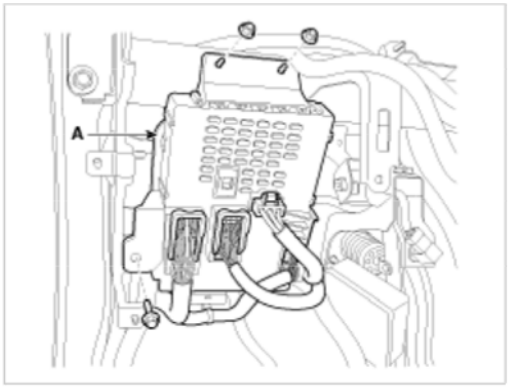
4. To perform functional test on SJB outputs, select "Actuation Test"



Removal

Passenger Compartment Junction Box (SJB)

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer Body - "Crash Pad Lower Panel")
3. Disconnect the connectors from the fuse side of the smart junction box.
4. Remove the smart junction box after loosening the mounting nuts (2EA) and bolt.



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

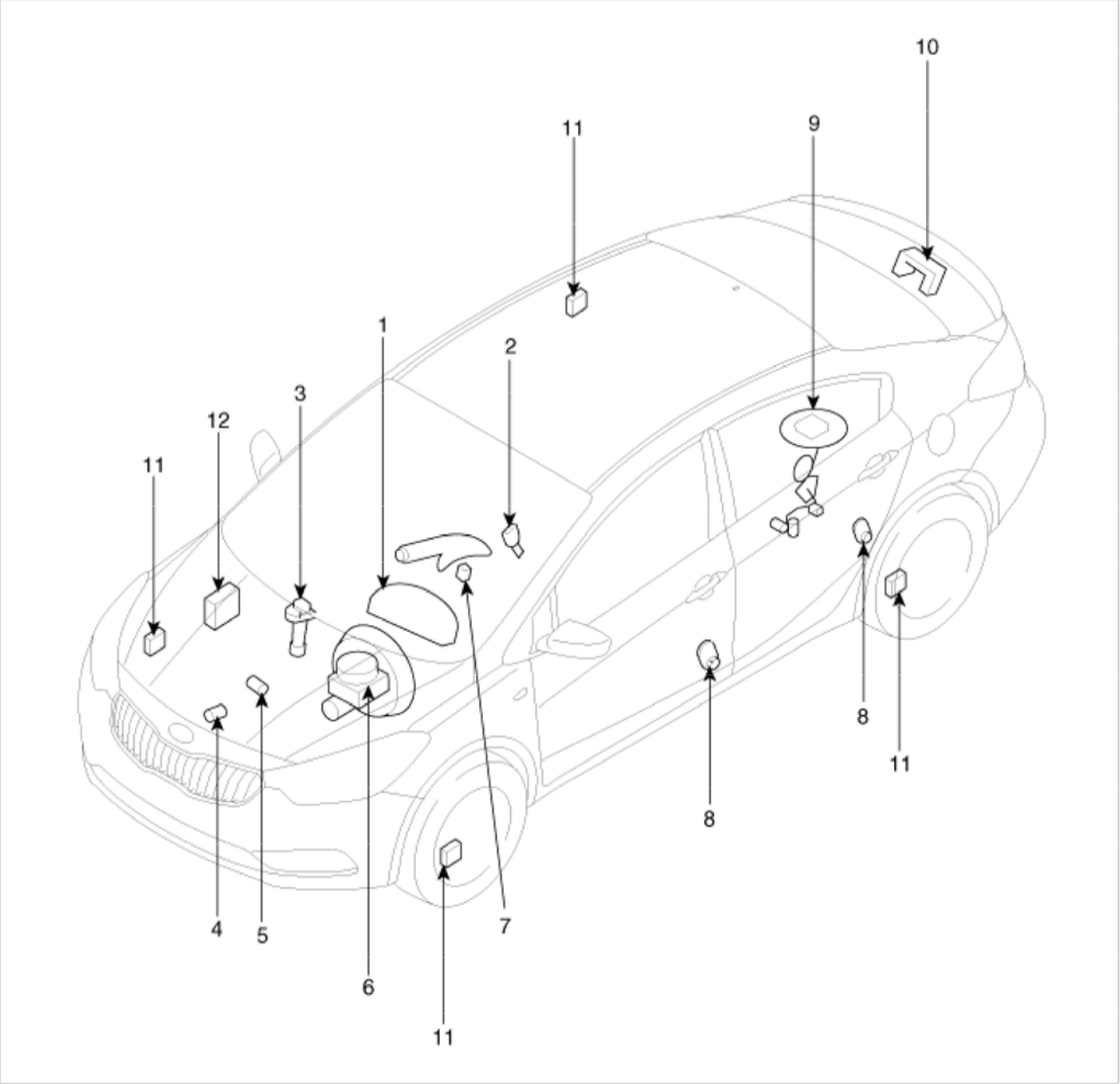
Installation

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

Body Electrical System

Component Location



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

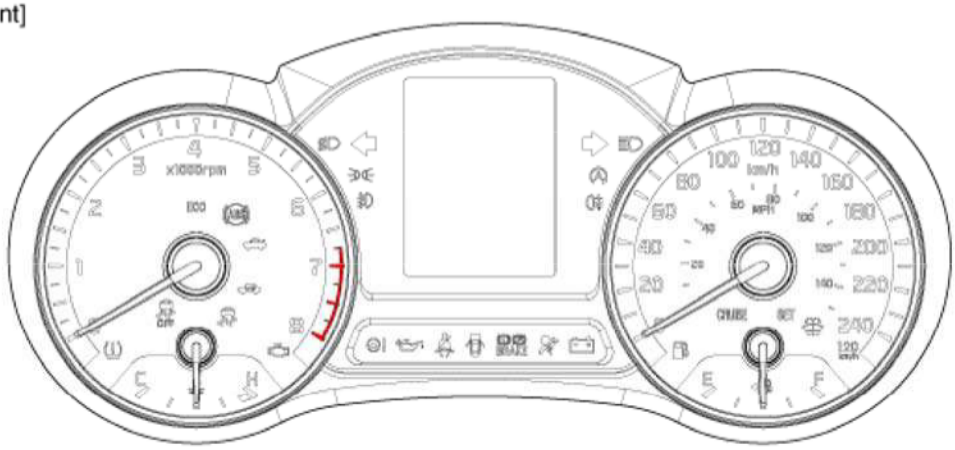
Body Electrical System

Components

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[DOT LCD]

[Front]



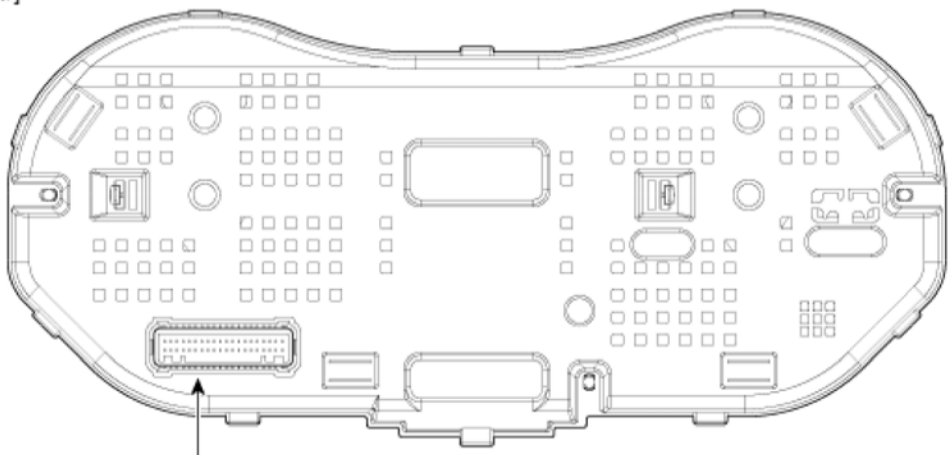


Speedo meter (KPH)



Speedo meter (MPH)

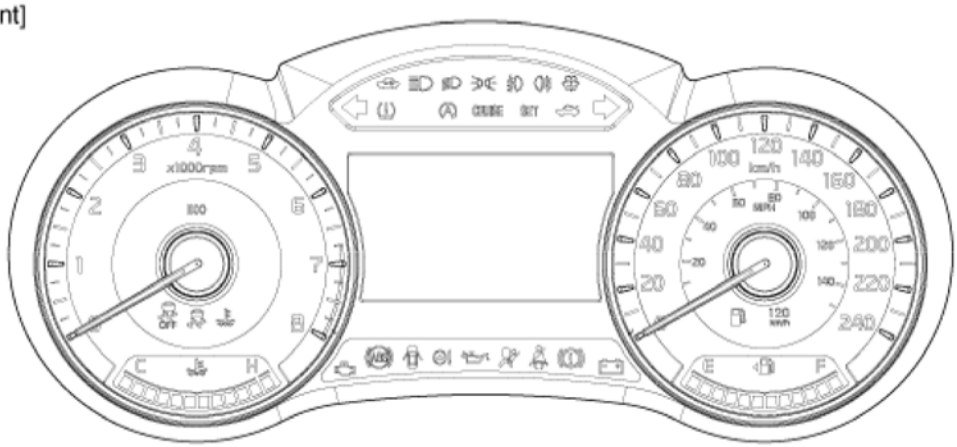
[Rear]



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[TFT LCD]

[Front]



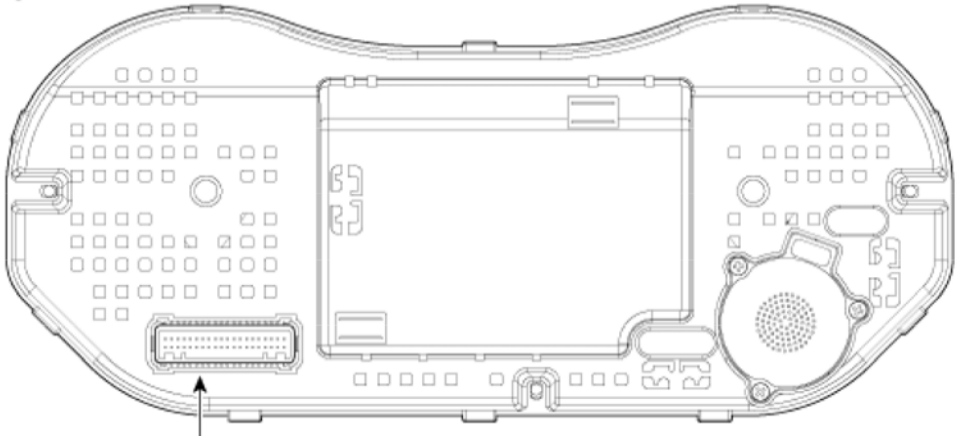


Speedo meter (KPH)



Speedo meter (MPH)

[Rear]



Connector A

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[Segment LCD]

[Front]



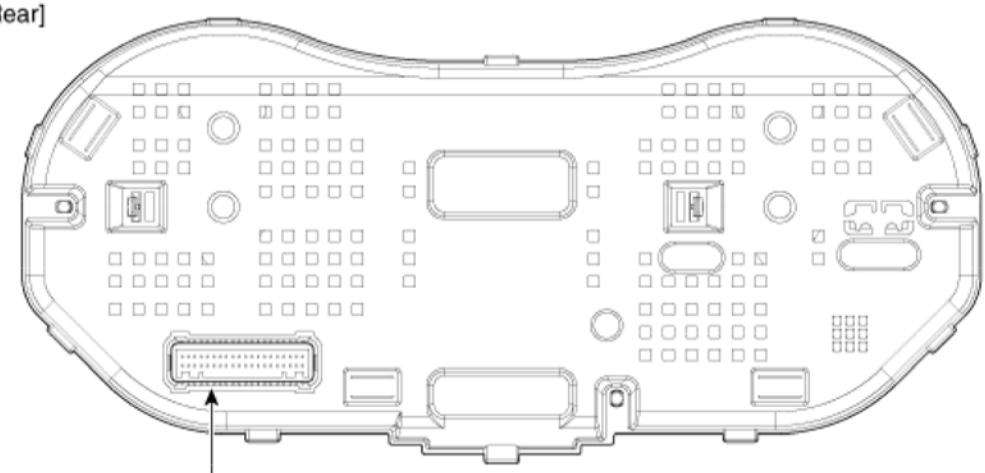


Speedo meter (KPH)

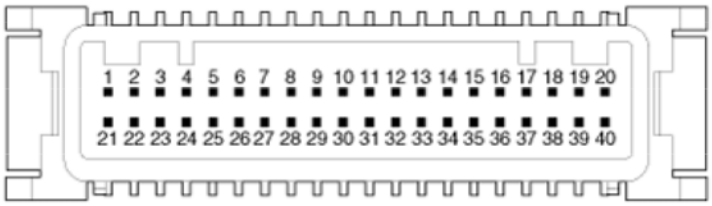


Speedo meter (MPH)

[Rear]



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Connector A

Connector Pin Information

No.	Description	No.	Description
1	Alternator L output	21	Battery (+)
2	ISG type : LDC unit General type : Battery(+)	22	Ignition (+)
3	Air bag (+)	23	Illumination (+)
4	Rheostat up switch	24	-
5	Rheostat down switch	25	Signal ground 1
6	Oil pressure	26	-
7	Acitve ECO	27	MM CAN High (TFT only)
8	Battery charge	28	MM CAN Low (TFT only)
9	Low washer	29	-
10	Immobilizer	30	C CAN High
11	Steeering wheel input (DOT/TFT only)	31	C CAN Low
12	Trip switch 1 (+)	32	-
13	Trip (-)	33	Signal ground 2
14	AT S output	34	Fuel (-)
15	AT R output	35	Fuel (+)
16	AT D output	36	5V output (FFV sender)
17	AT N output	37	Trip switch 2 (+)
18	AT P output	38	Speed input (M/T)
19	Detent output	39	Ice warning input
20	4P output	40	Illumination (-) output

Body Electrical System

Description

Cluster Variant Coding

As we have more options (ESC, TPMS, etc.) in the car, the dashboard now have more information to display depending on the chosen options.

For this reason, we need to learn which options the current vehicle when we replace the dashboard.

To address this issue, a course of learning based on the option required for the vehicle when replacing the dashboard should be carried out.

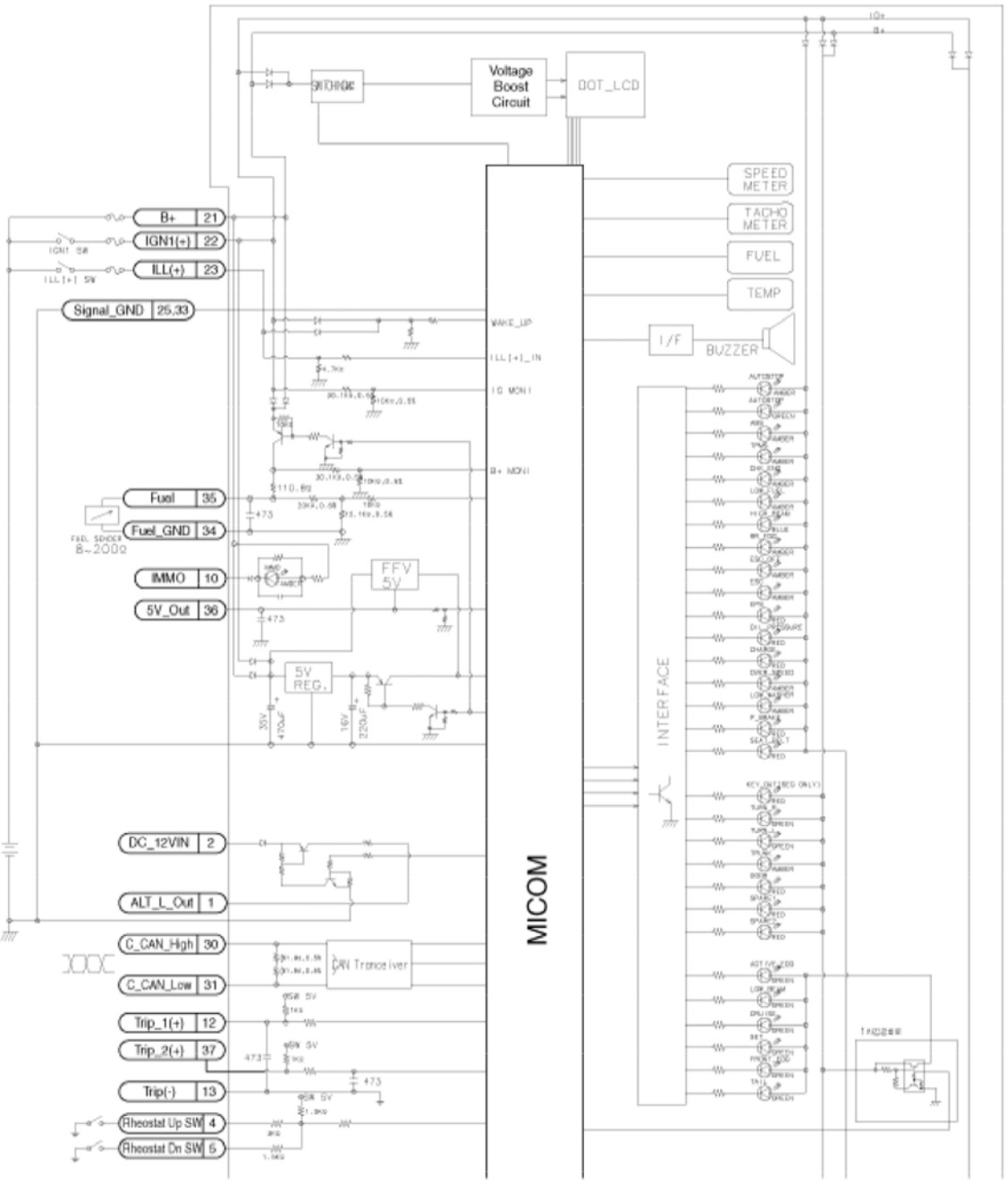
This is called Variant Coding.

Body Electrical System

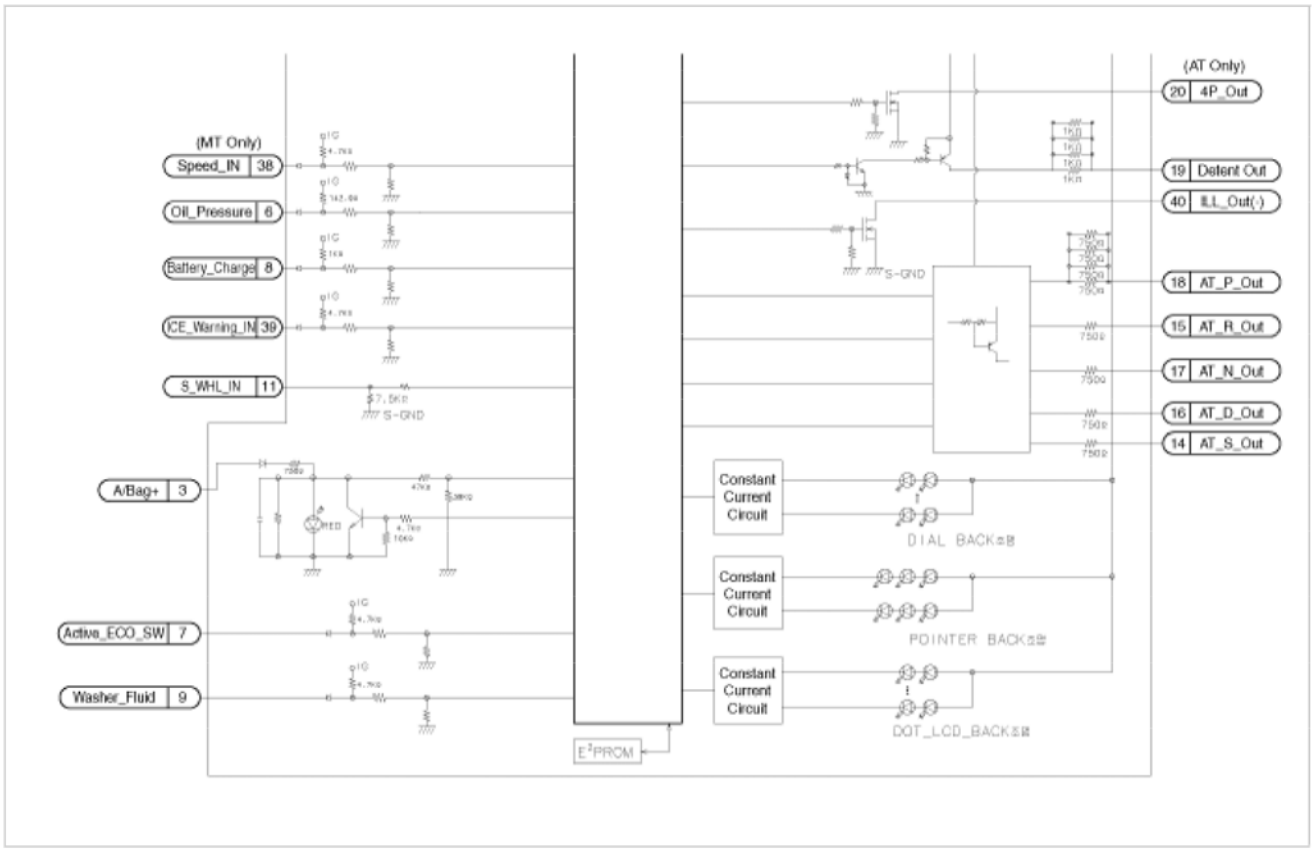
Circuit Diagram

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[DOT LCD]

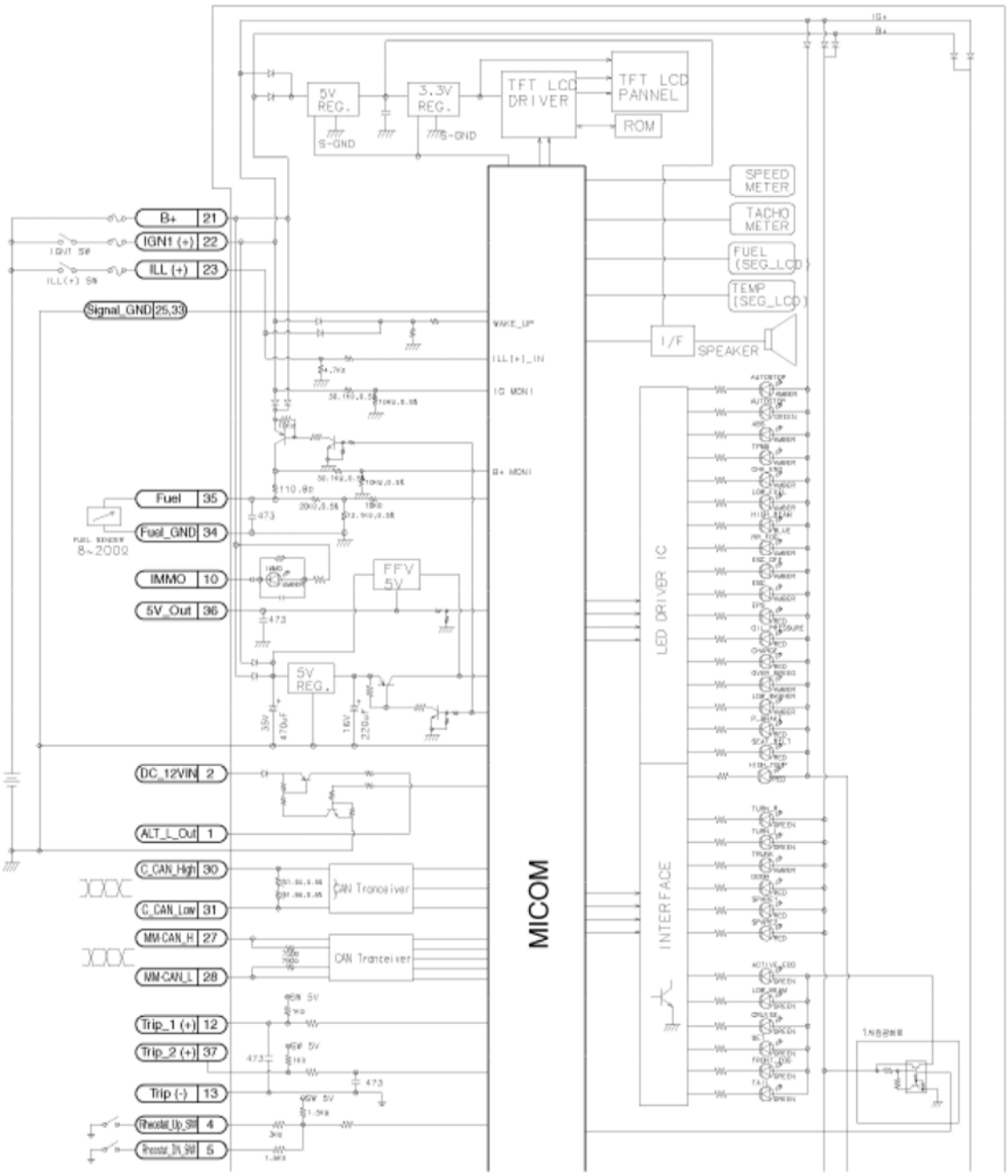


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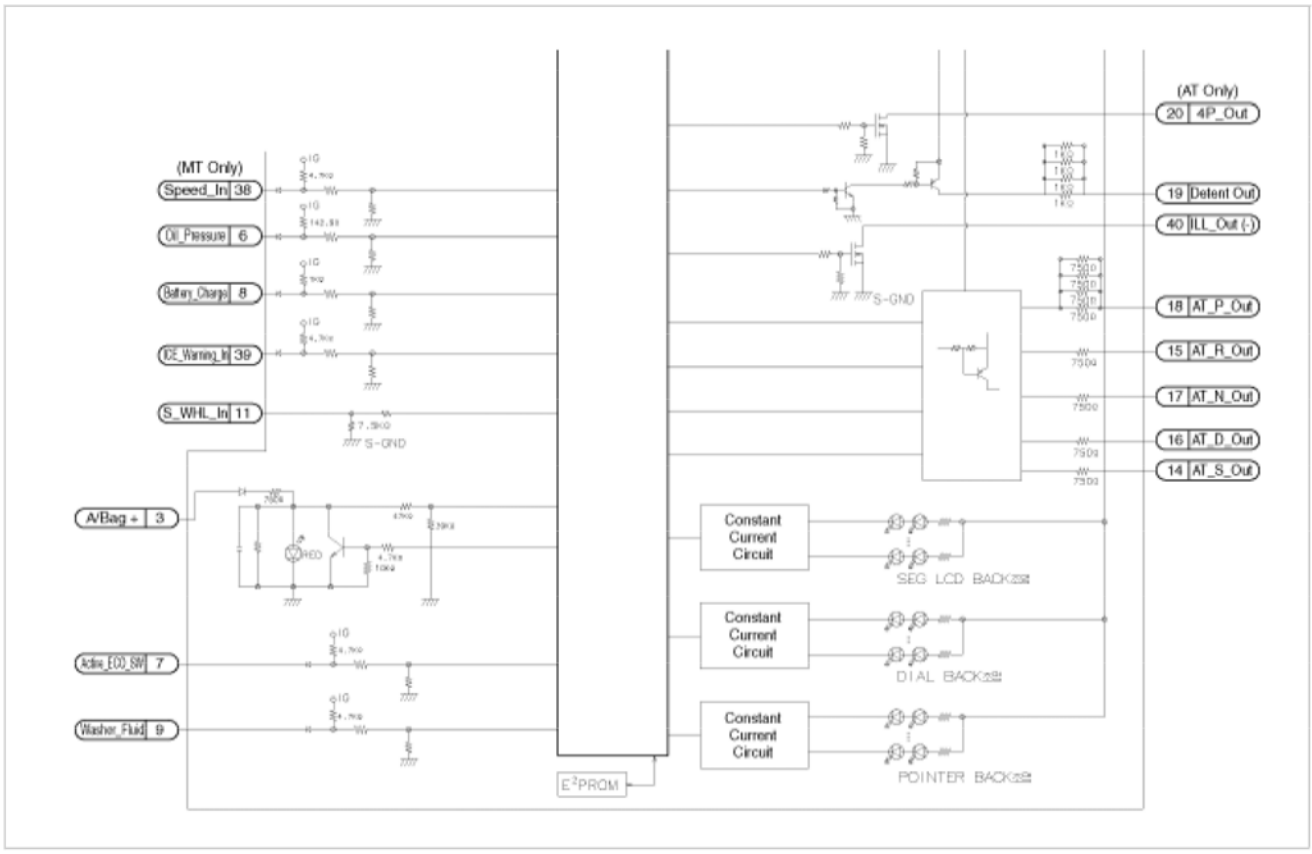


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[TFT LCD]

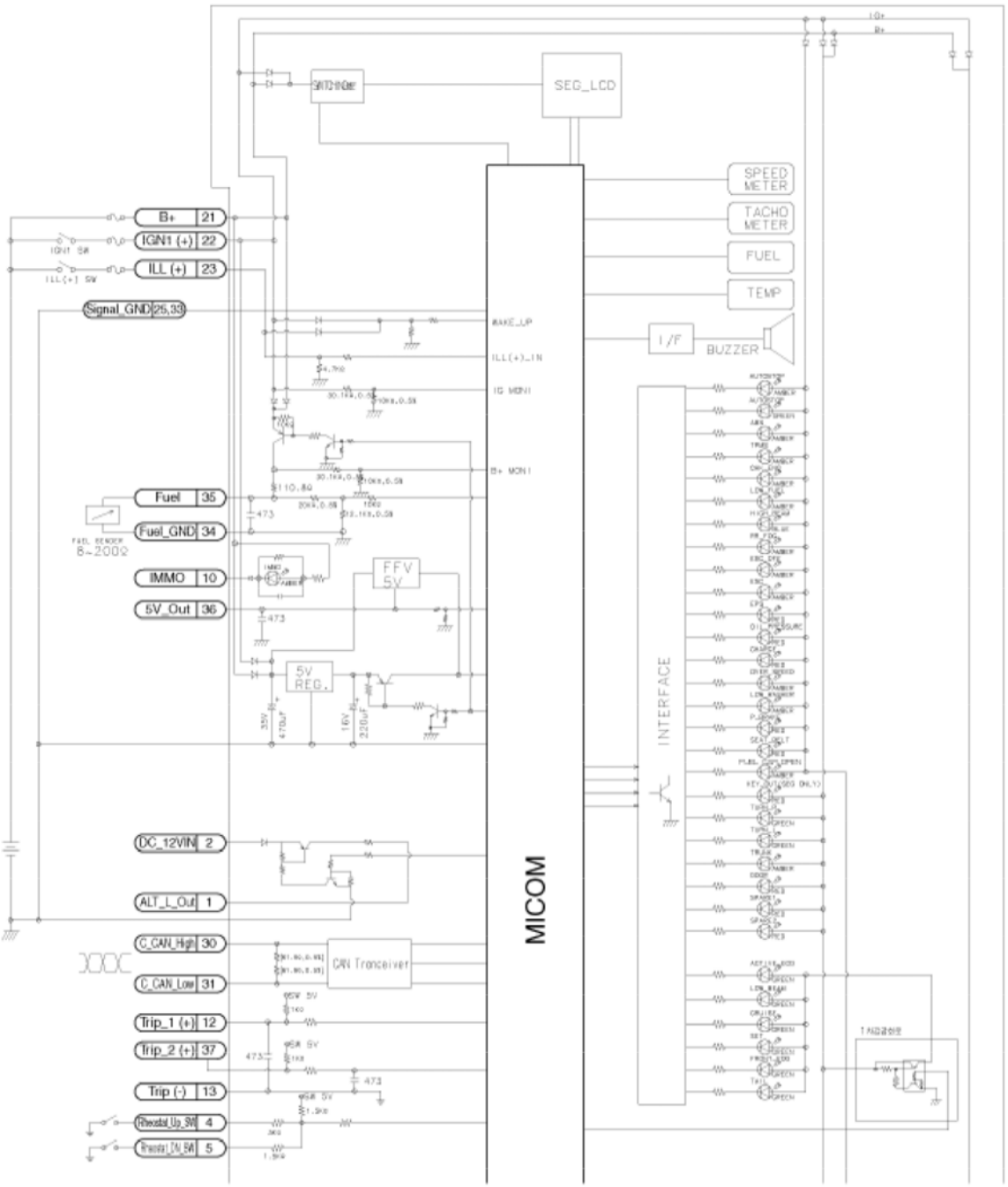


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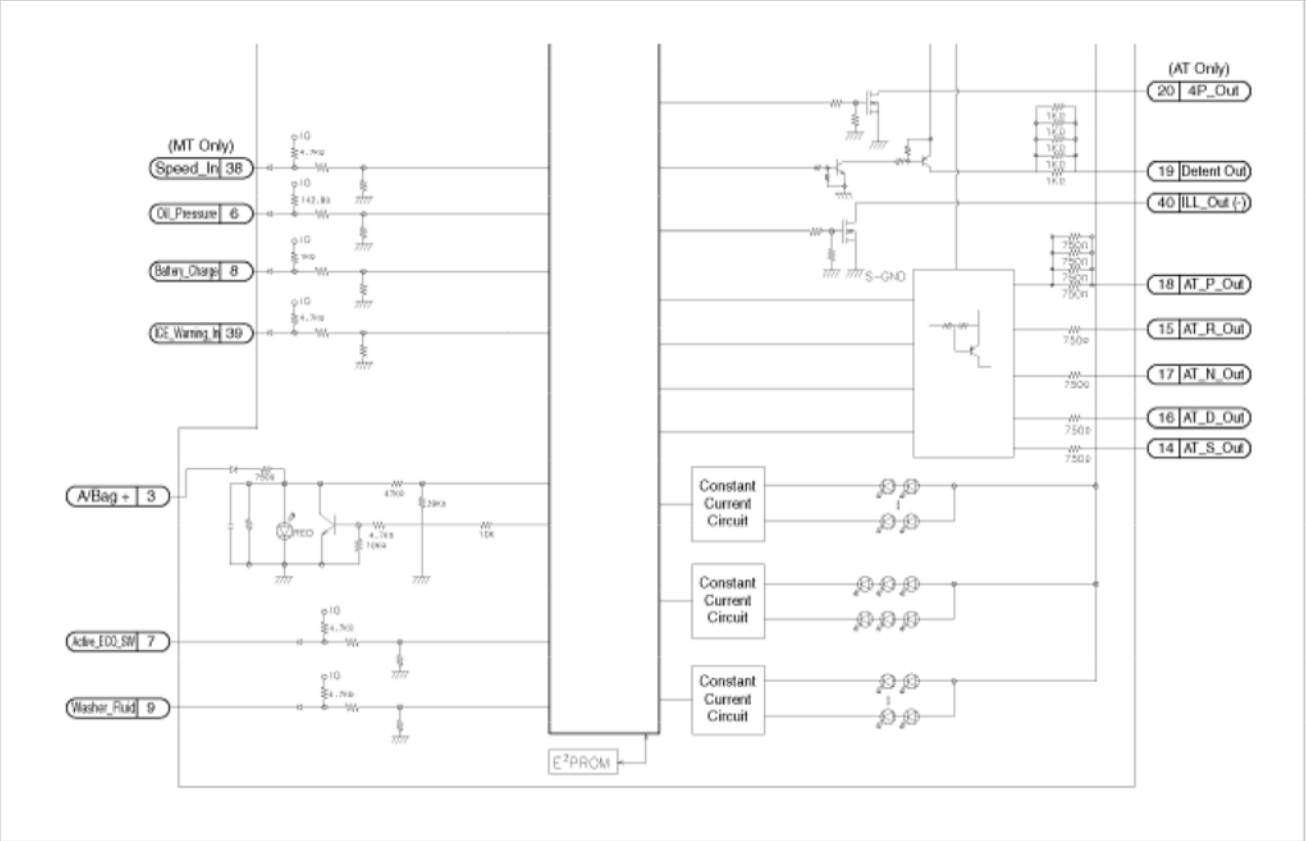


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[Segment LCD]



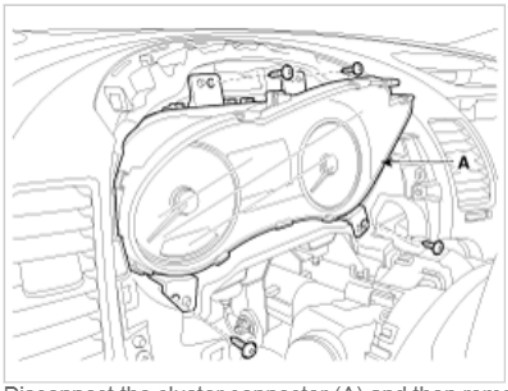
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Body Electrical System

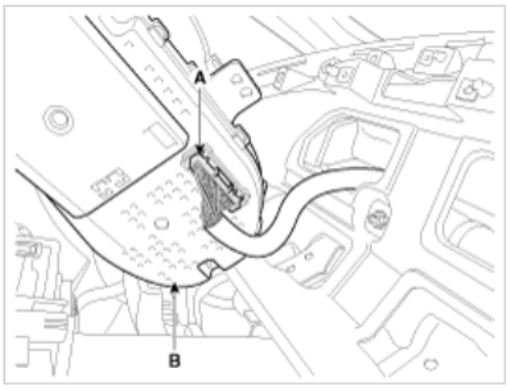
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the cluster fascia panel.
   (Refer to Body - "Cluster Fascia Panel")
3. Remove the cluster (A) from the housing after removing 4 screws.



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

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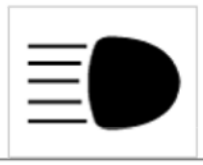


Installation

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

Inspection

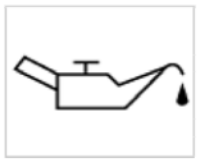
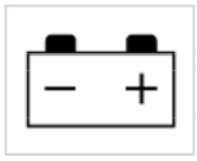
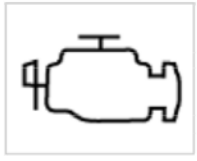
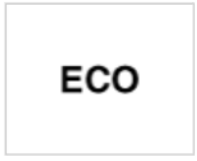
1. Check point (Warning indicator)

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

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

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18		Yellow	TPMS (Tread & Fail)	C-CAN	TPMS	CAN line failure
19		Yellow	Fuel Low	Low fuel resistance	Fuel Sender	1. Fuel sender failure 2. Wiring failure
20		Red	Parking Brake	C-CAN	BCM & ABS or ESC	1. CAN line failure
21		Yellow	Oil Pressure	Hardwire	Oil Pressure Sensor	1. Wiring failure
22		Red	Battery Charge	Hardwire	Battery Sensor	1. Wiring failure
23		Yellow	Check Engine	C-CAN	EMS	1. CAN line failure
24		Yellow	Low Washer	Hardwire	Water Level Sensor	1. Wiring failure
25		Green	Active ECO Passive ECO	Hardwire C-CAN	ECO ON/OFF Switch	1. Switch failure 2. Wiring failure
26		Red	EPS	C-CAN	EPS Unit	1. EPS unit failure 2. CAN line failure

2. Check point (Gauge)

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

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3. Connector terminal check list

No.	Description	Input/Output	Communication	Check Point	
				Spec	Condition
A1	Alternator L output	Output	Hardwire	-	IGN switch ON
A2	DC 12V input	Input	Hardwire	-	IGN switch ON
A3	Aig Bag (+)	Input	Hardwire	9 ~ 16 V	IGN switch ON
A4	Rheostat up switch	Input	Hardwire	Below 2V	IGN switch ON
					Rheostat up switch ON
A5	Rheostat down switch	Input	Hardwire	Below 2V	IGN switch ON
					Rheostat down switch ON
A6	Oil pressure indicator	Input	Hardwire	Below 1.5V	IGN switch ON
					Oil pressure switch ON
A7	Active ECO	Input	Hardwire	Below 1.5V	IGN switch ON
A8	Battery Charge	Input	Hardwire	Below 1.5V	IGN switch ON
					Charge switch ON
A9	Low washer	Input	Hardwire	-	IGN switch ON
A10	Immobilizer indicator	Input	Hardwire/CAN	Below 1.5V	IGN switch ON
A11	Steering wheel	input	Hardwire	-	IGN switch ON
A12	Trip switch 1	Input	Hardwire	0.7 ~ 4.4 V	IGN switch ON
A13	Trip switch (-)	Ground	Hardwire	Below 1V	Switch ground input
A14	AT S output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A15	AT R position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A16	AT D position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A17	AT N position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A18	AT P position output	Output	Hardwire	7 ~ 15 V	IGN switch ON
A19	Detent output	Output	Hardwire	9 ~ 16 V	IGN switch ON
					Rheostat MAX
A20	4P output	Output	Hardwire	9 ~ 16 V	IGN switch ON
					Vehicle speed 1㎞/h excess
A21	Battery (+)	Input	Hardwire	9 ~ 16 V	Always
A22	Ignition (+)	Input	Hardwire	9 ~ 16 V	IGN switch ON
A23	Illumination (+)	Input	Hardwire	Above 6 V	IGN switch ON
					Illumination (+) switch ON
A24	-				
A25	Signal ground 1	Ground	Hardwire	Below 1V	Switch ground input
A26	-				
A27	MM CAN High	Input/ Ouptut	CAN	-	-
A28	MM CAN Low	Input/ Ouptut	CAN	-	-
A29	-				
A30	C CAN High	Input/ Ouptut	CAN	-	-
A31	C CAN Low	Input/ Ouptut	CAN	-	-
A32	-				
A33	Signal ground 2	Ground	Hardwire	Below 1V	Switch ground input
A34	Fuel (-)	Ground	Hardwire	Below 1V	Always
A35	Fuel (+)	Input	Hardwire	Below 1.1 V	IGN switch ON
					Fuel Full
				Above 10.7V	IGN switch ON
					Fuel Empty
A36	5V output	Output	-	-	-
A37	Trip switch 2	Input	Hardwire	0.7 ~ 4.4 V	IGN switch ON
A38	Speed	Input	CAN	9 ~ 16 V	IGN switch ON
A39	Ice warning	Input	-	-	-
A40	Illumination output	Output	Hardwire	9 ~ 16 V	IGN switch ON

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					Illumination (+) switch ON

4. Communication information

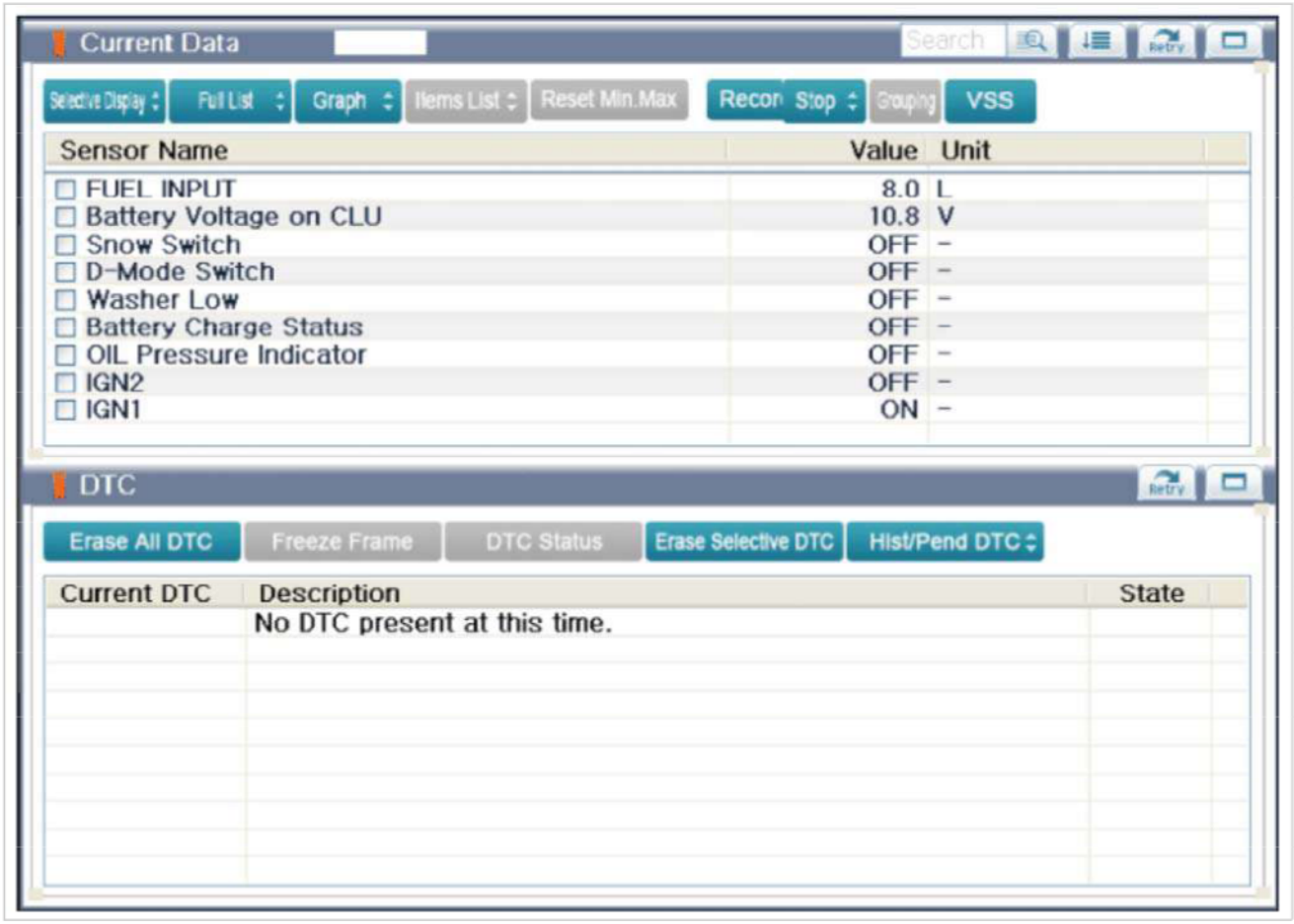
Transmision Unit	Receive Unit	CAN communication	Reference
Cluster	BCM	C-CAN	Refuel detecede state
			Instant fuel consumption information
			Low fuel warning information
			Vehicle setting condition
			Illumination setting
Cluster	EMS	C-CAN MM-CAN	SPORT/ECO Mode
	TCU		
	ECS		
	ESP		
	AVN		
Cluster	ACU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

5. The other information about the cluster
   (1) USM (User Setting Mode)
      A. USM is set using the steering wheel remote control button.
      B. IMS seat, IMS steering, auto door lock/unlock, head lamp escort, welcome light, welcome sound and triple turn signal lamp are controled.
   (2) USM setting procedure
      A. Send the USM value to the BCM
      B. BCM send the setting value to the each module through CAN.
      C. Each modules send the setting complete value to BCM.
      D. BCM send the final setting value to cluster through CAN.

Diagnosis with GDS

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

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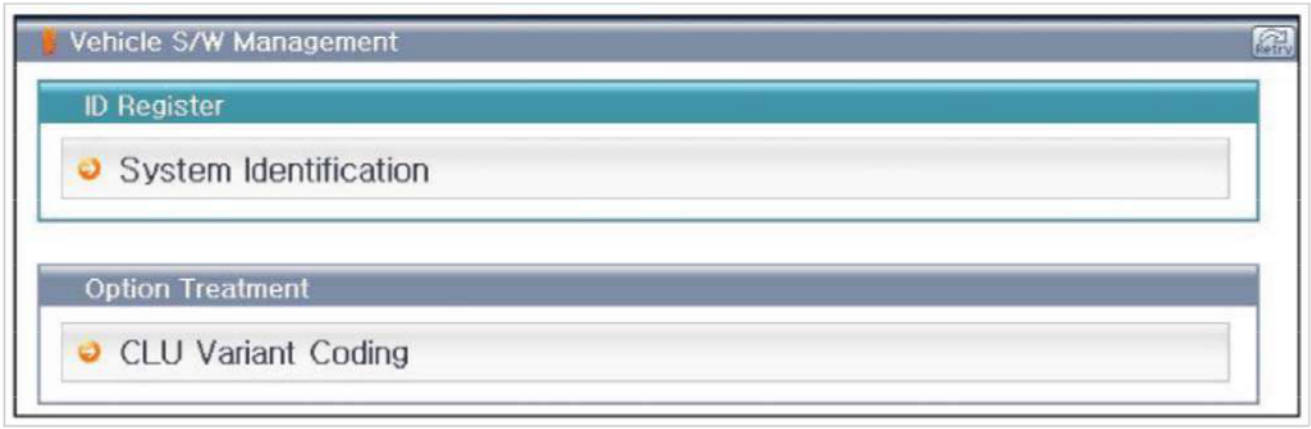


6. To check the DTC of the each module, select "DIAGNOSTIC TROUBLE CODES".

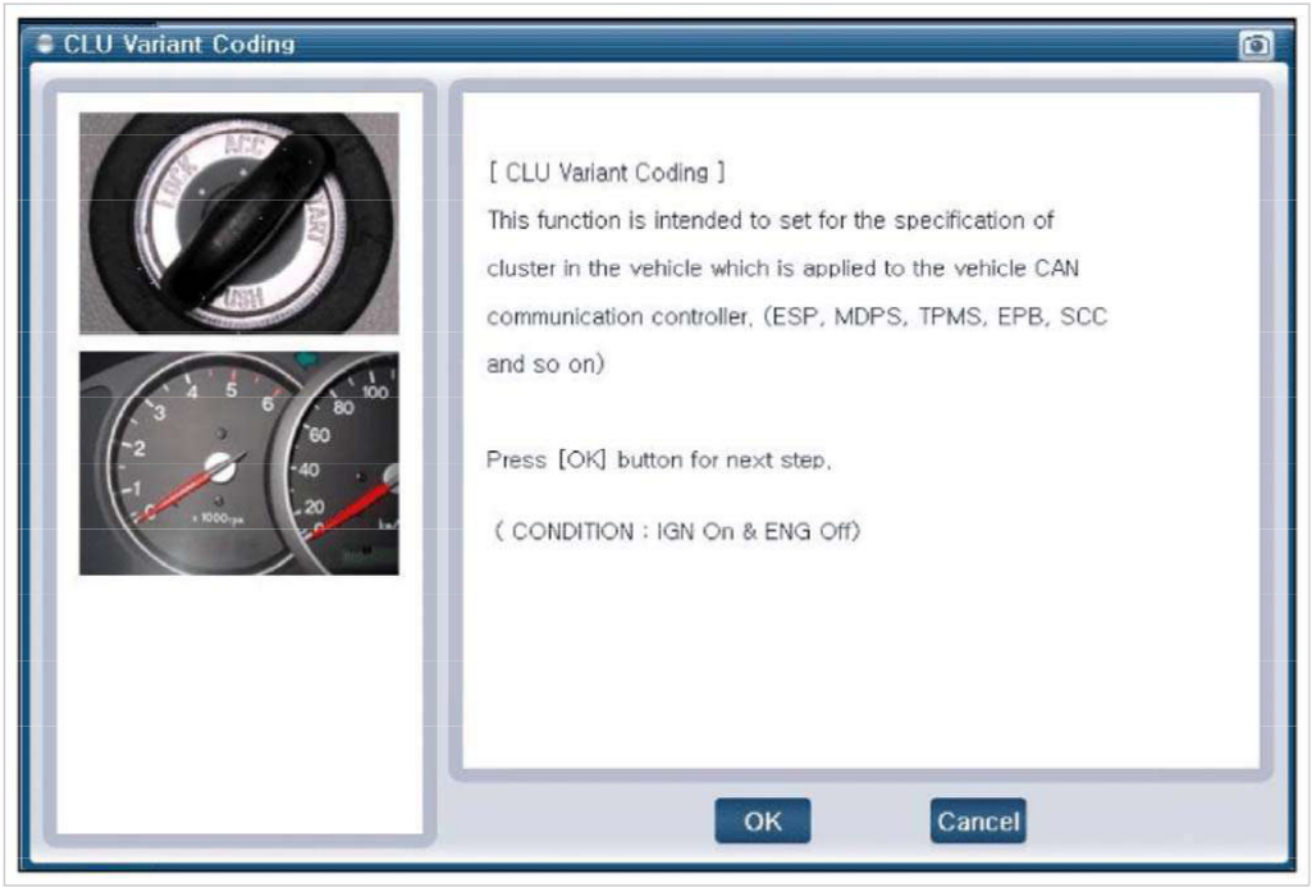
CLU Variant Coding

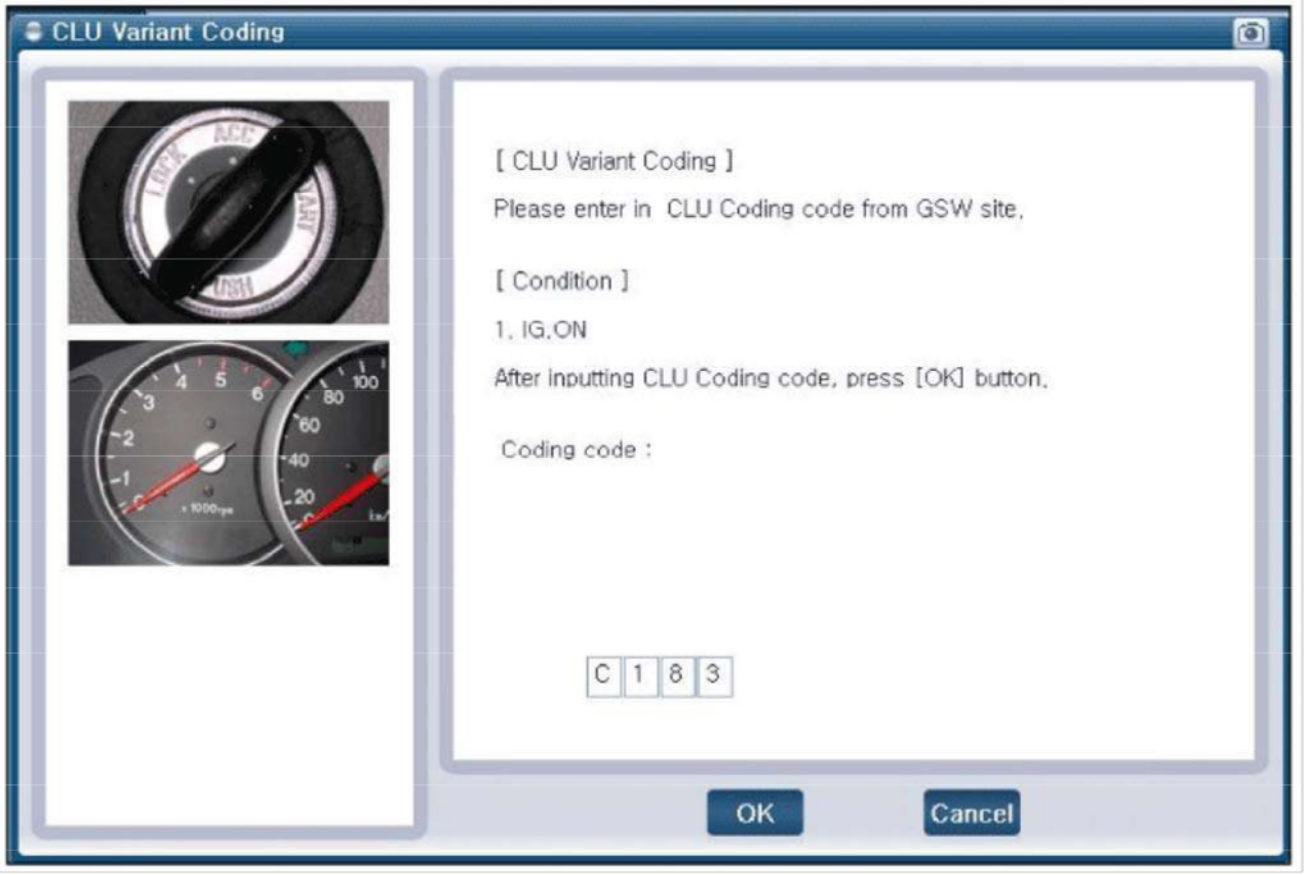
After replacing the cluster with a new one, must be performed the “Variant Coding” procedure.

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



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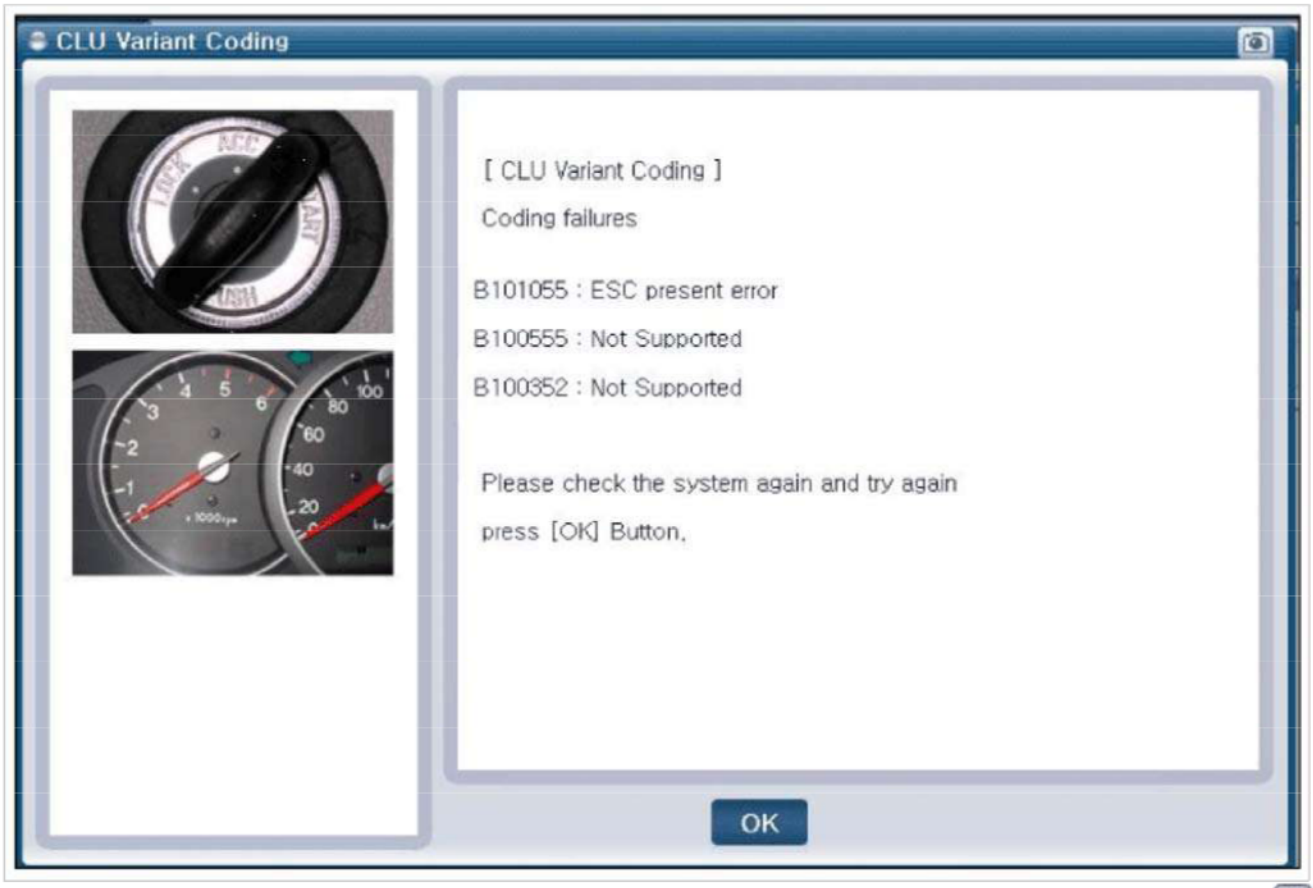




4.

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



Body Electrical System

Troubleshooting

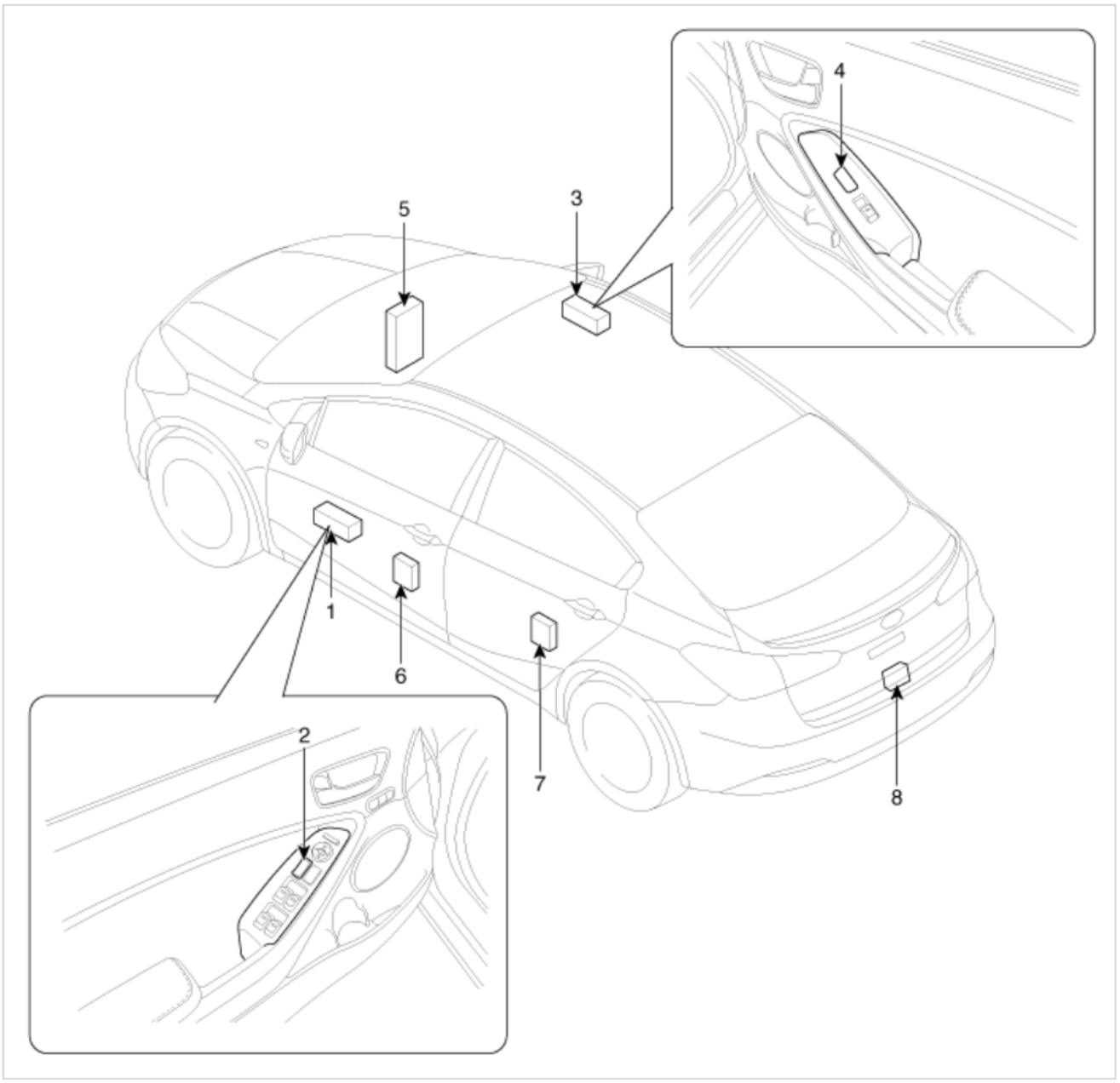
Symptom	Possible cause	Remedy
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	CAN line faulty	Check the EMS
	Tachometer faulty	Check tachometer
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and 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

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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

Component Location

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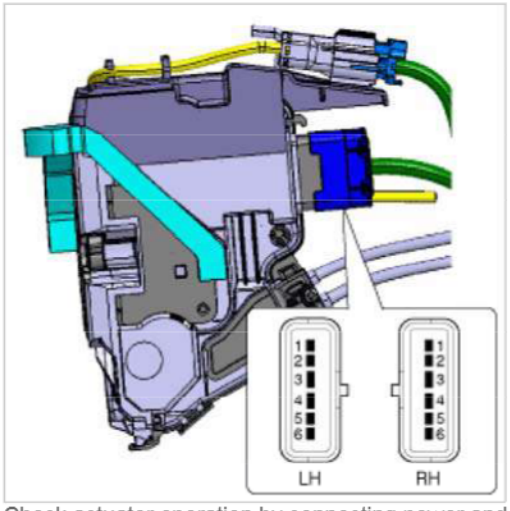
1. Driver power window switch	5. BCM (Body Control Module)
2. Door lock switch (Driver)	6. Front door lock actuator
3. Passenger power window switch	7. Rear door lock actuator
4. Door lock switch (Passenger)	8. Trunk lid open actuator

Inspection

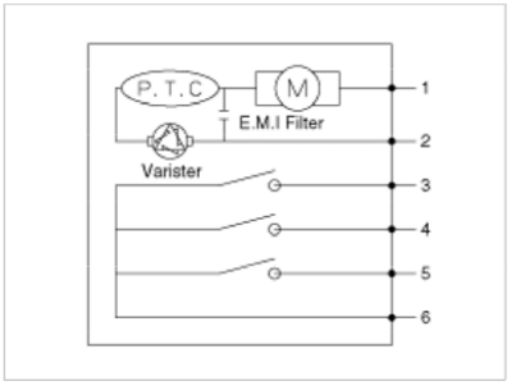
Front Door Lock Module Inspection

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

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



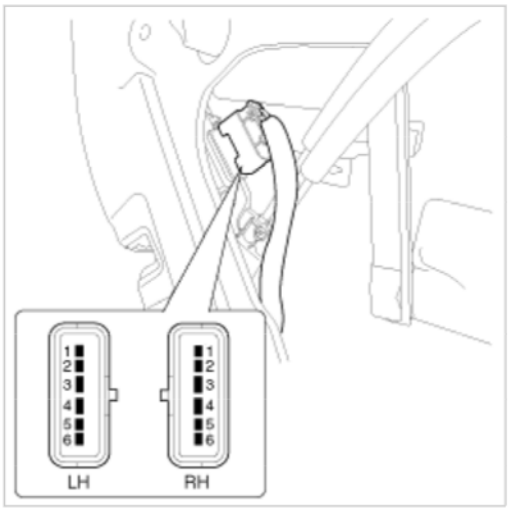
Terminal	Position	1	2
LH	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖
RH	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕

Terminal	Position	3	4	5	6
LH	Central Lock	○			○
	Central Unlock		○	○	○
RH	Central Lock	○			○
	Central Unlock		○	○	○

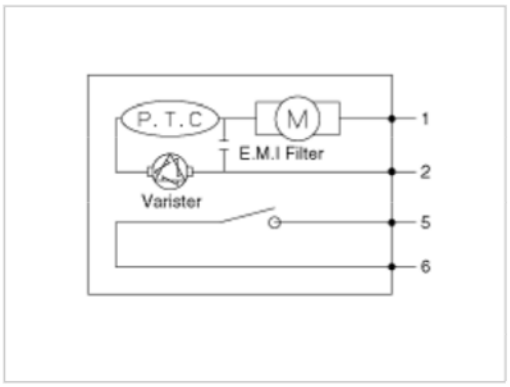
Rear Door Lock Module Inspection

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

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



Terminal	Position	1	2
LH	Central Lock	⊖	⊕
	Central Unlock	⊕	⊖
RH	Central Lock	⊕	⊖
	Central Unlock	⊖	⊕

Terminal	Position	5	6
LH	Central Lock		
	Central Unlock	○——	——○
RH	Central Lock		
	Central Unlock	○——	——○

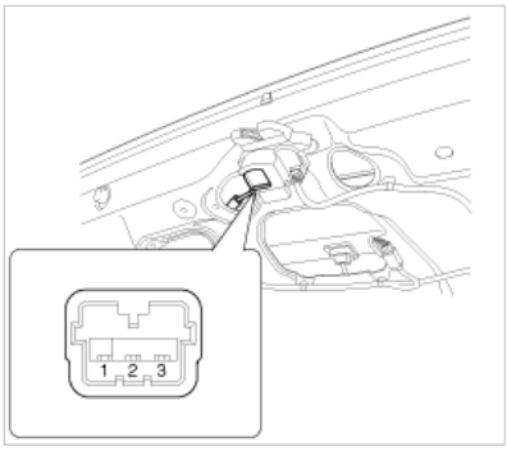
Trunk Lid / Tailgate Release Module Inspection

[2/4 Door]

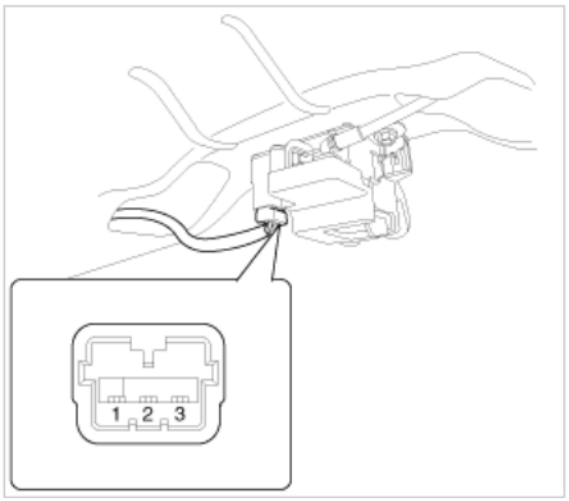
1. Remove the trunk lid trim.
   (Refer to Body - "Trunk Lid Trim")
2. Disconnect the connector from the actuator.

[2 Door]

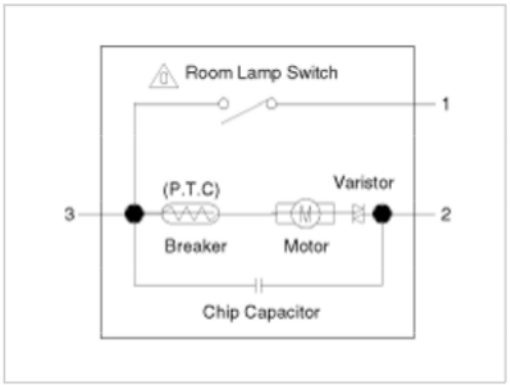
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[4 Door]



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

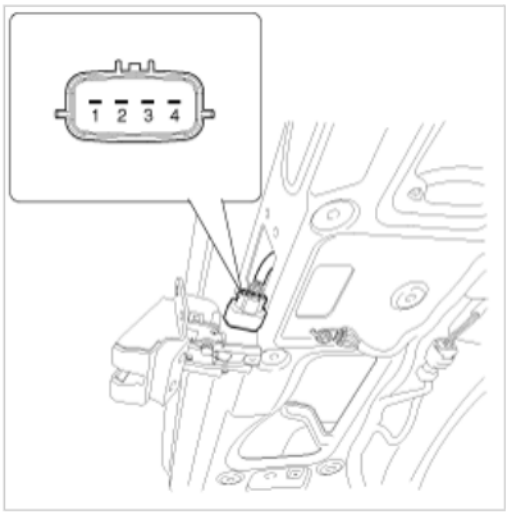


Position / Terminal	1	2	3
Lock release(Open)		⊕	⊖
		○	○

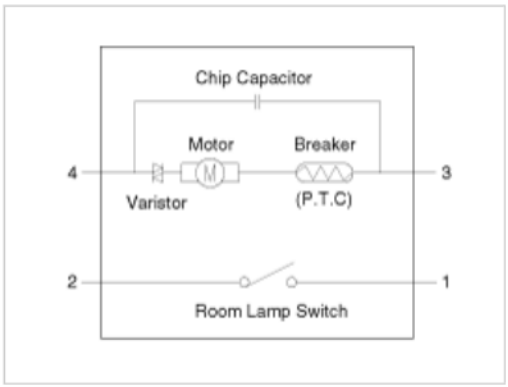
[5 Door]

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

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



Position \ Terminal	1	2	3	4
Lock release(Open)			⊕	⊖
	○—○			

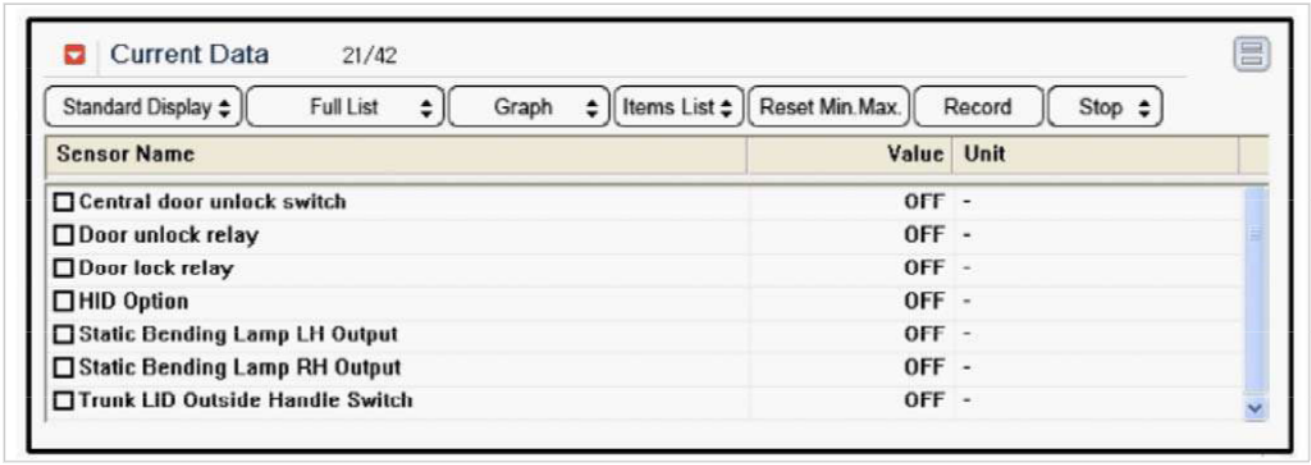
Body Electrical System

Inspection

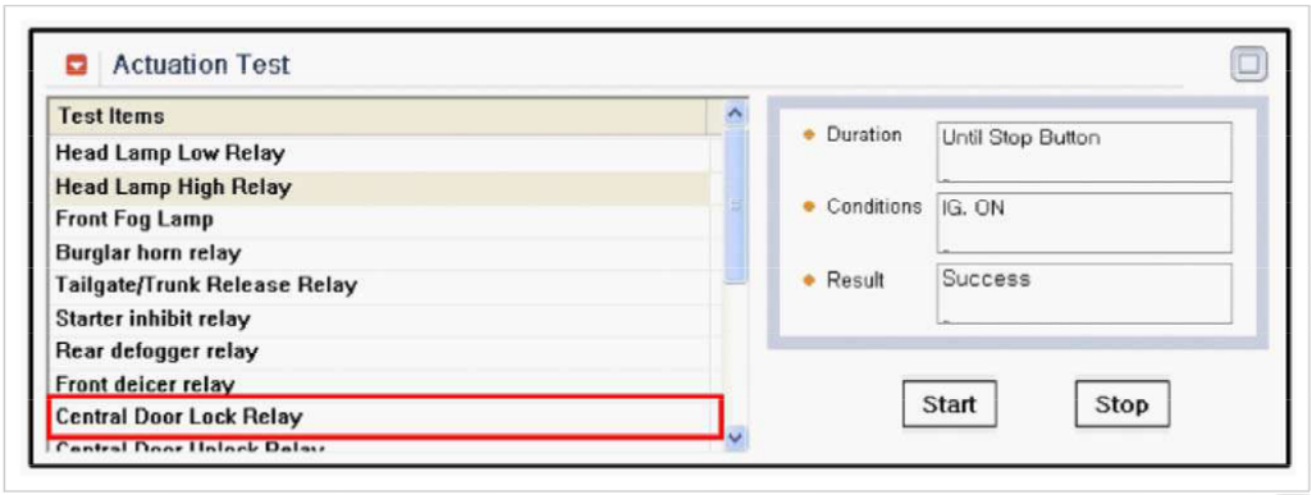
Diagnosis With GDS

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.

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5. If you will check the power door lock operation forcefully, select "Actuation test".

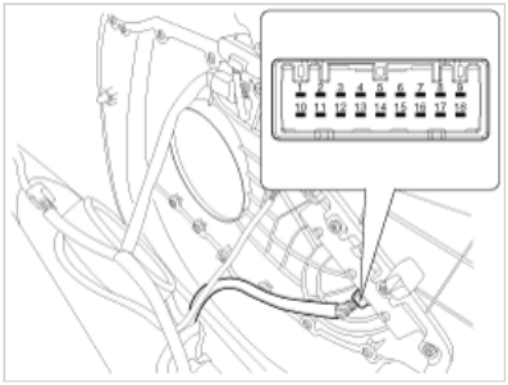


Body Electrical System

Inspection

Driver Door Lock Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the connector from the power window switch module.



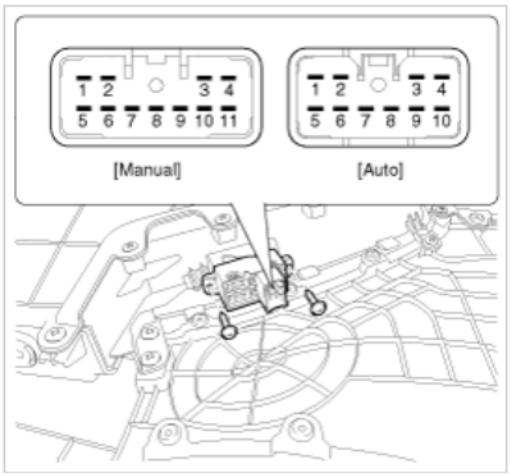
4. Check for continuity between the terminals in each switch position according to the table.

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Terminal \ Position	2	3	17
Lock	○		○
Unlock		○	○

Passenger Door Lock Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the connector from the power window switch module.



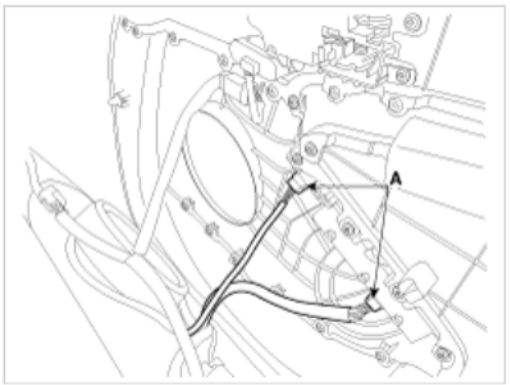
4. Check the continuity between the terminals in each switch position according the the table.

Terminal \ Position	2	1	8
Lock	○		○
Unlock		○	○

Removal

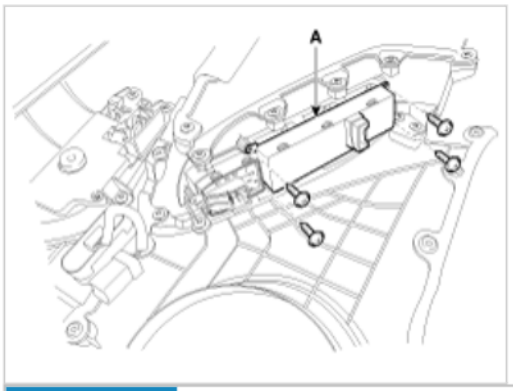
Driver Door Lock Switch

1. Disconnect the negative(-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch module connectors (A) from the door trim.



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

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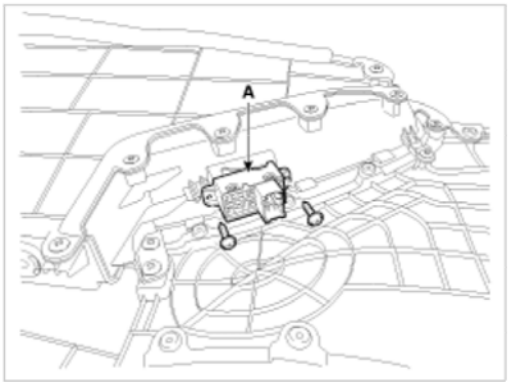


NOTICE

Be careful not to damage door trim panel and door module mounting hooks.

Passenger Door Lock Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch module connector from the door trim.
4. Remove the power window switch (A) after loosening the mounting screws.



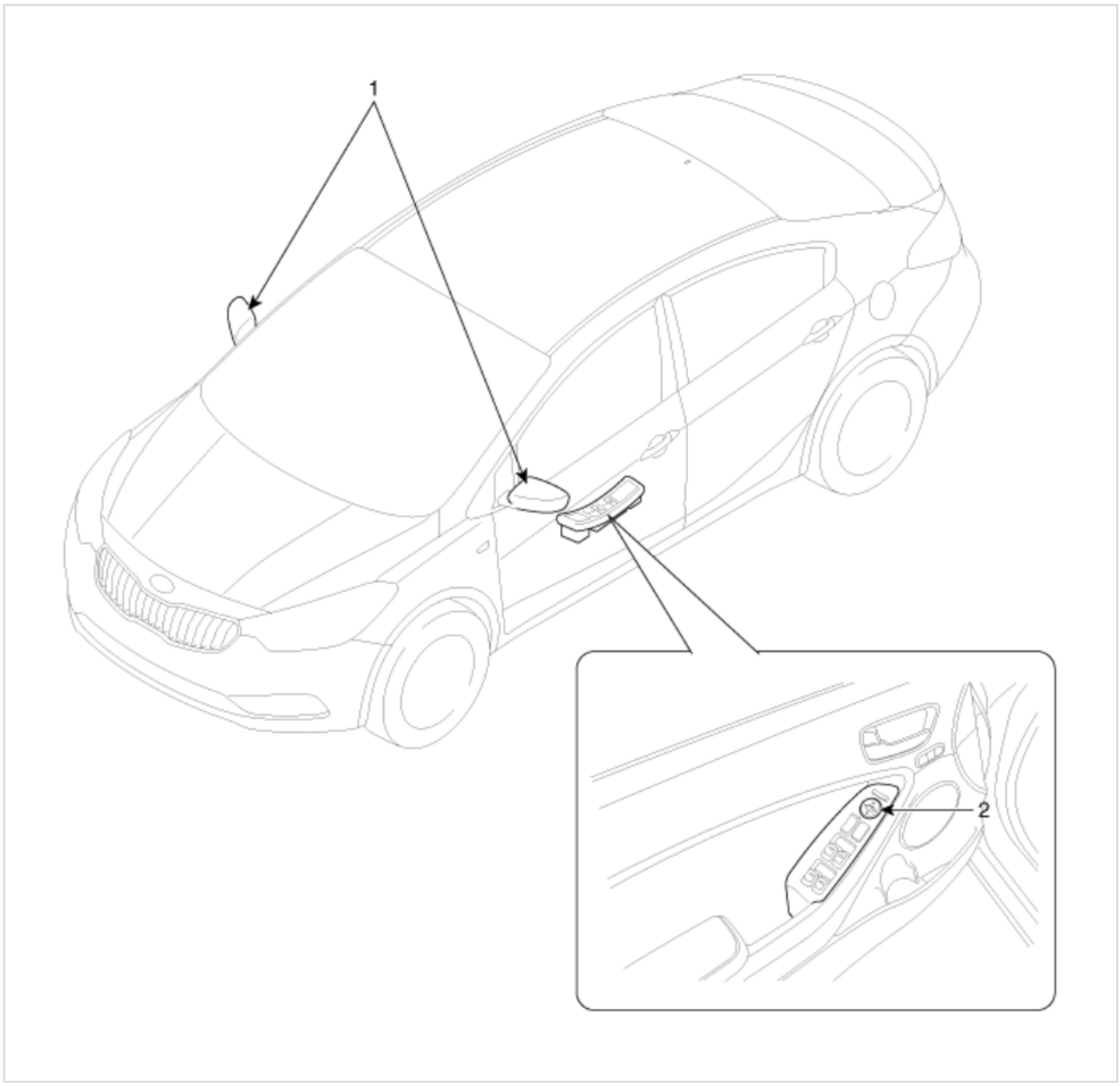
Installation

1. Install the power window switch.
2. Connect the connector and install the front door trim.

Body Electrical System

Components

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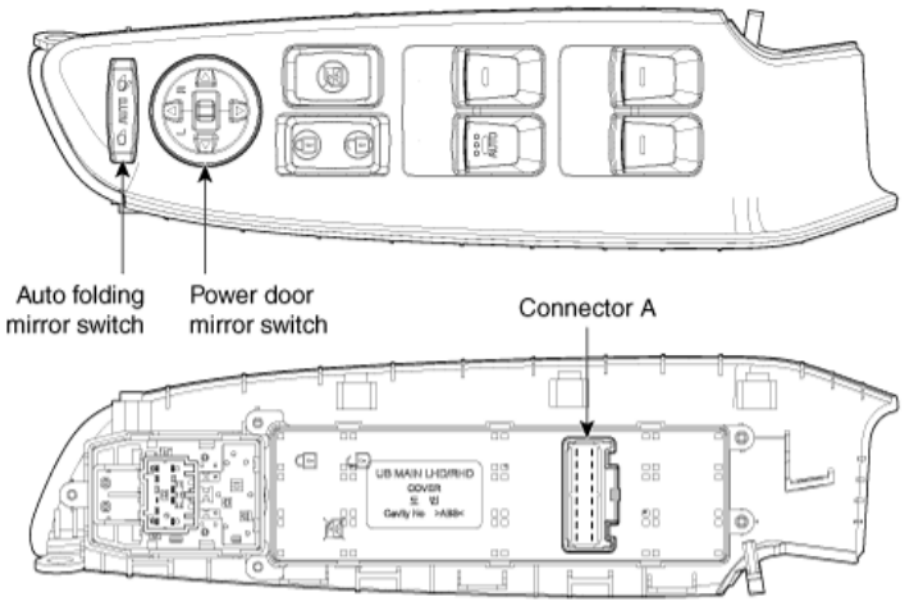


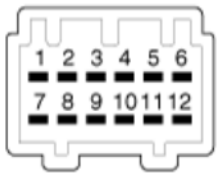
1. Power door mirror
2. Power door mirror switch

Body Electrical System

Circuit configuration

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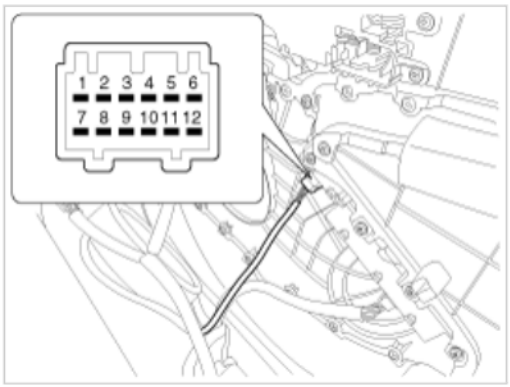


Pin No.	Connector A
1	Passenger door mirror motor(Horizontal)
2	-
3	Passenger door mirror motor(Vertical)
4	Driver door mirror motor(Vertical)
5	-
6	Driver door mirror motor(Horizontal)
7	ACC(Mirror)
8	Folding
9	-
10	Ground
11	Unfolding
12	C

Inspection

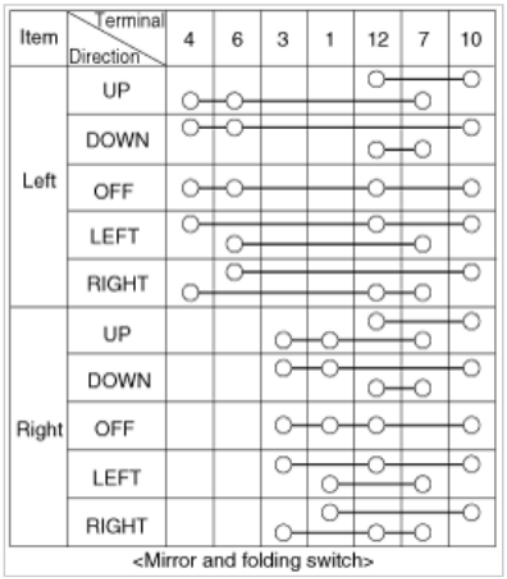
1. Disconnect the power door mirror switch module connector from front door trip panel.

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

[Power Door Mirror Switch]



<Mirror and folding switch>

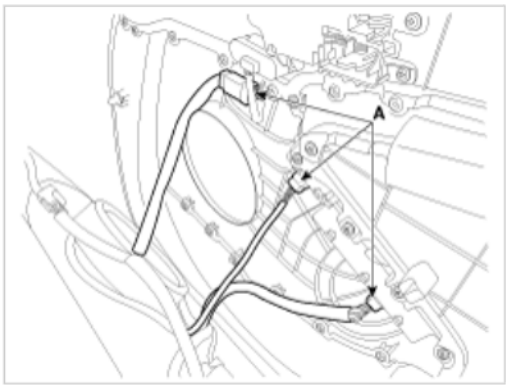
[Power Folding Mirror Switch]



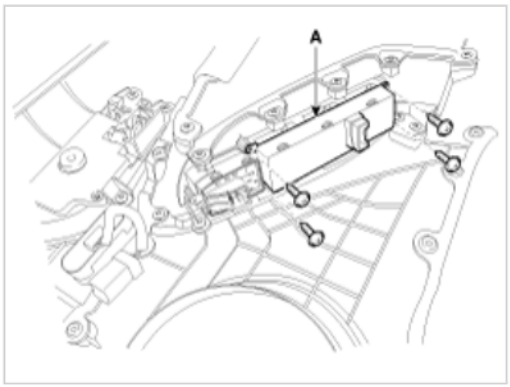
Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch connectors (A).

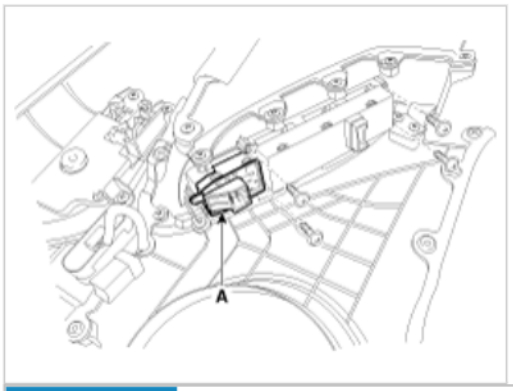
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4. Remove the power window switch (A) after loosening 4 screws.



5. Remove the power door mirror switch (A) after loosening a screw.



NOTICE

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

Installation

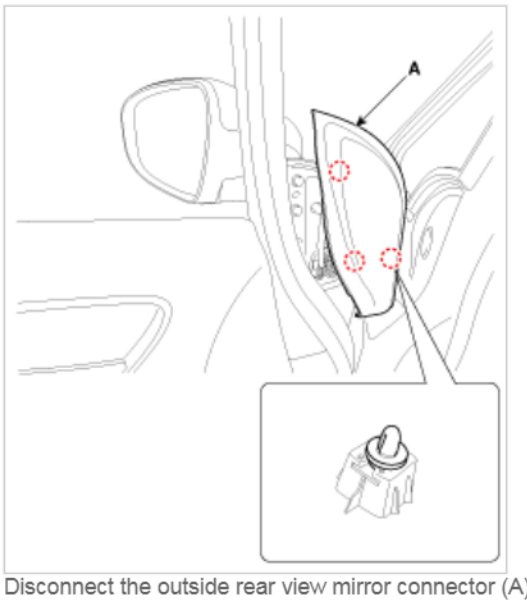
1. Install the driver power window switch and connectors.
2. Install the front door trim.

Body Electrical System

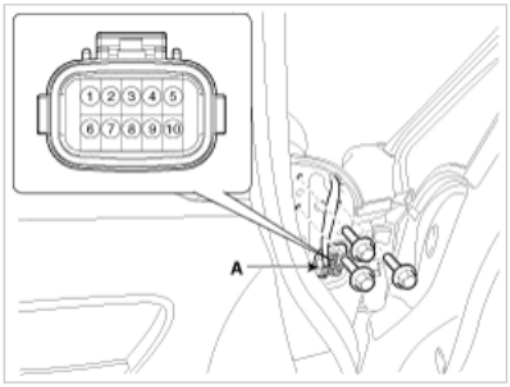
Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the front door quadrant inner cover (A).

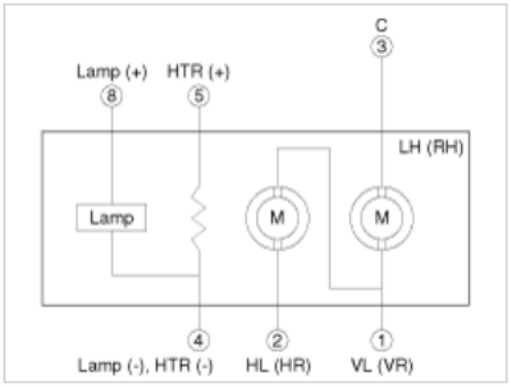
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3. Disconnect the outside rear view mirror connector (A).
4. Verify that the mirror operates properly as shown in the table.



[Actuator]



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	Direction	1	2	3	B+	Ground
Left	Up	○	○	○	○	○
	Down	○	○	○	○	○
	OFF	○	○		○	
	Right	○		○	○	○
	Left		○	○	○	○
Right	Up	○	○		○	○
	Down	○	○		○	○
	OFF	○	○		○	
	Right	○		○	○	○
	Left	○		○	○	○

Mirror Heater

Terminal / Position	5	4
Heater	⊕	⊖

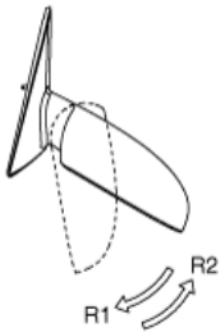
Turn Signal Lamp

Terminal / Position	8	4
Turn signal	⊕	⊖

Puddle Lamp

Terminal / Position	9	10
Puddle lamp	⊕	⊖

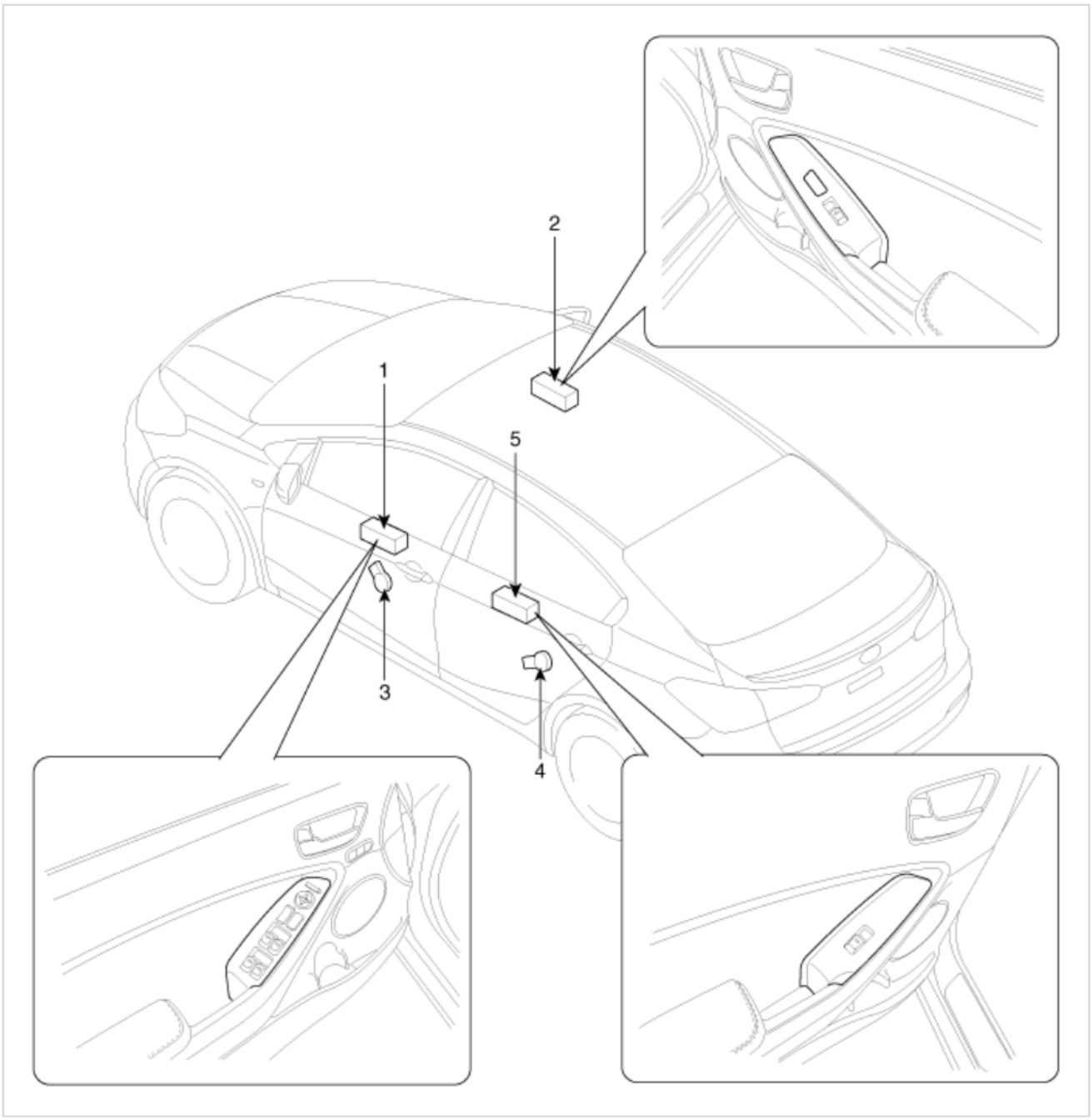
Folding Mirror



Terminal / Position	B (+)	GND (-)	6	7
Folding (R1)	○		○	○
Unfolding (R2)	○		○	○

Component Location

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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

Operation

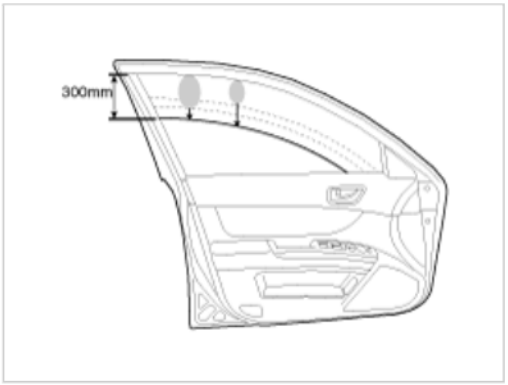
Function Of Safety Power Window

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

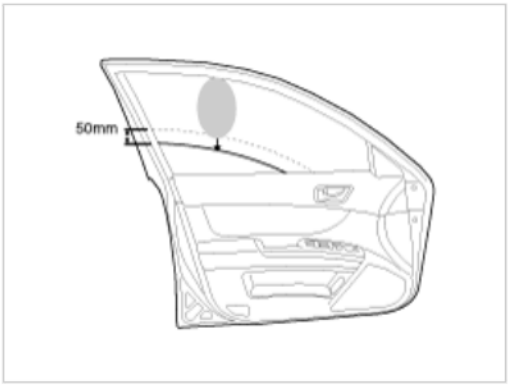
1. Safety function condition
   When detect the force of 100N during the window rising, window is reversed.
2. Length of window reversing (except holding the auto-up switch)
   A. When detect the jamming during the 4mm ~ 250mm from top of the door.

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

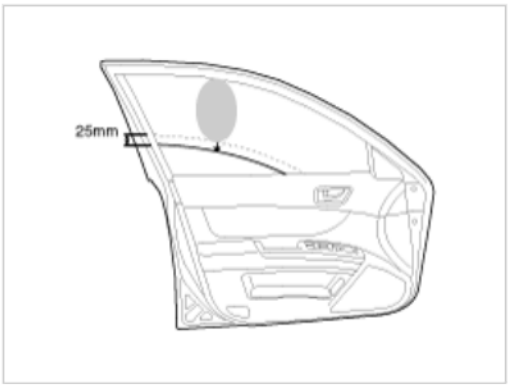


B. When detect the jamming over the 250mm from top of the door.
→ Window is reversed until 50mm from jamming position.
→ Window is reversed 50mm or bottom position in case of 50mm reversing distance.



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

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



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

Normalization (Teaching)

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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≥2 seconds.
  If the block is reconized, 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 demormalization, 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≤2 sec	IGN On	T≤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

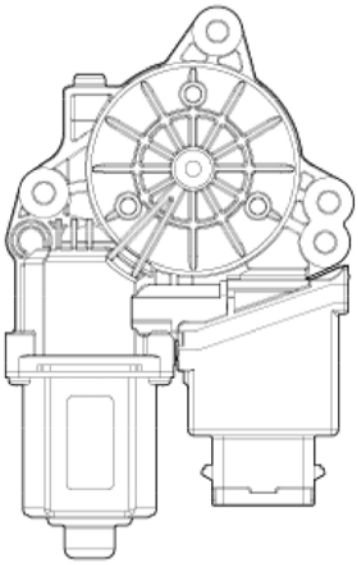
Maximal operation time of power window motor is limited to 15 sec (EEPROM programmable).

Body Electrical System

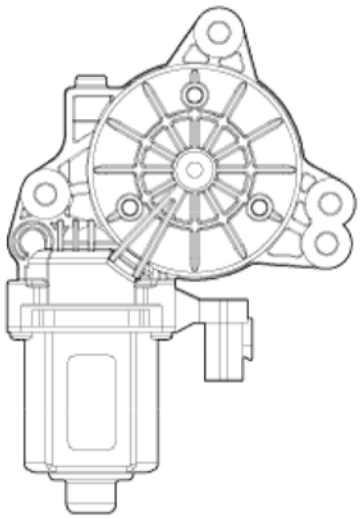
Circuit Diagram

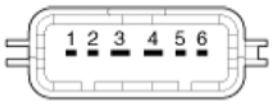
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[Safety window]



[General window]

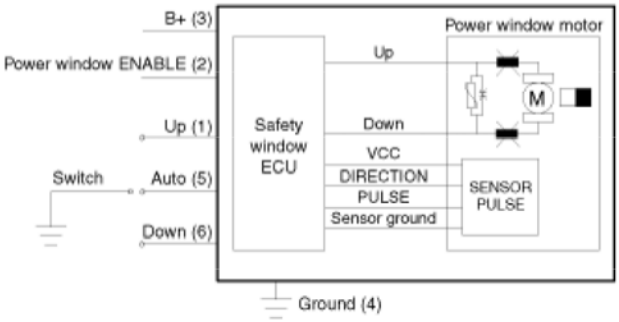


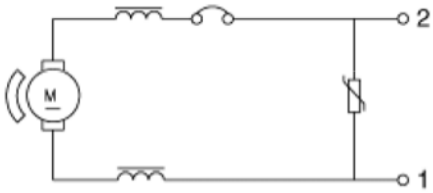


No.	Description	No.	Description
1	Up	4	Ground
2	Power window	5	Auto
3	B+	6	Down



No.	Description
1	⊕
2	⊖





Body Electrical System

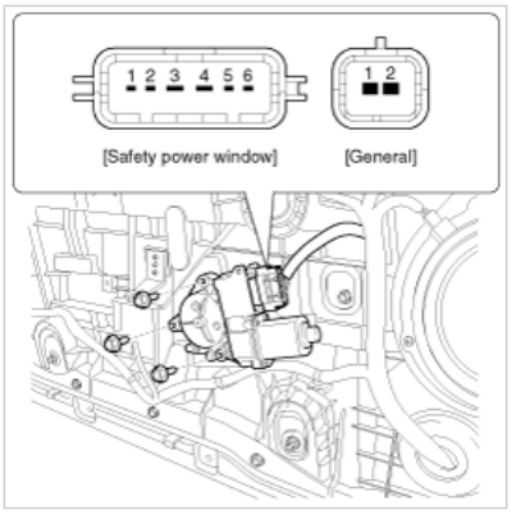
Inspection

Front Power Window Motor Inspection

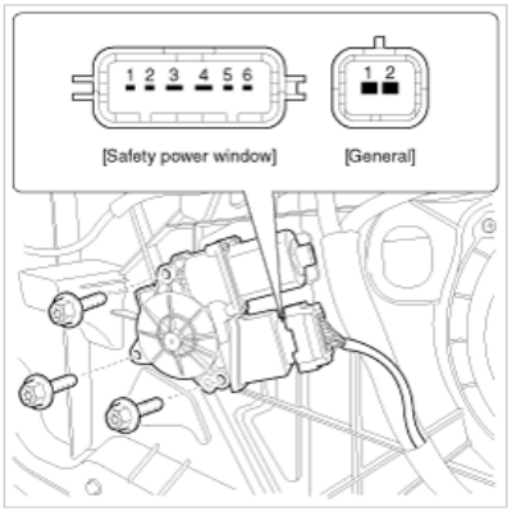
1. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
2. Disconnect the connector from the motor.

[2 Door]

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[4/5 Door]



3. Connect the motor terminals No.2 and No.3 directly to battery voltage (12V) and check that the motor operates smoothly. If the operation is abnormal, replace the motor.

[Safety Power Window]

Terminal / Position	1	4	6
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.

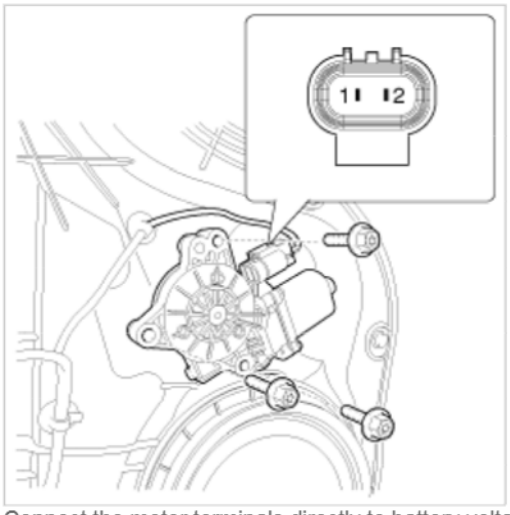
[General Power Window]

Position / Terminal			1	2
LH	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖
RH	UP	Counter-clockwise	⊖	⊕
	DOWN	Clockwise	⊕	⊖

Rear Power Window Motor Inspection

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

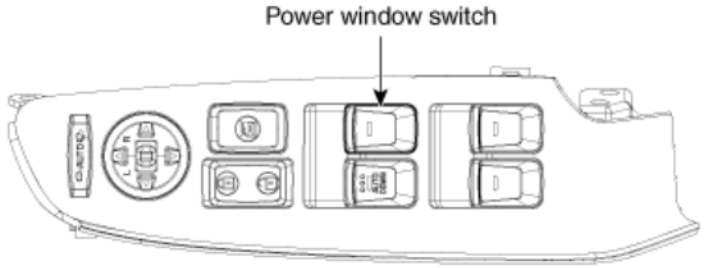
Position			Terminal 1	Terminal 2
LH	UP	Clockwise	⊕	⊖
	DOWN	Counter-clockwise	⊖	⊕
RH	UP	Counter-clockwise	⊕	⊖
	DOWN	Clockwise	⊖	⊕

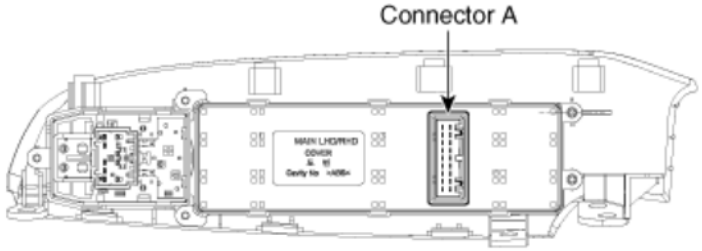
Body Electrical System

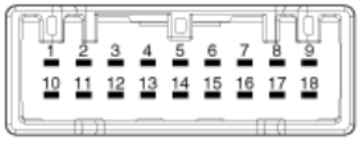
Circuit Diagram

Driver Power Window Switch

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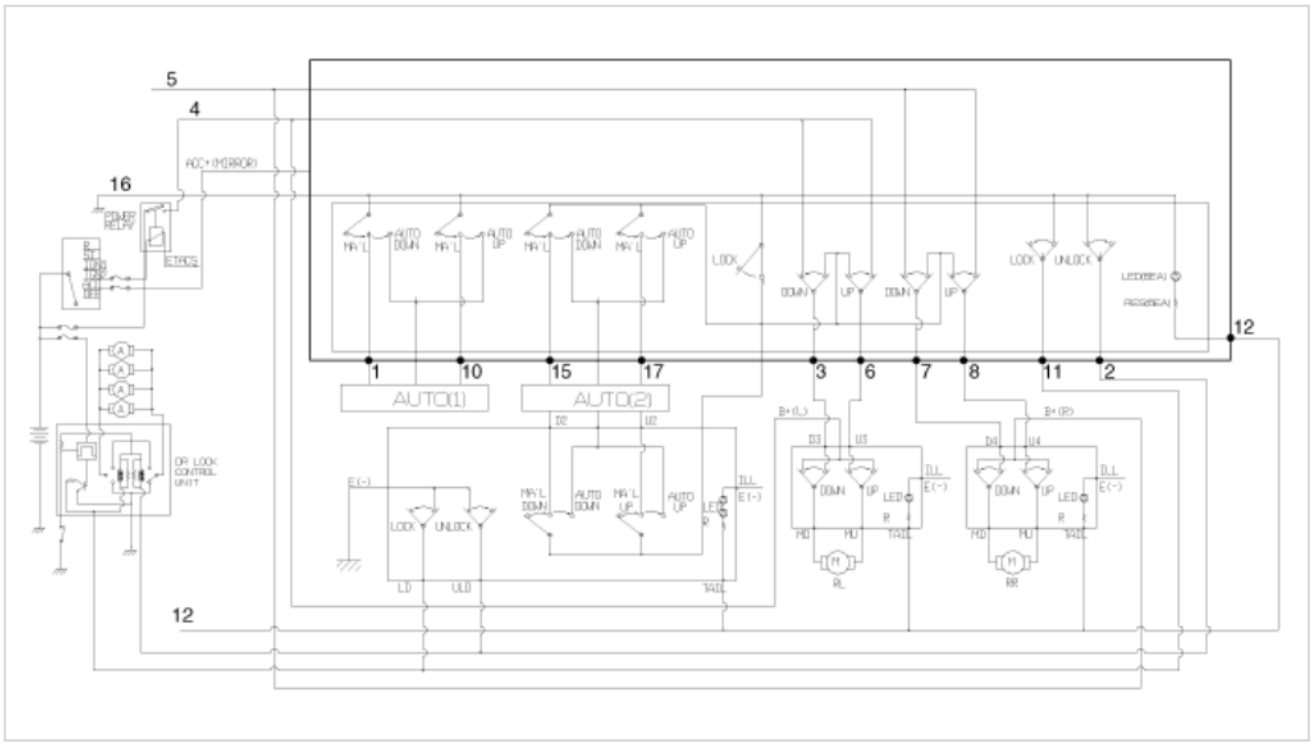




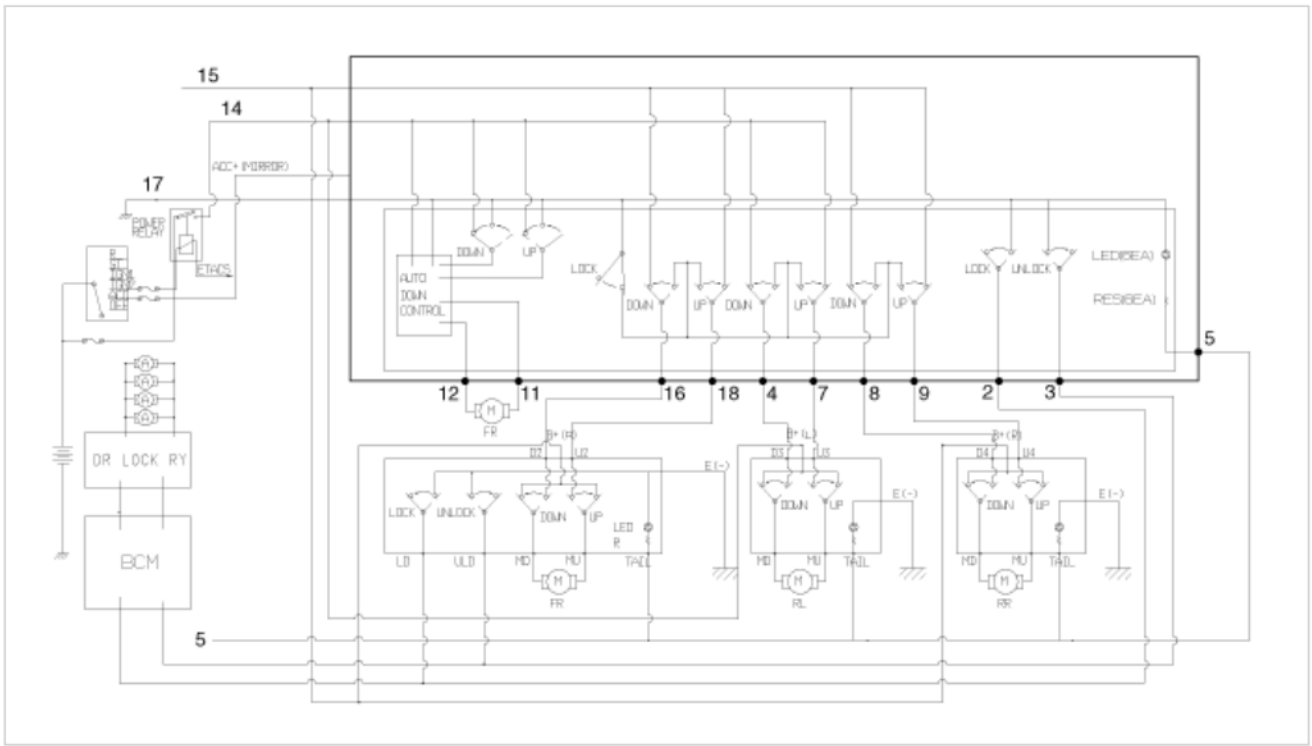
Connector A			
No.	**Driver/Passenger Safety**	**No.**	**Driver Auto Down**
1	Front left window down switch	1	SUB (right)
2	Door unlock	2	Door lock
3	Rear left window down switch	3	Door unlock
4	Battery (+) (left)	4	Rear left window down switch
5	Battery (+) (rigth)	5	Tail
6	Rear left window up switch	6	-
7	Rear rigth window down switch	7	Rear left window up switch
8	Rear rigth window up switch	8	Rear right window down switch
9	SUB (right)	9	Rear right window up switch
10	Front left window up switch	10	SUB (left)
11	Door lock	11	Front left window up switch
12	Tail	12	Front left window down switch
13	Auto (left)	13	-
14	Auto (right)	14	Battery (+) (left)
15	Front rigth window down switch	15	Battery (+) (right)
16	Ground	16	Front right window down switch
17	Front rigth window up switch	17	Ground
18	SUB (left)	18	Front right window up switch

[Driver/Passenger Safety]

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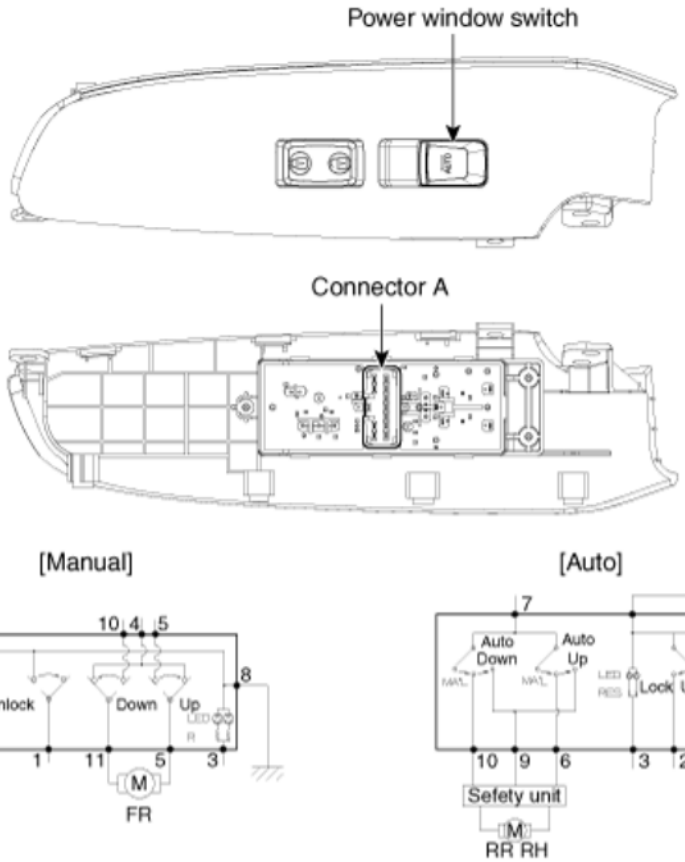


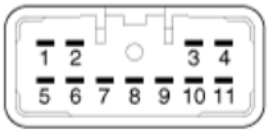
[Driver Auto Down]

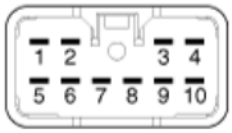


Passenger Power Window Switch

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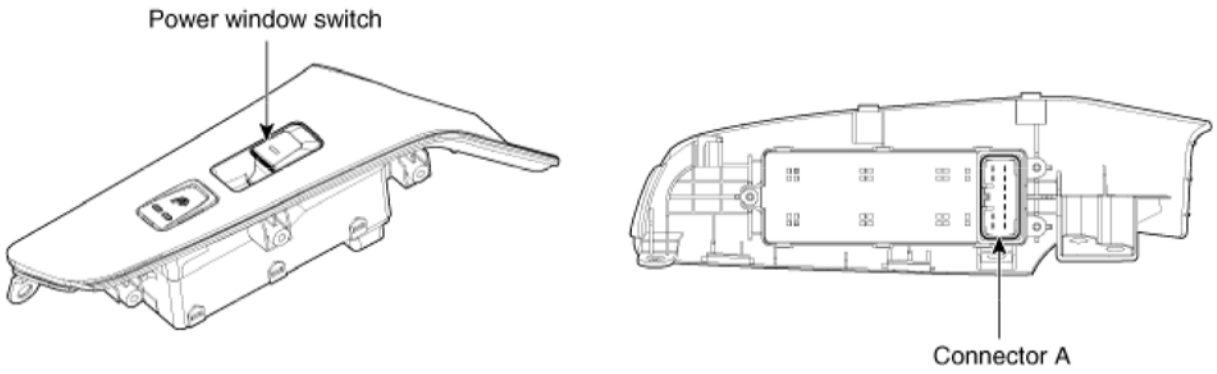


Connector A	
	
No.	**Description**
1	Door unlock
2	Door lock
3	Tail
4	Battery (+)
5	Power window motor up
6	Power window up switch
7	-
8	Ground
9	-
10	Power window down switch
11	Power window motor down

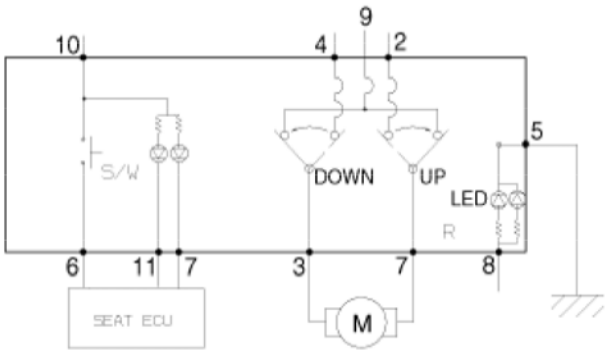
Connector A	
	
No.	**Description**
1	Door unlock
2	Door lock
3	Tail
4	-
5	-
6	Power window up switch
7	Window lock
8	Ground
9	Auto
10	Power window down switch

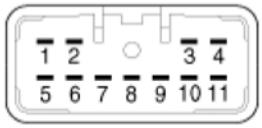
Rear Power Window Switch

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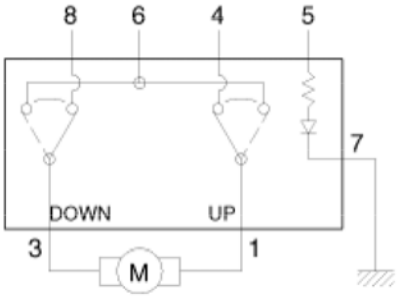


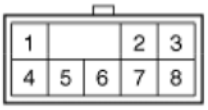
[Manual + Heater]



Connector A	
	
No.	**Description**
1	Heater indicator 2
2	Power window up switch
3	Motor down
4	Power window down switch
5	Ground
6	Signal output
7	Motor up
8	Tail
9	Battery (+)
10	IGN
11	Heater indicator 1

[Manual]



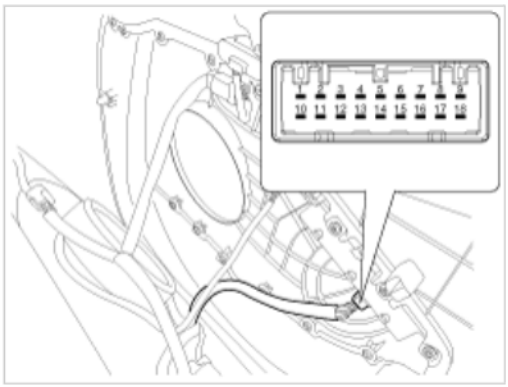
Connector A	
	
No.	**Description**
1	Power window motor up
2	-
3	Power window motor down
4	Power window up switch
5	Tail
6	Battery (+)
7	Ground
8	Power window down switch

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Inspection

Power Window Main Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the connector from the power window switch module.



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

[Driver/Passenger Safety]

Position \ Terminal	11	2	16
Lock	○		○
Unlock		○	○

Position \ Terminal	Front left				Front right			
	16	10	1	13	16	15	17	14
UP	○	○			○	○		
AUTO UP	○	○		○	○	○		○
OFF								
DOWN	○	○	○		○	○	○	
AUTO DOWN	○	○	○	○	○	○	○	○
Position \ Terminal	**Rear left**				**Rear right**			
	4	6	3	16	5	8	7	16
UP	○	○	○	○	○	○	○	○
OFF		○	○	○		○	○	○
DOWN	○	○	○	○	○	○	○	○

[Driver Auto Down]

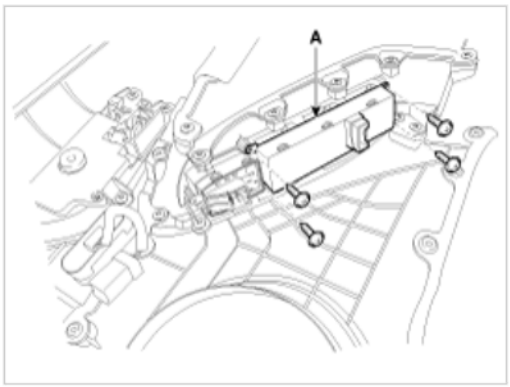
Position \ Terminal	2	3	17
Lock	○		○
Unlock		○	○

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Terminal / Position	Front left				Front right			
	17	11	12	13	15	18	16	17
UP	○—○				○—○		○—○	
AUTO UP	○—○		○—○					
OFF						○—○	○—○	
DOWN	○—○		○—○		○—○	○—○		○—○
AUTO DOWN	○—○		○—○					

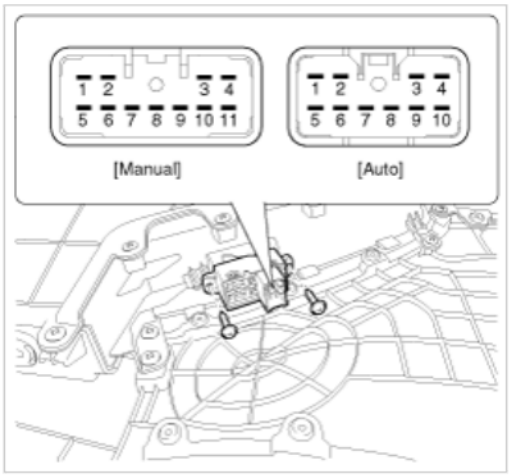
Terminal / Position	Rear left				Rear right			
	14	7	4	17	15	9	5	17
UP	○—○		○—○		○—○		○—○	
OFF		○—○	○—○			○—○	○—○	
DOWN	○—○	○—○		○—○	○—○	○—○		○—○

5. Remove the power window switch(A) after loosening the screws.



Passenger Power Window Switch Inspection

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

[Auto]

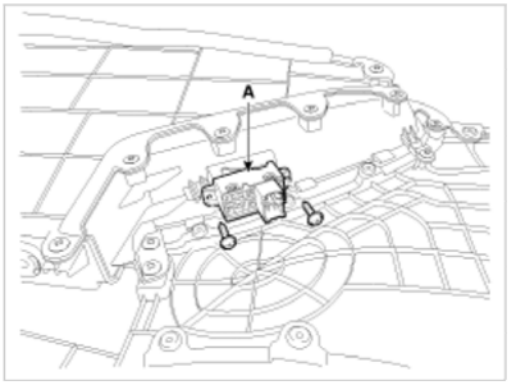
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Terminal / Position	5	7	6	2
UP	○	○		
AUTO UP	○	○		○
OFF				
DOWN	○		○	
AUTO DOWN	○		○	○

[Manual]

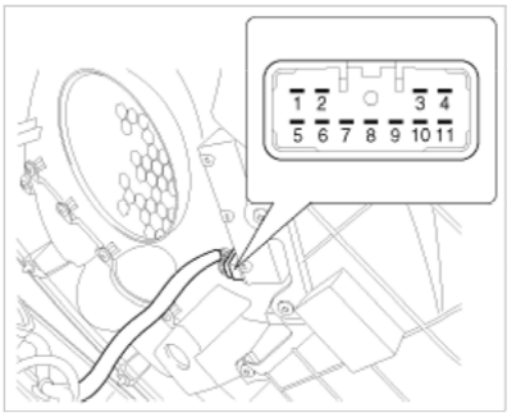
Terminal / Position	6	4	8	3	1
UP	○		○	○	○
OFF		○	○		○
DOWN	○	○		○	○

5. Remove the power window switch(A) after loosening the screws.



Rear Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim panel.
   (Refer to Body - "Rear Door Trim")
3. Disconnect the 8P connector from the switch.



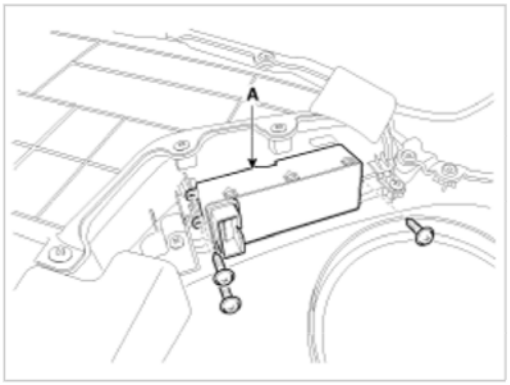
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

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( ) : Manual

Terminal / Position	9(6)	2(4)	4(8)	3	7(1)
UP	○		○	○	○
OFF		○	○		○
DOWN	○	○		○	○

5. Remove the power window switch(A) after loosening the screws.

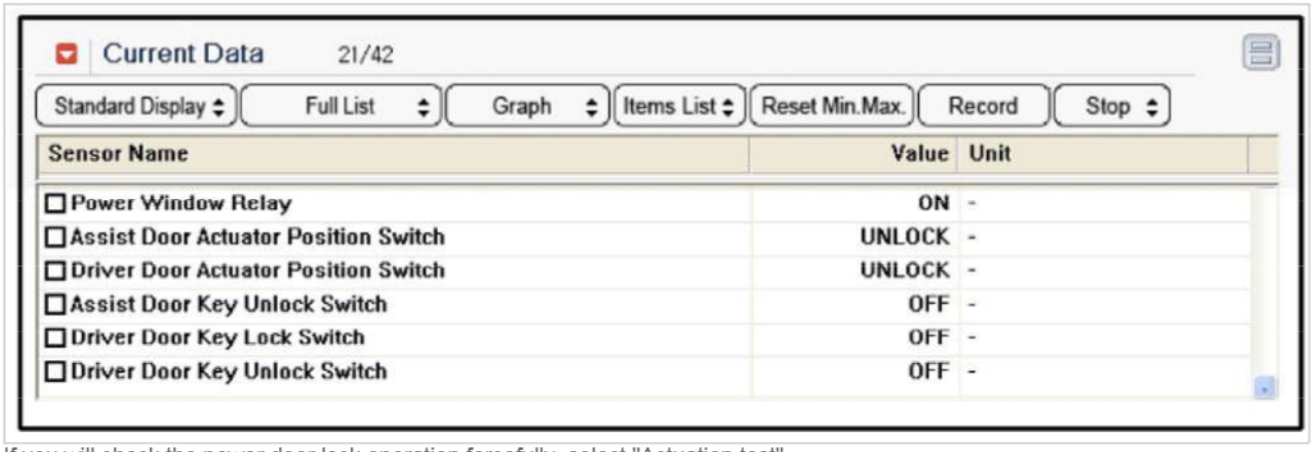


Body Electrical System

Inspection

Diagnosis With GDS

1. It will be able to diagnose defects of power window 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 window system. It provides input/output status of SJB.



5. If you will check the power door lock operation forcefully, select "Actuation test".

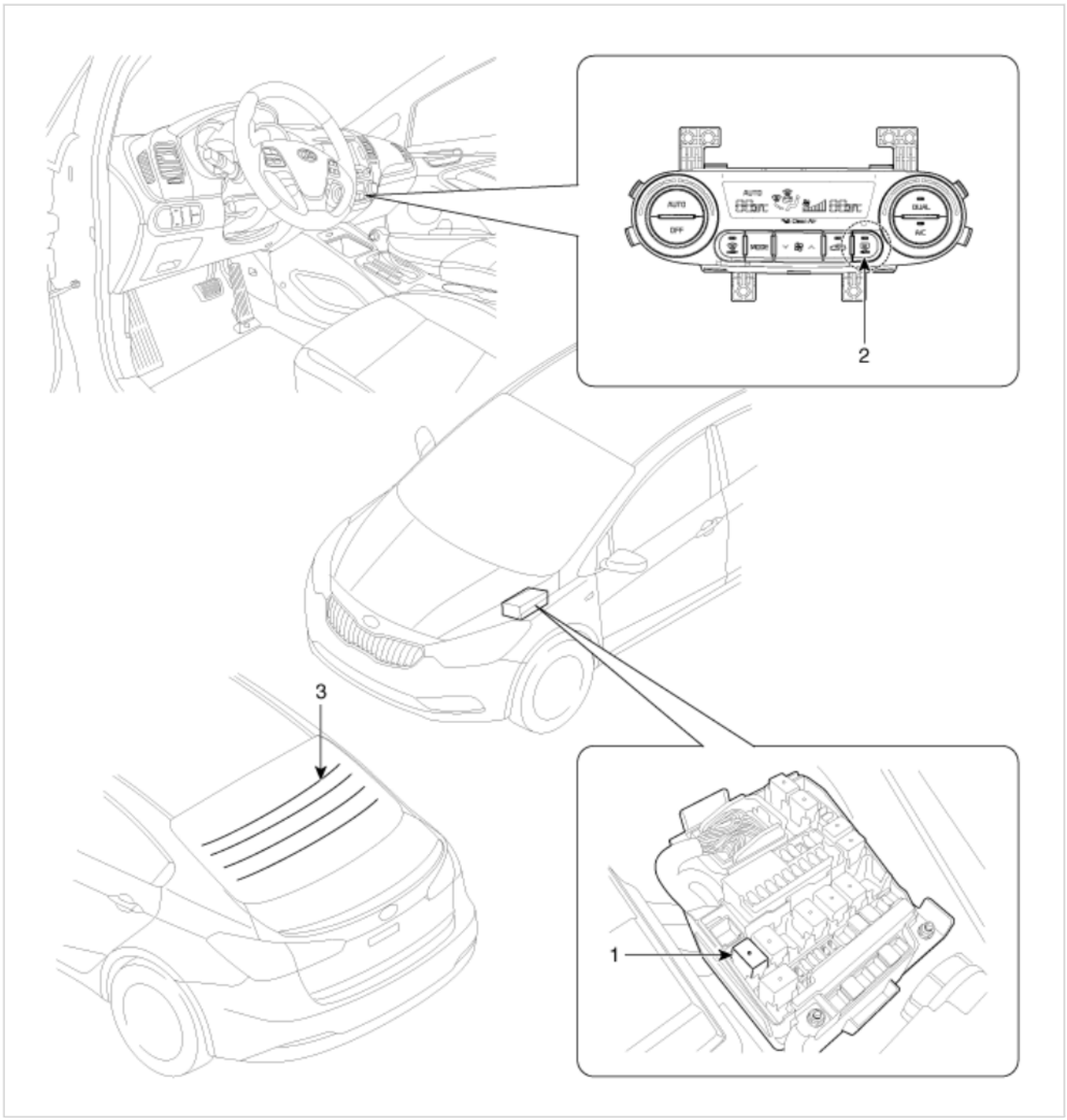
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Body Electrical System

Component Location

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

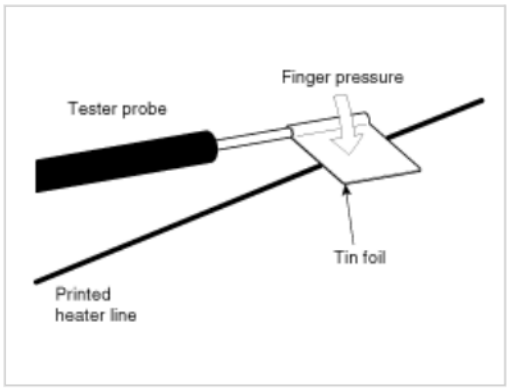
Body Electrical System

Inspection

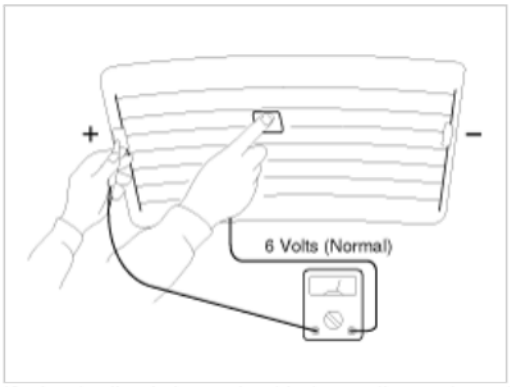
⚠ CAUTION

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

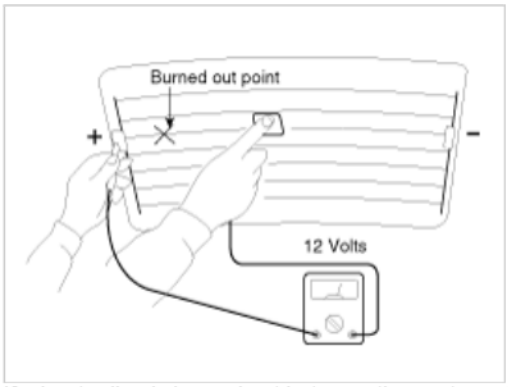
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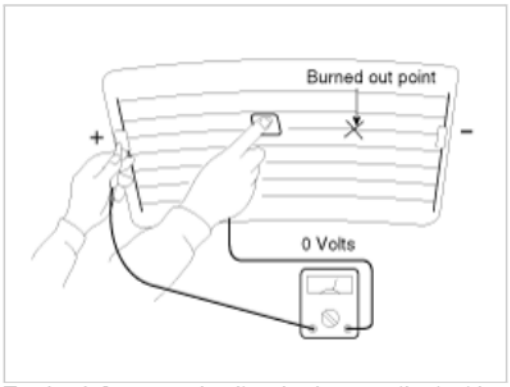
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



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

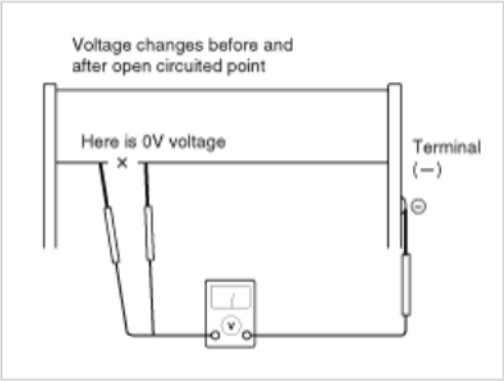


3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.

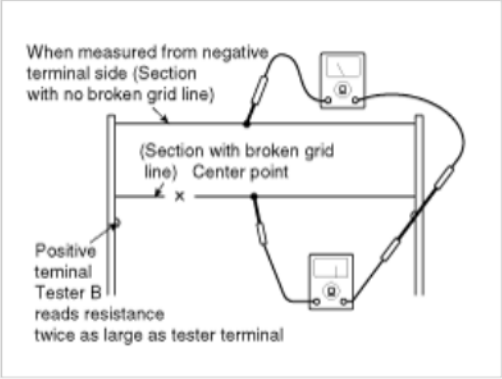


4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.

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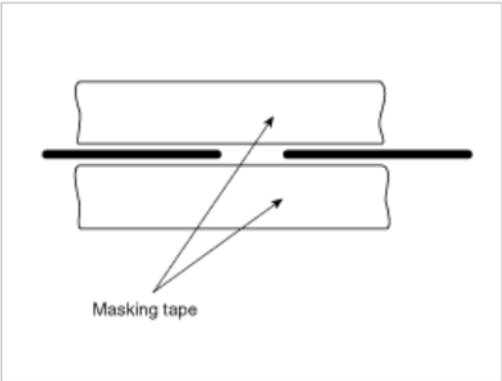
5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice as that in other sections. In the affected section,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



Repair Of Broken Heater Line

Prepare the following items:

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

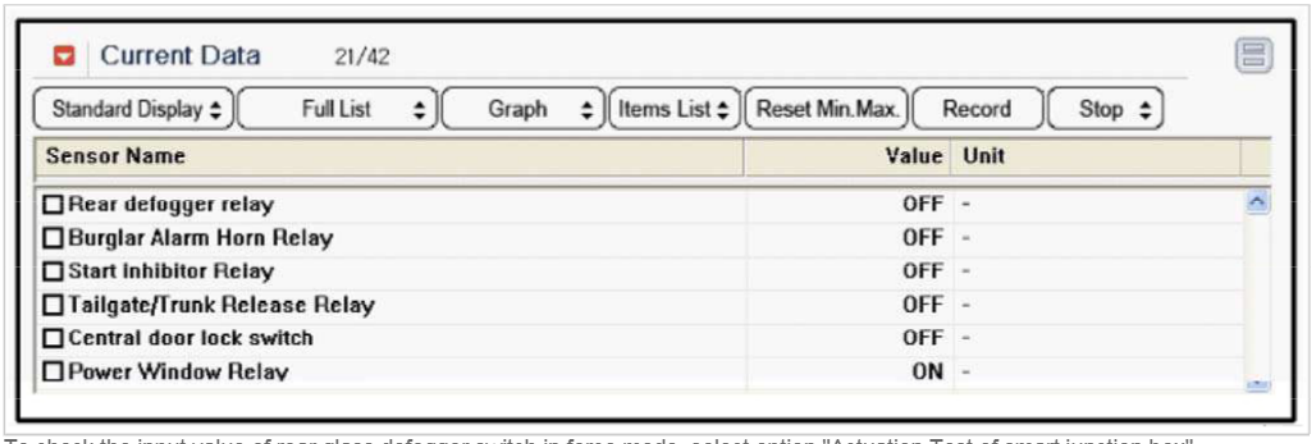


Inspection

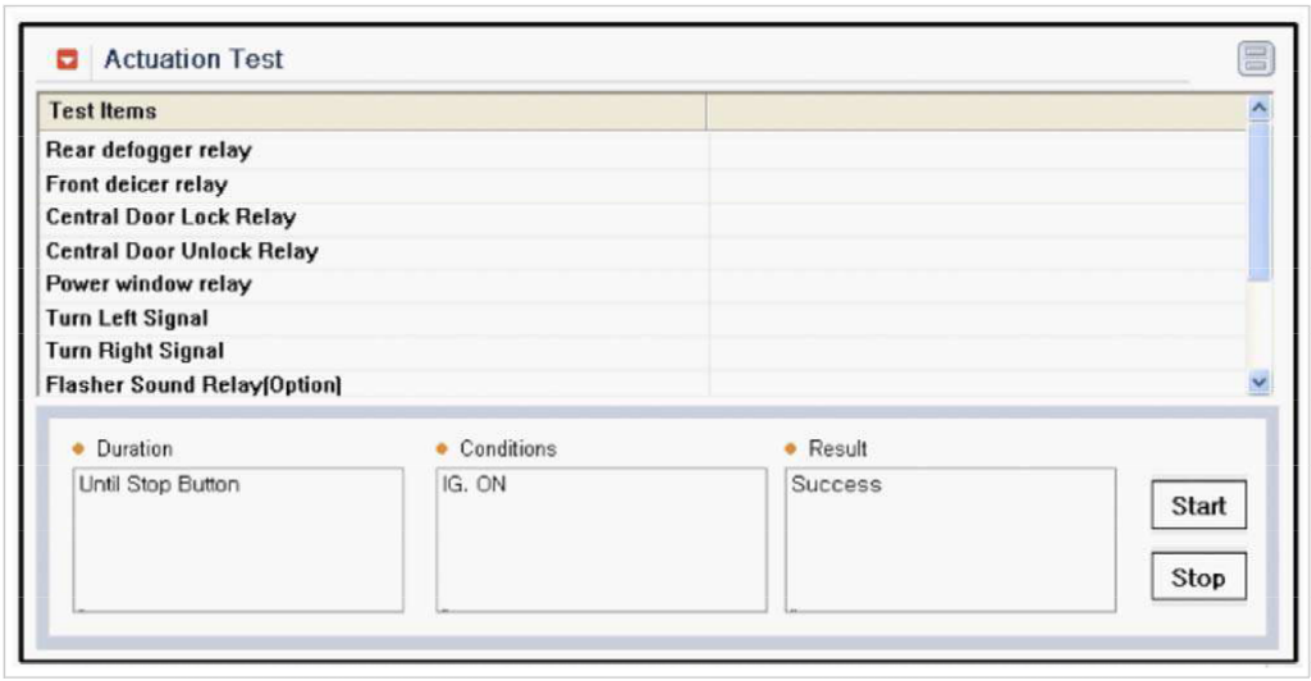
1. The rear glass defogger switch inputs can be checked using the GDS.
2. To check the input value of rear glass defogger switch, select option "Body Control Module".
3.

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To consult the present input/output value of BCM, "Current DATA". It provides information of BCM input/output conditions of smart junction box.



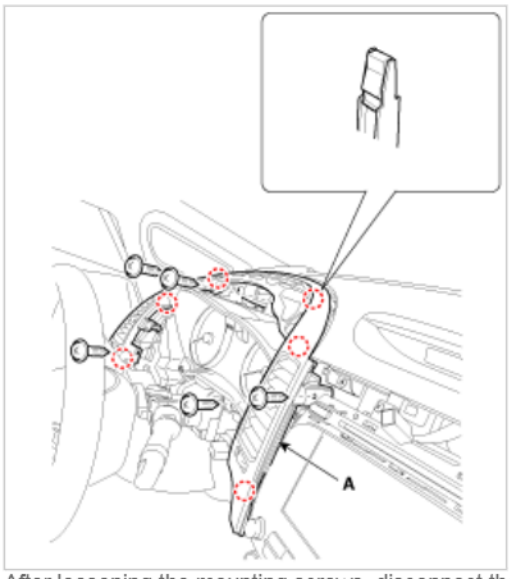
4. To check the input value of rear glass defogger switch in force mode, select option "Actuation Test of smart junction box".



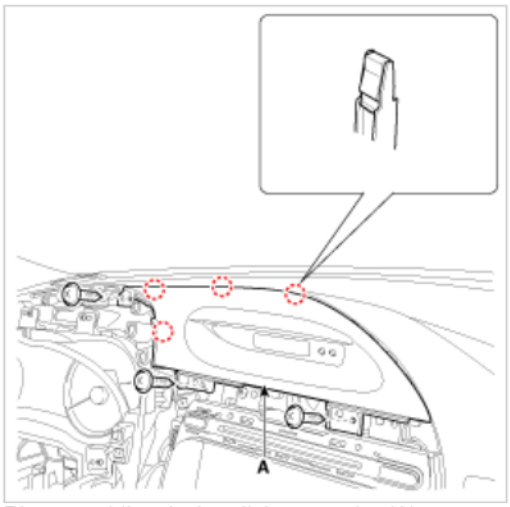
Replacement

1. Remove the center fascia panel.
   (Refer to Body - "Center Fascia Panel")
2. Remove the cluster fascia panel.
   (Refer to Body - "Cluster Fascia Panel")
3. After loosening the mounting screws, remove the drive airvent duct assembly (A).

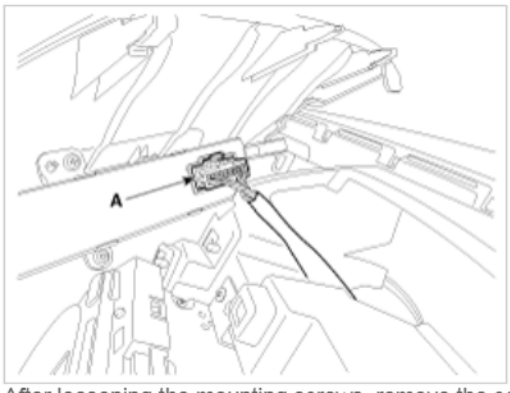
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4. After loosening the mounting screws, disconnect the connector (A), and then remove the center fascia cover (B).

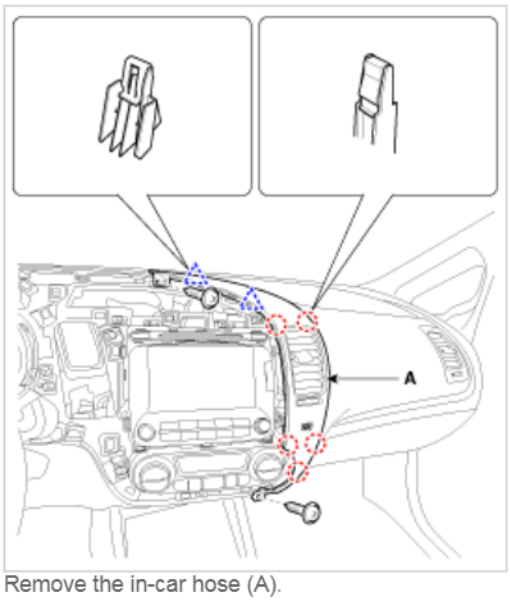


5. Disconnect the clock switch connector (A).

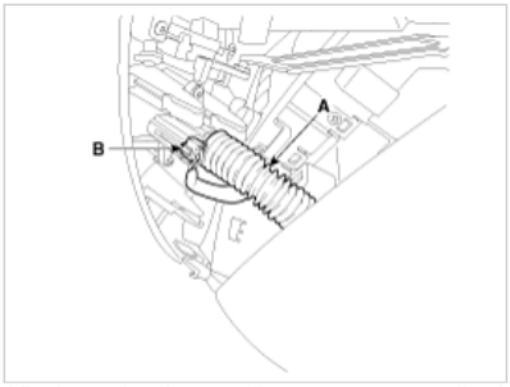


6. After loosening the mounting screws, remove the center airvent duct assembly [RH] (A).

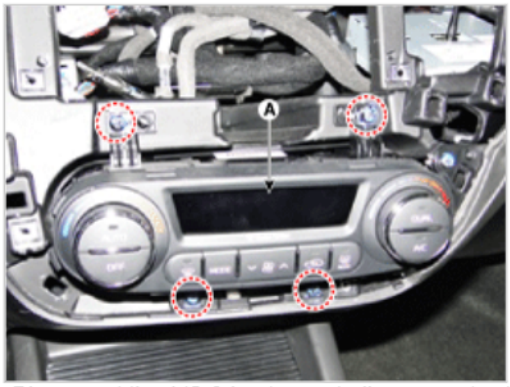
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7. Remove the in-car hose (A).
8. Disconnect the in-car sensor connector (B).



9. After loosening the mounting screws, remove the A/C & heater controller (A).



10. Disconnect the A/C & heater controller connector (A).

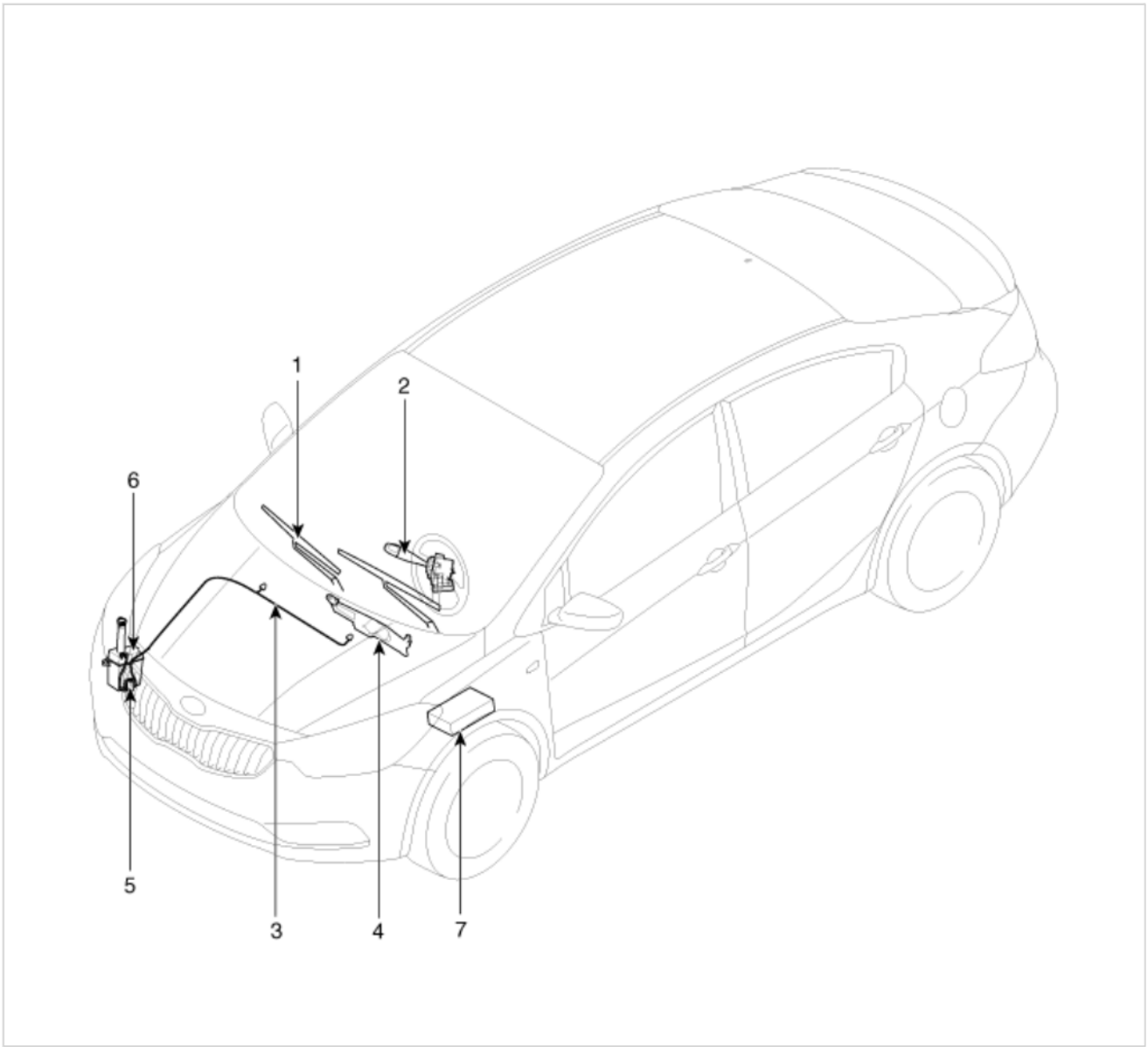
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11. Install in the reverse order of removal.

Body Electrical System

Component Location



1. Windshield wiper arm & blade	5. Washer motor
2. Wiper & washer switch	6. Washer reservoir
	7. Wiper relay (Engine room relay box)

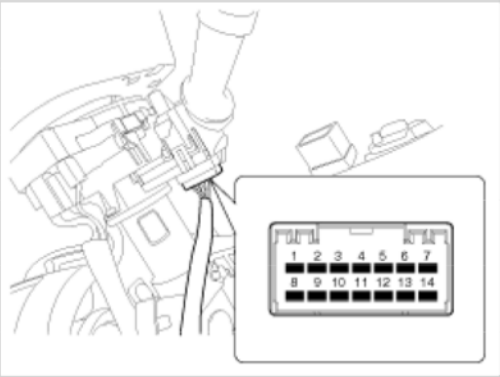
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3. Windshield washer hose
4. Windshield wiper motor & linkage

Body Electrical System

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

Position \ Terminal	5	13	6	14	12	7	10	9
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○	○		○	○
LOW	○				○			
HI		○			○			

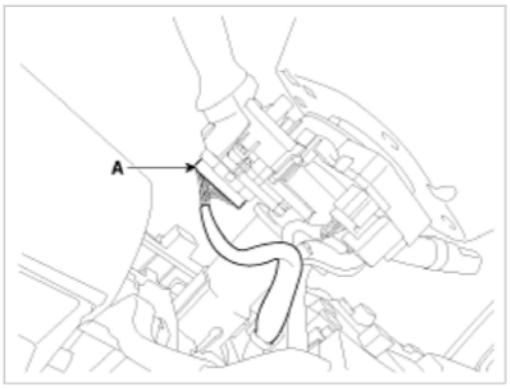
Washer Switch

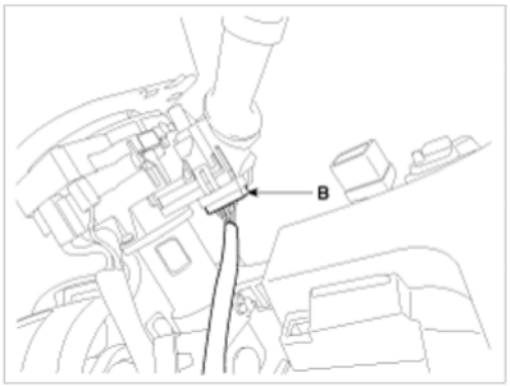
Position \ Terminal	11	12
OFF		
ON	○	○

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.
   (Refer to Steering System - "Steering Wheel")
3. Remove the steering column upper and lower shrouds.
   (Refer to Body - "Steering Column Shroud Panel")
4. Remove the clock spring.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
5. Disconnect the light switch connector (A) and the wiper switch connector (B).

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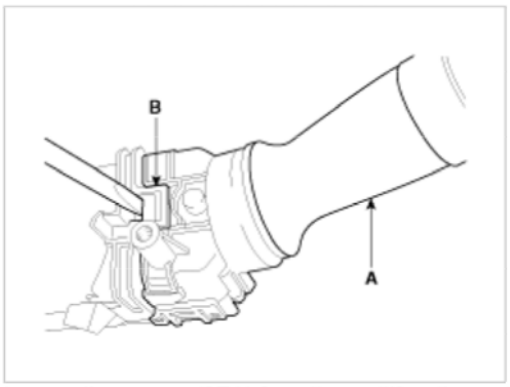




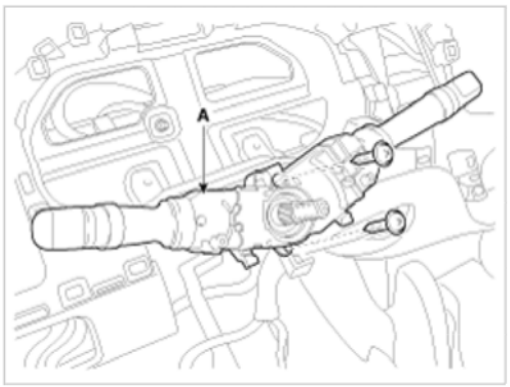
6. Remove the wiper switch (A) by pushing the lock pin (B).

NOTICE

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



7. Loosen the screws (2EA) from the multifunction switch assembly (A).



Installation

1. Install the multifunction switch.
2. Install the clock spring.

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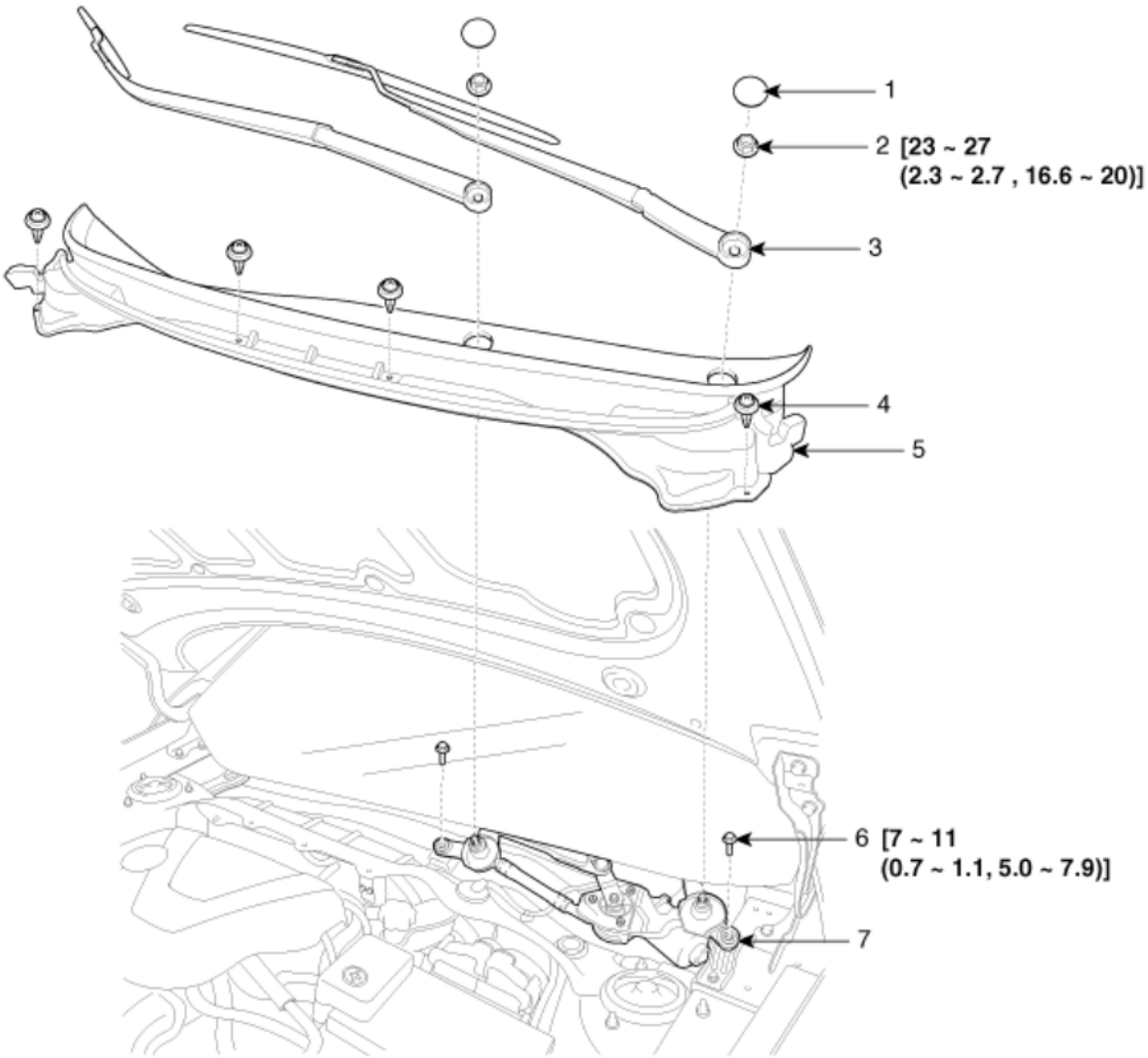
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.

NOTICE

Make sure the multifunction switch connectors are plugged in properly.

Body Electrical System

Component Location



Torque : N.m (kgf.m, lb-ft)

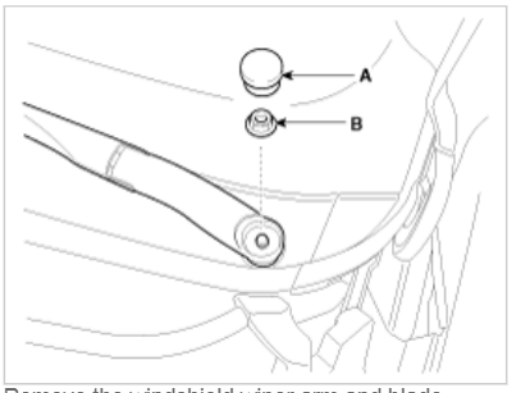
1. Cap	5. Cowl top cover
2. Nut	6. Bolt
3. Wiper arm & blade	7. Wiper motor & linkage assembly
4. Retainer	

Body Electrical System

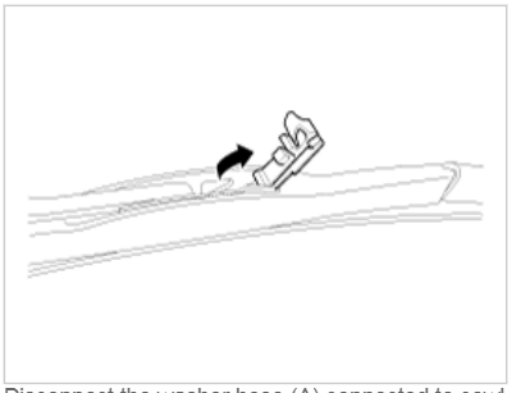
Removal

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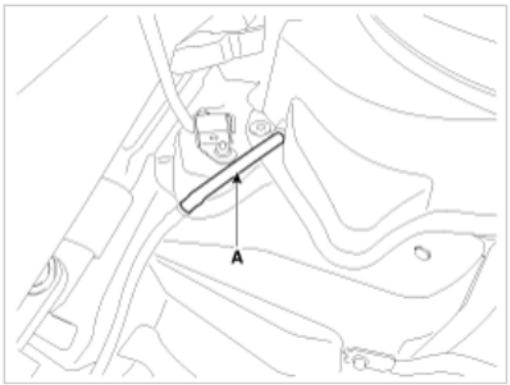
1. Loosen the windshield wiper arm nut (B) after removing a wiper cap (A).



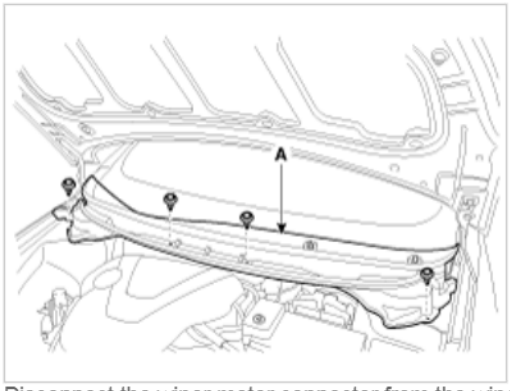
2. Remove the windshield wiper arm and blade.
3. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius of wiper arm.



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

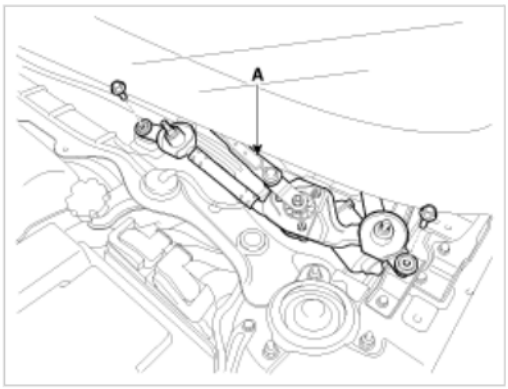


5. Remove the weather strip and the cowl top cover (A) after removing 4 retainers.

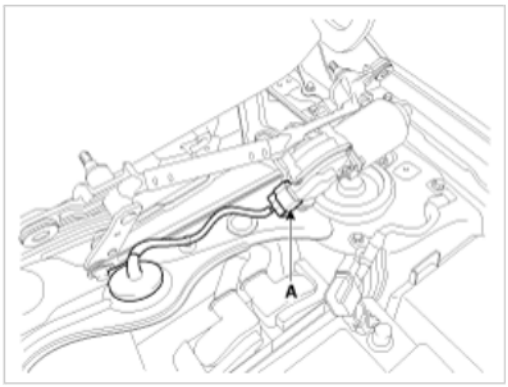


6. Disconnect the wiper motor connector from the wiper motor & linkage assembly.
7. Remove the windshield wiper motor and linkage assembly (A) after removing 2 bolts.

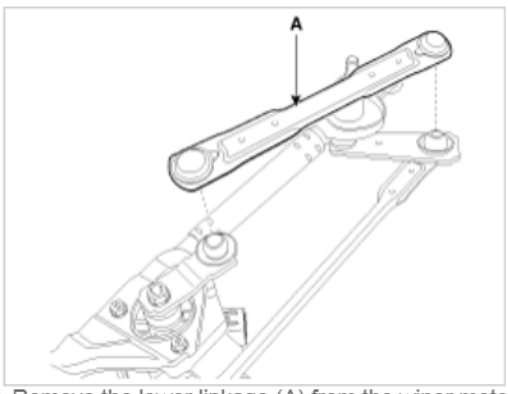
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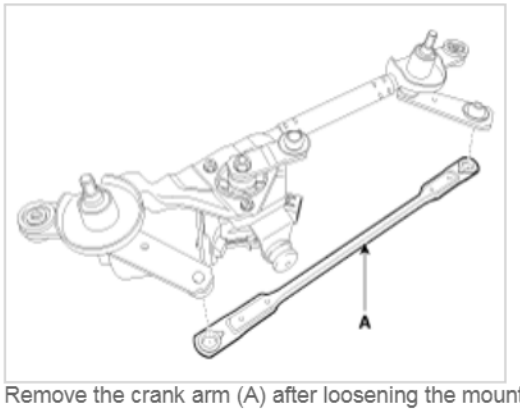
8. Disconnect the connector (A) from the wiper motor.



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

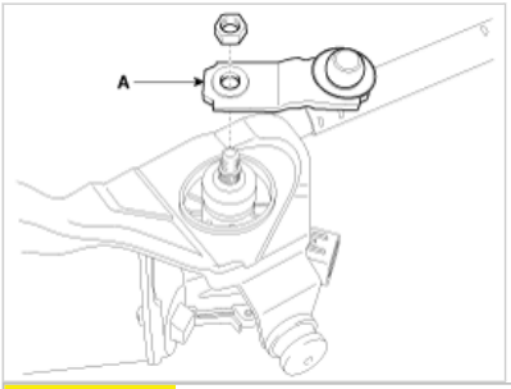


10. Remove the lower linkage (A) from the wiper motor crank arm.



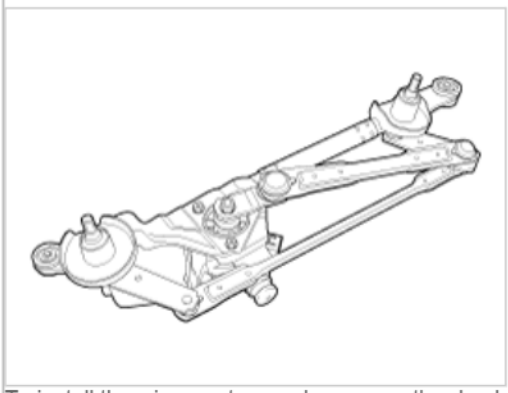
11. Remove the crank arm (A) after loosening the mounting nut.

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CAUTION

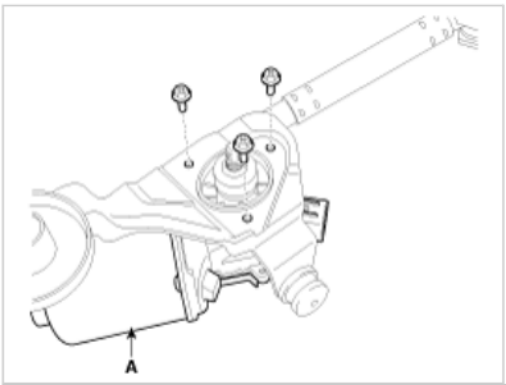
Before removing the wiper motor and linkage assembly, make sure that the linkage is stopped at auto stop position.



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.

12. Remove the wiper motor (A) with 3 bolts.



Information

When replacing only the wiper motor, it is not necessary to remove the upper/lower linkage. (Related procedures are 9 and 10.)

Installation

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

CAUTION

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

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

CAUTION

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

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Be careful not to bend the linkage.

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

Tightening torque:
7 ~ 11 N.m (0.7 ~ 1.1, kgf.m, 5.0 ~ 7.9 lb-ft)

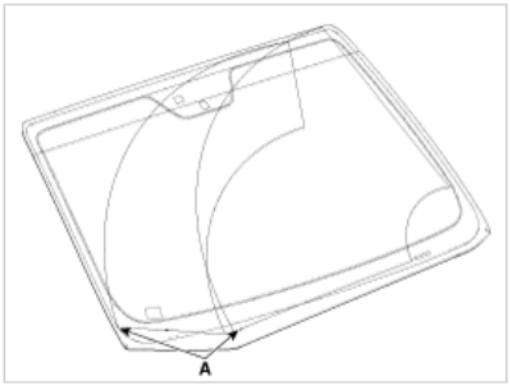
5. Install the cowl top cover.
6. Install the windshield wiper arm and blade.

Tightening torque:
22.5 ~ 26.4 N.m (2.3 ~ 2.7 kgf.m, 16.6 ~ 21.7 lb-ft)

NOTICE

- 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.

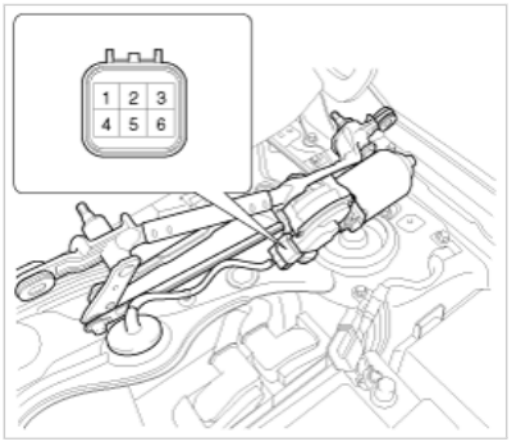
7. Install the wiper arm and blade to the auto stop position.
A : Auto stop position (Blade)



Inspection

Speed Operation Check

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



2. Attach the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 5.
3. Check that the motor operates at low or high speed as below table.

Terminal / Position	3	2	4	6
OFF	○			○
LOW		○		○
HIGH		○	○	

CAUTION

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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.

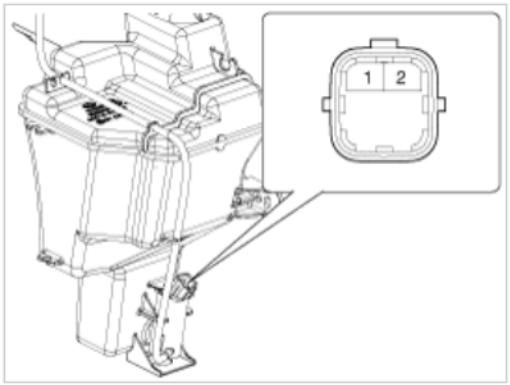
Inspection

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

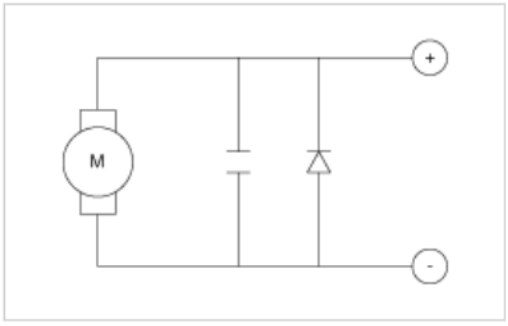
NOTICE

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 2 and negative (-) battery cables to terminal 1 respectively.
3. Check that the motor operates normally and the washer motor runs and water sprays from the front nozzles.
4. If they are abnormal, replace the washer motor.



NO	Description	NO	Description
1	Washer (+)	2	GND (-)



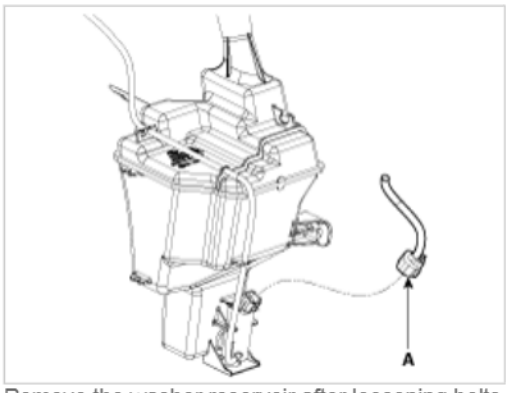
Removal

CAUTION

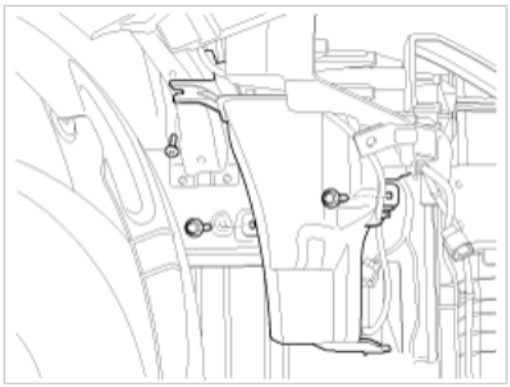
- When servicing the washer pump, be careful not to damage the washer pump seal.
- Do not operate the washer pump before filling the washer reservoir.
  Failure to do so could result in premature pump failure.

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

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4. Remove the washer reservoir after loosening bolts and screw.



Installation

1. Install the washer reservoir.

NOTICE

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

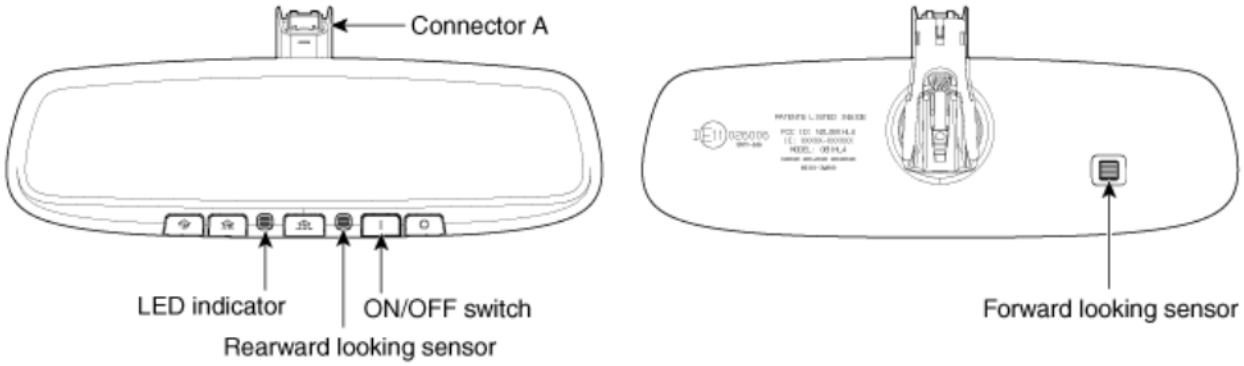
2. Install the washer motor.
3. Install the washer hose.
4. Connect the washer motor connector.
5. Install the front bumper.
6. Check the washer motor operation.

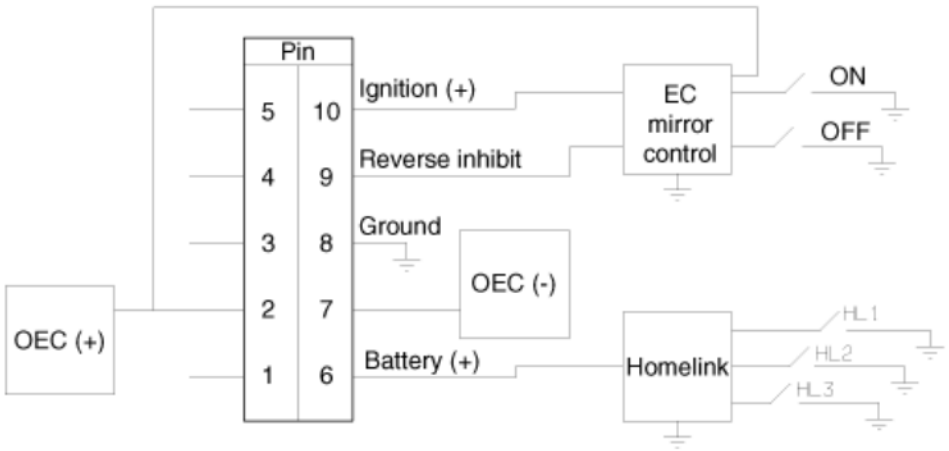
Body Electrical System

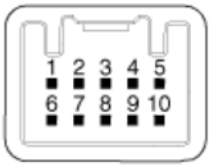
Components

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[ECM + Home Link]





Connector A	No.	Description	No.	Description
	1	-	6	-
	2	OEC (+)	7	OEC (-)
	3	-	8	Ground
	4	-	9	Reverse inhibit
	5	-	10	Ignition (+)

Body Electrical System

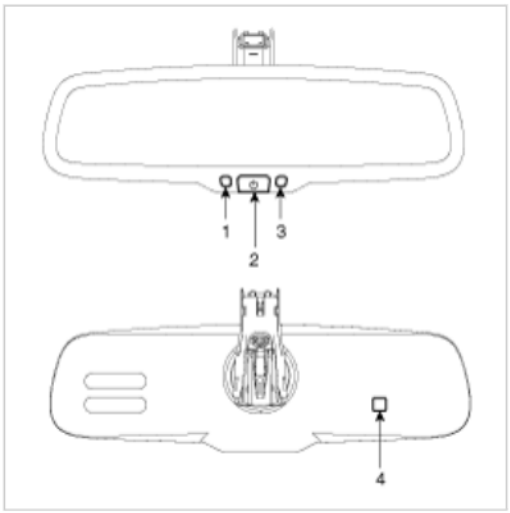
Description

The ECM (Electro Chromatic inside rear view Mirror) is for dimming the reflecting light from a vehicle behind at night, Preventing glare from the light. The forward facing sensor detects brightness of the surroundings, while the rearward looking sensor detects the strength of the reflecting light and adjusts the reflexibility of the mirror in the range of 7~85%. But, when the reverse gear is engaged, it stops functioning.

1. The forward facing sensor sees if the brightness of the surroundings is low enough for the mirror to operate its function.
2. The rearward looking sensor detects glaring of the reflecting light from a vehicle behind.
3. The ECM is darkened to the level as determined by the rearward looking sensor. When the glaring is no longer detected, the mirror stops functioning.
   1. LED indicator
   2. ON/OFF Switch

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3. Rearward looking sensor
4. Forward looking sensor



Automatic-dimming Function

To protect your vision during nighttime driving, your mirror will automatically dim upon detecting glare from the vehicles traveling behind you. The auto-dimming function can be controlled by the Dimming ON/OFF Button :

1. Pressing and holding the Feature Control button for more than 3 but less than 6 seconds turns the auto-dimming function OFF which is indicated by the green Status Indicator LED turning off.
2. Pressing and holding the Feature Control button again for more than 3 but less than 6 seconds turns the auto-dimming function ON which is indicated by the green Status Indicator LED turning on.

NOTICE

The mirror defaults to the "ON" position each time the vehicle is started.

Body Electrical System

Inspection

Check it by the procedure below to see if the function of the ECM is normal.

1. Turn the ignition key to the "ON" position.
2. Cover the front sensor to stop functioning.
3. Shine a light at the rear sensor.
4. The ECM should be darkened as soon as the rear sensor detects the light.

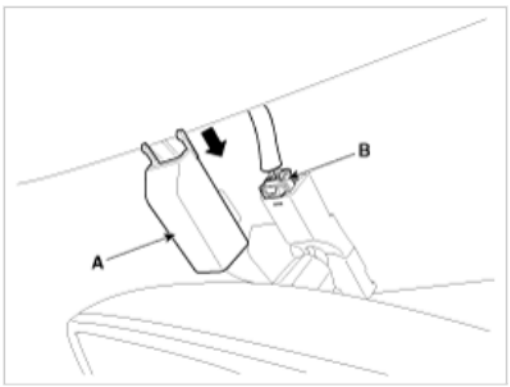
NOTICE

If this test is performed in daytime, the ECM may be darkened as soon as the front sensor is covered.

5. When the reverse gear is engaged, the ECM should not be darkened.
6. When heading lights to both the front and rear sensors, the ECM should not be darkened.

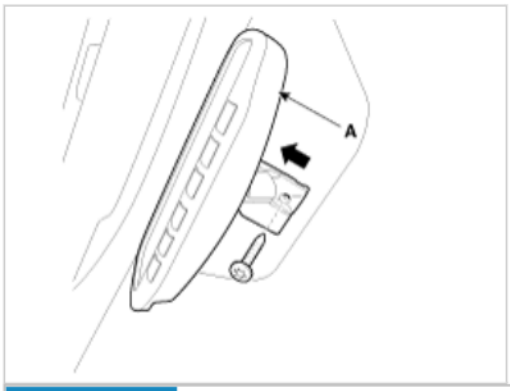
Removal

1. Remove the mirror wiring cover (A).
2. Disconnect the mirror connector (B).



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3. Loosen the mirror mounting screw.
4. Push the mirror base up to remove the mirror assembly (A).



NOTICE

Take care not to damage the mounting bracket during removal.

Installation

1. Install the mirror assembly.
2. Install the mirror wiring cover and connector.

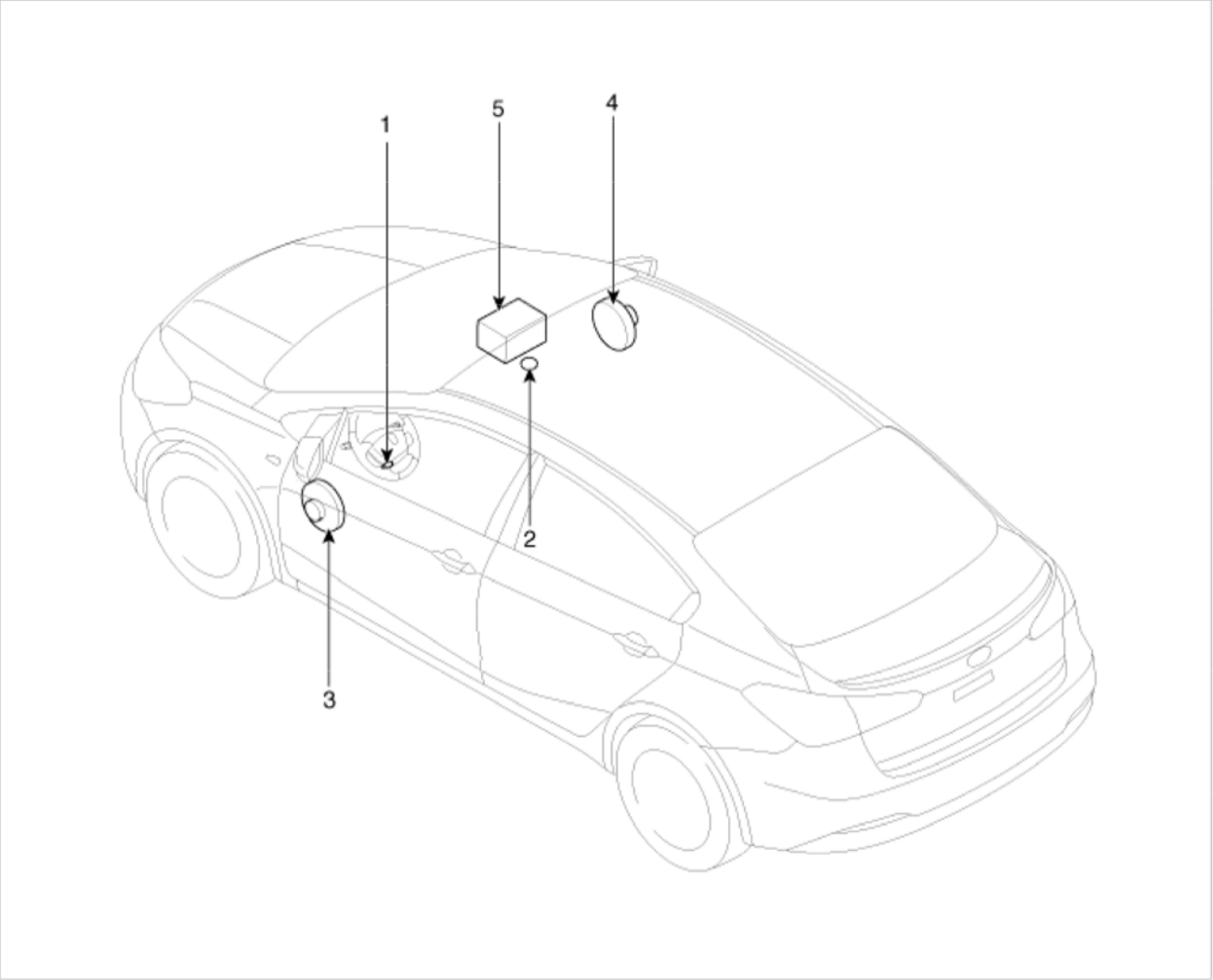
NOTICE

- Make sure the connector is plugged in properly.

Body Electrical System

Components

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

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

Body Electrical System

General Features

• This audio system supports Bluetooth® hands-free and stereo-headset features.

- HANDS-FREE feature: Making or receiving calls wirelessly.
- STEREO-HEADSET feature : Playingmusic from cellular phones (that supports A2DP feature) wirelessly.

NOTICE

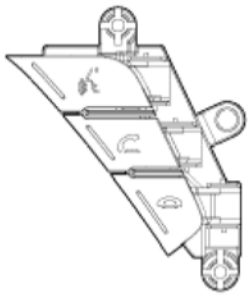
• The phone must be paired to the system before using Bluetooth® features.
• Only one selected (connected) cellular phone can be used with the system at a time.
• Some phones are not fully compatible with this system.

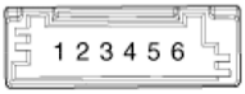
Body Electrical System

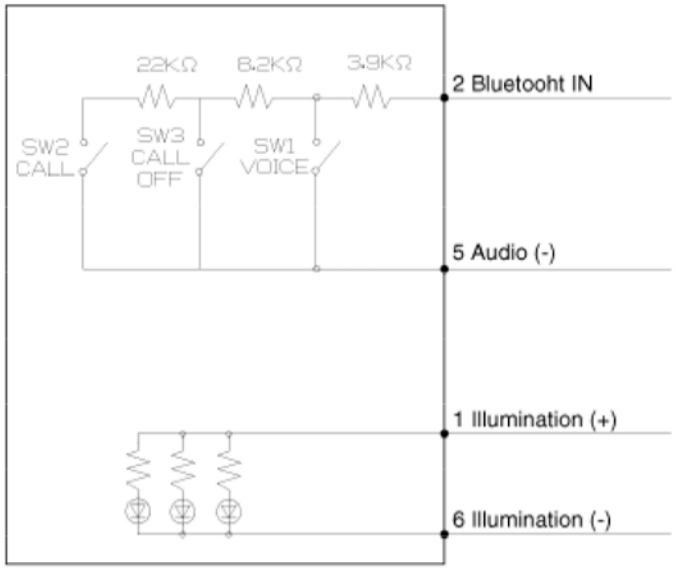
Circuit Diagram

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Bluetooth + Voice [LH]



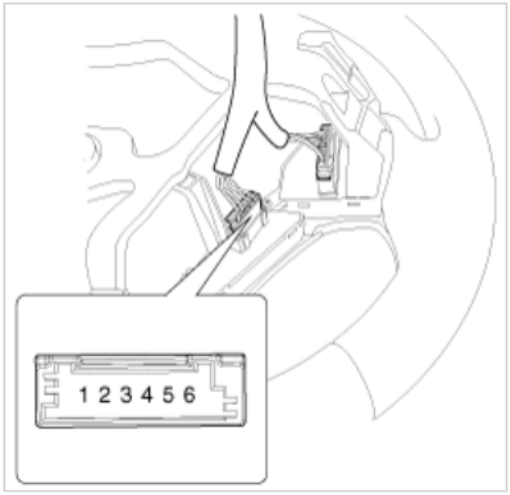
Connector	
	
No.	**Description**
1	Illumination (+)
2	Bluetooth IN
3	-
4	-
5	Audio (-)
6	Illumination (-)



Body Electrical System

Inspection

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



Switch	Connector terminal	Resistance (±5%)
Voice	2 - 5	10.71 kΩ
End of call	2 - 5	18.91 kΩ
Call	2 - 5	40.91 kΩ

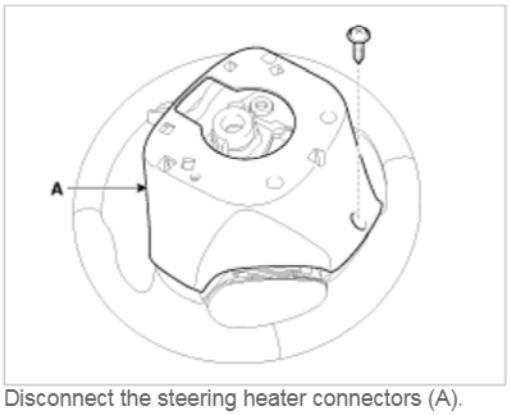
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
3. Remove the steering wheel.

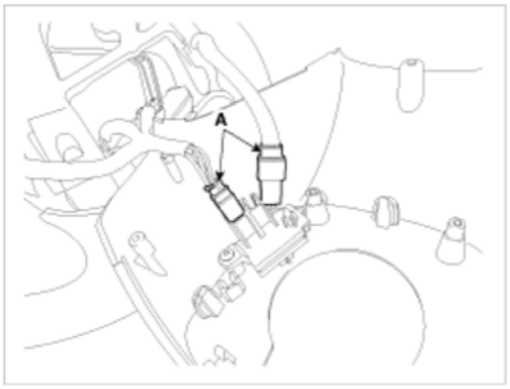
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(Refer to Steering System - "Steering Column and Shaft")

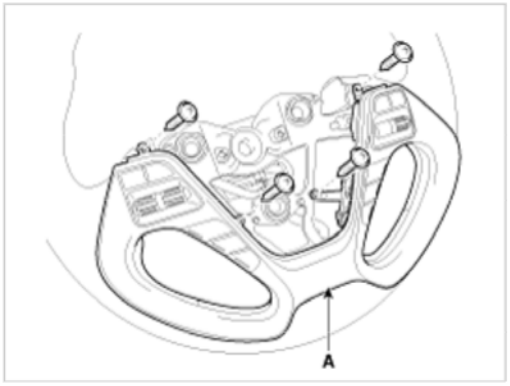
4. Remove the steering wheel cover (A) after loosening the screw.



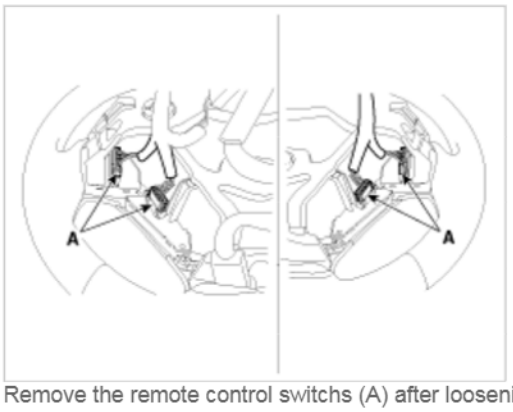
5. Disconnect the steering heater connectors (A).



6. Remove the steering remote control switch assembly after loosening the mounting screws (4EA).

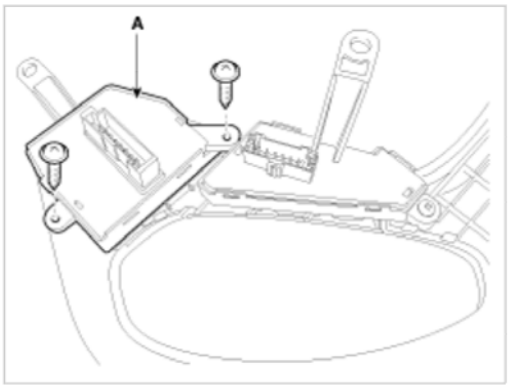


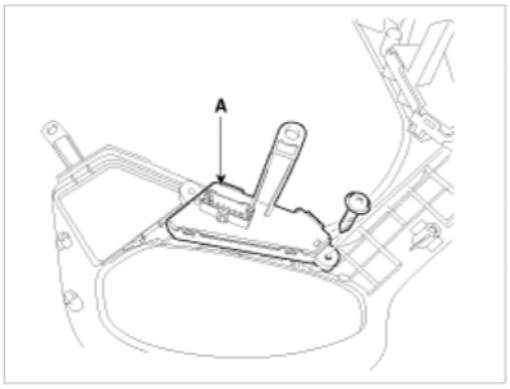
7. Disconnect the switch connectors (A).



8. Remove the remote control switchs (A) after loosening the mounting screws.

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Installation

1. Reassemble the steering wheel remote control switch after connecting the connector.
2. Reassemble the driver airbag module.

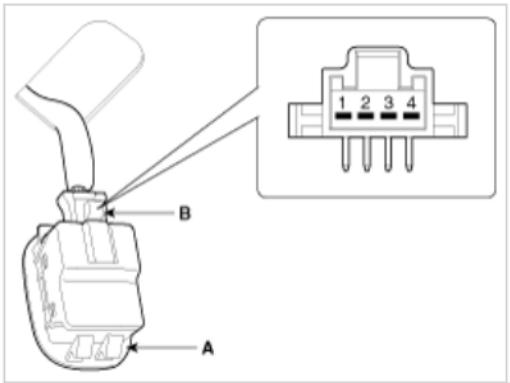
NOTICE

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

Body Electrical System

Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the handsfree mic (A) after disconnect the connector from roof trim.

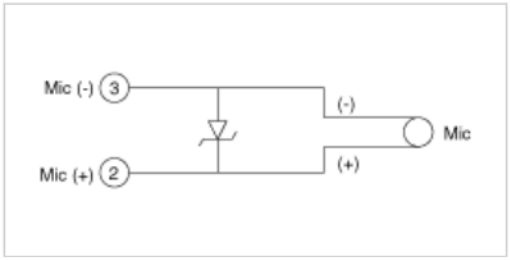


⚠ CAUTION

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

3. Check the continuity of Mic between terminals.

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Body Electrical System

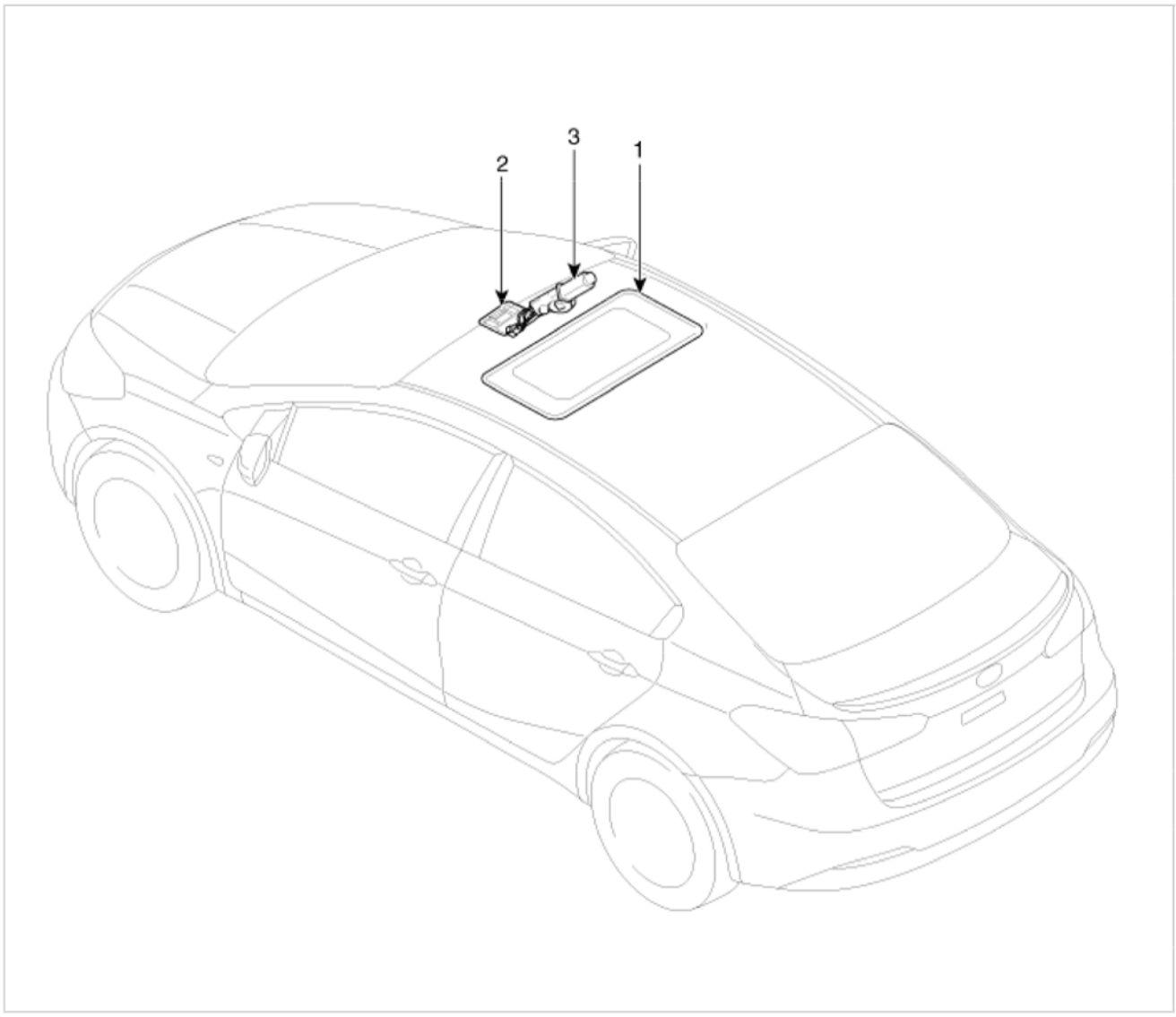
Troubleshooting

Problem	Possible cause	Solution
Not pairing	Bluetooth device of Car is not discoverable mode	Enter Bluetooth pairing (searching) mode
	User's phone is Bluetooth off mode	User's phone set Bluetooth on
	Making an attempt pairing others bluetooth system	Check Bluetooth device name and address (12 word) to attempt paring Ex) 000B24FFF123
	Pass key error	Input the passkey displayed on the audio screen into the phone.
	5 phones have already been registered.	Delete paired phone list
	Bluetooth system cannot communicate with the phone.	Refer to IOP sheet ※IOP : Inter-operability
Not connection	User's phone or Bluetooth device of Car dose not register Bluetooth device to connect	Retry pairing
	Bluetooth system cannot communicate with the phone.	Waiting 1minute then Retry connection or phone power off/on. Refer to IOP sheet
Not redial	User phone system issue	Push the 2 times Send button
Not accept call	User phone system issue	Refer to IOP sheet
Not dialing	User's phone playing other menu (internet, mp3, game, etc..)	Stop other menu then set normal mode
	Bluetooth system cannot communicate with the phone	Refer to IOP sheet

Body Electrical System

Component Location

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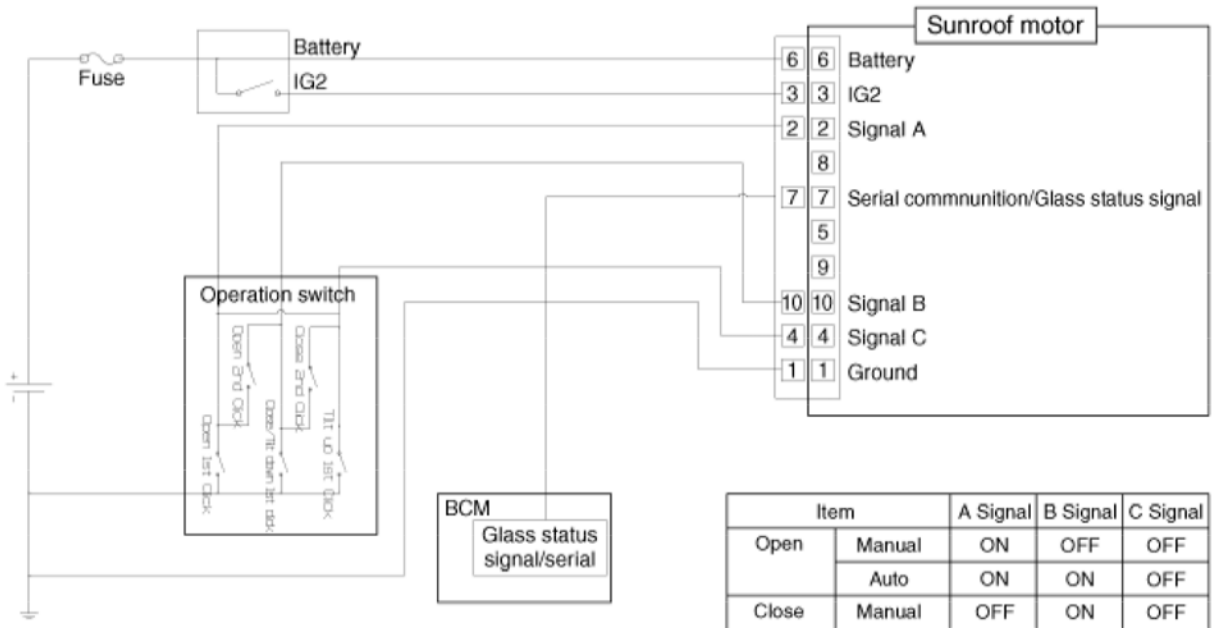


1. Sunroof 2. Sunroof switch	3. Sunroof motor & controller

Body Electrical System

Circuit Diagram

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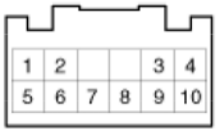
Item		A Signal	B Signal	C Signal
Open	Manual	ON	OFF	OFF
	Auto	ON	ON	OFF
Close	Manual	OFF	ON	OFF
	Auto	OFF	ON	ON
Tilt up	Manual	OFF	OFF	ON
Tilt down	Manual	OFF	ON	OFF

[Overhead console side]



No.	Description
1	Ground
2	Signal A
3	Signal B
4	Signal C
5	-
6	-

[Motor side]

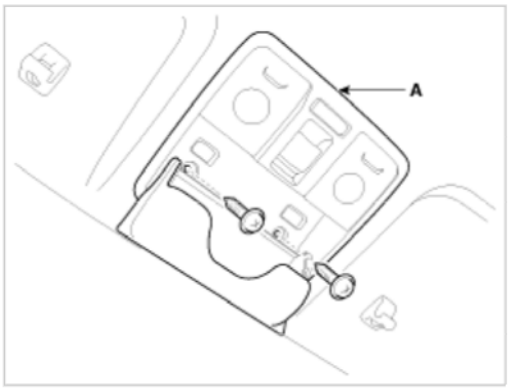


No.	Description	No.	Description
1	Ground	6	B+
2	Signal A	7	Glass status signal/serial
3	IG2	8	-
4	Signal C	9	-
5	-	10	Signal B

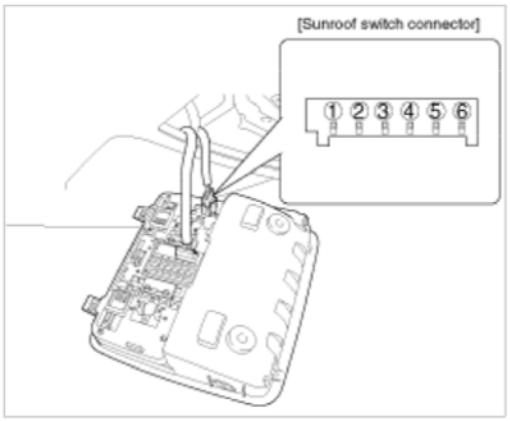
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Inspection

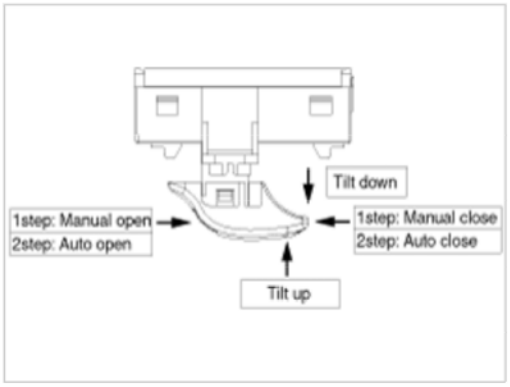
1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp assembly (A) after loosening 2 screws.



3. Check for continuity between the terminals.



Position \ Terminal	1	2	3	4
Tilt up	○			○
Manual close / Tilt close	○		○	
Manual open	○	○		
Auto open	○	○	○	
Auto close	○		○	○

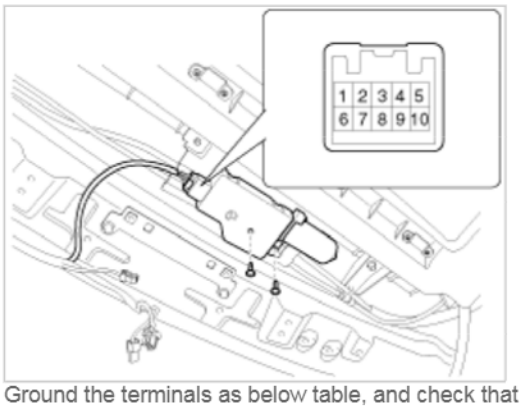


Body Electrical System

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim assembly.
   (Refer to Body - "Roof Trim Assembly")
3. Disconnect the sunroof motor (A) connector.

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4. Ground the terminals as below table, and check that the sunroof unit operates.

NOTICE

- When inspecting the sunroof motor operation, sunroof motor and roller blind motor always should be connected.

Position \ Terminal	3	4	2	10
Manual close	⊕			⊖
Tilt up	⊕	⊖		
Manual open	⊕		⊖	

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.

Resetting The Sunroof

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 :

1. Turn the ignition key to the ON position and then close the sunroof completely.
2. Release the sunroof control lever.
3. Press and hold the CLOSE button for more than 10 seconds until the sunroof closed and it has moved slightly.
4. Release the sunroof control lever.
5. Press and hold the CLOSE button once again within 3 seconds until the sunroof do as follows;
   A. Tilt down → Slide Open → Slide Close
   Then release the lever.
6. Reset procedure of sunroof system is finished.

Protecting Motor From Overheating

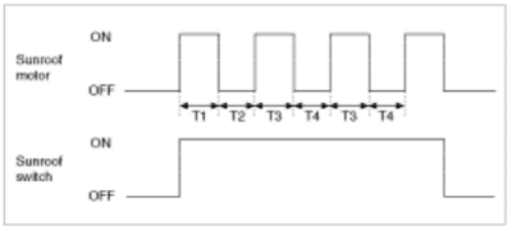
In order to protect the sunroof motor from overheating from continuous motor operation, the sunroof ECU controls the Run-time and Cool-time of the motor as follows:

1. The sunroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st run-time (120 ± 10sec.).
3. The continuous operation of motor stops after the 1st Run-time (120 ± 10sec.).
4. Then Motor is not operated for the 1st Cool-time (18 ± 2sec.).
5. Motor is operated for the 2nd Run-time (10 ± 2sec.) at the continued motor operation after 1st Cool-time (18 ± 2sec.)
6. The continuous operation of motor stops operating after the 2nd Run-time (10 ± 2sec.)
7. Motor is not operated for the 2nd Cool-time (18 ± 2sec.).
8. Motor repeats the 2nd run-time and 2nd cool-time at the continued motor operation.

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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 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 9 ± 2 sec., T4 : 18 ± 2 sec.

Body Electrical System

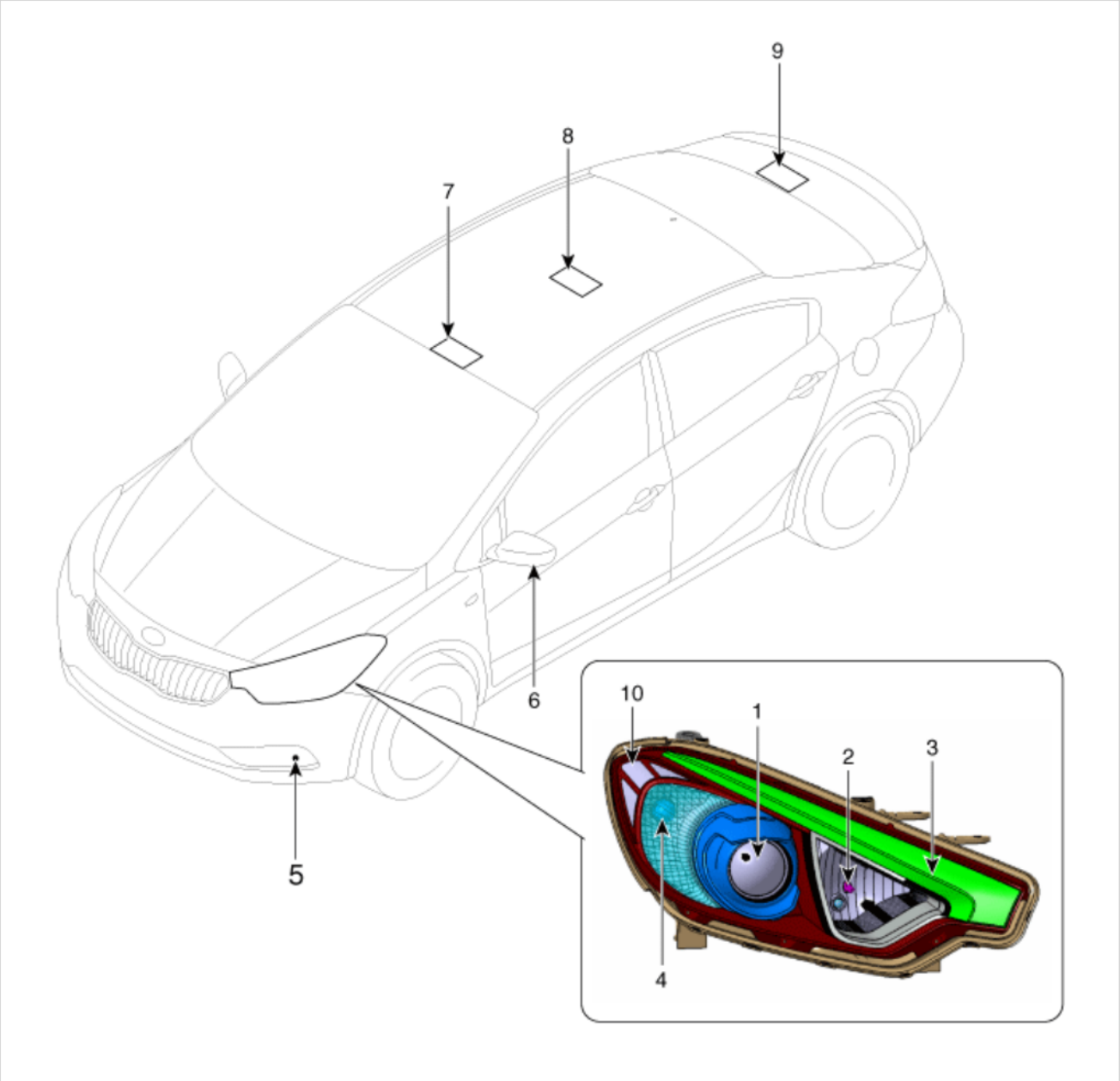
Specification

Item			Type	Watt (W)
Head lamp	Low	STD	H11	55
		HID	D8S	25
	High		H1	55
	Turn signal		PY28W/8W	28
	Position	STD	PY28W/8W	5
		LED	LED	LED
	Side marker		W5W	5
Side repeater lamp	STD		5	WY5W
	Outside mirror		LED	LED
DRL			H1	55
Front fog lamp			H8	35
Rear combination lamp (STD)	Outside	Tail/ Stop lamp	PY28/8	28/8
	Inside	Tail lamp	P28/8	8
	Turn signal		PY27W	27
	Backup		W16W	16
Rear combination lamp (LED)	Outside	Tail/ Stop lamp	LED	LED
	Inside	Tail/ Stop lamp	LED	LED
	Turn signal		PY27W	27
	Backup		W16W	16
Interior	Overhead console lamp		FESTOON	8
	Room lamp		FESTOON	8
	Luggage lamp		FESTOON	8
	Vanity lamp		FESTOON	5
HMSL			P21W or LED	21 or LED
License lamp			W5W	5

Body Electrical System

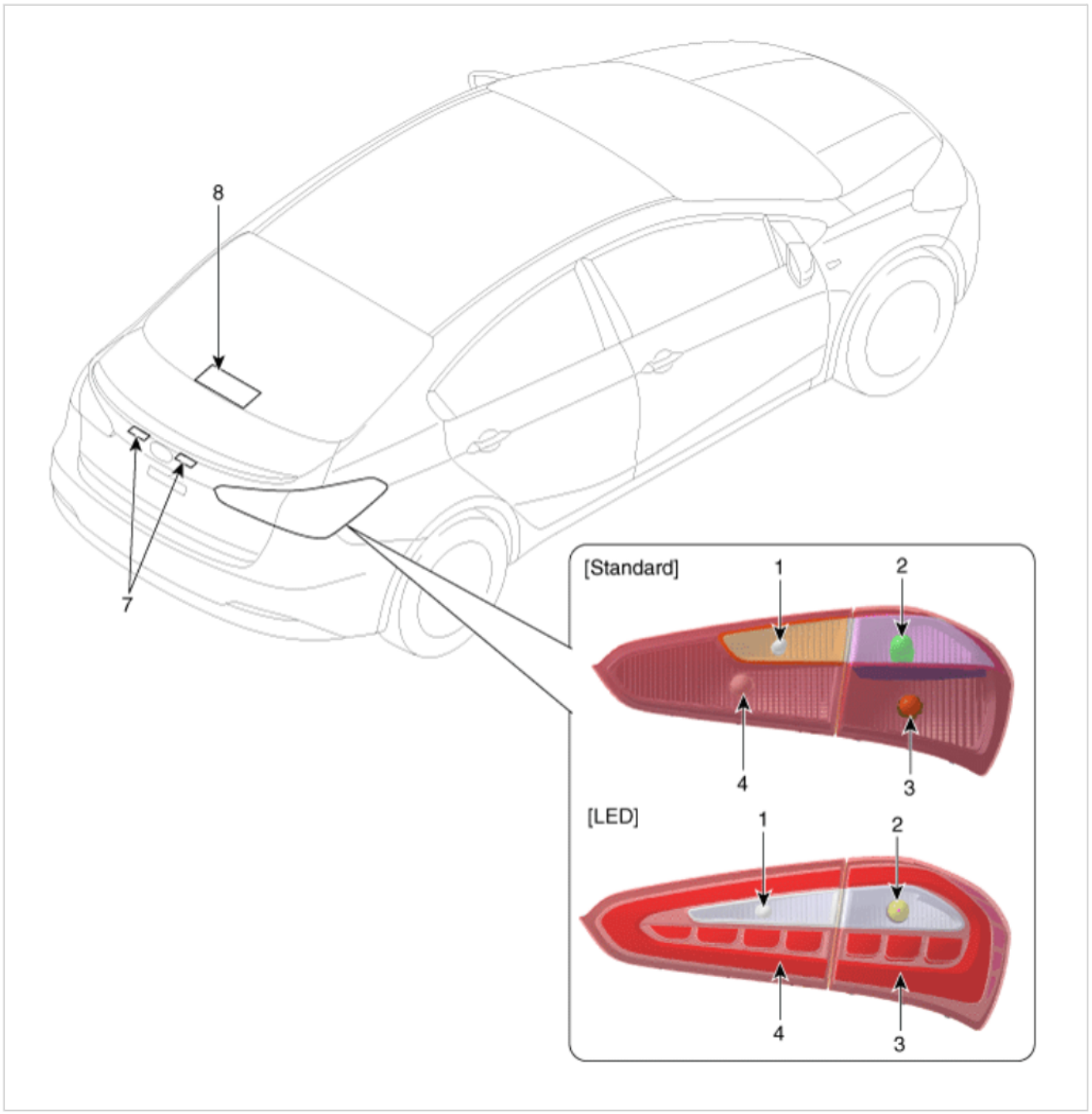
Component Location

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1. Head lamp (Low)	6. Turn signal lamp (Outside mirror)
2. Head lamp (High)	7. Overhead console lamp
3. Position lamp / DRL	8. Room lamp
4. Turn signal lamp	9. Luggage lamp
5. Front fog lamp	10. Side marker

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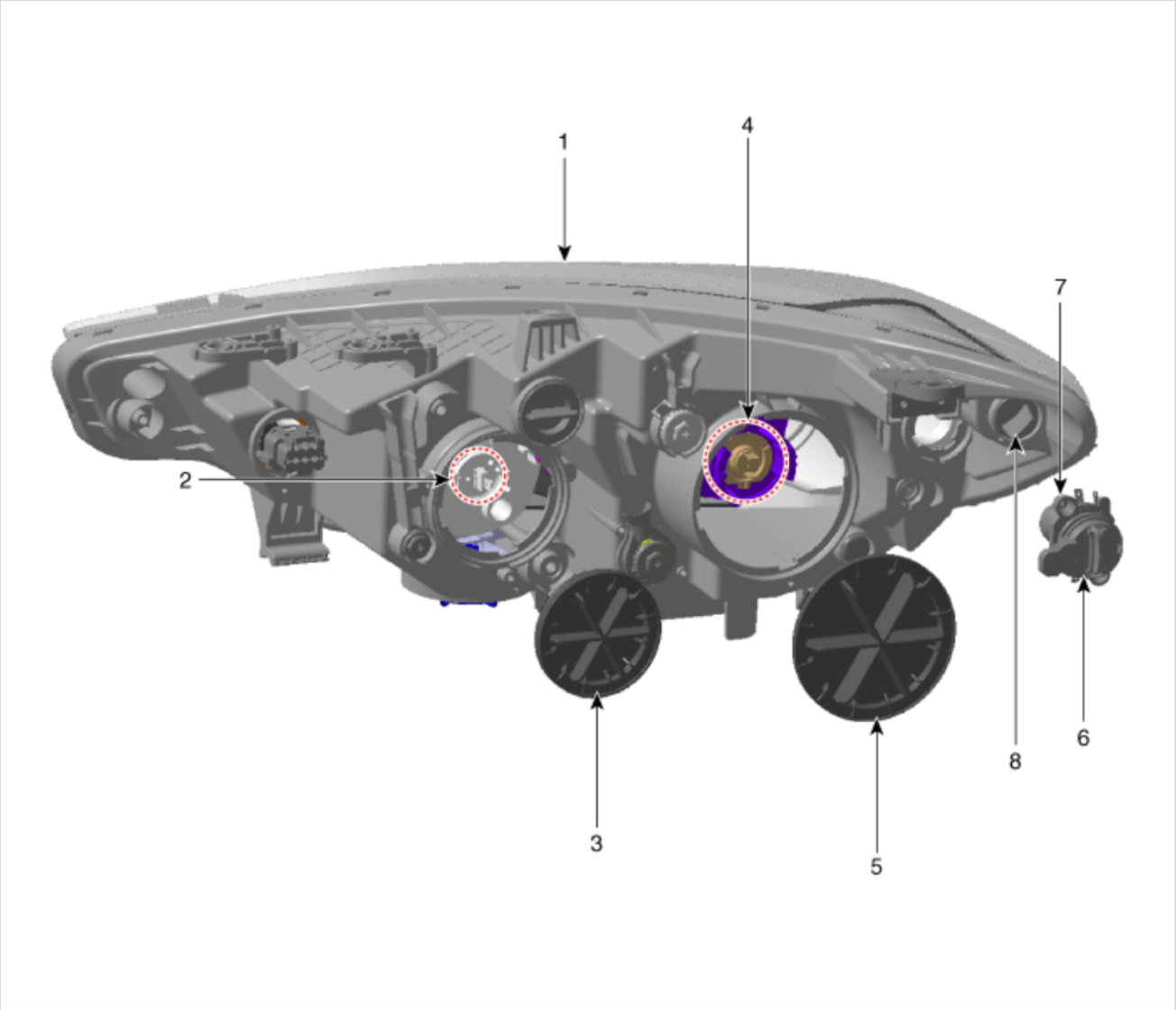


1. Backup lamp	4. Tail lamp
2. Turn signal lamp	5. High mounted stop lamp
3. Tail/ Stop lamp	6. License lamp

Body Electrical System

Component

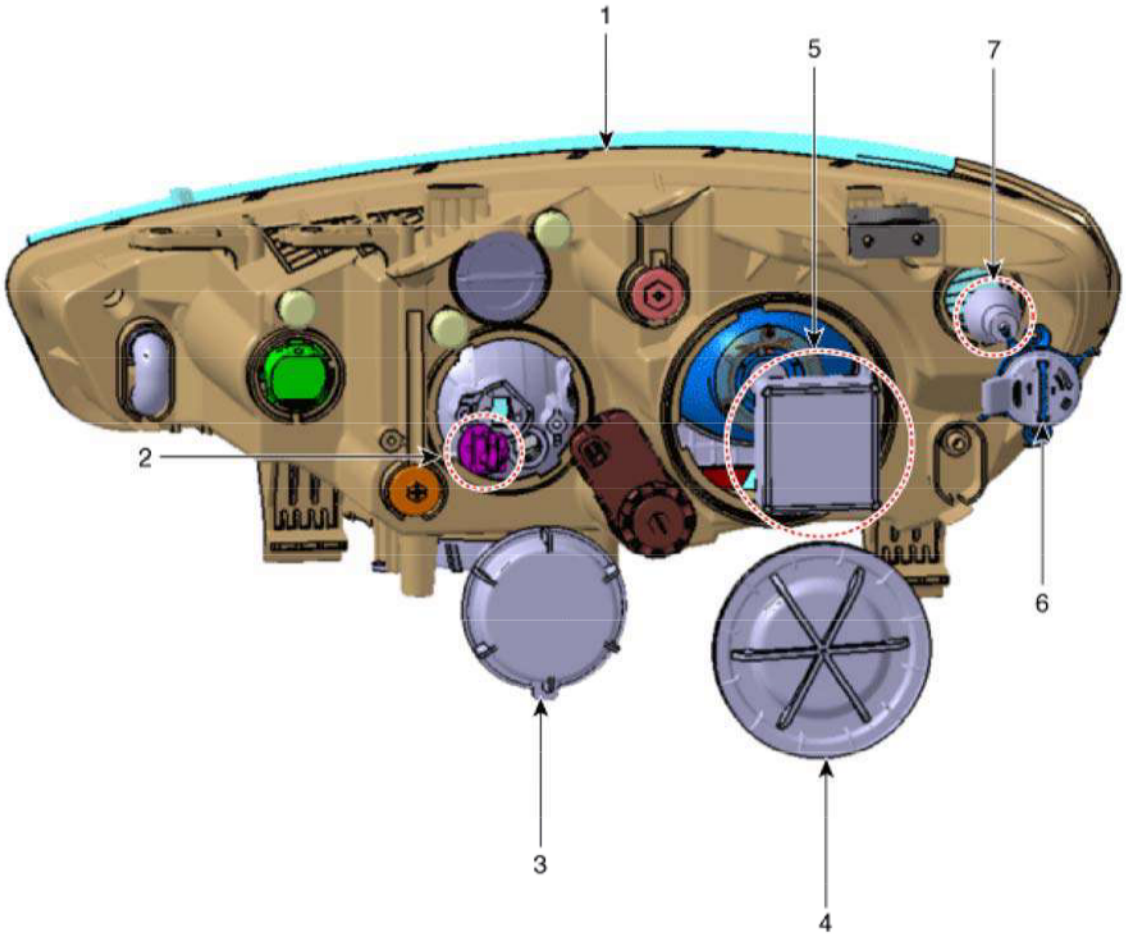
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1. Head lamp assembly lens & housing	5. Dust cap (Low)
2. Head lamp (High) lamp	6. Turn signal lamp socket
3. Dust cap (High)	7. Turn signal lamp
4. Head lamp (Low) lamp	8. Side marker

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[HID]



1. Head lamp assembly lens & housing	5. Dust cap (Low)
2. Head lamp (High) lamp	6. Turn signal lamp socket
3. Dust cap (High)	7. Turn signal lamp
4. Head lamp(LOW) bulb (HID) & Ignitor	

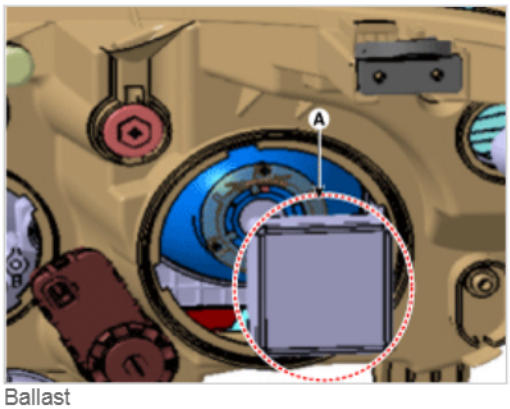
Body Electrical System

Description and Operation

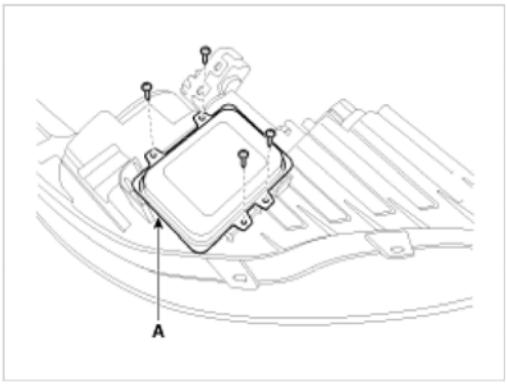
HID Head Lamp

1. Bulb
   (1) Elements
   Xenon gas: Xenon gas activates the initial reaction for rapid illuminating.
   Molybdenum electrode: anode arcing
   Metal halide salts: color composing component
   (2) Lightening principle
   When Xenon gas and metal halide salt will discharge the molybdenum anode in a capsule, it emits light.
2. Ignitor
   Ignitor (A) is an electromagnetic transformer that receives current from ballast and boost voltage to light on the arc light source in any environment.

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3. Ballast
   (1) Ballast (A) delivers an instant high voltage pulse to the ignitor electrode, to initialize discharge in the source.

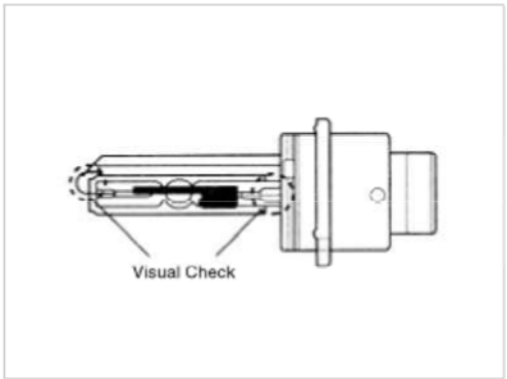


   (2) Ballast supplies the stable power to the bulb and the ignitor during initialization and normal state of arc.
4. Stability
   (1) Durable for vibration as there is no filament.
   (2) Does not operate if polarity are changed.
   (3) Doesn't operate if the input voltage is not in the range of 10-16V.
   (4) Doesn't operate if the circuit is short.
   (5) Doesn't operate if the bulb burnt out.

Body Electrical System

Inspection

1. Check-points upon head lamp failure (HID)
   (1) Check the battery voltage. (Low beam will be on when the battery voltage above 9V.)
   (2) Check the fuse and relay.
   (3) Check the polarity of ballast. (If the polarity are changed, low beam doesn't lighten)
   (4) Check the bulb connector securely.
   (5) Visually bulb checking (no filament): damaged glass, damaged for upper parts and lower parts of glass tube.
   (6) After (1)~(5), replace the ballast and the ignitor. (ballast assembly).



2. Service procedure and warning (HID)

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No.	Item	Service procedures	Warning	Remarks
1	Replacement of lamp assembly	1. Disconnect the power connector from the lamp. 2. Remove and replace the lamp assembly. 3. Connect the power connector.	• Disconnect the head lamp power connector to avoid high voltage.	• Other description is the same as the halogen bulbs.
2	Replacement of the Bulb	1. Disconnect the power connector from the lamp. (head lamp, turn signal, head lamp leveling device) 2. Remove the lamp assembly. 3. Remove the ballast and dust cover. 4. Remove the bulb socket and replace the bulb. 5. Installation is the reverse of removal.	• Disconnect the head lamp power connector to avoid high voltage. • Be careful not to damage the bulb and use genuine bulbs only. • Do not apply excessive force and fit it correctly.	
3	Replacement of the Ballast (with built-in ignitor)	1. Disconnect the power connector from the lamp. 2. Remove the lamp and then the ballast and the dust cover. 3. Remove the head lamp leveling device and then the bulb socket. 4. Connect the bulb socket on the replacement ballast and install the leveling device. 5. Installation is the reverse of removal.	• Disconnect the head lamp power connector to avoid high voltage.	• Replace the ballast only and install the used lamp. • Replace the sub assembly except the ballast.
4	Others	1. Power supply should be according to the rated capacity. 2. Use the rated fuse and wire. 3. Bulb socket shall be free from moisture or dirt. 4. Do not apply the ballast severe shock, water, or extreme	• All parts should be serviced only at specified service centers.	• HID lamp should not be installed on other cars (Dangerous, fire may occur.)

⚠ CAUTION

HID lamp shall not be used on other cars.(Fire may occur.)

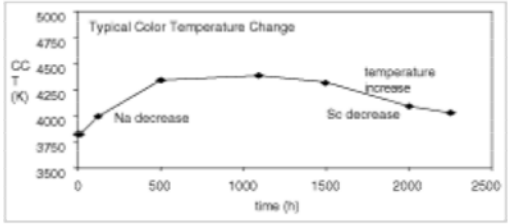
Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 30,000V) and high current (12-13A), and are different from the halogen lamp specification.

3. Understanding of color change by replacement of HID bulb.

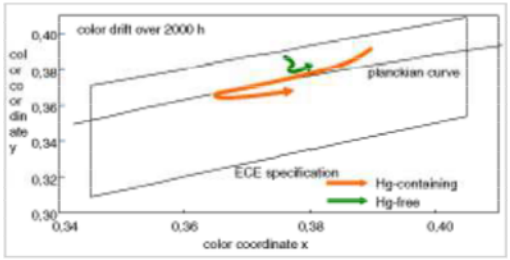
(1) The cause of HID color change.

(Change of color is HID feature)

A. The change of color occur during mixing three Elements in the HID bulb.



B. Color Coordinates by Lifetime



C. Chemical compounds in an arc tube :

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1. Xenon gas(an inert gas , protection of arc tube)
2. Mercury(increase voltage, protection of arc tube, blue in the first 3 second)
3. Metal halide
   - Natrium(Yellow) : 0.12mg
   - Scandium(Blue) : 0.06mg
   - Iodine(Halogen) : 0.02mg

(2) Change of Color by Lighting Up Time

A. It needs 4 seconds at least for stabilization.
   At first, you can see the blue for 3 seconds because of Mercury.

B. After stabilization, change of color occur by metal halide.
   - 0 Hour : Yellow(Na is more than Sc.)
   - 10 Hour : Bright Blue (Na and Sc are similar ratio.)
   - 1000Hour more : Blue (Sc is more than Na.)

C. The end of lifetime : When HID used up Natrium and Scandium, a beam of light will be dark suddenly.
   so you can see the red, purple and turn on and off.

Characteristic

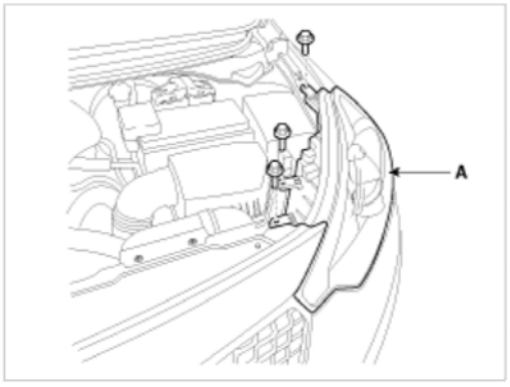
1. Durable for vibration as there is no filament.
2. HID lamp had a more long life than halogen lamp.
3. Does not operate if polarity is changed.
4. Operating input voltage : 9-16V

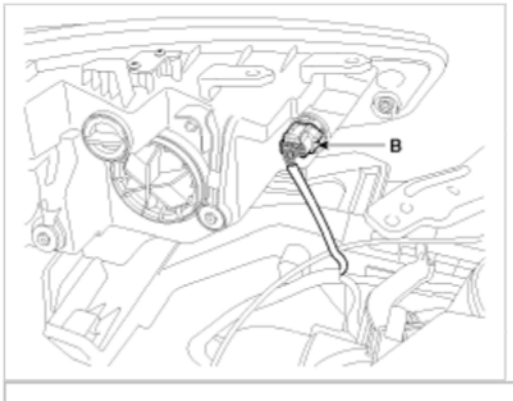
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover.
   (Refer to Body - "Front Bumper Cover")
3. Loosening the head lamp mounting bolts (3EA) and disconnect the head lamp connector (B).
   Then, remove the head lamp assembly (A).

NOTICE

- Take care not to scratch the head lamp lens or fender.

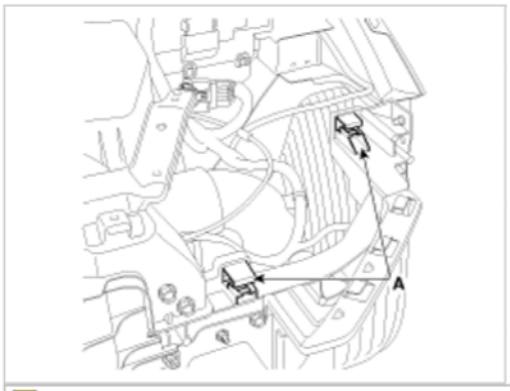




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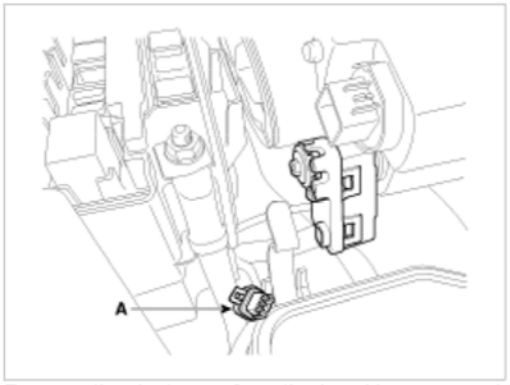
NOTICE

Take care that holding clip (A) is not to be damaged.

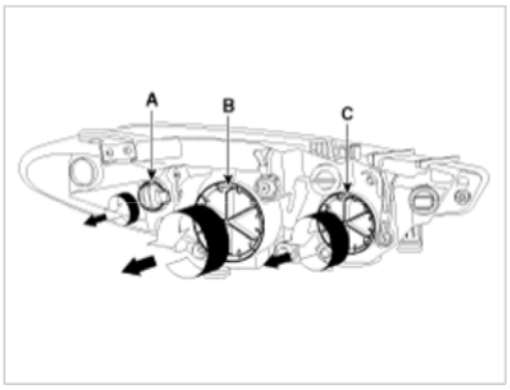


Information

When installing the HID head lamp, disconnect the head lamp leveling actuator connector.



4. Remove the dust caps from the head lamp assembly after turning in the counter clock-wise direction.

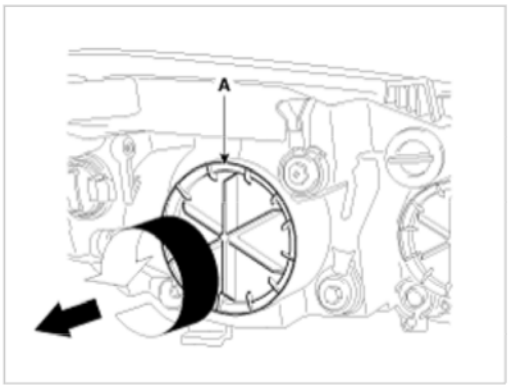


Head Lamp(low) Bulb

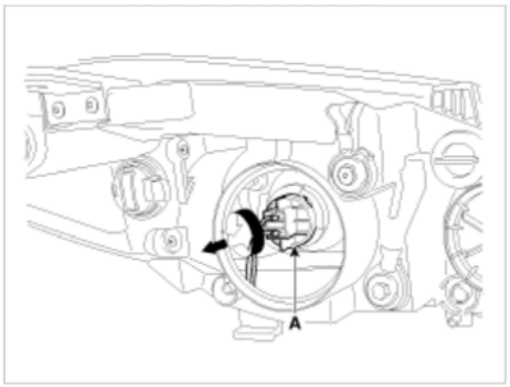
[Gdneral Type]

1. Turn the lamp switch off.
2. Disconnect the connector.
3. Remove the dust cap (A).

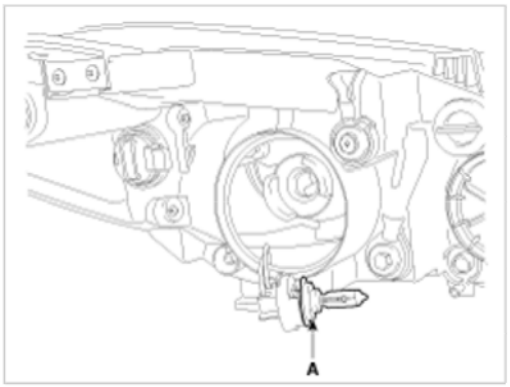
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4. Seperate the bulb connector (A) from the head lamp assembly.



5. Remove the bulb (A) from the connector.



[HID Type]

⚠ CAUTION

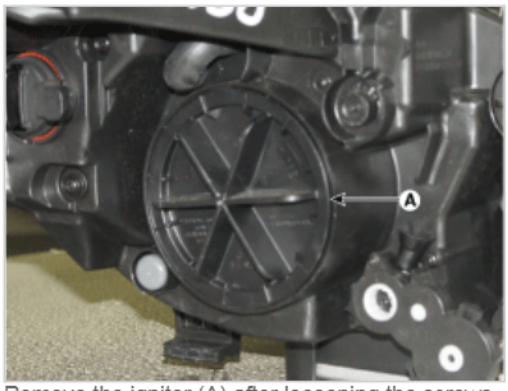
Turn the head lamp switch off to avoid high voltage

Be careful not to damage the bulb and use genuine bulbs only

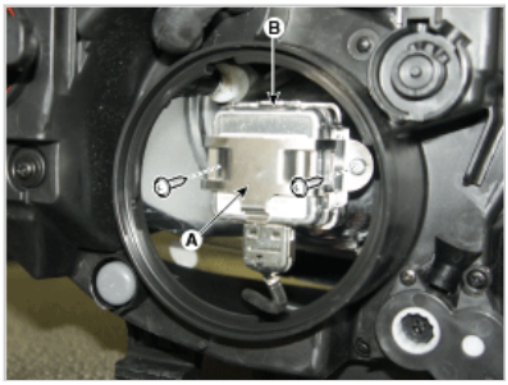
- Do not apply excessive force and fit it correctly.
- Confirm the bulb locking

1. Turn the head lamp switch off.
2. Disconnect the connector.
3. Remove the dust cap (A).

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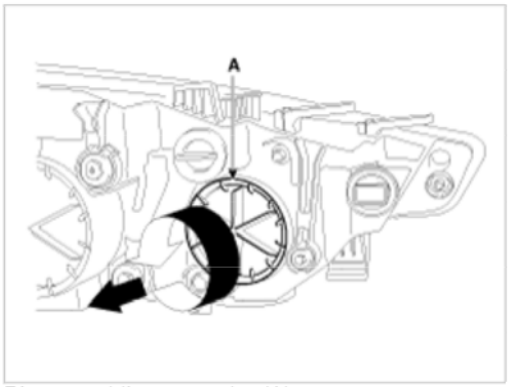


4. Remove the ignitor (A) after loosening the screws.
5. Remove the ignitor and HID bulb (B).

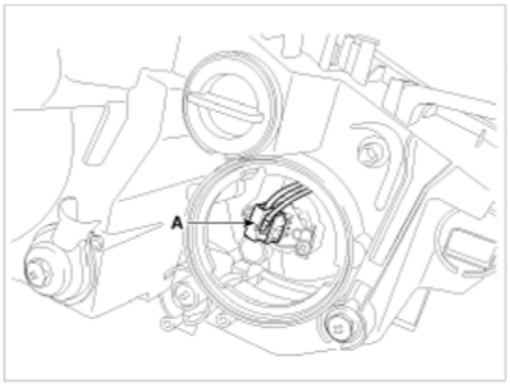


Head Lamp(High) Bulb

1. Turn off the lamp power.
2. Disconnect the connector.
3. Remove the dust cap (A).

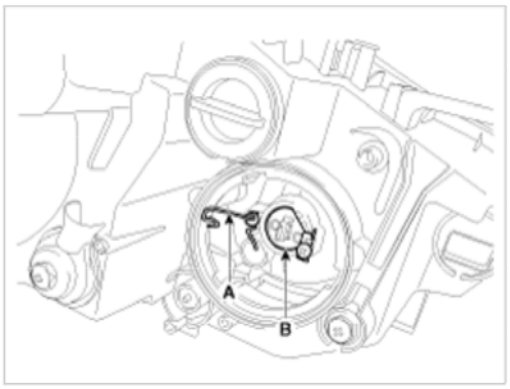


4. Disconnect the connector (A).



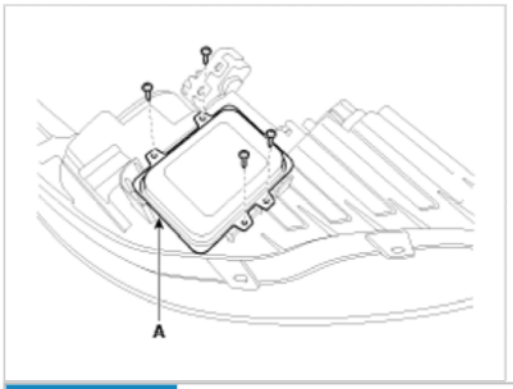
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5. Remove the fixing clip (A) and bulb (B).



Ballast

1. Turn the head lamp switch off.
2. Remove the head lamp assembly.
3. Disconnect the power connector from the lamp.
4. Remove the ballast (A) after loosening the screws (4EA).



NOTICE

Be careful not to be damaged when disconnecting the ballast connector.

5. Installation is the reverse of removal.

NOTICE

- Turn the head lamp switch off to avoid high voltage.

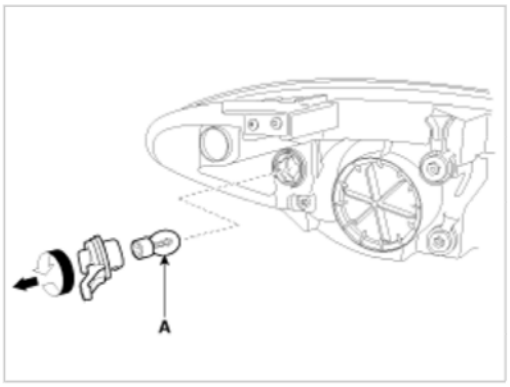
⚠ CAUTION

- HID lamp shall not be used on other cars.(Fire may occur.)
- Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 20,000V) and high current (12-13A), and are different from the halogen lamp specification.
- Install the dust cover after confirming the locking state between bulb and bulb holder.
- When testing the HID head lamp, turn the power on or off with switch between power supply and lamp because of high voltage.
- Do not operate the head lamp switch with the bulb not installed, because it generates spark momently.

Turn Signal Lamp

1. Turn the lamp power switch off.
2. Remove the socket and bulb (A) of turn signal lamp.

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Installation

1. Install the head lamp bulbs.
2. Connect the connectors.
3. Install the head lamp bolts (3EA).
4. Connect the negative (-) battery terminal.

Head Lamp Aiming Instructions

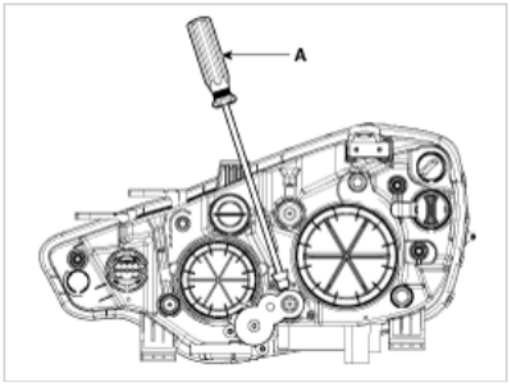
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

NOTICE

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:

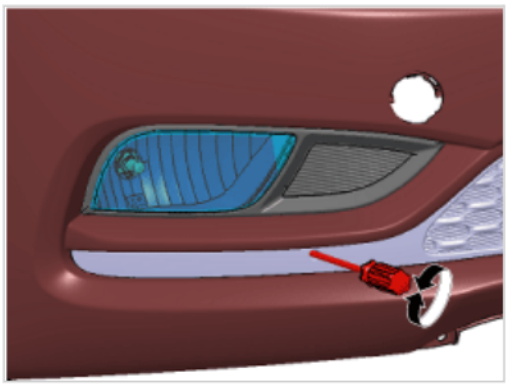
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the vertical lines.
   A : Vertical(Low)



Front Fog Lamp Aiming

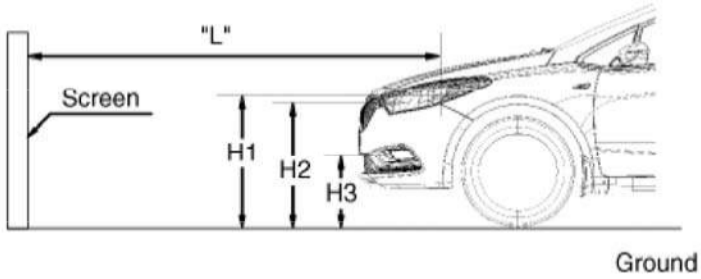
The front fog lamps should be aimed as the same manner of the head lamps aiming.
With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting screw (A) with a driver.

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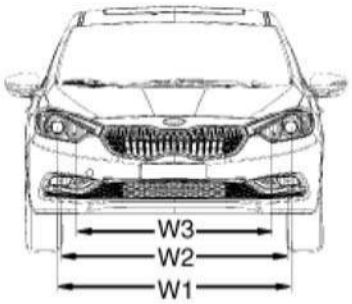


Head Lamp And Fog Lamp Aiming Point

< Ground Height >



< Distance between lamps >



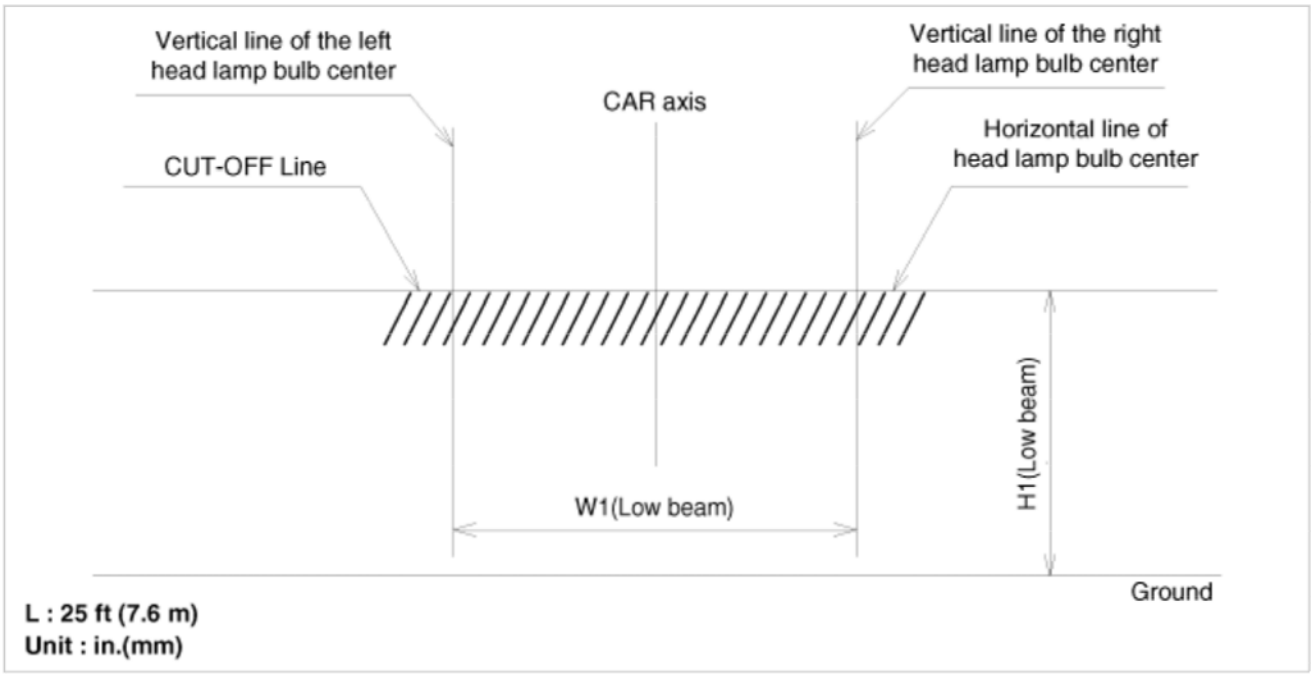
H1 : Height between the head lamp bulb center and ground (Low beam)
H2 : Height between the head lamp bulb center and ground (High beam)
H3 : Height between the fog lamp bulb center and ground
W1 : Distance between the two head lamp bulbs centers (Low beam)
W2 : Distance between the two head lamp bulbs 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	27.7(704)	26.4(671)	14.7(373)	55.0 (1,396)	45.4 (1,154)	54.7 (1,390)	Refer to aiming condition
With driver	27.5(698)	26.2(665)	14.4(367)				

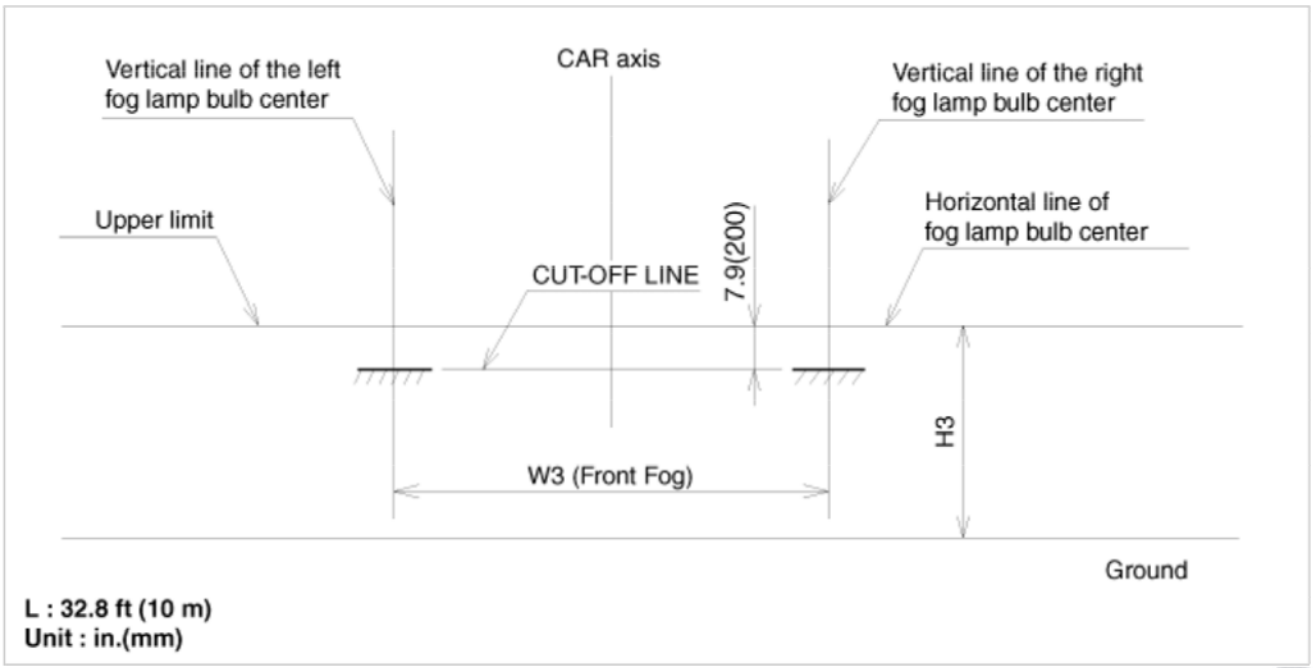
1. Head Lamp (Low beam)
   A. Turn the low beam on without driver aboard.
   B. The cut-off line should be projected in the cut-off line shown in the picture.
   C. If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.

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L : 25 ft (7.6 m)
Unit : in.(mm)

2. Turn the front fog lamp on without the driver aboard.
   The cut-off line should be projected in the allowable range (shaded region)



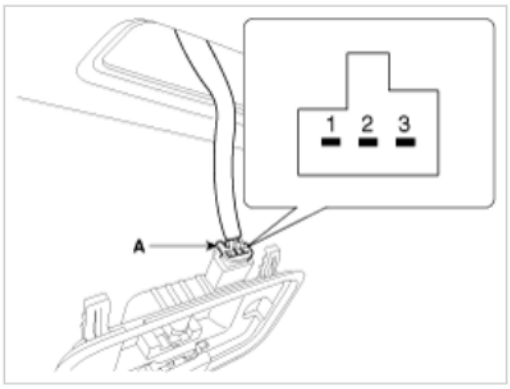
L : 32.8 ft (10 m)
Unit : in.(mm)

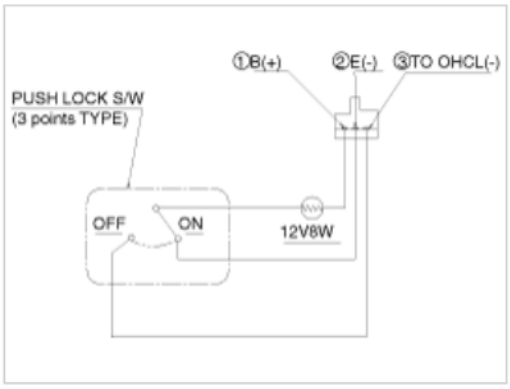
Inspection

Room Lamp

1. Check that the switch operates properly after disconnecting the room lamp connector (A).

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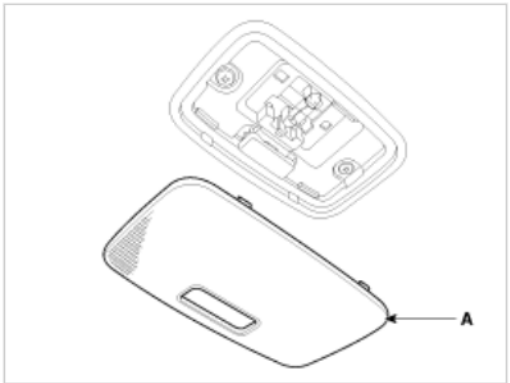


Terminal / Position	1	2
ON	○	○
OFF		

Removal

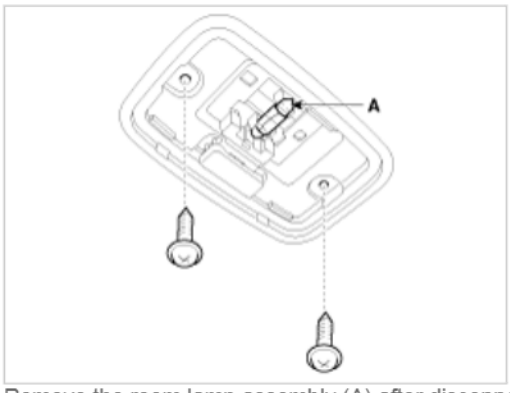
Room Lamp

1. Disconnect the negative(-) battery terminal.
2. Carefully remove the lamp lens (A) from the room lamp with a flat-tip screwdriver.

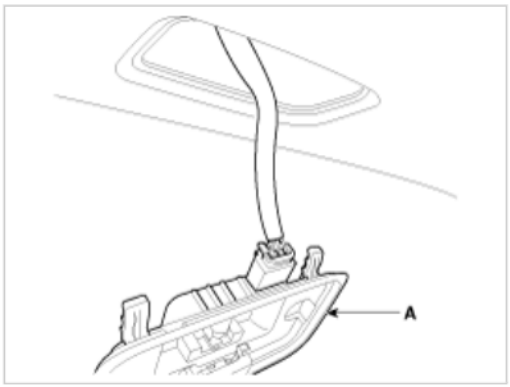


3. Replace the bulbs (A) and remove the screws if it is necessary.

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4. Remove the room lamp assembly (A) after disconnecting the connector.



Vanity Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the vanity lamp (A) using a screwdriver or remover and then disconnect the connector (B).



Installation

Room Lamp

1. Reconnect the connector.
2. Install the room lamp assembly.
3. Install the lens.

Vanity Lamp

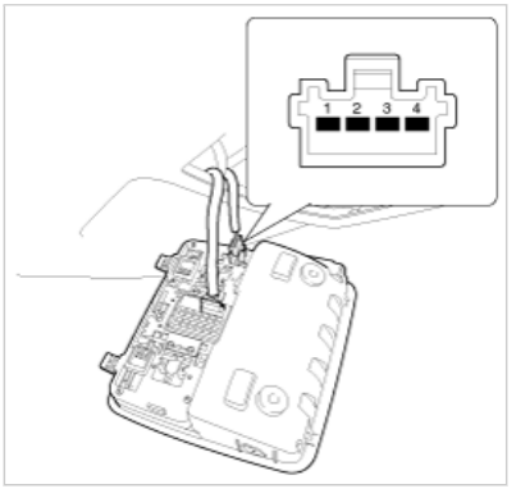
1. Reconnect the vanity lamp connector.
2. Install the vanity lamp.

Body Electrical System

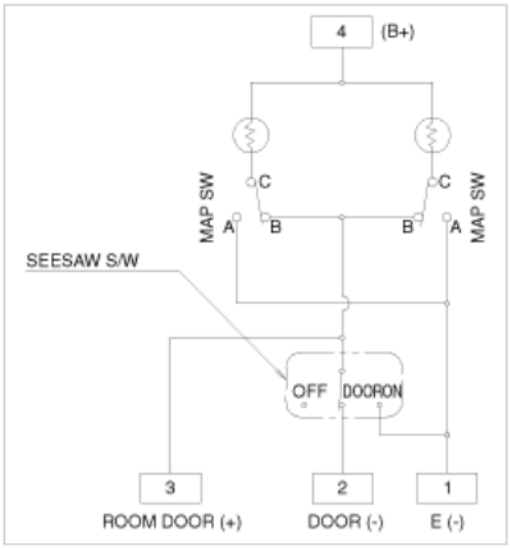
Inspection

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1. Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.

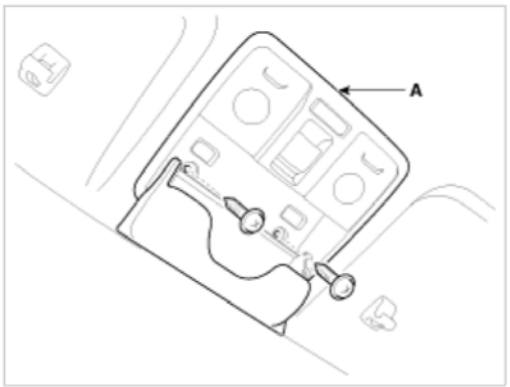


No.	Description
1	Ground (-)
2	Door (-)
3	Room (+)
4	Battery (+)



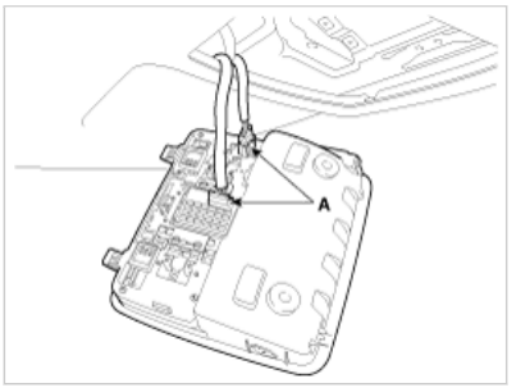
Removal

1. Disconnect the negative (-) battery terminal.
2. Loosen 2 screws holding the overhead console (A).



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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 disconnecting the connectors.

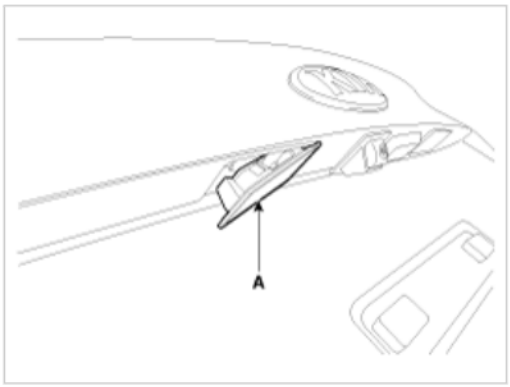
Installation

1. Install the overhead console lamp after connecting the sunroof switch connector and lamp connector.
2. Install the lens after tightening 2 screws.

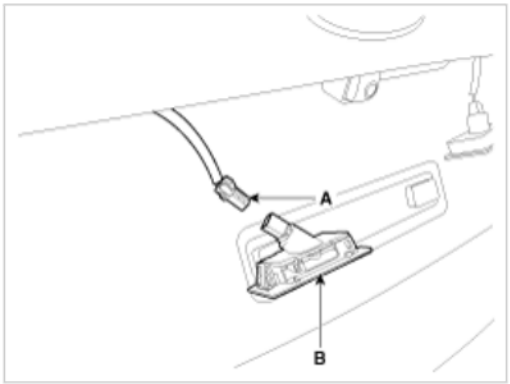
Body Electrical System

Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the lens (A) after loosening the mounting screws.



3. Remove the license lamp (B) after disconnecting the connector (A).



Installation

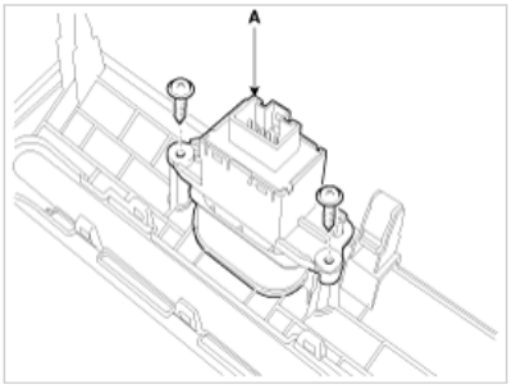
1. Connect the connector.
2. Install the license lamp.

Body Electrical System

Removal

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1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel.
   (Refer to Body - "Center Fascia Panel")
3. Remove the hazard switch (A) after loosening the screws.



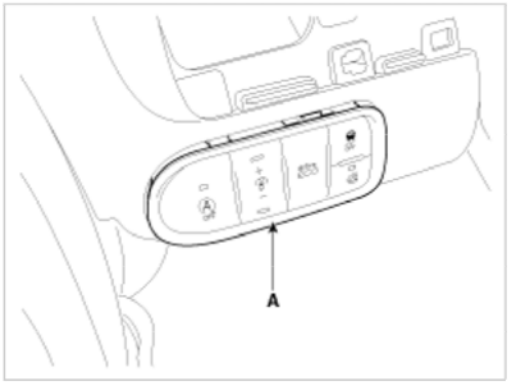
Installation

1. Install the hazard switch.
2. Install the center fascia panel.

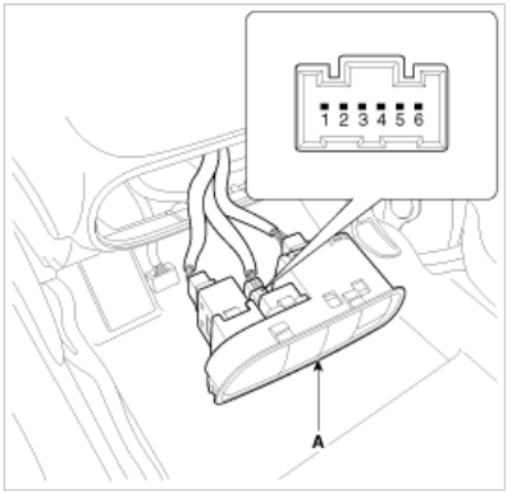
Body Electrical System

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side switch assembly (A).



3. Disconnect the head lamp leveling switch connectors (A) from lower crash pad switch.



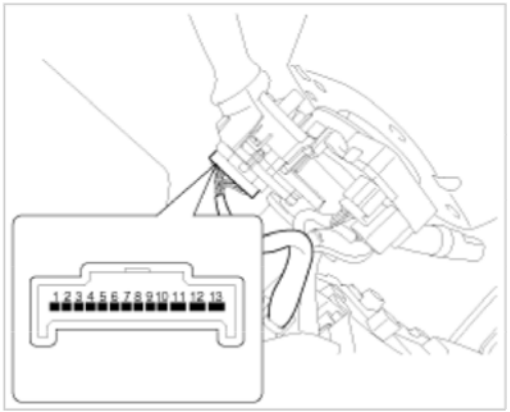
4. Operate the rheostat switch and check for continuity between terminals.

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Position / Terminal	UP	DOWN	Remarks
5	○	○	Ground
2	|	○	DOWN
6	○		UP
4	○—◇		Illumination(-)
3	○—∿		Illumination(+)

Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the lighting switch of the multi-function switch.
   (Refer to 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 multi-function switch.



Front Fog Lamp

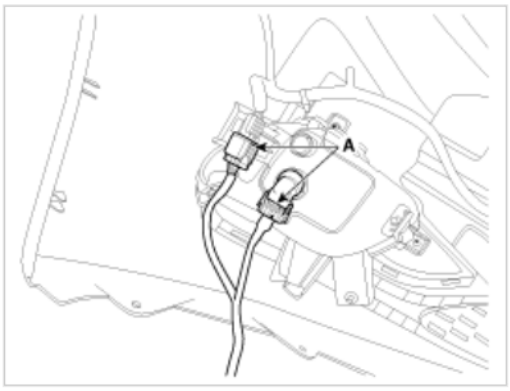
Position / Terminal	5	6
OFF		
ON	○	○

Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the front bumper cover.
   (Refer to Body - "Front Bumper Cover")
3. Remove the front fog lamp connectors (A) from the front bumper.

[LH]

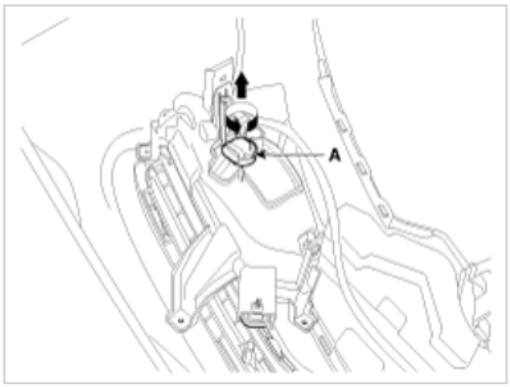
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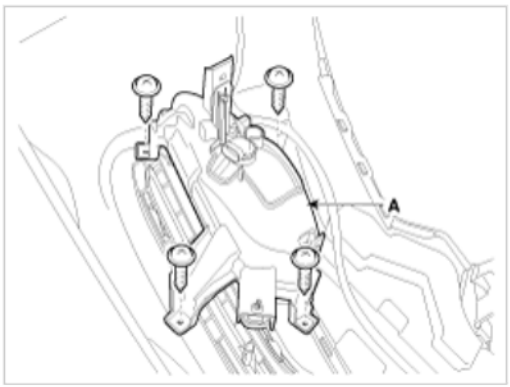
[RH]



4. Remove the front fog bulb (A) turning it in the counterclockwise direction.



5. Remove the front fog lamp assembly (A) after loosening the screws.



Installation

1. Install the front fog bulb.
2. Reconnect the lamp connector.

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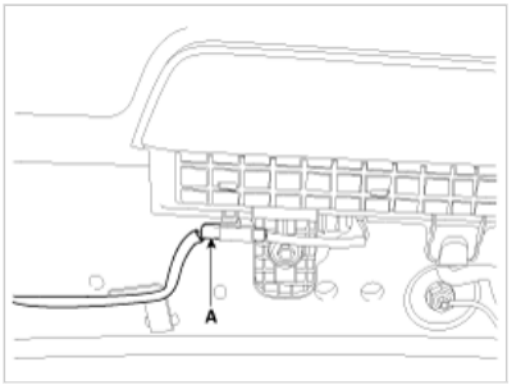
3. Install the front bumper cover.

Body Electrical System

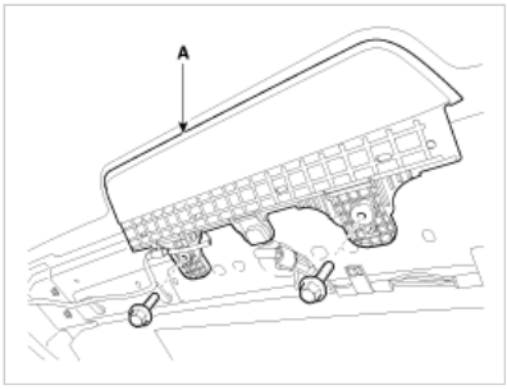
Removal

[2 Door]

1. Disconnect the negative (-) battery terminal.
2. Remove the rear roof trim.
   (Refer to Body - "Roof Trim Assembly")
3. Disconnect the connector (A) from the high mounted stop lamp assembly.

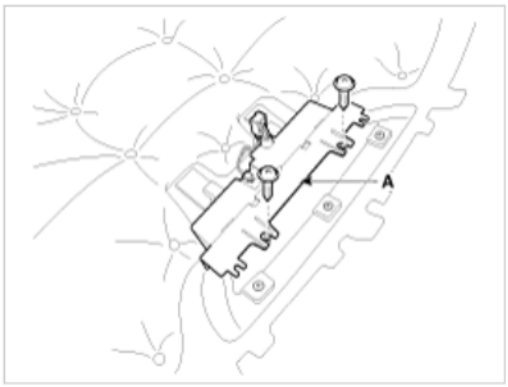


4. Remove the high mounted stop lamp assembly (A) after loosening the mounting bolts.



[4 Door]

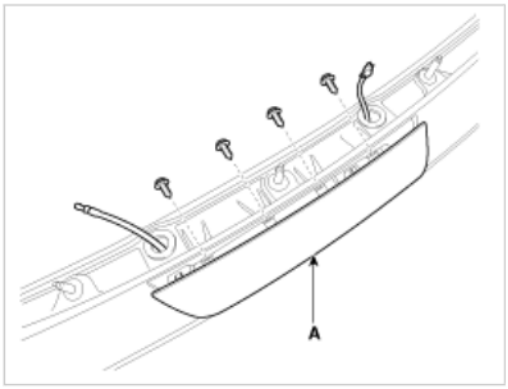
1. Disconnect the negative (-) battery terminal.
2. Remove the rear package tray trim.
   (Refer to Body - "Rear Package Tray Trim")
3. Remove the high mounted stop lamp assembly (A) after loosening the screws.



[5 Door]

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1. Disconnect the negative (-) battery terminal.
2. Remove the rear spoiler.
   (Refer to Body - "Rear Spoiler)
3. Remove the high mounted stop lamp (A) after loosening the mounting screws.



Installation

[2 Door]

1. Install the high mounted stop lamp assembly.
2. Install the roof trim assembly.

[4 Door]

1. Install the high mounted stop lamp assembly.
2. Install the rear package tray trim.

[5 Door]

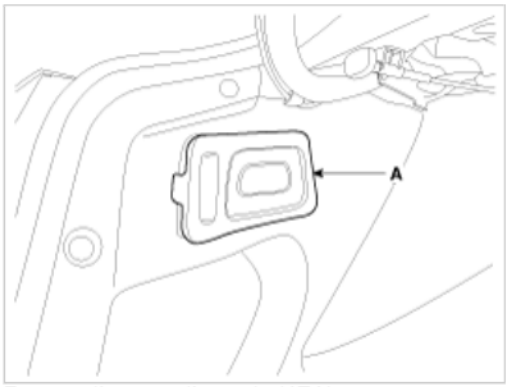
1. Install the high mounted stop lamp assembly.
2. Install the rear spoiler.

Body Electrical System

Removal

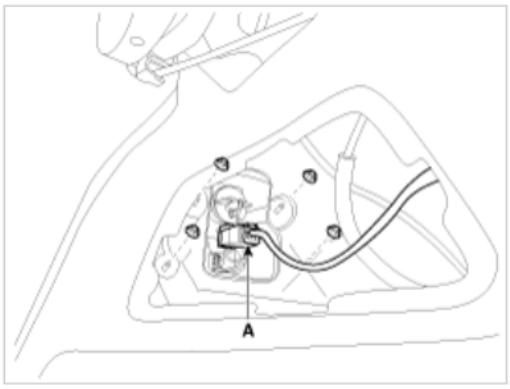
Rear Combination Lamp (Outside)

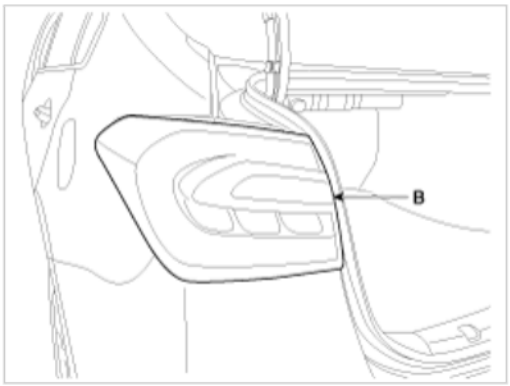
1. Disconnect the negative (-) battery terminal.
2. Remove the rear combination lamp cover (A).



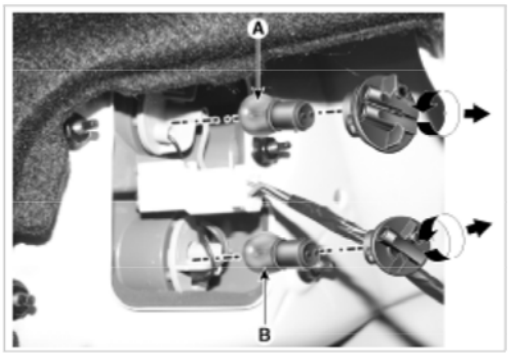
3. Remove the mounting nuts (4EA).
4. Remove the rear combination lamp (B) after disconnecting the connector (A).

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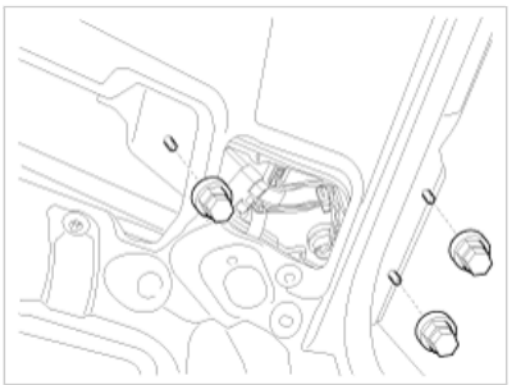


5. Replace turn signal lamp (A) and stop/tail lamp (B) by turning the sockets counterclockwise.

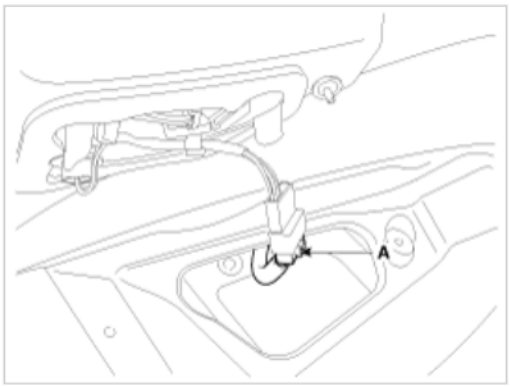


Rear Combination Lamp (Inside)

1. Disconnect the negative (-) battery terminal.
2. Remove the trunk trim.
   (Refer to Body - "Trunk Trim")
3. Remove the rear lamp assembly after removing the nuts (3EA) and connector (A).

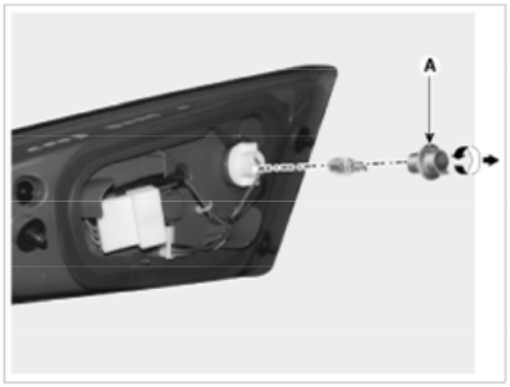


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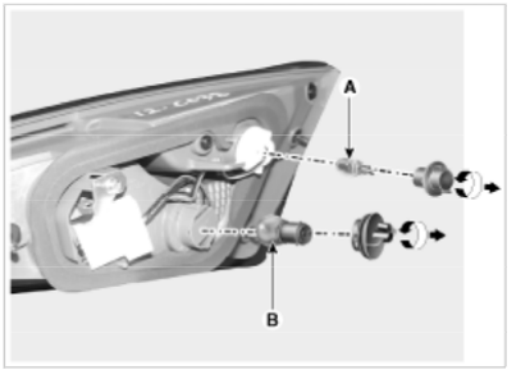


4. Replace the backup lamp (A) and stop lamp (B) by turning the sockets counterclockwise.

[General Type]



[LED Type]



Installation

1. Install the rear combination lamp (Inside) assembly.
2. Install the rear combination lamp (outside) assembly.

Body Electrical System

Removal

1. Remove the outside rear view mirror.
   (Refer to Body - "Outside Rear View Mirror")

Installation

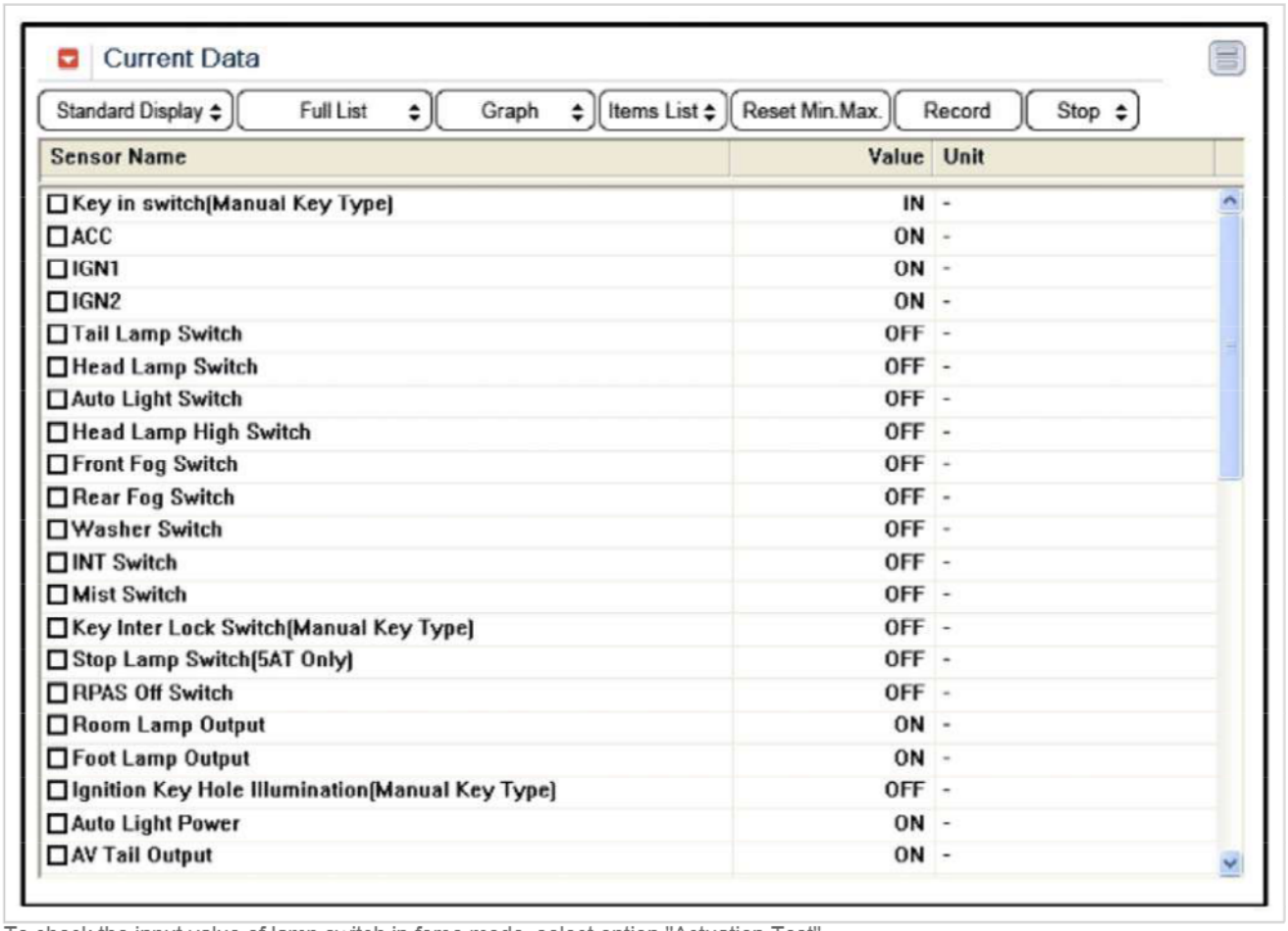
1. Install the outside rear view mirror.
   (Refer to Body - "Outside Rear View Mirror")

Body Electrical System

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Troubleshooting

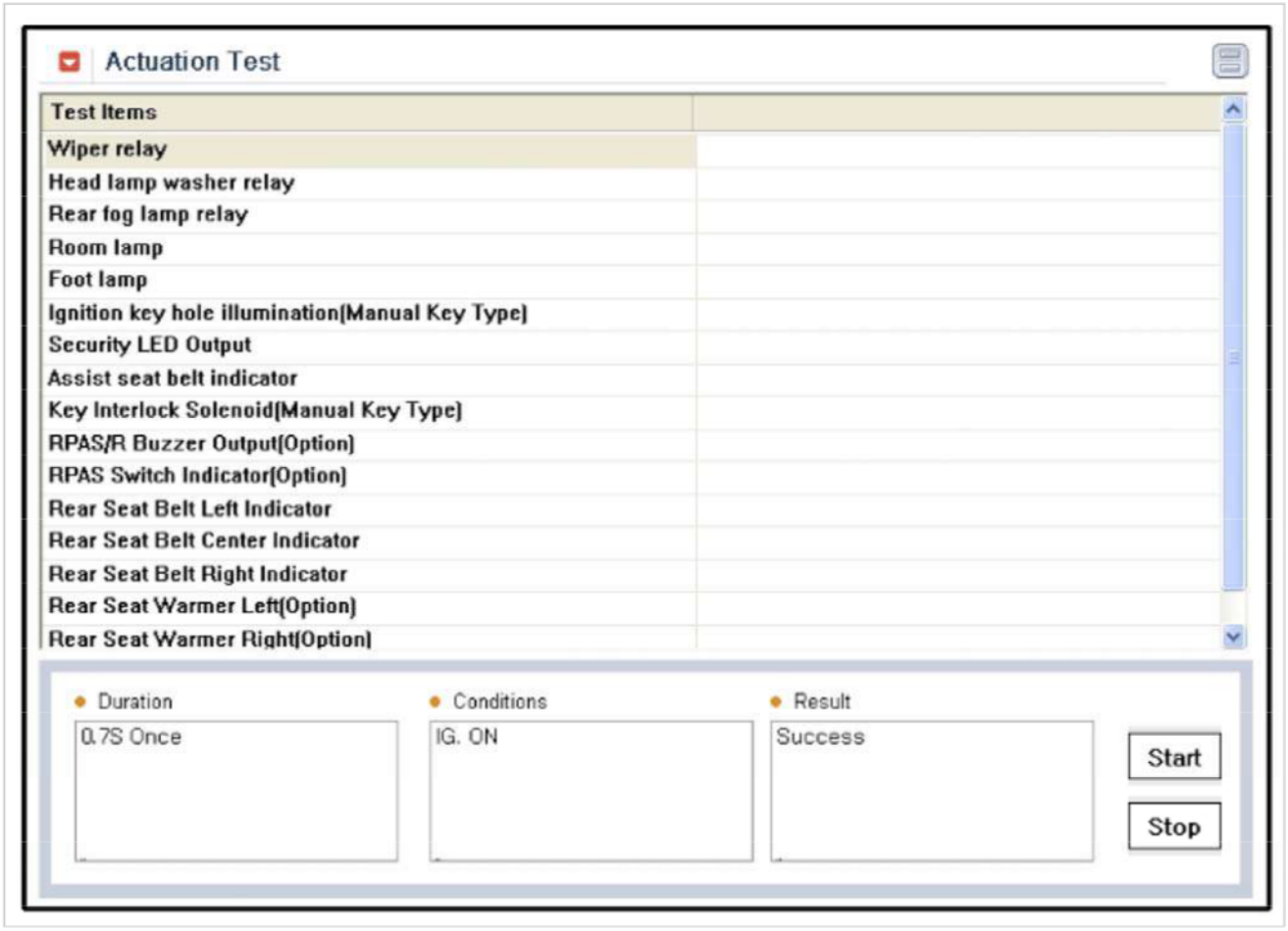
1. The lamp switch inputs can be checked using the GDS.
2. To check the input value of lamp switch, select option "Body Control Module".
3. To consult the present input/output value of BCM, "Current DATA". It provides information of BCM input/output conditions of power supply, turn signal/brake lamp, headlamp, door, locks, outside mirror, wiper, auto-light and transmitters etc.



Sensor Name	Value	Unit
Key in switch(Manual Key Type)	IN	-
ACC	ON	-
IGN1	ON	-
IGN2	ON	-
Tail Lamp Switch	OFF	-
Head Lamp Switch	OFF	-
Auto Light Switch	OFF	-
Head Lamp High Switch	OFF	-
Front Fog Switch	OFF	-
Rear Fog Switch	OFF	-
Washer Switch	OFF	-
INT Switch	OFF	-
Mist Switch	OFF	-
Key Inter Lock Switch(Manual Key Type)	OFF	-
Stop Lamp Switch(5AT Only)	OFF	-
RPAS Off Switch	OFF	-
Room Lamp Output	ON	-
Foot Lamp Output	ON	-
Ignition Key Hole Illumination(Manual Key Type)	OFF	-
Auto Light Power	ON	-
AV Tail Output	ON	-

4. To check the input value of lamp switch in force mode, select option "Actuation Test".

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Symptom	Possible cause	Remedy
One lamp does not light (all exterior)	Bulb burned out	Replace bulb
	Socket, wiring or ground faulty	Repair if necessary
Head lamps do not light	Bulb burned out	Replace bulb
	Ignition fuse (LOW:10A, HIGH:20A) blown	Check for short and replace fuse
	Head lamp fuse (15A) blown	Check for short and replace fuse
	Head lamp relay faulty	Check relay
	Lighting switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Tail lamps and license plate lamps do not light	Bulb burned out	Replace bulb
	Tail lamp fuse (10A) blown	Check for short and replace fuse
	Tail lamp relay faulty	Check relay
	Lighting switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Stop lamps do not light	Bulb burned out	Replace bulb
	Stop lamp fuse (15A) blown	Check for short and replace fuse
	Stop lamp switch faulty	Adjust or replace switch
	Wiring or ground faulty	Repair if necessary
Stop lamps do not turn off	Stop lamp switch faulty	Repair or replace switch
Instrument lamps do not light (Tail lamps light)	Rheostat faulty	Check rheostat
	Wiring or ground faulty	Repair if necessary
Turn signal lamp does not flash on one side	Bulb burned out	Replace bulb
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Turn signal lamps do not light	Bulb burned out	Replace bulb

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	Turn signal lamp fuse (10A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Hazard warning lamps do not light	Bulb burned out	Replace bulb
	Hazard warning lamp fuse (15A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Hazard switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps
	Flasher unit faulty	Check flasher unit
Back up lamps do not light	Bulb burned out	Replace bulb
	Back up lamp fuse (10A) blown	Check for short and replace fuse
	Back up lamp switch (M/T) faulty	Check switch
	Transaxle range switch (A/T) faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Front fog lamps do not light	Bulb burned out	Replace bulb
	Front fog lamp fuse (15A) blown	Check for short and replace fuse
	Front fog lamp relay faulty	Check relay
	Front fog lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Rear fog lamps do not light	Rear fog lamp fuse (15A) blown	Check for short and replace fuse
	Rear fog lamp fuse (15A) blown	Check for short and replace fuse
	Rear fog lamp switch faulty	Check switch
	Rear fog lamp relay faulty	Check relay
	Wiring or ground faulty	Repair if necessary
Map lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Map lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Trunk room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Trunk room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

Body Electrical System

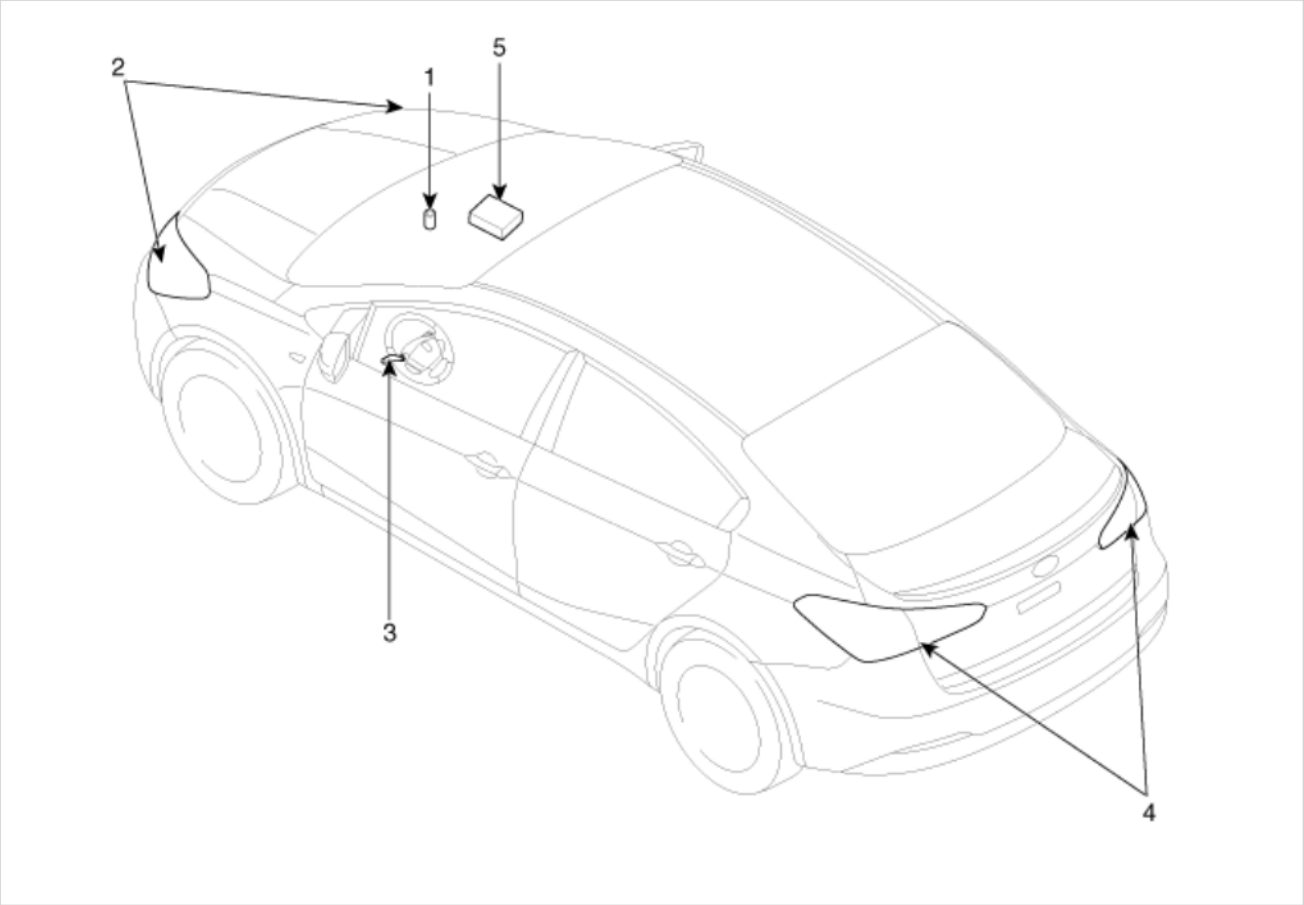
Specifications

Items		Specifications
Rated voltage		DC 5V
Load		Max. 1mA (When head lamp lighting)
Illuminations (LUX)	50	1.42 ± 0.31V
	100	2.63 ± 0.58V
	150	3.84 ± 0.84V

Body Electrical System

Component Location

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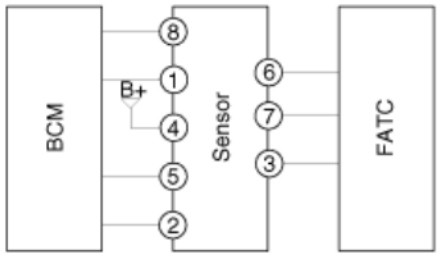


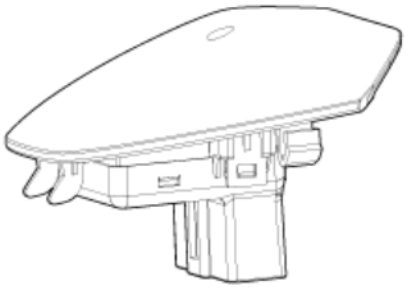
1. Auto light sensor	4. Tail lamps
2. Head lamps	5. Body control module (BCM)
3. Lighting switch (Auto)	

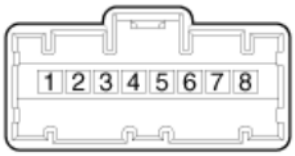
Body Electrical System

Circuit Diagram

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[Auto Light Connector]

No.	Description
1	Auto light signal
2	Auto light GND
3	Photo signal (RH)
4	LED power (B+)
5	LED GND (To BCM)
6	Photo signal (LH)
7	Photo power (SW)
8	Auto light power (5V)

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

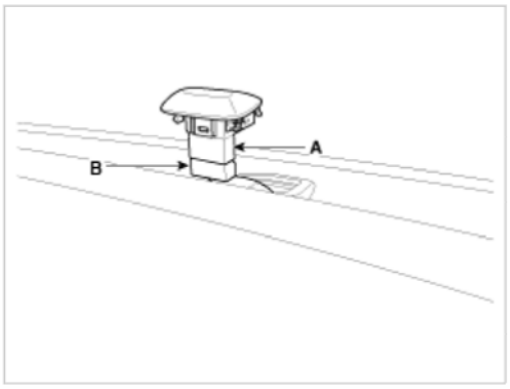
1. Disconnect the negative (-) battery terminal.
2. Remove the auto light sensor (A) from crash pad upper side by using screw (-) driver.

NOTICE

Apply the protective tapes to auto light sensor and its related parts.

3. Remove the auto light connector (B).

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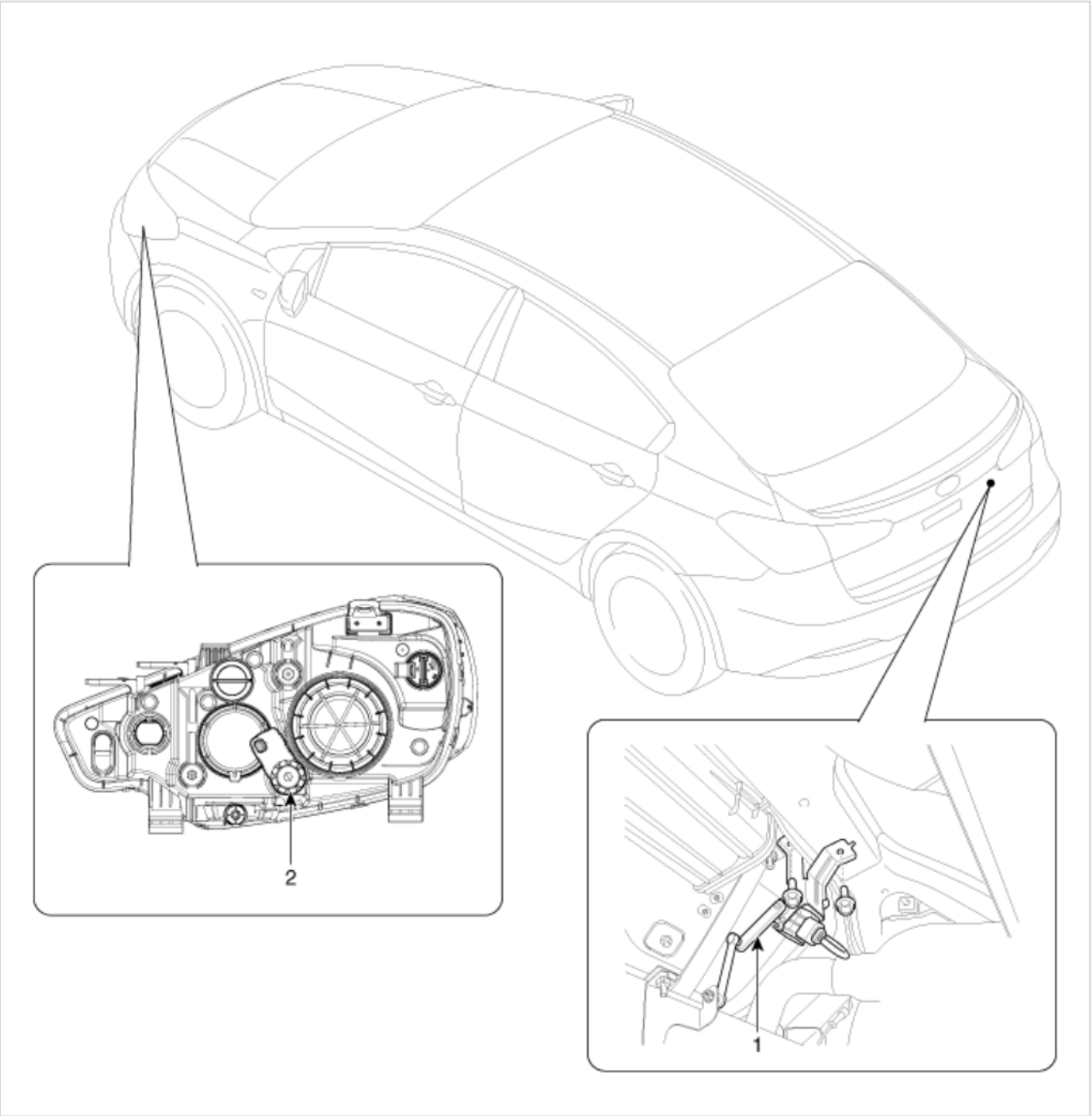
Installation

1. Reconnect the auto light connector.
2. Install the auto light sensor.

Body Electrical System

Component Location

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1. Headlamp leveling device switch	2. Headlamp leveling actuator

Body Electrical System

Inspection with GDS

Initialization and diagnosis sequence by using GDS equipment.
Below content summarize the procedure for A/S using GDS.

No.	Procedure
1	Locate vehicle to flat plane
2	Tire check
3	IGN1 ON
4	Head lamp Low Beam ON
5	Connection with diagnostic tool

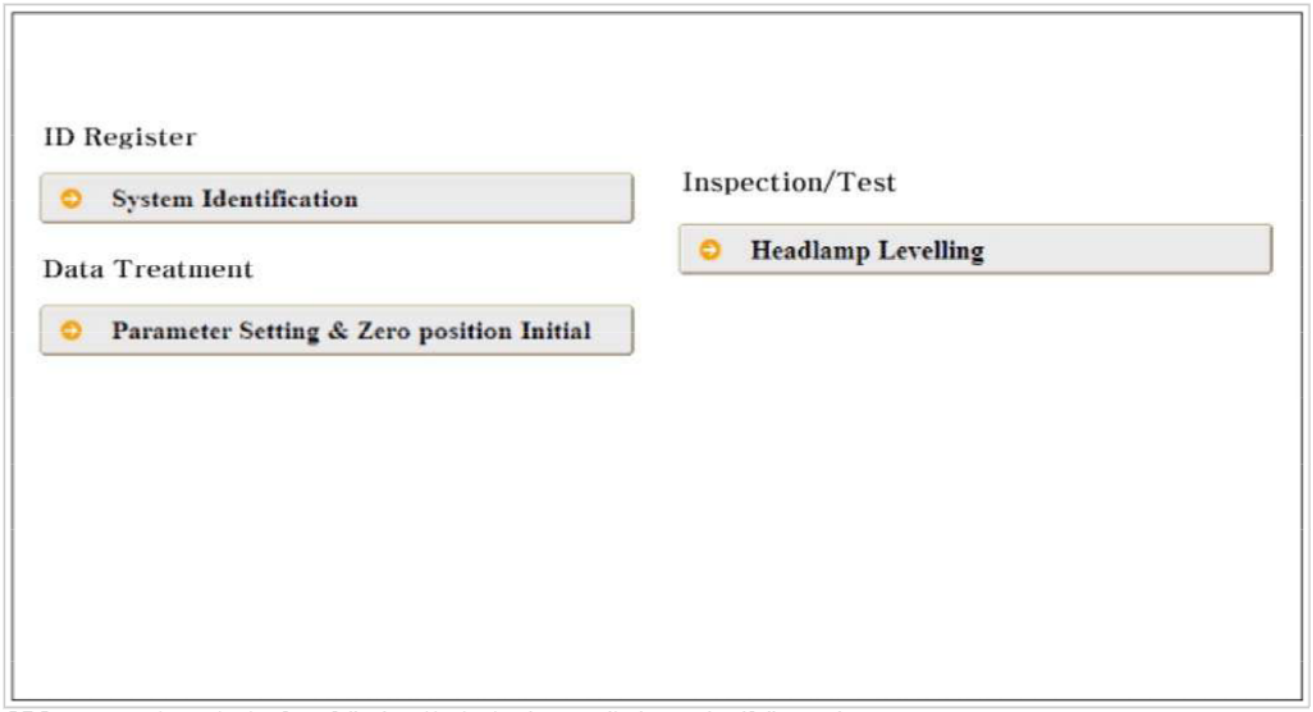
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6	Initial command by diagnostic tool
7	Clear DTC Code
8	IGN1 OFF → ON
9	Re- Connection with diagnostic tool
10	Checking of HLLD output value as 15% and DTC Code
11	HLLD actuating by diagnostic tool command
12	Head lamp mechanical Initial Aiming

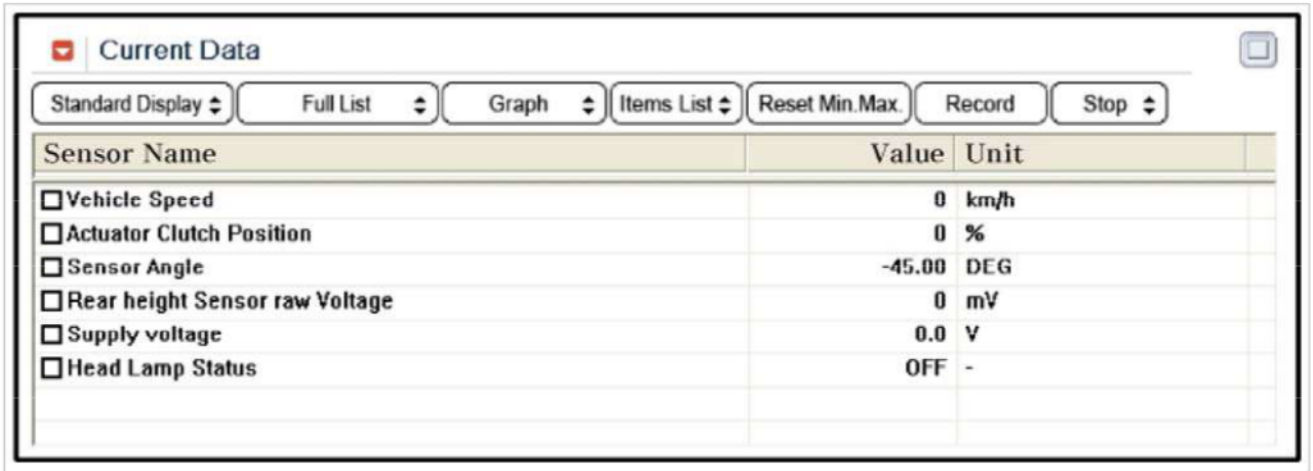
NOTICE

1. There's no loads in vehicle and vehicle should be on flat plane.
2. Should check of HLLD output value(15%) after initial setting.
3. Should do first electrical initial setting by diagnostic tool and then mechanical aiming afterward.

1. Select the vehicle model and "Head lamp leveling".

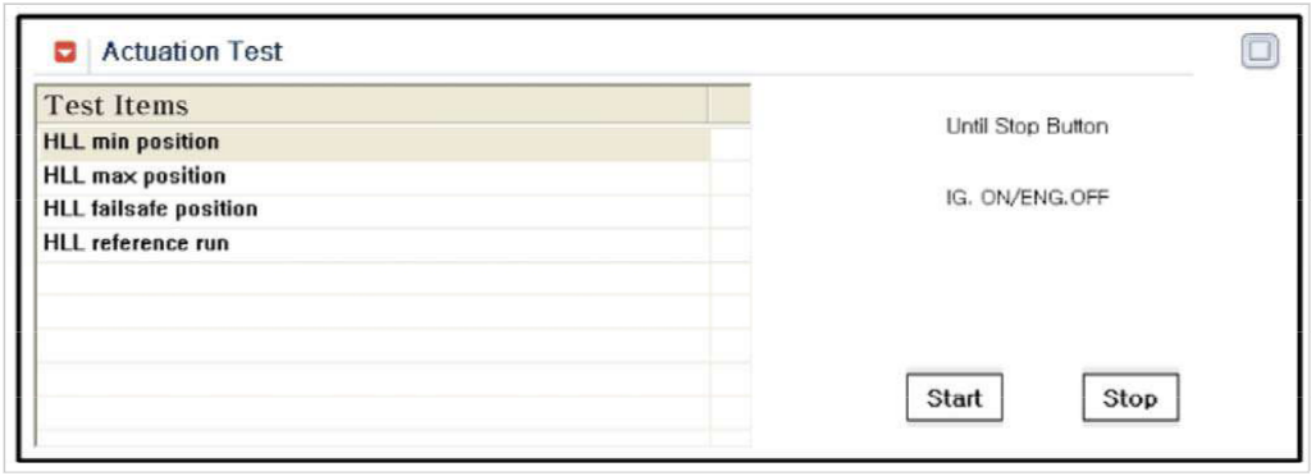


2. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.

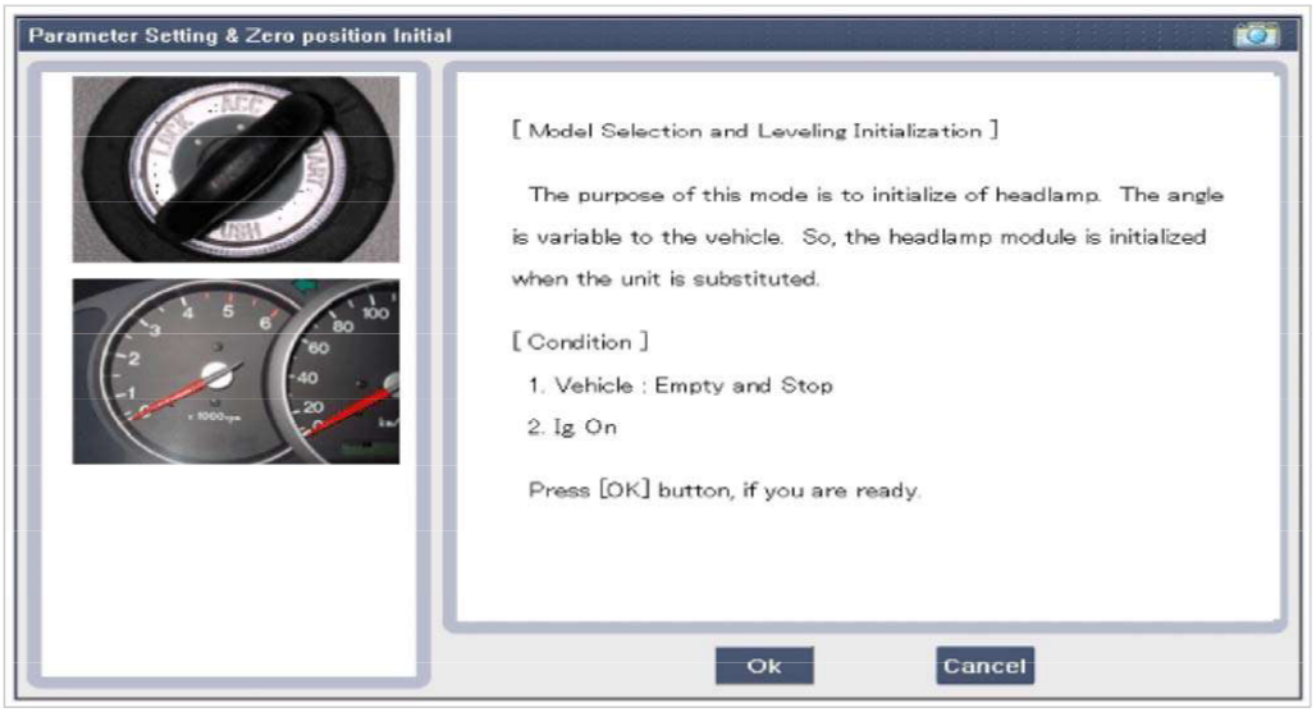


3. To perform functional test on AHLS outputs, select "Actuation Test".

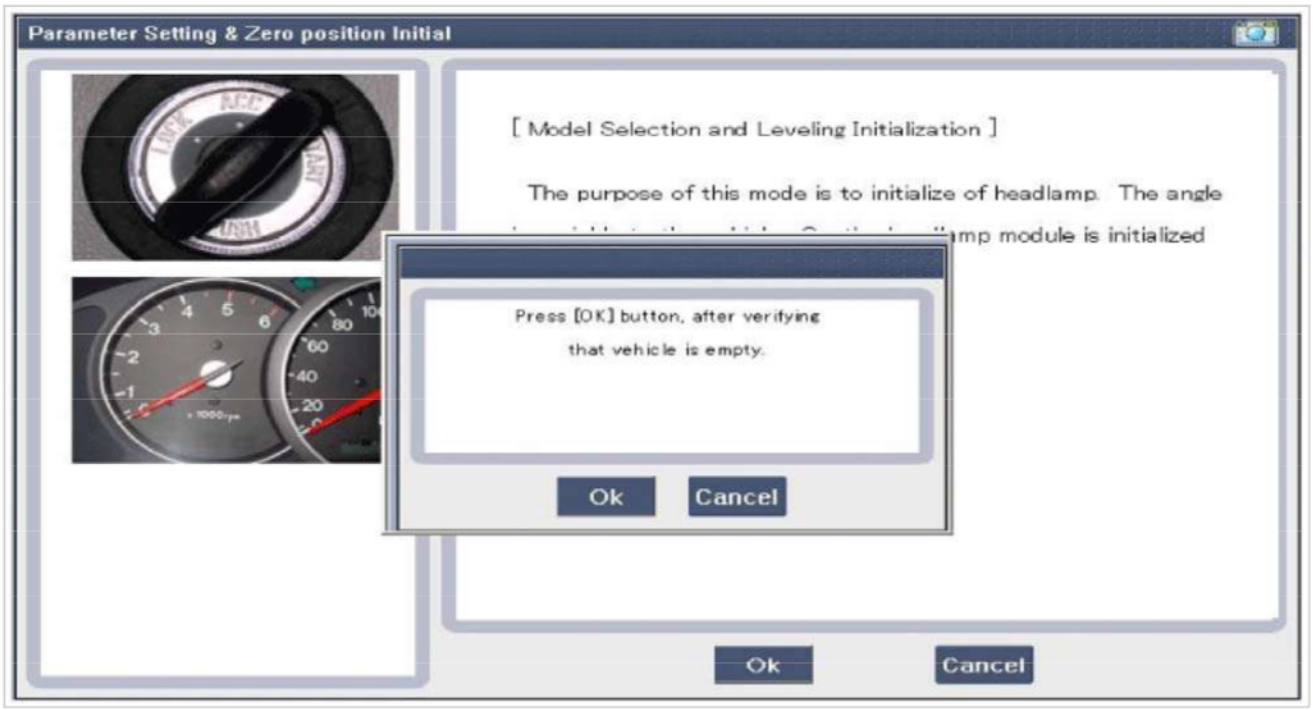
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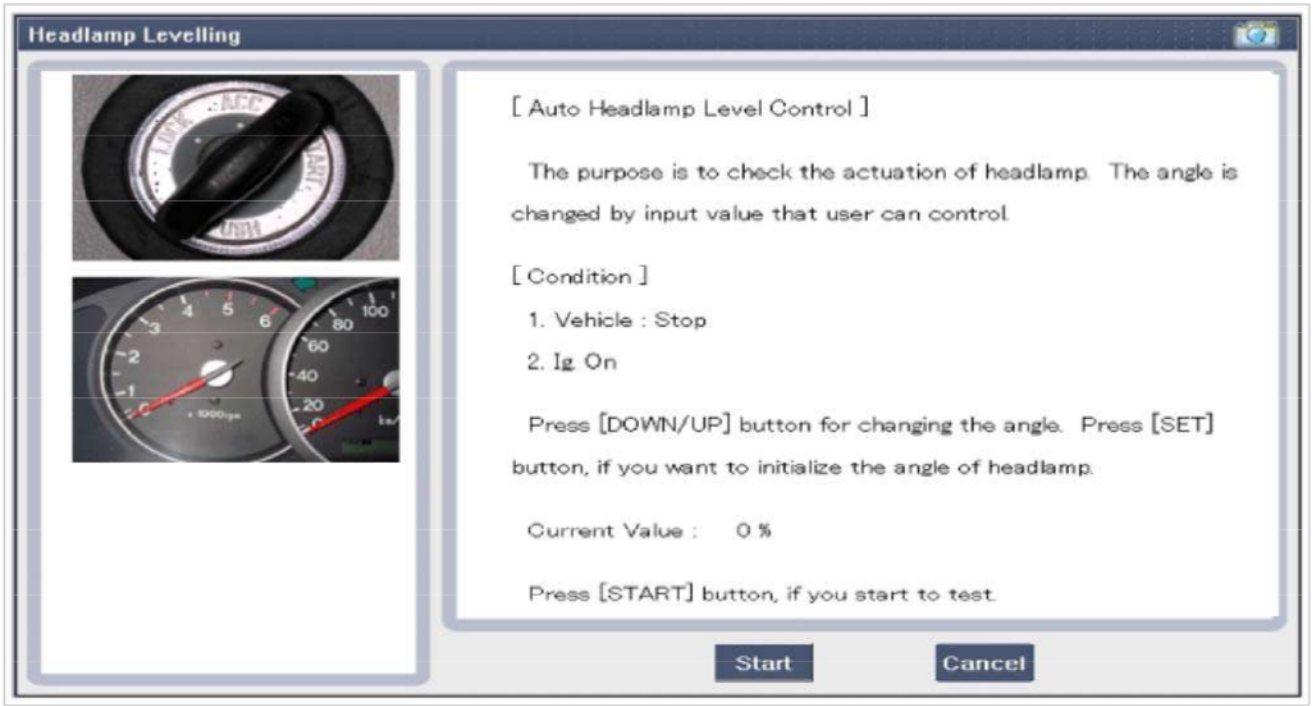
4. Select " Parameter setting & Zero position Initial".



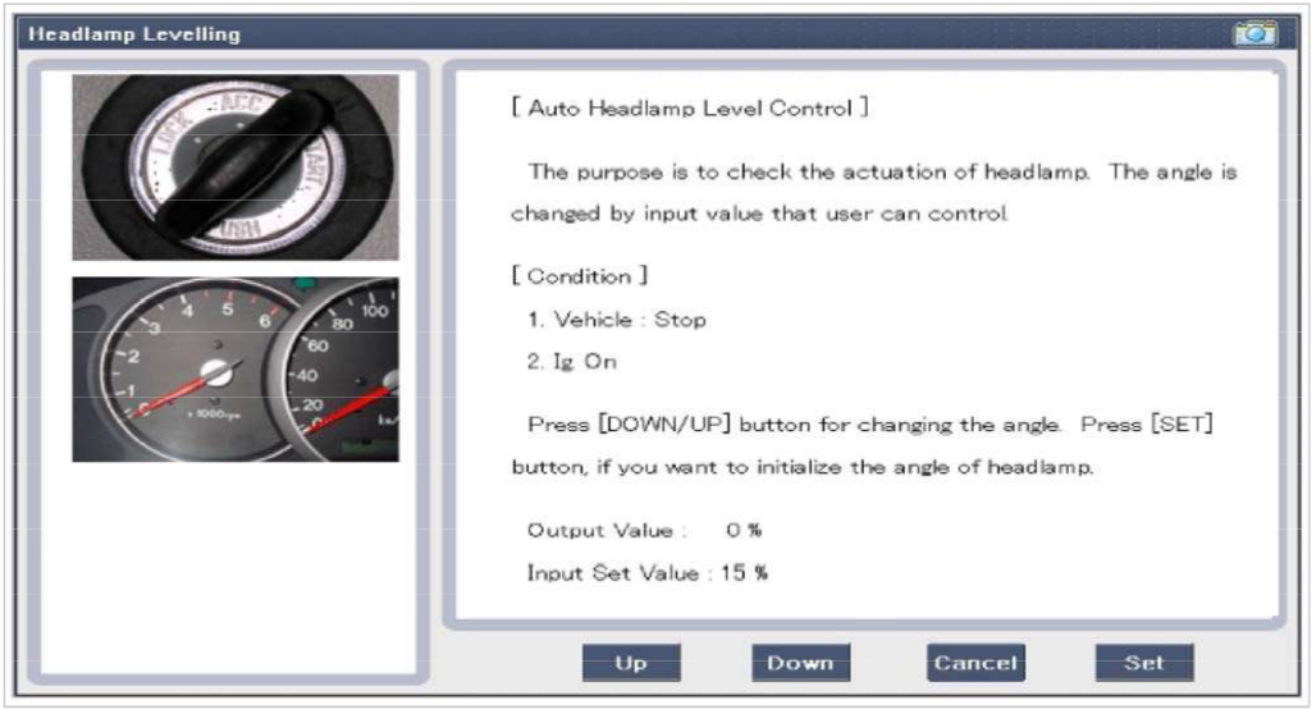
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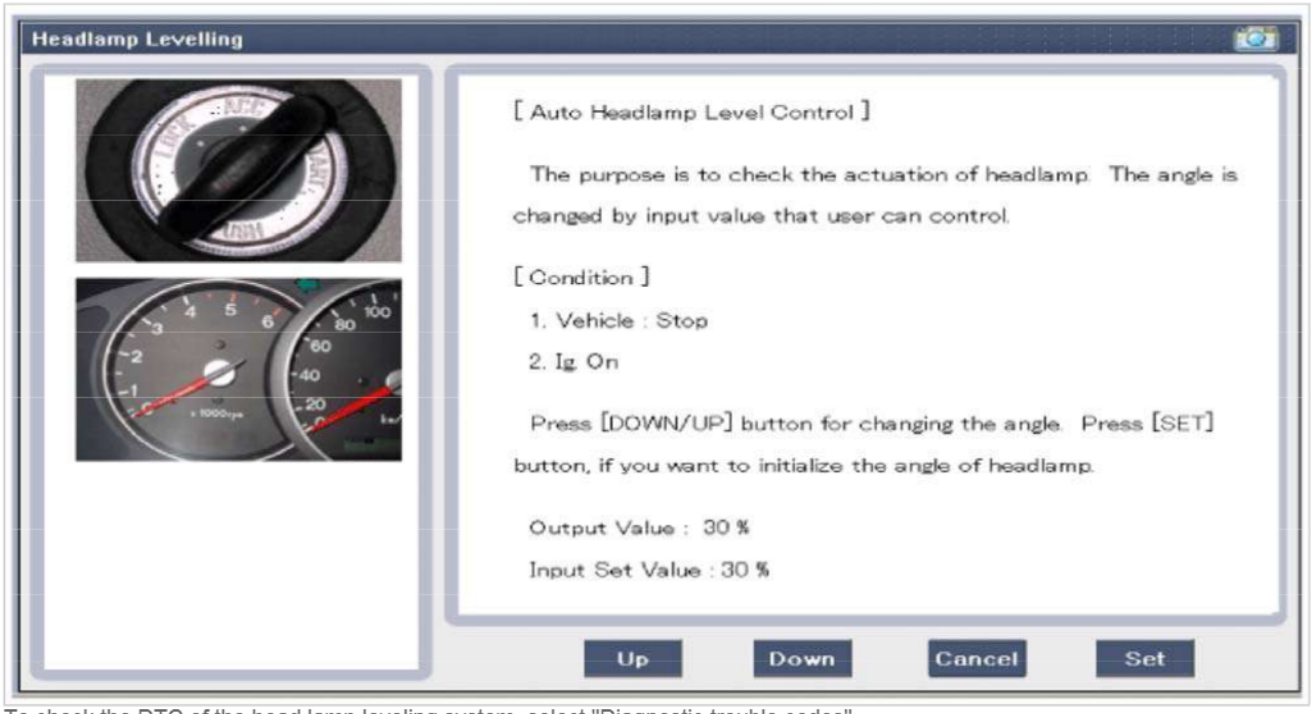


5. Confirm that AHLS operate forcefully in "Head lamp leveling" menu.



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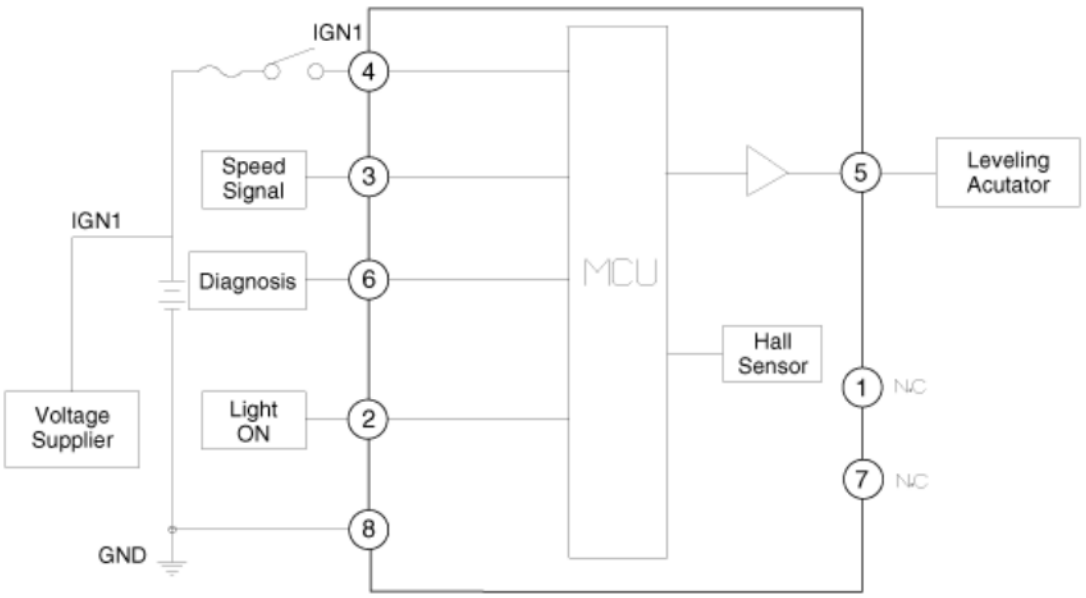


6. To check the DTC of the head lamp leveling system, select "Diagnostic trouble codes"

Body Electrical System

Circuit Diagram

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Connector	
	
No.	**Description**
1	-
2	Light ON
3	Speed signal
4	IGN 1
5	Leveling actuator
6	Diagnosis
7	-
8	GND

Body Electrical System

Description

According to driving environment and loading state of vehicle, head lamp lighting direction is changed to keep the driver's visibility range and to protect the driver's vision from glare, aiming at safety driving.

Sensor integrated ECU mounting on the rear center arm drives the actuator mounting on the head lamp since sensing the input signal following the vehicle's statically changes.

Head lamp beam is automatically operated by chassis tilt.

Operation

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Operating Procedure

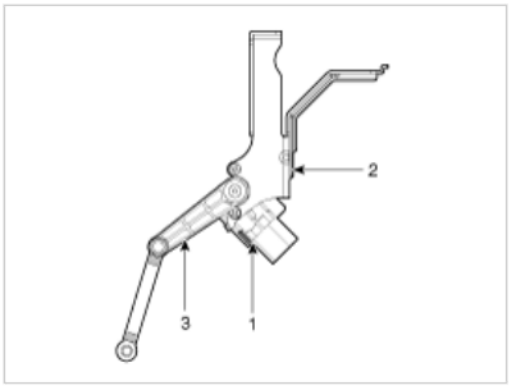
1. Suspension angle change resulted from vehicle's load change.
2. Sensor angle change.
3. Microprocessor calculates necessary head lamp angle change amount.
4. Sending a proper signal to head lamp leveling device and driving actuator.

Operating Condition

1. Ignition on
2. Low beam on
3. On stop : If sensor lever change is 0.7° and above, head lamp is operated after max. 1.5 sec.
4. On driving : If vehicle velocity is over 4km/h(2.48mile/h), velocity change is not over 0.8-1.6km/h(0.5 ~ 1.0mile/h) per second, and loading condition is changed, then head lamp is operated.

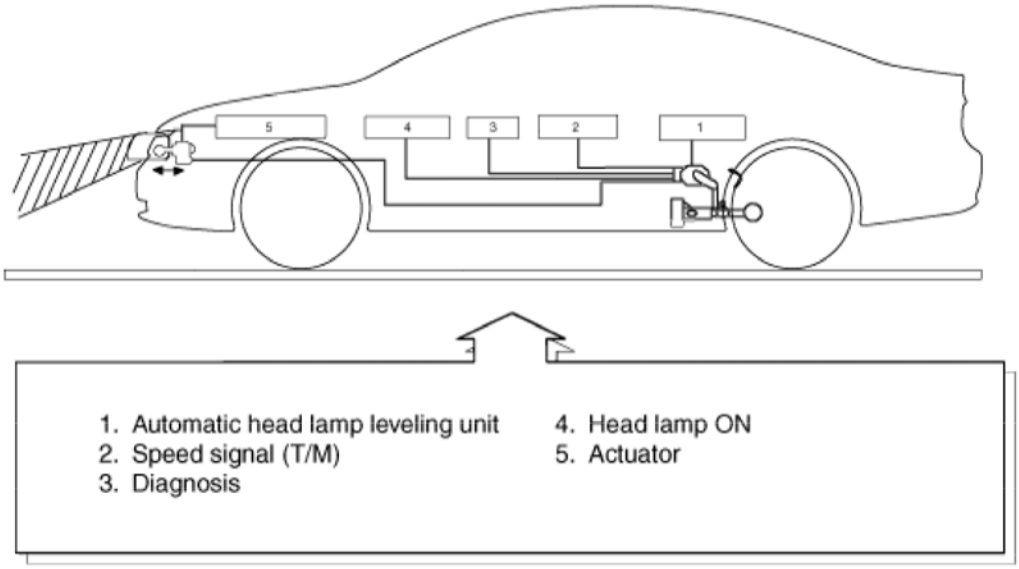
Components

1. Auto head lamp leveling unit
   1. Leveling unit & sensor
   2. Sensor mounting bracket
   3. Sensor linkage



   A. Using a Micro-processor, percept the operation lever's mechanical angle change or speed signal.
   B. As an actuator control device of inner control program, mounting on the rear center arm.
2. Actuator
   A. Change the head lamp lighting direction up or down since automatic head lamp leveling unit sensing the input signal following the vehicle's statically changes.

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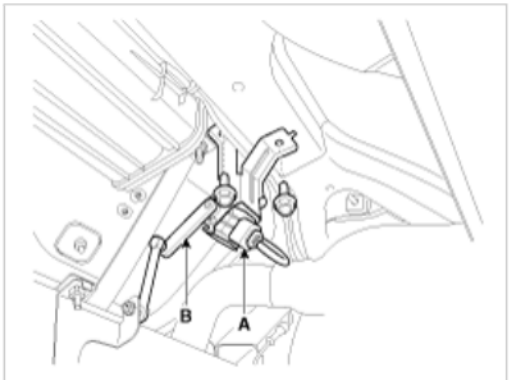
1. Automatic head lamp leveling unit
2. Speed signal (T/M)
3. Diagnosis
4. Head lamp ON
5. Actuator

Inspection

1. Ignition "ON".
2. Turn on the head lamp switch.
3. Check for operation. If the aim of the head lamps changes smoothly when the head lamp leveling switch is turned.
4. If the operation does not work well, inspect the connector and terminals to be sure they are all making good contact.
   If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system.
   If the terminals look OK, go to step 5.
5. Substitute with a known-good head lamp assembly and check for proper operation.

Removal

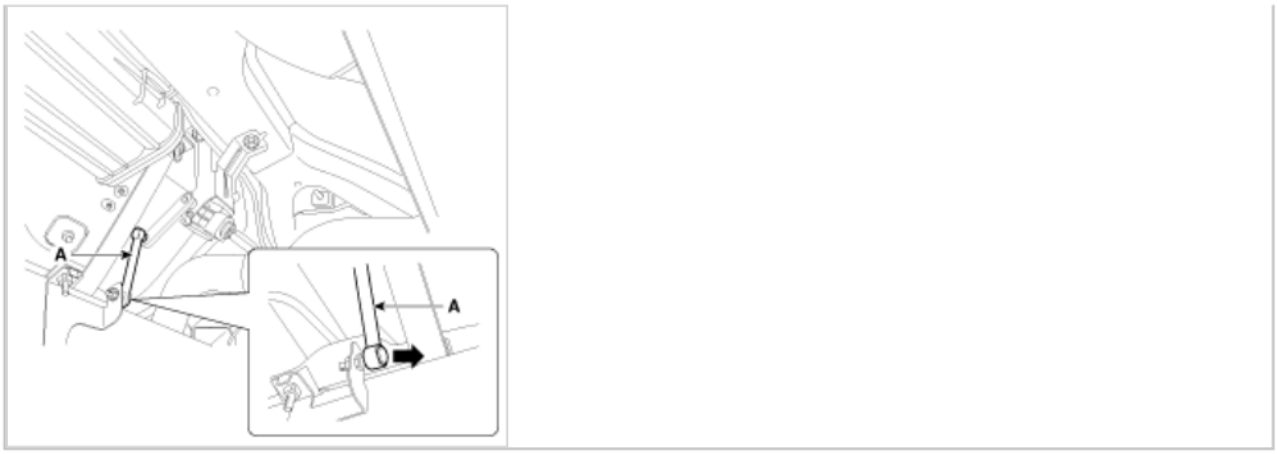
1. Remove the head lamp leveling unit connector (A).
2. Remove the head lamp leveling unit (B) after loosening the mounting bolts.



NOTICE

Pull the sensor linkage (A) to the direction of an arrow.

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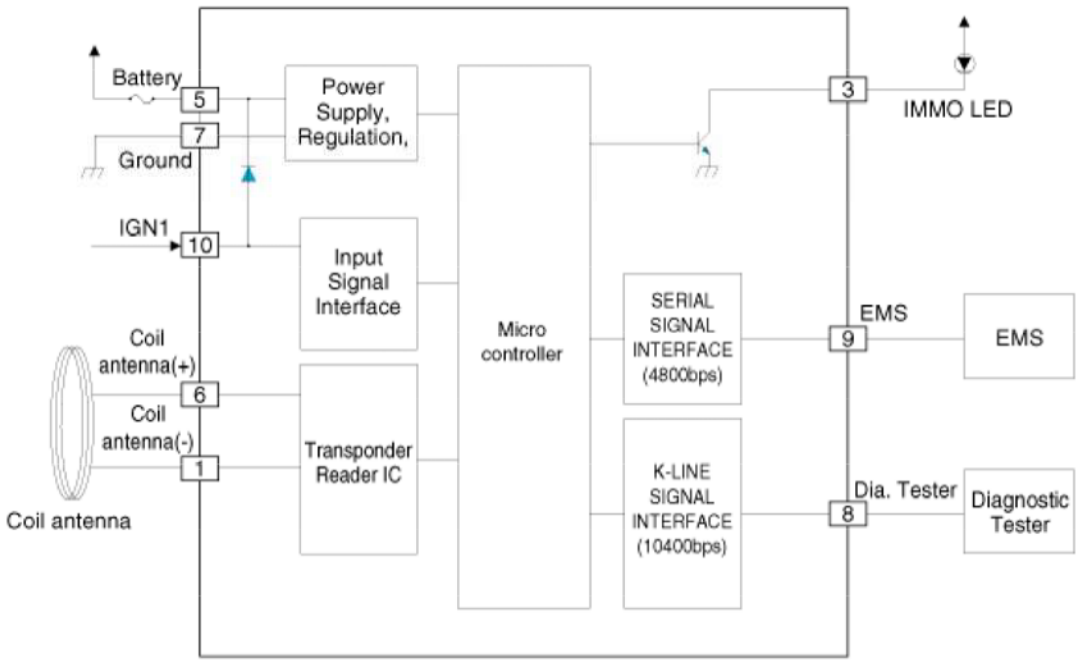
Installation

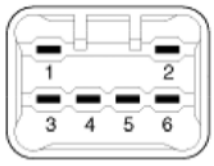
1. Install the head lamp leveling unit.
2. Reconnect the head lamp leveling unit connector.

Body Electrical System

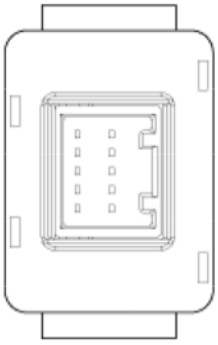
Components

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[Coil antenna]



[Immobilizer connector]



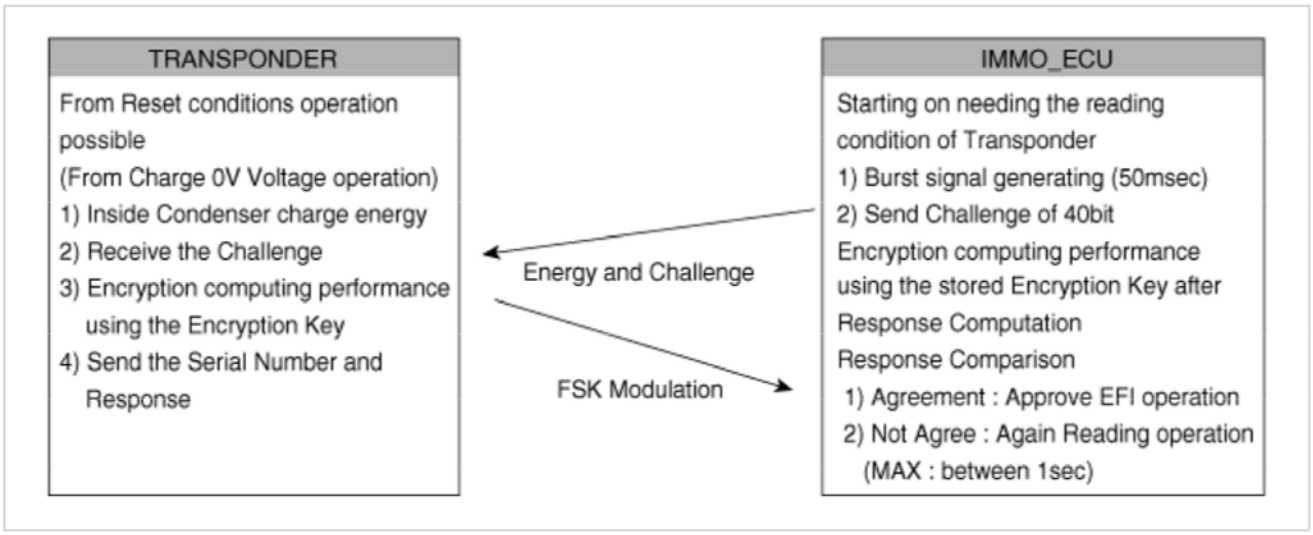
Body Electrical System

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.

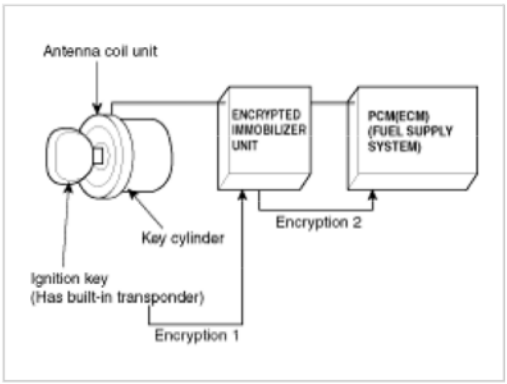
1. Transponder (TP) – IMMO ECU Communication

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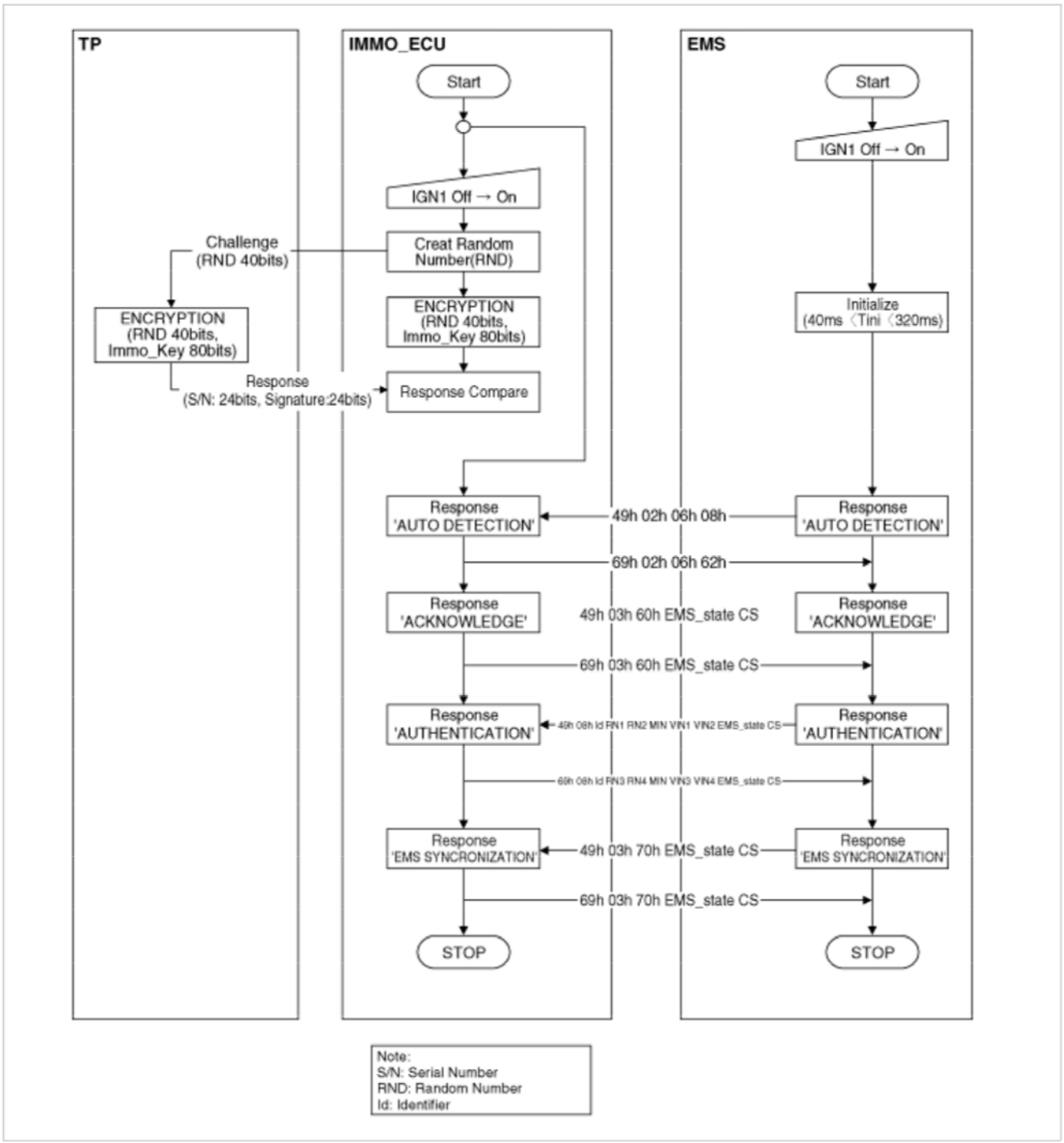
TP Read Protocol

(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

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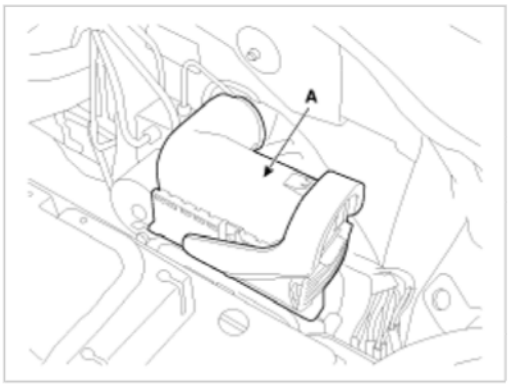
Components Operations

ECM (Engine Control Module)

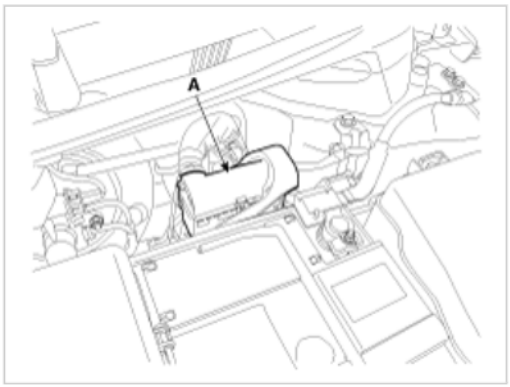
1. The ECM(PCM) (A) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the ECM simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the ECM.
   ERN (Encrypted Randorn Number) value between EMS and encrypted Immobilizer unit is checked and the validity of coded key is decided by EMS.

[1.6 Engine]

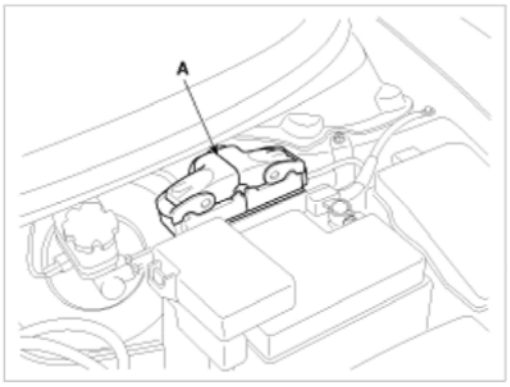
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[1.6 Engine (FFV)]



[2.0 Engine]



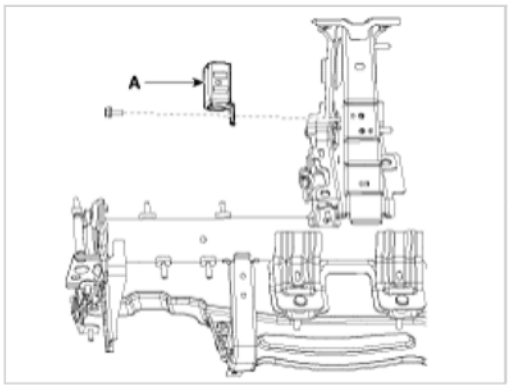
ENCRYPTED Immobilizer unit (A)

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.

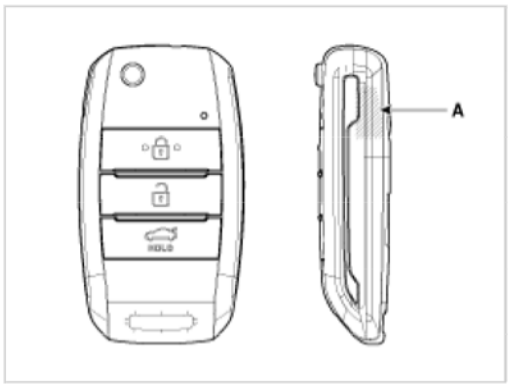
The Immobilizer does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the ECM and vice versa.

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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.

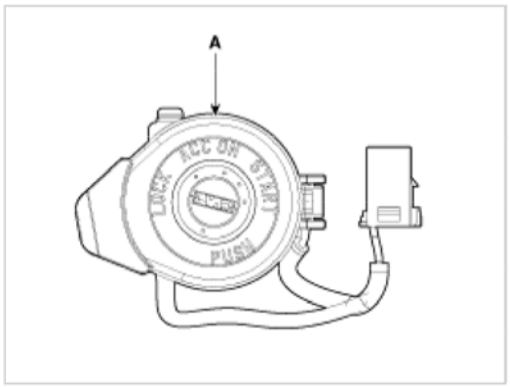


Antenna coil

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.



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 th stored data. If the data are correct, the teaching can proceed.

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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 the battery, the timer starts again for one hour.

The key teaching is done by ignition on with the key and additional tester commands. The ECM stores the relevant data in the EEPR(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. Thi 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 i the transponder or other reasons, which result from unsuccessful programming of data. If the ECM detects different authenticators of transponder and an ECM, the key is considered to be invalid.

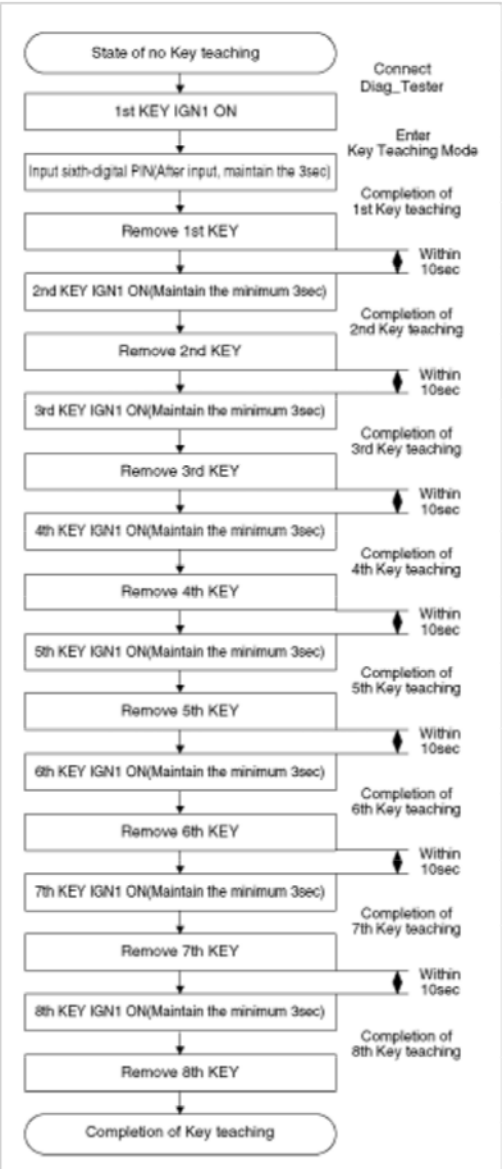
The maximum number of taught keys is 8

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 be stored at ECM.

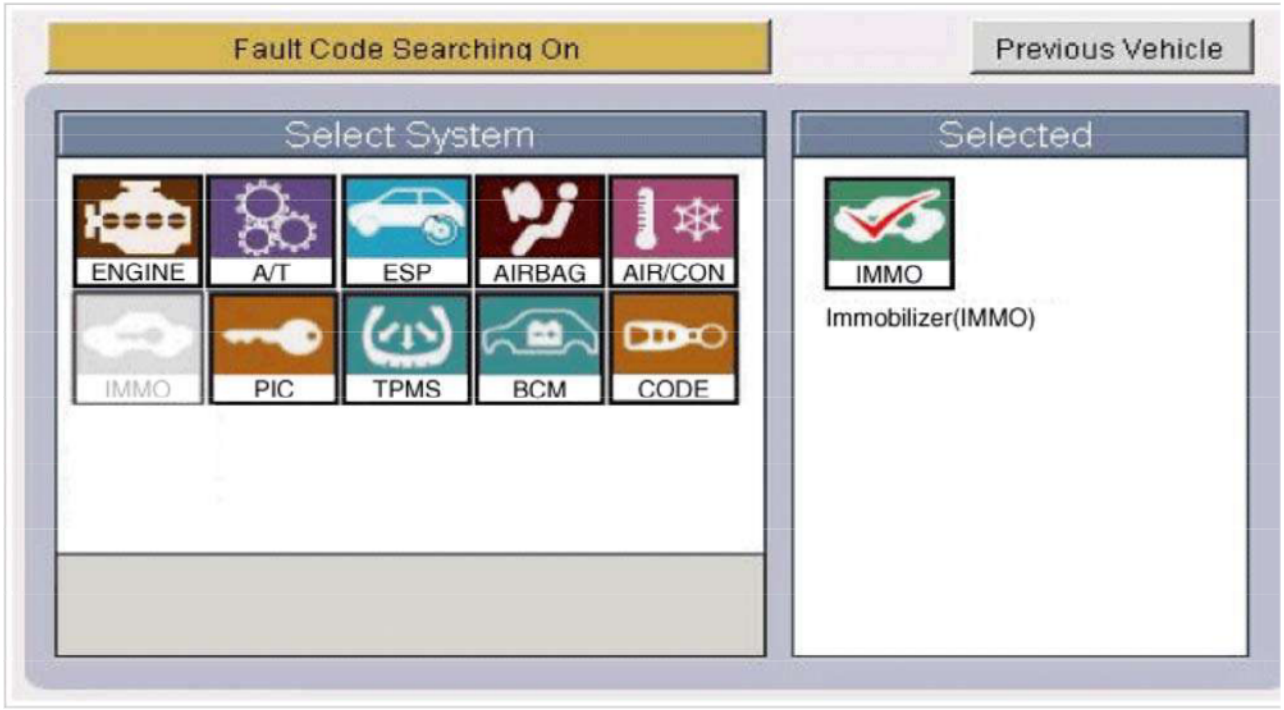
NOTICE

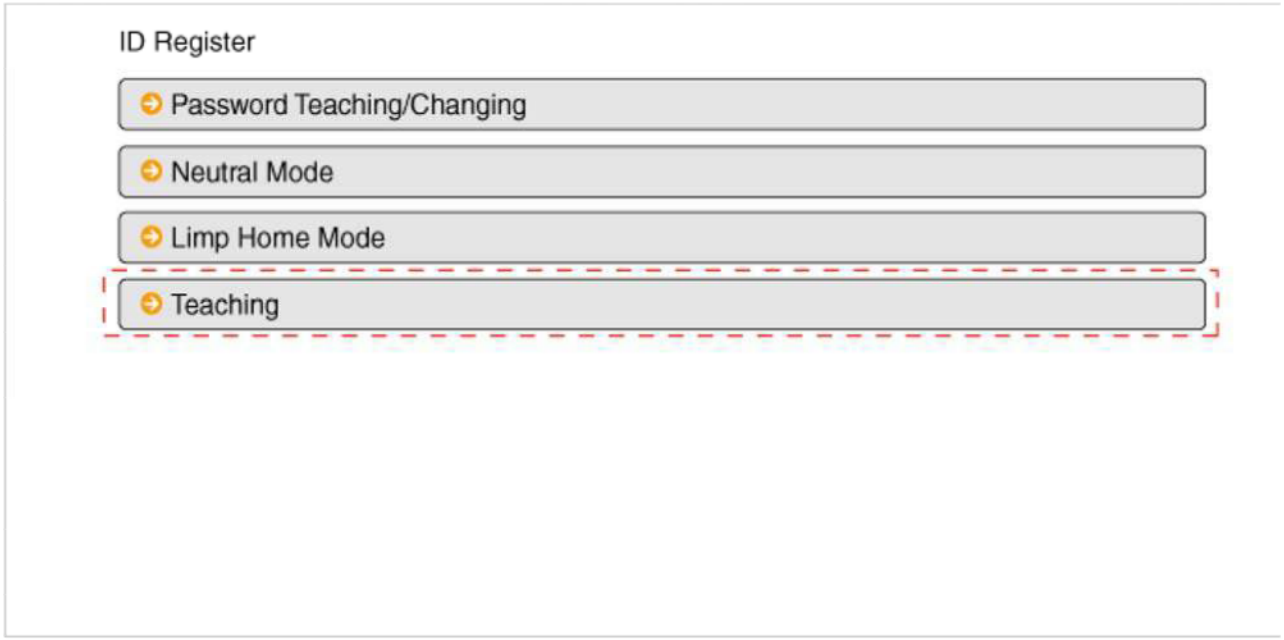
When teaching the 1st key, Immobilizer regists at the same time.



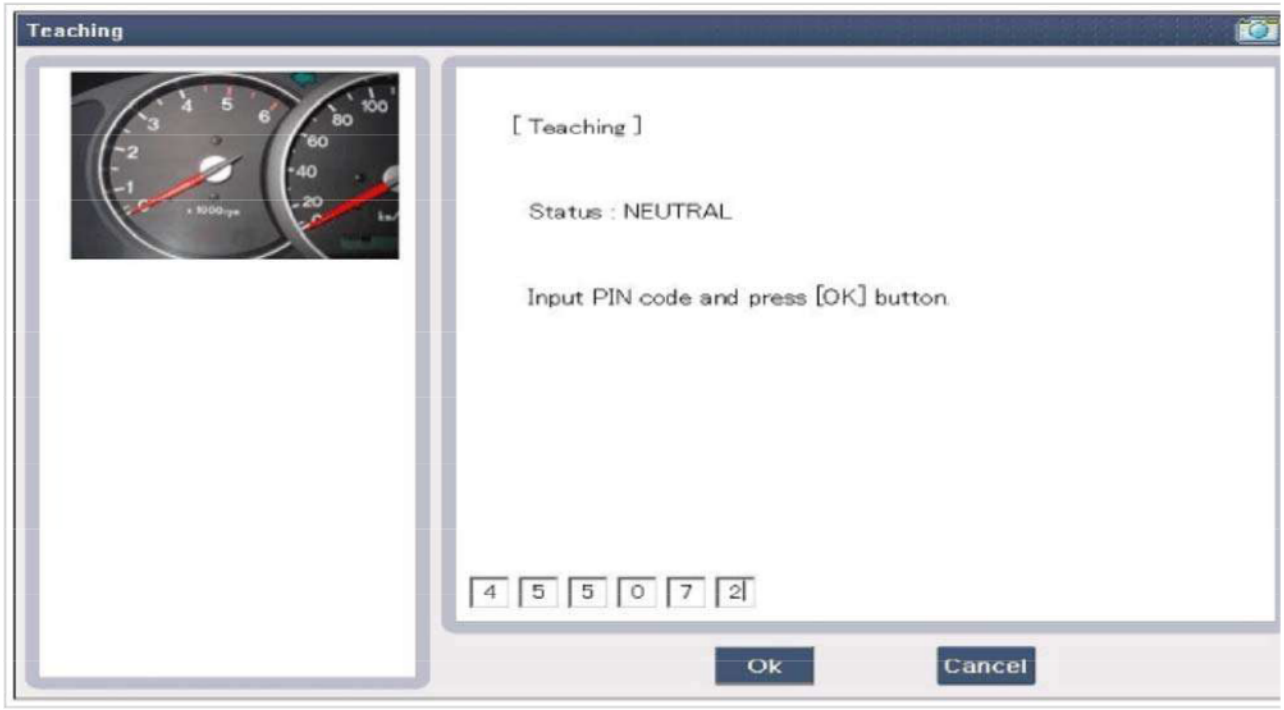
(1) ECM learnt status.

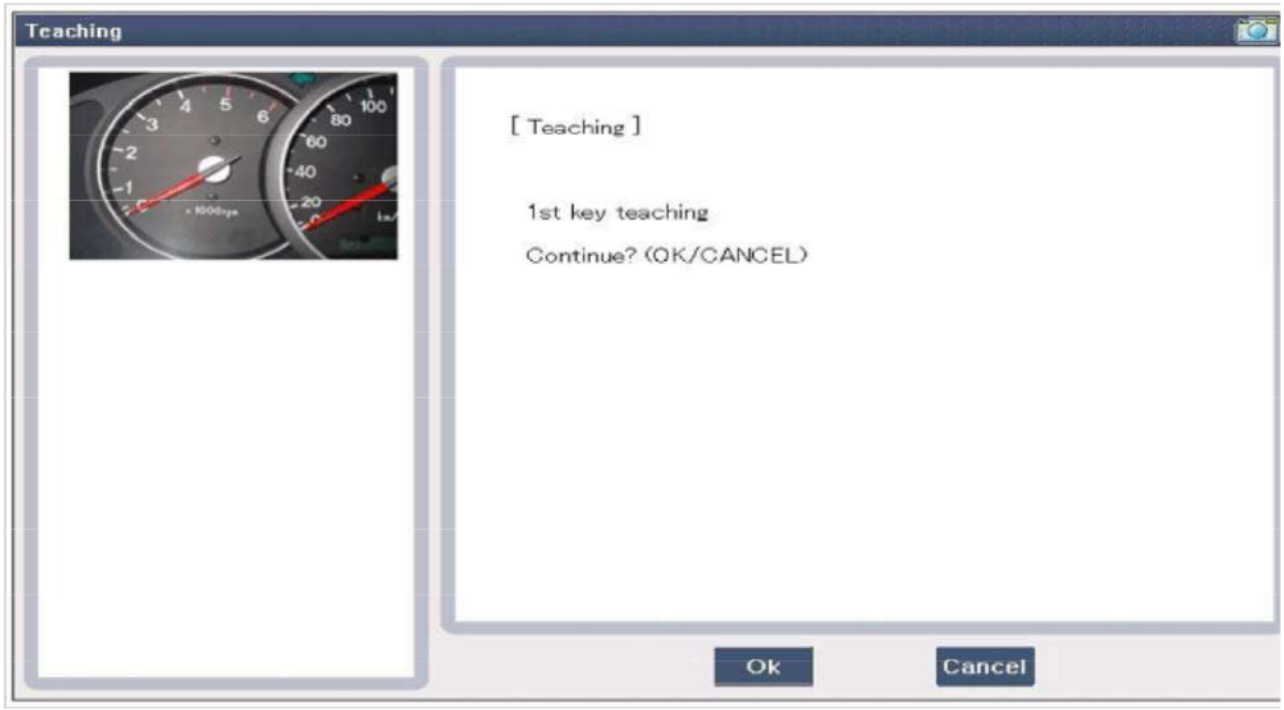
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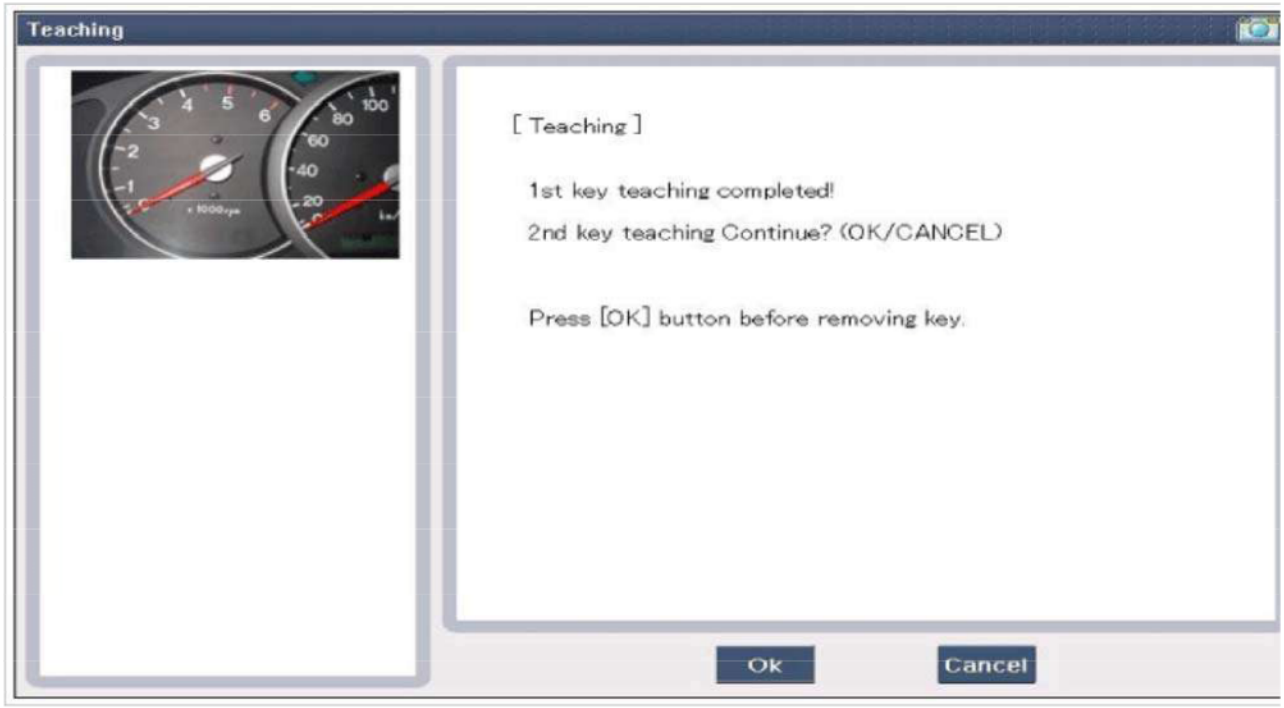


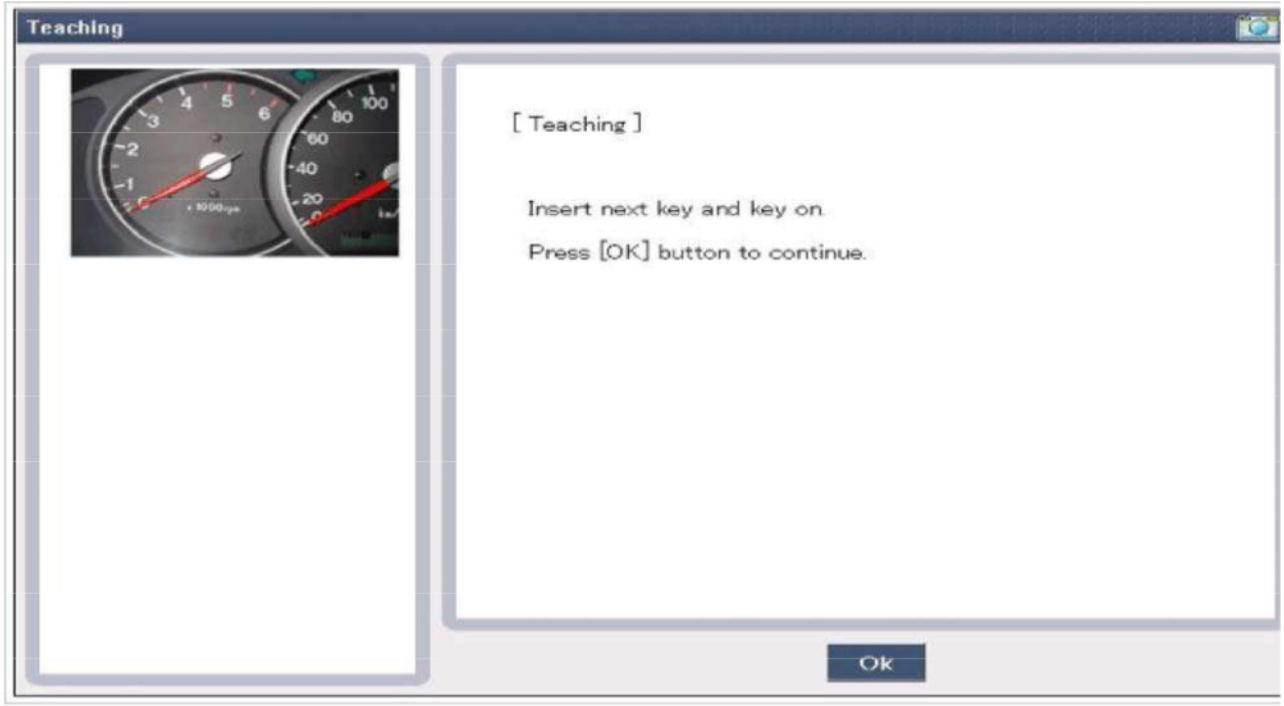
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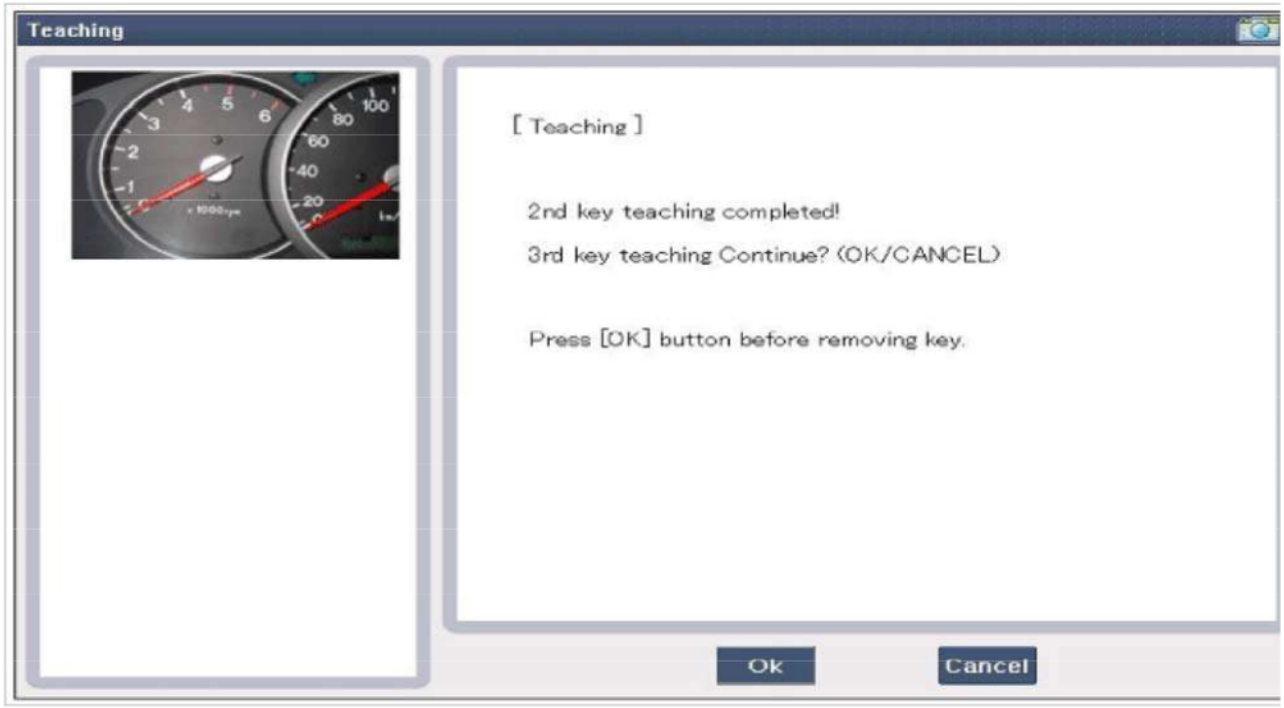


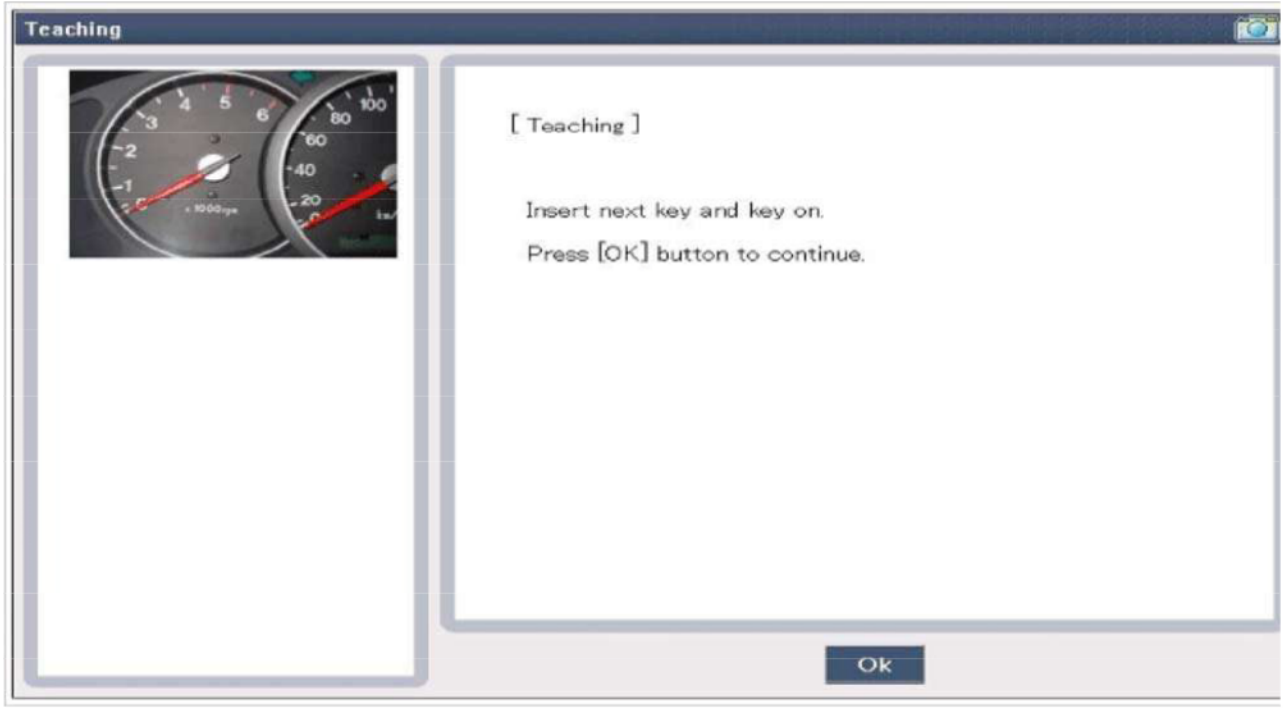
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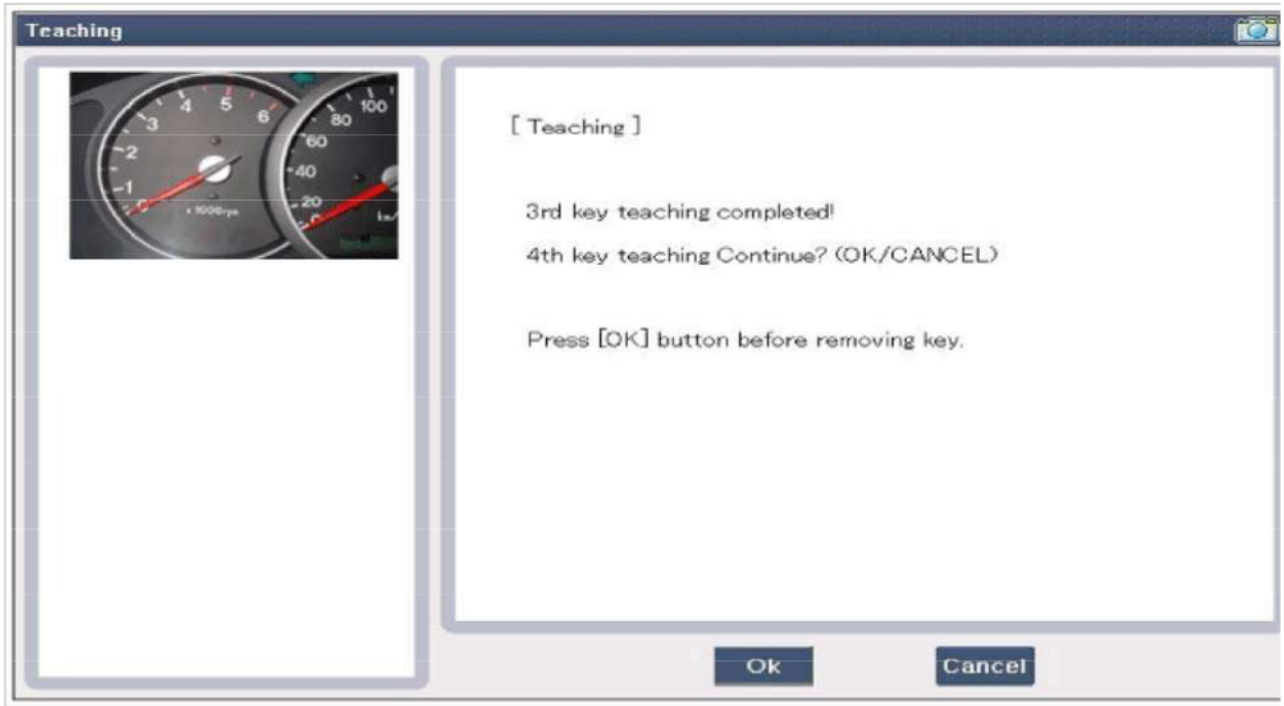


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(2) ECM virgin status.

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.

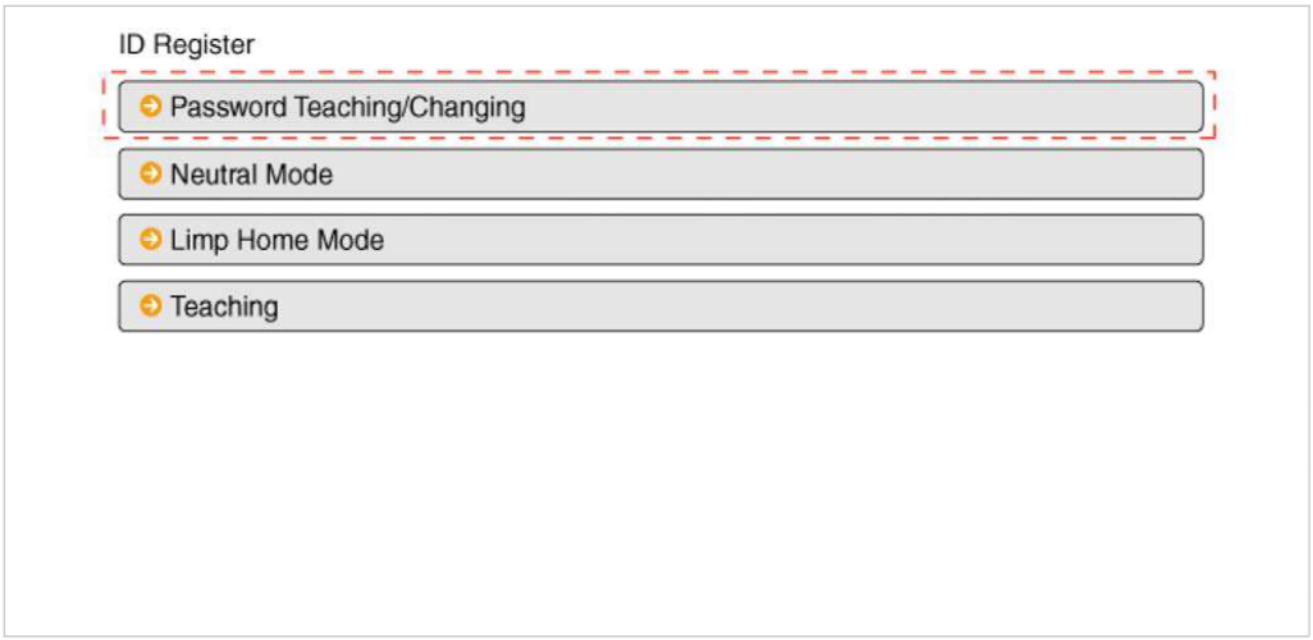
   The teaching is started by ignition on, with a valid key(learnt key) and sending the user password by tester. After successful teaching, the status of the user password changes from "virgin" to "learnt"

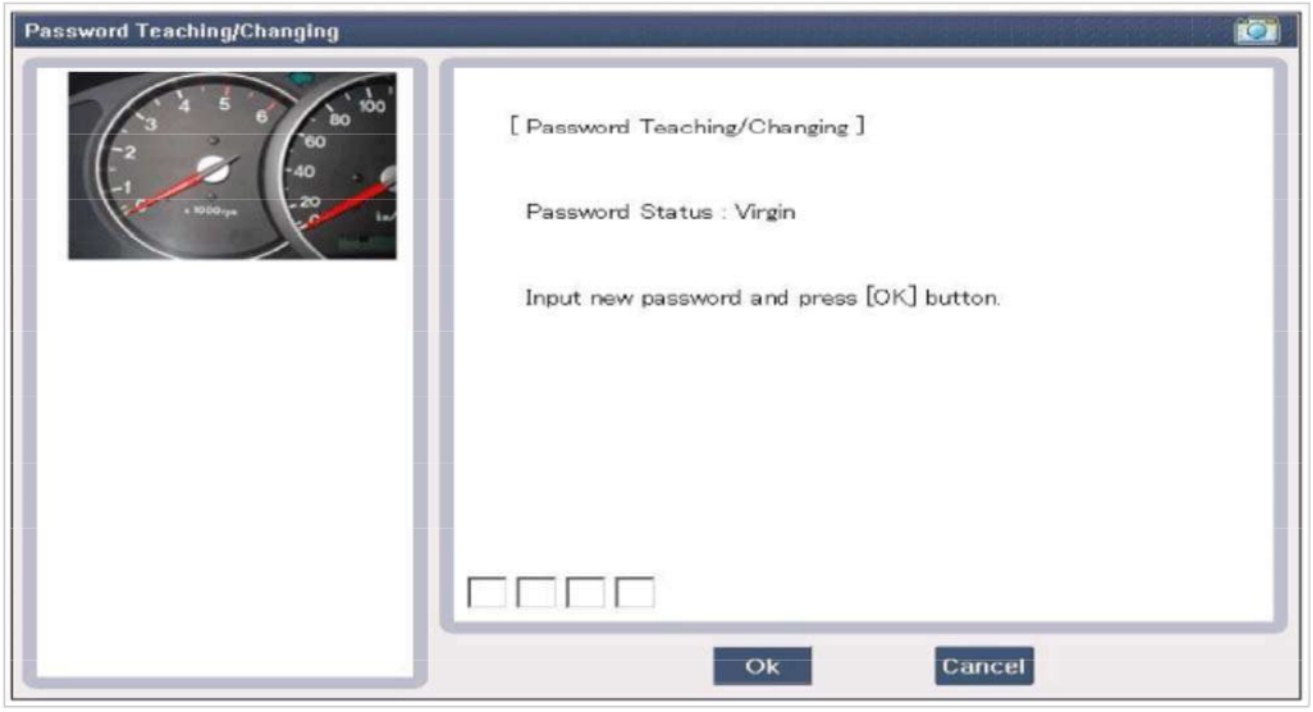
   The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the ECM requests the new user password. The status remains "learnt" 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.

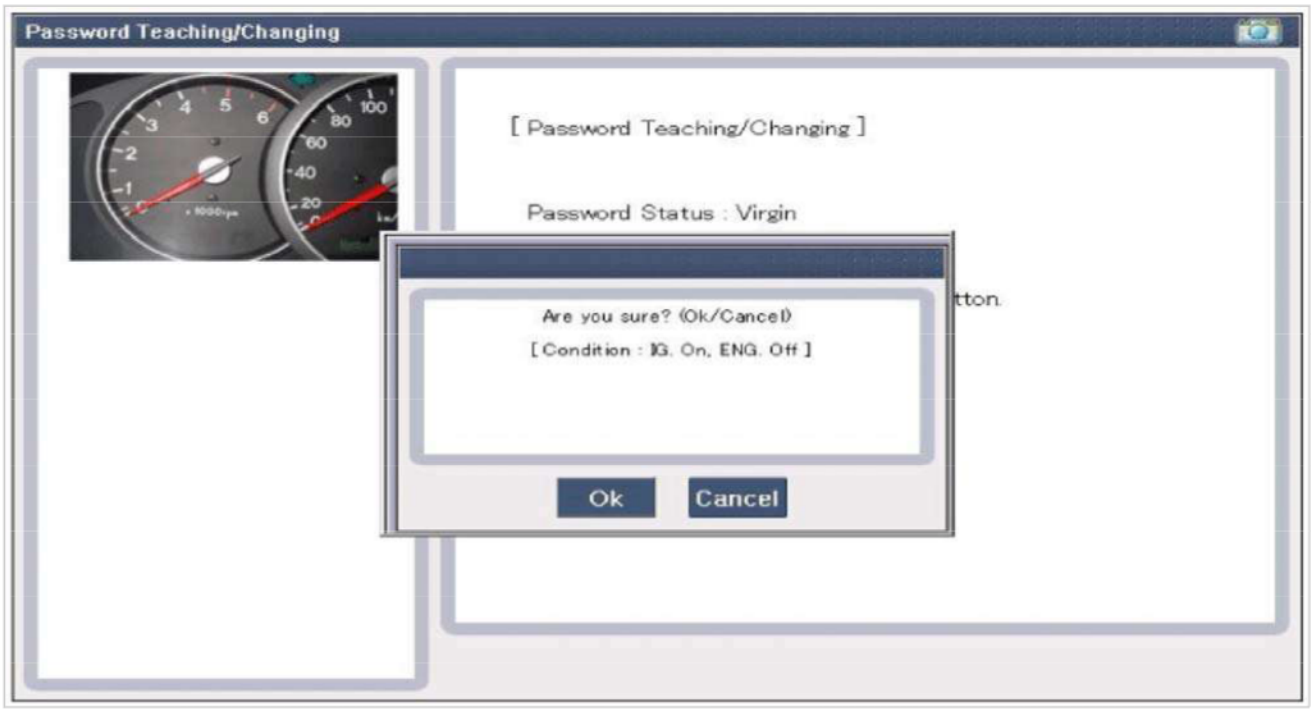
2. User password teaching

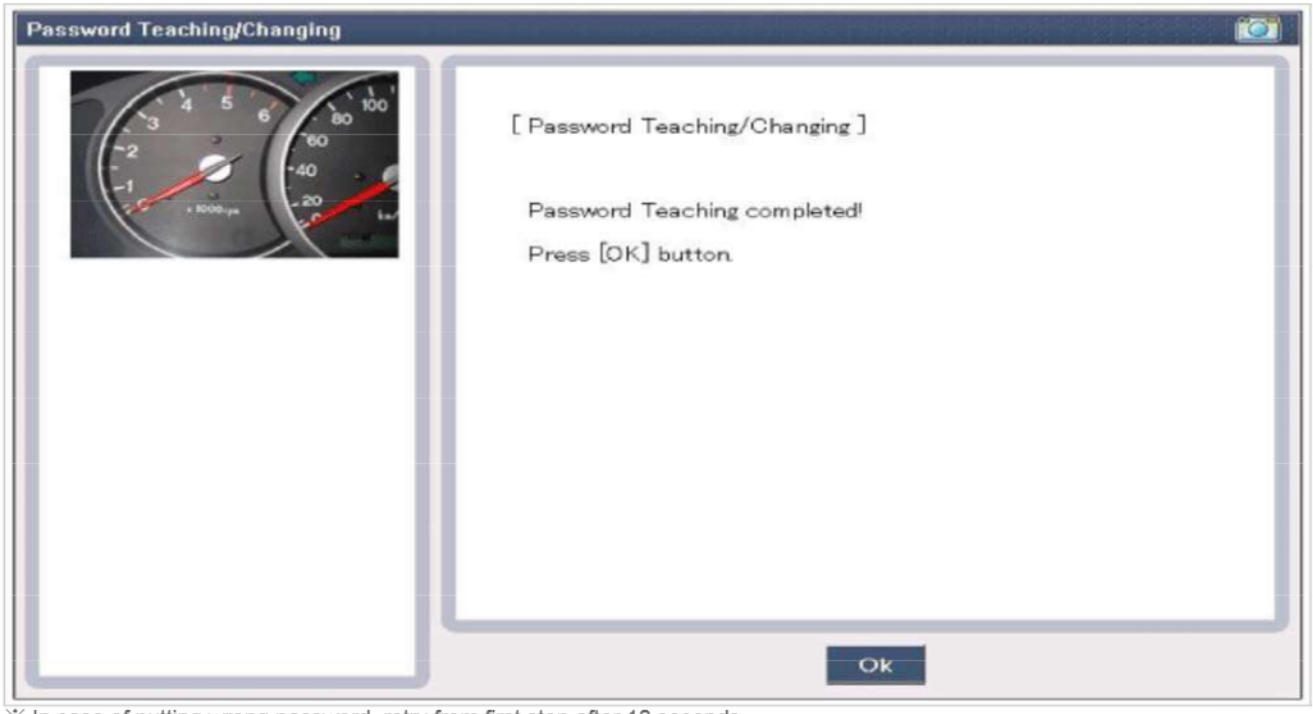
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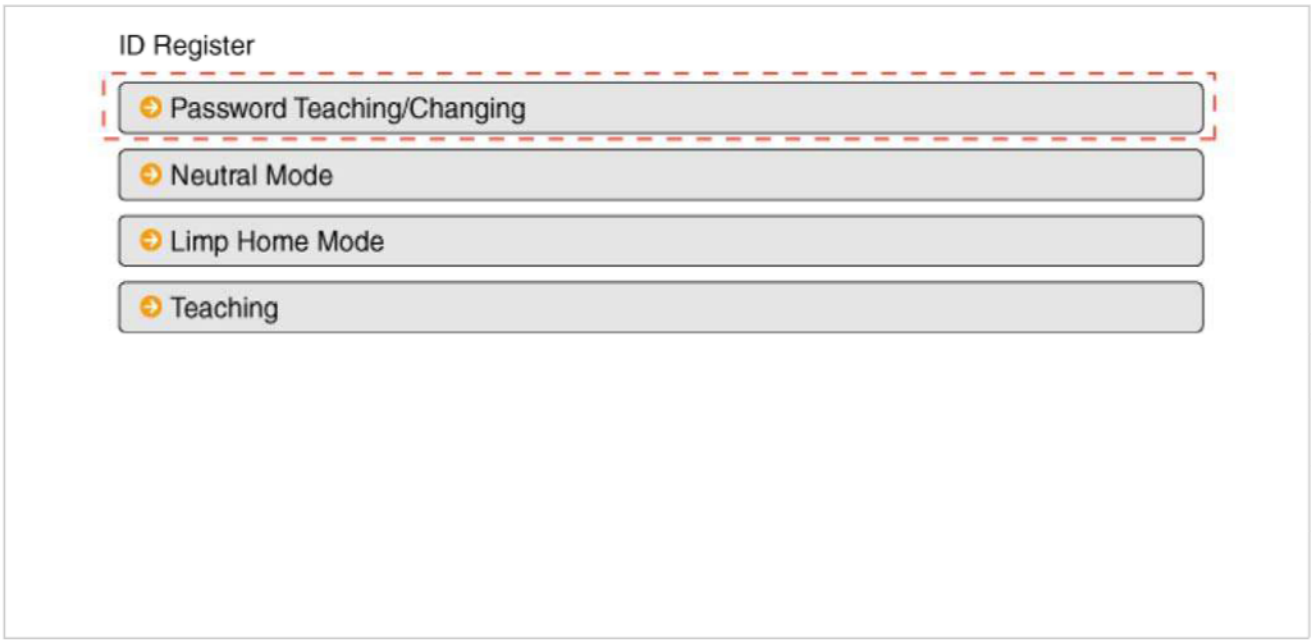


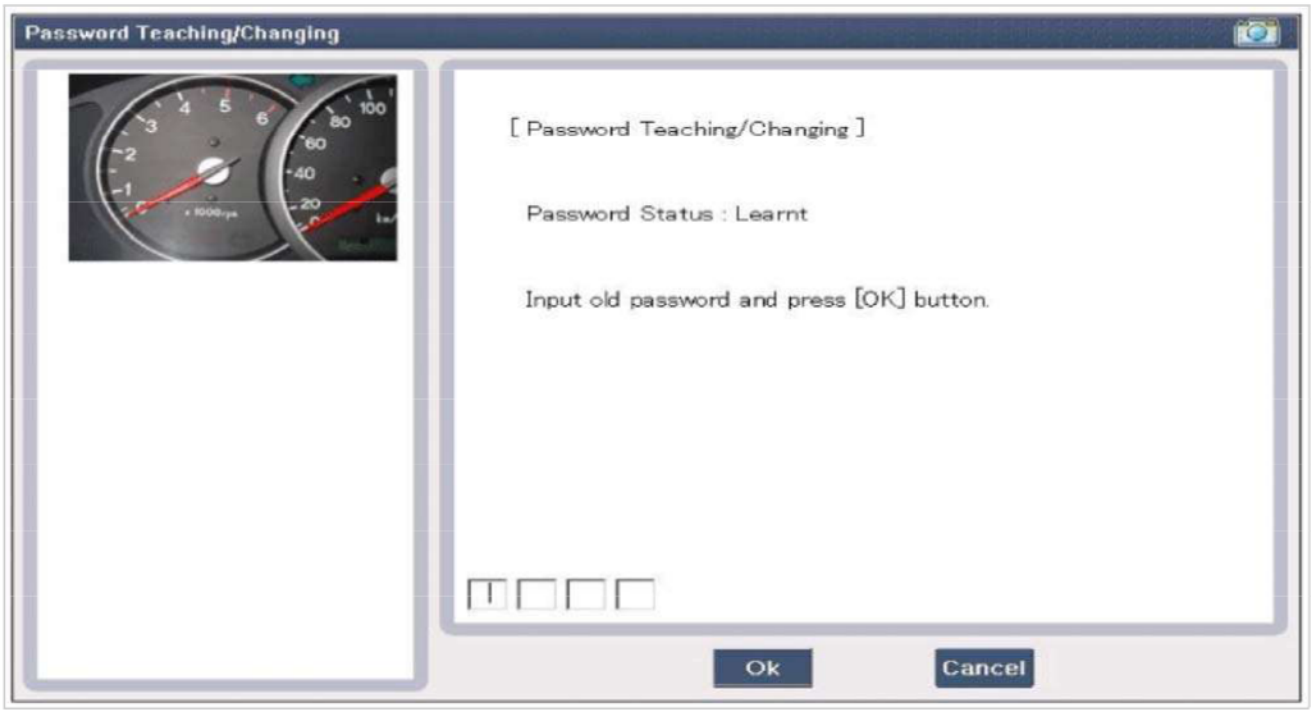


※ In case of putting wrong password, retry from first step after 10 seconds.

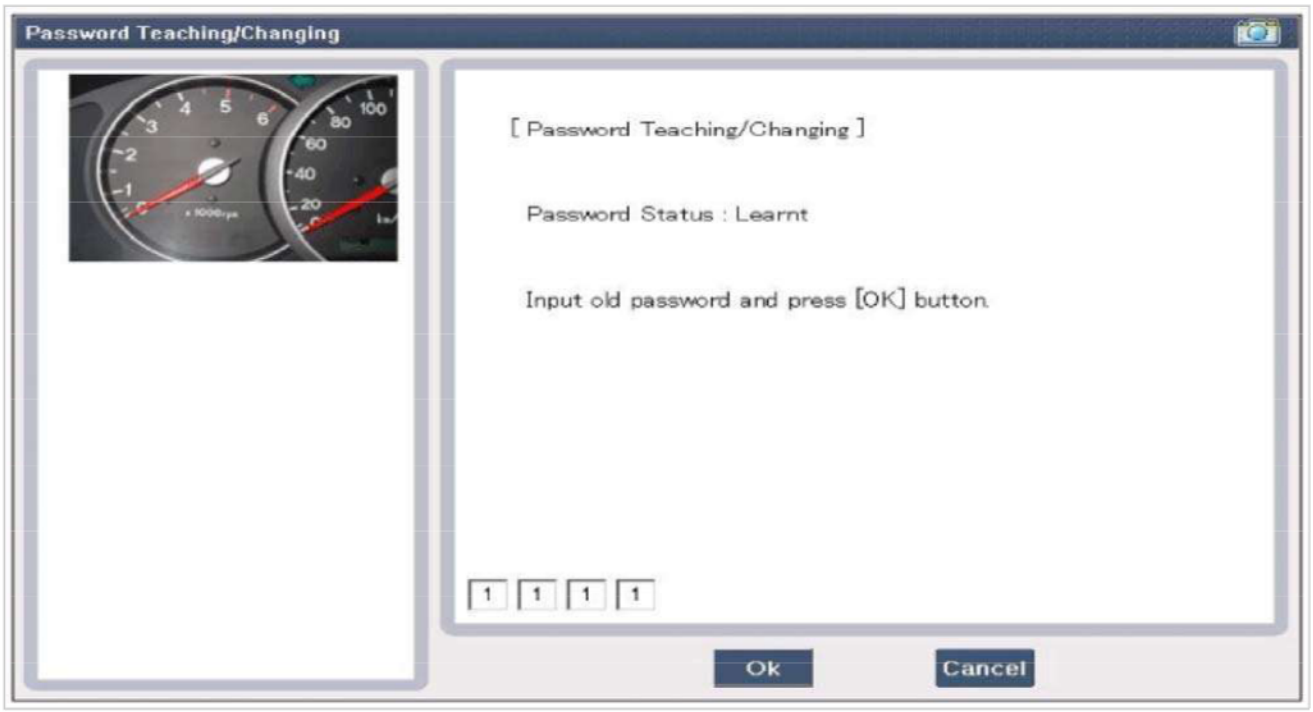
3. User password changing

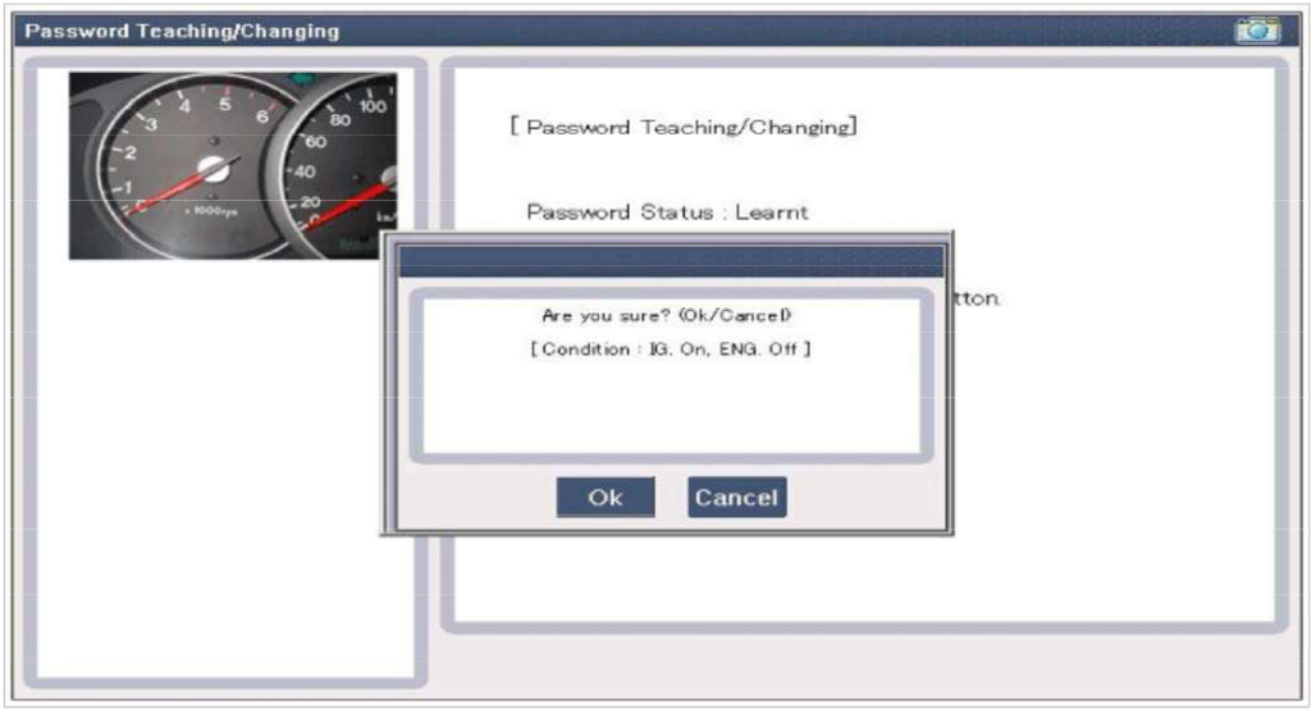
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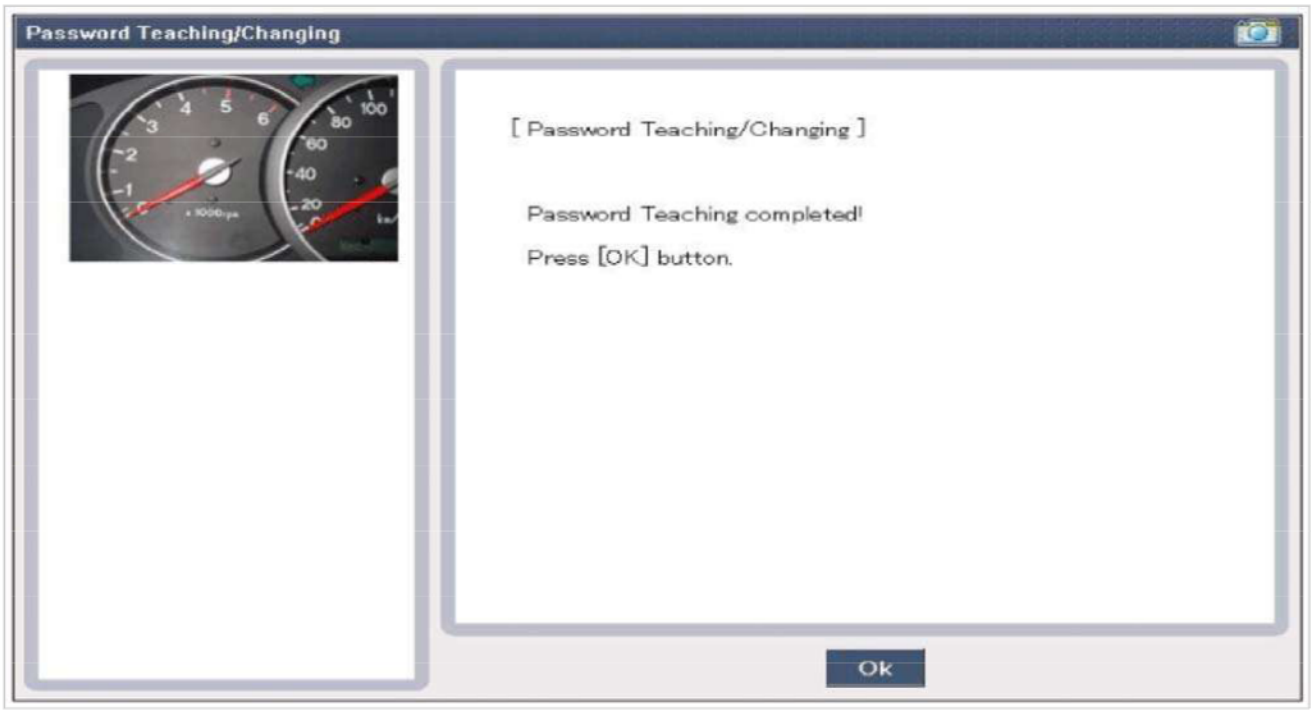


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Limp Home Function

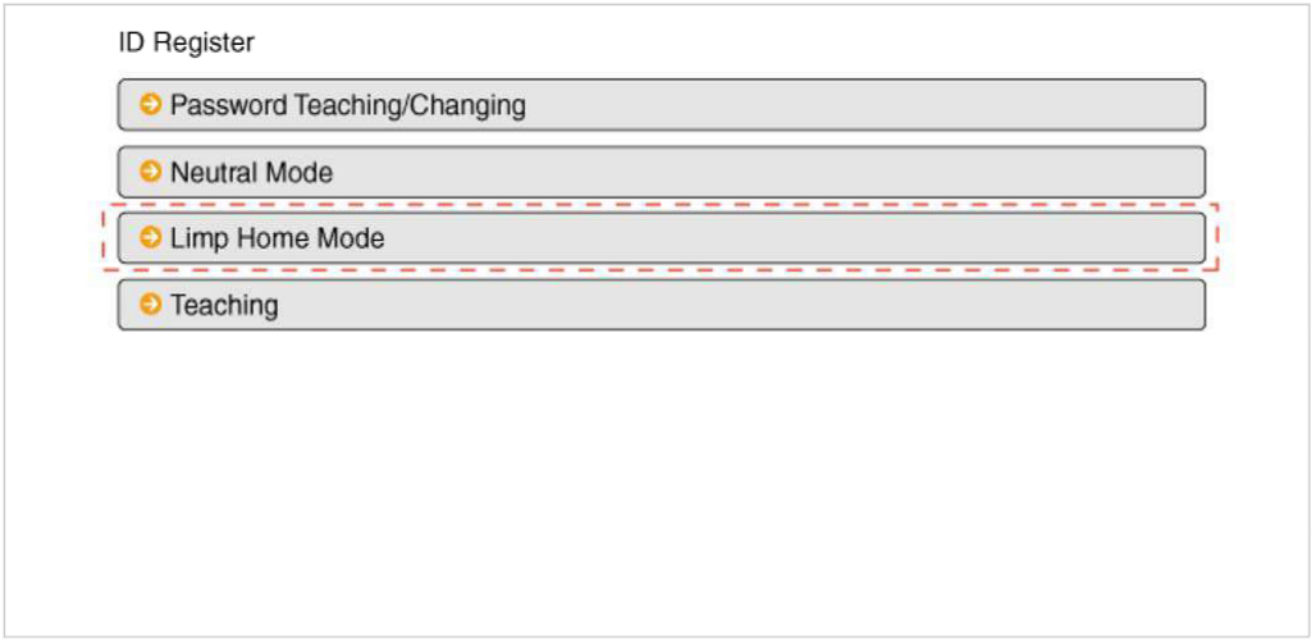
1. Limp Home By Tester

   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.

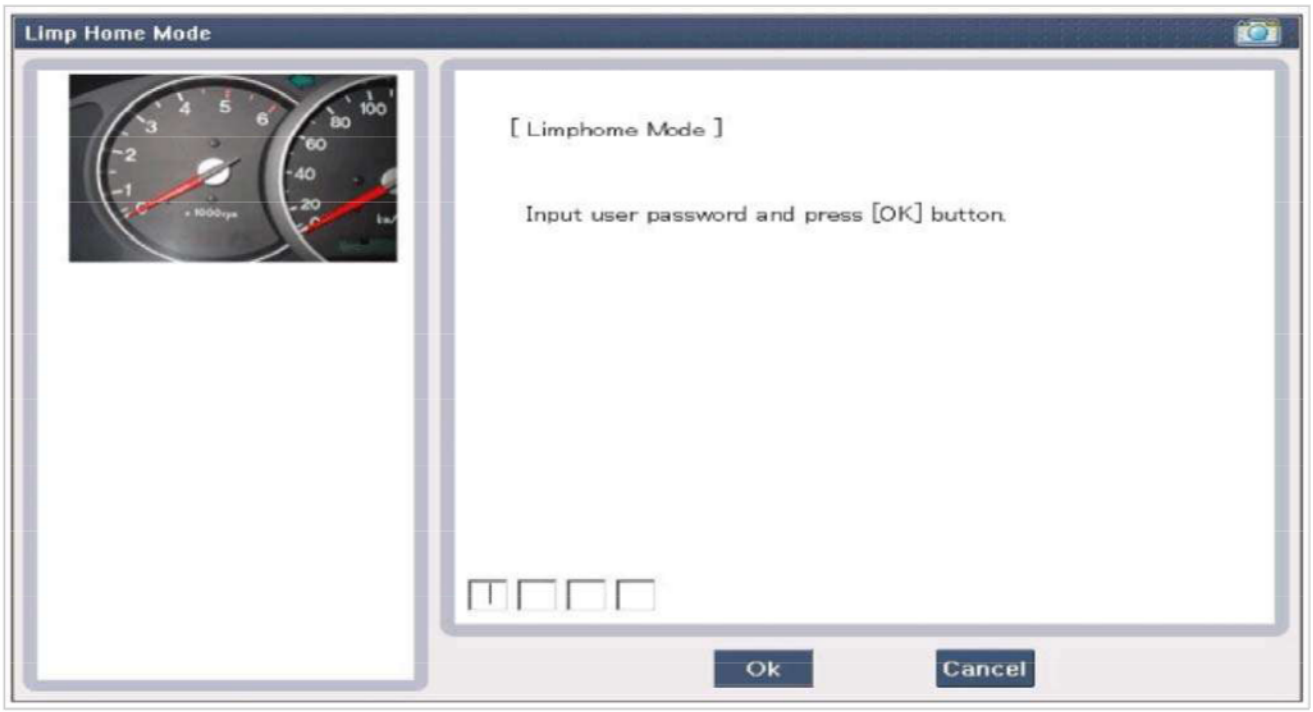
   The user password can be sent to the ECM via the special tester menu.

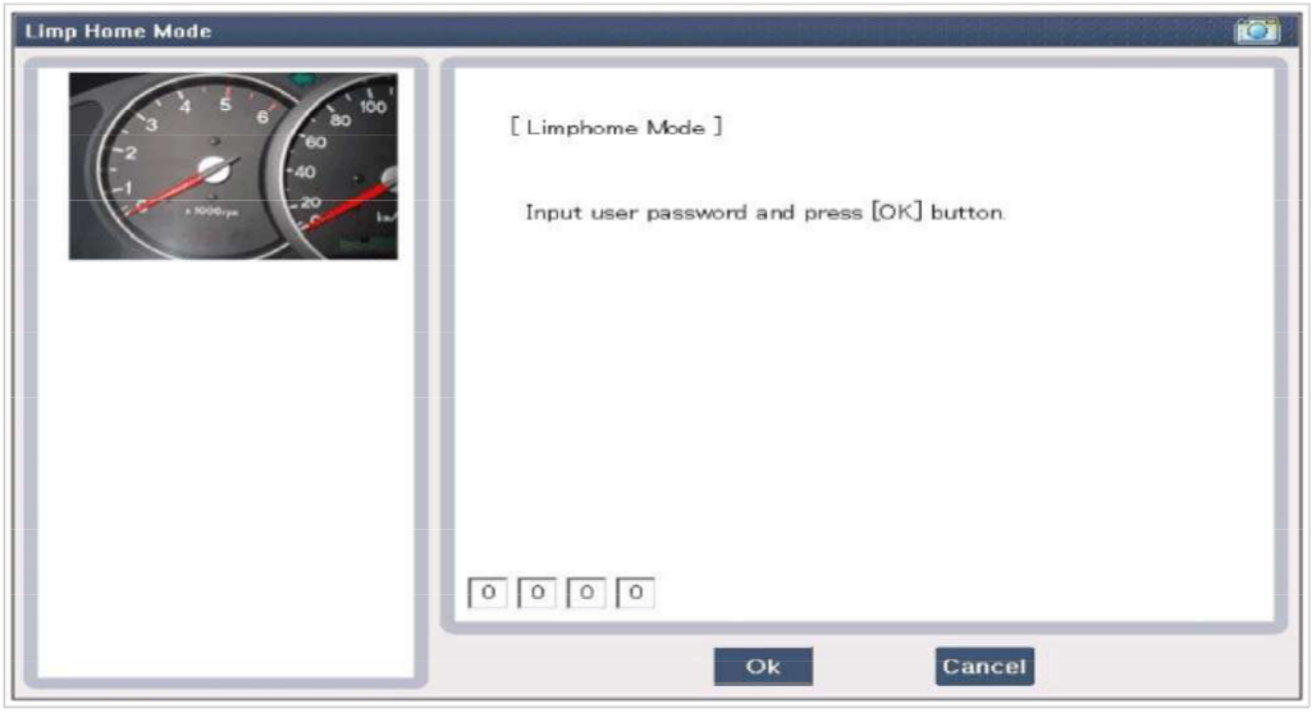
   Only if the ECM is in status "learnt" and the user password status is "learnt" and the user password is correct, the ECM will be unlocked for a period of time (30 sec.). The engine can only be started during this time. After the time has elapsed, engine start is not possible.

   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.

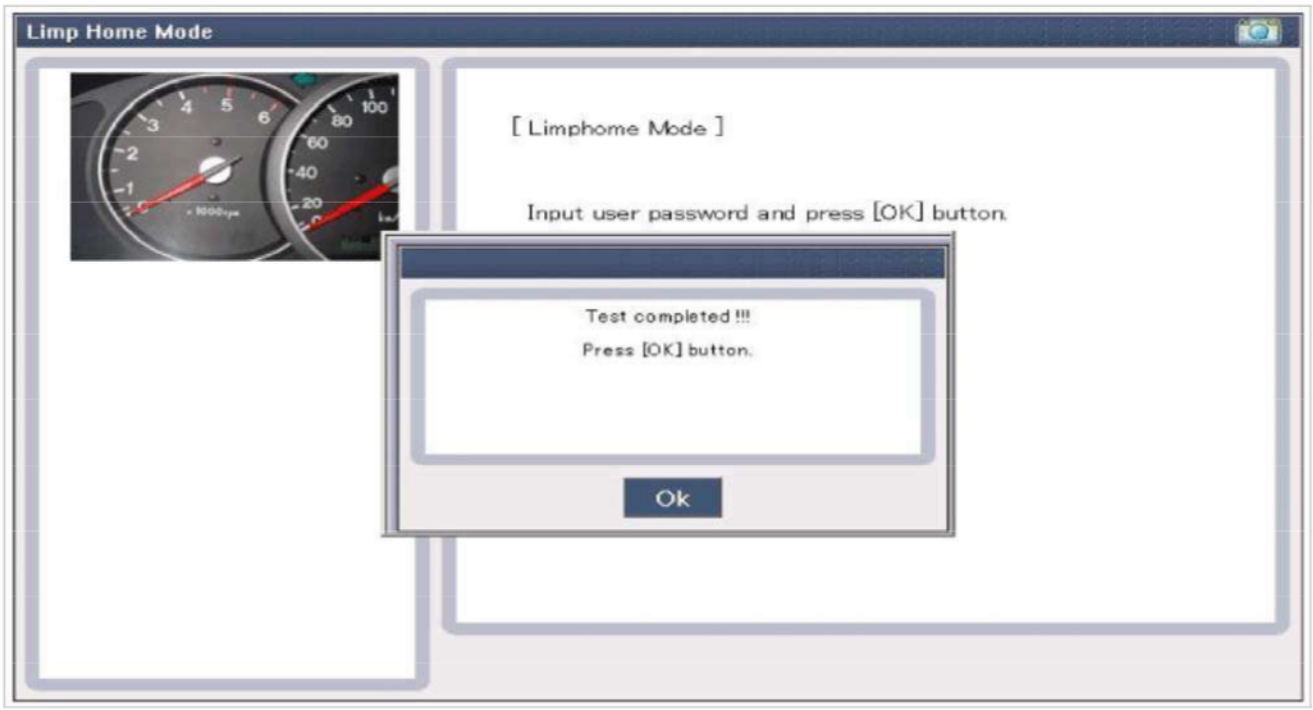


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2. Limp Home By Ignition Key

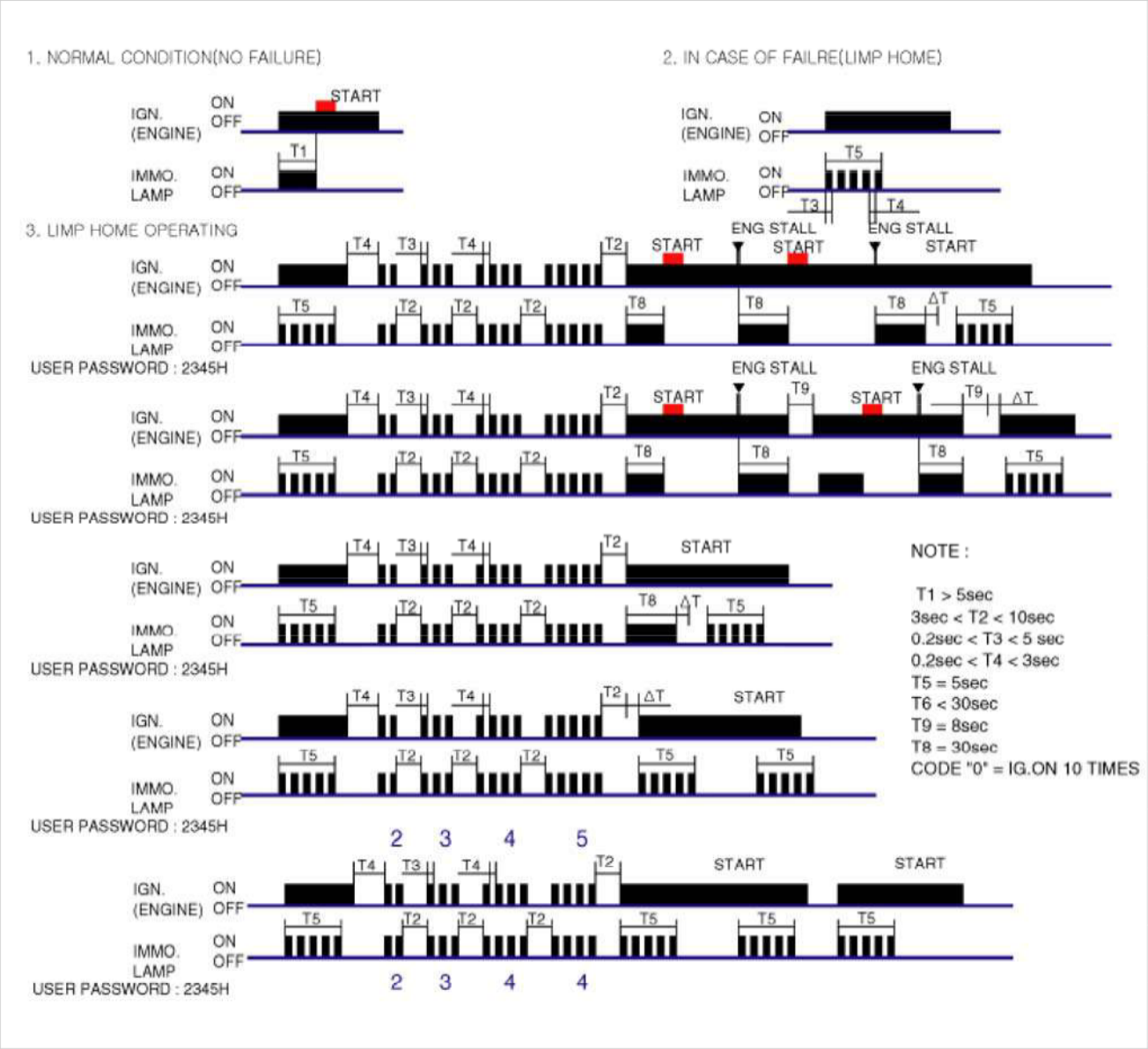
   The limp home can be activated also by the ignition key. The user password can be input to the ECM by a special sequence of ignition on/off.

   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.

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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

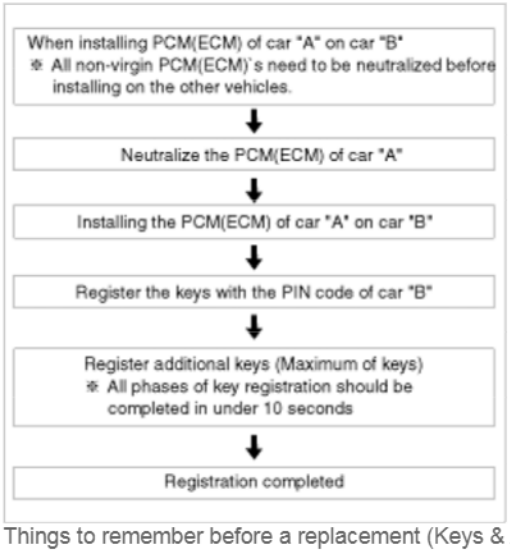
Replacement Of Ecm And Immobilizer

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.

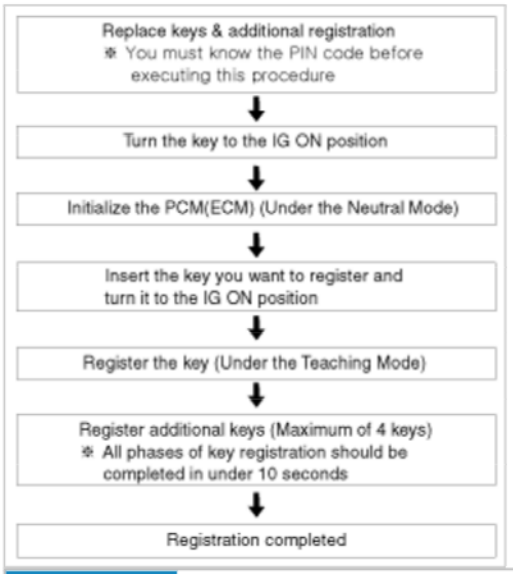
In case of a defective Immobilizer, it needs teaching the Immobilizer. A new Immobilizer device replaces the old one and Immobilizer need teaching.

1. Things to remember before a replacement (ECM)

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2. Things to remember before a replacement (Keys & Additional registration)



NOTICE

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.

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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.

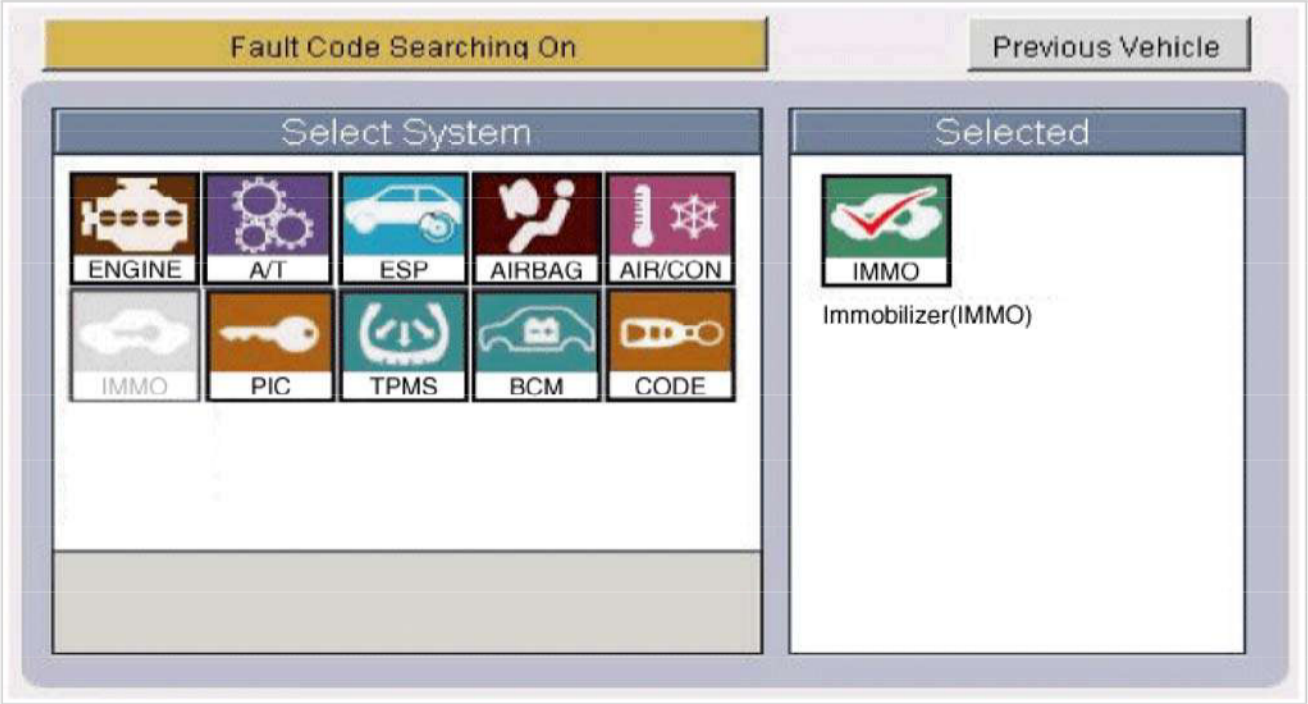
This function is for neutralizing the ECM and Key. Ex) when lost key, Neutralize the ECM then teach keys.

(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.

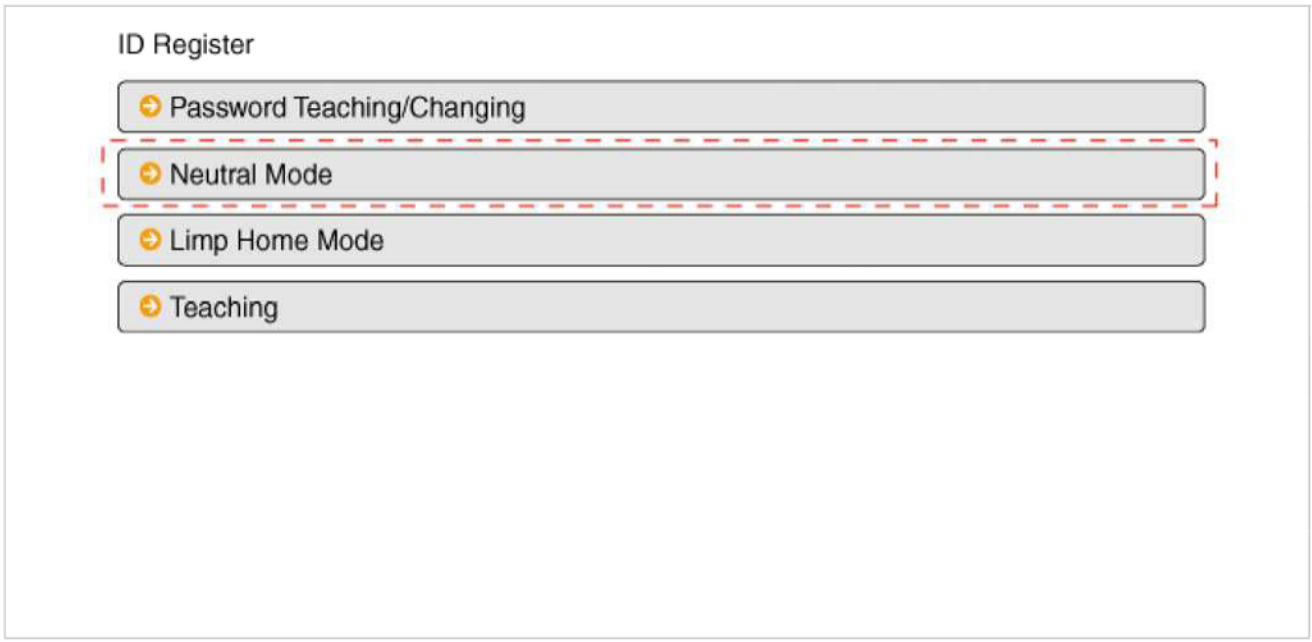
NOTICE

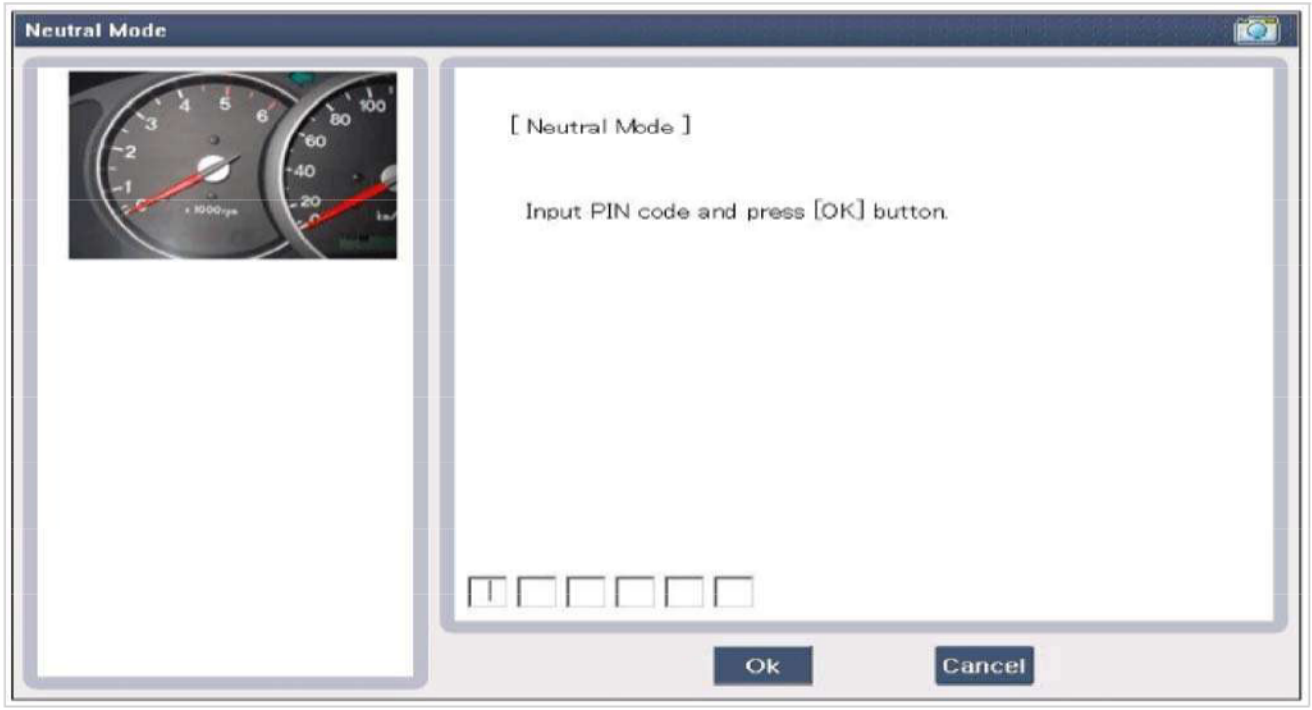
- Neutralizing setting condition
  - In case of ECM status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)
- Neutralizing meaning:
  - PIN Code(6) & User P/Word(4) deletion
  - Locking of EMS(except Key Learning permission)

Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No

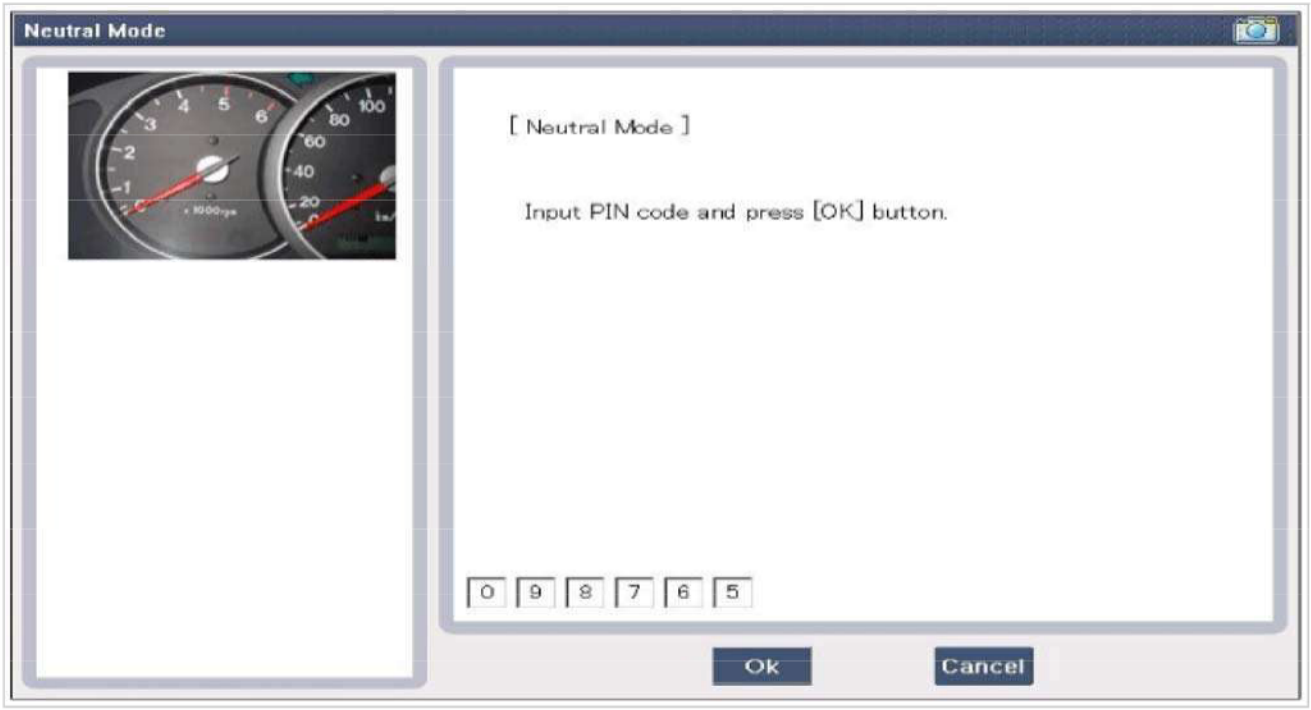


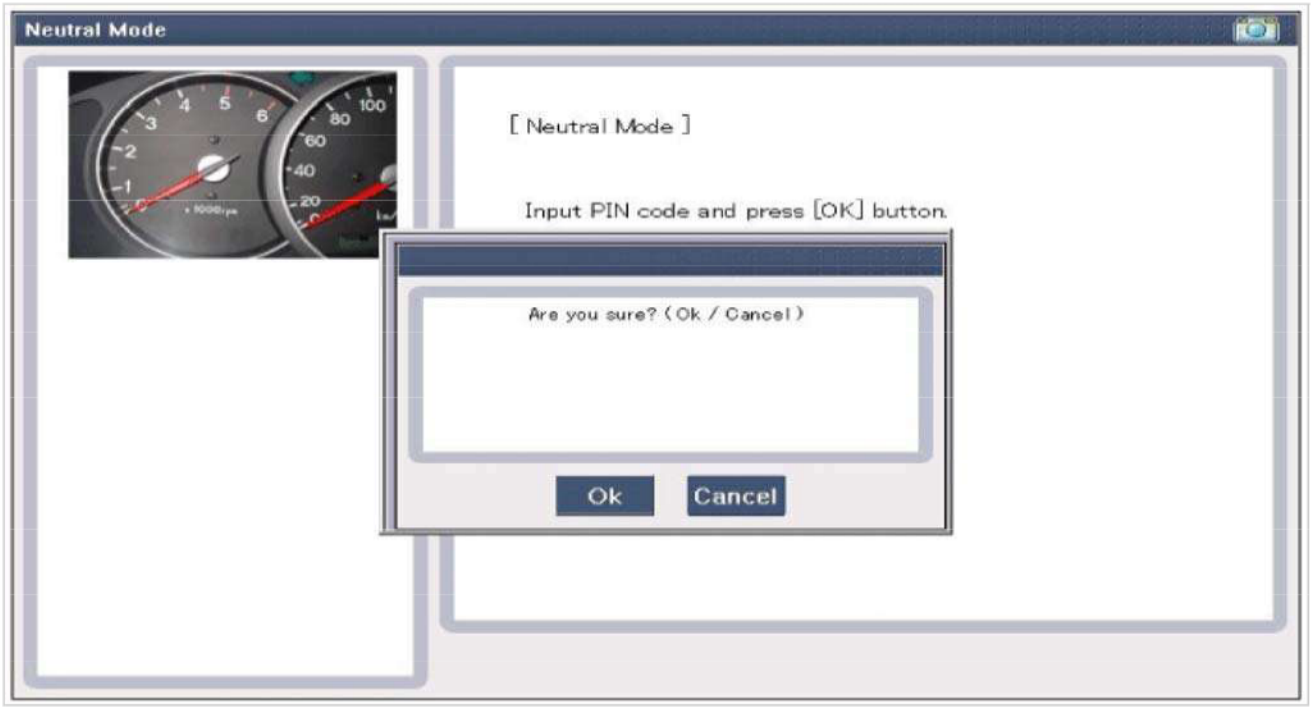
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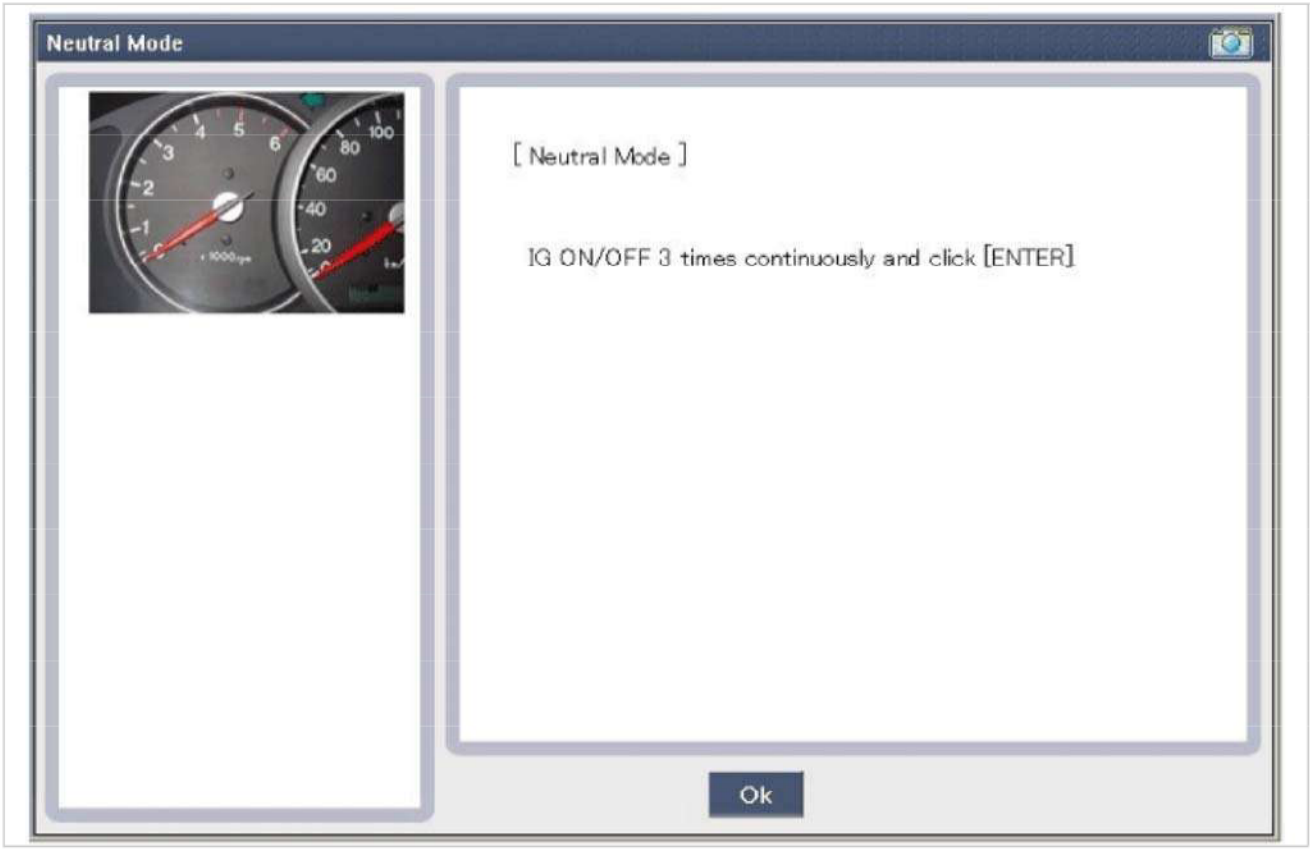


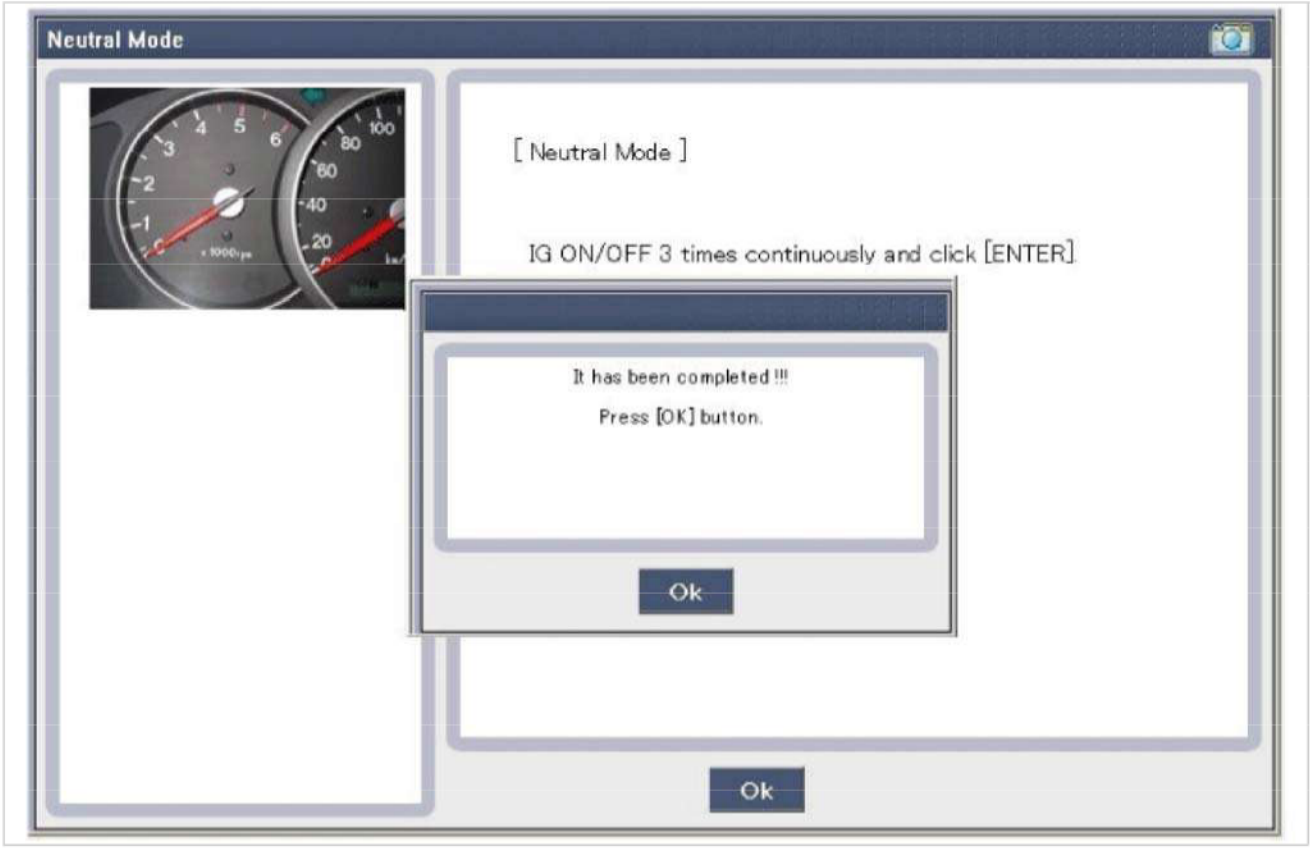
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Current Data

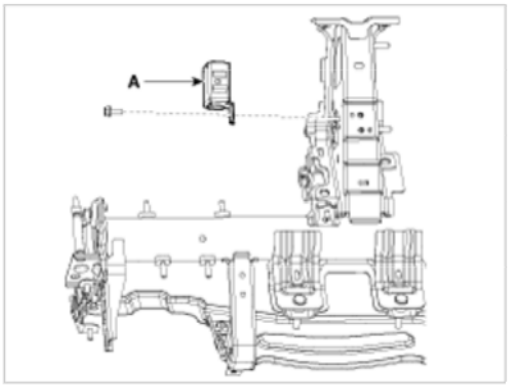
Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop | VSS

Sensor Name	Value	Unit
Number of Learnt Keys	2	-
ECU Status	LEARNT	-
Key Status	LEARNT	-
ICU Status	LEARNT	-

Body Electrical System

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Disconnect the connector of the immobilizer unit and then remove the immobilizer unit (A) after loosening the bolt.



Installation

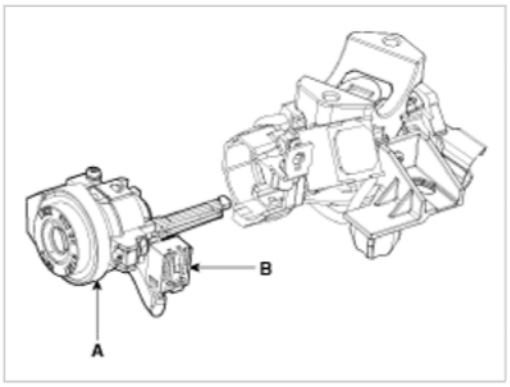
1. Install the immobilizer unit.
2. Connector the immobilizer unit.
3. Install the crash pad lower panel.

Body Electrical System

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Disconnect the connector (B) after loosening the screw and then remove the antenna coil (A).

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Installation

1. Install the antenna coil.
2. Connect the antenna coil connector.
3. Install the crash pad lower panel.

Body Electrical System

Specification

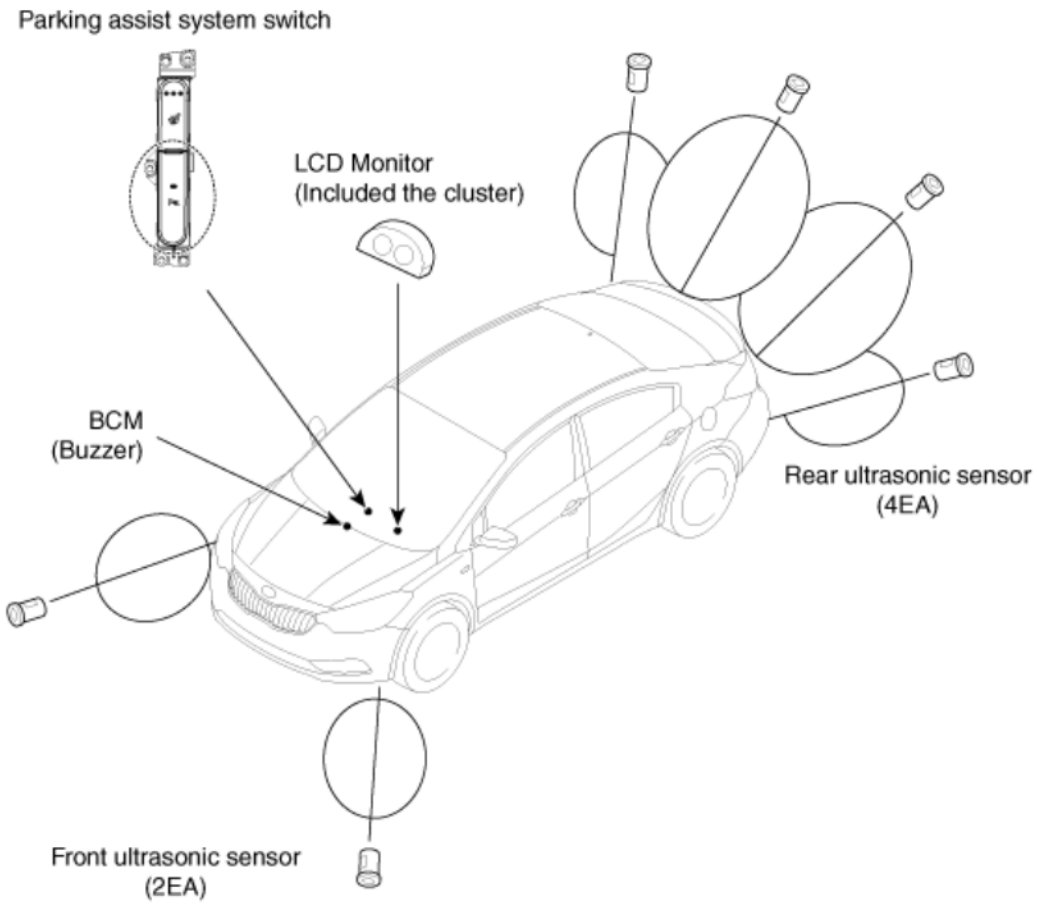
Item			Specification
Ultrasonic sensor	Voltage rating		DC 12 V
	Detecting range		30 cm ~ 120 cm
	Operation voltage		DC 9 ~ 16 V
	Operation current		MAX 300 mA
	Operation temperature		-30°C ~ +80°C (-22°F ~ +176°F)
	Operation frequency		48 ± 5 KHz
	Number of sensors	Front	2
		Rear	4

※ Parking assist control unit function and buzzer is built in BCM (body control unit).

Body Electrical System

Component Location

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Body Electrical System

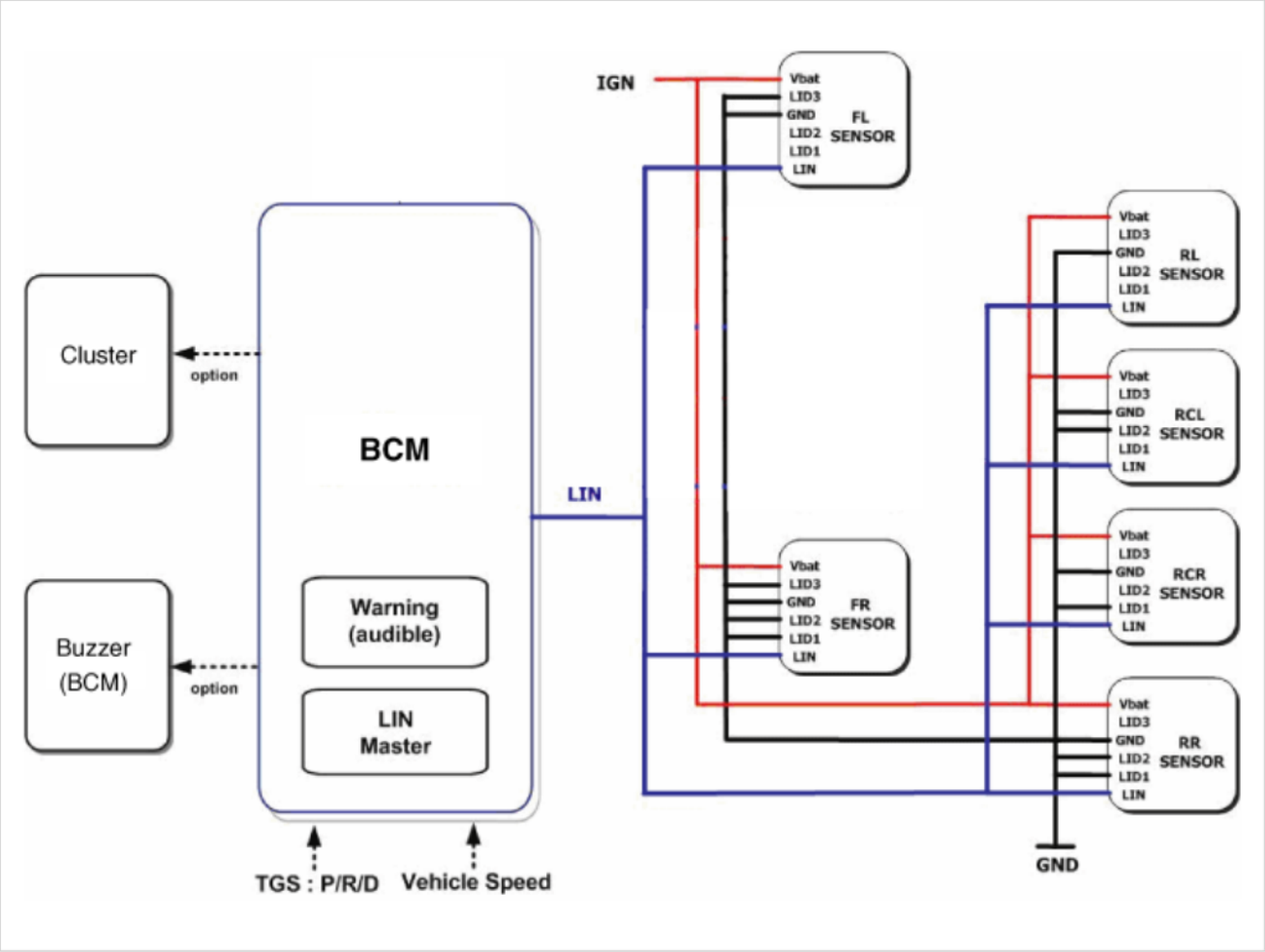
System Overview

PAS(Parking Assist System) is an electronic driving aid device warning driver to be cautious when they park or speed low after detecting an object on side and behind of vehicle by using the feature of ultrasonic waves.

PAS consists of Six(Front:2, Rear:4) PAS sensors which are detecting the obstacles and transmit the result separated into three warning levels, the first, second and third to BCM by Lin communication. BCM decides the alarm level by the transmitted communication message from the slave sensors, then operate the buzzer or transmits the data for display.

System Block Diagram

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System Operation Specification.

1. INIT mode
   (1) System initializing time is 500ms after IGN1+ R Gear.
   (2) RPAS recognizes LID and sets the sensor ID up during initialization.
   (3) RPAS activates each sensor and then executes the diagnosis after finishing initialization of BCM
   (4) R-PAS Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.
   (5) If any failure is received from the any sensors, R-PAS Starting Buzzer" does not work but the failure alarm is operated for a moment.
   If you have display option, warning sign is also shown on it.
   (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.
2. NORMAL Mode
   (1) LIN communication starts and keeps the routine after IGN1 ON+R gear
   (2) BCM send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.
   (3) After initialization, normal mode starts 100ms later after finishing alarm output.
   (4) Alarm for obstacles is divided into 3 levels.
   The first and second are intermittent sound, and the third alarms continuously (Front sensor have second and third alarms.)
   (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

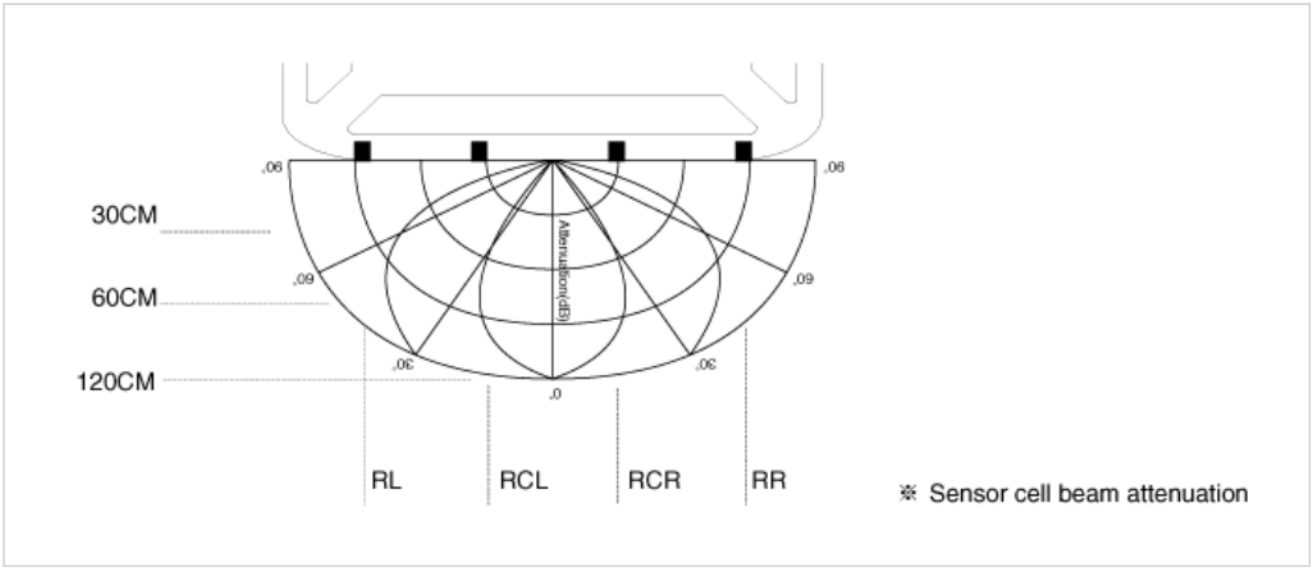
1. Measurement condition - PVC pole (Horizontal : daimeter 75mm, length 1m/ Vertical : daimeter 75mm, length 3m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)

Position	Level	Distance range

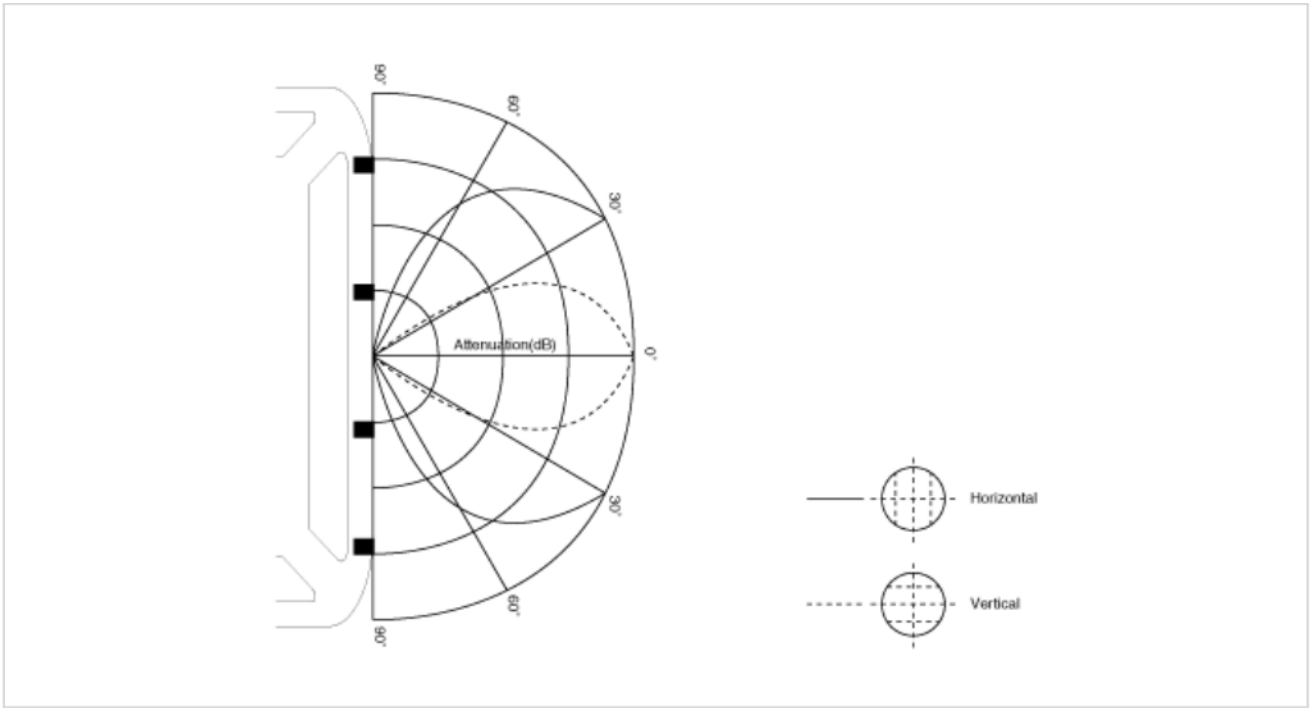
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		cm	inch
Front	2nd	31 ~ 60 (±15)	12.2 ~ 23.6 (±5.9)
	3rd	Less than 30 (±10)	Less than 11.8 (±3.9)
Rear	1st	61 ~120 (±15)	24.0 ~ 47.2 (±5.9)
	2nd	31 ~ 60 (±15)	12.2 ~ 23.6 (±5.9)
	3rd	Less than 30 (±10)	Less than 11.8 (±3.9)

Horizontal Sensing Area



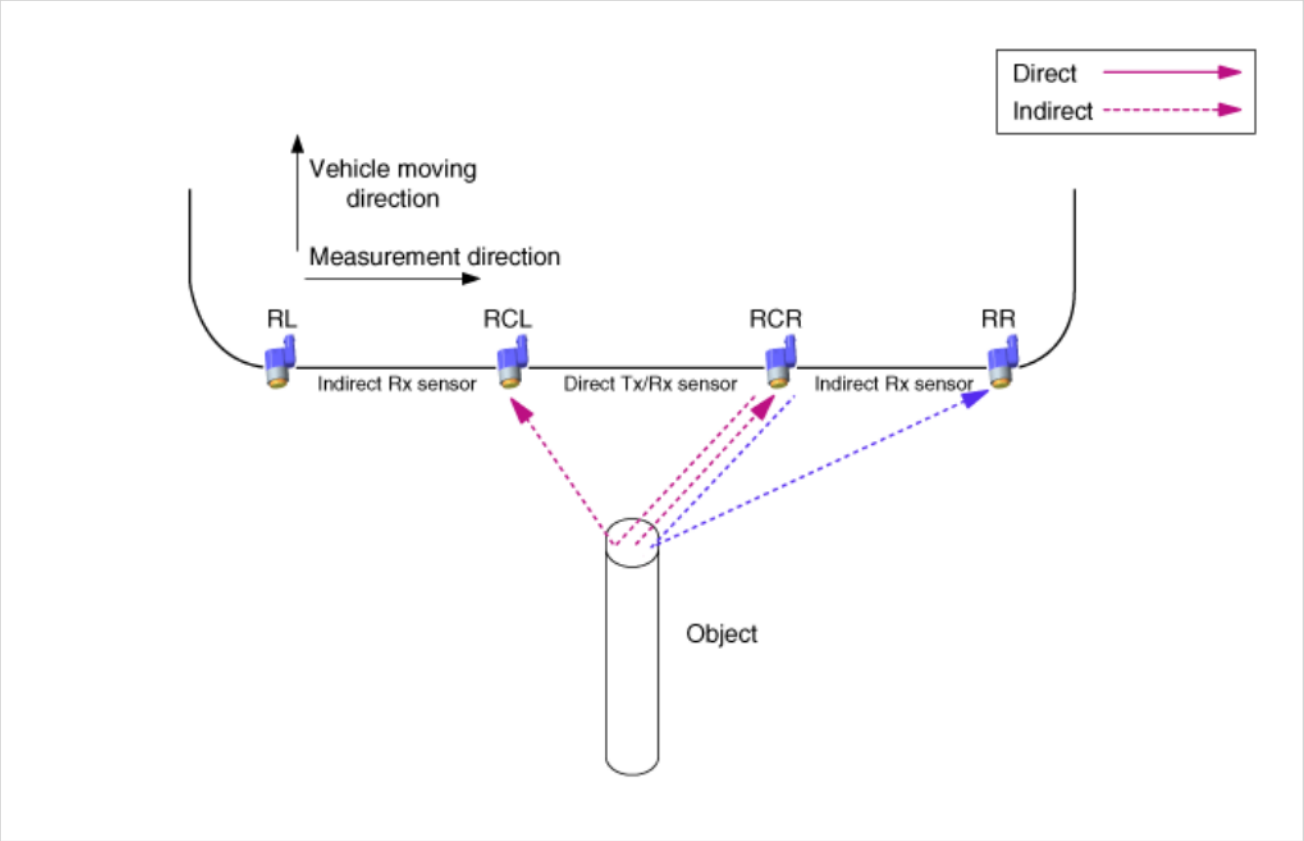
Vertical Sensing Area



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.

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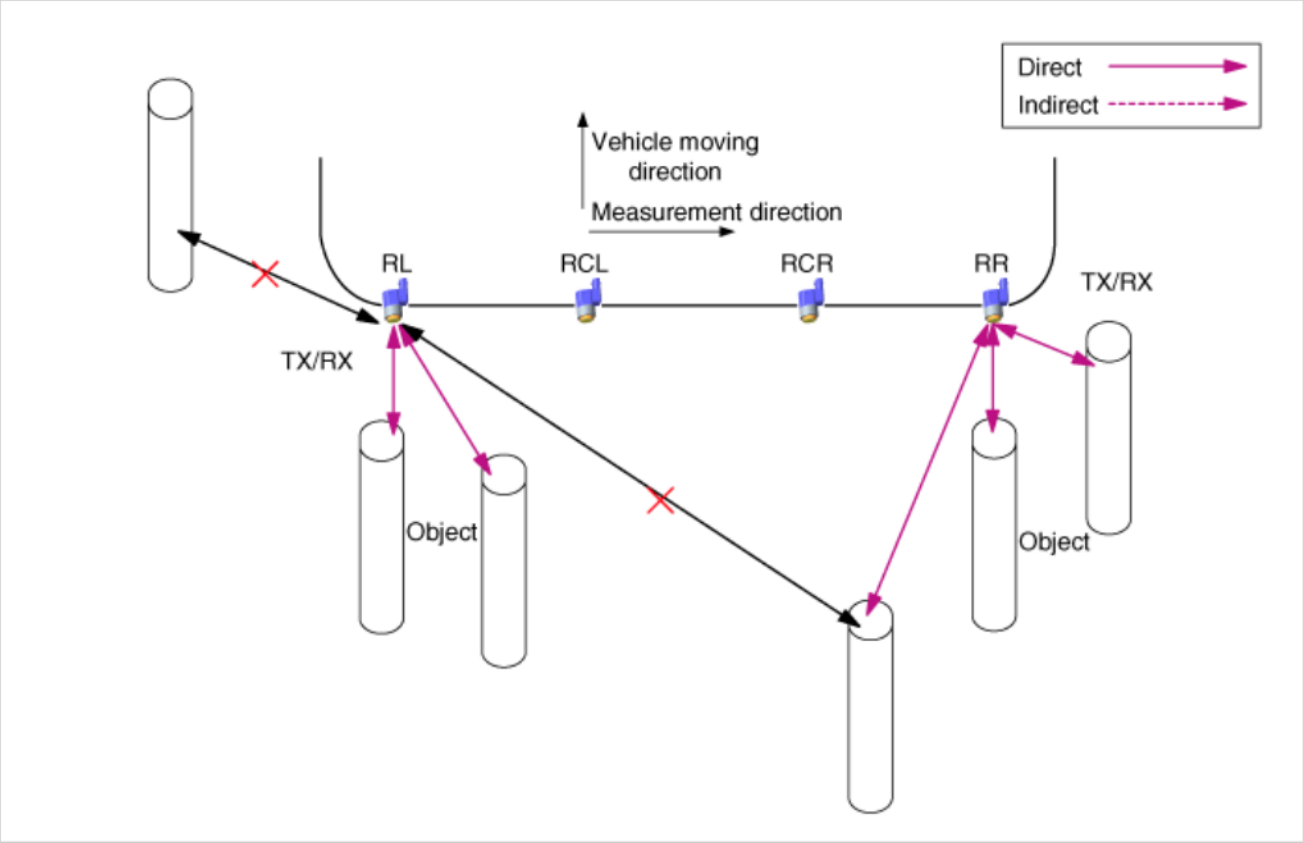


Distance Measurement

Direct Measurement

Transmission and Reception are executed with one sensor (RL, RCL, RCR, RR each sensor execution)

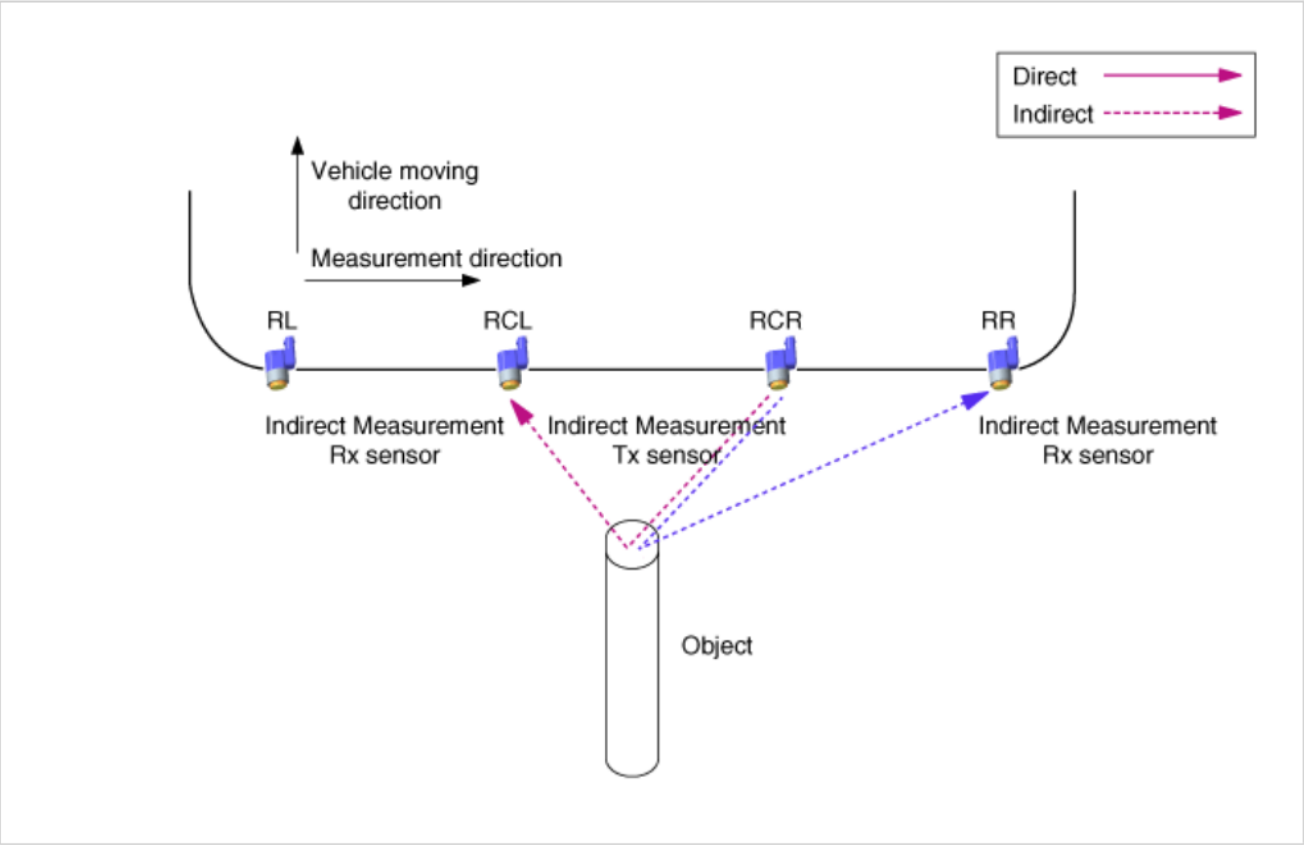
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Indirect Measurement

(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.



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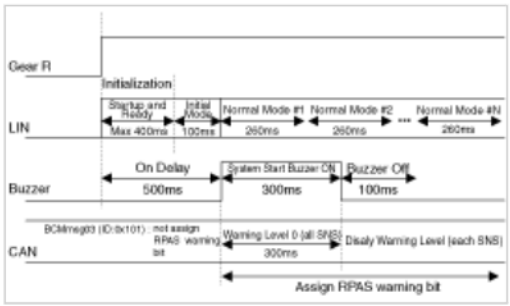
PAS alarm system

When the PAS sensor detects the object, warning is operated by audible alarm device as like buzzer. PAS sensor sends data to BCM with LIN communication and BCM implements audible warning for each PAS SENSOR by priority. And it performs a role of gateway only when it sends visible alarm device such as Cluster.

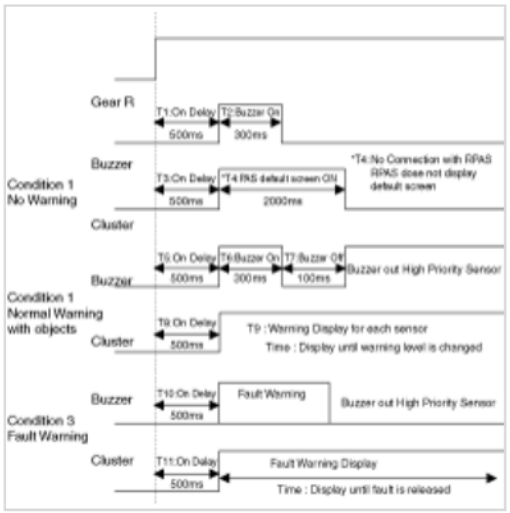
- Sensor buzzer/display information processing method of BCM In case of RL/RR sensor information, the BCM handles each sensor information directly about Display and buzzer output function. Buzzer output of CL/CR sensor, BCM handles center combination information by priority both sensor.

System Operation Spec

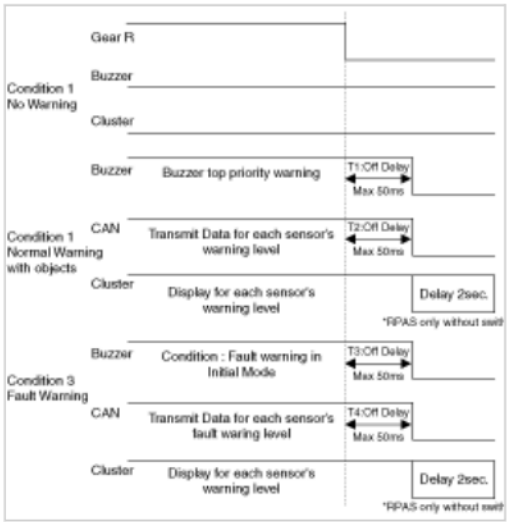
When the system has the power (after IGN ON and R gear), MICOM checks every sensor channel. In case it is not find any error, it sounds 300ms buzzer 500ms afterward. But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. Function for normal mode entrance is as below



With R Gear, system function is as below



With R gear releasing, system function is as below

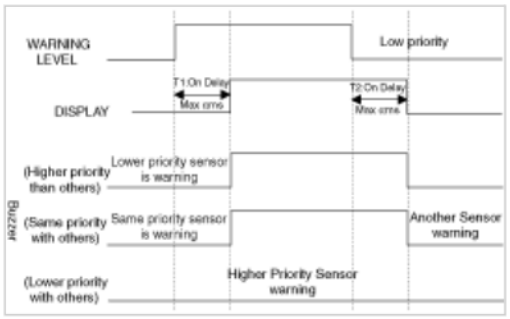


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※acceptable error range on waveform ±10%

Alarm Output Specification classified by distance between sensors

Condition logic according to priority of alarm level is as below. (the identical sensor)



*α value definition

1. low priority sensor off : α = 0ms
2. low priority sensor is 1st warning level : α < 340ms
3. low priority sensor is 2nd warning level : α < 170ms

*β value definition

1. low priority sensor is 1st warning level : β = 1700ms
2. low priority sensor is 2nd warning level : β = 1700ms
3. low priority sensor is 3rd warning level : β = 700ms

Alarm control by sensing distance is as below

1. First warning area (61cm ~ 120cm)



2. Second warning area (31cm ~ 60cm)



3. Third warning area (less than 30cm)



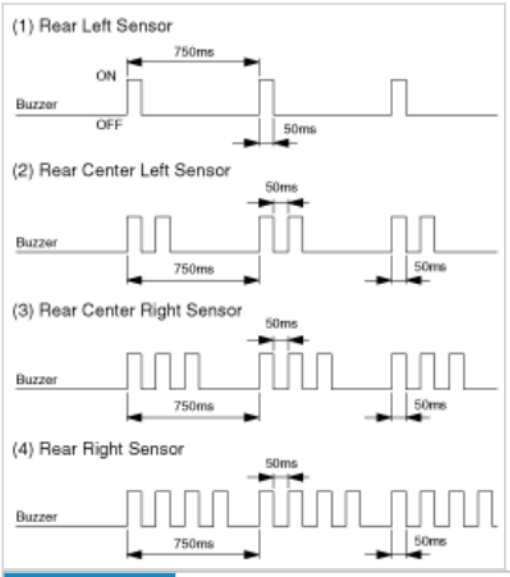
4. Period of fault alarm
   (1) With visible display



   (2) Without visible display

   When the system has error channel in initial time, sensor channel let us know the location of error via hearing device. (Three times for each sensor)

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NOTICE

1. Time tolerance of the above waveform : Time ± 10%
2. At nearer distance than 30cm, detection may not occur.
3. Alarm will be generated with vehicle reversing speed 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.

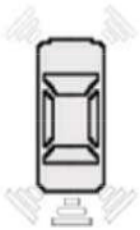
Visible Alarm Indicator Specification.

When the gear is applied to D or R, cluster lights the indicator as below figure.
When the system finds an object, it lights indicator immediately. During sensing an object, if there is no object, it lights indicator that is no alarm status for two seconds and then turns out afterward detecting an object.
(But when it turns third step alarm to No alarm status, it lights third step alarm for two second and turns out.)

Front alarm display

When the system operates, cluster lights the indicator as below figure.
When the system finds an object, it lights indicator immediately.

- Second step : 31~60 cm(12.2~23.6 in)
- Third step : Less than 30 cm(11.8 in)

Alarm level	No alarm	Second step alarm (Lighting) (31~60cm)	Third step alarm (Flickering) (Less than 30cm)
Indicator display			

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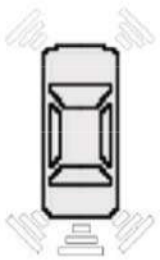
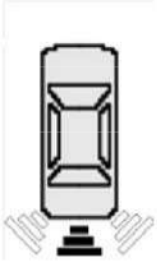
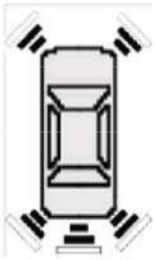
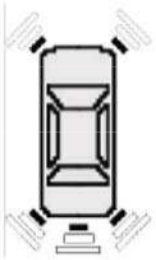
Rear alarm display

When the gear is applied to R, cluster lights the indicator as below figure.

When the system finds an object, it lights indicator immediately. During sensing an object, if there is no object, it lights indicator that is no alarm status for two seconds and then turns out afterward detecting an object.

(But when it turns third step alarm to No alarm status, it lights third step alarm for two second and turns out.)

- First step : 61~120 cm(12.2~23.6 in)
- Second step : 31~60 cm(12.2~23.6 in)
- Third step : Less than 30 cm(11.8 in)

Alarm level	No alarm	First step alarm (Lighting) (61~120cm)	Second step alarm (Lighting) (31~60cm)	Third step alarm (Flickering) (Less than 30cm)
Indicator display				

- It shows only the detecting position of obstacles.
- In third level alarm, indicator flickers at intervals of a second.
- In normal alarm level display, RCR/RCL indicator is combinated by priority.

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 with fault display(cluster).
3. Error in normal mode, fault is only displayed on Cluster without buzzer.

Sensor fault (LIN Msg : 0x08)

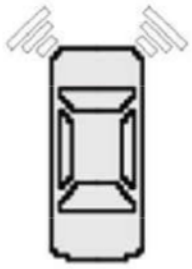
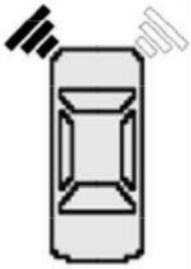
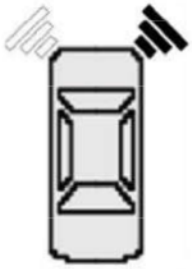
Section	Error recognition condition	Error releasing condition
Initial Routine	Sensor fault Message sensing once	Error is not released in initial mode.
Normal Routine	Sensor fault Message sensing four times in a row	The fault is released when BCM or LIN Master senses LIN BUS ON four times in a row in normal mode

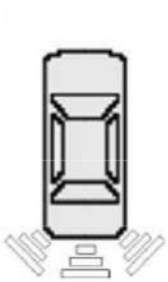
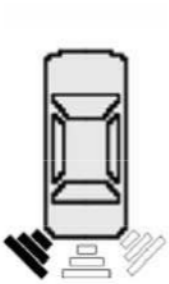
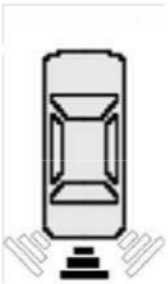
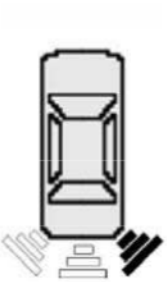
※ In fault display, RCR/RCL indicator is displayed individually

※ 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 with fault display(cluster).
3. Error in normal mode, fault is only displayed on Cluster without buzzer.
4. When the error occurs in direct condition, the sensors sent the same status of error for indirect condition.

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Alarm Level	No alarm/ No fault	FL fault	FR fault
Indicator			

Alarm Level	No alarm/ No fault	RL fault	RC fault	RR fault
Indicator				

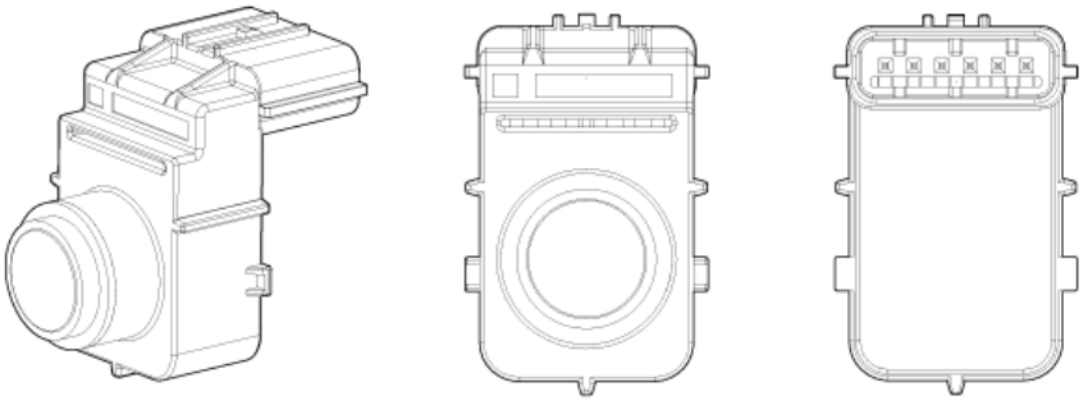
Communication Standard

This section defines the communication between PAS and BCM.
PAS 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.)

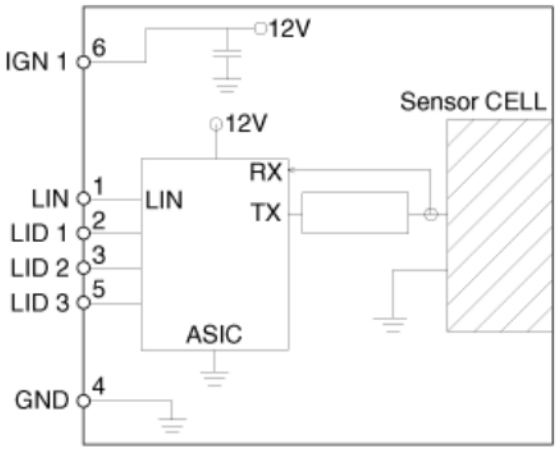
Body Electrical System

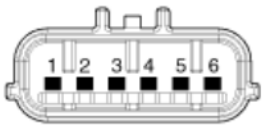
Component

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Circuit Diagram





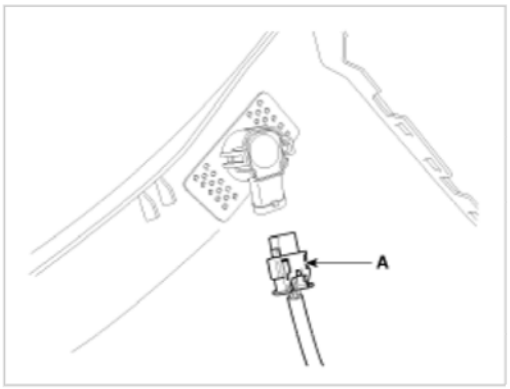
No.	Description
1	LIN
2	LID 1
3	LID 2
4	GND
5	LID 3
6	IGN 1

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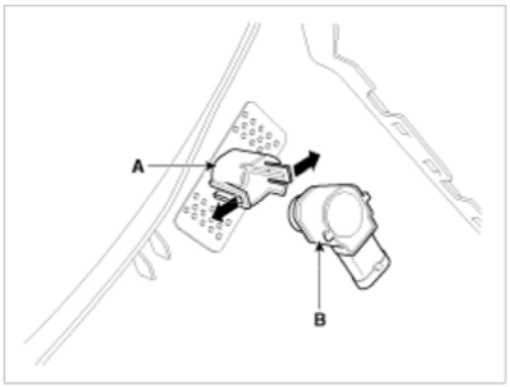
Removal

[Front Bumper]

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover.
   (Refer to Body - "Front Bumper Cover")
3. Disconnect the connector (A) from the ultrasonic sensor.

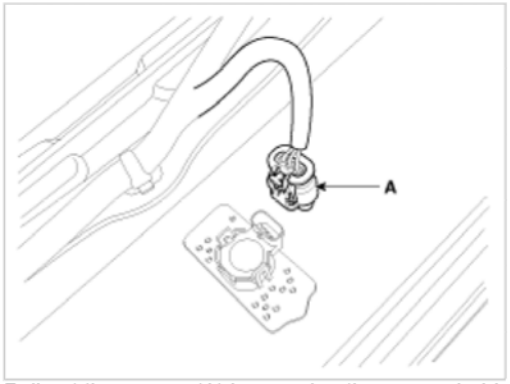


4. Pull out the sensor (A) by opening the sensor holder (B) out.

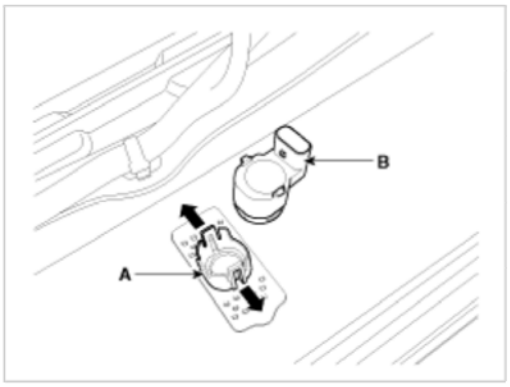


[Rear Bumper]

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper cover.
   (Refer to Body - "Rear Bumper Cover")
3. Disconnect the connector (A) from the ultrasonic sensor.



4. Pull out the sensor (A) by opening the sensor holder (B) out.



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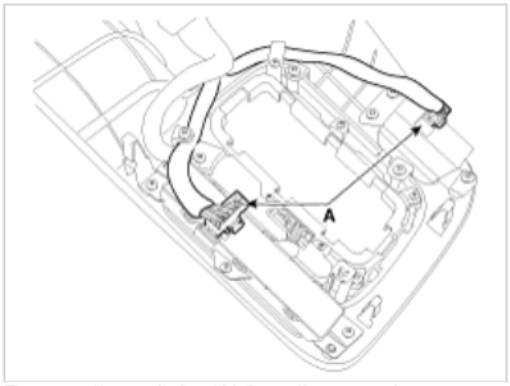
Installation

1. Install the ultrasonic sensor after connecting the connector.
2. Install the front/rear bumper.
3. Connect the negative (-) battery terminal.

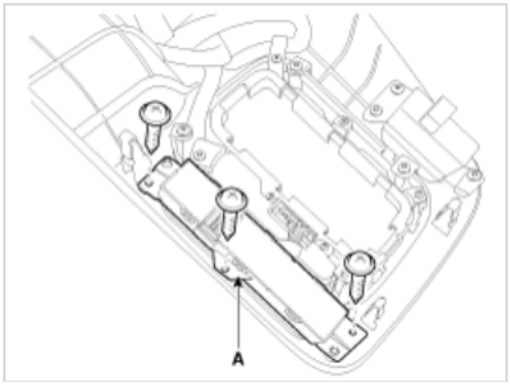
Body Electrical System

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Disconnect the switch connectors (A).



4. Remove the switchs (A) from the console upper cover.



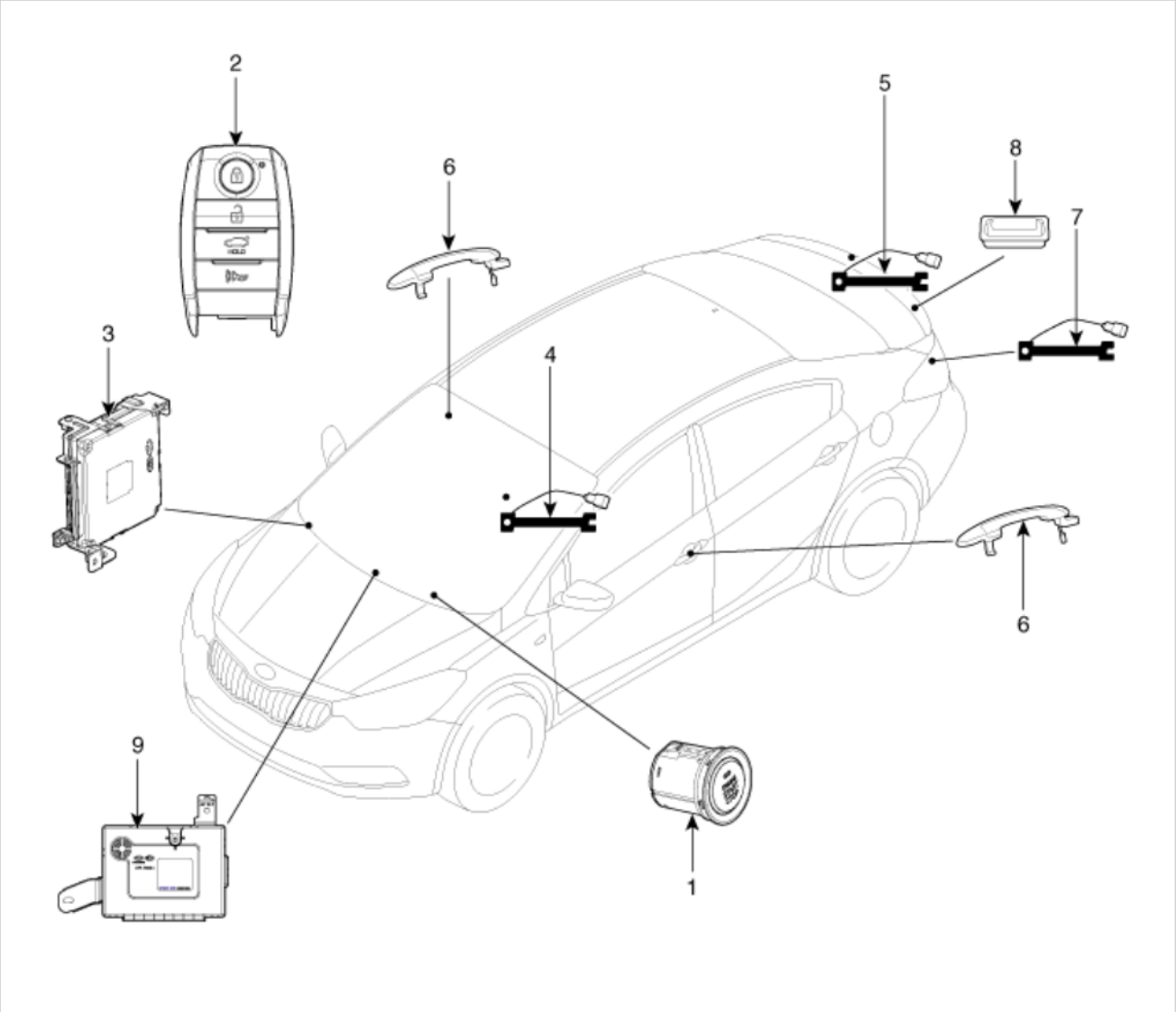
Installation

1. Install the switchs and connect the switch connectors.
2. Insatll the floor console assembly.
3. Connect the negative (-) battery terminal.

Body Electrical System

Component Location

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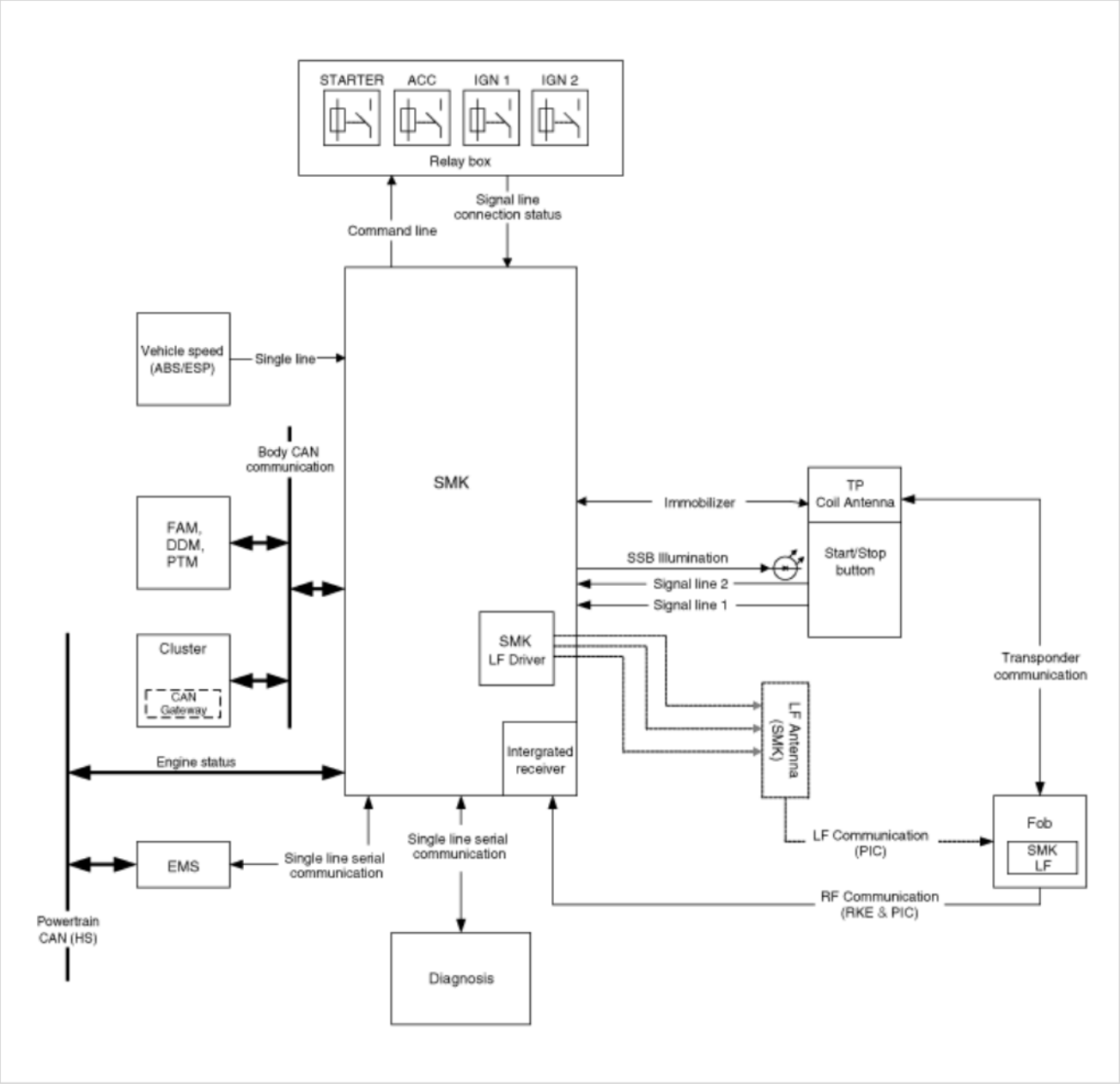


1. Start Stop Button(SSB)	6. Door handle & door antenna
2. FOB key	7. Bumper antenna
3. Smart key unit	8. Trunk lid open switch
4. Interior antenna	9. BCM (Body Control Module)
5. Trunk antenna	

Body Electrical System

Circuit Diagram

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Body Electrical System

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.
- Steering column locking with an ESCL device; Monitoring of the vehicle status to insure safe activation of the ESCL.
- Indication of vehicle status through LCD or explicit messages on display.
- Immobilizer function by LF transponder communication between fob and start/stop button.
- 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.

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System Main Function

- Steering column locking/unlocking with ESCL.
- 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.

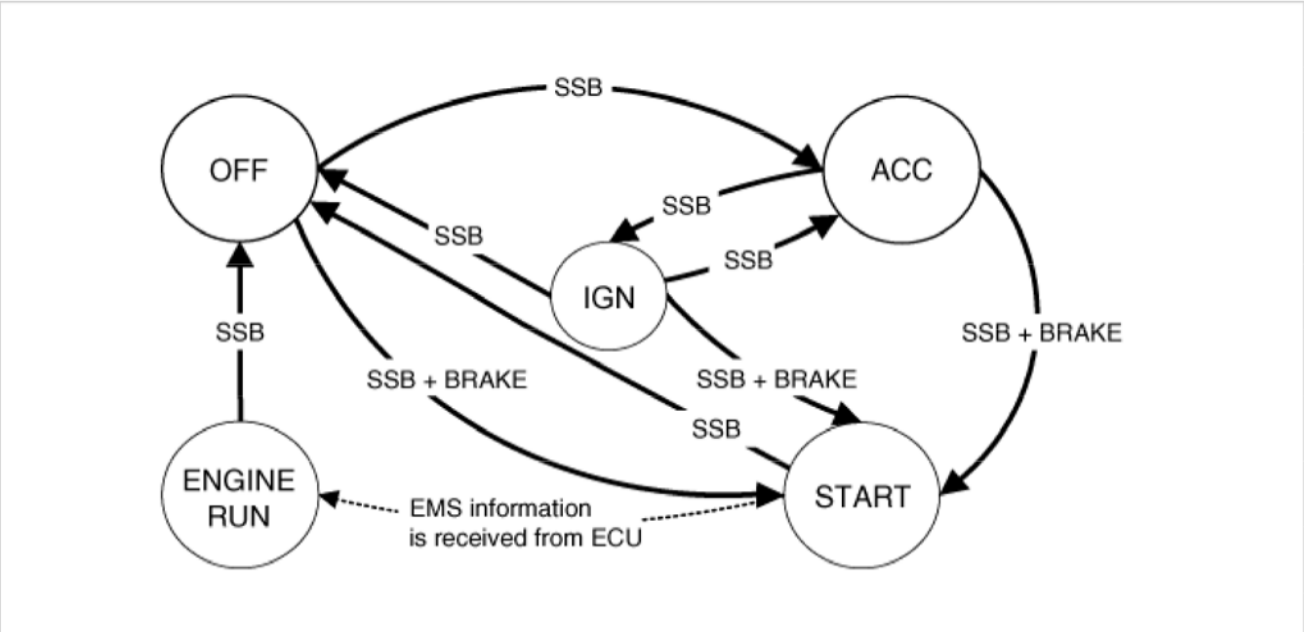
If the driver press the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the locking/unlocking of the steering column, the control of the terminal, and the cranking of the engine.

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 push the start / stop button.



- Control Ignition and engine ON/OFF by Sending signal to IPM.
- Display status by LED Lamp ON/OFF. (Amber or Blue)

Indicator ON/OFF Condition At Ignition Key Off Condition

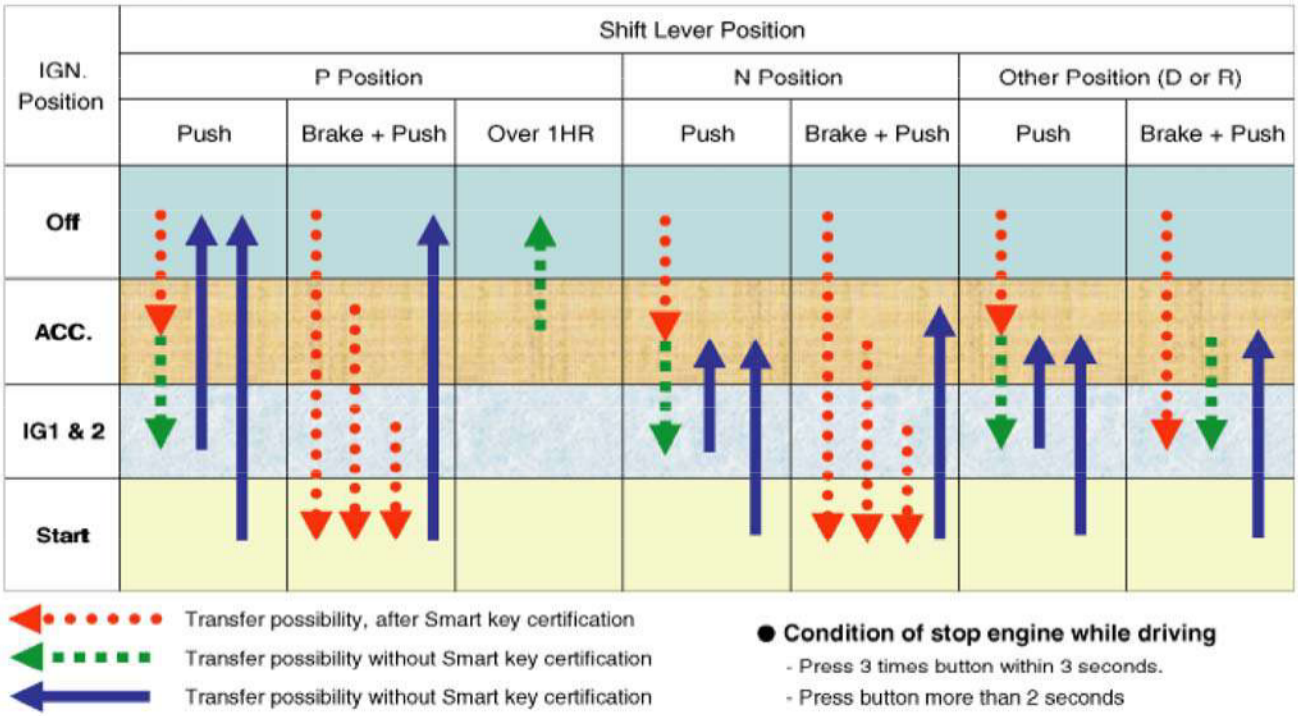
No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

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)	Blue color LED ON
4	Cranking	Maintain LED status before cranking
5	Engine running	LED OFF

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The shift of Ignition Position



Wireless Communication

Electromagnetic waves are used to exchange information between the vehicle and the FOB. Two types of RKE Key can supplement the BES system:

- Non-smart key RKE
- SMART KEY FOB

Currently the BES system comprises with SMART KEY FOB always.

The transmitter, receiver and antennas required for the communication between the fob and the vehicle will differ depending on functionalities and regional areas.

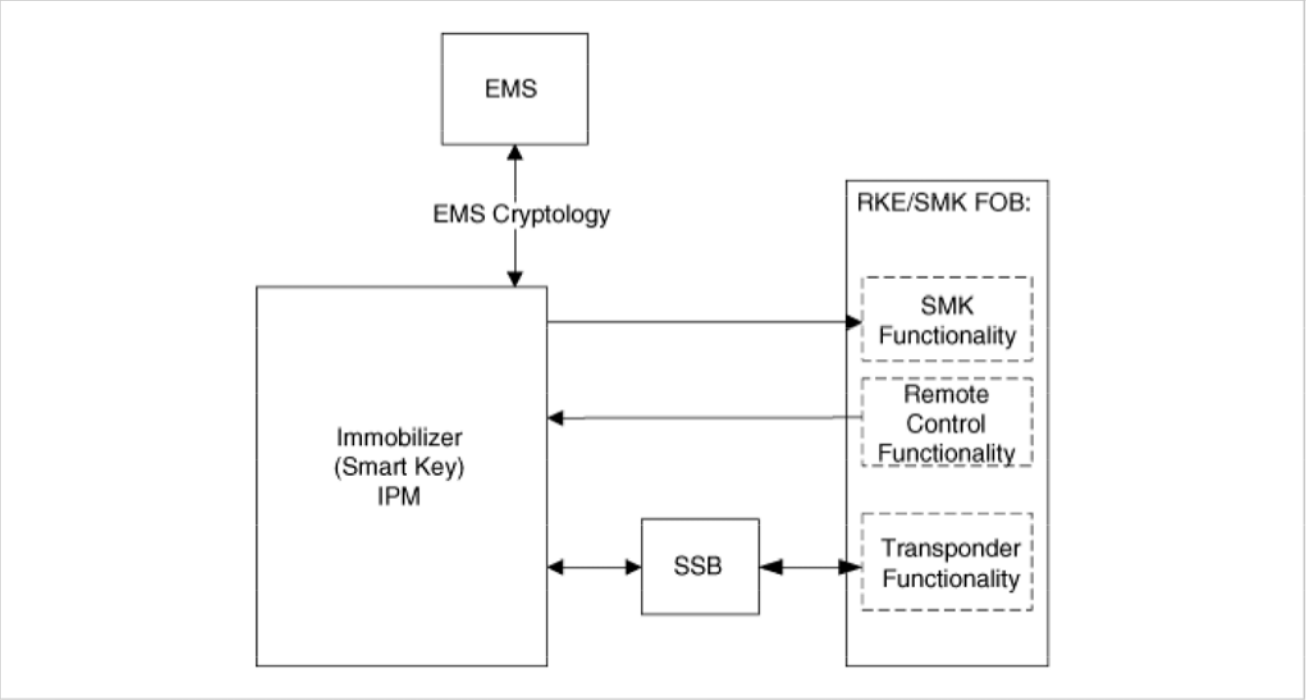
The RKE and SMART KEY functions are in separated documents. Refer to Smart key system for more detailed information about SMART KEY function.

Smart Key

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 .

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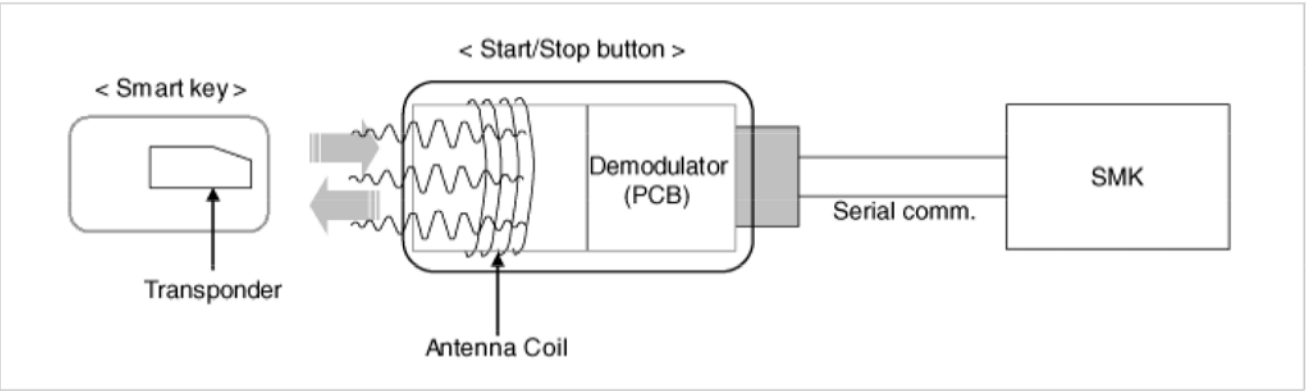
The unit behaves as Master role in the whole system.

In case of SMART KEY application, for example “Passive Access”, “Passive Locking” and “Passive Authorization are integrated for ESCL/Terminal switching Operations”.

It collects information about vehicle status from other modules (vehicle speed, alarm status, driver door open...), read the inputs (e.g. SSB, Lock Button and 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.

Transponder



Terminal And Starter Relays

Relays will be used to switch the terminals ACC / IGN1 / IGN2. Those normally-open relays will be driven by the SMK unit and located either in the passenger or engine compartment depending on the vehicle architecture.

Only one relay coil is connected to the terminal outputs of the SMK unit.

Those relays should integrate a resistor connected in parallel to the coil in order to reduce the transients during commutation.

Start/Stop Button(SSB)

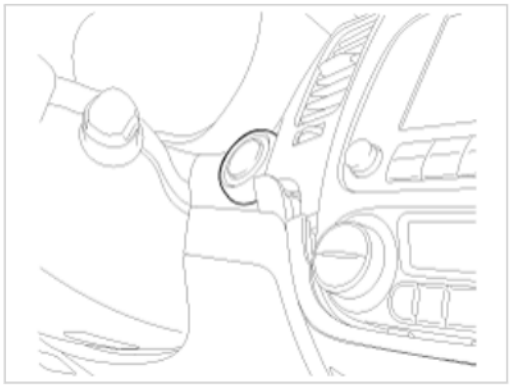
A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes ‘Off’, ’Accessory’, ‘Ignition’ and 'Start' by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.

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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 System State Chart

System STATES in LEARNT MODE

In learnt mode, the BES System can be set in 6 different sates, depending on the status of the terminals, ESCL and Engine status:

System State	Terminal Status	ESCL Status	Engine status
1. OFF - Locked	OFF	Locked	Stopped
2. OFF - Unlocked	OFF	Unlocked	Stopped
3. ACC	ACC	Unlocked	Stopped
4. IGN	IGN1, IGN2, ACC	Unlocked	Stopped
5. Start	IGN1, Start	Unlocked	Cranking
6. IGN - Engine	IGN1, IGN2, ACC	Unlocked	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

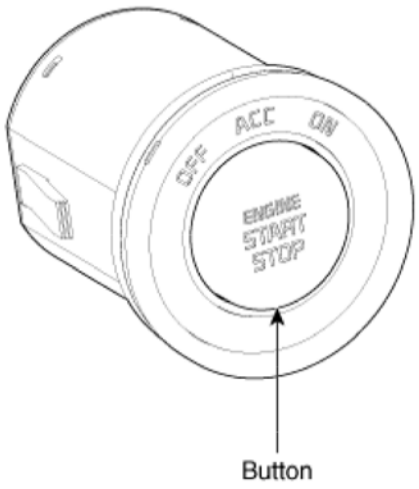
The BES System can be set in 5 different states (OFF LOCKED is not available in virgin mode), depending on the status of the terminals, ESCL and Engine status:

System State	Terminal Status	ESCL Status	Engine status
1. OFF - UNLOCKED	OFF	Unlocked	Stopped
2. ACC	ACC	Unlocked	Stopped
3. IGN	IGN1, IGN2, ACC	Unlocked	Stopped
4. Start	IGN1, START with special pattern of activation see Chap 6.2.1 for details	Unlocked	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Unlocked	Running (means "self-running")

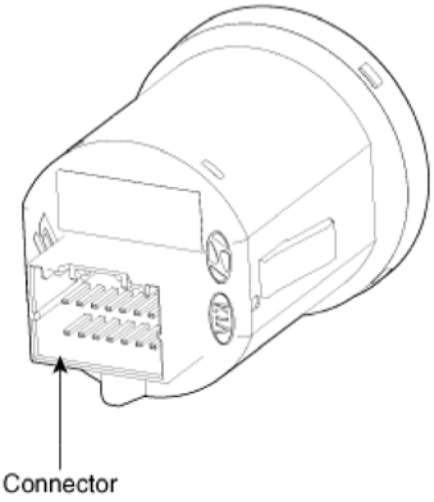
Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch. The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

Component

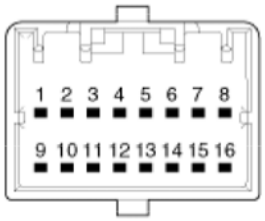
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Button



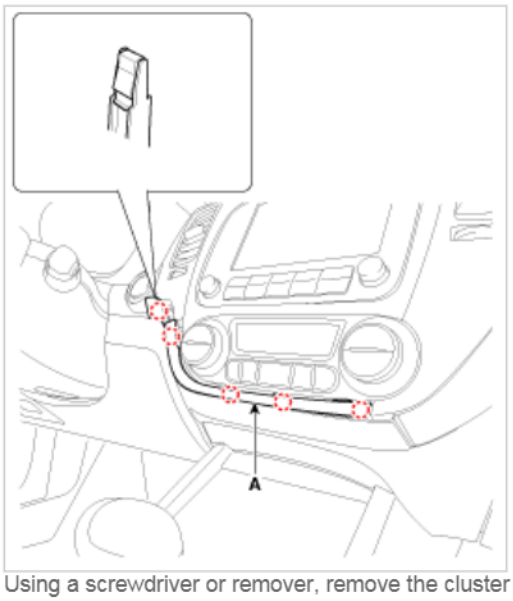
Connector

Connector (16 pin)			
No.	**Description**	**No.**	**Description**
1	-	9	Antenna 1
2	Switch1	10	Antenna 2
3	Switch2	11	-
4	-	12	OFF (White)
5	Immumination (-)	13	Ground
6	-	14	Illumination ground
7	-	15	ACC (Orange)
8	Illumination (+)	16	IG ON (Green)

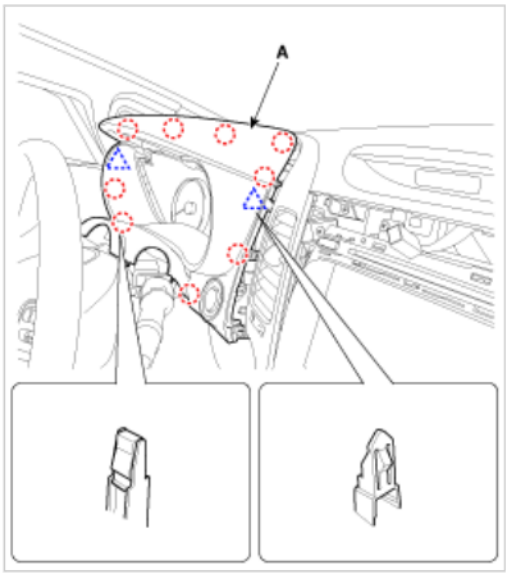
Removal

1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, remove the center garnish [LH] (A).

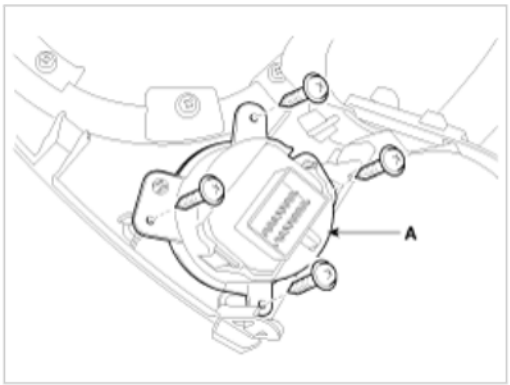
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3. Using a screwdriver or remover, remove the cluster fascia panel (A).



4. Remove the start/stop button (A) after loosening the screws from the cluster fascia panel.



Installation

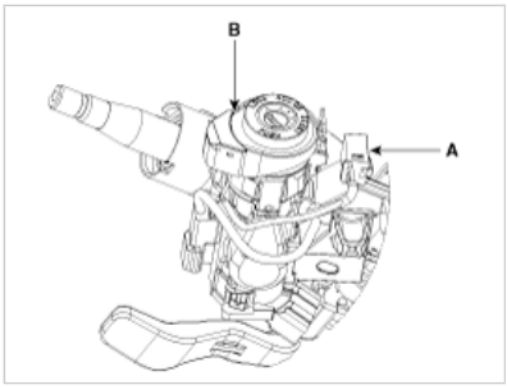
1. Install the start/stop button.
2. Connect the start/stop button connector.
3. Install the cluster fascia panel and center garnish.

Body Electrical System

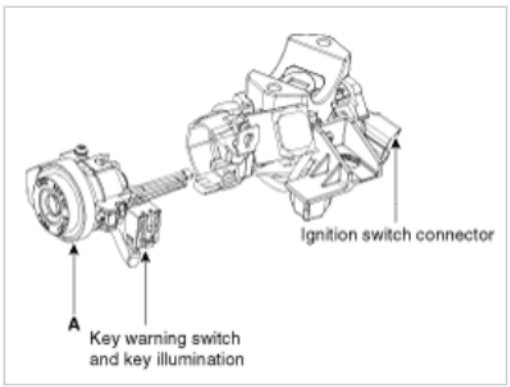
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Low Panal")
3. Remove the steering column upper and lower shrouds.
   (Refer to Body - "Steering Column Shroud Panel")
4. Remove the wiper switch.
   (Refer to "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 and key Illumination (B).
8. Pushing lock pin with key ACC.
9. Remove the key lock cylinder (A).



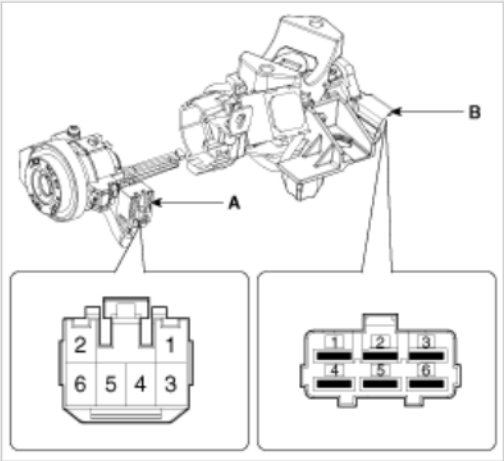
Installation

1. Install the key lock cylinder.
2. Install the key warning switch and key Illumination.
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.

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2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

Position \ Terminal	Key	Ignition switch (B) 5 (B1)	6 (ACC)	4 (IGN1)	1 (B2)	2 (IGN2)	3 (ST)	Key warning switch (A) 5	6
LOCK	Removal								
	Insert								
ACC		○	○						
ON		○	○	○	○	○		○	○
START		○		○	○		○		

Body Electrical System

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.

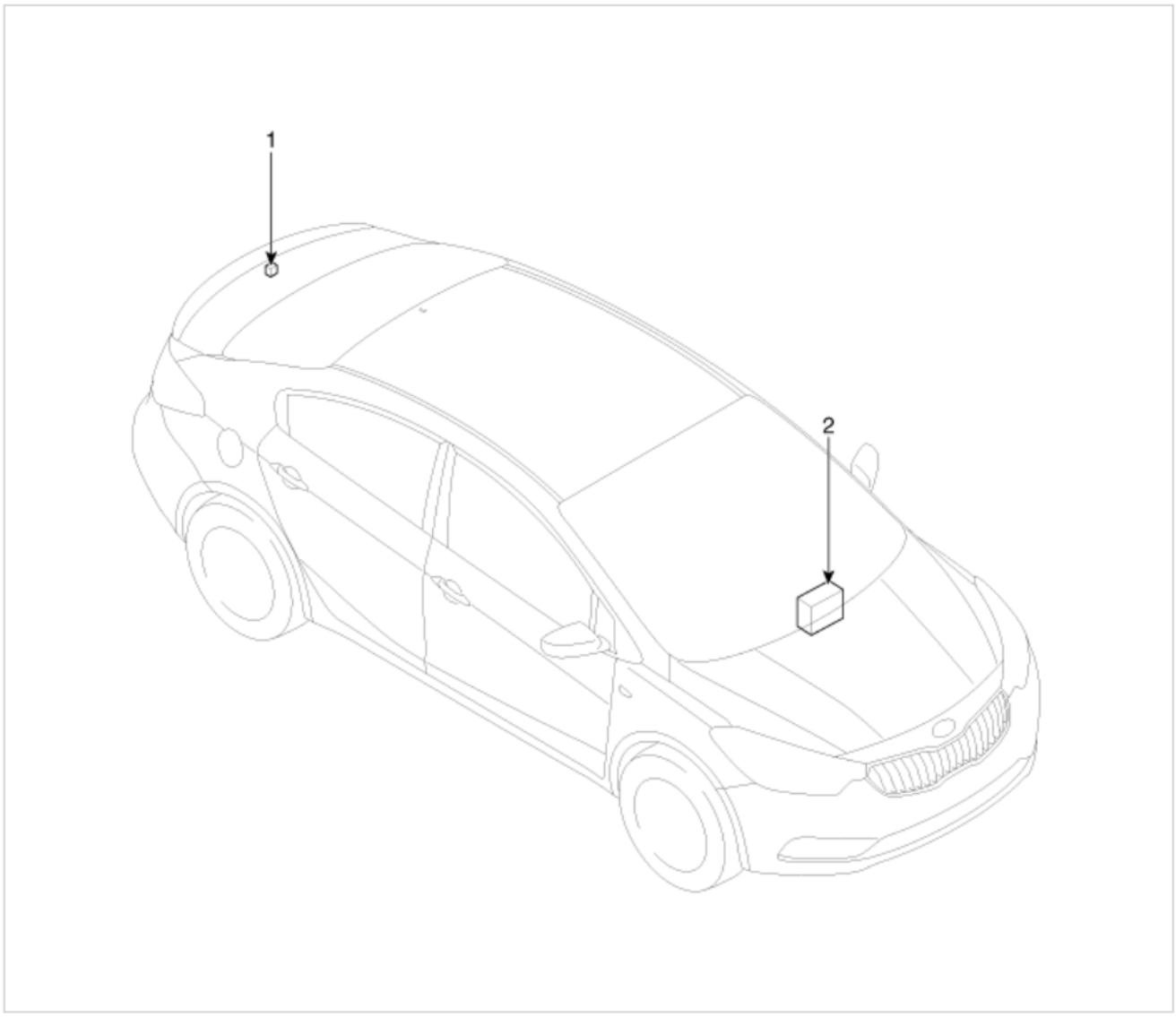
⚠ WARNING

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

Component Location

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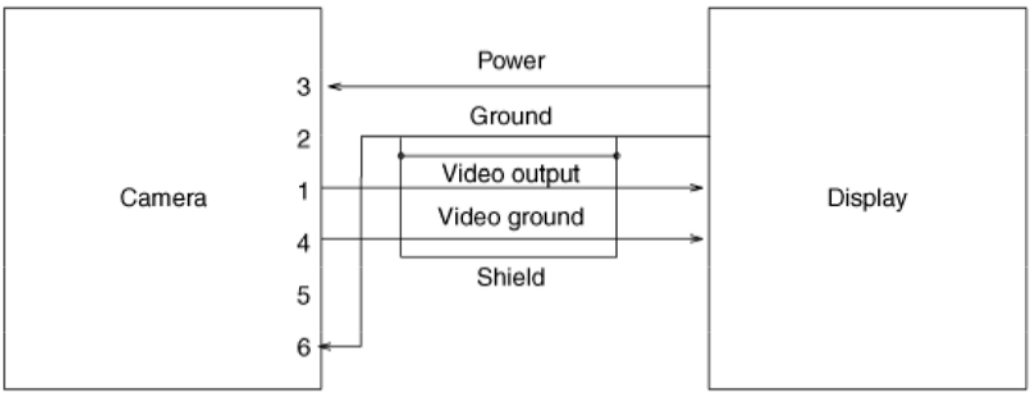


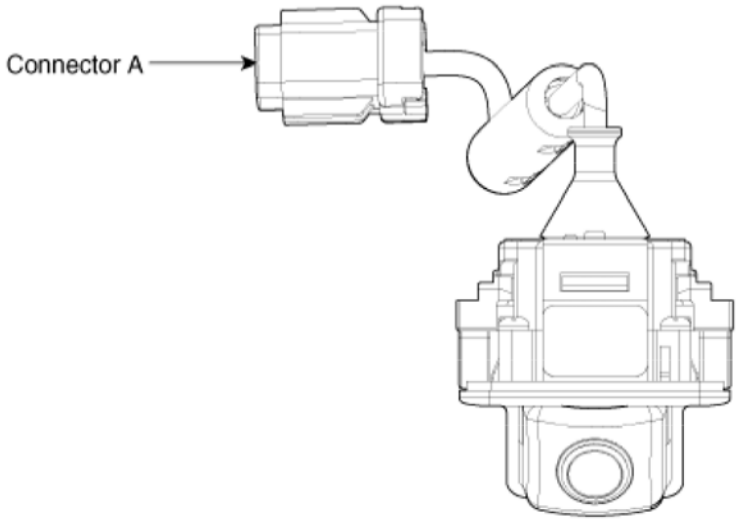
1. Back view camera
2. Audio head unit monitor

Body Electrical System

Circuit Diagram

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Connector A	No.	Description
	1	Video output
	2	-
	3	Power
	4	Video ground
	5	-
	6	Ground

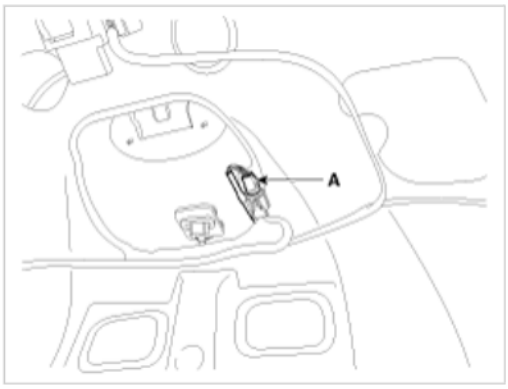
Removal

Back View Camera

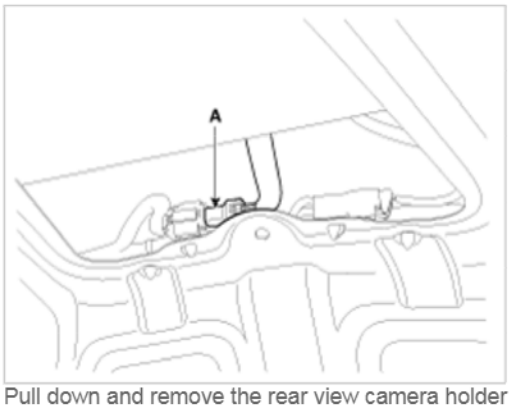
1. Disconnect the negative(-) battery terminal.
2. Open the trunk and remove the trunk lid trim.
   (Refer to Body - "Trunk Lid Trim")
3. Disconnect the rear view camera connector (A).

[2 Door]

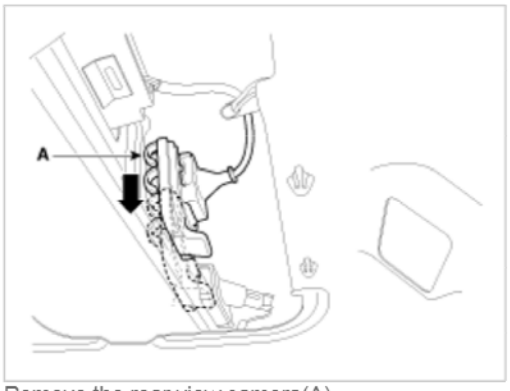
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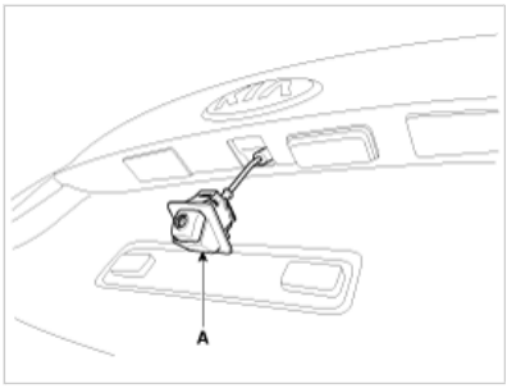
[4 Door]



4. Pull down and remove the rear view camera holder (A).



5. Remove the rear view camera(A).



Installation

1. Fix the rear view camera with the rear view camera holder.
2. Connect the rear view camera connector.

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3. Install the trunk door trim.

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