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")

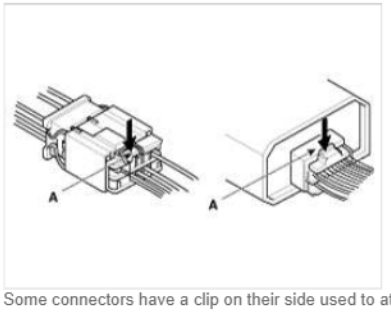
NOTICE

- 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.

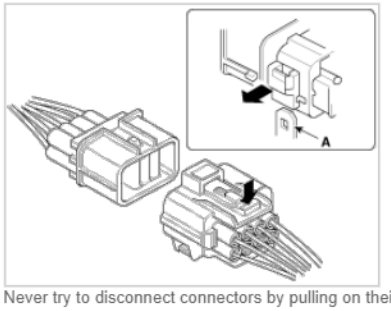
3. Check the alternator belt tension.

Handling Connectors

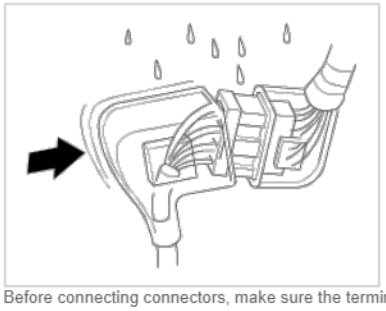
1. Make sure the connectors are clean and have no loose wire terminals.
2. Make sure multiple cavity connectors are packed with grease (except watertight connectors).
3. All connectors have push-down release type locks (A).



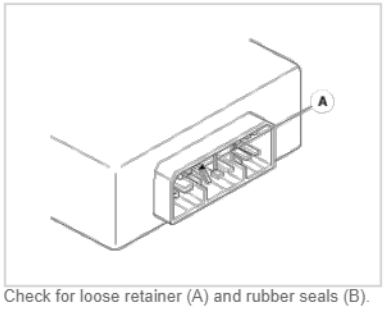
4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).



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

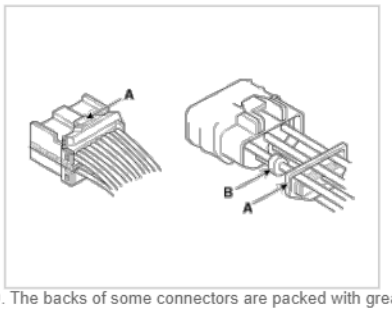


8. Before connecting connectors, make sure the terminals (A) are in place and not bent.

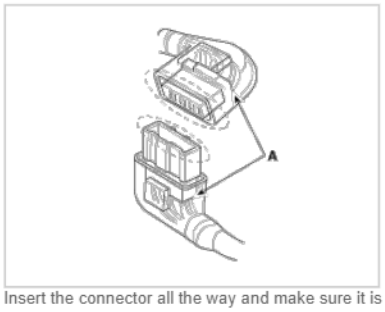


9. Check for loose retainer (A) and rubber seals (B).

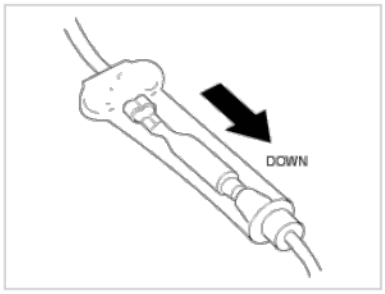
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10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.

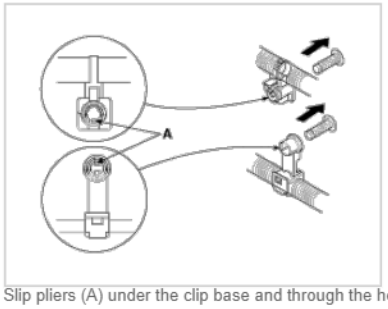


11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.

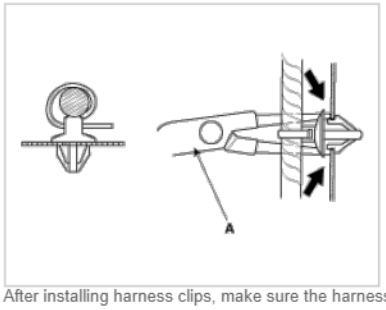


Handling Wires And Harnesses

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

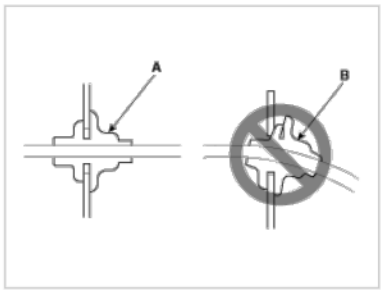


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



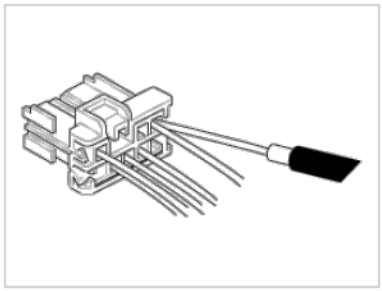
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.
6. Seat grommets in their grooves properly (A). Do not leave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

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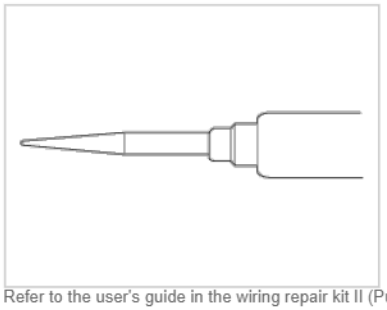


Testing And Repairs

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

Battery Reset

Description

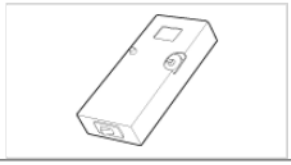
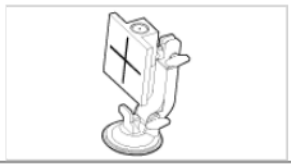
When reconnecting the battery cable after disconnecting, recharging battery after discharged or installing the memory fuse located on the driver's side panel after removing, be sure to reset systems mentioned on the below table.
In addition, when replacing or reinstalling their fuses after removing,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

System	Resetting
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.
Panoramaroof	Whenever the vehicle battery is disconnected or discharged, or related fuse isblown, you must reset your panoramaroof system as follows :

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	1. Turn the ignition switch to the ON position and close the panoramaroof glass and sunshade completely. 2. Release the control lever. 3. Push the panoramaroof control lever forward in the direction of close (about 10 seconds) until the panoramaroof moves a little. Then, release the lever. 4. Push the panoramaroof control lever forward in the direction of close until the sunroof operates as follows : SUNSHADE OPEN → TILT OPEN → SLIDE OPEN → SLIDE CLOSE → SUNSHADE CLOSE Then, release the control lever. When this is complete, the panoramaroof system is reset.
Trip computer	When the battery is disconnected and reconnected, the set functions of the trip computer become initialized. So, you need to explain this information to the customer.
Clock	Whenever the battery terminals or related fuses are disconnected, you must reset the time. (Refer to 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

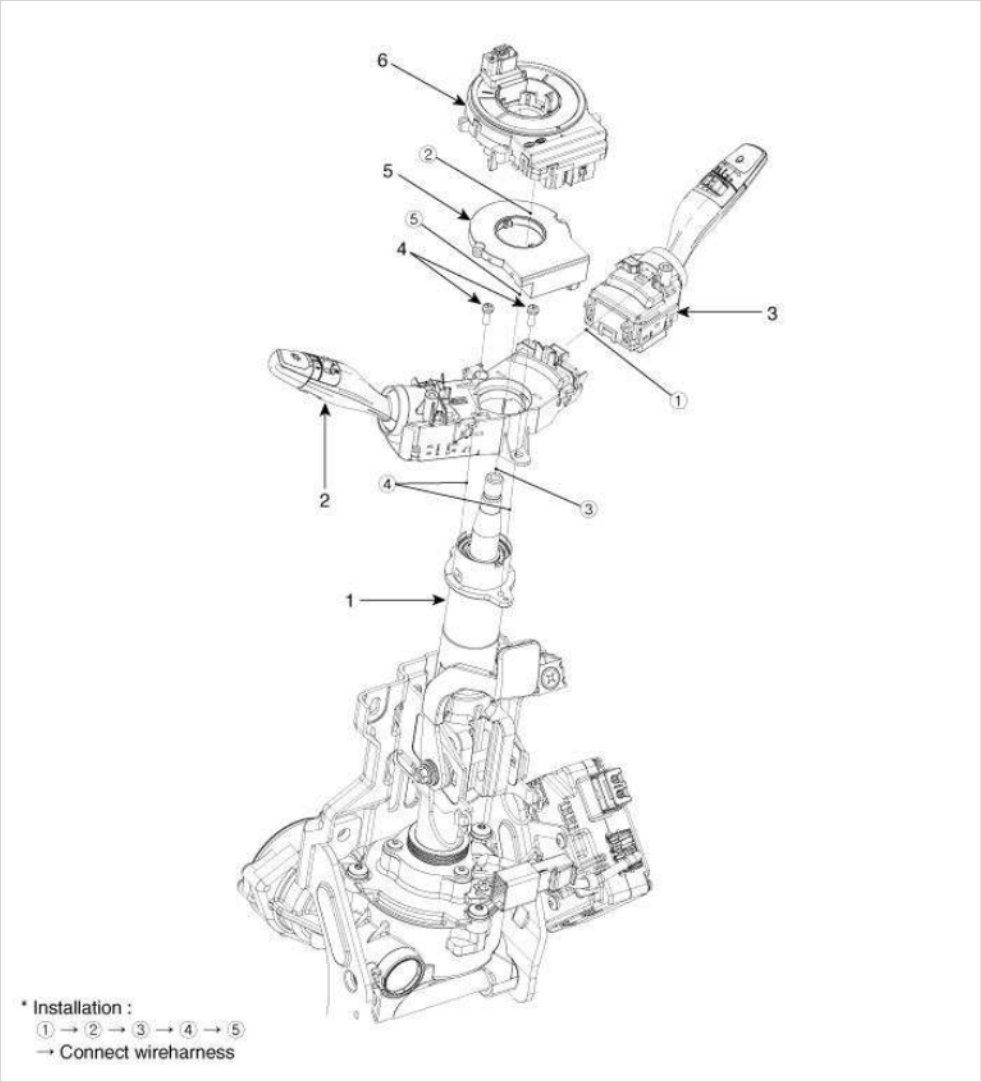
Tool (Number and Name)	Illustration	Application
RKE Battery Checker (09954-2P100)		Measuring the RKE battery voltage
Correction jig of LDWS (09890-3N100)		Correction of LDWS (Lane Departure Warning System)

Specifications

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-30°C ~ +80°C (-22 ~ +176°F)
Rated load	Dimmer & passing switch	High : 0.2A (Relay load) Low : 0.2A (Relay load) Passing : 0.2A (Relay load)
	Lighting switch / Auto lighting switch	Lighting : 0.2A (Relay load)
	Turn signal & lane change switch	6.6 A
	Front & rear fog lamp switch	0.2A (Relay load)
	Wiper & mist switch	Low, High : 4.5A (Motor load) Auto : 0.22 ± 0.05A (Relay load) Lock : Max. 28A (Motor load)
	Washer switch	4A (Motor load)
	Variable intermittent volume switch	Max. 25mA

Component (1)

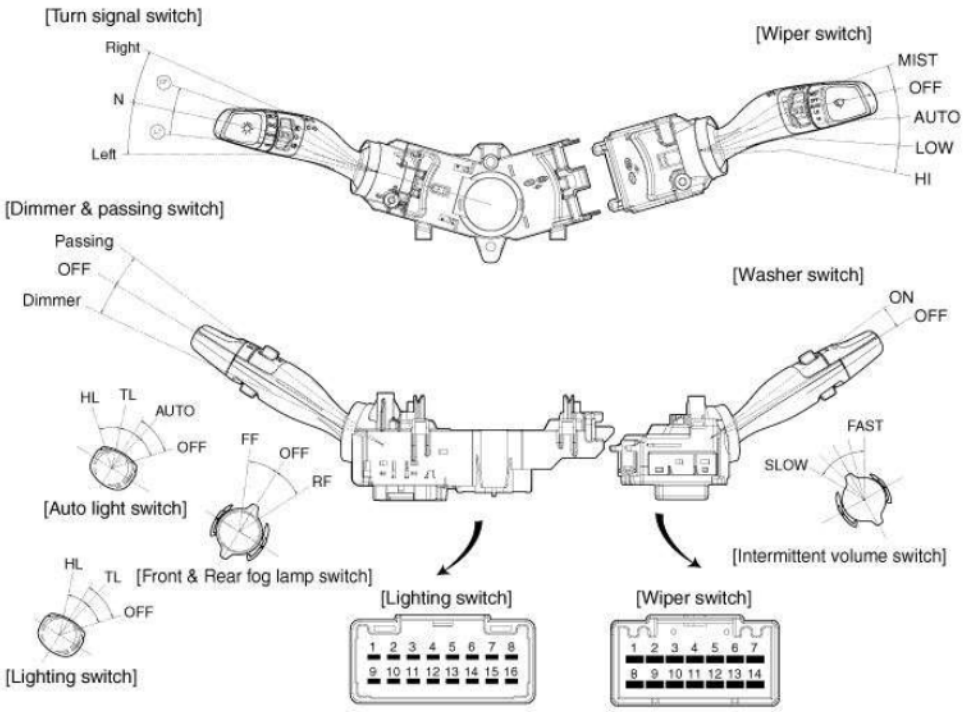
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1. Steering column	4. Screw
2. Lighting switch	5. Steering angle sensor
3. Wiper switch	6. Clock spring

Component (2)

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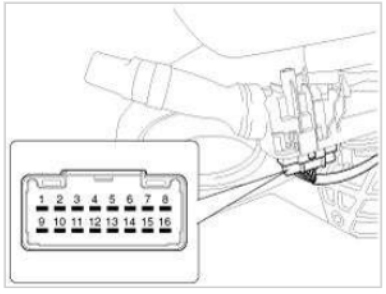


Connector	Pin No.	Name	Connector	Pin No.	Name
Lighting (16 pin) - LH side	1	Passing circuit	Wiper & washer (14 pin) - RH side	1	-
	2	Head lamp low beam		2	-
	3	Head lamp high beam		3	Front washer switch
	4	Dimmer switch base		4	IGN - Front washer & wiper
	5	Dimmer & passing ground		5	Wiper high speed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

Inspection

Lighting Switch Inspection

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



Lighting Switch (Auto Light)

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Terminal / Position	12	14	15	16
OFF				
AUTO	○	○		
Tail	○		○	
Head lamp	○		○	○

Lighting Switch

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

Dimmer And Passing Switch

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

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

Turn Signal Switch

Hazard switch / Terminal — Trun signal switch	7	8	6
OFF — L	○	○	
OFF — N			
OFF — R	○		○

Front Fog Lamp Switch

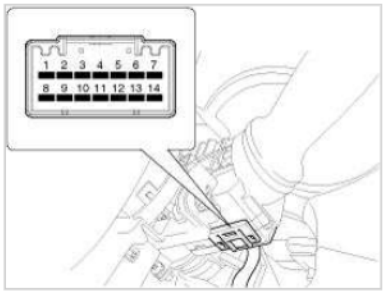
Terminal / Position	10	11
OFF		
ON	○	○

Front & Rear Fog Lamp Switch

Terminal / Position	10	11	12
OFF			
Front	○	○	
Rear	○	○	○

Wiper And Washer Switch Inspection

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



Wiper Switch

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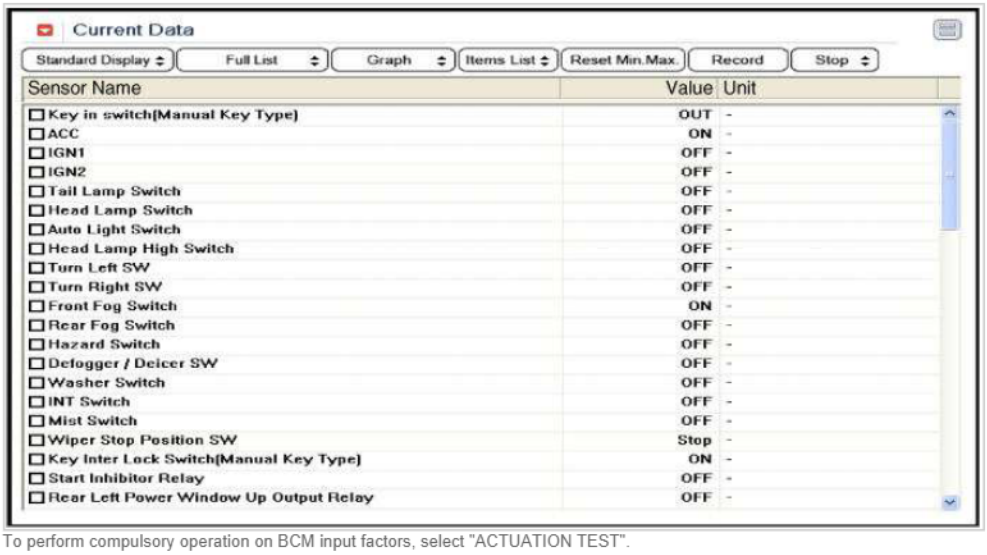
Position \ Terminal	13	5	14	6	4	7	9	11
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○		○	○	○
LOW	○				○			
HI		○			○			

Washer Switch

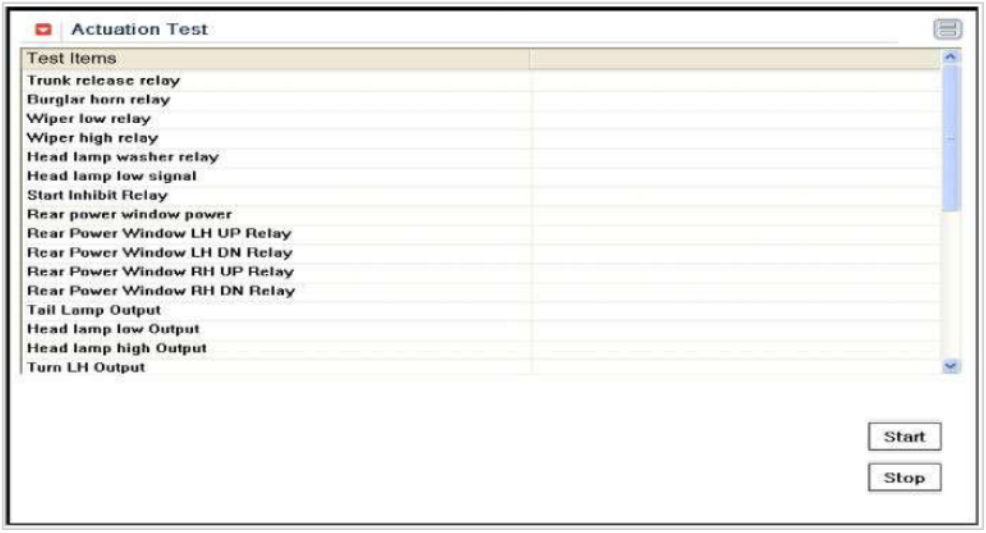
Position \ Terminal	3	4
OFF		
ON	○	○

Inspection (With GDS)

1. Check BCM input/output specification of multifunction switch using the GDS. If the specification is abnormal, replace the lamp or wiper switch.
2. If diagnosis is required on the multifunction switch, select model and "IPM".
3. 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.



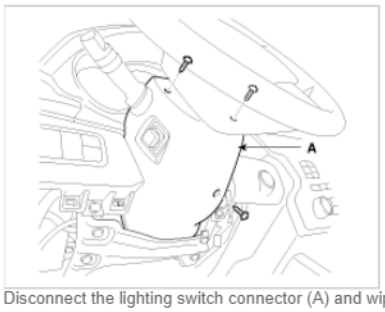
4. To perform compulsory operation on BCM input factors, select "ACTUATION TEST".



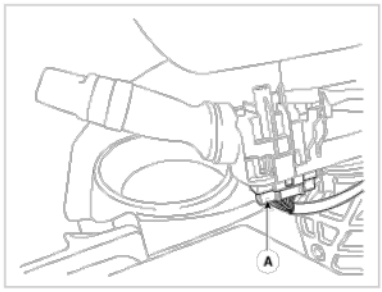
Removal

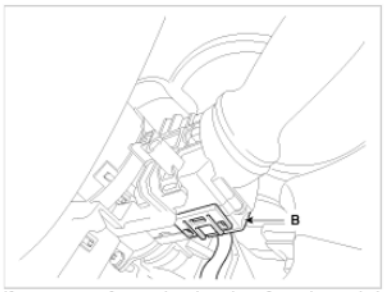
1. Remove the steering column upper and lower shrouds after removing 3 screws.

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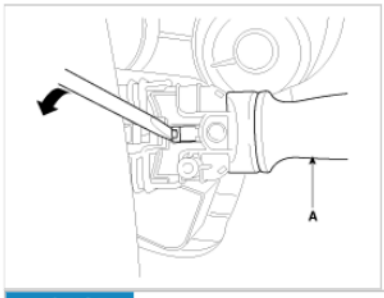


2. Disconnect the lighting switch connector (A) and wiper & washer switch connector (B).





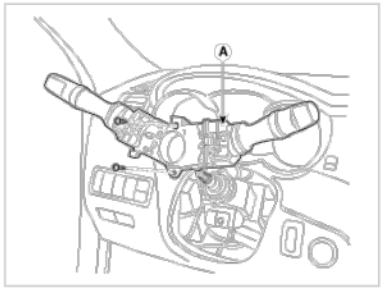
3. If necessary of removing the wiper & washer switch (A), release the lock of wiper switch using tool without removing the steering wheel and the clock spring.



NOTICE

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

4. Remove the steering wheel.
   (Refer to Steering System - "Steering Column & Shaft")
5. Remove the clock spring.
   (Refer to Restraint - "Airbag Module")
6. Remove the multifunction switch assembly (A) after loosening the mounting screws (2EA).



Installation

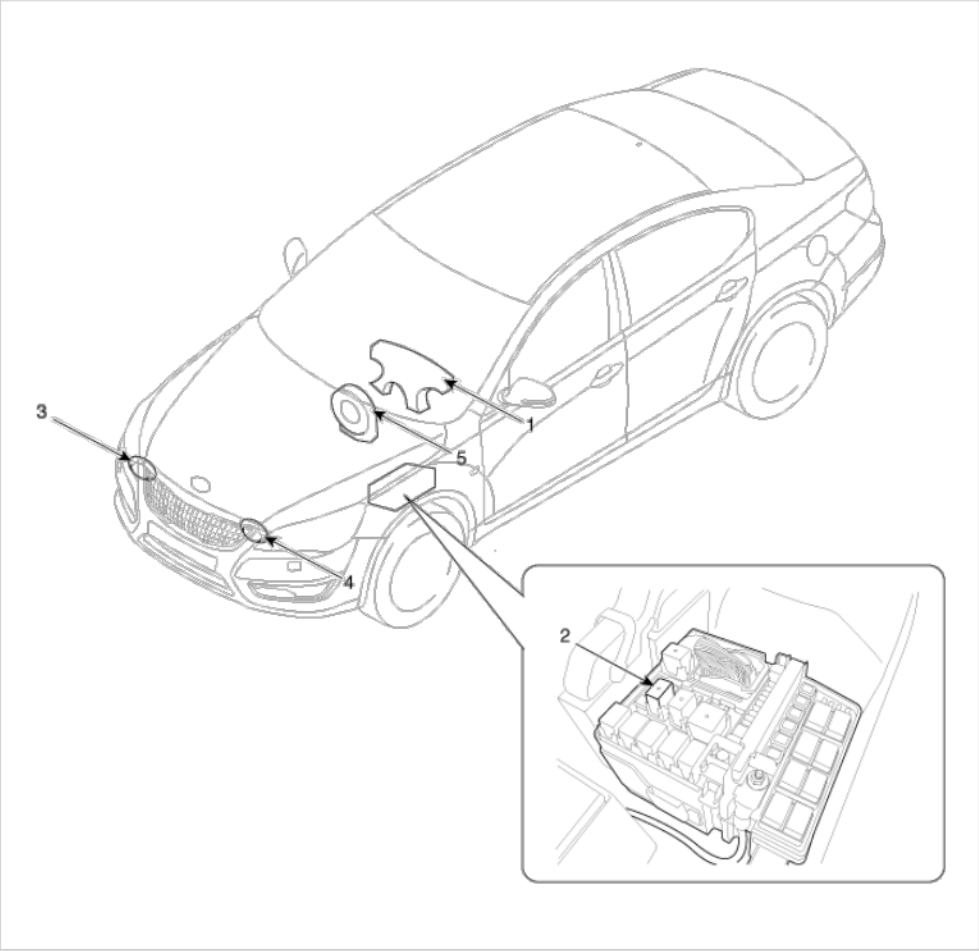
1. Install the multifunction switch.
2. Install the clock spring and steering.
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.

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NOTICE

Make sure the multifunction switch connectors are plugged in properly.

Component Location



1. Horn switch 2. Horn relay (Engine room compartment) 3. Horn - High pitch	4. Horn - Low pitch 5. Clock spring

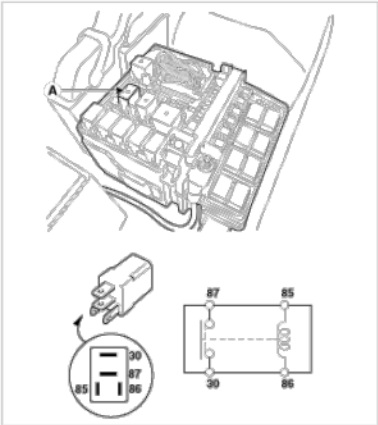
Inspection

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

Horn Relay Inspection

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

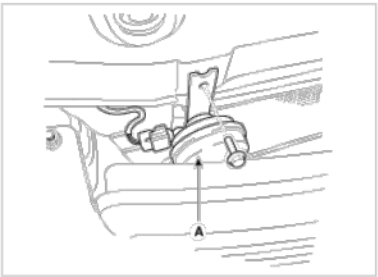
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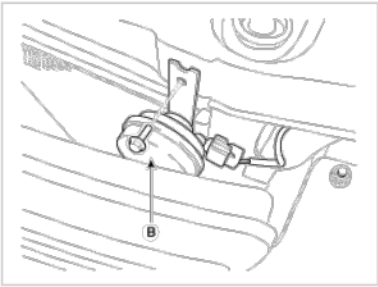


Terminal / Position	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

Removal

1. Remove the radiator grill upper gide.
   (Refer to Body - "Front Bumper")
2. Remove the mounting nut and disconnect the horn connector, then remove the high pitch horn (A) and low pitch horn (B).





Installation

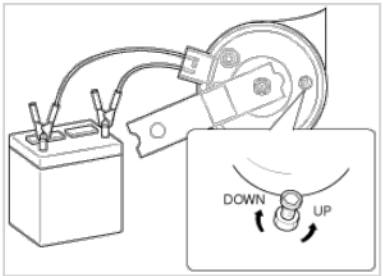
1. Connect the horn connector, then reassemble the horn.
2. Reassemble the radiator grill upper gide.

Adjustment

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

NOTICE

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



Specifications

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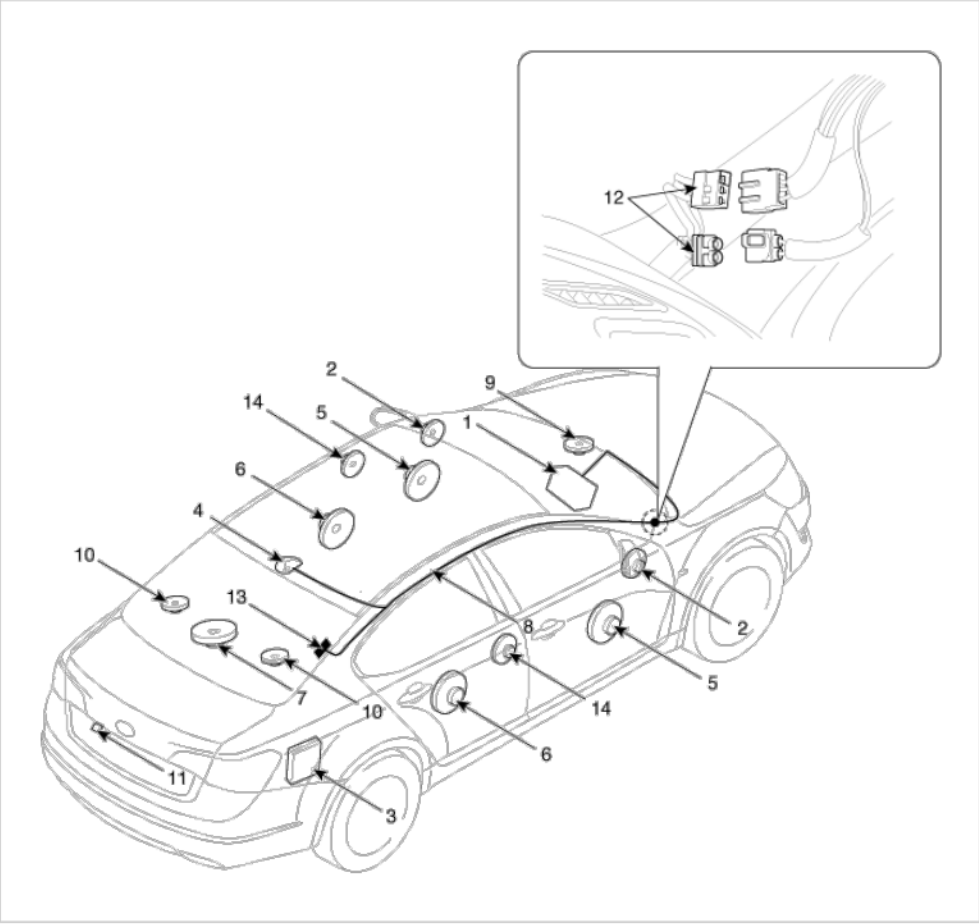
AVN Head Unit

Item	Specification
Power source	DC 14.4V (-) ground
Frequency range / Channel space	FM : 87.5 ~ 107.9 MHz / 200 KHz AM : 530 ~ 1710 KHz / 10 KHz
Tuning type	PLL SYNTHESIZED TUNING
Impedance	2 ohm x 4
Antenna	80 pF 75 Ohm
Dark current	Max. 2mA (Head unit only)
S/N	FM : MIN 50 dB AM : MIN 45 dB

Speaker

Item		Specification
Input power (W or V)	Front	MAX 50W
	Rear	MAX 50W
	Front center speaker	MAX 30W
	Front tweeter	MAX 40W
	Rear tweeter	MAX 40W
	Sub woofer	MAX 40W
	Rear surround speaker	MAX 50W
Impedance (Ω)	Front	4 ± 0.6
	Rear	2.0 ± 0.3
	Front center speaker	2.0 ± 0.3
	Front tweeter	3.4 ± 0.5
	Rear tweeter	3.4 ± 0.5
	Sub woofer	2.0 ± 0.3
	Rear surround speaker	2.0 ± 0.3
Number of speaker		12

Components Location

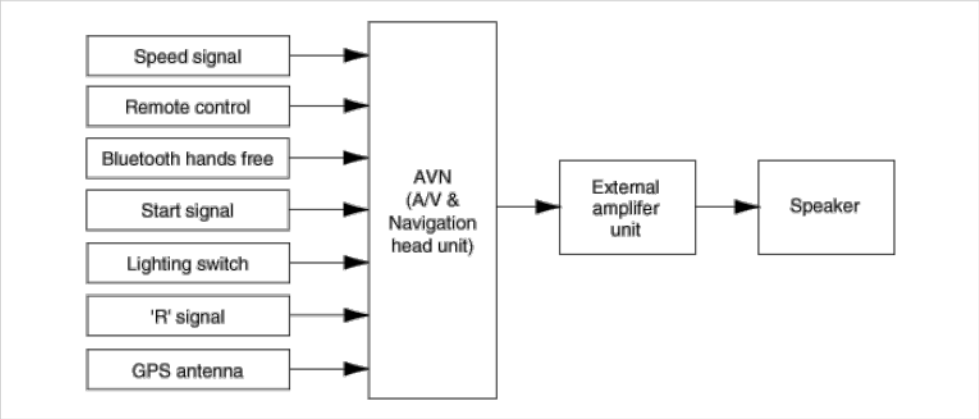


1. AVN (A/V & Navigation head unit)	8. Antenna feeder cable
2. Front tweeter speaker	9. Front center speaker

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3. External amplifier	10. Surround speaker
4. Roof antenna	11. Back view camera
5. Front door speaker	12. Feeder cable joint connector
6. Rear door speaker	13. Glass antenna (Radio)
7. Sub woofer speaker	14. Rear tweeter speaker

System Block Diagram



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

Route Guidance

Unsuitable route guidance situation may caused by the following 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.
-

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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).

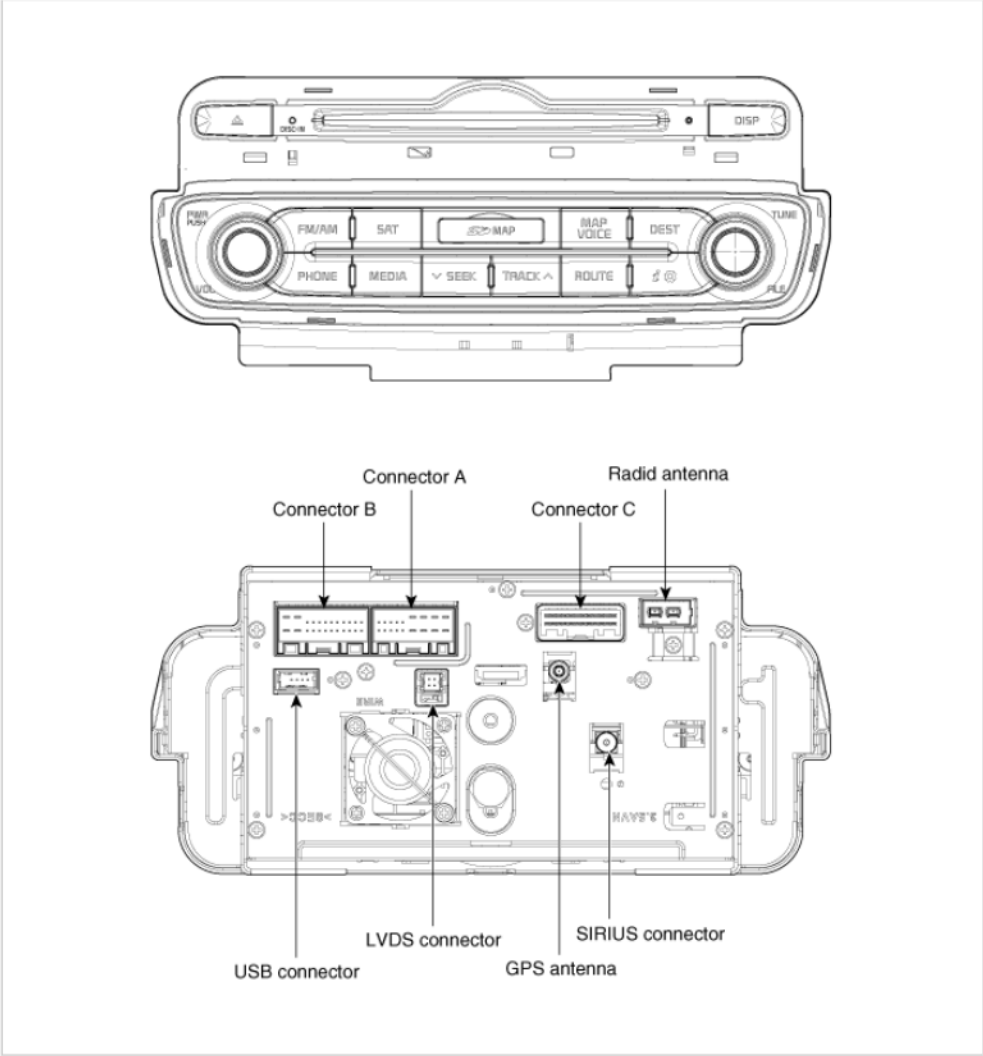
- Map Data may be missing or incorrect causing route guidance to not be given.

Route Re-calculation

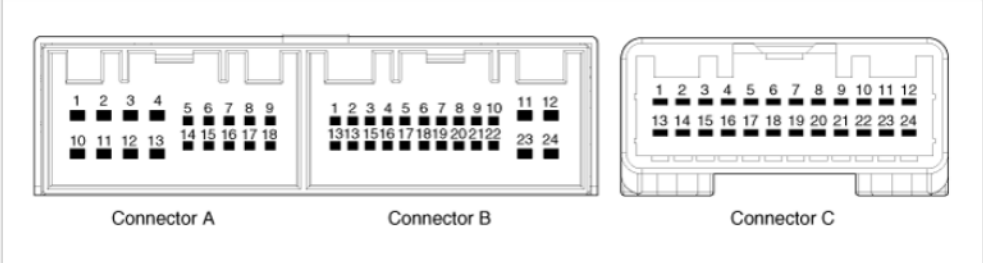
The following phenomena may occur after conducting route recalculation.

- 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)

Components



AVN (A/V & Navigation) Head Unit Connector

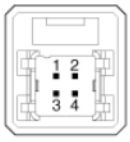


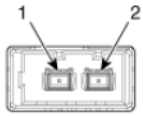
Connector Pin Information

No.	Connector A	Connector B	Connector C

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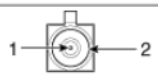
1	-	MM CAN high	-
2	Back view camera video	-	-
3	Back view camera video ground	-	-
4	Back view camera power ground	Steer key	RS422 ground
5	SPDIF ground	-	RS422 Tx (+)
6	SPDIF (+)	-	RS422 Tx (-)
7	-	-	RS422 Rx (-)
8	Illumination (+)	AUX right	RS422 Rx (+)
9	R position	AUX ground	LVDS PDN
10	-	MIC (+)	-
11	Camera battery (+)	ACC	-
12	Navigation voice (-)	Battery (+)	Ground
13	Navigation voice (+)	MM CAN low	LVDS LOCK
14	Back view camera DETECT	-	EXT B/L ON
15	SPDIF (-)	-	RS485 Rx (+)
16	Door unlock	Speed	RS485 Rx (-)
17	Illumination (-)	Steer key ground	RS485 ground
18	Antenna power	-	RS485 Tx (-)
19		-	RS485 Tx (+)
20		AUX DETECT	TMU voice (+)
21		AUX left	TMU voice (-)
22		MIC (-)	-
23		Ground	Ground
24		Ground	-

LVDS connector	No.	Description	No.	Description
	1	LVDS (-)	3	Ground
	2	Ground	4	LVDS (+)

Radio antenna	No.	Description	No.	Description
	1	FM1/AM	2	FM2

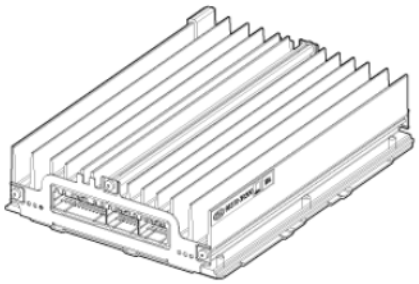
USB connector	No.	Description	No.	Description
	1	USB VCC	3	USB D (+)
	2	USB D (-)	4	USB ground

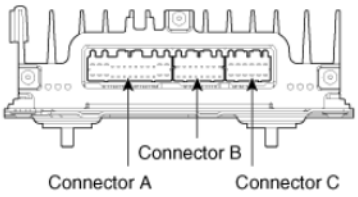
GPS connector	No.	Description	No.	Description
	1	GPS signal	2	Ground

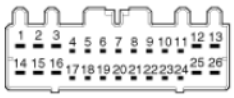
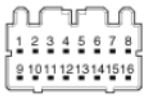
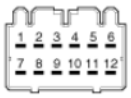
SIRIUS antenna	No.	Description	No.	Description
	1	Signal	2	Ground

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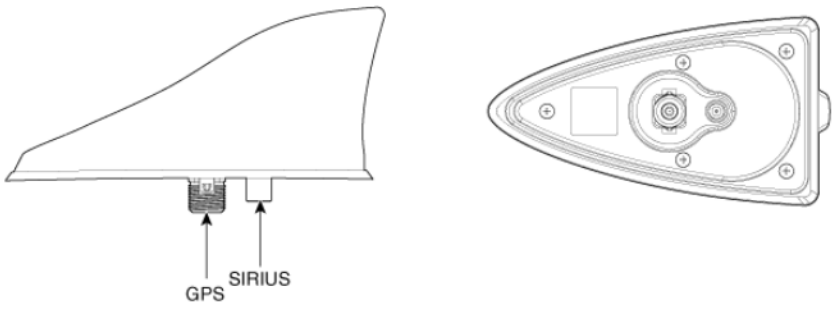
[External Amplifier]

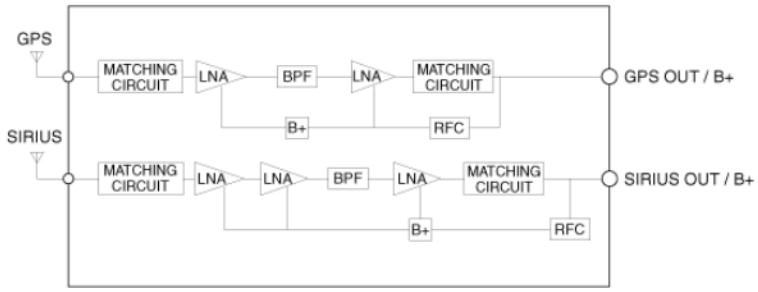




No.	Connector A (26Pin)	Connector B (16Pin)	Connector C (12Pin)
			
1	B (+)	Surround right (+)	Rear door right (+)
2	B (+)	Surround left (+)	Rear door left (+)
3	B (+)	-	Front tweeter right (+)
4	-	-	Front tweeter left (+)
5	CAN (+)	-	Front door right (+)
6	CAN (-)	-	Front door left (+)
7	ACC	Front center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

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※ LNA (Low Noise Amplifief)
BPF (Band Pass Filter)
RFC (Radio Frequency Choke)

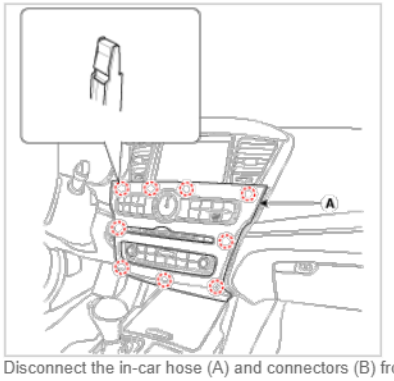
Removal

AVN Head Unit

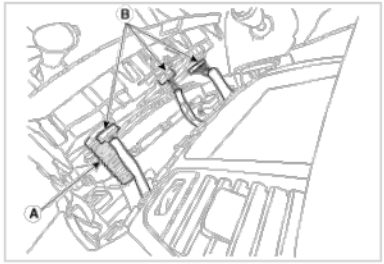
NOTICE

- 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. Using the flat driver or remover, remove the center fascia lower panel (A).

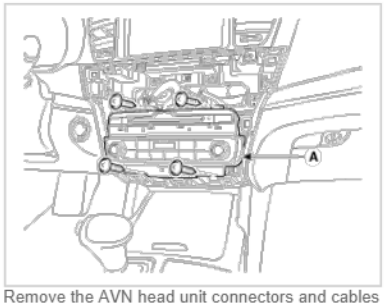


3. Disconnect the in-car hose (A) and connectors (B) from the center fascia panel.

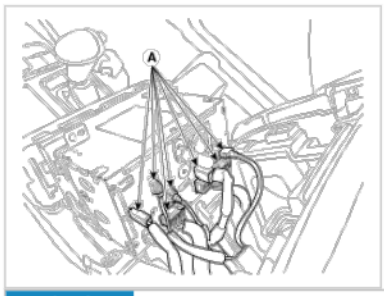


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4. Remove the AVN head unit (A) after loosening the mounting screws.



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

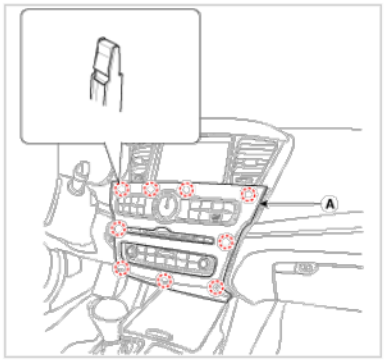


NOTICE

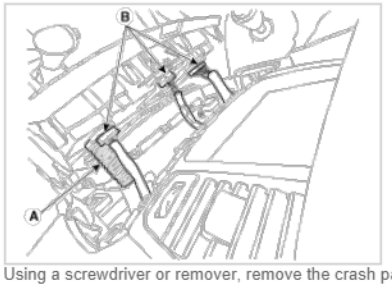
- If CD does not eject, don't try to remove it.
- The player may be damaged.
- Therefore, contact a service shop for repairs.

Monitor

1. Disconnect the negative (-) battery terminal.
2. Using the flat driver or remover, remove the center fascia lower panel (A).

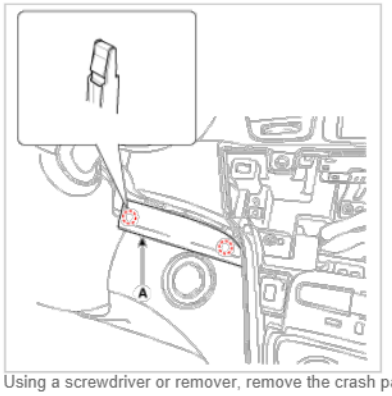


3. Disconnect the in-car hose (A) and connectors (B) from the center fascia panel.

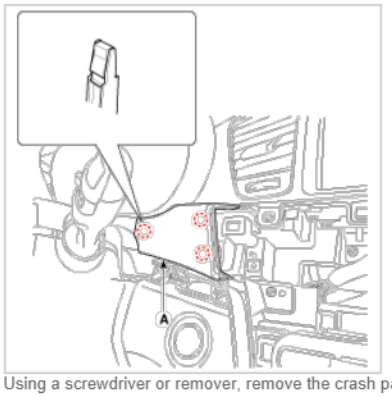


4. Using a screwdriver or remover, remove the crash pad garnish [RH] (A).

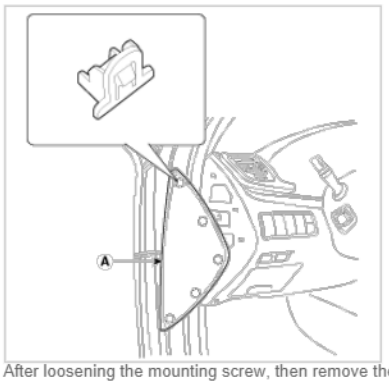
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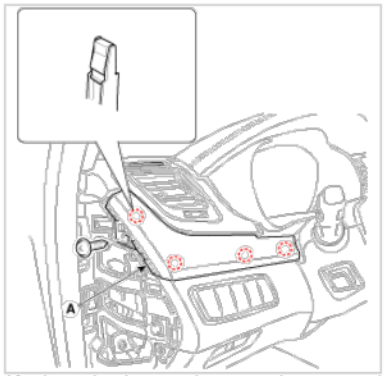
5. Using a screwdriver or remover, remove the crash pad center garnish (A).



6. Using a screwdriver or remover, remove the crash pad side cover [LH] (A).

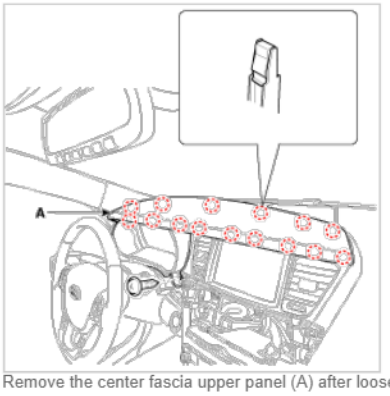


7. After loosening the mounting screw, then remove the crash pad garnish [LH] (A).

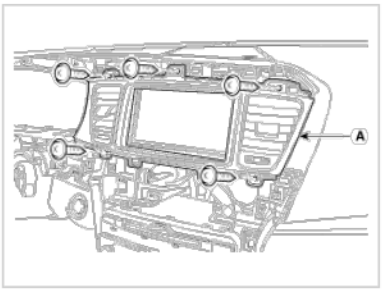


8. After loosening the mounting screw, then remove the cluster fascia panel (A).

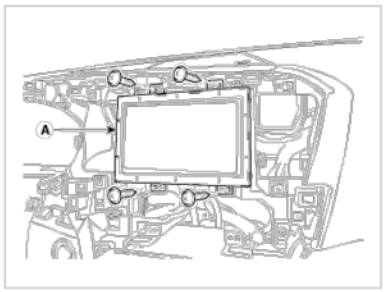
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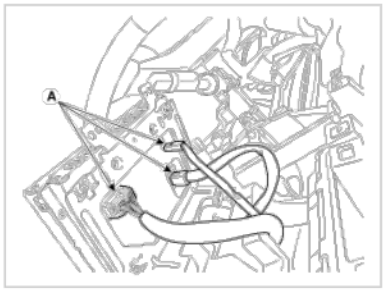
9. Remove the center fascia upper panel (A) after loosening the mounting screws.



10. Remove the monitor (A) after loosening the mounting screws.



11. Disconnect the monitor connectors (A).



Installation

AVN Head Unit

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

NOTICE

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

Monitor

1. Install the monitor.
2. Install the center fascia upper panel, cluster fascia panel, crash pad garnish [LH], crash pad side cover, crash pad center garnish and the crash pad garnish [RH].
3. Install the center fascia lower panel.
4. Connect the negative (-) battery terminal.

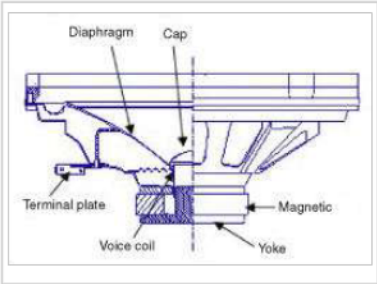
Inspection

1. Troubleshooting for Speaker

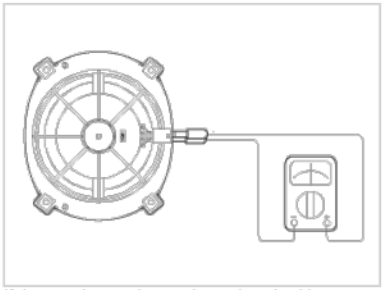
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(1) Basic inspection of speaker

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



(2) Case Troubleshooting

No.	Case	Inspection/Remedy
1	Trembling sound	1. Before replacing the speaker, inspect that the mounting screw is installed normally. 2. After re-installing the speaker, verify that no trembling sound is heard. 3. When hearing a trembling sound again, replace the speaker with new one.
2	Noise	1. Check if the wiring connector is connected normally. If not, reconnect the wiring connector. 2. In case of radio static, check if there is a noise from CD. 3. When a noise is heard on turning radio and CD on, replace the speaker with new one. **NOTICE** In case there is only radio static, this causes from poor radio reception. Thus the speaker needs no repair and replacement.
3	Poor working	Inspection of the wiring connection between the battery and the speaker 1. Before replacing the speaker, inspect the wiring connection between the battery and the speaker is normal. 2. Check the supply power to the speaker and the resistance, then inspect the sound quality. ■ Specified impedance : 2 ~ 4Ω  3. If the speaker works poorly, replace it with new one.

⚠ CAUTION

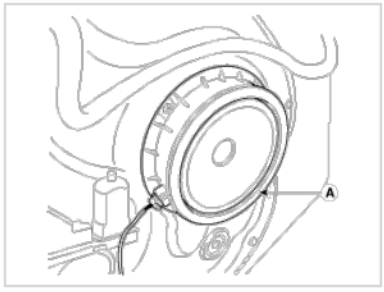
When handling the speakers:

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

Removal

Front Speaker

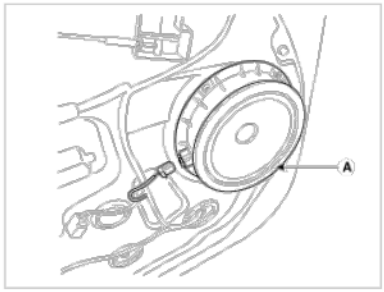
1. Remove the front door trim panel.
   (Refer to Body - "Front Door")
2. Remove the front speaker (A) after loosening 4 bolts.



Rear Speaker

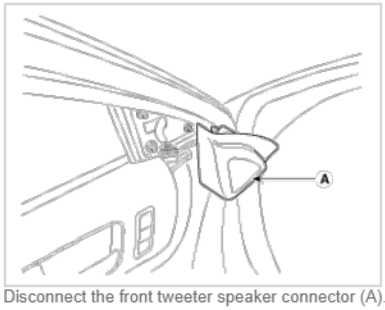
1. Remove the rear door trim panel.
   (Refer to Body - "Rear Door")
2. Remove the rear speaker (A) after removing 4 bolts.

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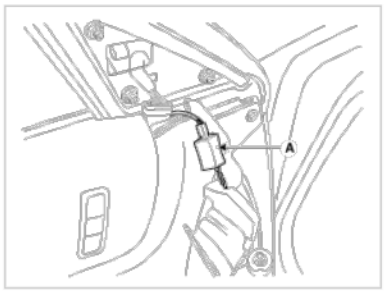


Front Tweeter Speaker

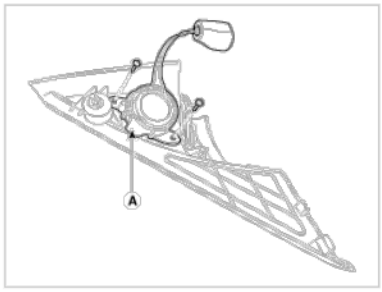
1. Remove the door frame inner cover (A).



2. Disconnect the front tweeter speaker connector (A).

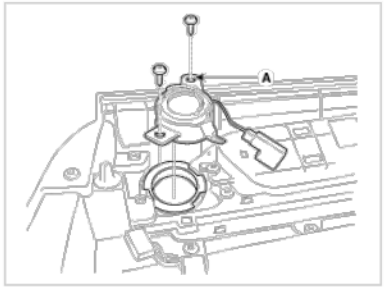


3. Remove the tweeter speaker (A) after loosening the screws (2EA).



Rear Tweeter Speaker

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

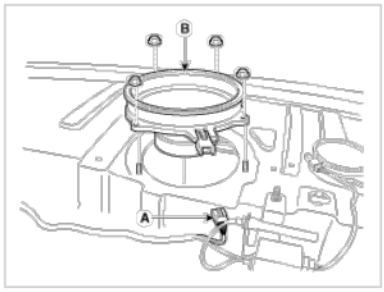


Sub Woofer Speaker

1. Romove the rear seat.
   (Refer to Body - "Rear Seat")

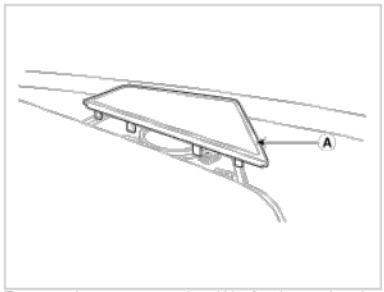
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2. Remove the rear package tray.
   (Refer to Body - "Package Tray")
3. Disconnect the subwoofer speaker connector (A).
4. Remove the subwoofer speaker (B) after removing 4 nuts.

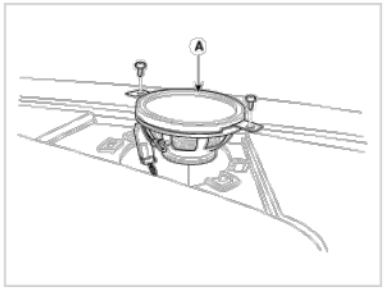


Front Center Speaker

1. Remove the center speaker grill (A).

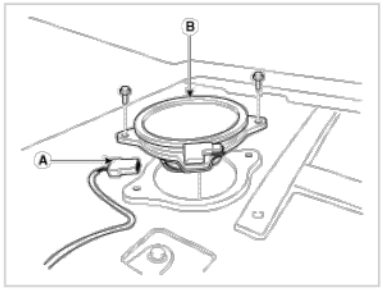


2. Remove the center speaker (A) after loosening the screws (2EA).



Rear Surround Speaker

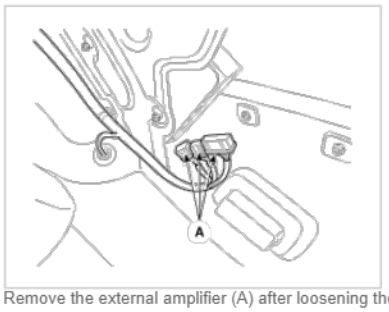
1. Remove the rear seat.
   (Refer to Body - " Rear Seat")
2. Remove the rear package tray.
   (Refer to Body - " Package Tray")
3. Disconnect the rear surround speaker connector (A).
4. Remove the rear surround speaker (B) after removing 2 bolts.



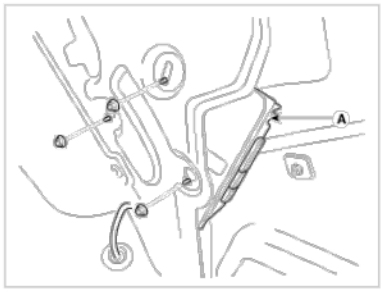
External Amplifier

1. Remove the trunk right luggage side trim.
   (Refer to Body - "Interior Trim")
2. Remove the external amplifier connectors (A).

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



Installation

Front Speaker

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

Rear Speaker

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

Front Tweeter Speaker

1. Install front the tweeter speaker.
2. Install front the tweeter speaker connector.
3. Install the door frame inner cover.

Rear Tweeter Speaker

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

Subwoofer Speaker

1. Install the subwoofer speaker after connecting the connector.
2. Install the rear package tray and rear seat assembly.

Center Speaker

1. Connecting the center speaker connector.
2. Install the center speaker.
3. Install the crash pad center speaker grill.

Rear Surround Speaker

1. Install the rear surround speaker.
2. Connecting the connector.
3. Install the rear package tray.
4. Inatall the rear seat.

External Amplifier

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

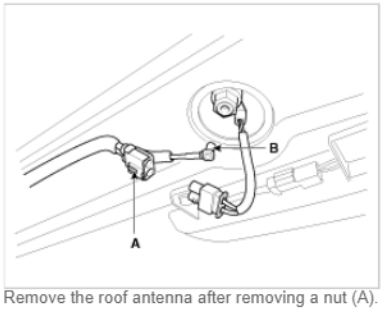
NOTICE

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

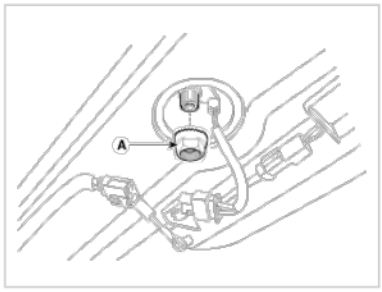
Removal

1. Remove the rear roof trim.
   (Refer to Body - "Roof Trim")
2. Disconnect the connector (A) and cable (B) from the roof antenna.

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



Installation

1. Installation the roof antenna.
2. Connect the connector and cable.
3. Install the rear roof trim.

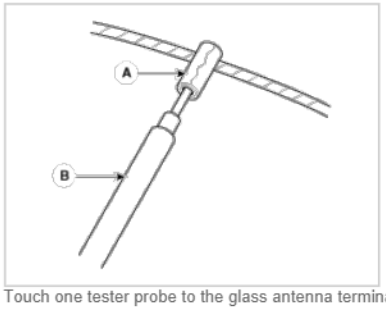
NOTICE

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

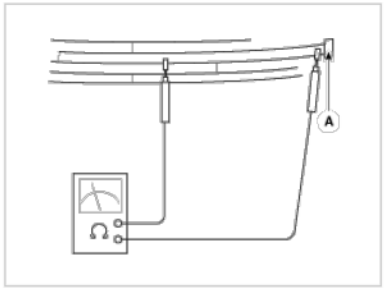
Inspection

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.



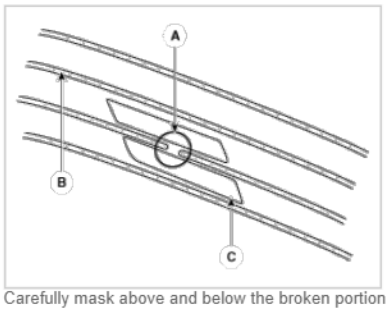
Glass Antenna Repair

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.

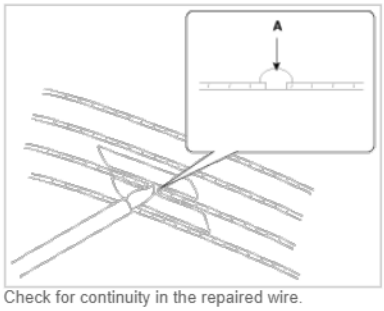
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2. Carefully mask above and below the broken portion of the glass antenna wire (B) with cellophane tape (C).
3. Using a small brush, apply a heavy coat of silver conductive paint (A) extending about 1/8"on both sides of the break. Allow 30 minutes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

NOTICE

Thoroughly mix the paint before use.

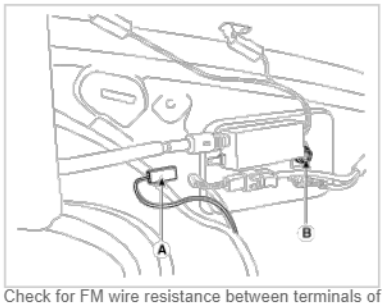


4. Check for continuity in the repaired wire.
5. Apply a second coat of paint in the same way. Let it dry three hours before removing the tape.

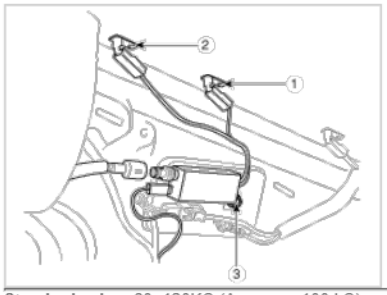
Glass Antenna Circuit Inspection

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 terminal 2 of the harness side feeder cable (A) and body ground (B).

OK :approximately 12V (ACC+)



3. Check for FM wire resistance between terminals of No.1 and 3
   1. FM antenna grid terminal
   2. AM antenna grid terminal
   3. Body ground.



Standard value :80~120KΩ (Average : 100 kΩ)
Short : Approx. 0Ω
Open :∞ Ω

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

Standard value :120~170KΩ (Average : 145 kΩ)
Short : Approx. 0Ω
Open :∞ Ω

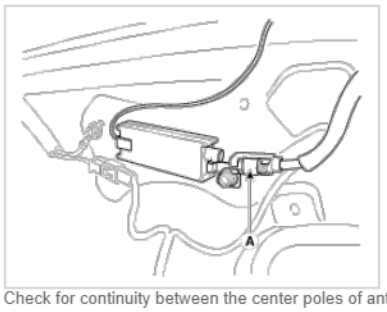
5. Check the grid lines for continuity.
6. When a poor radio reception is not repaired through the above inspection methods, replace the amp.

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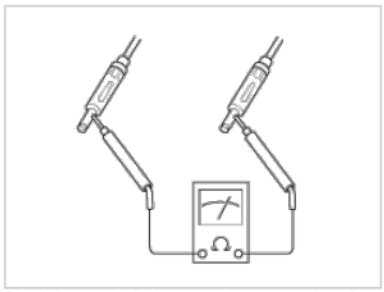
If the radio reception is still poor, check the radio cable for short and radio head unit for failure.

Antenna Cable

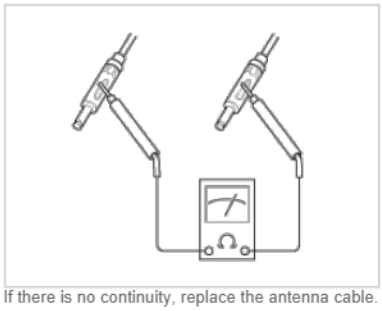
1. Remove the antenna jack (A) from the audio unit and antenna.



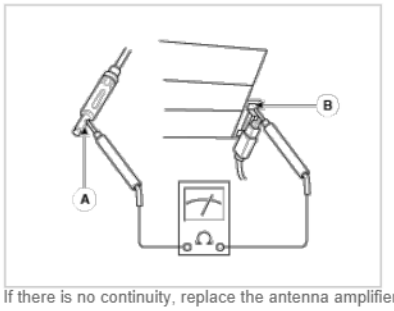
2. Check for continuity between the center poles of antenna cable.



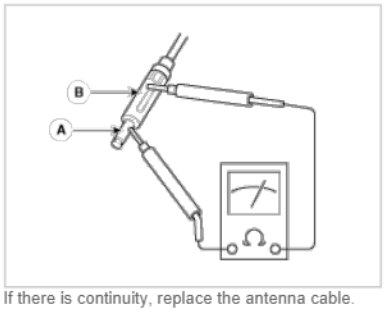
3. Check for continuity between the outer poles of antenna cable. There should be continuity.



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



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

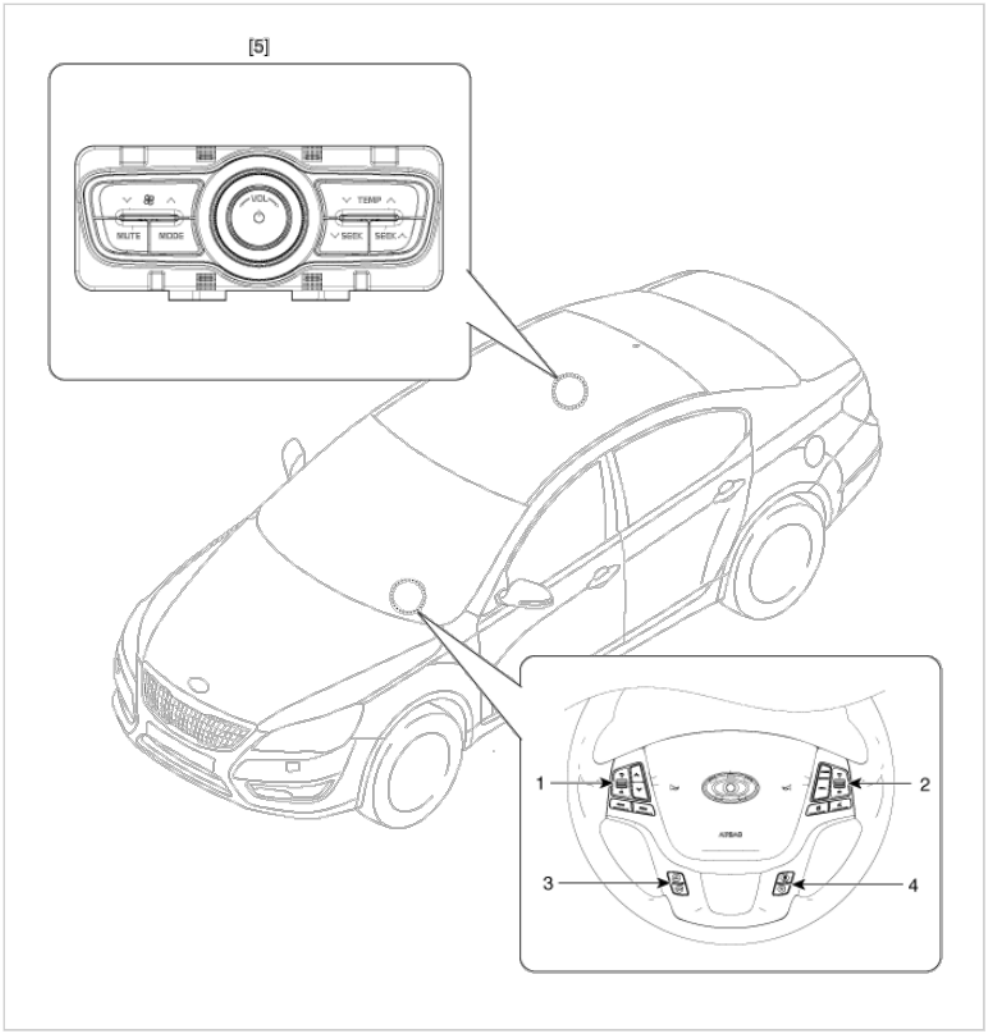


8. If there is continuity, replace the antenna cable.

Body Electrical System

Components Location

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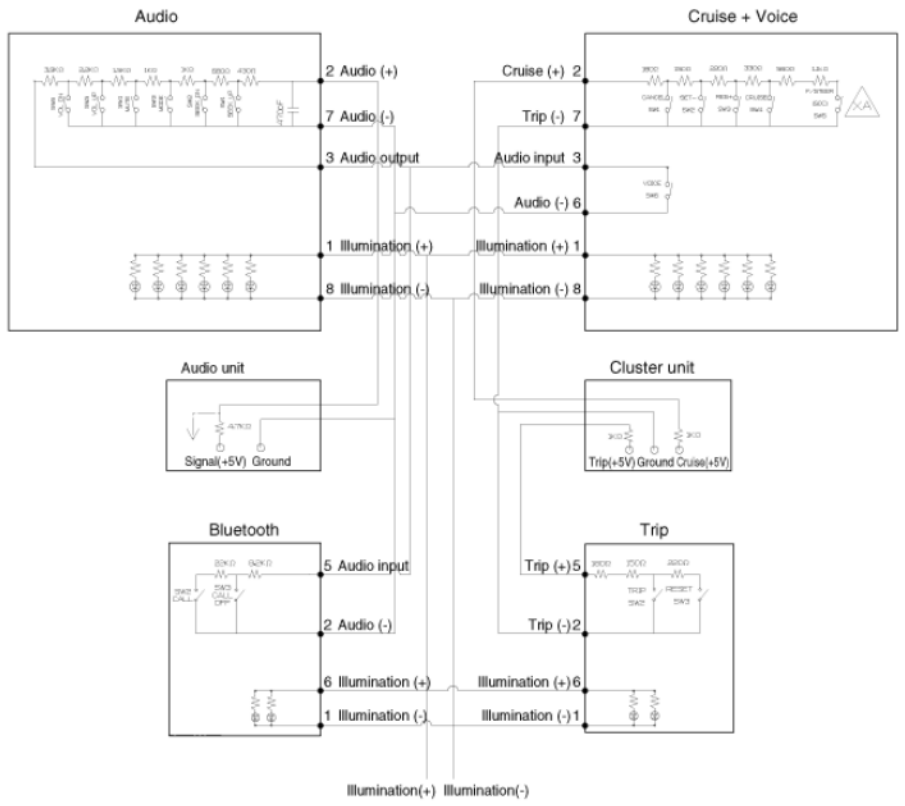
1. Remote control switch (Audio) [LH] 2. Remote control switch (Cruise) [RH] 3. Bluetooth hands fress switch	4. Trip switch 5. Rear seat remote control switch

Body Electrical System

Circuit Diagram

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[Steering remote control switch]



Audio [LH]



Connector



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

Cruise + Voice [RH]

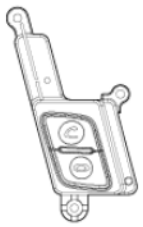


Connector

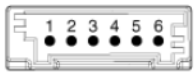


No.	Description
1	Illumination (+)
2	Cruise (+)
3	Audio input
4	-
5	-
6	Audio (-)
7	Trip (-)
8	Illumination (-)

Bluetooth [LH]



Connector

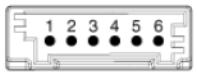


No.	Description
1	Illumination (-)
2	Audio (-)
3	-
4	-
5	Audio input
6	Illumination (+)

Trip [RH]



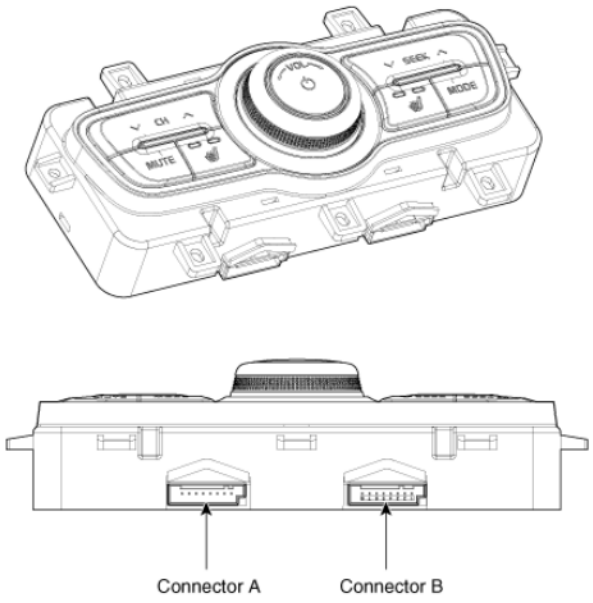
Connector



No.	Description
1	Illumination (-)
2	Trip (-)
3	-
4	-
5	Trip (+)
6	Illumination (+)

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[Rear saet remote control switch]

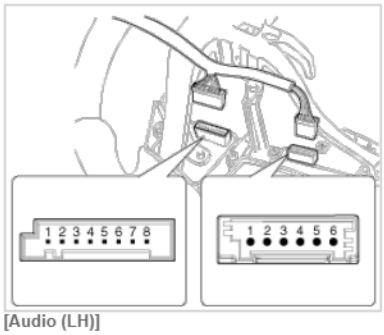


	Connector A	Connector B
	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8
No.	Description	Description
1	Battery (+)	-
2	ACC	Seat heater switch (LH)
3	Illumination (+)	Seat heater low indicator (LH)
4	Illumination (-)	Seat heater high indicator (LH)
5	Ground	IGN 1
6	Ground	Seat heater switch (RH)
7	CAN low	Seat heater low indicator (RH)
8	CAN high	Seat heater high indicator (RH)

Inspection

[Steering Remote Control Switch]

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



[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

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[Cruise + Voice (RH)]

Switch	Connector terminal	Resistance (±5%)
CANCEL	2-7	430 Ω
SET	2-7	1.1 kΩ
RESUME	2-7	2.11 kΩ
Cruise	2-7	3.11 kΩ
Smart Cruise	2-7	4.61 kΩ
Voice	2-7	6.81 kΩ

[Bluetooth (LH)]

Switch	Connector terminal	Resistance (±5%)
CALL	2-5	18.91 kΩ
CALL OFF	2-5	40.91 kΩ

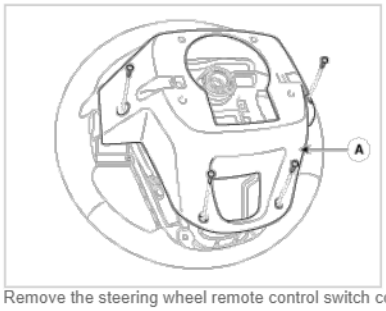
[Trip (RH)]

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

Removal

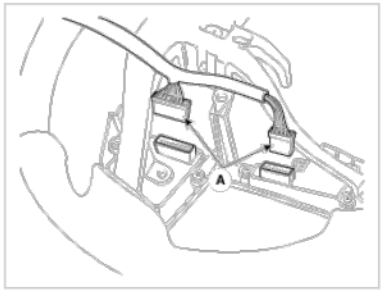
[Steering Wheel Remote Control Switch]

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

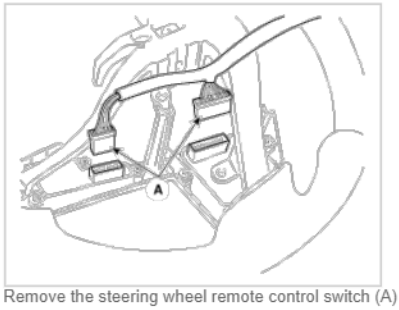


4. Remove the steering wheel remote control switch connector (A).

[LH - Audio]

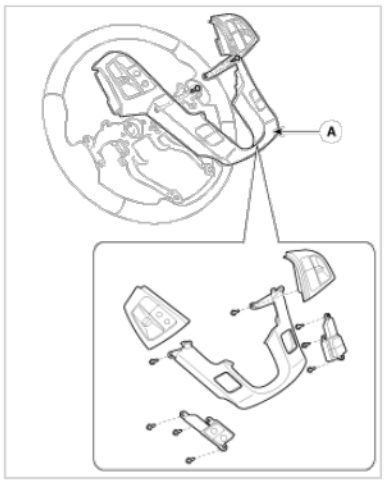


[RH - Bluetooth]



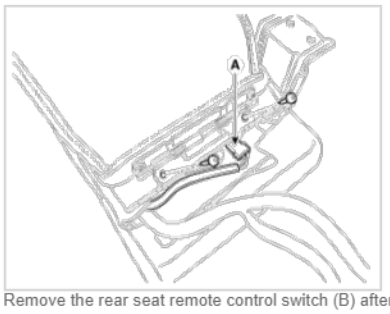
5. Remove the steering wheel remote control switch (A) after loosening the mounting screws.

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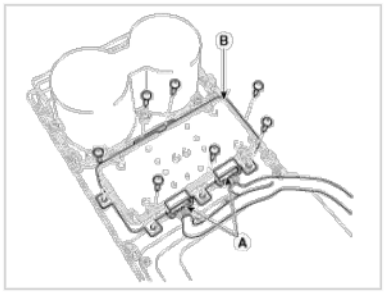


[Rear Seat Remote Control Switch]

1. Remove the rear seat armrest.
   (Refer to Body - "Rear Seat")
2. Disconnect the connector (A) after loosening the mounting screws.



3. Remove the rear seat remote control switch (B) after loosenig the mounting screws and disconnecting the connector (A).



Installation

[Steering Wheel Remote Control Switch]

1. Reassemble the steering wheel remote control switch.
2. Reassemble the steering wheel cover.
3. Reassemble the steering wheel.
4. Reassemble the steering wheel remote control switch and airbag connector.

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

5. Reassemble the driver airbag module.

[Rear Seat Remote Control Switch]

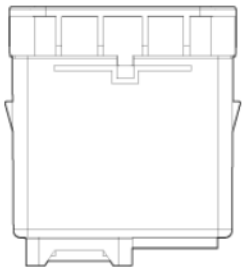
1. Install the rear seat remote control switch.
2. Install the rear seat armrest cover.
3. Install the rear seat.

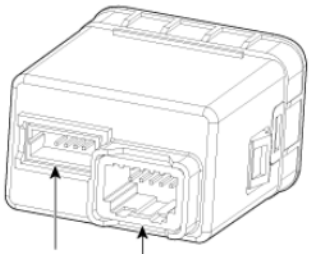
Body Electrical System

Circuit Diagram

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Connector A	Pin No.	USB connector
1 2 3 4	1	USB / iPod ground
	2	USB D (+) / iPod Rx
	3	USB D (-) / iPod Tx
	4	USB / iPod VCC

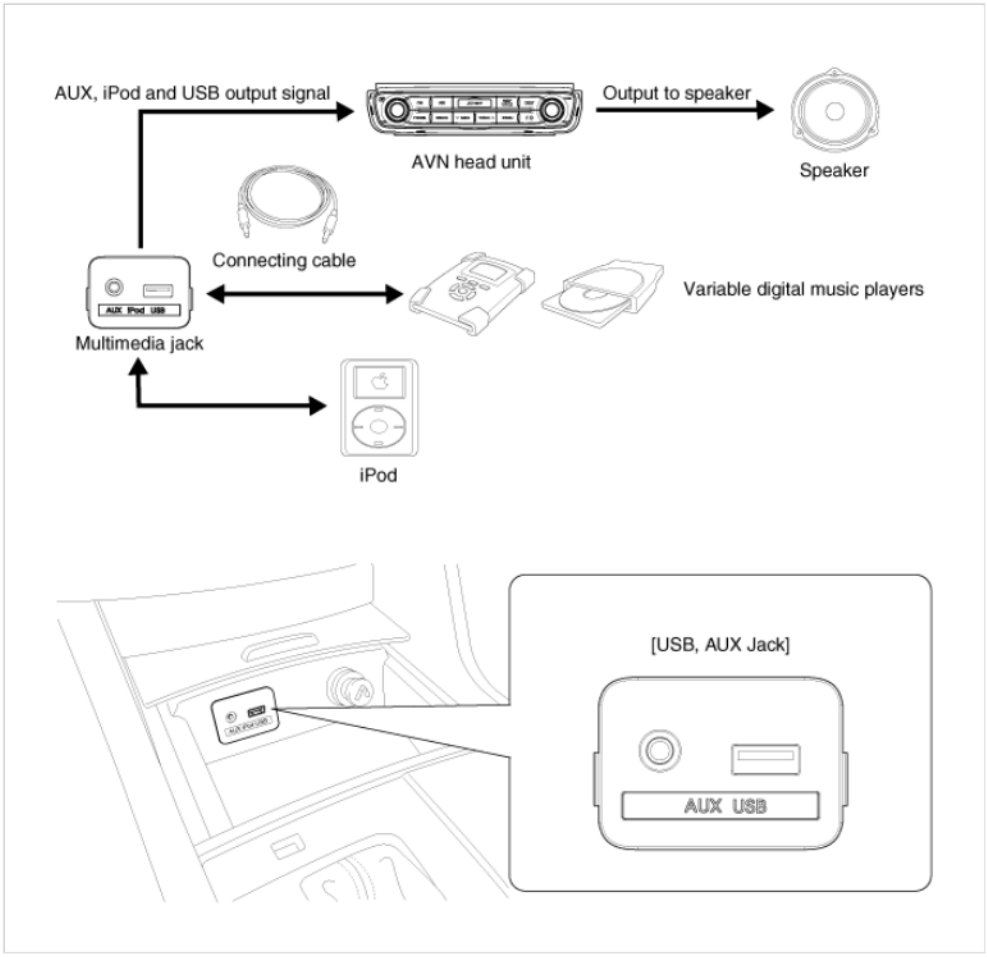
Connector B	Pin No.	AUX connector
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫	1	AUX input (LH)
	2	AUX input (RH)
	3	AUX DETECT
	4	AUX video
	5	-
	6	Illumination (+)
	7	Signal ground
	8	Shield ground
	9	-
	10	AUX video ground
	11	Illumination (-)
	12	Ground

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.

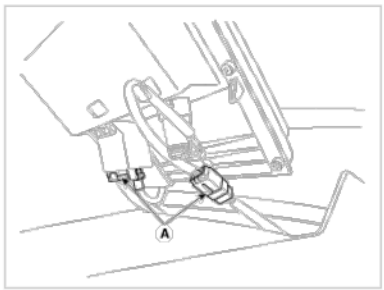
In case of distortions from media connected to the AUX source, the audio unit may not be defective but the output level of the used media does not match the specification of the AUX input.

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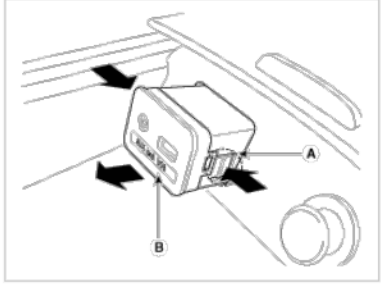


Removal

1. Remove the shift lever knob.
   (Refer to Body - "Console")
2. Remove the floor console upper cover.
3. Disconnect the connector (A) from the floor console upper cover.



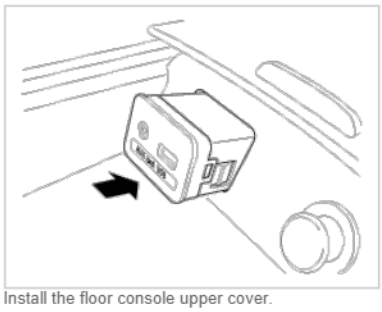
4. Remove the multimedia jack (B) from the console upper cover after releasing the fixed hooks (A).



Installation

1. Install the multimedia jack.

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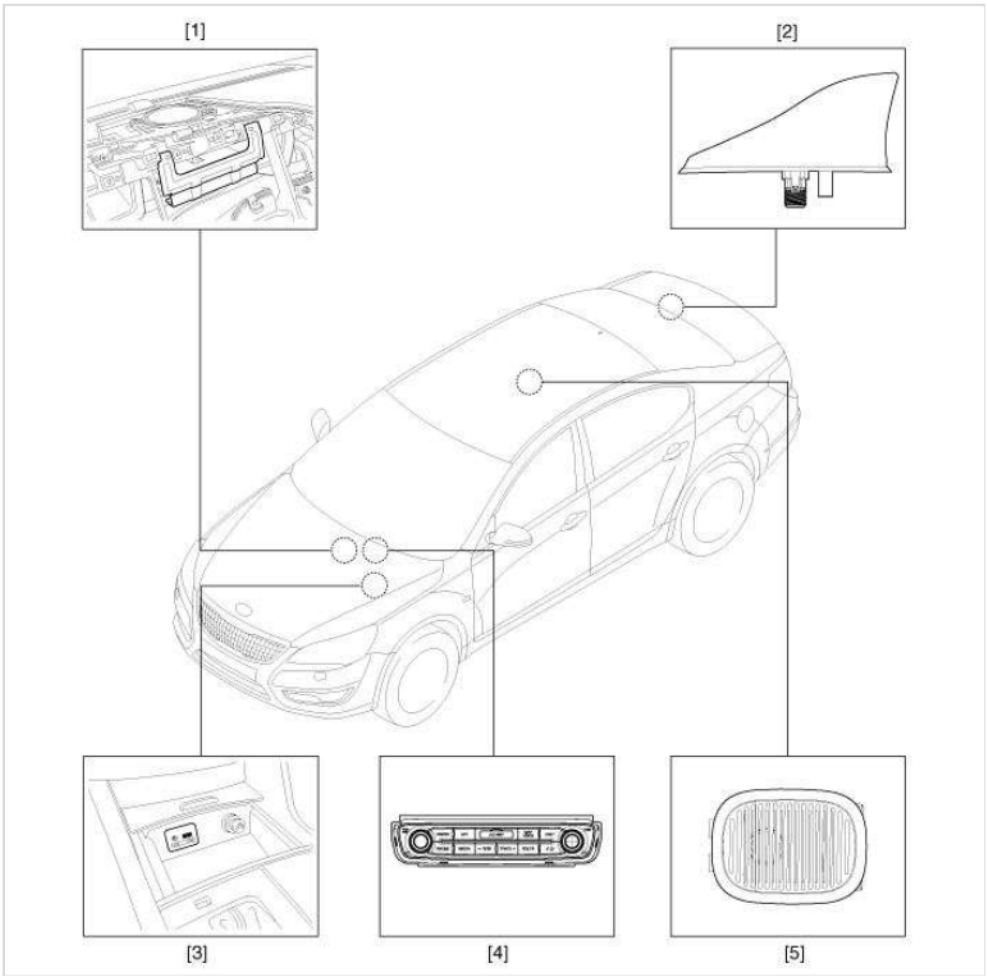


2. Install the floor console upper cover.
3. Install the shift lever knob.

NOTICE

Make sure the multimedia connector and the console upper cover connectors are plugged in properly.

Components



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

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

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

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- The Telematics system's goals are safety, diagnostics, vehicle management, and driving support.
- eServices via smartphone apps
- Features bi-directional communication between AVN3.0 devices and smartphones, and between smartphones and the call center. An 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



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)

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(1) 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



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

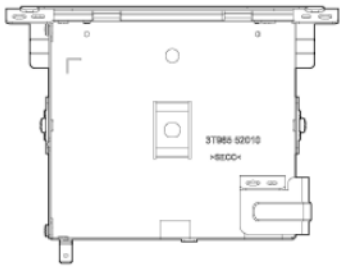
- TMU bin file should be in USB ROOT.
- TMU Update may take about 15 minutes.

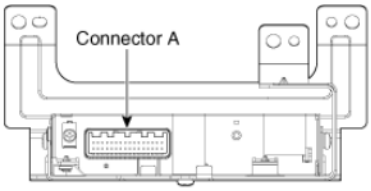
⚠ CAUTION

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

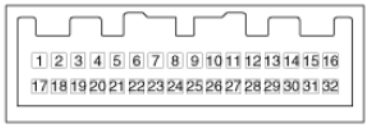
Component

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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	-
12	HSCAN -	28	-
13	HSCAN +	29	-
14	-	30	-
15	-	31	MMCAN -
16	-	32	MMCAN +

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	-	-	-	-	-
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	-	-	-	-	-
28	-	-	-	-	-

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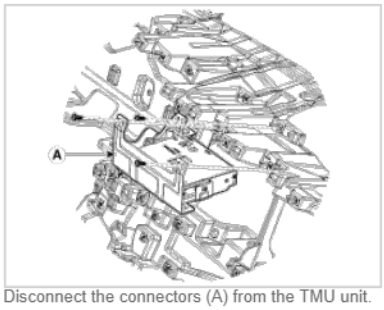
29	-	-	-	-	-
30	-	-	-	-	-
31	MM CAN (-)	Data I/O	BUS	BUS	Low Speed CAN bus low
32	MM CAN (+)	Data I/O	BUS	BUS	Low Speed CAN bus high

Removal

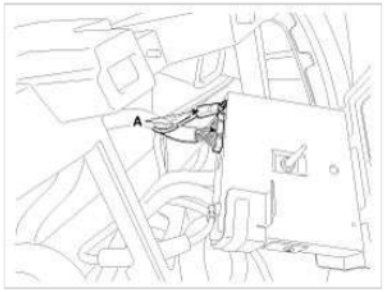
NOTICE

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

1. Disconnect the negative (-) battery terminal.
2. Remove the AVN monitor.
   (Refer to "AVN System" - "AVN Head Unit")
3. Remove the TMU unit (A) after loosening the mounting screws.



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

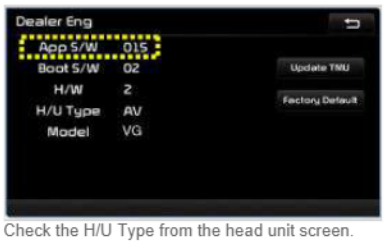


Installation

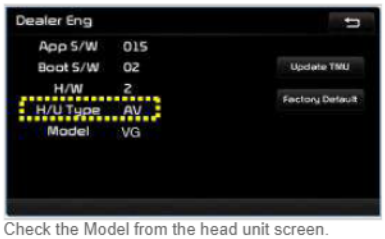
1. Install the TMU unit after connecting the connector.
2. Install the AVN monitor.
3. Connect the negative (-) battery terminal.

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.



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



4. Check the Model from the head unit screen.

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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 2.9mA (When welcome light function on : Max 4.9 mA)

RF Receiver

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

Smart Key FOB

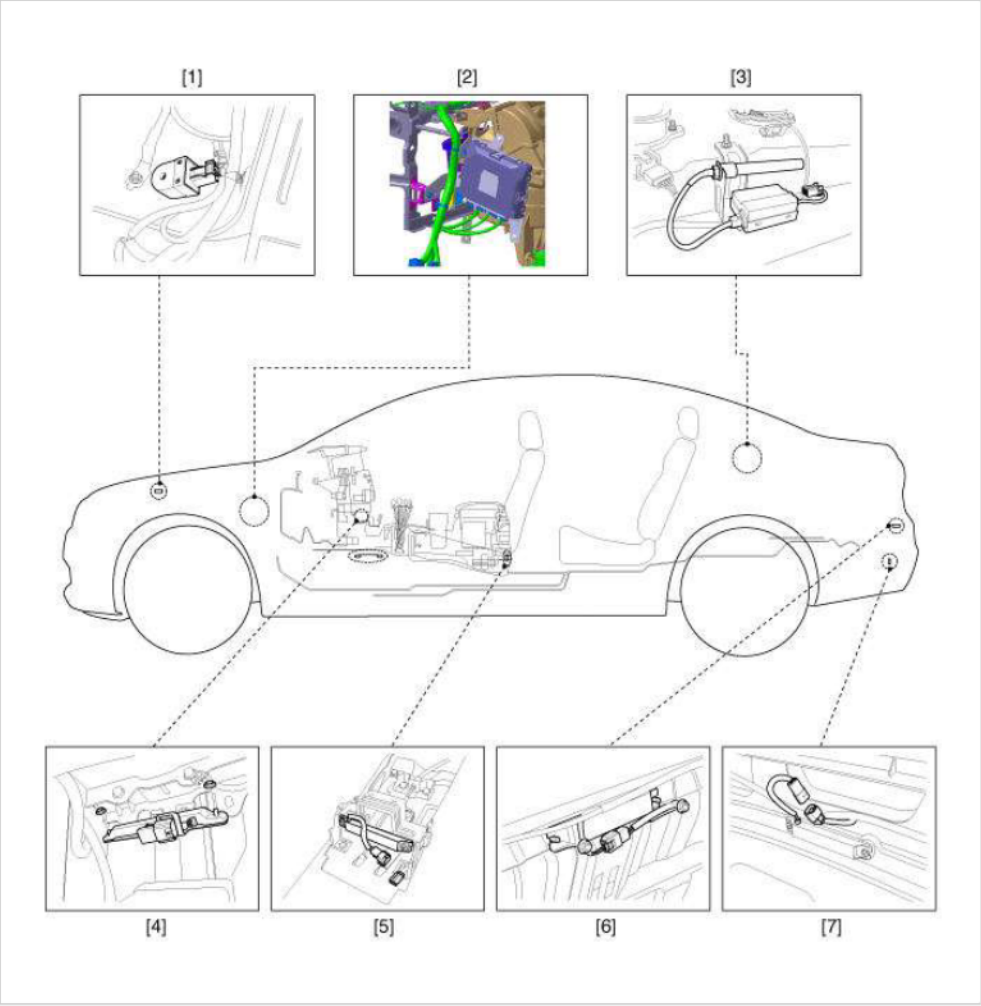
Items	Specification
Battery	Lithium battery 3V 1EA (CR2032)
Distance	30m from vehicle, RF : 30m, Passive(LF) : 0.7m
Battery life	More than 2years (10 times / a day) **⚠WARNING** An inappropriately disposed battery can be harmful to the environment and human health. Dispose the battery according to your local law(s) or regulation.
Push buttons	4 (Door lock / unlock, Trunk lid open, Panic)
Frequency(Rx)	125 kHz
Frequency(Tx)	315 MHz
Numbers	2EA

Antenna

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

Component Location (1)

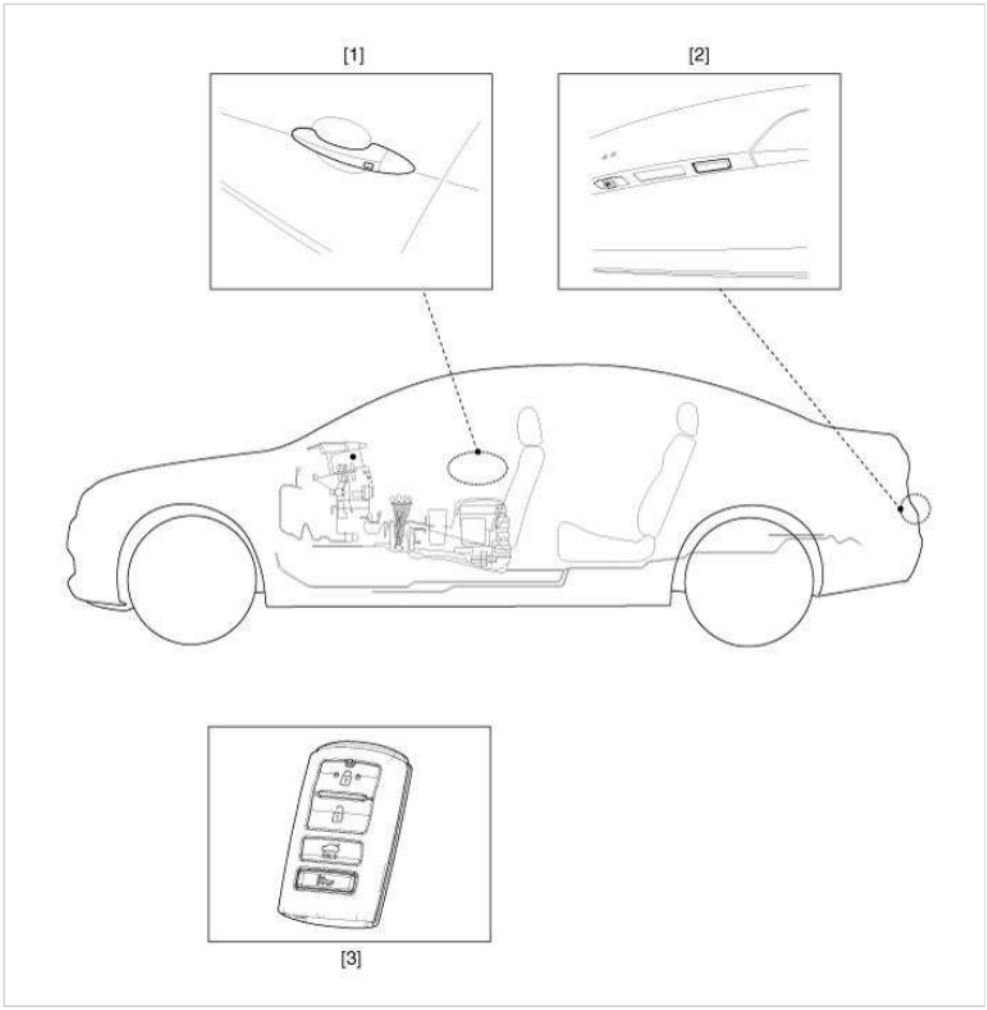
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1. Buzzer 2. Smart key unit 3. RF receiver 4. Interior antenna 1	5. Interior antenna 2 6. Trunk antenna 7. Bumper antenna

Component Location (2)

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1. Door outside handle & Button 2. Trunk lid open switch	3. FOB key

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 :

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

1. Passive unlock
   The system allows the user to access (unlock) the vehicle without performing any actions with the SMART KEY FOB. This feature could be different depending on platform as follows:
   A. Pressing Push button in door handle
2. Passive locking
   The system allows the user to lock the vehicle by pushing a button on door handle with the SMART KEY FOB.
3. Button start
   The system allows the user 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.

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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 as well as a single line interface to further devices of the car.
For communication with the SMART KEY FOB, SMK ECU generates a request (challenge) as an encoded and modulated 125 (or 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 125 (or 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 4 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.

Antennas

1. Emitting LF Antennas:
   Inductive antennas in and at the vehicle are used to transform the current, driven by the SMK ECU antenna driver, into a 125 (or 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 or tailgate.
   Up to three antennas cover the vehicle’s interior and the trunk or tailgate interior: two in the passenger compartment and one in the tailgate room or trunk.
2. Bidirectional Immobilizer Antenna (for Limp Home):
   The Immobilizer Backup Antenna is used for sending and receiving data: it emits a magnetic field (125 - 135 kHz challenge) and receives changes in the field strength (response of Transponder).

Door Handle

The front door handles of the two doors (driver door / passenger door) are equipped with emitting LF-antennas to emit the 125 (or 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 or tailgate lid.

Operation

Passive Functions

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

Operating Range

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

Passive Access (Passive Entry)

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

Passive Locking (Exit)

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

- At least one door is unlocked and two_steps timer is not running or
- Two_steps timer is running and one of the push button except Front Left side is triggered

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

Passive Open Tailgate

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

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.

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2. Event:
   At least 1 door knob status changed from unlock to lock.
3. SMK actions:
   A. IF NO FOB-IN ACTIVE
      SMK performs a search for the fobs in the interior of the vehicle. The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication
   B. IF FOB-IN ACTIVE
      SMK sends request toward PDM to search 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 sends request toward PDM to search valid TP
   If no fob has been found, no action is required.
   If any valid fob or valid TP has been found, SMK sends unlock command via CAN and activates ext. buzzer warning.
   If any valid fob has been found, SMK sends unlock command via CAN/LIN and activates ext. buzzer warning.

Smart Key Door Lock Warning

Door Lock Warning 1

1. Preconditions:
   While (at least one door knob is unlocked) & (ACC ON or IGN ON) & (No FOB-IN) :
   A. (All doors are closed) & (trunk closed)
2. Event:
   A. User presses the push button in door handle or trunk
3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".

Door Lock Warning 2

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

Door Lock Warning 3

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

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

Smart Key Lamp Warning

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.

User Information Functions

ID OUT Warning

1. Preconditions:
   A. (ACC or IGN1) & (any door open or trunk open)
2. Event:

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The last opened door is closed

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

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

Learning MODE

Whatever the mode, the learning procedures are managed by the SMK.
Prior to start learning service, Fob-In signal must be active and the vehicle secret code (called as PIN code) should be known.

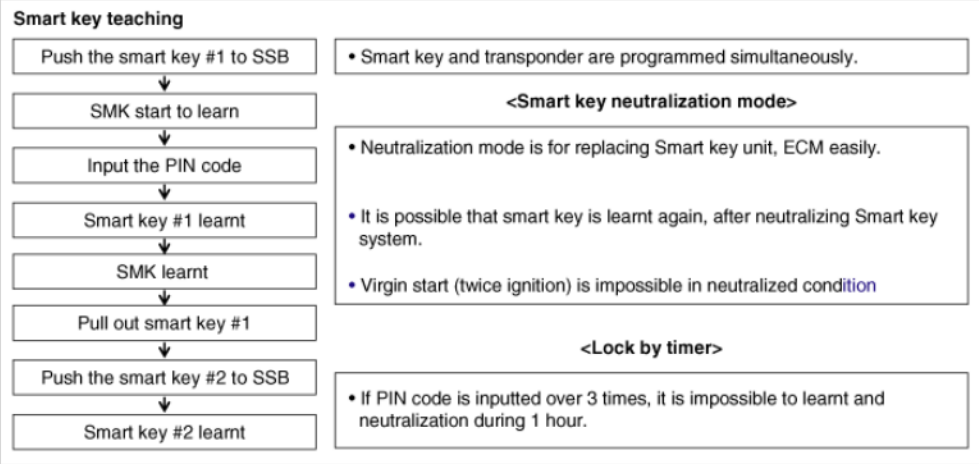
Teaching MODE

This mode is used by the dealers in order to replace SMK and/or 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 and SMART FOB are already learnt with same PIN code
- Additional or new keys teaching: SMK is already learnt with same PIN code



Starting After Replacing (Virgin Start)

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

- It is for starting at virgin condition
- All related parts are virgin condition (Smart key, IPM, ECM)
- Press brake pedal in P or N range
- Push the start button once with virgin smart key.



Inspection

Self Diagnosis With GDS

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

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

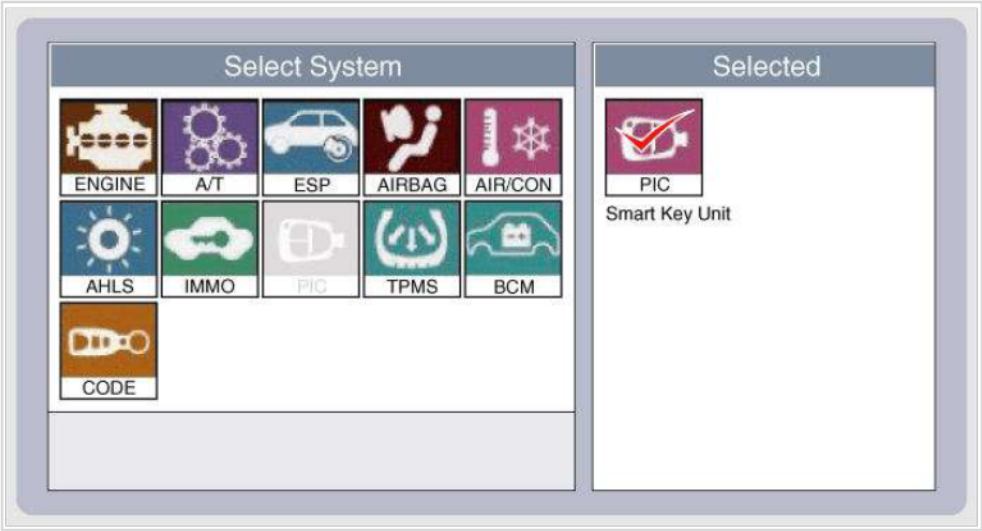
1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

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.
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".

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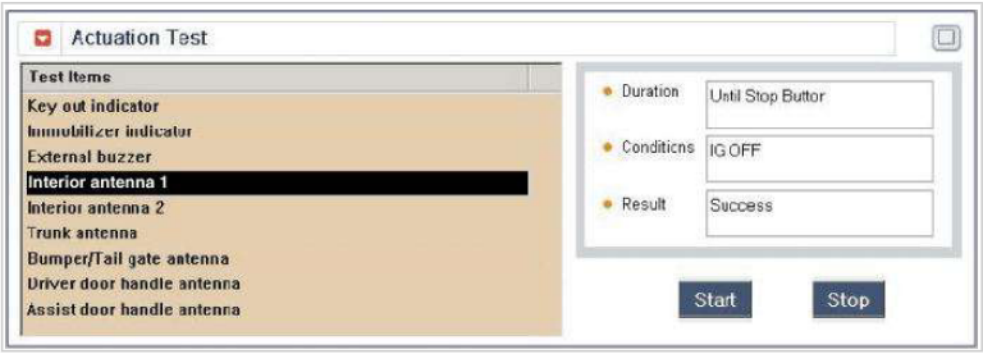


Antenna Actuation Diagnosis

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



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

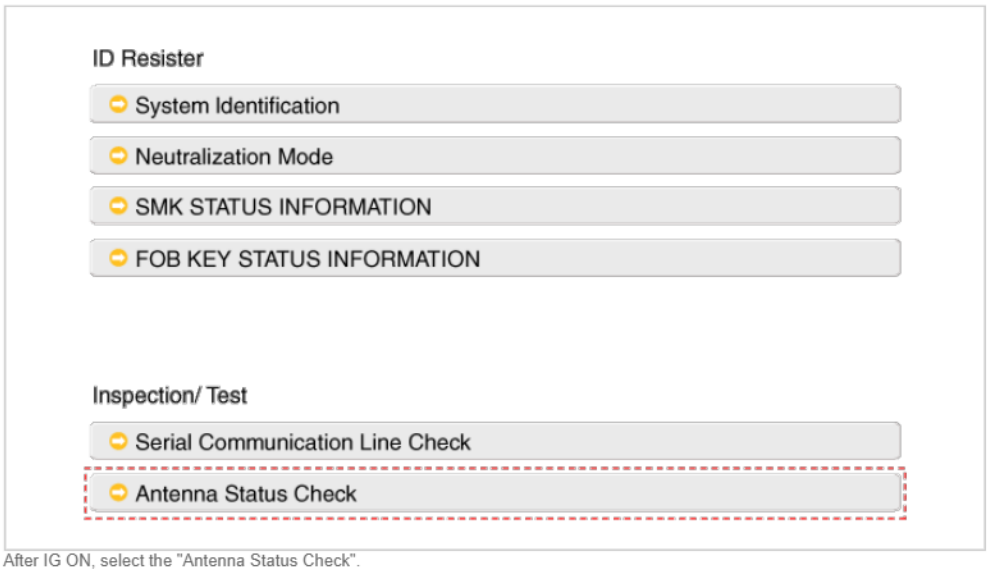


4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

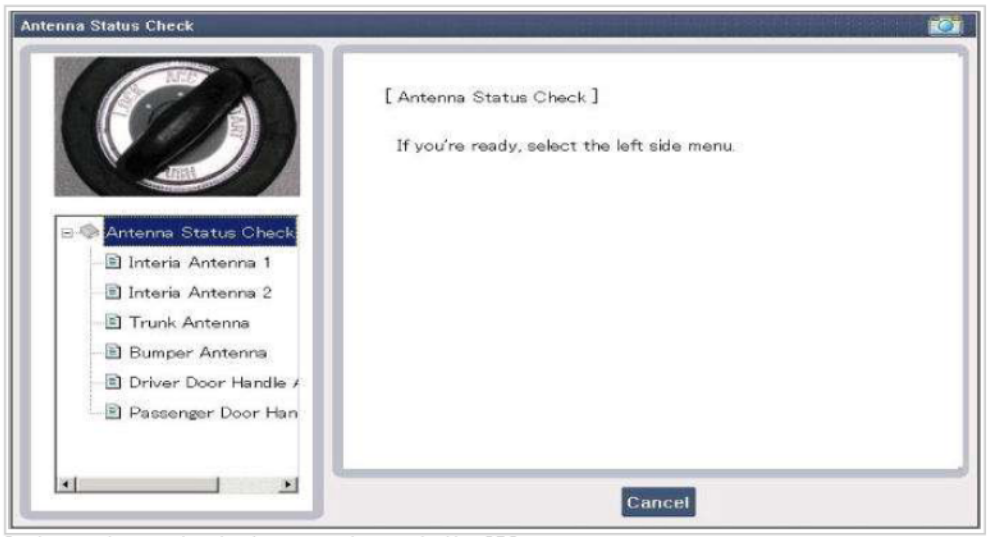
Antenna Status Check

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

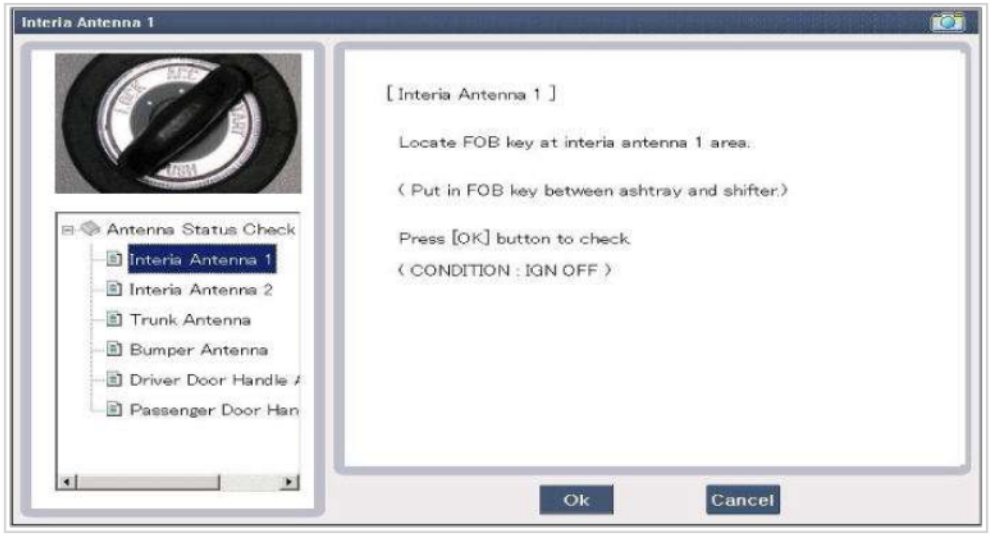
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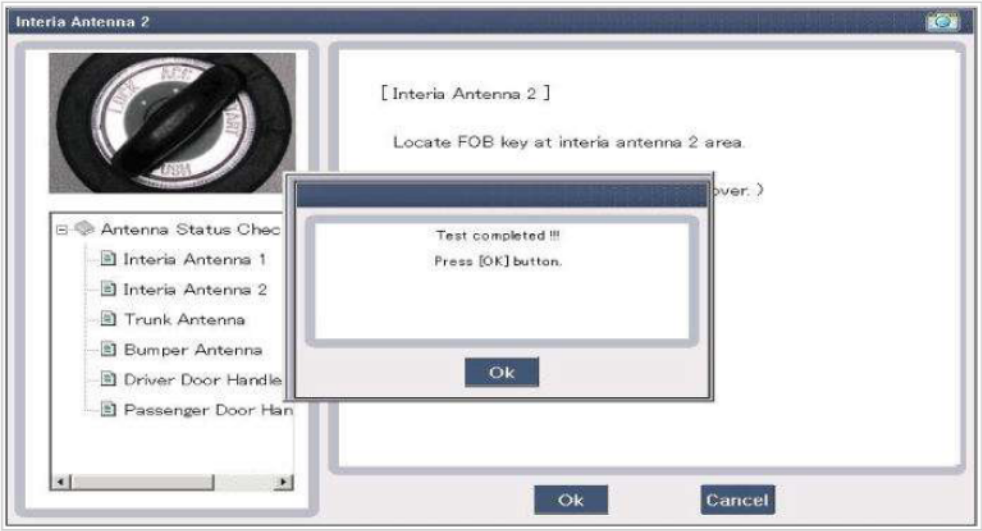
3. After IG ON, select the "Antenna Status Check".



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



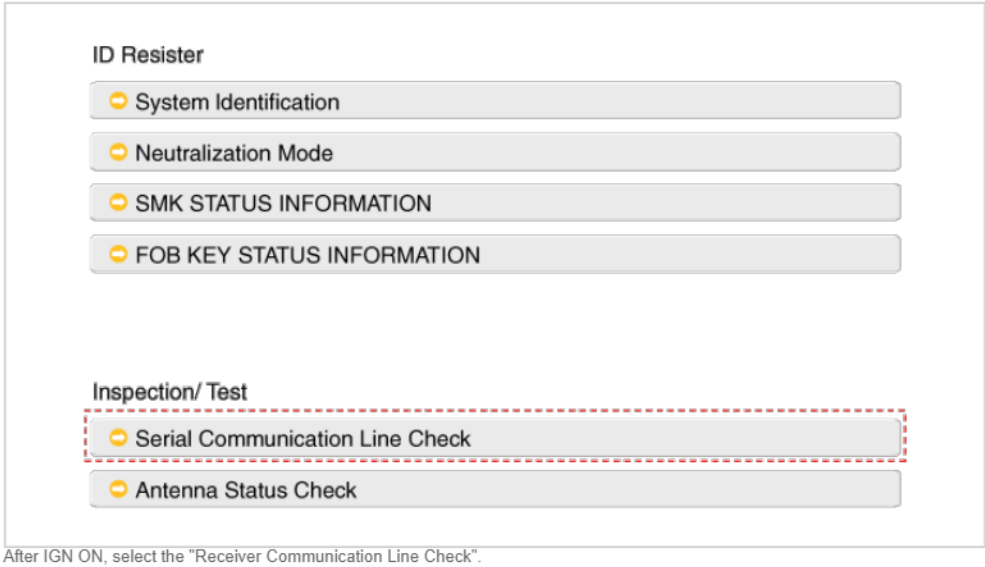
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5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/Antenna
   E. DRV_DR Antenna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

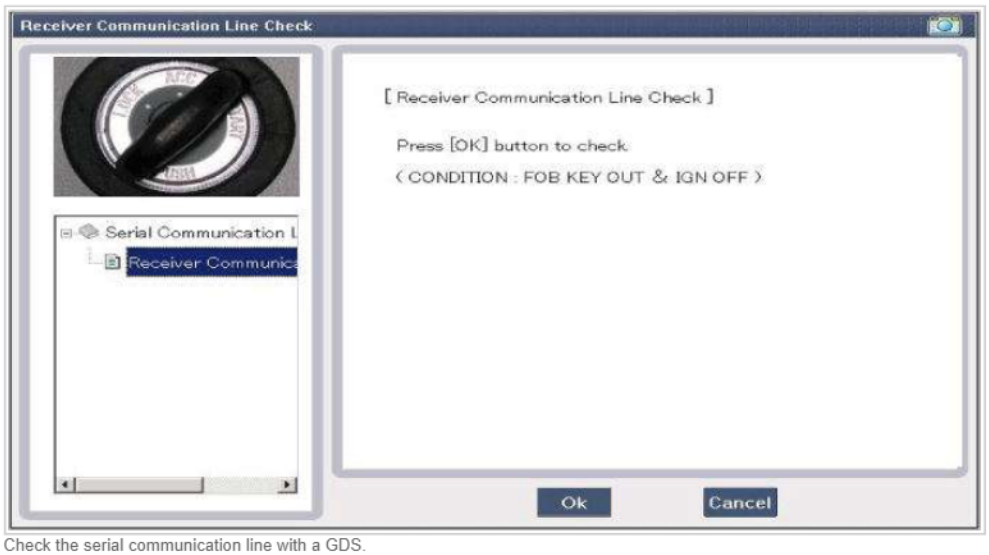
Serial Communication Status Check

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



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

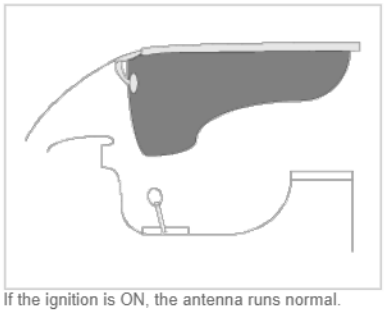
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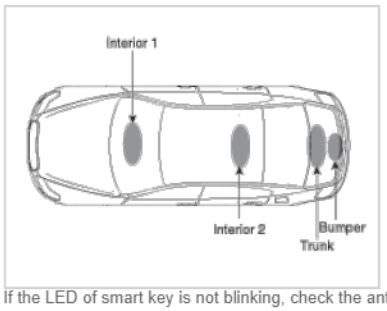
4. Check the serial communication line with a GDS.
5. If the smart key runs normal, the communication of smart key unit, exterior receiver and ESCL are normal.
6. If the smart key runs abnormal, check the following items.
   A. Disconnection or no response of the exterior receiver communication line.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

Interior Antenna Actuation Check

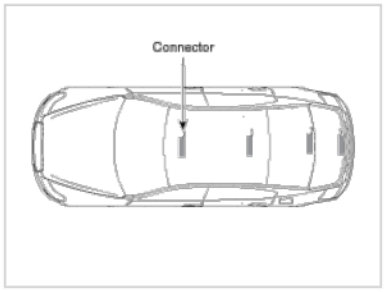
1. Set the smart key in the following shade area and check the IG ON.



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.



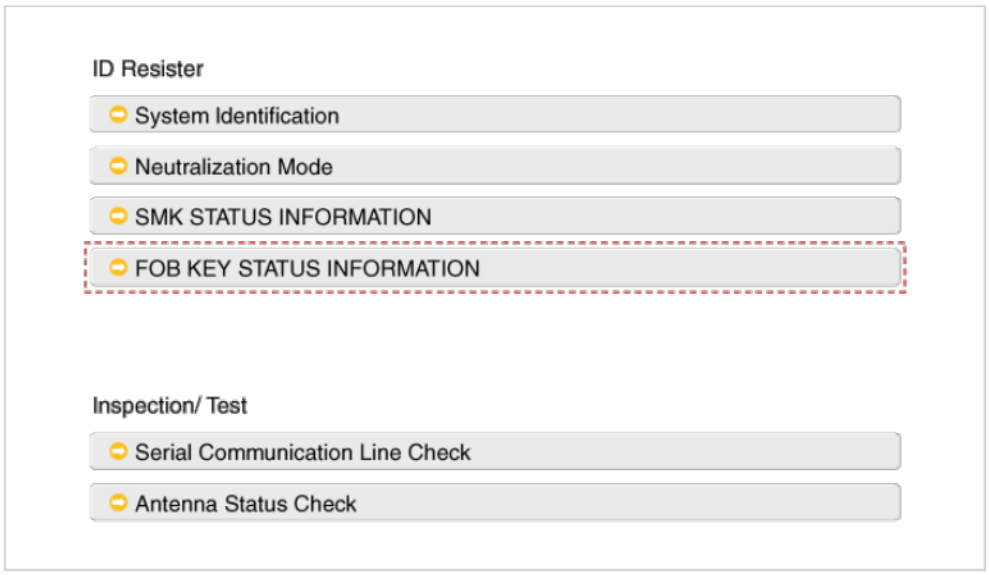
5. If the LED of smart key is not blinking, check the antenna in shade area.



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".

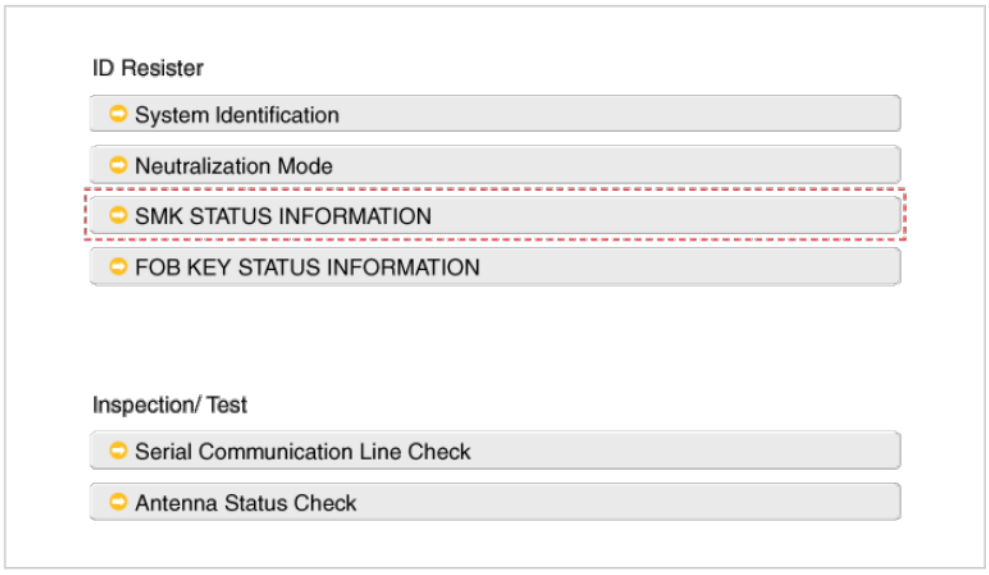
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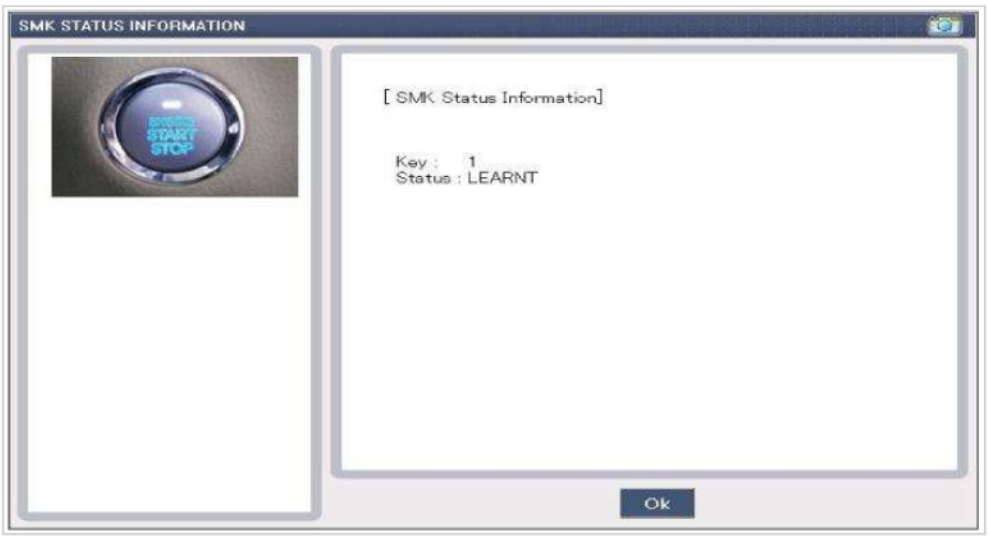


Smart Key Status Check

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

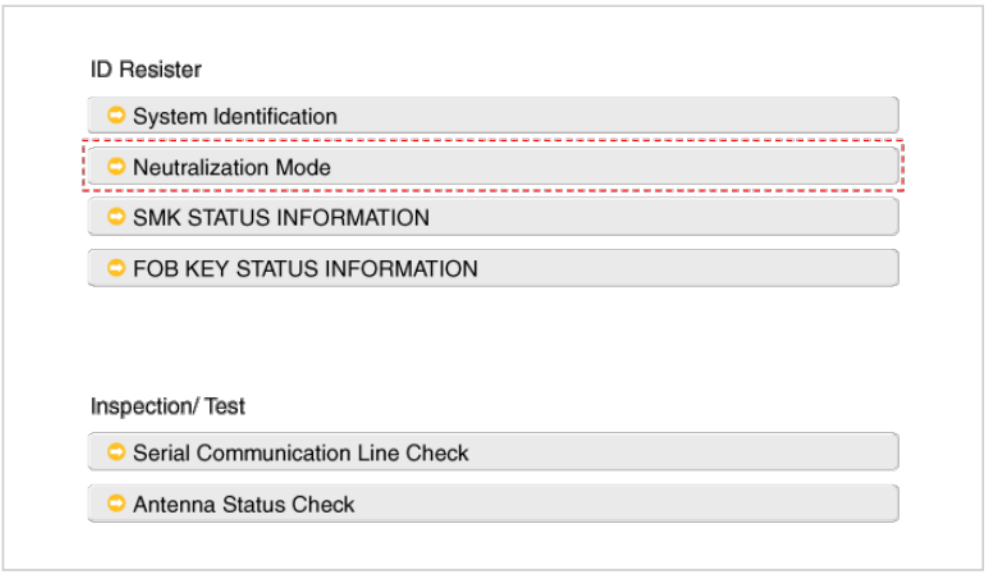


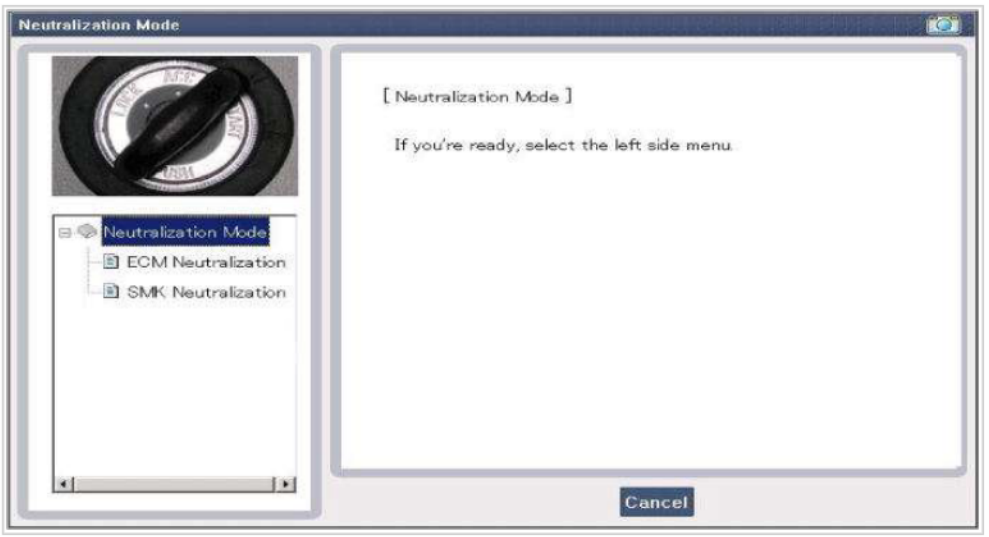
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Neutralization Status Check

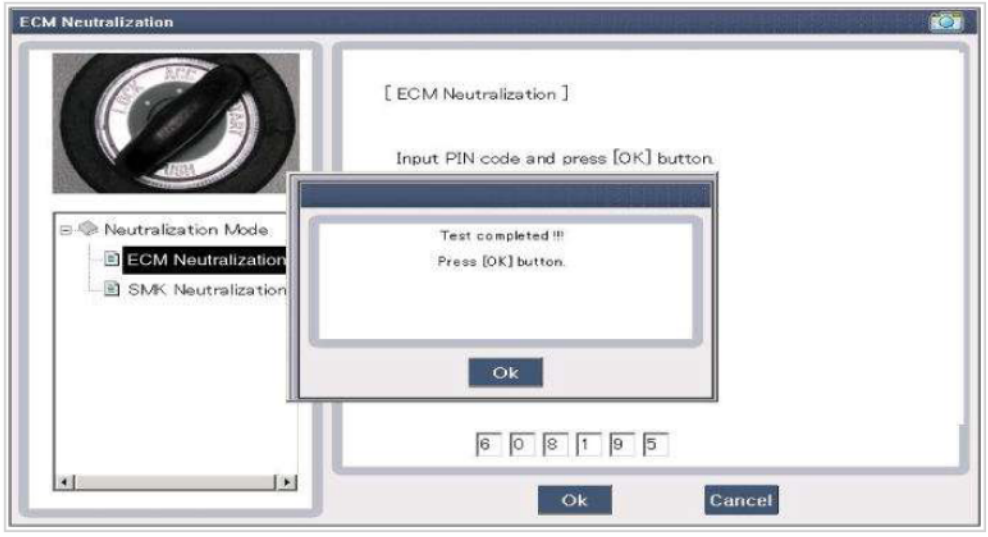
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IGN ON, select the "Neutralization mode".

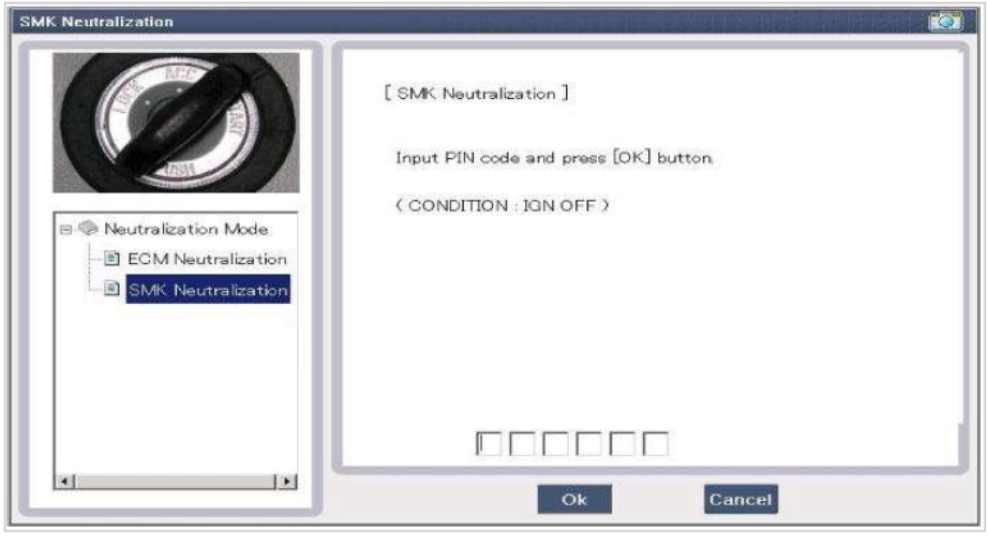




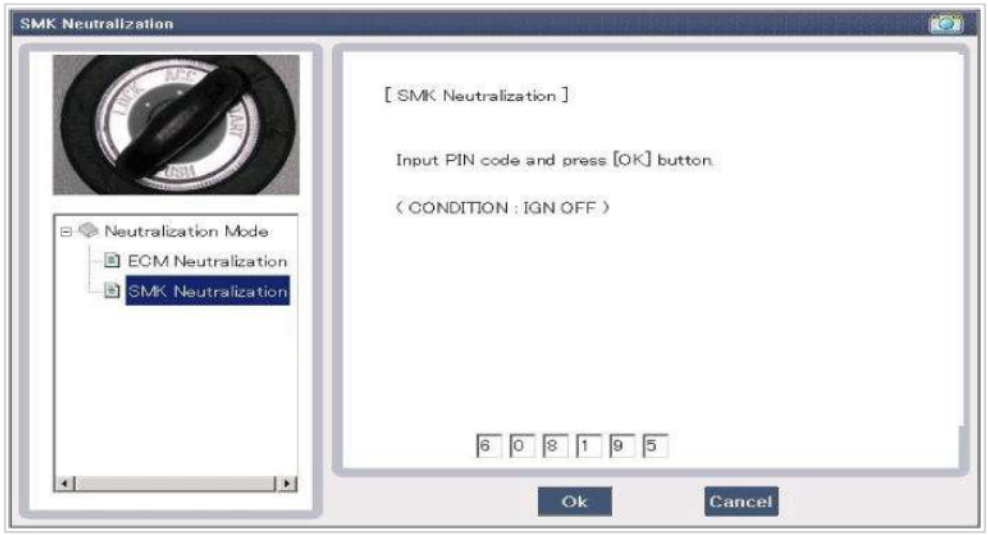
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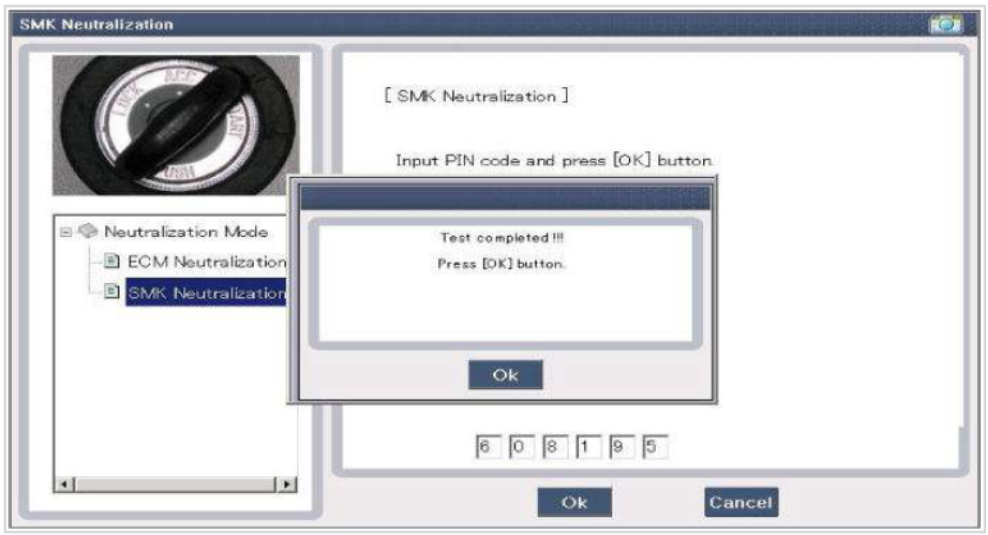






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Input Switch List

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

Actuator List

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

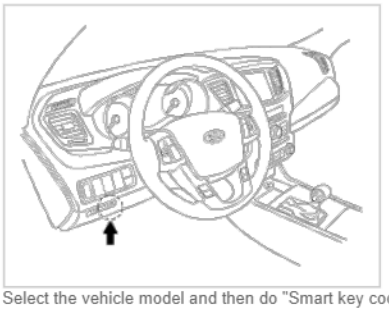
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7	DRV DR Antenna Active	Ignition switch ON Engine off
8	AST DR Antenna Active	Ignition switch ON Engine off

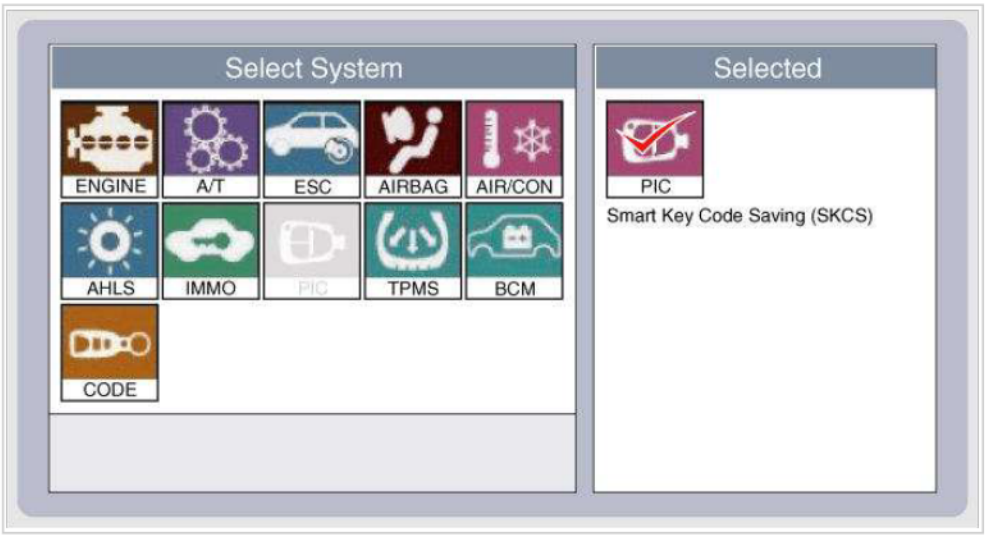
Smart Key

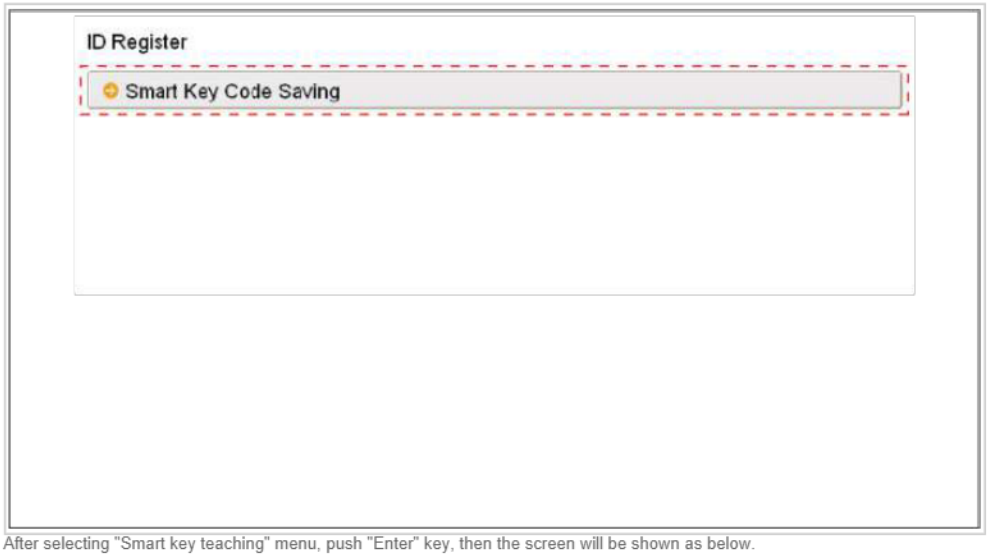
Smart Key Code Saving

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



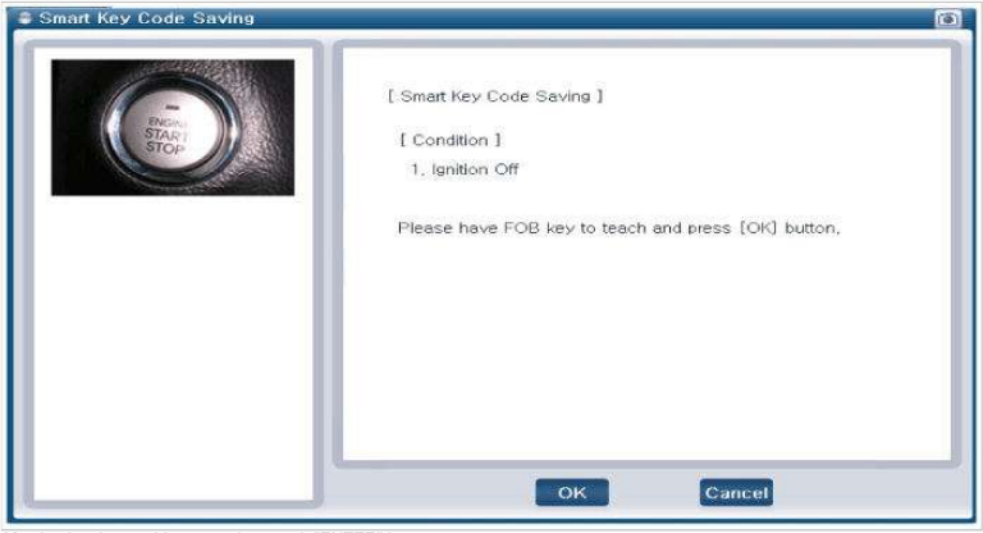
2. Select the vehicle model and then do "Smart key code saving".



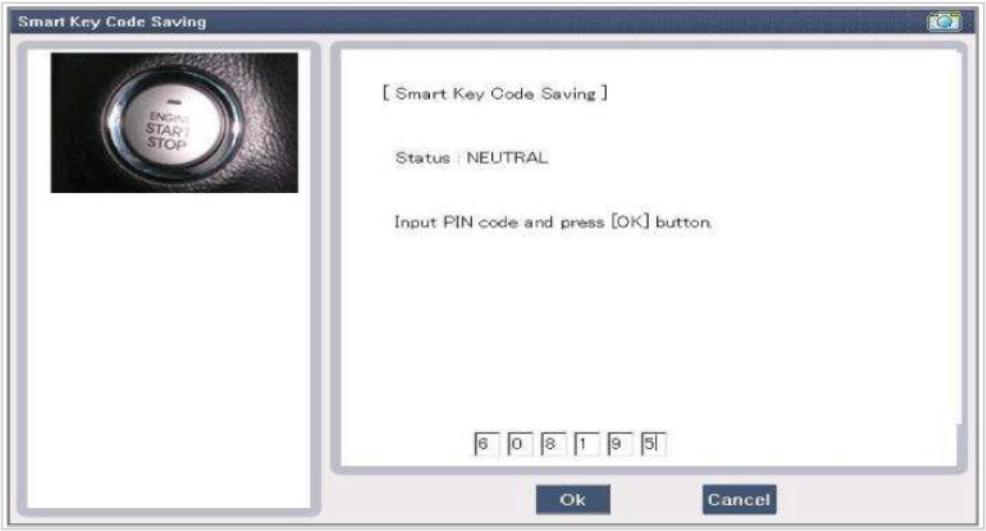


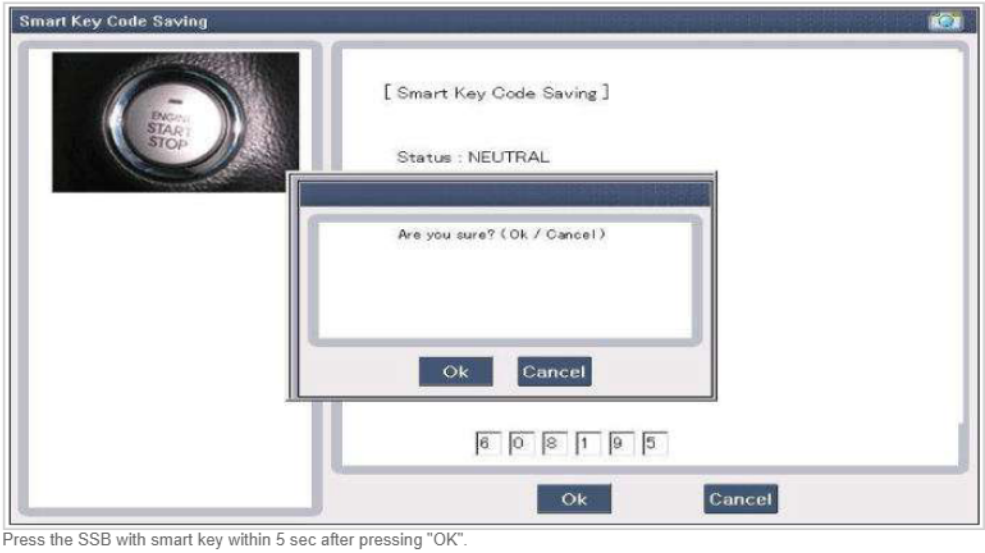
3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

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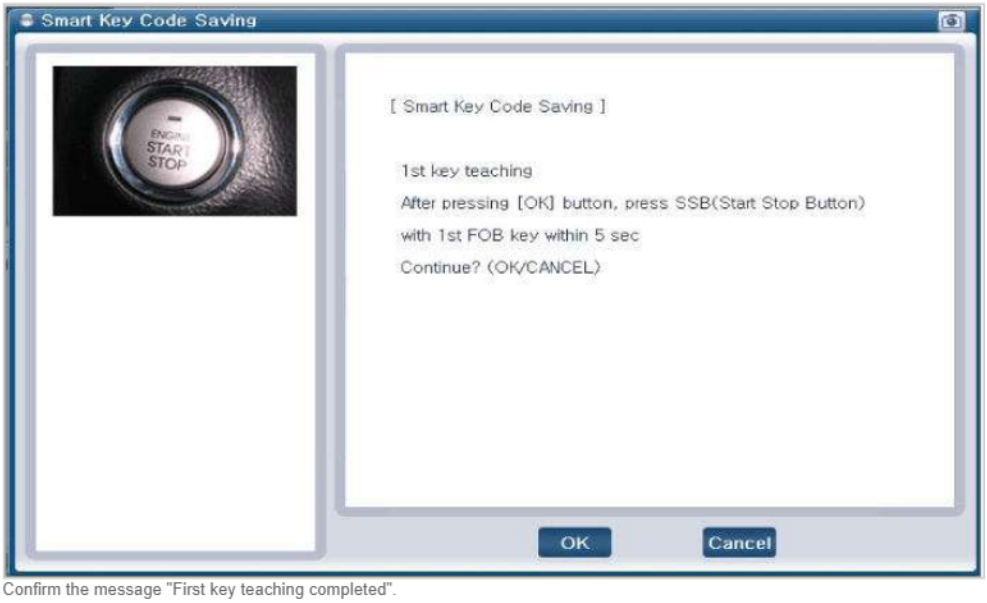
4. After having the teaching smart key, push "ENTER" key.
5. Input the "Pin code" for first key teaching.



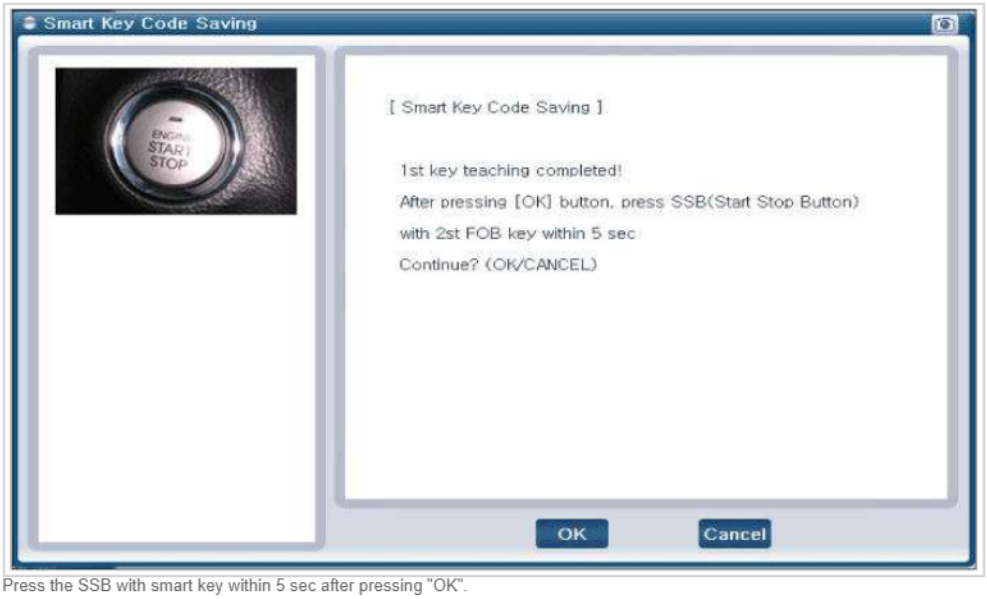


6. Press the SSB with smart key within 5 sec after pressing "OK".

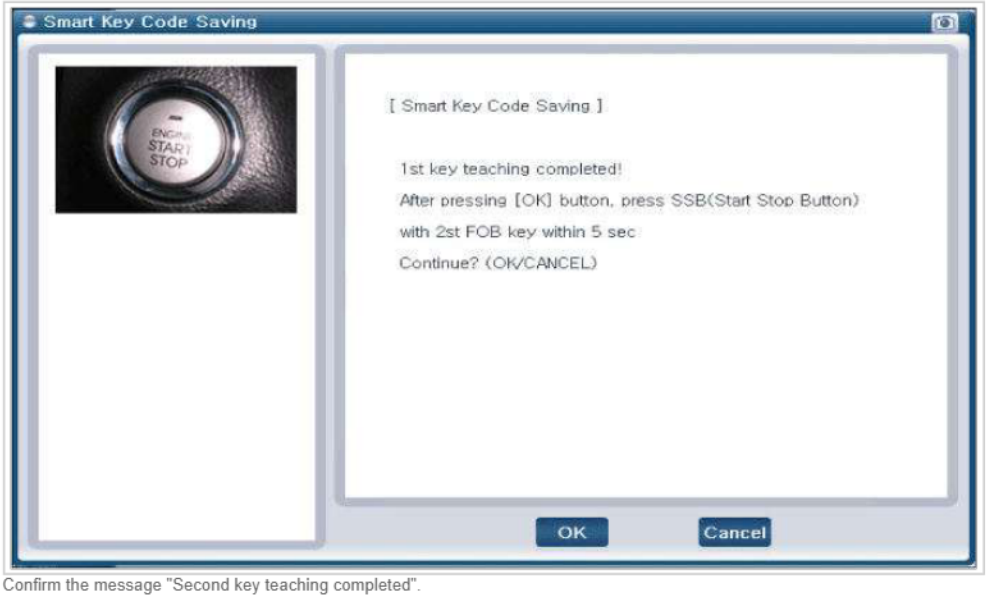
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7. Confirm the message "First key teaching completed".

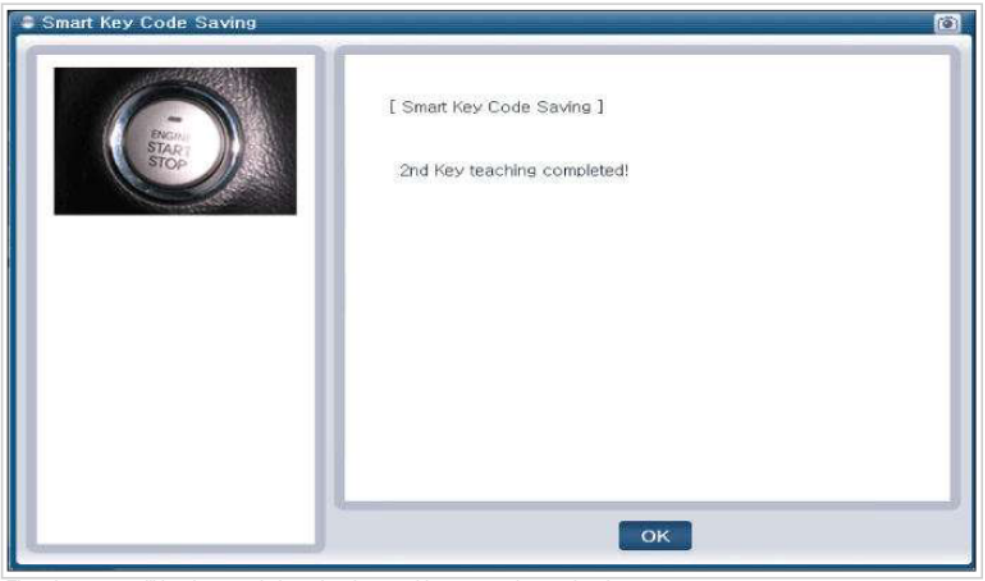


8. Press the SSB with smart key within 5 sec after pressing "OK".

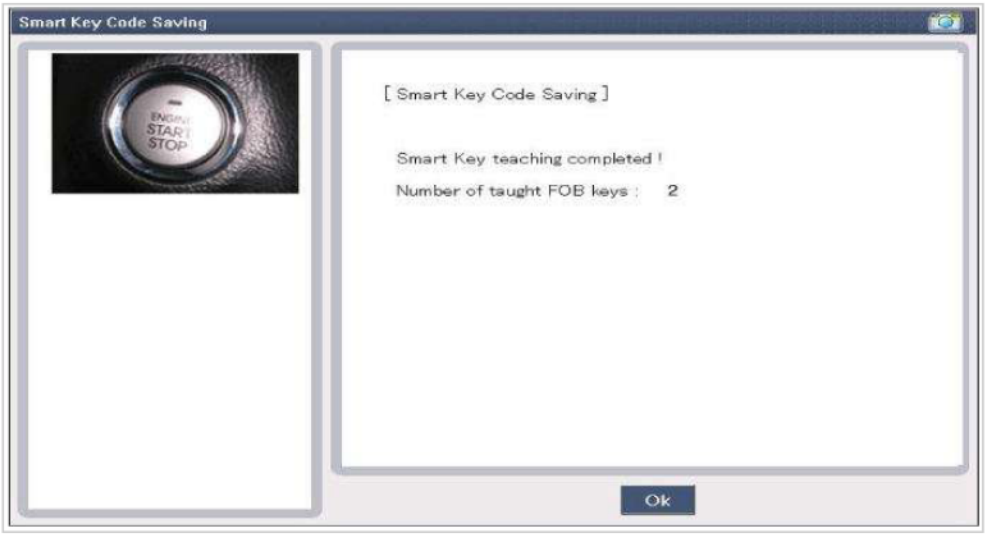


9. Confirm the message "Second key teaching completed".

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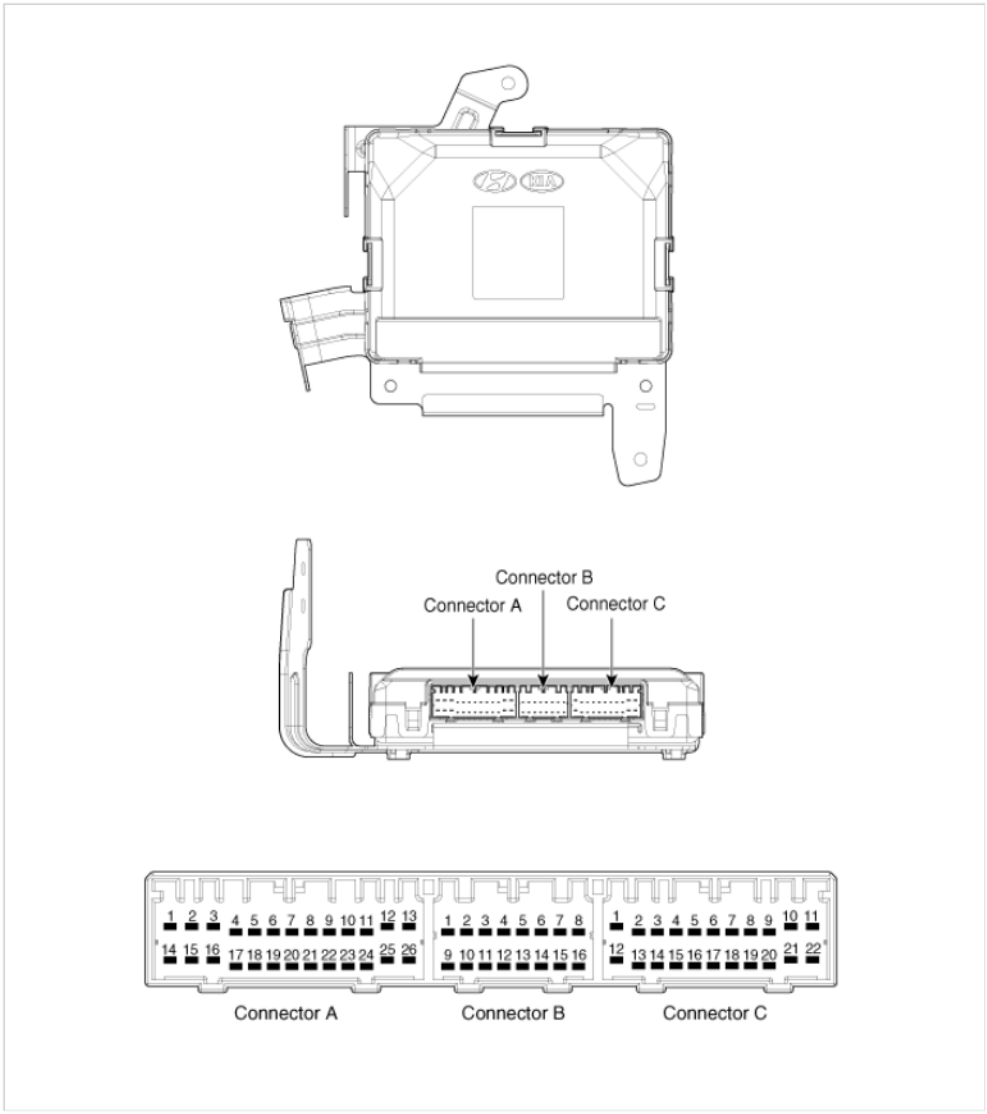


10. Then the screen will be shown as below when key teaching process is completed.



Component (1)

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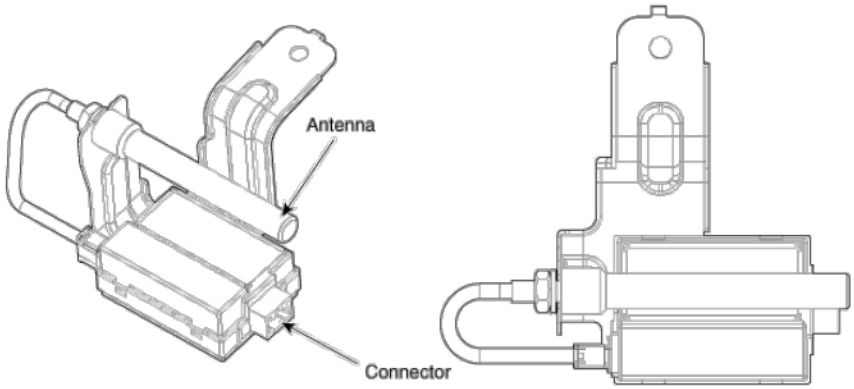
Connector Pin Information

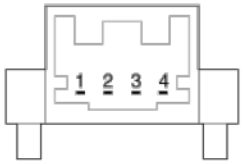
No.	Connector A (26 pins)	Connector B (16 pins)	Connector C (22 pins)
1	VBAT load	C CAN low	SSB illumination ground
2	-	C CAN high	-
3	Power ground 1	-	SSB LED OFF
4	IGN 1	-	Interior antenna #2 power
5	IGN1 relay	Brake switch	Interior antenna #1 power
6	ACC	Immobilizer antenna power	-
7	IGN 2	-	-
8	SSB switch 2	Wheel speed	Trunk antenna power
9	-	Driver toggle button	Bumper antenna power
10	RF COM	-	Assist side antena power
11	-	-	Driver side antenna power
12	B CAN high	P position/ Clutch switch	SSB LED IGN
13	B CAN low	Start feedback	SSB illumination power
14	VBAT CPU	Immobilizer antenna ground	-
15	-	-	Interior antenna #2 ground
16	Power ground 2	SSB LED ACC	Interior antenna #1 ground
17	Starter relay		-
18	IGN2 relay		-
19	ACC relay		Trunk antenna ground
20	-		Bumper antenna ground
21	-		Assist side antena ground
22	-		Driver side antenna ground
23	RPM		
24	EMS COM		
25	SSB switch 1		
26	Assist toggle button		

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Component (2)

[RF Receiver Unit]

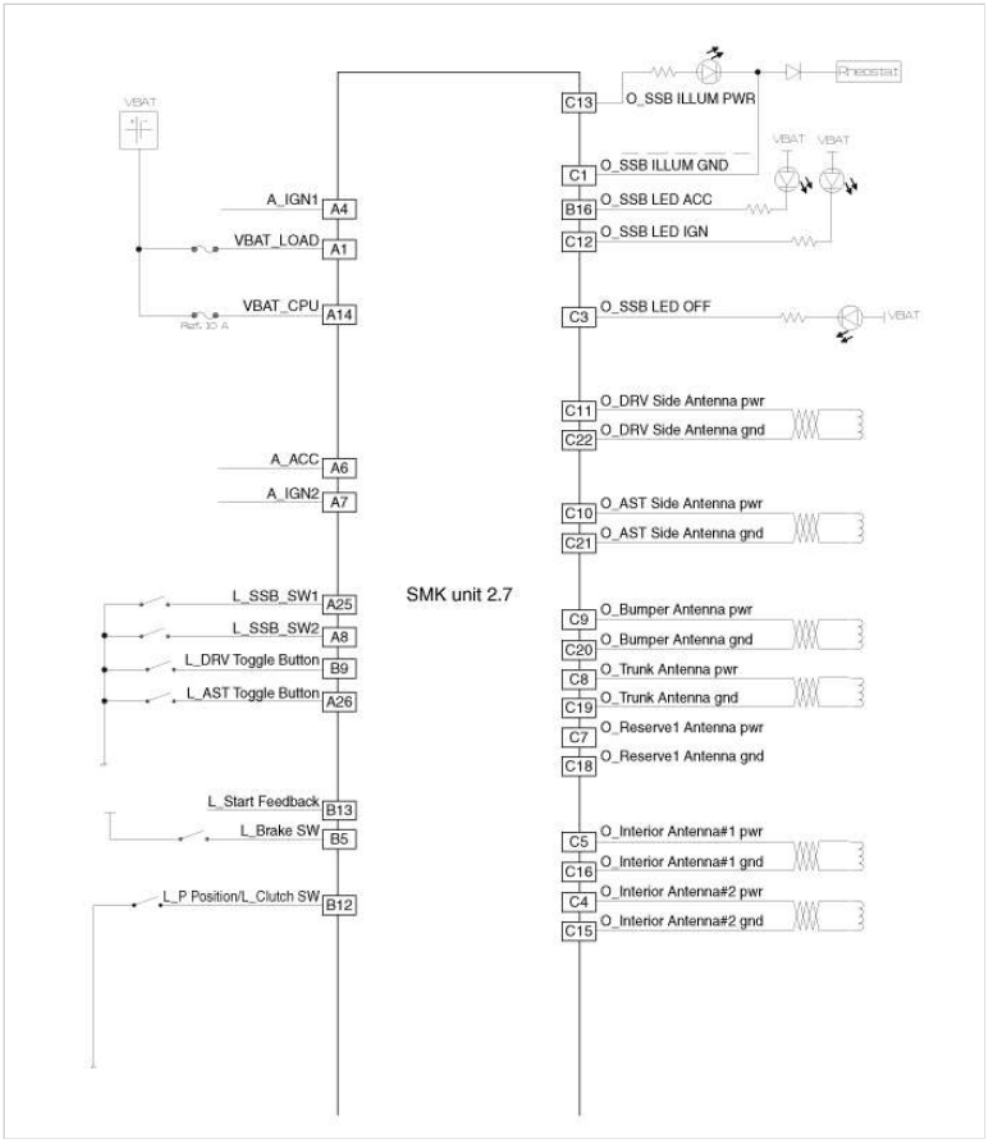




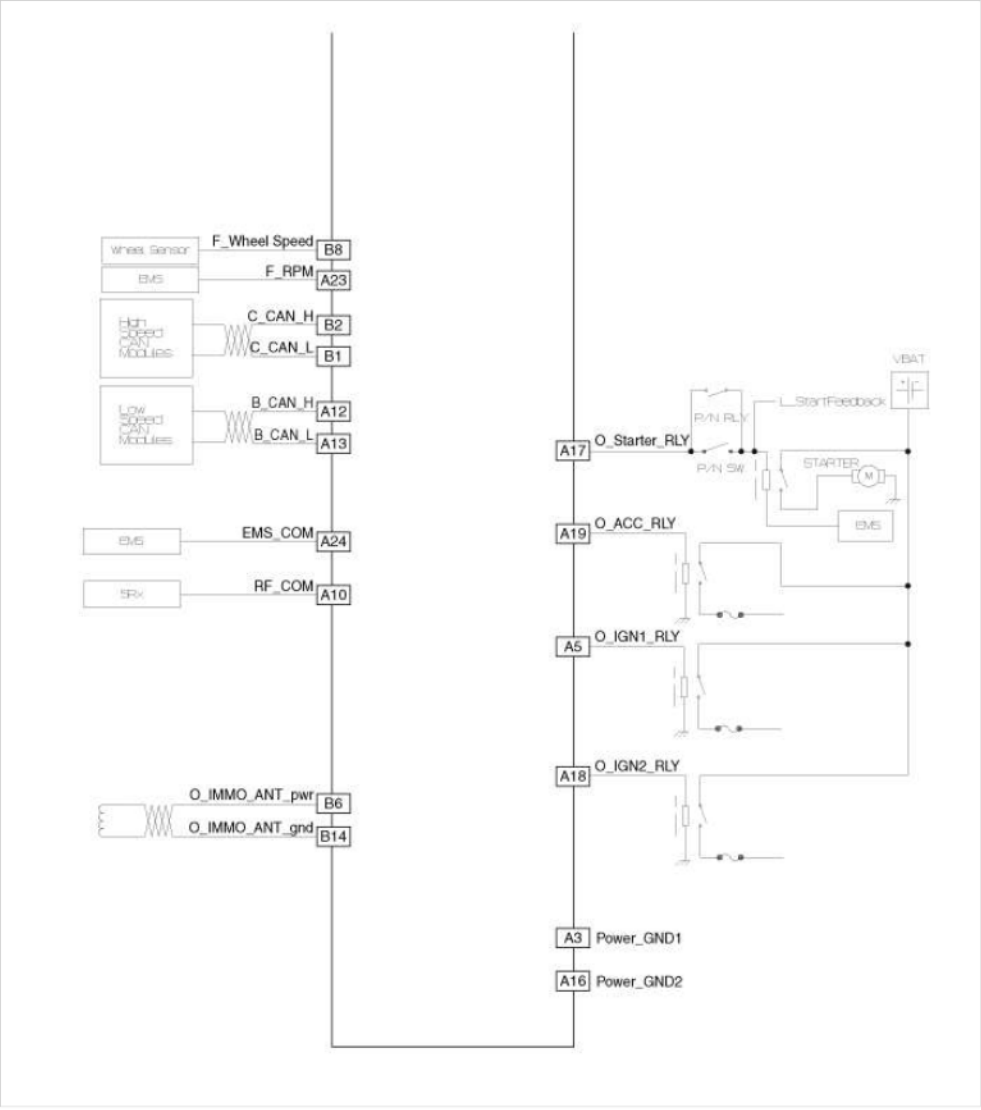
NO.	Description (4Pins)
1	Data
2	-
3	Power
4	Ground

Circuit Diagram

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Body Electrical System

Inspection

Smart Key Unit

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

Smart Key Switch

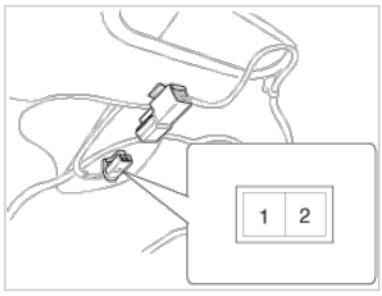
- Refer to the BE group - inspection / self diagnosis with GDS.

Antenna

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

Trunk Lid Open Switch

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



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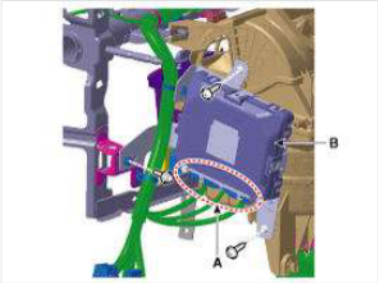
2. If continuity is not specified, inspect the switch

Terminal / Position	1	2
OFF		
ON	○	○

Removal

Smart Key Unit

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.
   (Refet to Body - "Crash Pad")
3. Disconnet the connector (A) after loosening the mounting screws and bolt. And then remove the SMK unit (B).

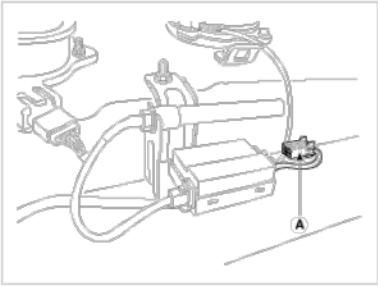


RF Receiver

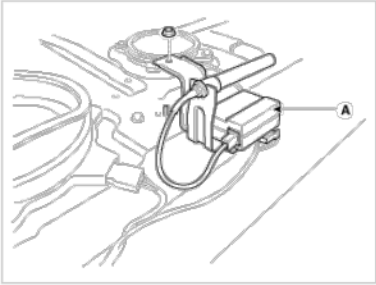
NOTICE

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

1. Disconnect the negative(-) battery terminal.
2. Remove the rear seat.
   (Refer to Body - "Rear Seat")
3. Remove the rear package tray.
   (Refer to Body - "Rear Package Tray")
4. Disconnect the RF receiver connector (A).



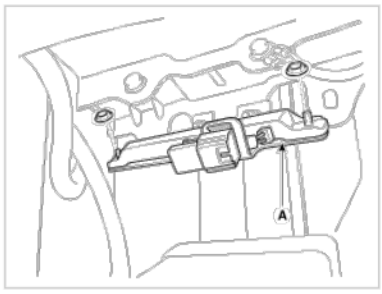
5. Remove the RF receive (A) after loosening the nut (1EA).



Interior 1 Antenna

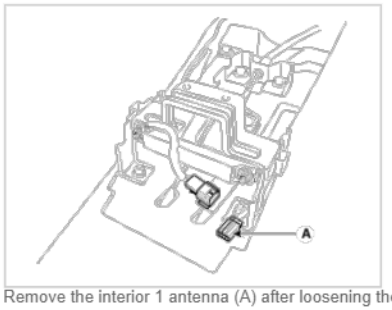
1. Disconnect the negative(-) battery terminal.
2. Remove the center console.
   (Refer to Body - "Console")
3. Remove the interior 1 antenna (A) after disconnecting the connector and loosening the mounting nuts (2EA).

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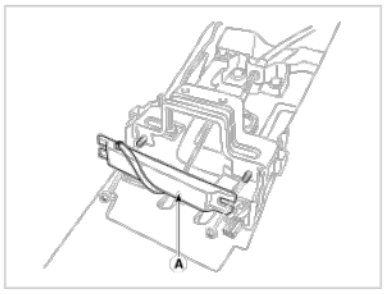


Interior 2 Antenna

1. Disconnect the negative(-) battery terminal.
2. Remove the center console.
   (Refer to Body - "Console")
3. Disconnect the interior 2 antenna connector (A).

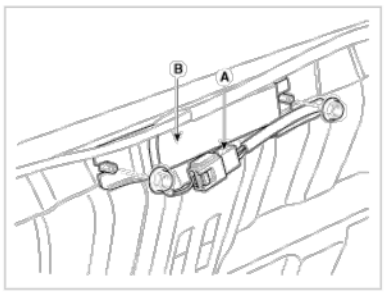


4. Remove the interior 1 antenna (A) after loosening the mounting nuts (2EA).



Trunk Antenna

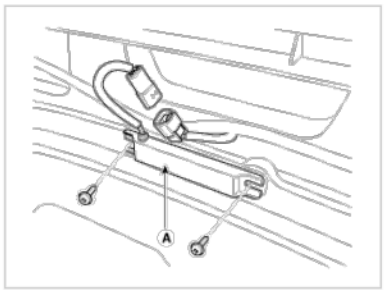
1. Disconnect the negative(-) battery terminal.
2. Remove the trunk transverse trim.
   (Refer to Body - "Interior Trim")
3. Disconnect the trunk antenna connector (A) and remove the trunk antenna (B) after loosening nut (2EA).



Exterior Bumper Antenna

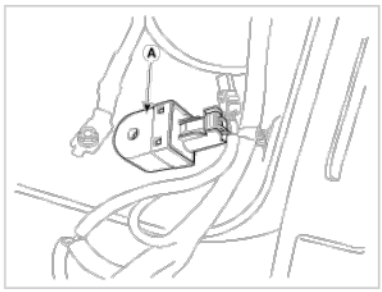
1. Disconnect the negative(-) battery terminal.
2. Remove the rear bumper.
   (Refer to Body - "Rear Bumper")
3. Disconnect the exterior bumper antenna connector on rear bumper center part.
4. Disconnect the antenna connector and remove the exterior bumper antenna (A) after loosening the screws (2EA).

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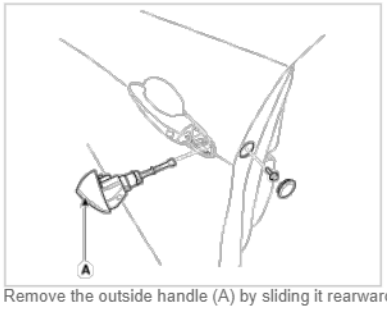
Buzzer

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

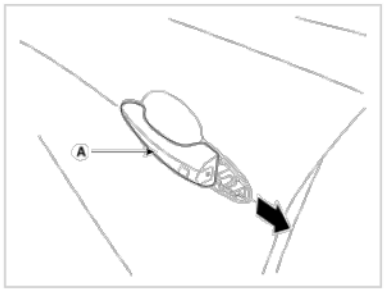


Door Outside Handle

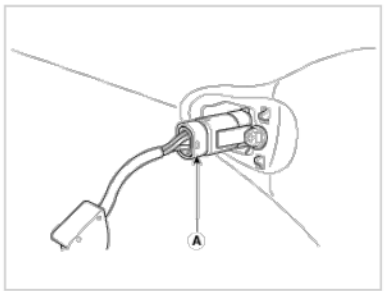
1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector after removing the door trim. (Refer to the BD group - "Front door")
3. Loosen the mounting bolt, then remove the door handle cover and door lock (A).



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



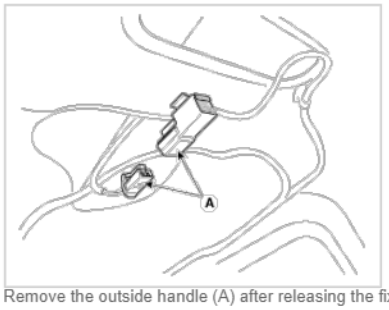
5. Disconnect the door outside handle connector (A).



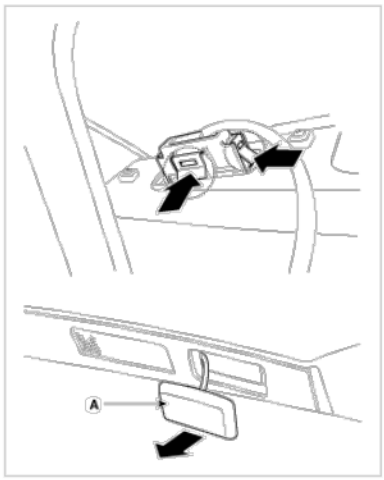
Trunk lid open switch

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



4. Remove the outside handle (A) after releasing the fixed hooks.



Installation

Smart Key Unit

1. Install the smart key unit.
2. Install the smart key unit and connectors.
3. Install the glove box housing.
4. Install the negative (-) battery terminal and check the smart key system.

RF Receiver

1. Install the RF receiver.
2. Install the rear package tray.
3. Install the rear seat.
4. Install the negative (-) battery terminal and check the smart key system.

Interior 1 Antenna

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

Interior 2 Antenna

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

Trunk Antenna

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

Exterior Bumper Antenna

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

Buzzer

1. Install the buzzer.

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2. Install the left side wheel guard.
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 lid open trim.
3. Install the negative (-) battery terminal and check the smart key system.

Door Outside Handle

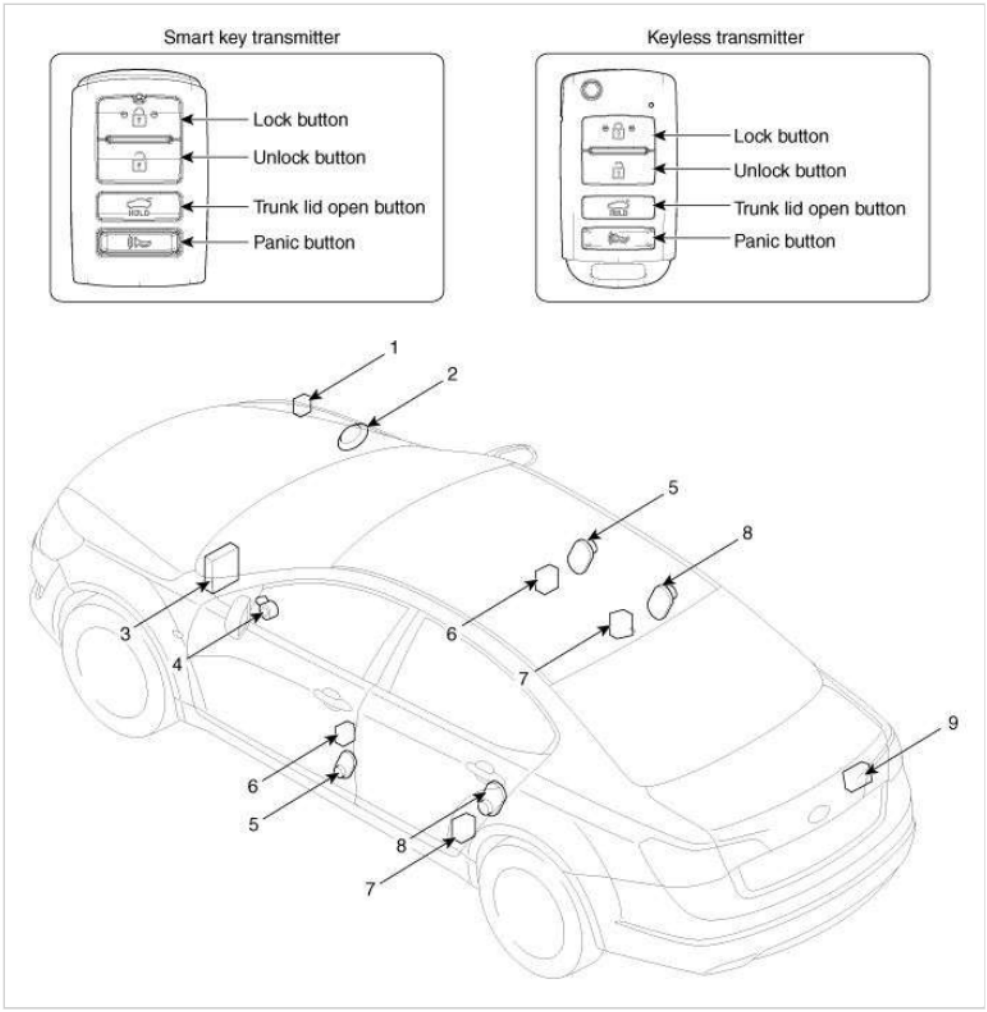
1. Install the outside handle.
2. Install the door trim.
3. Install the negative (-) battery terminal and check the smart key system.

Specification

Item	Description
Power source	3V
Operating temperature	-20°C ~ +60°C (-4°F ~ +140°F)
RF Modulation	FSK
LF Modulation	ASK
RF frequency	433.92MHz
Battery	1EA (CR2032) **⚠ 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.
Button number	3
Function	Door lock Door unlock Trunk lid open

Component Location

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

Body Electrical System

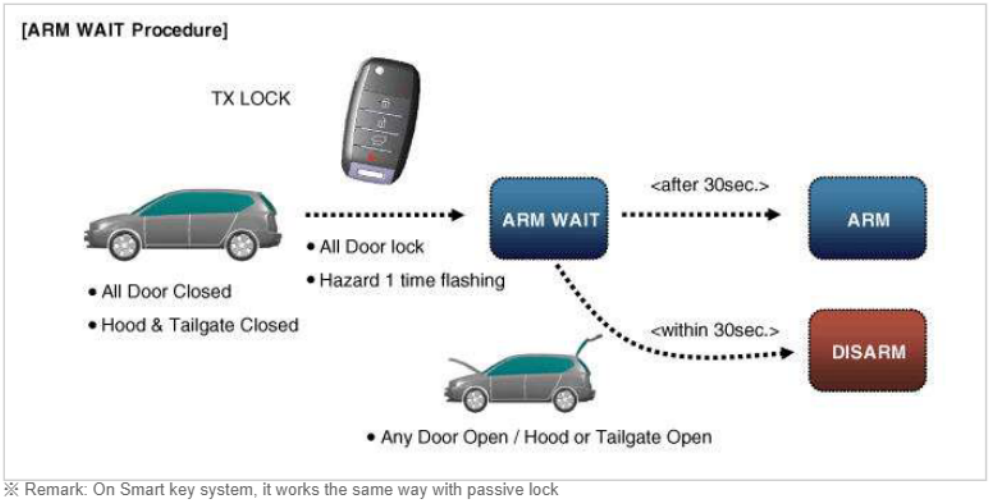
Description

Burglar Alarm State [B/A State]

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

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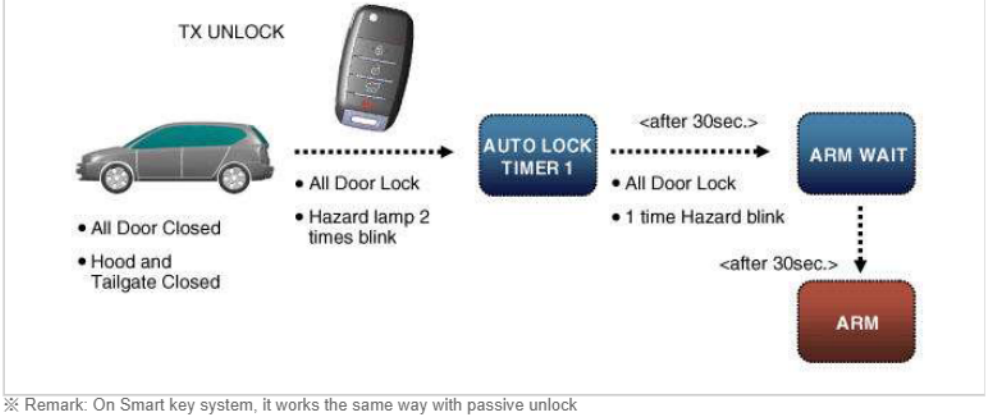
[ARM WAIT Procedure]



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

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

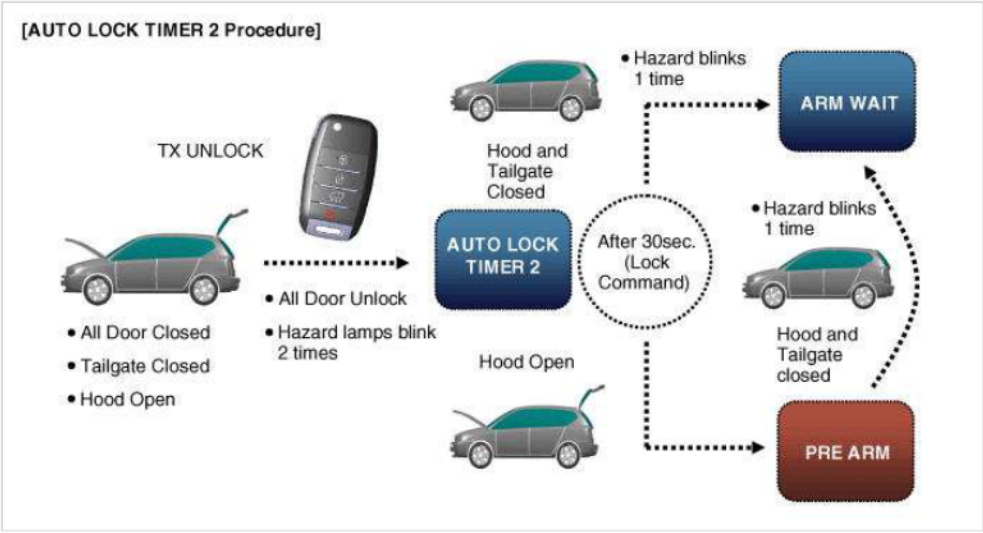
[AUTO LOCK TIMER 1 Procedure]



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

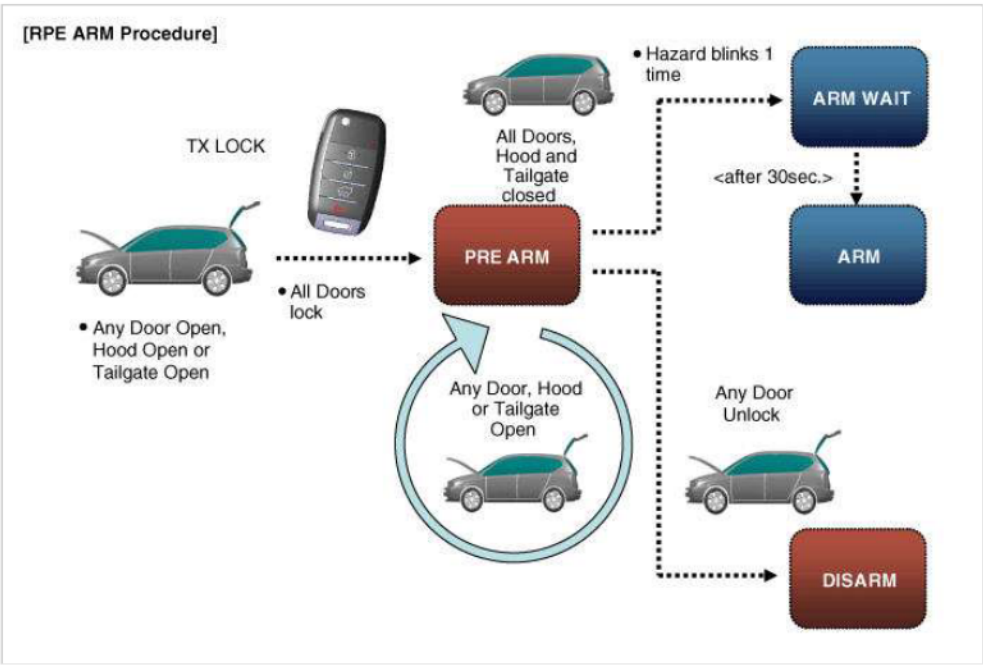
B/A State	Description
AUTO LOCK TIMER 2	1. In "AUTOLOCKTIMER2" state, when timer "30sec."is running, if this timer expired, the auto lock command is generated "Lock command". 2. All doors are Locked, Hood is closed and Tailgate is closed when "Lock command" operated, then B/A state changes to"AUTOLOCKTIMER2"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

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

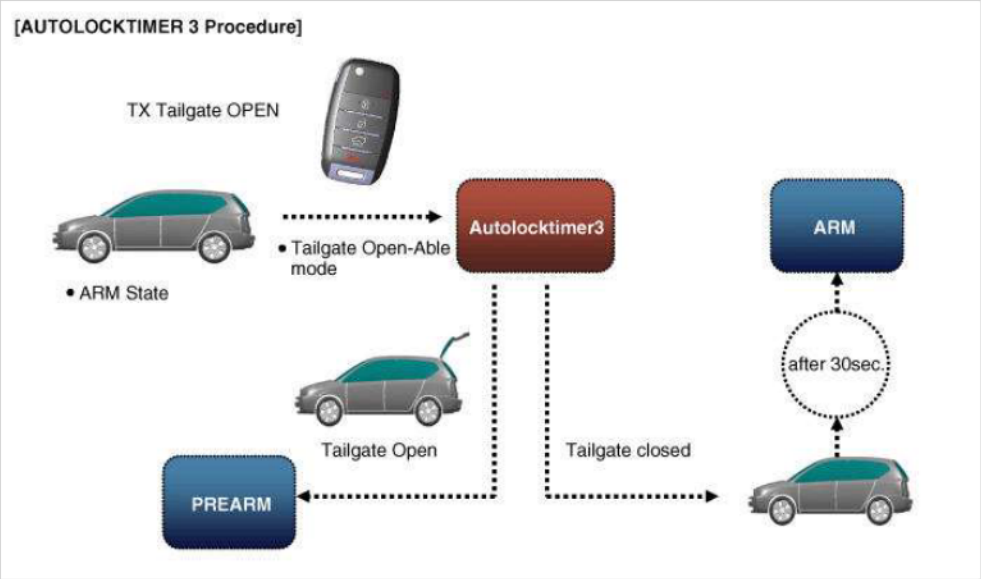
B/A State	Description
PRE ARM	1. The "PREARM" state is when user try to change to arm but pre-condition are not satisfied (door open, tailgate open, or hood open). 2. B/A state changes to “PREARM” when TX Lock command occurs with any door Open, Hood or Tailgate Open. 3. B/A state changes to “PREARM”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



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

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

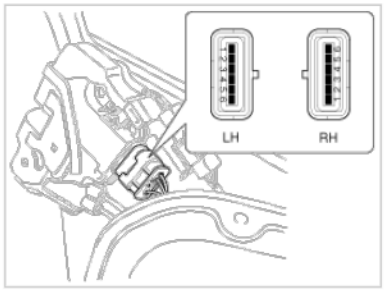
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Inspection

Front Door Lock Actuator Inspection

1. Remove the front door trim.
   (Refer to Body - "Front Door")
2. Remove the front door module.
3. Disconnect the 6P connector from the actuator.

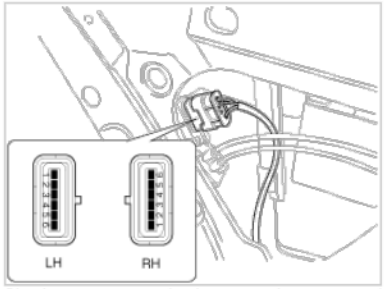


4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	1
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		**6**	**5**
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

Rear Door Lock Actuator Inspection

1. Remove the rear door trim.
   (Refer to Body - "Rear Door")
2. Remove the rear door module.
3. Disconnect the 6P connector from the actuator.



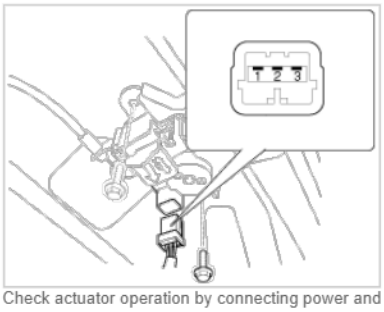
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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Position \ Terminal		2	1
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		6	5
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

Trunk Lid Release Actuator Inspection

1. Remove the trunk lid trim panel.
   (Refer to Body - "Trunk Lid")
2. Disconnect the 3P connector from the actuator.

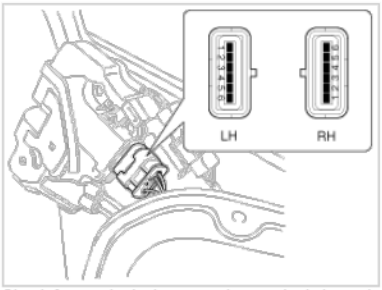


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	1	2
Open	⊖	⊕
Close	–	–

Front Door Lock Switch Inspection

1. Remove the front door trim panel.
   (Refer to Body - "Front Door")
2. Remove the front door module.
3. Disconnect the 6P connector from the actuator.



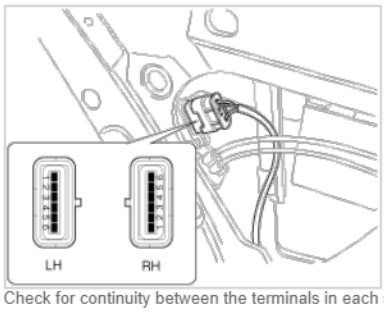
4. Check for continuity between the terminals in each switch position when inserting the key into the door according to the table.

Position \ Terminal		5	6
Front Left	Unlock	○——○	
Position \ Terminal		1	2
Front Right	Unlock	○——○	

Rear Door Lock Switch Inspection

1. Remove the rear door trim panel.
   (Refer to Body - "Rear Door")
2. Remove the rear door module.
3. Disconnect the 6P connector from the actuator.

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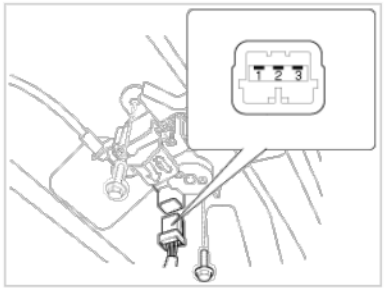
4. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		5	6
Rear Left	Unlock	○——○	

Position \ Terminal		1	2
Rear Right	Unlock	○——○	

Trunk Lid Open Switch Inspection

1. Remove the trunk lid trim.
   (Refer to Body - "Trunk Lid")
2. Disconnect the 3P connector from the actuator.

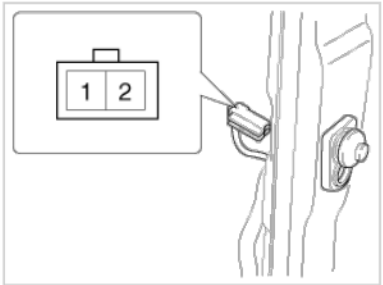


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	3
Open	○——○	
Close		

Door Switch Inspection

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

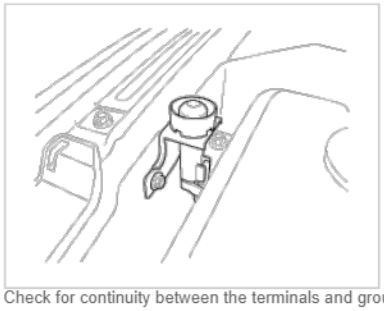


Position \ Terminal	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

Hood Switch Inspection

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

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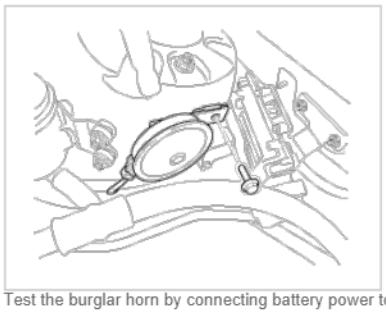


2. Check for continuity between the terminals and ground according to the table.

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

Burglar Horn Inspection

1. Remove the burglar horn (A) after removing 1 bolt and disconnect the 2P connector from the burglar horn.

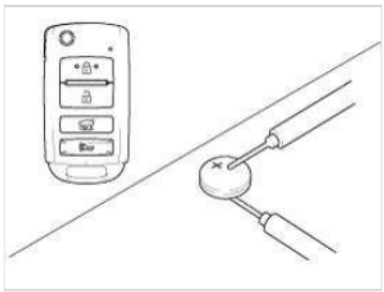


2. Test the burglar horn by connecting battery power to the terminal 1 and ground the terminal 2.
3. The burglar horn should make a sound. If the burglar horn fails to make a sound replace it.

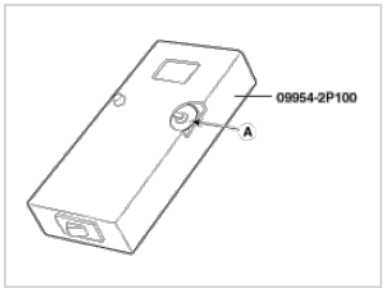
Inspection

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

Standard voltage : 3V



3. Insert the battery (A) into the tester (09954-2p100).



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

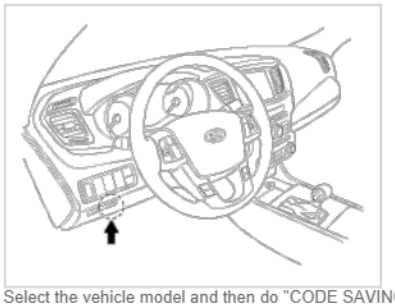
⚠ WARNING

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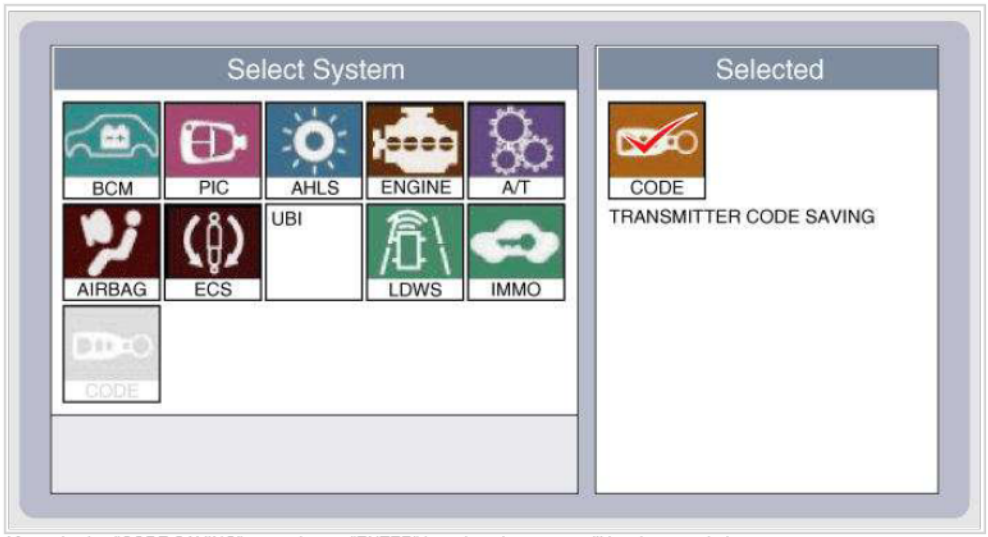
An inappropriately disposed battery can be harmful to the environment and human health.
Dispose the battery according to your local law(s) or regulation.

Transmitter Code Registration (Using GDS)

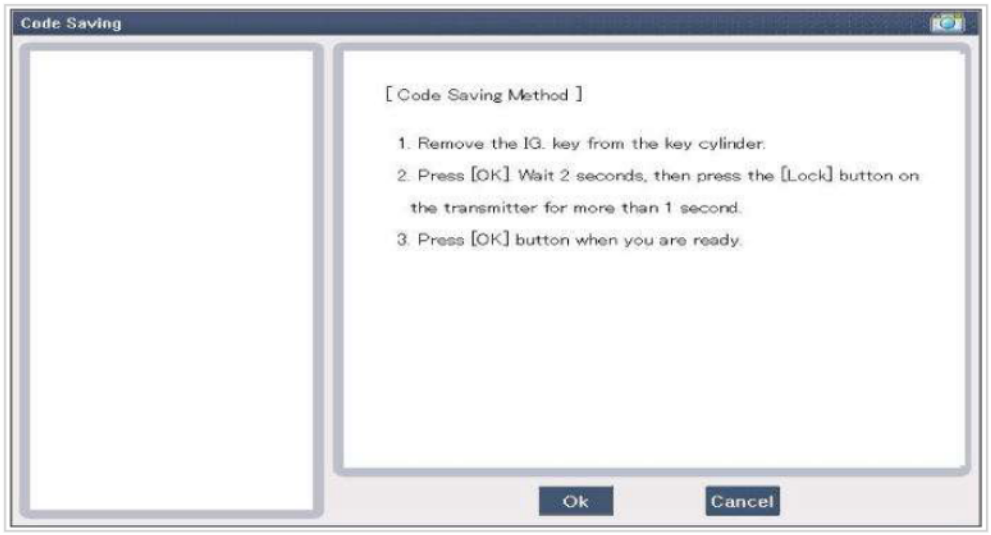
1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.



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

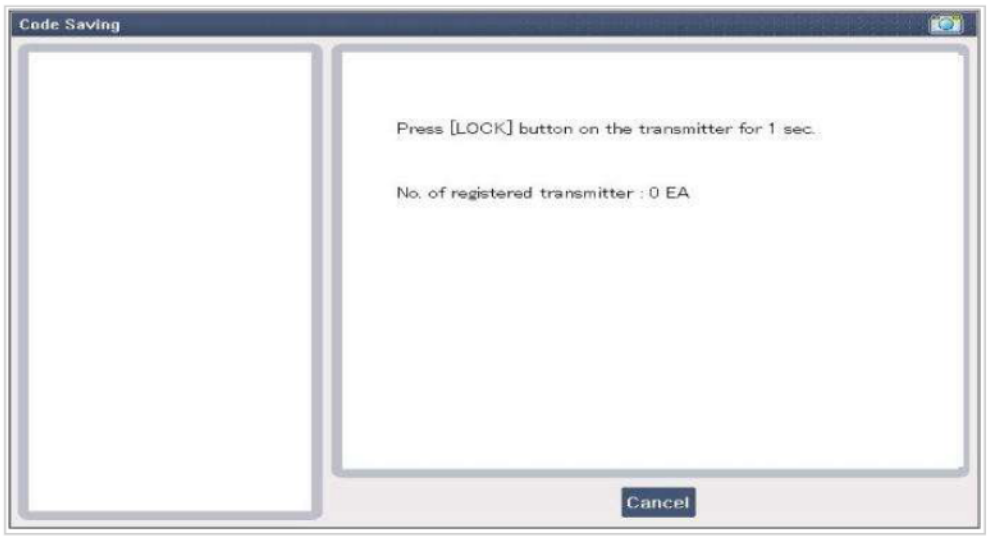


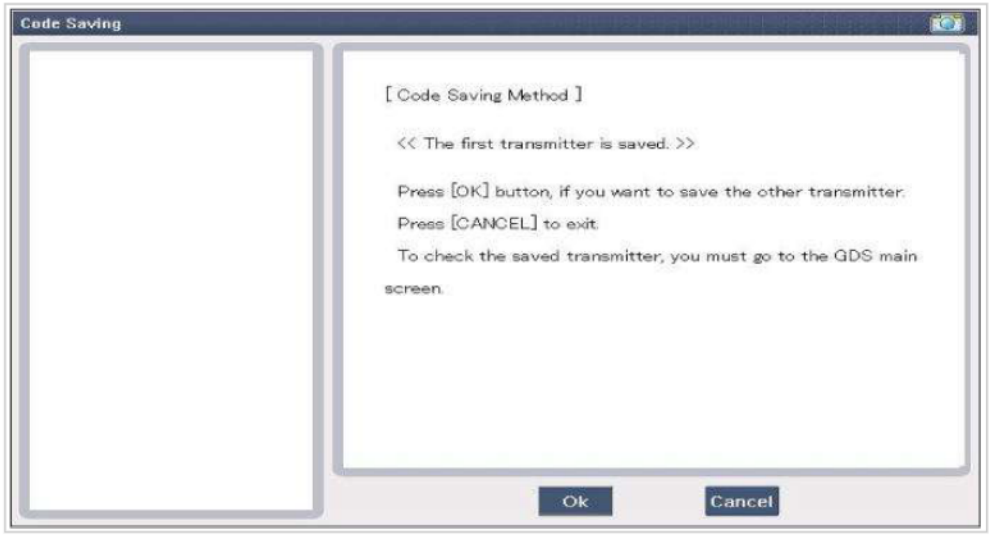
3. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.

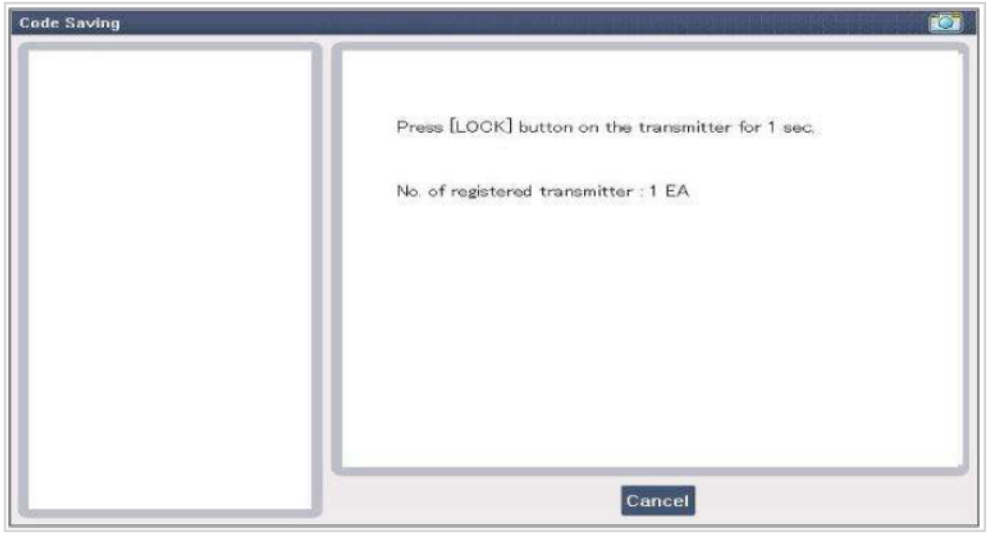


4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow steps 1 to 4 and then code saving is completed.

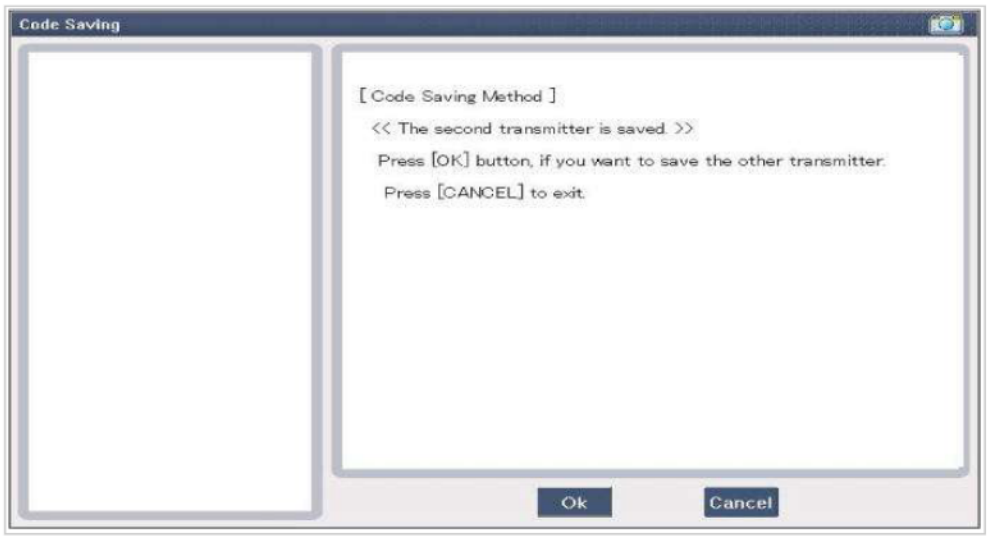
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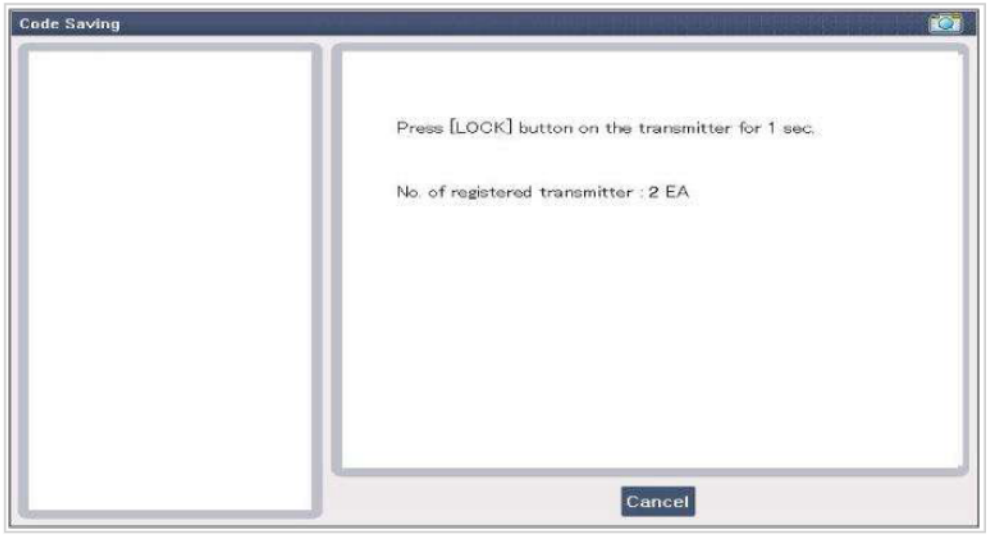


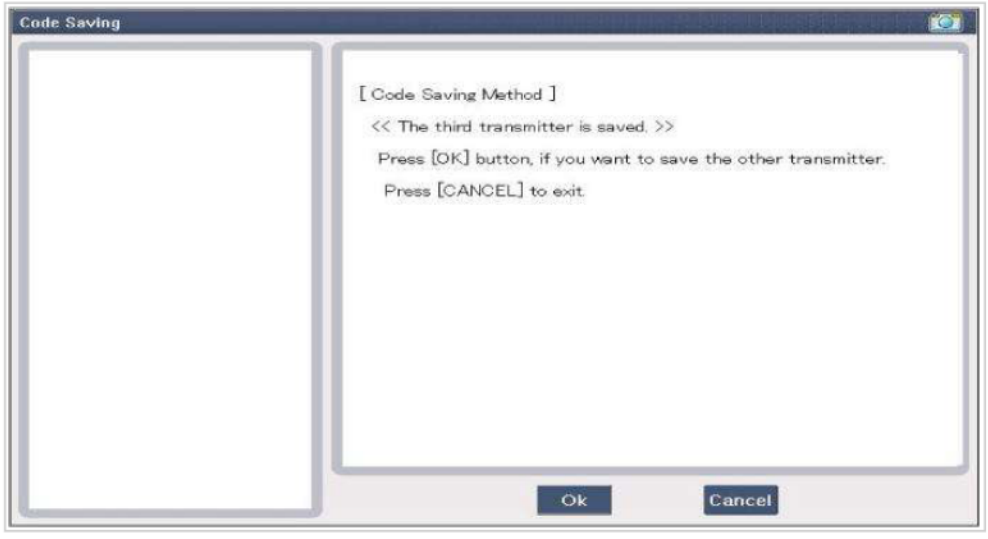




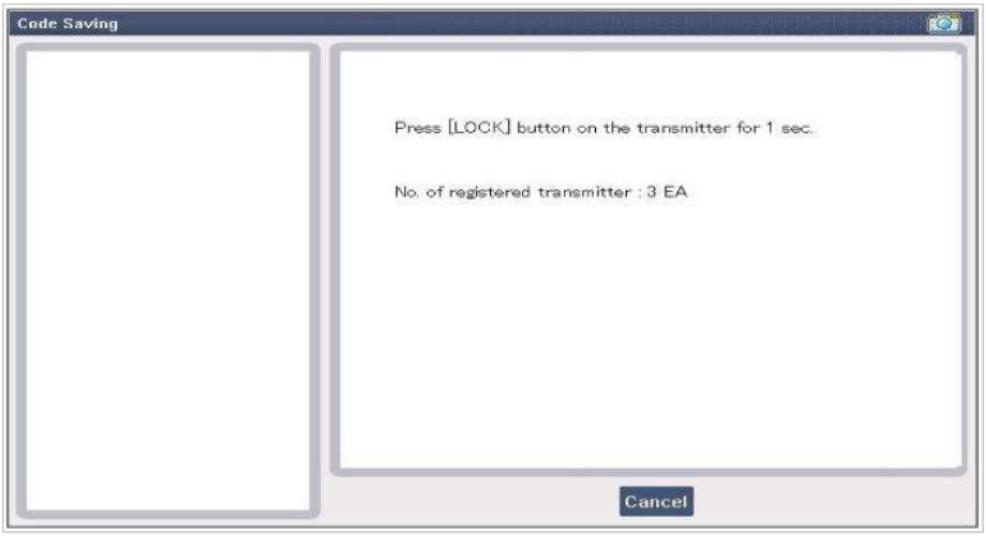
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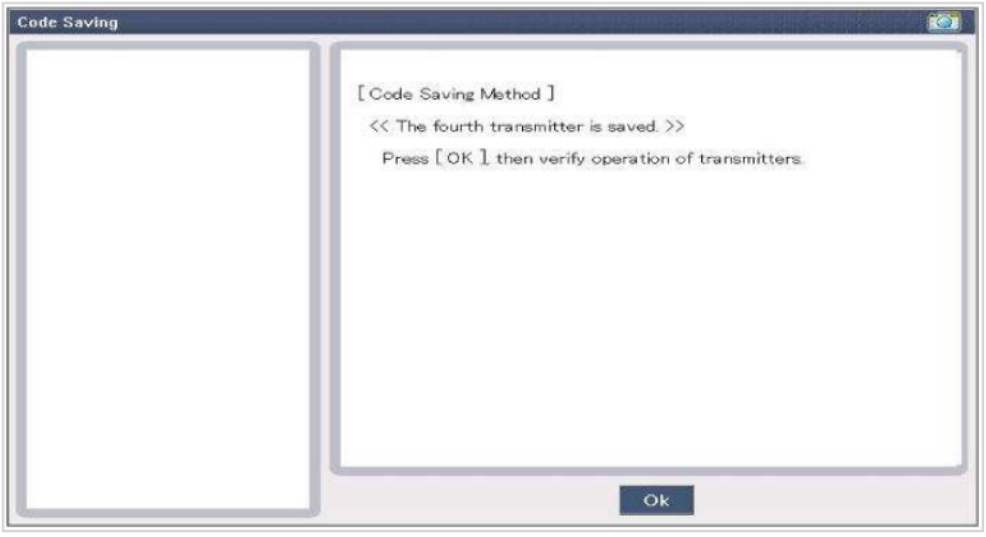


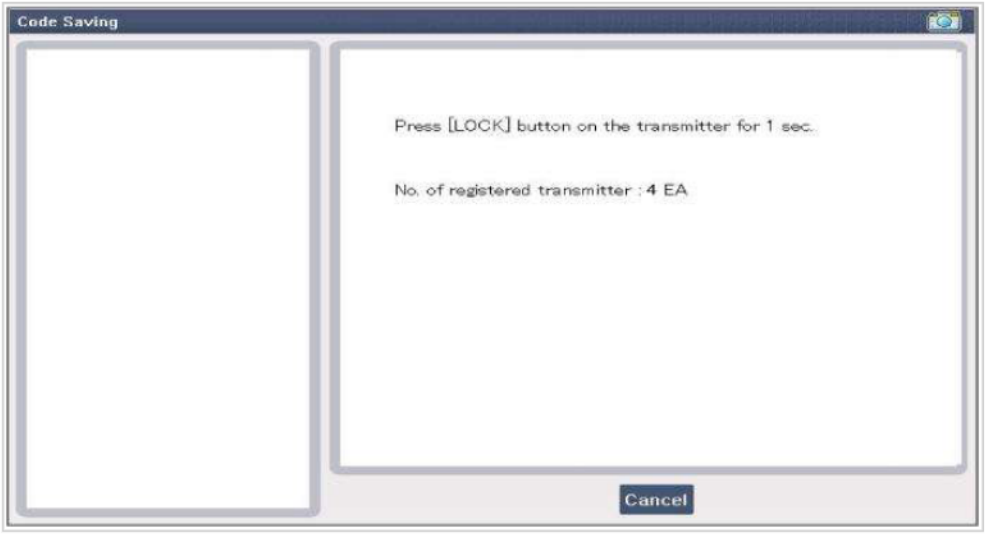




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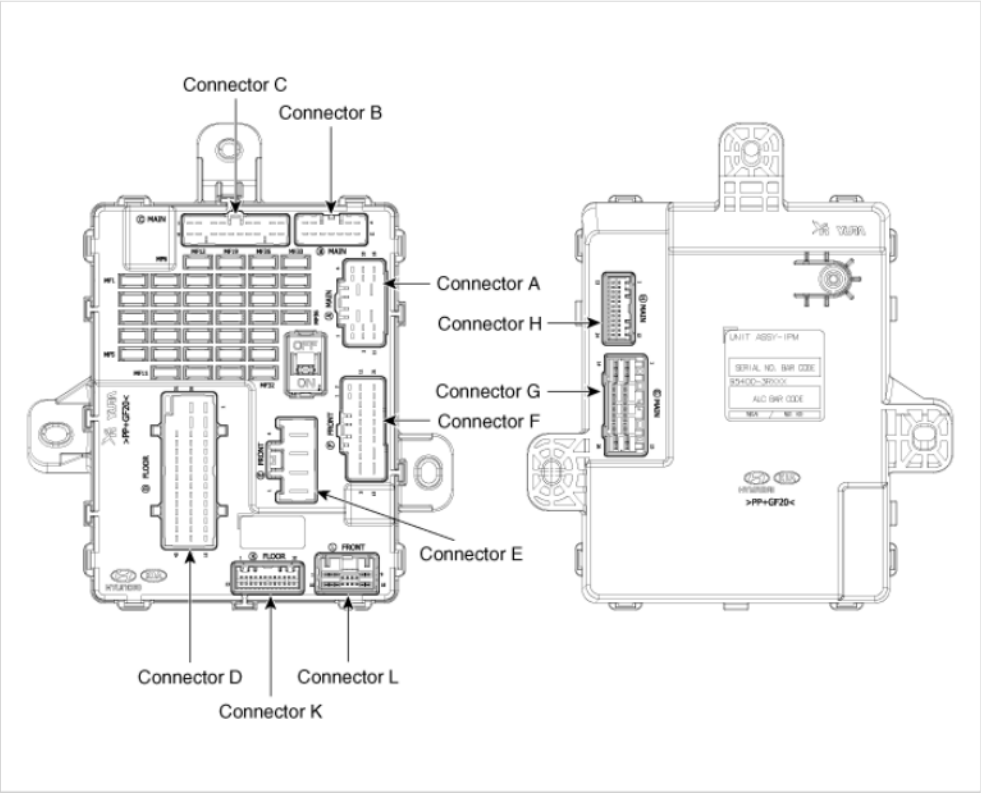
Specifications

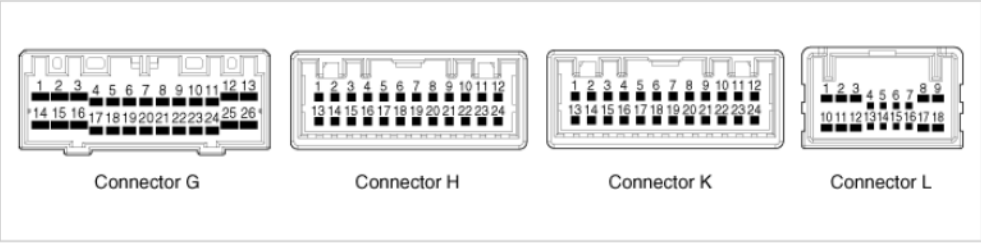
Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F ~ 167°F (-30°C ~ 75°C)
Dark current	

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	Keyless type : Max. 4.5mA Standard : Max. 3.0mA

Components





Connector Pin Information

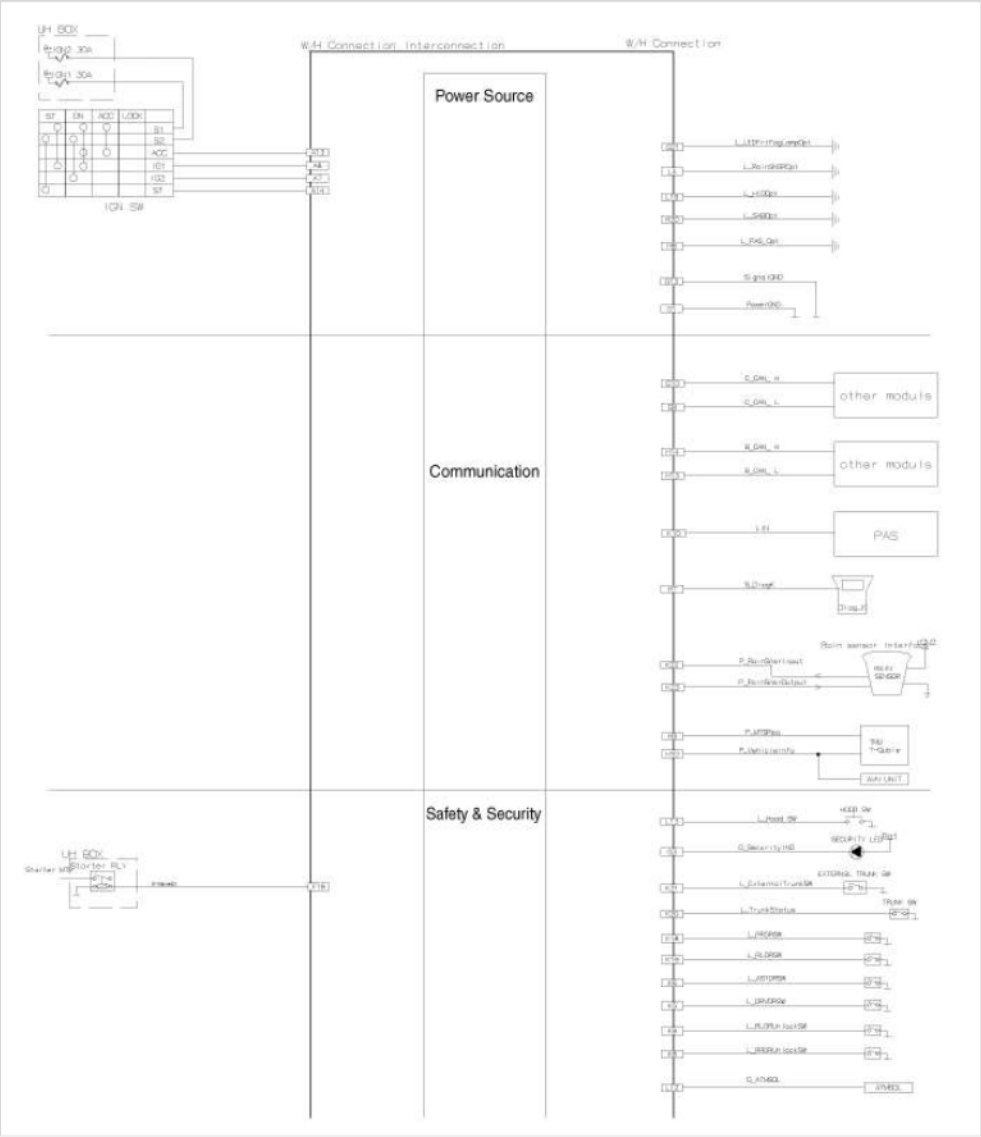
No.	Connector G	Connector H	Connector K	Connector L
1	Power ground	Front fog lamp switch	Room lamp	Front left turn signal lamp
2	Washer switch	PAS OFF switch	Rear power window relay power	LED DRL - LH
3	Security indicator	Defroster	Rear right power window up relay	LED DRL - RH
4	Assist seat belt switch	Auto light switch	Rear left power window up relay	Rain sensor option
5	Head lamp washer	Tail switch	Driver door open switch	-
6	Wiper intermittent volume	Left turn signal lamp switch	Assist door open switch	-
7	Body load	K Line	Driver seat belt switch	-
8	PAS OFF indicator	PAS/RPAS option	Rear right door unlock	-
9	C CAN low	MTS data	Rear left door unlock	External buzzer
10	C CAN high	BCM data	LIN	Front right turn signal lamp
11	Auto light ground	Key insert signal	-	Wiper low relay
12	AV tail	Rear fog lamp switch	Rear left turn signal lamp	ATM solenoid
13	Signal ground	B CAN low	Foot lamp	Hood switch
14	Kel solenoid	B CAN high	Trunk room lamp	-
15	Key hole illumination	Head lamp high switch	Rear right power window down relay	-
16	-	Wiper intermittent switch	Rear left power window down relay	HID option
17	-	Wiper mist switch	P position	Wiper high relay
18	Rear fog lamp relay	Right turn signal lamp switch	Rear right door open swith	Wiper stop status
19	Trunk release relay	Parking brake switch	Rear left door open swith	
20	Auto light power	Side airbag option	Trunk open status	
21	Frong fog lamp LED option	Passing switch	External trunk switch	
22	Stop lamp switch	Head lmap low switch	Rain sensor input	

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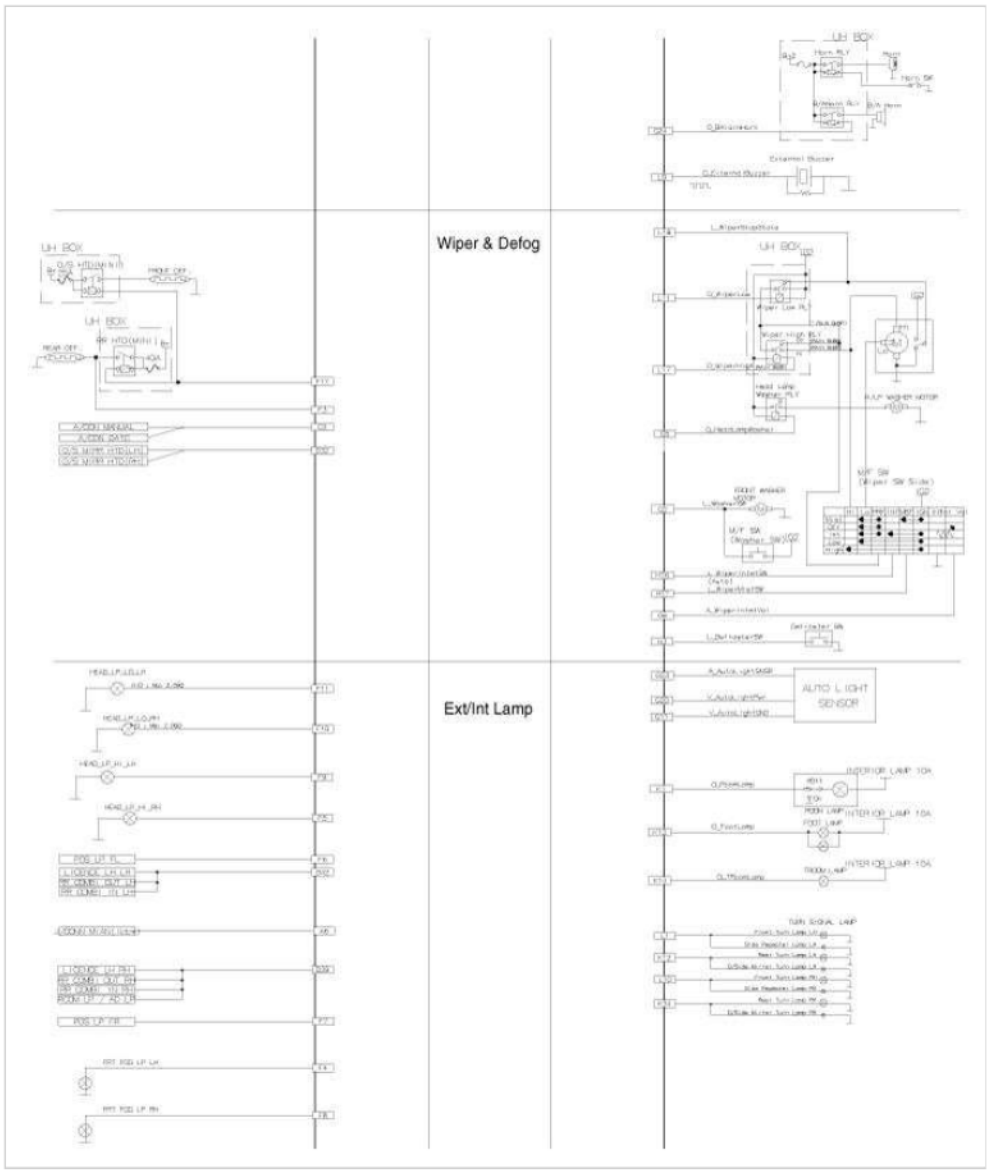
23	Auto light sensor	Hazard switch	Rain sensor output	
24	Burglar alarm horn relay	-	Rear right turn signal lamp	
25	-			
26	Assist seat belt indicator			

Body Electrical System

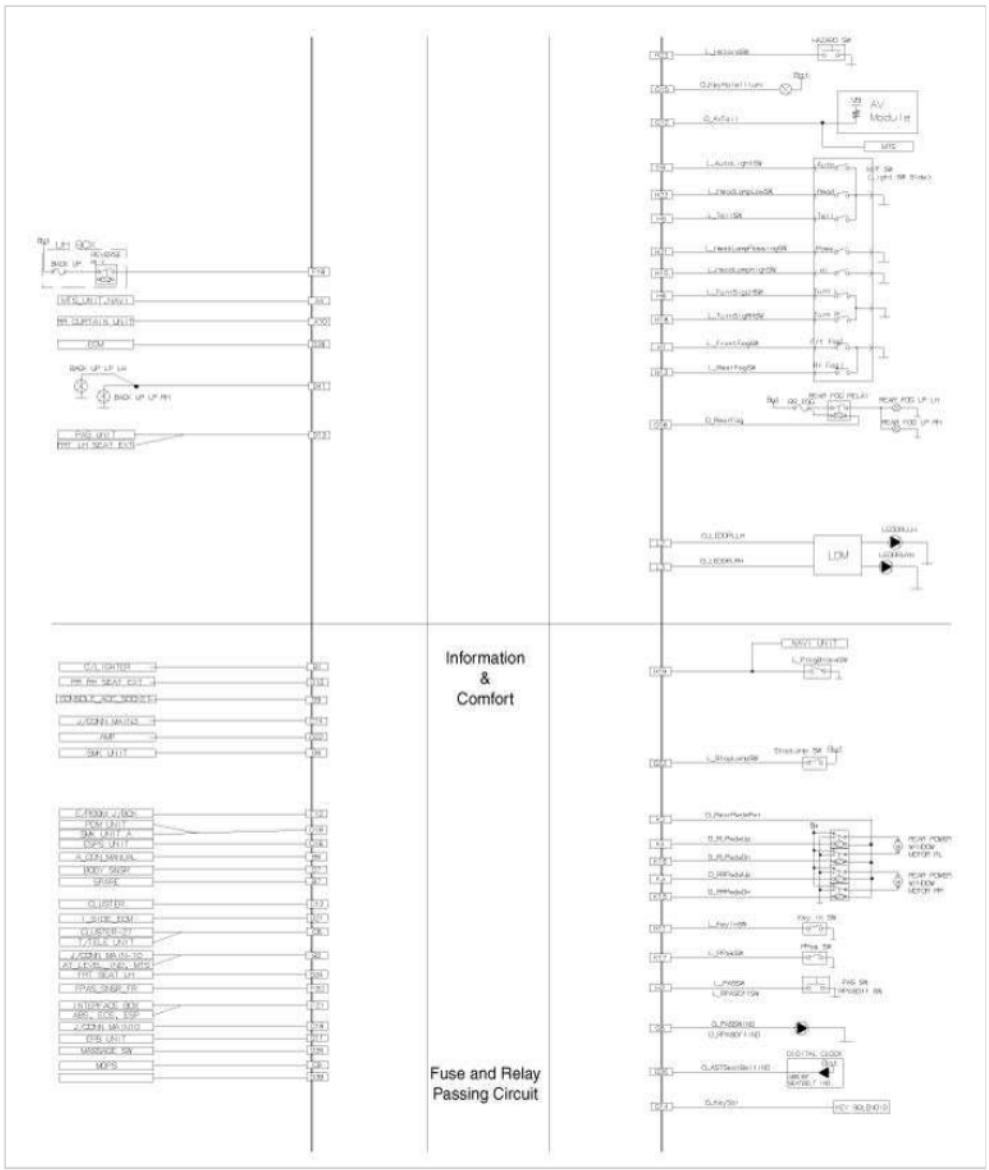
Circuit Diagram



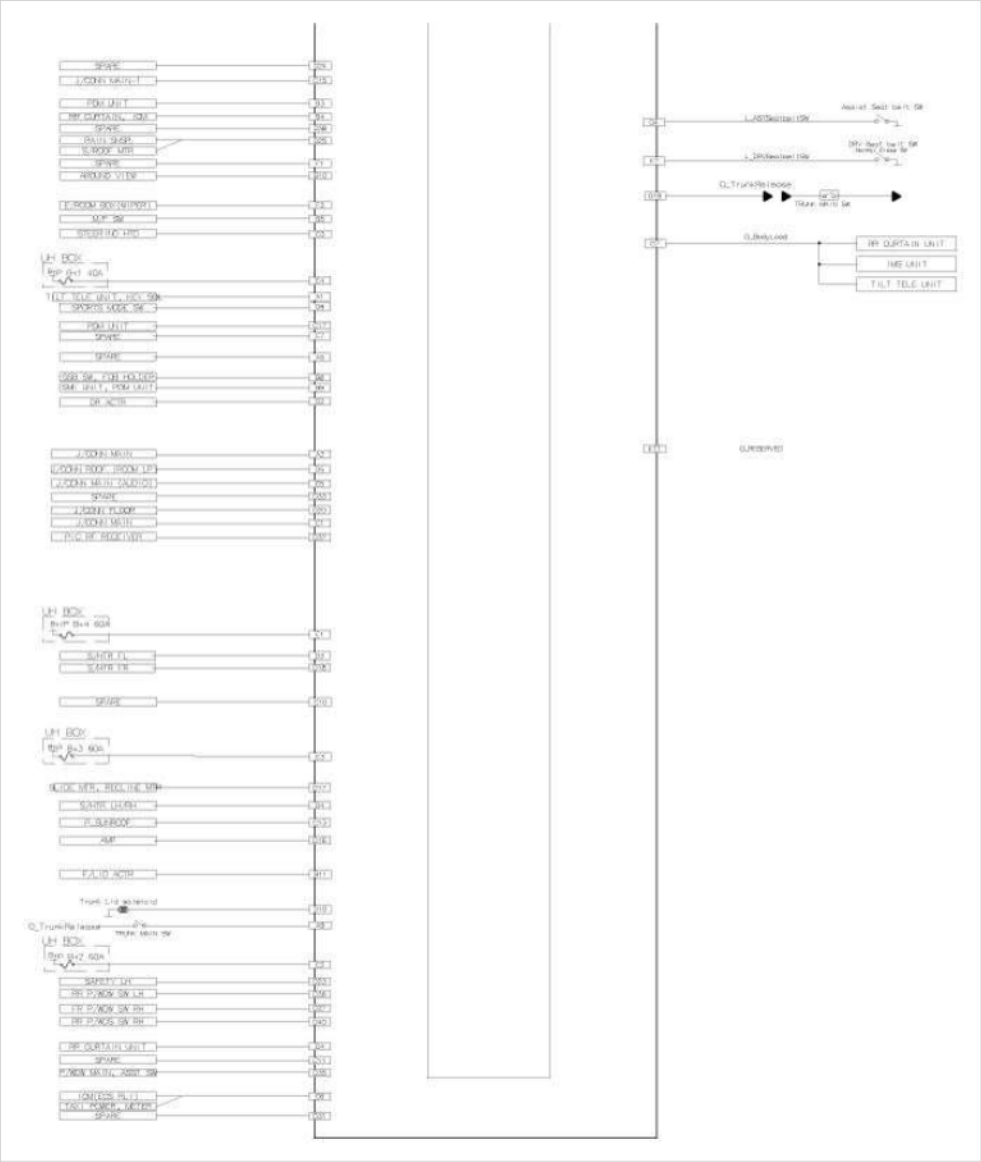
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Body Electrical System

IPM Overview

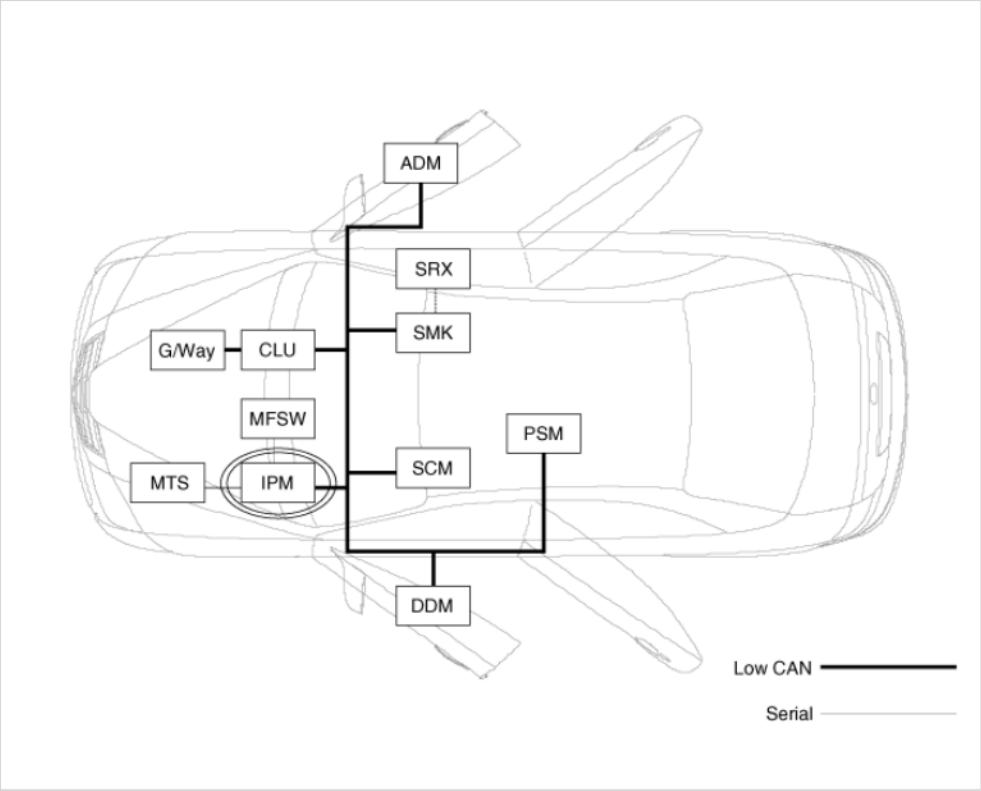
The Body Control Module (IPM-Intelligent integrated Platform Module) supplies vehicle occupants with visual and audible information and controls various vehicle functions. To provide and receive information, the module is interfaced to the vehicle's CAN bus communications network.

The IPM provides the following features :

- Door Lock Control(Send Lock/ Unlock commend via CAN)
- Burglar Alarm Control
- Decayed Room Lamp and MODE Lamp Control
- Key Hole Illumination Control
- Trunk Open Control
- Warning(Buzzer and indicator)Control
- Wiper control
- Lamp control (Tail, Head Lamp Low and High, Front fog, Room Lamp, Rear Fog lamp Control, HLLD)
- Turn/Hazard Signal Control
- Defroster
- External Buzzer and Burglar Alarm Horn control
- Panic
- MTS
- Window control
- Key interlock solenoid
- Input signal sends via CAN for local functions
- Diagnostic

Block Diagram

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Function

1. Wiper & Washer Control
   - A. Front wiper mist control function
   - B. Front washer interlock wiper control function
   - C. Front INT wiper control function
   - D. Rain sensor control function
   - E. Head lamp washer control function
2. Lamp Control
   - A. Tail lamp control function
   - B. Tail lamp autocut control function
   - C. AV tail control function
   - D. Head lamp control function (Low/ High)
   - E. Tail lamp welcome control function
   - F. Head lamp escort control function
   - G. Manual head lamp leveling device power function
   - H. Auto head lamp leveling device function
   - I. Auto light control function
   - J. DRL (LED) control function
   - K. Turn signal lamp & Hazard control function
   - L. One touch triple turn control function
   - M. LED rear turn signal lamp control function
   - N. Front fog lamp control function
   - O. Key hole illumination control function
   - P. Decayed room lamp control function
   - Q. Key OFF interlock room lamp lighting control function
   - R. Trunk room lamp control function
   - S. Foot lamp control function
3. Warning Control
   - A. Seat belt indicator control fucntion
   - B. Seat belt reminder control function
   - C. Key operated warnig control function
   - D. Parking brake warning control function
   - E. Trunk open warning control function
   - F. RKE learnig sound control function
   - G. SMK warning control function
   - H. PAS/ RPAS control function
4. Timer Control
   - A. Defogger timer control function
   - B.

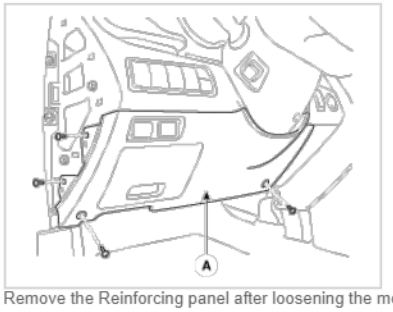
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Sunroof timer contrl function

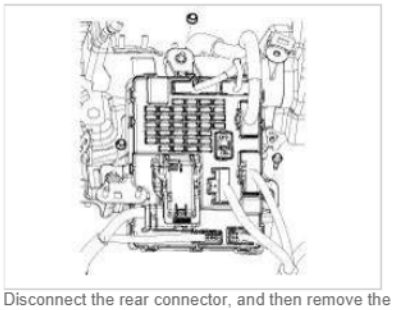
5. Panic & Alarm Control
   A. Panic control function
   B. Burglar alarm control function
6. MTS Control
   A. Door unlock control function
   B. MTS panic & hazard control function
   C. Warning state information function
7. Keyless Entry Control
   A. Tx Lock/ Unlock buzzer sound control function
   B. Horn answer back (Burglar alarm horn) control function
8. ATM
   A. Key interlock control function
   B. Shift lock control function

Removal

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



3. Remove the Reinforcing panel after loosening the mounting bolt and nut. (Refer to Body - " Crash Pad")
4. Disconnect the IPM connectors, loosening the nuts(2EA) and bolt (1EA).



5. Disconnect the rear connector, and then remove the IPM.

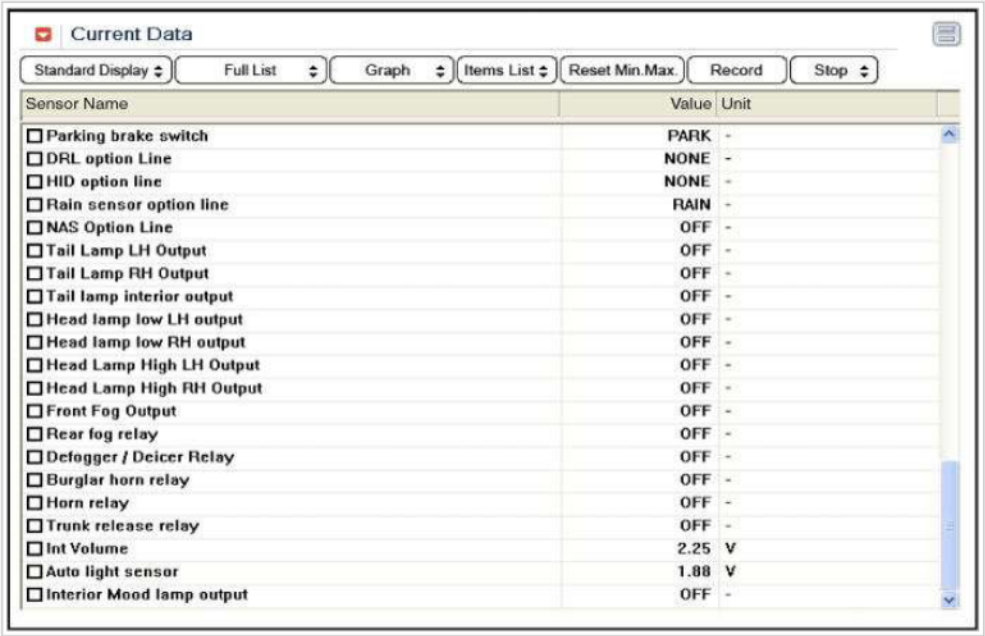
Installation

1. Install the IPM.
2. Install the reinforcing panel.
3. Install the crash pad lower panel.
4. Disconnect the negative (-) battery terminal.

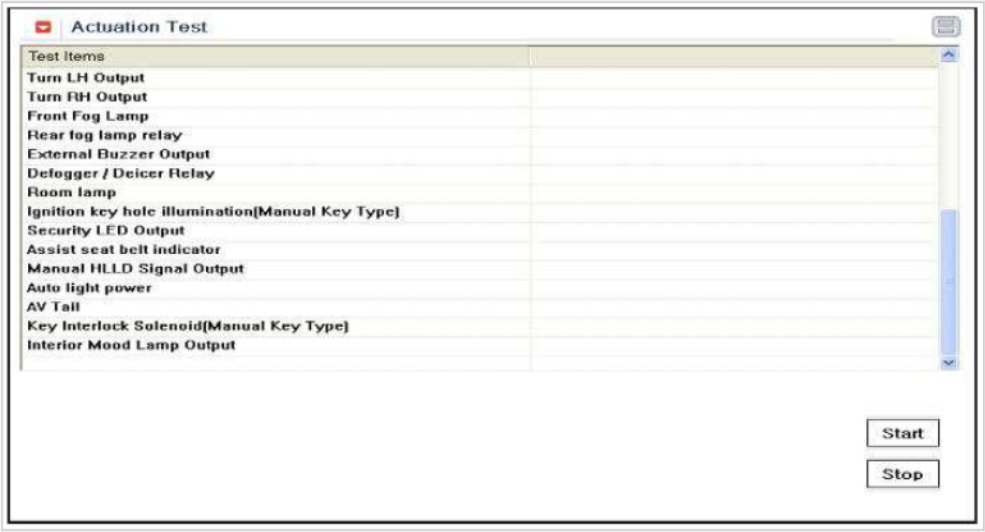
IPM Diagnosis With GDS

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

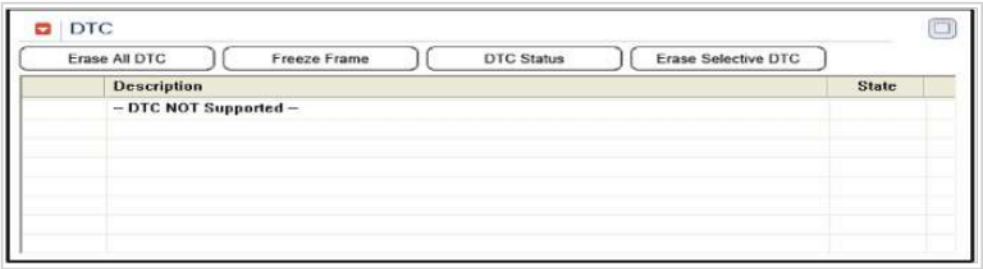
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5. If you will check each module data operation forcefully, select "Actuation test".



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



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

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Specifications

IMS Electrical System

Item	Specification
Rating voltage	DC 12V
Operating voltage	DC 9V ~ 16V
Operating temperature	-30°C ~ +80°C
Maintaining temperature	-40°C ~ +85°C
Max, humid	95%
Consumption current	MAX 700mA
Dark current	Below 2mA

Motor Electrical System

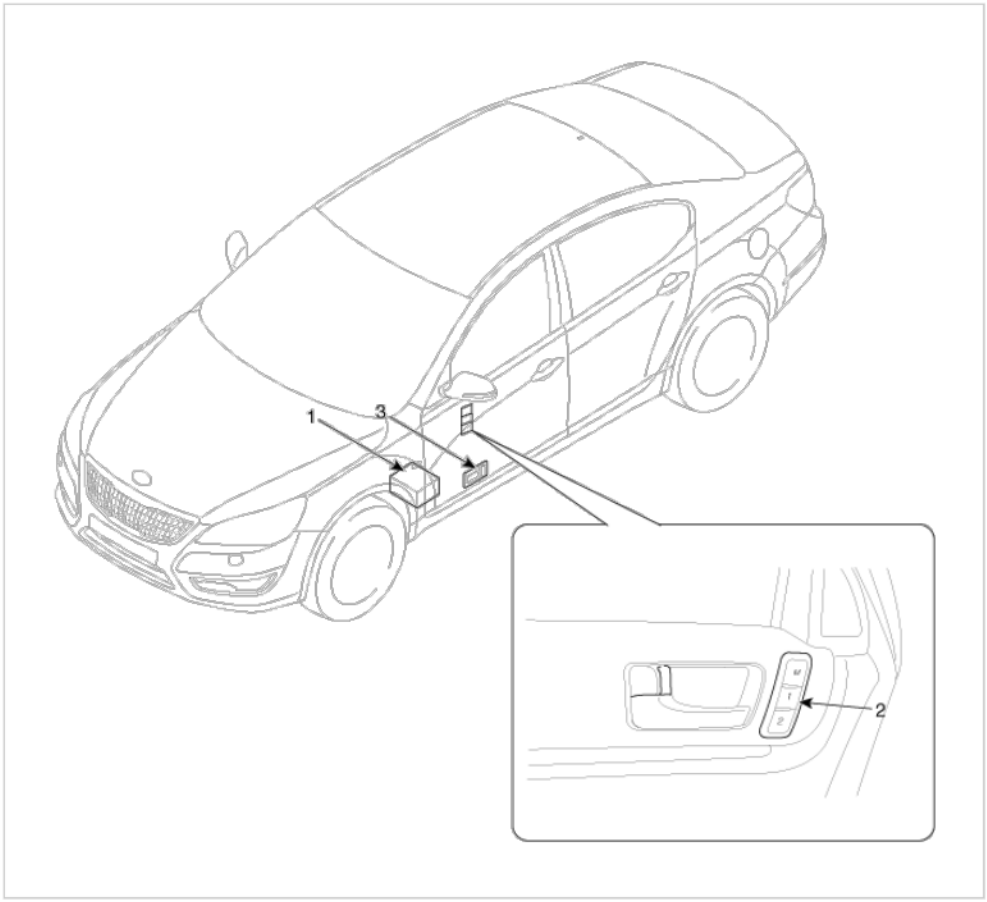
Item	Specification
Rating voltage	13.5V (Slide, Recline, Front height, Rear height)
Current	Slide : 8A
	Recline : 8A
	Front height : 7.5A
	Rear height : 7.5A
At worst current	Slide : 24A
	Recline : 20A
	Front height : 25A
	Rear height : 27A

Mechanical System

Item	Specification
Type	Motor with hall IC
Duty ratio	50 ± 15
Total stroke	Slide : 240mm
	Recline : 63°
	Front height : 32mm (Motor)
	Rear height : 52mm (Motor)
Total pulse number	Slide : 899
	Recline : 1,136
	Front height : 333
	Rear height : 412
Moving speed (Terminal voltage : 13.5V)	Slide (Forward) : 17.9 mm /sec or more, Slide (Backward) : 20.2 mm /sec or more
	Recline : 3.5 °/ sec
	Front height : 7 mm / sec or more
	Rear height : 7 mm / sec or more

Component Location

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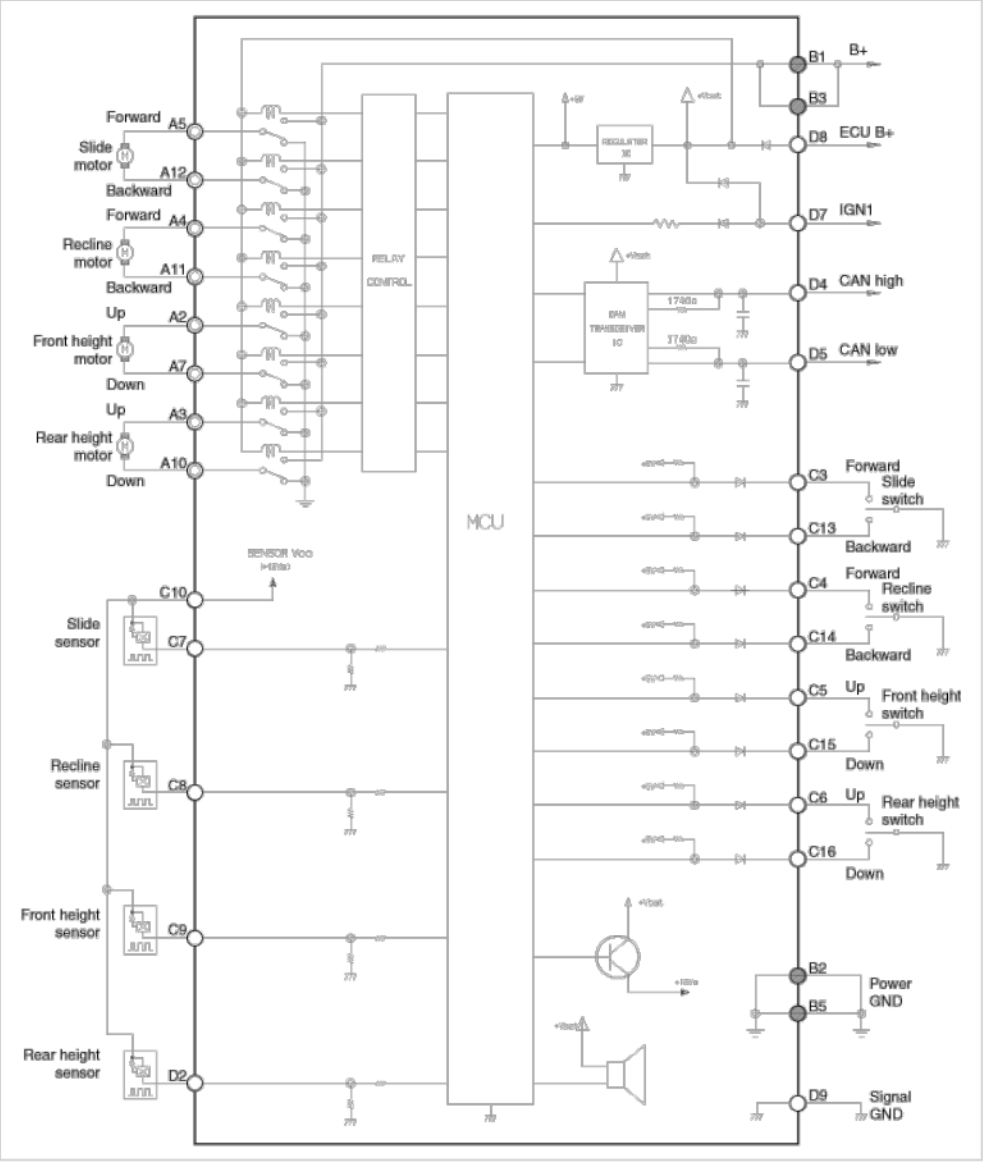


1. Seat Memory Unit (IMS) 2. IMS control switch	3. IMS driver power seat control

Body Electrical System

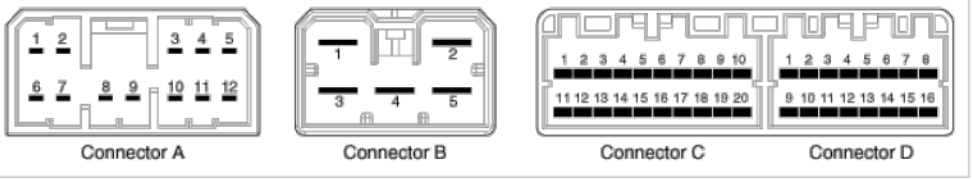
Circuit Diagram

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Input/Output Specification

Connector Pin Lay Out



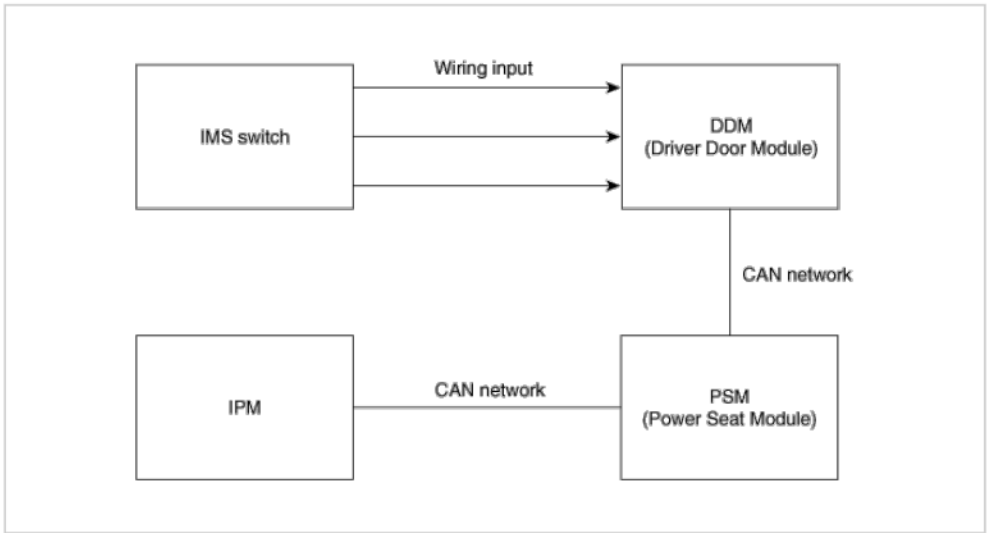
IMS input/output pin information

No	Signal Name	I/O	Contents	Remark
A1	-	-	-	
A2	FR height motor up	O	FR height motor up output	
A3	RR height motor up	O	RR height motor up output	
A4	Recline motor FR	O	Recline motor FR output	
A5	Slide motor FR	O	Slide motor FR output	
A6	-	-	-	
A7	FR height motor down	O	FR height motor down output	
A8	-	-	-	
A9	-	-	-	
A10	RR height motor down	O	RR height motor down output	
A11	Recline motor RR	O	Recline motor RR output	
A12	Slide motor RR	O	Slide motor RR output	
B1	GND(Power)	I	Power B+ for operating motor	

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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 FR manual switch	I	Slide FR manual switch input	On : GND
C4	Recline FR manual switch	I	Recline FR manual switch input	On : GND
C5	FR height up manual switch	I	FR height up manual switch input	On : GND
C6	RR height up manual switch	I	RR 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	FR height motor sensor	I	FR 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 RR manual switch input	ON : GND
C14	Recline RR manual switch	I	Recline RR manual switch input	ON : GND
C15	FR height down manual switch	I	FR height down manual switch input	ON : GND
C16	RR height down manual switch	-	RR height down manual switch input	ON : GND
C17	-	-	-	
C18	-	-	-	
C19	-	-	-	
C20	-	-	-	
D1	-	-	-	
D2	RR height up sensor	I	RR height up motor sensor	Pulse signal
D3	-	-	-	
D4	CAN high	I/O	CAN	
D5	CAN low	I/O	CAN	
D6	-	-	-	
D7	IGN1	I	IGN1 input	BAT
D8	B+(ECU)	I	ECU power input	BAT
D9	GND(ECU)	I	ECU GND	
D10	-	-	-	
D11	-	-	-	
D12	-	-	-	
D13	-	-	-	
D14	-	-	-	
D15	-	-	-	
D16	-	-	-	

Communication System



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

Input Specification

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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. “P” Position switch
   Sensing “P” position of SHIFT LEVER, not allowed for memory saving and easy access function by getting on and off a vehicle in the position other than “P.”
5. Dr Door switch
   Sensing that drive door opens
6. IPM KEY IN
   This signal is received for sensing state of KEY by IPM
7. Local KEY IN switch
   Sensing whether KEY is inserted or not.
8. Speed
   This signal is received for sensing vehicle speed by IPM
9. 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

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.

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, “P” Position 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 CAN 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. “P” Position switch is ON
      C. Vehicle speed input received from IPM is high (less than 3Km/h)
      D. Less than 5 seconds elapsed from SET switch OFF->ON (determined by IMS switch)
   (4) Memory SET is to be available for memory storage not with standing 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 CAN 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 , ② and ③ are satisfied, and also either ④ or ⑤ is satisfied.
   ① “P” Position switch is ON
   ② Vehicle speed input received from IPM is high (less than 3Km/h)
   ③ MANUAL switch of SEAT is not operated.
   ④ 1 and 2 switch of IMS switch is ON in case that driver door is open or within 30 seconds from driver door close.
   ⑤ Ignition switch is ON
3. Stopping Memory Reproduction
   Reproducing memory is stopped unless all of the following conditions are met.

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A. “P” Position switch of LOCAL switch is positioned at PARKING

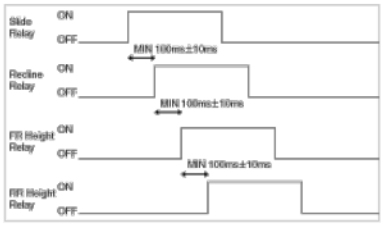
B. Vehicle speed input received from IPM is high (less than 3Km/h)

C. Target position of motor not reached

D. 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.

E. 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.

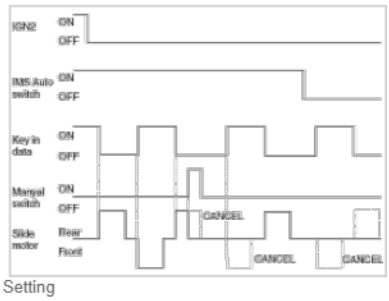


   TIME value of each continuous driving motor (excluding operation by MANUAL switch)
   SLIDE: 20 seconds, RECLINE: 35 seconds, Front rear height: 10 seconds, rear right height: 15 seconds
   (3) Motor Driving Control of Reverse Direction
   If motor driving requires being in reverse direction during operating 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 function

(user option - default : Operating easy access function)

1. If Signal “IPM KEY IN” transmitted from IPM and signal “LOCAL KEY IN” in case that key is removed are changed from “LOW”(KEY IN) ->“HIGH” (KEY OFF), SEAT SLIDE is moved 50mm backward from KEY OUT position.
2. Signal “IPM KEY IN” transmitted from IPM or signal “LOCAL KEY IN” is changed from “HIGH” (KEY OFF) ->“LOW” (KEY IN) by inserting KEY, it is moved to KEY OUT position.
3. 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) “P”Position switch is not ON
   (If "P" Position switch is OFF during operating, the operation is completed.)
   (2) Vehicle data “SPEED” transmitted from IPM is LOW (More than 3km/h)
   (3) MANUAL switch of SEAT is in operation
   (4) Reproduction command is received during easy access operation
   (5) “AUTO_SET” DATA transmitted from IMS switch has “ OFF” value.
   (If “AUTO_SET” is changed during operating, the operation is completed.)
   (6) SET message transmitted from IMS switch is “1” during easy access operation
4. 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.
5. MANUAL switch Input is operated during or after moving backward, it will move to KEY OUT position on easy access operated by KEY IN.
6. 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) 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

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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).

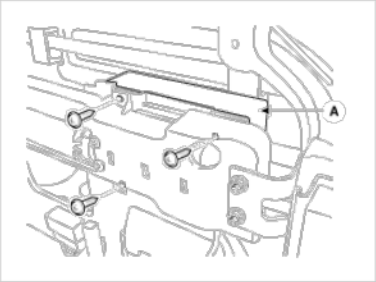
Determining Seat Position

Seat position is relatively determined rather than by absolute position.

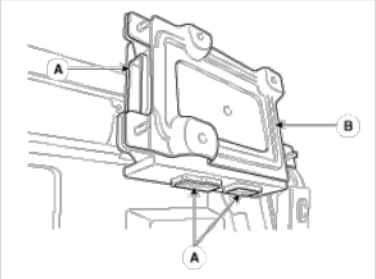
Body Electrical System

Removal

1. Remove the negative (-) battery terminal.
2. Remove the driver seat in the car.
   (Refer to Body - "Front Seat")
3. Remove the IMS module (A) after loosening 3 screws in the bottom of seat.



4. Disconnect the IMS module connector (A) and then remove the IMS module (B).



Installation

1. Install the IMS module after reconnecting the connector.
2. Install the driver seat.

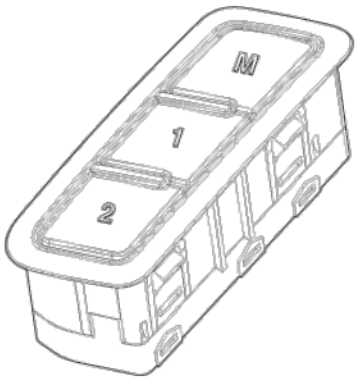
NOTICE

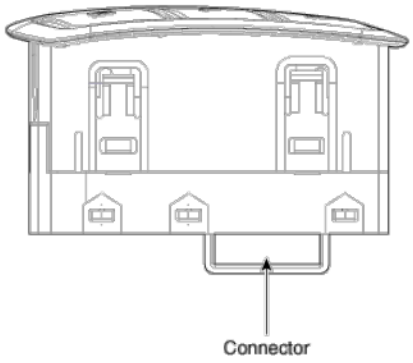
- Make sure the IMS module connectors and related connectors are plugged in properly.
- Check that IMS system operates normally.

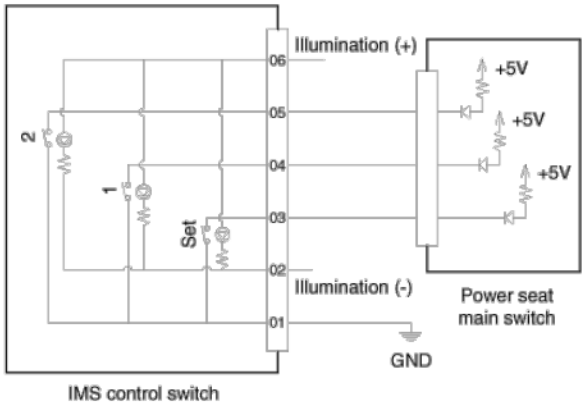
Body Electrical System

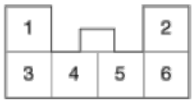
Circuit diagram

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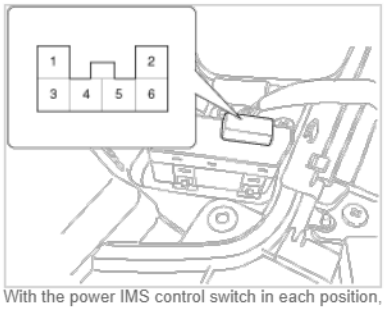




No	Description
1	GND
2	Illumination (-)
3	SET switch
4	M1 switch
5	M2 switch
6	Illumination (+)

Inspection

1. Disconnect the IMS control switch connector.



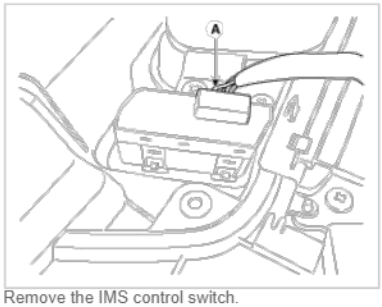
2. With the power IMS control switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the IMS control switch.

Position \ Terminal		1	3	4	5
Push (ON)	SET	○	○		
	1	○		○	
	2	○			○

Removal

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

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4. Remove the IMS control switch.

Installation

NOTICE

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

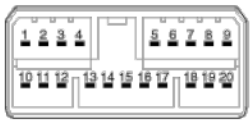
1. Connect the connectors and reassemble the IMS control switch.
2. Reassemble the front door trim panel.

Body Electrical System

Circuit diagram

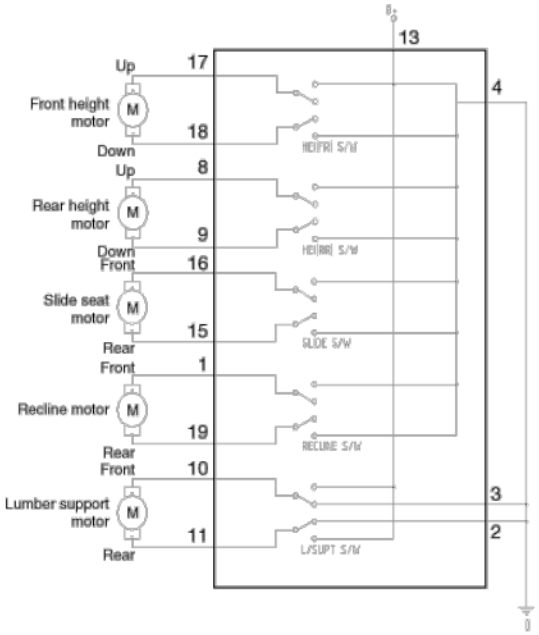
[IMS]

Power seat switch connector



Connector A

Pin NO.	Connector name
1	Front recline motor
2	Lumber support motor ground
3	Lumber support motor ground
4	Battery (-)
5	-
6	-
7	-
8	Rear height up motor
9	Rear height down motor
10	Lumber support motor (Front)
11	Lumber support motor (Rear)
12	-
13	Battery (+)
14	-
15	Rear slide seat motor
16	Front slide seat motor
17	Front height up motor
18	Front height down motor
19	Rear recline motor
20	-

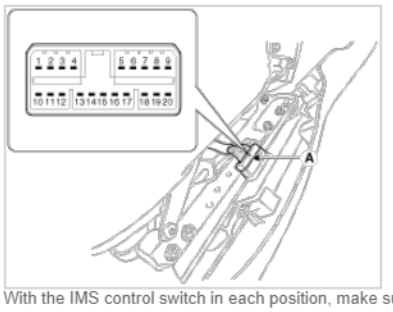


Body Electrical System

Inspection

1. Remove the IMS control switch connector (A).

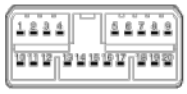
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2. With the IMS control switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the IMS control switch.

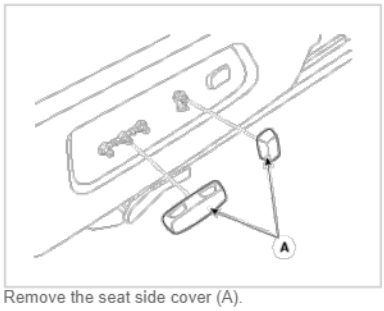
Driver Power Seat Control Switch (For IMS)

	Front height control switch		Seat control switch				Rear height control switch		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 down motor
8							○		○							Rear height up motor
13			○	○	○	○			○	○				○	○	⊕
4	○	○			○	○	○	○			○	○				GND ⊖
1										○	○					Front recline motor
19										○		○				Rear recline motor
18		○	○													Front height down motor
17	○		○													Front height up motor
15				○	○	○										Seat motor
16				○	○											Seat motor
10													○	○		Lumber motor (Front)
11													○		○	Lumber motor (Rear)
3													○			Lumber GND ⊖
2													○			Lumber GND ⊖

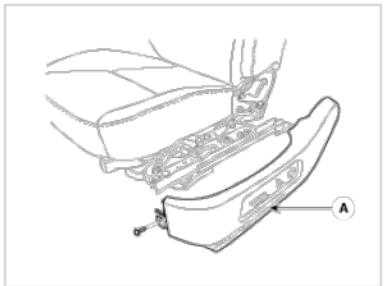


Removal

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

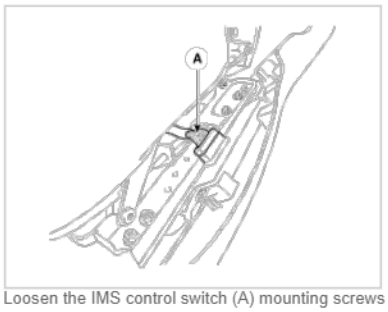


3. Remove the seat side cover (A).
(Refer to Body - "Front Seat")

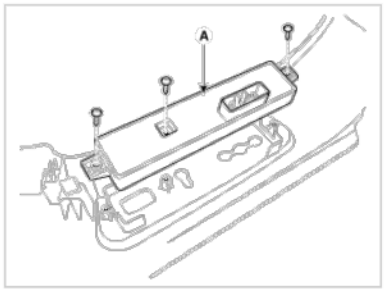


4. Disconnect the IMS control switch connector (A).

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5. Loosen the IMS control switch (A) mounting screws (3EA).



Installation

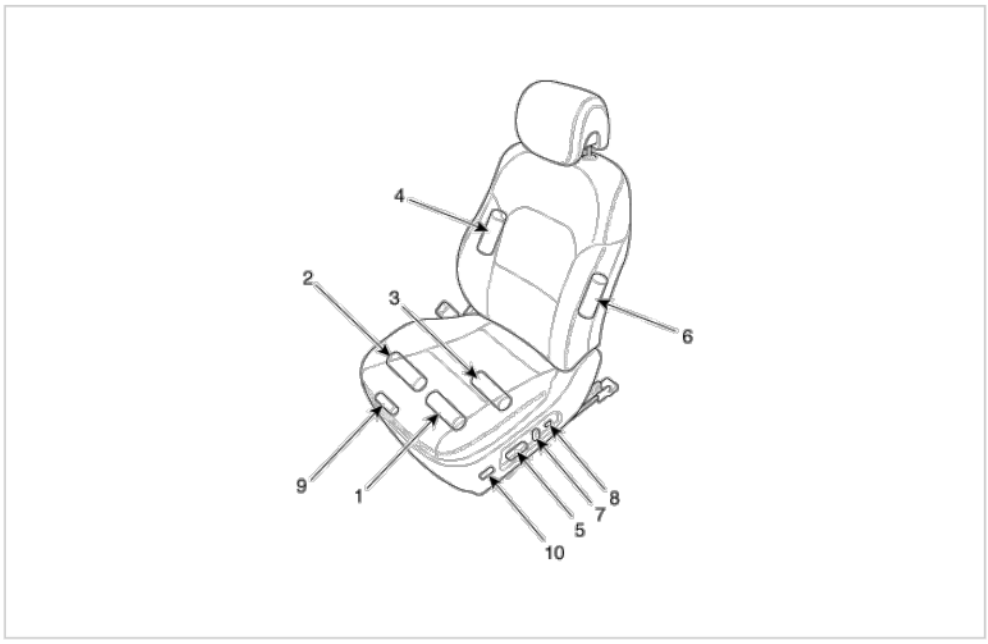
NOTICE

- 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 seat side cover.

Body Electrical System

Component Location



1. Slide motor	6. Recline motor
2. Front height motor	7. Recline control switch
3. Rear height motor	8. Lumber support switch
4. Lumber support motor	9. Cushion extension motor
5. Power seat control switch	10. Cushion extension switch

Body Electrical System

Inspection

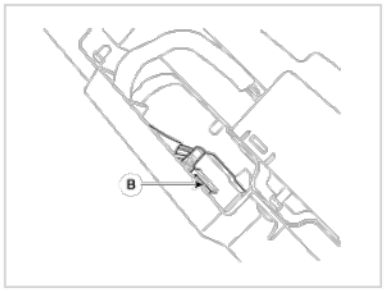
Power Seat Motor

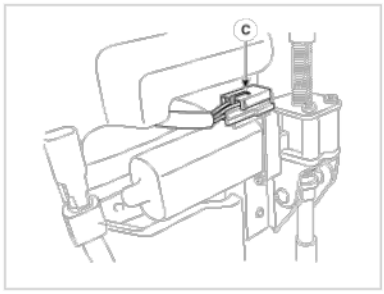
1. Disconnect the connectors for each motor.

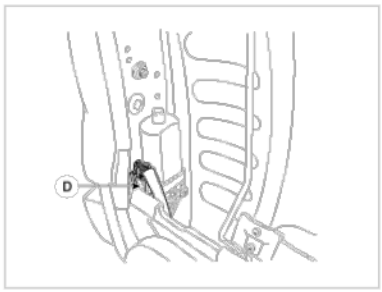
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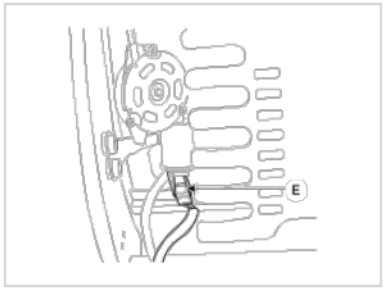
A : Front height motor
B : Slide motor
C : Rear height motor
D : Recline motor
E : Lumber support motor
F : Cushion extension motor



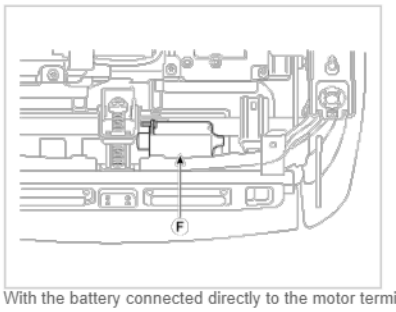




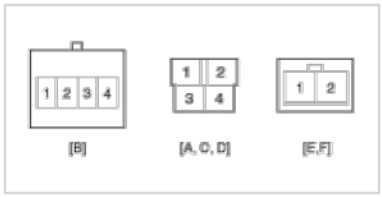




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2. With the battery connected directly to the motor terminals, check if the motors run smoothly.
3. Reverse the connections and check that the motor turns in reverse.
4. If there is an abnormality, replace the motors.

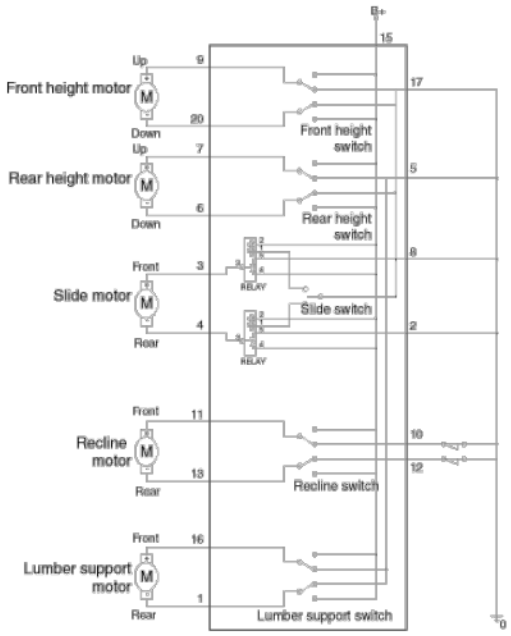


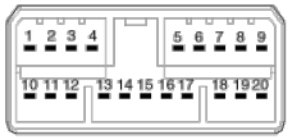
Position \ Terminal NO.		+	-
Front height motor A	Up	2	1
	Down	1	2
Slide motor B	Front	1	4
	Rear	4	1
Rear height motor C	Up	1	4
	Down	4	1
Recline motor D	Front	2	1
	Rear	1	2
Lumber support E	Front	1	2
	Rear	2	1
Cushion extension F	Front	1	2
	Rear	2	1

Circuit Diagram

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[Non - IMS]
[Driver]

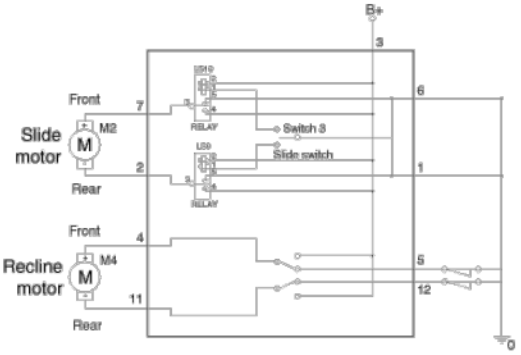


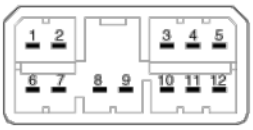


No.	Description	No.	Description
1	Lumber support motor (Rear)	11	Recline motor (Front)
2	Seat relay (-) (Front)	12	Recline limit switch (-)
3	Seat motor (Front)	13	Recline motor (Rear)
4	Seat motor (Rear)	14	-
5	GND	15	Battery (+)
6	Rear height motor (Up)	16	Lumber motor (Front)
7	Rear height motor (Down)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

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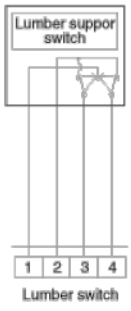
[Non - IMS]
[Passenger]

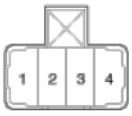




No.	Description	No.	Description
1	Seat relay (-)	7	Seat motor (Front)
2	Seat motor (Rear)	8	-
3	Battery (+)	9	-
4	Recline motor (Front)	10	-
5	Recline limit switch (-)	11	Recline motor (Rear)
6	Seat relay GND (-)	12	Recline limit switch (-)

[Lumber Support]



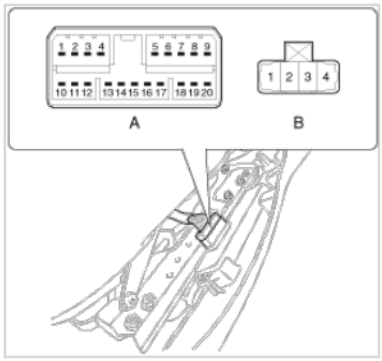


No.	Description
1	Battery (+)
2	GND
3	Lumber support motor (Front)
4	Lumber support motor (Rear)

Body Electrical System

Inspection

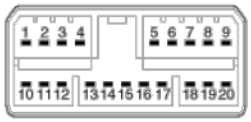
With the power seat switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the power seat switch.
A : Power seat control switch
B : Lumber support switch



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Driver power seat control switch (Non - IMS)

	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	
15	○	○			○	○	○	○			○	○		○	○	Battery ⊕
17			○	○												GND ⊖
20		○	○													Front height motor
9	○			○												Front height motor
4				○		○										Seat motor
3			○		○											Seat motor
8				○												Seat relay GND ⊖
2			○													Seat relay GND ⊖
7							○		○							Rear height motor (Up)
6								○	○							Rear height motor (Down)
11										○	○					Recline motor (Front)
13										○		○				Recline motor (Rear)
12										○						Recline limit switch ⊖
10										○						Recline limit switch ⊖
1													○		○	Lumber support motor (Rear)
16													○	○		Lumber support motor (Front)
5									○	○			○			Lumber GND ⊖



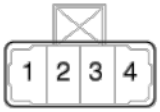
[Driver power seat control switch]

NOTICE

In case of IMS switch inspection, refer to "IMS" system.

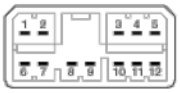
Driver Lumber Switch

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



Passenger power seat control switch

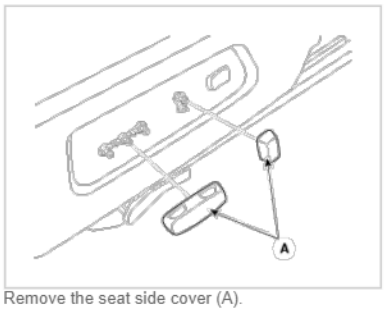
	Slide control switch			Rear recline control switch			Remark
	N	RH		RH		N	
	SEAT	Front	Rear	Front	Rear	REC	
3		○	○	○	○		Battery ⊕
7	○	○					Seat motor (Front)
2			○				Seat motor (Rear)
4				○		○	Recline motor (Front)
11					○	○	Recline motor (Rear)
6	○						Seat relay GND ⊖
1							Seat relay GND ⊖
5						○	Recline limit switch ⊖
12						○	Recline limit switch ⊖



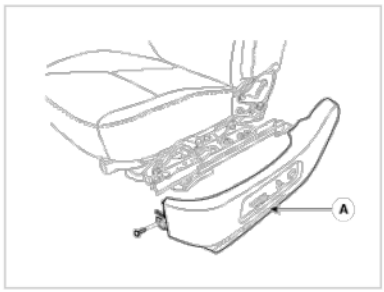
Removal

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

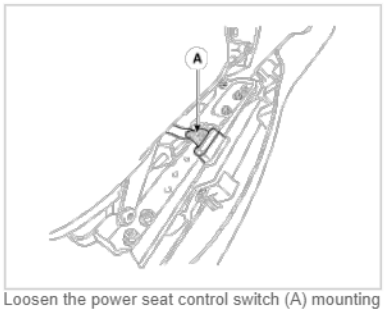
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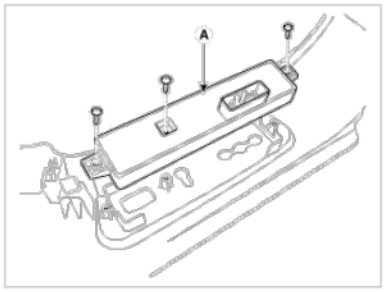
3. Remove the seat side cover (A).
   (Refer to Body - "Front Seat")



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



5. Loosen the power seat control switch (A) mounting screws (3EA).



Installation

NOTICE

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

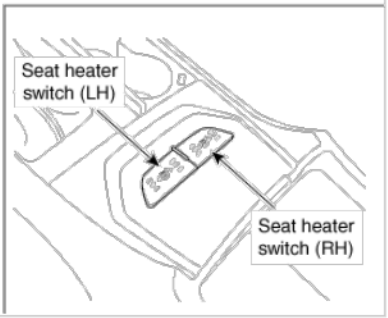
1. Connect the connectors and reassemble the IMS control switch.
2. Reassemble the seat side cover.

Component Location

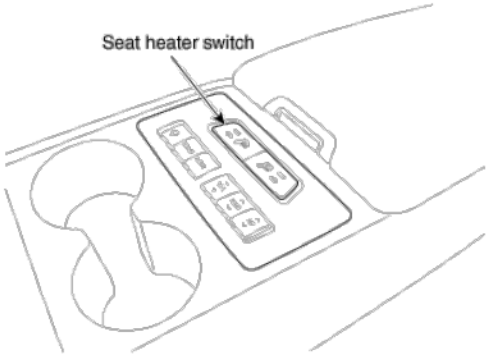
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[Front Seat]

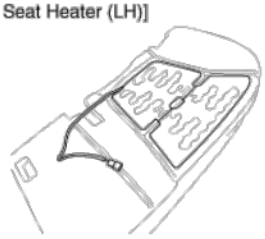




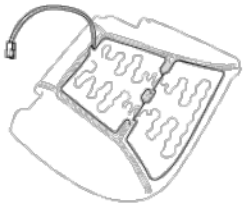
[Rear Heater Switch]



[Rear Seat Heater (LH)]



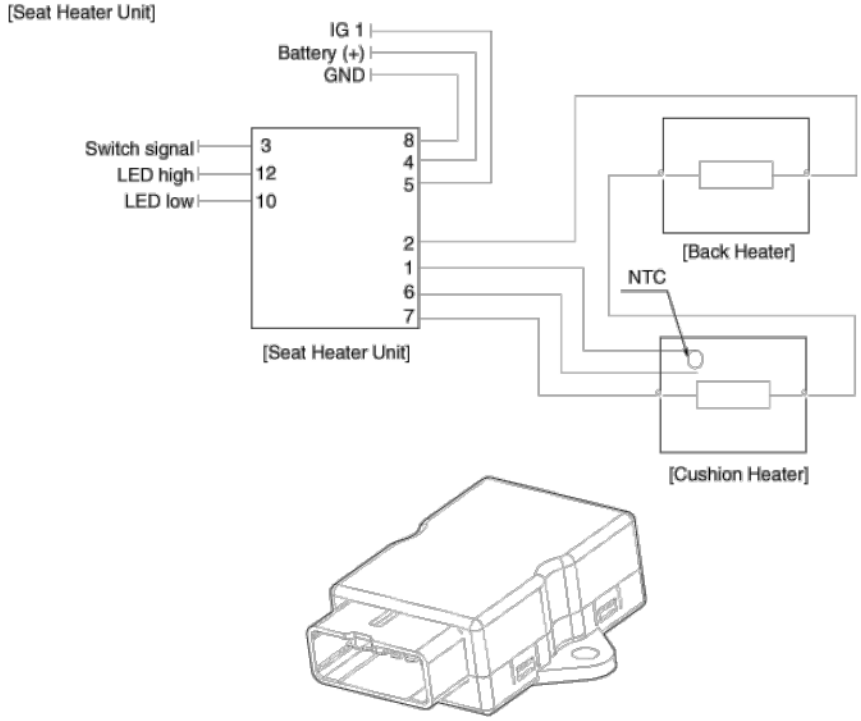
[Rear Seat Heater (RH)]

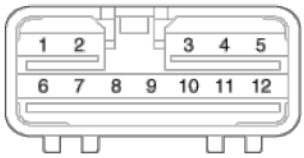


Body Electrical System

Circuit Diagram

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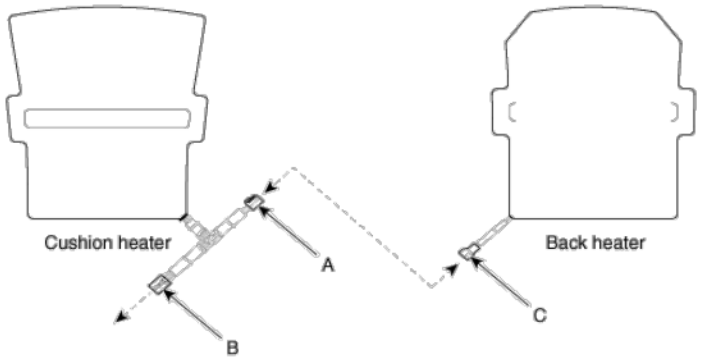


No.	Description	No.	Description
1	NTC (+)	7	Heater (-)
2	Heater (+)	8	GND
3	Switch signal	9	-
4	Battery (+)	10	LED low
5	IGN1	11	-
6	NTC (-)	12	LED high

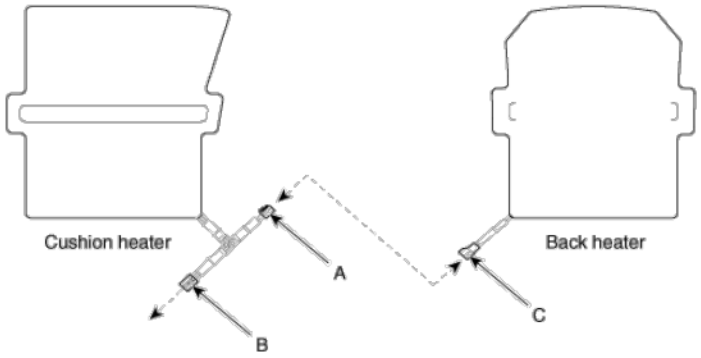
※ NTC : Negative Temperature Coefficient.

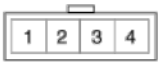
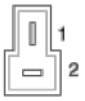
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[Front Seat Heater]



[Rear Seat Heater]

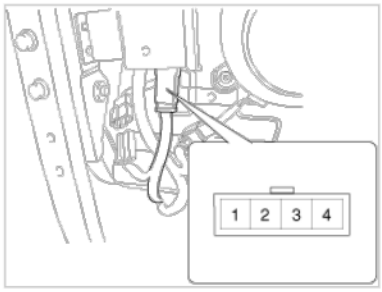


Connector A	Connector B	Connector C
		

Inspection

First Seat Heater

1. Check for continuity and measure the resistance between No.1 and NO.4 terminals.



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

Standard value (Fabric / Leather)
Cushion :1.04 Ω ± 10%
Back :1.1 Ω ± 10%
Set :2.14 Ω ± 10%

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

Standard value (Fabric / Leather)

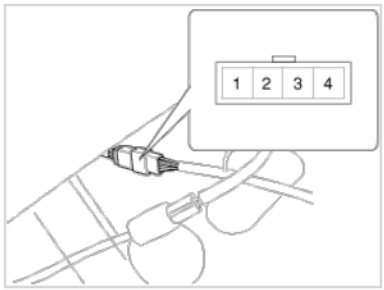
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Cushion :
1 Step : 40 ± 2°C(104 ± 3.6°F)
2 Step : 42 ± 2°C(107.6 ± 3.6°F)
Back :
1 Step : 46 ± 2°C(114.8 ± 3.6°F)
2 Step : 52 ± 2°C(125.6 ± 3.6°F)

3. Check for continuity between the terminals after disconnecting the connector.

2nd Seat Heater

1. Check for continuity and measure the resistance between No.1 and NO.4 terminals.



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

Standard value (Fabric / Leather)
Cushion :1.16 Ω ± 10%
Back :1.16 Ω ± 10%
Set :2.32 Ω ± 10%

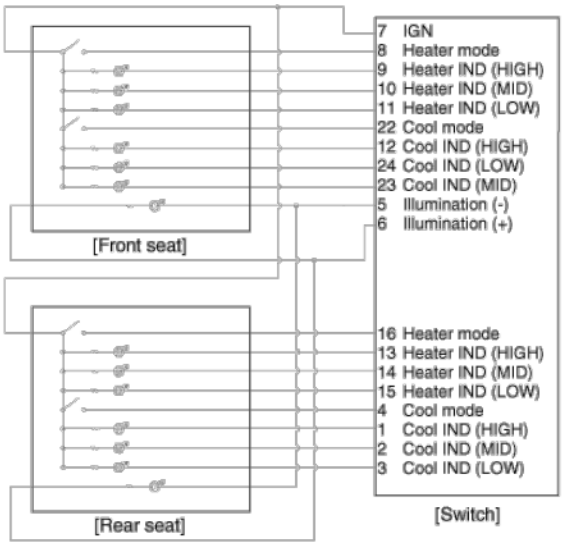
2. Operate the seat warmer after connecting the 3P connector, and then check the thermostat by measuring the temperature of seat surface.

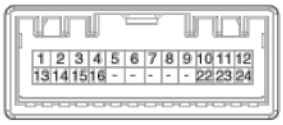
Standard value (Fabric / Leather)
Cushion :
1 Step : 40 ± 2°C(104 ± 3.6°F)
2 Step : 42 ± 2°C(107.6 ± 3.6°F)
Back :
1 Step : 46 ± 2°C(114.8 ± 3.6°F)
2 Step : 52 ± 2°C(125.6 ± 3.6°F)

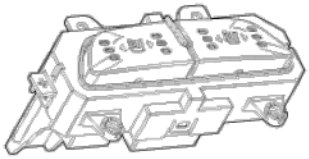
Circuit Diagram

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[Ventilation + Seat Heater]



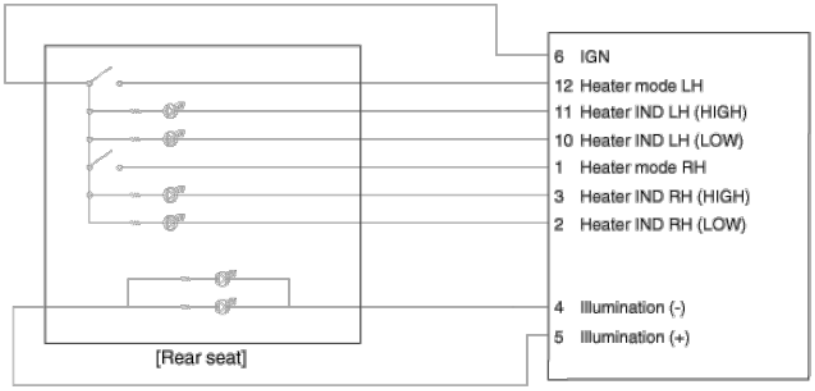


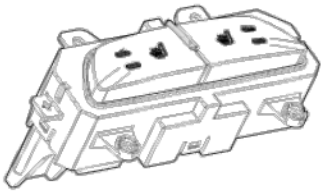


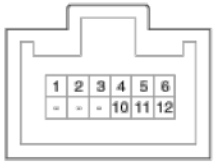
No.	Description (LH & Commom)	No.	Description (RH)
5	Illumination (-)	1	Cool IND (HIGH)
6	Illumination (+)	2	Cool IND (MID)
7	IGN	3	Cool IND (LOW)
8	Heater mode	4	Cool mode
9	Heater IND (HIGH)	13	Heater IND (HIGH)
10	Heater IND (MID)	14	Heater IND (MID)
11	Heater IND (LOW)	15	Heater IND (LOW)
12	Cool IND (HIGH)	16	Heater mode
22	Cool mode		
23	Cool IND (MID)		
24	Cool IND (LOW)		

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[Seat Heater]





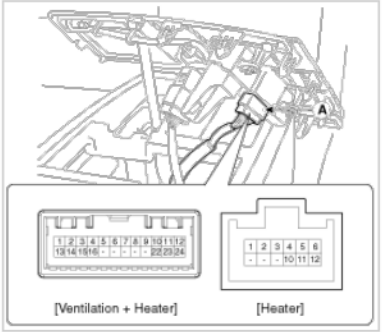


No.	Description
1	Heater mode RH
2	Heater IND RH (LOW)
3	Heater IND RH (HIGH)
4	Illumination (-)
5	Illumination (+)
6	IGN
7	-
8	-
9	-
10	Heater IND LH (LOW)
11	Heater IND LH (HIGH)
12	Heater mode LH

Inspection

Front Seat Heater Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the floor console upper cover (A).
   (Refer to Body - "Console")
3. Remove the seat heater switch connector (A) from the floor console upper cover.



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

[Ventilation + Heater]

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( ) : Assist

Position / Terminal	Driver	Assist	Remarks
7			IGN
8 (16)			Heat mode
9 (13)			Heater IND (HIGH)
10 (14)			Heater IND (MID)
11 (15)			Heater IND (LOW)
5			Illumination (-)
6			Illumination (+)

[Ventilation + Heater]

( ) : Assist

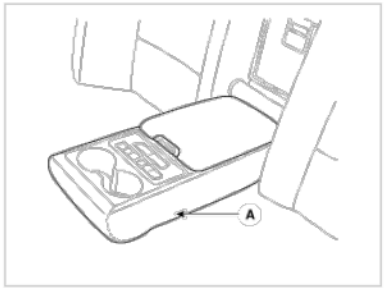
Position / Terminal	Driver	Assist	Remarks
7			IGN
22 (4)			Cool mode
12 (1)			Cool IND (HIGH)
24 (2)			Cool IND (MID)
23 (3)			Cool IND (LOW)
5			Illumination (-)
6			Illumination (+)

[Heater]

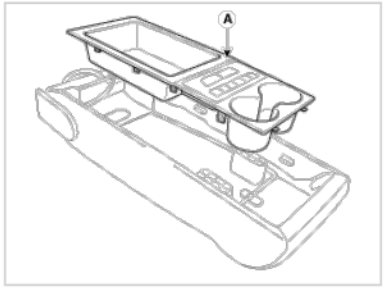
Position / Terminal	Right seat	Left seat	Remarks
6			IGN
12			Heat mode
11			Heater IND (HIGH)
10			Heater IND (MID)
1			Heat mode
3			Heater IND (HIGH)
2			Heater IND (MID)
4			Illumination (-)
5			Illumination (+)

Rear Seat Heater Switch

1. Disconnect the negative (-) battery terminal.
2. Open the rear seat arm rest (A).

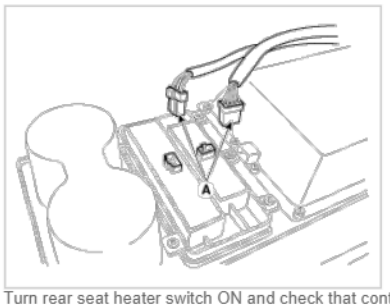


3. Remove the rear seat arm rest upper cover (A).

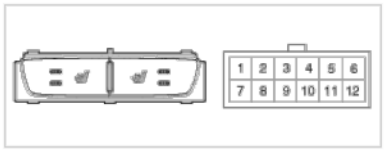


4. Disconnect the connector (A).

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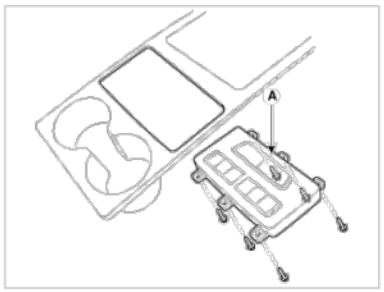


5. Turn rear seat heater switch ON and check that continuity exists between the terminals.



Position / Terminal	Left seat	Right seat	Remarks
3	○	○	IGN
6	○		Signal (Left)
5	○		Heater IND (LOW)
4	○		Heater IND (HIGH)
7		○	Signal (Right)
8		○	Heater IND (LOW)
9		○	Heater IND (HIGH)
2	○		Illumination (-)
1	○		Illumination (+)

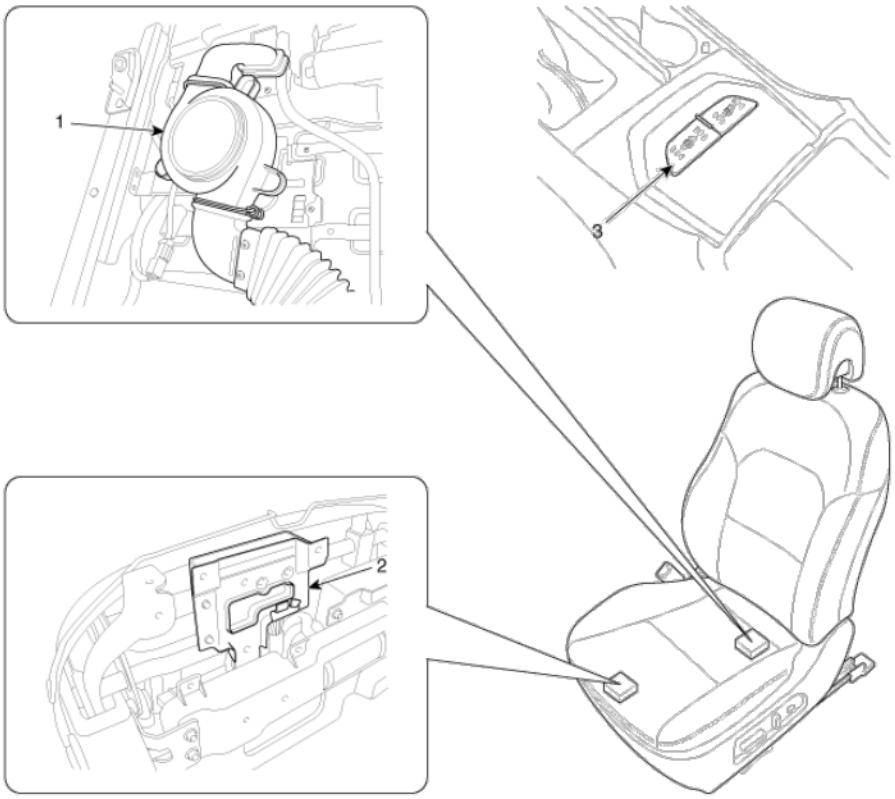
6. If there is no continuity, replace the seat heater switch (A).



Components (1)

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[Front Seat]

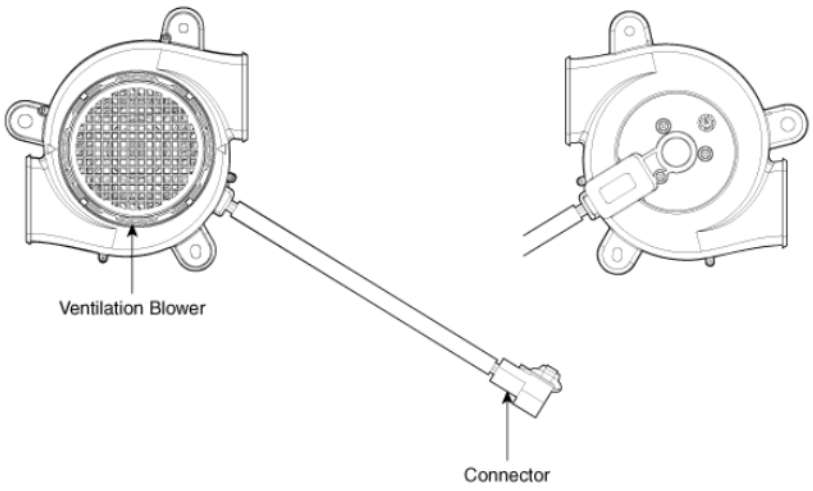


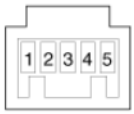
1. Ventilation blower 2. Ventilation ECU	3. Ventilation seat switch

Components (2)

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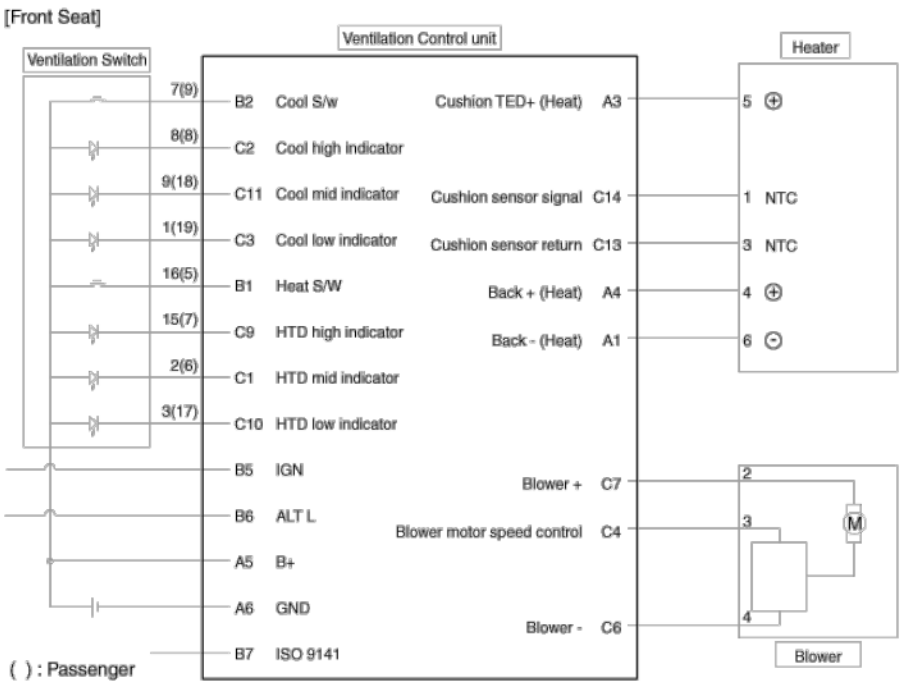
[Ventilation Blower]

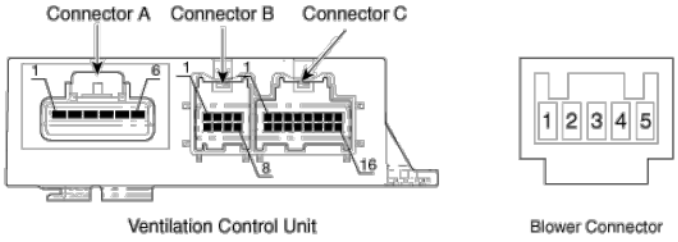


Connector	Pin	Description
	1	-
	2	12V
	3	RPM Control
	4	Ground
	5	-

Circuit Diagram

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Body Electrical System

Description

Using the blows power of FAN on seat, remove the moisture, sweat and warmth from occupants and surface of seats.
It inhales the indoor air through the blower installed at the seat cushion lower part, and supplies the air into the seat cushion and the seat back through the duct.
It sends a slight air throughout the seat surface through the air channel set up at seat cushion and seat back.

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.

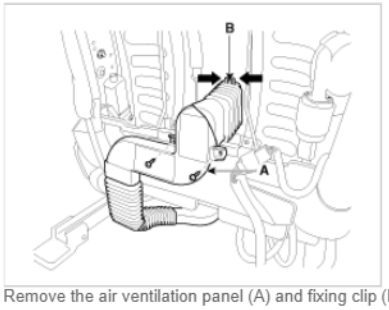
Body Electrical System

Removal

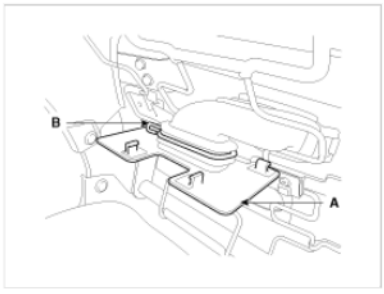
[Front Seat]

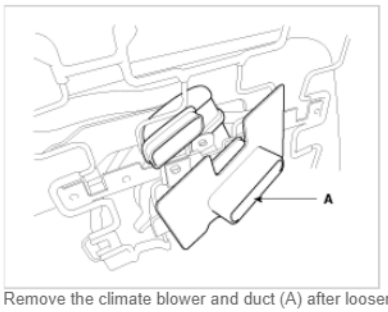
1. Remove the front seat assembly.
   (Refer to Body - "Front Seat")
2. Remove the seat back cover and cushion cover.
   (Refer to Body - "Front Seat")
3. Remove the ventilation duct (A) after loosening screws and removing fixing hook (B).

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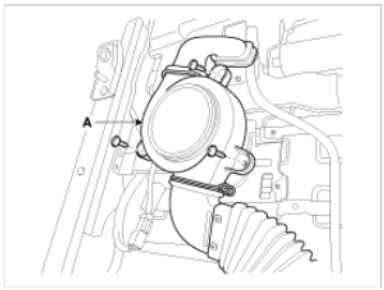


4. Remove the air ventilation panel (A) and fixing clip (B) from seat cushion.

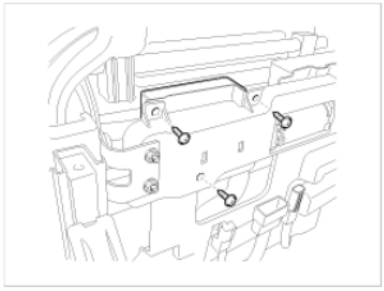


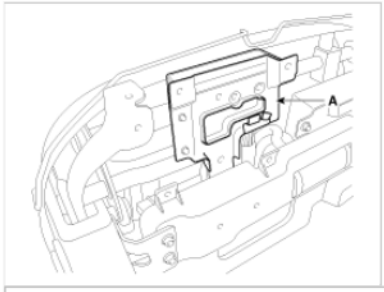


5. Remove the climate blower and duct (A) after loosening the fixing clips and screws.



6. Remove the climate control unit (A) after loosening the mounting screws.

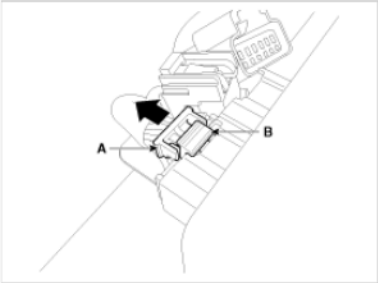




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NOTICE

Remove the fixing clip (A) as shown arrow direction, and then remove connector by pressing the knob (B).
Make sure the connectors and fixing clips are plugged in properly when installing process.



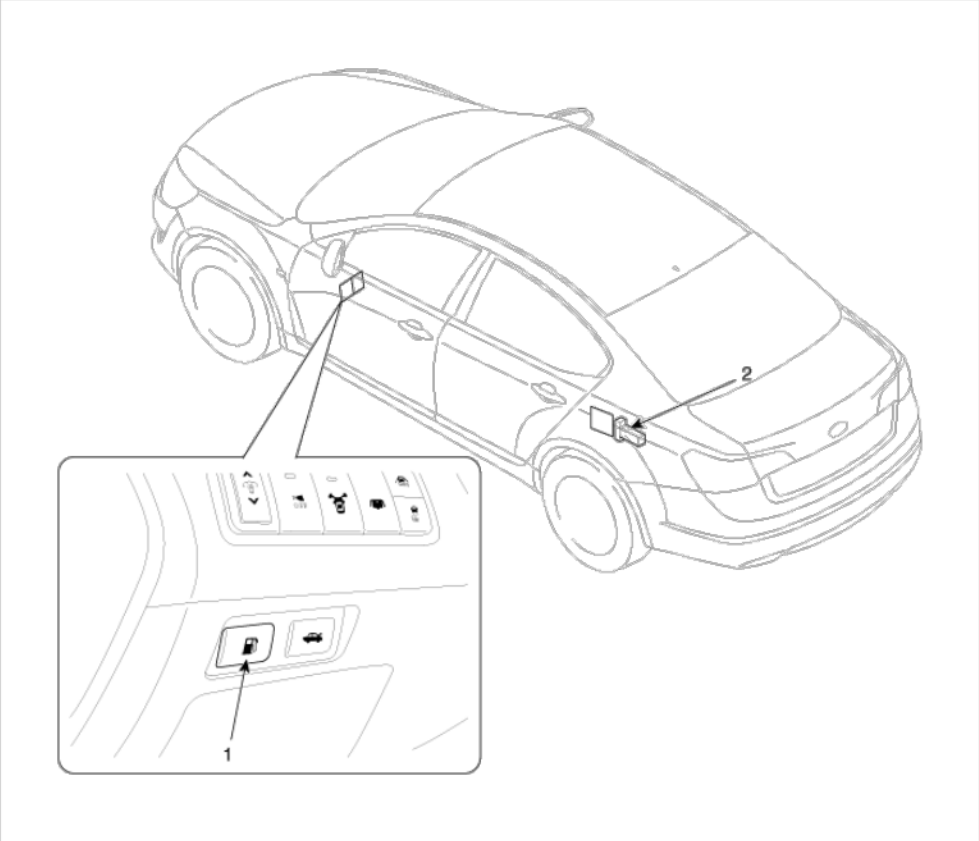
Installation

[Front Seat]

1. Install the connectors and air ventilation control unit.
2. Install the air ventilation duct and blower.
3. Install the seat back cover.
4. Install the seat assembly and seat track cover.

Body Electrical System

Component Location



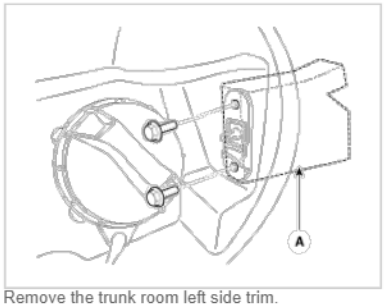
1. Fuel filler door open switch	2. Fuel filler door release actuator

Body Electrical System

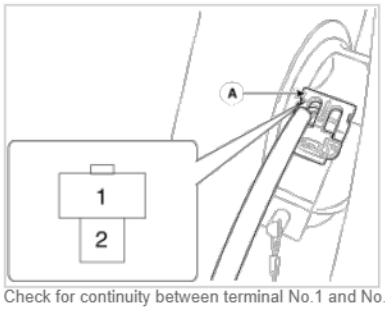
Inspection

1. Open the fuel filler door and remove the fuel filler door release actuator (A) after loosening the mounting bolts.

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2. Remove the trunk room left side trim.
   (Refer to Body - "Interior Trim")
3. Disconnect the release actuator connector (A).



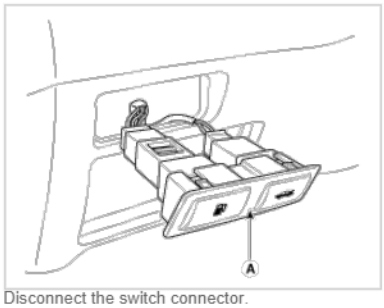
4. Check for continuity between terminal No.1 and No.2.
   If there is no continuity, replace the fuel filler door opener.

Inspection

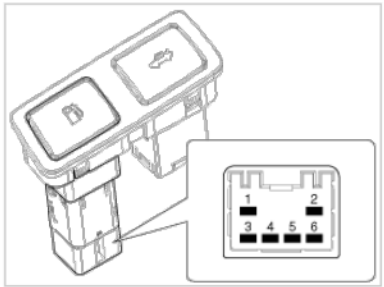
1. Open the junction box fuse cover.
2. Insert the hand to the junction box fuse cover hole and remove the crash pad side switch assembly (A) by pushing it.

NOTICE

Put on gloves to protect your hands.



3. Disconnect the switch connector.
4. Check for continuity between the terminal No.4 and No.5.
   If there is no continuity, replace the fuel filler door open switch.

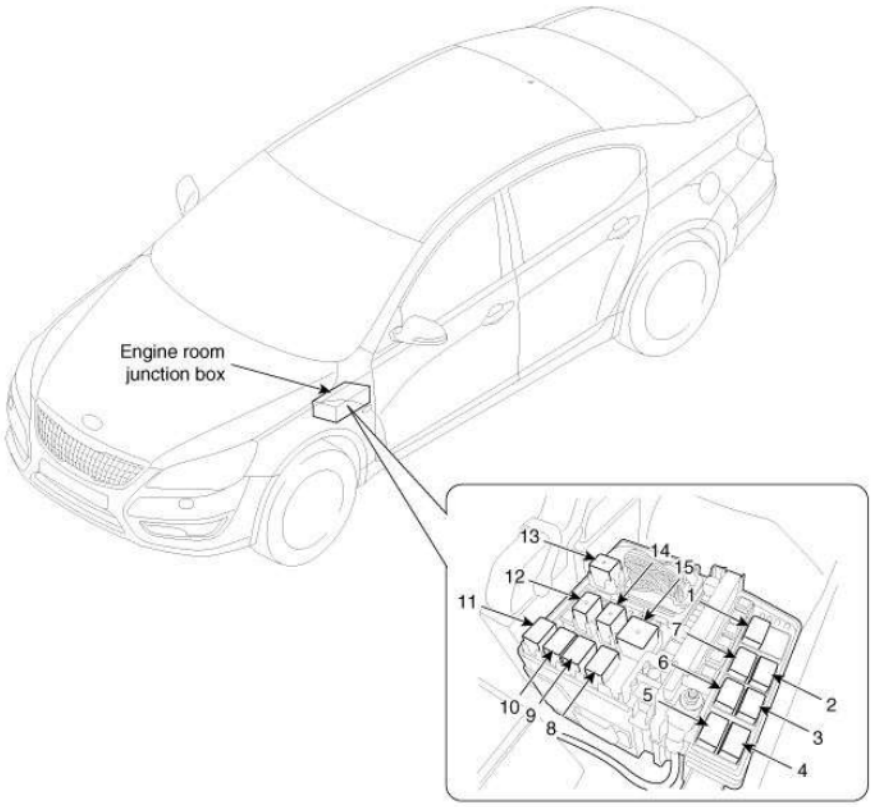


Position / Terminal	ON	OFF	Remarks
4			
5			
6			Illumination (+)
3			Illumination (-)

Component Location

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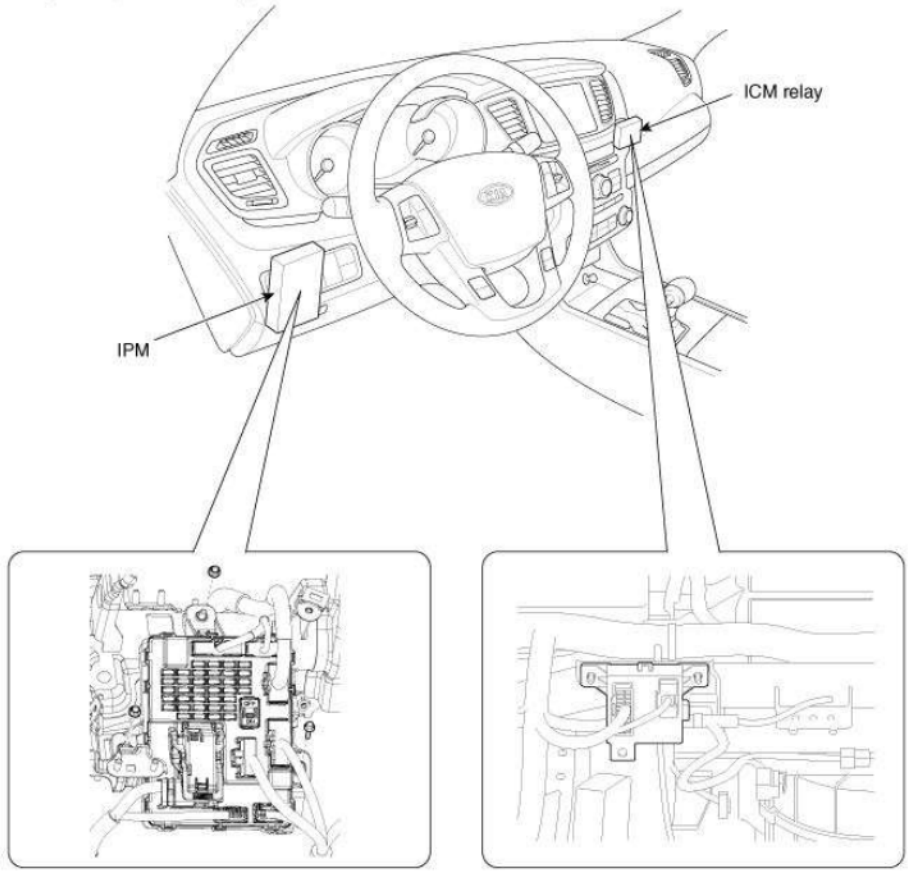
[Engine Room Junction Box]



1. Front deicer relay	8. Cooling pan relay #1
2. IGN2 relay	9. Cooling pan relay #2
3. Rain sensor relay	10. Start relay
4. Blower relay	11. Rear defogger relay
5. Burglar alarm horn relay	12. Horn relay
6. Wiper relay	13. ACC relay
7. IGN1 relay	14. Fuel pump relay
	15. ECU relay

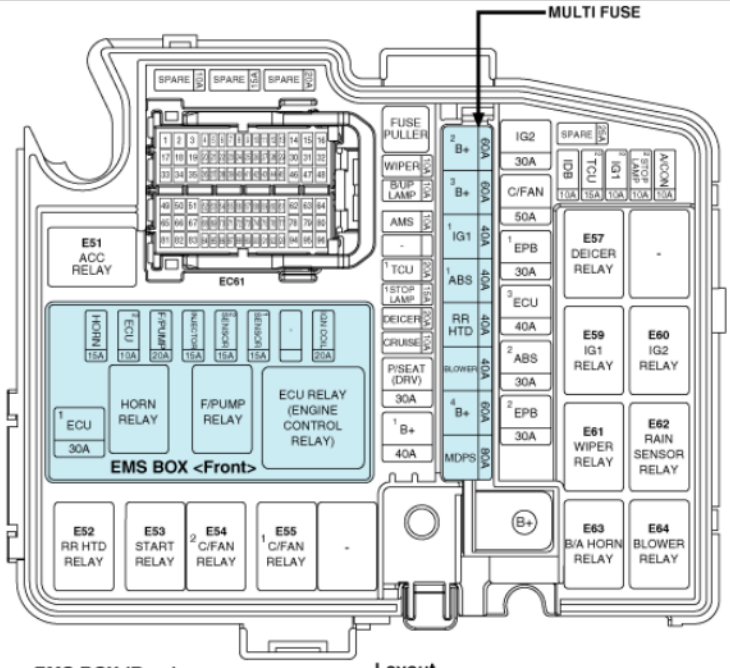
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[Passenger Compartment Relay]

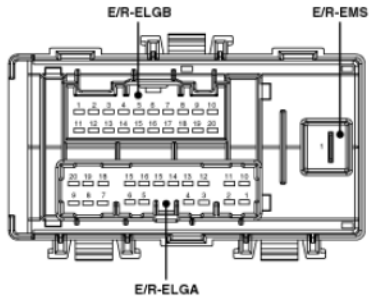


Components

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EMS BOX (Rear)



Layout

Relay No.		Relay Name	TYPE
E51		ACC RELAY	PLUG MICRO
E52		RR HTD RELAY	PLUG MICRO
E53		START RELAY	PLUG MICRO
E54		C/FAN 2 RELAY	PLUG MICRO
E55		C/FAN 1 RELAY	PLUG MICRO
E56		-	PLUG MICRO
E57		DEICER RELAY	PLUG MICRO
E58		-	PLUG MICRO
E59		IG 1 RELAY	PLUG MICRO
E60		IG 2 RELAY	PLUG MICRO
E61		WIPER RELAY	PLUG MICRO
E62		RAIN SENSOR RELAY	PLUG MICRO
E63		B/A HORN RELAY	PLUG MICRO
E64		BLOWER RELAY	PLUG MICRO
EMS BOX	RLY.1	HORN RELAY	PLUG MICRO
	RLY.2	F/PUMP RELAY	PLUG MICRO
	RLY.3	ENGINE CONTROL RELAY	PLUG MINI

※ USE THE DESIGNATED FUSE AND RELAY ONLY

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Circuit

Fuse Name		(A)	Circuit Protected
MULTI FUSE	B+ 2	60A	IPM (Fuse - CURTAIN 10A, P/WDW LH 25A, P/WDW RH 25A, IPS1, IPS2, IPS3, IPS5, IPS7, IPS12)
	B+ 3	60A	IPM (Fuse - SUNROOF20A, S/HEATER RR 20A, AMP 25A, P/SEAT PASS 20A, TRUNK 10A)
	IG1 #1	40A	E/R Fuse & Relay Box (IG1 Relay, ACC Relay)
	ABS 1	40A	ESC Module
	RR HTD	40A	E/R Fuse & Relay Box (RR HTD Relay)
	BLOWER	40A	E/R Fuse & Relay Box (Blower Relay)
	B+ 4	60A	IPM (Fuse - S/HEATER FRT 20A, IPS 0, IPS 4, IPS 6, IPS9, IPS10)
	MDPS	80A	MDPS Module
FUSE (E/R Fuse & Relay Box)	WIPER	10A	PCM, IPM (IPS Control Module)
	B/UP LAMP	10A	Rear Curtain Module, A/V Navigation Head Unit, Electro Chromic Mirror, Rear Combination Lamp (IN) LH/RH
	AMS	10A	Battery Sensor
	TCU 1	20A	IDB
	STOP LAMP 1	15A	Stop Signal Electronic Module
	DEICER	20A	E/R Fuse & Relay Box (Deicer Relay)
	CRUISE	10A	Smart Cruise Control Radar
	P/SEAT (DRV)	30A	Driver Lumbar Support Switch, Driver Cushion Extension Switch, Driver Manual Switch, IMS Control Module
	B+ 1	40A	EMS Box (Fuse - PDM 1 25A, Brake Switch 10A, DR/Lock 20A, P/Handle 15A, IPS 11, Leak Current Autocut Device)
	IG 2	30A	E/R Fuse & Relay Box (IG2 Relay, Start Relay)
	C/FAN	50A	E/R Fuse & Relay Box (C/FAN 1 Relay, C/FAN 2 Relay)
	EPB 1	30A	Electric Parking Brake Module

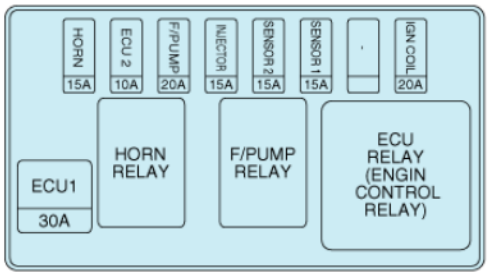
Fuse Name		(A)	Circuit Protected
FUSE (E/R Fuse & Relay Box)	ECU 3	40A	EMS Box (Fuse - HORN 15A, ECU 2 10A, ECU 1 30A, F/PUMP 20A)
	ABS 2	30A	ESC Module, Multipurpose Check Connector
	EPB 2	30A	Electric Parking Brake Module
	IDB	10A	IDB
	TCU 2	15A	Transaxle Range Switch
	IG1 #2	10A	PCM
	STOP LAMP 2	10A	Stop Lamp Switch
	A/CON	10A	A/C Control Module

※ USE THE DESIGNATED FUSE AND RELAY ONLY

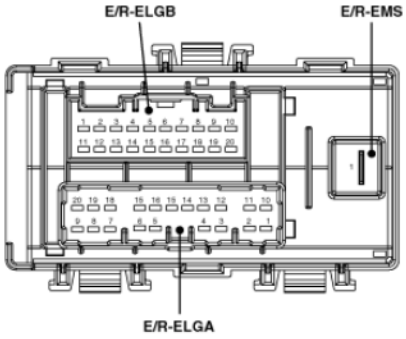
EMS BOX

Layout

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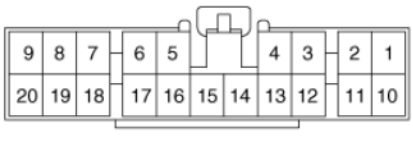


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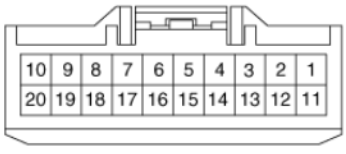


Relay Name.	Type
HORN RELAY	PCB
FUEL PUMP RELAY	PCB
ENGINE CONTROL RELAY	PCB

E/R-ELGB



E/R-ELGA



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Circuit

Fuse Name	(A)	Circuit Protected
HORN	15A	Horn Relay, E/R Fuse & Relay Box (B/A Horn Relay)
ECU 2	10A	PCM
F/PUMP	20A	F/Pump Relay
INJECTOR	15A	PCM, IDB, F/Pump Relay
SENSOR 2	15A	PCM, Oil Control Valve #1~#4, Purge Control Solenoid Valve, Variable Intake Solenoid Valve #1/#2
SENSOR 1	15A	PCM, Oxygen Sensor #1~#4, Canister Close Valve
-	-	-
IGN COIL	20A	Condensor #1/#2, Ignition Coil #1~#6
ECU 1	30A	Engine Control Relay

※ USE THE DESIGNATED FUSE AND RELAY ONLY

Inspection

Power Relay Test (Type A)

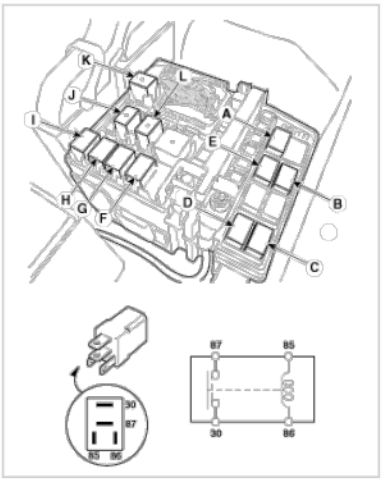
NOTICE

- 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. Front deicer	G. Cooling fan #2 relay
B. IGN2 relay	H. Start relay
C. Blower relay	I. Rear defogger
D. Burglar alarm horn relay	J. Horn relay
E. IGN1 relay	K. ACC relay
F. Cooling fan #1 relay	L. Fuel pump relay

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



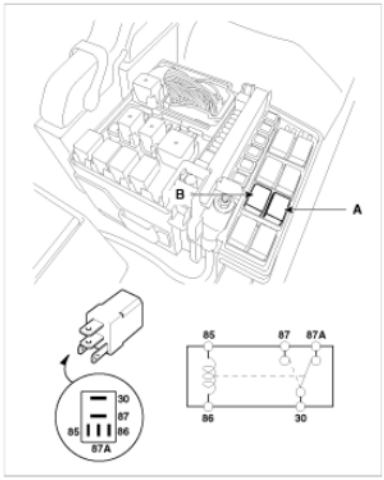
Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

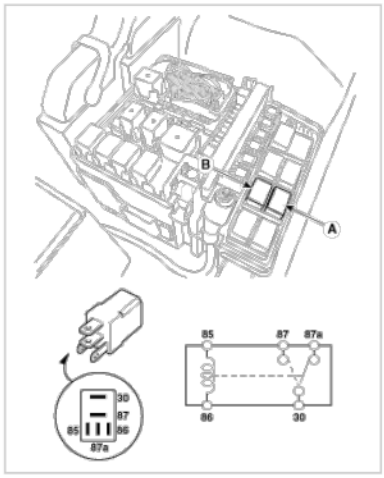
Power Relay Test (Type B)

Check for continuity between the terminals.
A : Rain sensor relay
B : 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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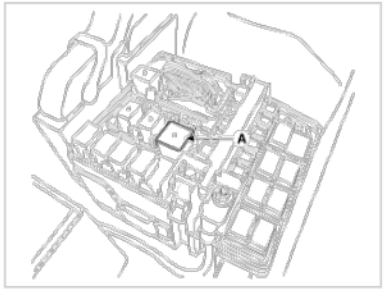


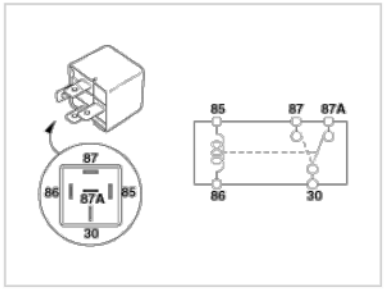
Power Relay Test (Type C)

Check for continuity between the terminals.

A : ECU relay

1. There should be continuity between the No.30, 87a 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, 87a and No.87 terminals when power is disconnected.





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

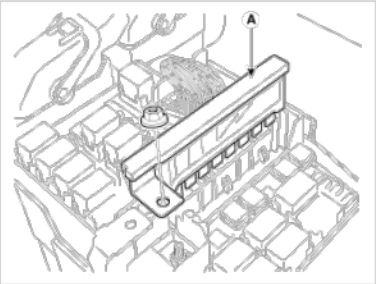
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Fuse Inspection

1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

Multi Fuse

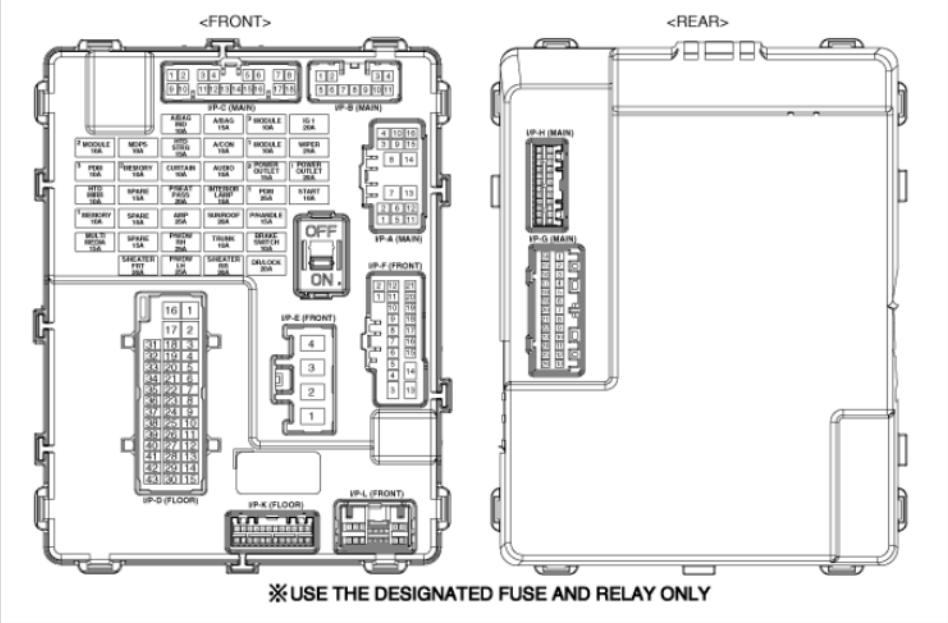
Multi Fuse is for optimizing the engine room package.



NOTICE

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

Components



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Circuit

Fuse Name	(A)	Circuit Protected
MODULE 2	10A	Tilt & Telescopic Module, Instrument cluste, IPS Control Module, Driver/Passenger Seat Warmer Module, Rear Seat Warmer Module LH/RH, IMS Control Module, Rear Parking Assist Sensor LH/RH, Rear Parking Assist Sensor LH/RH (Center), AMP, Console Switch, Driver/Passenger Door Module, LDWS Camera Module, Electro Chromic Mirror, Room Lamp, MTS Module, Driver/Passenger CCS Control Module, Multipurpos Check Connector, A/C Control Module, Head Lamp LH/RH, Adaptive Front Lighting Module, Head Lamp Leveling Device Actuator LH/RH
PDM 3	10A	Smart Key Control Module
HTD MIRR	10A	Driver Power Outside Mirror, Passenger Power Outside Mirror, A/C Control Module
MEMORY 1	10A	Auto Light & Photo Sensor, Data Link Connector, Driver/Passenger Foot Lamp, Instrument Cluster, Analog Clock, Rear Curtain Module, A/C Control Module, Room Lamp, Driver/Passenger Door Module, Tire Pressure Monitoring Module
MULTI MEDIA	15A	MTS Module, A/V & Navigation Head Unit, Front Monitor
MDPS	10A	MDPS Module
MEMORY 2	10A	RF Receiver
SPARE	15A	-
SPARE	10A	-
SPARE	15A	-
S/HEATER FRT	20A	Driver/Passenger Seat Warmer Module, Driver/Passenger CCS Control Module,
A/BAG IND	10A	Instrument Cluster
HTD STRG	15A	Clock Spring
CURTAIN	10A	Rear Curtain Module, Driver/Passenger Door Module
P/SEAT PASS	20A	Passenger Manual Switch
AMP	25A	AMP
P/WDW RH	25A	Passenger Safety Power Window Module, Rear Power Window Switch RH

Fuse Name	(A)	Circuit Protected
P/WDW LH	25A	Driver Safety Power Window Module, Rear Power Window Switch LH
A/BAG	15A	SRS Control Module, Body Sensor, A/C Control Module
A/CON	10A	Ionizer, A/C Control Module, E/R Fuse & Relay Box (Blower Relay)
AUDIO	10A	Smart Key Control Module, AMP, Front Monitor, Overhead Console Lamp Switch, MTS Module, IPS Control Module, A/V & Navigation Head Unit, Analog Clock, A/C Control Module
INTERIOR LAMP	10A	Driver/Passenger Vanity Lamp Switch, Glove Box Lamp, Room Lamp, Overhead Console Lamp Switch, Driver/Passenger Door Scuff Lamp, Driver/Passenger Door Lamp, Trunk Room Lamp
SUNROOF	20A	Panorama Sunroof
TRUNK	10A	Fuel Filler Door Switch, Trunk Lid Relay
S/HEATER RR	20A	Rear Seat Warmer Module LH/RH
MODULE 3	10A	ESC Module, Electric Parking Brake Module, Blind Spot Detection LH/RH, Rear Power Window Switch LH/RH, Steering Angle Sensor, Crash Pad Switch, Console Switch, Tire Pressure Monitoring Module, Smart Cruise Control Radar
MODULE 1	10A	Smart Key Control Module, Rear Curtain Module, Panorama Sunroof, Rain Sensor, IPS Control Module
POWER OUTLET 2	15A	Console Power Outlet
PDM 1	25A	Smart Key Control Module
P/HANDLE	15A	Tilt & Telescopic Module, Sport Mode Switch
BRAKE SWITCH	10A	Stop Lamp Switch, Start Stop Button Switch, Smart Key Control Module
DR/LOCK	20A	Driver Door Module
IG 1	20A	E/R Fuse & Relay Box (TCU 2 15A, IDB 10A, IG1 #2 10A, STOP LAMP 2 10A)
WIPER	25A	E/R Fuse & Relay Box (WIPER Relay, RAIN SENSOR Relay), Front Wiper Motor, Multifunction Switch
POWER OUTLET 1	20A	Front Cigarette Lighter
START	10A	Transaxle Range Switch, PCM

※ USE THE DESIGNATED FUSE AND RELAY ONLY

Body Electrical System

Fuse Inspection

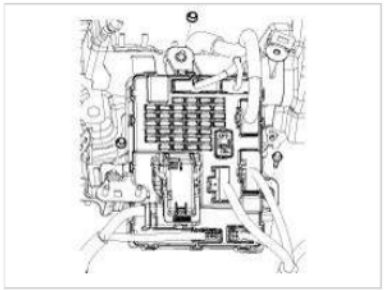
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

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

Removal

IPM

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad")
3. Disconnect the connectors (A) from the IPM (Intelligent intergrated Platform Module).



4. Remove the IPM after loosening the mounting nuts (2EA) and bolt (1EA).
5. Disconnect the connectors from the back side of the IPM.

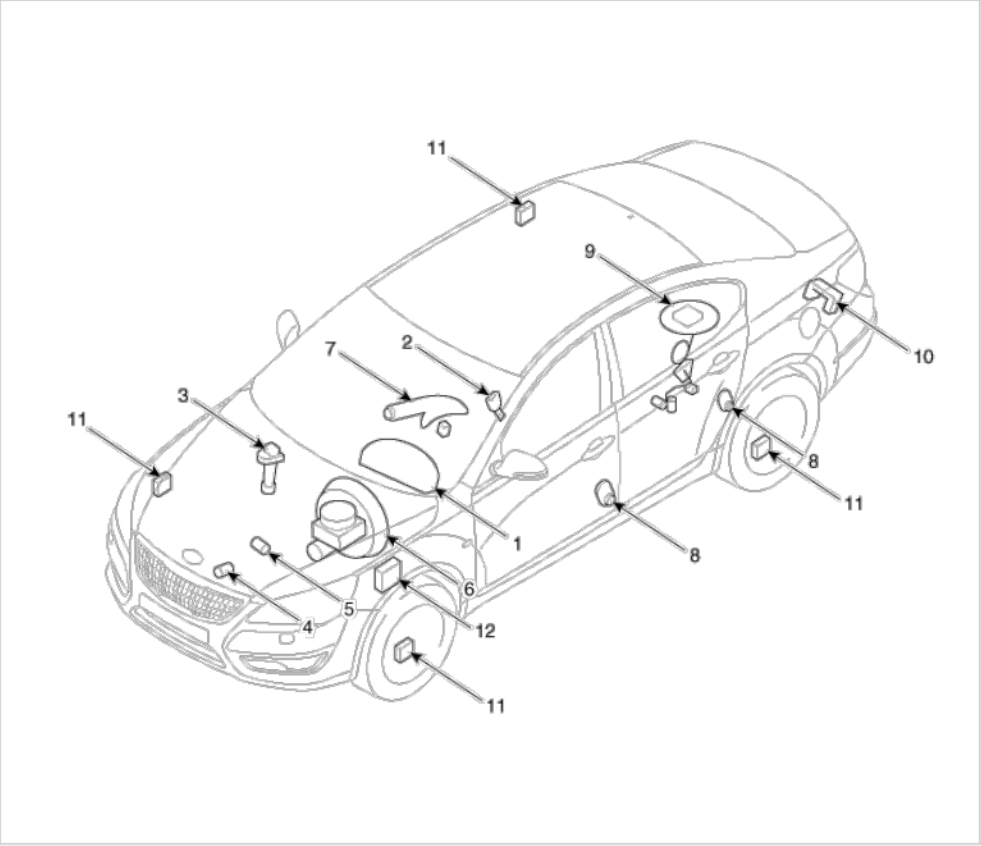
Installation

1. Install IPM (Intelligent intergrated Platform Module).
2. Connect the IPM connector.
3. Install the crash pad lower panel.

Body Electrical System

Component Location

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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

Components

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[Standard]

[Front]



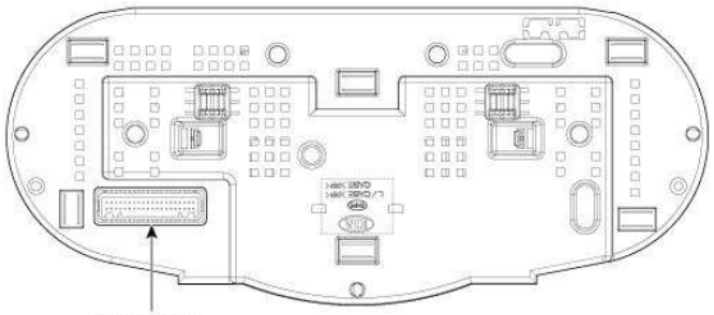


[KPH]



[MPH]

[Rear]

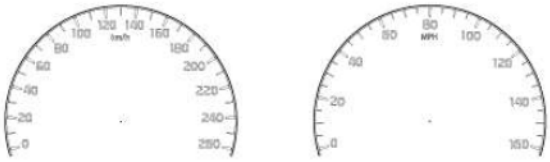


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[Supervision]

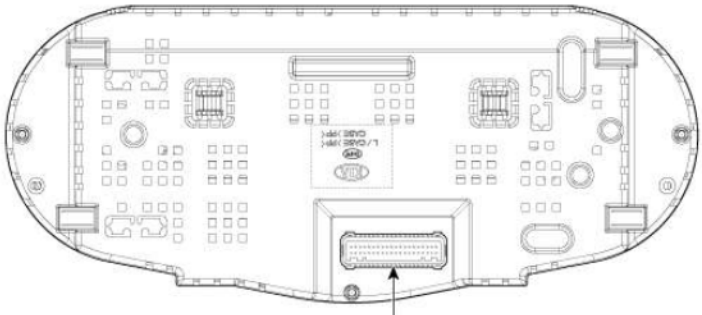
[Front]



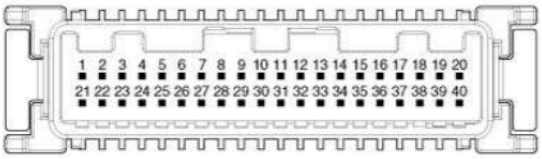


[KPH] [MPH]

[Rear]



Connector A



Connector A

Connector Pin Information

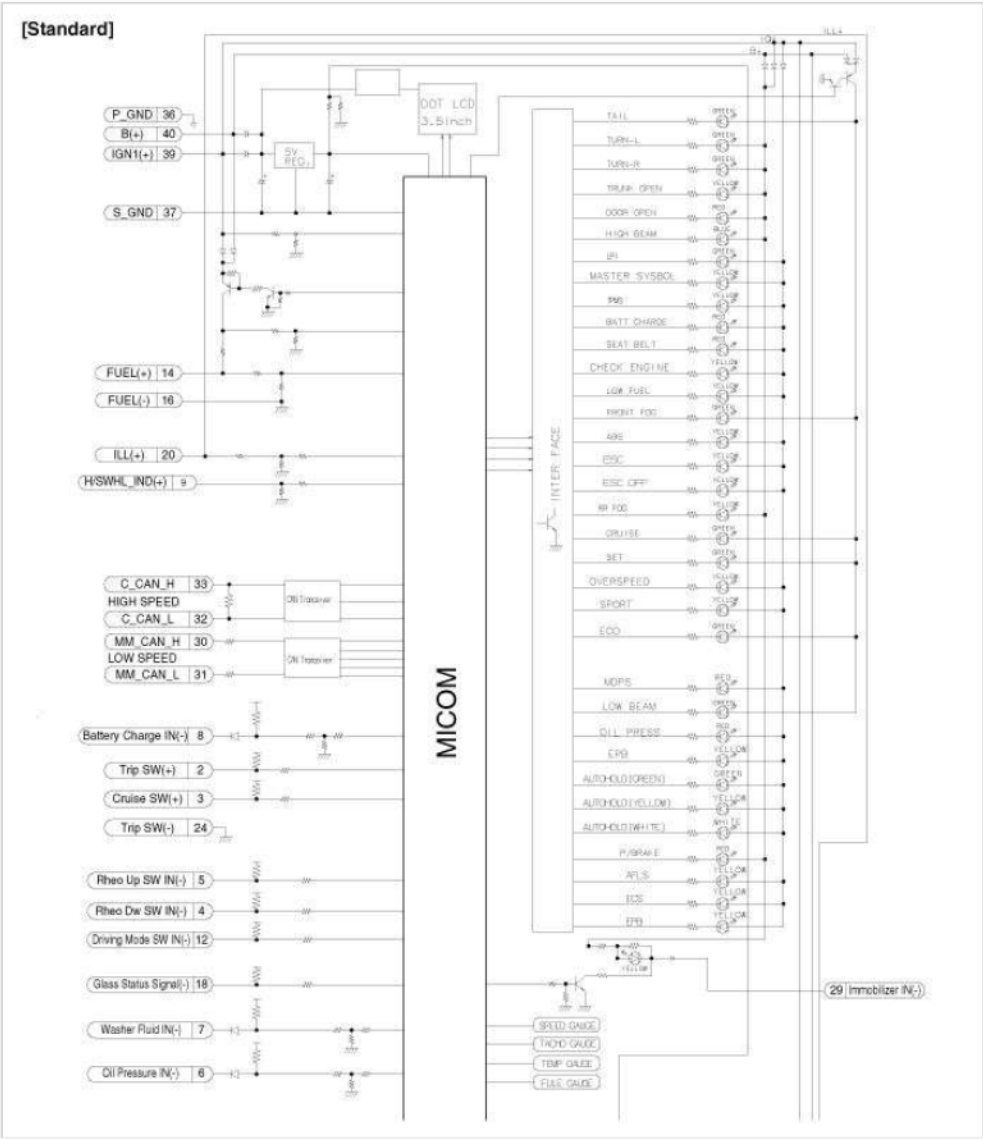
No.	Description	No.	Description
1	Air bag (+)	21	Aig bag (-)
2	Trip switch (+)	22	Speaker output (+)
3	Cruise switch (+)	23	Speaker output (-)
4	Rheostat down switch (-)	24	Trip switch (-)
5	Rheostat up switch (-)	25	VS 4P output (-)
6	Oil pressure (-)	26	AT R output (+)
7	Washer indicator (-)	27	AT P output (+)
8	Battery charge (-)	28	Detent output (+)
9	H/SWHL indicator (+)	29	Immobilizer (-)
10	Brake oil switch (-)	30	MM CAN high
11	Active ECO switch (-)	31	MM CAN low
12	Driving mode switch (-)	32	C CAN low
13	AT D output (+)	33	C CAN high
14	Fuel (+)	34	AT N output (+)
15	AT S output (+)(AT)	35	Illumniation (-)
16	Fuel (-)	36	P ground

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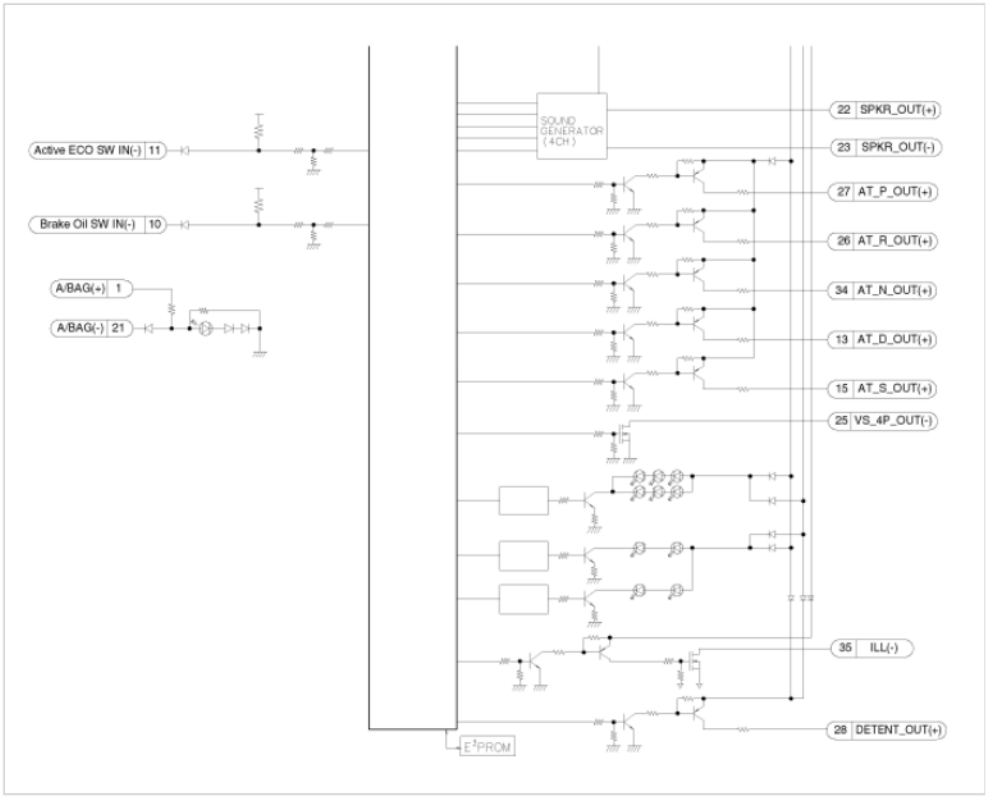
17	-	37	S ground
18	Glass status signal (-)	38	-
19	-	39	IGN 1 (+)
20	Illumination (+)	40	Battery (+)

Circuit Diagram

[Standard]

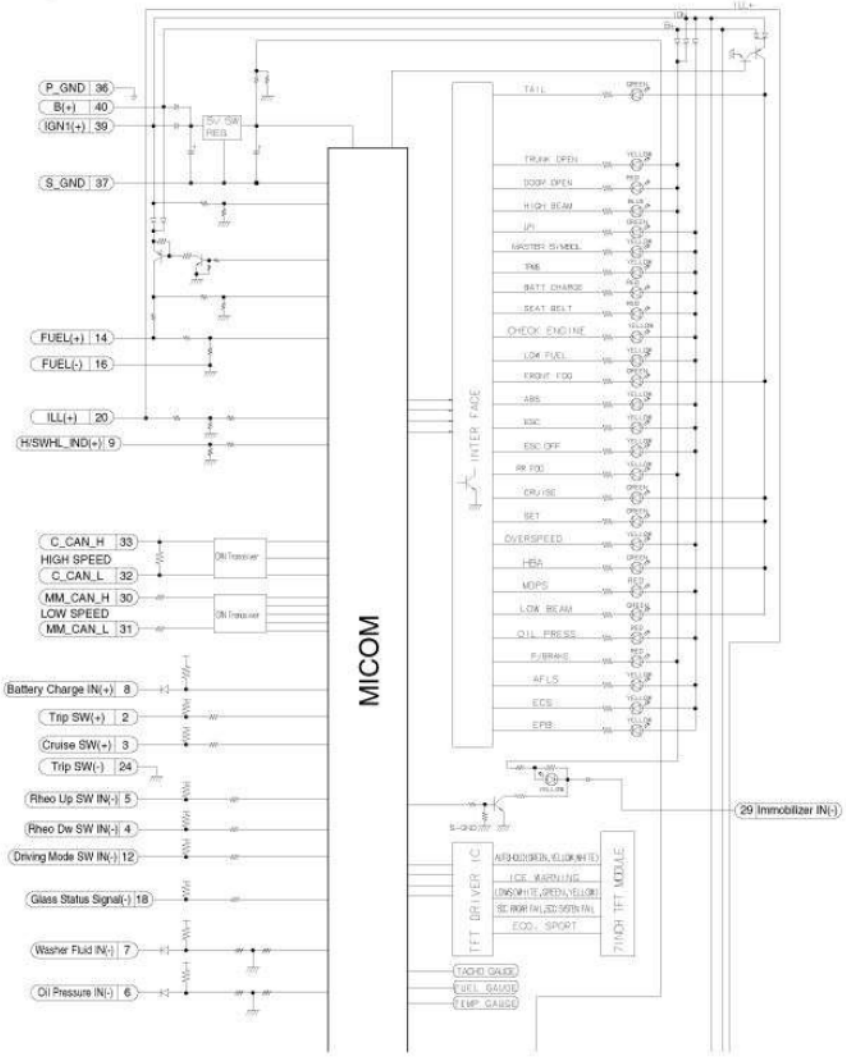


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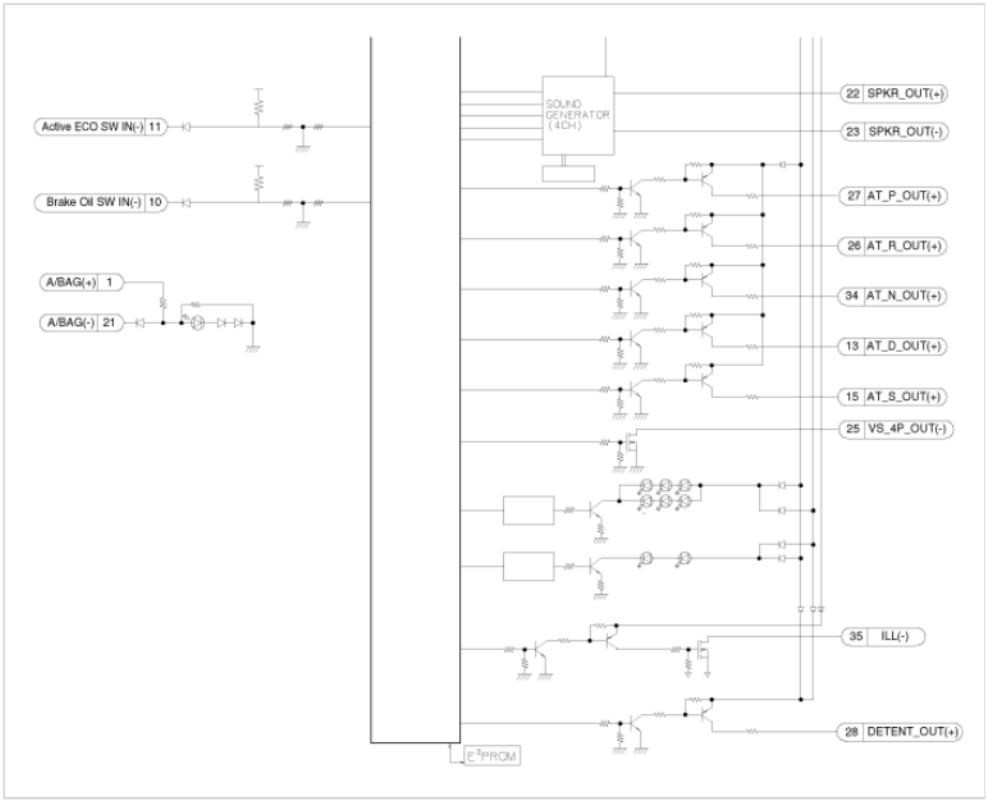


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[Supervision]



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Inspection

Speedometer

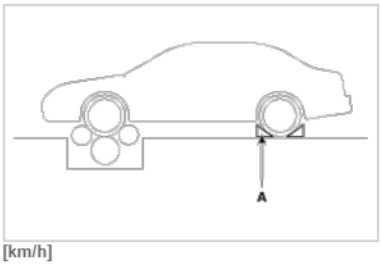
1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks (A) as appropriate.
3. Check if the speedometer indicator range is within the standard values.

⚠ CAUTION

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

NOTICE

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



[km/h]

Velocity (km/h)	Tolerance (km/h)	Velocity (km/h)	Tolerance (km/h)
20	+ 1.30 - 2.70	140	+ 5.51 + 1.51
40	+ 2.00 - 2.00	160	+ 6.21 + 2.21
60	+ 2.70 - 1.30	180	+ 6.91 + 2.91
80	+ 3.40 - 0.60	200	+ 7.61 + 3.61
100	+ 4.11 + 0.11	220	+ 8.32 + 4.32
120	+ 4.81 + 0.81	240	+ 9.02 + 5.02

[MPH]

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Velocity (MPH)	Tolerance (MPH)	Velocity (MPH)	Tolerance (MPH)
20	+ 0.81 - 1.67	100	+ 4.07 + 1.59
40	+ 1.63 - 0.85	120	+ 4.89 + 2.41
60	+ 2.45 - 0.04	140	+ 5.71 + 3.23
80	+ 3.26 + 0.78		

Tachometer

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

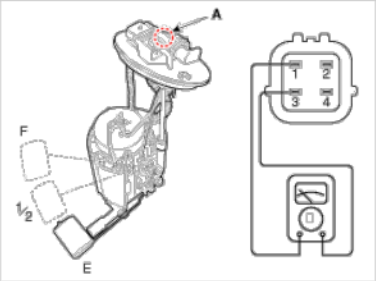
⚠ CAUTION

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

Revolution (rpm)	Tolerance (rpm)	Revolution (rpm)	Tolerance (rpm)
500	± 50	5,000	± 100
1.000	± 70	6,000	± 100
2,000	± 100	7,000	± 100
3,000	± 100	8,000	± 100
4,000	± 100		

Fuel Sender

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



Pin No.	Description
1	Fuel sender signal
2	Fuel pump motor (+)
3	Fuel sender ground
4	Fuel pump motor ground

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

[Standard - Gasoline]

Position	Fuel gauge angle (Cluster)	Fuel sender resistance
E	0 ± 2°	184 Ω
Warning lamp ON	4 ± 2°	170 Ω
Warning lamp OFF	15 ± 2°	142 Ω
1/2	60 ± 2°	66 Ω
F	120 ± 2°	15 Ω

[Supervision - Gasoline]

Position	Fuel gauge angle (Cluster)	Fuel sender resistance
E	0 ± 2°	184 Ω
Warning lamp ON	4 ± 2°	170 Ω
Warning lamp OFF	11.25 ± 2°	142 Ω
1/2	45 ± 2°	66 Ω
F	90 ± 2°	15 Ω

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

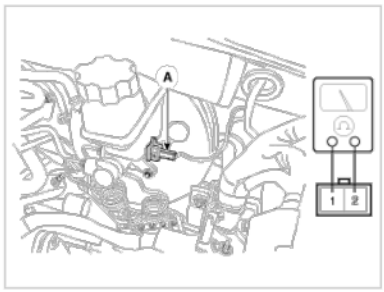
⚠ CAUTION

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

Brake Fluid Level Warning Switch

1. Remove the connector (A) from the switch located at the brake fluid reservoir.
2. Verify that continuity exists between switch terminals 1 and 2 while pressing the switch (float) down with a rod.

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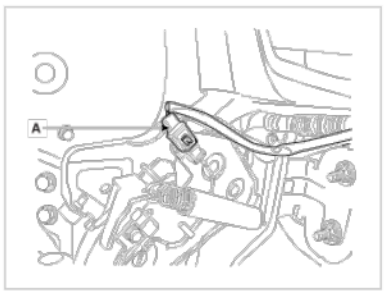
Brake Fluid Level Warning Lamp

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

Parking Brake Switch

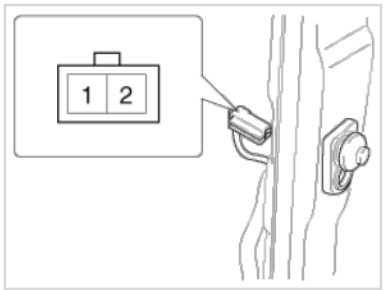
The parking brake switch (A) is a pulling type. It is located under the parking brake lever. To adjust, move the switch mount up and down with the parking brake lever released all the way.

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



Door Switch

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



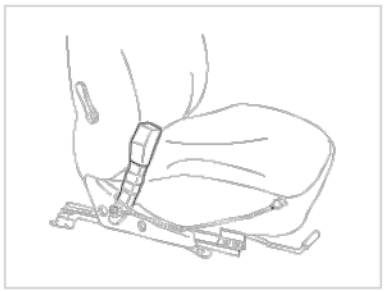
Terminal / Position	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

Seat Belt Switch

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

Seat belt condition	Continuity
Fastened	Non-conductive (∞Ω)
Not fastened	Conductive (Ω)

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Seat Belt Warning Lamp

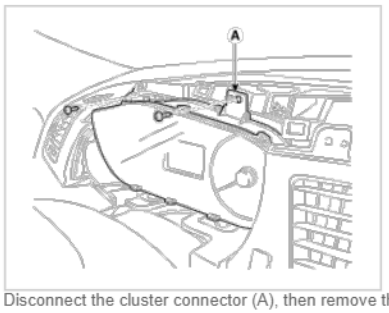
With the ignition switch turned ON, verify that the lamp glows.

Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

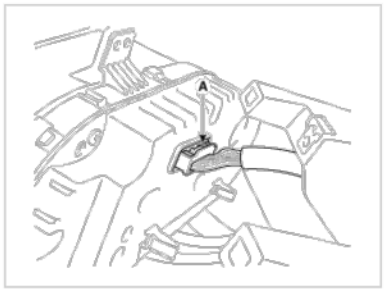
Removal

Instrument Cluster

1. Disconnect the negative (-) battery terminal.
2. Tilt the steering column down.
3. Remove the cluster facia panel after removing the screws.
   (Refer to Body - "Crash Pad")
4. Remove the instrument cluster (A) after loosening the screws.

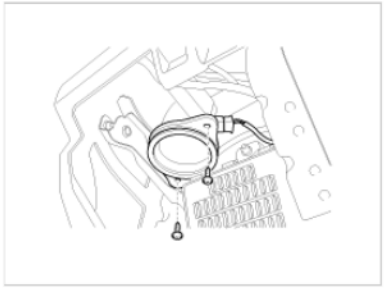


5. Disconnect the cluster connector (A), then remove the cluster.



Speaker

1. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad")
2. Remove the speaker (A) after removing the screws (2EA) and connector.



Installation

Instrument Cluster

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1. Install the cluster to the cluster housing.
2. Install the cluster fascia lower panel.

Speaker

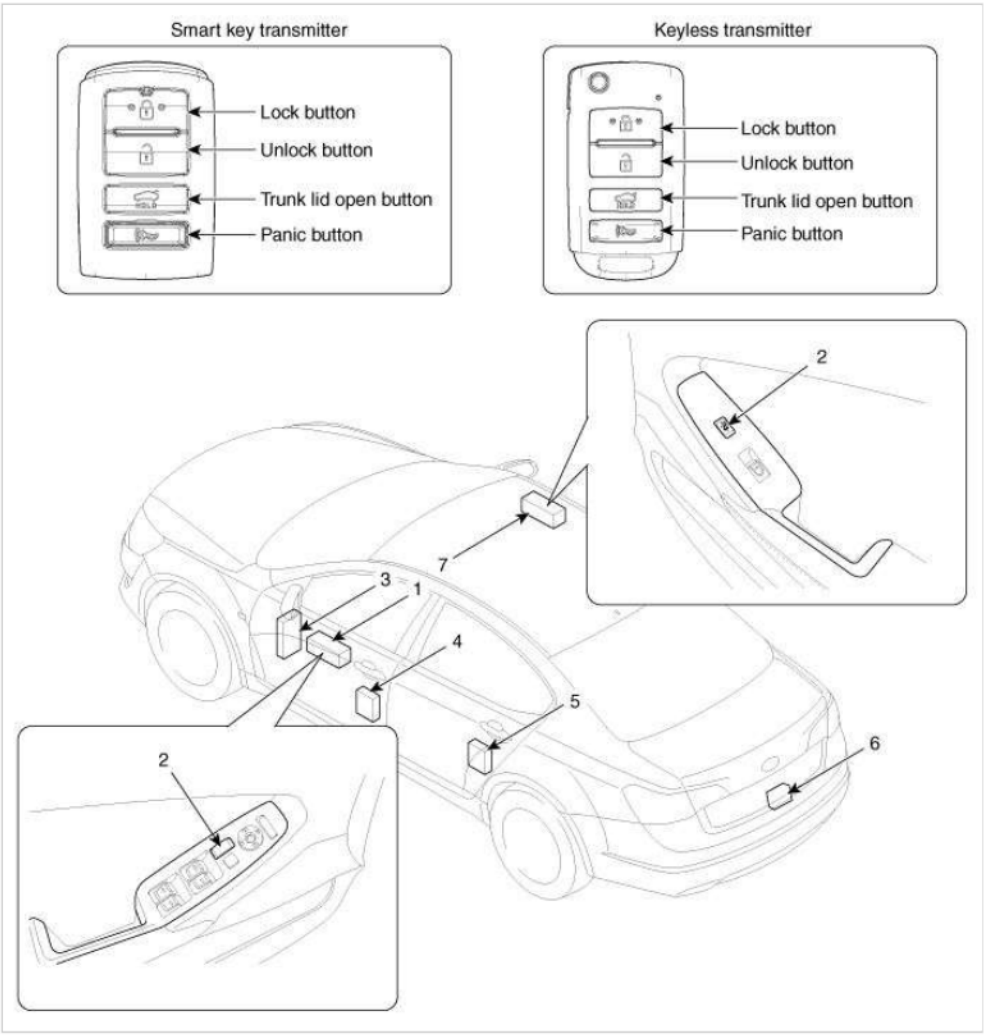
1. Install the speaker after connecting the connector.
2. Install the crash pad lower panel.

Troubleshooting

Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	CAN line faulty	Check the TCU
	Wiring or ground faulty	Repair if necessary
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Tachometer faulty	Check tachometer
	CAN line faulty	Check the TCU
	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
	Fuel level lamp faulty	Check fuel level lamp
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	CAN line faulty	Check the EMS
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Parking brake warning lamp faulty	Check parking brake warning lamp
	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 IPM
Open door warning lamp and tailgate warning lamp do not light up	Memory fuse (15A) blown	Check for short and replace fuse
	Door warning and tailgate warning lamp faulty	Check warning and tailgate warning lamp
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
	CAN line faulty	Check the IPM
Seat belt warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer and odometer faulty	Check speedometer and odometer
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
	CAN line faulty	Check the IPM
Speedometer and odometer does not operate	CAN line faulty	Check the ABS ECU
	Seat belt warning lamp faulty	Check seat belt warning lamp

Component Location

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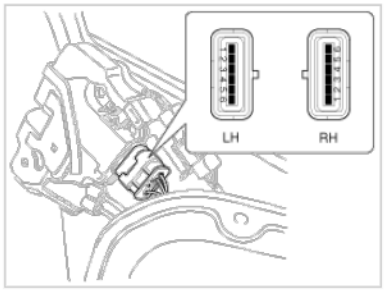


1. Driver power window switch 2. Door lock switch 3. IPM(Intelligent intergrated Platform Module) 4. Front door lock actuator	5. Rear door lock actuator 6. Trunk lid open actuator 7. Assit power window switch

Inspection

Front Door Lock Actuator Inspection

1. Remove the front door trim.
   (Refer to Body - "Front Door")
2. Remove the front door module.
3. Disconnect the 6P connector from the actuator.



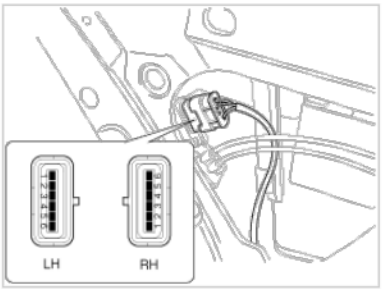
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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Position \ Terminal		2	1
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		6	5
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

Rear Door Lock Actuator Inspection

1. Remove the rear door trim.
   (Refer to Body - "Rear Door")
2. Remove the rear door module.
3. Disconnect the 6P connector from the actuator.

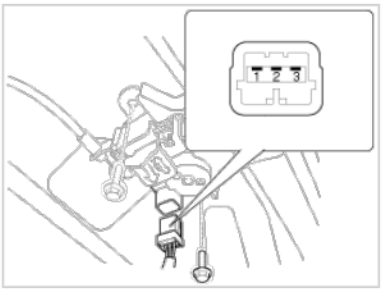


4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	1
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		6	5
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

Trunk Lid Release Actuator Inspection

1. Remove the trunk lid trim panel.
   (Refer to Body - "Trunk Lid")
2. Disconnect the 3P connector from the actuator.



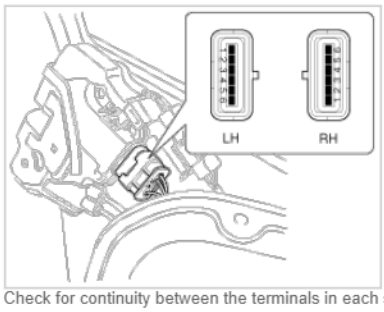
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	1	2
Open	⊖	⊕
Close	–	–

Front Door Lock Switch Inspection

1. Remove the front door trim panel.
   (Refer to Body - "Front Door")
2. Remove the front door module.
3. Disconnect the 6P connector from the actuator.

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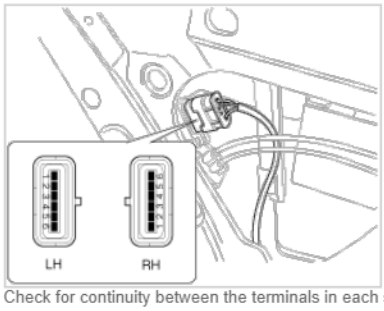


4. Check for continuity between the terminals in each switch position when inserting the key into the door according to the table.

Position \ Terminal		5	6
Front Left	Unlock	○———	———○
Position \ Terminal		1	2
Front Right	Unlock	○———	———○

Rear Door Lock Switch Inspection

1. Remove the rear door trim panel.
   (Refer to Body - "Rear Door")
2. Remove the rear door module.
3. Disconnect the 6P connector from the actuator.

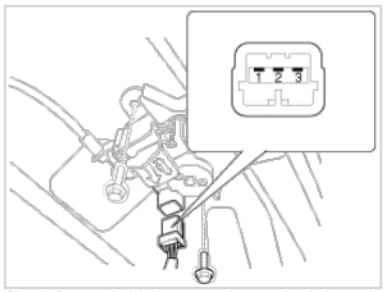


4. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		5	6
Rear Left	Unlock	○———	———○
Position \ Terminal		1	2
Rear Right	Unlock	○———	———○

Trunk Lid Open Switch Inspection

1. Remove the trunk lid trim.
   (Refer to Body - "Trunk Lid")
2. Disconnect the 3P connector from the actuator.



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

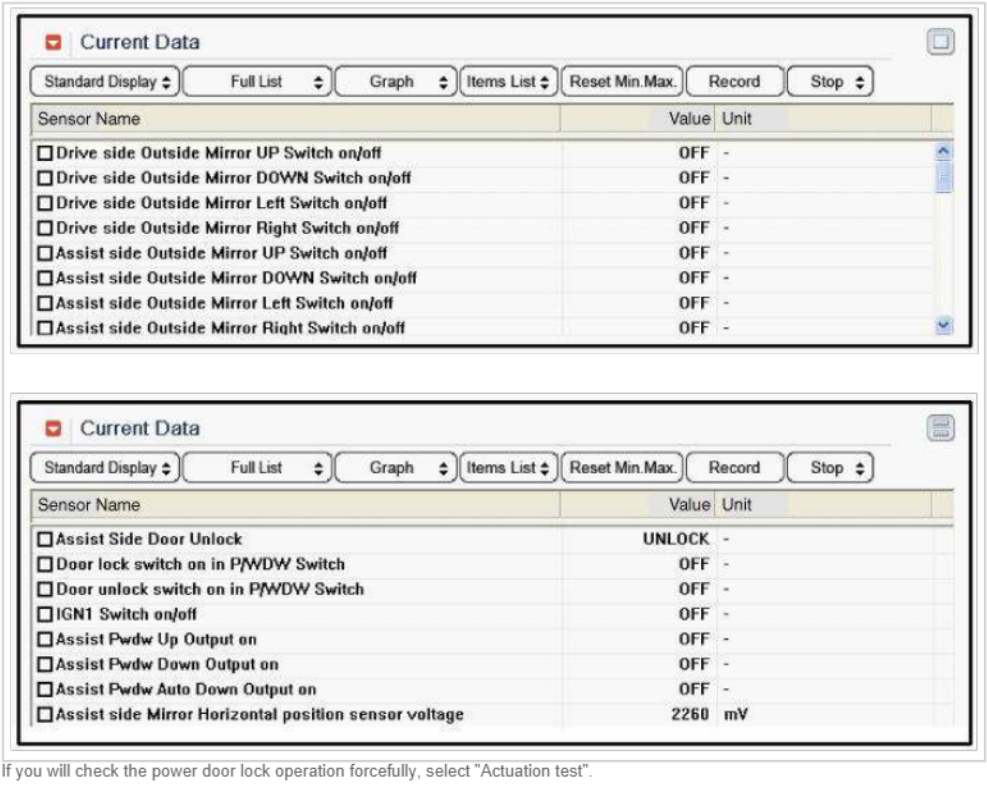
Position \ Terminal	1	3
Open	○———	———○
Close		

Inspection

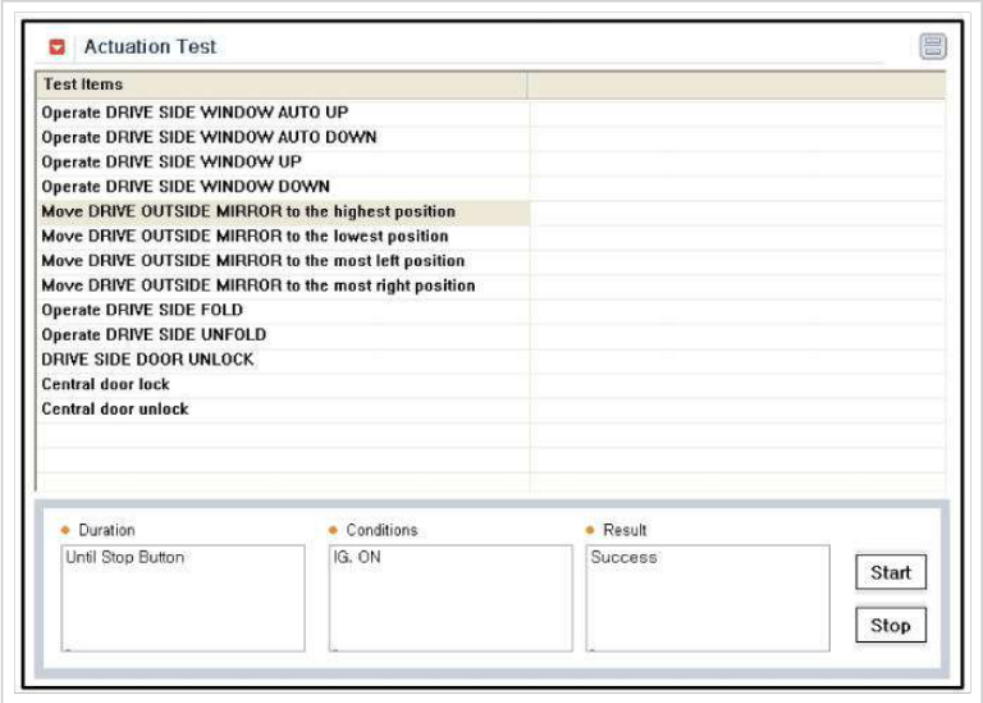
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Diagnosis With GDS

1. It will be able to diagnose defects of DDM/ADM with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and "IPM".
3. Select the "DDM (Power window main)" to check.
4. Select "Input/output monitoring", if you will check current data of power door lock system. It provides input/output status of DDM/ADM.

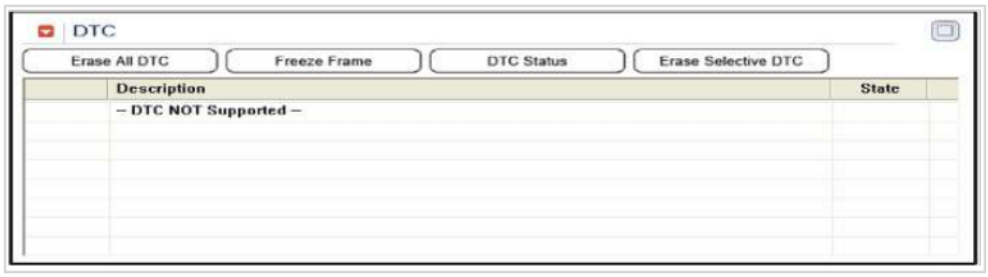


5. If you will check the power door lock operation forcefully, select "Actuation test".



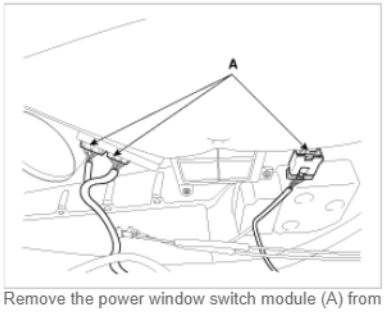
6. To check the DTC of the DDM/AMD module, select "Diagnostic trouble codes"

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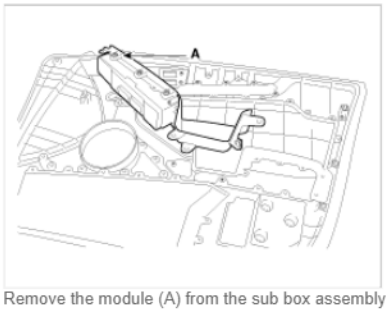


Removal

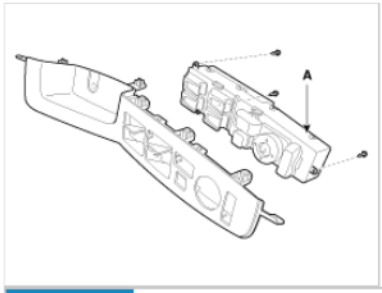
1. Disconnect the negative(-) battery terminal.
2. Remove the front door trim panel.
   (Refer to Body - "Front Door")
3. Disconnect the power window switch module connector (A) from the wiring harness.



4. Remove the power window switch module (A) from the door trim after loosening the mounting screws (13EA).



5. Remove the module (A) from the sub box assembly after loosening the mounting screw (3EA).



NOTICE

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

Installation

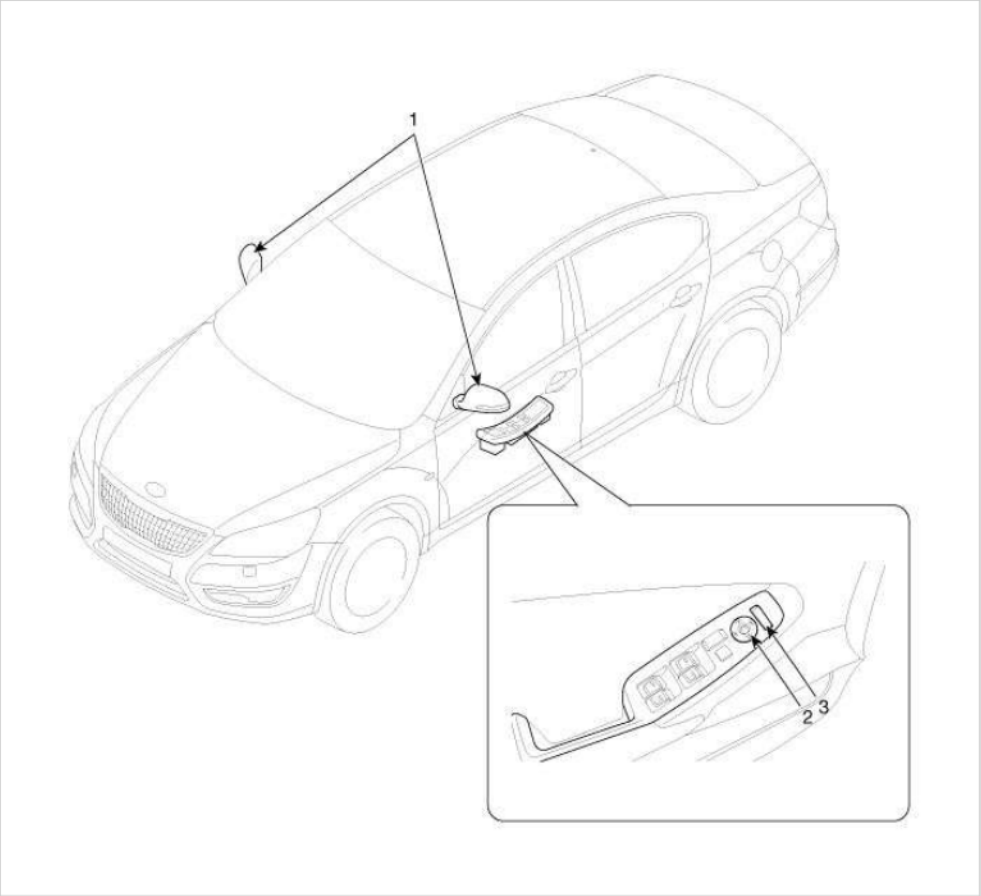
1. Install the power window switch module.
2. Install the door trim panel after reconnecting the relevant connectors

NOTICE

- Make sure that the power window switch module connectors are plugged properly.
- Check that the power window switch and door lock switch operate normally.

Component Location

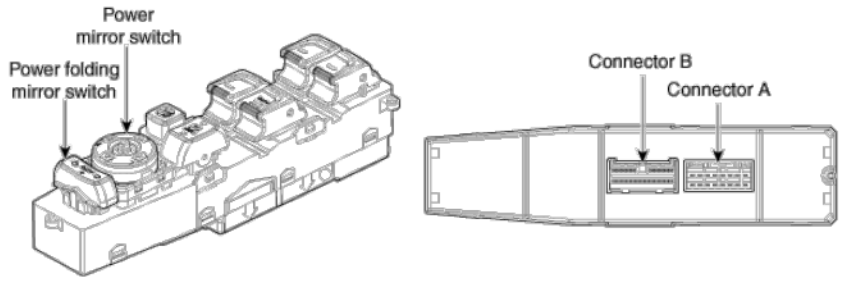
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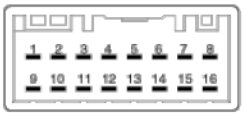


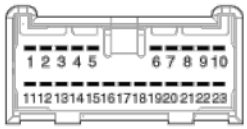
1. Power door mirror 2. Power door mirror switch	3. Power folding mirror switch

Component

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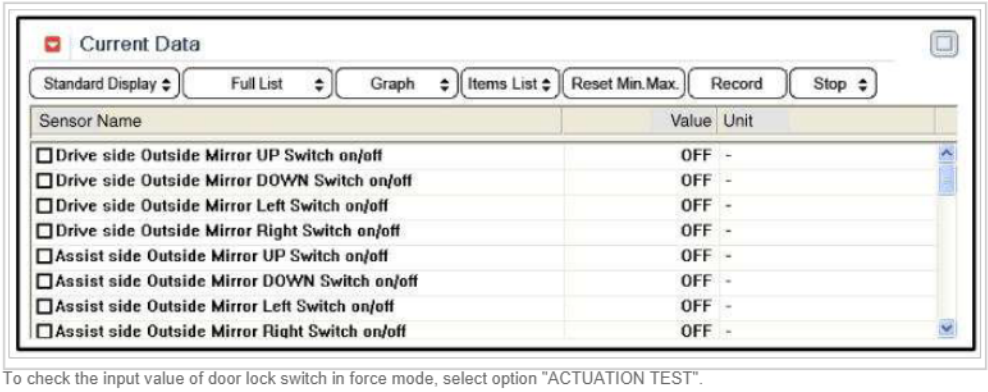


No.	Connector A
1	ECU GND
2	–
3	IGN1 (back up lamp)
4	Battery (+)
5	–
6	Mirror unfolding
7	Mirror folding
8	Power GND
9	Mirror motor (vertical)
10	Mirror motor (horizontal)
11	Mirror motor (center)
12	Puddle lamp
13	Door lock motor
14	Door unlock motor
15	Battery (+) power
16	Battery (+) mirror

No.	Connector B
1	CAN high
2	CAN low
3	Power (Safety window)
4	Down (Safety window)
5	SET switch (IMS)
6	Crash input
7	–
8	Auto (Safety window)
9	Mirror sensor Vcc
10	–
11	Switch 2 (IMS)
12	Switch 1 (IMS)
13	Door unlock switch
14	–
15	Mirror sensor (horizontal)
16	Mirror sensor (vertical)
17	–
18	–
19	Trunk open switch
20	Up (Safety window)
21	–
22	–
23	Sensor GND

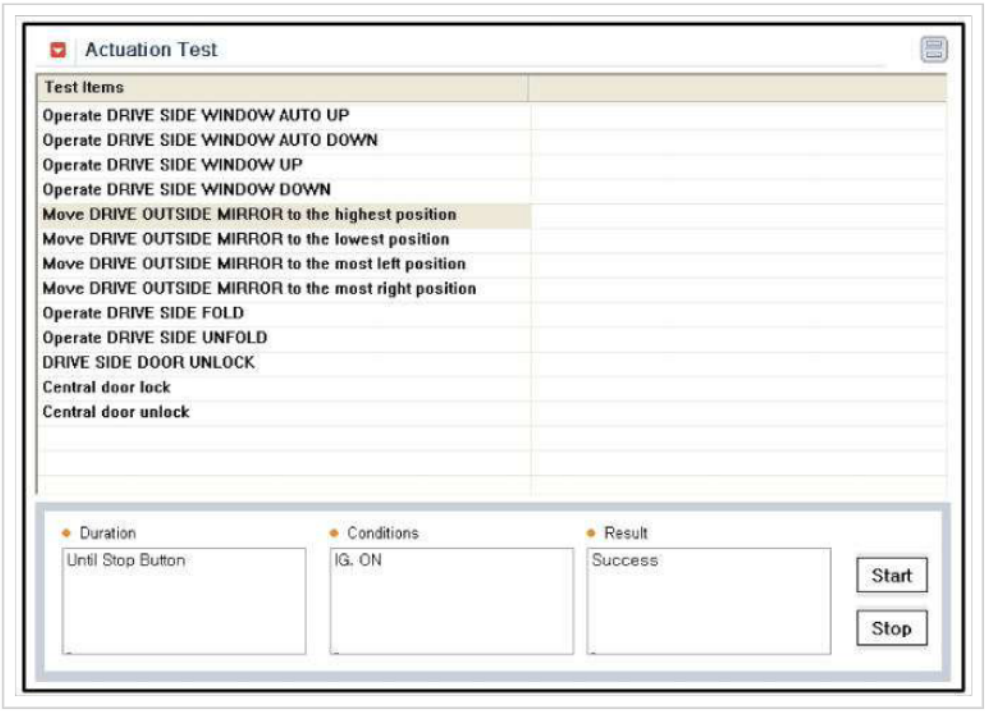
Inspection

1. The DDM inputs can be checked using the GDS.
2. To check the input value of door lock switch, select option "IPM".
3. Select option "DDM (Driver Door Module)".
4. Select option "Input/Output monitoring".



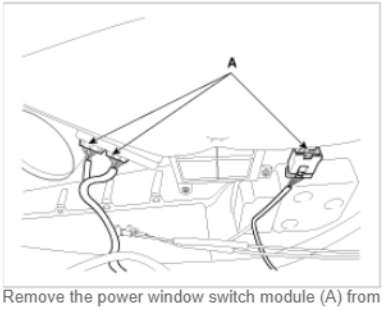
5. To check the input value of door lock switch in force mode, select option "ACTUATION TEST".

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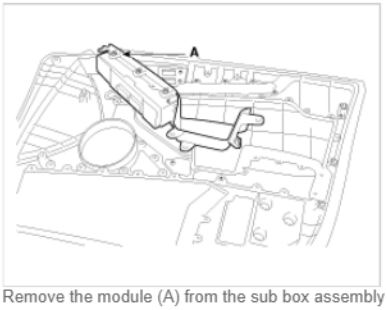


Removal

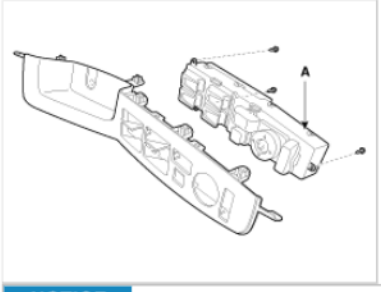
1. Disconnect the negative(-) battery terminal.
2. Remove the front door trim panel.
   (Refer to Body - "Front Door")
3. Disconnect the power window switch module connector (A) from the wiring harness.



4. Remove the power window switch module (A) from the door trim after loosening the mounting screws (13EA).



5. Remove the module (A) from the sub box assembly after loosening the mounting screw (3EA).



NOTICE

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

Installation

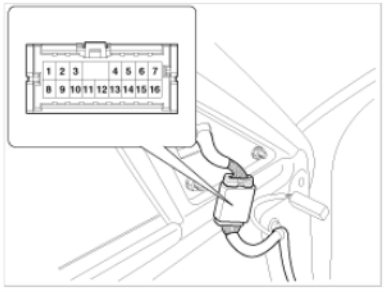
1. Install the power window switch module.
2. Install the door trim panel after reconnecting the relevant connectors

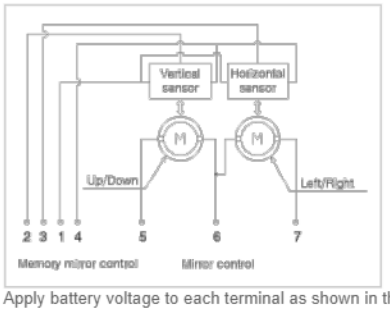
NOTICE

- Make sure that the power window switch module connectors are plugged properly.
- Check that the power window switch and door lock switch operate normally.

Inspection

1. Remove the front door quadrant delta cover.
   (Refer to Body - "Front Door")
2. Disconnect the power door mirror connector from the harness.





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

	Direction	7	6	5	B	GND	4	1	3	2
LH	UP						+	-		▲
	Down									▼
	OFF									
	Right						+	-	▲	
	Left								▼	
RH	Up						+	-		▲
	Down									▼
	OFF									
	Right						+	-	▲	
	Left								▼	

▲ Increasing voltage
▼ Decreasing voltage

Mirror Heater Inspection

Terminal / Position	10	11
Heater	⊕	⊖

Puddle Lamp

Terminal / Position	14	13
Lamp	⊕	⊖

ECM

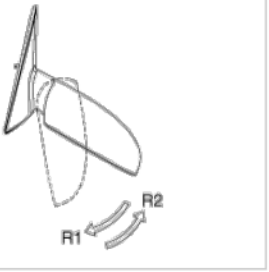
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Terminal / Position	9	8
Lamp	⊕	⊖

Side Repeater Lamp

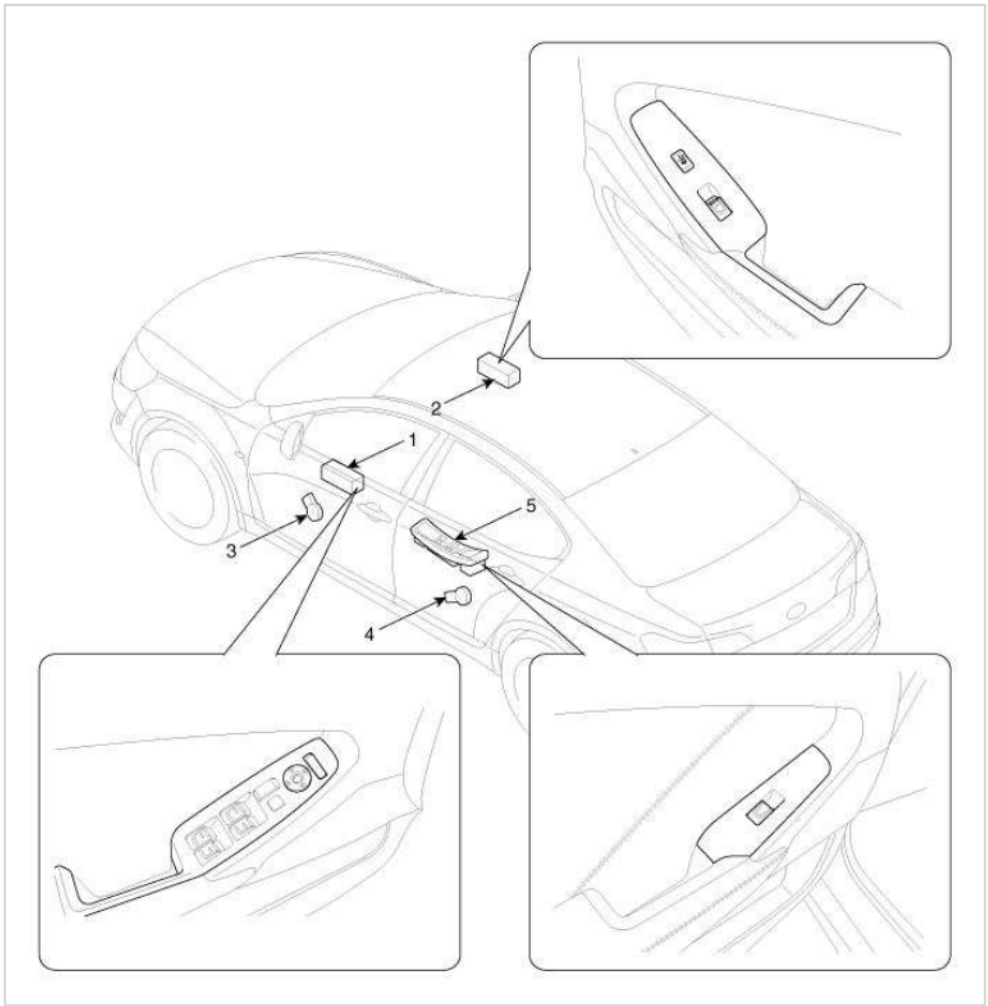
Terminal / Position	12	11
OEC	⊕	⊖

Folding Mirror



Terminal / Position	B (+)	GND (-)	8	9
Folding (R1)	○	○	○	
Unfolding (R2)	○	○		○

Component Location



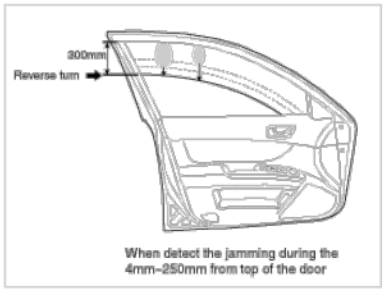
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1. Driver power window main switch 2. Passenger power window switch 3. Front window motor	4. Rear window motor 5. Rear window switch

Function Of Safety Power Window

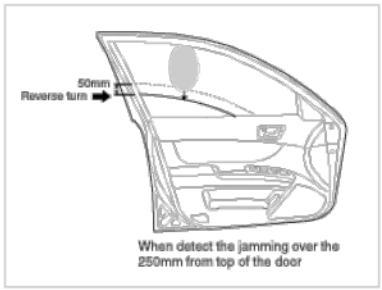
When driver door power window auto-up switch is operated, safety function is activated.

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



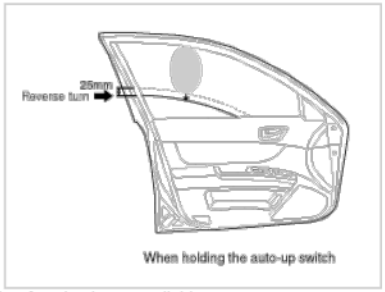
When detect the jamming during the 4mm~250mm from top of the door

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



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

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



When holding the auto-up switch

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

Initializing Method Of The Safety Power Window

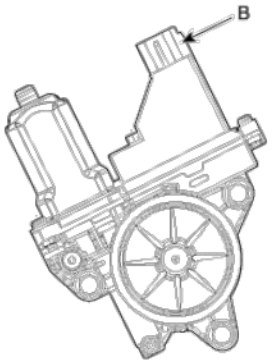
1. Initializing of Battery Connection
   When the battery is not connected the vehicle over the 5 minutes, safety power window switch need the initializing.
   (1) Power window operation before initializing
      A. Manual-Up/Down function is available
      B. Auto-Up function is not available
         (When holding the auto-up/down switch, window is operated as a manual-up/down.)
   (2) Initializing method
      Close the window in window open position, and holding the switch in window full close position over the 0.2 second.
      (If start the closing the window in window full close position, initializing could be failed.)
   (3) If initialize the safety power window in jamming status, could occur below conditions.
      A. Safety function is not available
2. Initializing of fail safe mode

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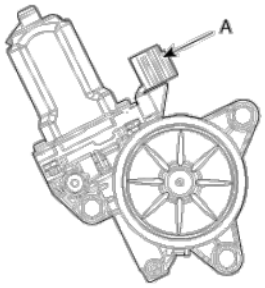
(1) If the window moved by compulsion and motor have a problem, power window switch could be entering the fail safe mode for user's safety.
(2) Power window operation in fail mode
A. Auto/Manual-Down function is available
B. Auto/Manual-Up function is not available
(When auto/manual-up is operated, window is rising 20mm and is stopped the moving.)

Circuit Diagram

[Safety Power Window]



[General]



[Connector A]

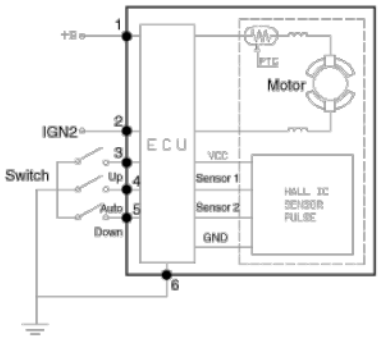


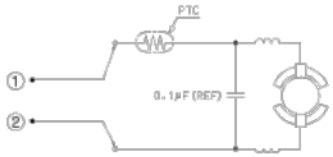
NO.	Description	NO.	Description
1	B+	4	Up
2	IGN 2	5	Down
3	Auto	6	GND

[Connector B]



NO.	Description
1	Up
2	Down



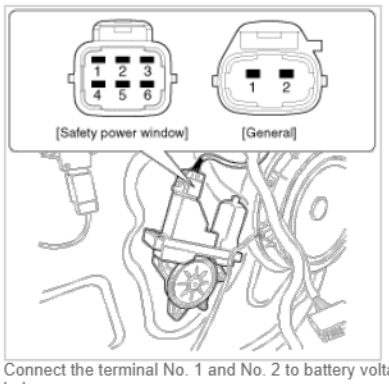


Inspection

Front Power Window Motor Inspection

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

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3. Connect the terminal No. 1 and No. 2 to battery voltage (12V) and terminal No. 6 to battery (-). And then check that the motor operates smoothly when connecting the terminals below.
   If the operation is abnormal, replace the motor.

[Safety Power Window]

Position \ Terminal		4	6 (GND)	5
LH	UP	○	○	
	DOWN		○	○
RH	DOWN	○	○	
	UP		○	○

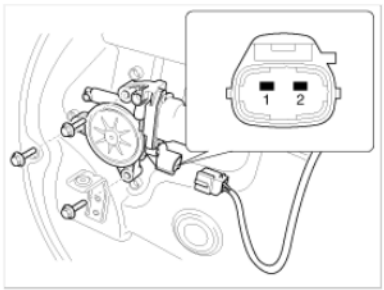
4. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

[General]

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

Rear Power Window Motor Inspection

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



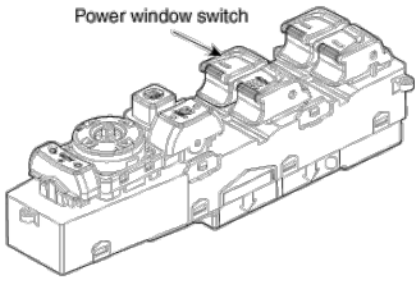
3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

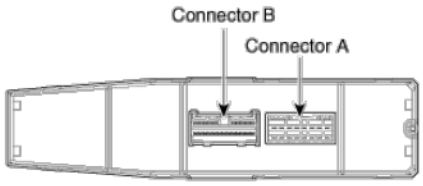
Position \ Terminal			1	2
LH	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖
RH	DOWN	Counter-clockwise	⊖	⊕
	UP	Clockwise	⊕	⊖

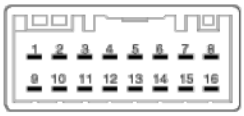
Circuit Diagram

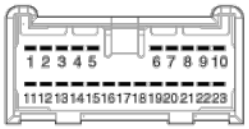
Driver Power Window Switch (1)

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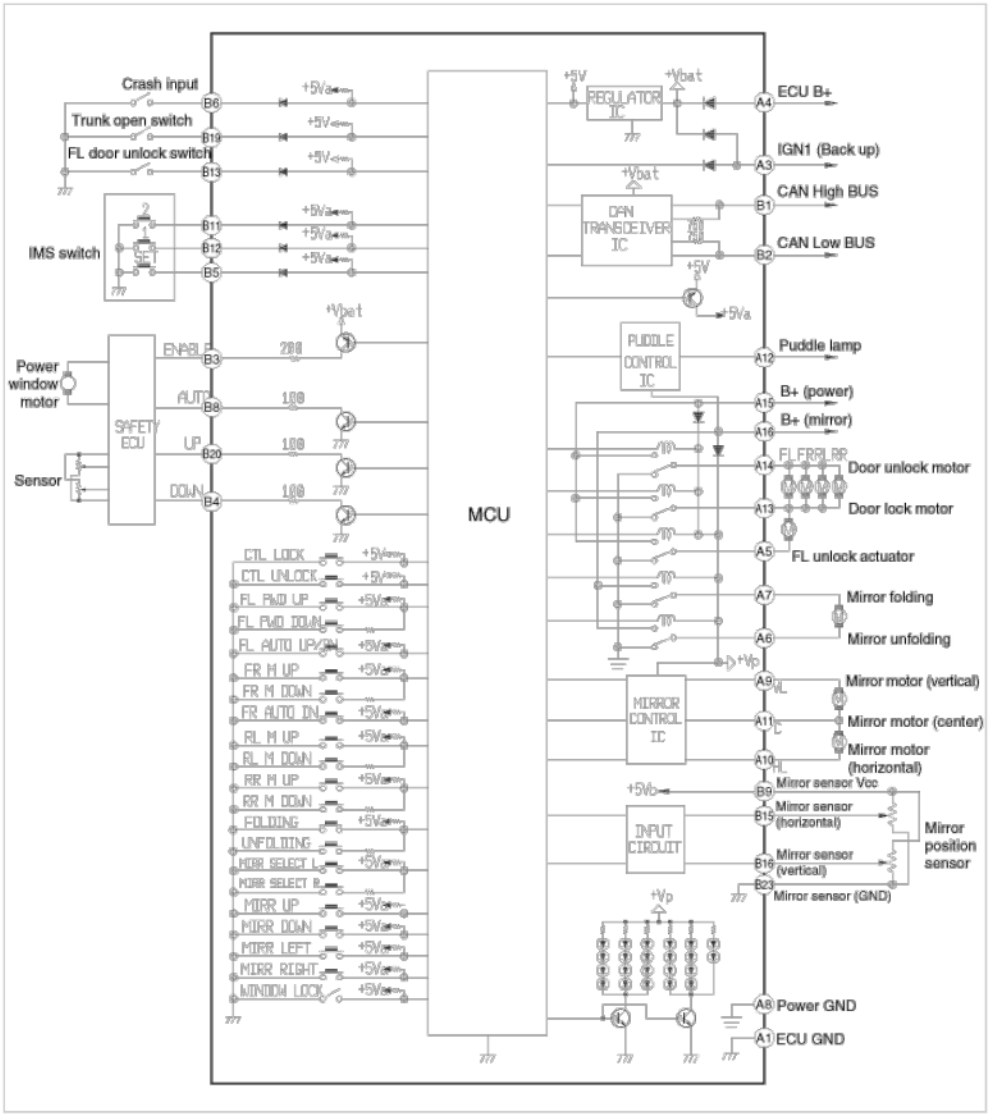




No.	Connector A	No.	Connector B
1	ECU GND	1	CAN high
2	-	2	CAN low
3	IGN1 (back up lamp)	3	Power (Safety window)
4	Battery (+)	4	Down (Safety window)
5	-	5	SET switch (IMS)
6	Mirror unfolding	6	Crash input
7	Mirror folding	7	-
8	Power GND	8	Auto (Safety window)
9	Mirror motor (vertical)	9	Mirror sensor Vcc
10	Mirror motor (horizontal)	10	-
11	Mirror motor (center)	11	Switch 2 (IMS)
12	Puddle lamp	12	Switch 1 (IMS)
13	Door lock motor	13	Door unlock switch
14	Door unlock motor	14	-
15	Battery (+) power	15	Mirror sensor (horizontal)
16	Battery (+) mirror	16	Mirror sensor (vertical)
		17	-
		18	-
		19	Trunk open switch
		20	Up (Safety window)
		21	-
		22	-
		23	Sensor GND

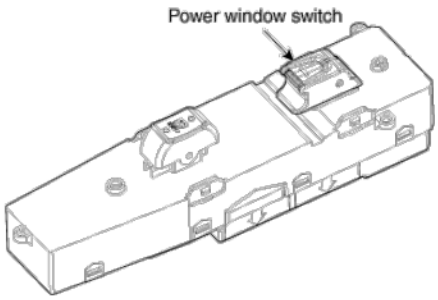
Driver Power Window Switch (2)

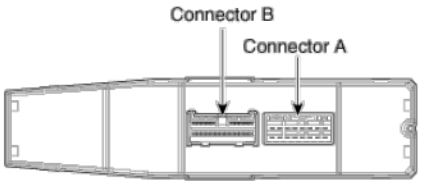
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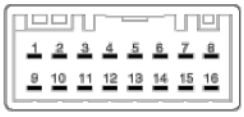


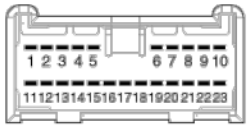
Passenger Power Window Swich

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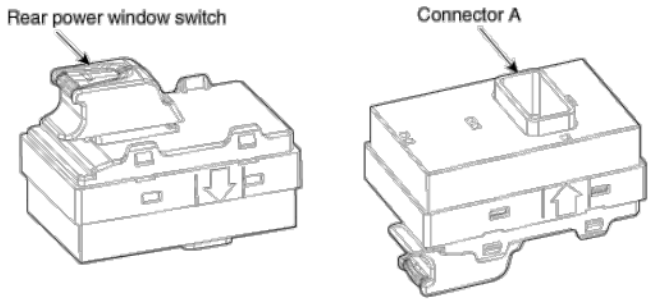


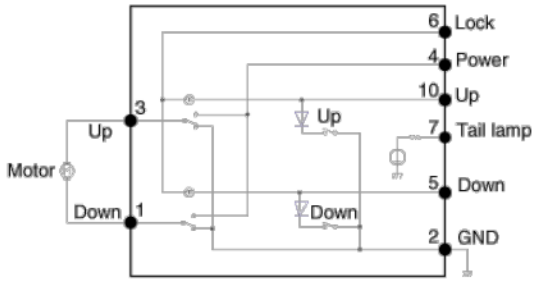
No.	Connector A
1	ECU GND
2	-
3	IGN1 (back up lamp)
4	Battery (+)
5	-
6	Mirror unfolding
7	Mirror folding
8	Power GND
9	Mirror motor (vertical)
10	Mirror motor (horizontal)
11	Mirror motor (center)
12	Puddle lamp
13	Up (Power window)
14	Down (Power window)
15	Battery (+) power
16	Battery (+) mirror

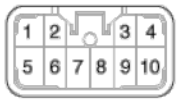
No.	Connector B
1	CAN high
2	CAN low
3	-
4	-
5	-
6	-
7	-
8	-
9	Mirror sensor Vcc
10	-
11	-
12	-
13	Door unlock switch
14	-
15	Mirror sensor (horizontal)
16	Mirror sensor (vertical)
17	-
18	-
19	-
20	-
21	-
22	-
23	Sensor GND

Rear Power Window Swich

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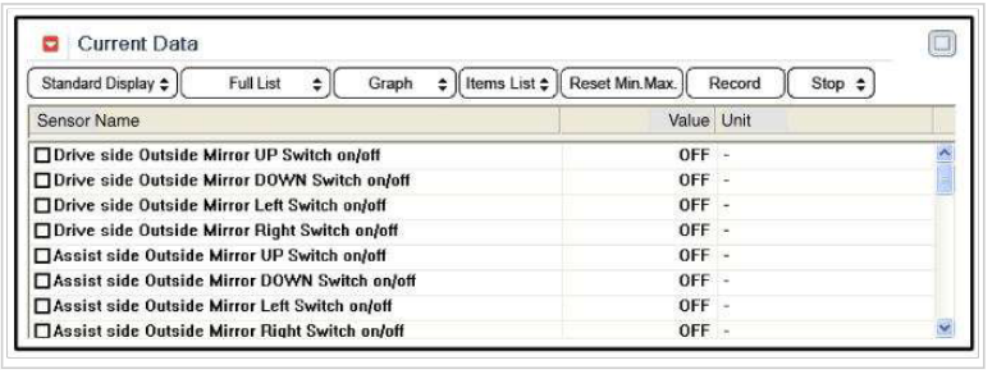


No.	Connector A
1	Power window motor down
2	GND
3	Power window motor up
4	Power
5	Power window switch down
6	Power window switch up
7	Tail lamp (IND)
8	-
9	-
10	Power window switch up

Inspection

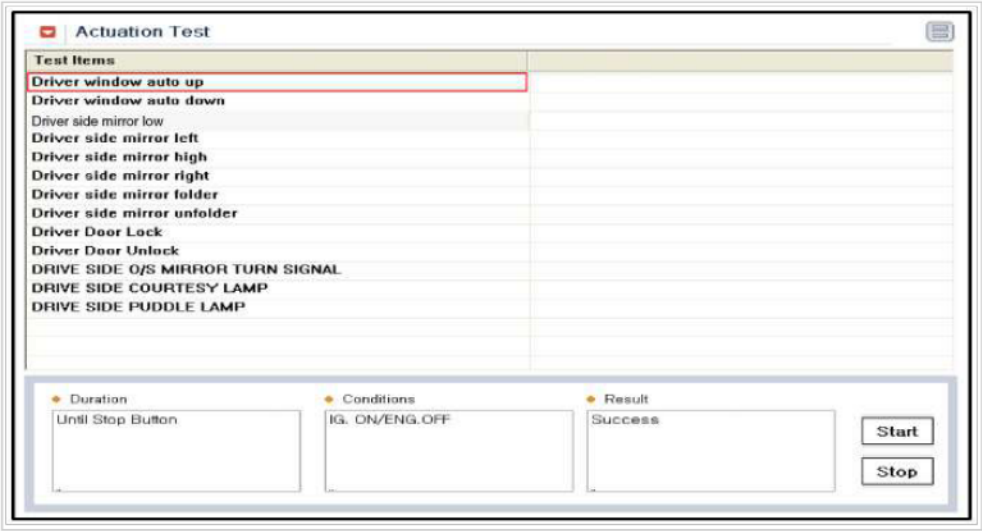
Driver Power Window Switch

1. When checking the driver power window switch, select a vehicle type and "IPM" menu.
2. Select "DDM (Driver Door Module)".
3. Select option "Input/Output monitoring".



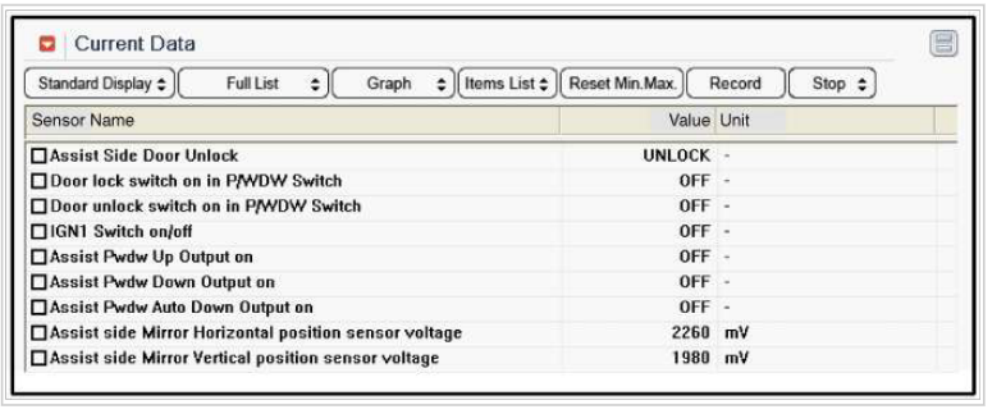
4. To check the input value of power window switch in force mode, select option "ACTUATION TEST".

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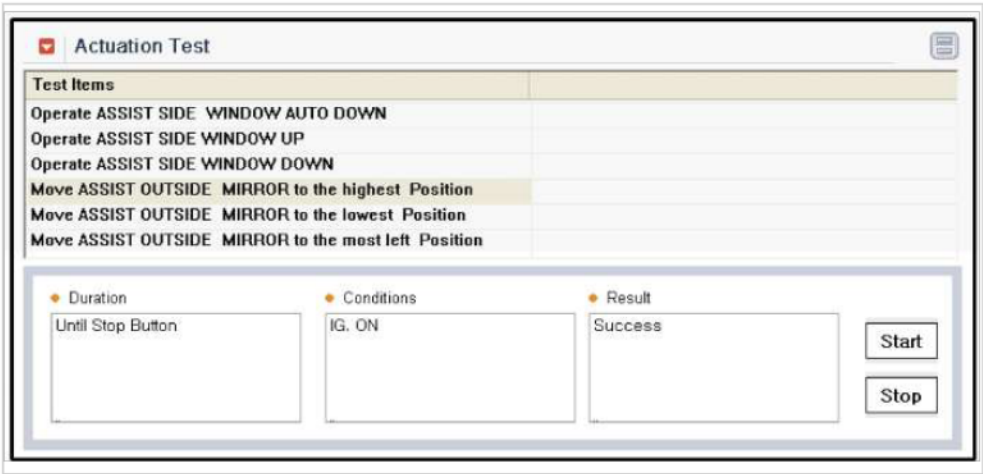


Assist Power Window Switch

1. When checking the assist power window switch, select a vehicle type and "IPM" menu.
2. Select "ADM (Assist Door Module)".
3. Select option "Input/Output monitoring".



4. To check the input value of power window switch in force mode, select option "ACTUATION TEST".

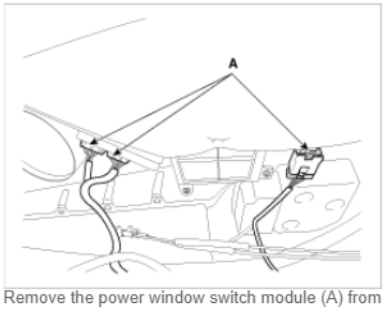


Removal

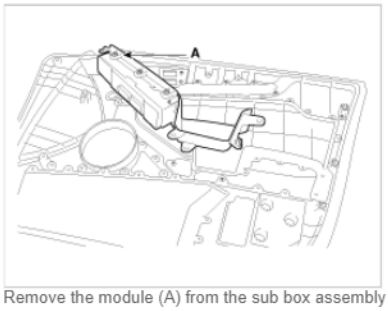
Driver Power Window Switch

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

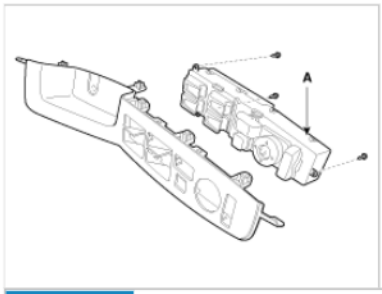
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4. Remove the power window switch module (A) from the door trim after loosening the mounting screws (13EA).



5. Remove the module (A) from the sub box assembly after loosening the mounting screw (3EA).

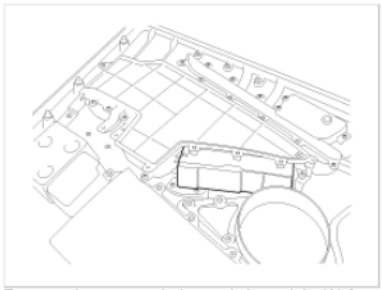


NOTICE

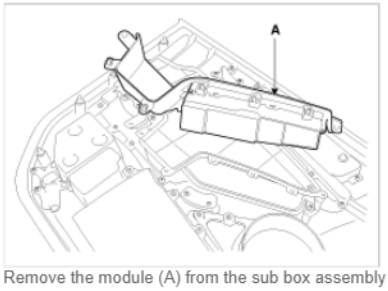
- Be careful not to damage door trim panel and door module mounting hooks.

Passenger Power Window Switch

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

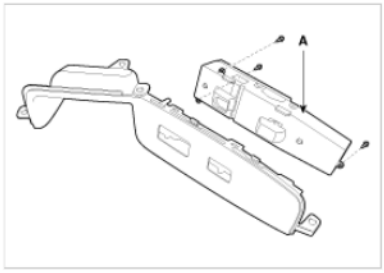


4. Remove the power window switch module (A) from the door trim after loosening the mounting screws (13EA).



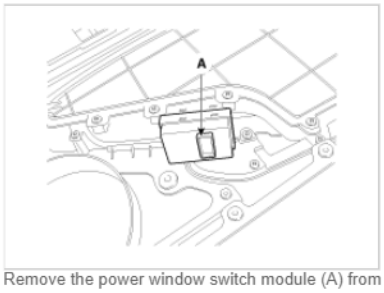
5. Remove the module (A) from the sub box assembly after loosening the mounting screw (3EA).

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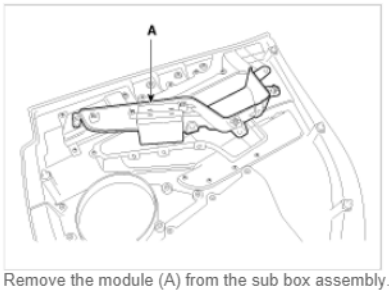


Rear Power Window Switch

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



4. Remove the power window switch module (A) from the door trim after loosening the mounting screws (13EA).



5. Remove the module (A) from the sub box assembly.

Installation

1. Install the power window switch module.
2. Install the door trim panel after reconnecting the relevant connectors

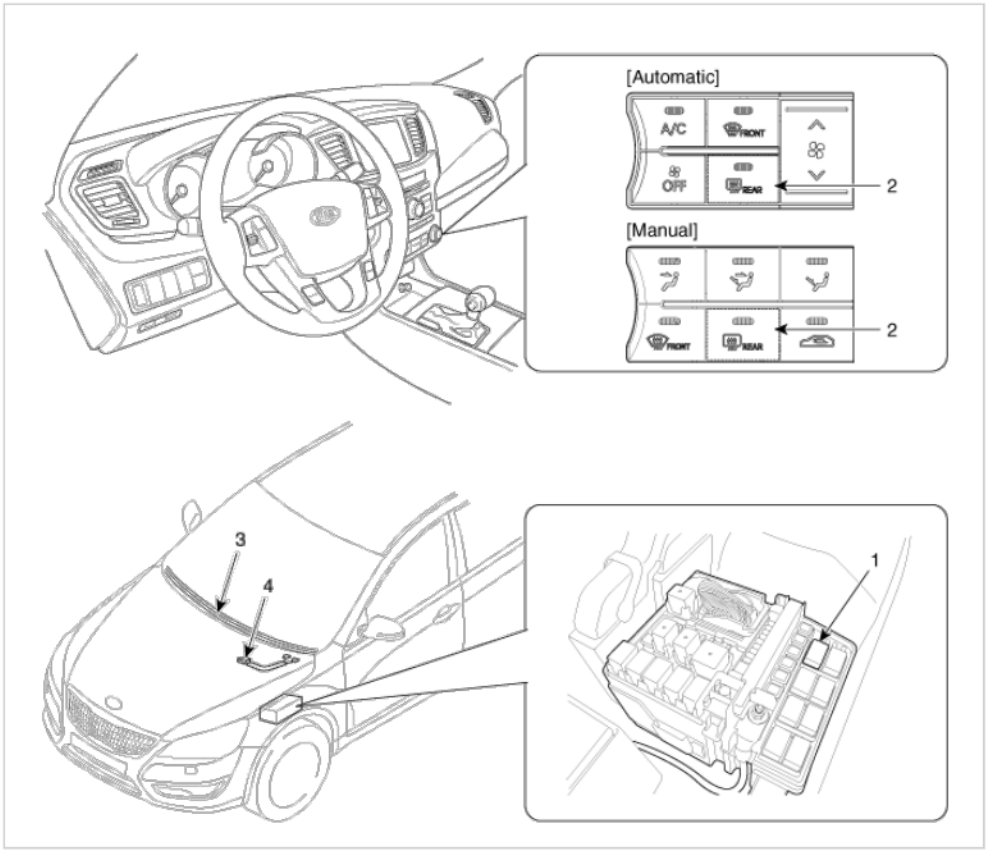
NOTICE

- Make sure that the power window switch module connectors are plugged properly.
- Check that the power window switch and door lock switch operate normally.

Body Electrical System

Component Location

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1. Windshield deicer relay (Built-in engine room relay box)	3. Windshield deicer
2. Windshield deicer switch (Rear glass defogger switch)	4. Deicer connector

Body Electrical System

Description

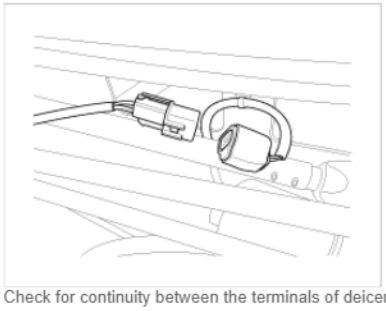
Windshield deicer system prevent windshield wiper from freezing in the winter season. It consists of deicer in the lower part of windshield, switch and relay. IPM receives an input signal from the deicer switch, then controls relay. Operating condition is the same that of rear window defogger system.

Since the generator "L" is switched ON, if the deicer switch is ON, then deicer output is ON for 20 minutes.

Body Electrical System

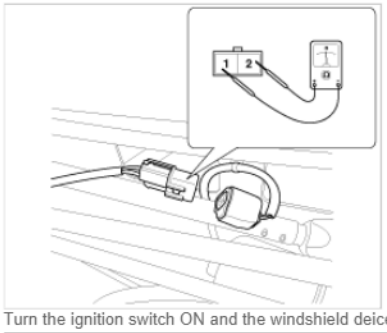
Inspection

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



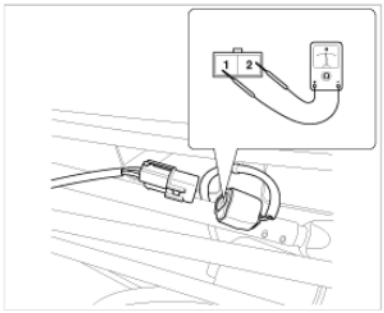
3. Check for continuity between the terminals of deicer lines.

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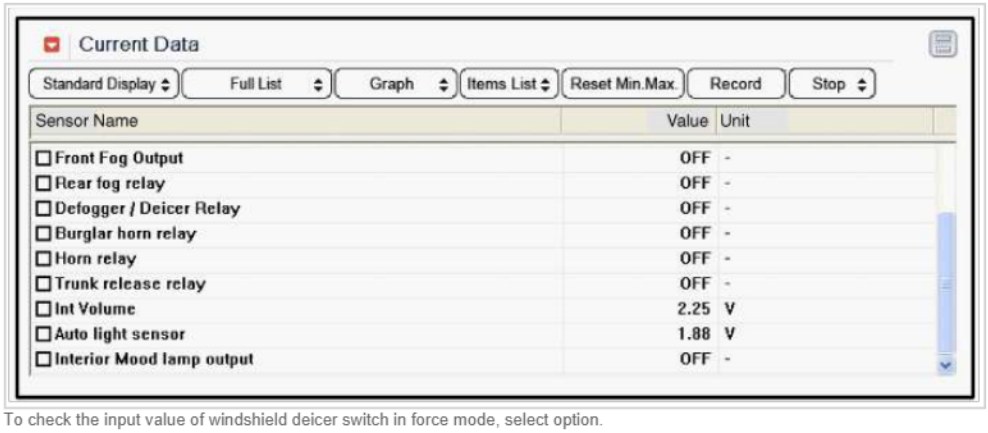
4. Turn the ignition switch ON and the windshield deicer switch ON, then measure the voltage between the terminals of harness side deicer connector.

OK :approx. Battery voltage

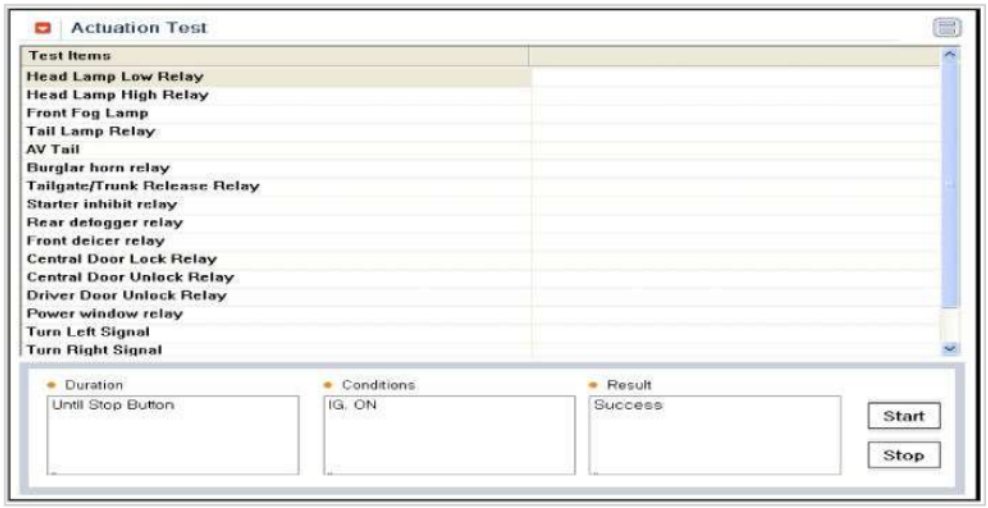


Inspection

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



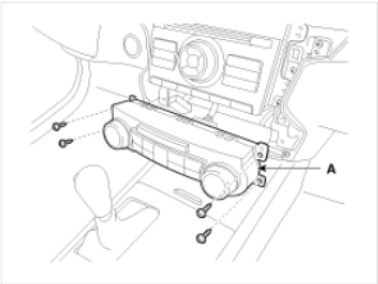
4. To check the input value of windshield deicer switch in force mode, select option.



Removal

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1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel.
   (Refer to Body - "Crash Pad")
3. Remove the heater control unit (A) after removing screws (4EA).

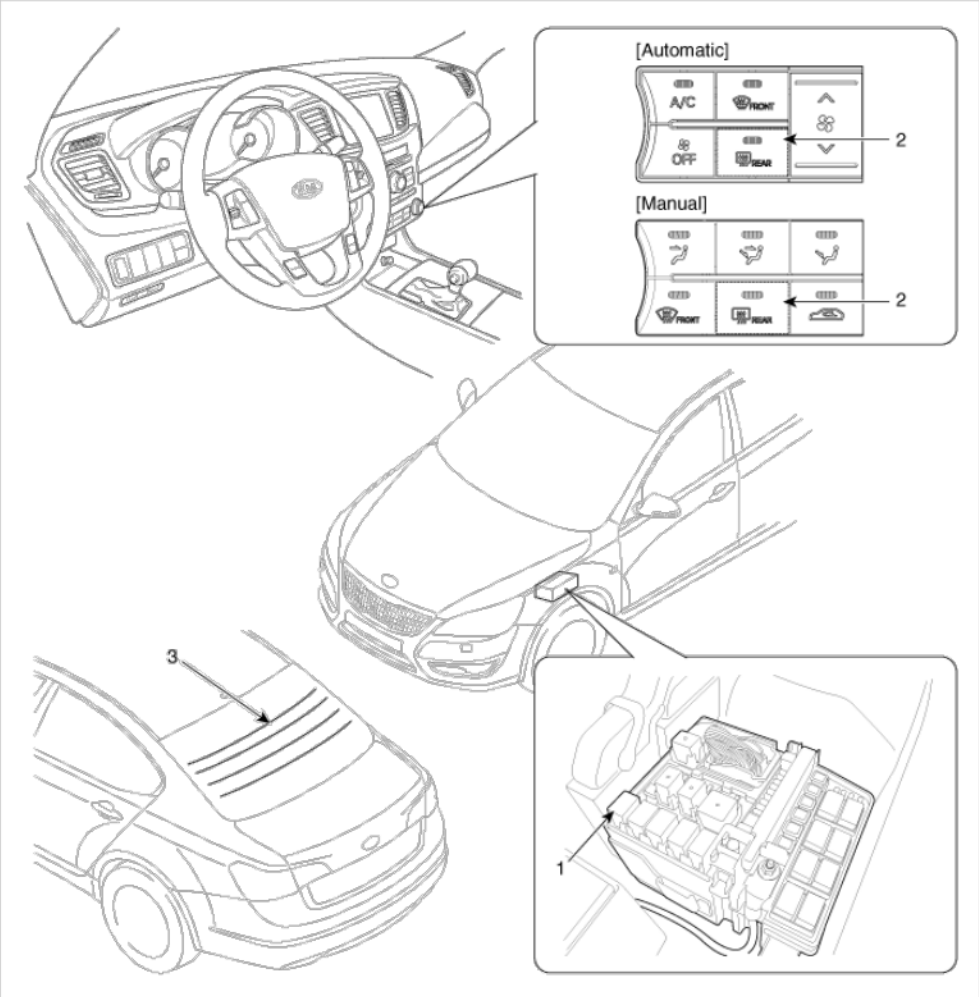


Installation

1. Install the heater control unit.
2. Install the center fascia panel.

Body Electrical System

Component Location



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

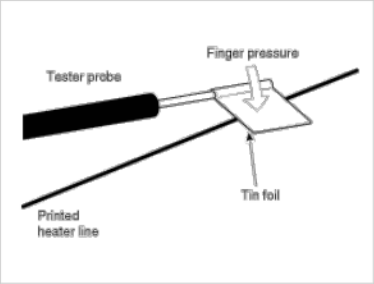
Body Electrical System

Inspection

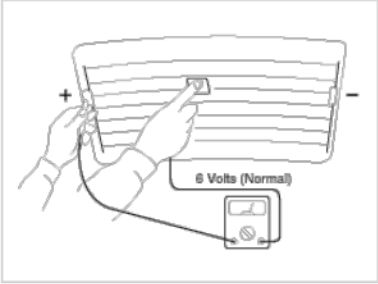
⚠ CAUTION

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.

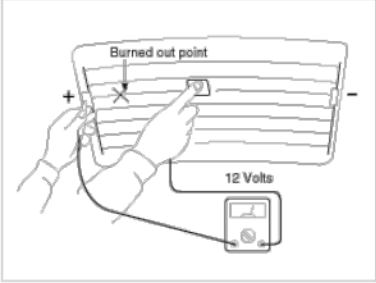
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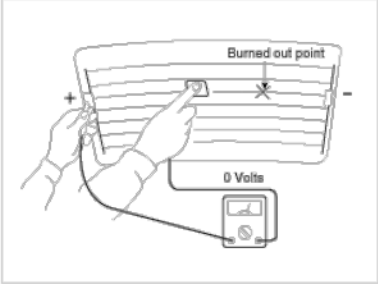
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



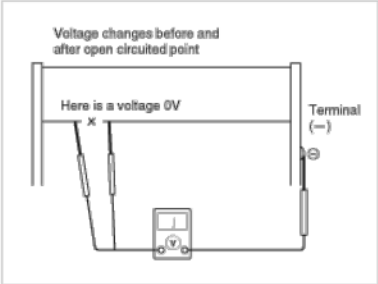
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.



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

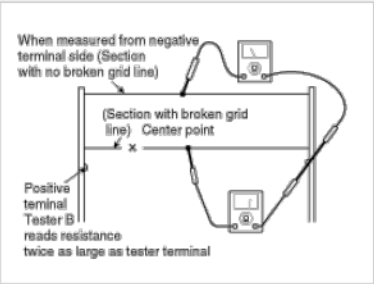


4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.



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.

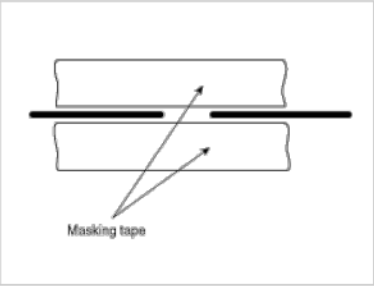
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Repair Of Broken Heater Line

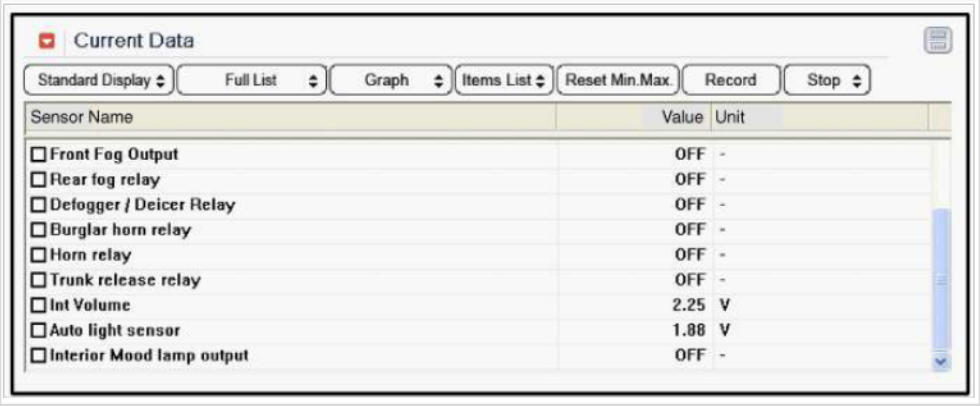
Prepare the following items:

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).



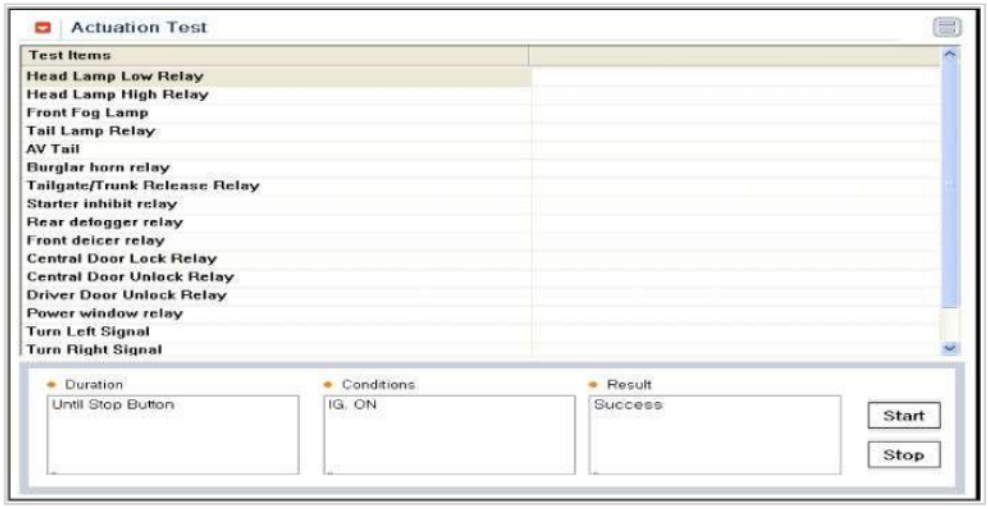
Inspection

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 "IPM".
3. To consult the present input/output value of IPM, "Current DATA". It provides information of IPM input/output conditions of rear defogger relay.



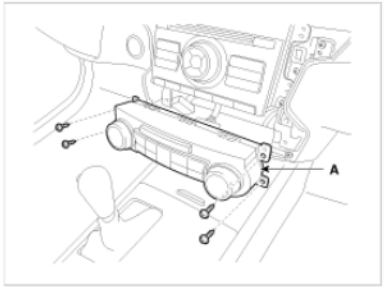
4. To check the input value of rear glass defogger switch in force mode, select option "Actuation Test".

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel.
   (Refer to Body - "Crash Pad")
3. Remove the heater control unit (A) after removing screws (4EA).



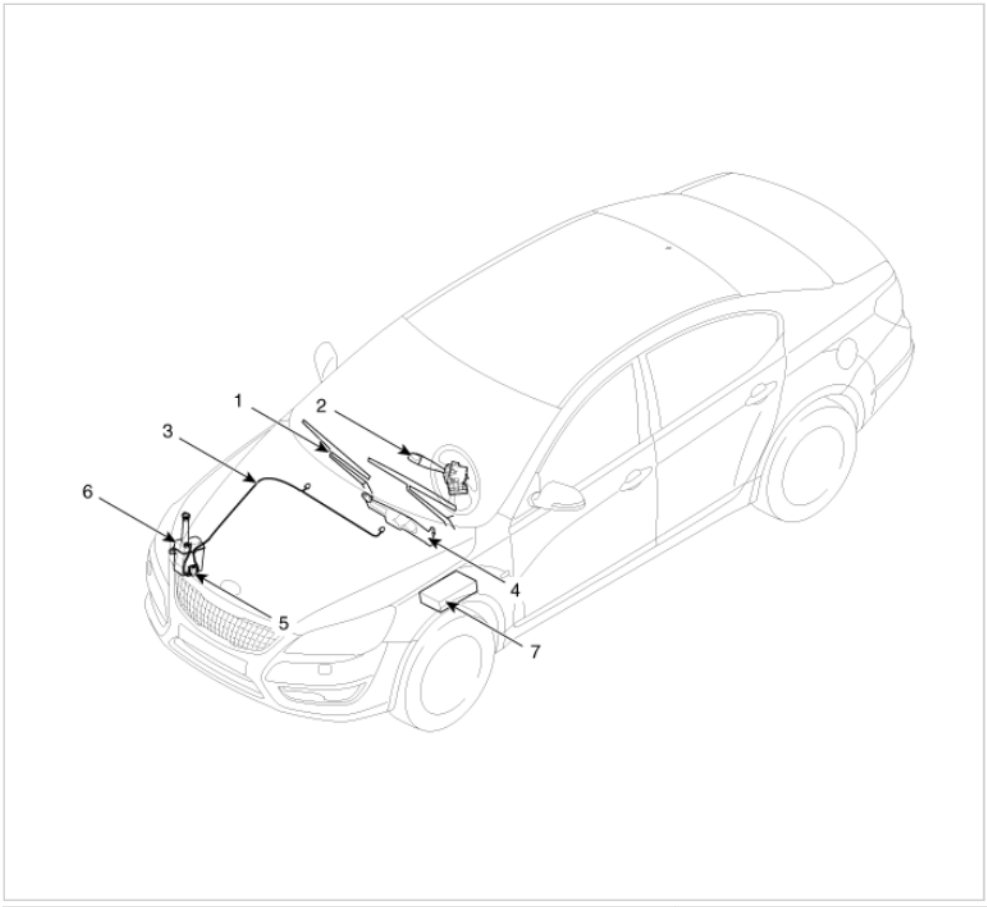
Installation

1. Install the heater control unit.
2. Install the center fascia panel.

Body Electrical System

Component Location

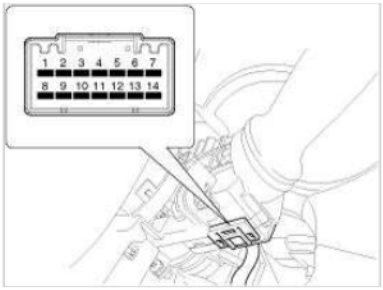
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1. Windshield wiper arm & blade	5. Washer motor
2. Wiper & washer switch	6. Washer reservoir
3. Windshield washer hose	7. Wiper relay (Engine room relay box)
4. Windshield wiper motor & linkage	

Inspection

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



Wiper Switch

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

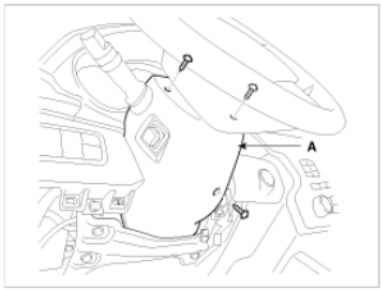
Washer Switch

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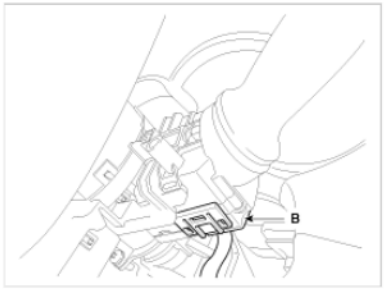
Terminal / Position	3	4
OFF		
ON	○	○

Removal

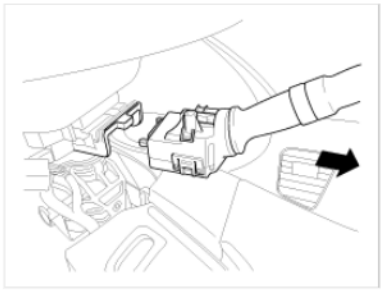
1. Remove the steering column upper and lower shrouds after removing 3 screws.

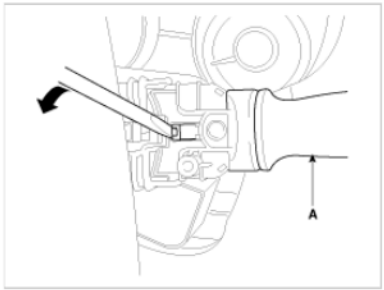


2. Remove the wiper switch connector (A) by releasing the part.



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





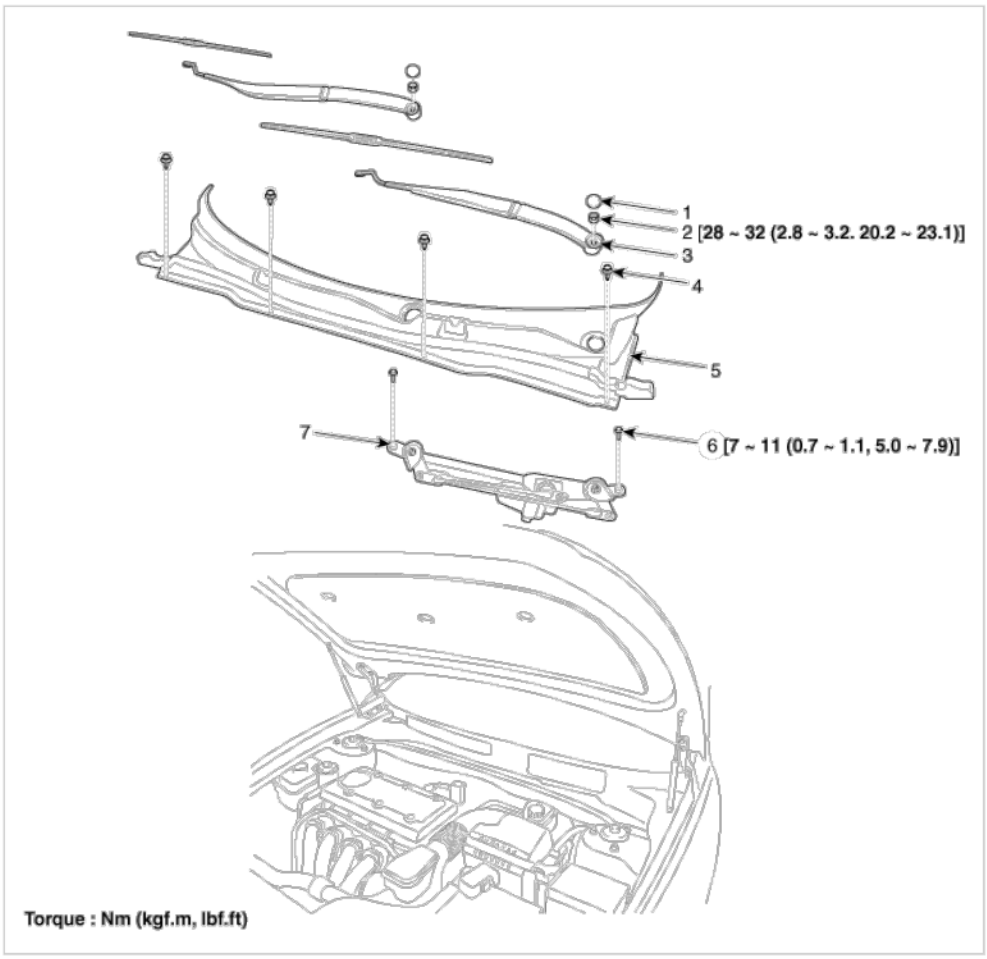
Installation

1. Install the wiper switch.
2. Install the steering column upper and lower shrouds.

Body Electrical System

Component Location

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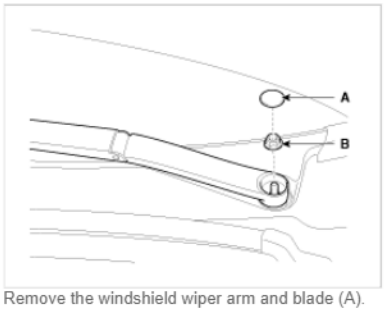


1. Cap 2. Nut 3. Wiper arm & blade 4. Rivet	5. Cowl top cover 6. Bolt 7. Wiper motor & linkage assembly

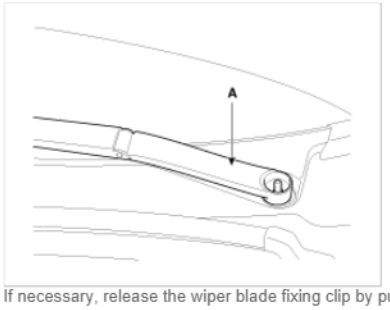
Body Electrical System

Removal

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

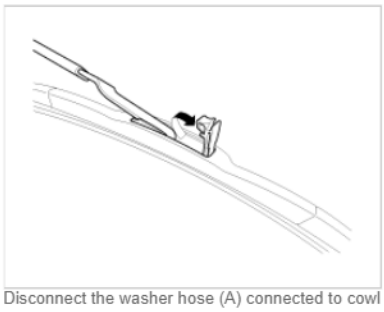


2. Remove the windshield wiper arm and blade (A).

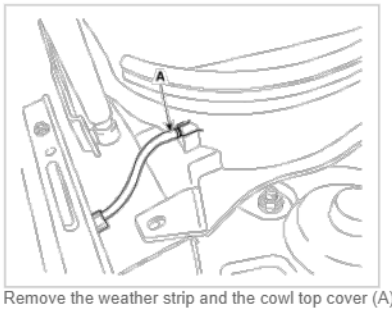


3. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius of wiper arm.

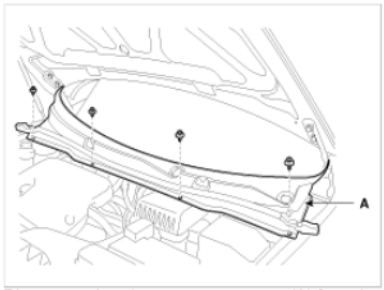
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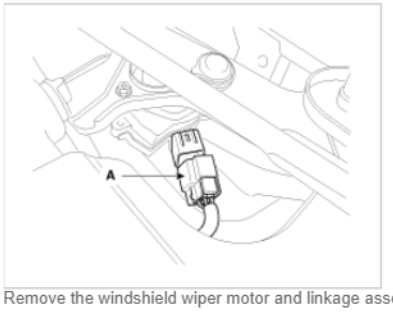
4. Disconnect the washer hose (A) connected to cowl top cover.



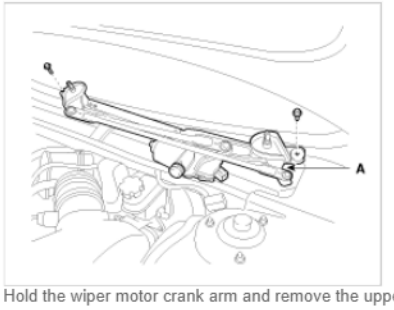
5. Remove the weather strip and the cowl top cover (A) after removing rivets.



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

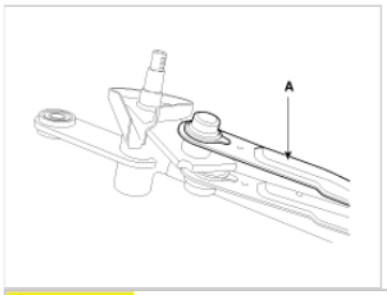


7. Remove the windshield wiper motor and linkage assembly (A) after removing 2 bolts.



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

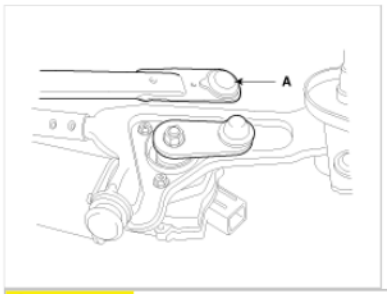
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CAUTION

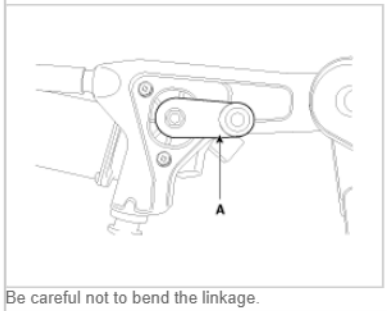
Before remving the wiper motor and linkage assembly, make sure that the linkage is stopped at auto stop position.
To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.
Be careful not to bend the linkage.

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



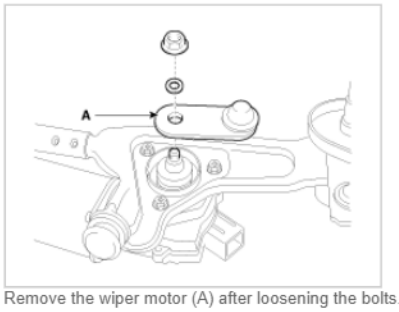
CAUTION

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

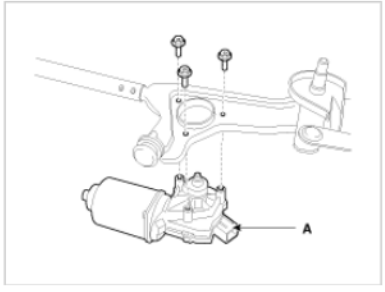


Be careful not to bend the linkage.

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



11. Remove the wiper motor (A) after loosening the bolts.



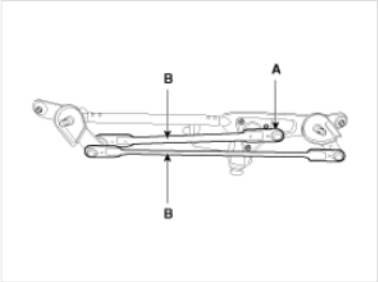
Installation

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

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Tightening torque :
12.7 ~ 17.6N.m (1.3 ~ 1.8, kgf.m, 9.4 ~ 13.0 lb-ft)

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



3. Install the lower and upper linkage to the wiper motor crank arm.
4. Install the wiper motor and linkage assembly and then connect the wiper motor connector.

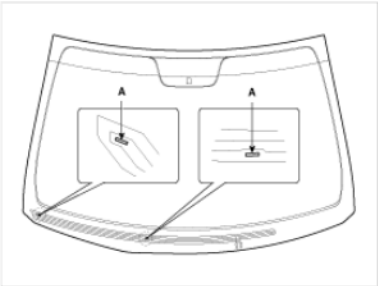
Tightening torque :
7 ~ 11N.m (0.7 ~ 1.1, kgf.m, 5.0 ~ 7.9 lb-ft)

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

Tightening torque :
28 ~ 32 N.m (2.8 ~ 2.7 kgf.m, 20.2 ~ 23.1 lb-ft)

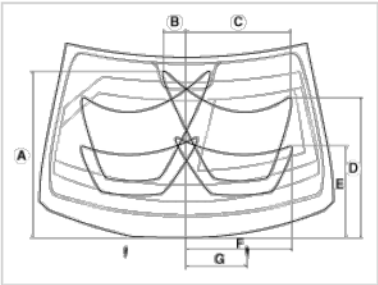
NOTICE
- The windshield wiper motor must be cycled to make sure that it is in the auto stop position. If necessary, adjust the wiper arm and blade.

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



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

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



Specified position	Distance (in)	Distance (mm)
B	4.7	120
C	20.9	531
D	27.9	710
E	18.2	463
F	21.0	534
G	12.0	306

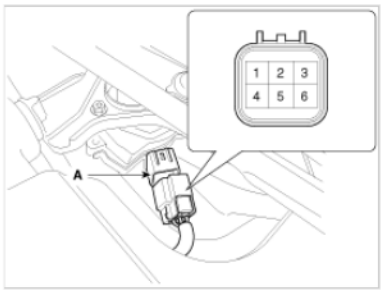
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Inspection

Speed Operation Check

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

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

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

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

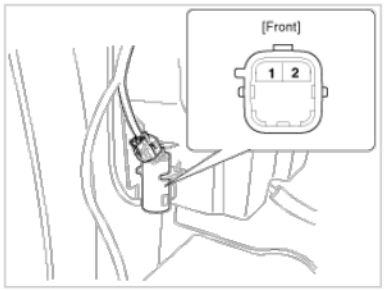
1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.

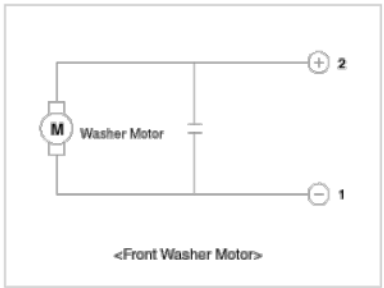
NOTICE

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

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



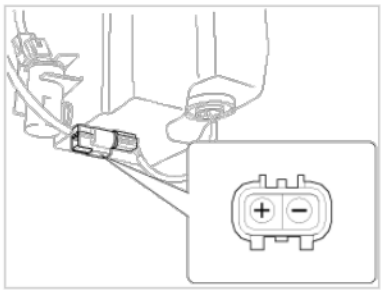


<Front Washer Motor>

Washer Fluid Level Sensor Switch

1. Disconnect the negative(-) battery terminal.
2. Drain the washer fluid less than 650 cc.
3. Check for continuity between the No. 1 and No.2 terminal in each float position.
   There should be continuity when the float is down.
   There should be no continuity when the float is up.
4. If the continuity is not as specified, replace the washer fluid level switch.

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

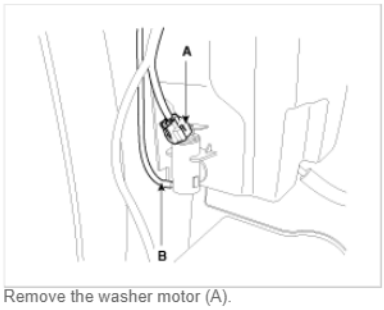
(Tolerance : -50cc ~ +100cc)

Removal

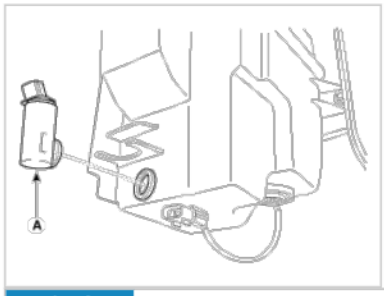
⚠ CAUTION

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

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



4. Remove the washer motor (A).

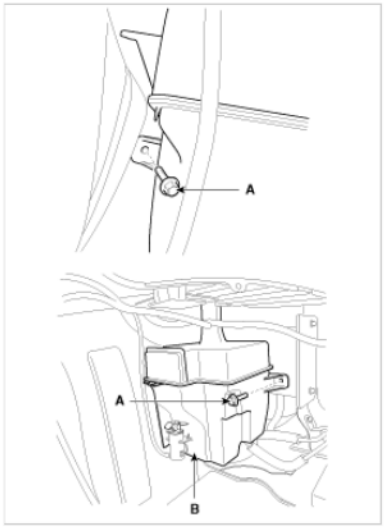


NOTICE

- Washer fluid may flow out of the opening of reservior.

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

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Installation

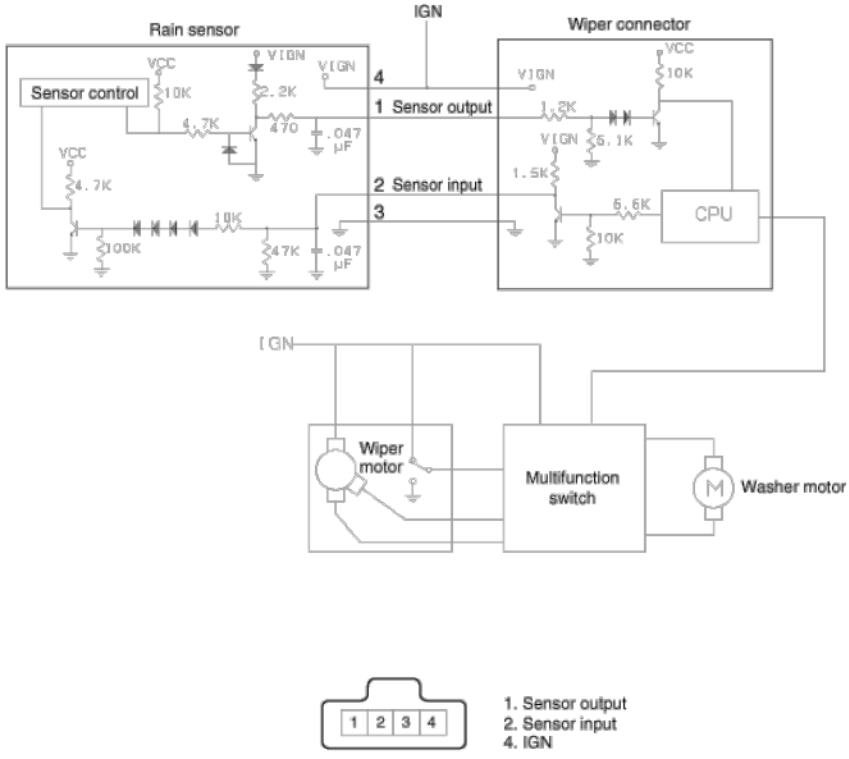
1. Install the washer reservoir.

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 and level sensor connector.
5. Install the front bumper.
6. Check the washer motor operation.

Circuit Diagram

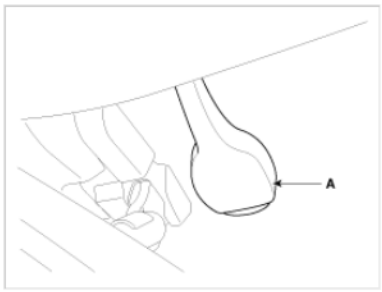


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Description

The Rain sensing windshield wiper system is a wiper system that, in addition to providing normal wiper functions off, mist, manual low speed, manual high speed, and wash, provides automatic control of automatic intermittent automatic low, and automatic high speeds.

When the ignition key is in the ON position, the rain sensor will be activated.



System Function

Basic Principle

Emitted Beam from luminosity diode is reflected entirely against the windshield exterior, and then turn into photo diode.

If there is water on the windshield exterior, beam separates optically, and the degree of remained beam is measured in the photo diode.

What there is water in the windshield, it means beam is not reflected all, so the degree of lost beam indicates the degree of glass surface wet.

NOTICE

Rainsensor consist of two luminosity diode, two photo diode, optic fiber and coupling pad.

Operation Control

Wiper ECU transmits the signal as a rainsesor, and then the rainsensor perceives the rainwater to transmit to the wiping order wiper ECU, wiper ECU controls the wiper motor according to the signal.

Contact Influence

The rainsensor can malfunction due to following condition

- Contamination of the measurement surface.
- Air bubbles between the windshield and the coupling pad contact surface.
- The movement of coupling pad by vibration.
- Damaged wiper blade.

Operation Condition

In case that engine starts under wiper switch AUTO, rainsensor activates after once wiper operation to inform the driver that the system is under AUTO.

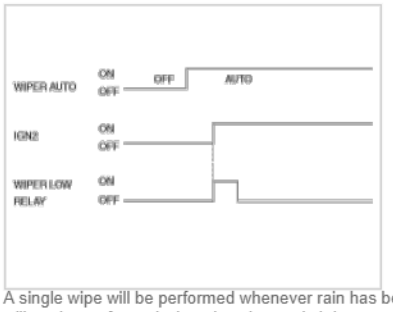
NOTICE

In case that the rainsensor doesn't work or malfunction, it is needed manual wiper switch operation by the driver.

Inspection

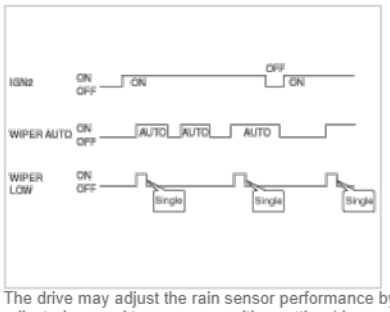
Rain Sensing Wiper

1. In IGN2 ON state, if auto switch input (LIN communication) is ON then both wiper low relay and wiper high relay outputs are controlled by the rain sensor input signal.
2. If the wiper switch has been left in automatic mode with the vehicle ignition OFF, and then the vehicle ignition switch is turned on, a single wipe will be performed.

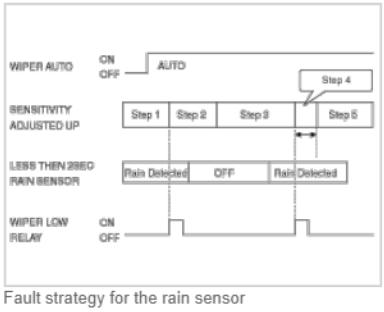


3. A single wipe will be performed whenever rain has been detected (Rain Detected signal from Rain sensor) and the wiper switch is moved to the AUTO position. But a single wipe will not be performed when the wiper switch is moved to the AUTO position and OFF signal is being received from Rain sensor. But if the wiper switch is moved to AUTO position for the first time since vehicle ignition switch is turned on then a single wipe will be performed regardless of Rain Detected or OFF signal.

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4. The drive may adjust the rain sensor performance by adjusting the sensitivity input. When in automatic mode, the BCM will perform a single wipe each time the sensitivity is adjusted upward to a more sensitive setting (downward more then one step). This single wipe will only be performed if Rain Detected signal is being received from the Rain sensor. If the sensitivity adjustment is adjusted upward more than one sensitivity, the BCM will only perform a single wipe unless the time between Increases is more than 2 seconds.

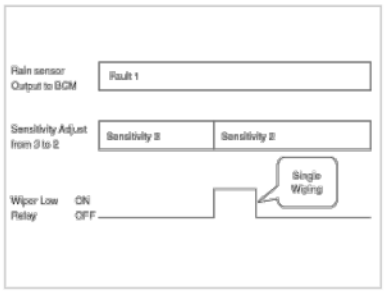


5. Fault strategy for the rain sensor

Rain Sensor Fault 1 - Internal Fault Detected

This failure is detected when the wiper is in automatic mode and the input faulty rain sensor from the rain sensor has a duty cycle corresponding to Fault 1. The confirmation delay for the failure is of 1 sec.

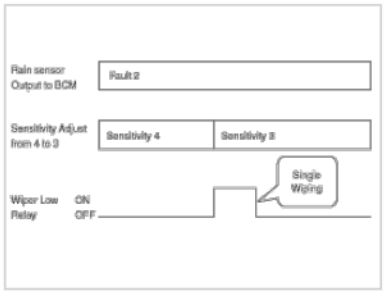
When this failure is detected, the wiper outputs are OFF and the wiper will also do a wipe in slow speed on the transition from sensitivity 3 to sensitivity 2 (Step 2 to 3) in order to signal the presence of this fault. If another sensitivity is set, the wiper won't make any additional wipe.



Rain Sensor Fault 2 - Glass Attachment Fault Detected

This failure is detected when the wiper is in automatic mode and the input faulty rain sensor from the rain sensor has a duty cycle corresponding to Fault 2. The confirmation delay for the failure is of 1 s.

When this failure is detected, the wiper outputs are OFF and the wiper will also do a wipe on the transition from sensitivity 4 to sensitivity 3 (Step 1 to 2) in order to signal the presence of this fault. If another sensitivity is set, the wiper won't make any additional wipe.



Rain Sensor Fault 3 - No Input Signal Present

This failure is detected when the wiper is in automatic mode and the input faulty rain sensor from the rain sensor has a duty cycle corresponding to Fault 3 or in case the duty cycle of the input faulty rain sensor is 0% or 100%. The confirmation delay for the failure is of 1 s.

When this failure is detected, the wiper outputs are OFF.

Removal

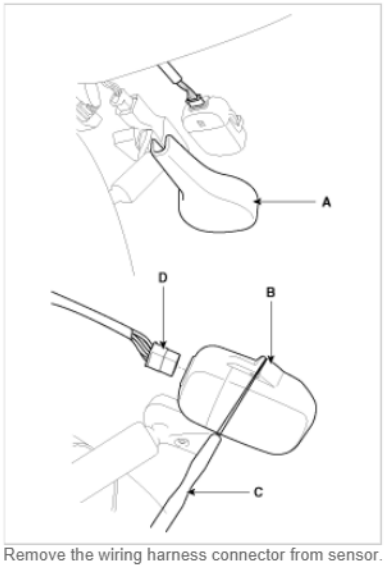
⚠ CAUTION

The rain sensor may not operate properly if contaminated. Protect the rain sensor surface by not removing the cover until installation time. The coupling pad on the rain sensor surface has adhesive strength. Take care when installing the sensor. If the sensor is separated from the windshield by force, the sensor or windshield may be damaged. Take care when removing the sensor.

1. Remove the rain sensor cover (A) first.

   Be careful not to damage the cover latch by applying excessive force. To remove the latch, pull aside the latch using the cover hole (B) with the little (-) screwdriver (C).

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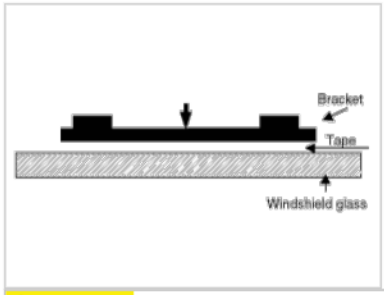
2. Remove the wiring harness connector from sensor.
3. Rain sensor module is attached to the front windshield by glue replacing the front windshield, remove the rain sensor module from the existing front windshield and install on the new front windshield.

Installation

NOTICE

- In case of the windshield with reflection layer which reflects the infrared rays in sensing field, remove the reflection layer from the rain sensor mounting position prior to installation.
- Avoid contamination of the sensor during installation.

1. Install the rainsensor bracket to the windshield glass using the tape.



⚠ CAUTION

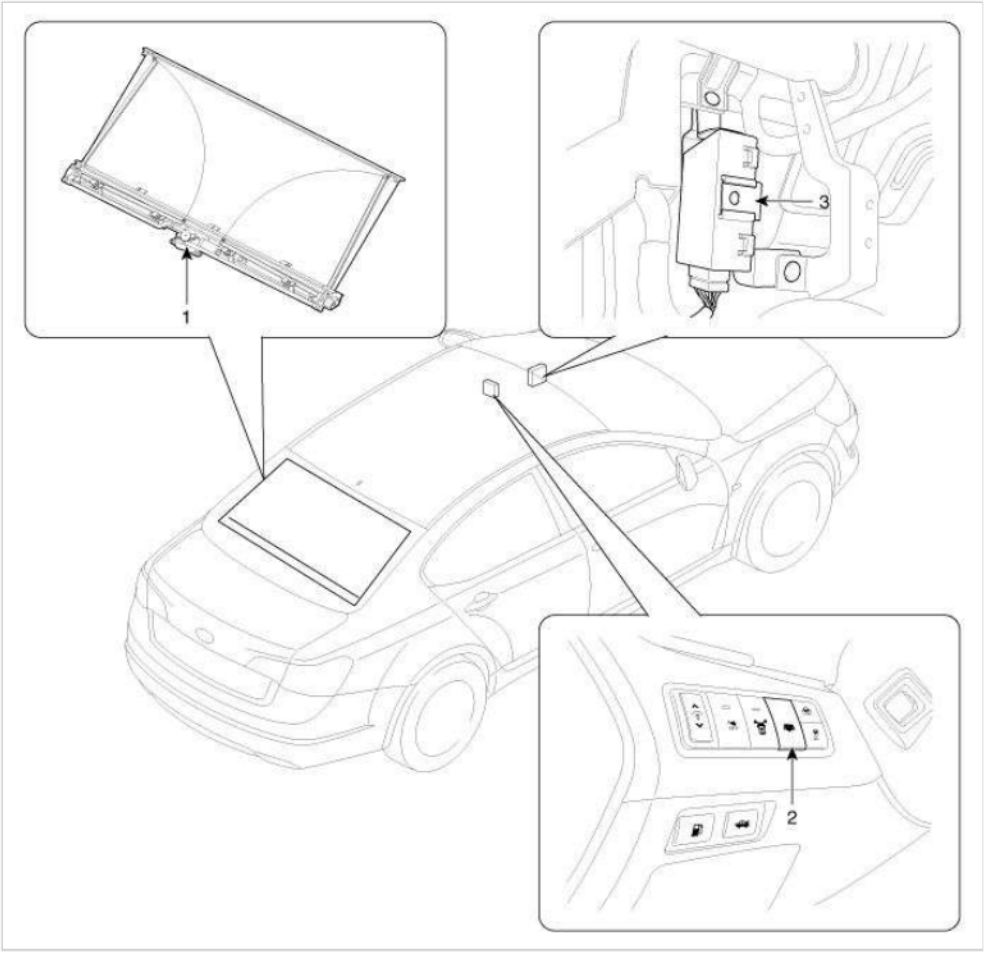
It is very important that the coupling pad pushes against the windshield completely to prevent bubbles from forming at the contact surface.

2. Connect the rainsensor connector, and then install the sensor cover.

Body Electrical System

Component Location

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1. Rear curtain 2. Rear curtain switch	3. Rear curtain unit

Body Electrical System

Description

You can up & down rear curtain automatically by pressing the rear curtain switch. Rear curtain protect passenger from a direct ray of light by covering rear glass.

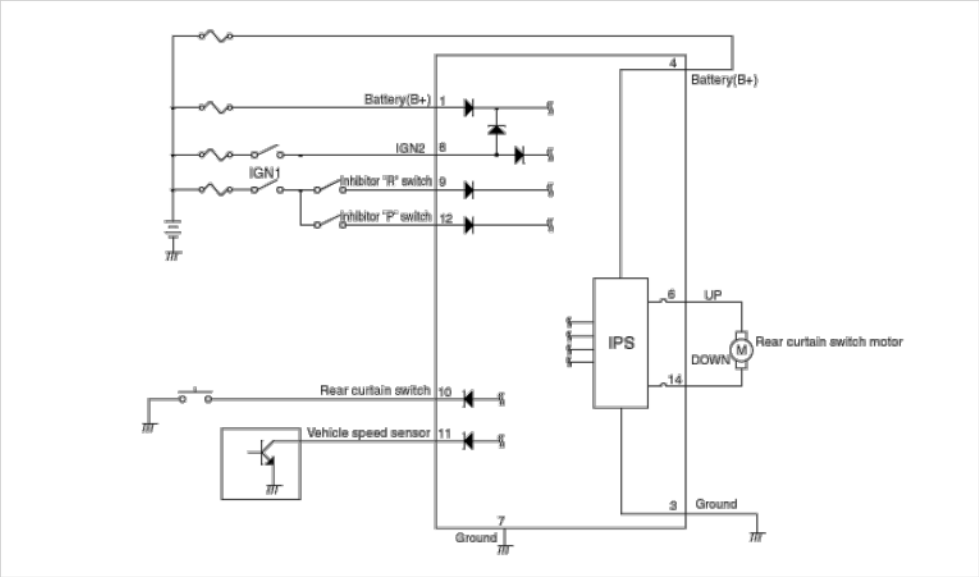
NOTICE

The rear curtain provides shade for the rear seat passengers and can be raised or lowered by using the rear curtain switch.

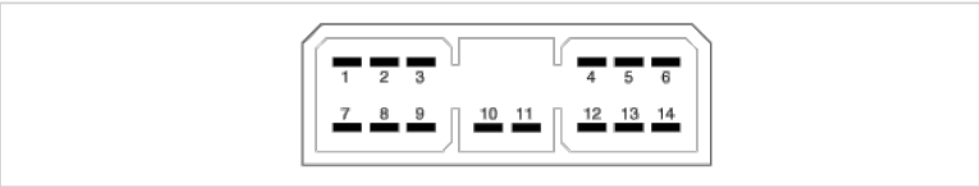
Body Electrical System

Circuit Diagram

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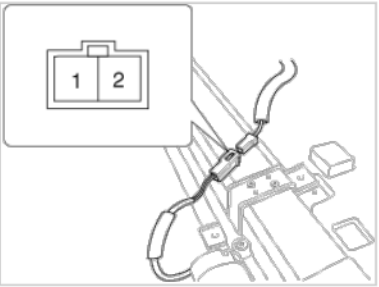
Rear Curtain Unit Connector



PIN NO.	Connector	PIN NO.	Connector
1	B+	8	IG2
2	-	9	Inhibitor “R” switch
3	Power GND	10	Rear curtain switch
4	Power B+	11	Vehicle speed sensor
5	-	12	Inhibitor “P” switch
6	Motor UP	13	-
7	Signal GND	14	Motor DOWN

Inspection

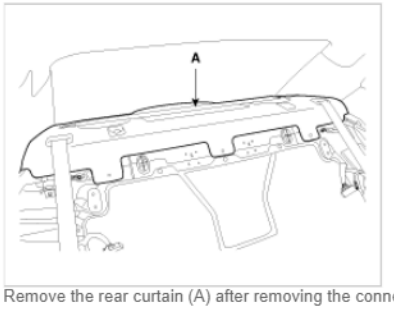
Connect the battery voltage and check the rear curtain motor rotation. If the motor does not operate properly, substitute with a known-good rear curtain motor and check for proper operation.



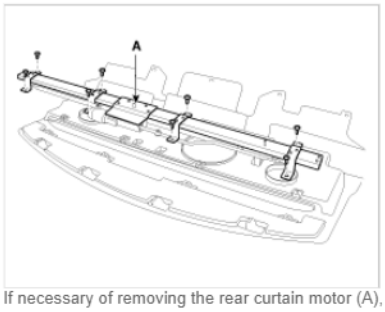
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the rear package tray (A) after removing the rear seat. (Refer to the Body group- interior trim)

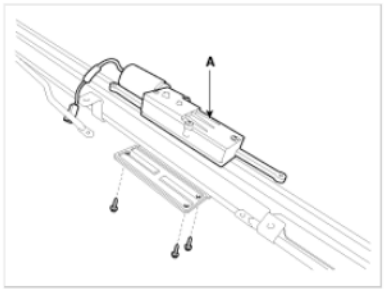
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3. Remove the rear curtain (A) after removing the connector and bolts (8EA).



4. If necessary of removing the rear curtain motor (A), remove the screws (3EA).

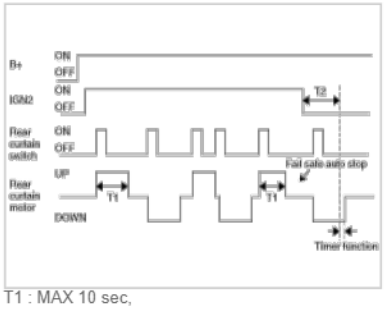


Installation

1. Install the rear curtain and connector.
2. Install the rear package tray and rear seat.
3. Connect the negative (-) battery terminal.

Inspection

1. AUTO UP/AUTO DOWN function
   (1) IGN ON, if you press the rear curtain switch, rear curtain motor operates the reverse direction of the before direction. (UP/DOWN)
   (2) After replacing battery, if you operates rear curtain switch, rear curtain is operated auto up.
   (3) If the switch input occurred during rear curtain auto up or auto down, rear curtain is operated to the reverse direction after making a pause.
   (4) AUTO function stop when detect an excess current.
2. TIMER function
   (1) It can be possible to operate rear curtain for 30 sec after IGN OFF.
   (2) It can be possible to operate rear curtain operation by the end of motor operation although timer is finished during auto up/ down.
3. FAIL SAFE function
   If motor operation doesn't stop more than 10 sec after starting, motor is stopped by inner relay auto OFF.

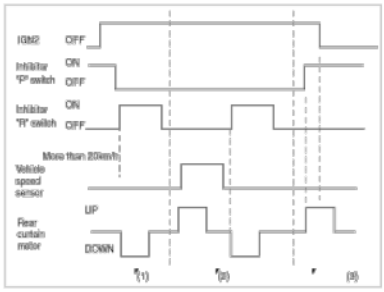


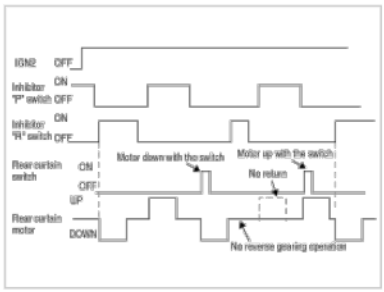
T1 : MAX 10 sec,
T2 : 30 sec.

4. RETROGRESSION GEARING function
   (1) When, rear curtain motor IGN ON, rear curtain UP and shift lever "R" position, rear curtain motor linked with the signal makes auto down.
   (2) When the vehicle speed is above 20 km/h from 1) condition, rear curtain motor linked with the signal makes auto up. Only, the motor does not operate below 20 km/h.
   (3) When shift lever position will be changed from R to P from 1) condition, rear curtain motor linked with the signal makes auto up. Only, the case where the driver presses the knock-down switch is excepted.

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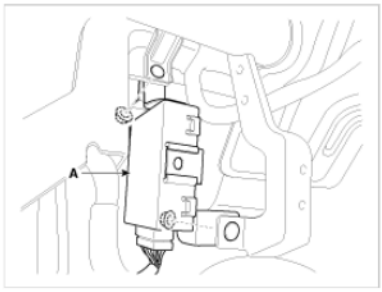
(4) To the case where the driver presses the down switch from rear curtain up condition motor does not do a retrogression gearing operation and the up return operation due to a vehicle speed. After that, when driver presses the switch and the motor becomes auto up, the retrogression gearing operation is possible again.





Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad")
3. Remove the rear curtain unit (A) after removing nuts (2EA) and connector.



Installation

1. Install the rear curtain unit and connector.

NOTICE

Make sure the connector are connected in properly.

2. Install the crash pad lower panel.
3. Connect the negative (-) battery terminal.

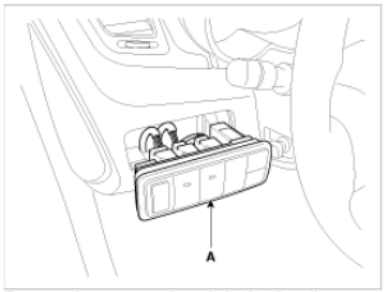
Body Electrical System

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the passenger compartment juction box cover.
3. Remove the crash pad side switch assembly (A) by pushing it through juction box cover hole.

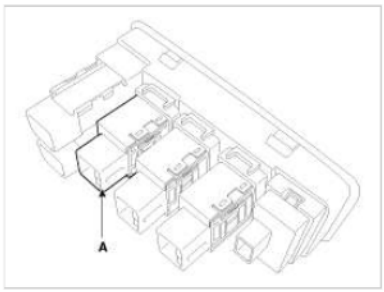
NOTICE

Put on gloves to protect your hands.



4. Remove the rear curtain switch (A) after disconnecting the connectors.

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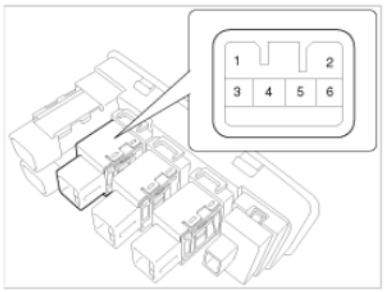


Installation

1. Install the rear curtain switch and connector to the crash pad.
2. Install the passenger compartment juction box cover.

Inspection

1. Operate the switch and check for continuity between terminals with an ohmmeter.

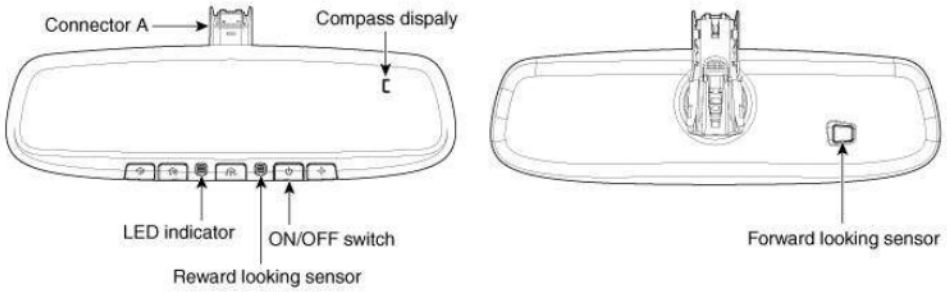


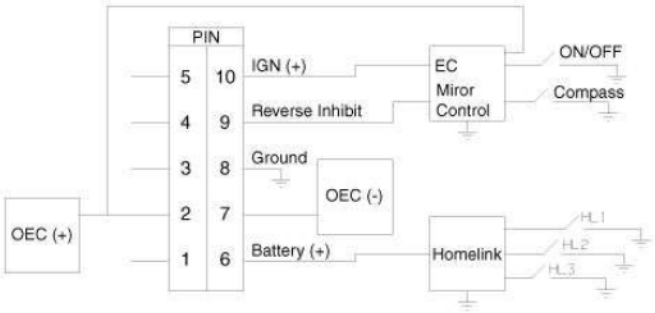
Position / Terminal	ON(Push)	OFF(Free)	Remarks
3	○		Up/Down
6	○		General
5	○		Illumination (-)
2	○ ⏦		Illumination (+)

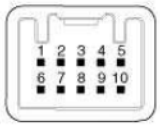
Components

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[ECM + Homelink + Compass]





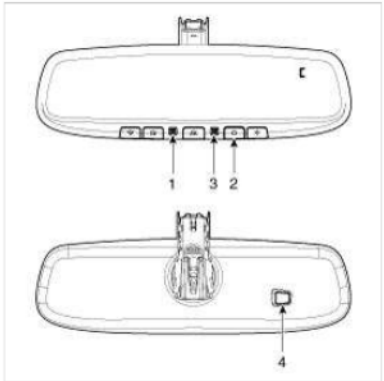
Connector A	No.	Description	No.	Description
	1	-	6	Battery (+)
	2	OEC (+)	7	OEC (-)
	3	-	8	Ground
	4	-	9	Reverse inhibit
	5	-	10	IGN (+)

Body Electrical System

Description

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

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



Automatic-dimming Function

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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.

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.

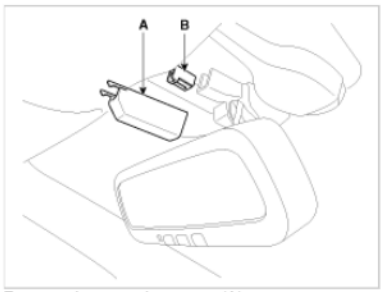
NOTICE

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

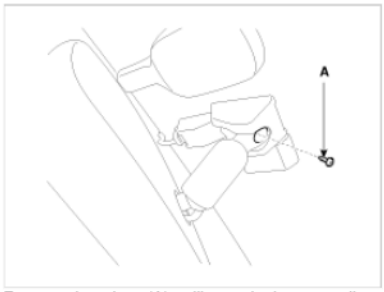
5. When the reverse gear is engaged, the ECM should not be darkened.
6. When heading lights to both the front and rear sensors, the ECM should not be darkened.

Removal

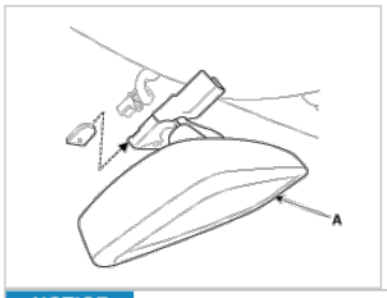
1. Remove the mirror wiring cover (A) and disconect mirror connector (B).



2. Remove the mounting screw (A).



3. Remove the mirror (A) pulling up in the arrow direction.



NOTICE

Make sure not to damage the mounting bracket when removing the mirror.

Installation

1. Install the mirror making sure the mounting bracket not to be damaged.
2. Install the mirror wiring cover after reconnecting the connector and tightening the screw.

NOTICE

- Make sure the connector is plugged in properly.

Function

1.

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Push the A button lower of the rear view mirror to turn on the function of the compass mirror so that displays a sign of a direction on the small board in the upper-right side of the mirror.

2. Push the A button again to turn off its function.

Calibration Procedure

If the compass has been calibrated or set to variance zone number incorrectly, or you are driving in specific places (tunnel, parking lot in building, underground parking lot, near transformer substation, etc.), the below conditions may occur.

- The display read "C".
- The compass headings become inaccurate.
- The compass heading is not changed.
- Some compass headings are not displayed.
- The compass headings are inaccurate in long distance driving.

This compass automatically calibrates itself while the vehicle is driven as your route takes you in complete circles.

If the vehicle's compass headings become inaccurate continuously, the compass should be manually calibrated as follows:

1. Move the vehicle from the large steel structure or electric power supply cable.
2. Turn on the compass by pressing the A button.
3. Check the zone number by pressing the A button for more than 4 seconds until the current zone number appears in the display.
   To re-calibrate, hold the A button for 3 seconds until C is displayed. If the zone number is different for your country, set the correct zone number referring to "Setting the compass zone" and do the "calibration procedure" again.
4. Drive your vehicle in at least 2 circles at less than 5 miles per hour (8 km/h) until the compass heading appears. Driving in a circle in right-handed direction and opposite direction is possible and if possible, stops the wiper operation.
5. If the vehicle's compass headings become inaccurate as before, do the following procedure again.

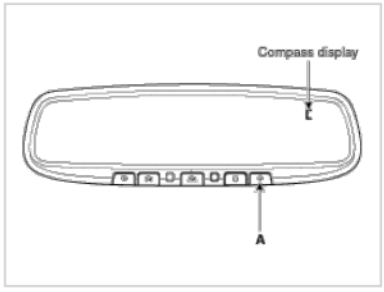
NOTICE

If new vehicle is first driven or if the battery has been disconnected, do the calibration procedure as above.

Setting The Compass Zone

This compass must be set to compensate for the variation between true north and magnetic north. To set variation:

1. Find your current location and variance zone number on the zone map.
2. Press the A button for more than 4 seconds. The current zone number will appear in the display.
3. Release and press the A button until the new zone number appears in the display. After you stop pressing the button in, the display will show a compass direction within a few seconds.



Zone Map

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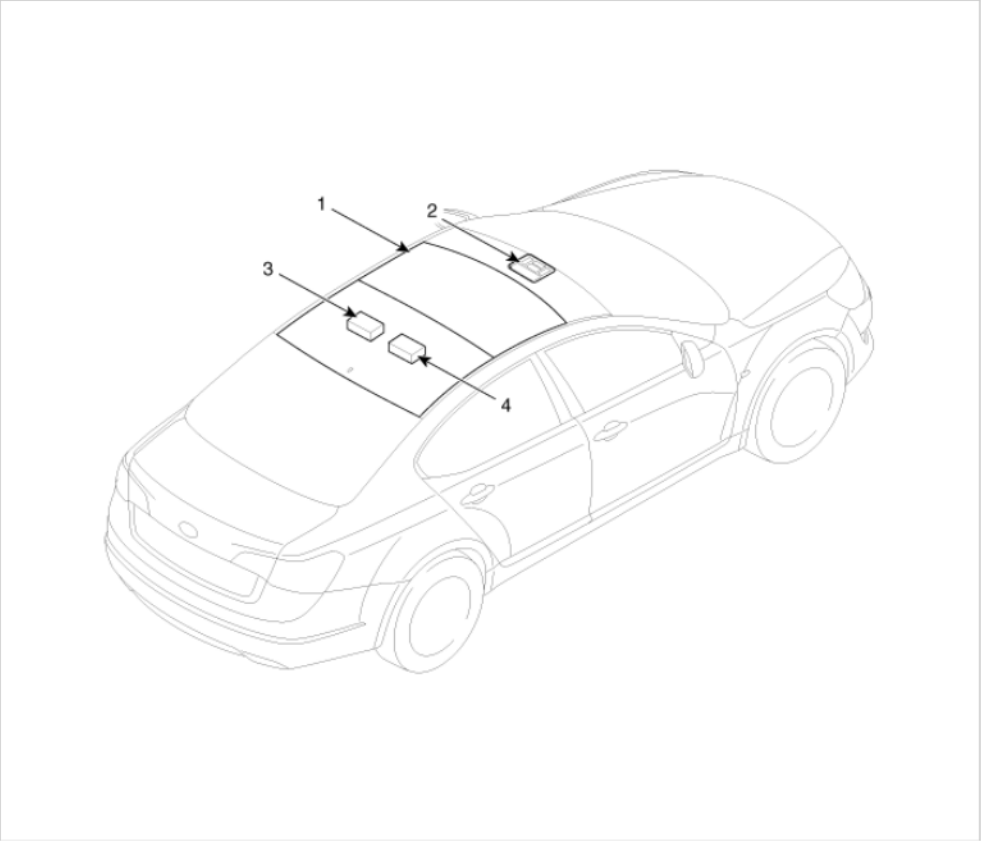


⚠ WARNING

1. Do not install the ski rack, antenna, etc. which are attached to the vehicle by means of a magnet. They affect the operation of the compass.
2. If the compass deviates from the correct indication soon after repeated adjustment, have the compass checked at an authorized dealer.
3. The compass may not indicate the correct compass point in tunnels or while driving up or down a steep hill. (The compass returns to the correct compass point when the vehicle moves to an area where the geomagnetism is stabilized.)

Component Location

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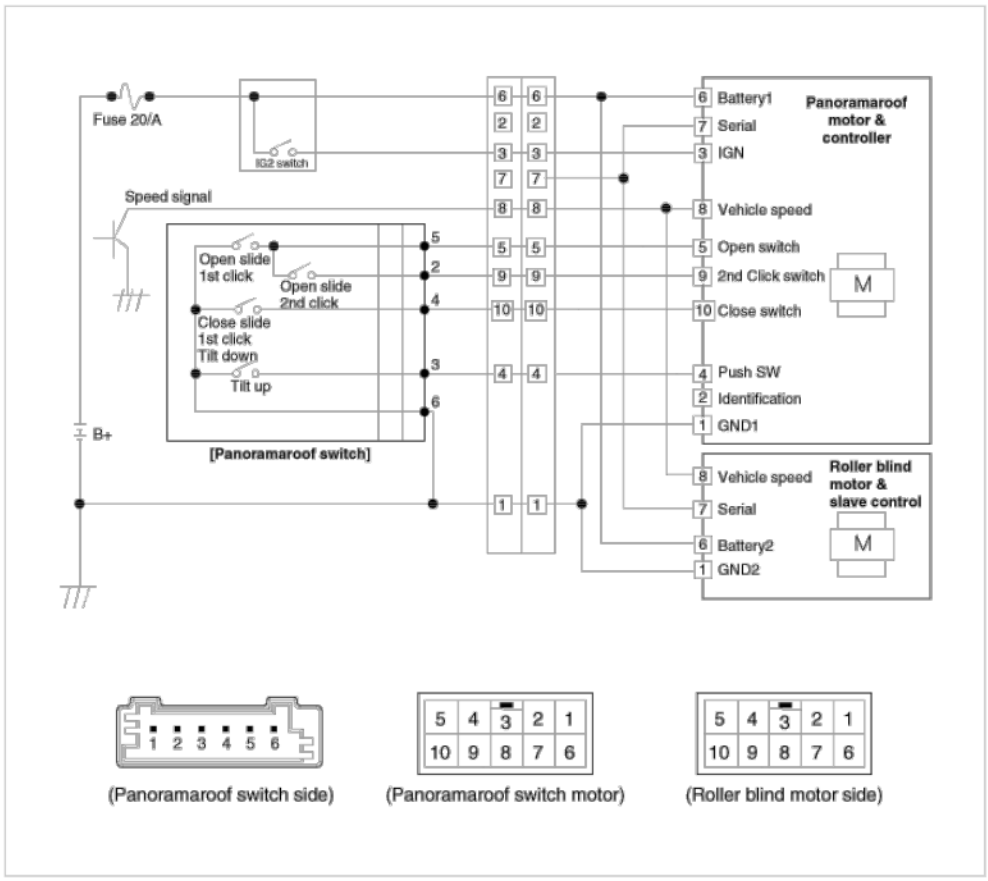


1. Panoramaroof 2. Panoramaroof switch	3. Panoramaroof motor & controller 4. Roller blind motor & slave controller

Body Electrical System

Circuit Diagram (1)

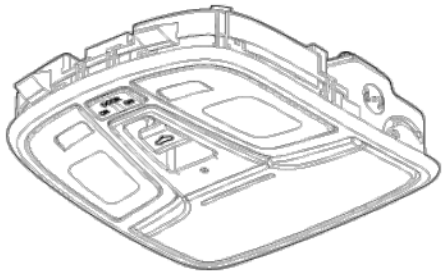
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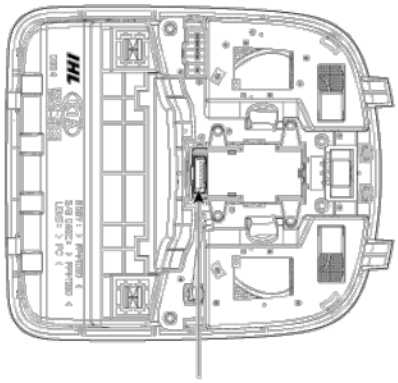


Circuit Diagram (2)

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[Panoramaroof swich]





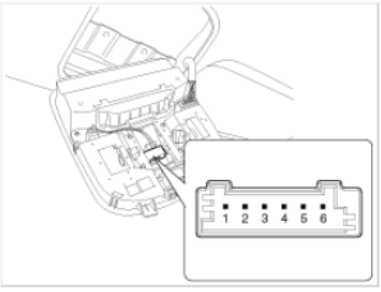
Panoramaroof swich



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

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp assembly.
   (Refer to Body - "Roof Trim")
3. Check for continuity between the terminals. If the continuity is not as specified, replace the panoramaroof switch.

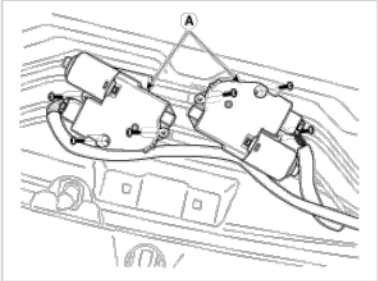


Terminal / Position	6	5	4	3	2
Open (1st click)	○	○			
Open (2nd click)	○	○			○
Tilt up	○			○	
Tilt down	○		○		
Close (1st click)	○		○		
Close (2nd click)	○		○		○

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Inspection

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



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

NOTICE

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

Terminal / Position	3	5	10	4	9
Open (1st click)	⊕	⊖			
Open (2nd click)	⊕	⊖			⊖
Tilt up	⊕			⊖	
Tilt down	⊕		⊖		
Close (1st click)	⊕		⊖		
Close (2nd click)	⊕		⊖		⊖

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 panoramaroof motor must be faulty; replace it.

Terminal	Test condition	Test: Desired result
3	IG2 ON	Check for voltage to ground: There should be battery voltage.
1	Under all conditions	Check for continuity to ground: There should be continuity.
6	Under all conditions	Check for voltage to ground: There should be battery voltage.

6. Ground the terminals as below table, and check that the roller blind motor operates.

Terminal / Position	6	1
Motor	⊕	⊖

Resetting The Panoramaroof

Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the panoramaroof, you have to reset your panoramaroof system as follows :

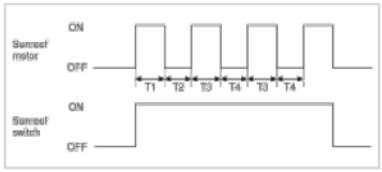
1. Turn the ignition key to the ON position and then close the panoramaroof completely.
2. Release the panoramaroof control lever.
3. Press and hold the CLOSE button for more than 10 seconds until the panoramaroof has moved slightly.
4. Release the panoramaroof control lever.
5. Press and hold the CLOSE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

Protecting Motor From Overheating

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

1. The panoramaroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st run-time(120 ± 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.
   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.

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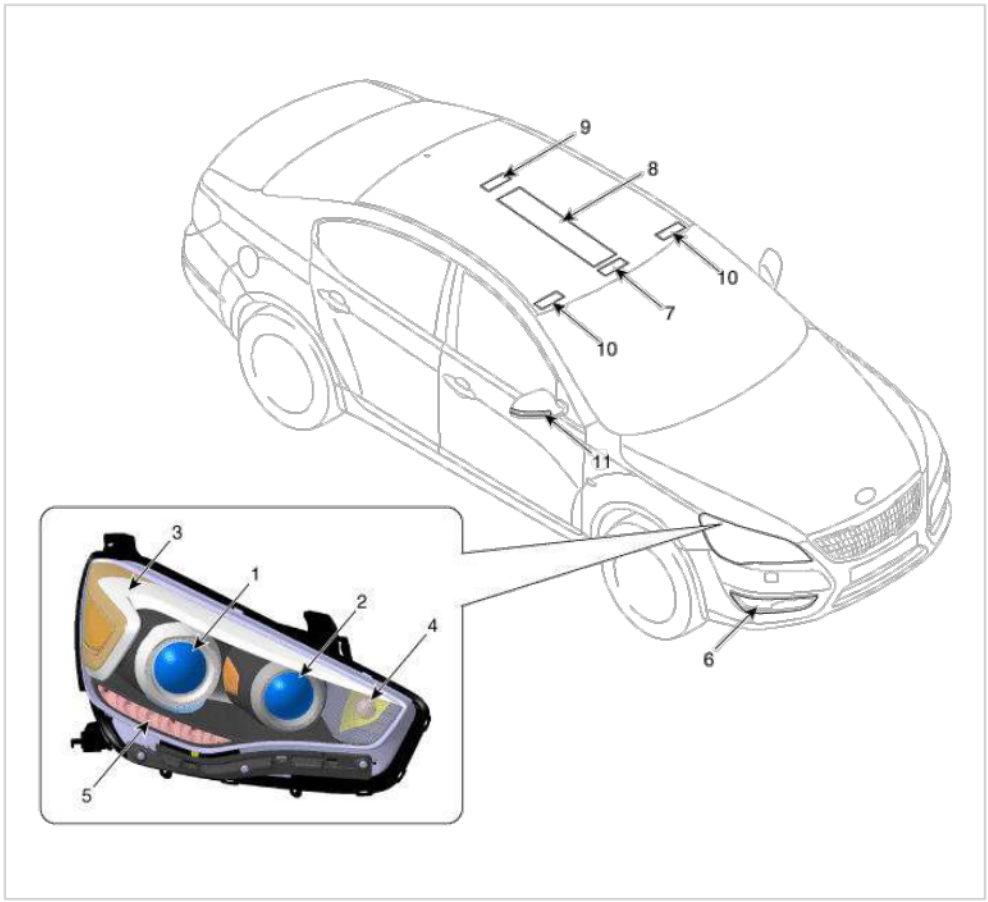


T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

Specification

Item			Type	Wattage (W)
Front	Head lamp (High)		H9	65
	Head lamp (Low)		H7/ D1S (HID)	55/ 35(HID)
	Front turn signal lamp		PY28/8	28W
	Position lamp		LED	LED
	Side repeater lamp (Outside mirror)		LED	LED
	Front fog lamp	General	H8	35
		LED	LED	LED
Rear	Stop and tail lamp		LED	LED
	Rear turn signal lamp		PY27	27W
	Back-up lamp		W16W	16
	High mounted stop lamp		LED	LED
	License plate lamp		W5W	5W
Interior	Overhead console lamp	Deluxe	LED	LED
		General	W10W	10W
	Room lamp		FESTOON	5
	Trunk lamp		FESTOON	5
	Vanity lamp		FESTOON	5

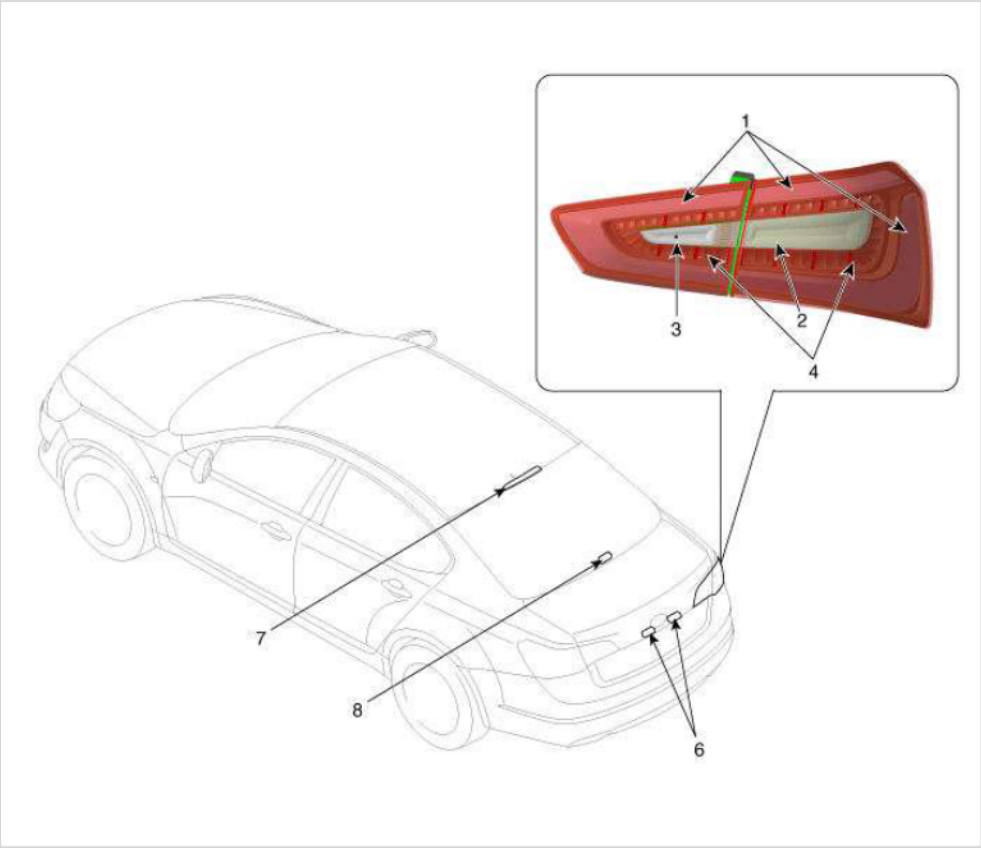
Component Location (1)



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1. Head lamp (Low) 2. Head lamp (High) 3. Position lamp 4. Turn signal lamp 5. DRL 6. Fog lamp	7. Overhead console lamp (General/ Panorama roof) 8. Deluxe overhead console lamp (Mode lamp + Map lamp + Room lamp) 9. Room lamp 10. Vanity lamp 11. Side repeater lamp (Outside mirror)

Component Location (2)

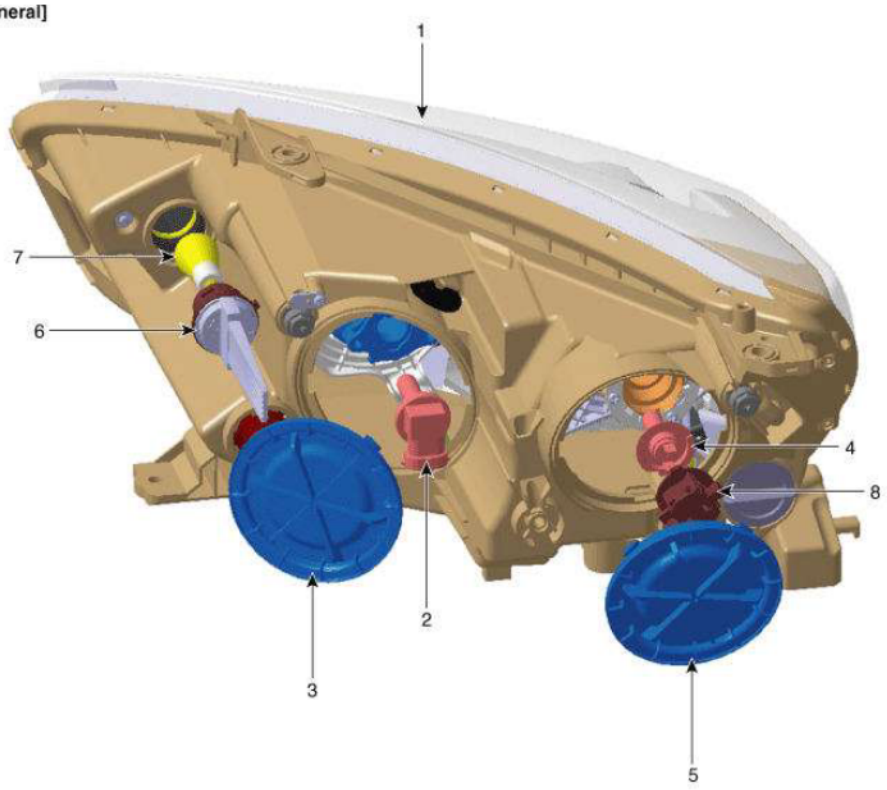


1. Stop and tail lamp 2. Turn signal almp 3. Back-up lamp 4. Stop lamp	5. License plate lamp 6. High mounted stop lamp 7. Trunk lamp

Component

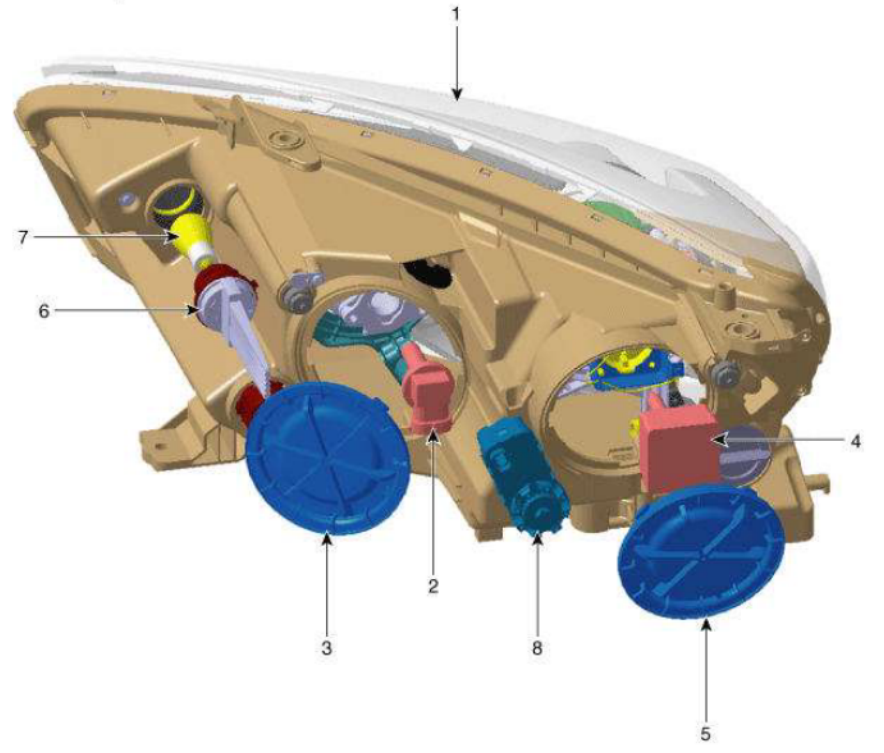
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[General]



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

[HID / HID + AFLS]

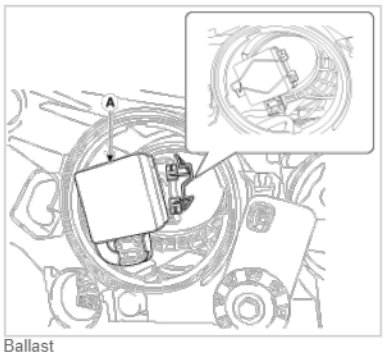


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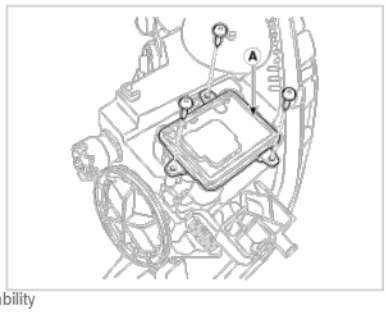
1. Head lamp assembly lens & housing	5. Dust cap (Low)
2. Head lamp high beam bulb	6. Turn signal lamp socket
3. Dust cap (High)	7. Turn signal lamp bulb
4. Head lamp low beam bulb (HID) & ignitor	8. Head lamp leveling actuator (HID type applies only)

HID Head Lamp

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



3. Ballast
   (1) Ballast (A) delivers an instant high voltage pulse to the ignitor electrode, to initialize discharge in the source.
   (2) Ballast supplies the stable power to the bulb and the ignitor during initialization and normal state of arc.



4. Stability
   (1) Durable for vibration as there is no filament.
   (2) Does not operate if polarity are changed.
   (3) Doesn't operate if the input voltage is not in the range of 10-16V.
   (4) Doesn't operate if the circuit is short.
   (5) Doesn't operate if the bulb burnt out.

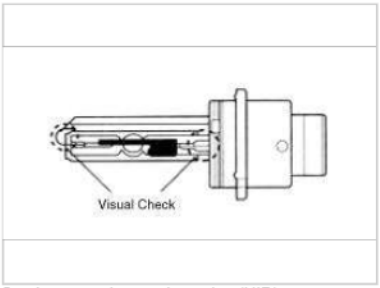
Inspection

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).

⚠ CAUTION

If a headlamp goes out after a period of operation but will immediately relights when the headlamp switch is cycled it is likely the HID lamp needs to be replaced.

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2. Service procedure and warning (HID)

No.	Item	Service procedures	Warning	Remarks
1	Replacement of lamp assembly	1. Disconnect the power connector from the lamp. 2. Remove and replace the lamp assembly. 3. Connect the power connector.	• 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.)

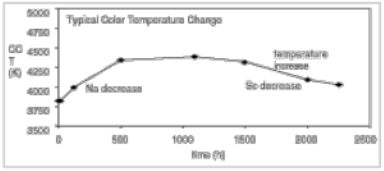
Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 30,000V) and high current (12-13A), and are different from the halogen lamp specification.

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

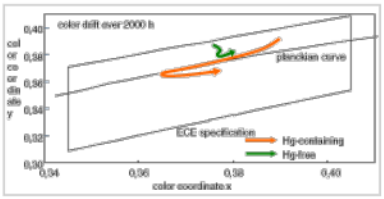
(1) The cause of HID color change.

(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 :

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.)

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- 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

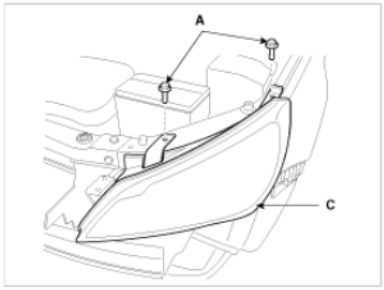
1. Durable for vibration as there is no filament.
2. HID lamp had a more long life than halogen lamp.
3. Does not operate if polarity is changed.
4. Operating input voltage : 9-16V

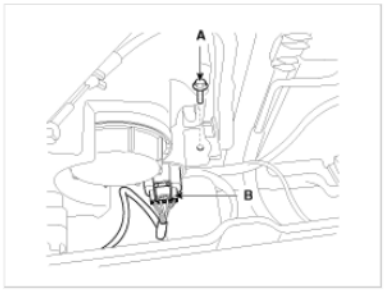
Removal

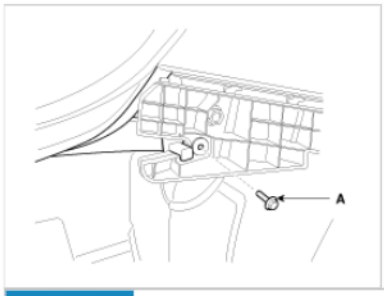
1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper.
   (Refer to Body - "Front Bumper")
3. Loosening the head lamp mounting bolts (A) (4EA) and disconnect the head lamp connector (B).
   Then, remove the head lamp assembly (C).

NOTICE

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







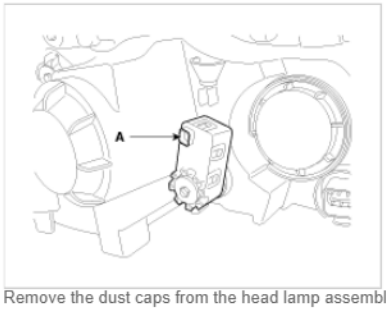
NOTICE

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

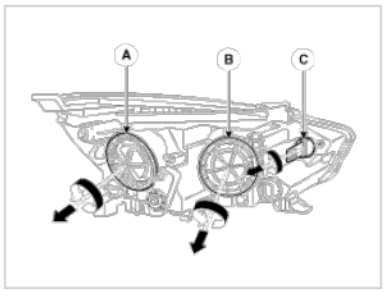


4. In case of HID type, disconnect the head lamp leveling actuator connector (A).

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5. Remove the dust caps from the head lamp assembly after turning in the counter clock-wise direction.
   A : Head Lamp (High) Cap
   B : Head Lamp (Low) Cap
   C : Turn Signal Lamp



Installation

1. Install the head lamp bulbs.
2. Connect the connectors.
3. Install the head lamp bolts (4EA) in alphabetical order.
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.

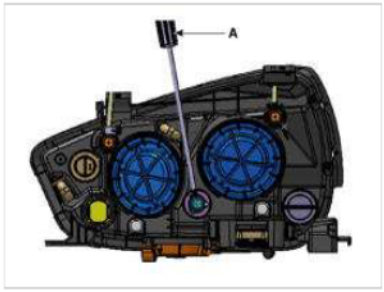
NOTICE

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.

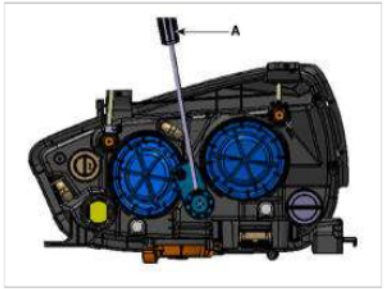
Alternately turn the adjusting gear to adjust the head lamp aiming. If beam-setting equipment is not available, proceed as follows:

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) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the horizontal and vertical lines.
   A : Vertical (Low/High)

[General type / HID + AFLS type]



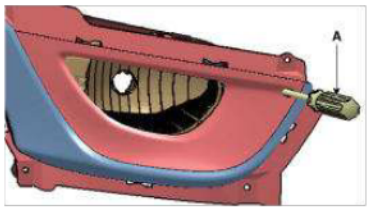
[HID type]



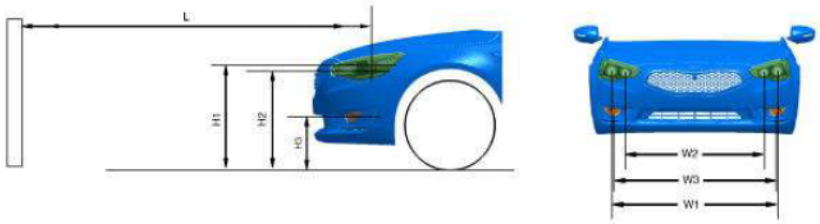
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Front Fog Lamp Aiming

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



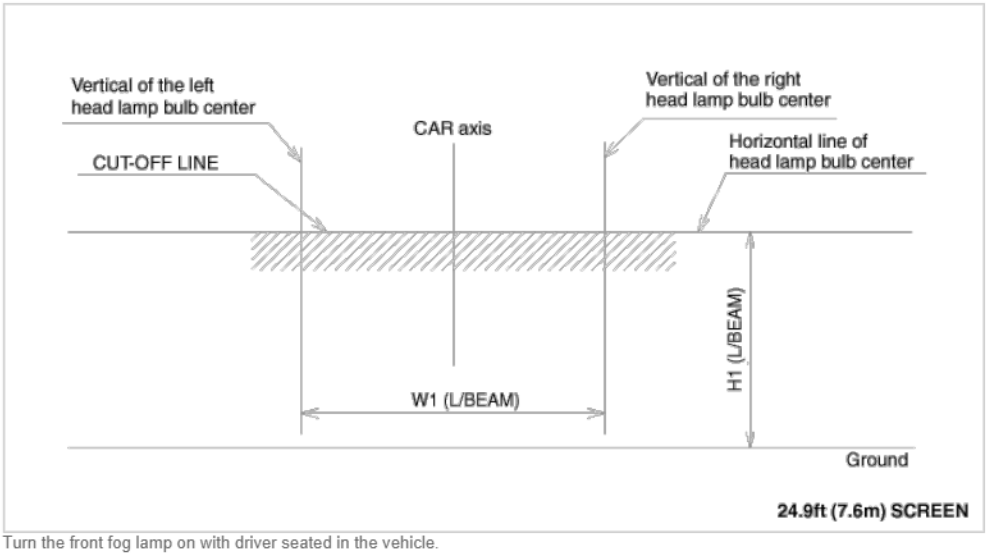
Head Lamp And Fog Lamp Aiming Point



H1 : Height between the head lamp bulb center and ground (Low beam)
H2 : Height between the head lamp bulb center and ground (High beam)
H3 : Height between the fog lamp bulb center and ground
W1 : Distance between the two head lamp bulbs centers (Low beam)
W2 : Distance between the two head lamp bulbs centers (High beam)
W3 : Distance between the two fog lamp bulbs centers
L : Distance between the head lamp bulb center and screen

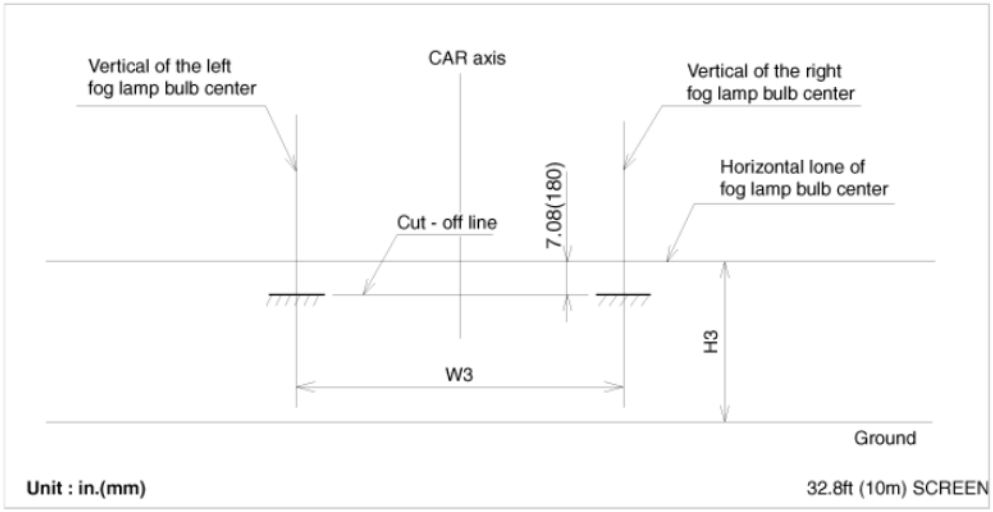
Vehicle condition	H1	H2	H3		W1	W2	W3		L
			BULB	LED			BULB	LED	
Without driver	28.3 (719)	27.7 (703)	14.4 (367)	14.3 (365)	57.2 (1,454)	47.8 (1,213)	56.2 (1,428)	56.9 (1,446)	Refer to aiming condition
With driver	28.0 (712)	27.4 (696)	14.2 (360)	14.1 (358)					

1. General Type (VOR)
   A. Turn the low beam on without driver aboard.
   B. The cut-off line should be projected in the allowable range (shaded region) shown in the picture.
   C. If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.



2. Turn the front fog lamp on with driver seated in the vehicle.
   The cut-off line should be projected in the allowable range shown in the picture.

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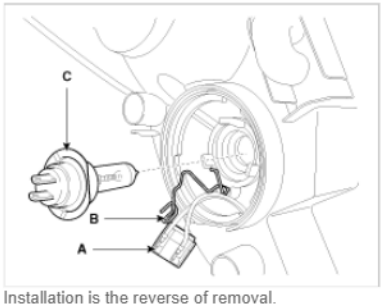


Replacement

Head Lamp (Low)

[General type]

1. Turn the head lamp switch off.
2. Disconnect the power connector from the lamp.
3. Remove the head lamp (Low) cap.
4. Disconnect the connector (A).
5. Remove the blub (C) after releasing the fixing clip (B).

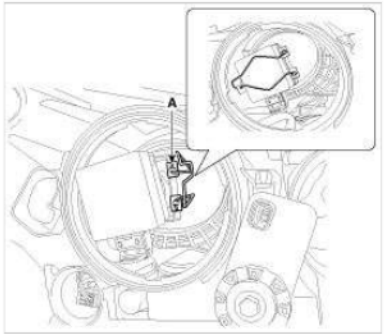


6. Installation is the reverse of removal.

Head Lamp (Low)

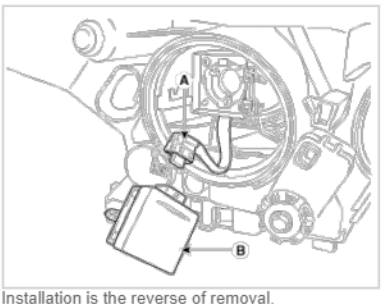
[HID type]

1. Turn the head lamp switch off.
2. Disconnect the power connector from the lamp.
3. Remove the head lamp (Low) cap.
4. Remove the fixed clip (A).



5. Remove the ignitor (B) after disconnecting the connector (A).

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6. Installation is the reverse of removal.

⚠ CAUTION

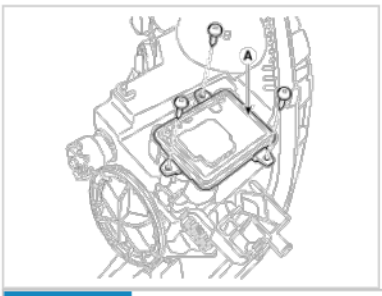
Turn the head lamp switch off to avoid high voltage

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

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

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 removing the screws.



NOTICE

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

5. Installation is the reverse of removal.

NOTICE

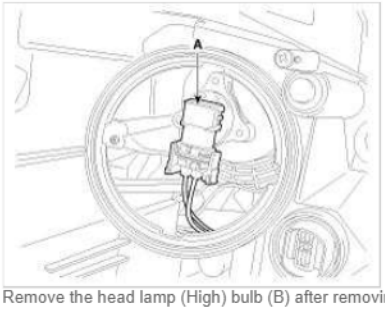
- Turn the head lamp switch off to avoid high voltage.

⚠ 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.

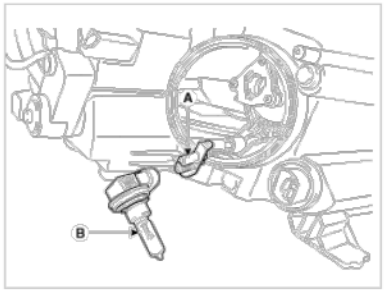
Head lamp(High) bulb

1. Turn the head lamp power off.
2. Disconnect the power connector from the lamp.
3. Remove the head lamp (High) cap.
4. Turn the bulb (A) counter clockwise to remove the bulb.



5. Remove the head lamp (High) bulb (B) after removing the connector (A).

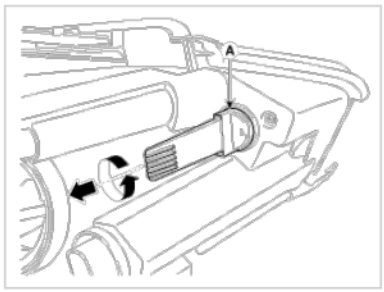
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6. Installation is the reverse of removal.

Turn Signal Lamp

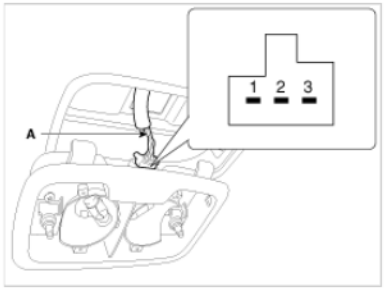
1. Turn the head lamp power off.
2. Turn the bulb socket (A) counterclockwise to remove the turn signal bulb.

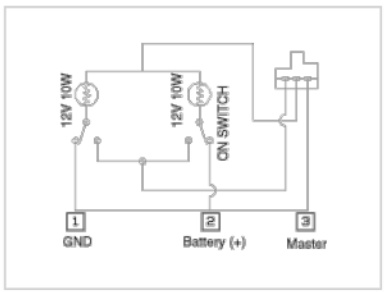


Inspection

Room Lamp

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





Terminal / Position	1	4
ON	○	○
OFF		

Removal

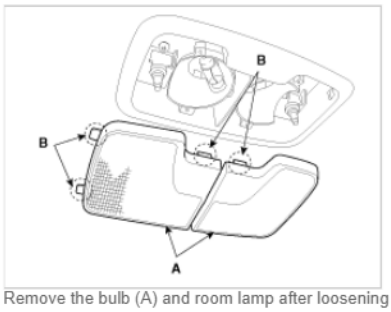
Room Lamp

1. Disconnect the negative(-) battery terminal.
2. Carefully remove the lens (A) using a small screwdriver.

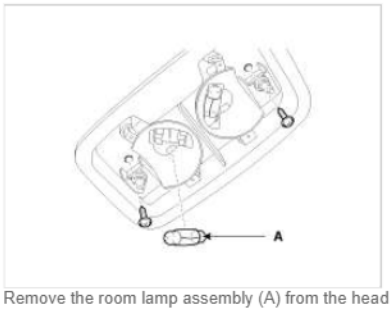
⚠ CAUTION

Take care not to damage the part (B).

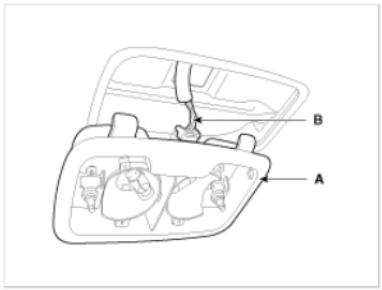
cardiagn.com



3. Remove the bulb (A) and room lamp after loosening the mounting screws.

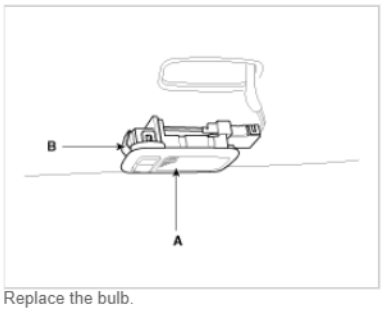


4. Remove the room lamp assembly (A) from the head lining after disconnecting the connector (B).



Vanity Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the vanity lamp (A) by pressing the clip (B) with a flat-tip screwdriver.



3. Replace the bulb.

Installation

Room Lamp

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

Vanity Lamp

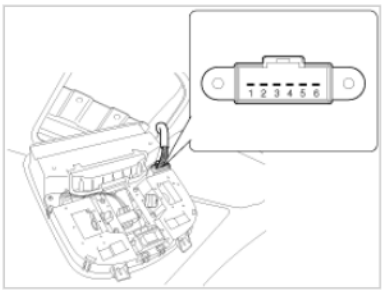
1. Reconnect the vanity lamp connector.
2. Install the vanity lamp.

Inspection

Overhead Console Lamp

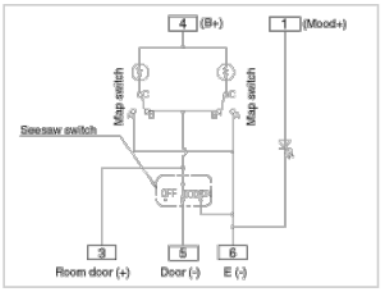
Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.

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No.	Description	No.	Description
1	Mood (+)	4	Battery (+)
2	-	5	Door (-)
3	Master (+)	6	GND

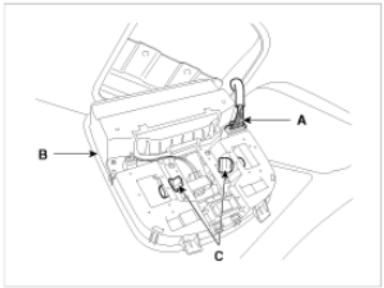
Type / Position / Terminal	Map lamp switch			
	Left		Right	
	ON	OFF	ON	OFF
6	●		●	
4	●		●	



Removal

Overhead Console Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp assembly.
   (Refer to Body - "Roof Trim")
3. Remove the overhead console lamp (B) after disconnecting the panoramaroof switch connector and lamp connector (A).



4. If necessary to replace the bulb, replace the bulb (C).

Deluxe Overhead Console Lamp

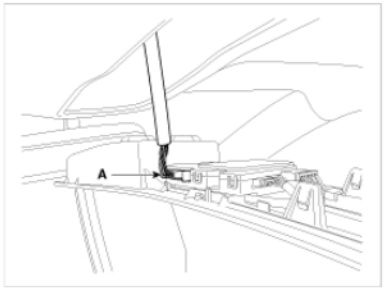
1. Disconnect the negative (-) battery terminal.
2. Open the holder and then remove the bolts (2EA).



3. Remove the deluxe overhead console lamp assembly.
   (Refer to Body - "Roof Trim")

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4. Disconnect the connector (A).



Installation

Overhead Console Lamp

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

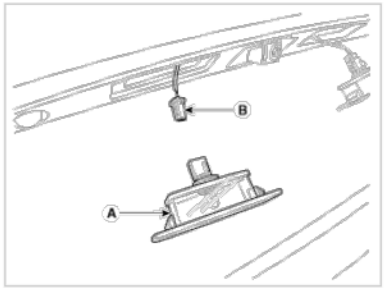
Deluxe Overhead Console Lamp

1. Install the deluxe overhead console lamp assembly after connecting the connector.

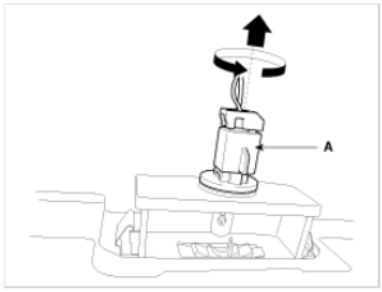
Body Electrical System

Removal

1. Disconnect the negative(-) battery terminal.
2. Disconnect the connector (B) after removing the license lamp assembly (A).



3. Turn the license bulb socket (A) counterclockwise to remove the bulb.



Installation

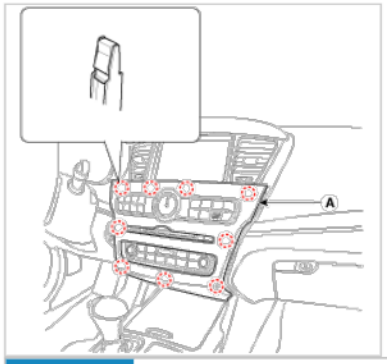
1. Install the bulb.
2. Install the license lamp assembly.

Body Electrical System

Removal

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

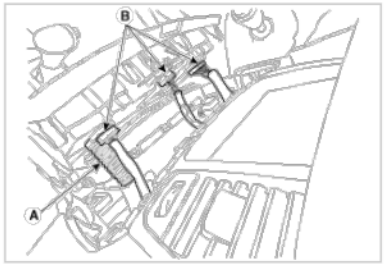
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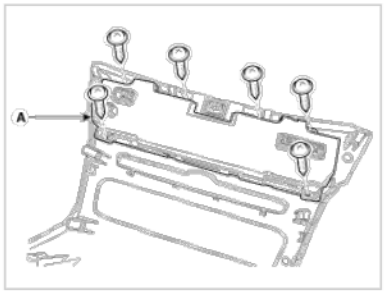
NOTICE

Apply the protective tapes to the center fascia panel and its related parts.

3. Disconnect the in-car hose (A) and hazard lamp switch connector (B).



4. Remove the hazard lamp switch assembly (A) after removing the screws.

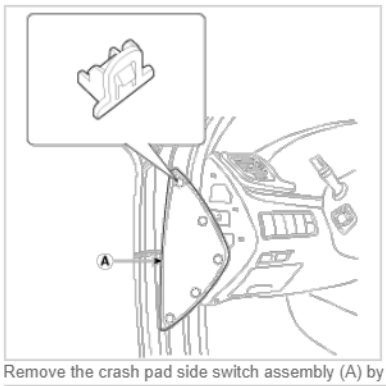


Installation

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

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the passenger compartment juction box cover.
3. Remove the side cover (A).

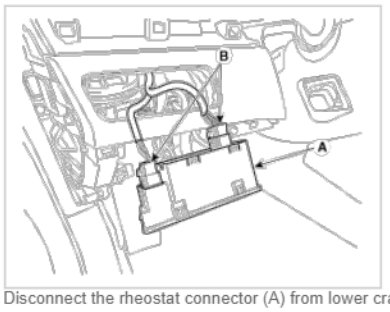


4. Remove the crash pad side switch assembly (A) by pushing it through side cover hole.

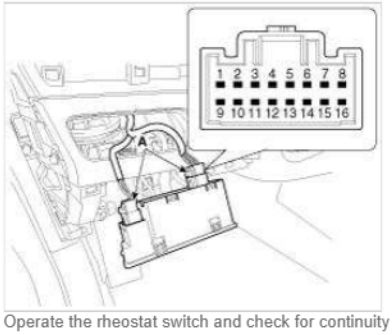
NOTICE

Put on gloves to protect your hands.

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5. Disconnect the rheostat connector (A) from lower crash pad switch.

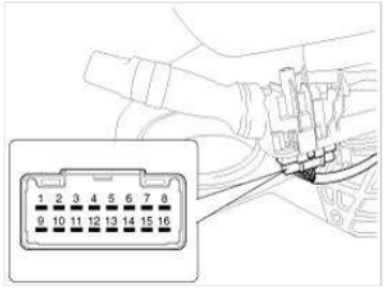


6. Operate the rheostat switch and check for continuity between terminals.

Terminal / Position	Up	Down	Remark
9		○	Down
8	○	○	GND
10	○		Up
7	○		ILL (-)
12	○		ILL (+)

Inspection

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



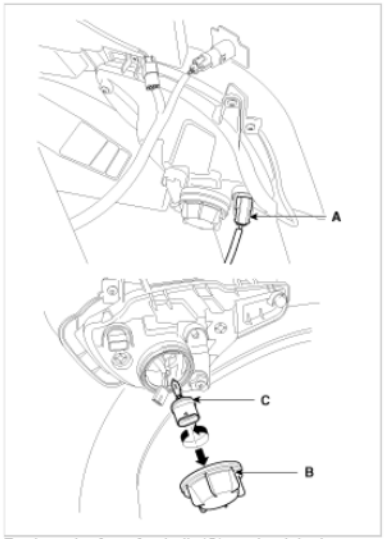
Front Fog Lamp

Terminal / Position	10	11
OFF		
ON	○	○

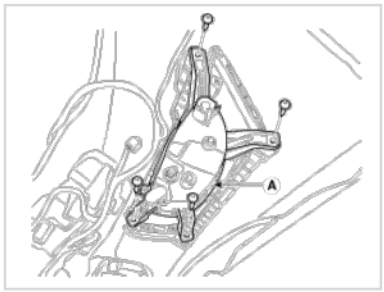
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front wheel housing.
   (Refer to Body - "Front Bumper")
3. Disconnect the front fog lamp connector (A) and remove the cover (B).

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4. Replace the front fog bulb (C) turning it in the counterclockwise direction.
5. Remove the front fog lamp (A) after removing the screws.

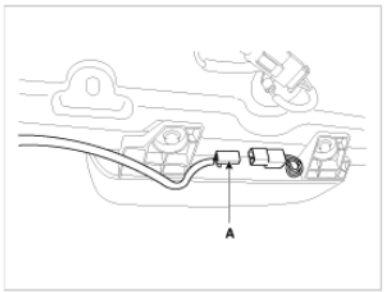


Installation

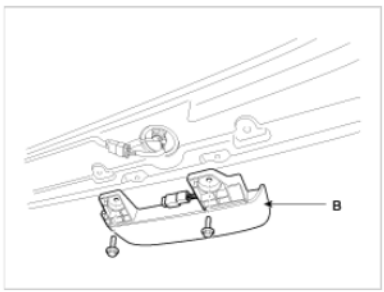
1. Install the front fog bulb.
2. Reconnect the lamp connector.
3. Install the front wheel housing.

Removal

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



4. Remove the high mounted stop lamp (B) after removing the bolts (2EA).



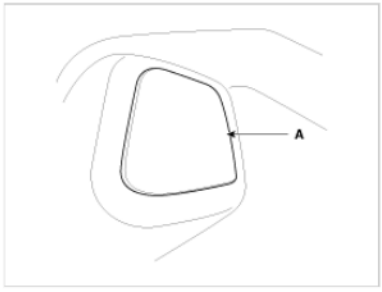
Installation

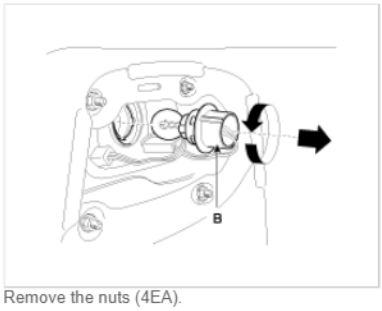
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1. Install the high mounted stop lamp to the roof trim.
2. Install the roof trim.

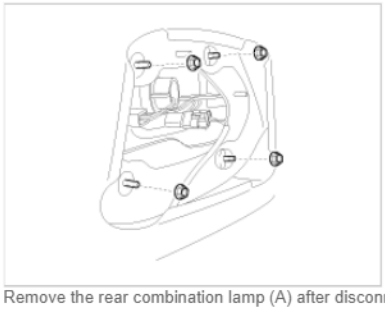
Rear Combination Lamp (Outside)

1. Disconnect the negative (-) battery terminal.
2. If the bulbs should be only replaced without removing lamp assembly, replace the turn signal lamp bulb (B) after removing the trim cover (A) in the trunk.

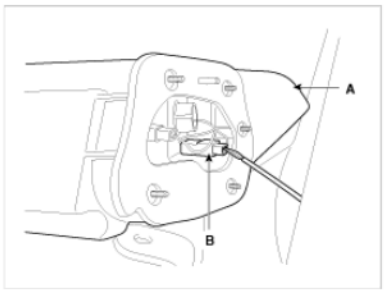




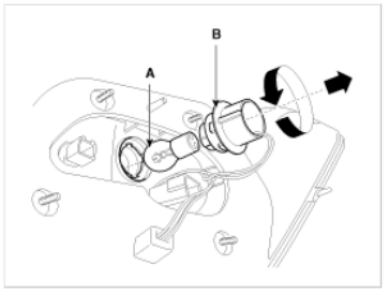
3. Remove the nuts (4EA).



4. Remove the rear combination lamp (A) after disconnecting the connector (B).



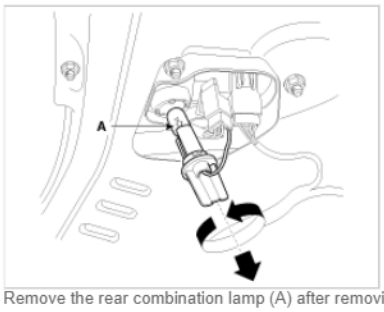
5. Turn the socket counterclockwise to remove the turn signal lamp bulb (A).



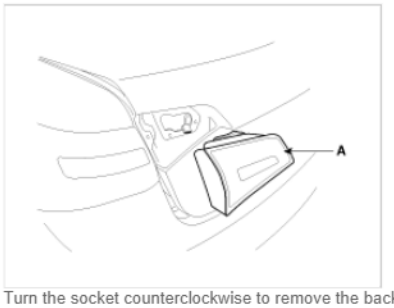
Rear Combination Lamp (Inside)

1. Disconnect the negative (-) battery terminal.
2. If the bulbs should be only replaced without removing lamp assembly, replace the back up lamp bulb (A) after removing the trim cover in the trunk.

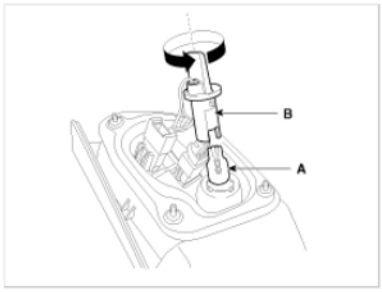
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3. Remove the rear combination lamp (A) after removing the connector and nuts (3EA).



4. Turn the socket counterclockwise to remove the back up lamp bulb (A).



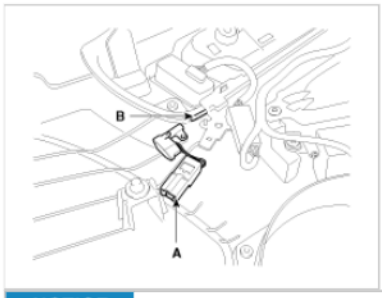
Installation

1. Install the rear combination lamp assembly after assembling the bulb.
2. Install the lamp cover to the tailgate after connecting the lamp connector.

Removal

Mood Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door")
3. Remove the connector and LED mood lamp (A).

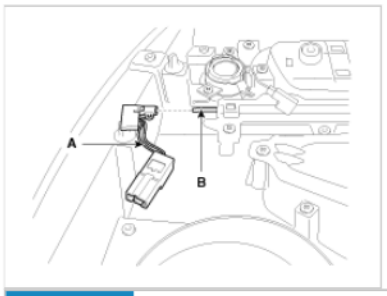


NOTICE

Take care not to damage the reflector (B) when removing the LED mood lamp.

4. Remove the rear door trim.
   (Refer to Body - "Rear Door")
5. Remove the connector and LED mood lamp (A).

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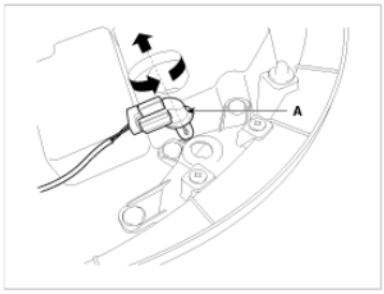


NOTICE

Take care not to damage the reflector (B) when removing the LED mood lamp.

Door Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door")
3. Turn the socket counterclockwise to remove the door lamp bulb (A).



Installation

Mood Lamp

1. Install the door mood lamp after connecting the connector.
2. Install the door trim.
3. Connect the negative (-) battery terminal.

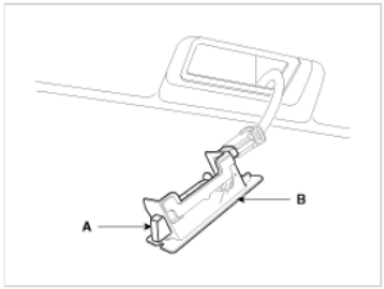
Door Lamp

1. Install the door lamp after connecting the connector.
2. Install the door trim.
3. Connect the negative (-) battery terminal.

Body Electrical System

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage room lamp (B) when prying the hole (A) with a flat-up screwdriver.



3. Remove the luggage room lamp bulb in case of necessity.

Installation

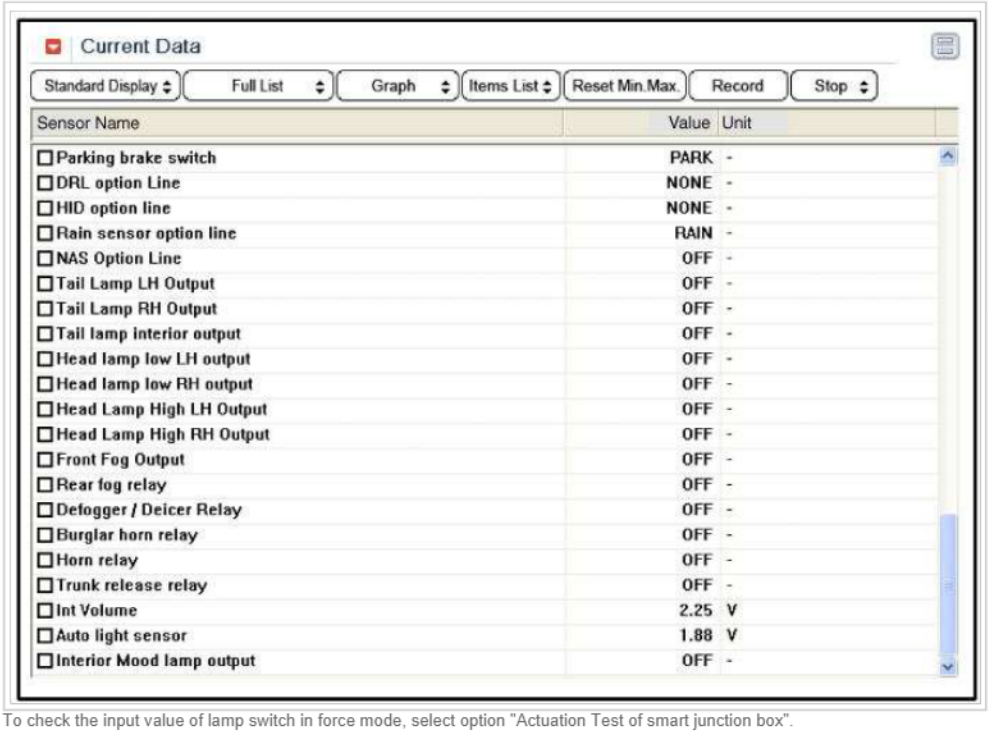
1. Install the luggage room lamp assembly after connecting the lamp connector.

Body Electrical System

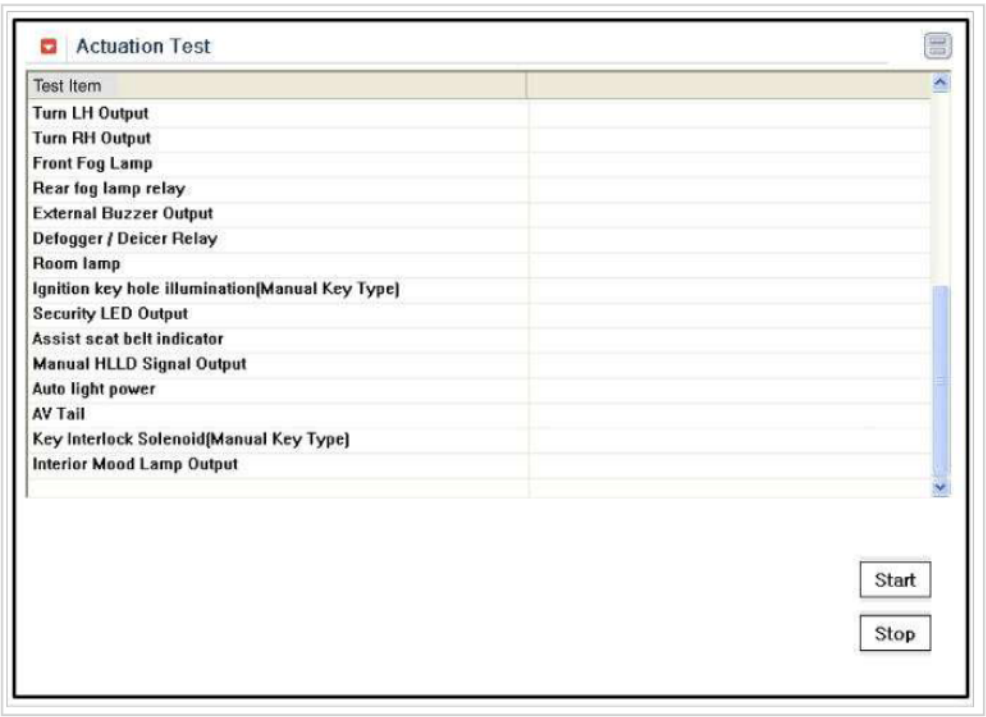
Troubleshooting

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

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



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

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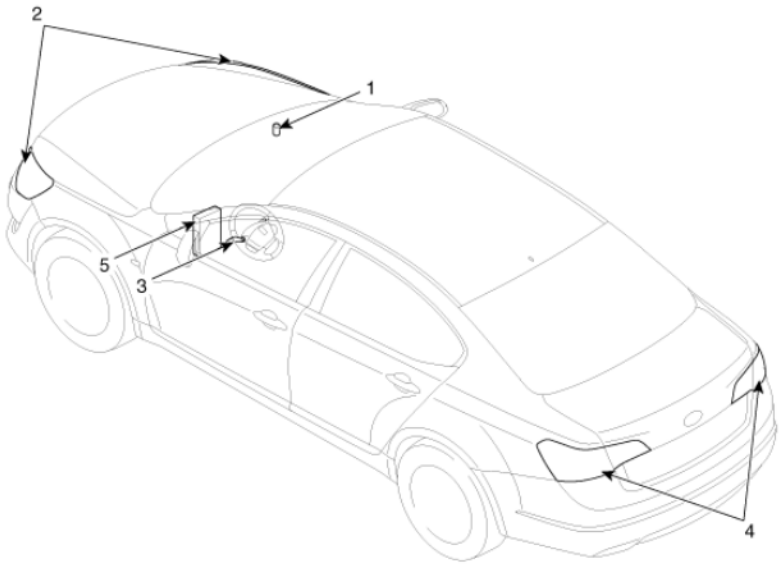
Stop lamps do not light	Bulb burned out	Replace bulb
	Stop lamp fuse (15A) blown	Check for short and replace fuse
	Stop lamp switch faulty	Adjust or replace switch
	Wiring or ground faulty	Repair if necessary
Stop lamps do not turn off	Stop lamp switch faulty	Repair or replace switch
Instrument lamps do not light (Tail lamps light)	Rheostat faulty	Check rheostat
	Wiring or ground faulty	Repair if necessary
Turn signal lamp does not flash on one side	Bulb burned out	Replace bulb
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Turn signal lamps do not light	Bulb burned out	Replace bulb
	Turn signal lamp fuse (10A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Hazard warning lamps do not light	Bulb burned out	Replace bulb
	Hazard warning lamp fuse (15A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Hazard switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps
	IPM faulty	Check IPM
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 lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Wiring or ground faulty	Repair if necessary

Specifications

Items		Specifications
Rated voltage		DC +5V
Load		Max. 1mA (When head lamp lighting)
Illuminations	Tail lamp	ON : 0.52 ± 0.03 (V)
		OFF : 1.58 ± 0.05 (V)
	Head lamp	ON : 0.52 ± 0.03 (V)
		OFF : 1.58 ± 0.05 (V)

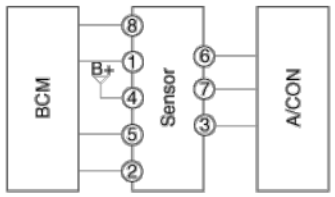
Component Location

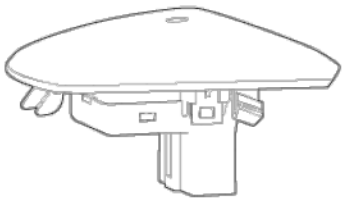
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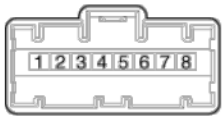


1. Auto light sensor 2. Head lamps 3. Lighting switch (Auto)	4. Tail lamps 5. IPM (Intelligent intergrated Platform Module)

Circuit Diagram







[Auto Light Sensor Connector]

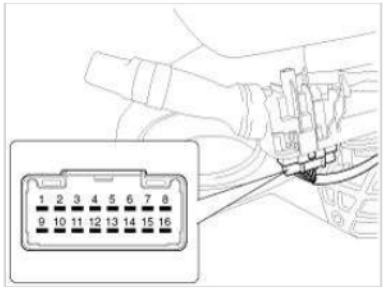
No.	Description
1	Auto light signal
2	Auto light GND
3	Photo signal (RH)
4	LED power (B+)
5	LED GND (To IPM)
6	Photo signal (LH)
7	Photo power (SW)
8	Auto light power (5V)

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Inspection

Lighting Switch Inspection

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



Lighting Switch (Auto Light)

Terminal / Position	12	14	15	16
OFF				
AUTO	○	○		
Tail	○		○	
Head lamp	○		○	○

Body Electrical System

Inspection

In the state of IGN1 ON, when multi function switch module detects auto light switch on, tail lamp relay output and head lamp low relay output are controlled according to auto light sensor's input.

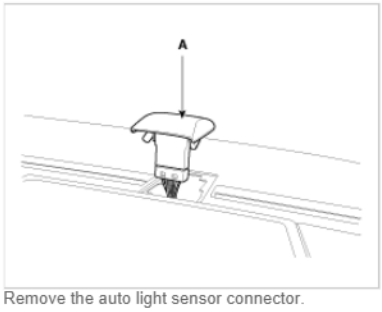
The auto light control doesn't work if the pin sunlight supply (5V regulated power from Ignition 1 power to sunlight sensor) is in short circuit with the ground.

If IGN1 ON, The 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.



3. Remove the auto light sensor connector.

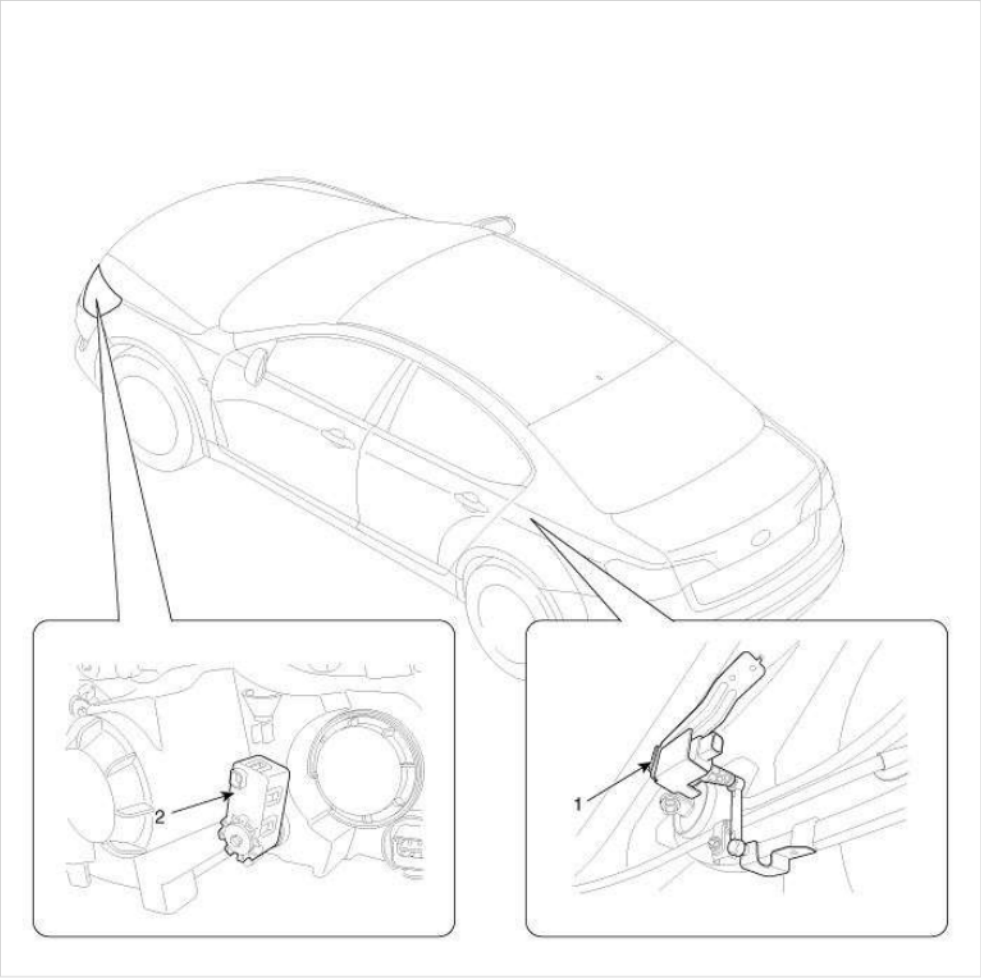
Installation

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

Body Electrical System

Component Location

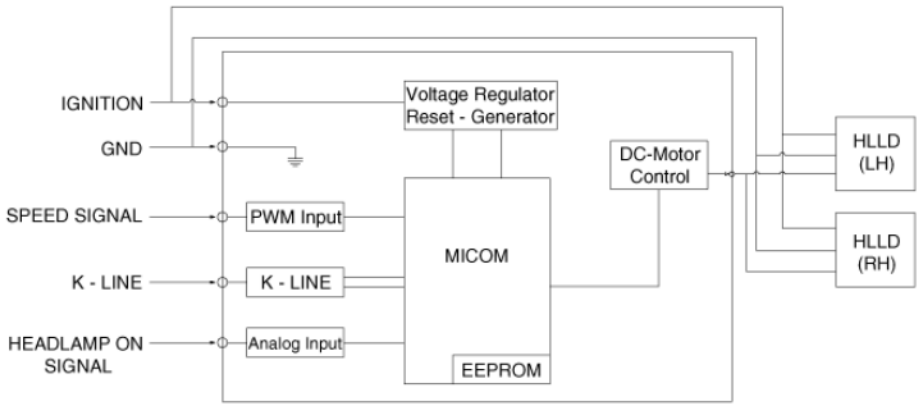
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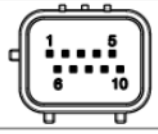


1. Head lamp leveling unit and sensor	2. Head lamp leveling actuator

Circuit Diagram

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Connector	No.	Description	No.	Description
	1	Ground	6	Vehicle speed
	2	-	7	Head lamp ON/OFF
	3	-	8	HLLD signal
	4	K-Line	9	-
	5	Ignition	10	-

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

Head lamp beam is automatically operated by chassis tilt.

Purpose of AHLS(Auto Headlamp Leveling System)

- Compensation of headlamp visual range for changes in vehicle load.
- Preventing oncoming traffic being blinded by excessive glare.
- Meeting regulation

Operation

Operating Procedure

1. Suspension angle change resulted from vehicle's load change.
2. Height sensor signal change
3. Calculation of HLLD signal by AHLS ECU algorithm.
4. Sending a proper signal to HLLD (head lamp levelling device) and driving actuator.
5. Actuation of HLLD and compensation of headlamp beam range.

Operating Condition

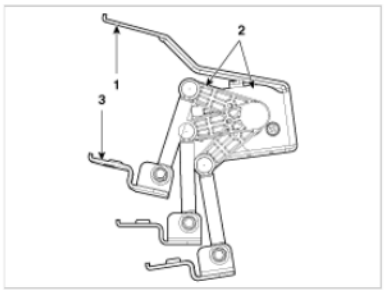
- IGN1 ON & Head lamp low bean ON
- Sensor angle changed over 1° and keeping 10~12seconds with vehicle standing.
- Sensor angle changed over 1° and keeping 10~12seconds and when vehicle runs over 20km/h with constant speed.
- Leveling control is off after controlling HLLD for few seconds.
- To eliminate mechanical tolerance, the lamp position is always reached from the lower side.

System characteristics

1. Height sensor and link.

No.	Components
1	Sensor mounting bracket
2	Height sensor and link
3	Link bracket

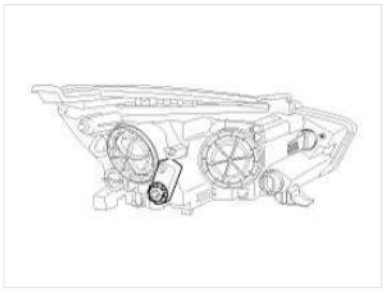
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A. Using a Micro-processor, percept the operation lever's mechanical angle change or speed signal.

B. As an actuator control device of inner control program, mounting on the rear center arm.

2. HLLD (head lamp leveling device) actuator.

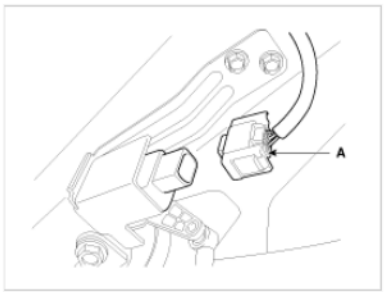


A. Change the head lamp lighting direction up or down since automatic head lamp levelling unit sensing the input signal following the vehicle's statical changes.

Removal

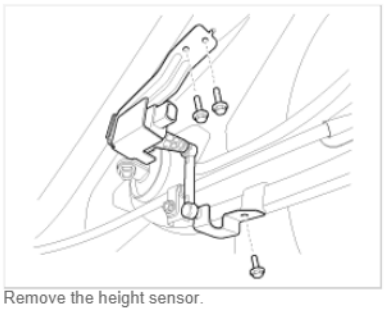
Height Sensor

1. Remove the height sensor connector (A).



2. Loosen the mounting bolts(Body: 2EA, chassis: 1EA) from height sensor bracket.

Tightening torque :
3 ~ 5N.m (30 ~ 50kgf.m, 2.21 ~ 3.68lb-ft)



3. Remove the height sensor.

HLLD (head lamp leveling device) Actuator

1. Remove the head lamp assembly.

Installation

Height Sensor

1. Install the height sensor.
2. Connect the connector.

HLLD (Head Lamp Leveling Device) Actuator

1. Install the head lamp assembly.

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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
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

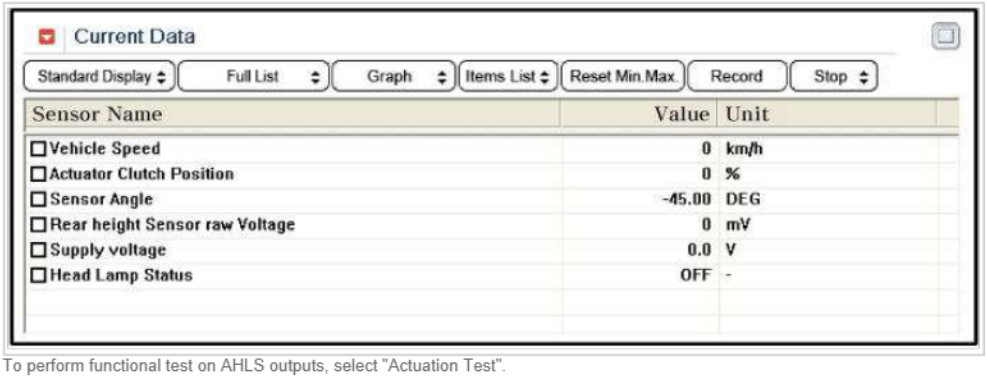
NOTICE

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".

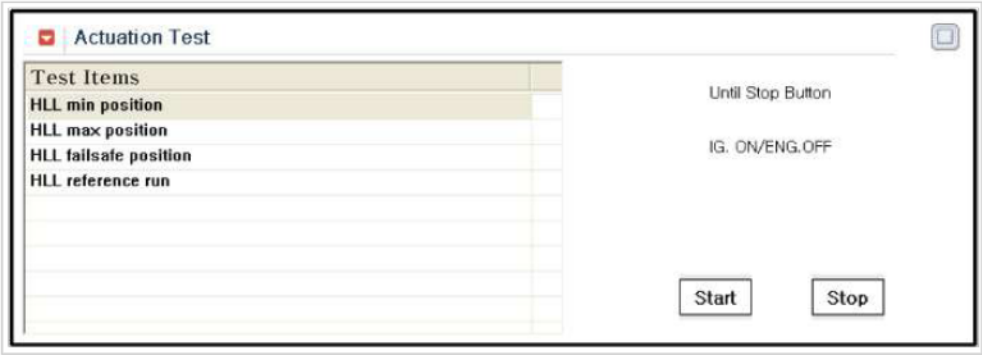


2. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.

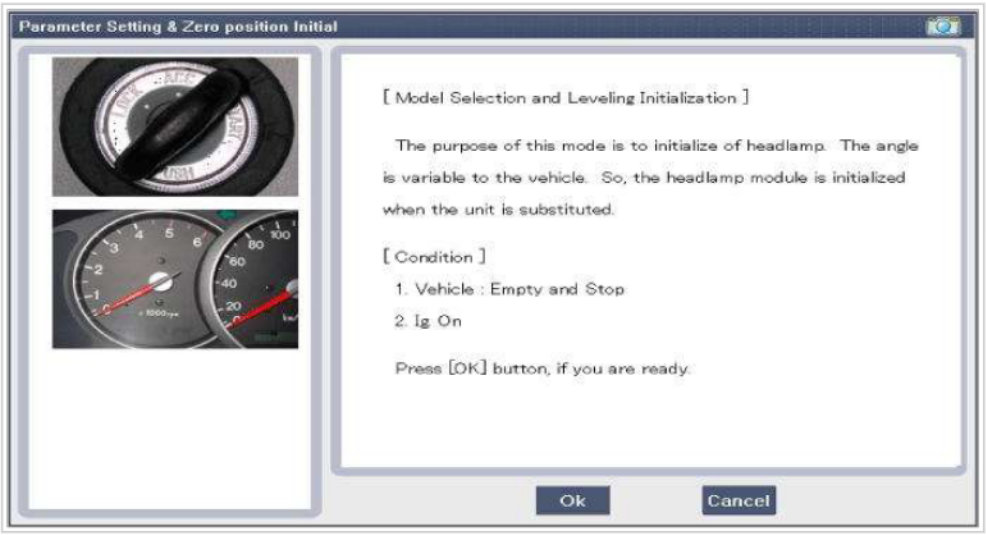


3. To perform functional test on AHLS outputs, select "Actuation Test".

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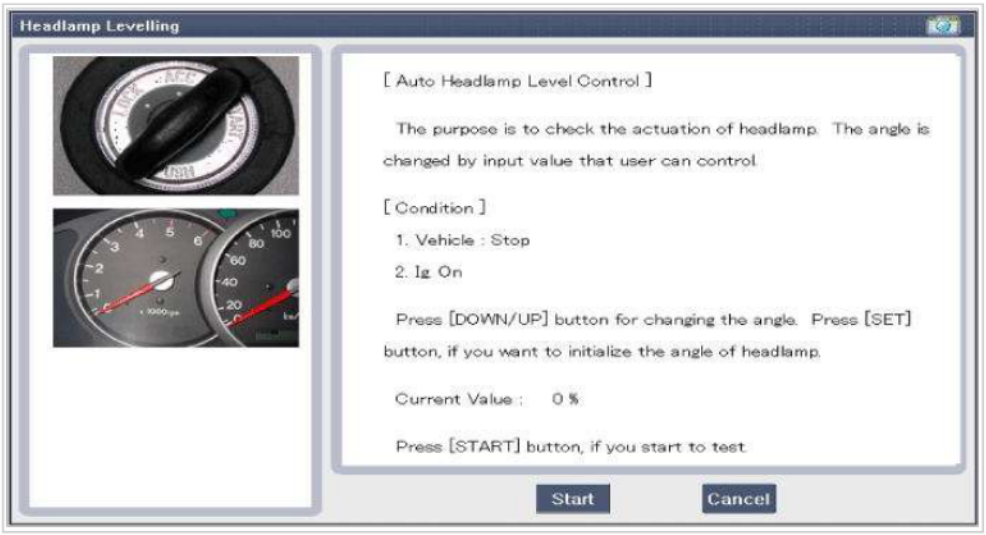
4. Select " Parameter setting & Zero position Initial".

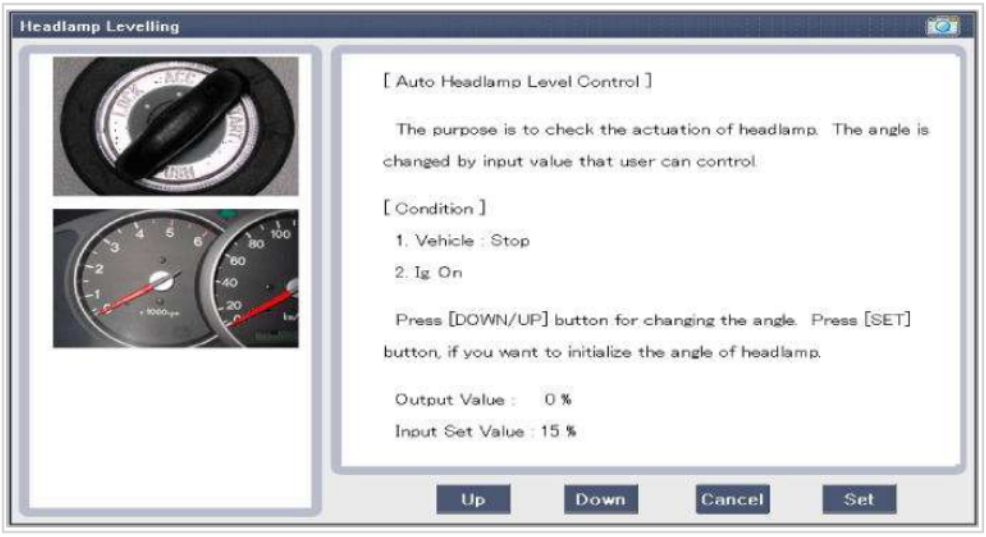


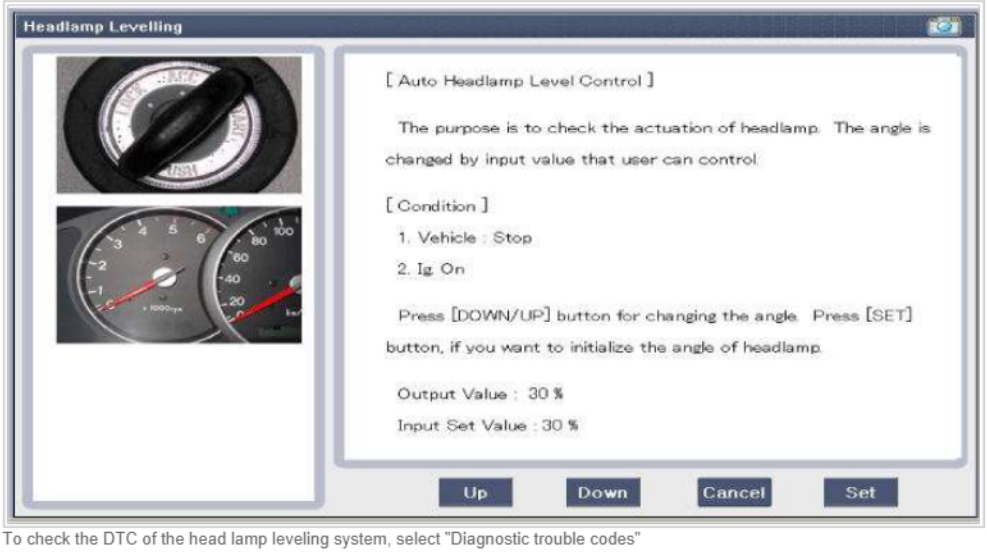


5. Confirm that AHLS operate forcefully in "Head lamp leveling" menu.

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

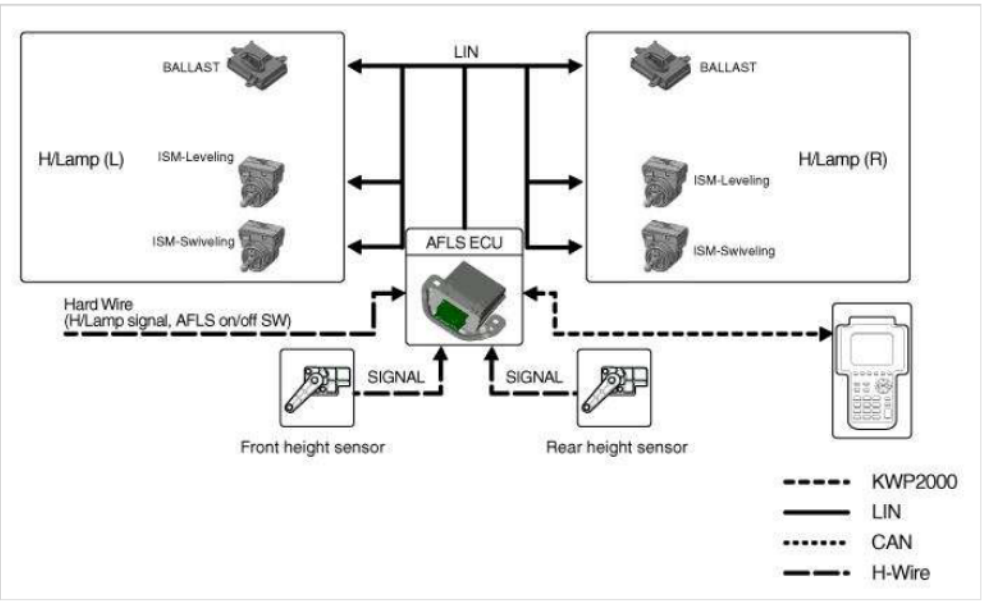
Body Electrical System

Specifications

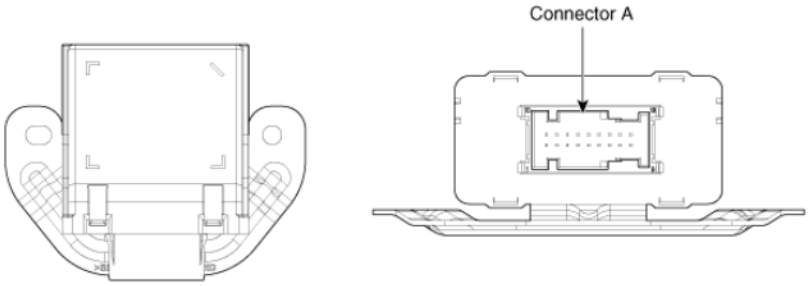
Content		Value
AFLS	Nominal Voltage	DC 13.5V
	Operating Voltage	DC 9~16V
	Operating Temperature	-40°C ~ +85°C

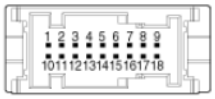
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Components



Circuit Diagram



Connector A	No.	Description	No.	Description
	1	Power	10	-
	2	Sensor voltage (Front)	11	Sensor voltage (Rear)
	3	Sensor ground (Front)	12	Sensor ground (Rear)
	4	CAN Low	13	-
	5	CAN High	14	-
	6	Sensor signal (Front)	15	Sensor signal (Rear)
	7	-	16	Ground
	8	LIN	17	-
	9	K-Line	18	-

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Description

Adaptive Front-lighting System (AFLS)

AFLS(Adaptive Front-lighting System〉is a headlamp orientation control system that takes into account both steering angle and vehicle speed to orient the headlamps to an angle that provides better nighttime visibility.
Variable conditions make lighting pattern of running vehicle kaleidoscope.

Component of AFLS

1. Input part : It is provided that information of speed sensor, height sensor and so on related to condition of vehicle.
2. Control part (AFLS Unit) : It controls Output part by analyzing/judging Input signal.
3. Output part : It drive Low beam of H/Lamp to upper/lower and left/right side optimum lighting pattern according to output control signal of AFLS Unit.

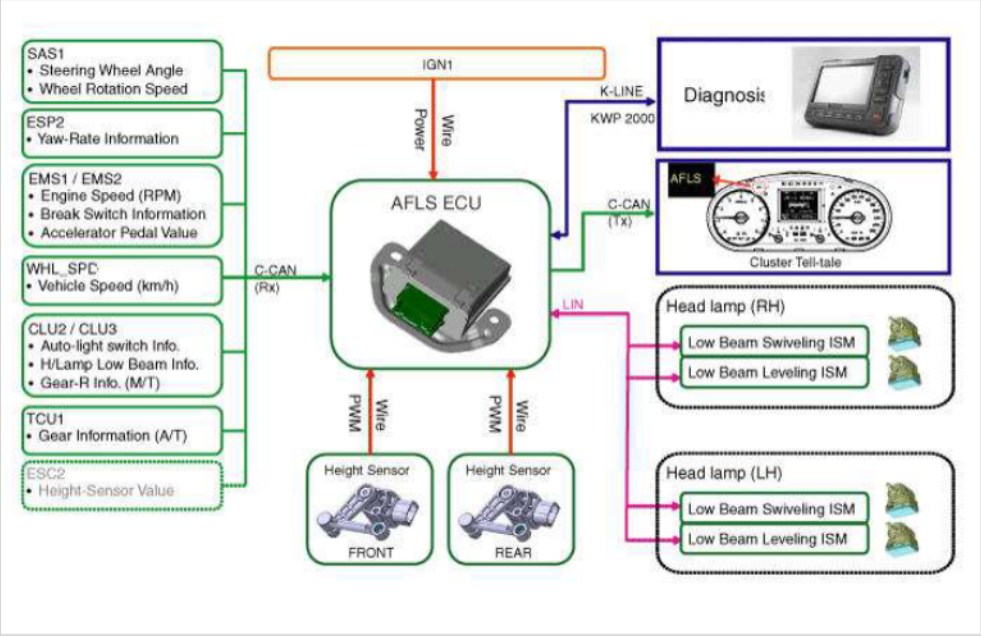
Main function of AFLS

	Content	Description
1	Dynamic Bending (Swivelling)	• Providing optimum beam pattern in the curve road 1. Enhanced visibility in the curve road 2. Drive Low beam to left / right side
2	Automatic Leveling (Leveling)	• Compensating Low beam according to inclination of vehicle 1. Compensation according to static condition (Load) 2. Compensation according to dynamic condtion (Quick start, Sudden stop)
3	Fail-safe	• Fail-safe reaction while detecting system failure and malfunction 1. Detecting signal / communication error for Swivelling 2. Detecting signal /communication error for Leveling 3. Detecting system failure

Advantage of AFLS

	Content	Description
1	Enhanced stability	• Visibility Guarantee In case of curve road • According to vehicle Speed/Steering angle, speed/angle of Swivel actuator is automatically controlled to provide optimum lighting pattern • Fail-safe reaction application for Driver on opposite side road →In case error communication,automatically return initial position of Swivel actuator
2	Enhanced convenience	• AFLS operating application by driver's selection(AFLS Off switch) • Providing Diagnostic function for detecting system failure and malfunction and check up data information (by using Diagnostic equipment) • Reduced wiring-harness by Applying CAN/LIN communication in vehicle

Block Diagram



Operation

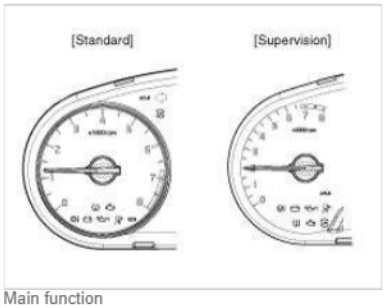
Component

AFLS Unit (A)

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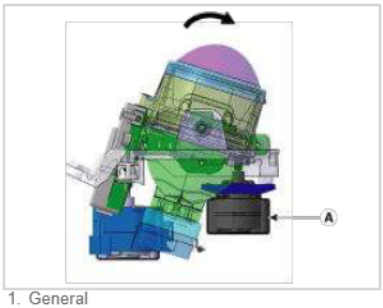


1. General
   System initialization, In case of input Engine signal (AFLS ECU, Levelling /Swivelling motor)
   Adaptation of AFLS OFF switch
   AFLS operate normally ,only under turning auto light switch on.
   Providing Tel-tale function of AFLS (display 'AFLS' on dashboard).
   In case of system failure, display light on 'AFLS' on dashboard



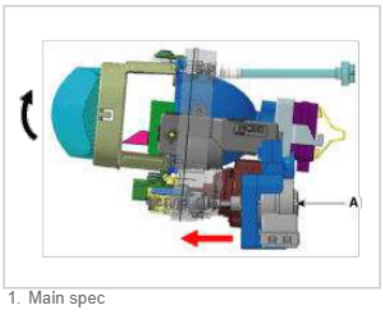
2. Main function
   Swivelling function
   Levelling function
   Processing signal of Height sensor
   Control the clynamic bending light

Swivelling Motor (A)



1. General
   communicate AFLS Unit through LIN protocol
   Robust control to Disturbance
   Doesn't work out of rated voltage range.
2. Main function & Rating
   Drive Low beam to left / right side
   Fail-safe function : In case of detecting malfunction or system failure , drive to secure position

Levelling Motor (A)

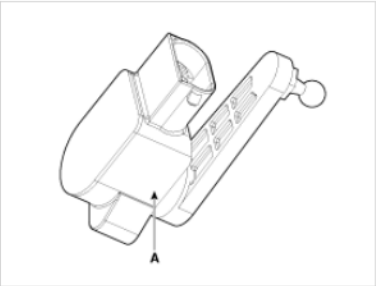


1. Main spec
   communicate AFLS Unit through LIN protocol
   Robust control to Disturbance
   Doesn't work out of rated voltage range.
2. Main function & Rating
   Drive Low beam to upper / lower

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Fail-safe function : In case of detecting malfunction or system failure , drive to secure position

Height Sensor



1. General
   Height Sensor connecting body & suspension measures inclination information from load condition.
   Vehicle having the Steel-suspension system transmits inclination signal to AFLS ECU by using Hard-wire.
2. Rating
   Rated Voltage : 5V ± 5%

Inspection

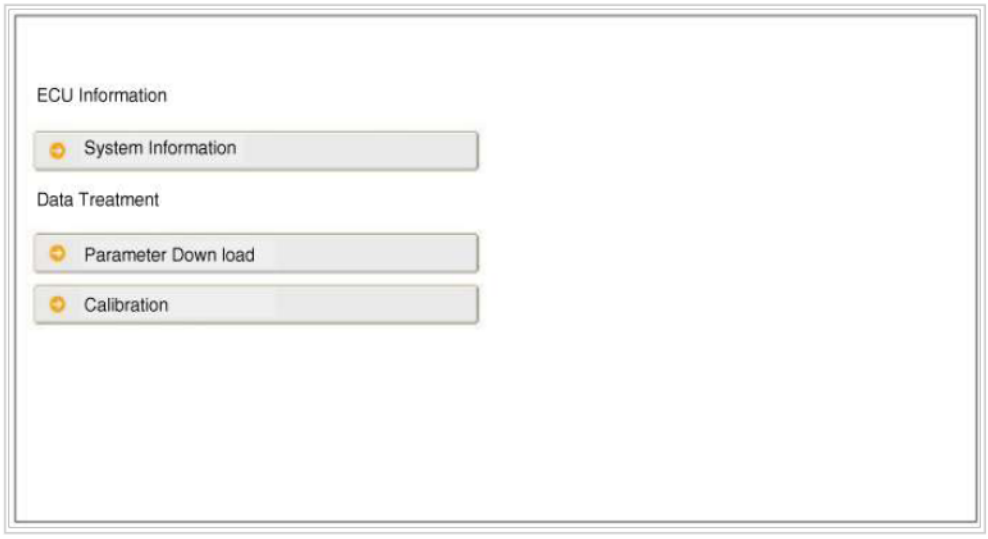
Initialization and diagnosis sequence by using diagnostic equipment
Below content summarize the procedure for A/S using Diagnostic equipment

Download Parameter

1. Select "AFLS" menu after selecting a vehicle.



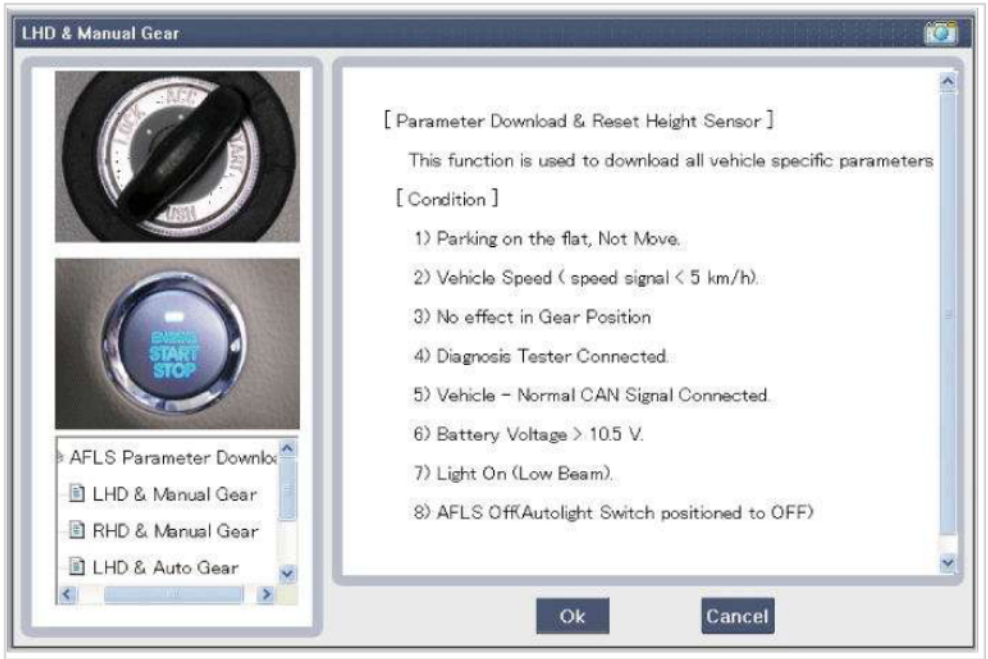
2. Select "Parameter download" menu for define a characteristc of vehicle.



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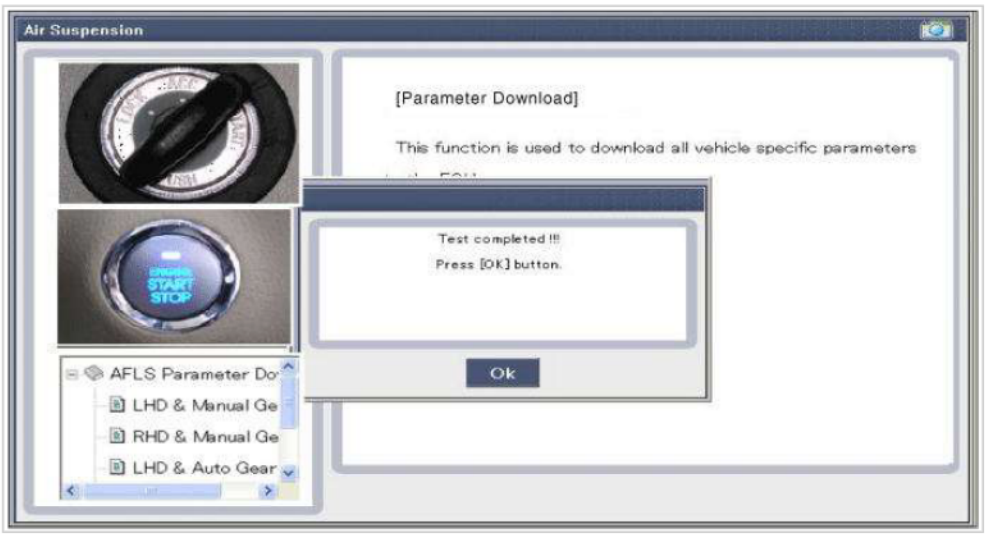


3. Select the LHD/RHD and MT/AT option refer to the vehicle options.



4. When "Parameter download" is done,display belows.

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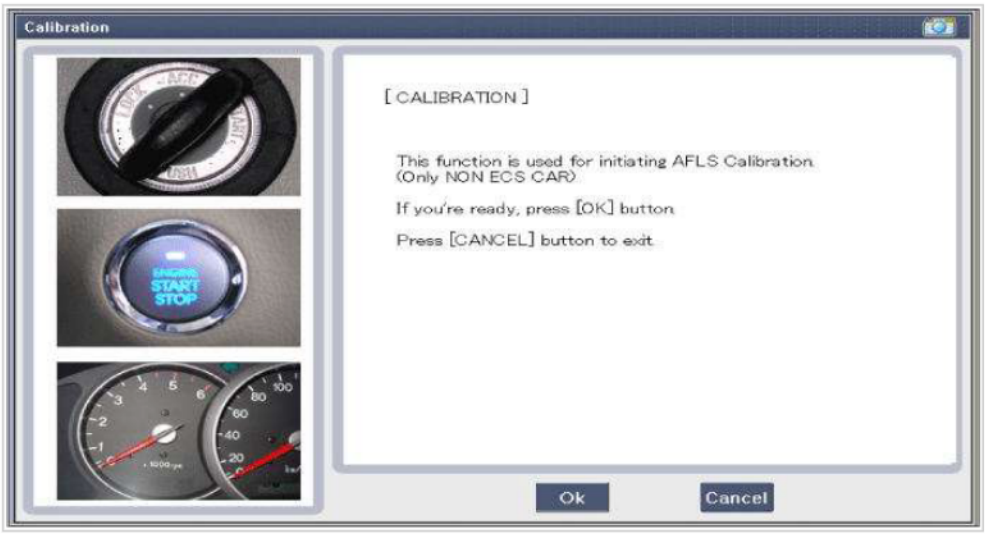


System Calibration

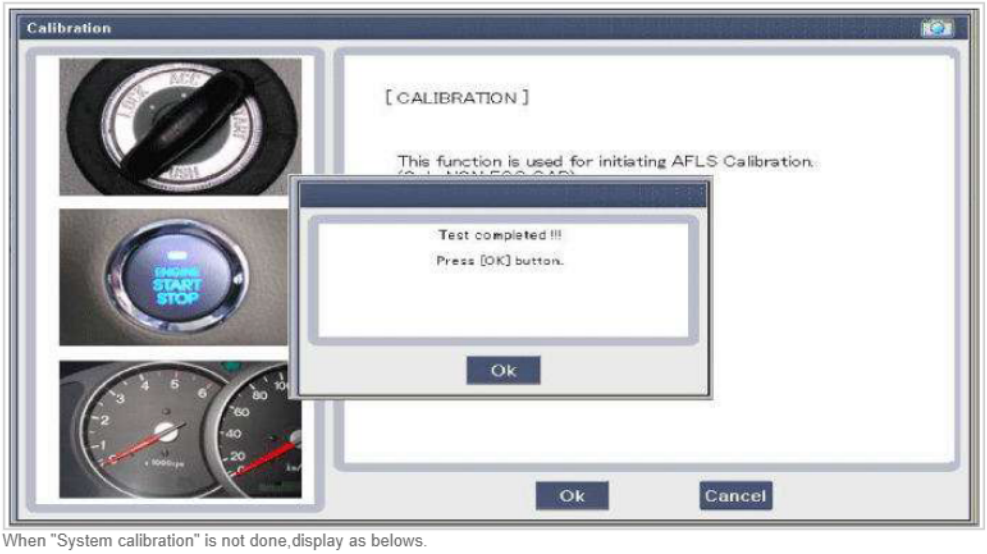
⚠ CAUTION

This menu is applied only if vehicle has a Steel suspension

1. Select "AFLS" menu after selecting a vehicle.
2. Select "Sensor initializing-Non ECS" if vehicle has a Steel suspension



3. When "System calibration" is done,display belows.



4. When "System calibration" is not done,display as belows.

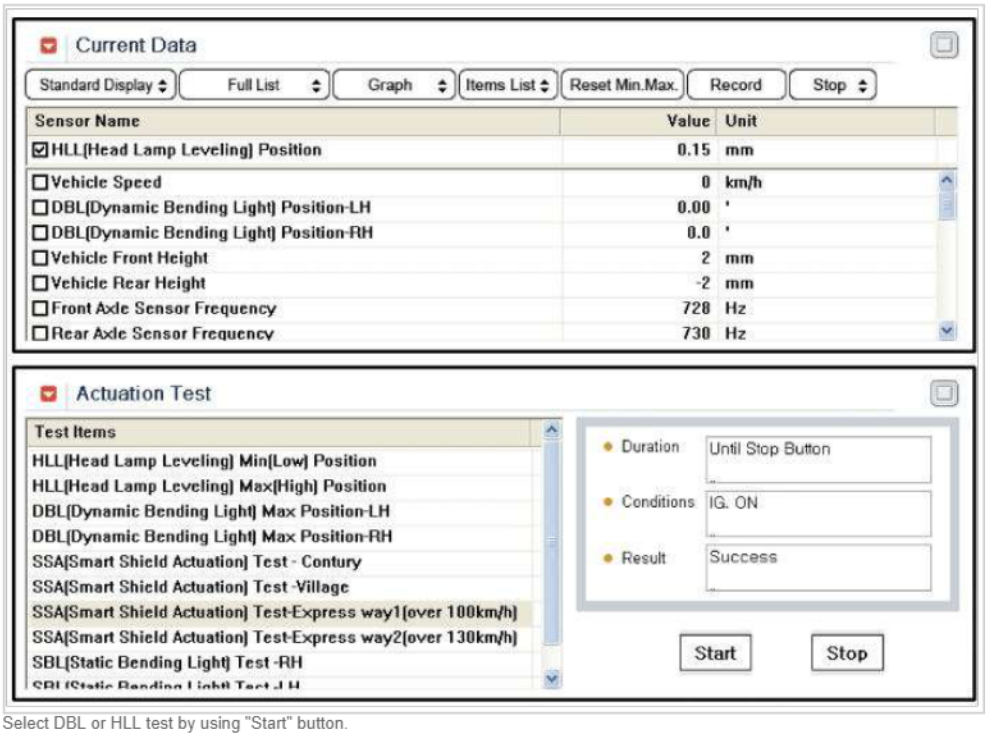
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Actuator Test

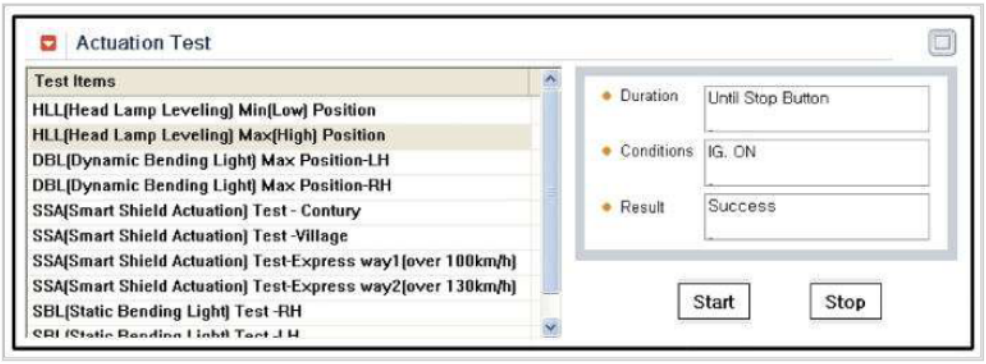
When it replace H/Lamp Unit, it necessarily check up by operating actuator test.

1. Select "AFLS" menu after selecting a vehicle.
2. Select "Actuator test"



3. Select DBL or HLL test by using "Start" button.
4. In case select DBL or HLL ACTUATOR DRIVE TO MAX POS(swivelling)
   In case select "Start" button : drive to max position right direction (15°)
   In case select another item : back to initial position

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AFLS Fail-safe Function

If the error condition of AFLS occurred during system operation, the system have to fail-safe reaction for prevent dazzling of opposite side driver

AFLS Fail-safe Index

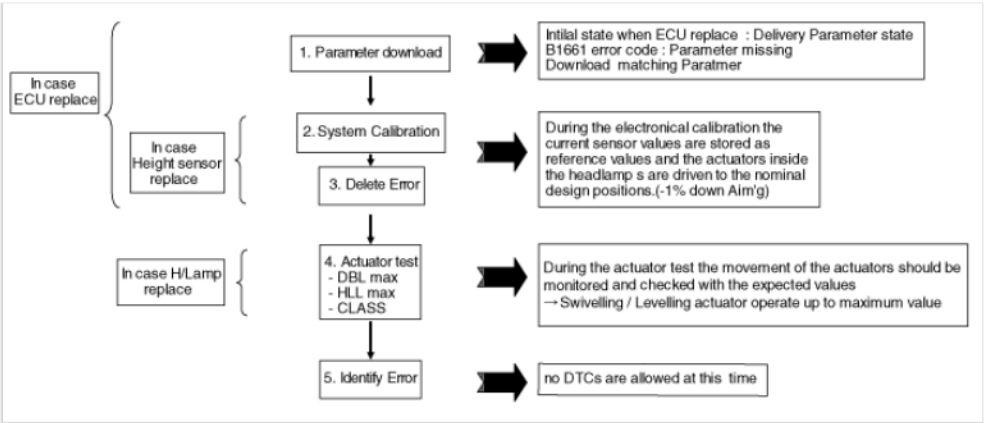
Part		Content			Fail-safe Reaction	Tell-tale Result
ECU		ECU Hardware (A/D Converter fail)			1) Levelling : staying in current POS 2) Swivelling : staying in current POS	-
		ECU Software (EEPROM/ROM fail)			1) Levelling : staying in current POS 2) Swivelling : staying in current POS	
		Control Unit not initialized Calibration not performed			1) Levelling : drive to error POS (H-15) 2) Swivelling : drive to error POS (0°)	
Levelling module fault	Right	Short circuit			1) Right Levelling : staying in current POS 2) Left Levelling : normal operation 3) Swivelling : Normal operation	-
		Over temperature				
		LIN communication error			1) Right Levelling: staying in current POS(Before), drive to error POS 2) Left Levelling: normal operation 3) Swivelling : normal operation	
	Left	Short circuit			1) Left Levelling : staying in current POS 2) Right Levelling : normal operation 3) Swivelling : Normal operation	-
		Over temperature				
		LIN communication error			1) Right Levelling: normal operation 2) Left Levelling: staying in current POS(Before), drive to error POS 3) Swivelling : normal operation	
Swivelling module fault	Right	Short circuit			1) Right Swivelling : staying in current POS 2) Left Swivelling : drive to error POS 3) Right Levelling : drive to error POS 4) Left Levelling : Normal operation	Tell-tale
		Over temperature				
		Stall detected				
		LIN coummunication	LIN fault	Before	1) Swivelling : staying in current POS 2) Lefvelling : drive to error POS	
				After	1) Swivelling : drive to error POS 2) Lefvelling : drive to error POS	
			DBL supply fault	Before	1) Swivelling : staying in current POS 2) Lefvelling : drive to error POS	
				After	1) Right Swivelling : staying in current POS 2) Left Swivelling : drive to error POS 3) Lefvelling : drive to error POS	
	Left	Short circuit			1) Left Swivelling : staying in current POS 2) Right Swivelling : drive to error POS 3) Left Levelling : drive to error POS 4) Right Levelling : Normal operation	Tell-tale
		Over temperature				
		Stall detected				
		LIN coummunication	LIN fault	Before	1) Swivelling : staying in current POS 2) Lefvelling : drive to error POS	
				After	1) Swivelling : drive to error POS 2) Lefvelling : drive to error POS	
			DBL supply fault	Before	1) Swivelling : staying in current POS 2) Lefvelling : drive to error POS	
				After	1) Left Swivelling : staying in current POS 2) Right Swivelling : drive to error POS 3) Lefvelling : drive to error POS	
AXLE sensor	Front & Rear	external(5V) Sensor power supply fault (short to ground or to Bat)			1) Levelling : drive to error POS 2) Swivelling : Normal operation	-
	Front	FREQ_LOWER , FREQ_UPPER			1) Levelling : drive to error POS 2) Swivelling : Normal operation	
		Signal line open circuit			1) Levelling : drive to error POS 2) Swivelling : Normal operation	
		Signal line short circuit				
		Front sensor out of range				
		FREQ_LOWER , FREQ_UPPER			1) Levelling : drive to error POS 2) Swivelling : Normal operation	

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	Front sensor out of range	Signal line open circuit Signal line short circuit Front sensor out of range		1) Levelling : drive to error POS 2) Swivelling : Normal operation	
Battery		battery voltage too high		1) Levelling: staying in current POS(Before), drive to error POS 2) Swivelling : staying in current POS(Before), drive to error POS	-
		battery voltage too low		1) Levelling: staying in current POS(Before), drive to error POS 2) Swivelling : staying in current POS(Before), drive to error POS	
LIN physical fault		Short circuit to battery or GND (physical fault)	Before	1) Levelling : staying in current POS 2) Swivelling : staying in current POS	Tell-tale
			After	1) Levelling : drive to error POS 2) Swivelling : drive to error POS	
CAN communication fault	Speed signal fault	speed signal invalid supplying ECU not available on CAN		1) Levelling : Medium dynamic mode 2) Swivelling : drive to error POS	-
	Steering angle signal fault	Steering wheel sensor not O.K (signal invalid) supplying ECU not available on CAN		1) Levelling : normal operation 2) Swivelling : drive to error POS	-
	Gearbox signal fault	Reverse gear signal invalid supplying ECU not available on CAN		1) Levelling : normal operation 2) Swivelling : drive to error POS	-
	Accelator pedal signal fault	Accelator pedal signal invalid supplying ECU not available on CAN		1) Levelling : Medium dynamic mode 2) Swivelling : Normal operation	-
	Engine state signal fault	Engine state signal invalid supplying ECU not available on CAN		1) Levelling : Normal operation, no operation(Before) 2) Swivelling : Normal operation, no operation(Before)	-
	Yaw rate signal fault	Yaw rate signal invalid supplying ECU not available on CAN		1) Levelling : Normal no operation(Before) 2) Swivelling : Reduced performance	-
	Brake pedal signal fault	Brake signal invalid supplying ECU not available on CAN		1) Levelling : Medium dynamic mode 2) Swivelling : Normal operation	-
	CAN 'Bus off' fault	ECU is isolated from the CAN network	Air suspension	1) Swivelling : drive to error POS 2) Levelling : drive to error POS	-
			Steel suspension	1) Swivelling : drive to error POS 2) Levelling : slow dynamic mode	
	Lamp unction Signal Fault	Supplying ECU not available on CAN		1) Levelling : Normal operation 2) Swivelling : Normal operation	-

AFLS Setting Procedure

When it replace AFLS ECU or H/Lamp Unit or Height sensor, it operates in setting procedure by using Diagnostic equipment following belows.
When AFLS setting procedure operate, necessarily confirm suspension type and then download parameter.



※ DTC : Diagnostic Trouble Code
DBL : Dynamic bending Light
HLL : Head Lamp Leveling

Vehicle Condition While AFLS Setting

1. Vehicle on an even surface
2. No vehicle movement
3. Gear position in P & N
4. Ignition switched on & Engine RPM >500RPM
5. Diagnostic equipment connected
6. ALL ECUs on CAN mounted and activated
7. Battery voltage > 10.5 V (ECU supply to be ensured)

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8. Light switched
9. AFLS ON or OFF

Action In Case Of Download Wrong Parameter

1. Download Delivery Parameter
2. Check up B1661(Parameter missing)
3. Ignition OFF
4. Ignition ON & Engine RPM > 500RPM
5. Download matching Paratmer

Body Electrical System

Description

AFLS Unit(ECU)

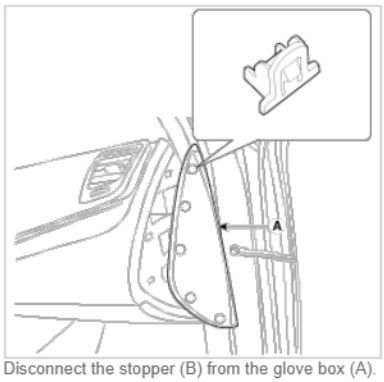
AFLS located in Cockpit Module is provided information of vehicle (steering wheel signal,vehicle speed, inclination of vehicle).
Based on provided information , it calculates algorithm and adjust Low beam of H/Lamp.
It transmits driving information by using LIN protocol, it is operated in Fail-safe reaction mode In case system failure occurred.

Body Electrical System

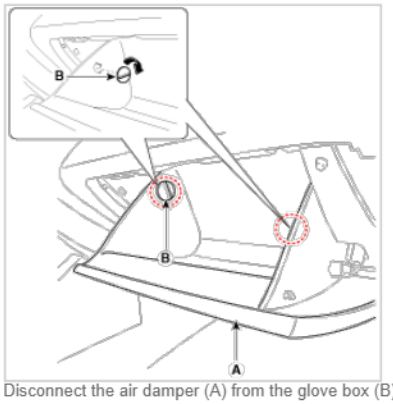
Removal

1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, remove the crash pad side cover (A).

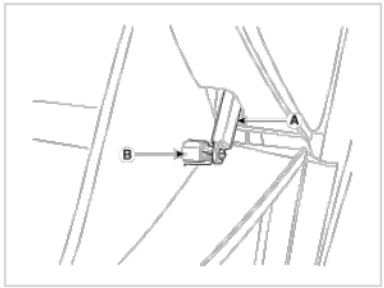
[RH]



3. Disconnect the stopper (B) from the glove box (A).

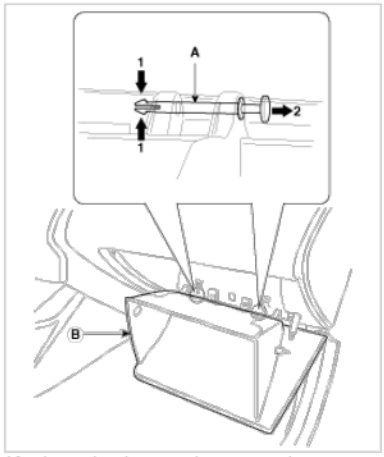


4. Disconnect the air damper (A) from the glove box (B).

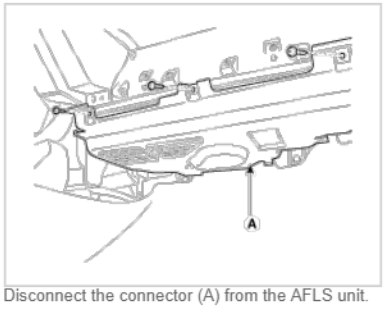


5. Disconnect the pins (A) and then remove the glove box (B).

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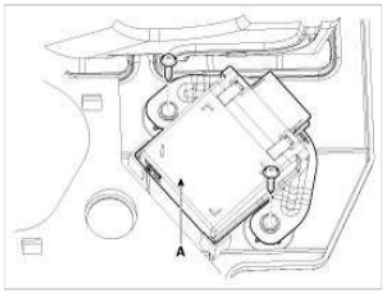
6. After loosening the mounting screws, then remove the crash pad under cover [RH] (A).



7. Disconnect the connector (A) from the AFLS unit.



8. Remove the AFLS unit (A), after loosening the mounting screws.



Installation

1. Install the AFLS unit.
2. Install the crash pad under cover and glove box.
3. Connect the negative (-) battery terminal.

Body Electrical System

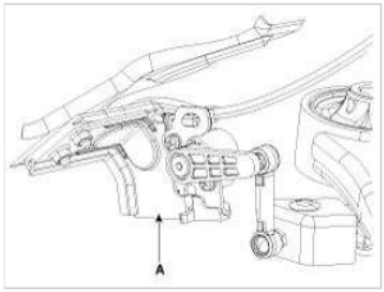
Removal

Height Sensor

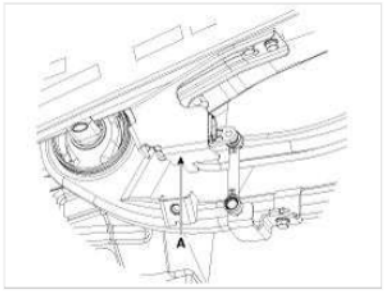
1. Disconnect the negative (-) battery terminal.
2. Remove the height sensor linkage (A) installed on the front axle and rear axle.

[Front]

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[Rear]



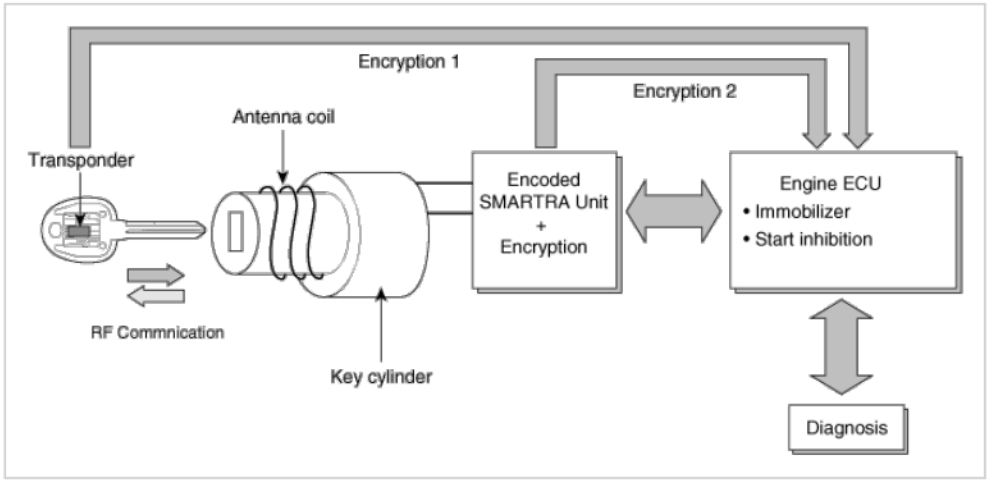
Installation

Height Sensor

1. Install the height sensor assembly after connecting the connector.

Body Electrical System

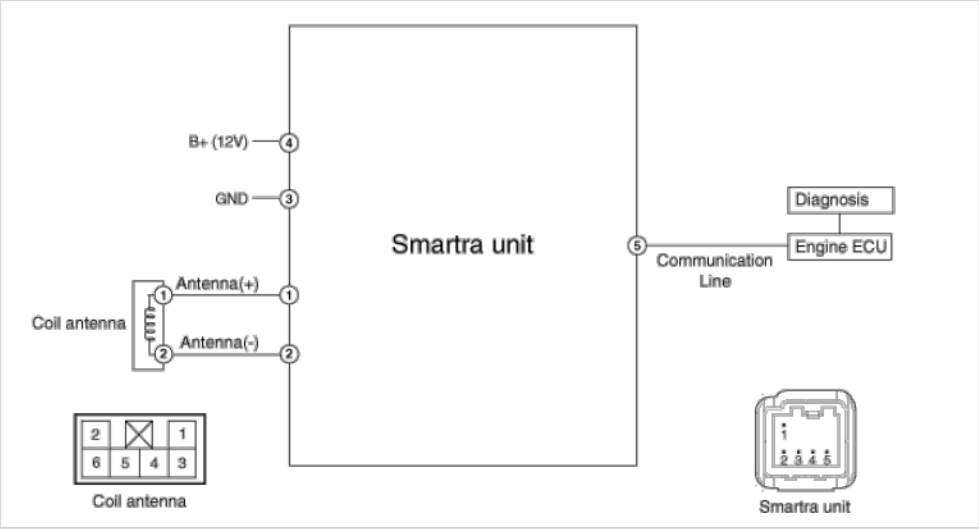
Components



Body Electrical System

Circuit Diaram

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Description

The immobilizer system will disable the vehicle unless the proper ignition key is used, in addition to the currently available anti-theft systems such as car alarms, the immobilizer system aims to drastically reduce the rate of auto theft.

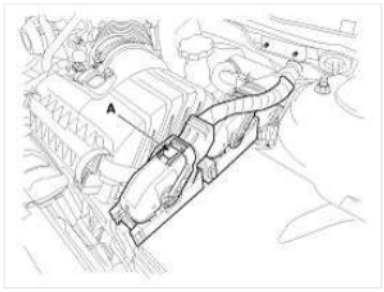
1. Encrypted SMARTRA type immobilizer
   - A. The SMARTRA system consists of a passive challenge - response (mutual authentication)transponder located in the ignition key, an antenna coil, a encoded SMARTRA unit, an indicator light and the PCM(ECM).
   - B. The SMARTRA communicates to the PCM(ECM) (Engine Control Module) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the SMARTRA.
   - C. When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the SMARTRA unit to the PCM(ECM).
   - D. If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the cluster will simultaneously come on for more than five seconds, indicating that the SMARTRA unit has recognized the code sent by the transponder.
   - E. If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue blinking for about five seconds until the ignition switch is turned OFF.
   - F. If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the GDS equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
   - G. The immobilizer system can store up to eight key codes.
   - H. If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.

Components Operations

PCM (Power Train Control Module)

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

[3.3 gasoline]



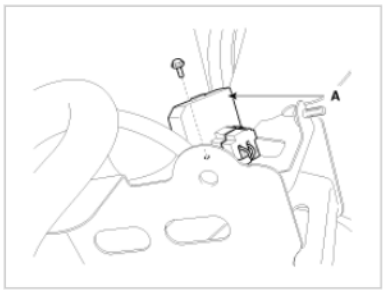
ENCRYPTED SMARTRA unit (A)

The SMARTRA carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The SMARTRA is mounted behind of the crash pad close to center cross bar.

The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the SMARTRA device. And, the received messages from the PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna.

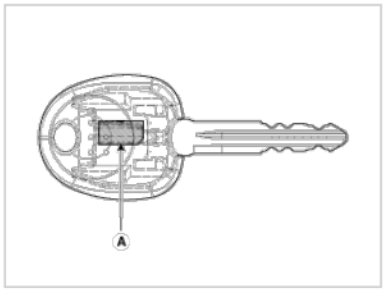
The SMARTRA does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the PCM(ECM) and vice versa.

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TRANSPONDER (Built-in keys)

The transponder (A) has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.

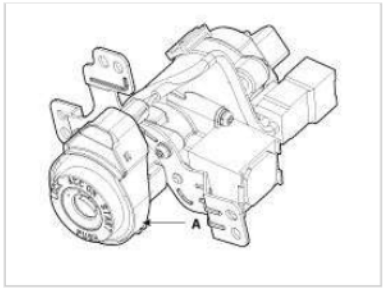


Antenna coil

The antenna coil (A) has the following functions.

- The antenna coil supplies energy to the transponder.
- The antenna coil receives signal from the transponder.
- The antenna coil sends transponder signal to the SMARTRA.

It is located directly in front of the steering handle lock.



Teaching Procedures

1. Key Teaching Procedure

Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehicle owner.

The procedure starts with an PCM(ECM) request for vehicle specific data (PIN code: 6digits) from the tester. The "virgin" PCM(ECM) stores the vehicle specific data and the key teaching can be started. The "learnt" PCM(ECM) compares the vehicle specific data from the tester with the stored data. If the data are correct, the teaching can proceed.

If incorrect vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the request of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation. After reconnecting the battery, the timer starts again for one hour.

The key teaching is done by ignition on with the key and additional tester commands. The PCM(ECM) stores the relevant data in the EEPROM and in the transponder. Then the PCM(ECM) runs the authentication required for confirmation of the teaching process. The successful programming is then confirmed by a message to the tester.

If the key is already known to the PCM(ECM) from a previous teaching, the authentication will be accepted and the EEPROM data are updated. There is no changed transponder content (this is impossible for a learnt transponder).

The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognized by the PCM(ECM). This rejects the key and a message is sent to the tester.

The PCM(ECM) rejects invalid keys, which are presented for teaching. A message is sent to the tester. The key can be invalid due to faults in the transponder or other reasons, which result from unsuccessful programming of data. If the PCM(ECM) detects different authenticators of a transponder and an PCM(ECM), the key is considered to be invalid.

The maximum number of taught keys is 8

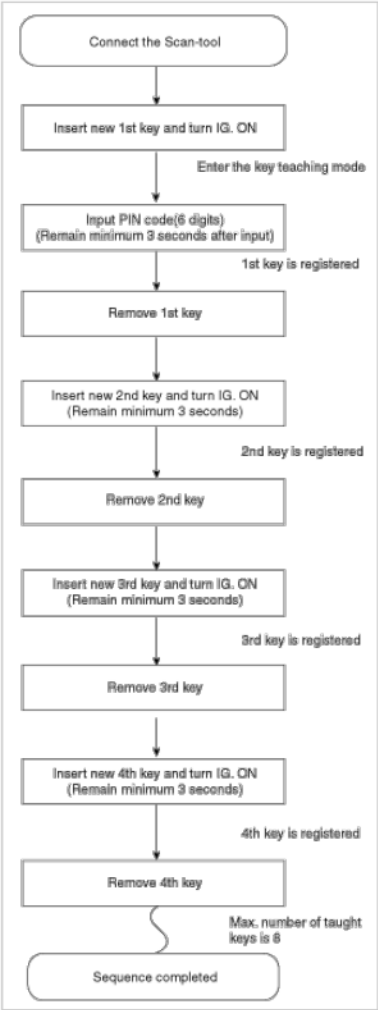
If an error occurs during the Immobilizer Service Menu, the PCM(ECM) status remains unchanged and a specific fault code is stored.

If the PCM(ECM) status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at PCM(ECM).

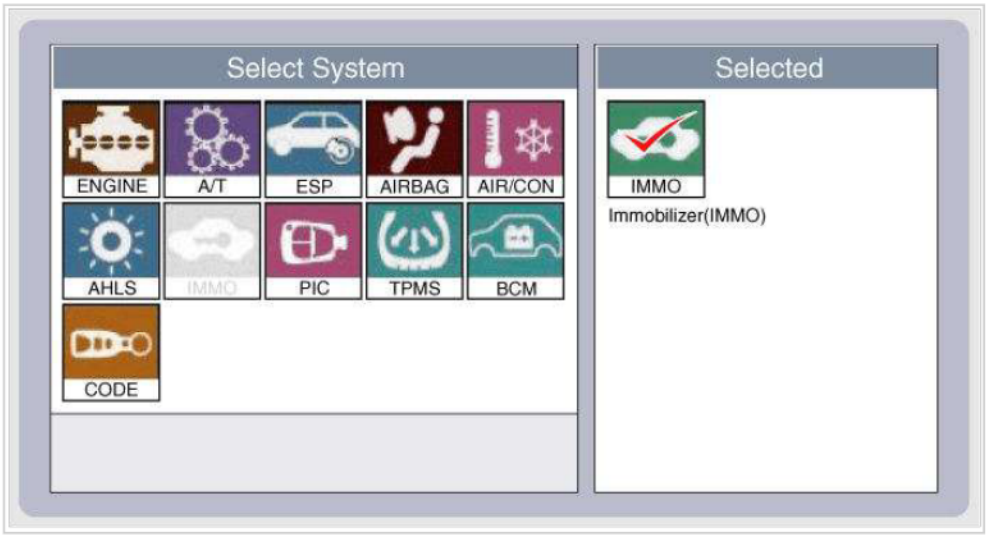
NOTICE

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

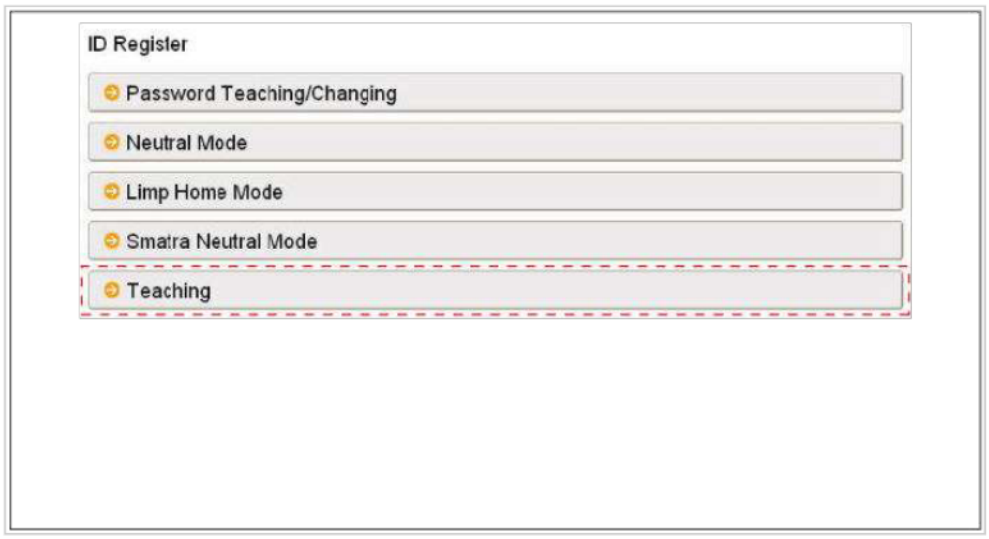
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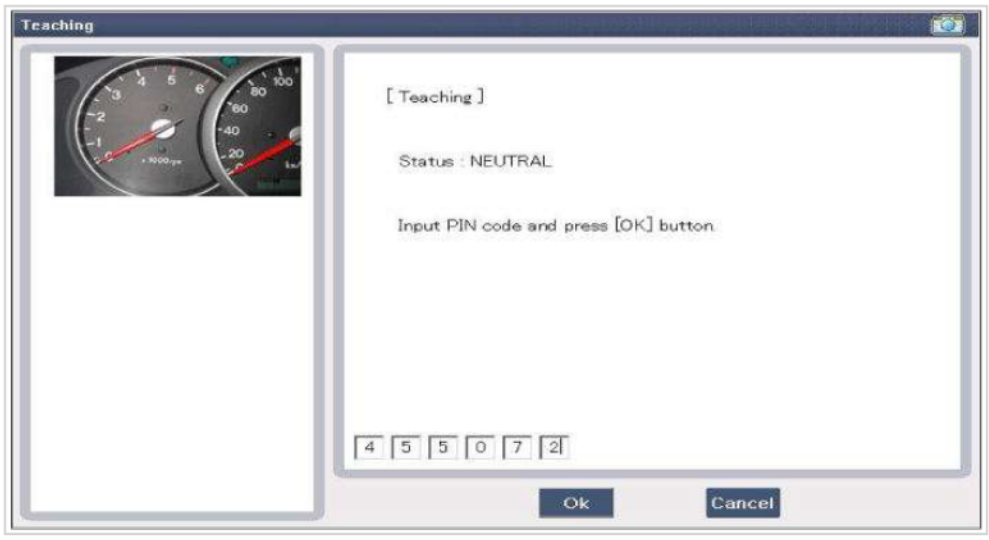


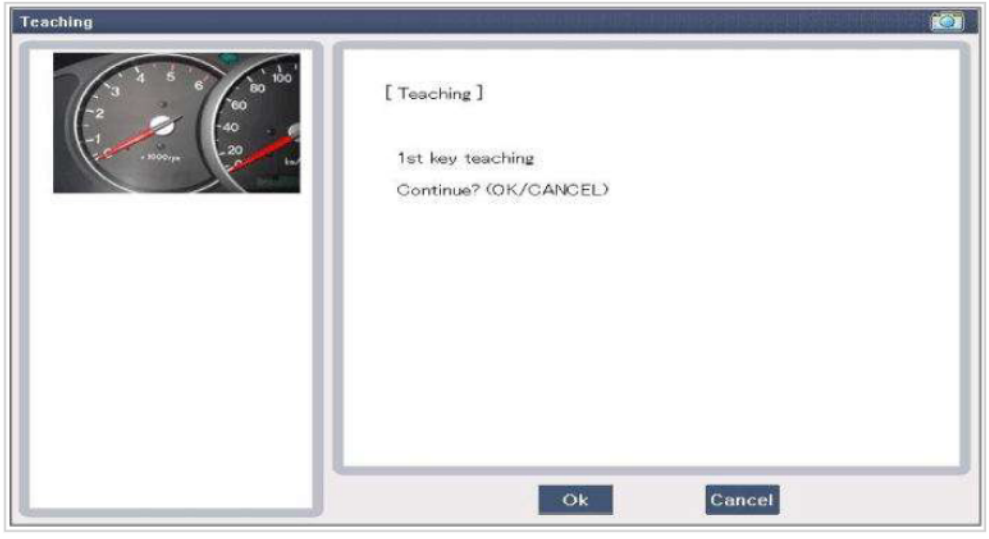
(1) PCM(ECM) learnt status.



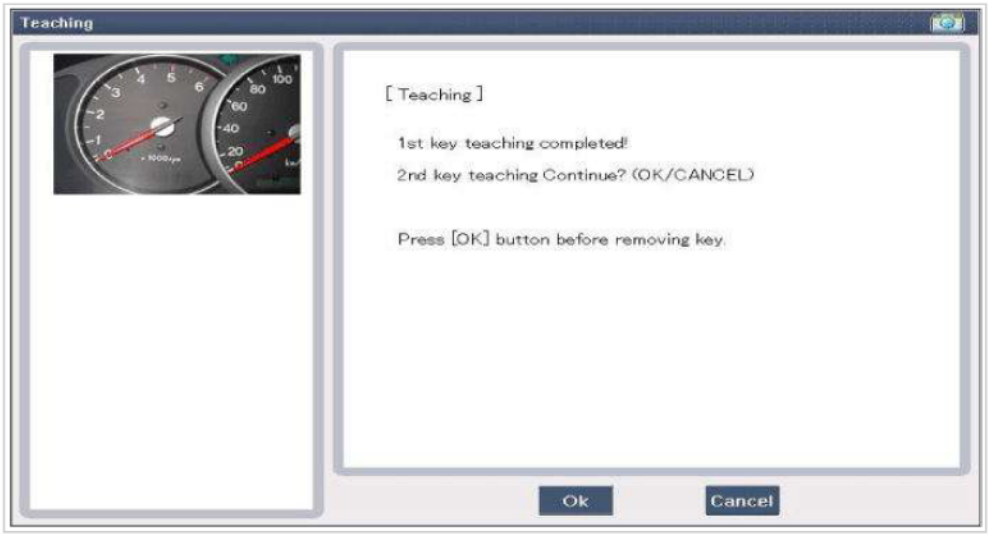
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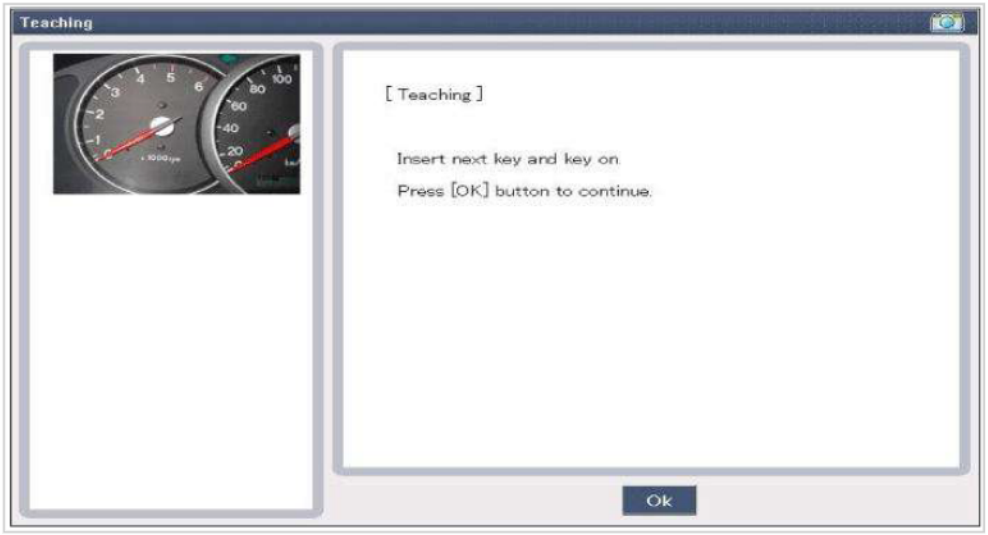


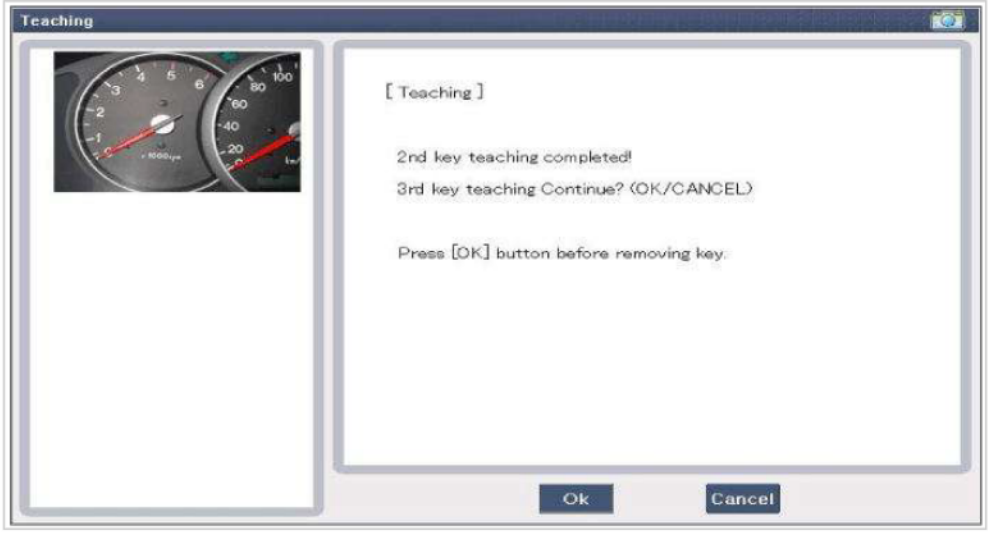




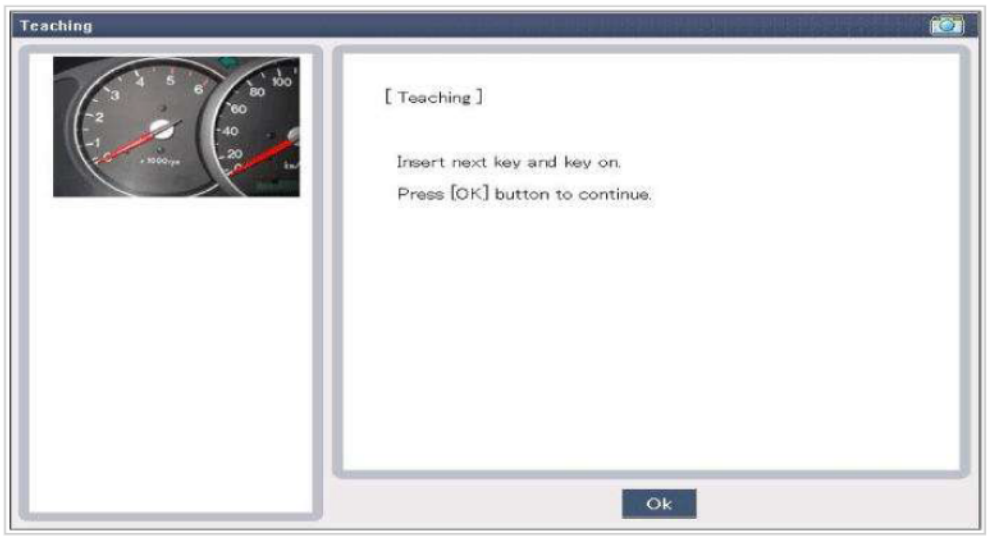
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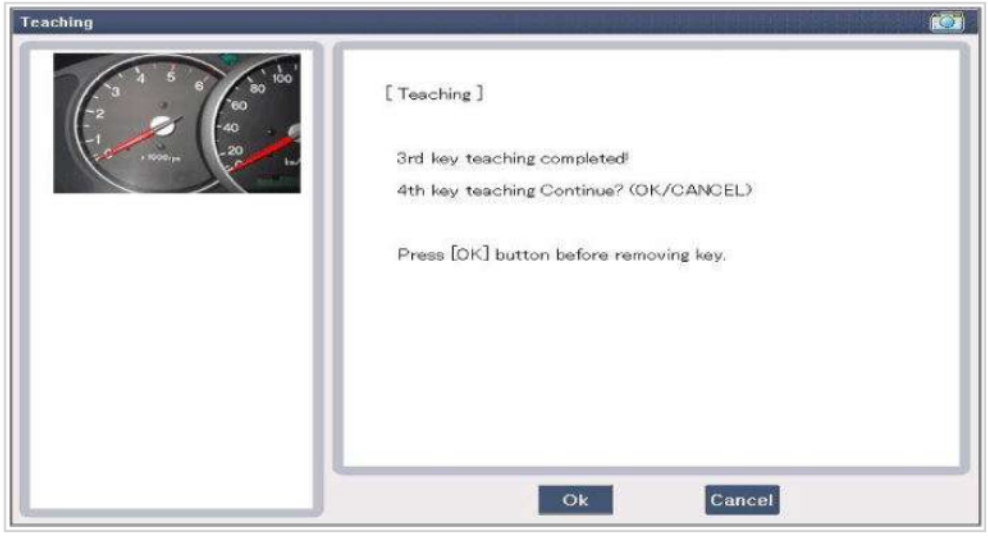


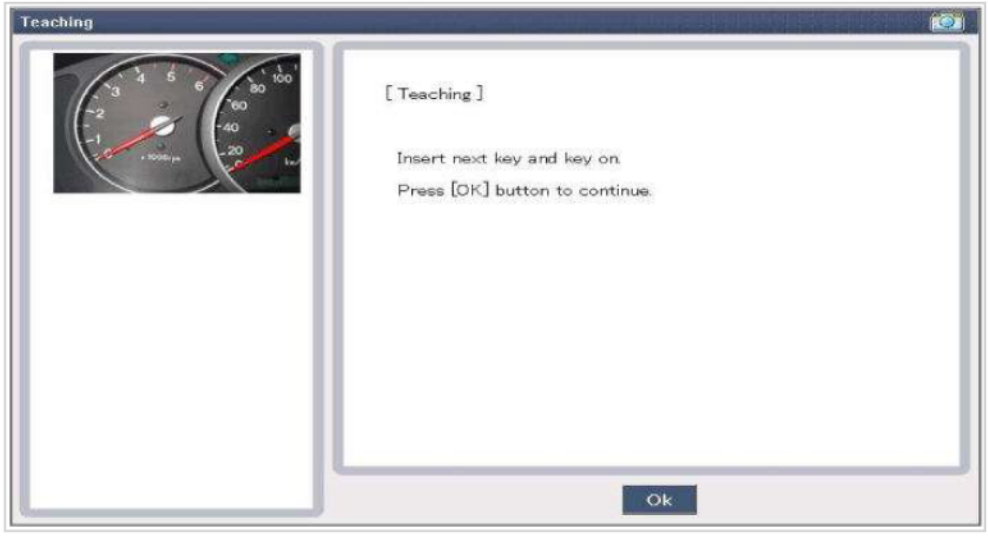




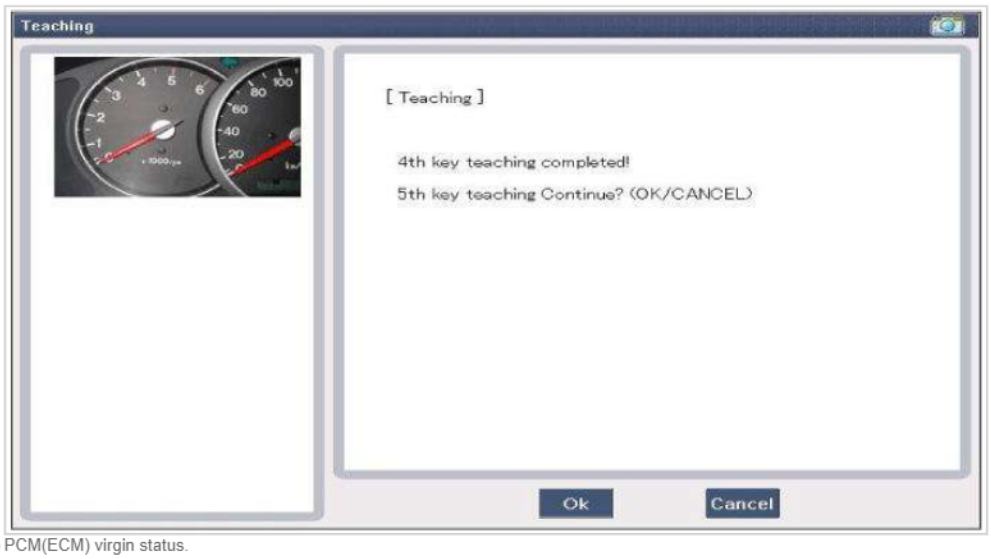
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(2) PCM(ECM) virgin status.

After replacing new "PCM(ECM)" GDS displays that PCM(ECM) is virgin status in Key Teaching mode.

"VIRGIN" status means that PCM(ECM) has not matched any PIN code before.

2. User Password Teaching Procedure

The user password for limp home is taught at the service station. The owner of the vehicle can select a number with four digits.

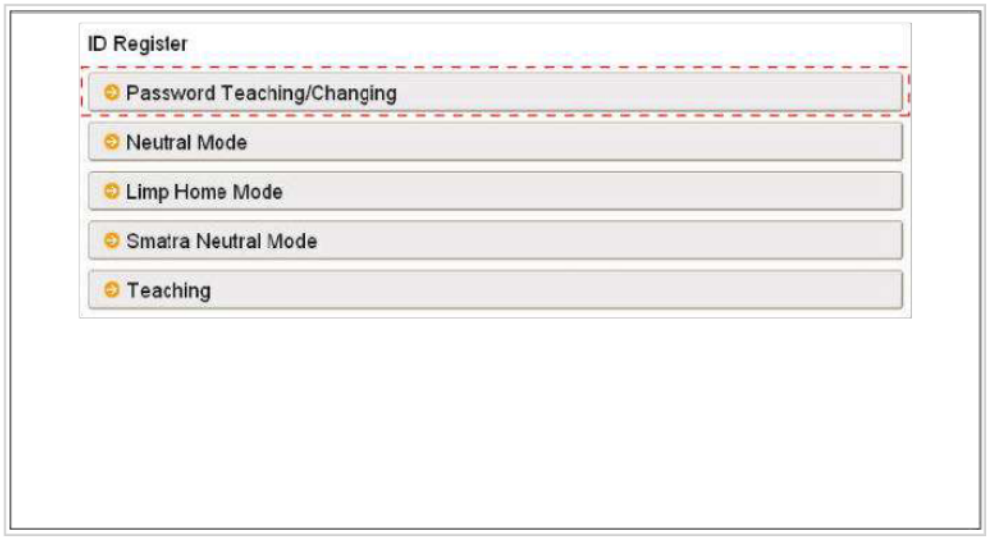
The user password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to an PCM(ECM), the status of the password is "virgin" No limp home function is possible.

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

The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the PCM(ECM) requests the new user password. The status remains "learnt" and the new user password will be valid for the next limp home mode.

If wrong user passwords or wrong vehicle specific data have been sent to the PCM(ECM) three times continuously or intermittently, the PCM(ECM) will reject the request to change the password for one hour. This time cannot be reduced by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hour.

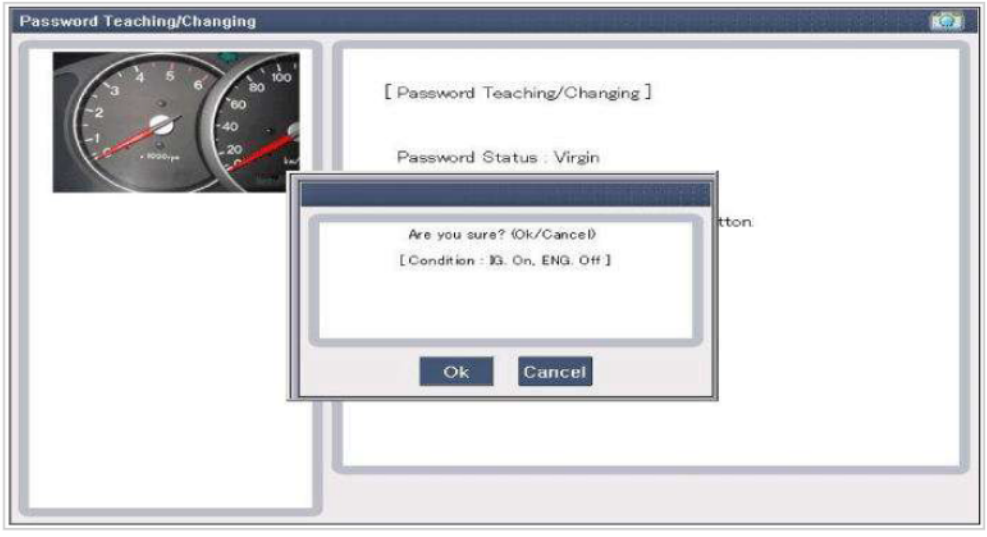
(1) User password teaching



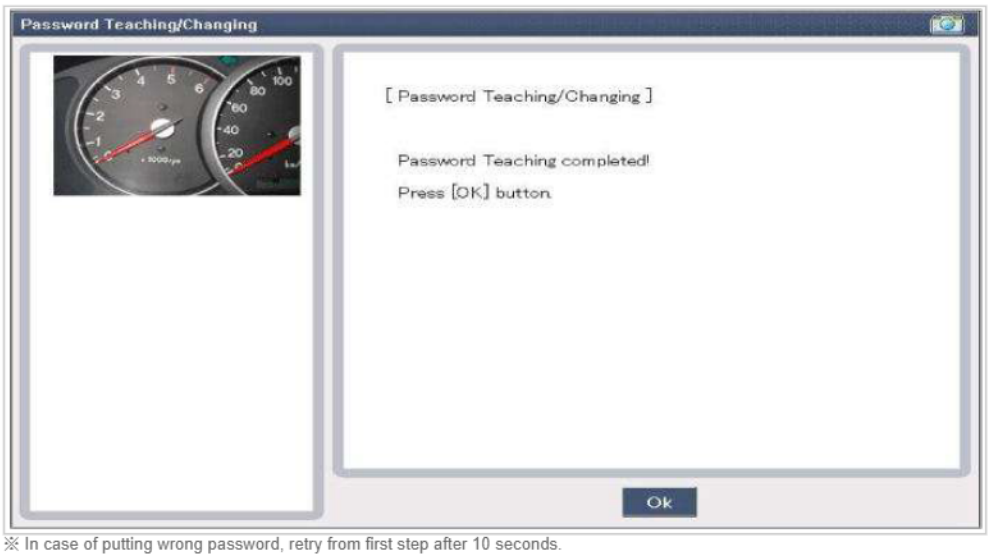
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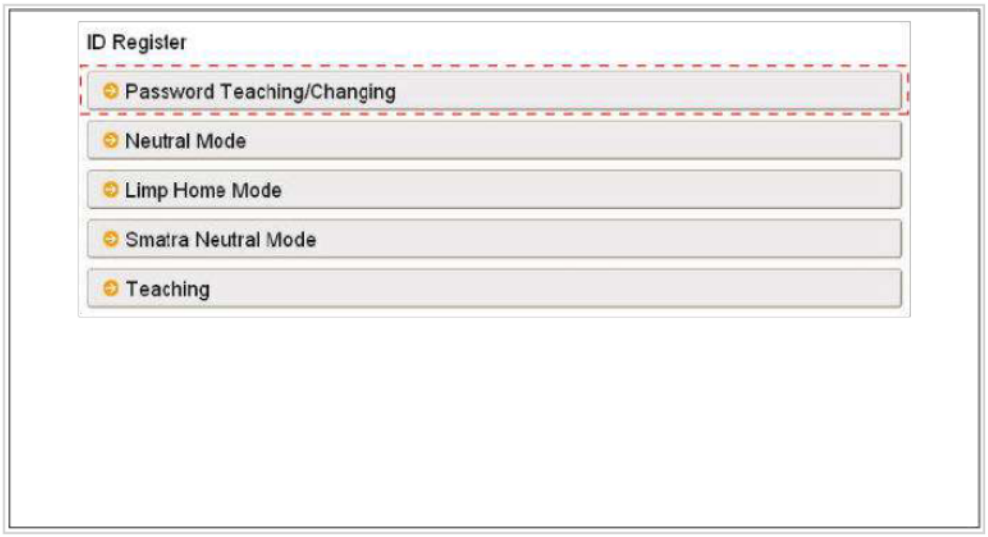


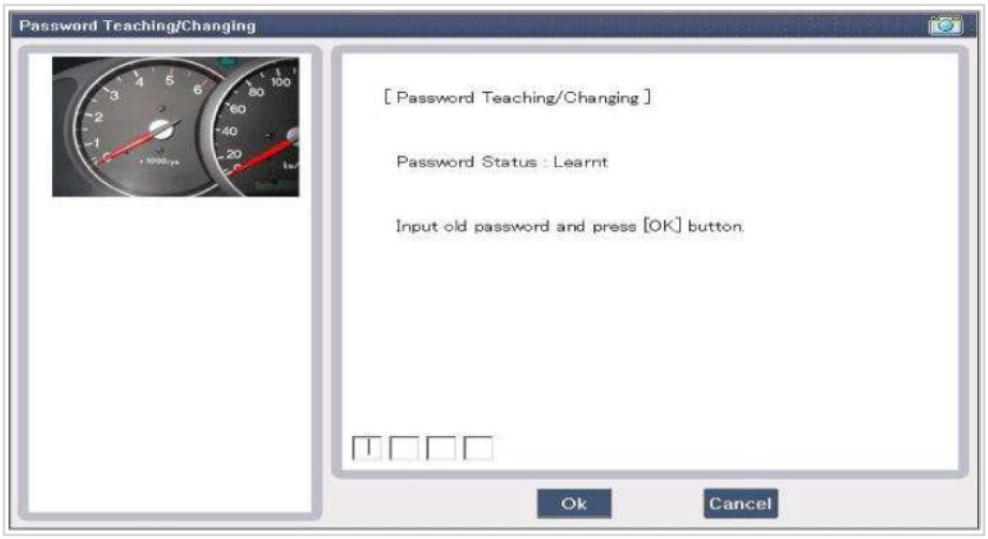
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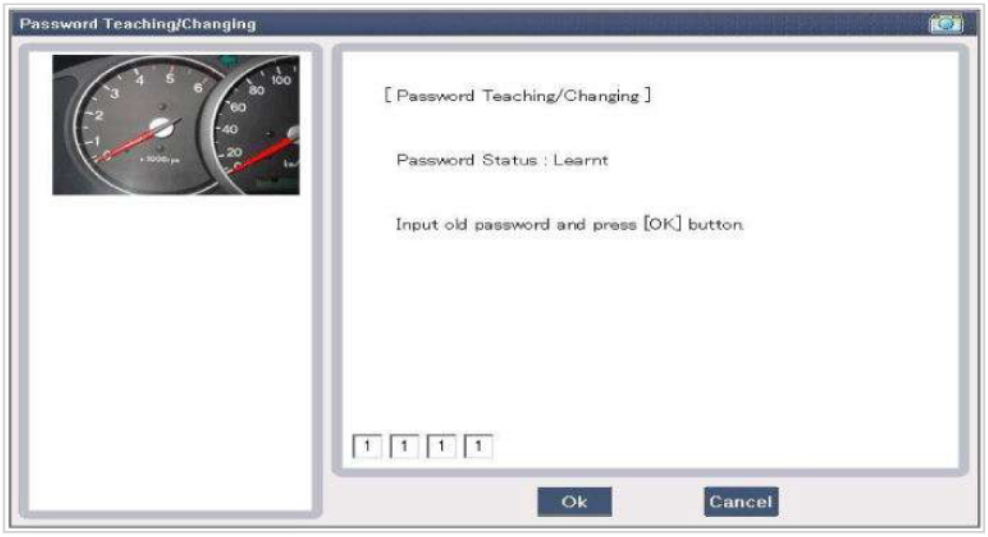
※ In case of putting wrong password, retry from first step after 10 seconds.

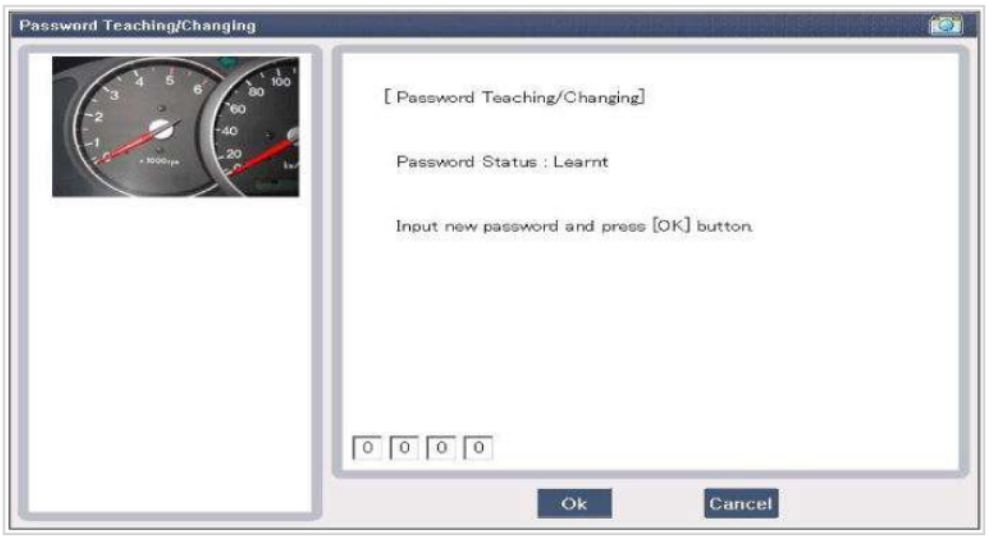
(2) User password changing

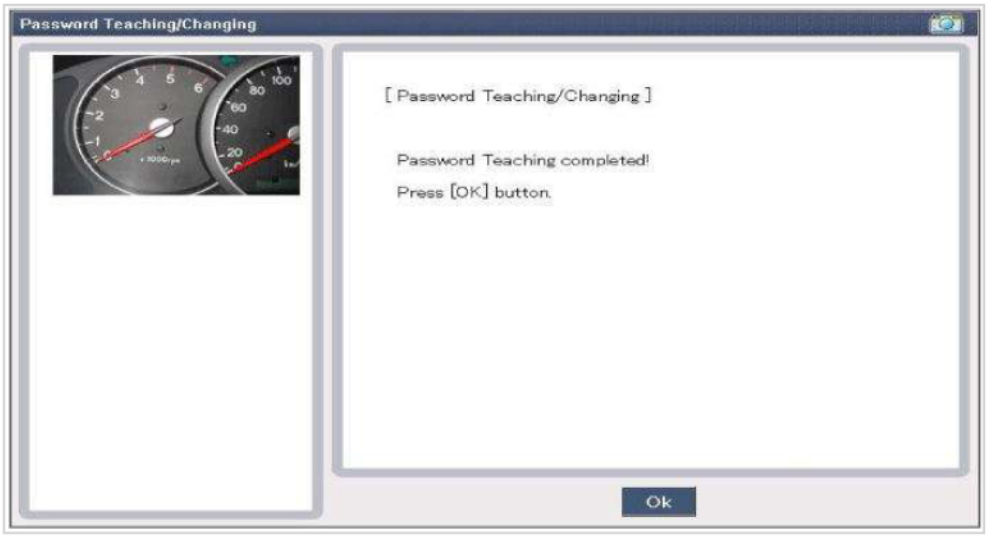




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Limp Home Function

1. Limp Home By Tester

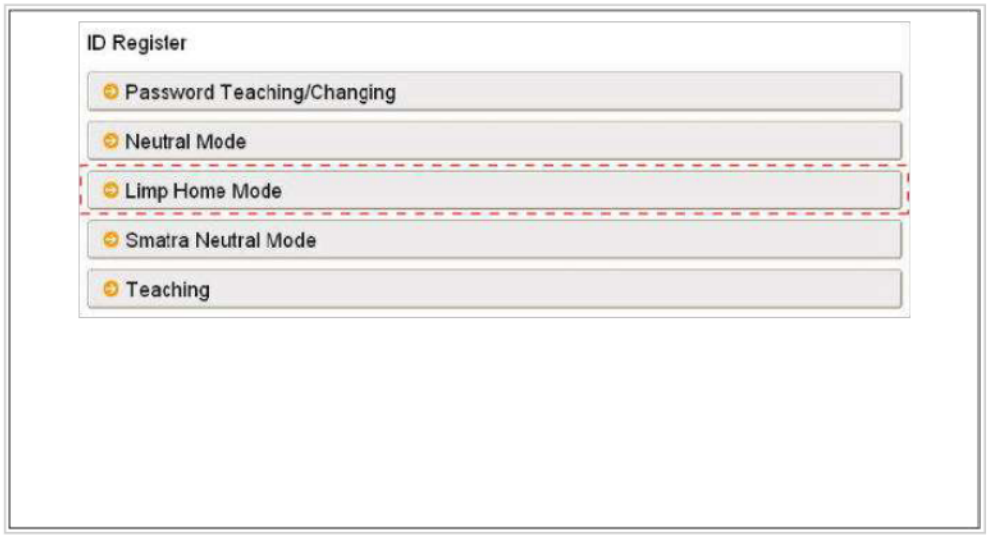
   If the PCM(ECM) detects the fault of the SMARTRA or transponder, the PCM(ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service station.

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

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

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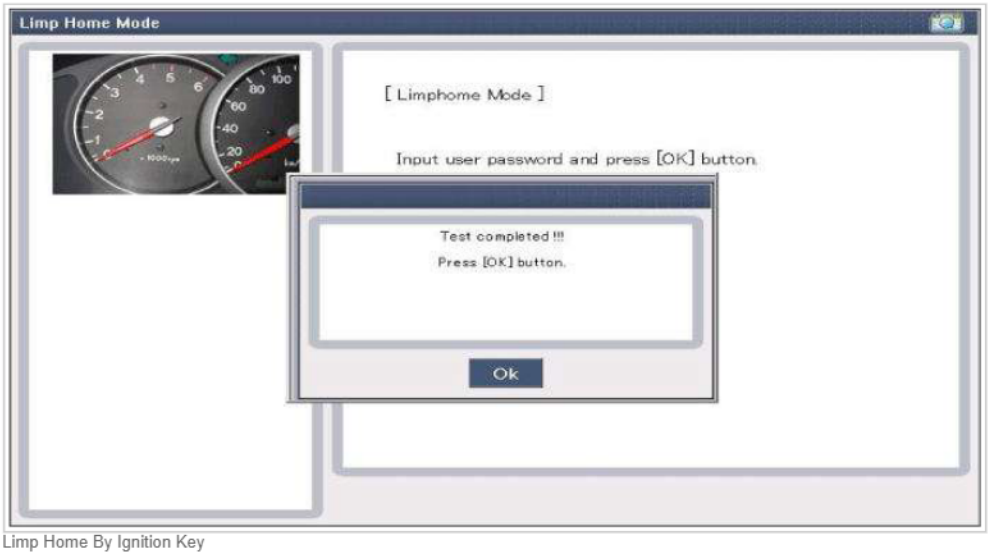
If the wrong user password is sent, the PCM(ECM) will reject the request of limp home for one hour. Disconnecting the battery or any other action cannot reduce this time. After connecting the battery to the PCM(ECM), the timer starts again for one hour.







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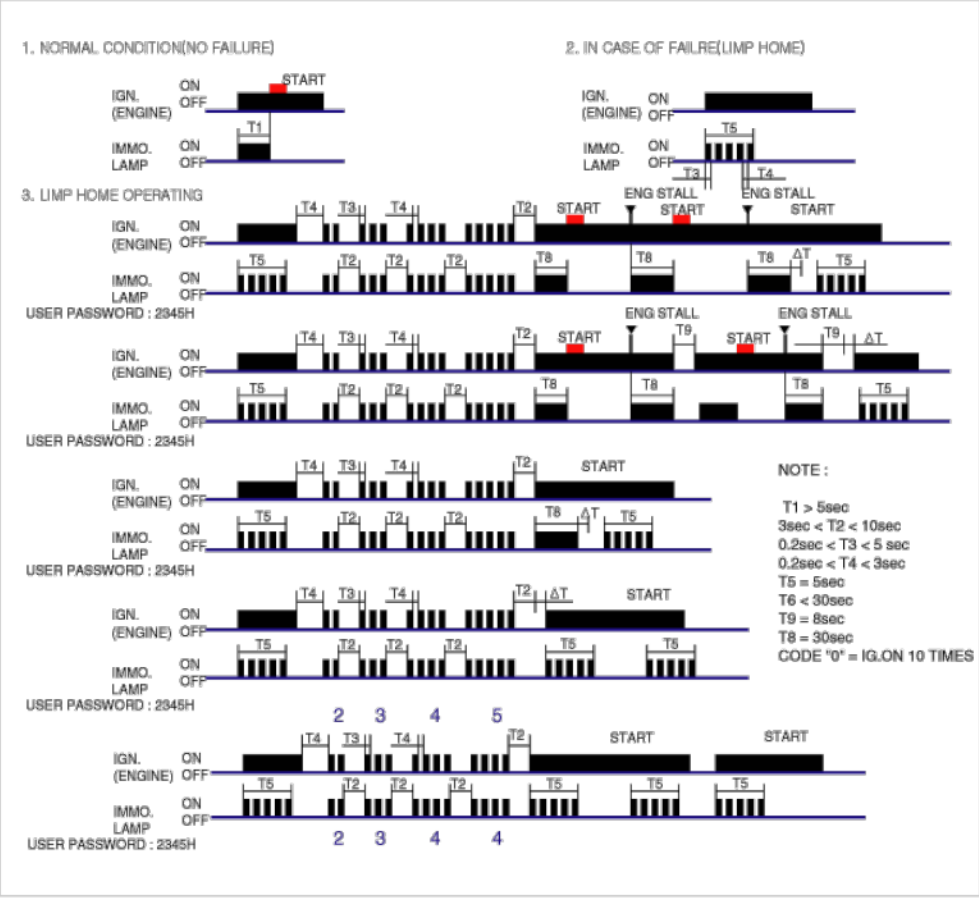
2. Limp Home By Ignition Key

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

Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM(ECM) will be unlocked for a period of time (30 sec.).

The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again.

After ignition off, the PCM(ECM) is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.



Replacement

Problems And Replacement Parts:

Problem	Part set	GDS required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

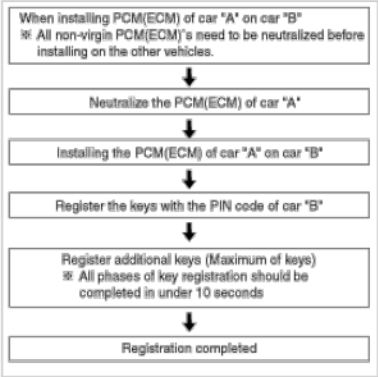
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Replacement Of Ecm And Smartra

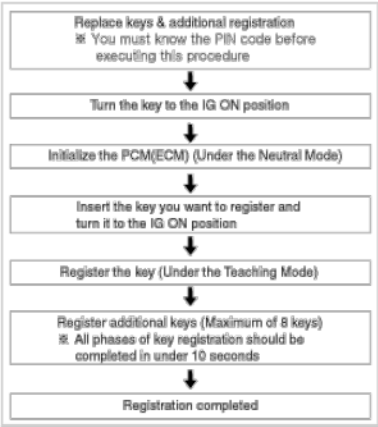
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching procedure). The vehicle specific data have to be left unchanged due to the unique programming of transponder.

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

1. Things to remember before a replacement (PCM(ECM))



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



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 PCM(ECM) can be set to the "neutral" status by a tester.

A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) is neutralized.

The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function, is accepted by the PCM(ECM).

The teaching of keys follows the procedure described for the virgin PCM(ECM). The vehicle specific data have to be unchanged due to the unique programming of the transponder. If data should be changed, new keys with a virgin transponder are requested.

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

(Refer to the Things to do when Key & PIN Code the PCM(ECM) can be set to the "neutral" status by a scanner. If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

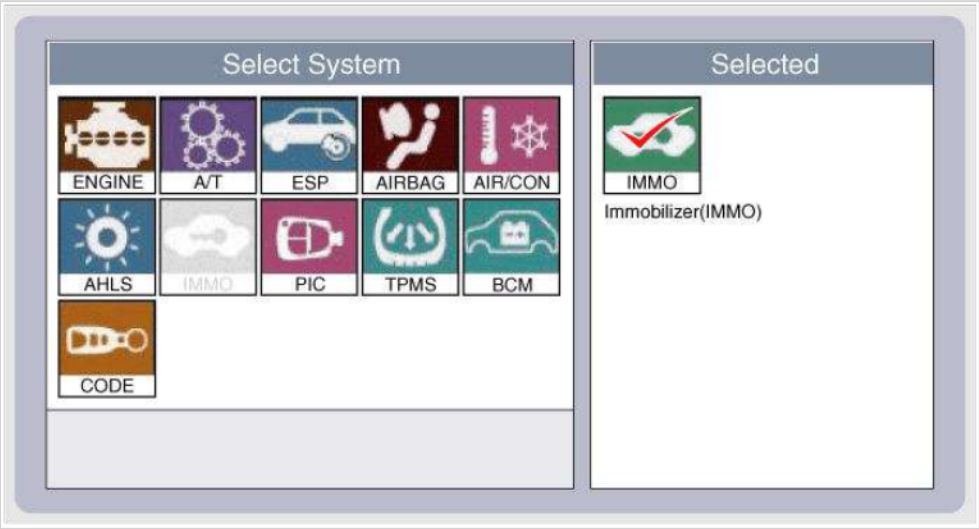
NOTICE

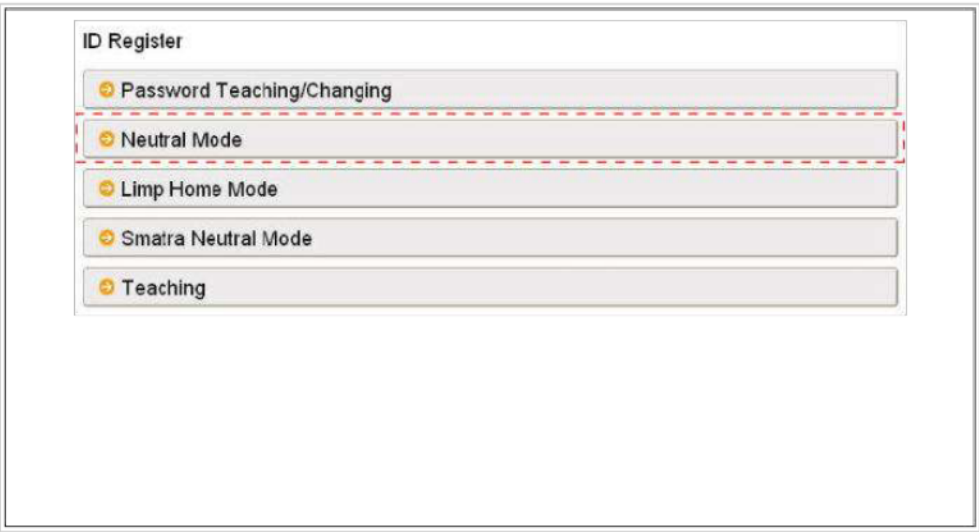
- Neutralizing setting condition
  - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)
- Neutralizing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

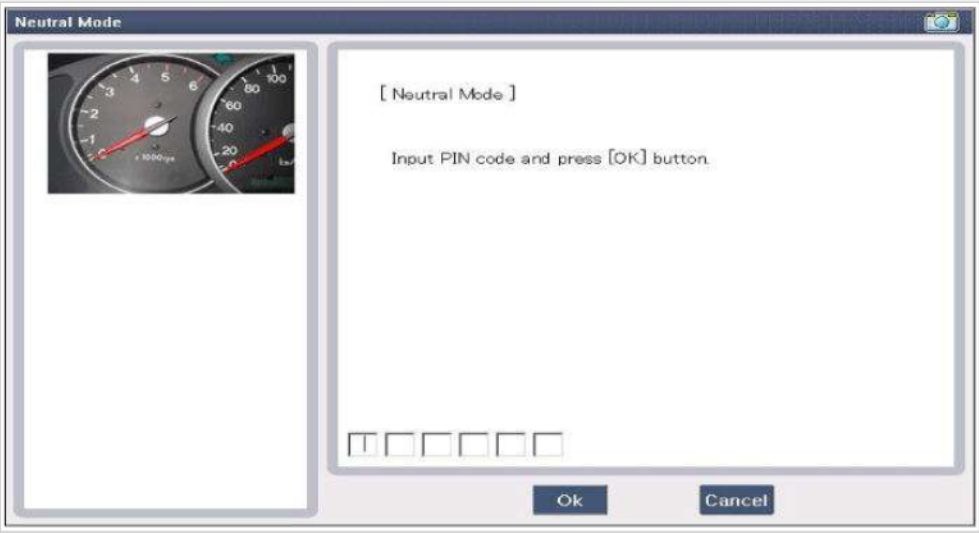
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- PIN Code(6) & User P/Word(4) deletion
- Locking of EMS(except Key Learning permission)

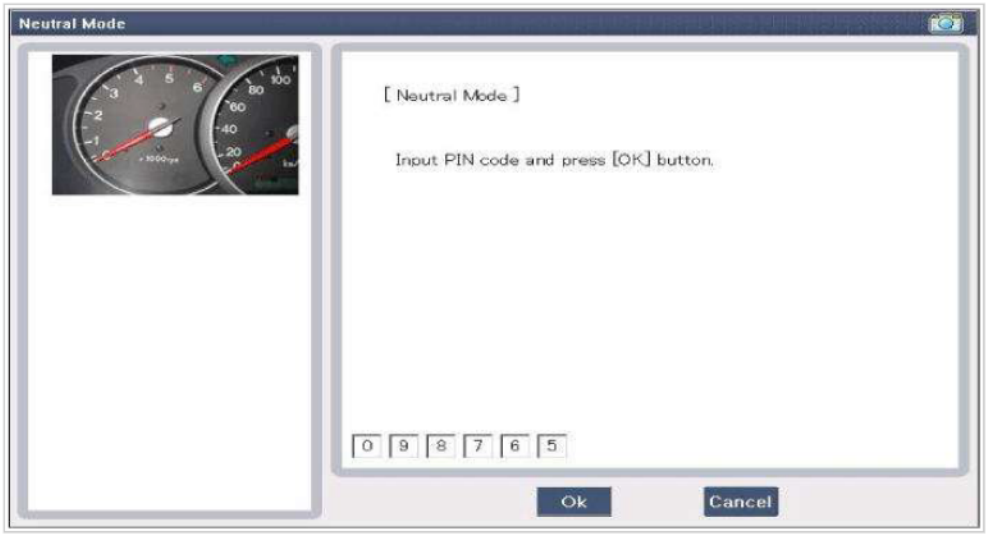
Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No

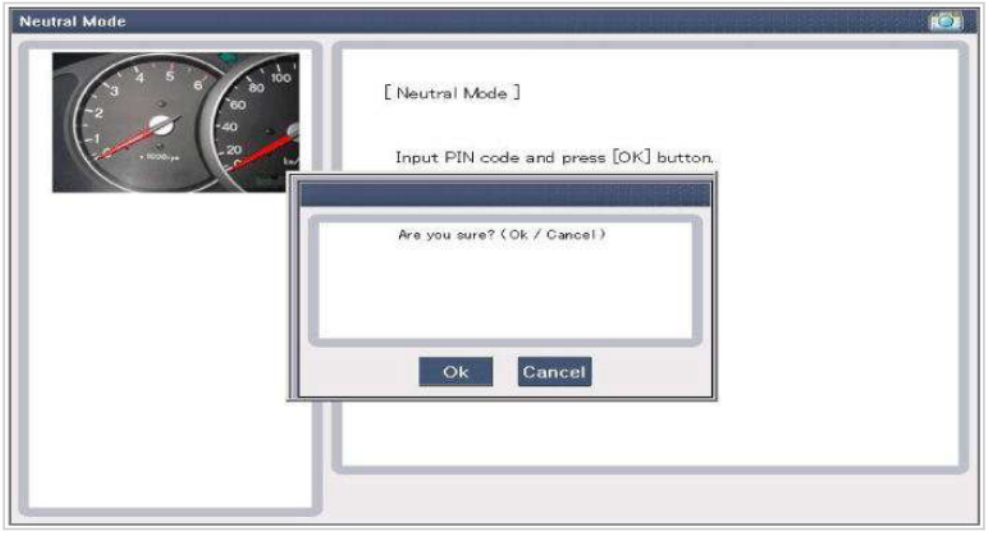






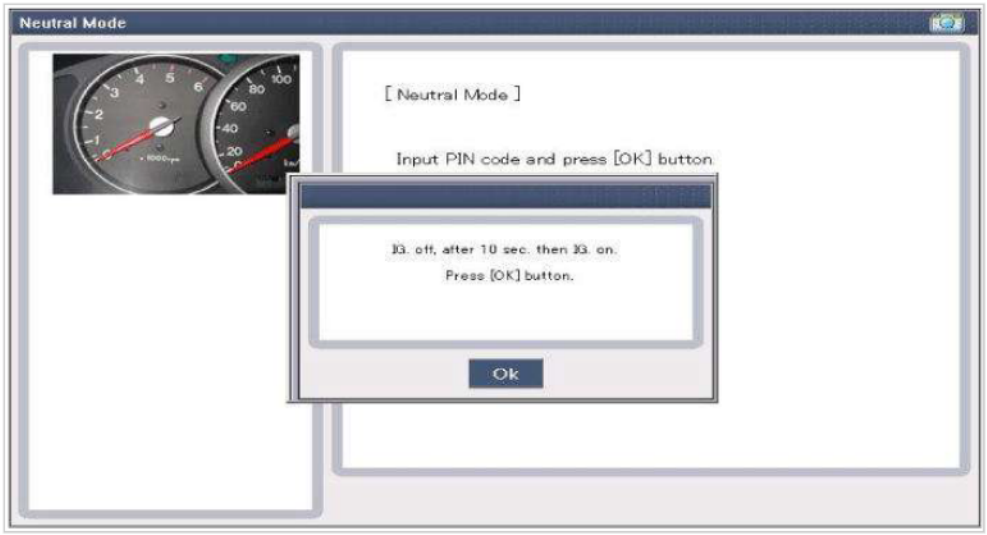
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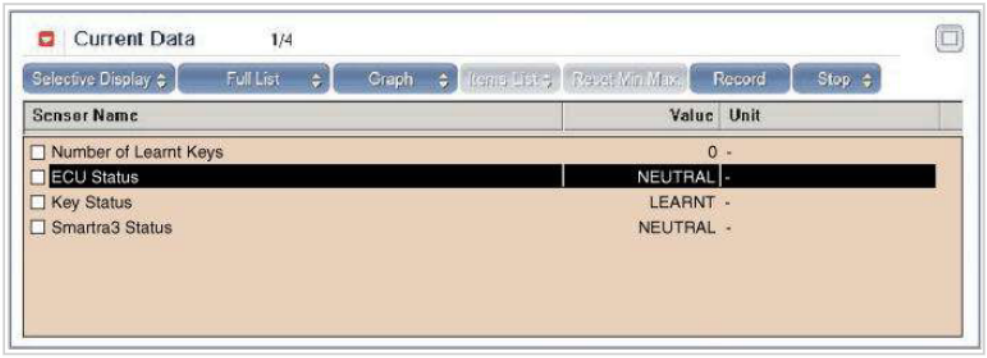






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Neutralizing Of SMARTRA

The EMS can be set to the status "neutral" by tester

Ignition key (regardless of key status) is inserted and after IGN ON. If receiving the correct vehicle password from GST, SMARTRA can be neutralized. The neutralization of SMARTRA is possible if DPN is same as the value inputted by GST.

In case that the SMARTRA status is neutral, the EMS keeps the lock state. And the start is not possible by "twice ignition".

In case of changing the vehicle password, new virgin transponder must be only used. And in case of virgin key, after Learning the key of vehicle password, it can be used.

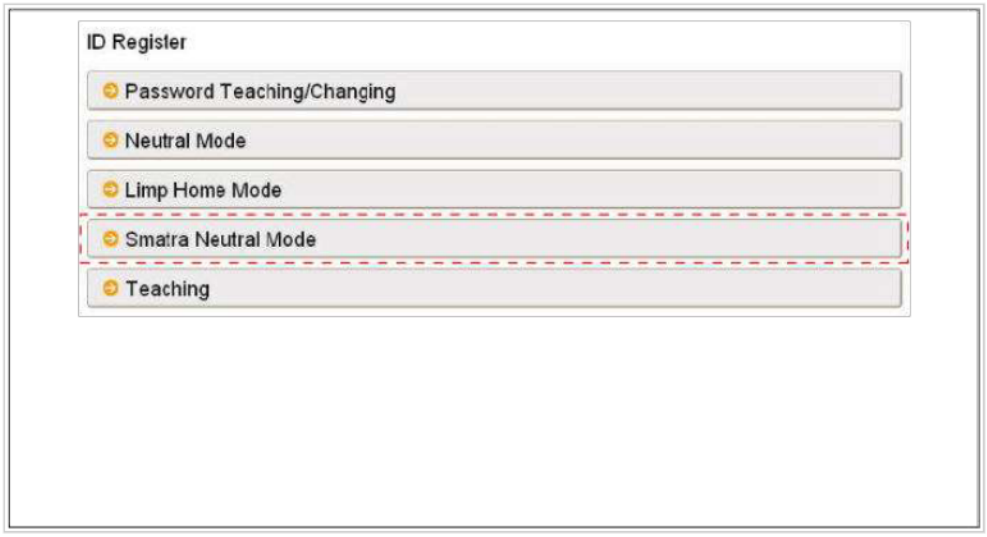
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

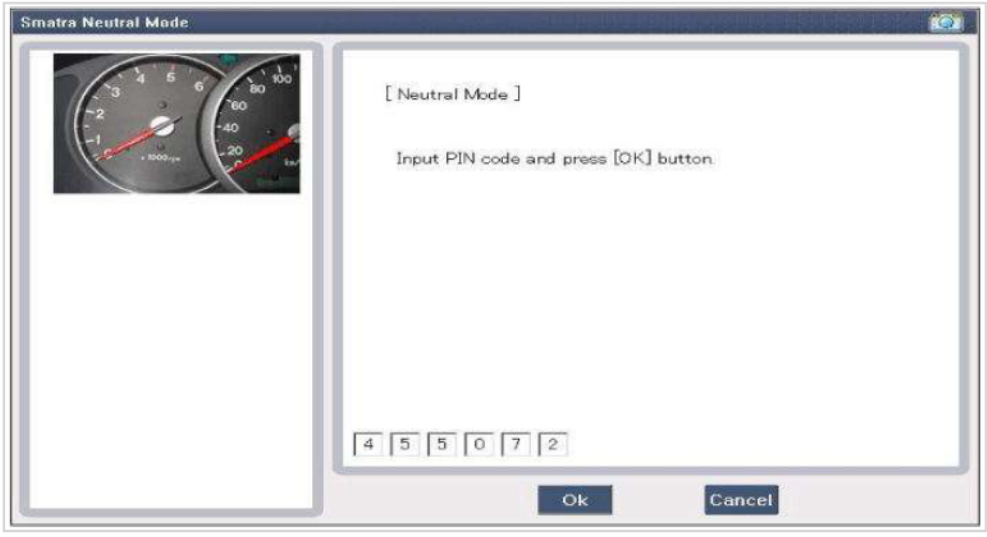
NOTICE

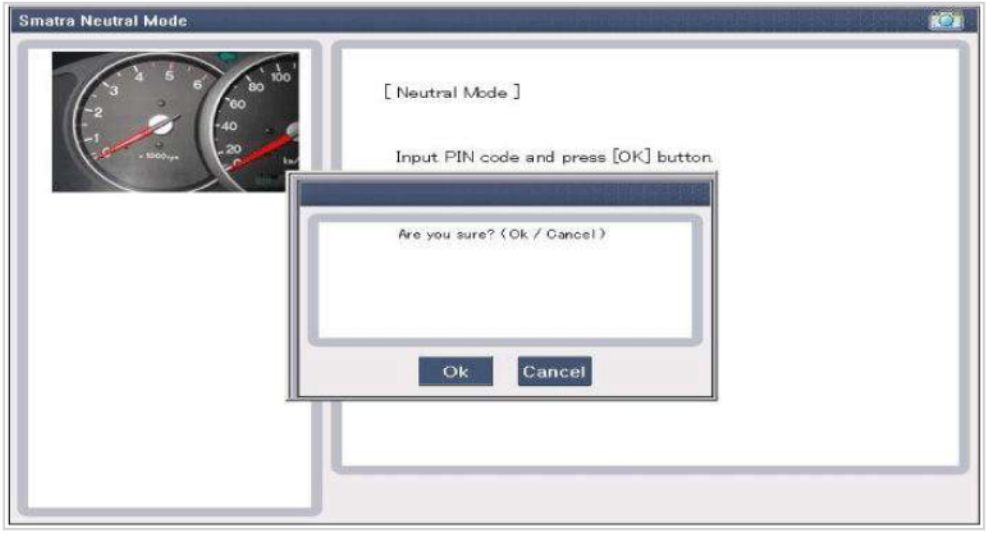
- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learnt"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

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

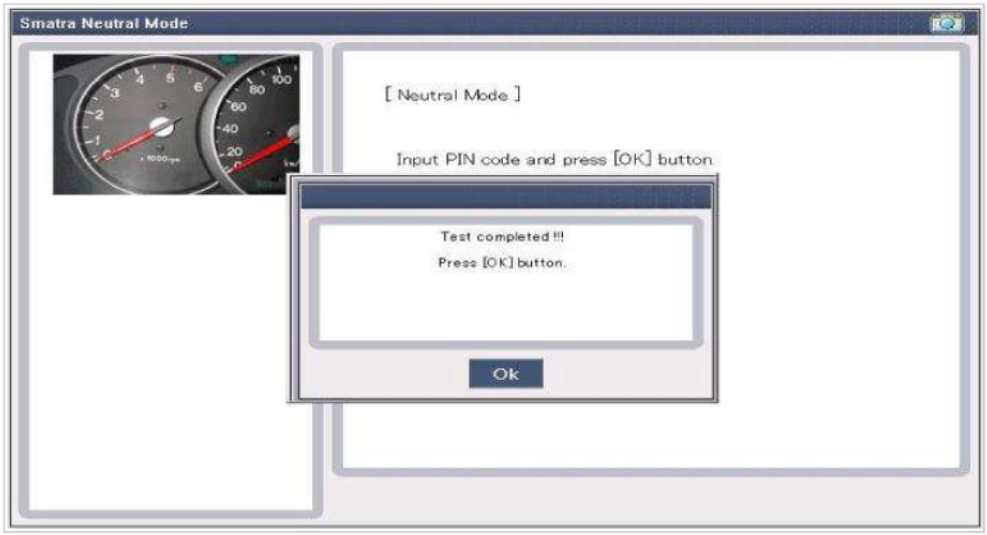
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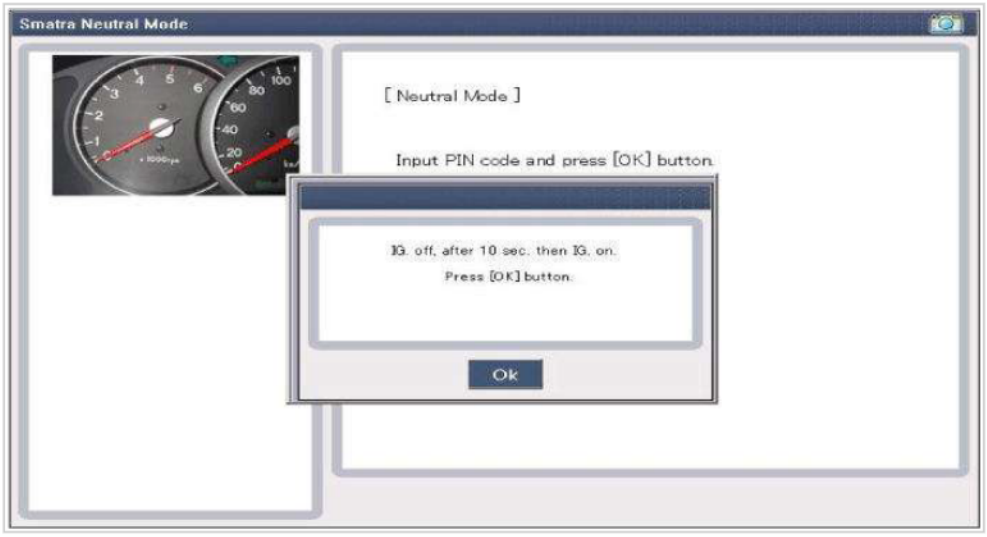


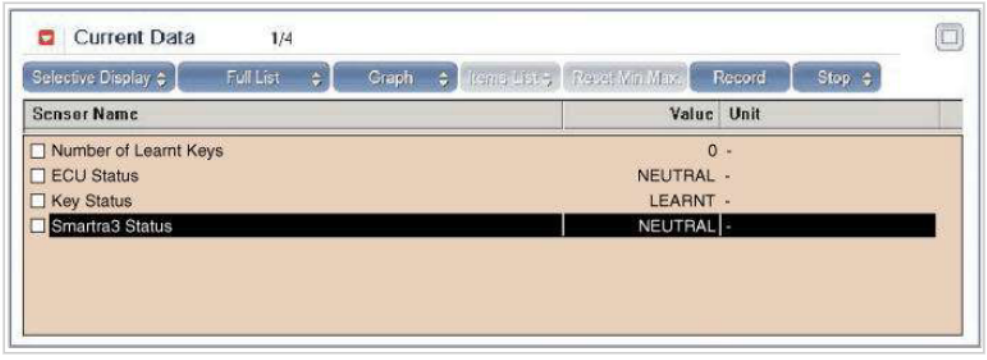




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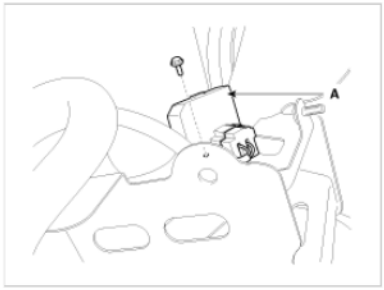




Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad")
3. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) after loosening the bolt.

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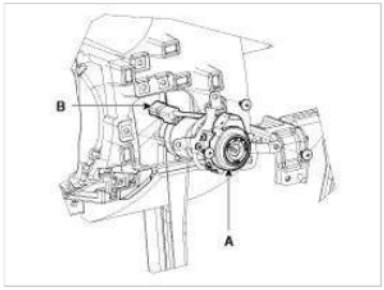
Installation

1. Install the immobilizer control unit after connecting the unit connector.
2. 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")
3. Disconnect the 6P connector (B) of the coil antenna and then remove the coil antenna (A) after loosening the screw.



Installation

1. Install the coil antenna and connect the 6P connector.
2. Install the crash pad lower panel.

Body Electrical System

Specification

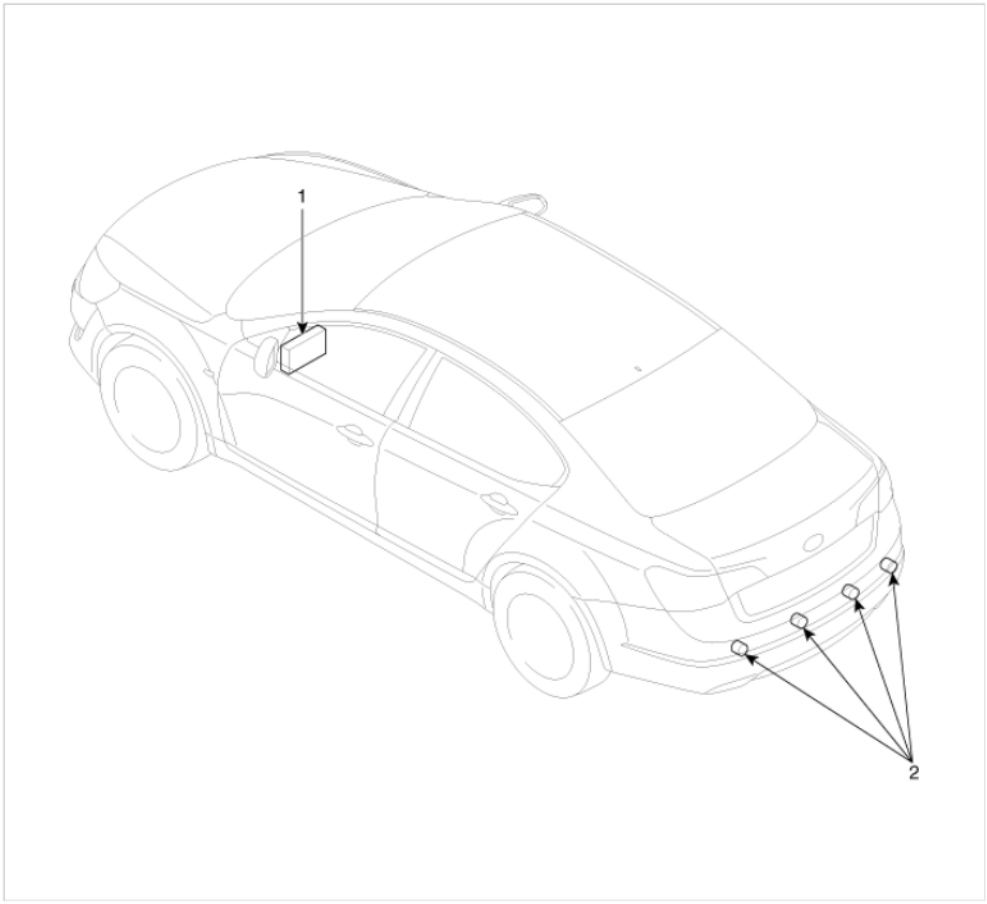
Item		Specification
Ultrasonic sensor	Voltage rating	DC 12 V
	Detecting range	30 cm ~ 120 cm
	Operation voltage	DC 9 ~ 16 V
	Operation current	MAX 300 mA
	Operation temperature	-30°C ~ +80°C (-22°C ~ +176°C)
	Operation frequency	48 ± 5 KHz
	Effective operating velocity	10 KPH (6.2 MPH)
	Number of sensors	4 (Left side, Left center, Right center, Right side)

※ Rear parking assist control unit function is built in IPM (Intelligent integrated Platform Module).

Body Electrical System

Component Location

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1. BCM (Body Control Module)	2. Ultrasonic sensor

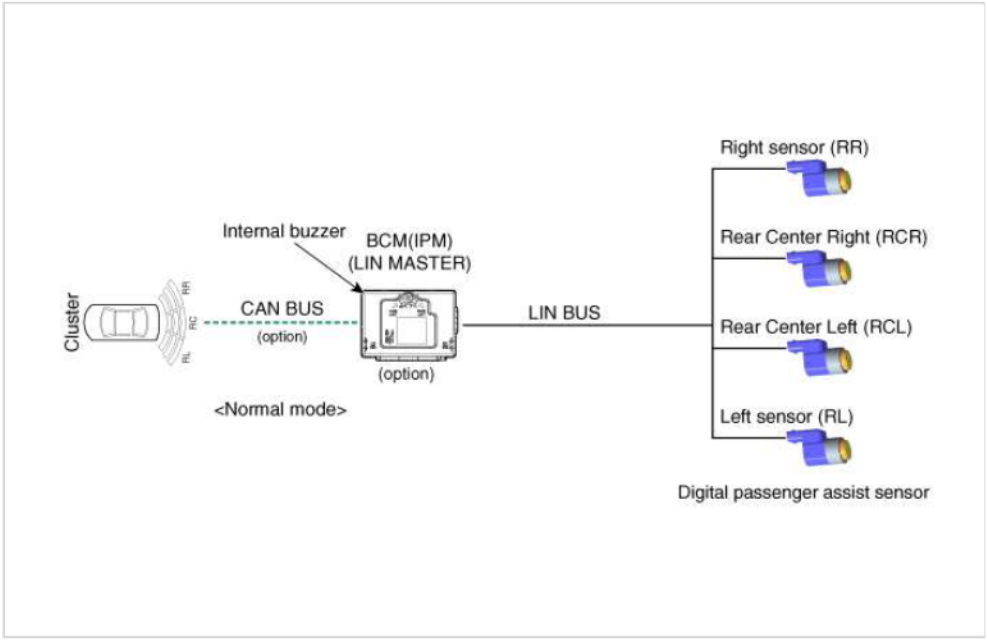
※ Rear parking assist control unit function is built in IPM (Intelligent integrated Platform Module).

Body Electrical System

System Overview

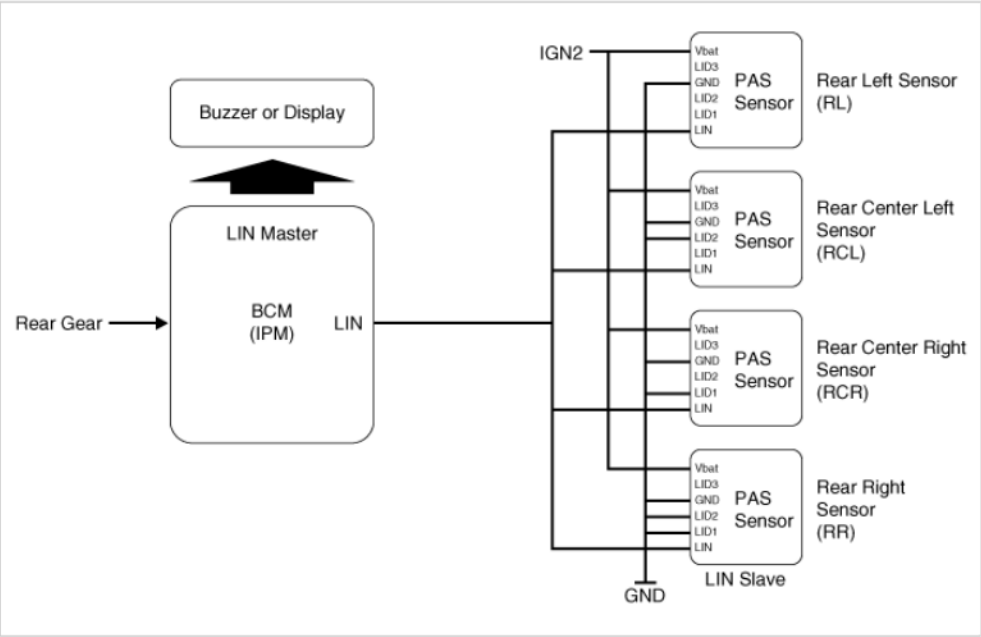
RPAS (Rear Parking Assist System) is an electronic driving aid that warns the driver to be cautious while parking or in low speed environments. The sensor uses ultrasonic waves to detect objects within proximity of the vehicle.

RPAS consists of four RPS sensors which are detecting the obstacles and transmit the result separated into three warning levels, the first, second and third to BCM by Lin communication. BCM decides the alarm level by the transmitted communication message from the slave sensors, then operate the buzzer or transmits the data for display.



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System Block Diagram



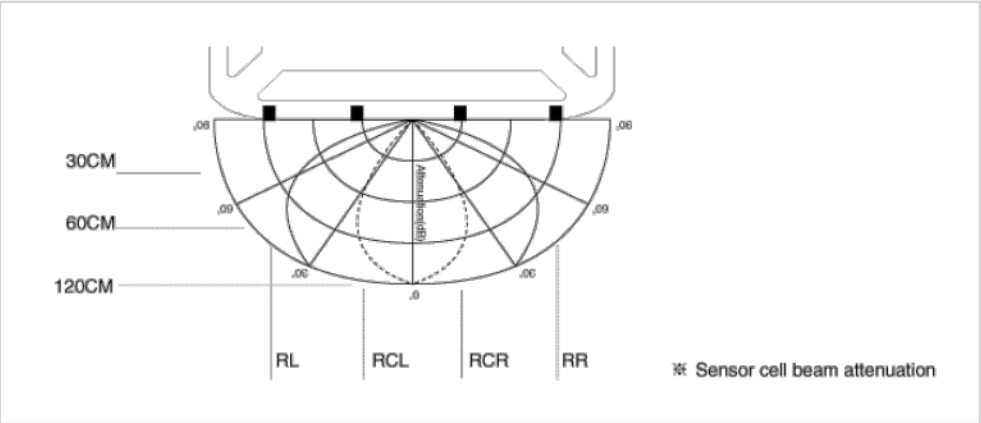
System Operation Specification.

1. INIT mode
   (1) System initializing time is 500ms after IGN1+ R Gear.
   (2) RPAS recognizes LID and sets the sensor ID up during initialization.
   (3) RPAS activates each sensor and then executes the diagnosis after finishing initialization of BCM
   (4) R-PAS Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.
   (5) If any failure is received from the any sensors, R-PAS Starting Buzzer" does not work but the failure alarm is operated for a moment.
   If you have display option, warning sign is also shown on it.
   (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.
2. NORMAL Mode
   (1) Lin communication starts and keeps the routine after IGN1 ON+R gear
   (2) BCM send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.
   (3) After initialization, normal mode starts 100ms later after finishing alarm output.
   (4) Alarm for obstacles is divided into 3 levels.
   The first and second are intermittent sound, and the third alarms continuously
   (5) The efficient vehicle speed of RPAS operation is under 10Km/h.
   (6) Refer to 'Digital PAS Project LIN communication' for the more detailed communication specification.

Sensing Area

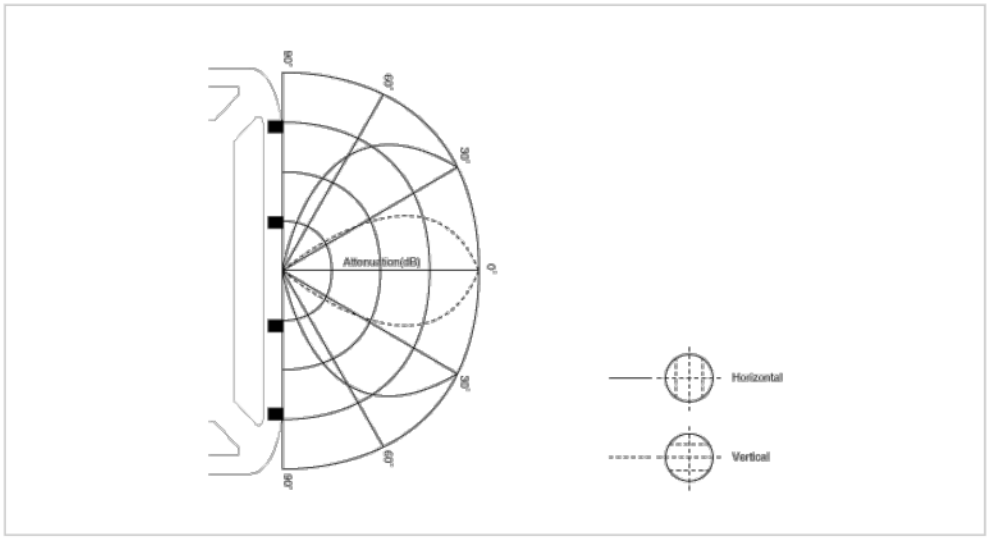
1. Measurement condition – PVC pole (diameter 75mm, length 3m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)
   61cm(24.0in) ~ 120cm(47.2in) : ± 15cm(5.9in)
   31cm(12.2in) ~ 60cm(23.6in): ± 15cm(5.9in)
   Less than 30cm(11.8in) : ± 10cm(3.9in)

Horizontal Sensing Area



Vertical Sensing Area

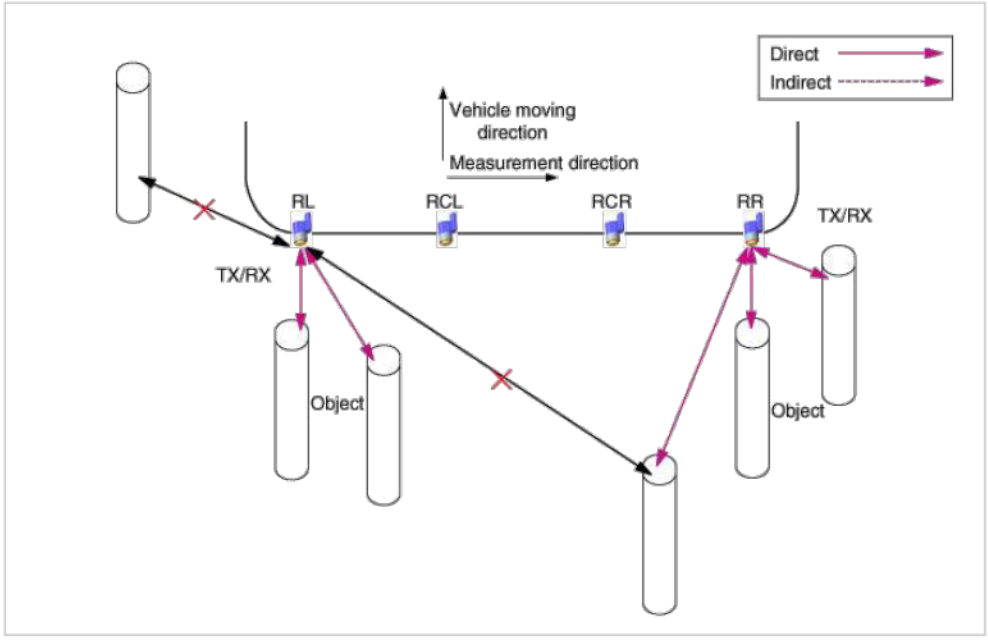
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Distance Measurement

Direct Measurement

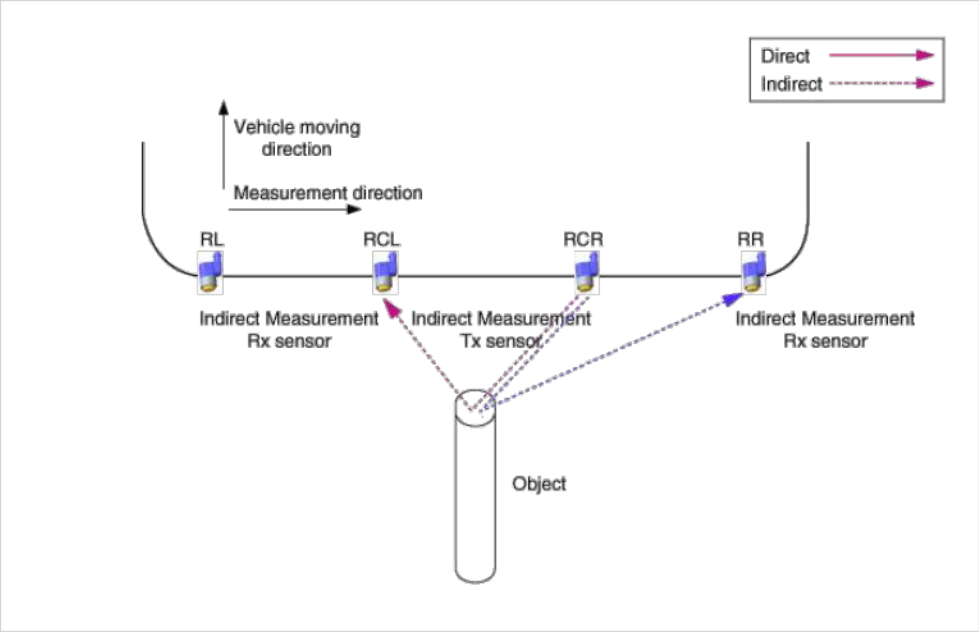
Transmission and Reception are executed with one sensor
(RL, RCL, RCR, RR each sensor execution)



Indirect Measurement

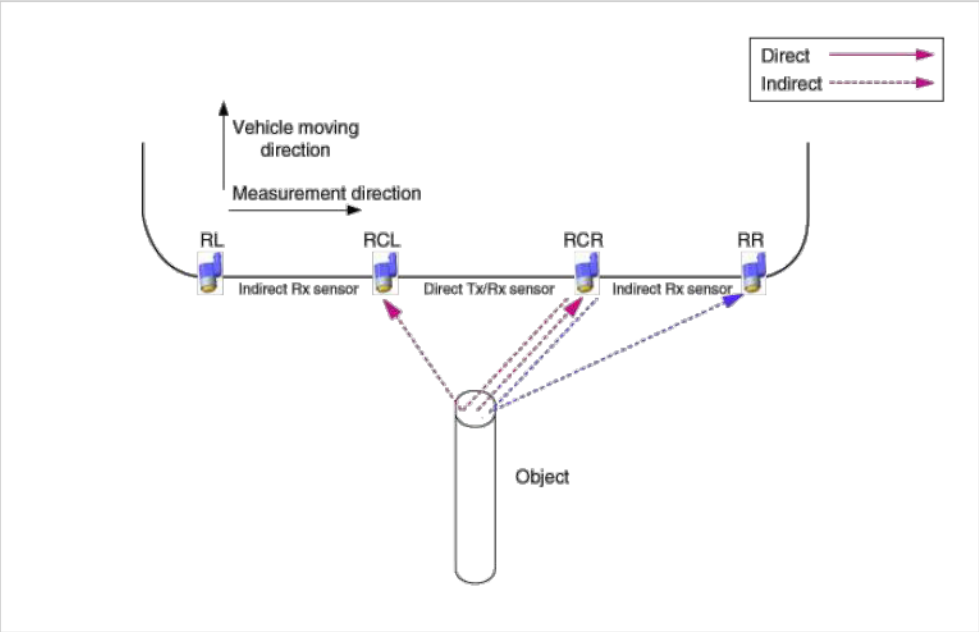
(RCL → RL, RCL → RCR, RCR → RCL, RCR → RR Execution in order)
With two or three sensors, one of them sends the transmission and the others get the reception.

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Direct and Indirect Measurement at once

With two or three sensors, the one sensor performs both transmission and reception, and the others perform only reception.



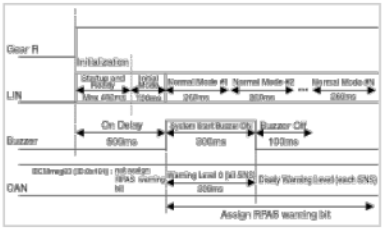
RPAS alarm system

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

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

System Operation Spec

When the system has the power (after IGN ON and R gear), MICOM checks every sensor channel. In case it finds any error, it sounds 300ms buzzer 500ms afterward. But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. Function for normal mode entrance is as below

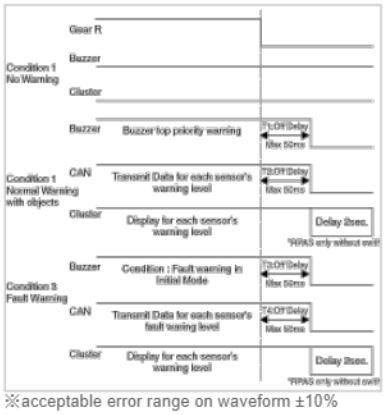


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With R Gear, system function is as below



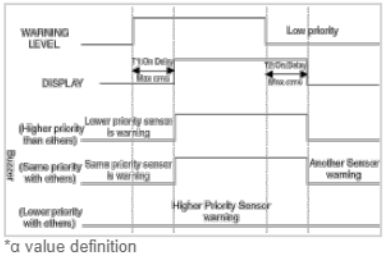
With R gear releasing, system function is as below



※acceptable error range on waveform ±10%

Alarm Output Specification classified by distance between sensors

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



*α value definition

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

*β value definition

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

Alarm control by sensing distance is as below

1. First warning area (61cm ~ 120cm / 24 ~ 47.2 in.)



2. Second warning area (31cm ~ 80cm / 12.2 ~ 23.6 in.)



3. Third warning area (less than 30cm / 11.8 in.)

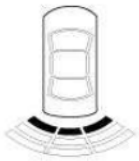


Visible Alarm Indicator Specification

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

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

Alarm level	No alarm	First step alarm (Lighting)	Second step alarm (Lighting)	Third step alarm (Flickering)
Indicator display				

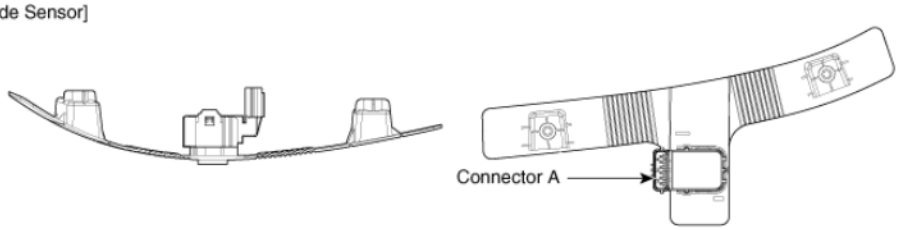
- It shows only the detecting position of obstacles.
- In third level alarm, indicator flickers at intervals of a second.
- In normal alarm level display, RCR/RCL indicator is combinated by priority.

Communication Standard

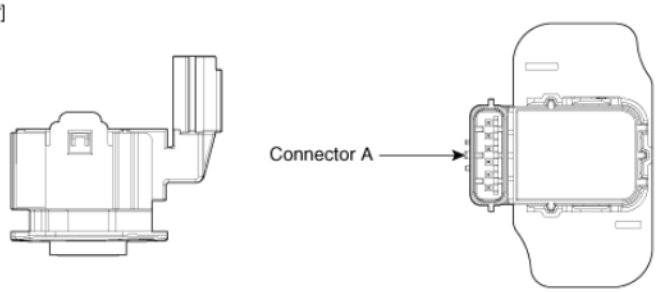
This section defines the communication between RPAS and BCM.
RPAS send a detecting result of object and sensor diagnosis result to BCM according to this document, and BCM takes a role to alarm.
Indicator shows the transmitted position and alarm data, in alarm case, it finds the nearest DATA and alarms the nearest DATA first.
(Ex. In case, RL is first step alarm and RR is third step, RR alarm has priority.)

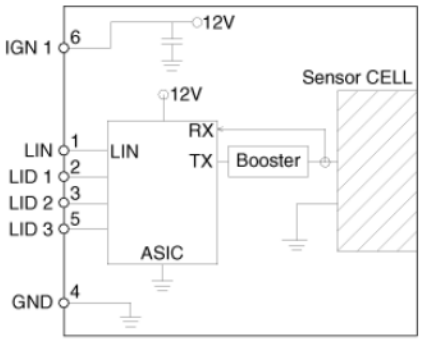
Component

[Side Sensor]

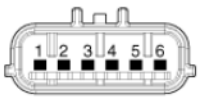


[Center Sensor]





Connector A

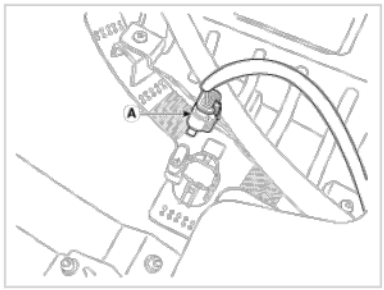


No.	Description
1	LIN
2	LID 1
3	LID 2
4	GDN
5	LID 3
6	IGN 1

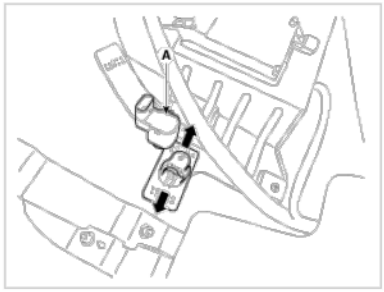
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Removal

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 parking assist sensor.



4. Pull out the sensor (A) by opening the sensor holder (B) out.

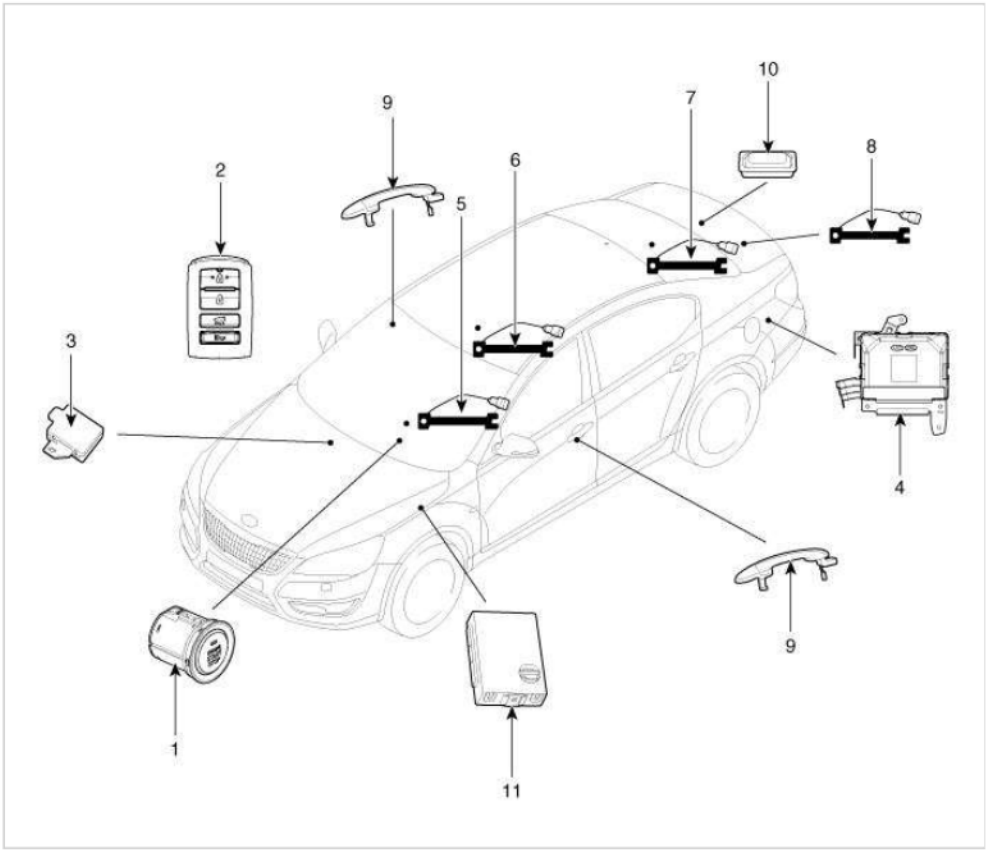


Installation

1. Install the rear ultra sensor after connecting the connector.
2. Install the rear bumper cover.
3. Connect the negative (-) battery terminal.

Body Electrical System

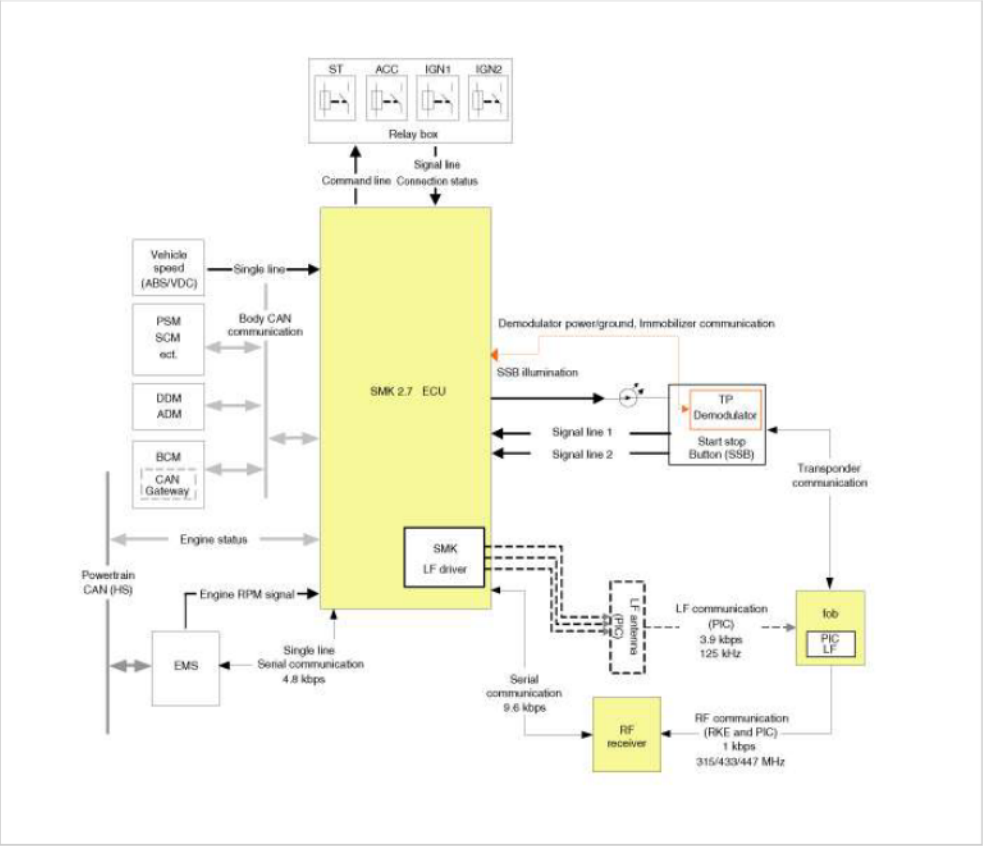
Component Location



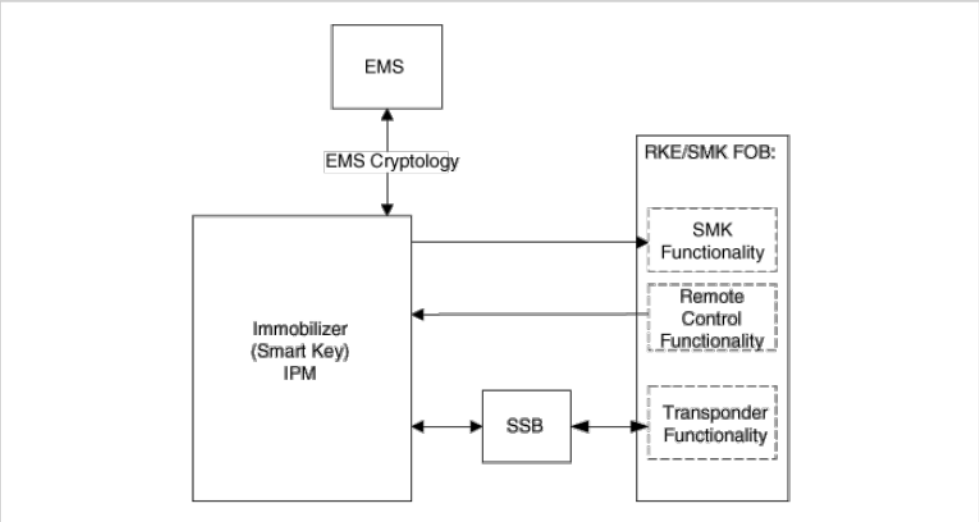
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1. Start Stop Button(SSB) 2. FOB key 3. RF receiver 4. Smart key unit 5. Interior antenna 1 6. Interior antenna 2	7. Trunk antenna 8. Bumper antenna 9. Door handle & door antenna 10. Trunk lid open switch 11. IPM (Intelligent intergrated Platform Module)

Circuit Diagram (1)



Circuit Diagram (2)



Description

System Overview

The System offers the following features:

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- Human / machine interface through a 1-stage button, for terminal switching and engine start.
- Control of external relays for ACC / IGN1 / IGN2 terminal switching and STARTER, without use of mechanical ignition switch.
- Indication of vehicle status through LED or explicit messages on display.
- Immobilizer function by LF transponder communication between fob and fob holder.
- Redundant architecture for high system dependability .
- Interface with Low Speed CAN vehicle communication network.
- Interface with LIN vehicle communication network depending on platform .

The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in separated system.

System Main Function

- Switching of ACC / IGN1 / IGN2 terminals.
- Control of the STARTER relay BAT line (high side) based on communication with EMS ECU.
- Management of the Immobilizer function.
- Management of BES warning function.

Button Engine Start System

The Button Start System allows the driver to operate the vehicle by simply pressing a button (called as SSB) instead of using a standard mechanical key.

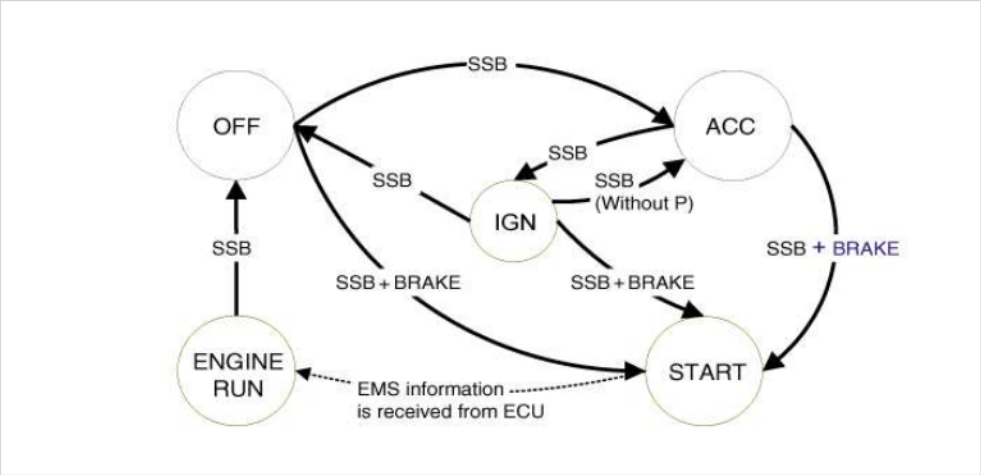
If the driver press the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the locking/unlocking of the steering column, the control of the terminal, and the cranking of the engine.

The driver can release the SSB as soon as this sequence initiated. After positive response from immobilizer interrogation, the system will activate the starter motor and communicate with the EMS to check the engine running status for starter release.

The driver will be able to stop the engine by a short push on the SSB if the vehicle is already in standstill. Emergency engine stop will be possible by a long press of the SSB or 3 consecutive presses in case the vehicle is in ENGINE RUNNING.

If the conditions for engine cranking are not satisfied while a push on the SSB is detected and a valid fob authenticated, the system will unlock the steering column and switch the terminals to IGN. Another push on the SSB will be necessary to start the engine.

In case of a vehicle equipped with SMART KEY system, fob authentication will not require any action from the driver. For limp home start or in case of vehicle without SMART KEY, the driver will have to insert the fob into the fob holder.



- Control Ignition and engine ON/OFF by Sending signal to IPM.
- Display status by LED Lamp ON/OFF. (Amber or Green)

Indicator ON/OFF Condition At Ignition Key Off Condition

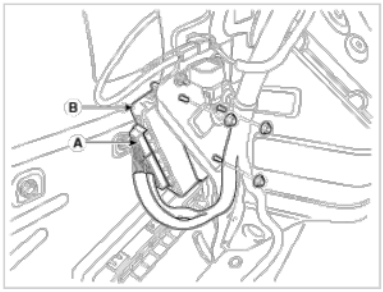
No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

Indicator ON/OFF Condition According To Ignition Key's Position

No.	Ignition conditions	Start Button LED status
1	IG OFF	White color LED ON
2	IG ACC	Amber color LED ON
3	IG ON (Engine OFF)	Green color LED ON
4	Cranking	Maintain LED status before cranking
5	Engine running	LED OFF

Smart Key Unit

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The SMK manages all function related to:

- "Start Stop Button (SSB) monitoring",
- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication),
- "System consistency monitoring",
- "System diagnosis",
- Control of display message / warning buzzer .

The unit behaves as Master role in the whole system.

In case of SMART KEY application, for example “Passive Access”, “Passive Locking” and “Passive Authorization are integrated for Terminal switching Operations”.

It collects information about vehicle status from other modules (vehicle speed, alarm status, driver door open...), reads the inputs (e.g. SSB, Capacitive Sensor / Lock Button, PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates with others devices via the CAN network as well as a single line interfaces.

The diagnosis and learning of the components of the BES System are also handled by the SMK.

The SMK manages the functions related to the "terminal control" by activating external relays for ACC, IGN1 and IGN2. This unit is also responsible for the control of the STARTER relay.

The SMK is also controlling the illumination of the SSB as well as the "system status indicator", which consists of 2 LEDs of different color. The illumination of the fob holder is also managed by the SMK.

The SMK reads the inputs (Engine fob in, vehicle speed, relays contact status), controls the outputs (Engine relay output drivers), and communicates with others devices via the CAN.

The internal architecture of the SMK is defined in a way that the control of the terminal is secured even in case of failure of one of the two microcontrollers, system inconsistency or interruption of communication on the CAN network.

In case, failure of one of the two controllers, the remaining controller shall disable the starter relay. The IGN1 and IGN2 terminals relays shall be maintained in the state memorized before the failure and the driver shall be able to switch those IGN terminals off by pressing the SSB with EMERGENCY_STOP pressing sequence. However, engine restart will not be allowed. The state of the ACC relay will depend on the type of failure.

The main functions of the SMK are:

- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/ESP ECU.
- Control of SSB LEDs (illumination, clamp state).
- Control of the base station located in SSB through direct serial interface.
- System consistency monitoring to diagnose SMK failure and to switch to relevant limp home mode.
- Providing vehicle speed information
- Start Stop Button (SSB) monitoring
- Starter power control

Start/Stop Button (SSB)

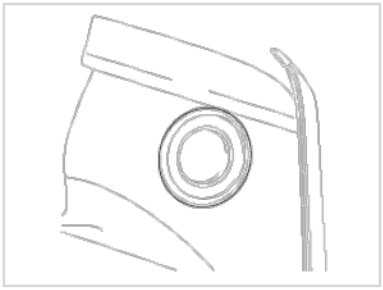
A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes ‘Off’, ‘Accessory’, ‘Ignition’ and 'Start' by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.

Three (3) LED colors are located in the outside ring of the switch assy. They display the status of the system.

They are OFF(White) / ACC(Amber) / ON(Green).



BES(Button Engine Start) System State Chart

System STATES in LEARNT MODE

In learnt mode, the BES System can be set in 6 different sates, depending on the status of the terminals and Engine status:

System State	Terminal Status	Engine status
1. OFF - Locked	OFF	Stopped
2. OFF - Unlocked	OFF	Stopped
3. ACC	ACC	Stopped

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4. IGN	IGN1, IGN2, ACC	Stopped
5. Start	IGN1, Start	Cranking
6. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch.
The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

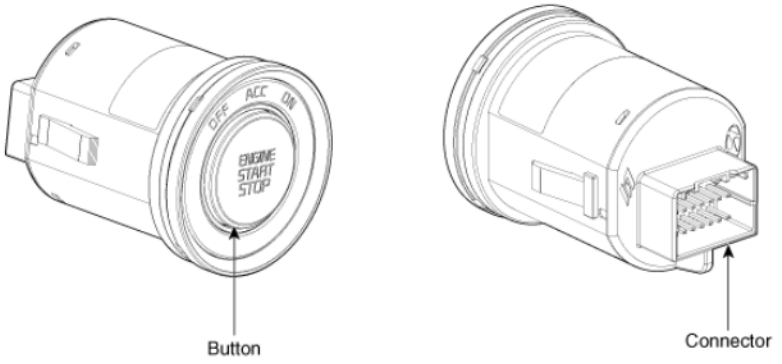
System STATES IN VIRGIN MODE

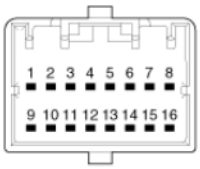
The BES System can be set in 5 different states (OFF LOCKED is not available in virgin mode), depending on the status of the terminals and Engine status :

System State	Terminal Status	Engine status
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch.
The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

Component



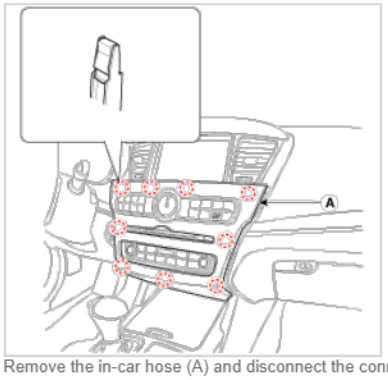
Connector (16 pins)			
No.	**Description**	**No.**	**Description**
1	Battery (+)	9	Immobilizer power
2	Switch 1	10	Immobilizer ground
3	Switch 2	11	SSB illumination power
4	SSB ring illumination	12	SSB LED OFF (White)
5	Rheostat	13	Ground
6	-	14	SSB illumination ground
7	-	15	SSBLED ACC (Orange)
8	-	16	SSBLED ON (Reddish orange)

Body Electrical System

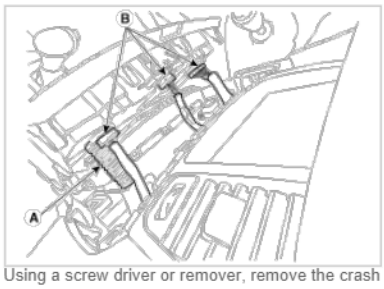
Removal

1. Disconnect the negative (-) battery terminal.
2. Using a screw driver or remover, remove the center fascia lower panel (A).

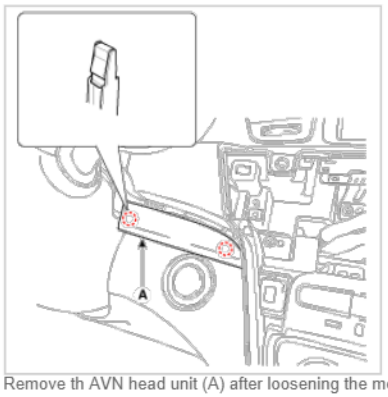
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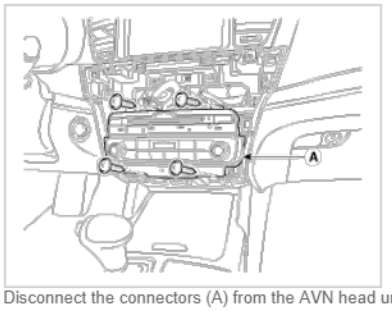
3. Remove the in-car hose (A) and disconnect the connectors (B) from the heater & A/C control unit.



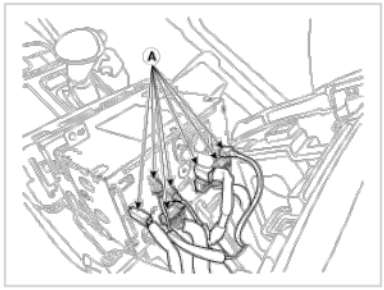
4. Using a screw driver or remover, remove the crash pad garnish [RH] (A).



5. Remove th AVN head unit (A) after loosening the mounting screws.

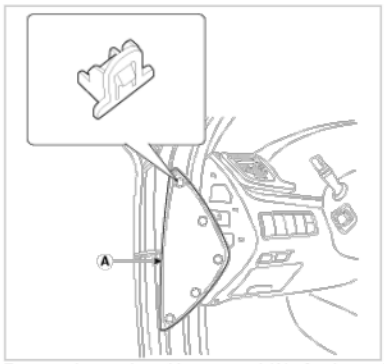


6. Disconnect the connectors (A) from the AVN head unit.

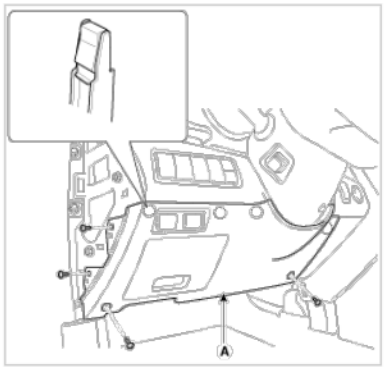


7. Using a screw driver or remover, remove the crash pad side cover (A).

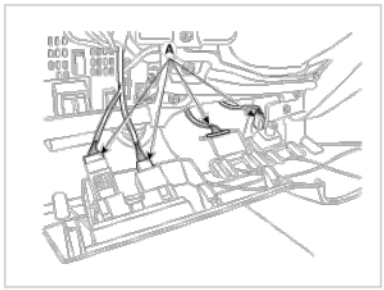
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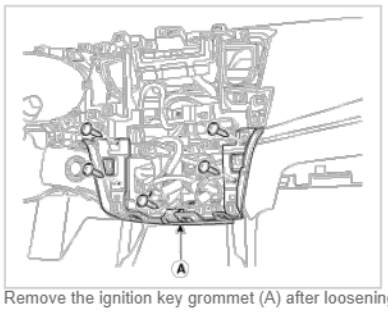
8. Remove the crash pad lower panel (A) after loosening the mounting screws.



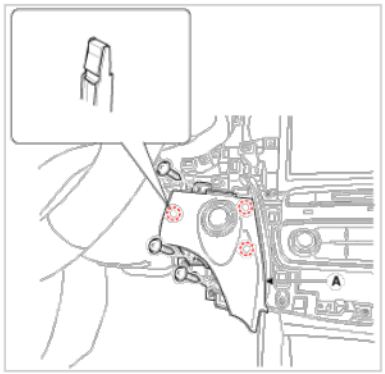
9. Disconnect the connectors (A).



10. Remove the crash pad center panel (A) after loosening the mounting screws.

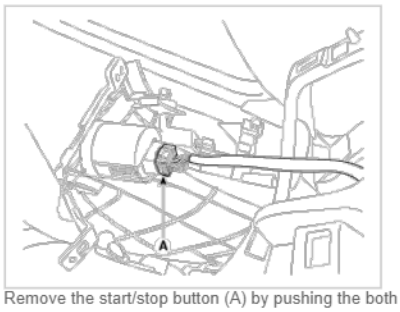


11. Remove the ignition key grommet (A) after loosening the mounting screws.

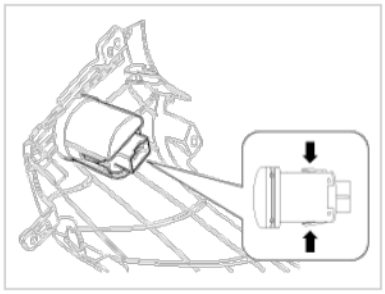


12. Disconnect the start/stop button connector (A).

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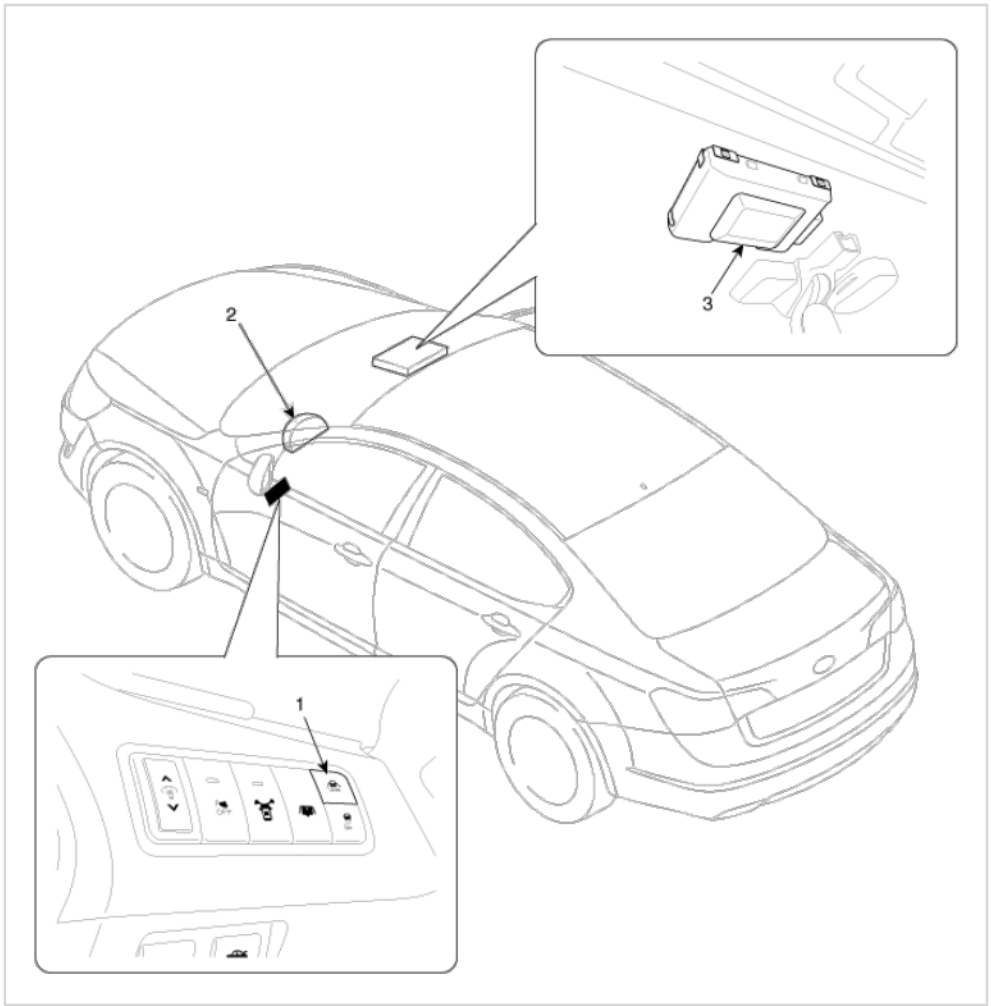
13. Remove the start/stop button (A) by pushing the both sides of the hooks.



Installation

1. Install the start/stop button.
2. Install the crash pad center panel, crash pad lower panel, AVN head unit, heater & A/C control unit and center fascia lower panel.

Components



	3. LDWS Unit & Camera Module

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1. LDWS ON/OFF Switch 2. Instrument Cluster	

Description

System Operation

Typically, lane departure warning is activated at a speed over 70 KPH, but suppressed in case of unintentional lane departure when driver do not operate turn signal.

System Operation Conditions

1. User Conditions
   (1) When unintended lane departure is occured, warnings are generated.
   (2) When driver operates a turn signal for lane departure, no warnings are generated.
2. Vehicle Conditions
   (1) When the accelerated velocity of vehicle exceeds certain speed, LDW system is activated.
   (2) When a turn signal is not used. LDW system activates.
3. Lane Conditions
   (1) lanes are visible and recognizable , LDWS can be on normal operation mode.
   (2) Operate on all roads, including highways, country roads and urban freeways at a speed of 70 km/h and from 2.5 to 5.0 meters of lane width.
   (3) Lane material: asphalt roads, concreat roads
   (4) Lane color: White, Yellow, Blue,
   (5) Temporary lane marker for repairing road
   (6) lanes are visible and recognizable, LDWS can be on normal operation mode independent of season or time,
   (7) Operate under partially visible lane markers such as and regardless of inclement weather, including rain and wet roads, and time limit
   (8) Be performed in a curve of radius 250 meters

Lane Departure Warning

This lane Departure Warning Algorithm is for HKMC whole vehicle that will apply to LDWS

1. Lane departure warning start speed: 70KPH
   (1) Warning Start Speed: 70KPH
   (2) Warning Stop Speed: 65KPH
   To prevent repetation of system warning on and off according to vehicle speed variation, This specification establish warning stop speed as 55 KPH for hystheresis characteristic.
2. Warning Method
   (1) Warning Device
   Cluster, Buzzer
   (2) Cluster Display Symbols

		
Lane not detected	Lane detected and warning system engaged	Right side deviation
		
Left side deviation	Wiper motor speed is more than 45 RPM	System malfunction

※ Display symbol and period vary according to vehicle's LCD and alarm.
(It is possible to adjust blinking period.)

Lane Type

LDW System can recognize a full lane, a dotted lane, Bott's Dot and yellow Retroreflective on a road.
In case of double lane, LDW System can recognize the lane on the inside. This is a standard about a dotted lane.

Recognition of double lane

In case of double lane, LDW System can recognize the lane on the inside.

Determination of Lane Departure

Lane Departure is determined according to vehicle speed, lane width and color.
LDW System set lane recognition error limits under 8cm.

1. Lane width (L)

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If Lane width is 2.5 ~ 5.0m(Including North America standard) then departure warning is activated. Also Lane width is less than 2.8m then departure warning is deactivated.

2. Line painted width (p)
   Line painted width is refered to 16cm (the minimum 10cm, the maximum 55cm). LDWS can distinguish left,right lane color. If it is technically possible, LDWS can distinguish kind of lane such as solid and dot.
3. Vehicle Width (W)
   Vehicle width is defined by kind of vehicle.
4. Left,Right normal Lane (Blue, White, Right Yellow)
   Condition : Lane width standard is a 16cm.
   A. 1st Lane Departure Warning
      The departure alarm of the general lane when the wheel of the vehicle reaches to the lane, does in standard.
   B. Cancellation of lane departure warning
      When the vechicle departs the lane toward opposite lane more than 40% of the lane width, the warnings are stopped.
5. The case of recognizing one of two lines (lane)
   The case of recognizing one of two lane, system provide departure warning using one line.

Lane departure warning deactivation

1. Turn signal is actived
   A. Depart from lane after turn signal is activate
      If vehicle departs from lane after turn signal is activated, the departure warning of turn signal direction is not activated. Warning alarm is not activated while turn signal is activated. If turn signal is deactivated during lane departure after turn signal activates, system can issue warning after 2sec when it can recognize lane.
      If turn signal is deactivated after lane departure during turn signal activated, Warning signal can be generated after 2 second.
   B. Turn signal is activated after lane departure
      Alarm is immediately deactivated when driver operates turn signal during lane departure.
      Alarm can be activated again after 2 second when turn signal is deactivated.
2. Tracking on a curve under 250m radius
   When measured curve radius which is derived from lane recognition and Yaw Rate is under 250m,
   LDWS do not warn lane departure. LDWS can recognize if a road curvature condition is under 250m
   (R >= 250m)
3. Lane is unrecognizable
   A. During the warning, lane becomes unrecognizable
      - In lane departure alarm, the case where one lane becomes unrecognizable: Alarm is activated using previously measured lane width, a hue and a curvataure.
      - In lane departure alarm, the case where both lanes become unrecognizable: Lane departure Warning is immediately stopped and LDWS signal that lanes are unrecognizable to warn its condition to driver.
   B. A line is unrecognizable
      During vehicle is tracking the lane, if a line is not recognizable, LDWS can excute lane departure warning using previous lane width which is measured from previous image processing. LDWS normally refer the color of lines to previous recognition result, but if there are any changes of system operation and power on/off, when system can not determine the color of the lane, system can excute lane departure warning algorithm refer lane color to white. When system line unrecognized state is maintained, System status is changed to line unrecognized state.
   C. Both lanes are unrecognizable
      LDWS signal the status of unrecognizable lane. If there are none of additional indicator, system do not indicate recognition status.

⚠ CAUTION

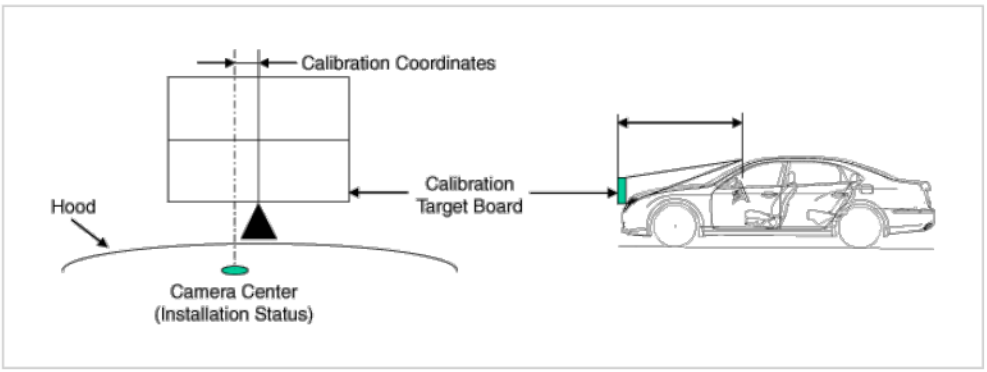
LDWS is capable of recognizing continuing lines as lanes and has limited lane recognition capabilities when it comes to sharp-bending roads.
In addition, the system may not function properly under the following circumstances:

- No or faded lane markings (failed lane detection).
- Low visibility due to foul weather conditions.
- Low light or sudden change in exterior light conditions.
- Sharp bends of the road (curvature radius of less than 250m).
- Sidewalks and other dividing structures along the edge of the lane.
- Dirty windshield (low camera visibility).

Camera Calibration

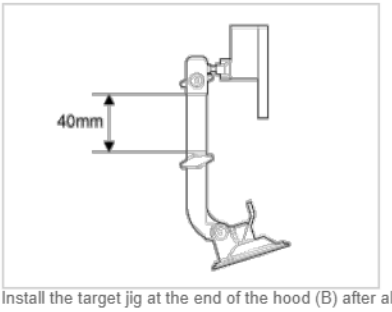
1. Necessity
   Once installed to the vehicle, LDWS needs to be calibrated to achieve accurate lane marking recognition.
   Specifically, the system needs to be calibrated to correct any difference between the ideal road coordinates and the actual road coordinates.
   A. When replacing the lane departure warning system unit.
   B. When repairing the roof panel of chassis by vehicle crash.
   C. When repairing the LDWS unit mounting bracket
   D. The system need to be calibrated to corect any vehicle crash.
2. Schedule
   Calibrate after LDWS replacement and as necessary.
   A. **Condition :**There should be an error between ideal road coordinates and actual road coordinates after installing the LDWS unit.
   B. **Object :**Calibrate an error in LDWS unit to improve coordinates accuracy.
   C. **Procedure :**Operate the calibration procedure using the GDS and calibration target jig.
   D. **Environment :**Vehicle on an even surface and align the center of target jig to down the degree of scattering.
   E. **Calibration process :**Refer to bellow "Calibration procedures"

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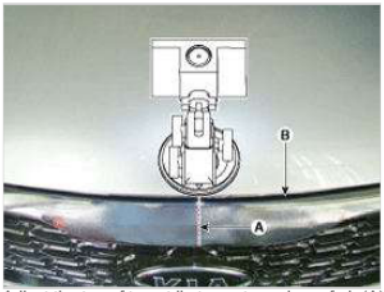
Calibration Procedures

1. Install the calibration target jig (09890-3N100) on the hood.

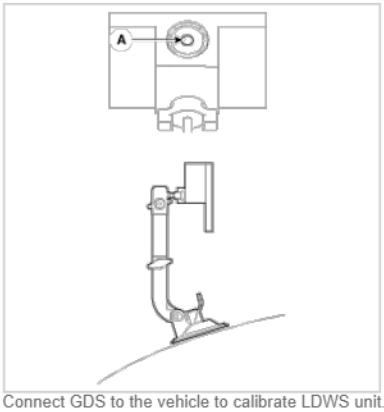


2. Install the target jig at the end of the hood (B) after alighting the center (A) of the target jig and emblem.

Tolerance : ± 0.19 in (± 5mm)



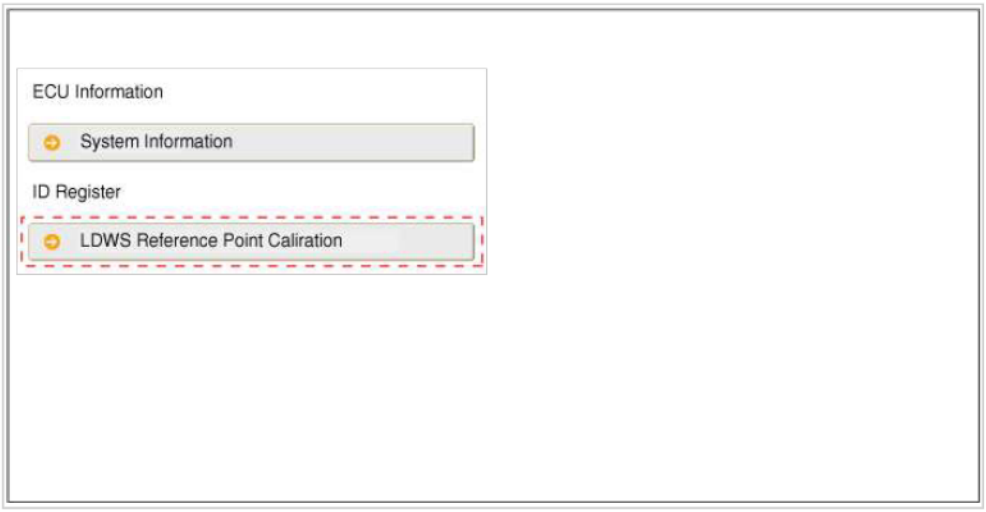
3. Adjust the top of target jig to center a drop of air (A) in circle by bending the target board.
(To adjust the target vertically)

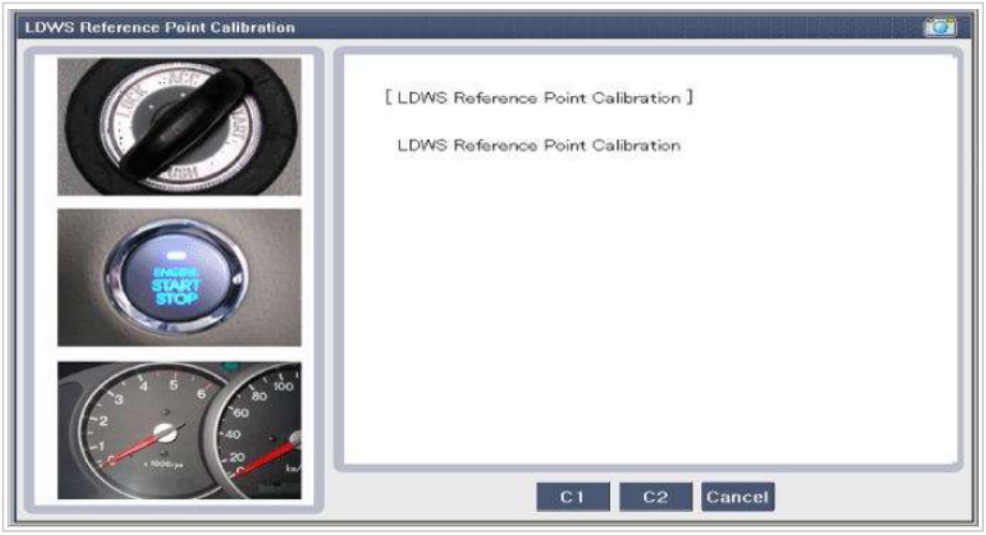


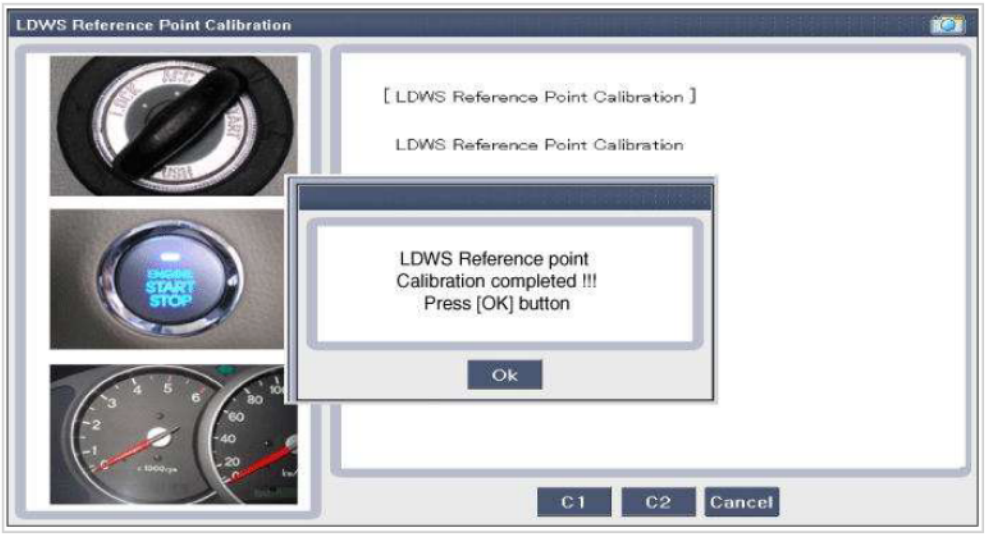
4. Connect GDS to the vehicle to calibrate LDWS unit.
5. Select model and LDWS system.
6. Select calibration.
7. Operate calibration automatically.
8. Select "LDWS Reference Point Calibration" and complete calibration procedures.

Coordinates allowance ranges
X : 171 ~ 211
Y : 179 ~ 219

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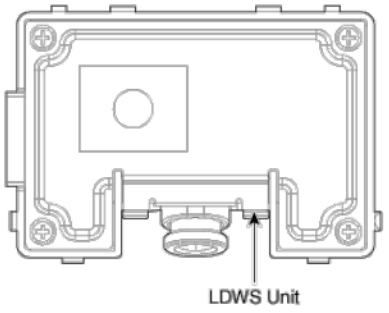


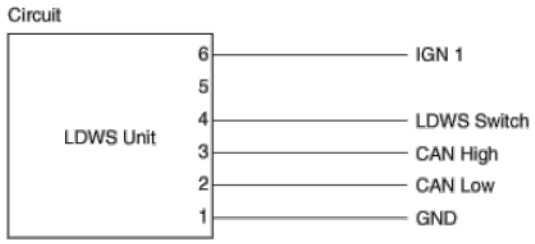


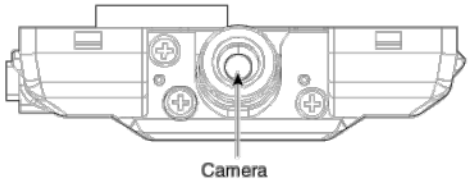


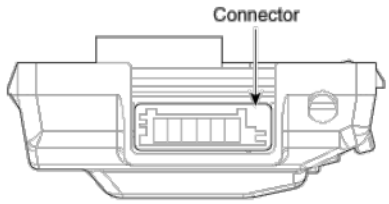
Components

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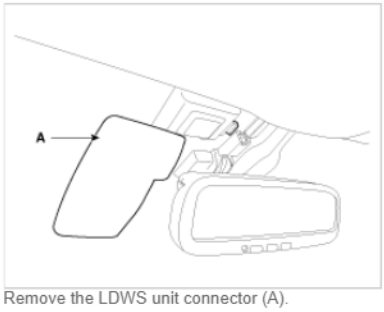




Connector	
1 2 3 4 5 6	
Plin No.	Description
1	GND
2	CAN Low
3	CAN High
4	LDWS Switch
5	-
6	IGN1

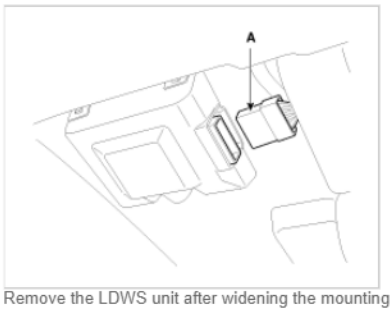
Removal

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

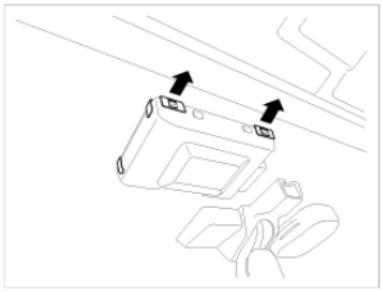


3. Remove the LDWS unit connector (A).

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4. Remove the LDWS unit after widening the mounting clips.

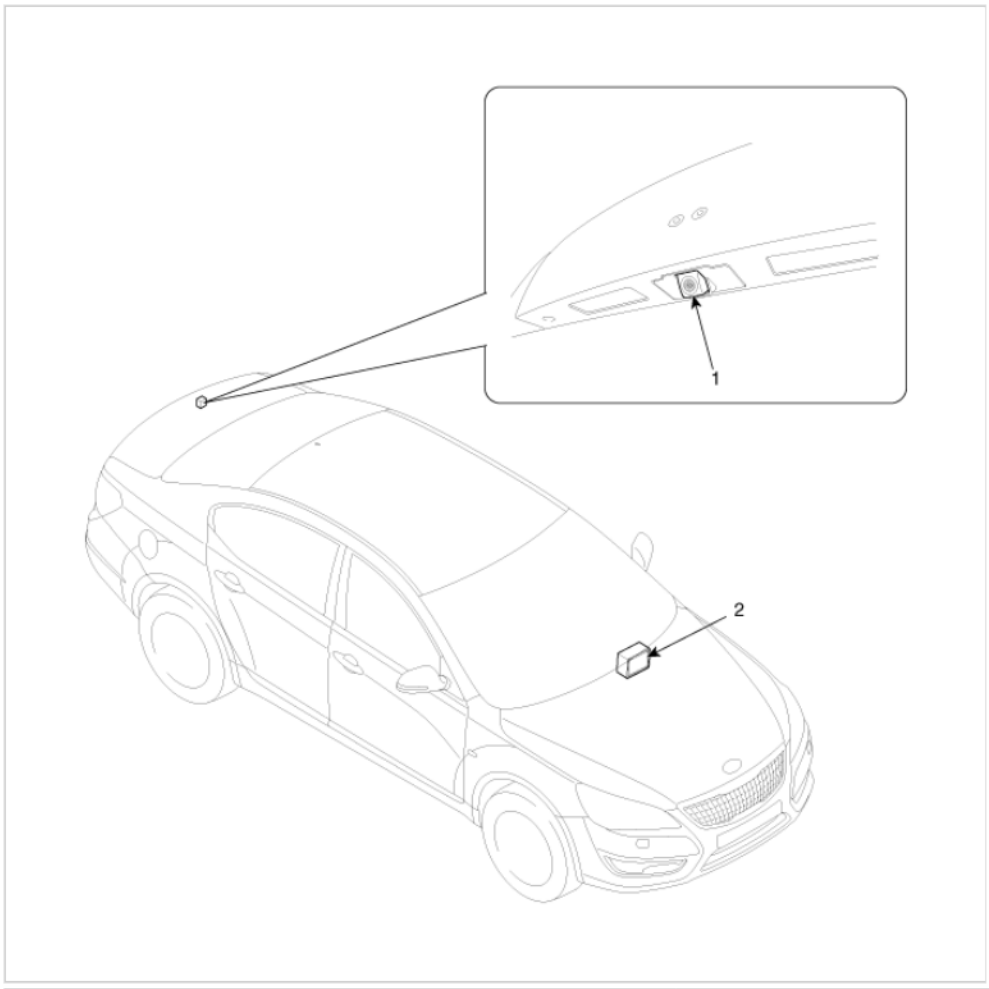


Installation

1. Install the LDWS unit.
2. Install the LDWS unit cover.
3. Check LDWS system operation.

Body Electrical System

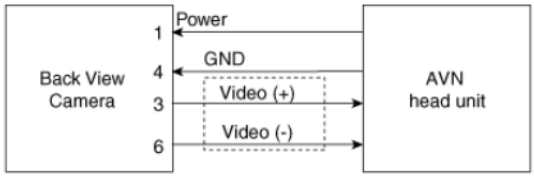
Component Location

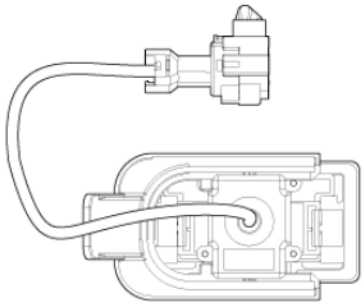


1. Back view camera	2. AVN head unit

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Circuit Diagram





Back View Camera Connector



Pin No.	Description
1	Power
2	Serial Line
3	Video (+)
4	Ground
5	-
6	Video (-)

Description

Back view camera will activate when the backup light is ON with the ignition switch ON and the shift lever in the R position.

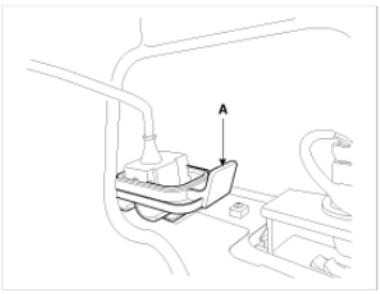
This system is a supplemental system that shows behind the vehicle through the ECM (Reverse Display Room Mirror) mirror or AVN head unit while backing-up.

⚠ WARNING

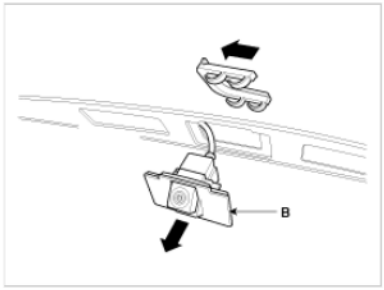
This system is a supplementary function only. It is the responsibility of the driver or always check the inside/ outside rearview mirror and the area behind the vehicle before and while backing up because there is a dead zone that can't see through the camera.

Removal

1. Remove the trunk trim in the trunk after removing the screws and clips.
   (Refer to Body - "Trunk")
2. Remove the camera holder (A) as shown arrow direction, and then remove the back view camera (B).



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Installation

1. Install the back view camera and camera holder.
2. Install the trunk tirm.

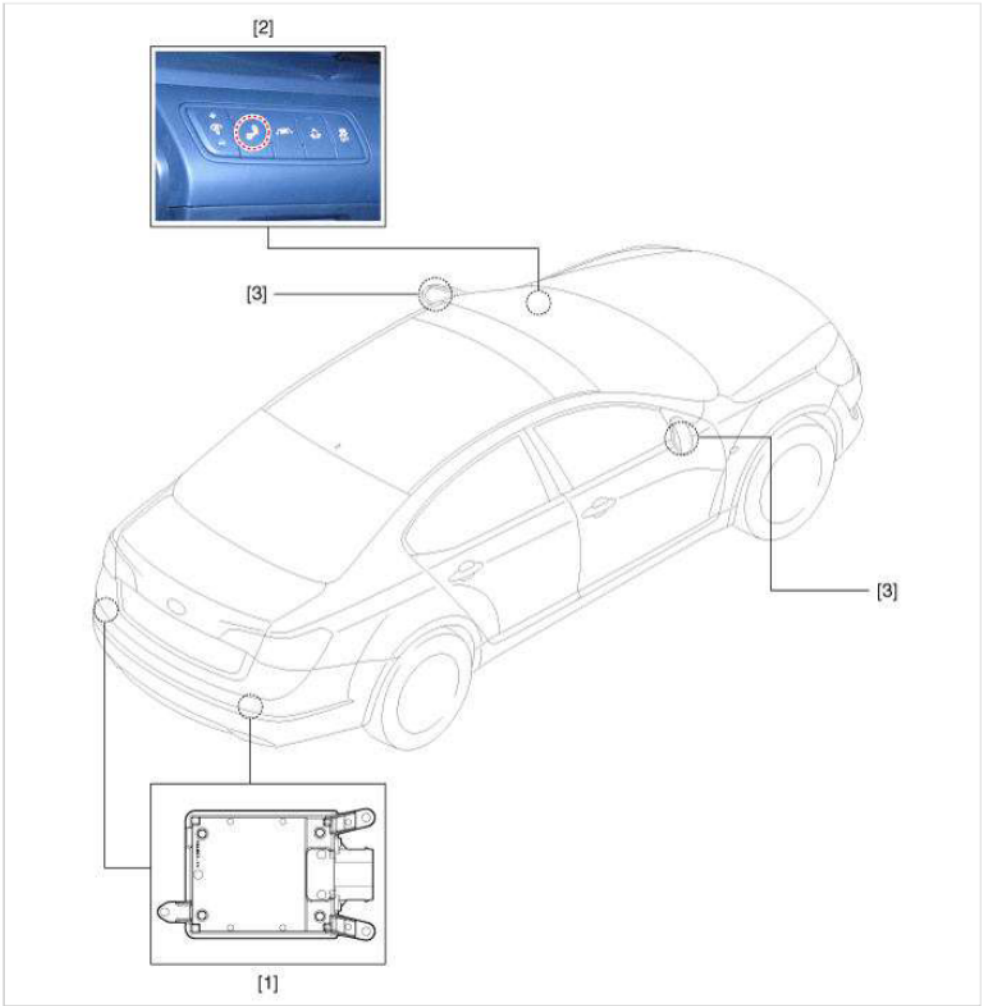
Body Electrical System

Specifications

Items	Specification
Rated voltage	DC 12V
Operating voltage	9V ~ 16V
Operating speed	15km/h ~ 250km/h
Sensible distance	70m (Sedan)
Curvature radius	Start : More than 100m Stop : Less than 70m
Frequency	24 GHz
Numbers	2EA (Master 1EA, Slave 1EA)

Body Electrical System

Components



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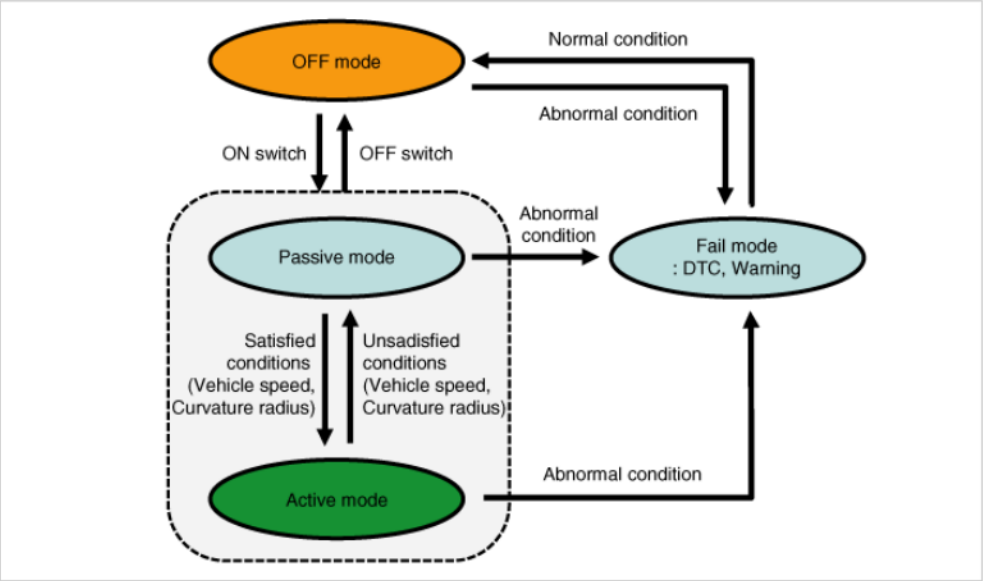
1. Blind Spot Detection (BSD) Unit 2. BSD switch	3. BSD warning lamp (Built in the outside mirror)

Description

BSD is a system that uses two magnetic wave radar sensors attached on the rear bumper to measure the distance from the following vehicles and provides the sensing and (visual and auditory) alarm of any vehicle coming into the blind spot.

- Blind Spot Detection (BSD) : Senses other high-speed access vehicles in the blind spot and then displays a BSD warning lamp on the side mirror for the driver.
  Warning lamp and alarm is ON when driver turns on the turn signal lamp to enter the lane where another vehicle is.
- Lane Change Assist (LCA) : Senses other vehicles in the blind spot and then displays a BSD warning lamp on the side mirror for the driver.
  Warning lamp and alarm is ON when driver turns on the turn signal lamp without recognizing any sudden approaching vehicle from that direction.

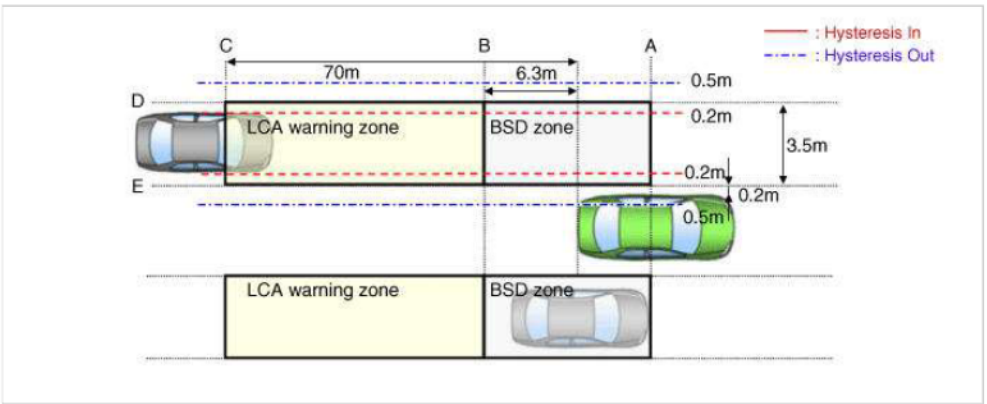
System Operating Mode



1. When starting the engine with the switch off, OFF mode is on.
2. When pressing ON switch in OFF mode, Passive mode is on.
3. If starting the engine with the switch ON, Passive mode is on.
   ※ When IGN is ON, the switch is in the initial state : The last position is kept.
   A. If IGN OFF → ON with the switch ON, the switch is ON.
   B. If IGN OFF → ON with the switch OFF, the switch is OFF.
4. If you start the engine with BSD switch ON, or if you turn on BSD with BSD switch OFF, the warning lamp of the door mirror flickers for 2 to 3 seconds.
   This is to inform the driver that the BSD system is ready. (provided that if the system is in Fail mode, there is no flickering.)
5. If the activation conditions (speed and curvature radius) are met while driving, Active mode is on (warning issued).
6. If the activation conditions (speed and curvature radius) are not met while driving, Passive mode is on (warning removed).
7. If BSD & LCA operation fails in any mode, Fail mode is on.
8. If BSD & LCA operation operates normally in Fail mode, OFF mode is on.
9. If pressing OFF switch while BSD & LCA function is operating (Active/Passive), OFF mode is on.

Warning Condition

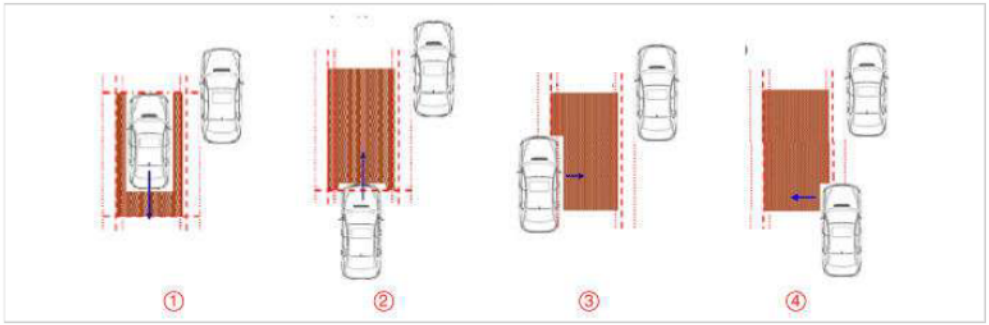
1. Warning zone



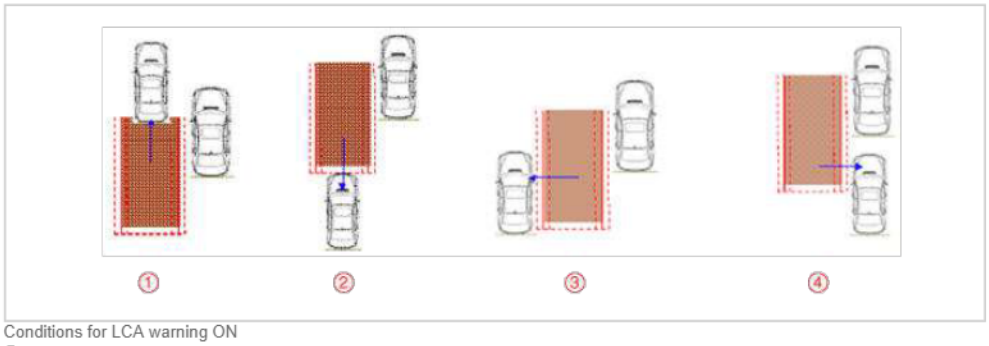
2. Conditions for BSD warning ON
   ① The entire body of the target vehicle is located behind the line A.
   ② Any part of the target vehicle pass the line B.
   ③ Any part of the target vehicle passes the line D and Hysteresis In.

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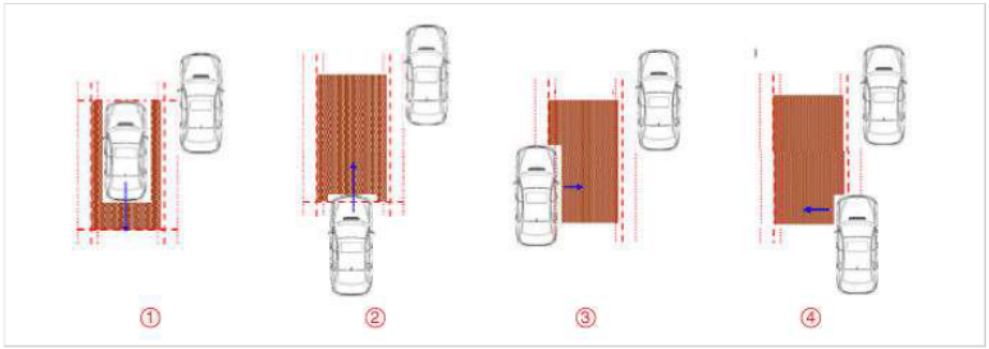
④ The entire part of the target vehicle passes the line D and Hysteresis In.



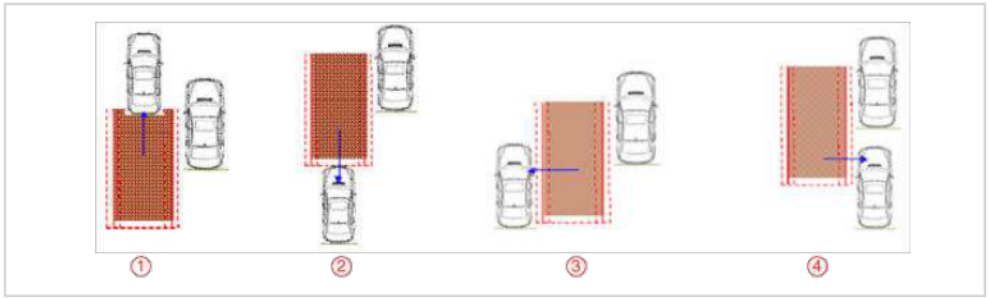
3. Conditions for BSD warning OFF
   ① The entire body of the target vehicle moves before the line A.
   ② The entire body of the target vehicle moves behind the line B.
   ③ The entire body of the target vehicle passes the line D and Hysteresis Out.
   ④ The entire part of the target vehicle passes the line E and Hysteresis Out.



4. Conditions for LCA warning ON
   ① The entire body of the target vehicle is located behind the line B.
   ② Any part of the target vehicle pass the line C.
   ③ Any part of the target vehicle passes the line D and Hysteresis In.
   ④ The entire part of the target vehicle passes the line E and Hysteresis In.
   ⑤ In the all above condition, TTC(Time to Collision) is not less than 4.5 sec.



5. Conditions for LCA warning OFF
   ① The entire body of the target vehicle is located before the line B.
   ② The entire body of the target vehicle pass the line C.
   ③ The entire body of the target vehicle passes the line D and Hysteresis Out.
   ④ The entire body of the target vehicle passes the line E and Hysteresis Out.
   ⑤ In the all above condition, TTC(Time to Collision) is not more than 4.5 sec.



6. Sensor activation conditions
   ① BSD & LCA switch (indicated by the switch LED) is on.
   ② Vehicle Speed: 15 km/h or faster

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③ Curvature radius: 150m or more
④ Relative car speed: -10 ~ 250㎞/h
("-" means overtaking the preceding vehicle)

7. Sensor deactivation conditions
   ① BSD & LCA switch (indicated by the switch LED) is off.
   ② Vehicle Speed: 28 km/h or slower
   ③ Curvature radius: 150m or less
   ④ Relative car speed: All except -10 ~ 250㎞/h
   ("-" means overtaking the preceding vehicle)
8. System control prohibition
   ① The radar is covered by debris: System conditions - Blockage message is outputted

> **Information**
> If the sensor on the rear bumper is contaminated by snow, mud or stickers, its detecting performance may be lowered.

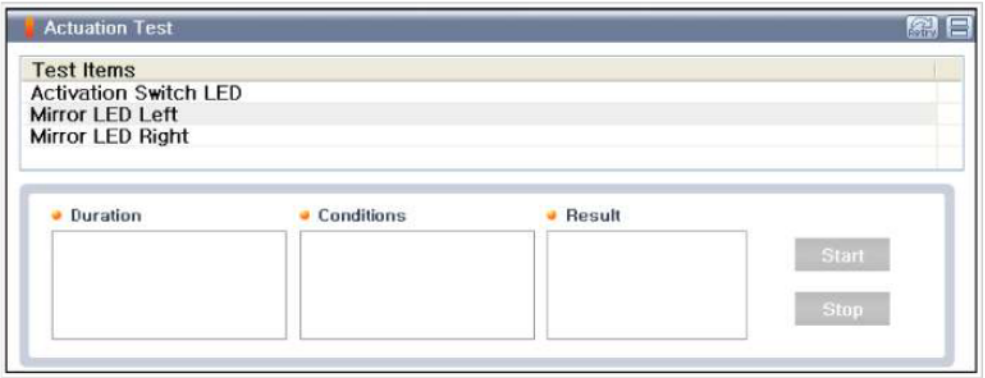
   ② The radar installation is damaged by an outside shock: Send the error code
   ③ BSD & LCA system fails: Send the error code
   ④ The radar is overheated: System conditions - Over Temperature message is outputted.

Diagnosis With GDS

1. BSD system defects can be quickly diagnosed with the GDS. GDS operates actuator quickly to monitor, input/output value and self diagnosis.
2. Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.
3. Select the vehicle model and then BSD system.
4. Select "Input/output monitoring", if you want to check current data of BSD system.

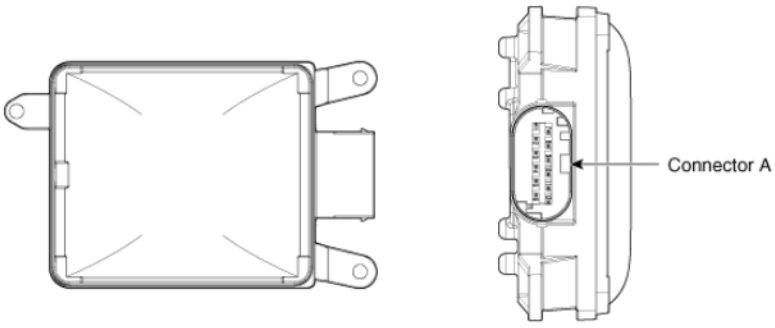


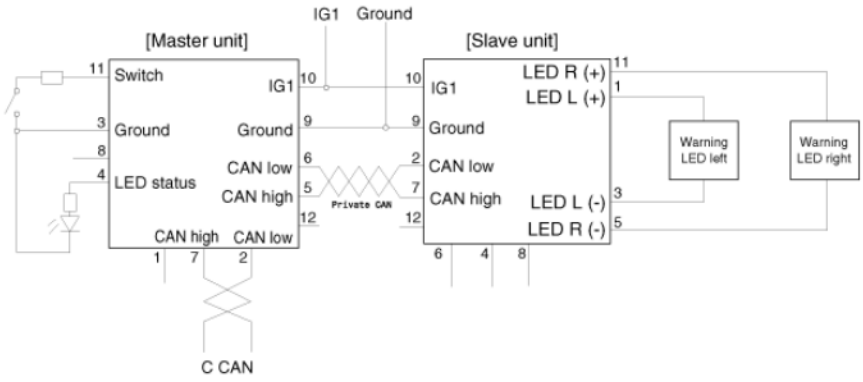
5. If you want to check each module operation forcefully, select "Actuation test".

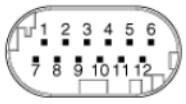


Circuit Diagram

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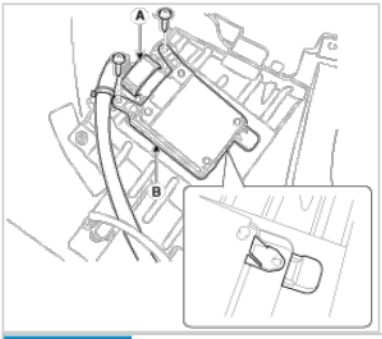




Connector A	No.	Description (LH-Slave)	No.	Description (RH-Master)
	1	Left outside mirror LED warning indicator (+)	1	-
	2	Private CAN low	2	C CAN low
	3	Left outside mirror LED warning indicator (-)	3	BSD switch ground
	4	-	4	BSD switch signal (LED status)
	5	Right outside mirror LED warning indicator (-)	5	Private CAN high
	6	-	6	Private CAN low
	7	Private CAN high	7	C CAN high
	8	-	8	-
	9	Ground	9	Ground
	10	IGN 1	10	IGN 1
	11	Right outside mirror LED warning indicator (+)	11	BSD switch
	12	-	12	-

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper.
   (Refer to Body - "Rear Bumper")
3. Remove the BSD unit (A) after loosening the mounting screws.



NOTICE

Take care not to separate the bracket from rear bumper when removing the BSD sensor.

Installation

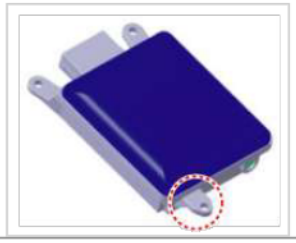
1. Install the BSD units to the rear bumper.
2. Install the rear bumper.

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3. Connect the negative (-) battery terminal.

NOTICE

Take care not to confuse left side (slave) and right side (master) unit when installing.

Item	Left (Slave)	Right (Master)
Shape		
Remarks	Check the mounting screw hole shape	

Description

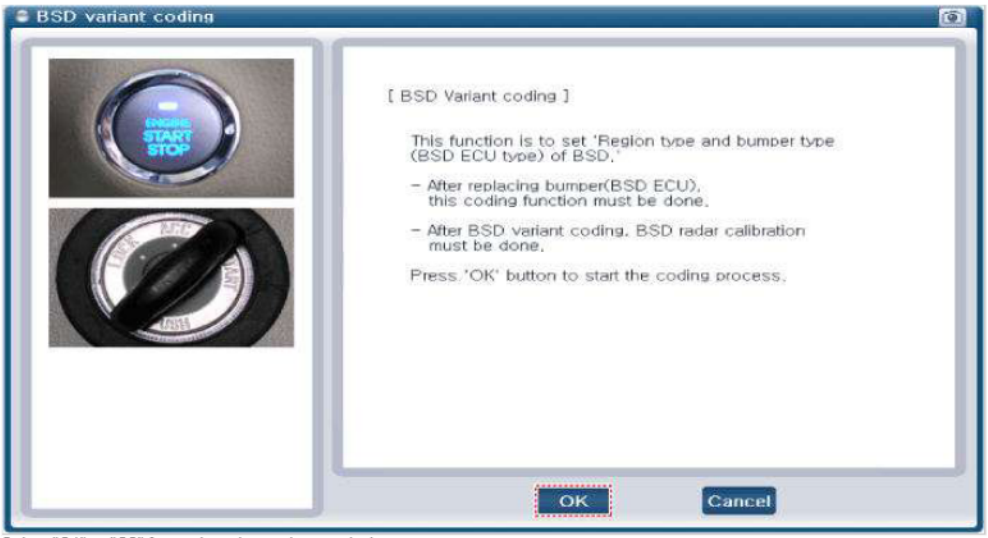
The used radar frequency of BSD is two, "North America region" and "Except North America region".
If it replaces BSD unit, BSD unit has to perform the procedure of variant coding.

BSD Variant Coding

1. Select the "BSD Variant Coding" procedure in BSD system.

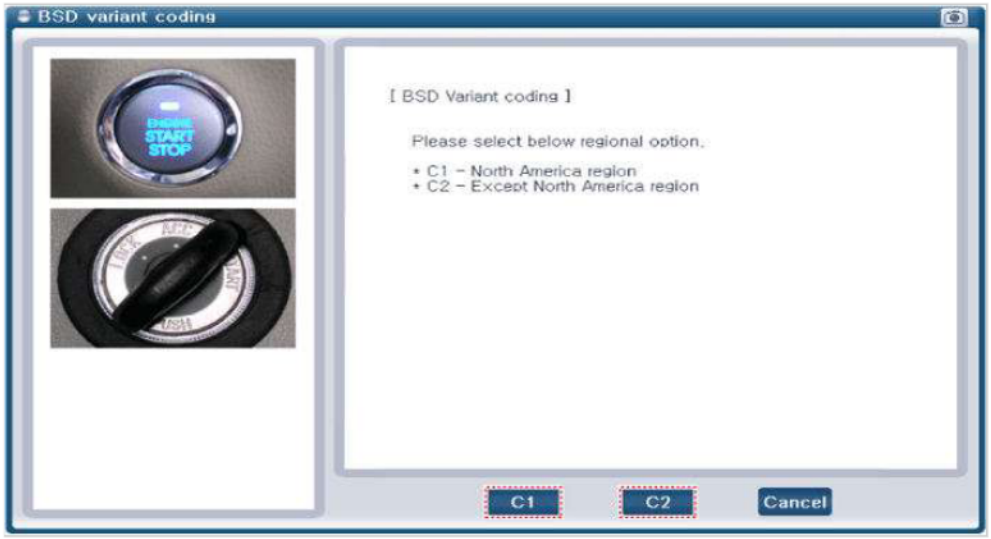


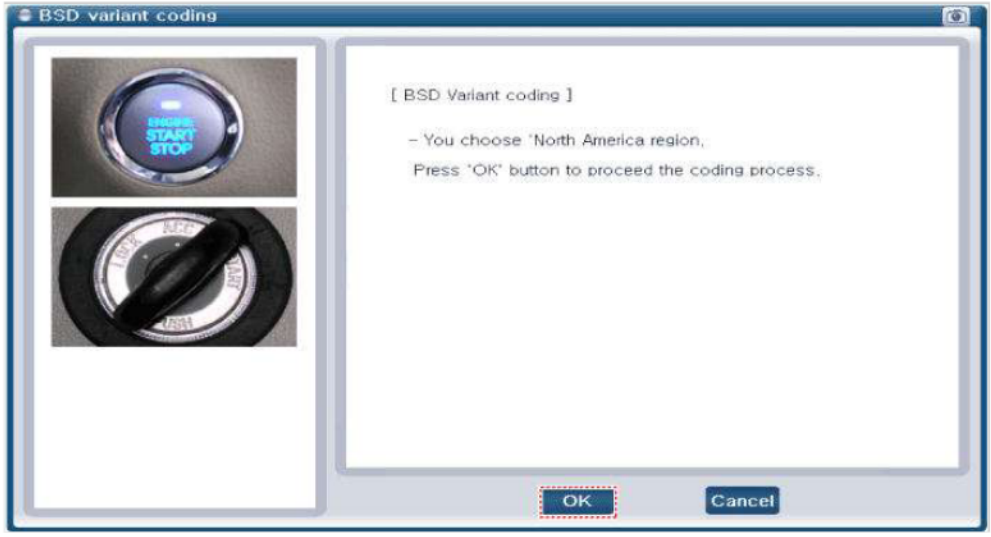
2. Perform the "BSD Variant Coding" procedure according to the GDS screen message.

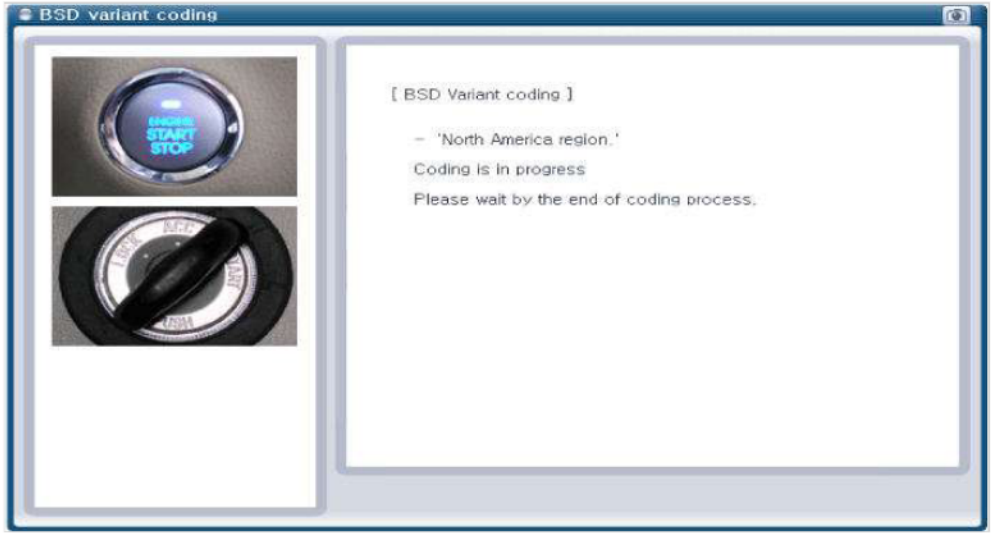


3. Select "C1" or "C2" for each region and transmission.
And then proceed the BSD variant coding process.

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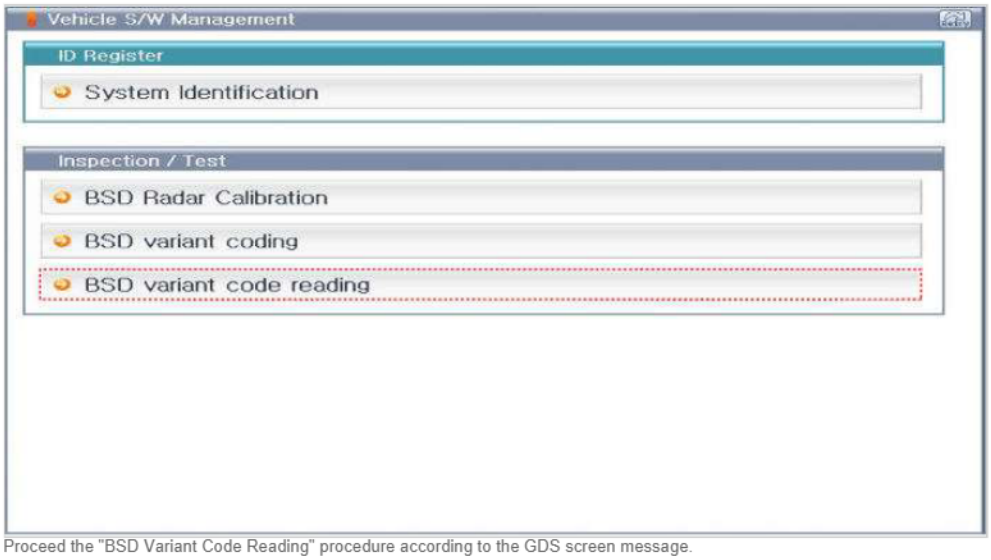


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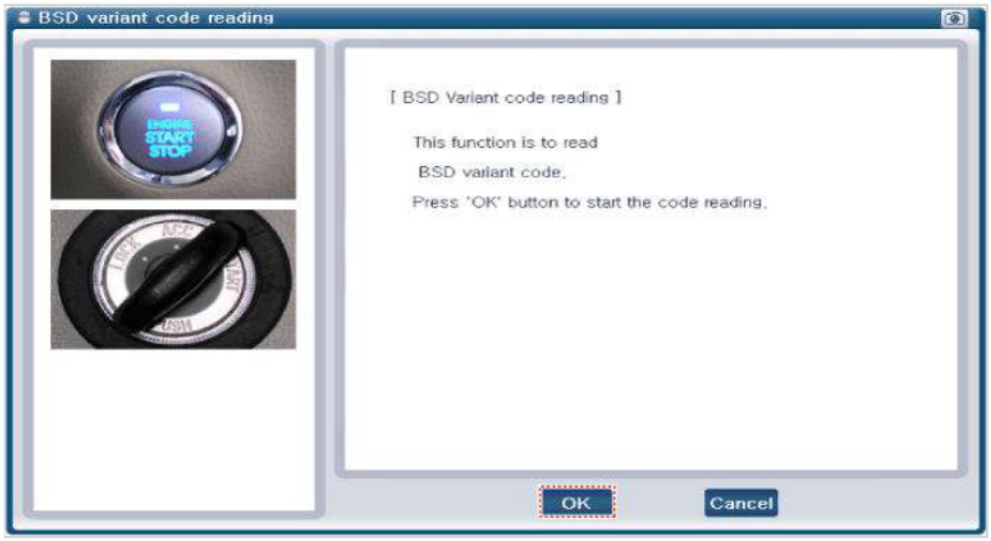


BSD Variant Code Reading

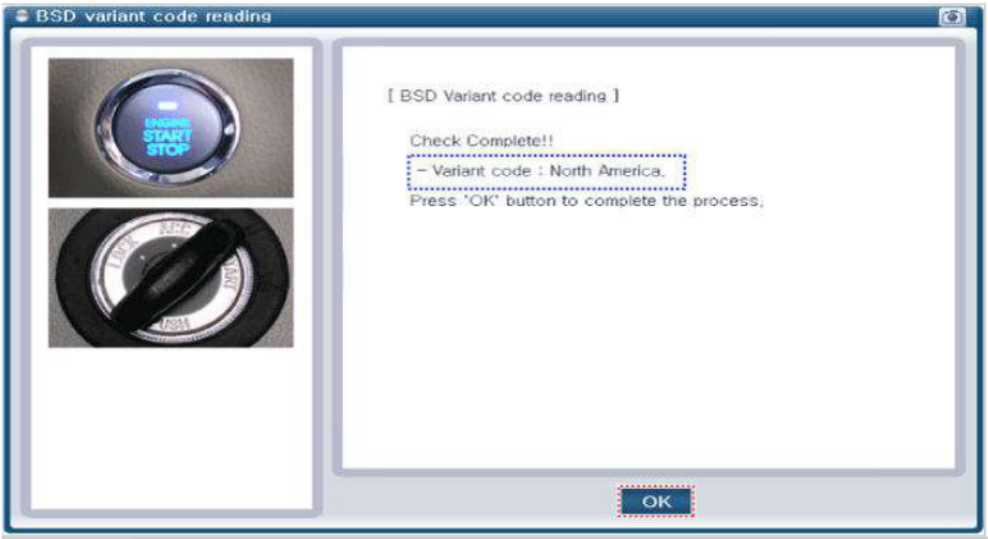
1. Select the "BSD Variant Code Reading" procedure.



2. Proceed the "BSD Variant Code Reading" procedure according to the GDS screen message.

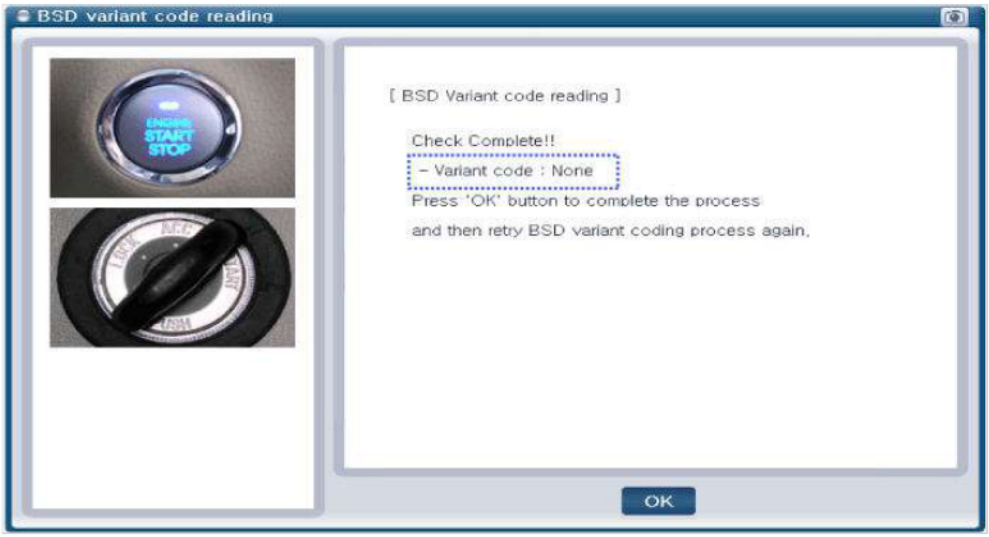


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Information

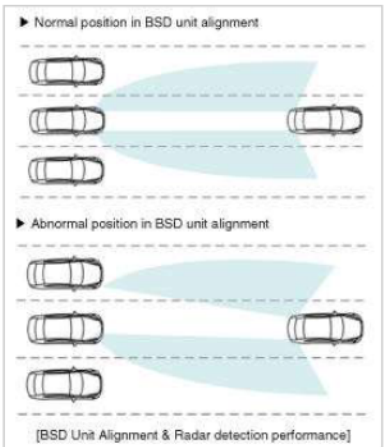
If BSD unit does not set "BSD Variant Coding", "Variant code : None" is verified.
Perform the "BSD Variant Coding" certainly.



Body Electrical System

Description

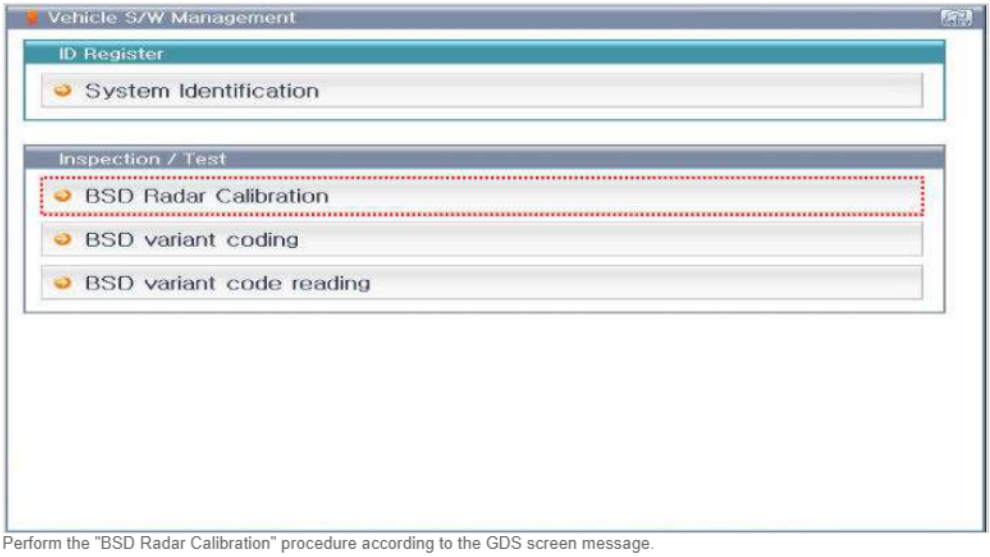
To sense the cars exactly in the next lane with the radar, the direction of the sensor and the direction of the vehicle have to align.
This is BSD unit alignment. If this alignment is not performed as below illustration, the degradation of detection performance and the cause of false alarms.
The rear bumper accident vehicle and after replacing the BSD unit vehicle have to do this align especially.



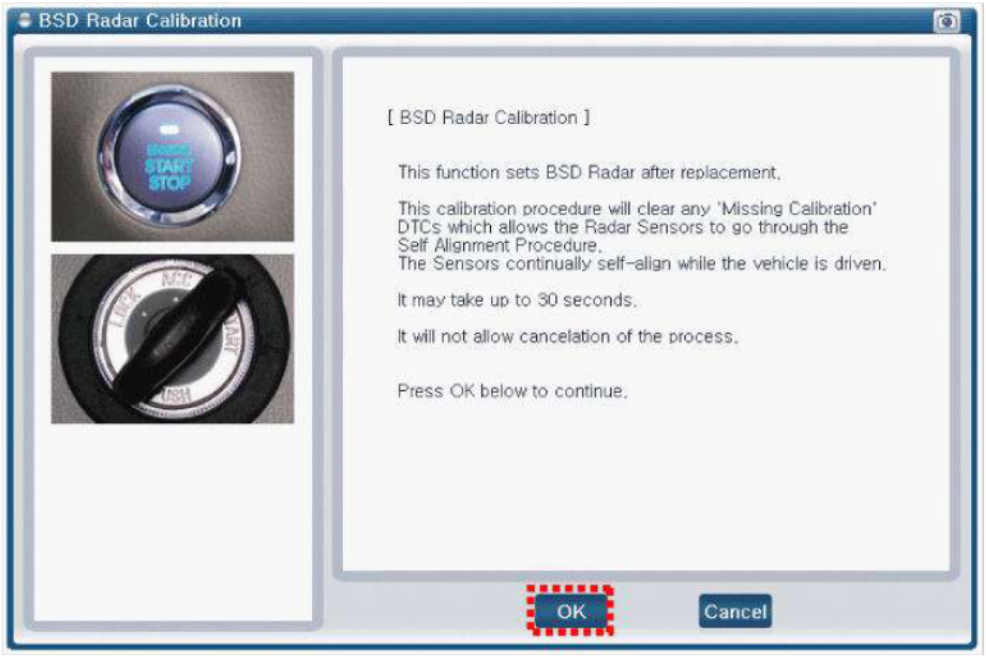
[BSD Unit Alignment & Radar detection performance]

1. The rear bumper accident vehicle and after replacing the BSD unit vehicle have to do BSD unit alignment using GDS.
2. Select "BSD Radar Calibration" procedure in BSD system.

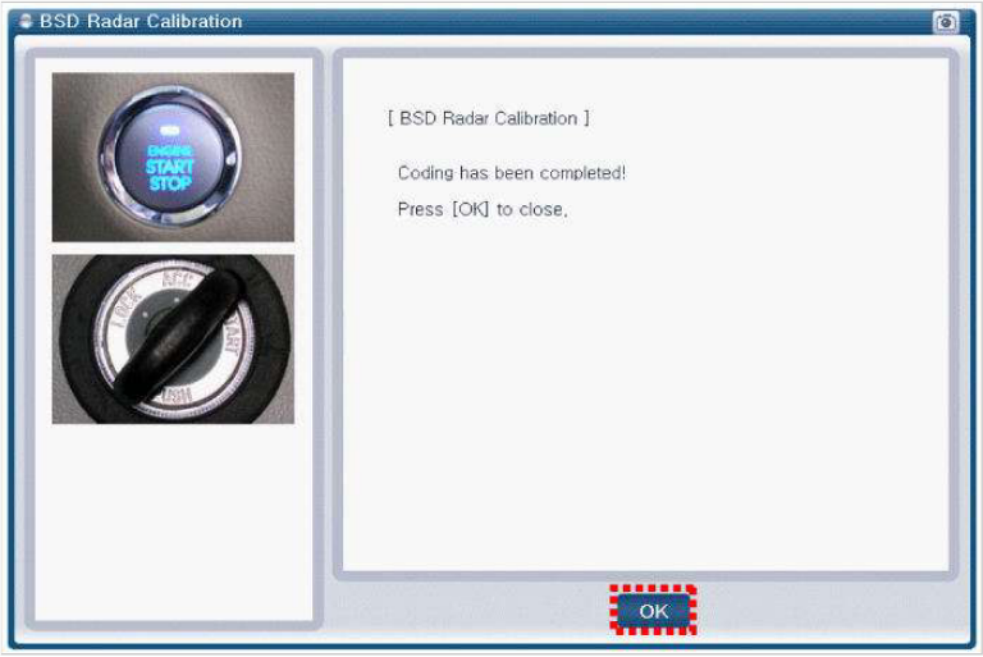
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3. Perform the "BSD Radar Calibration" procedure according to the GDS screen message.

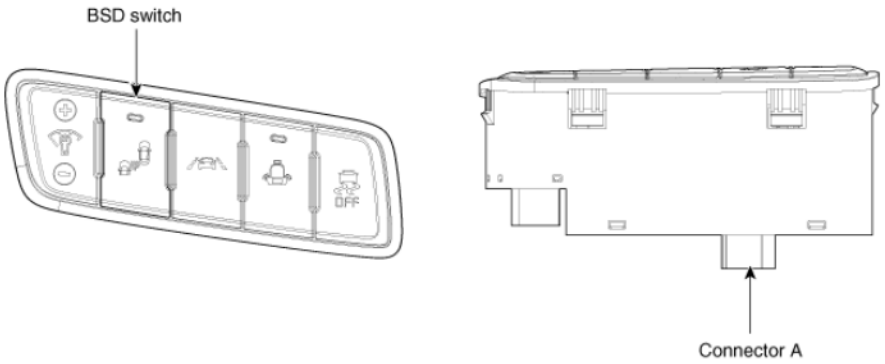


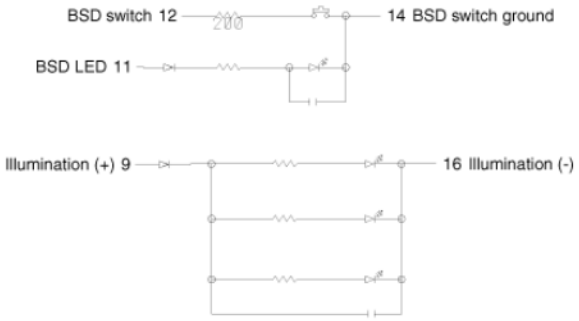
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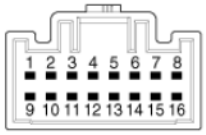


Circuit Diagram

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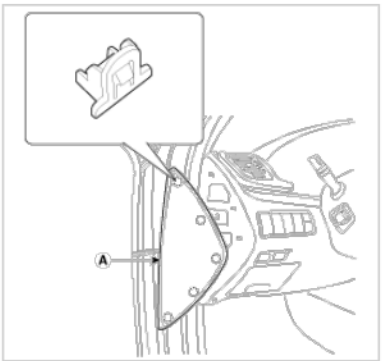




Connector A	No.	Description	No.	Description
	1	IGN	9	Illumination (+)
	2	Haptic switch	10	Main relay L
	3	-	11	BSD LED
	4	LDWS switch	12	BSD switch
	5	-	13	-
	6	Haptic LED	14	BSD switch ground
	7	-	15	ESC switch
	8	Ground	16	Illumination (-)

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the passenger compartment junction box cover.
3. Remove the driver side cover (A).

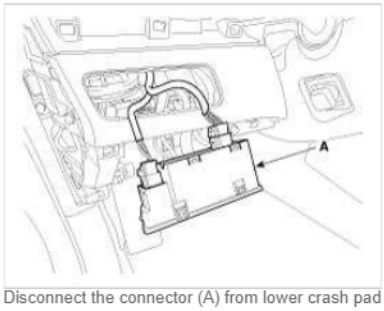


4. Remove the crash pad side switch assembly (A) by pushing it through side cover hole.

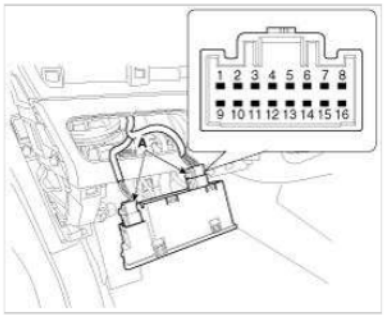
NOTICE

Put on gloves to protect your hands.

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5. Disconnect the connector (A) from lower crash pad switch.

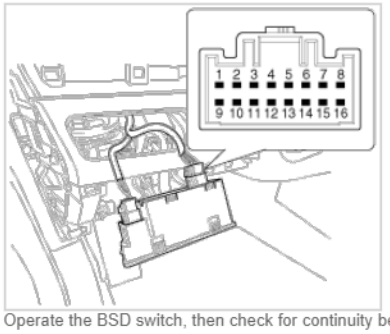


Installation

1. Install the lower crash pad switch.
2. Install the driver side cover.
3. Connect the negative (-) battery terminal.

Inspection

1. Disconnect the BSD switch connector.



2. Operate the BSD switch, then check for continuity between terminals of BSD switch connector.

Terminal / Position	ON(PUSH)	OFF(FREE)	Remarks
12			BSD unit (input)
14			GND
11			BSD unit (output)/IND
16			Illumination(-)
9			Illumination(+)

Troubleshooting

Examples of False-Alarm Occurrence from system characteristics (It's not a problem)

- Characteristics of EM Wave : EM Waves are reflected against all material and especially metal very well. Reflections of EM Waves are varies with the shape of object. (※ EM : Electro Magnetic)
- Radar Sensor : Radar Sensor sense the car by 24GHz echo signal.
- Special enviroment make the 'False-Alarm' occurrence because of EM waves.

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