General Information

General Troubleshooting Information

Before Troubleshooting

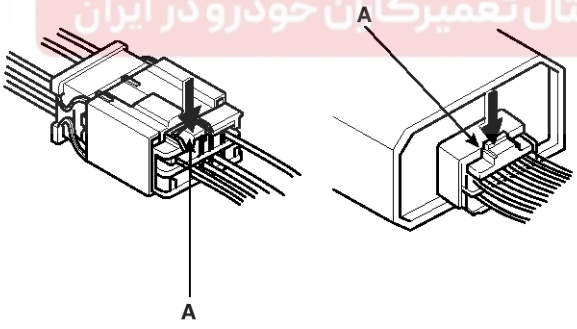
1. Check applicable fuses in the appropriate fuse/relay box.
2. Check the battery for damage, state of charge, and clean and tight connections.

   (Refer to the 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.

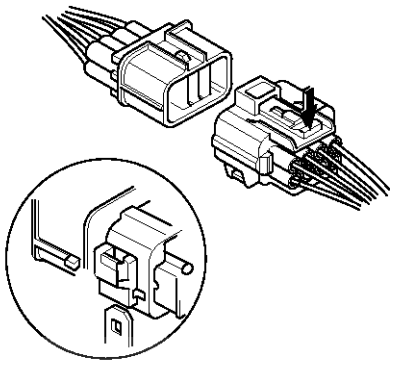
Handling Connectors

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).



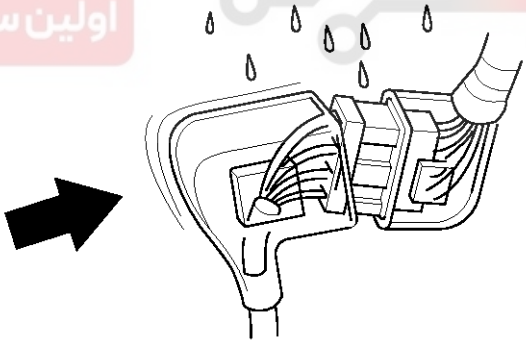
ETKD150A

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).



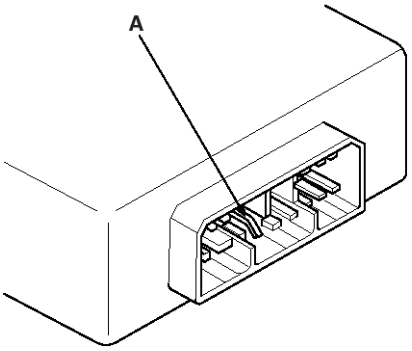
ETKD150B

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



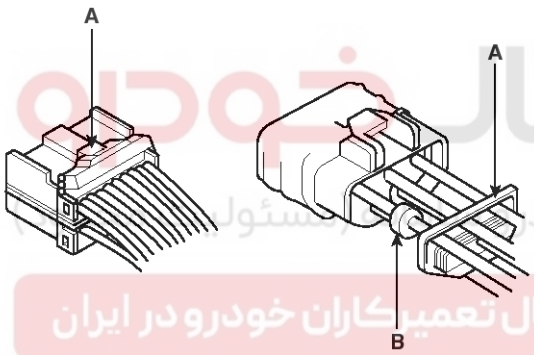
ETKD150C

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



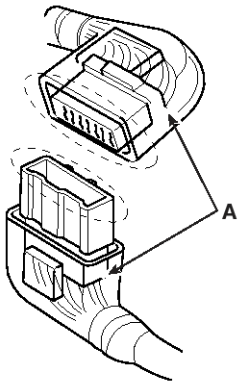
ETKD150D

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



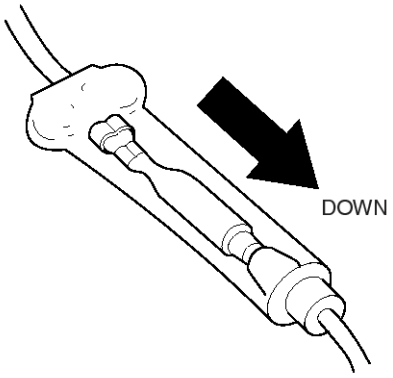
ETKD150E

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



ETKD150F

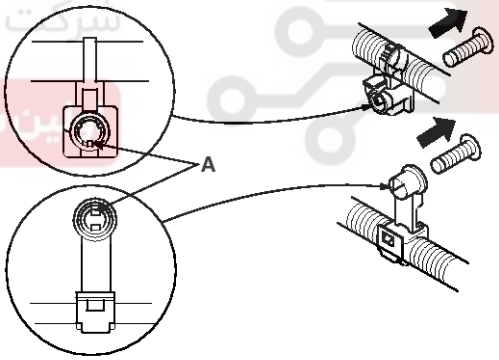
11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.



ETKD150G

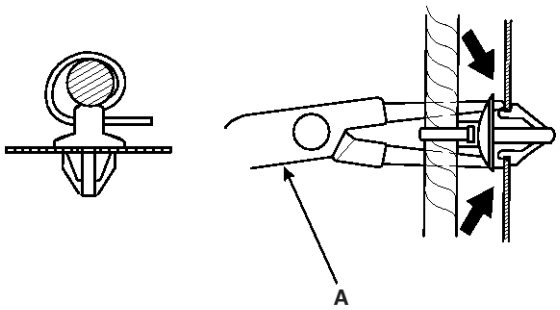
Handling Wires And Harnesses

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).



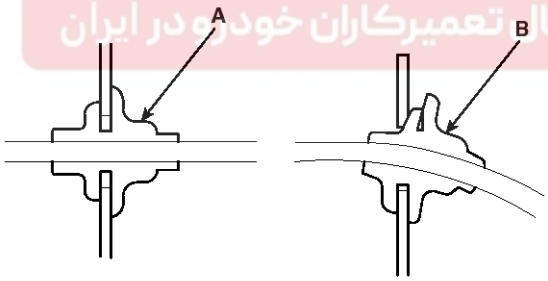
ETKD150H

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.



ETKD150I

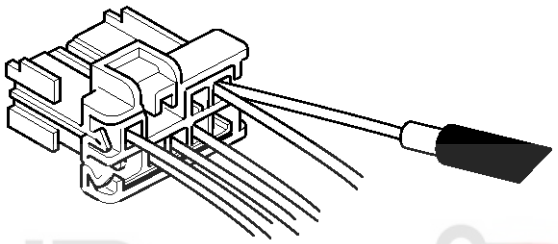
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.
6. Seat grommets in their grooves properly (A). Do not leave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



ETKD150J

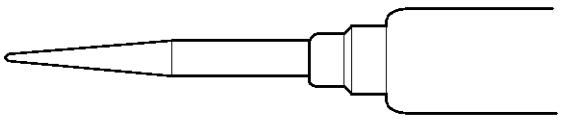
Testing And Repairs

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).



ETKD150K

5. Use a remover tool with a tapered tip.



ETKD150L

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.

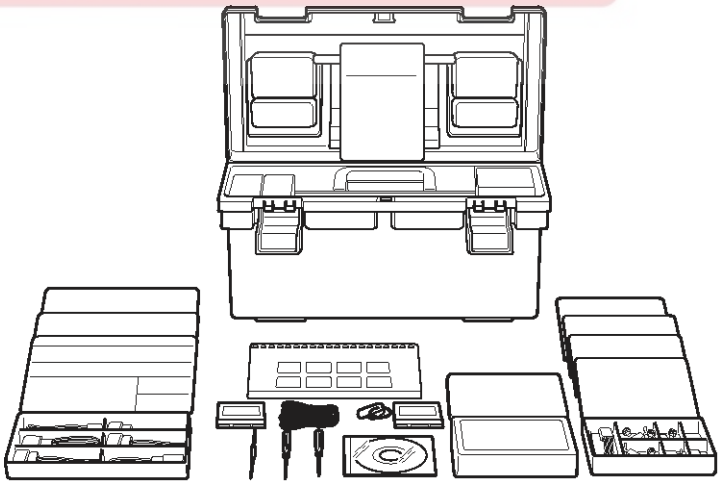
5. Make sure the circuit works

   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.

Reference Service Tools

Tool Number	Tool Name
0K000 003 AA0	Wire Harness Repair Kit II
0K000 003 A01 (001~028)	Connector Assembly Set
0K000 003 A02 (TS01~TS19)	Terminal & Seal Set
0K000 003 A03 (029~031)	Removal Tool Set
0K000 003 029	Removal Tool 1 (Flat Type)
0K000 003 030	Removal Tool 2 (Round Type)
0K000 003 031	Tweezers
0K000 003 A04 (032-1~032-9)	Inner Box Set
0K000 003 032-1~3	Inner Box A~C (Large)
0K000 003 032-4~7	Inner Box A~C (Samll)
0K000 003 032-8	Inner Box H (Empty Box for Storage of Terminals)
0K000 003 032-9	Inner Box H (Empty Box for Storage of Connectors)
0K000 003 033	Carrying Case
0K000 003 034	Shrink Tube (#Black, Ø4, 1M)
0K000 003 035	Shrink Tube (#Black, Ø5, 1M)
0K000 003 036	Wire (0.5SQ, 2M)
0K000 003 061	Inline Solder Connector 1 (Ø3.85 X 8mm)
0K000 003 062	Inline Solder Connector 1 (Ø5.25 X 8mm)

* For the wiring repair kit II, refer to the User's guide of the Wiring Repair Kit II(Pub. No. : 0K000 003 A05).



Audio

Specification

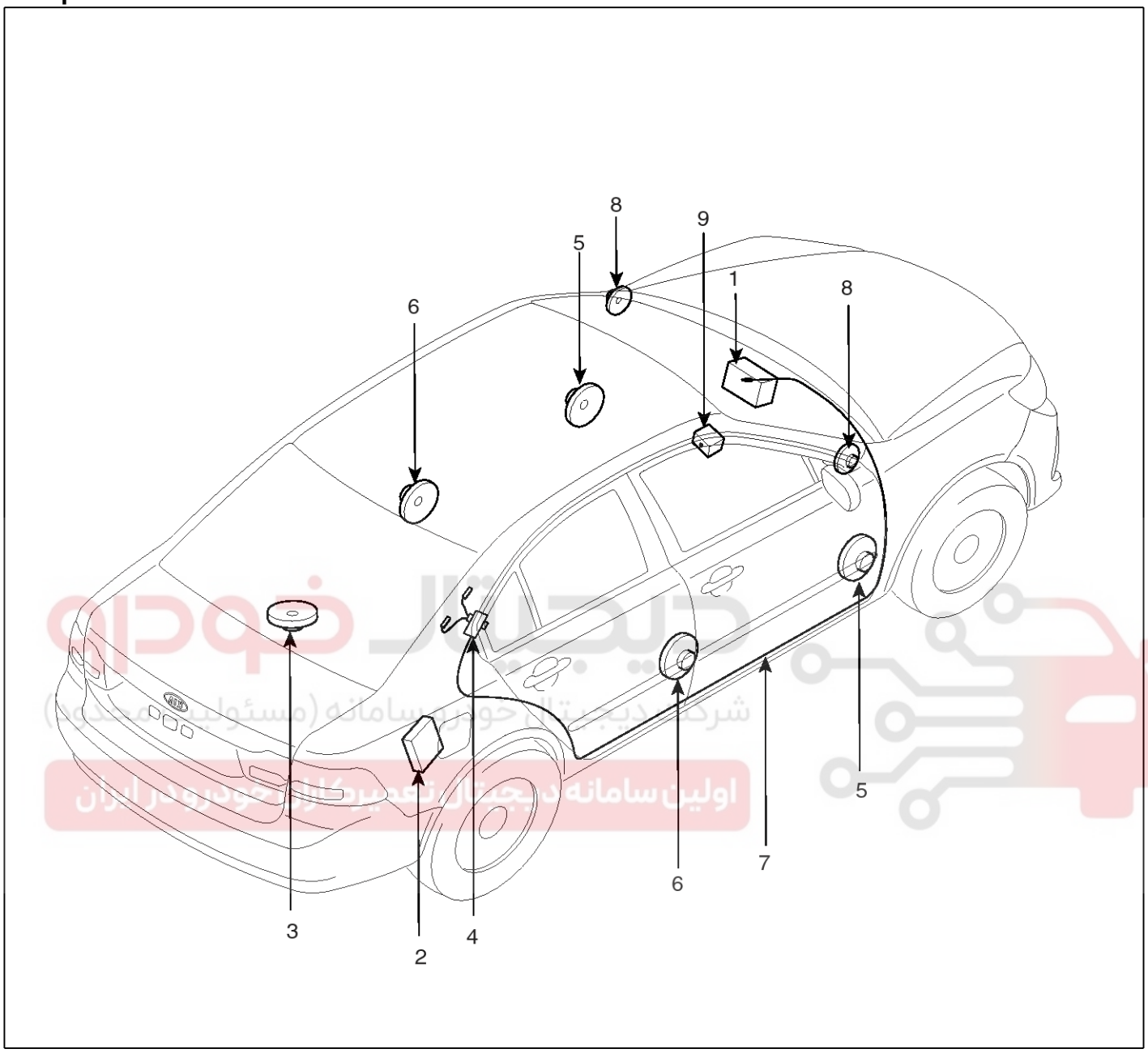
Audio

Item		Specification		
Model		Radio/CD	Radio/CD/MP3	Radio/CDC/MP3
Power supply		DC 14.4V		
Rated output		Max 43W x 4	14W x 4	3.2 Vrms
Antenna		80PF 75Ω		
Tuning type		PLL synthesized type		
Load Impedance		4Ω x 4		10KΩ x 4
Frequency range / Channel space	FM	87.5~108 MHz/ 100KHz (General), 50KHz(Europe)		
	AM	531~1602 KHz/ 9KHz (General)		
	MW	522~1620 KHz/ 9KHz (Europe)		
	LW	153~279 KHz/ 1KHz (Europe)		
	FM	76.0~90.0 MHz/ 100KHz (Japan)		
	AM	522~1629KHz/ 9KHz (Japan)		

Speaker

Item	Specification						
Model	Front	Rear	Tweeter	-	-		
Input power	Max 25W	Max 25W	Max 40W	-	-		
Impedance	4±0.6Ω	4±0.6Ω	4±0.6Ω	-	-		
Audio external a-mplifier	Front	Rear	Tweeter	Center	Sub woofer		
Input power	Max 25W	Max 25W	Max 40W	Max 32W	Max 64W		
Impedance	2±0.4Ω	2±0.4Ω	4±0.6Ω	2.15±0.25Ω	1.35±0.25Ω		
DVD external am-plifier	Front	Rear	Tweeter	Center	Sub woofer	Rear center	Sliding door
Input power	Max 25W	Max 25W	Max 40W	Max 32W	Max 64W	Max 32W	Max 32W
Impedance	4±0.6Ω	4±0.6Ω	4±0.6Ω	2±0.25Ω	1.35±0.25Ω	2±0.25Ω	2±0.6Ω

Component Location



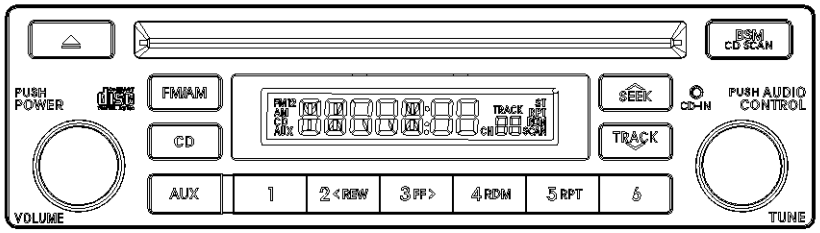
SMGBE9000L

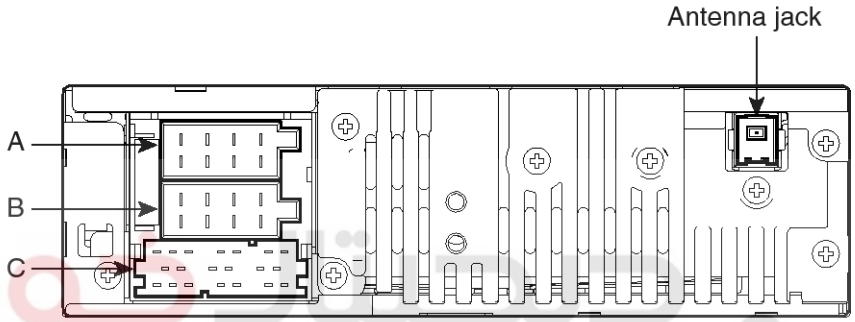
1. Audio unit
2. External amp
3. Woofer speaker
4. Glass antenna
5. Front door speaker
6. Rear door speaker
7. Antenna feeder cable
8. Tweeter speaker
9. Aux Jack

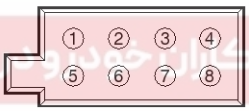
Audio Unit

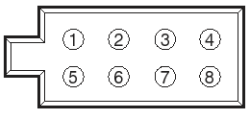
Components

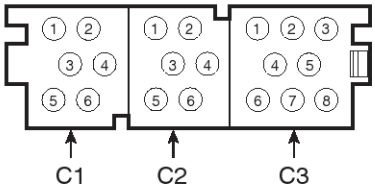
[Radio/CD]





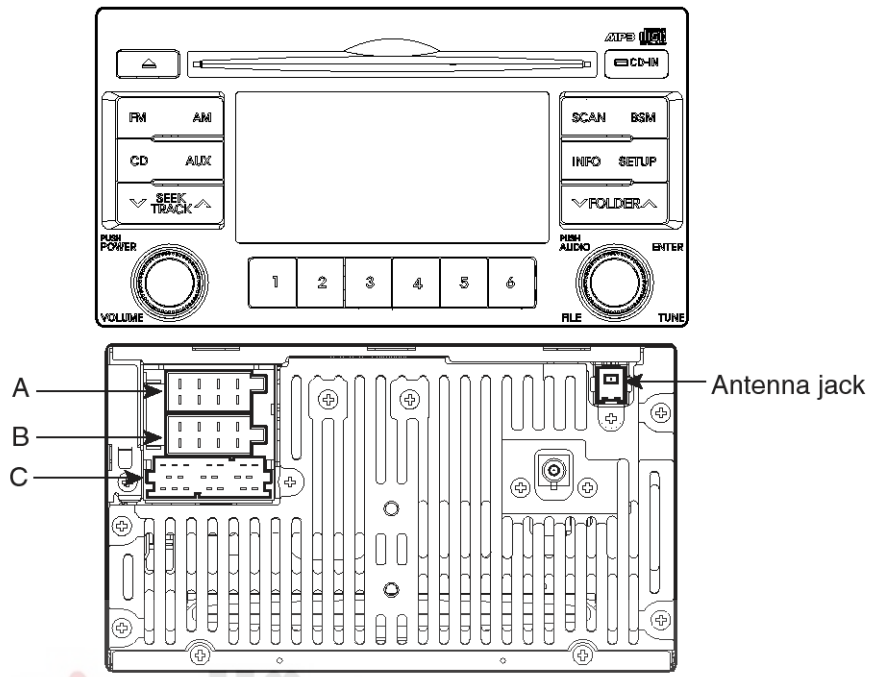
Connector A	Pin	Description	Pin	Description
	1	Speed	5	-
	2	Illumination (+)	6	IGN +12V
	3	Remote antenna	7	Illumination (-)
	4	Battery (+)	8	GND

Connector B	Pin	Description	Pin	Description
	1	Speaker RR +	5	Speaker RR -
	2	Speaker FR +	6	Speaker FR -
	3	Speaker FL +	7	Speaker FL -
	4	Speaker RL +	8	Speaker RL -

Connector C	Pin	Description	Pin	Description
	1-1	-	2-5	Steering Wheel Remote
	1-2	-	2-6	Remote GND
	1-3	-	3-1	-
	1-4	-	3-2	-
	1-5	Mute	3-3	-
	1-6	-	3-4	-
	2-1	Aux Input R	3-5	-
	2-2	Aux Input L	3-6	-
	2-3	Aux REF	3-7	-
	2-4	Aux DET	3-8	-

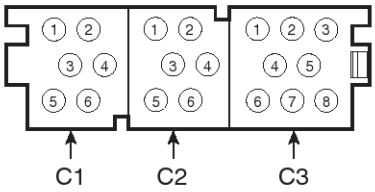
SMGBE9040L

[Radio/CD/MP3]



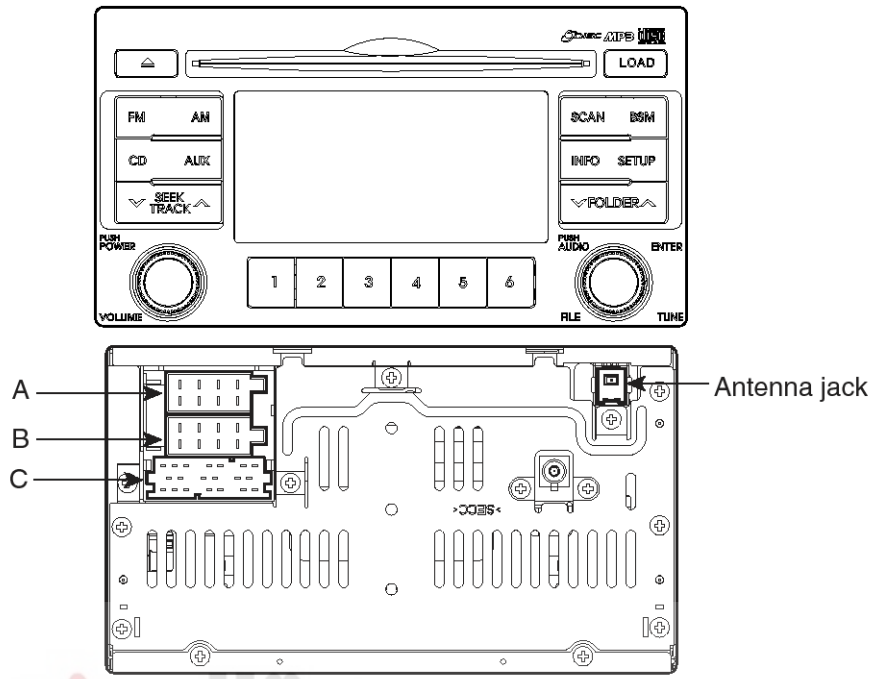
Connector A	Pin	Description	Pin	Description
	1	Speed	5	-
	2	Illumination (+)	6	IGN +12V
	3	Remote antenna	7	Illumination (-)
	4	Battery (+)	8	GND

Connector B	Pin	Description	Pin	Description
	1	Speaker RR +	5	Speaker RR -
	2	Speaker FR +	6	Speaker FR -
	3	Speaker FL +	7	Speaker FL -
	4	Speaker RL +	8	Speaker RL -

Connector C	Pin	Description	Pin	Description
	1-1	-	2-5	Steering Wheel Remote
	1-2	-	2-6	Remote GND
	1-3	-	3-1	-
	1-4	-	3-2	USB D-
	1-5	Mute	3-3	-
	1-6	-	3-4	USB D+
	2-1	Aux Input R	3-5	USB/iPod/GND
	2-2	Aux Input L	3-6	-
	2-3	Aux REF	3-7	USB/iPod/VDO
	2-4	Aux DET	3-8	-

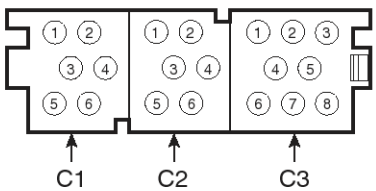
SMGBE9041L

[Radio/CDC/MP3]



Connector A	Pin	Description	Pin	Description
	1	Speed	5	-
	2	Illumination (+)	6	IGN +12V
	3	Remote antenna	7	Illumination (-)
	4	Battery (+)	8	GND

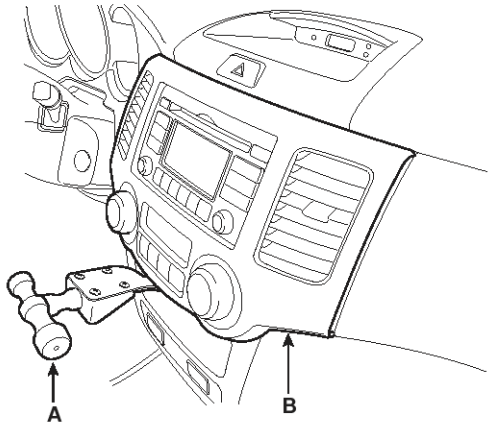
Connector B	Pin	Description	Pin	Description
	1	Speaker RR +	5	Speaker RR -
	2	Speaker FR +	6	Speaker FR -
	3	Speaker FL +	7	Speaker FL -
	4	Speaker RL +	8	Speaker RL -

Connector C	Pin	Description	Pin	Description
	1-1	-	2-5	Steering Wheel Remote
	1-2	-	2-6	Remote GND
	1-3	-	3-1	Amp Mute
	1-4	-	3-2	USB D-
	1-5	Mute	3-3	-
	1-6	-	3-4	USB D+
	2-1	Aux Input R	3-5	USB/iPod/GND
	2-2	Aux Input L	3-6	Remote Amp
	2-3	Aux REF	3-7	USB/iPod/VDO
	2-4	Aux DET	3-8	-

SMGBE9042L

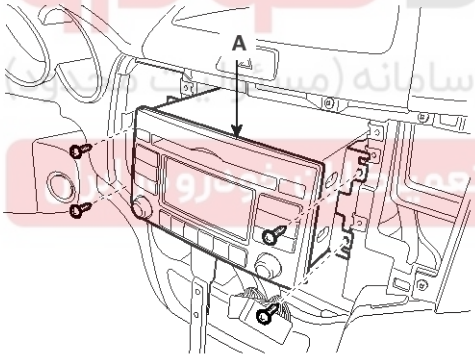
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center facia panel(B) using the SST (A). (refer to the BD group - crash pad)



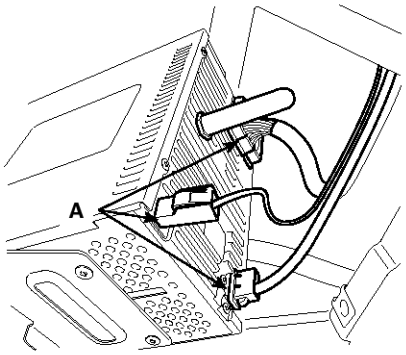
SMGBE9031D

3. Remove the mounting screws (A) then remove the audio unit (B).



SMGBE9005L

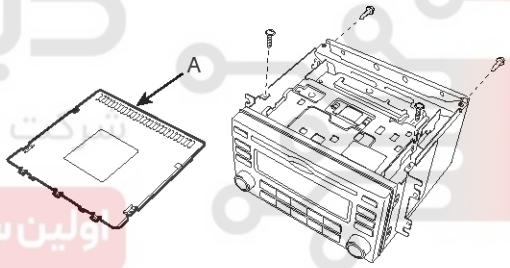
4. Remove the connectors(A).



SMGBE9006L

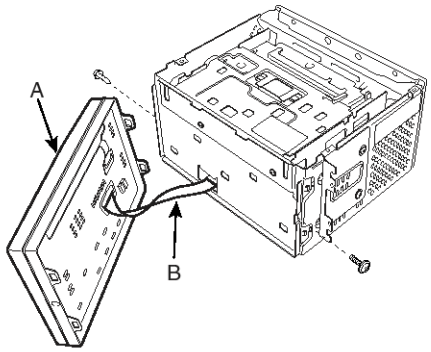
Disassembly

1. Disassemble the top cover (A) after loosening 4 screws.



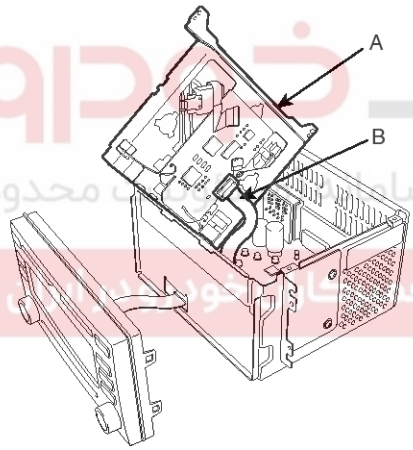
SSABE8114L

2. Disassemble the front cover (A) then disconnect the connector (B) between the unit and front cover if necessary.



SSABE8115L

3. Disconnect the connector (B) between the unit and the deck after loosening 4screws.



SSABE8113L

4. Disassemble the deck (A) from the unit.

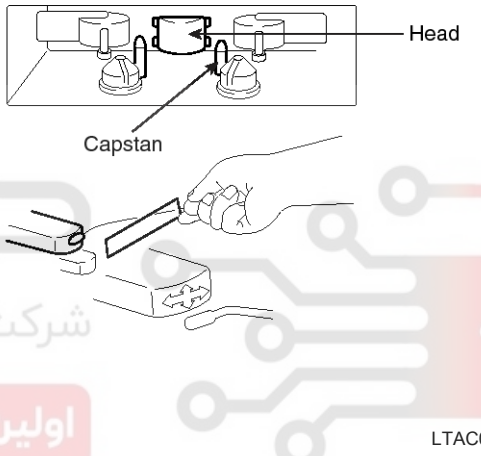
Installation

1. Connect the audio unit connectors and cables.
2. Install the audio unit.
3. Install the crash pad center facia panel.
4. Check the audio system.

Inspection

Tape Head And Capstan Cleaning

1. To obtain optimum performance clean the head, and capstan as often as necessary, depending on frequency of use and tape cleanness.
2. To clean the tape head and capstan, use a cotton swab dipped in ordinary rubbing an alcohol. Wipe the head and capstan.



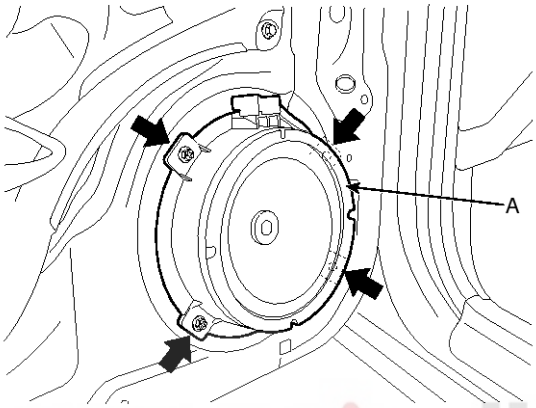
LTAC005A

Speakers

Removal

Front Speaker

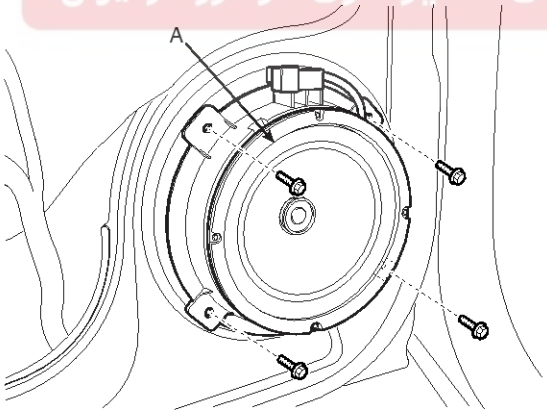
1. Remove the front door trim panel (Refer to the Body group - front door).
2. Remove the front speaker (A) after loosening 4 screws.



ATLG022B

Rear Speaker

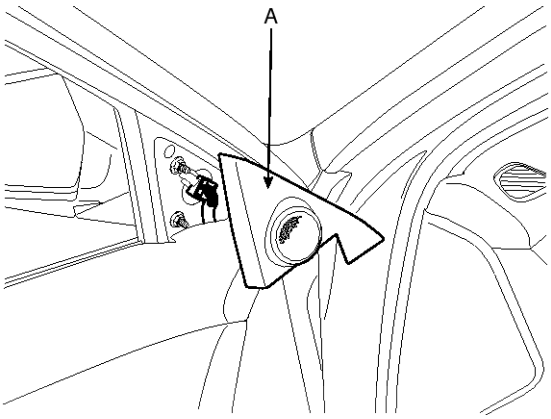
1. Remove the rear door trim panel (Refer to the Body group - rear door).
2. Remove the rear speaker (A) after removing 4 rivets.



ATLG022C

Tweeter Speaker

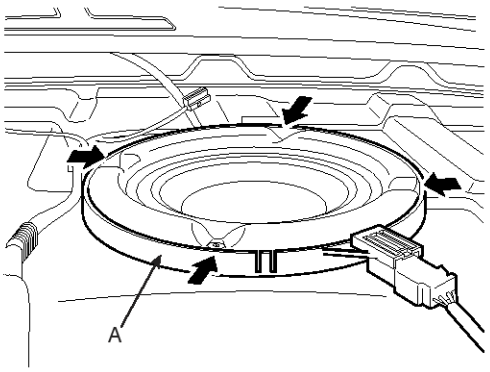
1. Remove the front door delta cover (A) (Refer to the Body group - front door).
2. Remove the tweeter speaker after disconnecting the connector.



ATLG022D

Woofer Speaker

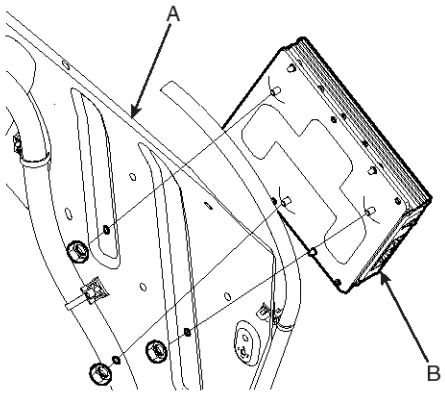
1. Remove the rear seat. (Refer to the Body group - rear seats)
2. Remove the rear package tray. (Refer to the Body group - interior trim)
3. Remove the woofer speaker (A) after removing 4 bolts.



KTRE022E

External Amp

1. Remove the luggage side trim.
2. Remove the external amp (B) from the quarter inner panel after removing 3 nuts.



KTRE022F

Installation

Front Speaker

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

Rear Speaker

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

Tweeter Speaker

1. Install the tweeter speaker after connecting the tweeter speaker connector.
2. Install the front door delta cover.

Woofer Speaker

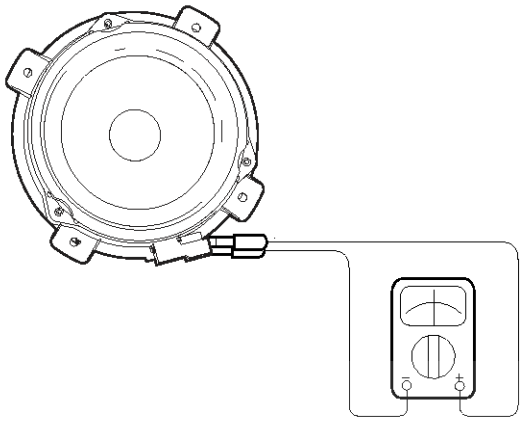
1. Install the woofer speaker after connecting the connector.
2. Install the rear package tray and rear seat assembly.

External Amp

1. Install the external amp after connecting the connector.
2. Install the luggage side trim.

Inspection

1. Check the speaker with an ohmmeter. If an ohmmeter indicates the correct impedance of the speaker when checking between the speaker (+) and speaker (-) of the same channel, the speaker is OK.
2. If a clicking sound is emitted from the speaker when the ohmmeter is connected to the speaker terminals, the speaker is OK.



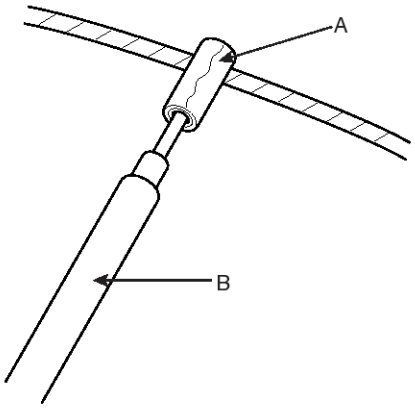
ATLG022E

Antenna

Inspection

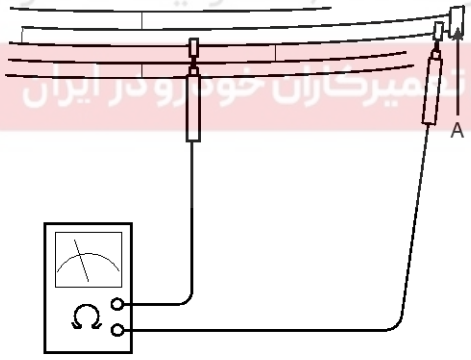
Glass Antenna Test

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



ETRF023C

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.



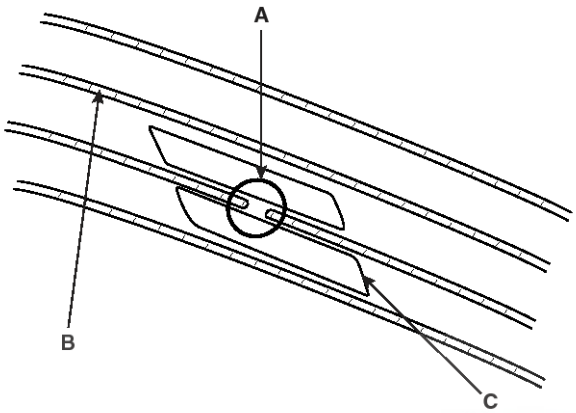
ETRF023D

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.

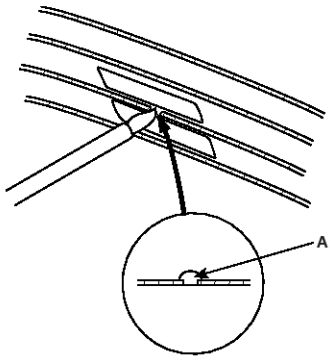


ETKD004K

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.



KTKD006Z

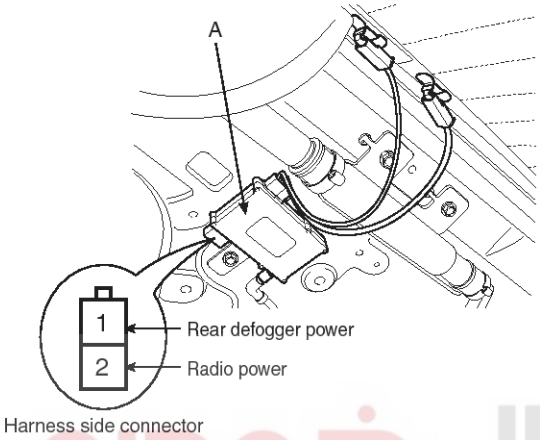
4. Check for continuity in the repaired wire.
5. Apply a second coat of paint in the same way. Let it dry three hours before removing the tape.

Glass Antenna Circuit Inspection

1. Remove the right side rear pillar trim. Then disconnect the 2P power connector from the glass antenna amp (A).
2. Turn the radio ON.

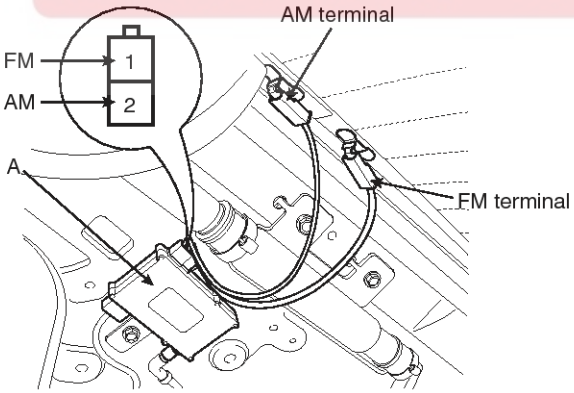
   Measure the voltage between terminal 2 of the harness side power connector and body ground.

OK : approximately 12V (ACC+)



LTLG023A

3. Disconnect the 2P connector of radio wiring from the glass antenna amp (A).
4. Check for continuity between terminals of harness side connector and antenna grid terminals (AM, FM).



LTLG023B

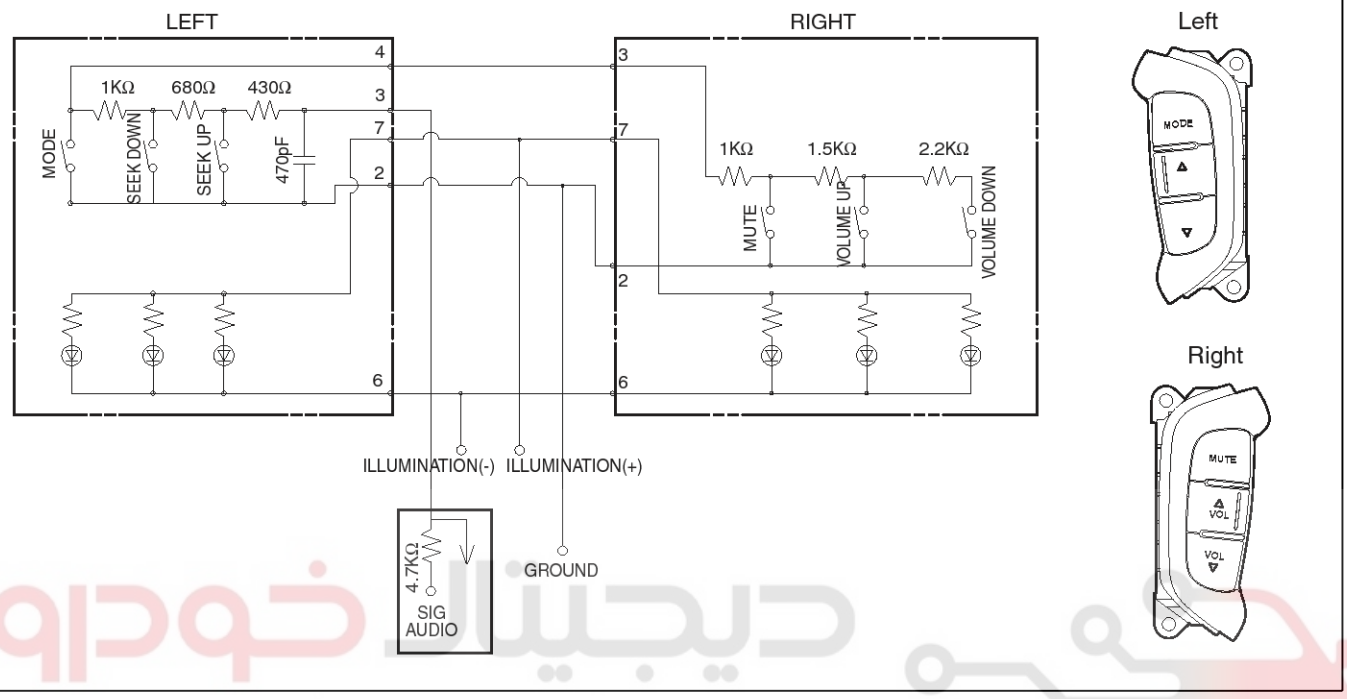
5. Check the grid lines for continuity.
6. When a poor radio reception is not repaired through the above inspection methods, replace the amp.

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

Audio Remote Control

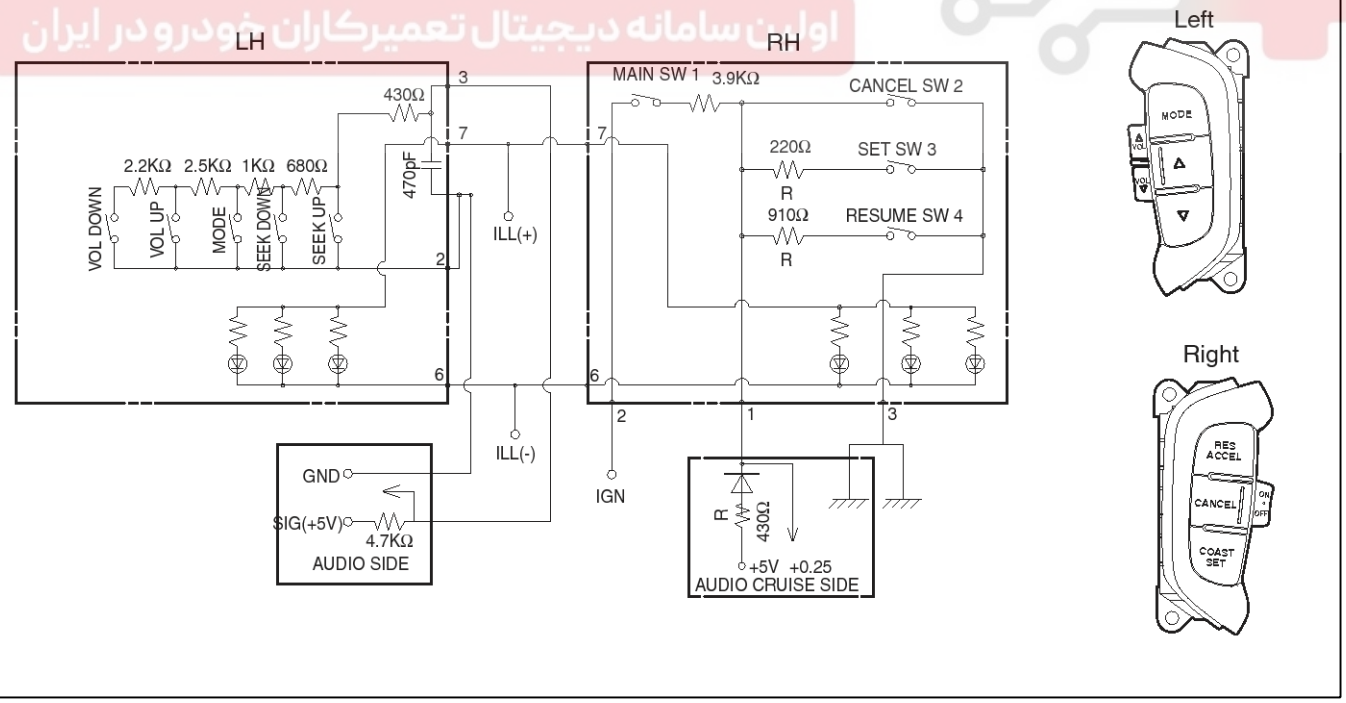
Circuit Diagram

[Audio(LH) + Audio(RH) remote control]



SMGBE7024N

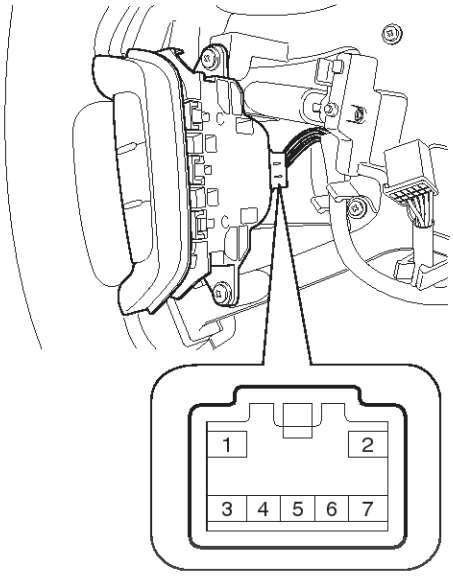
[Audio(LH) + Cruise(RH) remote control]



SMGBE7025N

Inspection

1. Check for resistance between No.2 and No.3 terminals in each switch position.

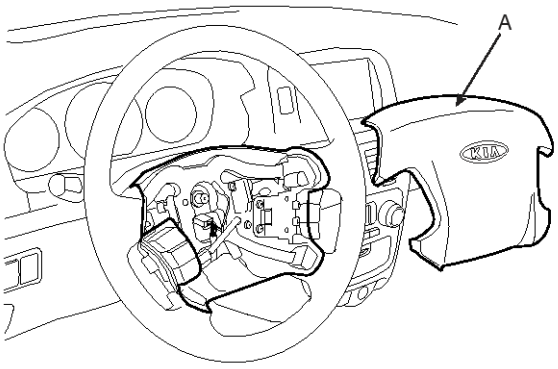


ATLG024B

Switch	Connector terminal	Resistance (±5%)
Volume Down	2 - 3 (Right)	6.81 kΩ
Volume Up	2 - 3 (Right)	4.61 kΩ
Seek Up	2 - 3 (Left)	430 Ω
Seek Down	2 - 3 (Right)	1.11 kΩ
Mode	2 - 3 (Left)	2.11 kΩ
Mute	2 - 3 (Right)	3..11 kΩ

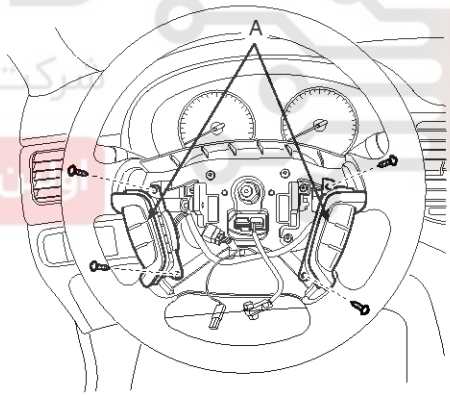
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module. (Refer to the airbag group)



ATLG024D

3. Remove the audio remote control switch (A) after remove the steering wheel remote control switch connector and 2 screws.



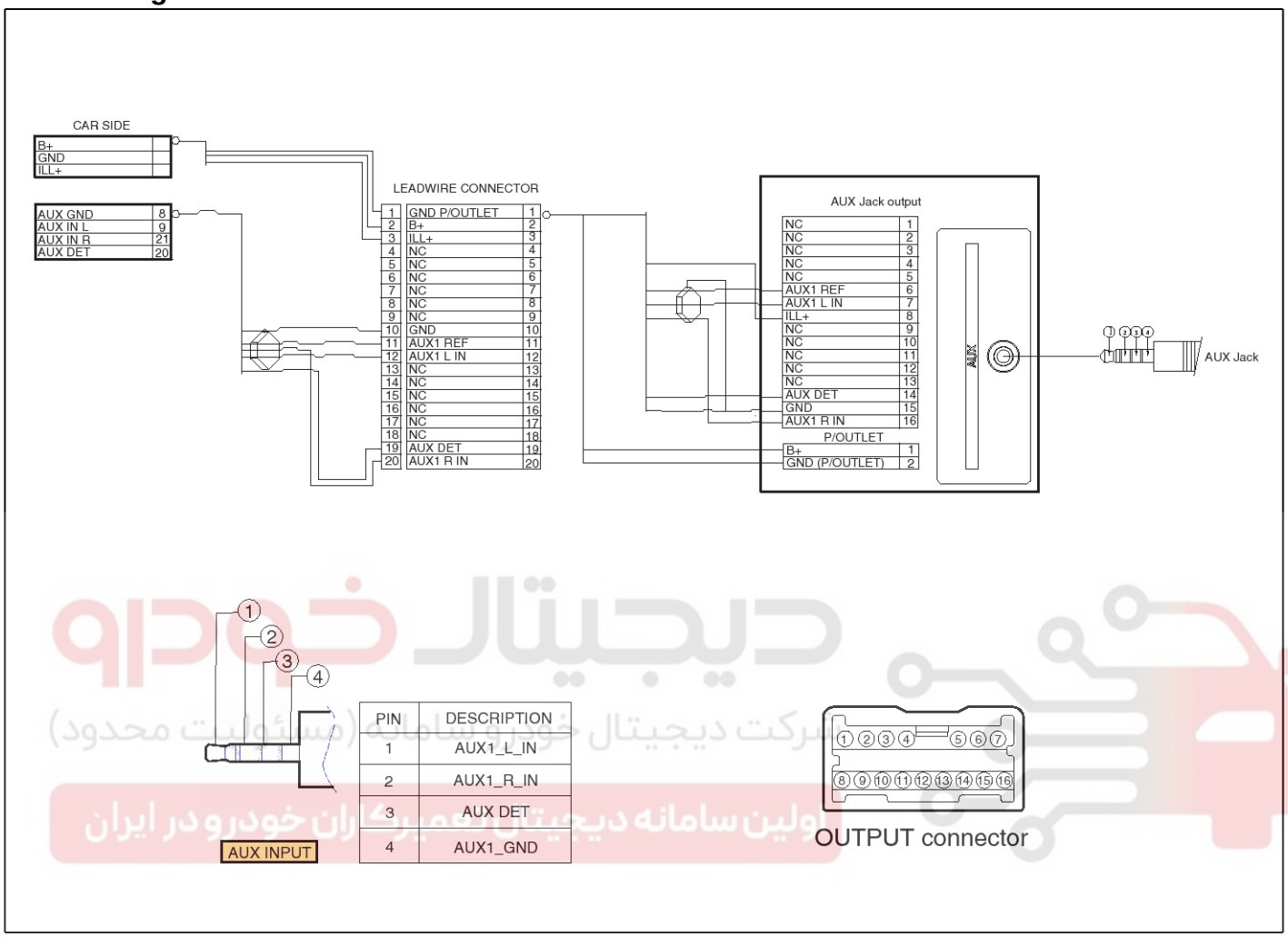
ATLG024A

Installation

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

AUX(Auxiliary) Jack

Circuit Diagram

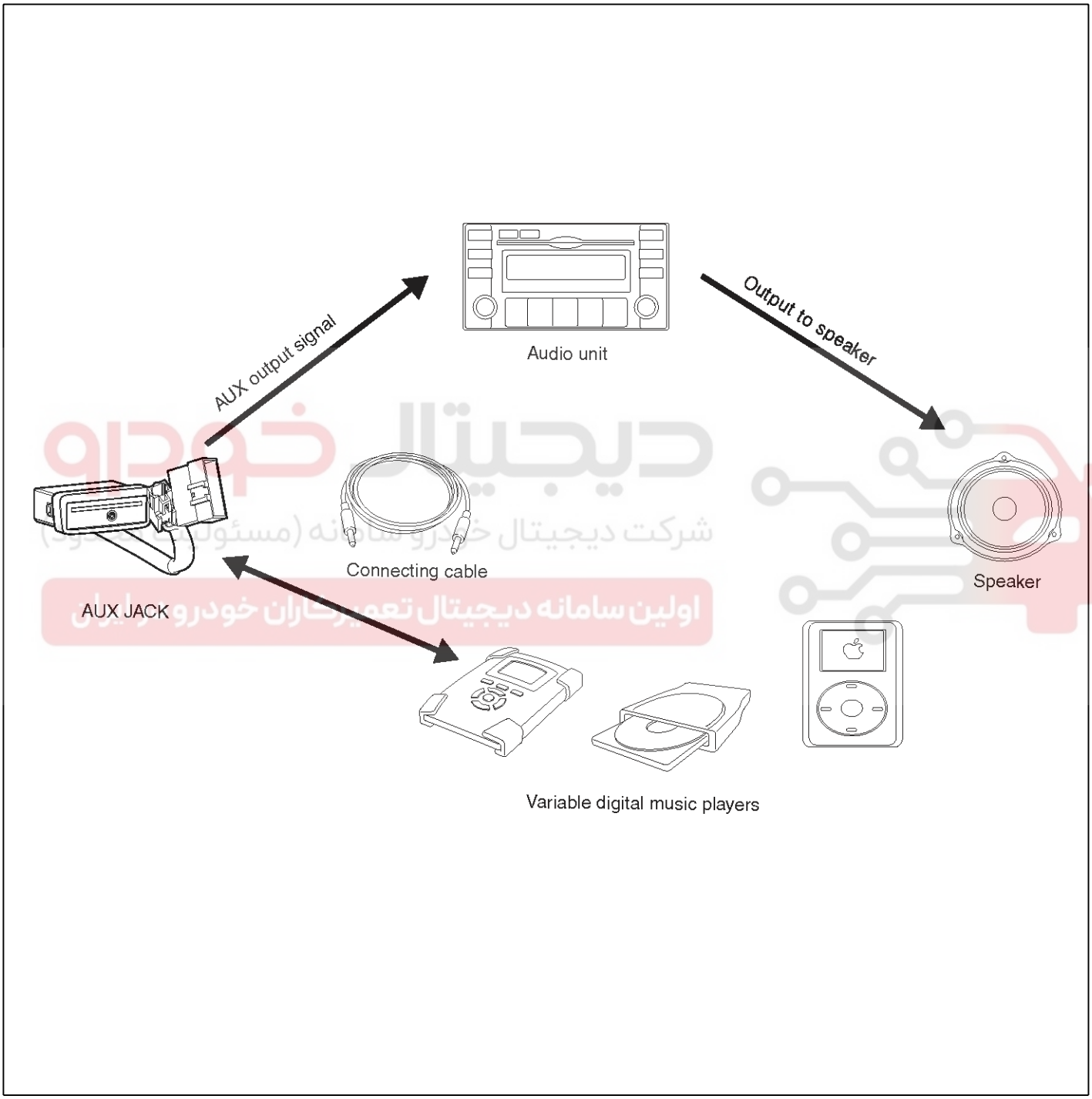


SMGBE8007L

Description

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

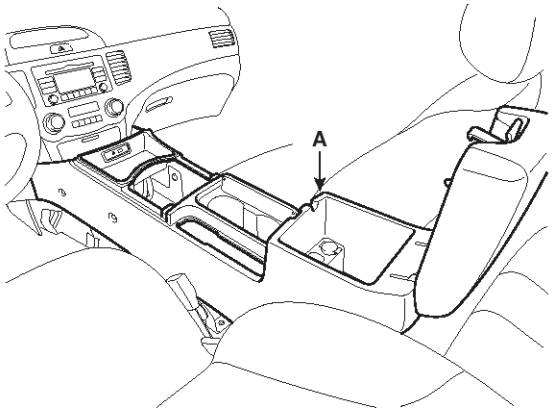
In case of distortions from media connected to the AUX source, the audio unit may not be defect but the output level of the used media does not match the specification of the AUX input.



SMGBE8006L

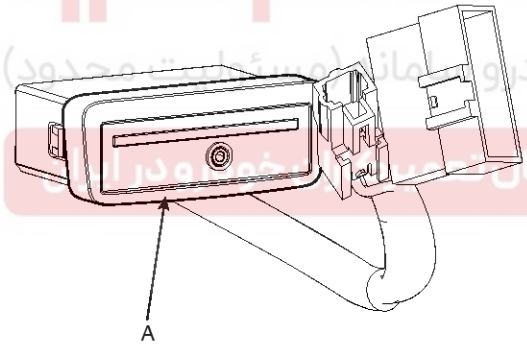
Removal

1. Remove the center console(A). (Refer to Body Gr. - Center console)



SMGBE9092D

2. Disconnect the jack assembly connector from the center console.
3. Remove the AUX jack(A) from the center console.



SMGBE8017D

Installation

1. Install the AUX jack.
2. Connect the AUX jack connector.
3. Install the center console.

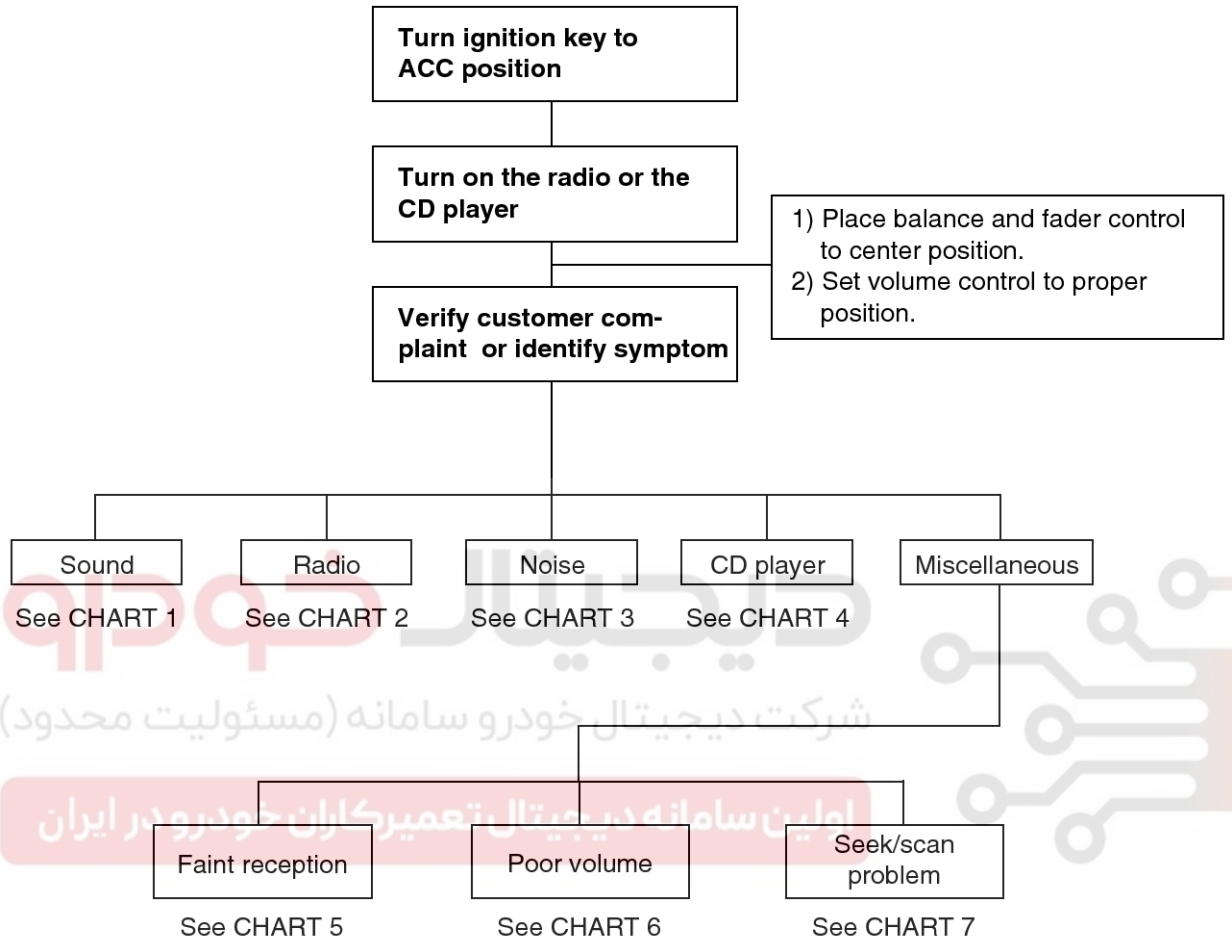
Troubleshooting

Customer Complaint Analysis Check Sheet

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

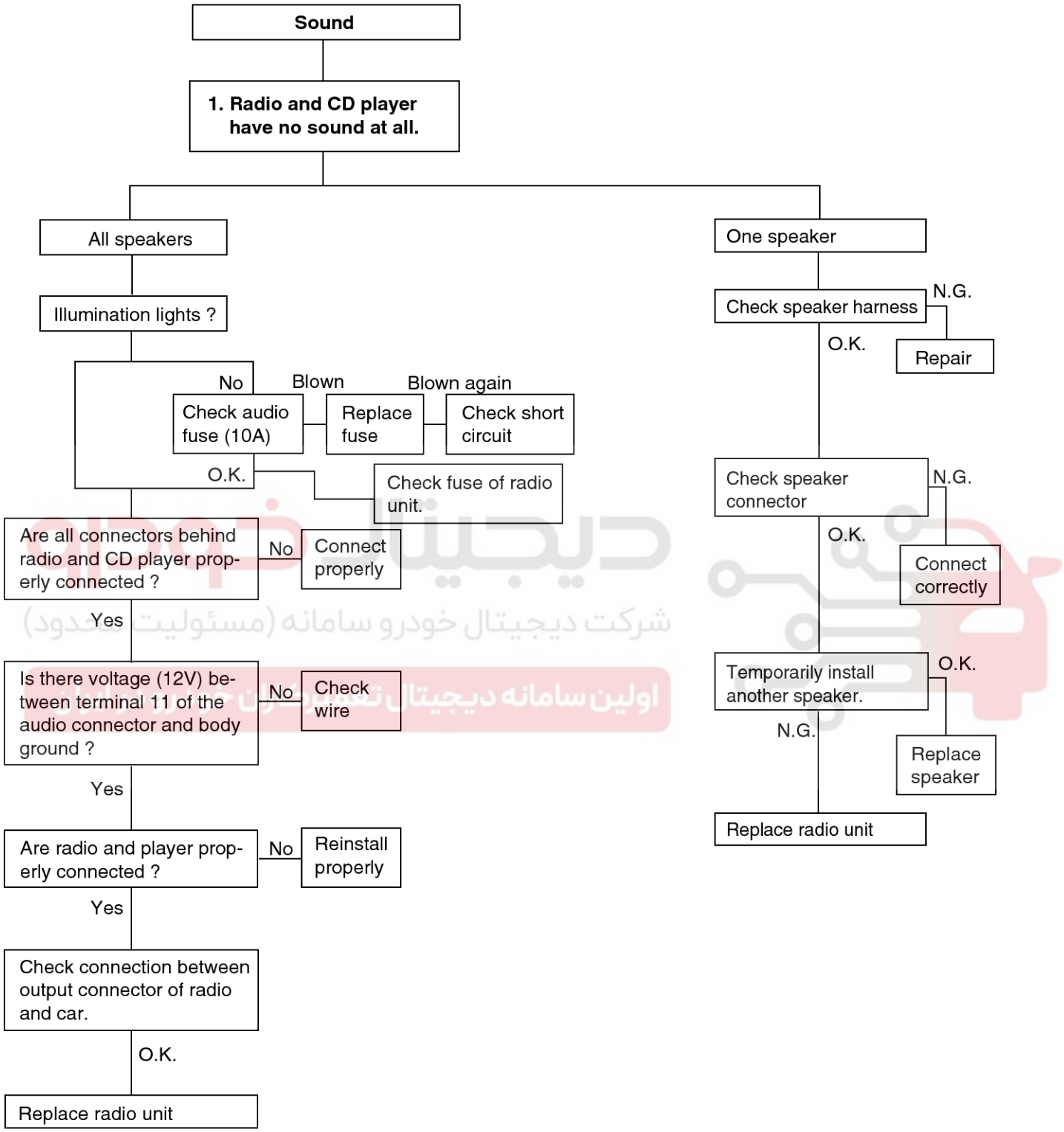
SNFBE8132L

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

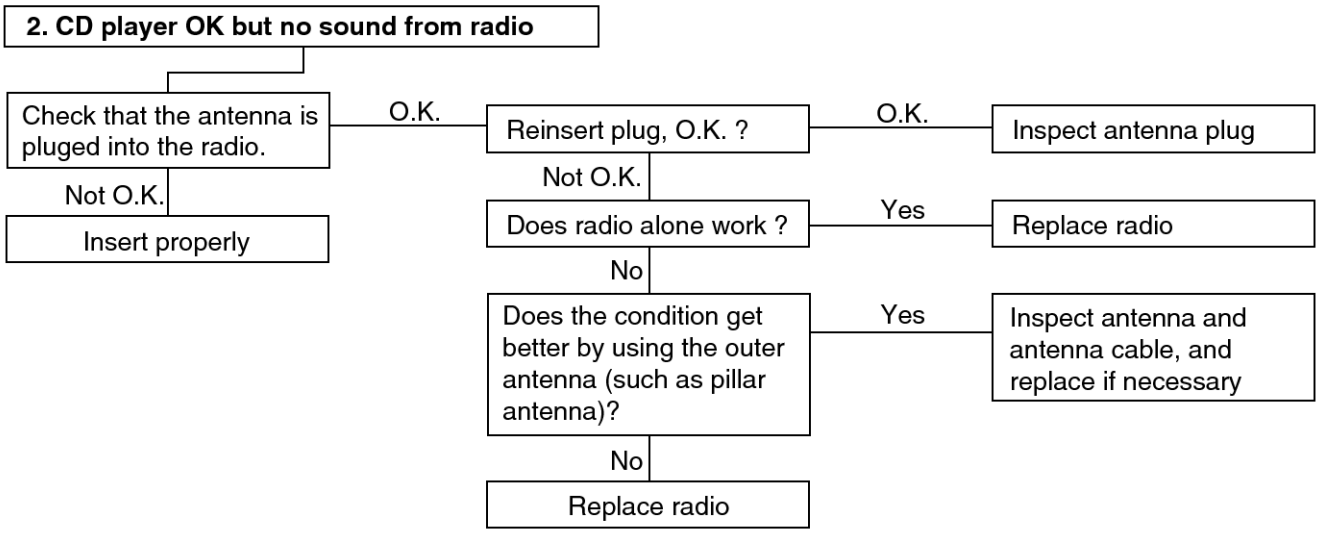


SENBE7047L

Chart 1

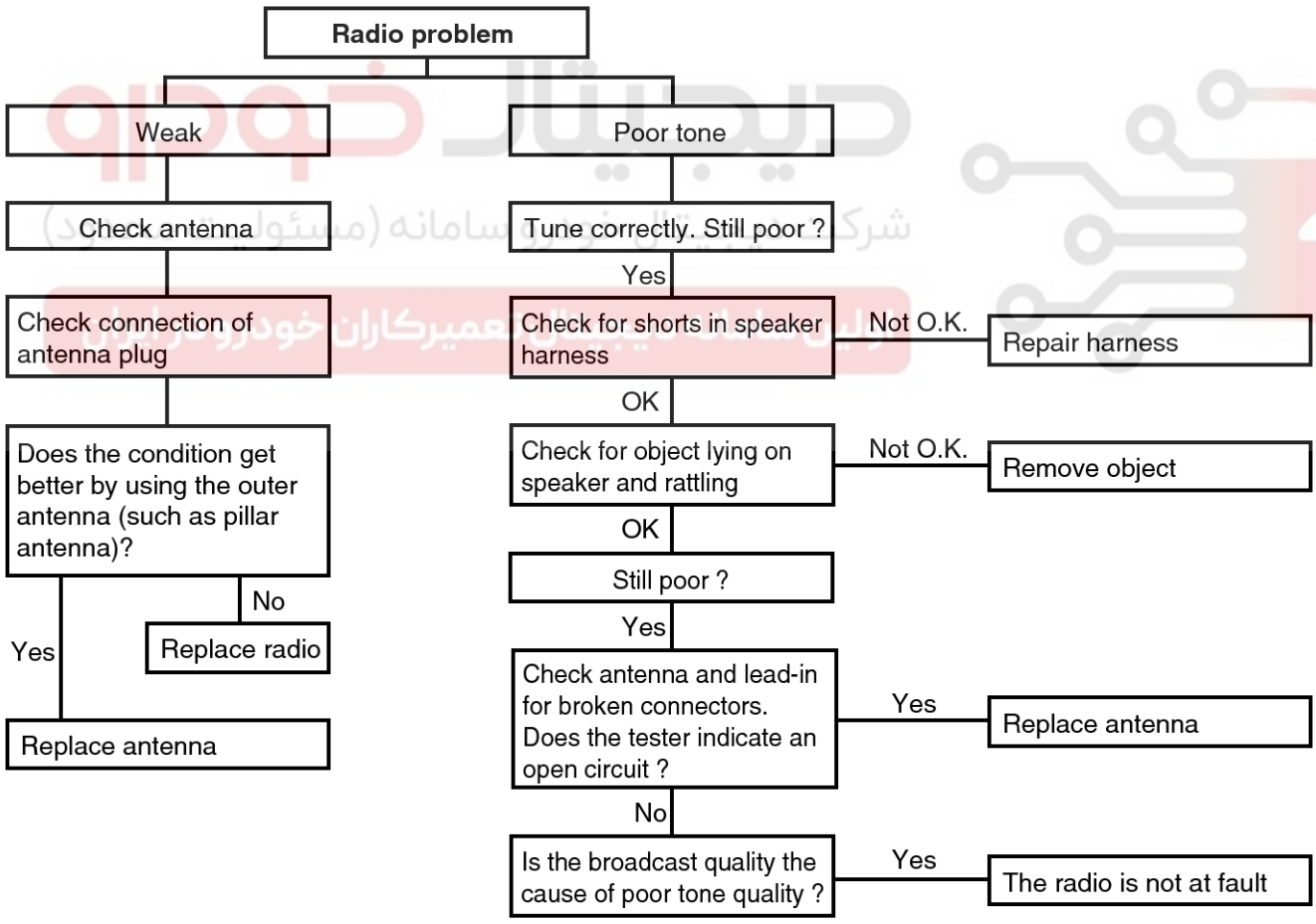


SENBE7048L



SNFBE8133L

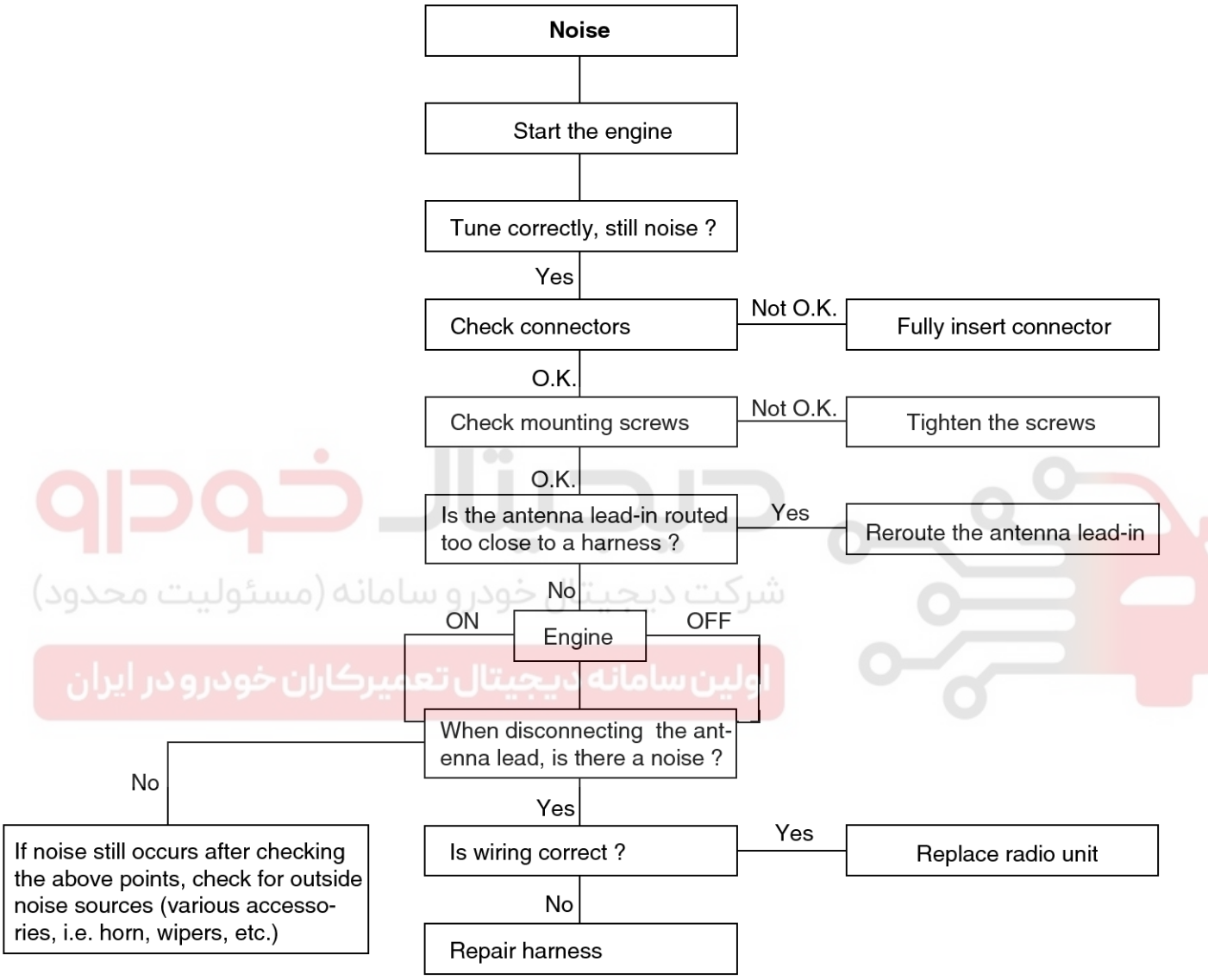
Chart 2



BTIF001D

Chart 3

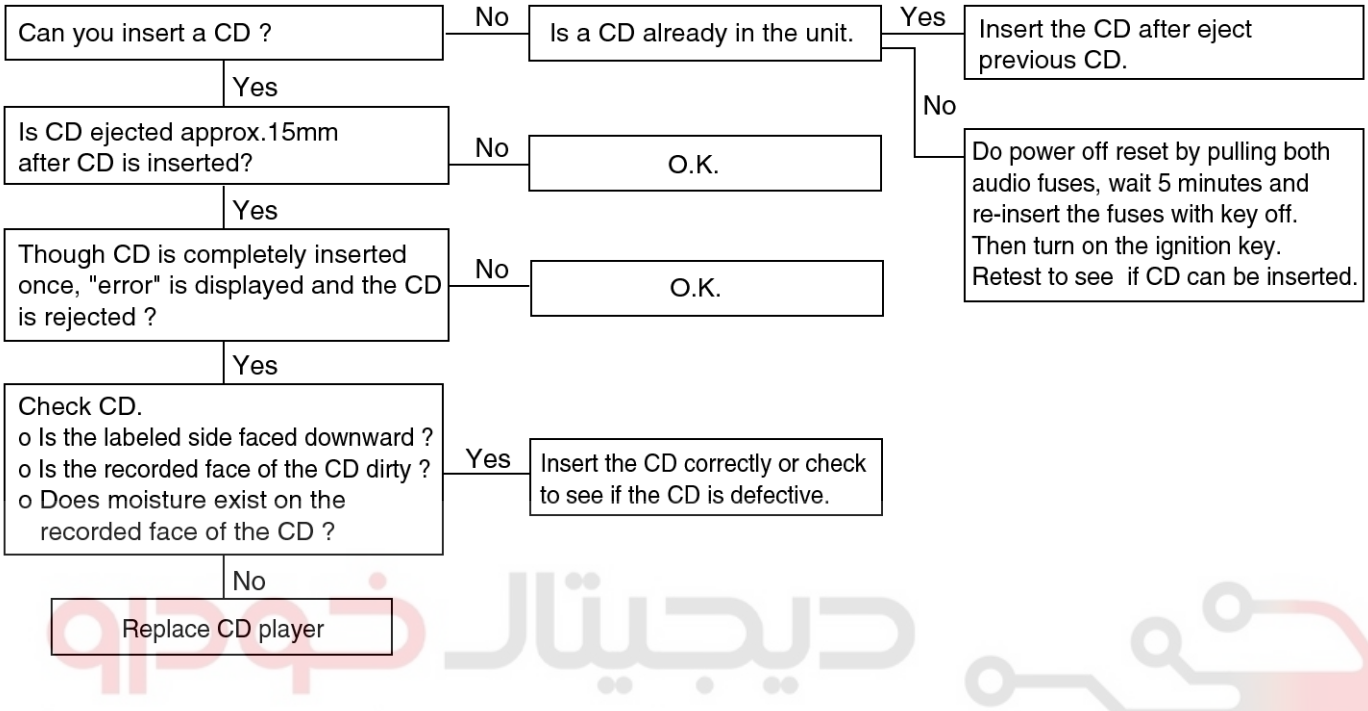
1. RADIO



SNFBE8134L

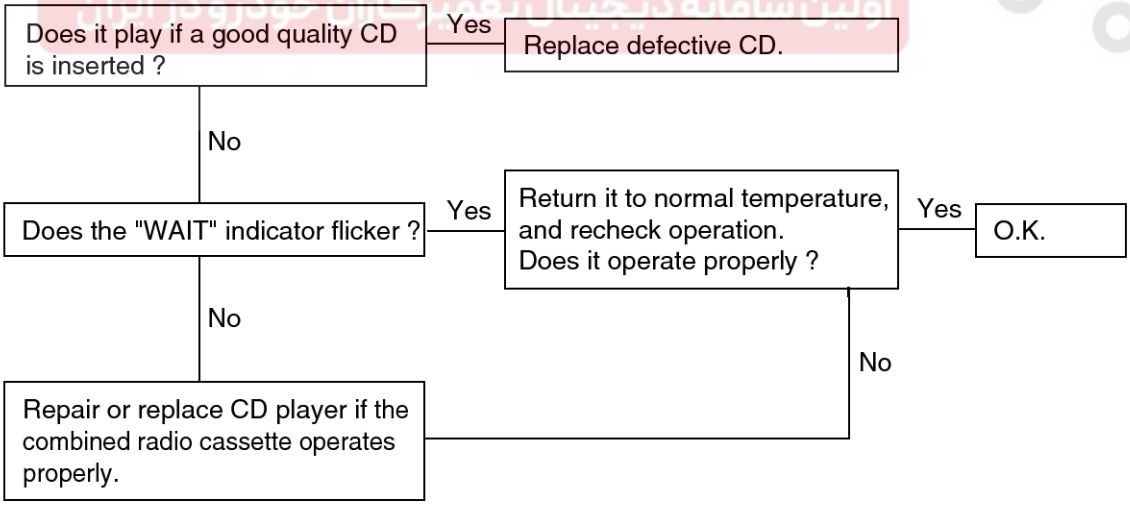
Chart 4

1. CD WILL NOT BE ACCEPTED



LTIF001H

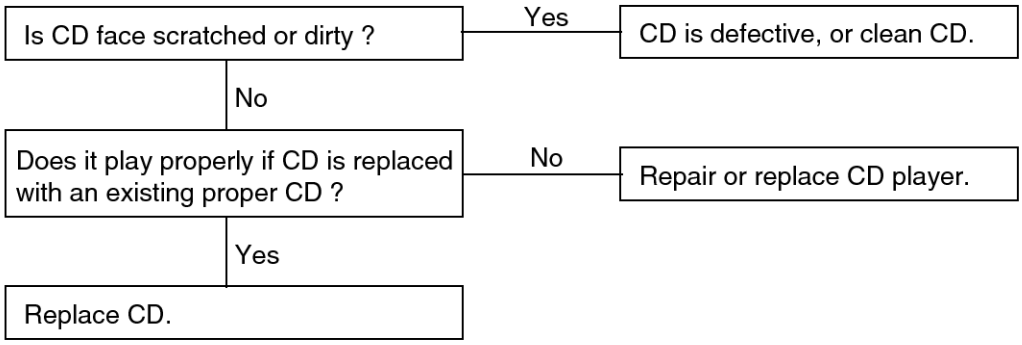
2. NO SOUND



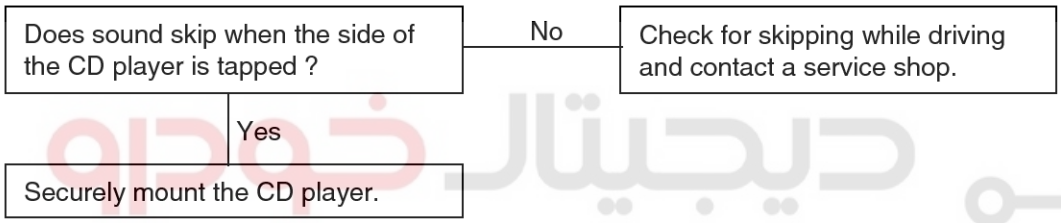
LTIF001I

3. CD SOUND SKIPS

1) Sound sometimes skips when parking.

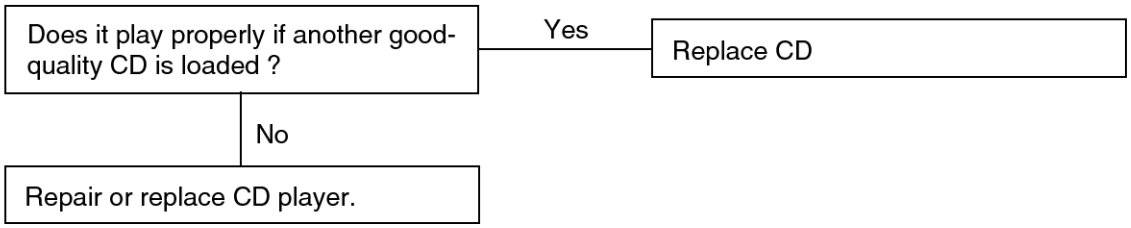


2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)

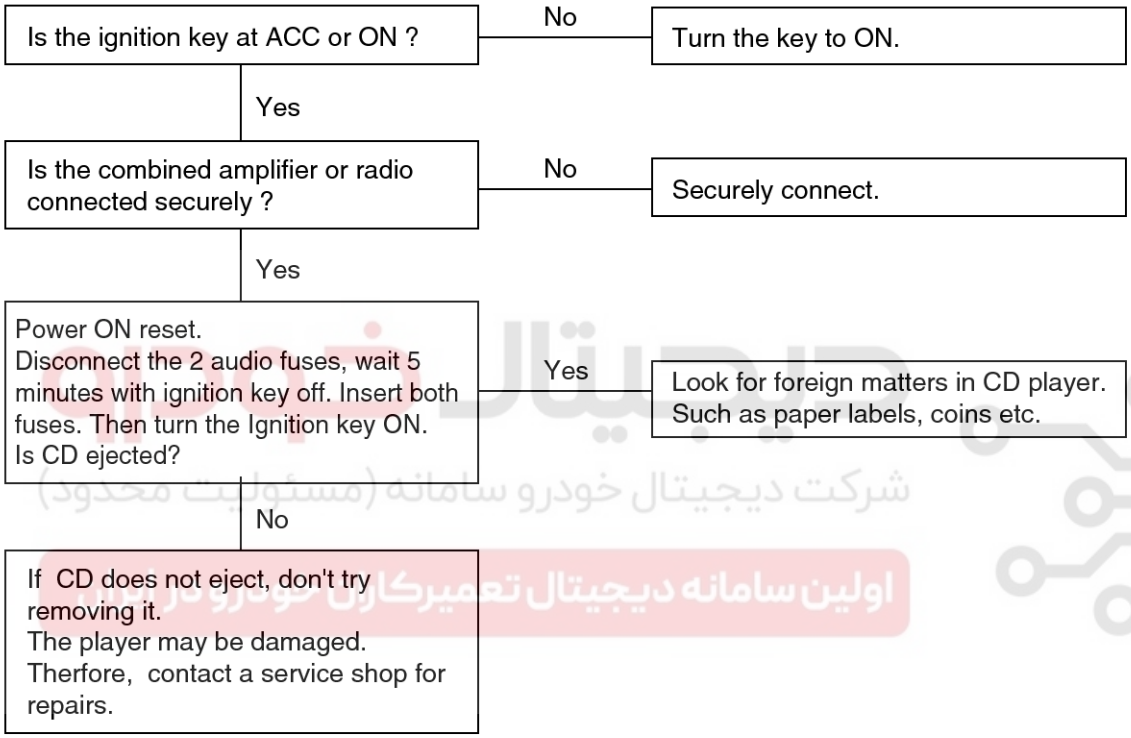


LTIF001J

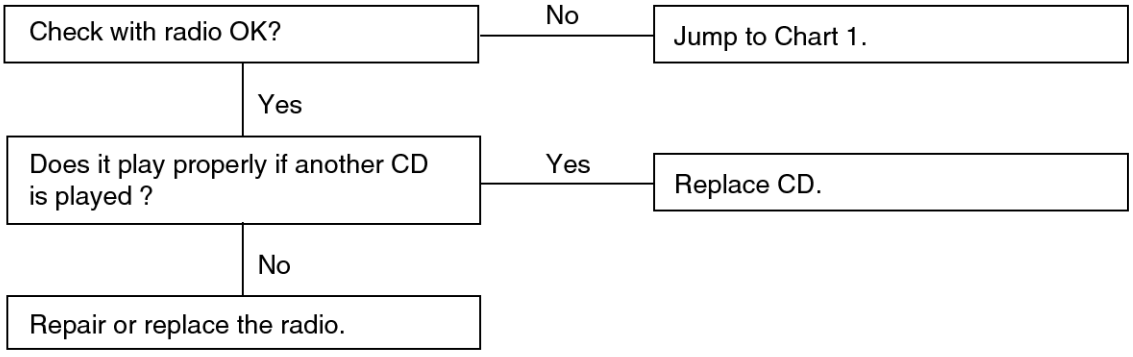
4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT

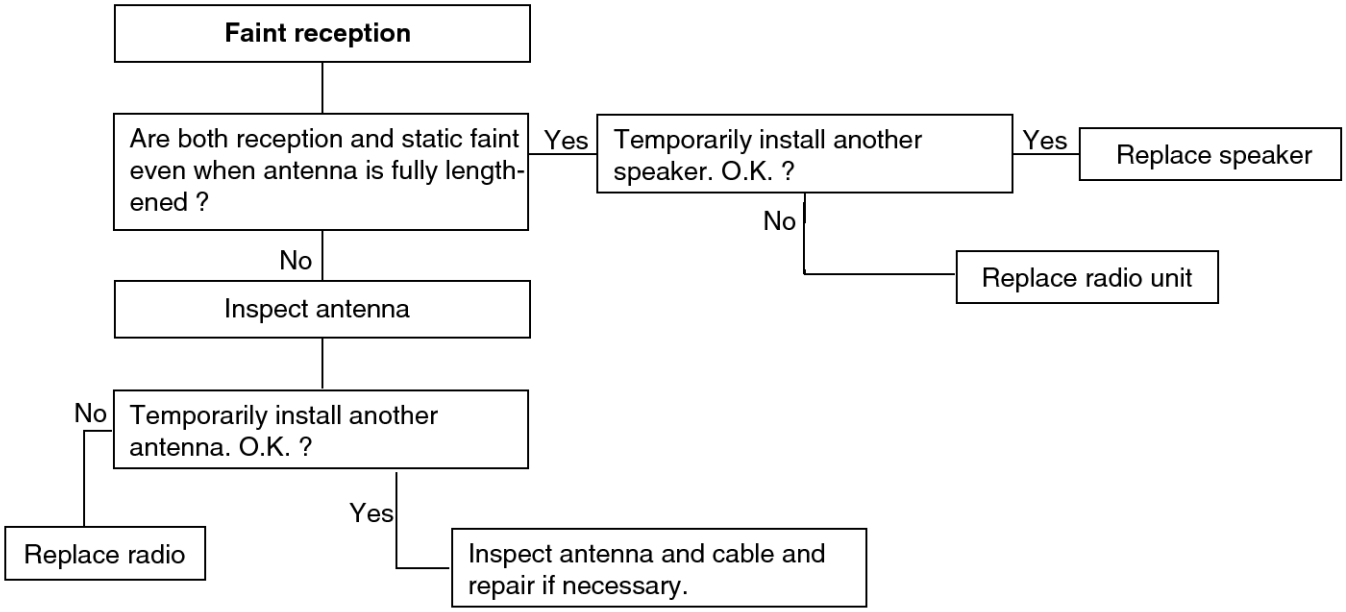


6. NO SOUND FROM ONE SPEAKER



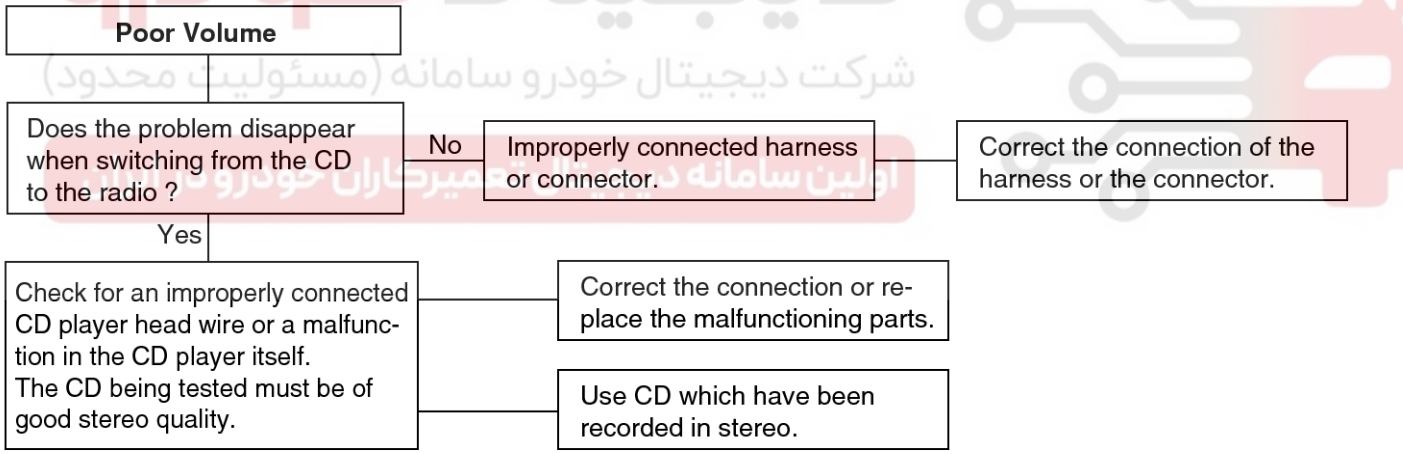
LTIF001K

Chart 5



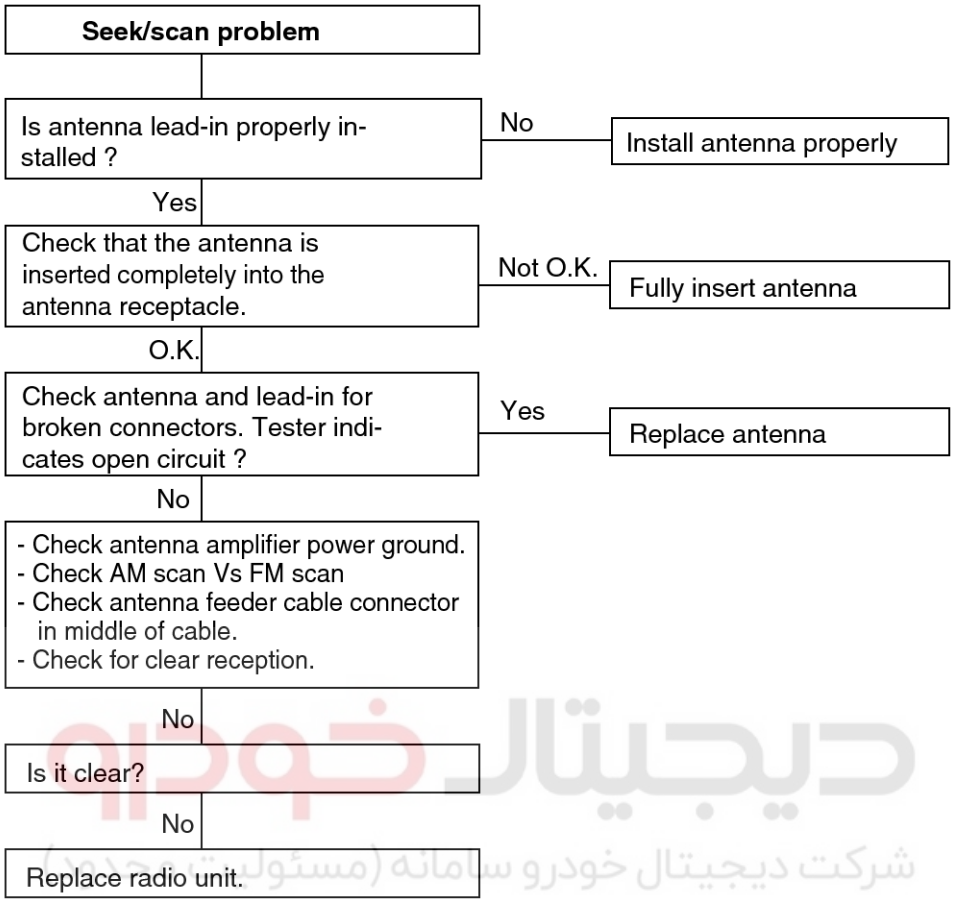
LTIF001L

Chart 6



SENBE7039L

Chart 7



LTIF001N

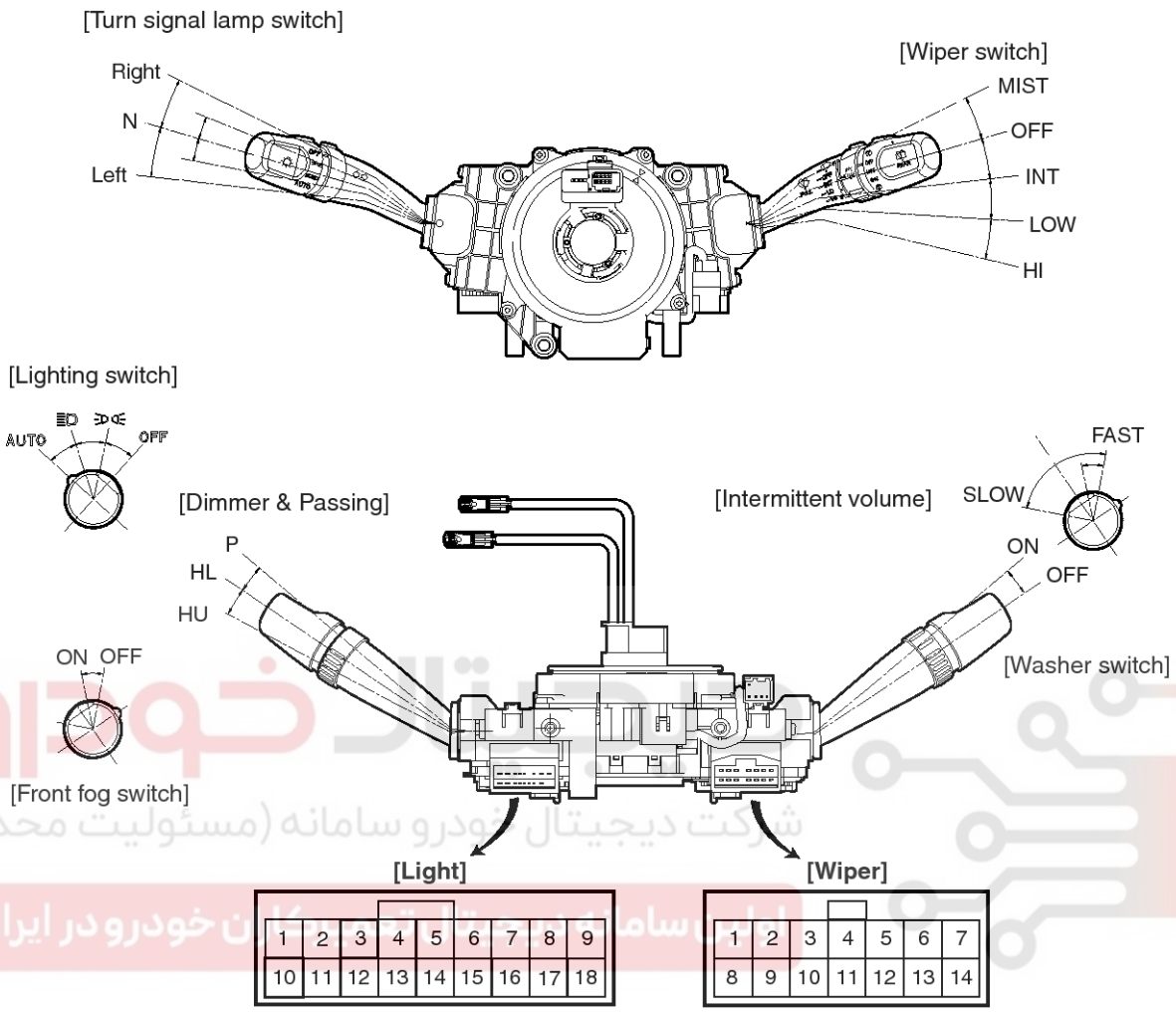
Multifunction switch

Specifications

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-30˚C ~ +80˚C (-22 ~ +176˚F)
Rated load	Dimmer & passing switch	High : 1A (Relay load) Low : 1A (Relay load) Passing : 1A (Relay load)
	Lighting switch	Lighting : 1A (Relay load)
	Turn signal & lane change switch	6.6±0.5A (Lamp load)
	Front fog lamp switch	1A (Relay load)
	Wiper & mist switch	Low, High : 4A (Motor load) Intermittent : 0.22±0.05A (Relay load) Lock : Max. 23A (Motor load) Mist: 4A (Motor load)
	Washer switch	4A (Motor load)
	Variable intermittent volume switch	Max. 25mA

Components

[LHD]

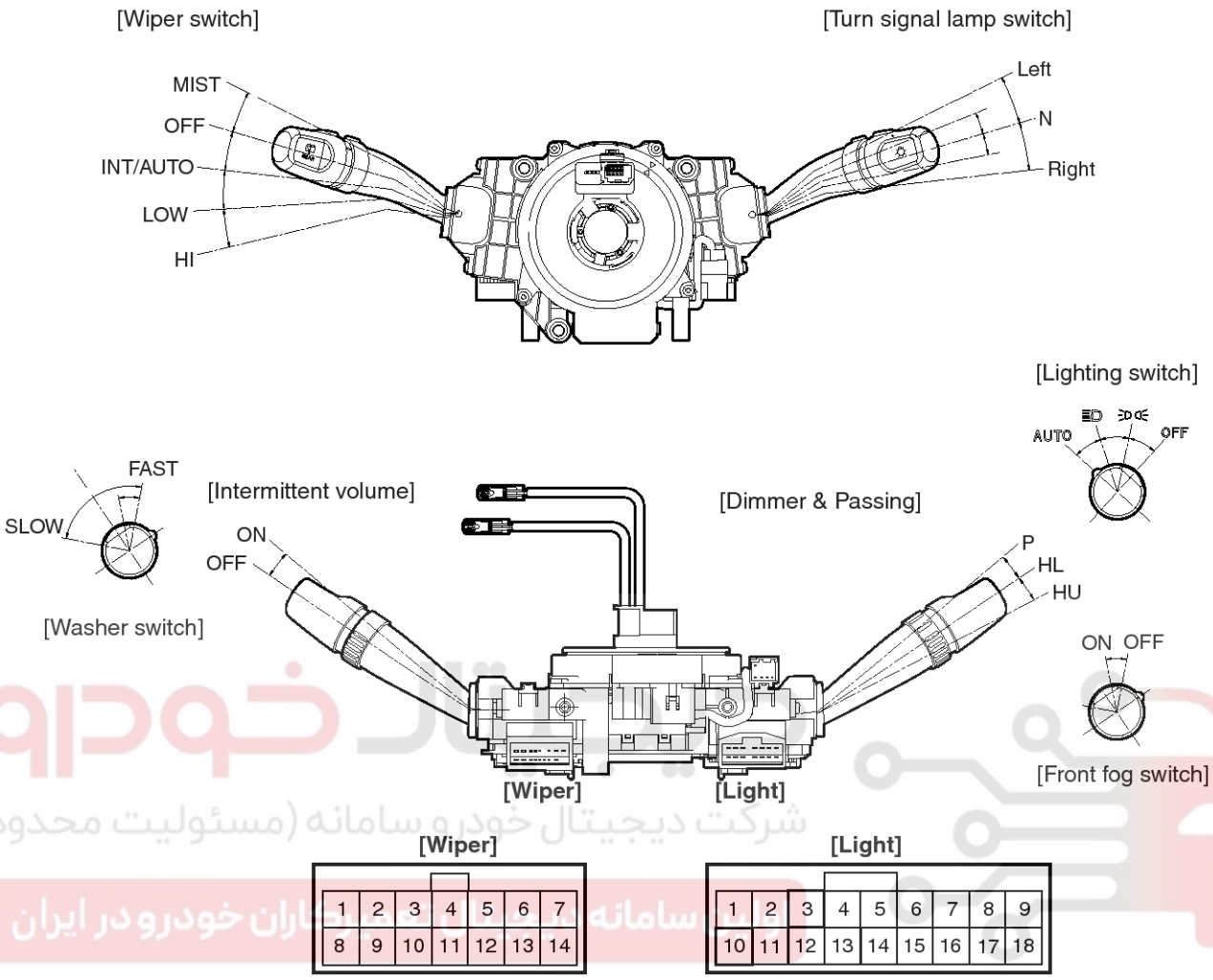


Circuit connection

Connector Name	Terminal No.	Description	Connector Name	Terminal No.	Description
Light	1	Head lamp passing	Wiper	1	Wiper high speed
	2	Head lamp high beam power		2	Wiper low speed
	7	Turn signal lamp (RH)		3	Wiper parking
	8	Flasher unit power		4	Mist switch
	9	Turn signal lamp (LH)		5	Wiper & washer power
	10	Head lamp low beam power		6	Intermittent wiper
	11	Dimmer & passing ground		7	Front washer switch
	12	Front fog switch		8	-
	13	Front fog switch ground		9	-
	14	Tail lamp switch		10	-
	15	Head lamp switch		11	-
	16	Auto light switch		12	-
	17	Lighting switch ground		13	Intermittent wiper volume
	18	-		14	Intermittent wiper ground

LTLG031A

[RHD]



[Wiper]

1	2	3	4	5	6	7
8	9	10	11	12	13	14

[Light]

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18

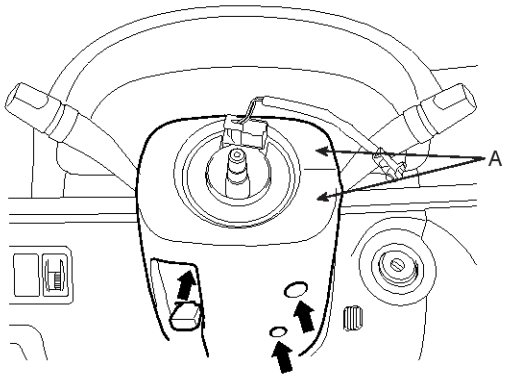
Circuit connection

Connector Name	Terminal No.	Description	Connector Name	Terminal No.	Description
Light	1	Turn signal lamp (RH)	Wiper	1	Front washer switch
	2	Flasher unit power		2	Intermittent wiper
	3	Turn signal lamp (LH)		3	Wiper & washer power
	8	Head lamp high beam power		4	Mist switch
	9	Head lamp passing		5	Wiper parking
	10	-		6	Wiper low speed
	11	Front fog switch		7	Wiper high speed
	12	Front fog switch ground		8	-
	13	Tail lamp switch		9	-
	14	Head lamp switch		10	-
	15	Rear fog switch/Auto light switch		11	-
	16	Lighting switch ground		12	-
	17	Dimmer & passing ground		13	Intermittent wiper volume
	18	Head lamp low beam power		14	Intermittent wiper ground

LTLG031L

Removal

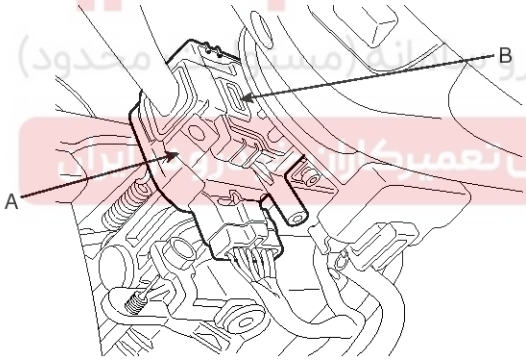
1. Disconnect the negative (-) battery terminal.
2. Remove the steering column upper and lower shrouds (A) after removing 3 screws.



KTRE031B

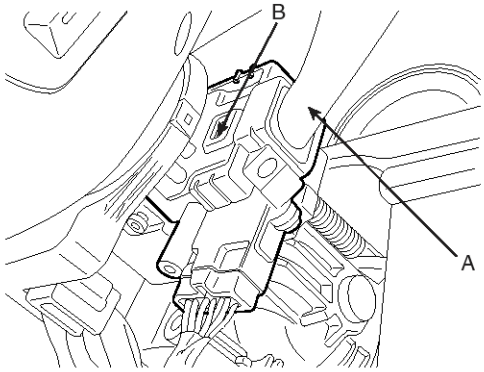
3. Remove the light switch (A) by pushing the lock pin (B) after disconnecting the connector.

[LHD]



KTRE031C

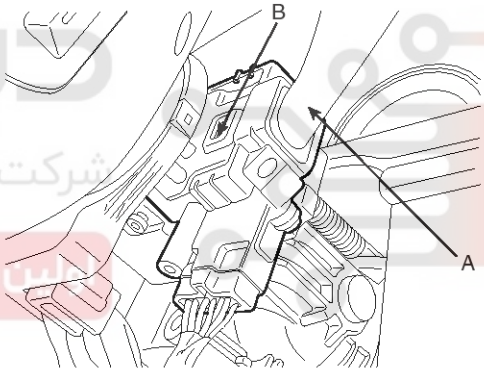
[RHD]



KTRE031V

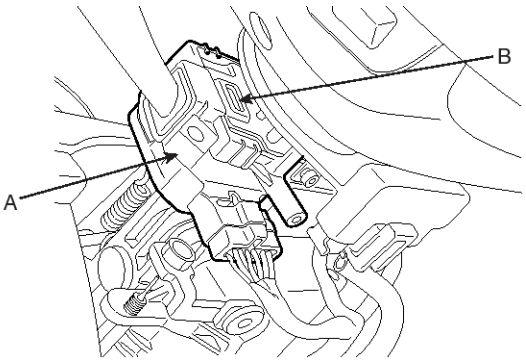
4. Remove the wiper switch (A) by pushing the lock pin (B) after disconnecting the connector.

[LHD]



KTRE031D

[RHD]



KTRE031W

Installation

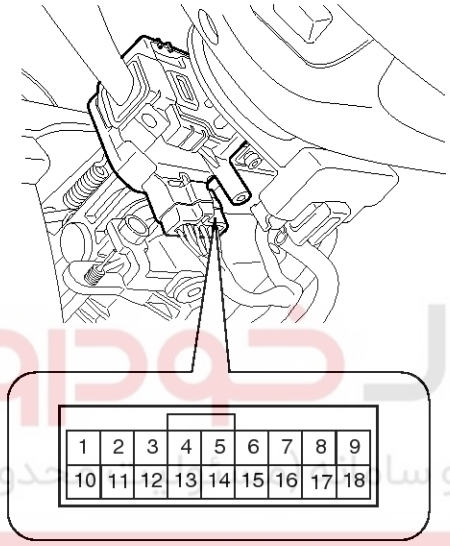
1. Install the wiper switch
2. Install the light switch
3. Install the steering column upper and lower shrouds

Inspection

Lighting Switch Inspection

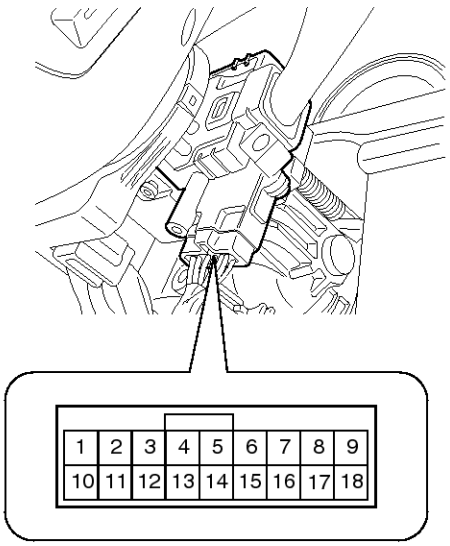
With the multi function switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.

[LHD]



KTRE031E

[RHD]



KTRE031M

Lighting Switch (Auto Light)

[LHD]

Terminal / Position	14	15	16	17
OFF				
I	○	—	—	○
II	○	○	—	○
AUTO			○	○

LTGE031E

[RHD]

Terminal / Position	13	14	15	16
OFF				
I	○	—	—	○
II	○	○	—	○
AUTO			○	○

ETRF031N

Lighting Switch

[LHD]

Terminal / Position	14	15	17
OFF			
I	○	—	○
II	○	○	○

SMGBE9043L

[RHD]

Terminal / Position	13	14	16
OFF			
I	○	—	○
II	○	○	○

SMGBE9044L

Dimmer And Passing Switch

[LHD]

Position \ Terminal	1	2	10	11
HU		○		○
HL			○	○
P	○	○		○

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

LTGE031F

[RHD]

Position \ Terminal	9	8	18	17
HU		○		○
HL			○	○
P	○	○		○

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

ETRF031P

Turn Signal Switch

[LHD]

Hazard switch	Trun signal switch \ Terminal	7	8	9
OFF	L		○	○
	N			
	R	○	○	

LTGE031G

[RHD]

Hazard switch	Trun signal switch \ Terminal	1	2	3
OFF	L		○	○
	N			
	R	○	○	

ETRF031Q

Front Fog Lamp Switch

[LHD]

Position \ Terminal	12	13
OFF		
ON	○	○

LTGE031H

[RHD]

Position \ Terminal	11	12
OFF		
ON	○	○

ETRF031R

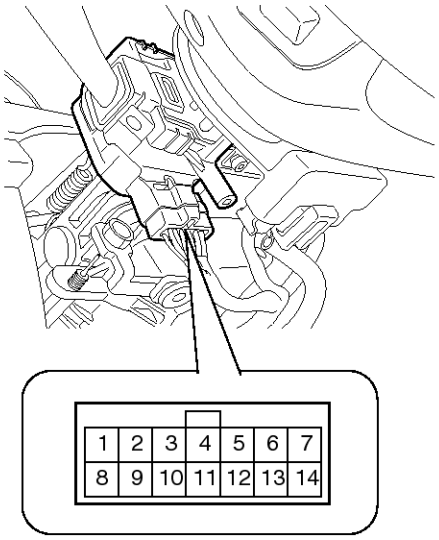
Wiper And Washer Switch Inspection

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.

[LHD]

KTRE031G

[RHD]



KTRE031S

Wiper Switch

[LHD]

Position \ Terminal	1	2	3	4	5	6	13	14
MIST		○—○		○—○				
OFF		○—○						
INT		○—○			○—○		○~○	
LOW		○—○			○—○			
HI	○—○				○—○			

SMGBE9045L

[RHD]

Position \ Terminal	7	6	5	4	3	2	13	14
MIST		○—○		○—○				
OFF		○—○						
INT		○—○			○—○		○~○	
LOW		○—○			○—○			
HI	○—○				○—○			

SMGBE9046L

Washer Switch

[LHD]

Position \ Terminal	5	7
OFF		
ON	○—○	

LTGE031J

[RHD]

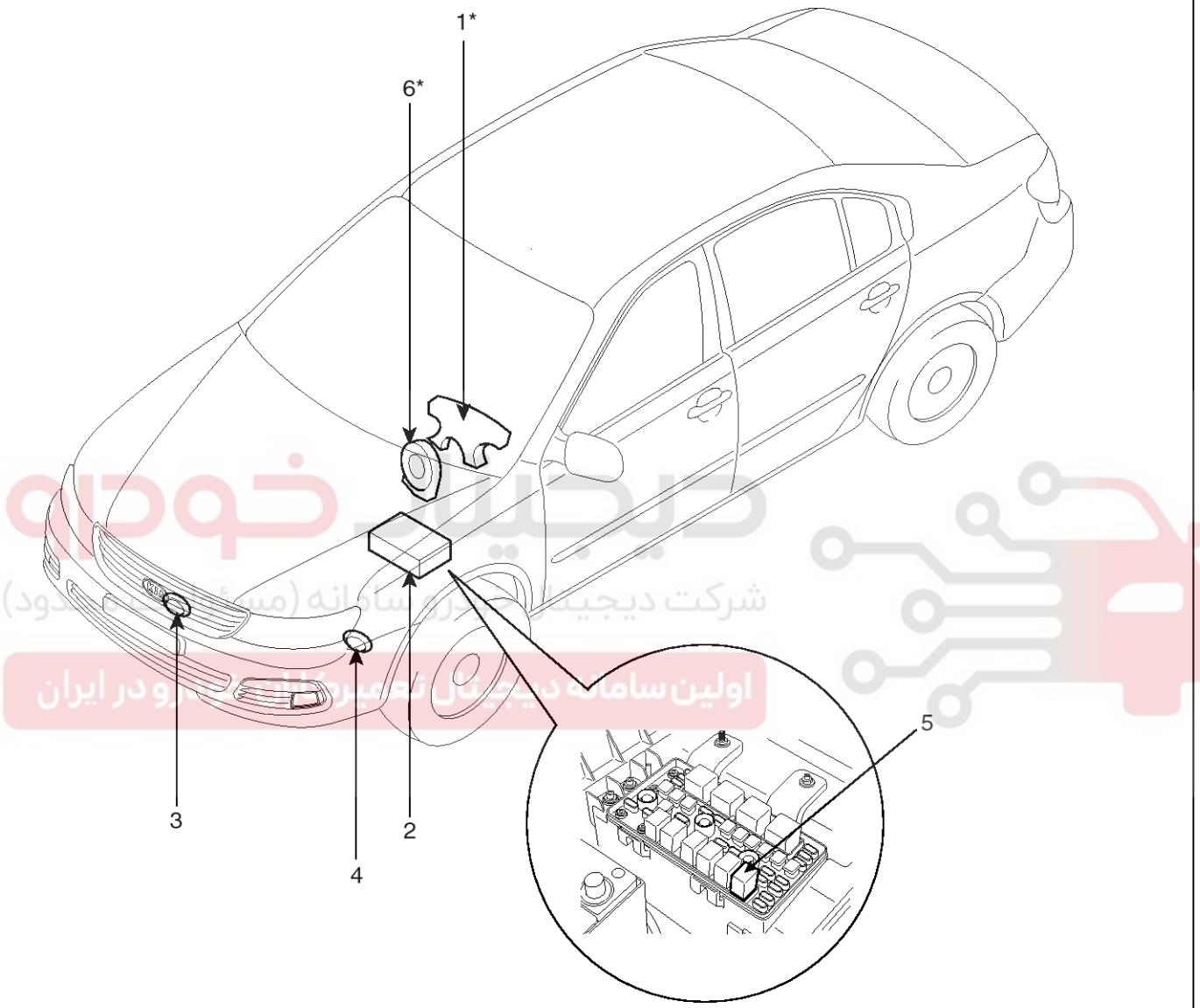
Position \ Terminal	3	1
OFF		
ON	○—○	

ETRF031U

Horn

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.

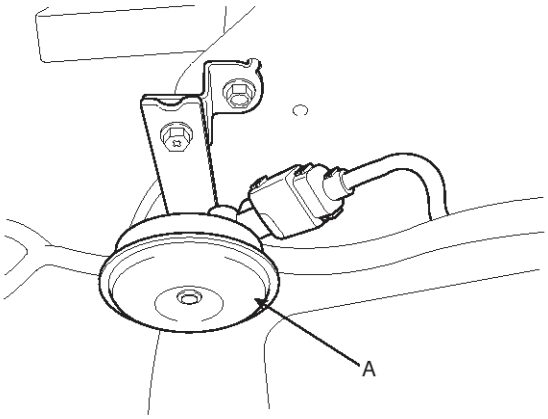


SMGBE9001L

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

Removal

1. Remove the front bumper. (Refer to the Body group - front bumper).
2. Remove the bolt and disconnect the horn connector, then remove the pitch horn (A).



ATLG051B

Installation

1. Connect the horn connector, then reassemble the high pitch horn and low pitch horn.
2. Reassemble the front bumper.

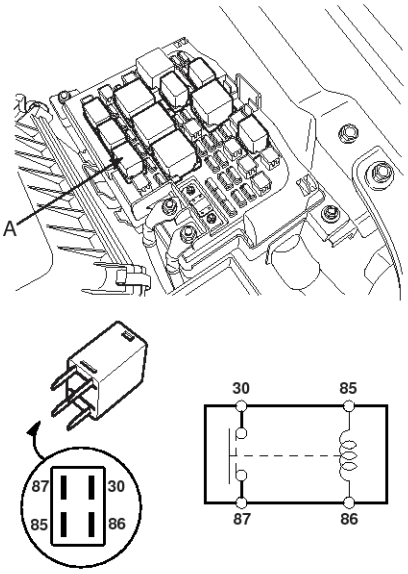
Inspection

Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.

The horn should make a sound. If the horn fails to make a sound, replace it.

Horn Relay Inspection

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



ATLG051C

Terminal / Power (No.3-No.4)	30	85	86	87
Disconnected				
Connected		⊖	⊕	

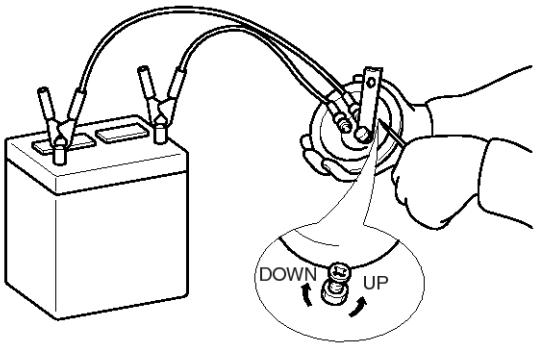
LTLG051D

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.



ETDA050A

Smart key System

Specification

IPM (Smart Key Unit)

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-22°F ~ 167°F)
Load	Max. 2mA

RF Receiver

Items	Specification
Frequency	433.92 MHz (China : 315 MHz)
Antenna type	FSK (Frequency Shift Keying)

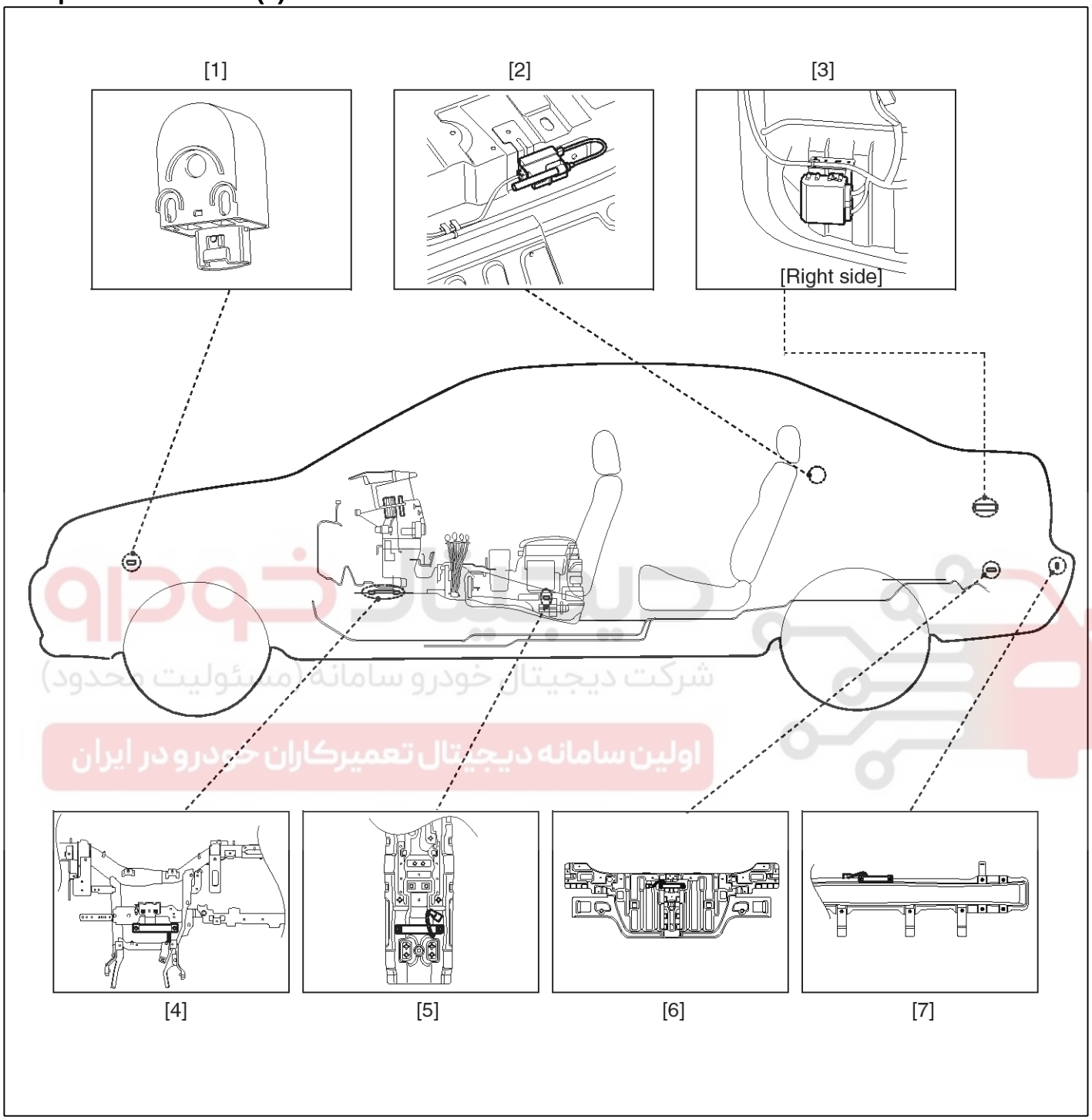
Smart Key FOB

Items	Specification
Battery	Lithium battery 3V 1EA
Distance	10m
Battery life	More than 2years
Push buttons	Door lock / unlock, Trunk lid
Frequency(Rx)	125 kHz
Frequency(Tx)	433.92 MHz (China : 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)

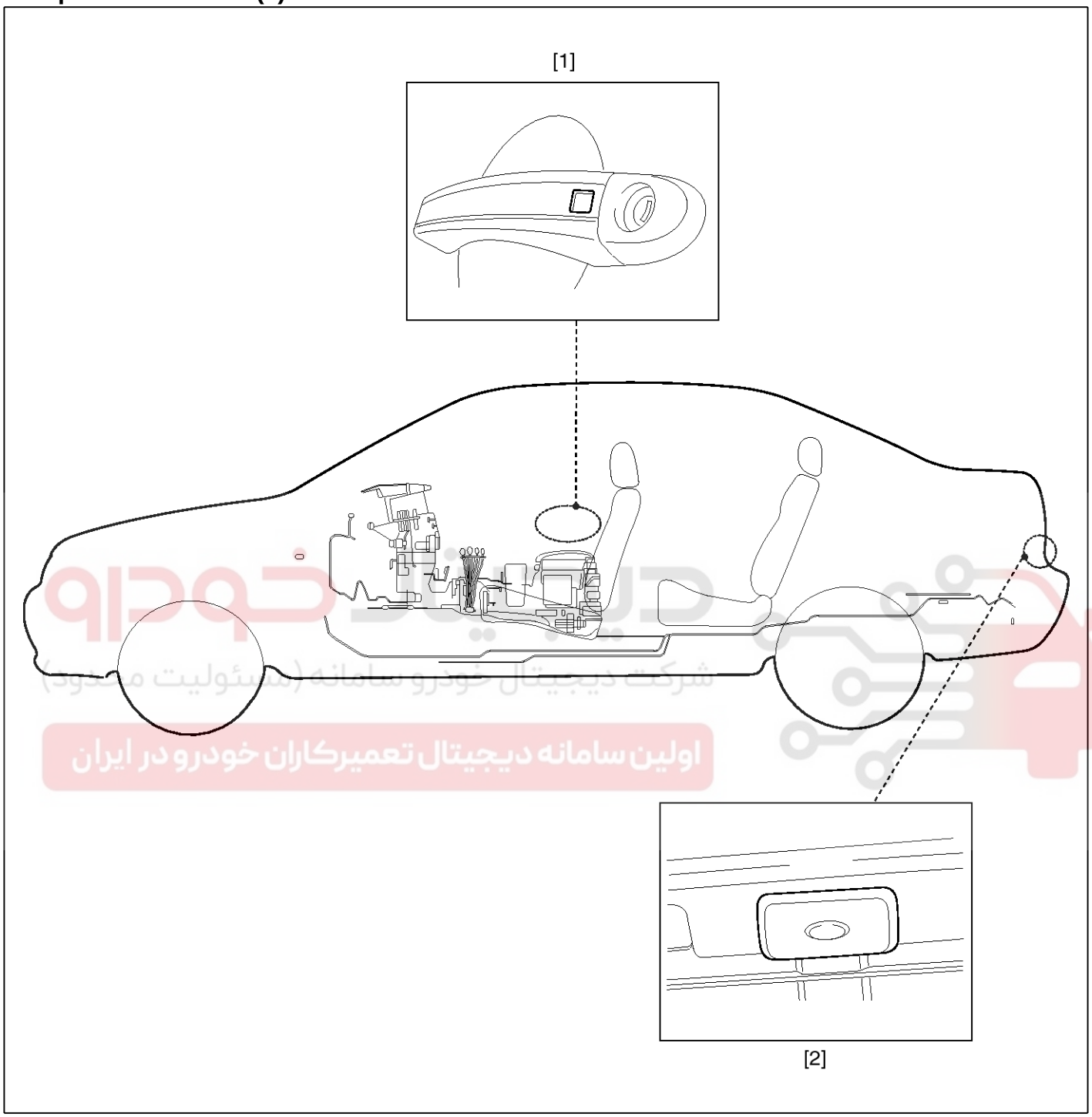
Component Location (1)



SMGBE9106L

1. Buzzer
2. RF receiver
3. SMART KEY unit
4. Interior antenna 1
5. Interior antenna 2
6. Interior antenna 3
7. Bumper antenna

Component Location (2)



SMGBE0005D

1. Trunk lid switch
2. Door outside handle

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.

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/tailgate 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 FOB-HOLDER 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:

   - Pressing Push button in door hadle

2. Passive locking

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

3. Button start

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

4. LIMP HOME Mode

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

Smart Key ECU (SMK ECU)

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

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

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

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

The main functional blocks of the SMK ECU are:

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

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

Smart Key FOB

The system supports up to 2 SMART KEY FOBs.

The main functions of the SMART KEY FOB are:

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

NOTICE

The FOB's LED indicator may continue to light even with a low transmitter battery.

If the performance or range of the FOB is less than expected, check the transmitter battery.

Antennas

1. Emitting LF Antennas:

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

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

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

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

2. Bidirectional Immobilizer Antenna (for Limp Home):

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

3. External Receiver

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

   The SMK ECU provides a connector pin for the serial communication Line.

Door Handle

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

Push Button

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

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

Another button is installed at the trunk lid.

Operation

Passive Functions

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

Operating Range

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

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

Passive Access (Passive Entry)

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

Passive Locking (Exit)

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

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

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

Passive Open Tailgate

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

Passive Trunk Warning

Whenever the trunk is closed, SMK ECU uses a suitable search strategy to avoid trunk buzzer warning by a fob outside the vehicle. Then SMK searches for a SMART KEY FOB in the interior of the trunk. If a valid SMART KEY FOB is found in the trunk, the SMK ECU activates SMK external buzzer (TBD) to inform the user that the trunk has been closed with a fob inside the trunk.

SMK will send the trunk open command to BCM for trunk reopening if Trunk reopening bit is set for this functionality, a "valid" SMART KEY FOB means any SMART KEY FOB that belongs to the vehicle, even if it's DEACTIVATED.

NOTICE

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

Smart Key Reminder 1

1. Preconditions:

   All terminals OFF & at least one door open & locking status is not locked checked by SMK periodically every 100ms, as long as CAN/LIN active.

2. Event:

   At least 1 door knob status changed from unlock to lock.

3. SMK actions:

   - 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

   - 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 tail gate) 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 tail gate 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:

   - 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)

   - 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) :

   - (All doors are closed) & (tailgate closed)
2. Event:
   - User presses the push button in door handle or tailgate
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:
   - User presses the door handle Push button
3. SMK ECU actions:
   - If ATWS(Anti Theft Warning System) is in DISARM status, SMK ECU performs a search for the fob inside of the vehicle (use "Door Lock Warning 3" scenario)

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

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

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

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

Smart Key Lamp Warning

1. SMK actions:

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

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

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

Failsafe Functions (Backup For Limp Home)

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

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

User Information Functions

ID OUT Warning

1. Preconditions:
   - (ACC or IGN1) & (any door open or tailgate open)
2. Event:

   The last opened door is closed
3. SMK action:

   SMK searches for a SMART KEY FOB in the interior.
   - 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).
   - 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, PDM and FOBs is described.

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

Learning MODE

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

Prior to start learning service, Fob-In signal must be active and the vehicle secrect code (called as PIN code) should be known.

Teaching MODE

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

Teaching MODE Procedure Description (Step By Step)

Objective: Key teaching procedure at service station

Initial state:

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

Smart key teaching

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

- Smart key system is learnt **transponder and smart key** by once at same time.

<Smart key neutralization mode>

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

<Lock by timer>

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

SMGBE0006L

Inspection

Self Diagnosis With Scan Tool

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

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

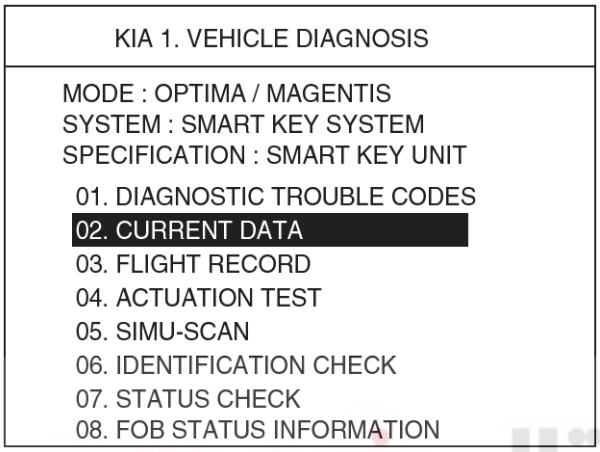
1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

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

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

Switch Diagnosis

1. Connect the cable of scan tool to the data link connector in driver side crash pad lower panel, turn the power on scan tool.
2. Select the vehicle model and then SMART KEY system.
3. Select the "SMART KEY unit".
4. After IG ON, select the "Current data".



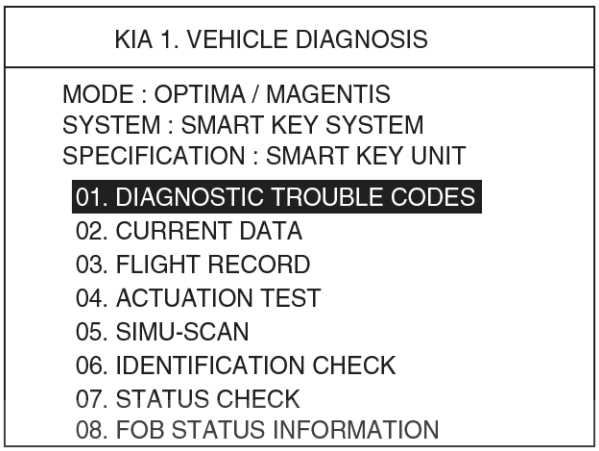
SMGBE9107L

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

Display	Description
FL Toggle SW	ON : Push button is ON in the driver door handle.
FR Toggle SW	ON : Push button is ON in the assist door handle.
Trunk/tail Gate SW	ON : Tailgate button is ON.
Gear P Position	ON : Shift lever is P position.
IGN 1	ON : IGN switch is IG position.
ACC	ON : IGN switch is ACC position.
Push Knob SW	ON : Push knob switch is ON.
External Buzzer	ON : Buzzer is ON.

Communication Diagnosis With Scan Tool (Self Diagnosis)

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



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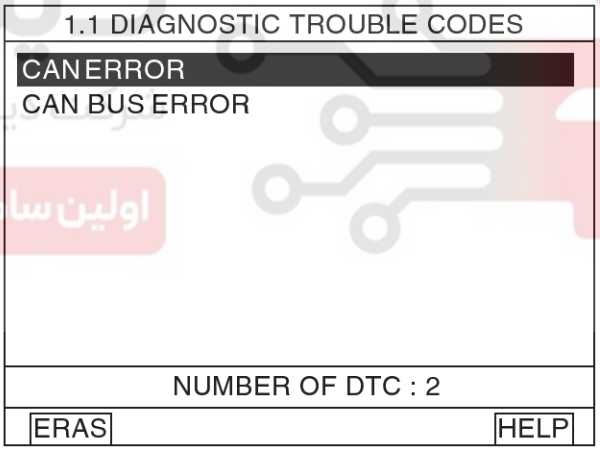
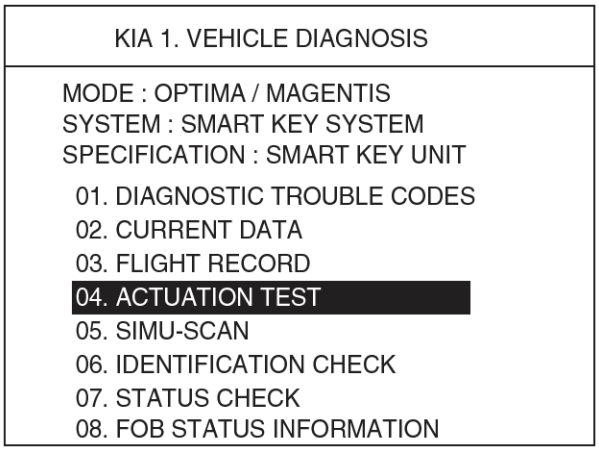


SBHBE9277L

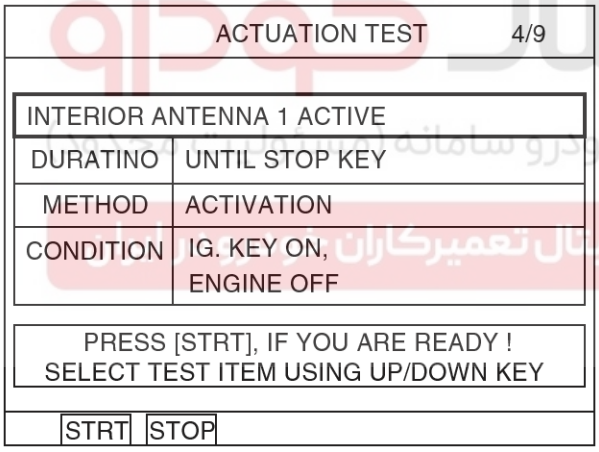
Antenna Actuation Diagnosis

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



SMGBE9109L

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

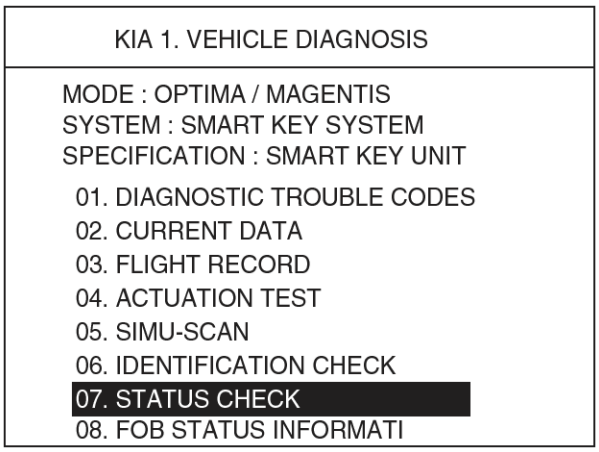


SENBE8017N

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
   - INTERIOR Antenna 1
   - INTERIOR Antenna 2
   - INTERIOR Antenna 3
   - BUMPER/ TAIL GATE Antenna
   - DRV_DR Antenna
   - AST_DR Antenna

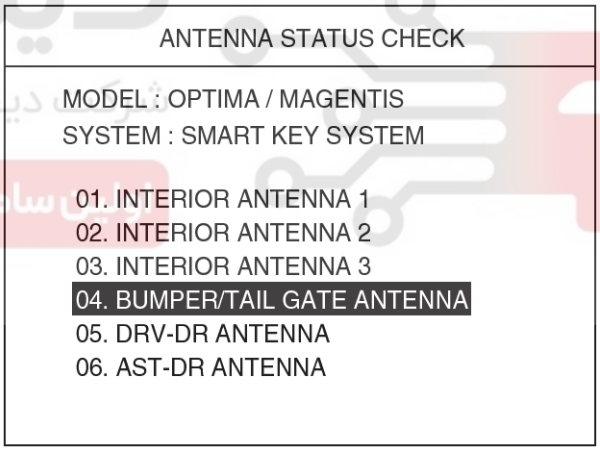
Antenna Status Check

1. Connect the cable of scan tool to the data link connector in driver side crash pad lower panel.
2. Select the "07.Status Check".
3. After IG ON, select the "03.Antenna Status Check".

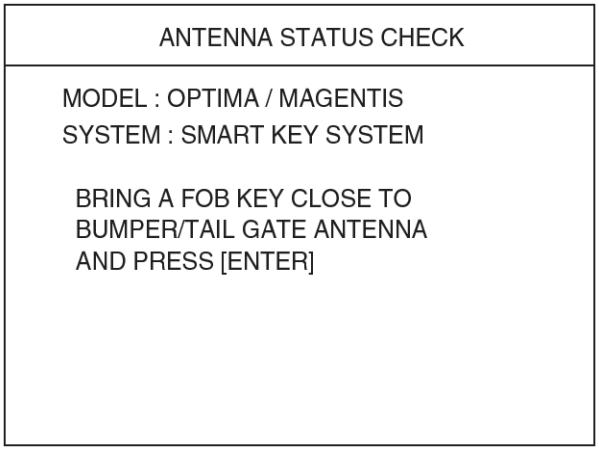


SMGBE9110L

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



SMGBE9111L

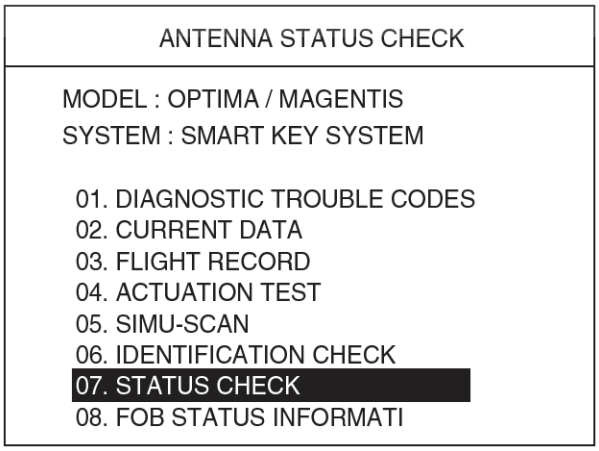


SMGBE9112L

5. If the smart key runs normal , the related antenna, smart key(transmission, reception)and exterior receiver are normal.
6. Antenna status
   - INTERIOR Antenna 1
   - INTERIOR Antenna 2
   - INTERIOR Antenna 3
   - BUMPER/ TAIL GATE Antenna
   - DRV_DR Antenna
   - AST_DR Antenna

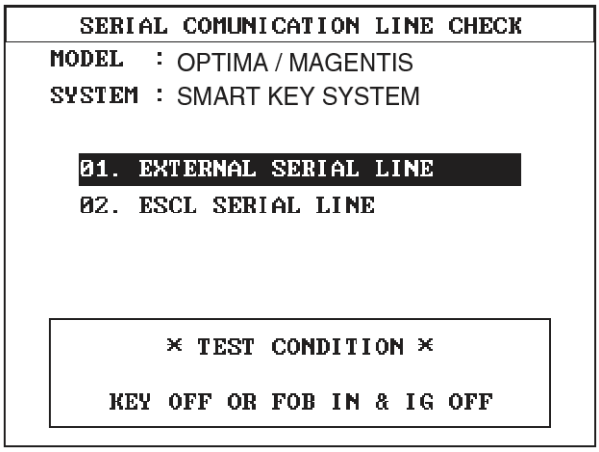
Serial Communication Status Check

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



SMGBE9113L

3. After IG ON, select the "SRx COMM. LINE Status Check".

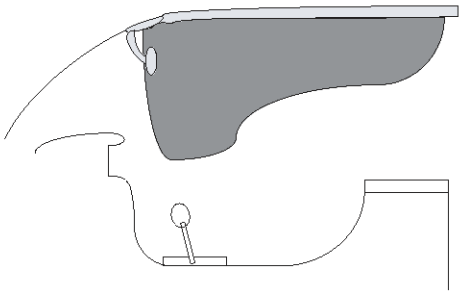


SMGBE9114L

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

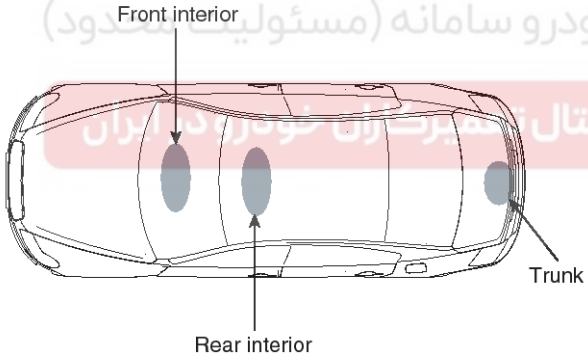
Interior Antenna Actuation Check

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



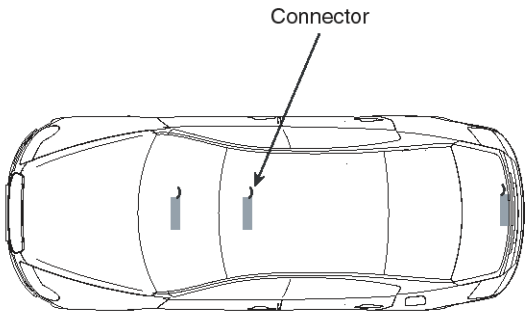
KTCF113A

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.



SMGBE9115L

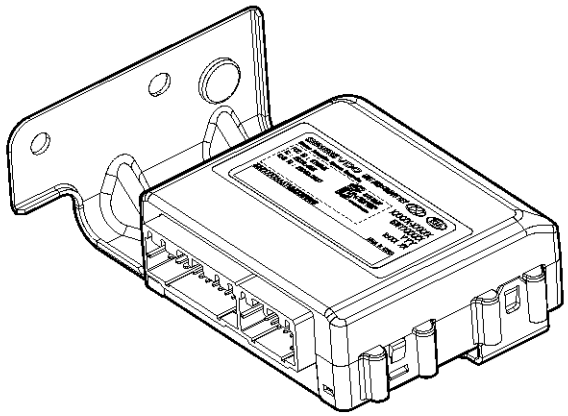
5. If the LED of smart key is not blinking, check the antenna in shade area.

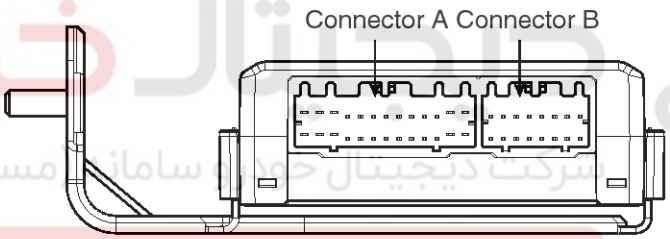


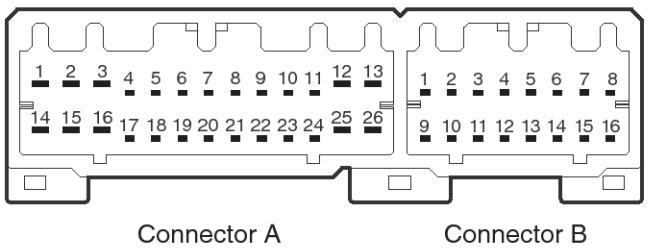
SMGBE9116L

Smart key unit

Components







SMGBE9117L

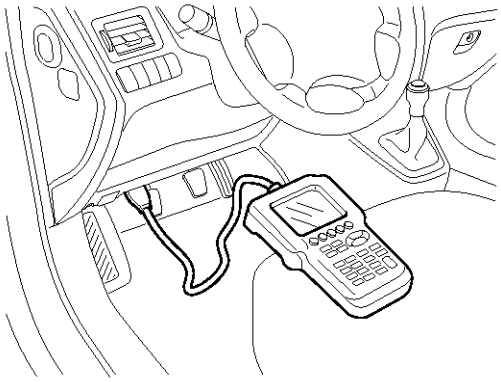
Connector Pin Information

Pin	Connector A	Pin	Connector B
1	BAT	1	Interior 2 antenna 2
2	IMMO Indicator	2	Interior 1 antenna 2
3	GND 1	3	-
4	-	4	-
5	Trunk lid	5	Trunk 1 antenna 1
6	Front left door lock / unlock	6	Bumper antenna 1
7	Buzzer	7	RH side antenna 1
8	ALT L	8	LH side antenna 1
9	ACC	9	Interior 2 antenna 1
10	CAN high	10	Interior 1 antenna 1
11	CAN low	11	-
12	-	12	-
13	RF COM	13	Trunk 1 antenna 2
14	IGN 1	14	Bumper antenna 2
15	P position	15	RH side antenna 2
16	GND 2	16	LH side antenna 2
17	Key out ILL		
18	-		
19	-		
20	Front right door lock / unlock		
21	-		
22	Diagnosis		
23	SSB switch 2		
24	Brake		
25	EMS COM		
26	-		

Smart Key

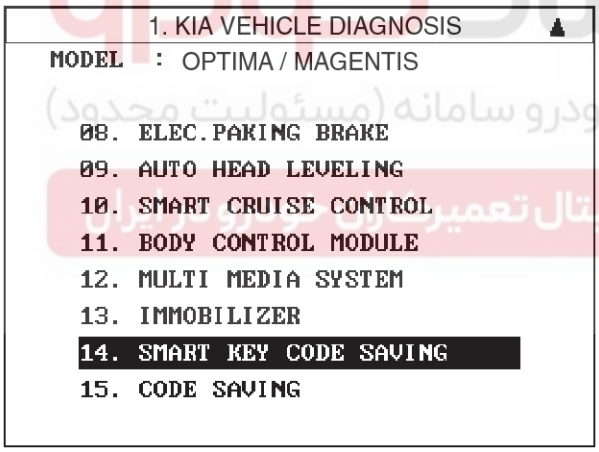
Smart Key Code Saving

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



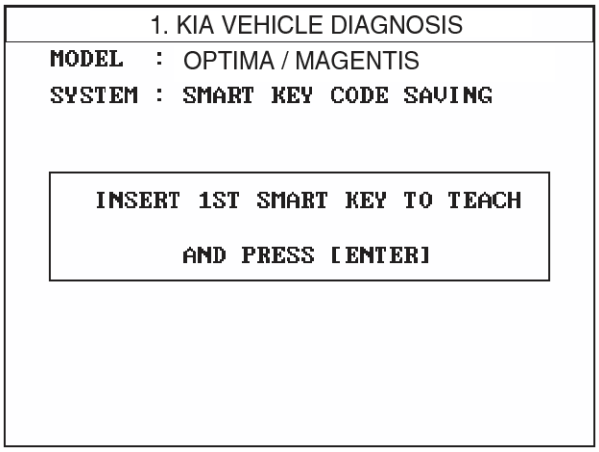
KRQE900A

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



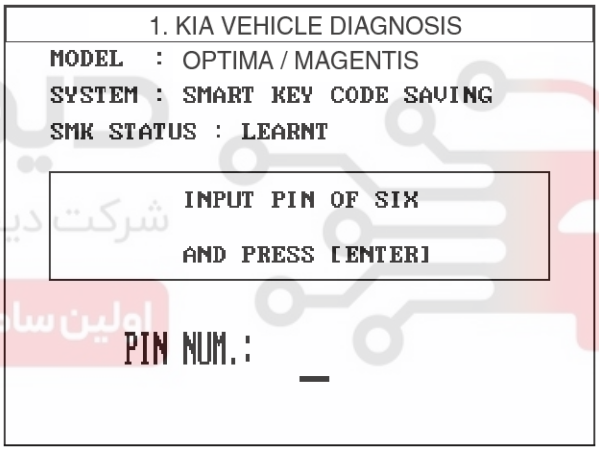
SMGBE9118L

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

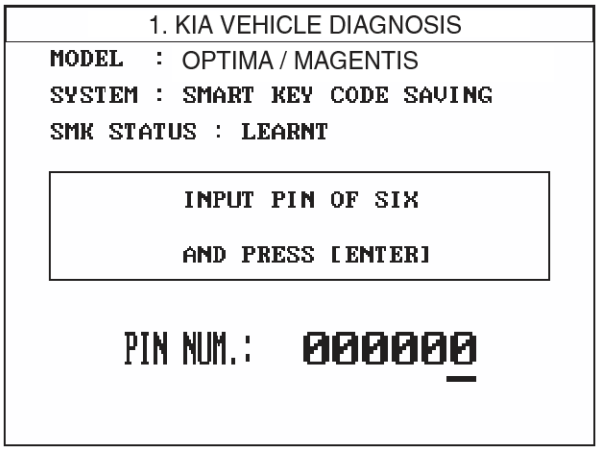


SMGBE9119L

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

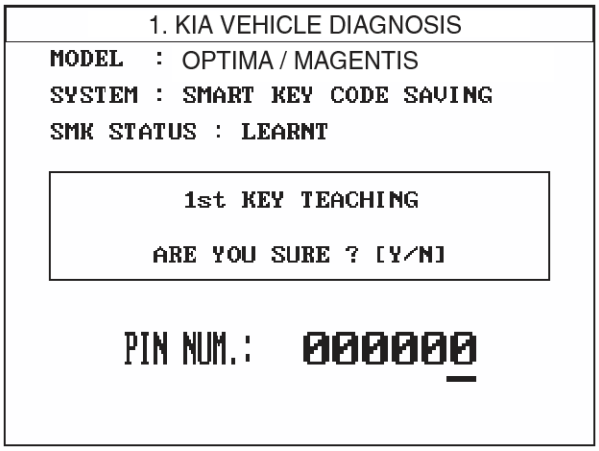


SMGBE9120L



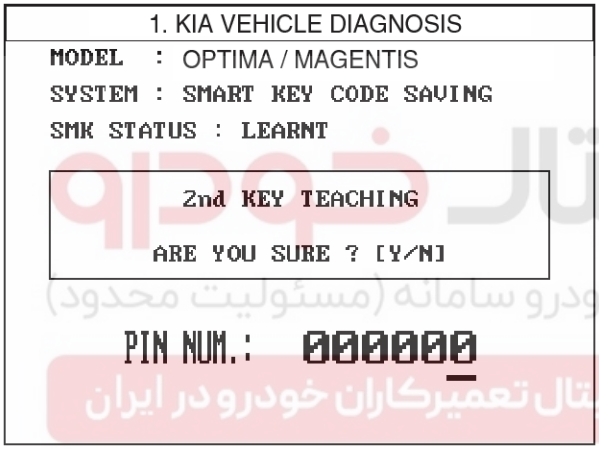
SMGBE9121L

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



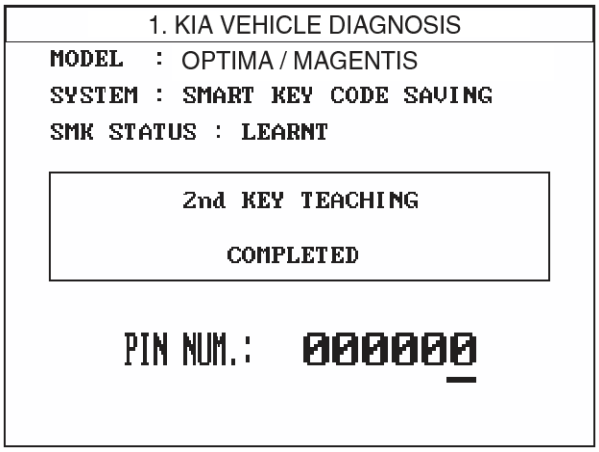
SMGBE9122L

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



SMGBE9123L

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



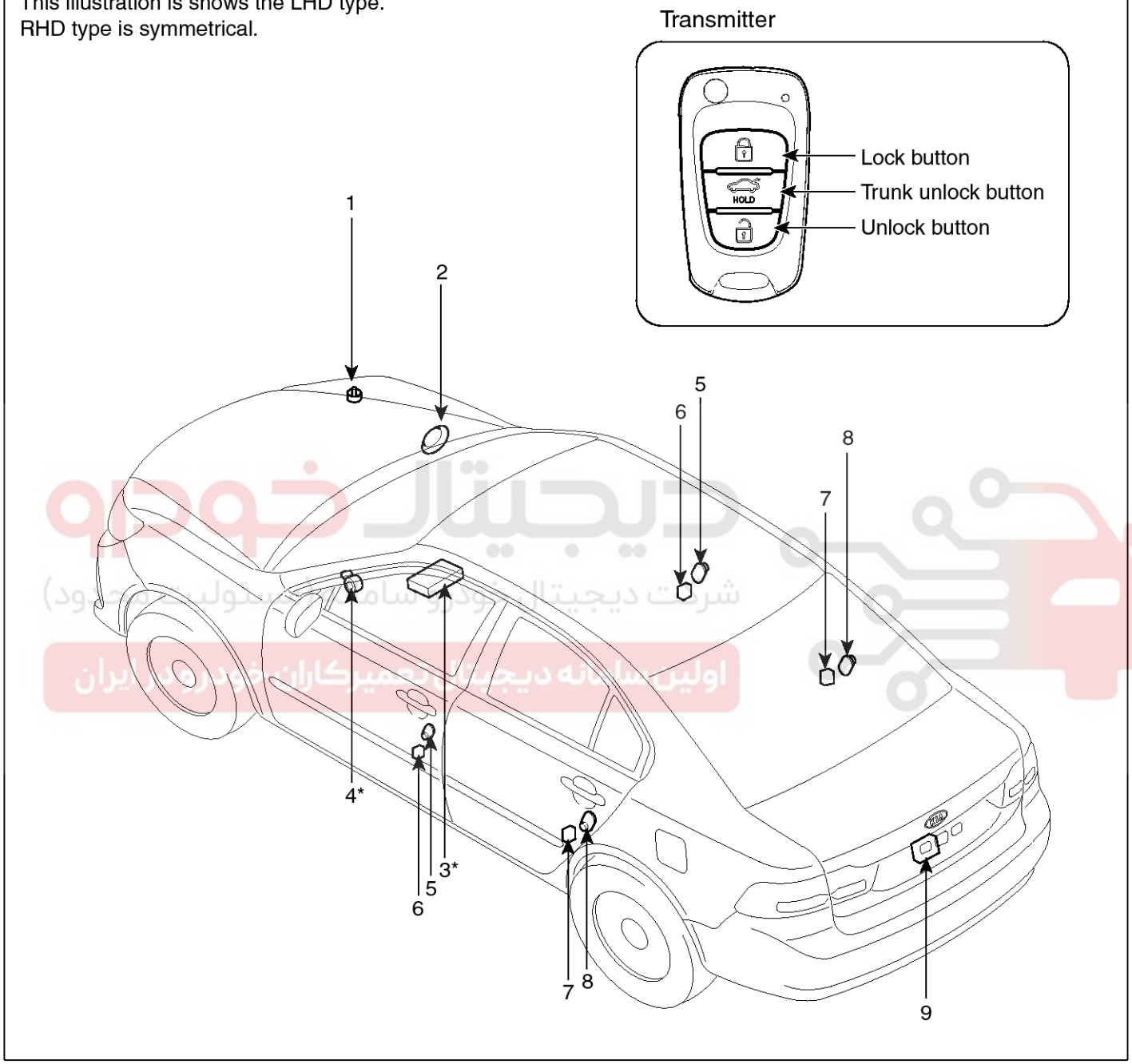
SMGBE9124L

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

Keyless Entry And Burglar Alarm

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE0001L

1. Hood switch
2. Burglar horn
3. Body control module
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 lock actuator

Description

Burglar Alarm System

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

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

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

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

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

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

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

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

The receiver is integrated in the body control module.

Keyless Entry System

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

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

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

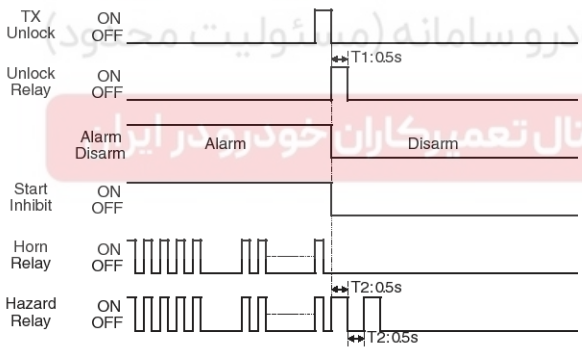
The system will signal you when the doors lock and unlock by flashing the hazard lamp once when they lock, and twice when they unlock.

Functions

1. **Disarm**

Condition 1

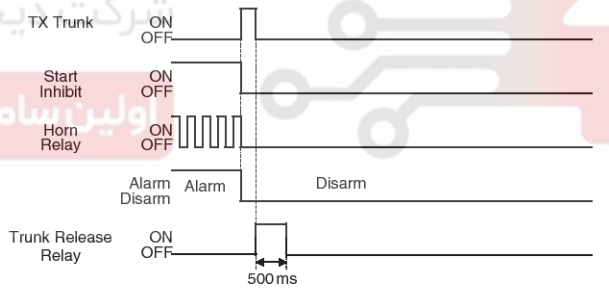
State	Description
Initial Condition	ALARM
Event	- IGN KEY ON during 30sec or ALT"L"=on
	NON SMK(Smart key) - Any door open&TX UNLOCK - TX TRUNK-TX Lock & Lock confirm Failed
	SMK : - Any door open&RKECMD=UNLOCK/PassiveAccessUnlock=1 - RKE_TRUNK=1-TP(Transponder)AUTH=1/PICAUTH=1 - RKE CMD=LOCK/PassiveAccessLock=1 &Lock confirm Failed
	Mechanical KeyOPTIONEnable: - Mechanical UNLOCK - Mechanical LOCK&Lock confirm Failed
Action	The state goes toDISARMstate - HornRelay, HazardRelay, StartInhibitRelayOFF - TX Unlock or MTS Unlock →UnlockRelayon for 0.5sec →HazardRelayon (twice)



SMGBE9090L

T1 : 0.5s

T2 : 0.5s +-0.1s



SMGBE9091L

Condition 2

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

Condition 3

State	Description
Initial Condition	ARM WAIT state
Event	- Any door open or Hood Switch OPEN or Trunk switch OPEN - Any door is unlocked - Key In switch ON
	SMK : TP AUTH=1 / PIC AUTH=1
	Mechanical Key OPTION Enable: M UNLOCK
Action	The state goes to DISARM state

Condition 4

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

Condition 5

State	Description
Initial Condition	AUTOLOCK TIMER2 STATE
Event	- Any door open - Key In Switch ON - AUTO LOCK & Lock confirmation failure - Hood Switch Open and Memory Hood was Close - Trunk Switch Open and Memory Trunk was Close
	NON SMK : - TX LOCK& Lock confirmation failure
	SMK : - RKE CMD=LOCK/ PassiveAccessLock=1& Lock confirmation failure - TP AUTH=1/ PIC AUTH=1
	Mechanical Key option Enable: Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state

Condition 6

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

Condition 7

State	Description
Initial Condition	REARM state
Event	Execpt china spec: - IGN KEY ON during 30sec or ALT ”L”=on
	NON SMK : - TX LOCK & Lock confirmation failure - TX TRUNK
	SMK : - TP AUTH=1 / PIC AUTH=1 - RKE CMD=LOCK / PassiveAccess Lock=1 & Lock confirmation failure - RKE TRUNK=1
	Mechanical Key option Enable: - Mechanical UNLOCK - Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state Start Inhibit Relay OFF

Condition 8

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

Condition 9

State	Description
Initial Condition	ARMHOLD
	- IGN KEY ON
	SMK : - TP AUTH=1 / PIC AUTH=1
	Mechanical Key option Enable: - MECHANICAL UNLOCK
Action	The state goes to DISARMECHANICAL state

2. **Arm**

Condition 1

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

Condition 2

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

Condition 3

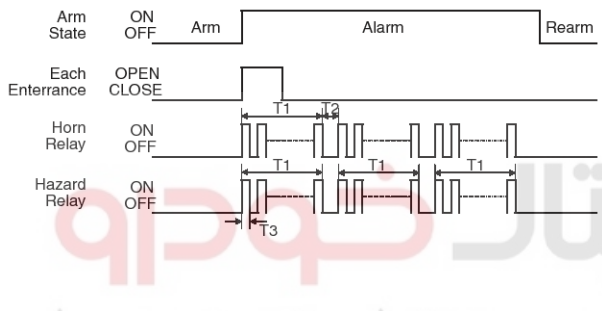
State	Description
Initial Condition	ARMHOLD state
Event	Trunk close for at least Trunk Release Time Out(default 30sec) in ARMWAIT state
Action	The state goes to ARM state

3. **Alarm**

Condition 1

State	Description
Initial Condition	ARM state
Event	Any door open or Hood Switch open or Trunk Switch open
	China spec ; Key In Switch ON or IG1 ON or IG2 ON
Action	The state goes to ALARM state - Engine Start Inhibit is ON - GEN, M/E, CHINA AREA : The horn is ON one time for 27sec(±2sec) - The hazard is driven also (During Horn driving)

Non-middle East Area



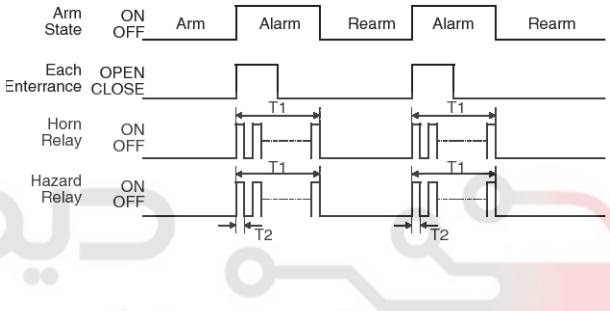
SMGBE9092L

T1 : 27s(±2sec),

T2 : 10s(±2sec),

T3 : 0.5s ± 0.1sec

Middle East, GEN/EC, CHINA-Area



SMGBE9093L

T1 : 27s ± 2sec

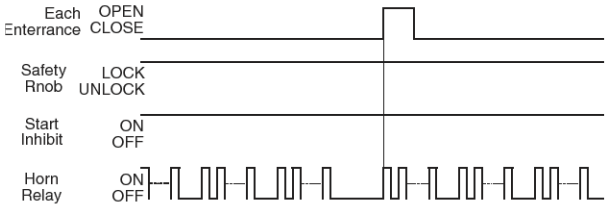
T2 : 0.5s ± 0.1sec

Condition 2

State	Description
Initial Condition	REARM state
Event	Any door open or Hood Switch OPEN or Trunk Switch OPEN
Action	The state goes to ALARM state GEN, M/E, CHINA AREA : The horn is ON one time for 27sec(±2sec) The hazard is driven also (During Horn driving)

Condition 3

State	Description
Initial Condition	ARMHOLD state
Event	Any door open or Hood Switch OPEN
Action	The state goes to ALARM state GEN, M/E, CHINA AREA : The horn is ON one time for 27sec(±2sec) The hazard is driven also (During Horn driving).



SMGBE9094L

4. **Arm Wait Mode**

Condition 1

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

Condition 2

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

Condition 3

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

Condition 4

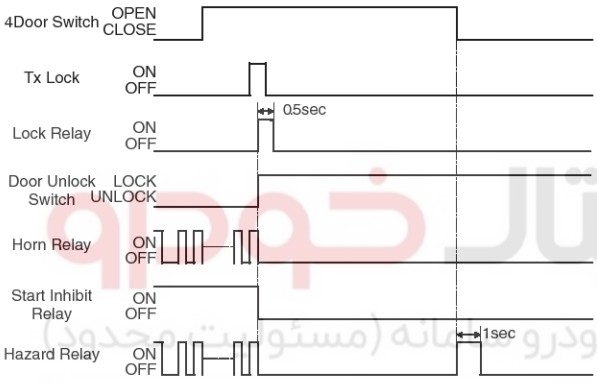
State	Description
Initial Condition	AUTOLOCK TIMER1 state
Event	AUTOLOCK & locked confirmed
	NON SMK: - Tx Lock & locked confirmed
	SMK: - RKE CMD=LOCK / PassiveAccessLock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State -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

Condition 5

State	Description
Initial Condition	PREARM state
Event	All door closed and (Trunk Switch CLOSE & TRUNK MARK=CLEAR) & Hood Switch CLOSE & DOO-R LOCK
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) - Start ARMWAIT TIMER

Condition 6

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



SMGBE9095L

5. **Rearm Mode**

Condition 1

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

6. **Autolocktimer1 Mode**

Condition 1

State	Description
Initial Condition	ARM state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD=UNLOCK / PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER1 state - Start AUTOLOCKTIMER1 - Hazard Relay Twice on (0.5s ON/0.5s OFF)

Condition 2

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

Condition 3

State	Description
Initial Condition	ARM WAIT state
Event	NON SMK : TX UNLOCK
	SMK: RKE CMD=UNLOCK / PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER1 state - Start AUTOLOCKTIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 4

State	Description
Initial Condition	DISARM state & All entrances closed(DOORS, HOOD & TRUNK) & IGN KEY OUT
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER1 state - Start AUTOLOCKTIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 5

State	Description
Initial Condition	ALARM state & All door closed and Trunk Switch CLOSE, Hood Switch CLOSE
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER1 state - Start AUTOLOCKTIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Start Inhibit Relay off / Horn Relay off

Condition 6

State	Description
Initial Condition	REARM state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ PassiveAccessUnlock=1
Action	The state goes to AUTOLOCKTIMER1 state - Start AUTOLOCKTIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Start Inhibit Relay off

7. **Autolocktimer2 Mode**

Condition 1

State	Description
Initial Condition	AUTO-LOCK TIMER2 state
Event	Finished AUTOLOCK TIMER2
	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ PassiveAccessUnlock=1
Action	No change state
	CASE1: AUTOLOCK TIMER2 finished AUTOLOCK
	CASE2: TX UNLOCK, RKE CMD=UNLOCK, PassiveAccessUnlock=1 - Start AUTOLOCKTIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT & (Trunk or Hood Switch OPEN) state
Event	NON SMK : TX UNLOCK
	SMK: RKE CMD=UNLOCK/ PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER2 state - Start AUTOLOCKTIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/ Trunk state

Condition 3

State	Description
Initial Condition	ALARM state & All door closed & (Trunk or Hood Switch OPEN) state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER2 state - Horn Relay, Start Inhibit Relay = OFF - Start AUTOLOCKTIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

Condition 4

State	Description
Initial Condition	PREARM state & All door closed & (Trunk Switch or Hood OPEN)state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER2 state - Start AUTOLOCKTIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

Condition 5

State	Description
Initial Condition	ARMHOLD state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / PassiveAccessUnlock=1
Action	- The state goes to AUTOLOCKTIMER2 state - Start AUTOLOCKTIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

8. **Prearm Mode**

Condition 1

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

Condition 2

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

Condition 3

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

Condition 4

State	Description
Initial Condition	ARMHOLD state
Event	NON SMK: TX LOCK & locked confirmed
	SMK: RKE CMD=LOCK/ PassiveAccessLock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK locked confirmed
Action	The state goes to PREARM state

Condition 5

State	Description
Initial Condition	ARMWAIT state
Event	NON SMK: TX TRUNK
	SMK: RKE TRUNK=1
Action	The state goes to PREARM state Start TRUNKTIMER TRUNK MARK = Set

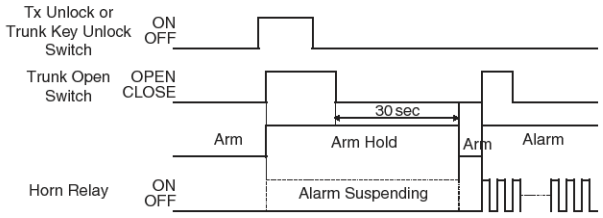
Condition 6

State	Description
Initial Condition	PREARM state
Event	Trunk Switch OPEN TRUNKTIMER expired (Trunk Release Time Out: 30s)
Action	No state change CASE Trunk Switch OPEN : • Stop to TRUNKTIMER. • TRUNK MARK = Clear CASE TRUNKTIMER expired • TRUNK MARK = Clear

9. **Armhold Mode**

Condition 1

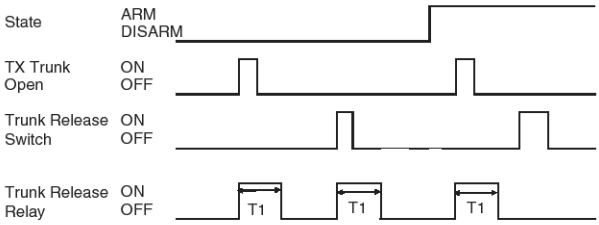
State	Description
Initial Condition	ARM state
Event	NON SMK: TX TRUNK
	SMK: RKE TRUNK=1
Action	The state goes to ARMHOLD state



SMGBE9096L

10. **Trunk Open With Tx**

1) TRUNK RELEASE RELAY is turned ON for 0.5s if TRUNK signal of TX is received.
2) TRUNK RELEASE RELAY is turned ON for 0.5s in case of TRUNK RELEASE Switch OFF→ON .
3) ARM mode, signal by TRUNK RELEASE Switch input is not output.



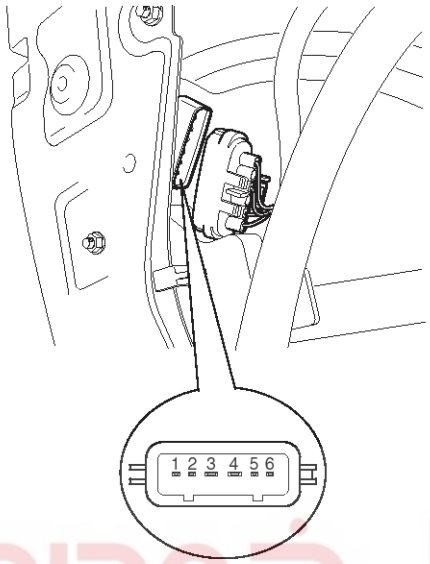
SMGBE9097L

T1 : 0.5s ± 0.1s

Inspection

Front Door Lock Actuator Inspection

1. Remove the front door trim. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.



ATLG122A

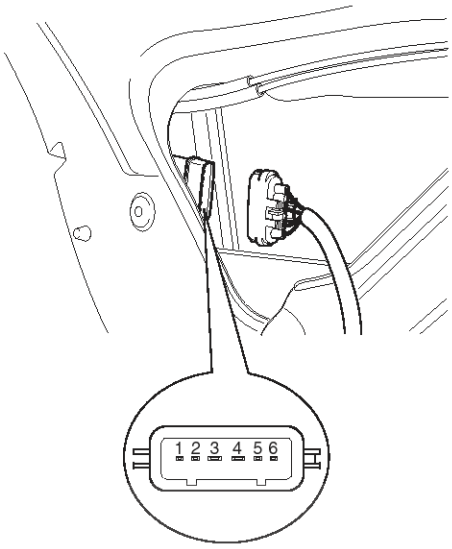
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

LTLG122B

Rear Door Lock Actuator Inspection

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.



ATLG122C

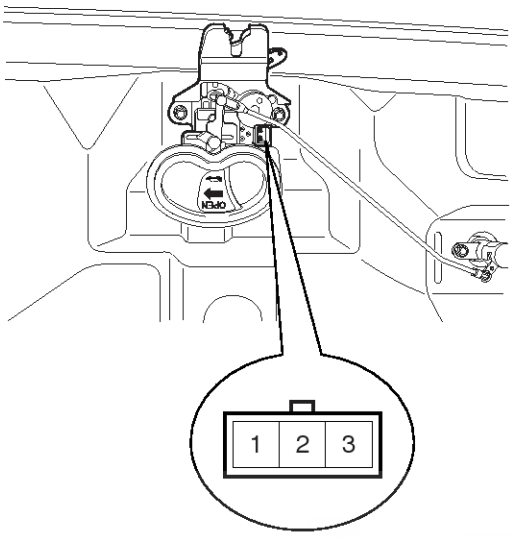
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

LTLG122D

Trank Lid Release Actuator Inspection

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



LTLG122E

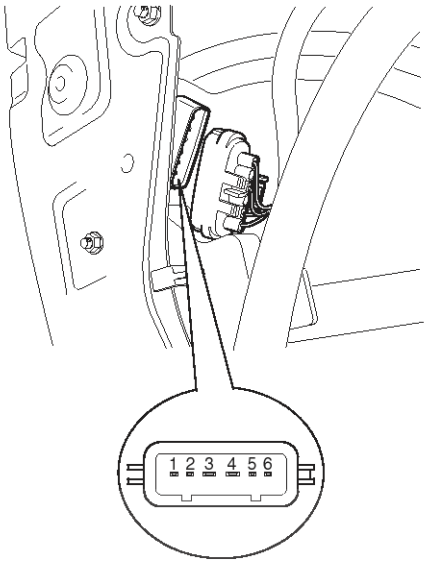
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

LTLG122F

Front Door Lock Switch Inspection

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.



ATLG122A

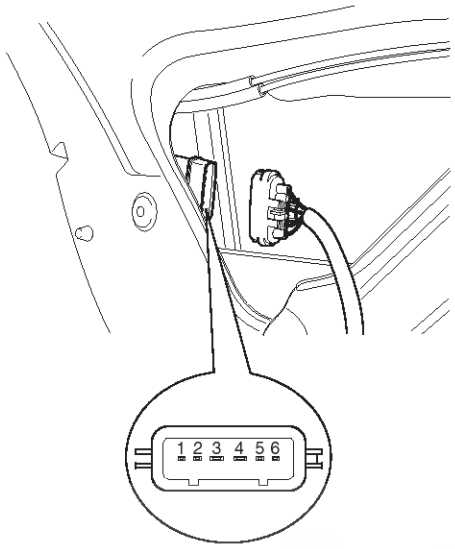
3. Check for continuity between the terminals in each switch position according to the table.

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

LTLG122B

Rear Door Lock Switch Inspection

1. Remove the rear door trim. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.



ATLG122C

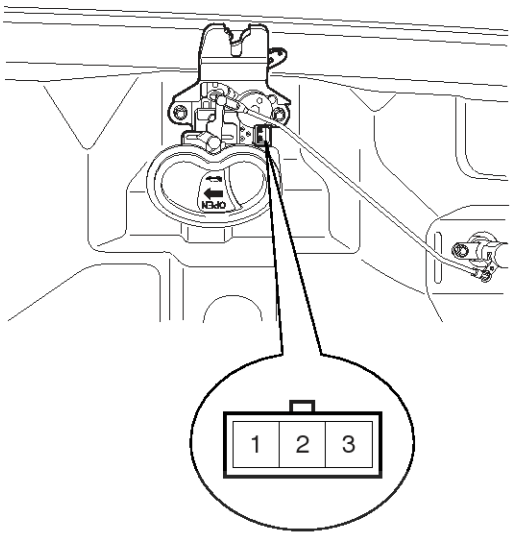
3. Check for continuity between the terminals in each switch position according to the table.

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

LTLG122D

Trank Lid Open Switch Inspection

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



LTLG122E

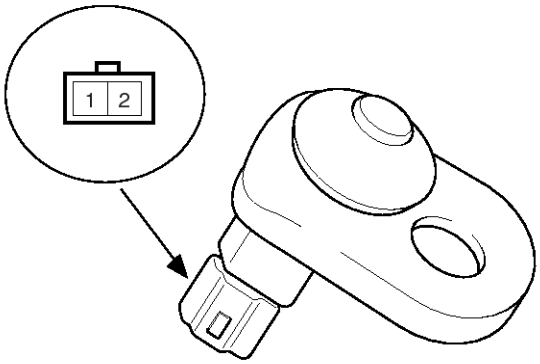
3. Check for continuity between the terminals in each switch position according to the table.

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

LTLG122F

Door Switch Inspection

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



ATIE121Q

[Front Door Switch]

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

ETQF180D

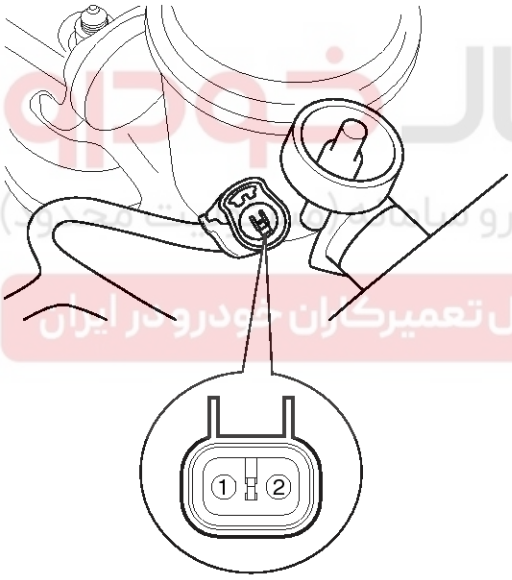
[Rear Door Switch]

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

ETRF262E

Hood Switch Inspection

1. Disconnect the 1P connector from the hood switch.



SMGBE9240D

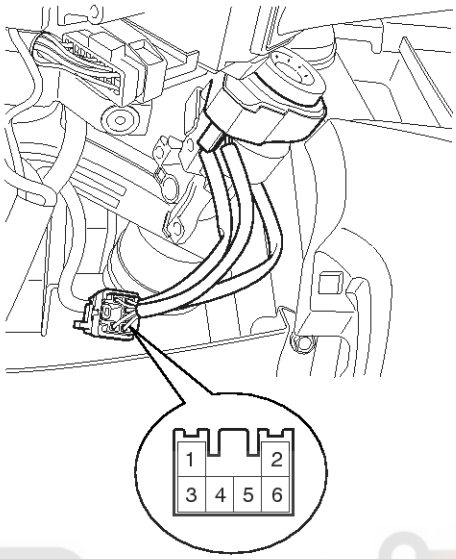
2. Check for continuity between the terminals and ground according to the table.

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

SMGBE9050L

Key Warning Switch Inspection

1. Remove the driver's crash pad lower panel. (see Body group-crash pad)
2. Disconnect the 6P connector from the door warning switch.



ATLG280G

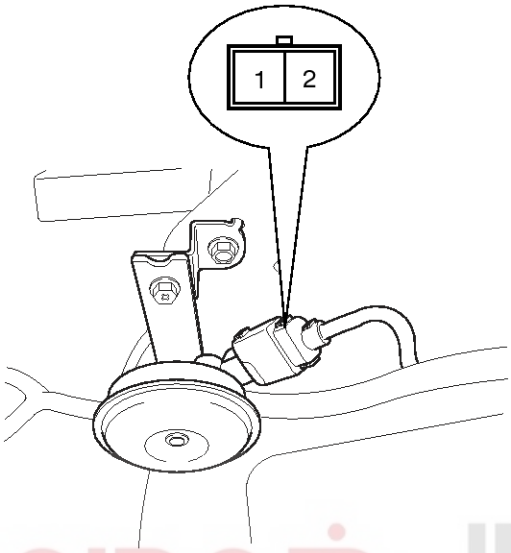
3. Check for continuity between the terminals in each position according to the table.

Terminal / Key position	5	6
Insert	○	○
Removal		

ETQF180F

Burglar Horn Inspection

1. Remove the burglar horn 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.



ATLG530D

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

Transmitter

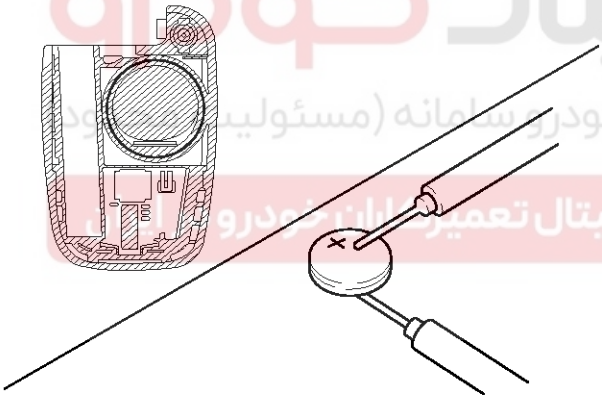
Specifications

Items	Specifications
Keyless entry transmitter Power source	Lithium 3V battery (1EA)
Transmissible distance	10m or more
Life of battery	2 years or more (at 20 times per day)
Button	Door lock Door unlock Trunk lid open
Transmission frequency	433.92 MHz

Inspection

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

Standard voltage : 3V



SHMBE8129D

3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. 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.
5. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, replace the transmitter.

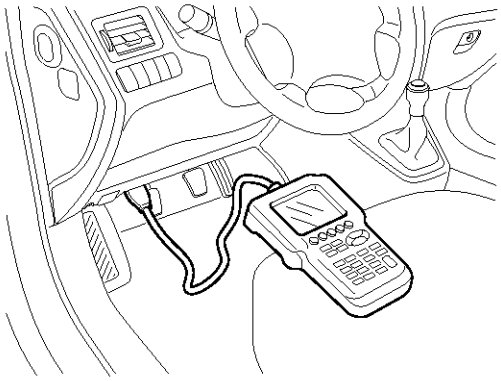
WARNING

An inappropriately disposed battery can be harmful to the environment and human health.

Dispose the battery according to your local law(s) or regulation.

Transmitter Code Registration

1. Connect the DLC cable of hi-scan to the data link connector (16 pins) in driver side crash pad lower panel, turn the scan tool ON.



KRQE900A

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

1. KIA VEHICLE DIAGNOSIS
MODEL : ALL
02. ENGINE
03. AUTOMATIC TRANSAXLE
04. ANTI-LOCK BRAKE SYSTEM
:
:
:
07. CODE SAVING

LTLG065R

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

TRANSMITTER CODE SAVE
REMOVE THE IG. KEY FROM THE KEY CYLINDER. CONNECT THE DLC CABLE AND 16 PIN CONNECTOR OF THE VEHICLE.
PRESS [ENTER], IF YOU ARE READY!

ETRF065M

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.

TRANSMITTER CODE SAVE
1ST. TRANSMITTER SAVE PRESS THE TRANSMITTER [LOCK] BUTTON OR [UNLOCK] BUTTON FOR 1 SECOND.
* NO. OF CODED KEY : 0 EA

ETRF065N

TRANSMITTER CODE SAVE

1ST. TRANSMITTER SAVE
PRESS THE TRANSMITTER [LOCK] BUTTON
OR [UNLOCK] BUTTON FOR 1 SECOND.

1ST. TRANSMITTER SAVE SUCCESS!

IF YOU WANT TO SAVE THE 2ND KEY
PRESS [YES], OR NOT PRESS [NO]

* NO. OF CODED KEY : 1 EA

ETRF065O

TRANSMITTER CODE SAVE

2ND. TRANSMITTER SAVE
PRESS THE TRANSMITTER [LOCK] BUTTON
OR [UNLOCK] BUTTON FOR 1 SECOND.

* NO. OF CODED KEY : 1 EA

ETRF065P

TRANSMITTER CODE SAVE

2ND. TRANSMITTER SAVE
PRESS THE TRANSMITTER [LOCK] BUTTON
OR [UNLOCK] BUTTON FOR 1 SECOND.

2ND. TRANSMITTER SAVE SUCCESS!

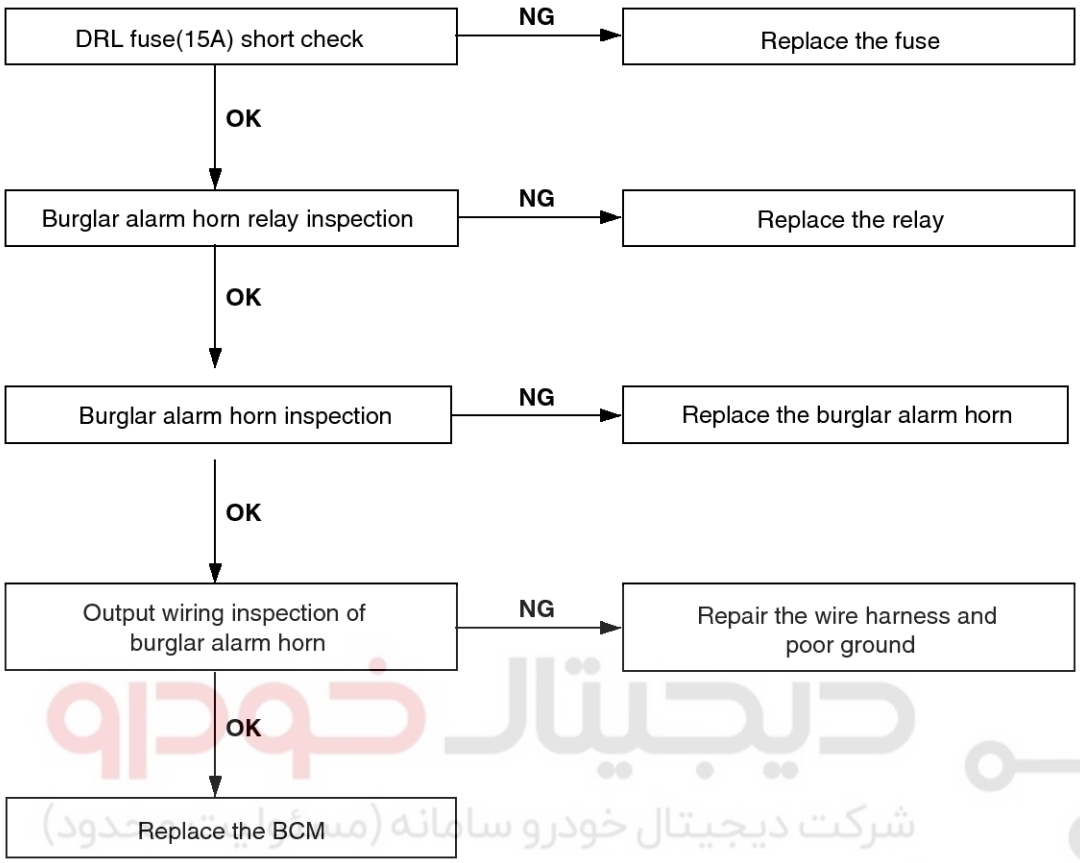
CODE SAVING IS COMPLETED!
IF YOU STOP, PRESS [ESC] KEY!!!

* NO. OF CODED KEY : 2 EA

ETRF065Q

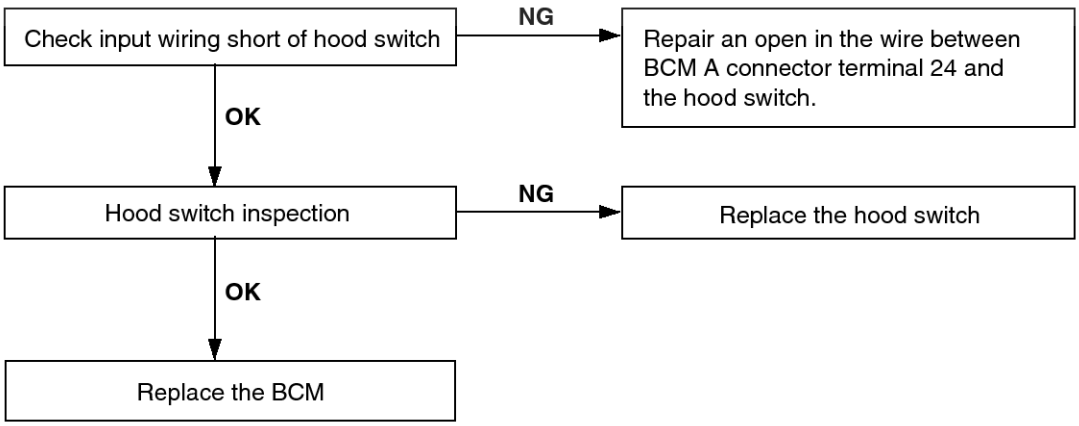
Troubleshooting

1. Alarm does not work. (Hazard lamp works)



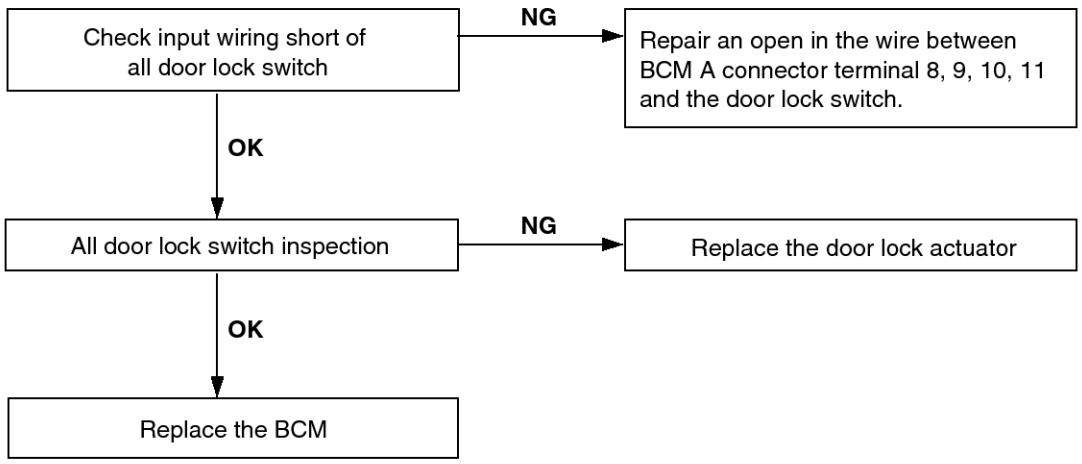
LTLG900I

2. When hood is opened inside the car, burglar horn does not work.



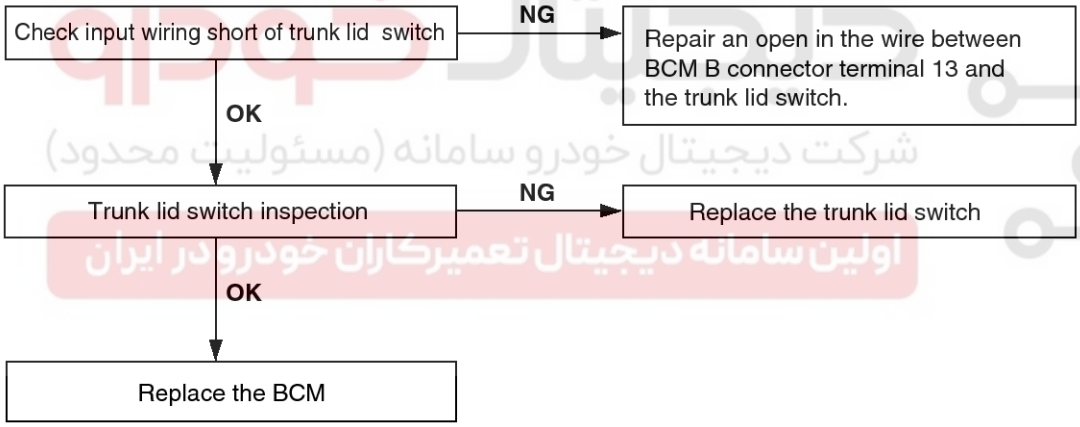
LTLG900J

3. When door is opened inside the car, burglar horn does not work (If tailgate and hood is opened, alarm works)



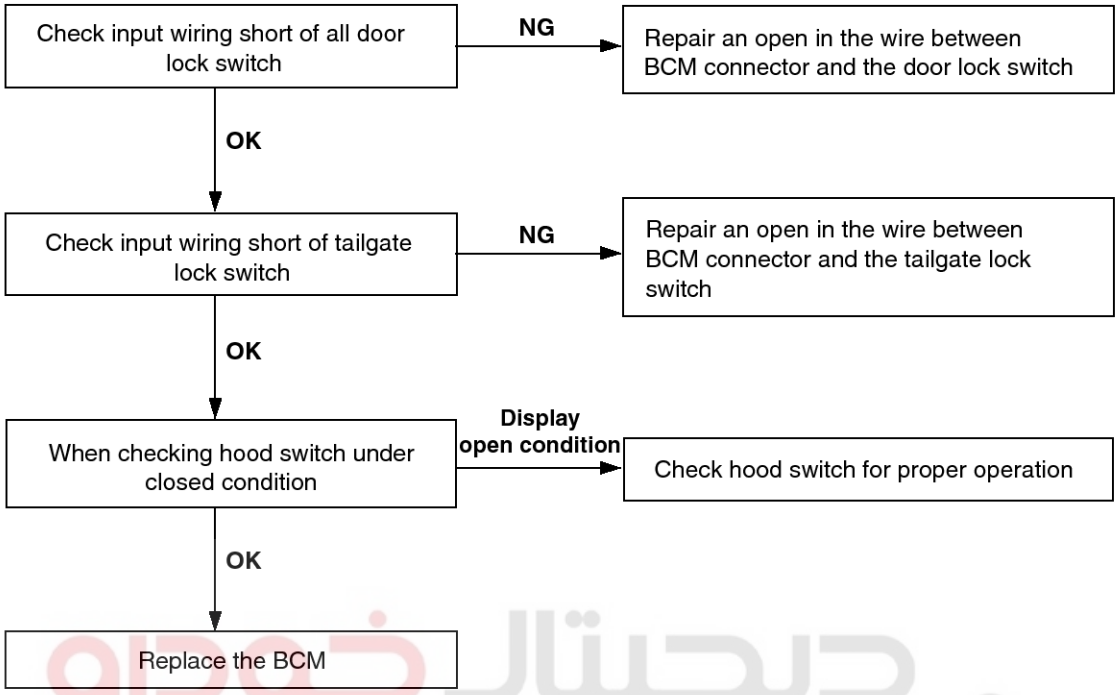
LTLG900K

4. When trunk lid is opened inside the car, siren does not work.



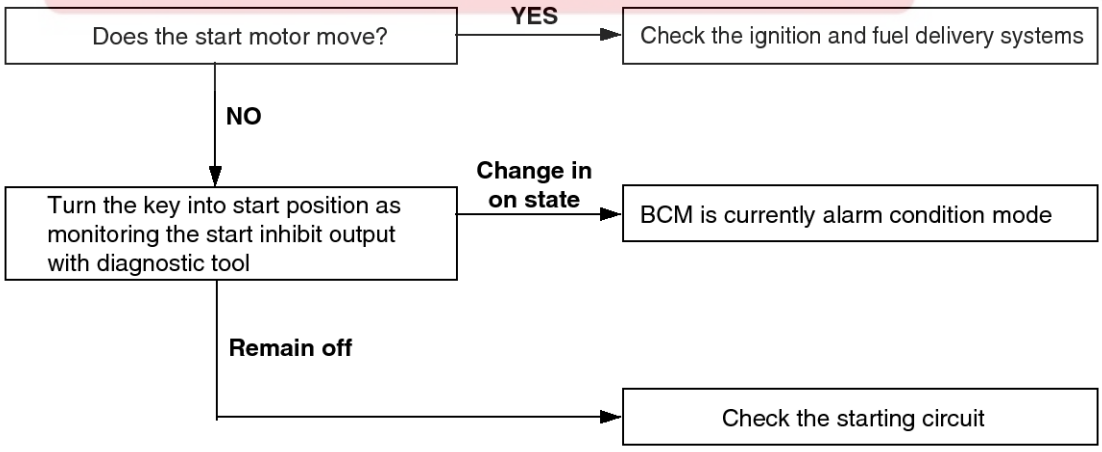
LTLG900L

5. When the vehicle is locked by the transmitter, central door lock function works but hazard lamp doesn't blink.



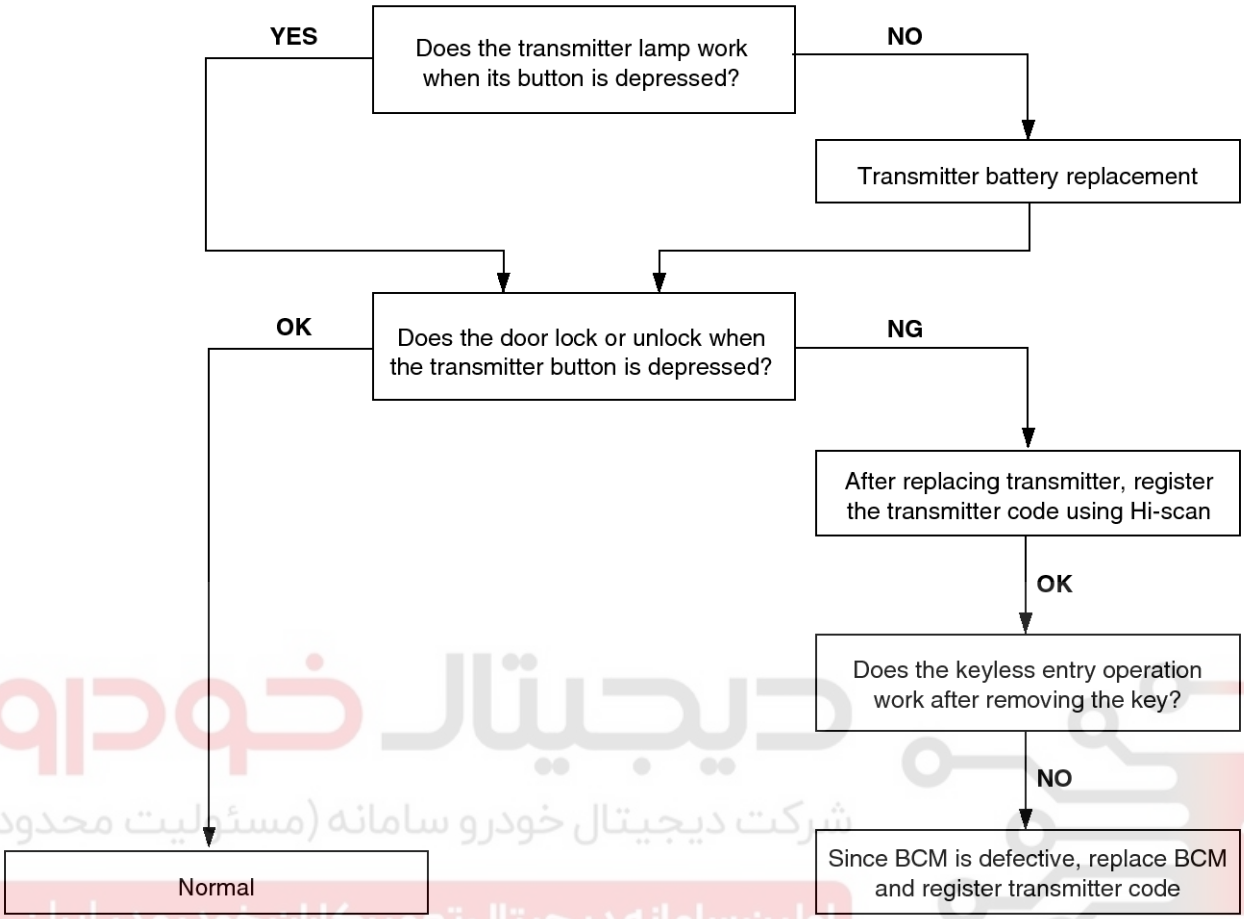
LTLG900M

6. Engine does not start, even when the alarm is disarmed.



LTLG900N

7. Central door lock function works, but keyless entry system does not work.



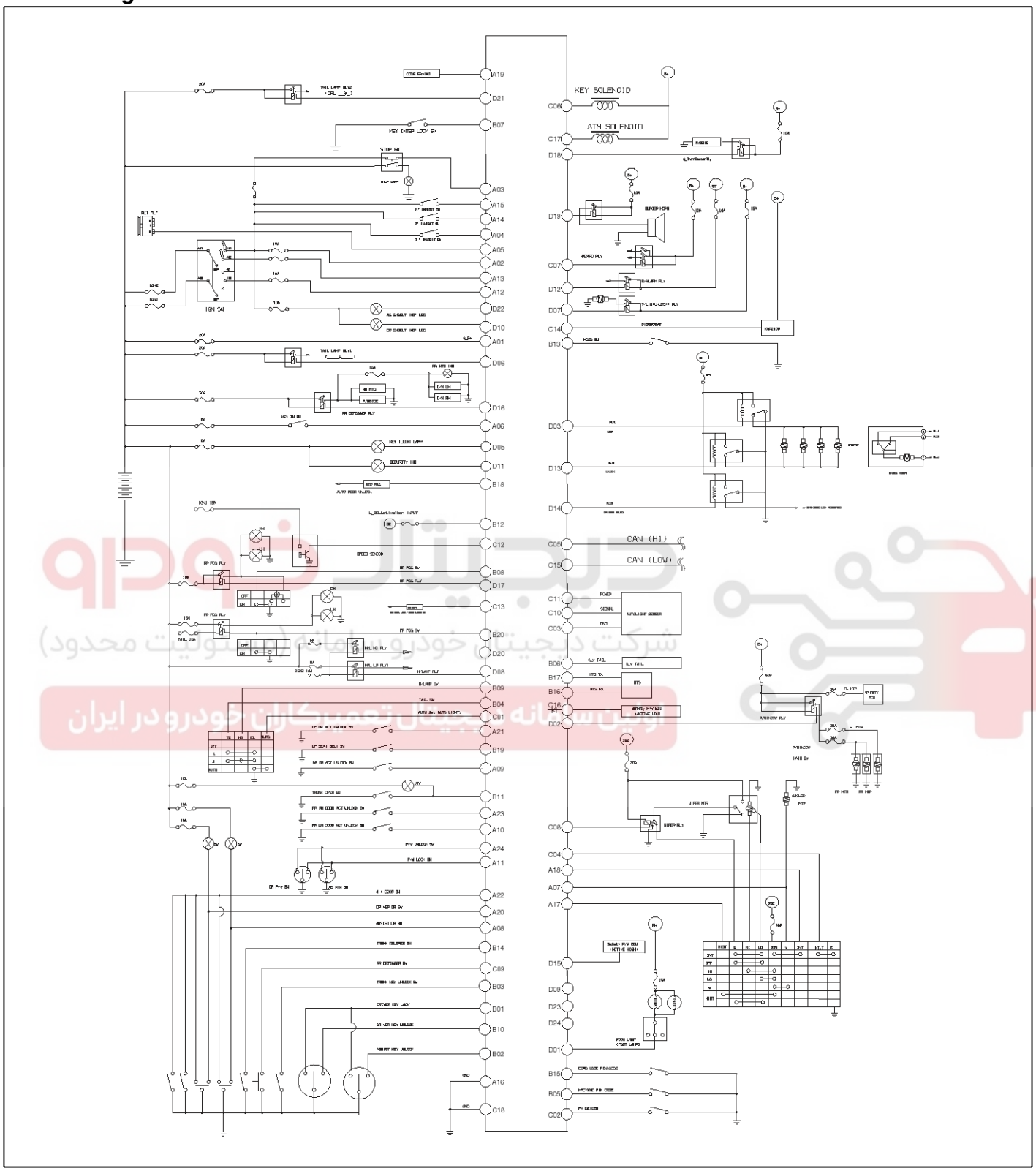
BCM (Body Control Module)

Body Control Module (BCM)

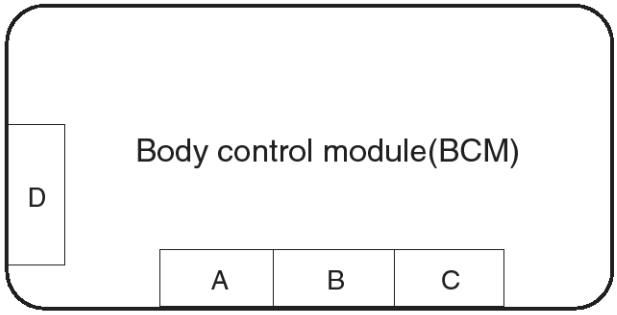
Specifications

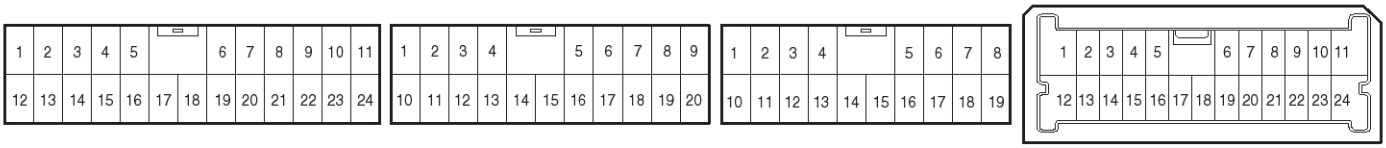
Items		Specifications
Rated voltage		DC 12V
Operating voltage		DC 9 ~ 16V
Operating temperature		-22˚F~176˚F(-30˚C~ 80˚C)
Insulation resistance		100MΩ or more
Dark current		Less than 8mA (12.8 V) - BCM & Receiver Less than 4mA (12.8V) - BCM
Rated load	Burglar relay	DC 12V, 200mA (Inductance load)
	Horn relay	DC 12V, 200mA (Inductance load)
	Tail lamp relay	DC 12V, 200mA (Inductance load)
	Head lamp relay	DC 12V, 200mA (Inductance load)
	Rear defogger relay	DC 12V, 200mA (Inductance load)
	Power window timer relay	DC 12V, 200mA (Inductance load)
	Seat belt warning indicator (Driver/Assist)	DC 12V, 1.2W (LED load)
	Key hole illumination lamp	DC 12V, 2W (Lamp load)
	Room lamp	DC 12V, 20W (Lamp load)
	Intermittent wiper relay	DC 12V, 200mA (Inductance load)
	DRL relay	DC 12V, 200mA (Inductance load)
	Door lock relay	DC 12V, 200mA (Inductance load)
	Door unlock relay	DC 12V, 200mA (Inductance load)
	Hazard lamp relay	DC 12V, 200mA (Inductance load)
	Driver door unlock relay	DC 12V, 200mA (Inductance load)
	Trunk lid lock actuator	DC 12V, 200mA (Inductance load)
	Rear fog relay	DC 12V, 200mA (Inductance load)

Circuit Diagram



BCM Connector Terminals





Connector A Connector B Connector C Connector D

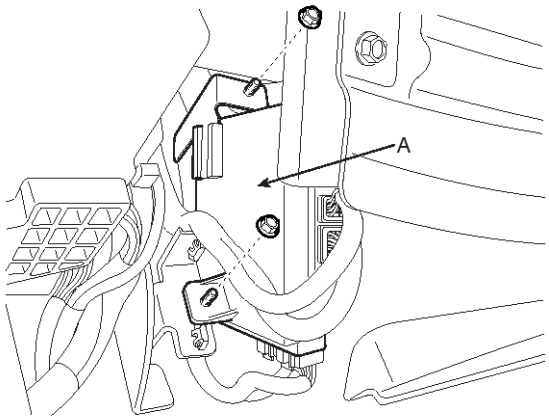
SMGBE9003L

Pin No.	Connector A	Connector B	Connector C	Connector D
1	B+	Driver door key lock switc-h	Auto light switch	Room / Foot lamp
2	IGN 1	Assist door key unlock sw-itch	Front deicer switch	Power window relay
3	Stop lamp switch	Trunk key unlock switch	Auto light GND	Lock relay
4	"D" Inhibit switch	Tail switch	Wiper INT volume switch	Front fog relay
5	ALT L	Pin code	CAN hi	Key hole illumination
6	Key in switch	AV tail	Key solenoid	Tail lamp relay
7	Washer switch	Key inter lock switch	Hazard relay	Trunk relay
8	Assist door switch	Rear fog switch	Head lamp relay	Head lamp relay
9	Assist door unlock switch	Head lamp switch	Rear defogger switch	-
10	Rear door unlock switch LH	Driver door key unlock sw-itch	Auto light signal	Driver seat belt relay
11	Power window door lock switch	Trunk open switch	Auto light power	Security indicator
12	IGN 2	DRL activation	Speed sensor	START Inhibit relay
13	ACC	Hood swithc	PAB signal	Unlock relay
14	"P" Inhibit switch	Trunk release switch	Hi scan	DEAD LOCK
15	"N" Inhibit switch	Dead lock pin code	CAN low	Safety power window E-CU hi

16	GND	-	Safety power window E-CU low	Defogger relay
17	MIST switch	-	ATM solenoid	Rear fog relay
18	INT switch	Crush input	GND power	Front deicer relay
19	Code save unit	Seat belt switch		Horn relay
20	Driver door switch	Front fog switch		
21	Driver door unlock switch			Tail lamp relay
22	4 door switch			Assist seat belt indicator
23	Rear door unlock switch RH			
24	Power window door unlock switch			

Description

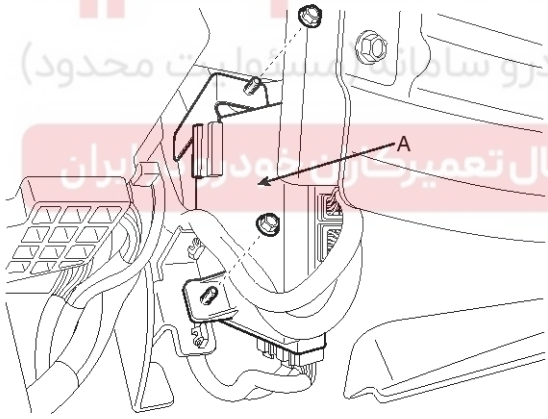
Body control module (A) receives various input switch signals controlling time and alarm functions for the intermittent wiper timer, washer timer, rear defogger timer, seat belts warning, delayed out room lamp, central door lock, ignition key reminder, power window timer, door warning, tail lamp auto cut, crash door unlock, ignition key hole illumination, rear fog lamp control and keyless entry & burglar alarm.



ATLG140A

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (Refer to the Body group-crash pad).
3. Remove the keyless antenna cable and body control module (A) after loosening 2 nuts.



ATLG140A

Installation

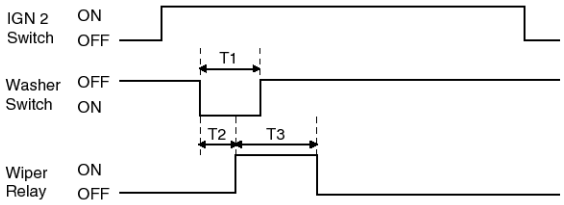
1. Install the body control module and keyless antenna cable.
2. Install the crash pad lower panel.

Inspection

1. **Wiper Control**

- Wahser Control Coupled With Wiper

1) Under "IGN2 SWITCHithc = ON", WIPER RELAY is turned ON after T2 from "WASHER SWITCH = ON" if WASHER SWITCH is ON for T1 and WIPER RELAY is turned OFF after T3.



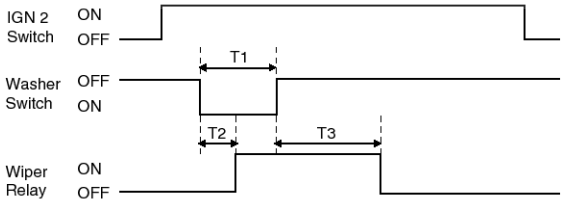
SMGBE9060L

T1 : 0.06s ~ 0.2s

T2 : 0.3s ± 0.1s

T3 : 0.7s ± 0.1s

2) Under "IGN2 SWITCH = ON", WIPER RELAY is turned ON after T2 from "WASHER SWITCH = ON" if WASHER SWITCH is ON for at least T1, and WIPER RELAY is turned OFF after T3 from the moment that WASHER SWITCH is turned OFF.



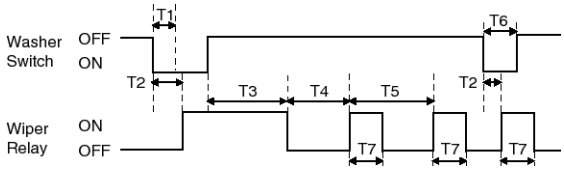
SMGBE9061L

T1 : 0.2s(Min)

T2 : 0.3s ± 0.1s

T3 : 2.5s ~ 3.8s (2~3 Turn)

3) Operation in Item 2) is performed if WASHER SWITCH is ON for at least T1 during WIPER operation with INT SWITCH. peration in Item 1) is performed if WASHER SWITCH is ON for T6.



SMGBE9062L

T1 : 0.2s(Min), T2 : 0.3s ± 0.1s

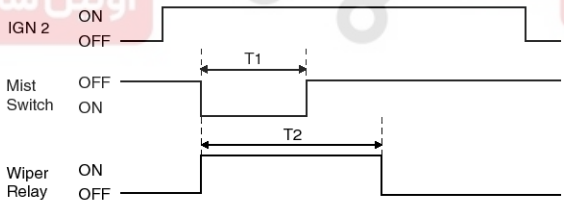
T3 : 2.5s ~ 3.8s (2~3 Turn)

T4 : T5 - 0.7s, T5 : INT TIME

T6 : 0.06s ~ 0.2s, T7 : 0.7s ± 0.1s

- Wiper Mist Function

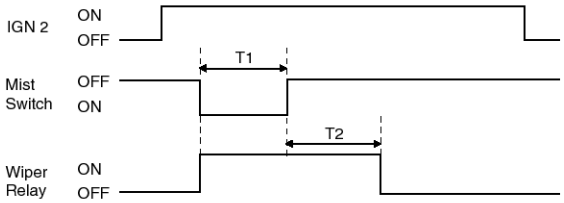
1) Under "IGN2 SWITCH = ON", WIPER RELAY is turned ON immediately from "Mist SWITCH = ON" if "Mist SWITCH = ON" for T1 , Wiper RELAY is turned OFF after T2.



SMGBE9063L

T1 : 0.7s Within, T2 : 0.7s ± 0.1s

2) Under "IGN2 SWITCH = ON", WIPER RELAY is turned ON immediately from "Mist SWITCH = ON" if "Mist SWITCH = ON" for more than 1, Wiper RELAY is turned OFF after T2 from Mist SWITCH = OFF.



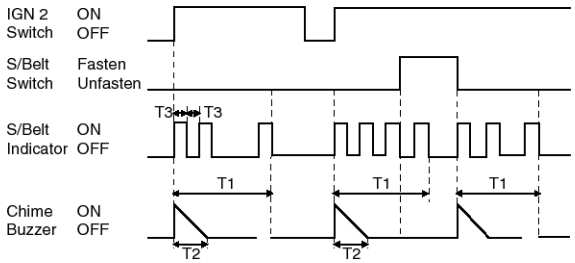
SMGBE9064L

T1 : 0.7s(Min), T2 : 0.7s ± 0.1s

2. **Warning**

- Seat Belt Warning Timer

1) SEAT BELT WARNING LAMP is ON for 1sec(DUTY 50%), CHIME BUZZER output on cycle 1.0s for 6sec.
2) LAMP, CHIME BUZZER's OUTPUT is OFF IGN1 OFF in time.
3) CHIME BUZZER's OUTPUT is OFF, WARNING LAMP output for remnant time if SEAT BELT SWITCH ON in time.
4) Under IGN1 ON, WARNING LAMP & CHIME BUZZER operate as the condition of above 1) at SEAT BELT is unfastend after fasten SEAT BELT.



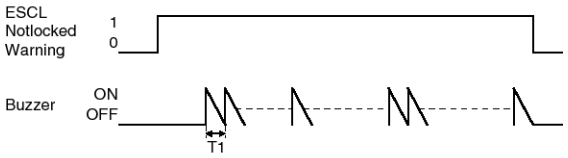
SMGBE9065L

T1 : 6s ± 1s, T2 : 1s ± 0.1s

T3 : 0.5s ± 0.1s

- ESCL Not Locked Warning (SMK option)

1) When receiving ESCL Not locked Warning(CAN) ON, when releasing while putting a alarm into effect, it'll be canceled immediately.

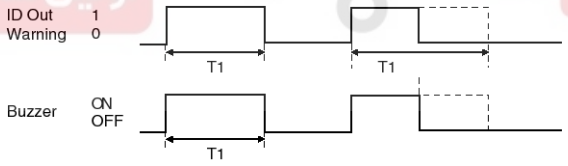


SMGBE9066L

T1 : 0.6 ± 0.1sec

- Out Warning (SMK option)

1) Warning BUZZER output for the time of reception about "ID OUT Warning =1" SMK UNIT, Warning BUZZER OUTPUT OFF when receive ID OUT Warning =0 (The time of transmission about ID OUT Warning =1 is 3sec from SMK UNIT.)
2) CHIME BUZZER OUTPUT OFF when "ID OUT Warning=0" during CHIME BUZZER OUTPUT.

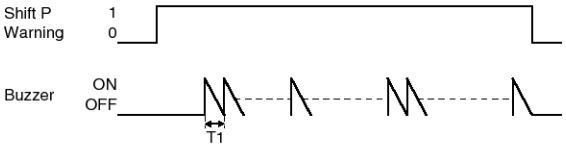


SMGBE9067L

T1 : 3sec

- Shift “P” Warning (SMK option)

1) When receiving "Shift P Warning(CAN) = ON" , outputting a alarm, and when receiving OFF, a stop will do a alarm immediately.



SMGBE9068L

T1 : 0.6 ± 0.1sec

- SSB Switch Warning (SMK option)

1) When receiving SSB Warning (CAN) ON, outputting a alarm, and when receiving OFF, a stop will do a alarm immediately.

SMGBE9069L

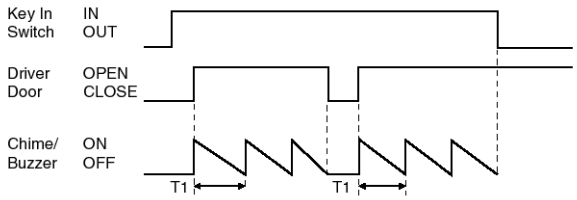
T1 : 0.6 ± 0.1sec

- Key Operated Warning

1) Buzzer sounds every 1sec when DRIVER DOOR is opened under KEY IN SWITCH =IN.
2) Buzzer stops sounding if "KEY IN SWITCH =OUT" and "DRIVER DOOR=CLOSE" are met during CHIME BUZZER output.
3) At IGN1 ON, CHIME BUZZER OFF.

(SMK option)

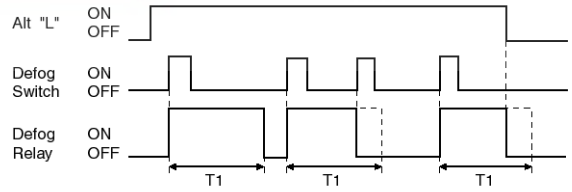
1) Buzzer sounds every 1sec when DRIVER DOOR is opened under "Fob IN =ON" or "ACC=ON".
2) Buzzer stops sounding if "Fob IN =OFF" & "ACC=OFF" and "DRIVER DOOR=CLOSE" are met during CHIME BUZZER output.
3) At IGN1 ON, CHIME BUZZER OFF.



SMGBE9070L

T1 : 1.0s ± 0.06s

3. **Defogger Control**
   1) DEFOG RELAY is turned for T1 if DEFOG SWITCH is turned ON under "ALT L = ON".
   2) DEFOG RELAY is turned OFF if DEFOG SWITCH is turned ON again under output ON or "ALT L = OFF".

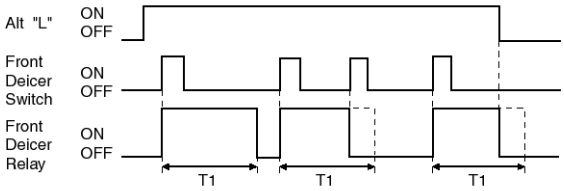


SMGBE9071L

ON : IGN1 = ON & ALT "L" = ON

OFF : IGN1 = OFF or ALT "L" = OFF

4. **Front Deicer Control**
   1) Front Deicer Relay is turned for T1 if Front Deicer SWITCH is turned OFF⇒ON under "ALT L = ON".
   2) Front Deicer RELAY is turned OFF if Front Deicer SWITCH is turned OFF⇒ON again under output ON or "ALT L = OFF".



SMGBE9072L

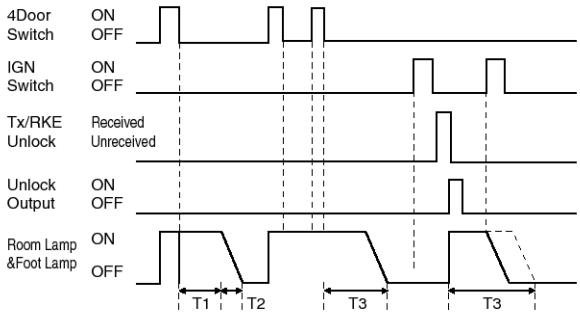
T1 : 20min ± 1min

ON : IGN1 = ON & AltL = ON

OFF : IGN1 = OFF or AltL = OFF

5. **Decayed Room Lamp (Except SMK)**
   1) ROOM LAMP & FOOt LAMP lights 100% at DOOR OPEN (4DOOR SWITCH = ON).
   2) ROOM LAMP & FOOt LAMP is turned ON always when DOOR OPEN at "IGN SW=ON".
   3) Resolution is 32 STEP or more.
   4) The lamp is immediately turned OFF at ALL DOOR LOCK or "IGN SWITCH = ON" during T1(phasing out lighting for 2sec).
   5) Shall be no phasing out lighting if 4DOOR SWITCH ON time is 0.08sec or less.
   6) Shall be no flashing under 4DOOR OPEN and ROOM LAMP & FOOT LAMP ON at IGN1 ON.

6. **Decayed Room Lamp (SMK option)**
   1) ROOM LAMP & FOOT LAMP lights 100% at DOOR OPEN (4DOOR SWITCH = ON).
   2) ROOM LAMP & FOOT LAMP is turned ON always when DOOR OPEN at "IGN SW=ON".
   3) Resolution is 32 STEP or more.
   4) The lamp is immediately turned OFF at ALL DOOR LOCK or "IGN SWITCH = ON" during T1(phasing out lighting for 2sec).
   5) Shall be no phasing out lighting if 4DOOR SWITCH ON time is 0.08sec or less.
   6) Shall be no flashing under 4DOOR OPEN and ROOM LAMP & FOOT LAMP ON at IGN1 ON.



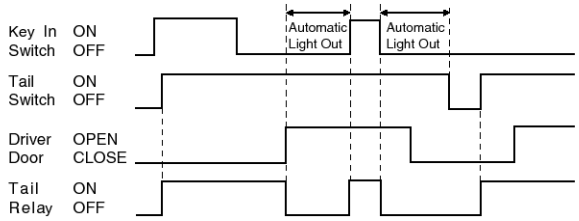
SMGBE9073L

T1 : 30s ± 3s, T2 : 2s ± 0.2s

T3 : 32s ± 3.2s

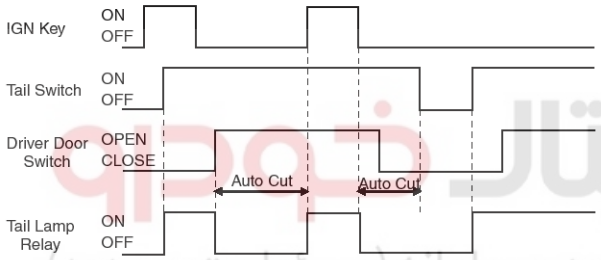
ON : IGN1 = ON, OFF : IGN1 = OFF

7. **Tail Lamp Auto Cut**
   1) TAIL RELAY is turned ON when changing TAIL SWITCH from OFF to ON.
   2) TAIL RELAY is turned OFF when TAIL SWITCH is OFF.
   3) TAIL RELAY is turned OFF if the state is changed from "KEY IN SWITCH = ON" & "TAIL SWITCH = ON "to "KEY IN SWITCH = OFF" & "TAIL SWITCH = ON" & "DRIVER DOOR = OPEN". (automatic light out)
   4) TAIL RELAY is turned ON when KEY IN SWITCH is turned ON after the operation in (3).
   5) TAIL RELAY is not turned ON if DRIVER DOOR is closed after the operation in (3).



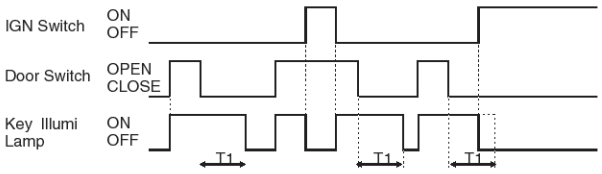
SMGBE9074L

8. **Tail Lamp Auto Cut (SMK option)**
   1) IGN On1 after Tail SW, in the case when on is here, IGN OFF2 and DRIVER DOOR SW, Tail Lamp RELAY is made off (Automatic light out) in OPEN.
   2) In IGN ON state, DRIVER DOOR SW, when there is IGN OFF behind OPEN, Tail Lamp RELAY is made off (Automatic light out).
   3) After it was off, when turning on Tail SWITCH on will be Tail Lamp RELAY again behind Automatic light out, and the AUTO CUT function is released.
   4) When doing IGN ON again behind automatic light out, on will be Tail Lamp RELAY, and the AUTO CUT function is released.
   5) The B+ AUTO CUT circumstances at attachment are maintained in the AUTO CUT state.



SMGBE9075L

9. **IGN Key Illumination Lamp**
   1) KEY ILLUMI LAMP is turned ON at "ACC SWITCH = OFF" & "IGN SWITCH = OFF" & "DOOR = OPEN".
   2) KEY ILLUMI LAMP is turned ON for T1 at "DOOR = CLOSE" after the operation in (1).
   3) KEY ILLUMI LAMP is immediately turned OFF at "ACC SWITCH = ON" & "IGN SWITCH = ON" during output.
   4) KEY ILLUMI LAMP is immediately turned OFF at transition to warning MODE during output.



SMGBE9076L

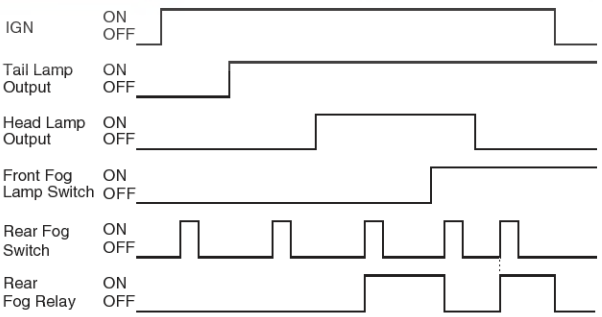
T1 : 30s ± 3s

ON : IGN1 = ON, OFF : IGN1 = OFF

OPEN : Dr DOOR = OPEN or As DOOR = OPEN

CLOSE : Dr DOOR = CLOSE or As DOOR = CLOSE

10. **Rear Fog Lamp**
   1) REAR FOG RELAY is turned ON if pushing REAR FOG SWITCH under "Head Lamp Output =ON" and "Front FOG SWITCH=ON" after "IGN=ON" & "TAIL Lamp Output =ON".
   2) Output is turned OFF if pushing REAR FOG SWITCH again under REAR FOG RELAY ON.
   3) REAR FOG RELAY is turned OFF unless the condition “IGN=ON" & "TAIL Lamp Output =ON" & "Head Lamp Output =ON" (or Front FOG SWITCH=ON) is met.



SMGBE9077L

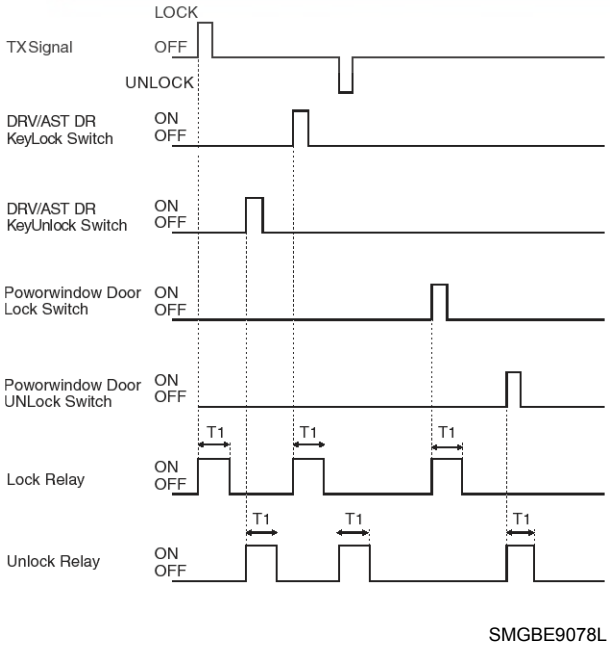
ON : IGN1 = ON

OFF : IGN1 = OFF

11. **Door LOCK/UNLOCK Control**

- Central Door Lock/Unlock

1) ALL DOOR LOCK signal is output for T1(0.5s) if DRIVER/ASSIST DOOR Unlock SWITCH is turned within 3sec after DRIVER DOOR KEY LOCK SWITCH is turned ON.
2) All DOOR UNLOCK signals are output for T1(0.5s) if DRIVER/ASSIST DOOR Unlock SWITCH is turned within 3sec after DRIVER/ASSIST DOOR KEY UNLOCK SWITCH is turned ON.
3) Change of UNLOCK(LOCK) → LOCK(UNLOCK) is ignored during LOCK(UNLOCK) signaloutput by other functions.
4) All DOOR Lock Rly are output for T1 when TX LOCK signal is received.
5) All DOOR Unlock Rly are output for T1 when TX UNLOCK signal is received.
6) All DOOR Lock Rly are output for T1 when DRIVER/ASSIST Lock SW(POWER WINDOW) is locked.
7) All DOOR Unlock Rly are output for T1 when DRIVER/ASSIST Lock SW(POWER WINDOW) is unlocked.
8) LOCK/UNLOCK by SAFETY KNOB operation is not interlocked (mechanical operation).
9) LOCK signals are output for T1 TX LOCK signal is received.

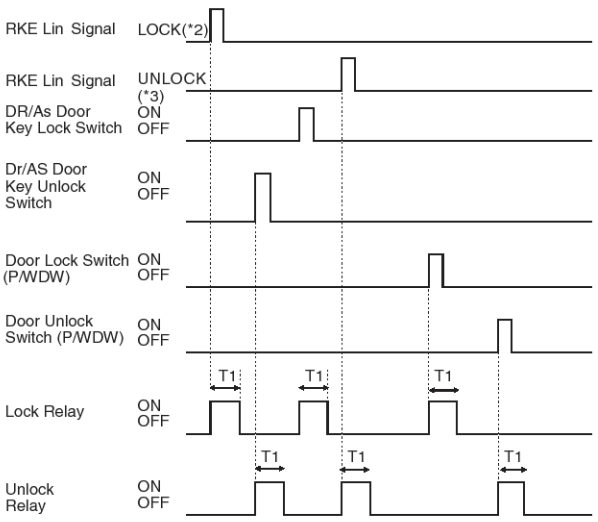


SMGBE9078L

T1 : 0.5s ± 0.1s

- Central Door Lock/Unlock (SMK option)

1) ALL DOOR LOCK signal is output for T1(0.5s) if DRIVER/ASSIST DOOR Unlock SWITCH is turned within 3sec after DRIVER DOOR KEY LOCK SWITCH is turned ON.
2) All DOOR UNLOCK signals are output for T1(0.5s) if DRIVER/ASSIST DOOR Unlock SWITCH is turned within 3sec after DRIVER/ASSIST DOOR KEY UNLOCK SWITCH is turned ON.
3) Change of UNLOCK(LOCK)→LOCK(UNLOCK) is ignored during LOCK(UNLOCK) signal output by other functions.
4) When "RKE CMD = LOCK" or "PassiveAccessLock = ON", ALL DOOR LOCK output is T1=ON. But, when DRIVER DOOR SWITCH ON or ASSIST DOOR SWITCH ON, "PassiveAccessLock = ON" signal is ignored.
5) When "RKE CMD = UNLOCK" or "PassiveAccess=Unlock" ALL DOOR UNLOCK output is T1=ON.
6) ALL DOOR LOCK signals are output for T1 if DOOR LOCK SWITCH(POWER WINDOW) is locked. And informing of the All Door Lock state to SMK UNIT by LIN communication.
7) ALL DOOR UNLOCK signals are output for T1 if DOOR LOCK SWITCH(POWER WINDOW) is unlocked.
8) LOCK/UNLOCK by SAFETY KNOB operation is not interlocked (mechanical operation).
9) Inputs which are 40msec or less shall not be received. (KEY LOCK/UNLOCK SW)

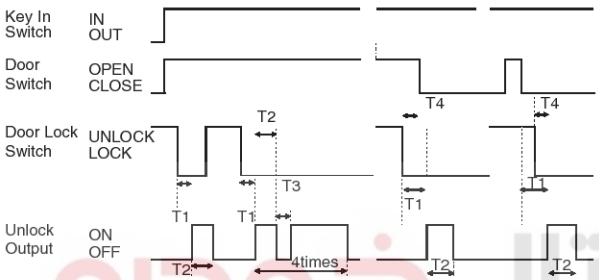


SMGBE9079L

T1 : 0.5s ± 0.1s

- IGN Key Reminder

1) This function is not performed when vehicle speed is 3km/h or more.
2) All Door Unlock Rly signals are output for 1s after 0.5s from when the state becomes "Key In SWITCH = IN" & "DRIVER DOOR SWITCH = OPEN" & "DRIVER DOOR Lock SWITCH = LOCK".
3) All DOOR Unlock Rly signals are output for 1s after 0.5s from when the state becomes "Key In SWITCH = IN" & "ASSIST DOOR SWITCH = OPEN" & "ASSIST DOOR Lock SWITCH = LOCK".



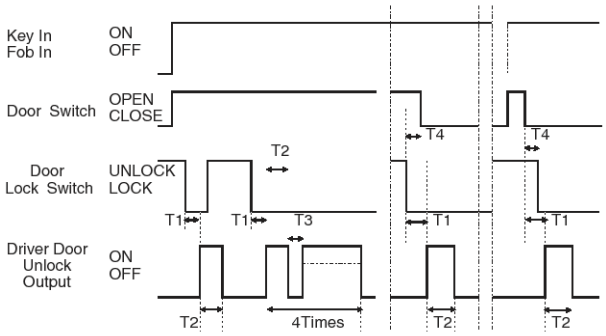
SMGBE9080L

T1, T3 : 0.5s ± 0.1s

T2 : 1s ± 0.1s, T4 : 0.5s MAX

- IGN Key Reminder (SMK option)

1) This function is not performed when vehicle speed is 3km/h or more.
2) ALL DOOR UNLOCK signals are output for 1s after 0.5s from when the state becomes.
3) ALL DOOR UNLOCK signals are output for 1s after 0.5s from when the state becomes (KEY= IN or FOB IN or IGN1= ON or IGN2 =ON or ACC= ON) & ASSIST DOOR = OPEN & ASSIST DOOR LOCK SWITCH = LOCK.
4) ALL DOOR UNLOCK signals are output for 1s after 0.5s from SMK UNIT when "KEY REMIND=ON" signal received.



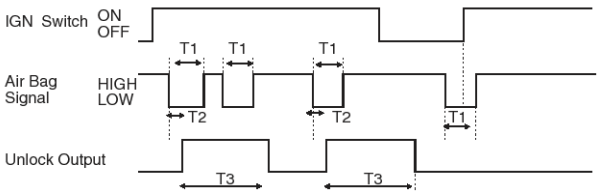
SMGBE9081L

T1, T3 : 0.5s ± 0.1s

T2 : 1s ± 0.1s, T4 : 0.5s MAX

- Crash Door Unlock

1) UNLOCK signal is always output when AIR BAG signal is input under "IGN SWITCH = ON".
2) UNLOCK signal is output for the remaining time even when "IGN SWITCH = ON" is turned to OFF during UNLOCK output.
3) UNLOCK signal is not output when "IGN SWITCH = OFF" is turned to ON after AIR BAG signal is input in advance.
4) UNLOCK signal is output for T3 when Driver, Assist or Rear DOOR LOCK SWITCH is locked from UNLOCK after UNLOCK signal is output.
5) AUTO DOOR LOCK function is not performed when CRASH UNLOCK condition is met.



SMGBE9082L

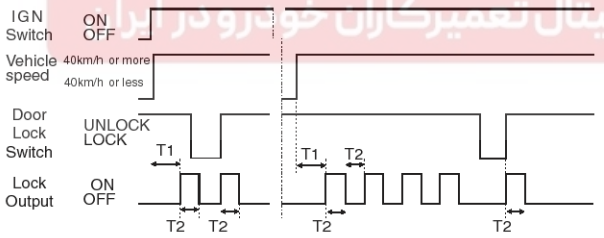
T1 : 0.2s, T2 ; 40ms

T3 : 5s ± 0.5s

- Auto Door Lock

This does not activate when vehicle speed is less than 40km/h.

1) This does not activate when vehicle speed is less than 40km/h.
2) LOCK signal is output if vehicle speed is 40km/h or more for at least 1s under ALT"L" ON, "IGN SWITCH = ON". But, LOCK signal is not output if all DOORs are lockedor all DOORs are FAIL in advance.
3) LOCK signal is output 3 times as Max [(2) is ignored] if either one door is unlocked after LOCK signal output in (2).(1s cycle) But, DOOR, which is locked from UNLOCK state during 3-time output, is ignored.
4) Relevant DOOR is FAIL if the state is UNLOCK after 3-time output.
5) LOCK signal is output once if the FAIL DOOR is unlocked again after the DOOR is locked.
6) LOCK signal is output once if locked doors, which are LOCK state after LOCK signal output in (2), are unlocked again. But, LOCK signal is output once for the relevant DOOR even when UNLOCK state continues after LOCK signal output.
7) AUTO DOOR LOCK function is not performed when CRASH UNLOCK condition is met.



SMGBE9083L

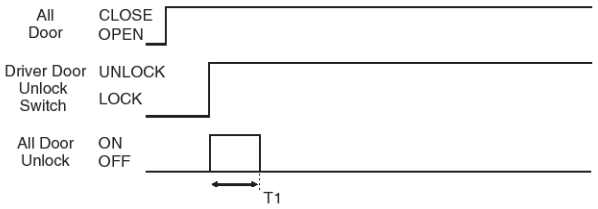
T1 : 1s ± 0.1s

T2 : 0.5s ± 0.1s

- Auto Door Unlock

DRIVER DOOR UNLOCK SWITCH INTERLOCKING AUTO DOOR UNLOCK (EC/AUSTRALIA)

1) Perform after AUTO DOOR LOCK.
2) If ALL DOOR CLOSE & DR DOOR UNLOCK SWITCH LOCK ⇒ UNLOCK, ALL DOOR LOCK signal is output for T1(one time).

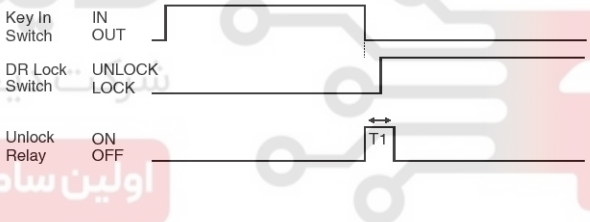


SMGBE9084L

T1 : 0.5s ± 0.1s

- All Door Unlock At Key Out (GEN,M/E,AUS)

1) Perform after AUTO DOOR LOCK.
2) Under ANY DOOR LOCK, ALL DOOR UNLOCK signal is output at IGN KEY IN→OUT.

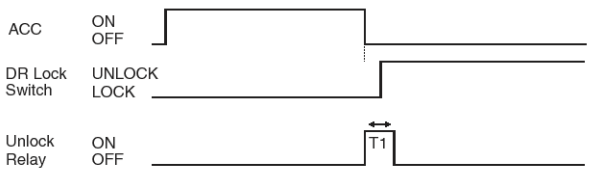


SMGBE9085L

T1 : 0.5s ± 0.1s

- Auto Door Unlock (Smk)

1) Under ANY DOOR LOCK, ALL DOOR UNLOCK signal is output at ACC ON→OFF.

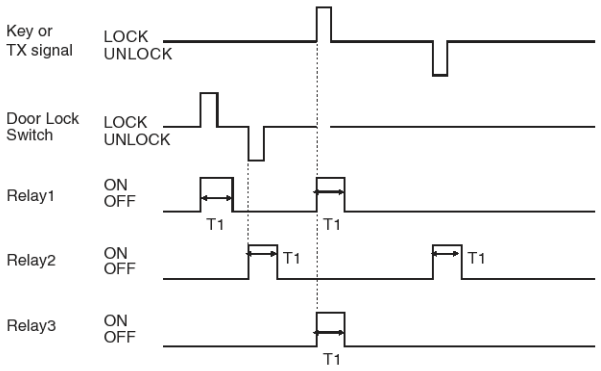


SMGBE9086L

T1 : 0.5s ± 0.1s

- Dead Lock

1) All door close is output for 0.5s if Central Door LOCK is performed with Driver/Assist KEY or TX. Then, DEAD LOCK signal is output for 0.5s after checking the state (after 200msec).
2) Only Central Door LOCK is performed and DEAD LOCK is not performed after outputting Central Door LOCK signal for 0.5s if Central Door LOCK is performed with Centrol Door LOCK SW of Power window SW.
3) When receiving a LOCK signal (TX LOCK/Door KEY LOCK Switch) again in the state of (2), DEAD LOCK signal output is turned on for 0.5 seconds.
4) When it was Central Door LOCK once again by Central Door LOCK SW in Power window SW in the state of (2), Central Door LOCK is turned on again for 0.5 seconds.
5) When receiving a LOCK signal (TX LOCK/Door KEY LOCK Switch) once again in the DEAD LOCK state, LOCK output is always turned on for 0.5 seconds.
6) When operating UNLOCK by a driver's seat/passenger seat KEY and TX by the Central Door LOCK state or the DEAD LOCK state, UNLOCK output is turned on for 0.5 seconds.
7) When operating UNLOCK by Central Door UNLOCK Switch in Power window SW in the Central Door LOCK state, Central Door UNLOCK output is performed.
8) Power Window Switch UNLOCK operation is prohibited in the state you did DEADLOCK entry of.
9) When an entrance and exit way between the 30s isn't OPEN or KEY IN after TX UNLOCK reception, DEADLOCK output will be performed 30s later after UNLOCK reception.
10) DEAD LOCK is canceled at KEY IN & IGN ON after DEAD LOCK.

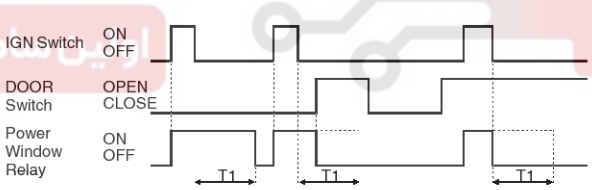


SMGBE9087L

T1 : 0.5s ± 0.1s

12. **Power Window Timer**

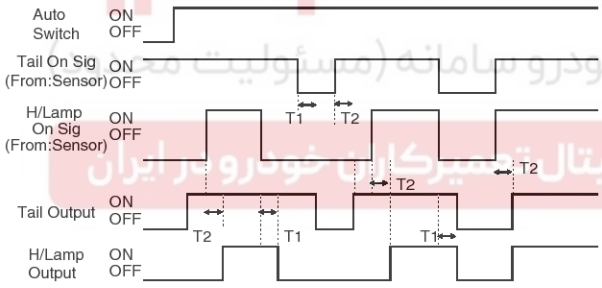
1) POWER WINDOW RELAY it turned ON at IGN SW = ON.
2) POWER WINDOW RELAY is turned ON for T1 at IGN SW = OFF.
3) POWER WINDOW RELAY is immediately turned OFF if DOOR is opened under POWER WINDOW RELAY ON for T1.
4) POWER WINDOW RELAY is immediately turned OFF at IGN SW ON□OFF under DOOR OPEN.



SMGBE9088L

T1 : 30s ± 3s

13. **Auto Light Control**
    1) AUTO LIGHT SENSOR value is always read at IGN1 ON.
    2) LIGHT is turned ON after 2.5sec±0.2sec when AUTO LIGHT SENSOR value is same as LIGHT ON input value.
    3) LIGHT is turned OFF after 2.5sec±0.2sec when SENSOR valueis same as LIGHT OFF input value.
    4) Tail Lamp Signal & H/LAMP signal is output when HEAD LAMP OUTPUT is ON.
    5) When HEAD LAMP is turned OFF, HEAD LAMP signal output is immediately stopped if Tail switch off condition is met at AUTO LIGHT SW ON.
    6) When it's HEAD LAMP ON furniture condition at movement in AUTO SW ON location at HEAD LAMP SW ON location, HEAD LAMP output is maintained with the pear which is carelessly.
    7) The case that HEAD LAMP twinkles and isn't when moving SW during HEAD LAMP ON operation to the HEAD LAMP SW location at the AUTO location by AUTO LIGHT.



SMGBE9089L

T1 : 2.5s ± 0.2s

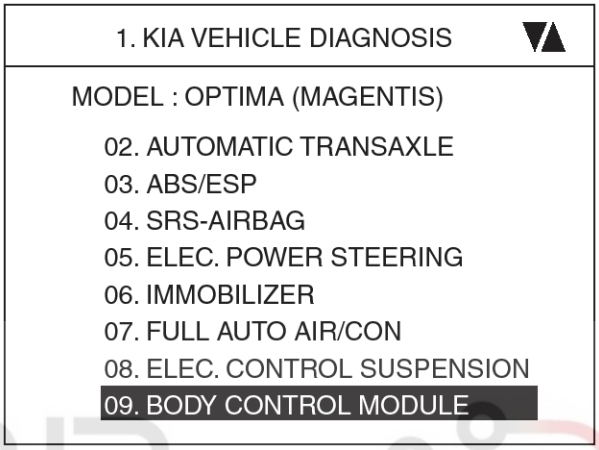
T2 : 2.5s ± 0.2s

Trouble Diagnostics When Using Diagnosis Tool

1. The body control module can diagnose by using the diagnosis tool more quickly.

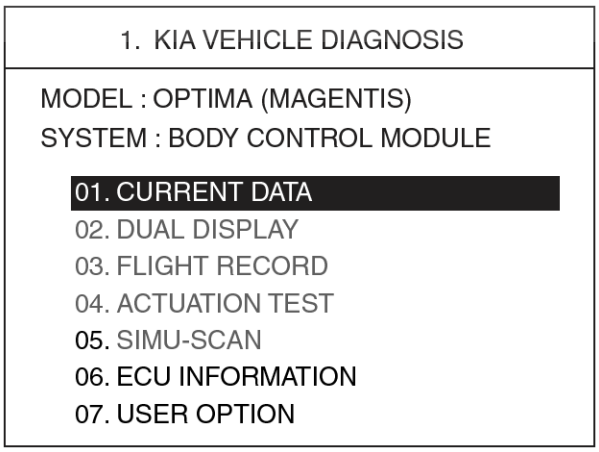
   The BCM communicates with the diagnosis tool and then reads the input/output value and drives the actuator.

2. To diagnose the BCM function, select the menu of model and body control module.

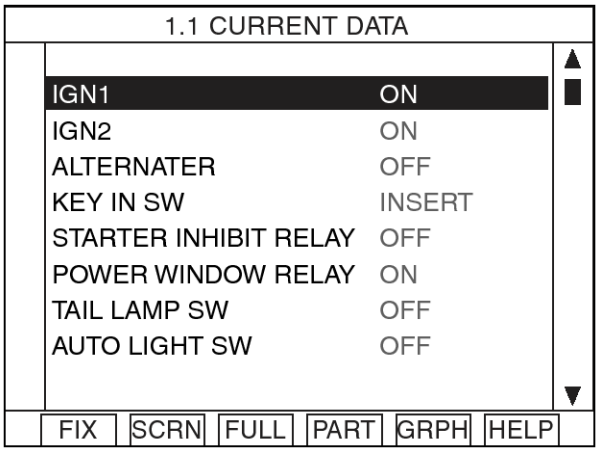


LTLG144A

3. To consult the present input/out value of BCM, "02. INPUT/OUTPUT MONITORING". 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.

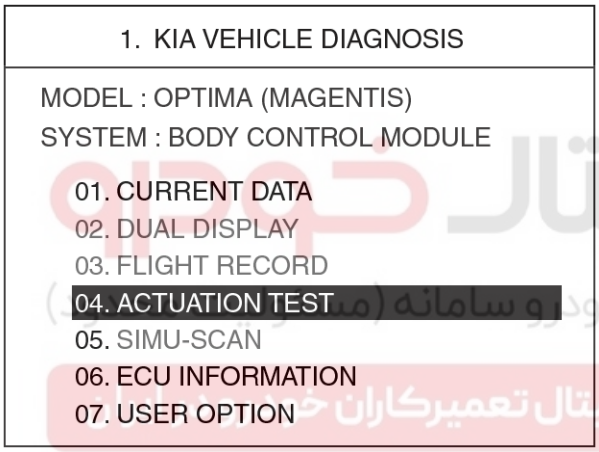


LTLG144B

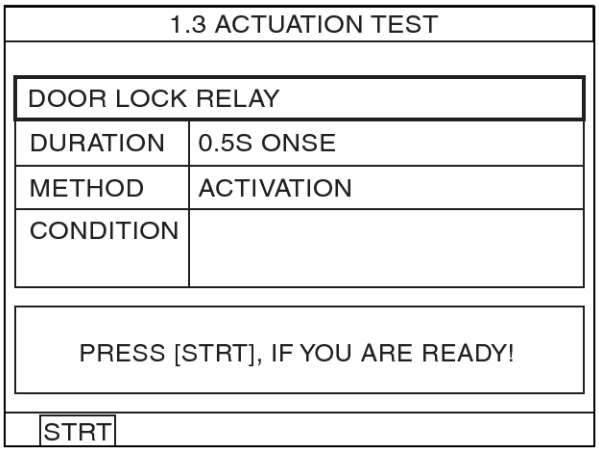


ETRF144C

4. To perform compulsory operation on BCM input factors, select "04. ACTUATION TEST".



LTLG144D

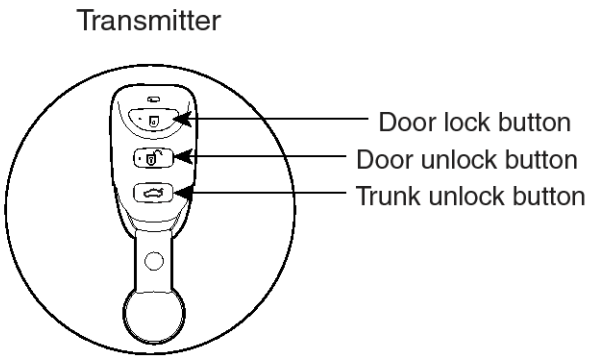


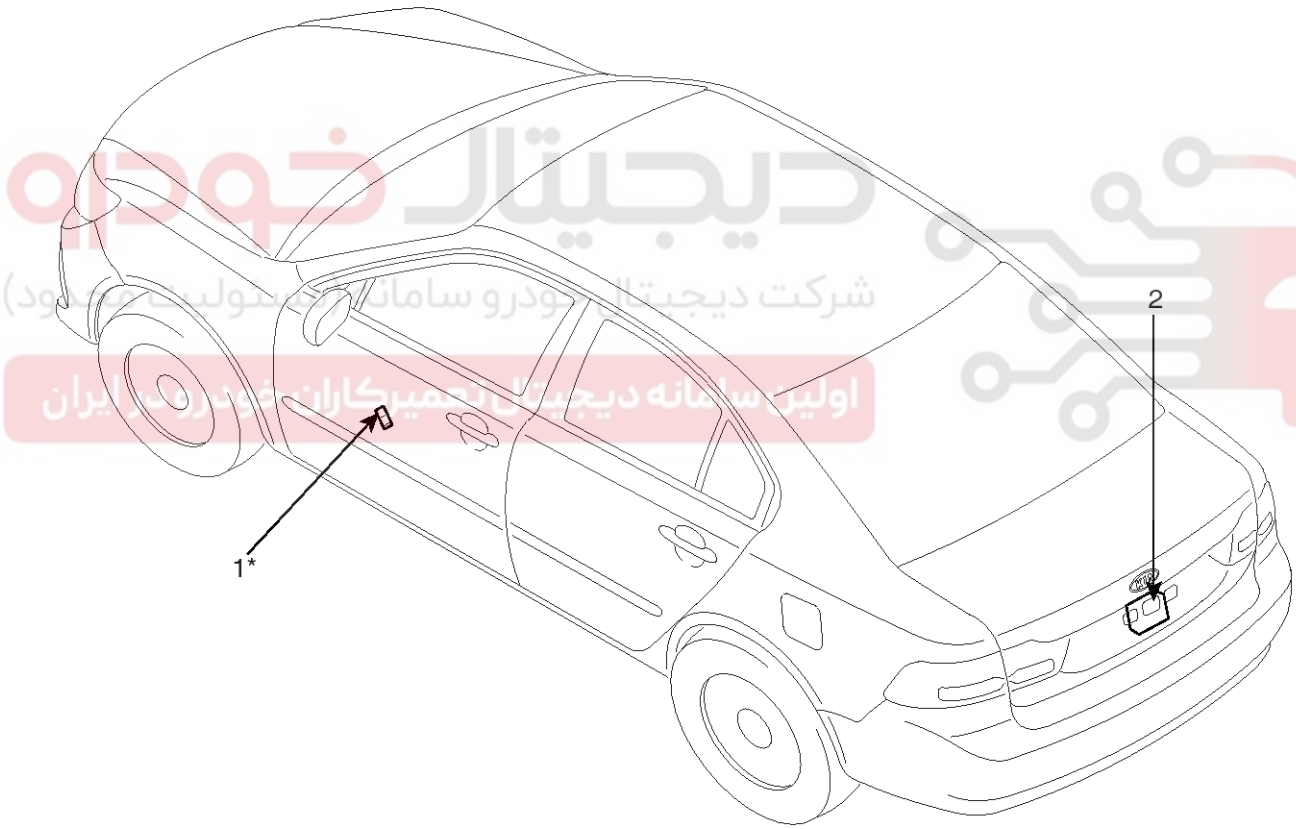
LTLG144E

Trunk lid

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.





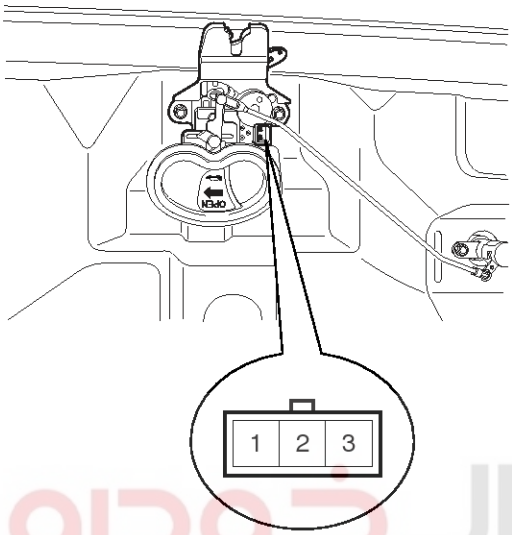
SMGBE9013L

1. Trunk lid open switch
2. Trunk lid release actuator

Trunk Lid Release Actuator

Inspection

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



LTLG122E

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

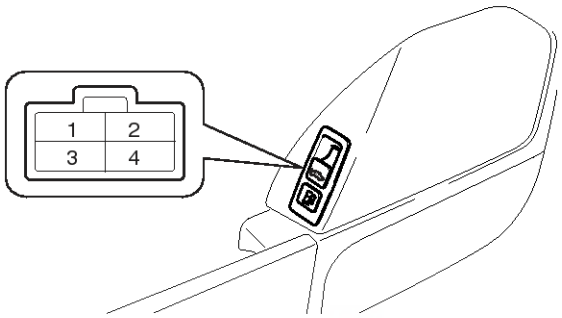
Terminal / Position	1	2
Lock release(Open)	⊖	⊕

LTLG122F

Trunk Lid Open Switch

Inspection

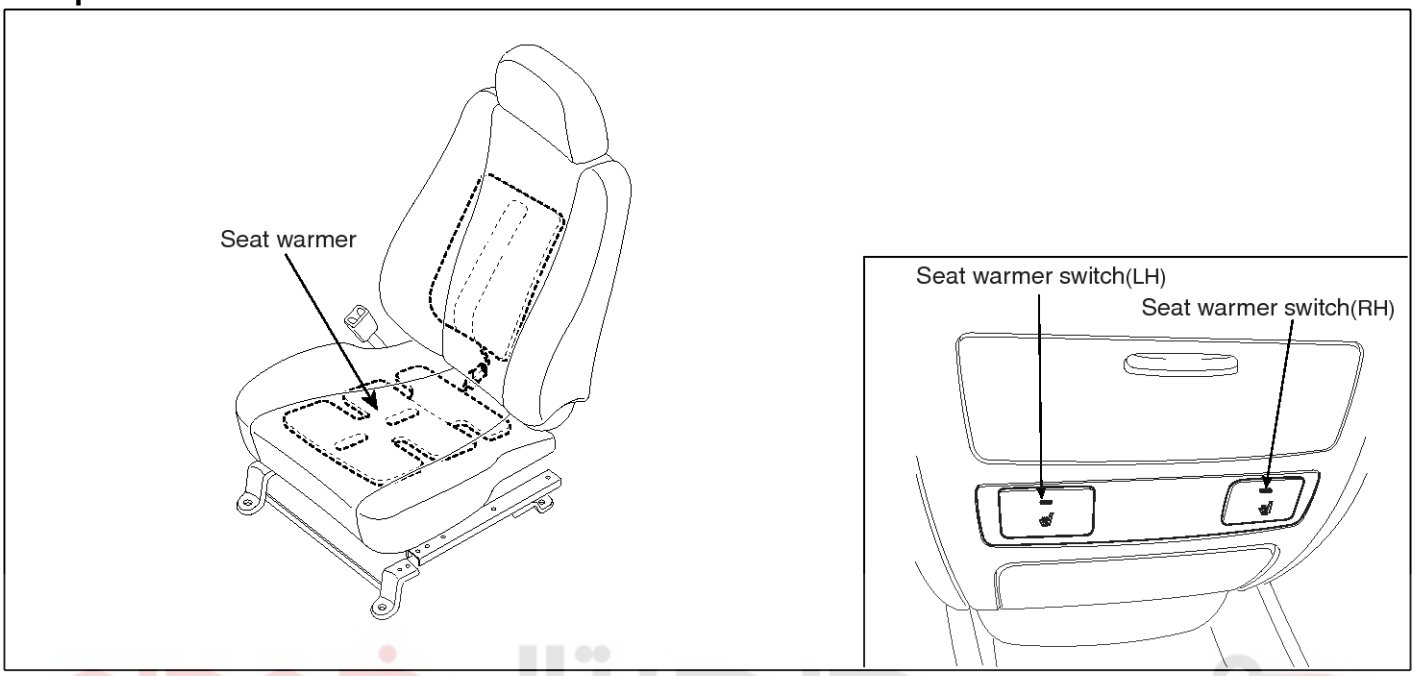
1. Remove the front door trim. (Refer to the Body group-front door)
2. Check the switch for continuity between the No. 3 and No. 4 terminals.
3. If the continuity is not as specified, replace the switch.



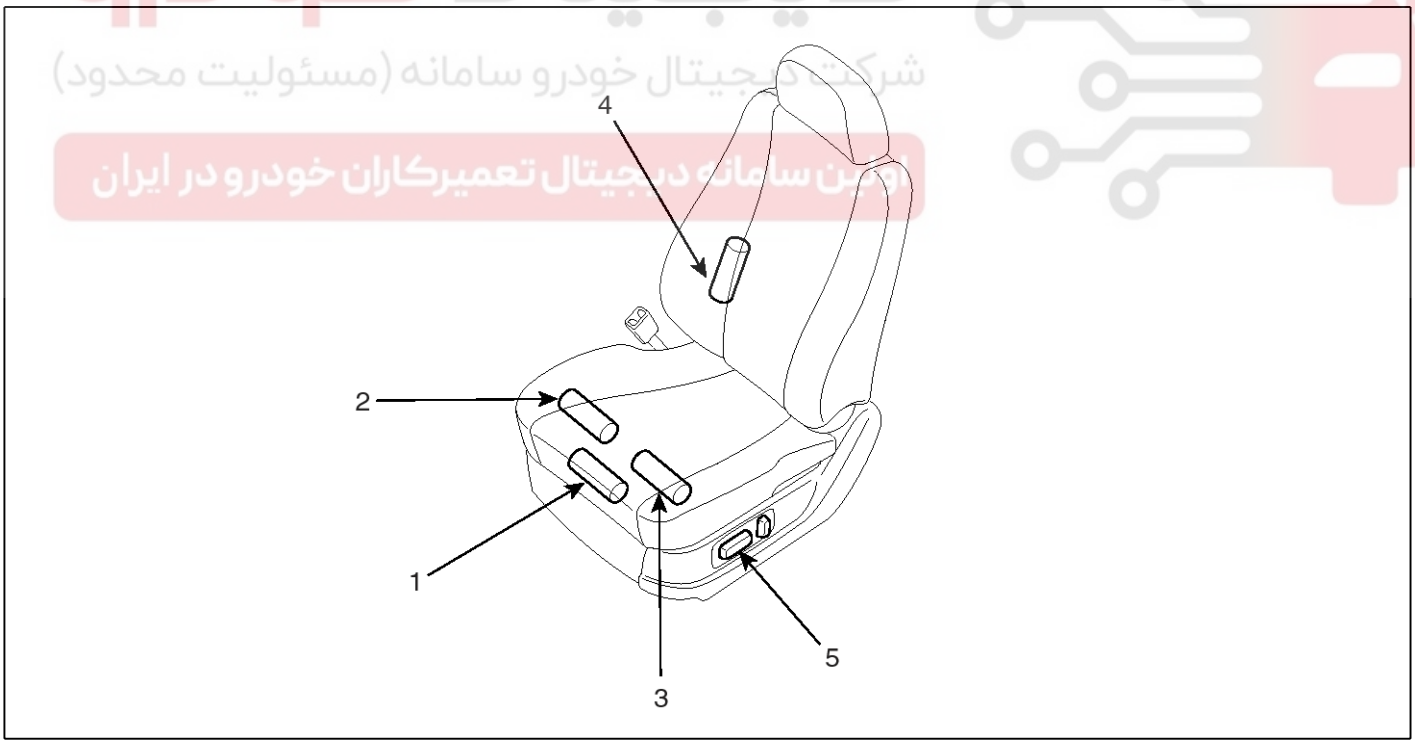
KTRE162A

Seat Electrical

Component Location



SMGBE8008L



SMGBE9052L

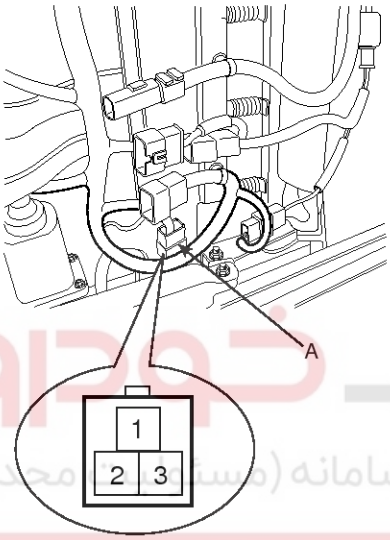
1. Slide motor
2. Front height motor
3. Rear height motor
4. Reclining motor
5. Power seat switch

Power Seat Motor

Inspection

Slide Motor Limit Switch

1. Disconnect the limit switch (A) and operate the limit switch.
2. Check for continuity between the terminals.
3. Make sure that the seat operation is normal in the reverse after the maximum operation.
4. If there is an abnormality, replace the limit switch.



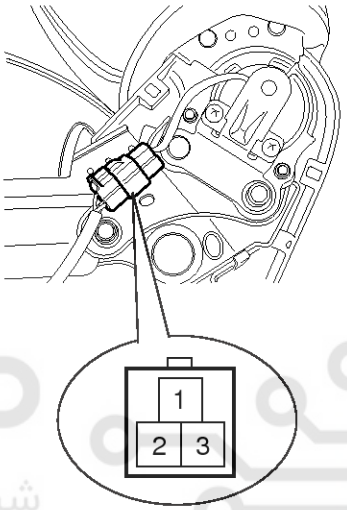
KTRE421A

Position \ Terminal NO.	1	2	3
Frontward	○		○
Backward	○	○	

ETRF421B

Reclining Motor Limit Switch

1. Disconnect the limit switch and operate the limit switch.
2. Check for continuity between the terminals.
3. Make sure that the seat operation is normal in the reverse after the maximum operation.
4. If there is an abnormality, replace the limit switch.



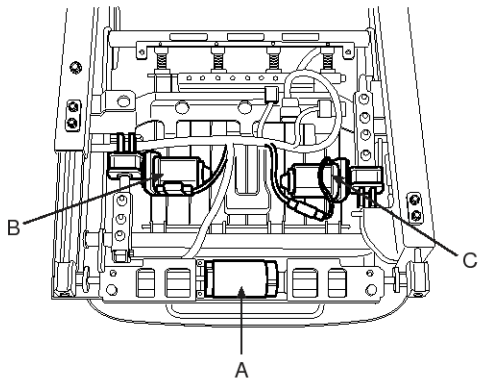
KTRE421C

Position \ Terminal NO.	1	2	3
Frontward	○		○
Backward	○	○	

ETRF421B

Power Seat Motor

1. Disconnect the connectors for each motor.



KTRE421D

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.		1	2
Slide motor A	Front ward	⊖	⊕
	Back ward	⊕	⊖
Reclining motor D	For ward	⊕	⊖
	Rear ward	⊖	⊕

<Driver>

Position \ Terminal NO.		1	2
Slide motor A	Front ward	⊕	⊖
	Back ward	⊖	⊕
Reclining motor D	For ward	⊖	⊕
	Rear ward	⊕	⊖

<Assist>

ETRF421E

Position \ Terminal NO.		1	2
Front height motor B	UP	⊖	⊕
	DOWN	⊕	⊖
Rear height motor C	UP	⊕	⊖
	DOWN	⊖	⊕

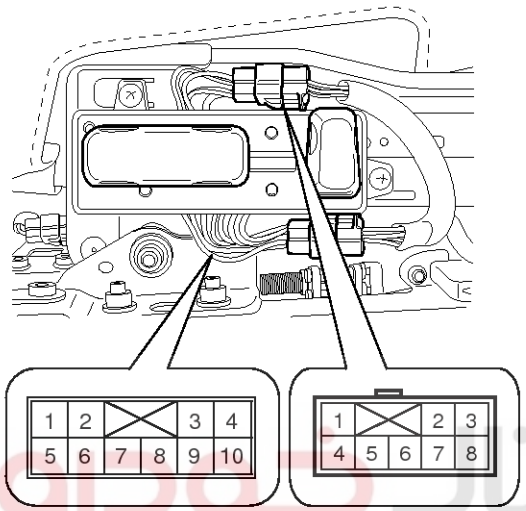
<Driver>

ETRF421F

Power Seat Control Switch

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.



KTRE421G

Position	Terminal NO.	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7	B8
Slide switch	Front ward	○	—	—	—	—	—	—	—	—	—	○	—	—	○	○			
	Back ward	○	—	—	—	○									○	○			
Front height switch	UP				○	—	—	—	—	—	—	—	○	○	—	○			
	DOWN		○	—	○								○	—	—	○			
Rear height switch	UP						○	○								○	○		
	DOWN						○	—	—	—	—	—	—	—	—	○	—		
Reclining switch	Front ward									○	—	—	—	—	—	○		○	○
	Back ward									○	○					○	—	—	○

<Driver>

ETRF421H

Position \ Terminal NO.		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Slide switch	Frontward				○	○		○	○		
	Backward					○	○	○	○		
Reclining switch	Frontward	○	○						○	○	
	Backward	○	○						○		○

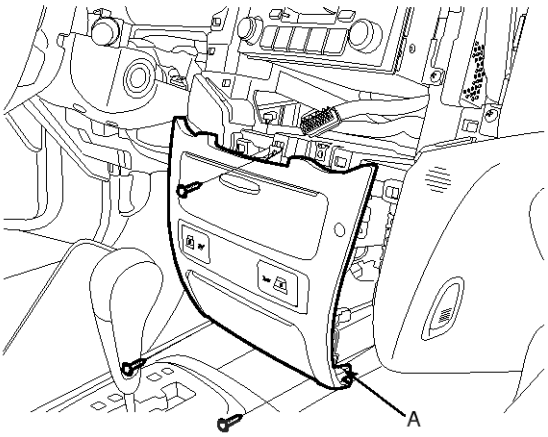
<Assist>

ETRF421I

Seat Heater Switch

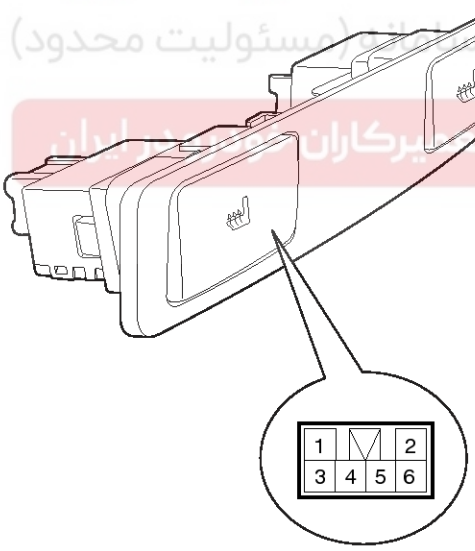
Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia lower panel (A) with scraper.



ATLG441A

3. Remove the switch after disconnecting the two seat warmer connectors from the center facia lower panel.



SMGBE8009L

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

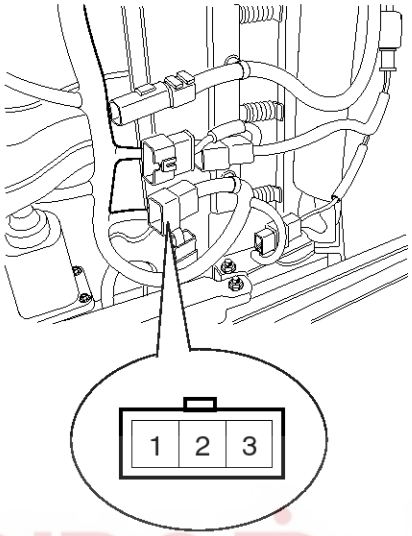
Position / Terminal	ON	OFF	REMARK
1			
4			
3			
6			ILL+
2			ILL-

SMGBE8010L

Seat Heater

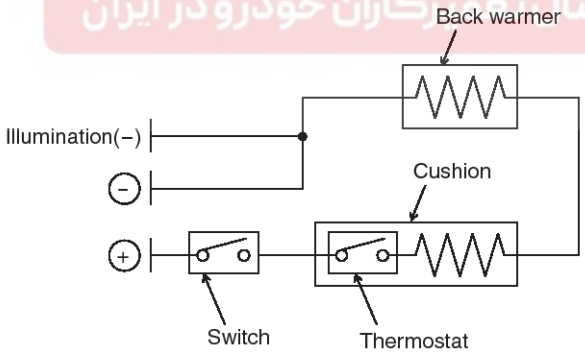
Inspection

1. Check for continuity and measure the resistance between No.1 and NO.3 terminals.



KTRE441D

Standard value: 2.45Ω ± 10%
(Cushion: 1.2Ω ± 10%, Back: 1.2Ω ± 10%)



ETRF441C

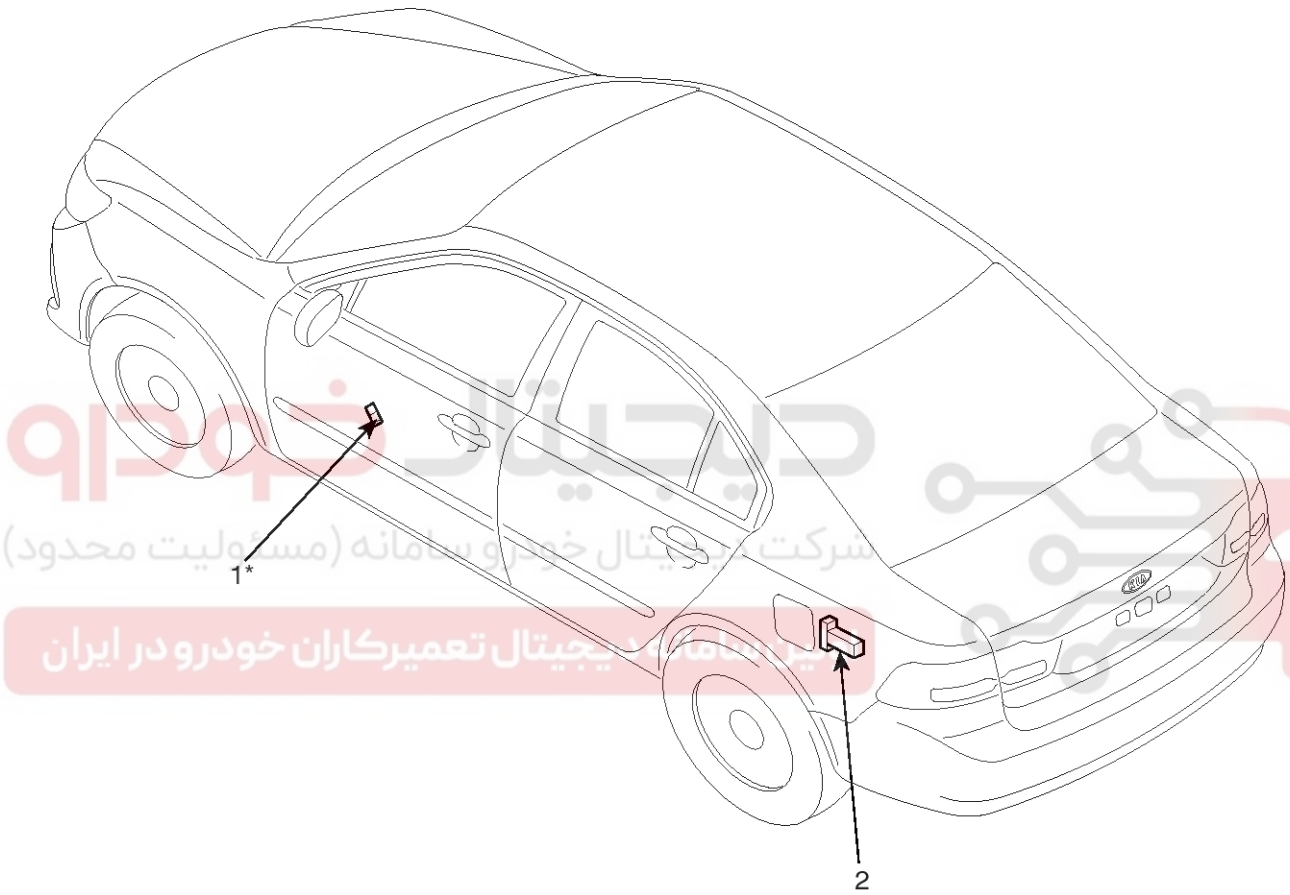
2. Operate the seat warmer after connecting the 3P connector, and then check for the thermostat by measuring the temperature of seat surface.
3. Check for continuity between the terminals after disconnecting the 3P connector.

Standard value :
28 ± 3.5°C(Continuity), 37 ± 3.0°C(Short)

Fuel Filler Door

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



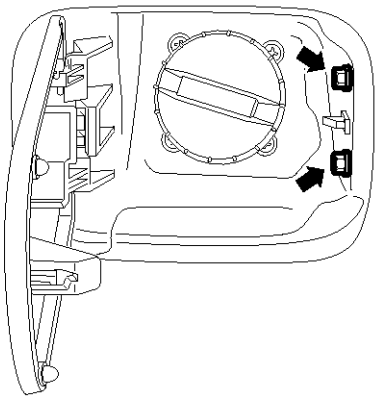
SMGBE9014L

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

Fuel Filler Door Release Actuator

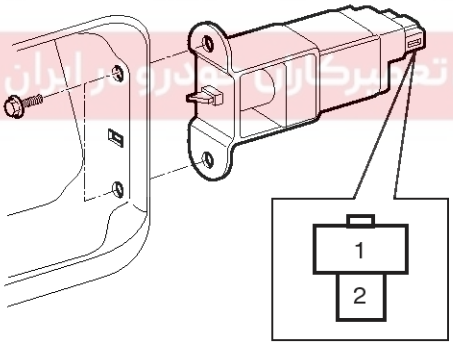
Inspection

1. Remove the trunk room left trim.
2. Open the fuel filler door and remove the fuel filler door release actuator.



KFWG044A

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

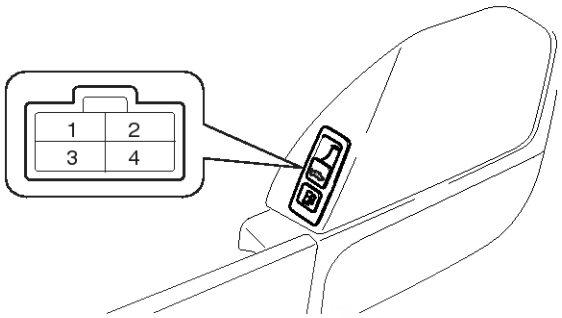


KTRE181A

Fuel Filler Door Open Switch

Inspection

1. Remove the front door trim panel. (Refer to the Body group-front door)
2. Check the switch for continuity between the No. 1 and No. 2 terminals.
3. If the continuity is not as specified, replace the switch.

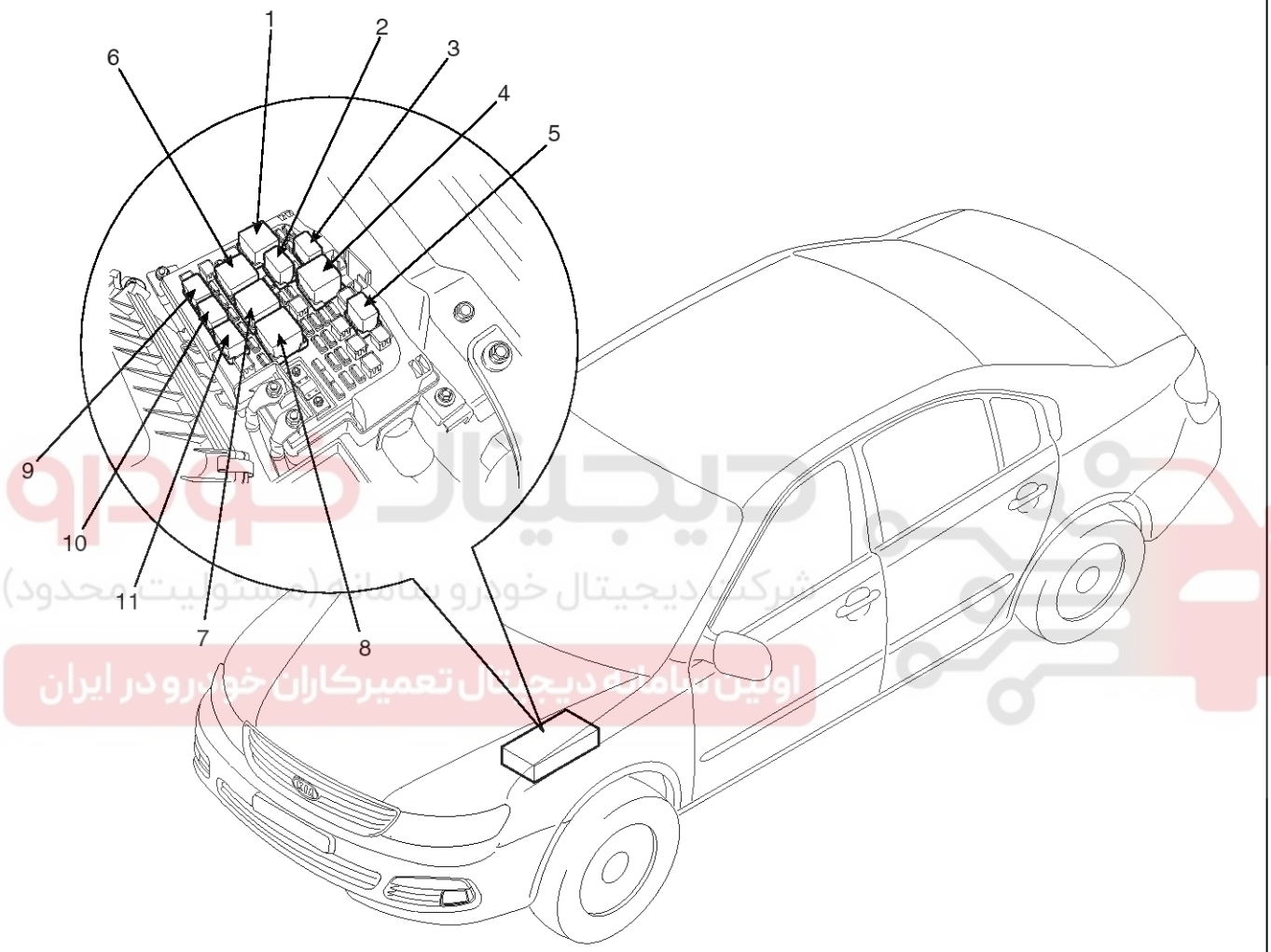


KTRE162A

Fuses And Relays

Component Location

[Engine room relay box]

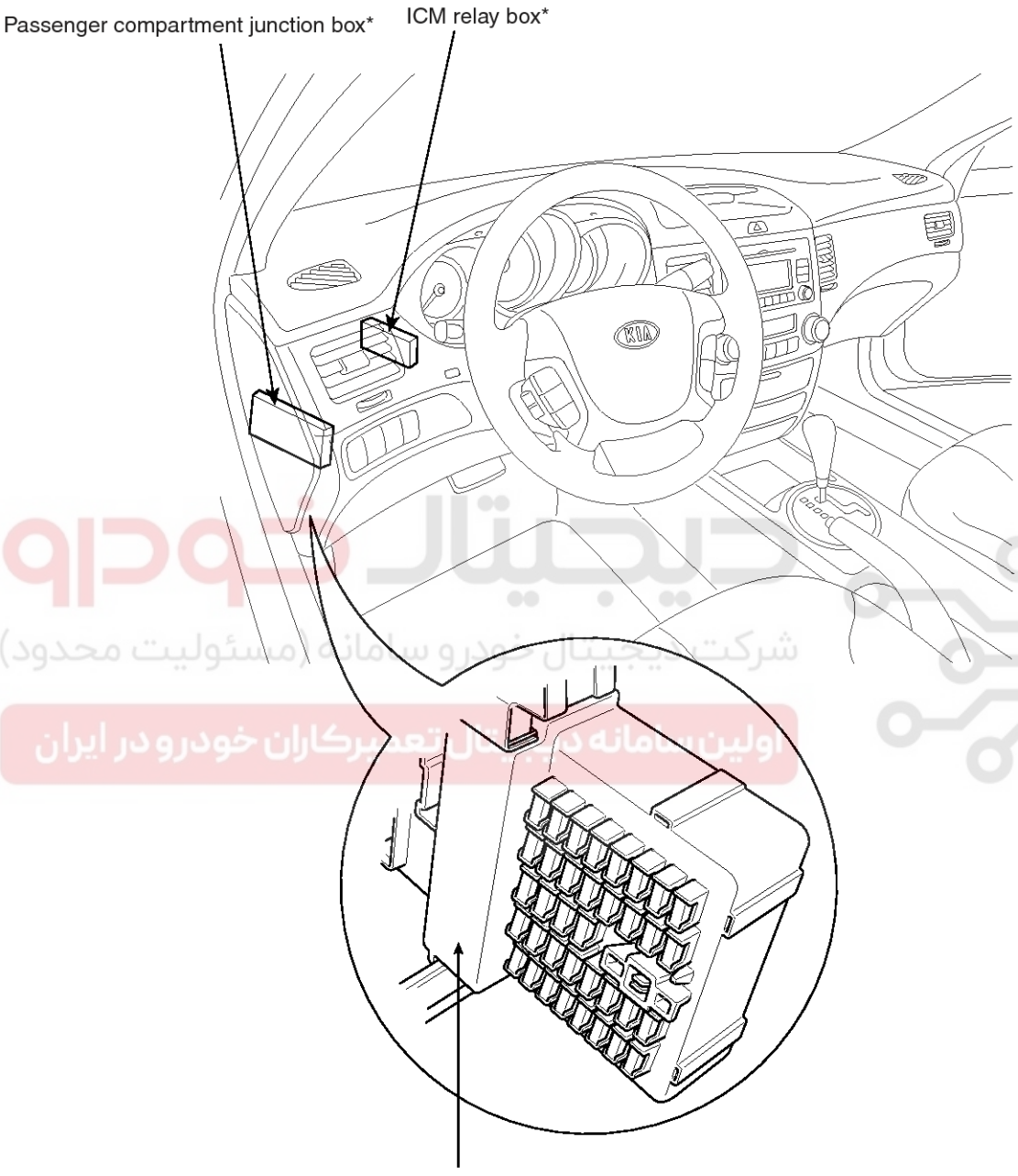


SMGBE9015L

1. Main relay
2. Wiper relay
3. Air conditioning relay
4. Start relay
5. A/T relay
6. Fuel pump relay
7. Cooling pan (Low) relay
8. Cooling pan (High) relay
9. Head lamp relay (High)
10. Head lamp relay (Low)
11. Horn relay

[Passenger compartment relay box]

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.

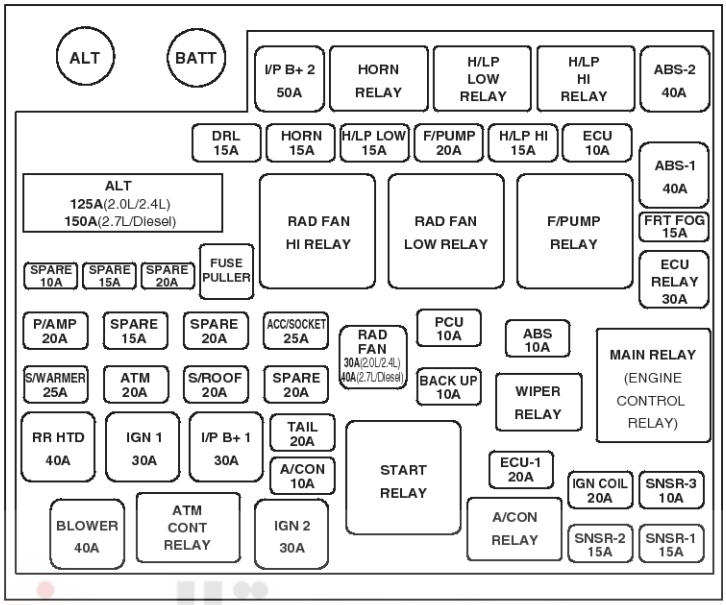


Blower relay, Trunk lid open relay, Power window relay,
Tail lamp relay, Door lock relay, Door unlock relay,
Rear defogger relay (Built-in junction box)

SMGBE9016L

Relay Box (Engine Compartment)

Components



Description		(A)	Circuit Protected
FUSIBLE LINK	ALT	125A(2.0L/2.4L) 150A(2.7L/Diesel)	Alternator
	I/P B+.2	50A	I/P Junction box(Hot at all times)
	ABS-2	40A	ABS/ESP control module
	ABS-1	40A	ABS/ESP control module, Multipurpose check connector
	BLOWER	40A	Blower relay
	RR HTD	40A	Rear defogger relay
	IGN 1	30A	Ignition switch(ACC, IG1)
	RAD	30A(2.0L/2.4L) 40A(2.7L/Diesel)	Radiator fan relay
	ECU RLY	30A	Engine control relay, PCM
	IGN 2	30A	Ignition switch(IG2, START), Start relay
	I/P B+.1	30A	I/P Junction box(Hot at all times)
FUSE	S/WARMER	25A	Seat warmer relay
	ACC SOCKET	25A	Power outlet
	ATM	20A	ATM control relay
	S/ROOF	20A	Sunroof control module
	P/AMP	20A	Audio amp
	F/PUMP	20A	Fuel pump relay
	IGN COIL	20A	Ignition coil(Gasoline)
	ECU-1	20A	PCM(2.0L/2.4L/Diesel)
	TAIL	20A	Tail lamp relay
	FRT FOG	15A	Front fog lamp relay
	DRL	15A	DRL control module
	HORN	15A	Horn relay, Burglar horn relay
	H/LP LOW	15A	Head lamp relay(Low)
	H/LP HI	15A	Head lamp relay(High)
	SNSR-1	15A	Immobilizer control module, Camshaft position sensor, Mass air flow sensor, Oil control valve, Canister purge solenoid valve
	SNSR-2	15A	Fuel pump relay, Oxygen sensor, EGR actuator
	SNSR-3	10A	A/C relay, Injector, Lambda sensor, VGT actuator
	ECU	10A	TCM, Alternator, PCM
	PCU	10A	Pulse generator, TCM, Radiator fan relay
	ABS	10A	ABS/ESP control module, Multipurpose check connector
	BACK-UP	10A	Vehicle speed sensor, Stop lamp switch, Back-up lamp switch
	A/CON	10A	A/C relay

※ USE THE DESIGNATED FUSE ONLY

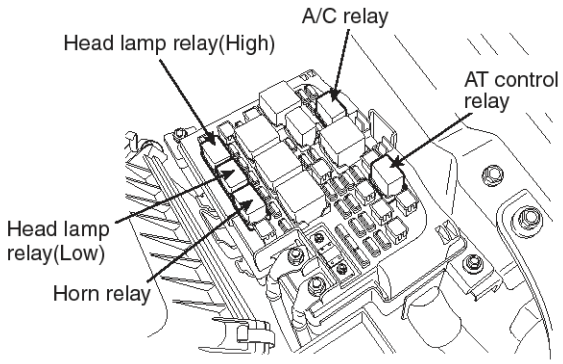
LTLG220C

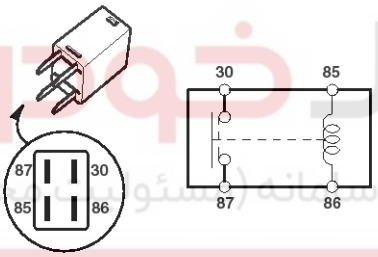
Inspection

Power Relay Test (Type A)

Check for continuity between the terminals.

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.





LTLG201A

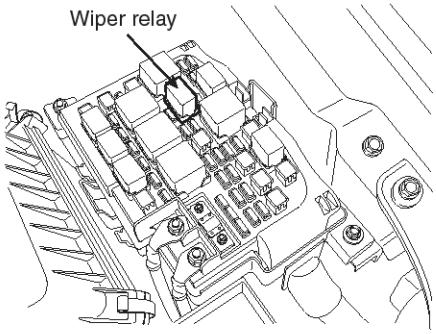
Terminal / Power	85	86	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

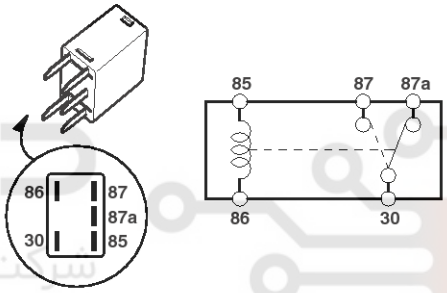
LTLG201E

Power Relay Test (Type B)

Check for continuity between the terminals.

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.87a terminals when power is disconnected.





LTLG201B

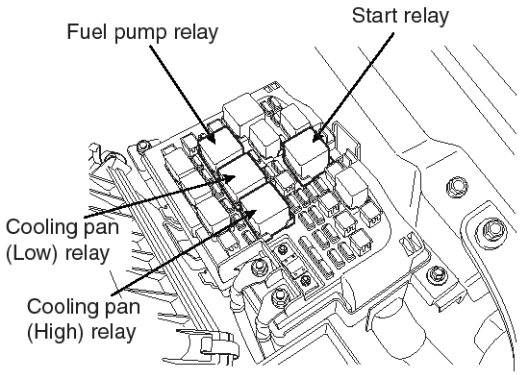
Terminal / Power	30	85	86	87	87a
Disconnected	○				○
Connected	○	⊖	⊕	○	

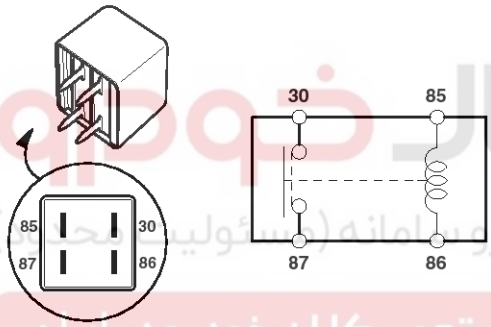
LTLG201C

Power Relay Test (Type C)

Check for continuity between the terminals.

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.





LTLG201D

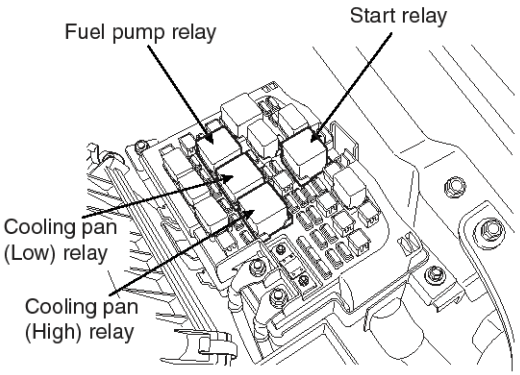
Terminal / Power	85	86	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

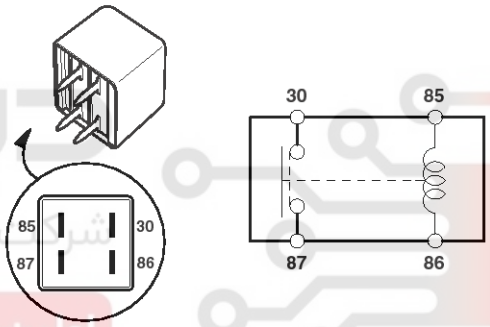
LTLG201E

Power Relay Test (Type D)

Check for continuity between the terminals.

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.





LTLG201D

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

LTLG201G

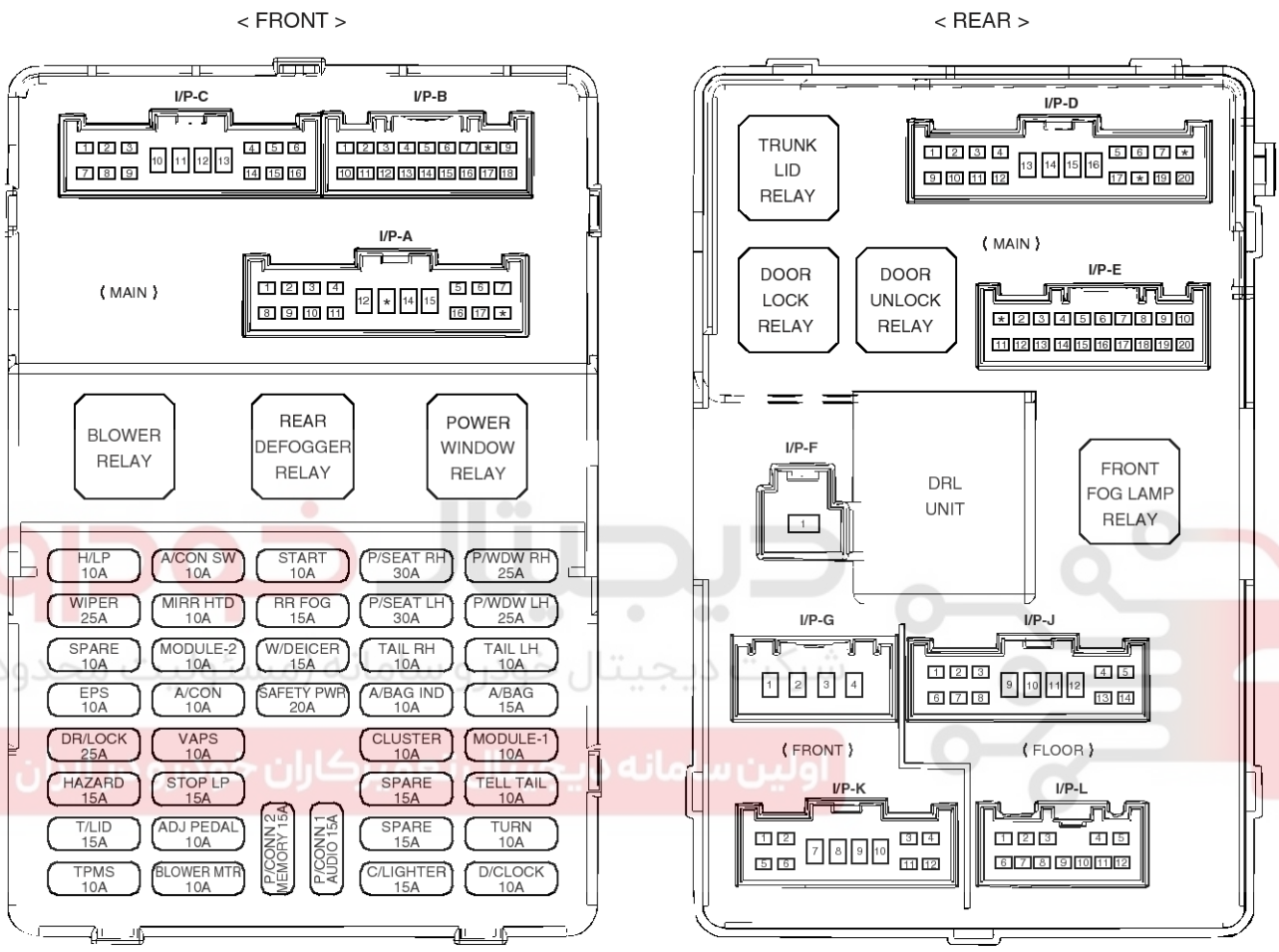
Fuse Inspection

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.

Relay Box (Passenger Compartment)

Components



※ USE THE DESIGNATED FUSE ONLY

LTLG220D

CIRCUIT

FUSE		(A)	Circuit Protected
H/LP		10A	Head lamp relay, AQS sensor, HLLD,PTC heater relay, Fuel filter heater relay
WIPER		25A	Wiper relay, Wiper motor
EPS		10A	-
DR/LOCK		25A	Door lock/unlock relay, Dead lock relay
HAZARD		15A	Hazard switch, Data link connector
T/LID		15A	Fuel filler door & Trunk lid switch
TPMS		10A	-
A/CON SW		10A	A/C control module, Blower motor
MIRR HTD		10A	Outside mirror motor & Defogger
MODULE-2		10A	Sunroof, Rain sensor, BCM, Blower relay, Rheostat, Seat warmer, Electronic chrome mirror
A/CON		10A	A/C control module
VAPS		10A	-
STOP LP		15A	Stop lamp switch
ADJ. PEDAL		10A	Adjustable pedal relay, Sport mode switch
BLOWER MTR		10A	A/C control module
START		10A	Burglar alarm relay
RR FOG		15A	Rear fog lamp relay
W/DEICER		15A	Windshield defogger relay
SAFETY PWR		20A	Safety window motor
P/SEAT LH		30A	Driver seat manual switch
P/SEAT RH		30A	Assister seat manual switch
TAIL RH		10A	Head lamp RH, Rear combination lamp RH, License lamp RH
A/BAG IND		10A	Instrument cluster
CLUSTER		10A	Instrument cluster, BCM
C/LIGHTER		15A	Cigarette lighter
P/WDW RH		25A	Power window main switch, Power window switch RH
P/WDW LH		25A	Power window main switch, Safety window motor
TAIL LH		10A	Head lamp LH, Rear combination lamp LH, License lamp LH,
A/BAG		15A	SRS control module, PAB cut off switch
MODULE-1		10A	ATM key lock control module, Multifunction switch, Back warning buzzer, ESP switch
TELL TAIL		10A	-
TURN		10A	Hazard switch
D/CLOCK		10A	Power outside mirror switch, Audio, BCM Digital clock, ATM key lock control module
POWER CONNECTOR	MEMORY	15A	BCM, Key ill. switch, Door lamp, Foot lamp, Instrument cluster, Room lamp, Overhead console
	AUDIO	15A	Audio

※ USE THE DESIGNATED FUSE ONLY

LTLG220E

Fuse Inspection

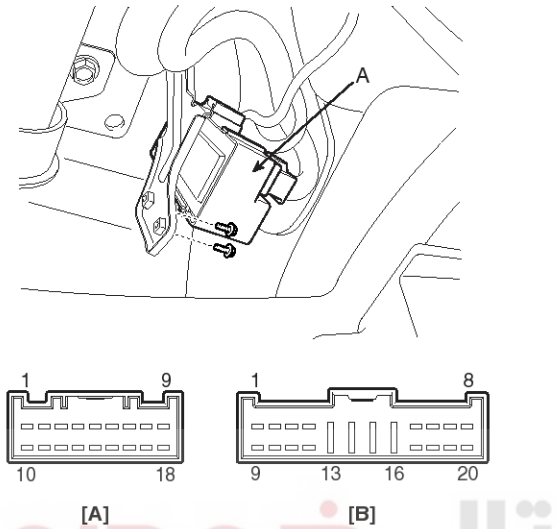
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

   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.

ICM (Integrated Circuit Module) Relay Box

Description

The ICM is united with many kinds of relay and installed at the below the relay box (passenger compartment).



ATLG220F

Inspection

Hazard Lamp Relay

Check for continuity between the terminals.

1. There should be continuity between the No.14 and No.15 terminals when power and ground are connected to the No.5 and No.15 in the ICM relay B terminals.
2. There should be no continuity between the No14 and No.15 terminals when power is disconnected.

Burglar Alarm Horn

Check for continuity between the terminals.

1. There should be continuity between the No.11 and No.12 terminals when power and ground are connected to the No.4 and No.11 in the ICM relay B terminals.
2. There should be no continuity between the No.11 and No.12 terminals when power is disconnected.

Burglar Alarm

Check for continuity between the terminals.

1. There should be no continuity between the No.9 and No.10 terminals when power and ground are connected to the No.1 and No.9 in the ICM relay B terminals.
2. There should be continuity between the No.9 and No.10 terminals when power is disconnected.

Rain Sensor

Check for continuity between the terminals.

1. There should be continuity between the No.9 and No.10 terminals when power and ground are connected to the No.1 and No.4 in the ICM relay A terminal.
2. There should be continuity between the No.9 and No.10 terminals when power is disconnected.

Adjustable Pedal

Check for continuity between the terminals.

1. There should be continuity between the No.5 and No.12 terminals when power and ground are connected to the No.6 and No.12 in the ICM relay A terminals.
2. There should be no continuity between the No.5 and No.12 terminals when power and ground are disconnected.

Seat Warmer

Check for continuity between the terminals.

1. There should be continuity between the No.7 and No.17 terminals when power and ground are connected to the No.14 and No.15 in the ICM relay A terminals.
2. There should be no continuity between the No.7 and No.17 terminals when power and ground are disconnected.

Rear Defogger Relay

Check for continuity between the terminals.

1. There should be continuity between the No.8 and No.18 terminals when power and ground are connected to the No.8 and No.9 in the ICM relay A terminals.
2. There should be no continuity between the No.8 and No.18 terminals when power and ground are disconnected.

Rear Fog Relay

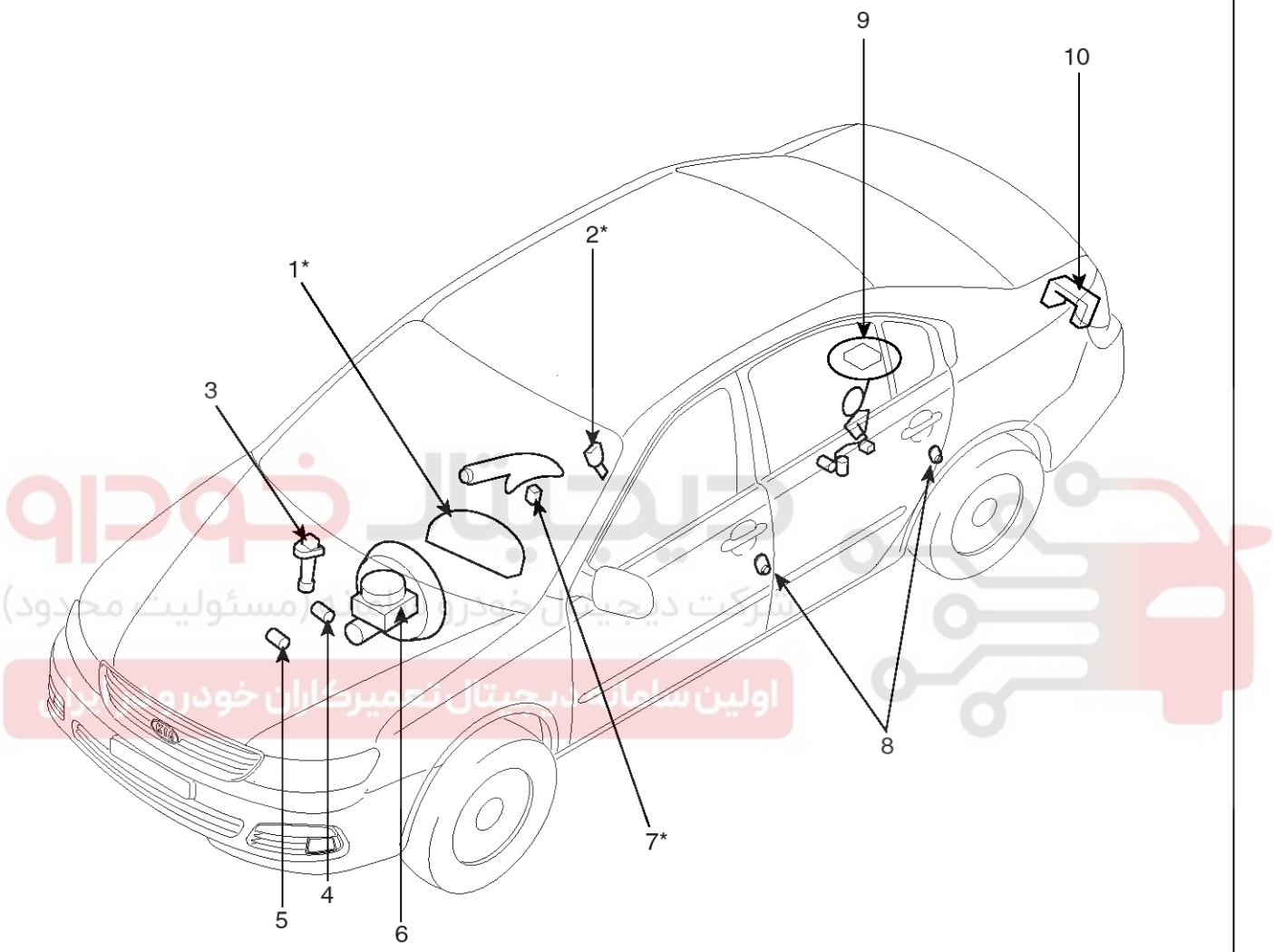
Check for continuity between the terminals.

1. There should be continuity between the No.2 and No.18 terminals when power and ground are connected to the No.17 and No.18 in the ICM relay A terminals.
2. There should be no continuity between the No.2 and No.18 terminals when power and ground are disconnected.

Indicators And Gauges

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



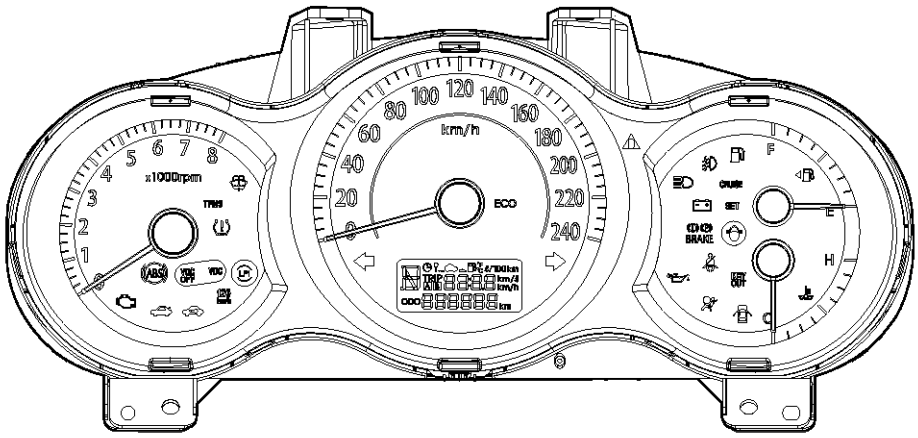
SMGBE9017L

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

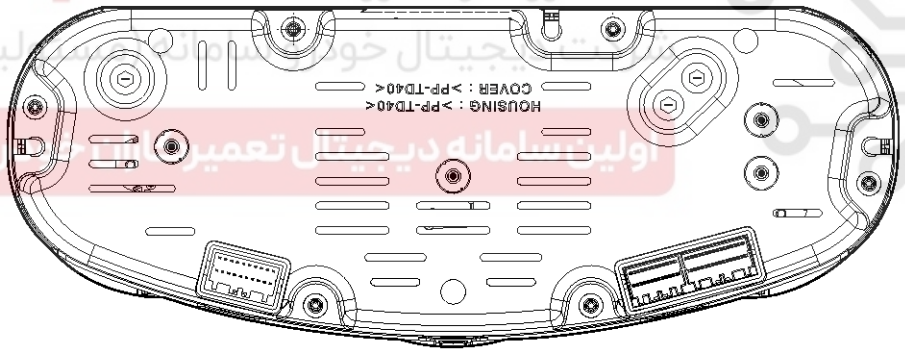
Instrument Cluster

Components

[Front]

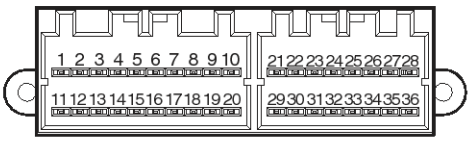


[Rear]

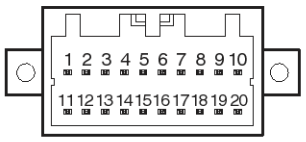


SMGBE9018L

[Connector]



Connector A



Connector B

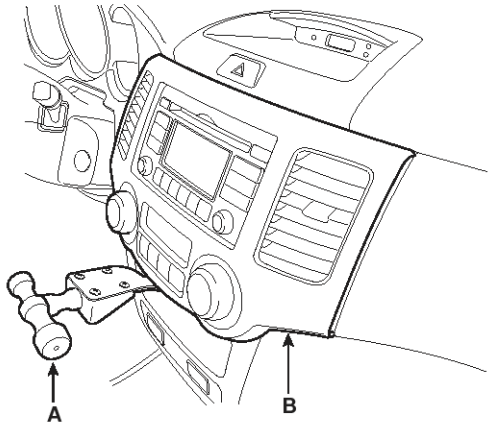
Pin No.	Connector A	Pin No.	Connector A
1	CAN B−	21	Airbag supply +
2	CAN B+	22	Airbag input −
3	IGN2	23	−
4	−	24	−
5	−	25	−
6	−	26	−
7	−	27	Illumination −
8	−	28	IGN
9	−	29	Turn left
10	Battery charge	30	Seat belt
11	−	31	High beam input
12	−	32	Brake
13	Immobilizer	33	SGND
14	Front fog	34	Battery
15	Turn right	35	PGND
16	−	36	FGND
17	−		
18	Key out		
19	Water SEP		
20	Door open		

Pin No.	Connector B
1	ABS
2	Reset/Mode switch
3	Illumination +
4	VDC
5	Oil pressure
6	Check engine
7	ESP OFF
8	diagnosis
9	Ambient temperature
10	Speed
11	CAN C−
12	CAN C+
13	Washer low
14	TPMS check
15	TPMS
16	Fuel
17	Trunk open
18	−
19	GLOW / LPI
20	−

SMGBE9019L

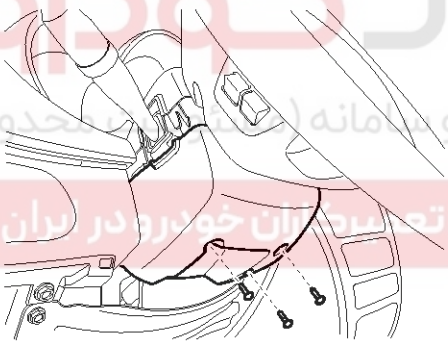
Removal

1. Disconnect the negative (-) battery terminal.
2. Tilt the steering column down and remove the center fascia panel (B).



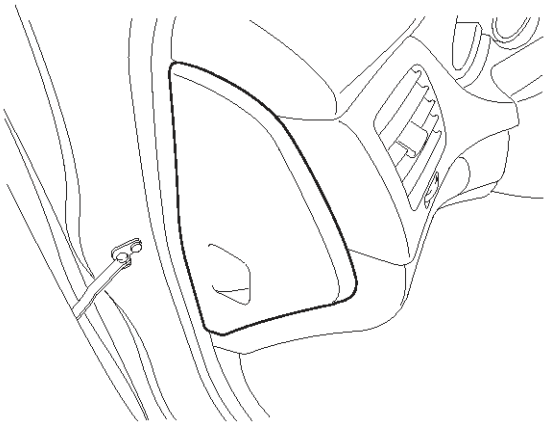
SMGBE9031D

3. Remove the shroud (A) after removing the screws.



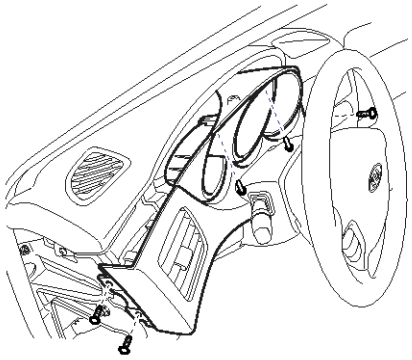
SMGBE9008L

4. Remove the crash pad side cover (A).



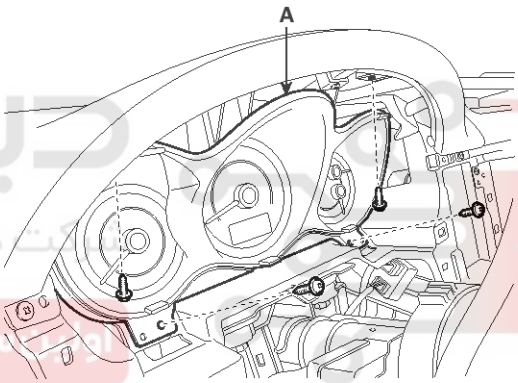
SMGBE9009L

5. Remove the left air vent cover and cluster fascia panel (A) after removing the screws.



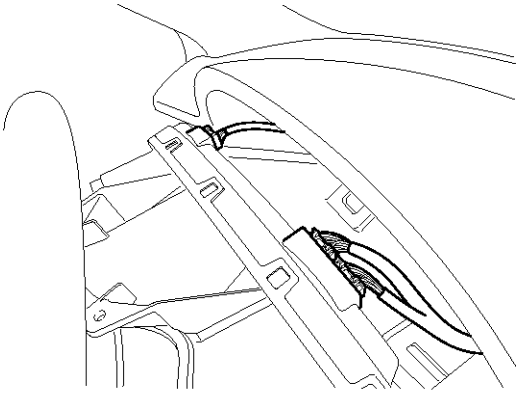
SMGBE9010L

6. Remove the cluster (A) after loosening the screws.



SMGBE9039D

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



SMGBE9012L

Inspection

Speedometer

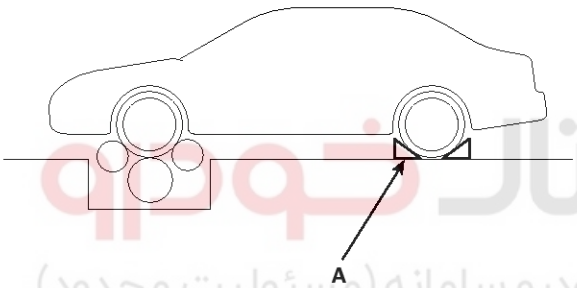
1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.
3. Check if the speedometer indicator range is within the standard values.

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.



ETKE100E

[Except Australia - km/h]

Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	+4.3 +0.1	+4.8 +0.2	+5.5 +0.3	+6.0 +0.4	+7.0 +0.8	+8.6 +1.2
Velocity (km/h)	140	160	180	200	220	240
Tolerance (km/h)	+9.8 +1.6	+11.0 +2.0	+12.2 +2.4	+13.2 +2.8	+13.6 +3.2	+14.0 +4.0

[Australia- km/h]

Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	+3.8 -0.0	+4.1 -0.1	+4.5 +0.1	+4.9 +0.1	+5.7 +0.3	+6.5 +0.7
Velocity (km/h)	140	160	180	200	220	240
Tolerance (km/h)	+7.4 +1.0	+8.3 +1.3	+9.4 +1.6	+11.0 +2.0	+12.6 +2.4	+14.0 +3.2

[MPH]

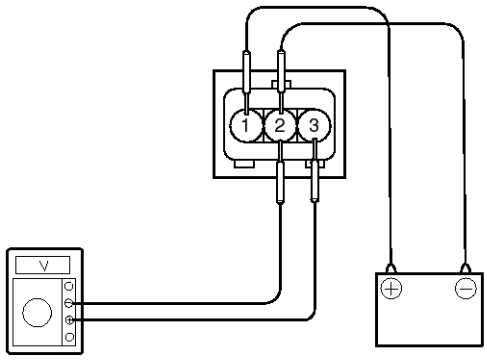
Velocity (MPH)	10	20	40	60
Tolerance (MPH)	+2.2 +0.1	+2.6 +0.2	+3.0 +0.6	+3.6 +0.9
Velocity (MPH)	80	100	120	140
Tolerance (MPH)	+4.8 +1.2	+5.5 +1.7	+6.0 +2.2	+7.0 +2.4

Vehicle Speed Sensor

1. Connect the positive (+) lead from battery to terminal 1 and negative (-) lead to terminal 2.
2. Connect the positive (+) lead from tester to terminal 3 and the negative (-) lead to terminal 2.
3. Rotate the shaft.
4. Check that there is voltage change from approx. 0V to 11V or more between terminals 3 and 2.

5. The voltage change should be 4 times for every revolution of the speed sensor shaft.

   If operation is not as specified, replace the sensor.



ETRF261E

Tachometer

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

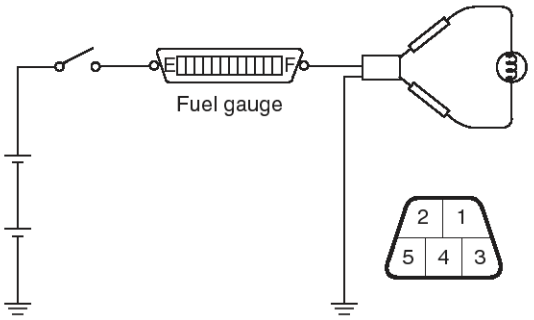
⚠CAUTION

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

Revolution(rpm)	1,000	2,000	3,000	4,000
Tolerance (rpm)	±100	±125	±150	±170
Revolution(rpm)	5,000	6,000	7,000	8,000
Tolerance (rpm)	±200	±240	±260	±260

Fuel Gauge

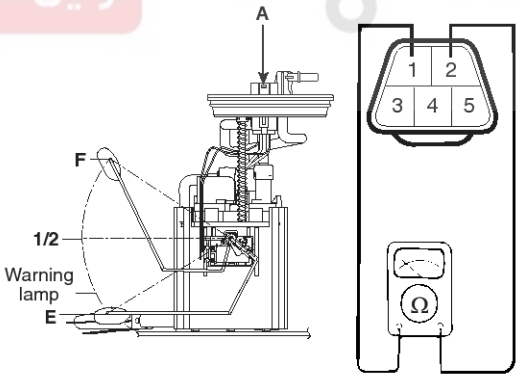
1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 watt, 12V test bulb to terminals 3 and 4 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



LTLG262A

Main Fuel Gauge Sender

1. Using an ohmmeter, measure the resistance between terminals 1 and 2 of sender connector (A) at each float level.



LTLG262B

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

Position	Resistance(Ω)
Sender (E)	200 ± 2
Warning lamp	174.8 ± 1.7
1/2	98.4 ± 1
Sender (F)	8.0 ± 1

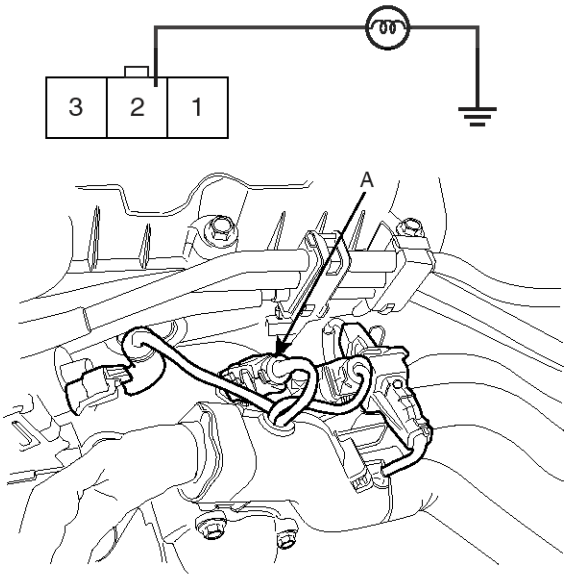
3. If the height resistance is unsatisfied, replace the fuel sender as an assembly.

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

Engine Coolant Temperature Gauge

1. Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
2. Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
3. Connect a 12V, 3.4 watt test bulb between the harness side connector and ground.
4. Turn the ignition switch ON.
5. Verify that the test bulb flashes and that the indicator moves to HOT.

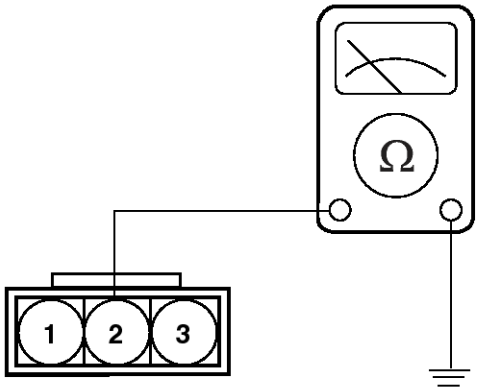
   If operation is not as specified, replace the engine coolant temperature gauge. Then recheck the system.



ATLG262C

Engine Coolant Temperature Sender

1. Using an ohmmeter, measure the resistance between the terminal 2 and ground.



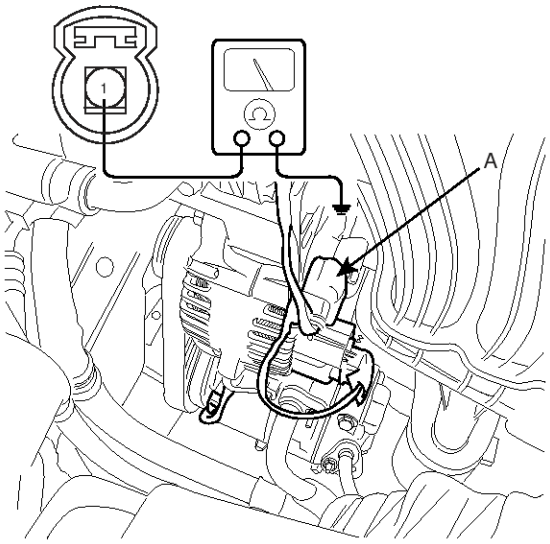
ETKE110I

2. If the resistance value is not as shown in the table, replace the temperature sender.

Temperature [°F(°C)]	131(55)	160(71)	230(110)	257(125)
Gauge angle (°)	0	38	38	85

Oil Pressure Switch

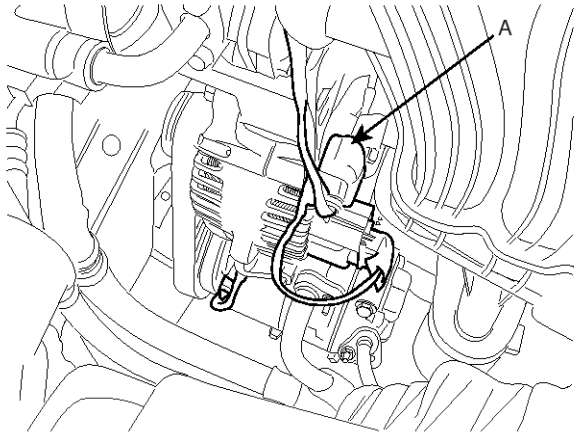
1. Check that there is continuity between the oil press switch terminal (A) and ground with the engine off.
2. Check that there is no continuity between the terminal and ground with the engine running.
3. If operation is not as specified, replace the switch.



ATLG530A

Oil Pressure Warning Lamp

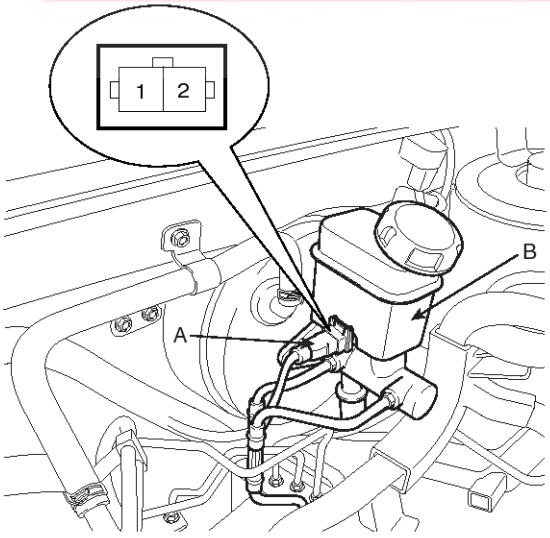
1. Disconnect the connector (A) from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up. If the warning lamp doesn't light, test the bulb or inspect the wire harness.



ATLG530B

Brake Fluid Level Warning Switch

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



ATLG060M

Brake Fluid Level Warning Lamp

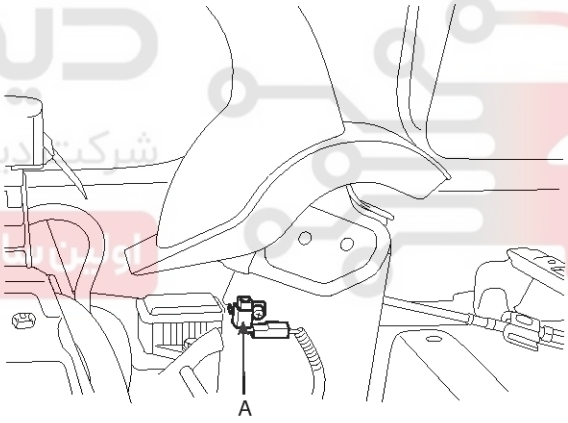
1. Ignition "ON"
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

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).

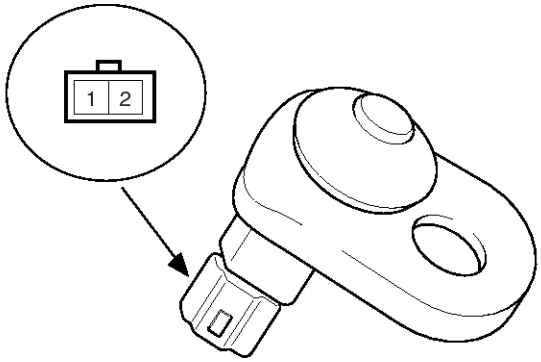
   If continuity is not as specified, replace the switch or inspect its ground connection.



ATLG038B

Door Switch

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



ATIE121Q

[Front Door Switch]

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

ETQF180D

[Rear Door Switch]

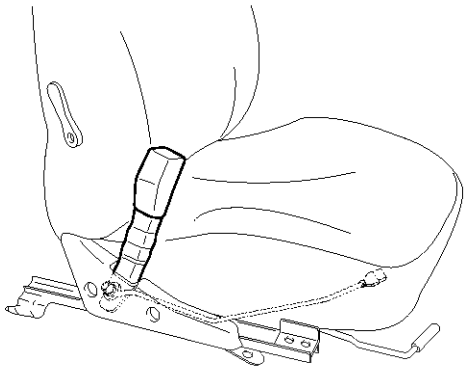
Terminal / Position	1	Ground
Free(Door open)	○	○
Push(Door close)		

ETRF262E

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)



V5BE060Q

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

Troubleshooting

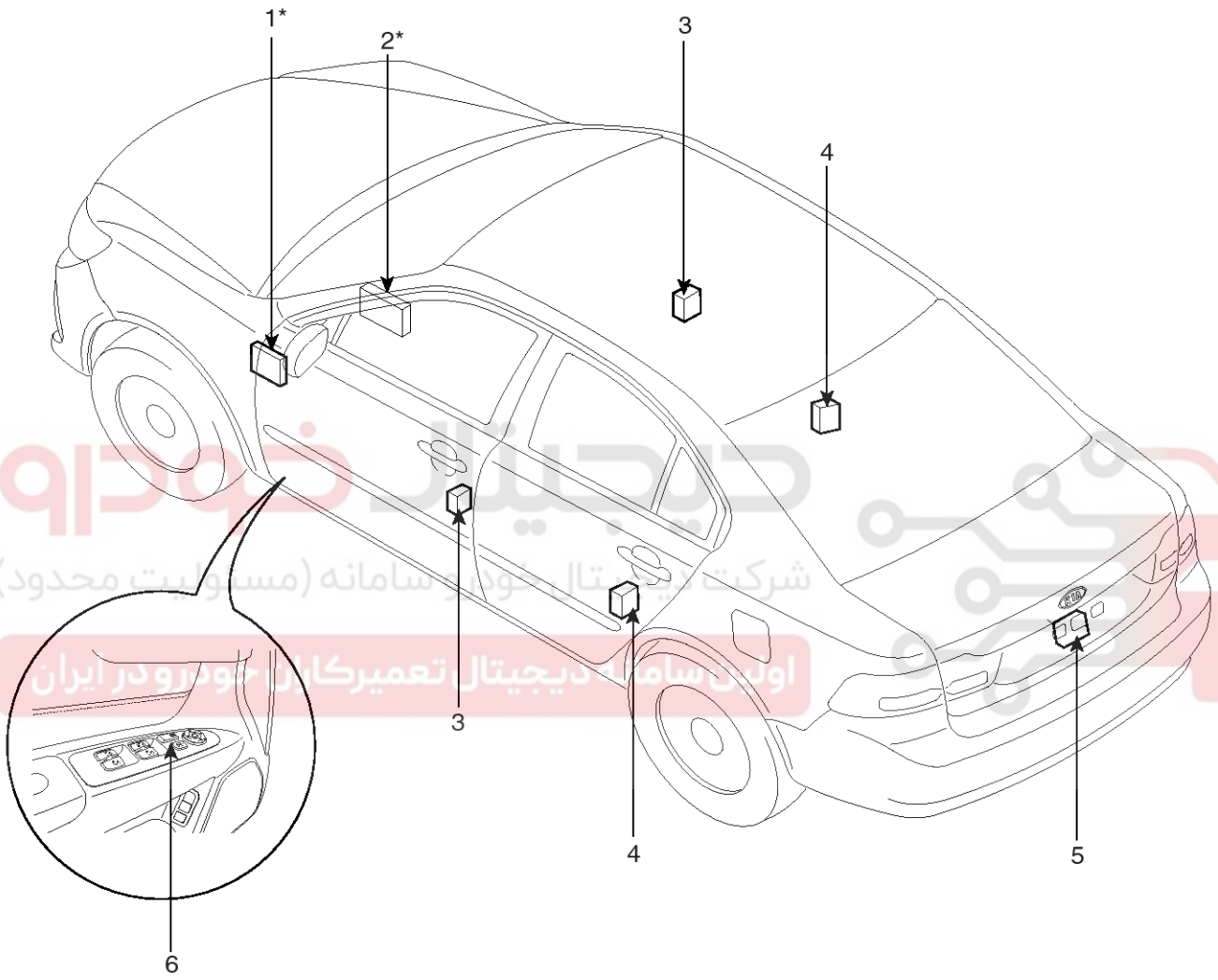
Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	Vehicle speed sensor faulty	Check vehicle speed sensor
	Wiring or ground faulty	Repair if necessary
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Tachometer faulty	Check tachometer
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Fuel gauge faulty	Check gauge
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Low fuel warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Brake fluid level warning switch faulty	Check switch
	Parking brake switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Open door warning lamp and trunk lid warning lamp do not light up	Memory fuse (15A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

Symptom	Possible cause	Remedy
Seat belt warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

Power Door Locks

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE9020L

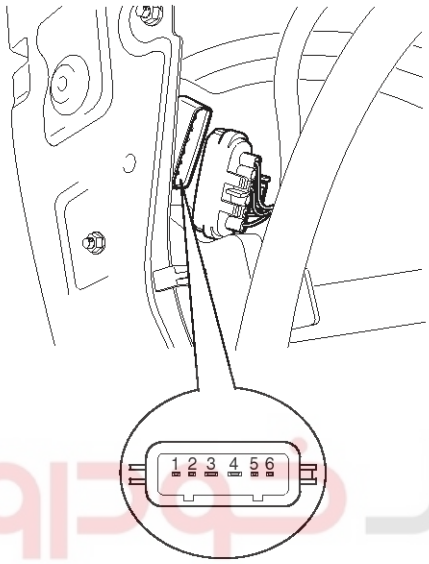
1. Junction box (Door lock/unlock relay)
2. Body control box
3. Front door lock actuator & switch
4. Rear door lock actuator & switch
5. Trunk lid release actuator
6. Door lock switch

Power Door Lock Actuators

Inspection

Front Door Lock Actuator Inspection

1. Remove the front door trim. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.



ATLG122A

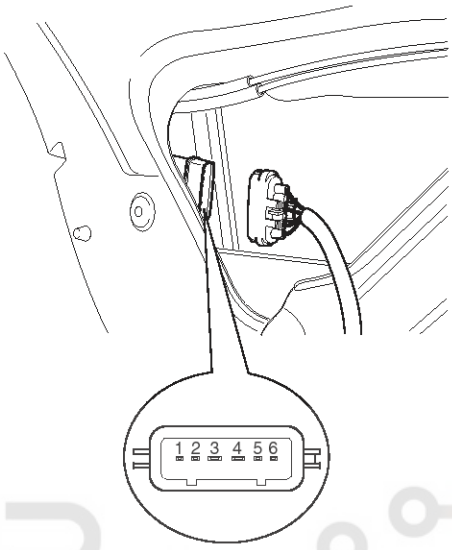
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

LTLG122B

Rear Door Lock Actuator Inspection

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.



ATLG122C

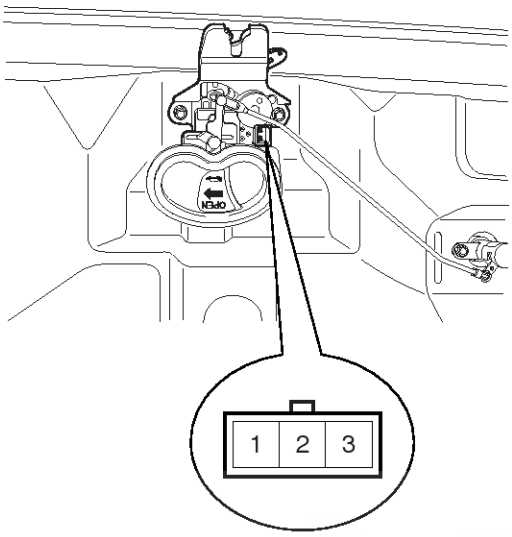
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

LTLG122D

Trank Lid Release Actuator Inspection

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



LTLG122E

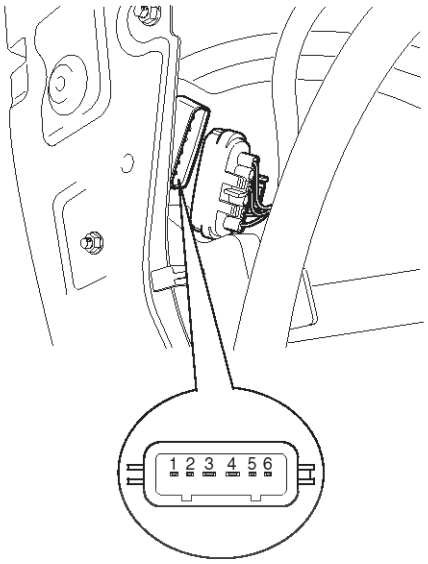
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

LTLG122F

Front Door Lock Switch Inspection

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.



ATLG122A

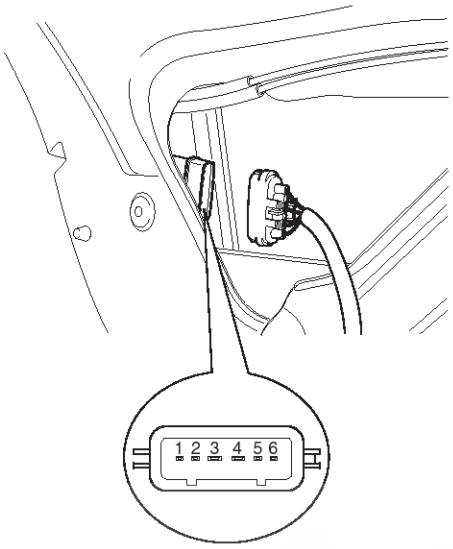
3. Check for continuity between the terminals in each switch position according to the table.

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

LTLG122B

Rear Door Lock Switch Inspection

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.



ATLG122C

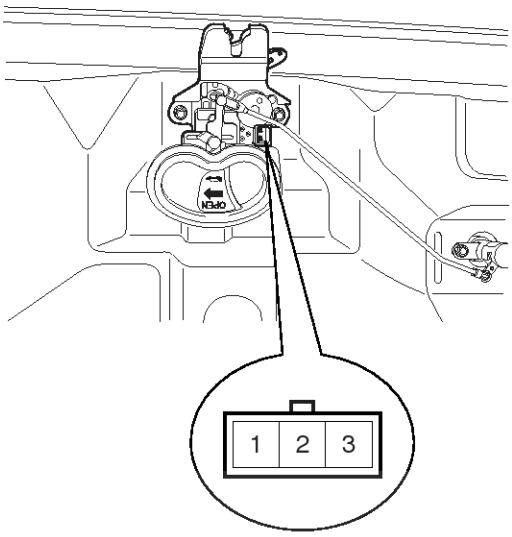
3. Check for continuity between the terminals in each switch position according to the table.

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

LTLG122D

Trunk Lid Open Switch Inspection

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



LTLG122E

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

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

LTLG122F

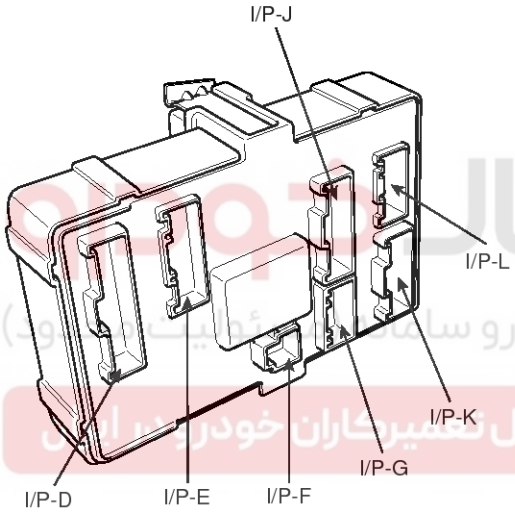
Power Door Lock Relay

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.

Door Lock

1. There should be continuity between the No.12 and No.9 terminals in the I/P-D when power and ground are connected to the No.12 terminal in the I/P-E and No.9 terminal in the I/P-D.
2. There should be no continuity between the No.12 terminal in the I/P-E and No.9 terminal in the I/P-D when power is disconnected.



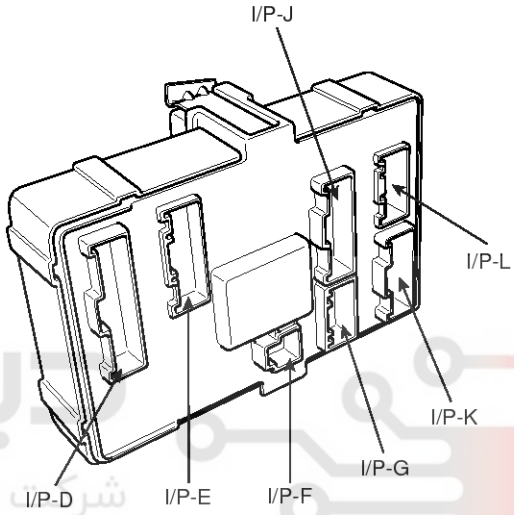
LTLG323A

Terminal / Power	I/P-D (9)	I/P-E (12)	I/P-D (12)	I/P-D (9)
Disconnected			○	○
Connected	○	○	⊖	⊕

ETRF323B

Door Unlock

1. There should be continuity between the No.3 terminal in the I/P-E and No.9 terminal in the I/P-D when power and ground are connected to the No.11 terminal in the I/P-E and No.9 terminal in the I/P-D.
2. There should be no continuity between the No.11 terminal in the I/P-E and No.9 terminal in the I/P-D when power is disconnected.



LTLG323A

Terminal / Power	I/P-D (9)	I/P-E (11)	I/P-E (3)	I/P-D (9)
Disconnected			○	○
Connected	○	○	⊖	⊕

ETRF323C

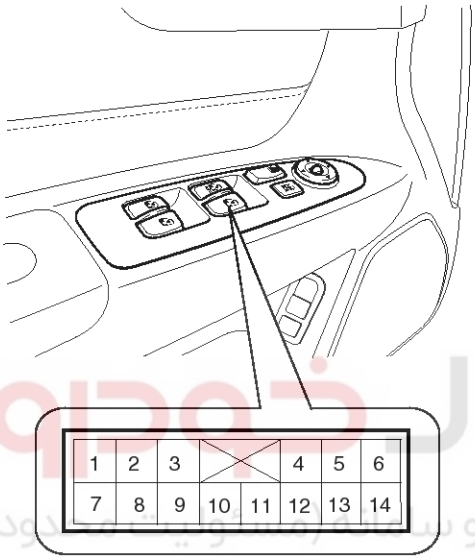
Power Door Lock Switch

Inspection

Driver Door Lock Switch Inspection

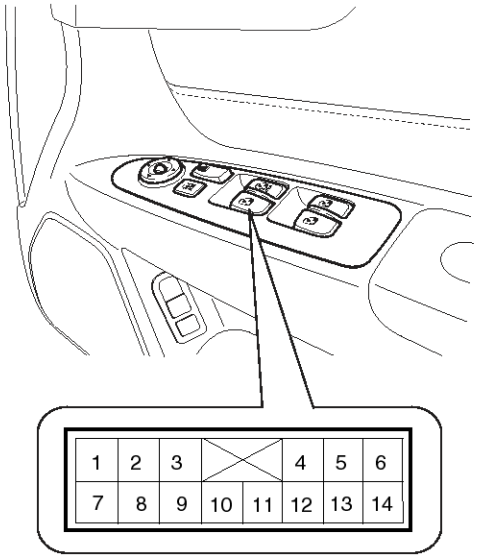
1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)
3. Disconnect the 14P connector from the switch.

[LHD]



ATLG284A

[RHD]



LTLG284B

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

[LHD]

Terminal / Position	4	10	11
Lock		○——	——○
Unlock	○——	——○	

LTLG284C

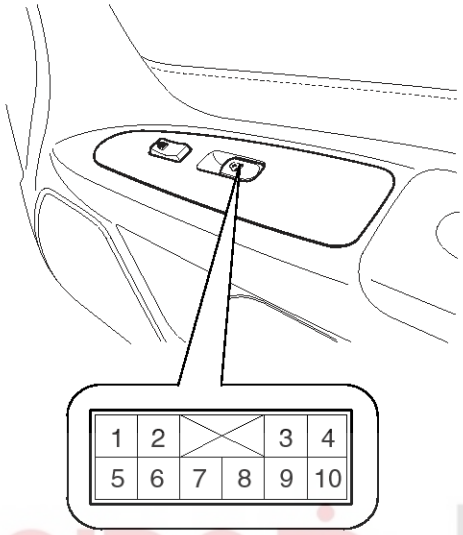
[RHD]

Terminal / Position	4	10	11
Lock		○——	——○
Unlock	○——	——○	

LTLG284C

Assist Door Lock Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)
3. Disconnect the 11P connector from the switch.



ATLG284D

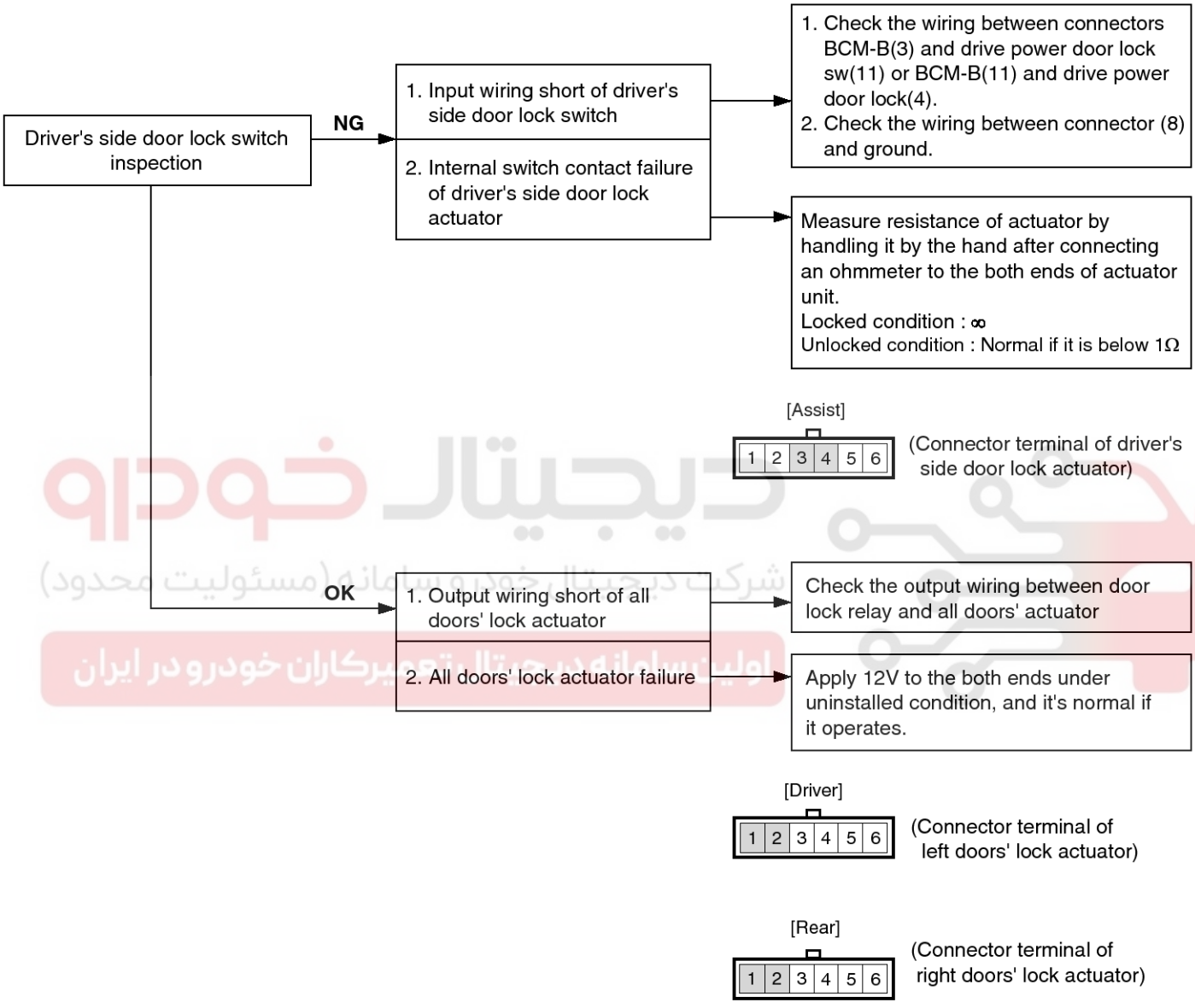
4. Check for continuity between the terminals in each switch position according to the table.

Terminal / Position	3	4	7
Lock	○——	——○	
Unlock		○——	——○

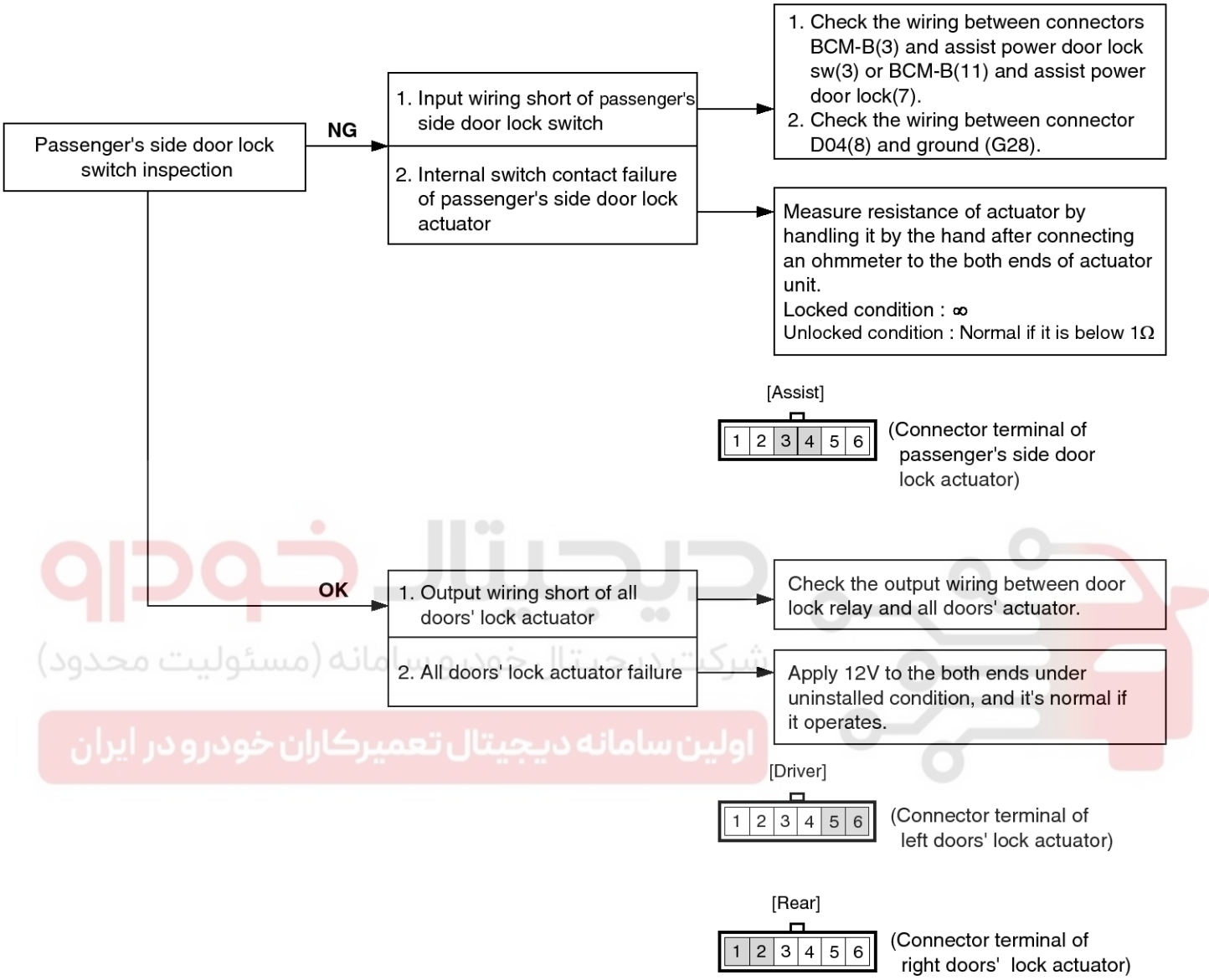
LTLG284E

Troubleshooting

1. Lock function works but unlock function does not work. → Since door unlock relay is malfunction, replace the door unlock relay.
2. Unlock function works but lock function does not work. → Since door lock relay is malfunction, replace the door lock relay.
3. When passenger side knob is controlled, all doors locks, but when driver side knob is controlled, all doors do not lock.

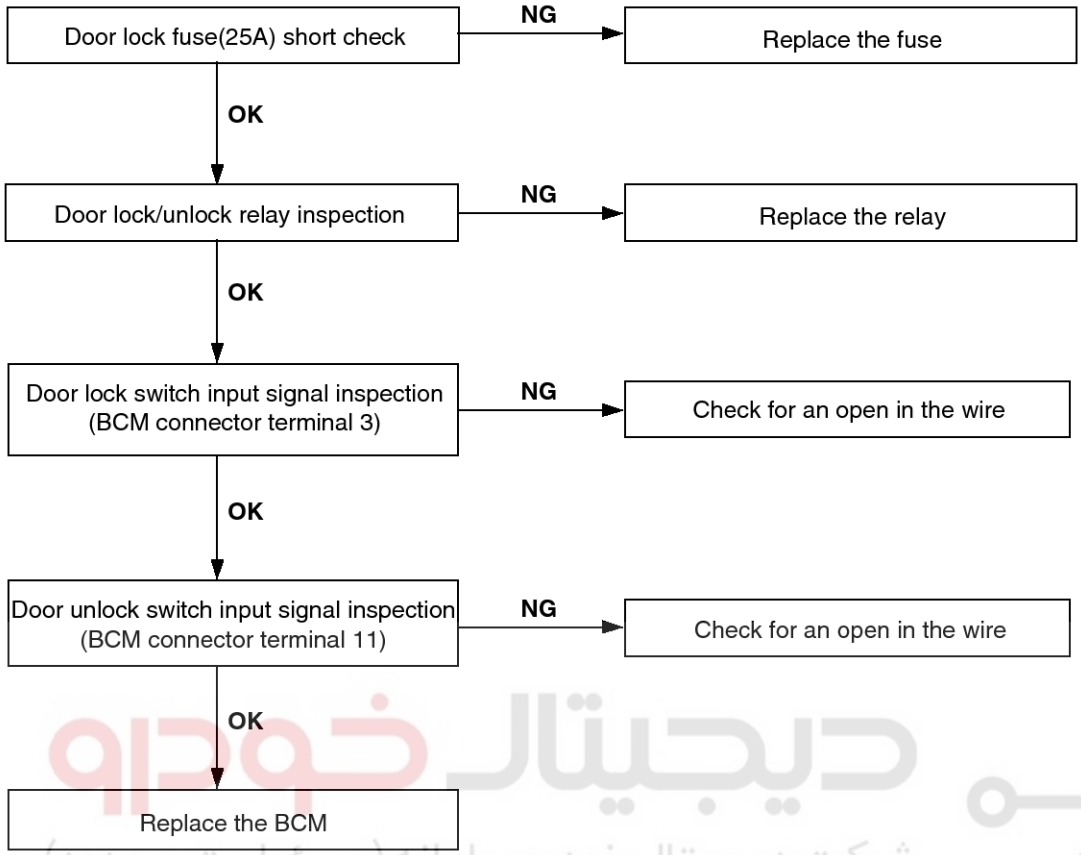


4. When driver side knob is controlled. All doors lock. But when the passenger side knob is controlled, all doors do not lock.



LTLG900G

5. Both sides do not lock either.

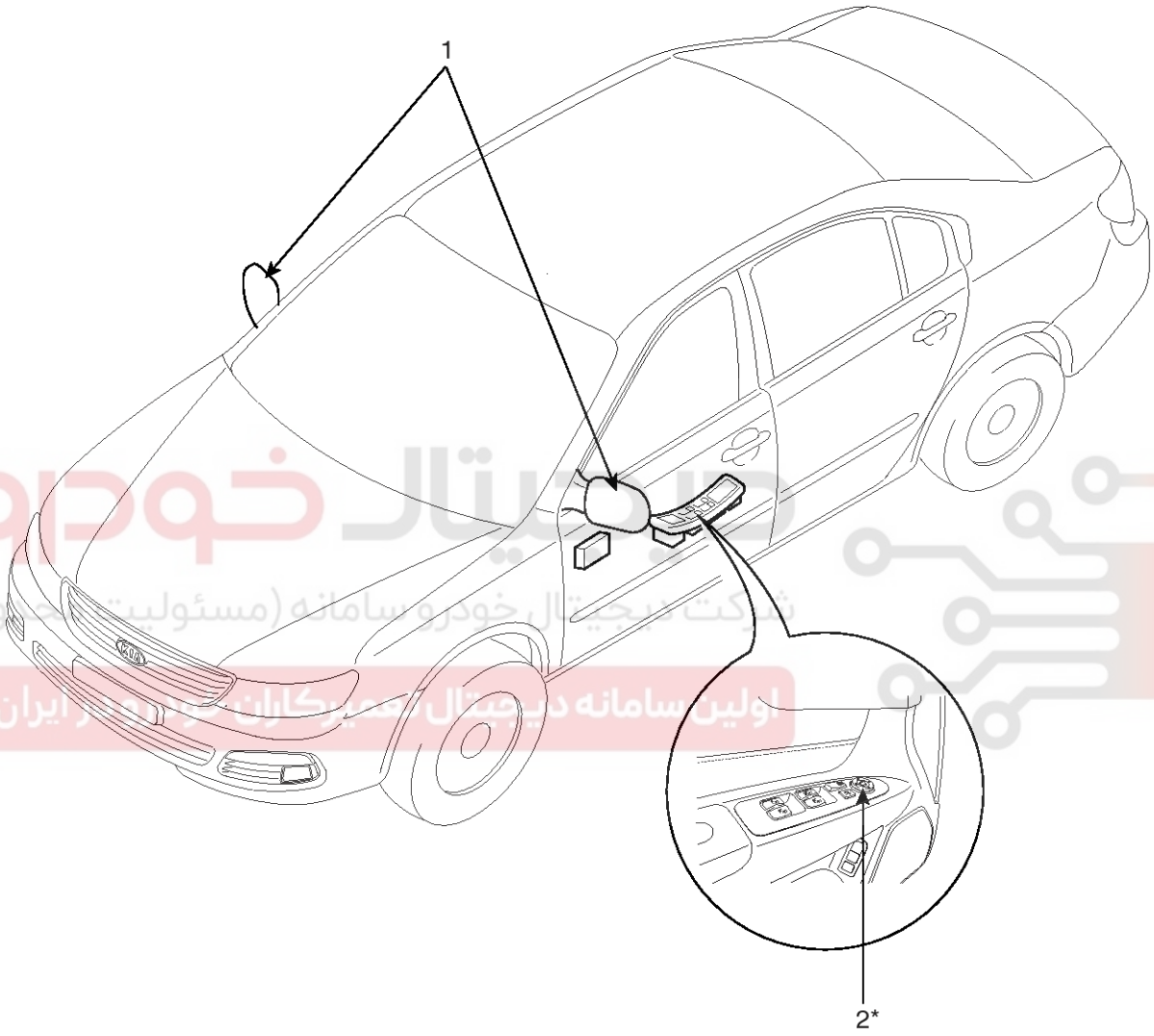


LTLG900H

Power Door Mirrors

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.

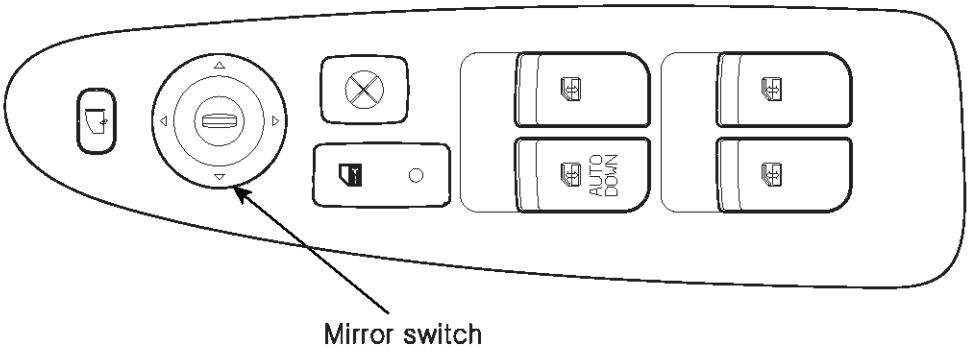


SMGBE9021L

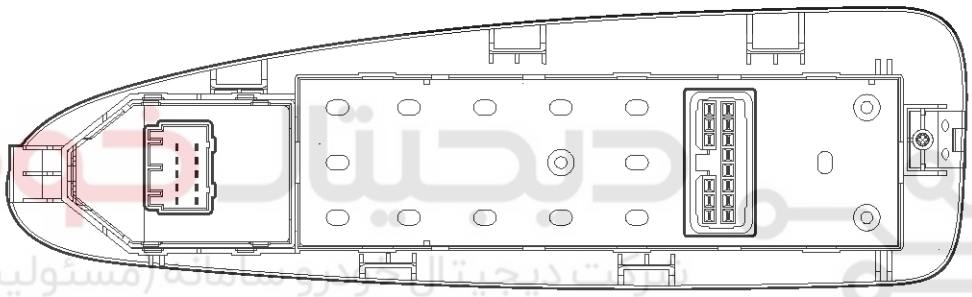
1. Power door mirror
2. Power door mirror switch

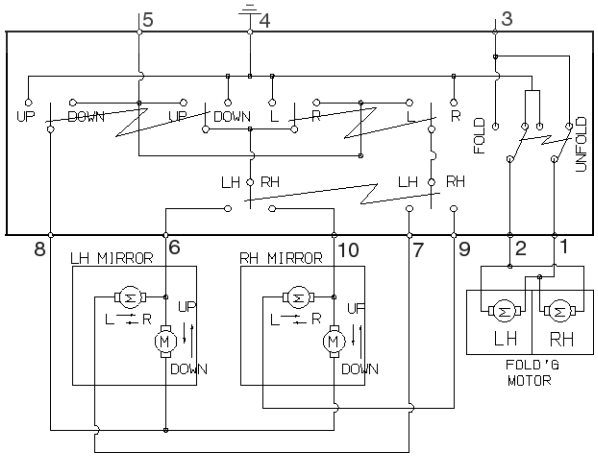
Power Out Side Mirror Switch

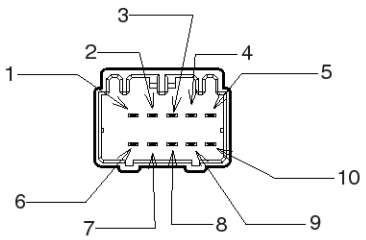
Component



Mirror switch



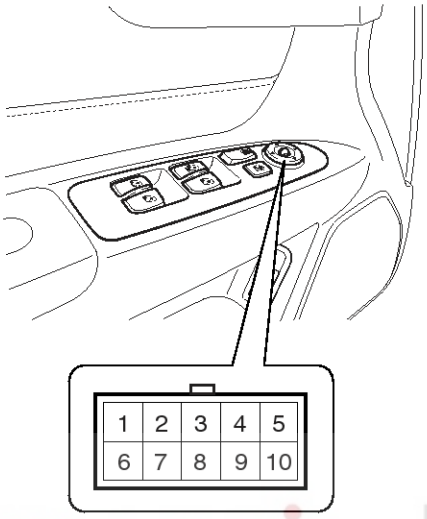




LTLG300A

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group-front door)
3. Disconnect the 10P connector from the switch.



Mirror switch

LTLG301A

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

Class	Terminal / Direction	5	4	6	7	8	9	10
LEFT	UP		○		○	○		
	DOWN	○				○		
	OFF		○	○	○	○		
	LEFT	○			○	○		
	RIGHT	○		○		○		
RIGHT	UP	○	○			○	○	○
	DOWN	○				○	○	○
	OFF		○			○	○	○
	LEFT	○	○			○	○	
	RIGHT	○	○			○		○

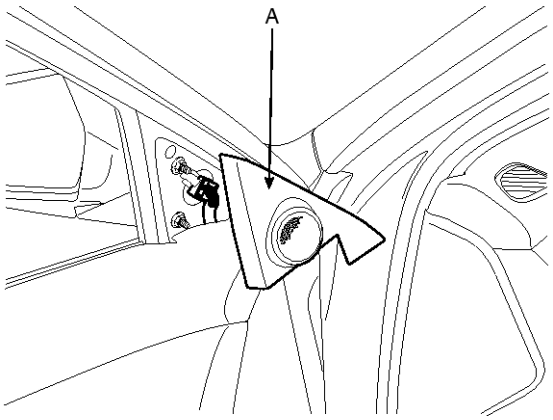
<Mirror switch>

LTLG301B

Power Door Mirror Actuator

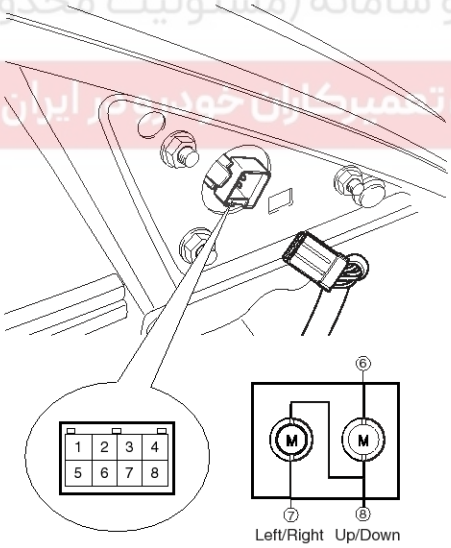
Inspection

1. Remove the front door quadrant delta cover (A) (Refer to the Body group - front door)



ATLG302F

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.



LTLG302B

Terminal / Position	6	7	8
UP	⊖	⊕	⊕
DOWN	⊕	⊖	⊖
OFF	⊕	⊕	⊕
LEFT	⊖	⊕	⊖
RIGHT	⊕	⊖	⊕

ETKE195B

Mirror Heater Inspection

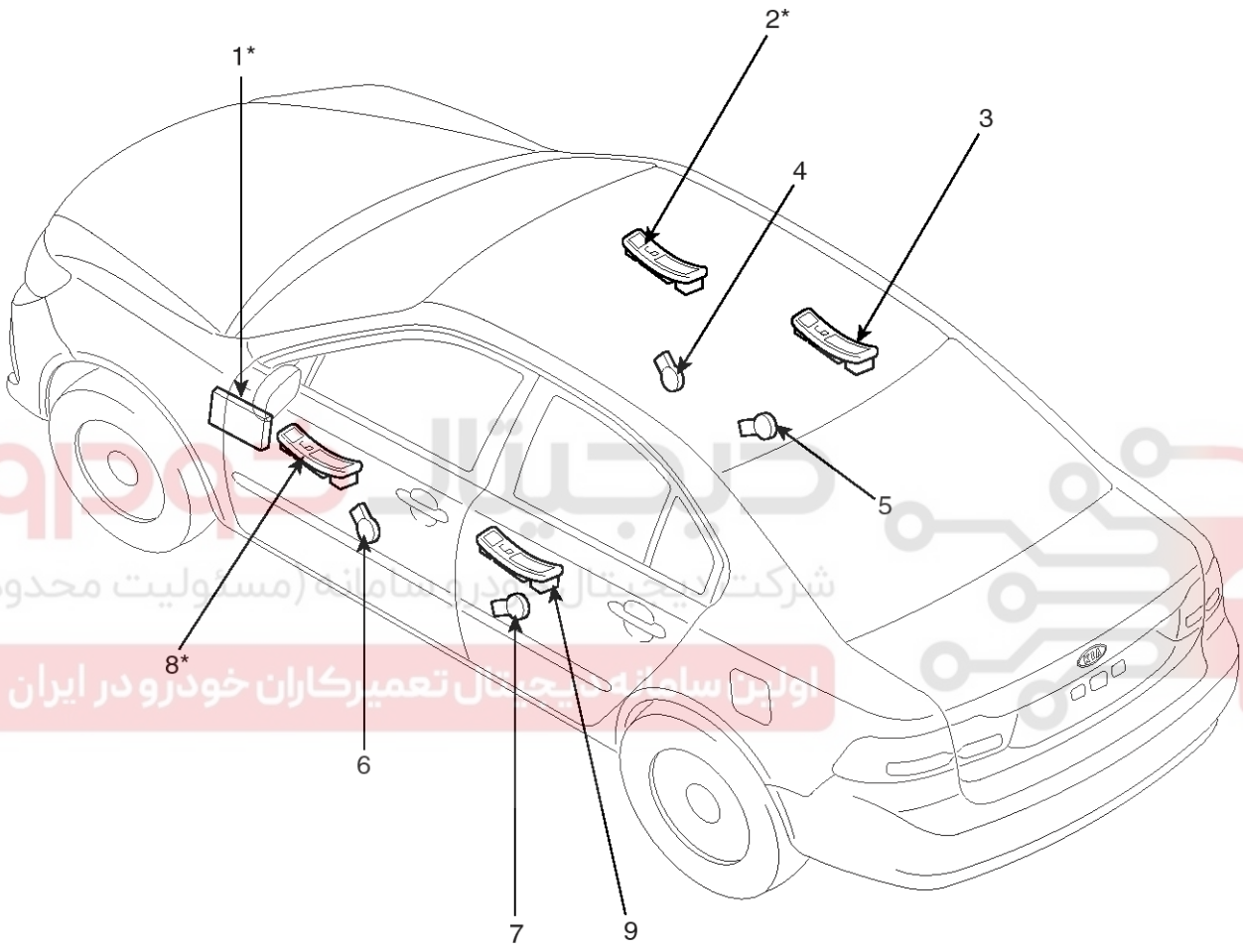
Terminal / Position	1	2
Heater	○	○

ETRF302D

Power Windows

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE9022L

1. Passenger compartment junction box (Power window relay)
2. Assist window switch
3. Rear window switch
4. Front window motor
5. Rear window motor
6. Front window motor (Safety window)
7. Rear window motor
8. Driver window main switch
9. Rear window switch

Function Of Safety Power Window

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

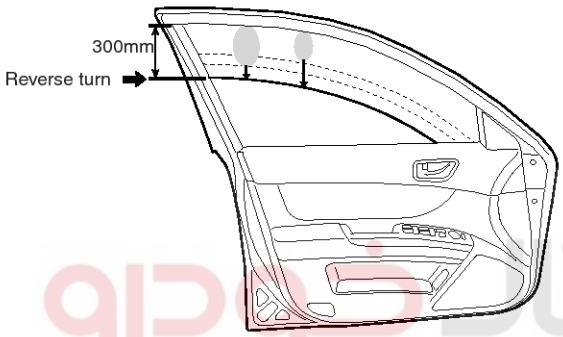
1. Safety function condition

   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)

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

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

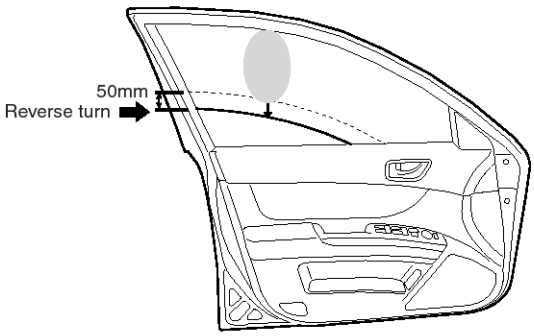


When detect the jamming during the 4mm~250mm from top of the door

ETRF320B

   - 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

ETRF320C

3. Length of window reversing (holding the auto-up switch)

   - When detect the jamming during holding the auto-up switch.

     → Window is reverse until 25mm from jamming position.

   - 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.)

   - When holding the auto-up switch after 5 seconds from above condition.

     → Window is reverse until 25mm from jamming position.

ETRF320D

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
      - Manual-Up/Down function is available
      - 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.
      - Safety function is not available

2. Initializing of fail safe mode

   1) If the window moved by compulsion and motor have a problem, power window switch could be entering the fail safe mode for user's safety.
   2) Power window operation in fail mode
      - Auto/Manual-Down function is available
      - Auto/Manual-Up function is not available

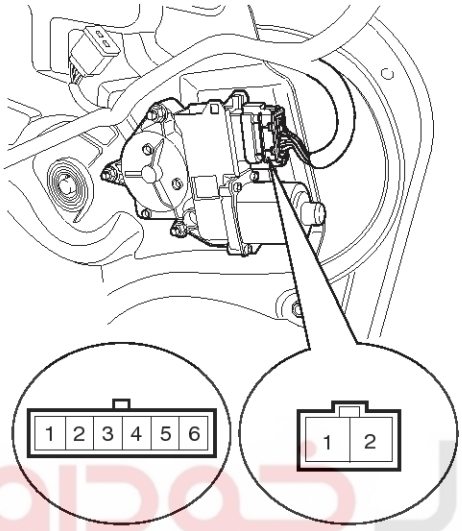
        (When auto/manual-up is operated, window is rising 20mm and is stopped the moving.)

Power Window Motor

Inspection

Front Power Window Motor Inspection

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



[Safety power window]

LTLG321A

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	Clockwise	⊕	⊖
	UP	Counter-clockwise	⊖	⊕

ETQF057A

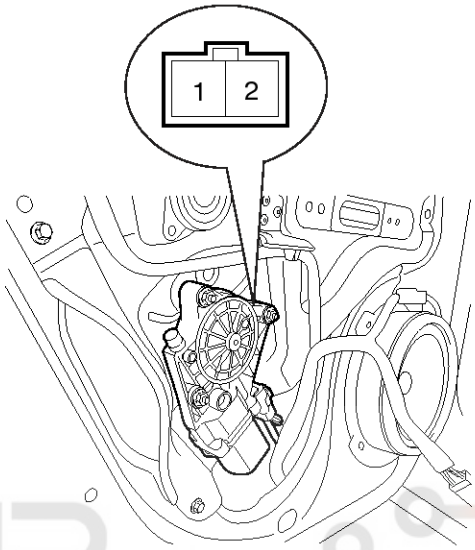
[With Driver's Side Safety Window]

Position		Terminal	1	2	3
Driver's side	UP	Clockwise		⊕	⊖
	DOWN	Counter-clockwise	⊕		⊖

ETRF321B

Rear Power Window Motor Inspection

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



ATLG321C

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	Clockwise	⊕	⊖
	UP	Counter-clockwise	⊖	⊕

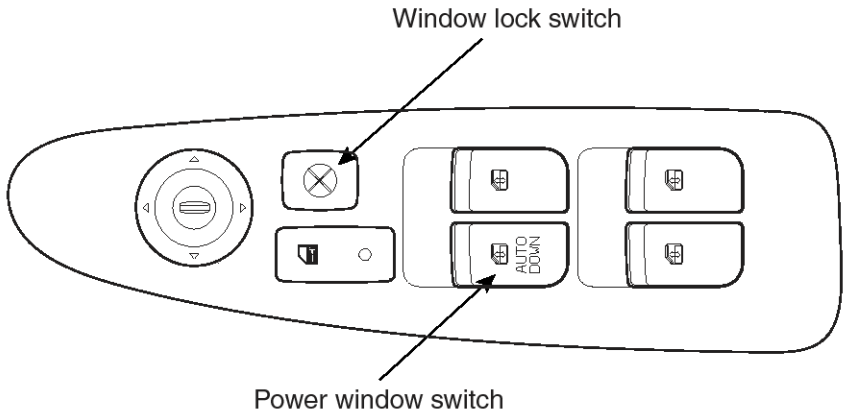
ETQF057A

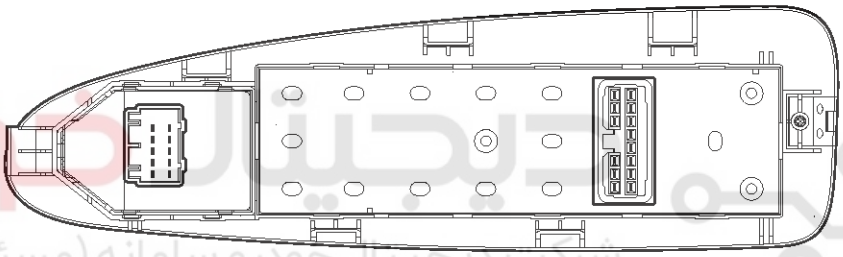
Power Window Switch

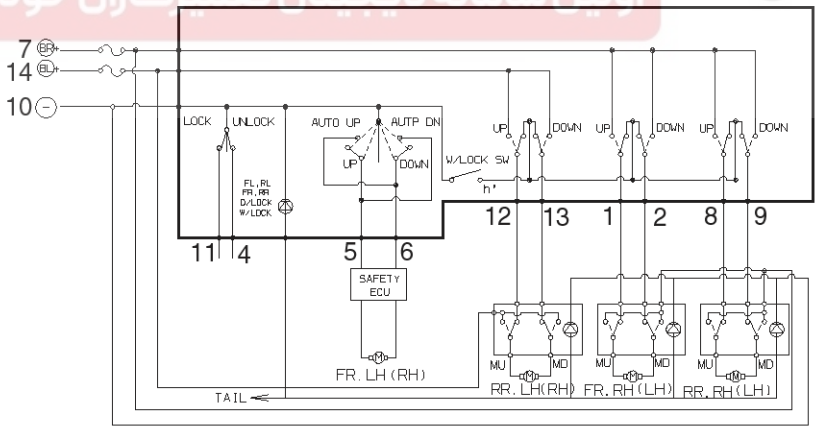
Circuit Diagram

Driver Power Window Switch

[LHD]



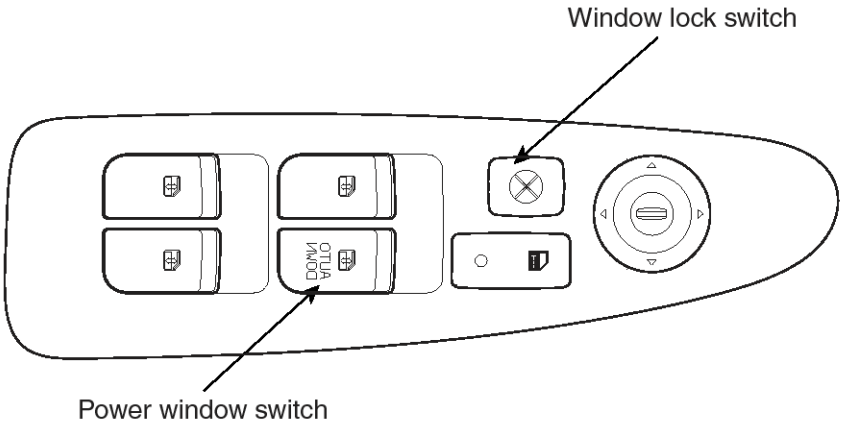


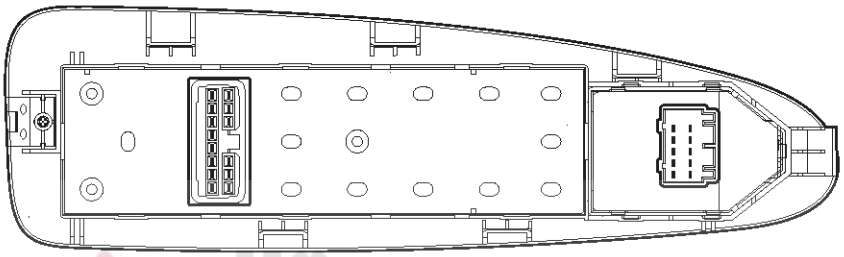


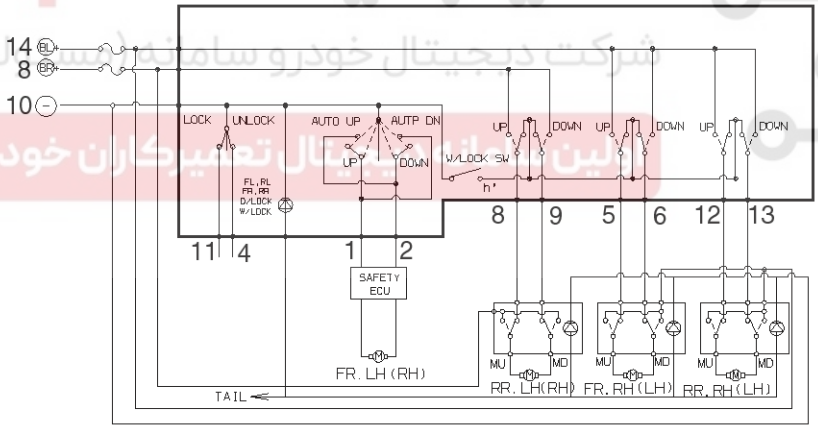
1	2	3			4	5	6
7	8	9	10	11	12	13	14

LTLG322A

[RHD]



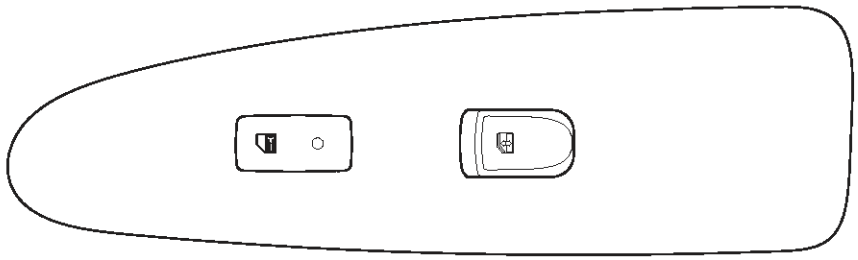


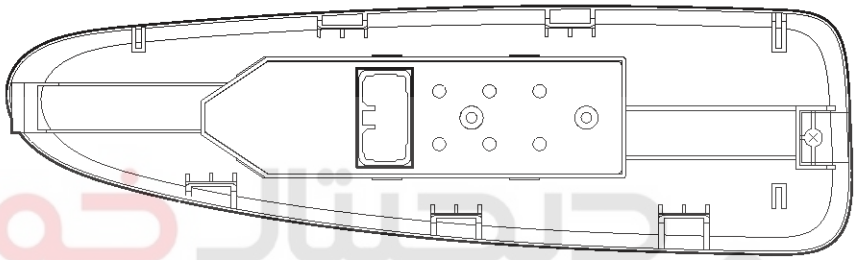


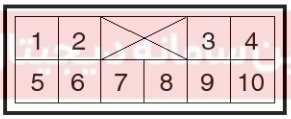
1	2	3			4	5	6
7	8	9	10	11	12	13	14

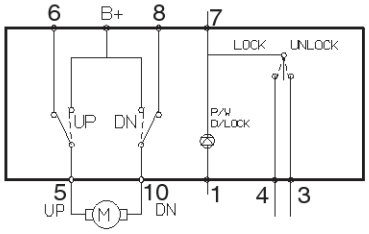
LTLG322B

Assist Power Window Switch



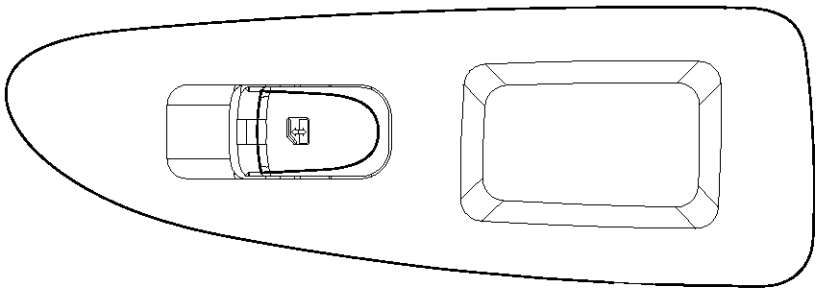


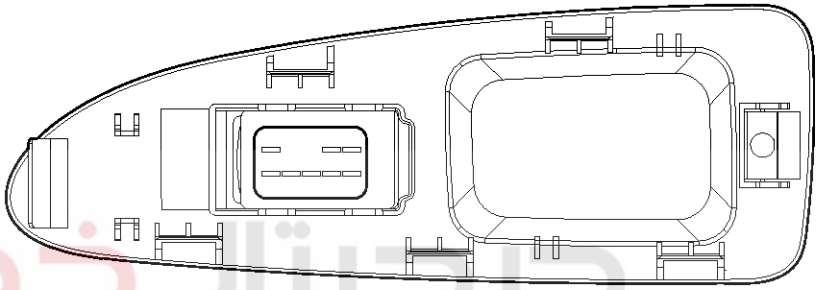


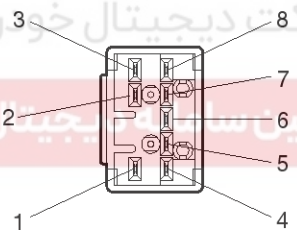


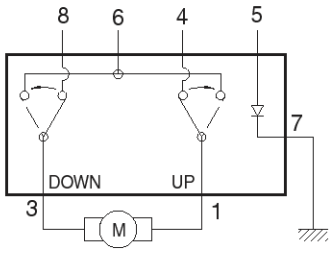
ATLG322C

Rear Power Window Switch









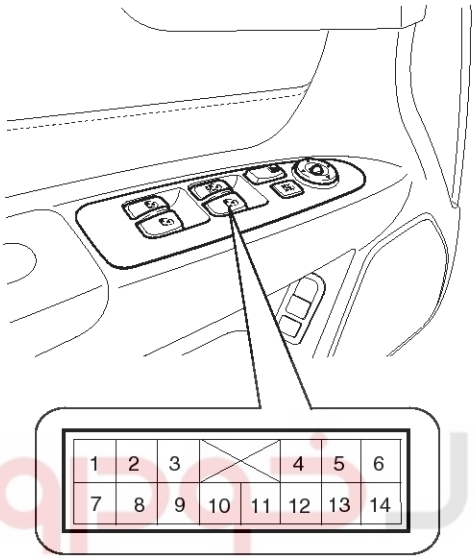
ATLG322D

Inspection

Power Window Main Switch Inspection

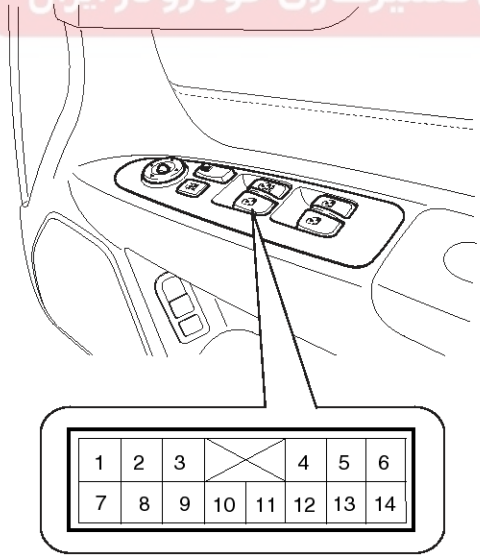
1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)
3. Disconnect the 14P connector from the switch.

[LHD]



ATLG284A

[RHD]



LTLG284B

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

[LHD]

Position \ Terminal	Front left				Front right			
	6	10	5	14	1	2	10	7
UP	○	○	○	○	○	○	○	○
OFF	○	○	○		○	○	○	
DOWN	○		○	○	○		○	○

Position \ Terminal	Rear left				Rear right			
	12	13	10	7	9	7	8	10
UP	○	○	○	○	○	○	○	○
OFF	○	○	○		○		○	○
DOWN	○		○	○	○		○	○

LTLG322F

[RHD]

Position \ Terminal	Front left				Front right			
	2	10	1	7	5	6	10	14
UP	○	○	○	○	○	○	○	○
OFF	○	○	○		○	○	○	
DOWN	○		○	○	○		○	○

Position \ Terminal	Rear left				Rear right			
	8	9	10	14	13	14	12	10
UP	○	○	○	○	○	○	○	○
OFF	○	○	○		○		○	○
DOWN	○		○	○	○		○	○

LTLG322J

Power Window Lock Switch

[LHD]

Position \ Terminal	10	12
NORMAL	○	○
LOCK		

LTLG322E

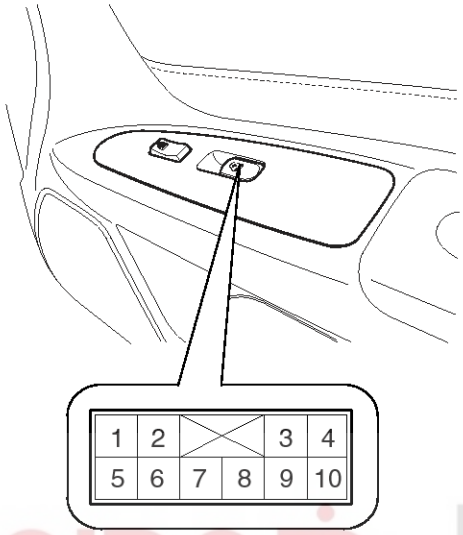
[RHD]

Position \ Terminal	10	8
NORMAL	○	○
LOCK		

LTLG322K

Assist Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)
3. Disconnect the 10P connector from the switch.



ATLG284D

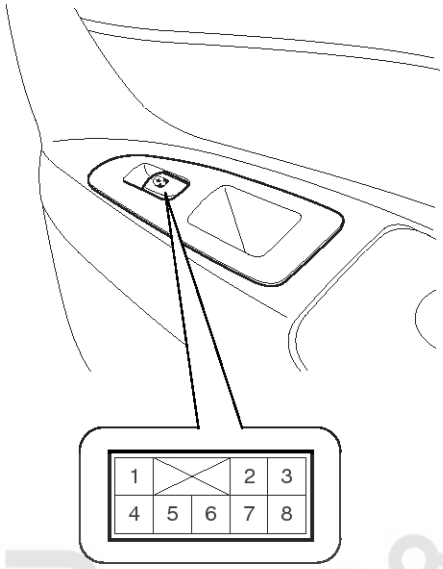
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Position \ Terminal	8	10	6	9	5
UP	○—○			○—○	
OFF	○—○		○		○
DOWN		○	○—○		○

LTLG322G

Rear Power Window Switch Inspection

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



ATLG322H

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

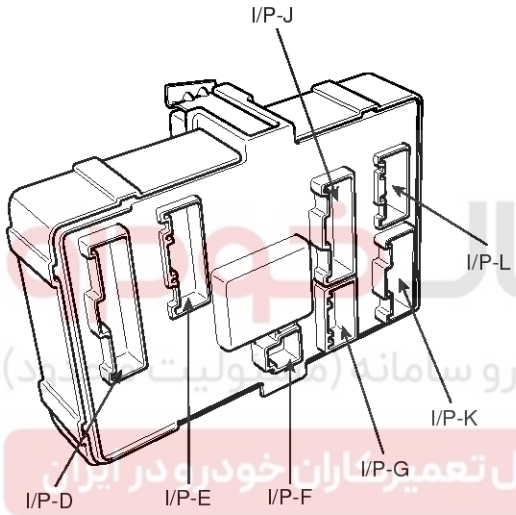
Position \ Terminal	6	7	2	1	4
UP	○			○	
		○			○
OFF		○	○		
				○	
DOWN	○		○	○	
					○

LTLG322I

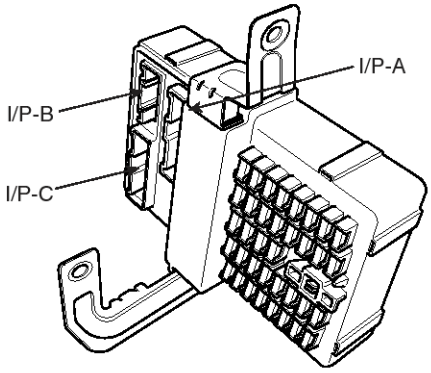
Power Window Relay

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.1 in the I/P-G and No.12 terminal in the I/P-A when power and ground are connected to the No.1 terminal in the I/P-G and No.2 terminal in the I/P-A.
5. There should be no continuity between the No.1 terminal in the I/P-G and No.12 terminal in the I/P-A when power is disconnected.



LTLG323A



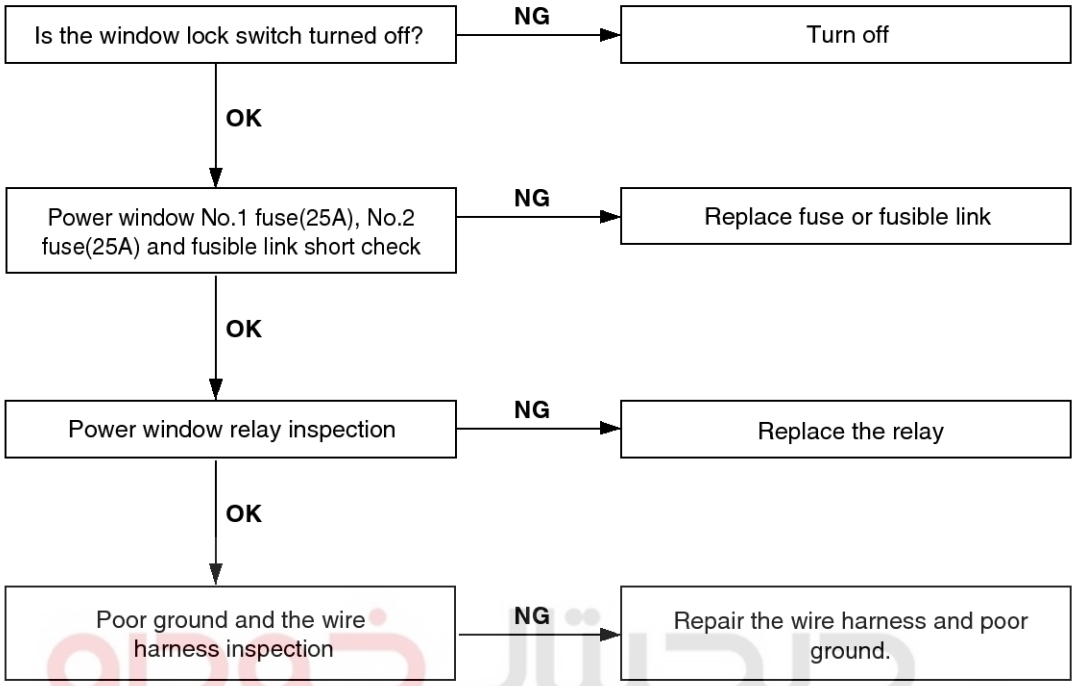
KTRE323D

Terminal / Power	I/P-A (12)	I/P-G (1)	I/P-A (2)	I/P-G (1)
Disconnected			○——○	
Connected	○——○		⊖——⊕	

ETRF323E

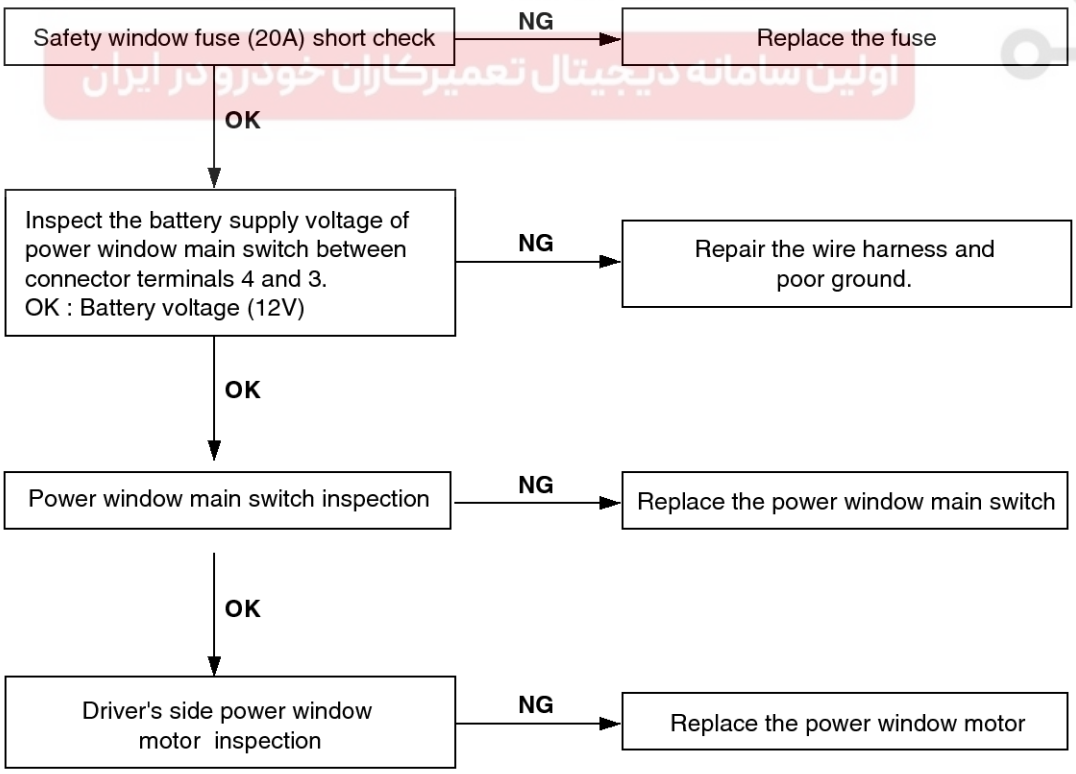
Troubleshooting

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



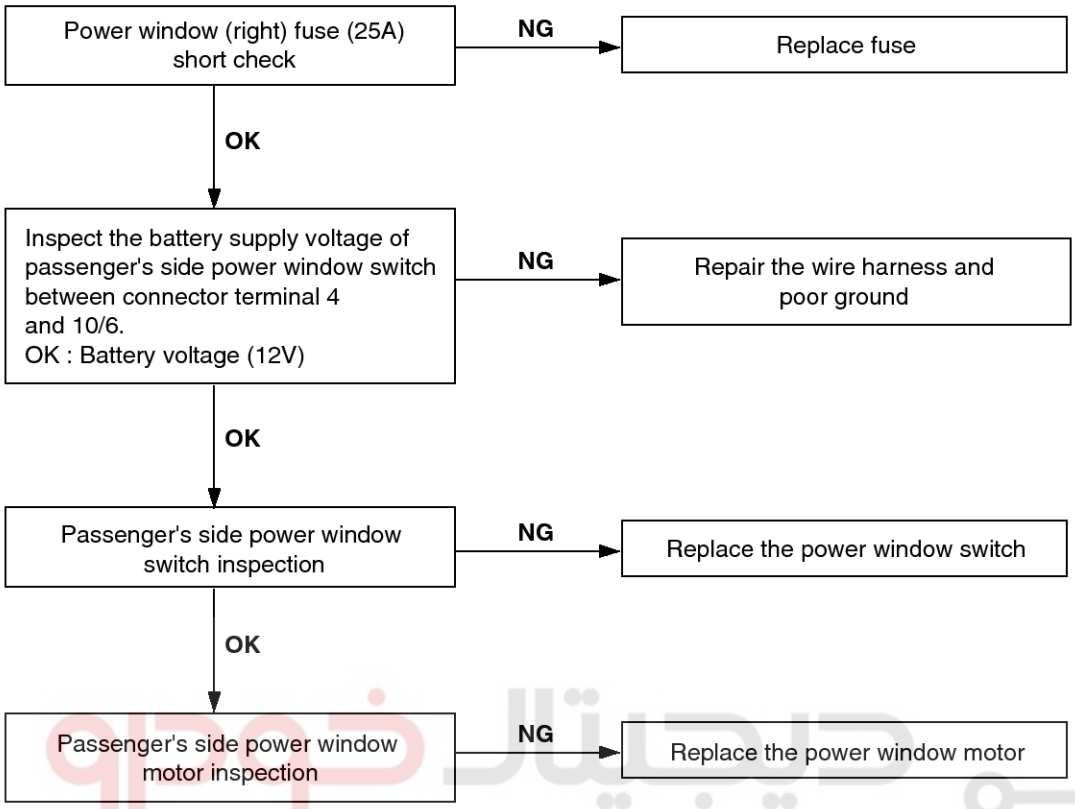
LTLG900C

2. Driver's side window does not operate.



LTLG900D

3. Passenger's side window does not operate.

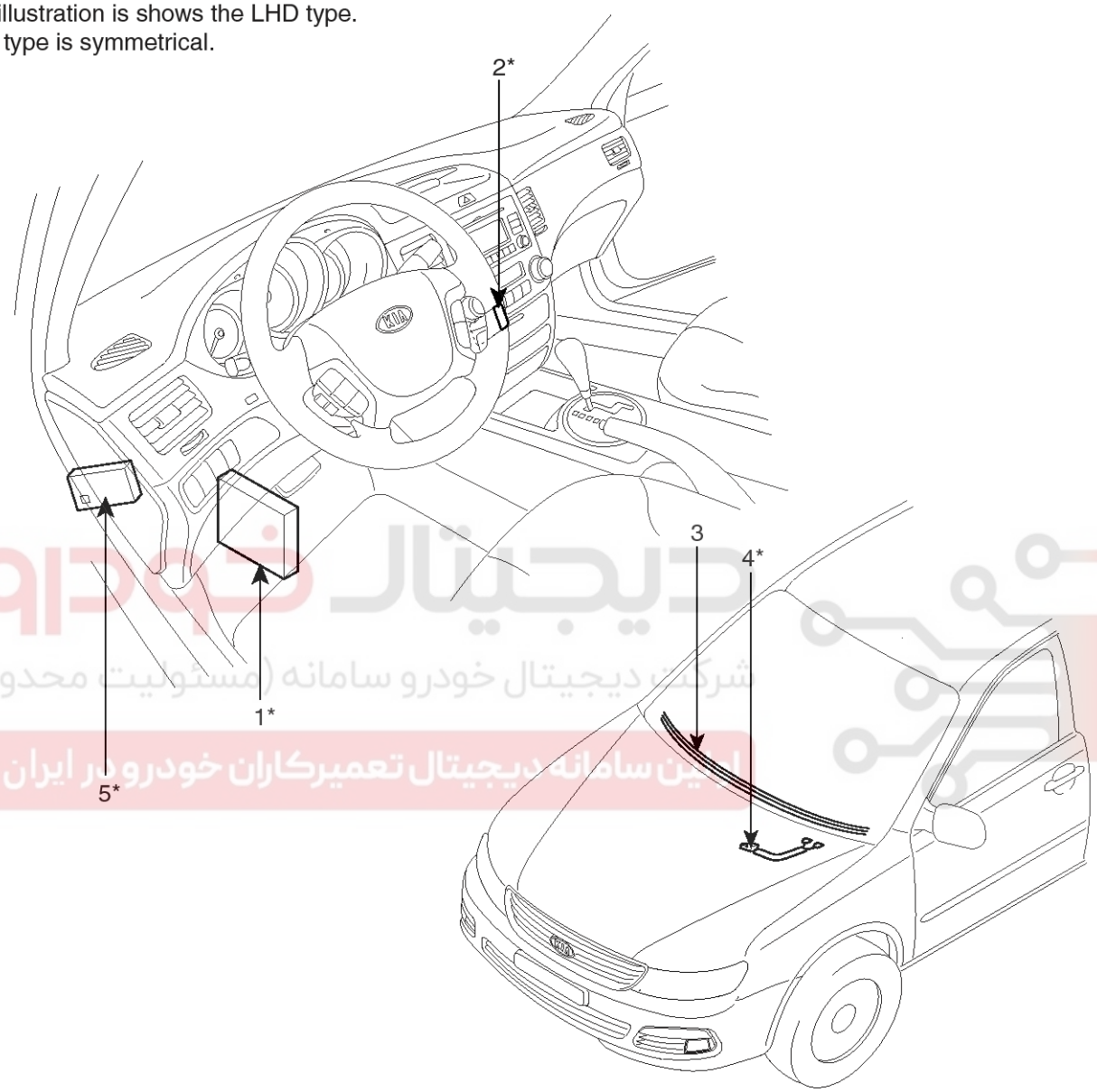


LTLG900E

Windshield Deicer

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE9023L

1. Body control module
2. Windshield deicer switch
3. Windshield deicer
4. Deicer connector
5. Windshield deicer relay (Built-in junction box)

Windshield Deicer BE-165

Description

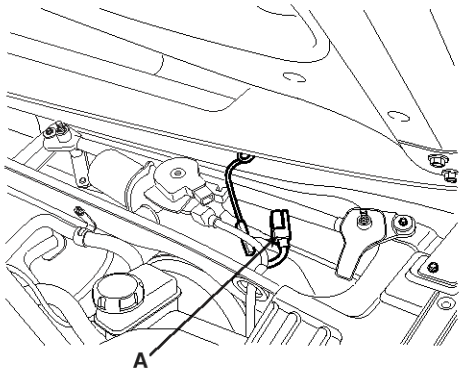
Windshield deicer system prevent windshield wiper from freezing in the winter season. It consists of deicer in the lower part of windshield, switch and relay. Body control module receives an input signal from the deicer switch, then controls relay. Operating condition is the same that of rear window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

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

Windshield Deicer

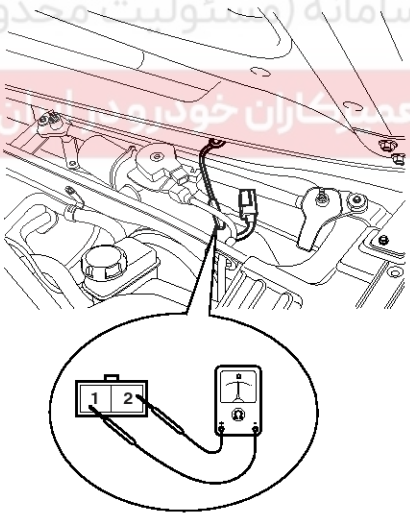
Inspection

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



KTRE331A

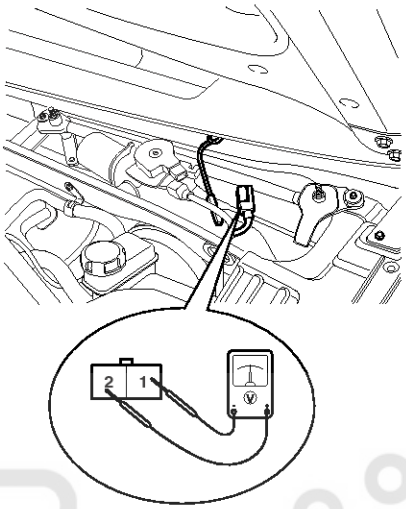
3. Check for continuity between the terminals of deicer lines.



KTRE331B

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

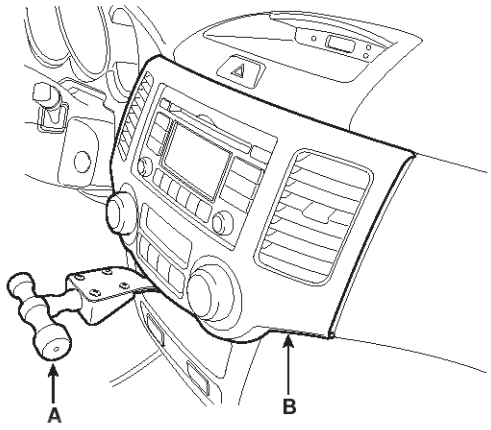


KTRE331C

Windshield Deicer Switch

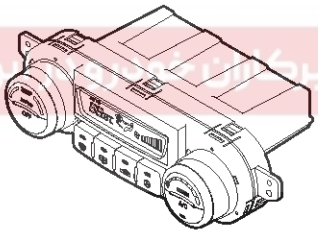
Inspection

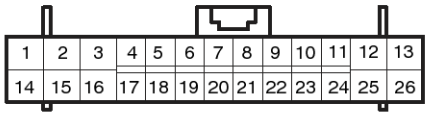
1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel(B) by using a scraper(A). Take care of fixing clip.



SMGBE9031D

3. Disconnect the connectors.
4. Using an ohmmeter, inspection the continuity between the terminals after removing to the switch connector.





M21-1/M22-2

ATLG332A

Terminal / Position	M22-2 (23)	M22-2 (26)	M21-1 (26)	M21-1 (10)
ON (Manual)	○	○		
ON (Auto)			○	○
OFF				

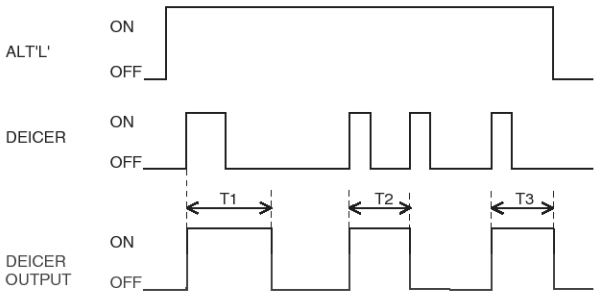
ETRF332B

Windshield Deicer Timer

Inspection

While operating the components, check whether the operations are normal as shown in the timing chart.

1. Once ALT "L" is ON, if the defogger is switched ON, the defogger will stay ON for 20 minutes duration.
2. If defogger switch is pressed again (see Step 1), or if ignition is switched OFF, the defogger will shut OFF.



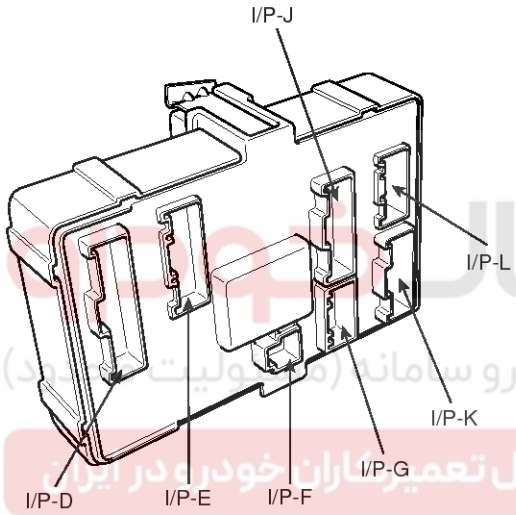
LTLG141F

T1 : 20 ± 1 min.
T2 : MAX 20 ± 1 min.

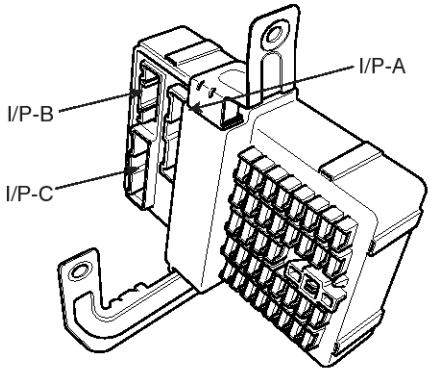
Windshield Deicer Relay

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.2 in the I/P-G and No.8 terminal in the I/P-K when power and ground are connected to the No.2 terminal in the I/P-G and No.8 terminal in the I/P-C.
5. There should be no continuity between the No.2 terminal in the I/P-G and No.8 terminal in the I/P-K when power is disconnected.



LTLG323A



KTRE323D

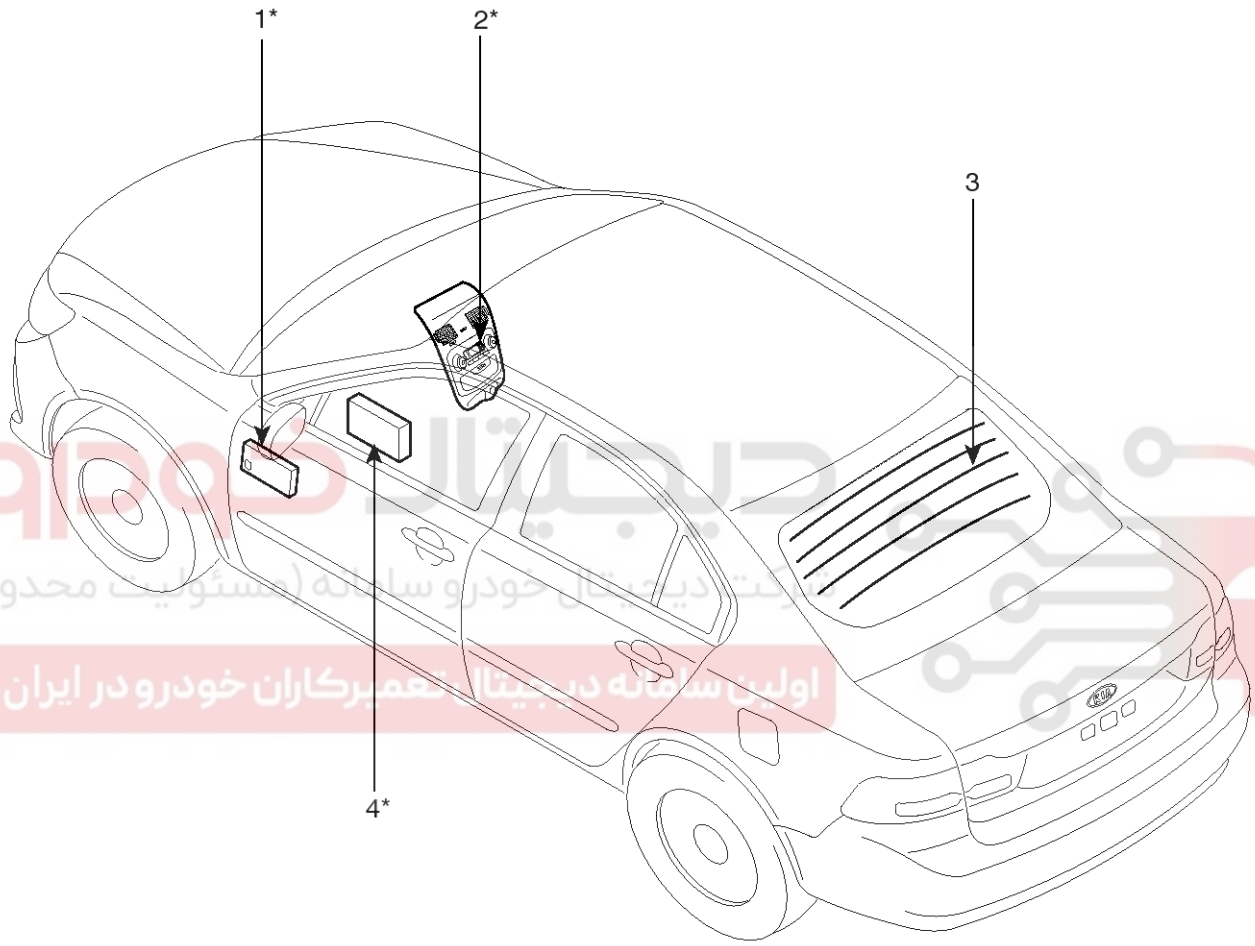
Terminal / Power	I/P-K (8)	I/P-G (2)	I/P-C (8)	I/P-G (2)
Disconnected			○	○
Connected	○	○	⊖	⊕

ETRF334A

Rear Glass Defogger

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE9024L

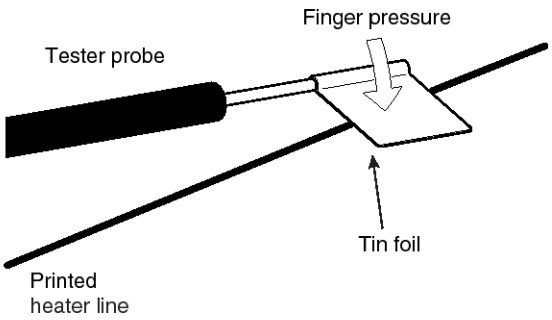
1. Junction box (Rear window defogger)
2. Rear window defogger switch (A/C controller)
3. Rear window defogger
4. Body control module

Rear Glass Defogger Printed Heater

Inspection

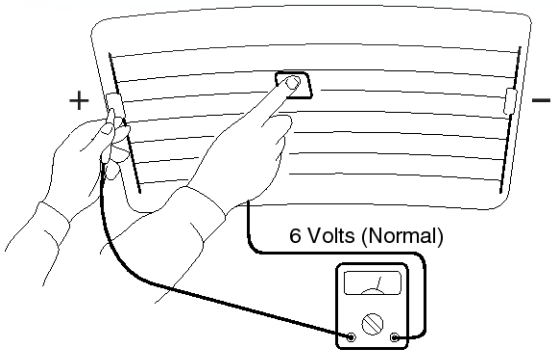
⚠CAUTION

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.



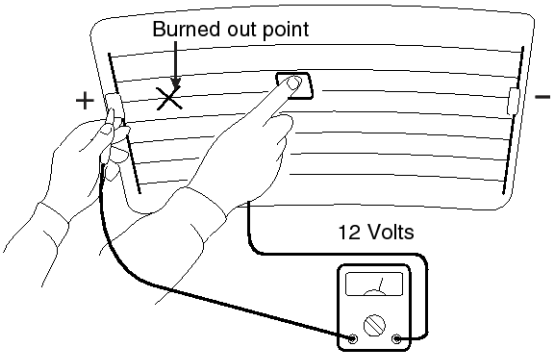
ETA9165A

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.



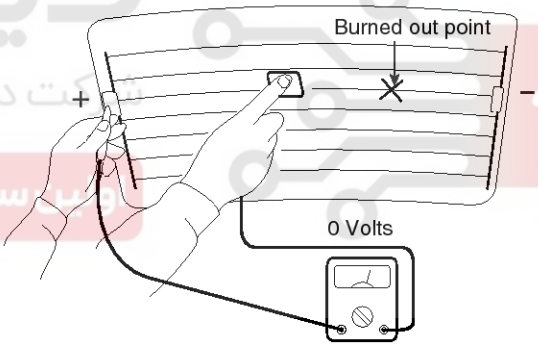
ETA9165B

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



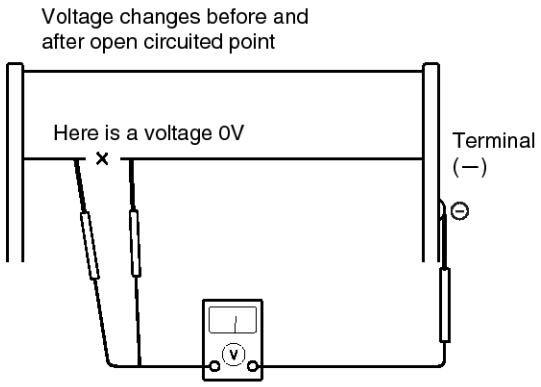
ETA9165C

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



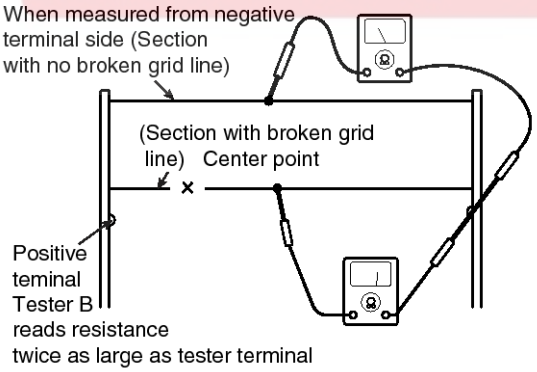
ETA9165D

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.



ETA9165E

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.



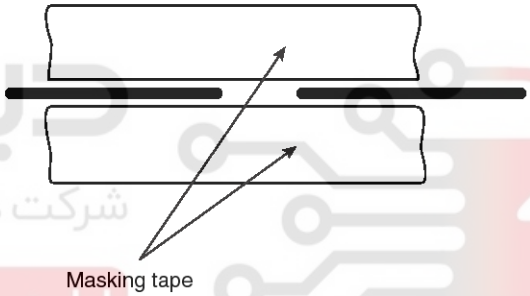
ETA9165F

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).

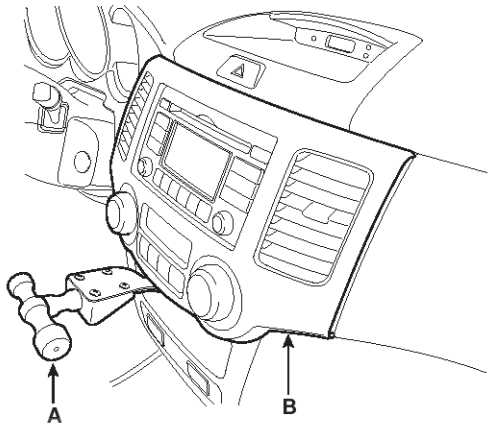


ETA9165G

Rear Glass Defogger Switch

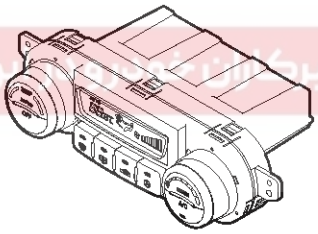
Inspection

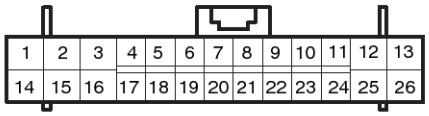
1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel(B) by using a scraper(A). Take care of fixing clip.



SMGBE9031D

3. Disconnect the connectors.
4. Using an ohmmeter, inspection the continuity between the terminals after removing to the switch connector.





M21-1/M22-2

ATLG332A

Position \ Terminal	M22-2 (23)	M22-2 (26)	M21-1 (26)	M21-1 (10)
ON (Manual)	○	○		
ON (Auto)			○	○
OFF				

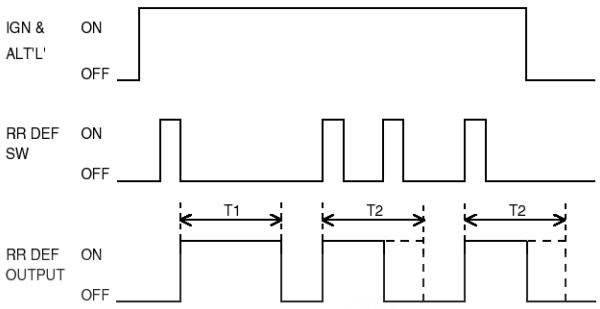
ETRF332B

Rear Glass Defogger Relay

Inspection

While operating the components, check whether the operations are normal as shown in the timing chart.

1. Once ALT "L" is ON, if the defogger is switched ON, the defogger will stay ON for 20 minutes duration.
2. If defogger switch is pressed again (see Step 1), or if ignition is switched OFF, the defogger will shut OFF.



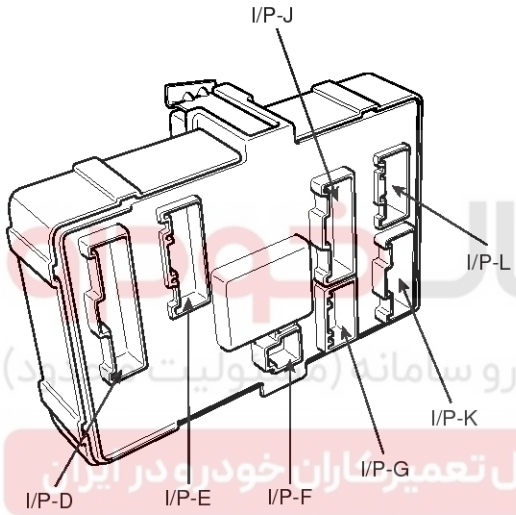
LTGE141J

T1 : 20 ± 1 min.
T2 : MAX 20 ± 1 min.

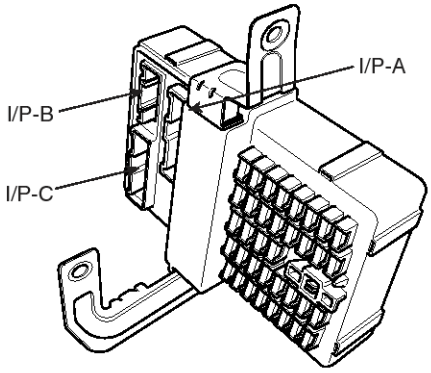
Rear Glass Defogger Timer

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.2 in the I/P-G and No.7 terminal in the I/P-C when power and ground are connected to the No.2 terminal in the I/P-G and No.8 terminal in the I/P-C.
5. There should be no continuity between the No.2 terminal in the I/P-G and No.7 terminal in the I/P-C when power is disconnected.



LTLG323A



KTRE323D

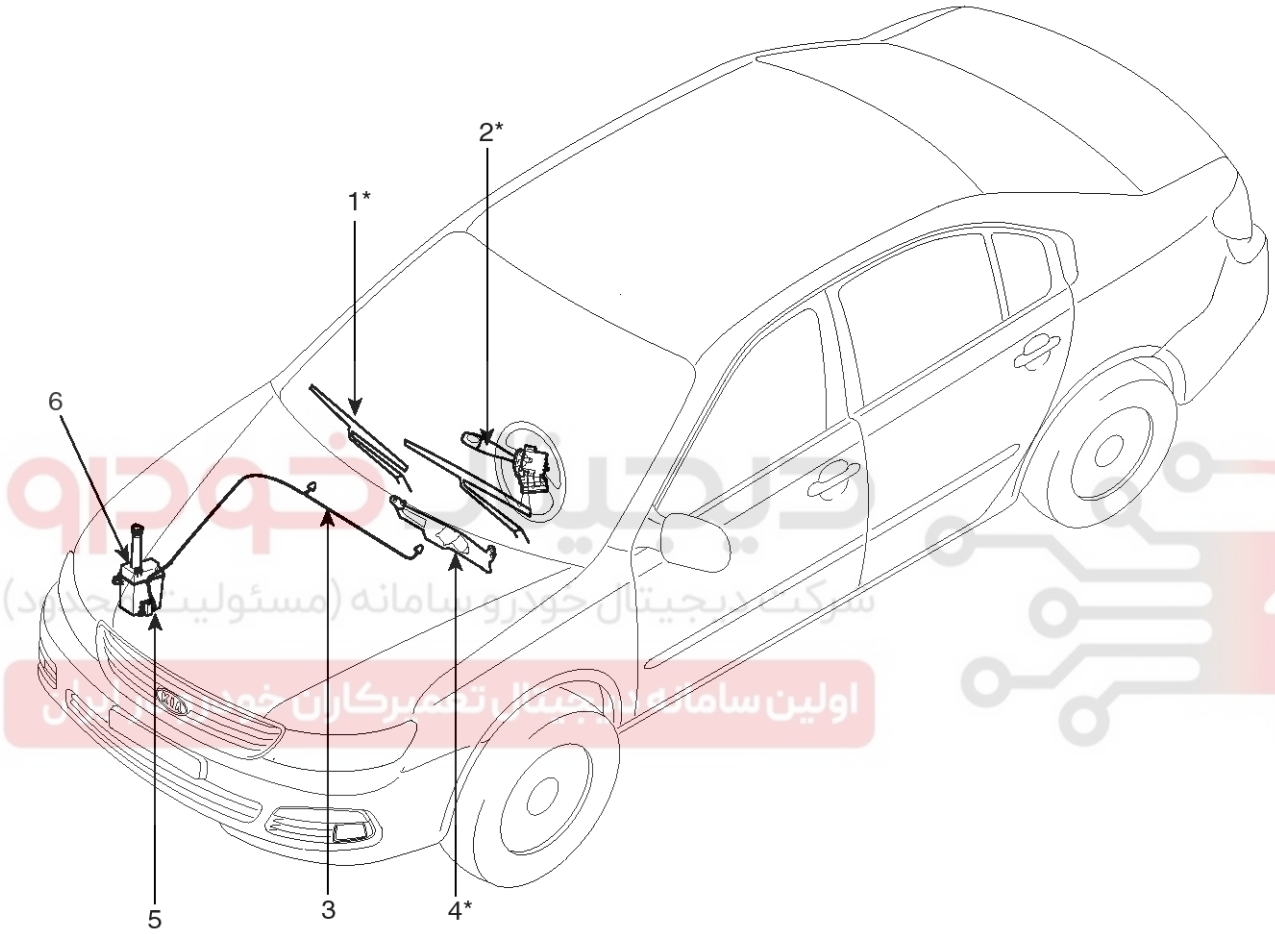
Terminal / Power	I/P-C (7)	I/P-G (2)	I/P-C (8)	I/P-G (2)
Disconnected			○ — ○	
Connected	○ — ○		⊖ — ⊕	

ETRF343A

Windshield Wiper/Washer

Component Location

The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



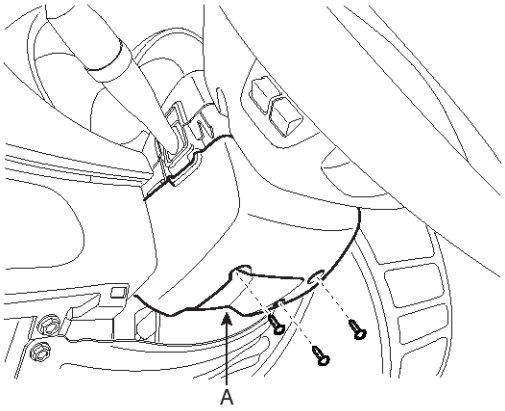
SMGBE9025L

1. Windshield wiper arm & blade
2. Wiper & washer switch
3. Windshield washer hose
4. Windshield wiper motor & linkage
5. Washer motor
6. Washer reservoir

Windshield Wiper-Washer Switch

Removal

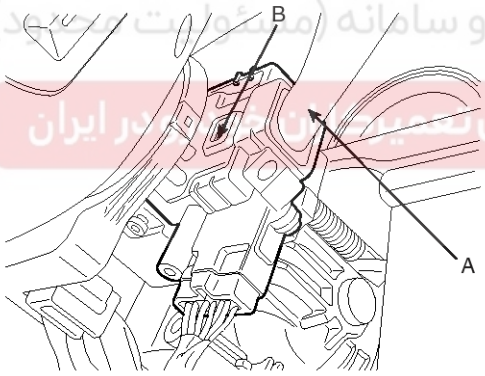
1. Remove the steering column upper and lower shrouds (A) after removing 3 screws.



SMGBE9080D

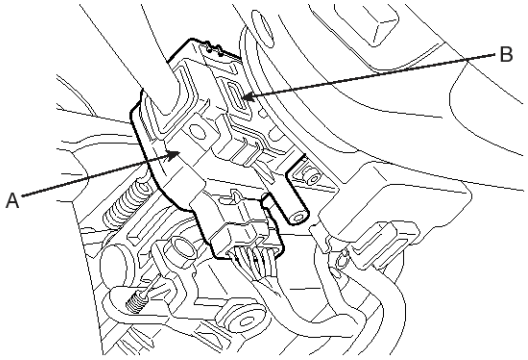
2. Remove the wiper switch (A) by pushing the lock pin (B) after disconnecting the connector.

[LHD]



KTRE031D

[RHD]



KTRE031W

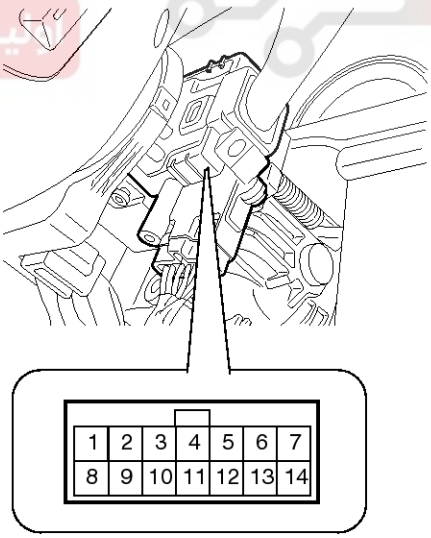
Installation

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

Inspection

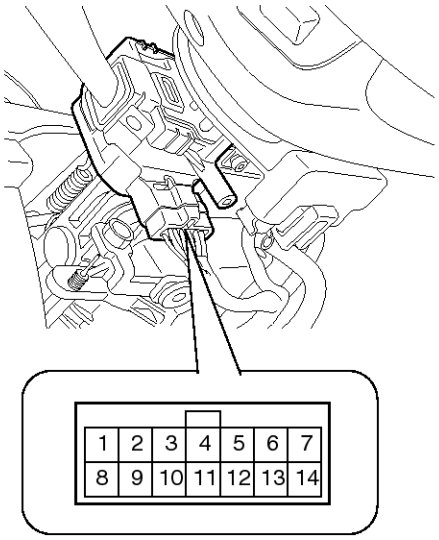
Check for continuity between the terminals while operating the wiper and washer switch. If it is not normal condition, replace wiper and wiper switch.

[LHD]



KTRE031G

[RHD]



KTRE031S

Wiper Switch

[LHD]

Position \ Terminal	1	2	3	4	5	6	13	14
MIST				○	○			
OFF		○	○					
INT		○	○		○	○	○	○
LOW		○			○			
HI	○				○			

LTGE031I

[RHD]

Position \ Terminal	7	6	5	4	3	2	13	14
MIST				○	○			
OFF		○	○					
INT		○	○		○	○	○	○
LOW		○			○			
HI	○				○			

ETRF031T

Washer Switch

[LHD]

Position \ Terminal	5	7
OFF		
ON	○	○

LTGE031J

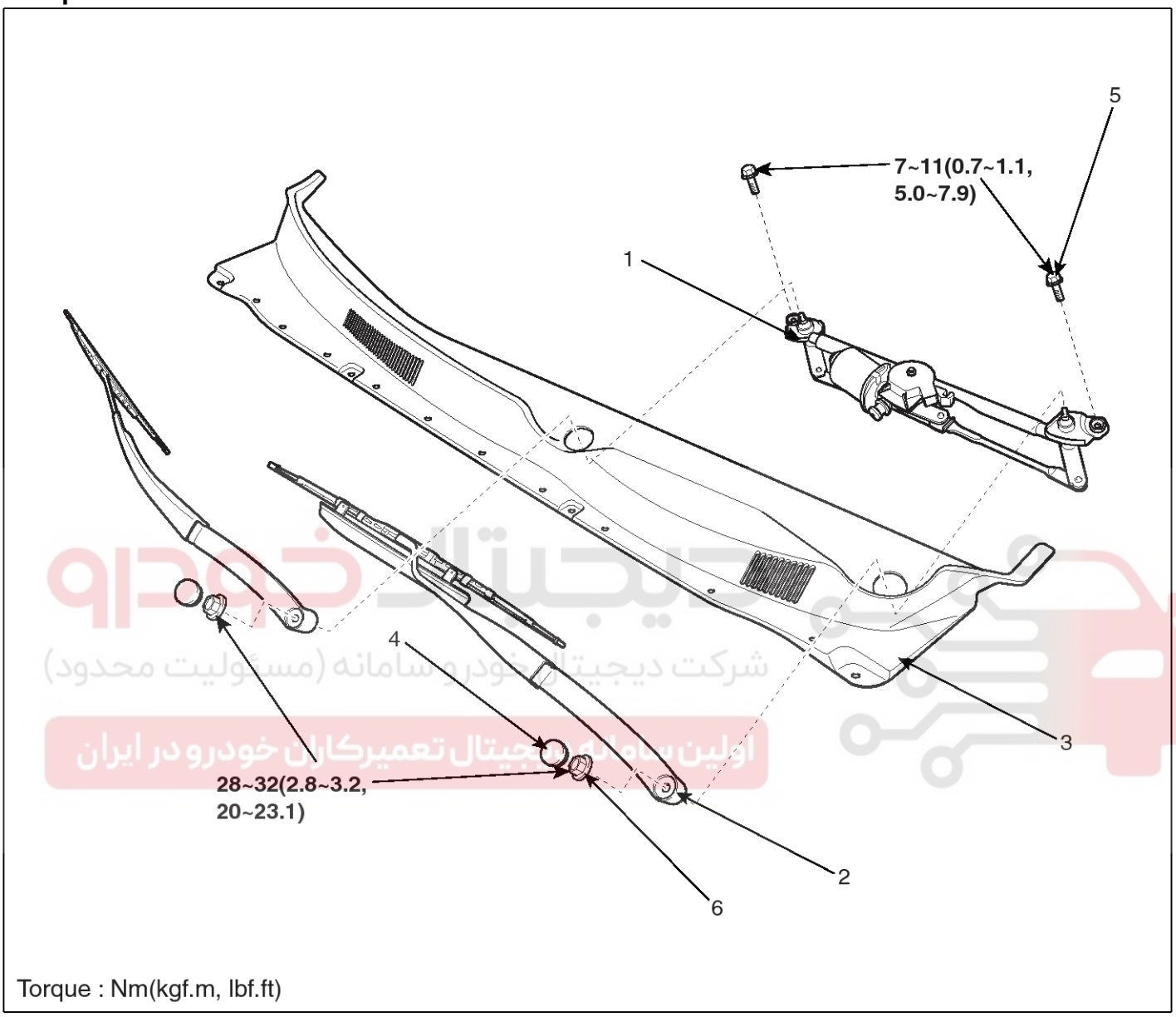
[RHD]

Position \ Terminal	3	1
OFF		
ON	○	○

ETRF031U

Front Wiper Motor

Component Location



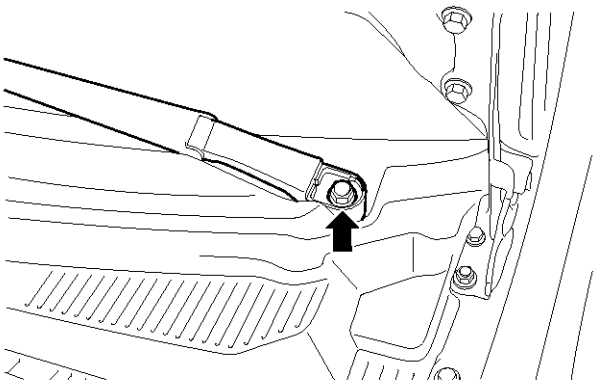
SMGBE9026L

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

Removal

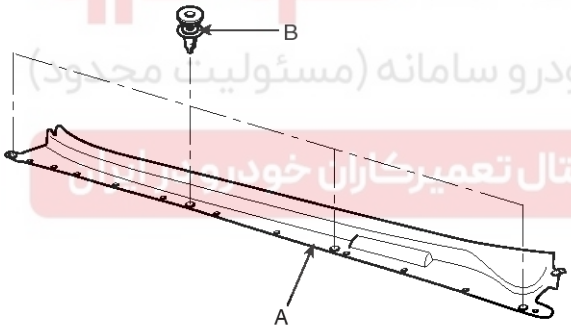
1. Remove the windshield wiper arm and blade after removing a nut (A).

Torque : 28~32 Nm (2.8~3.2 kgf.m, 20~23.1 lbf.ft)



KTPC365A

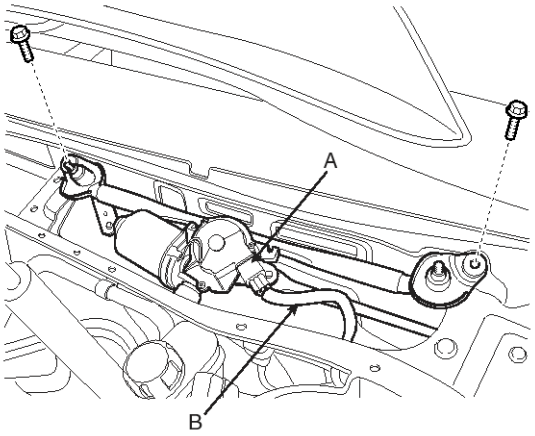
2. Remove the weather strip then remove the cowl top cover (A) after removing 4 clips (B).



ETRF362C

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

Torque : 7-11Nm (0.7-1.1, kgf.m, 5.0-7.9 lbf.ft)

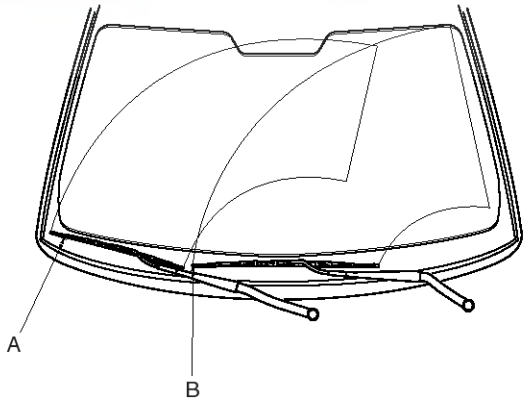


ATLG362C

Installation

1. Install the wiper arm and blade to the specified position.

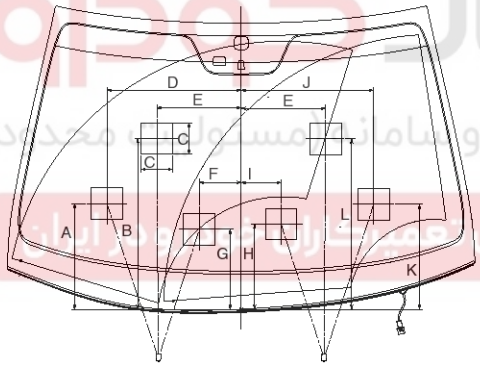
Specified position	A	B
Distance [in (mm)]	1.26+0.2/0 (32+5/0)	1.26+0.2/0 (32+5/0)



ATGE362C

2. Set the washer nozzle on the specified spray position.

Specified position	Distance [in (mm)]
A	14.6 (370)
B	21.2 (540)
C	3.9 (100)
D	17.5 (445)
E	9.4 (240)
F	3.5 (90)
G	10.4 (265)
H	12.6 (320)
I	2.7 (70)
J	15.9 (405)
K	10.0 (255)
L	19.9 (505)



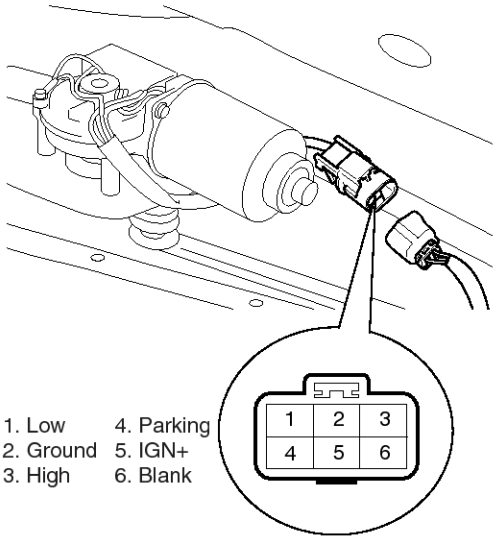
Unit : mm

LTLG362E

Inspection

Speed Operation Check

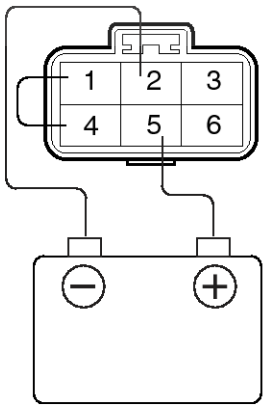
1. Remove the connector from the wiper motor.
2. Attach the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 5.
3. Check that the motor operates at low speed.
4. Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 5.
5. Check that the motor operates at high speed.



LTLG310B

Automatic Stop Operation Check

1. Operate the motor at low speed using the stalk control.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 6.
3. Connect terminals 3 and 6.
4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 5.
5. Check that the motor stops running at the off position.

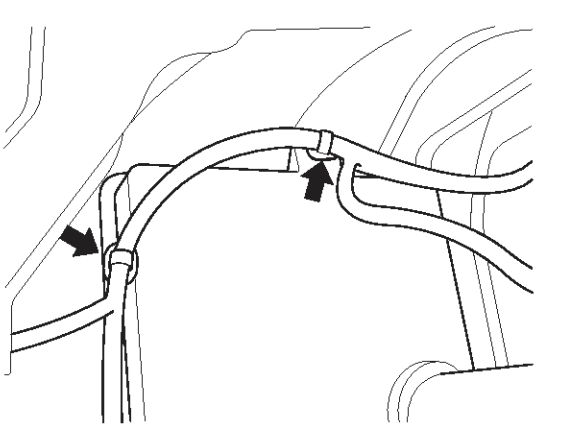


ATLG362D

Front Washer Motor

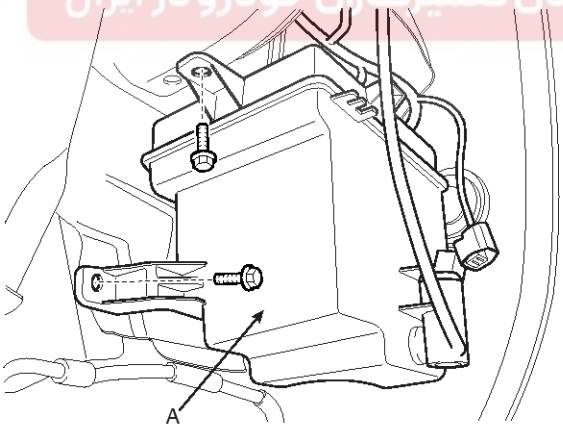
Rempval

1. Disconnect the negative (-) battery terminal.
2. Remove the wire harness on the front washer reservoir.



ATLG363C

3. Remove the tires.
4. Remove the wheel guide.
5. Remove the washer hose and the washer motor connector.
6. Remove the washer reservoir (A) after removing 2 bolts.



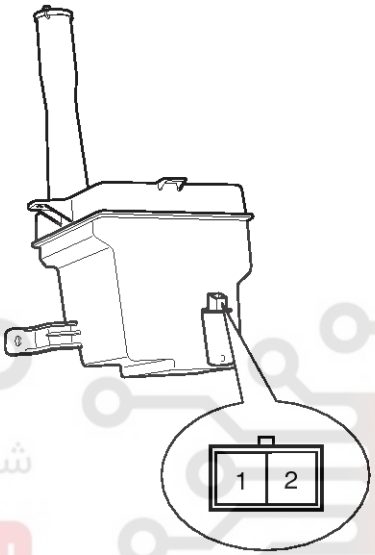
ATLG363A

Installation

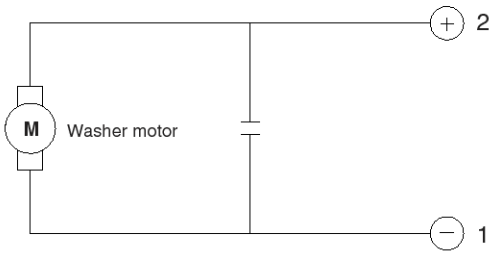
1. Install the washer reservoir.
2. Install the washer hose and washer motor connector.
3. Install the wheel guide and tires.
4. Install the wire harness on the front washer reservoir.

Inspection

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Connect positive (+) battery cables to terminal 2 and negative (-) battery cables to terminal 1 respectively.
3. Check that the motor operates normally and the washer motor runs and water sprays from the front nozzles.
4. If they are abnormal, replace the washer motor.



ATLG363B

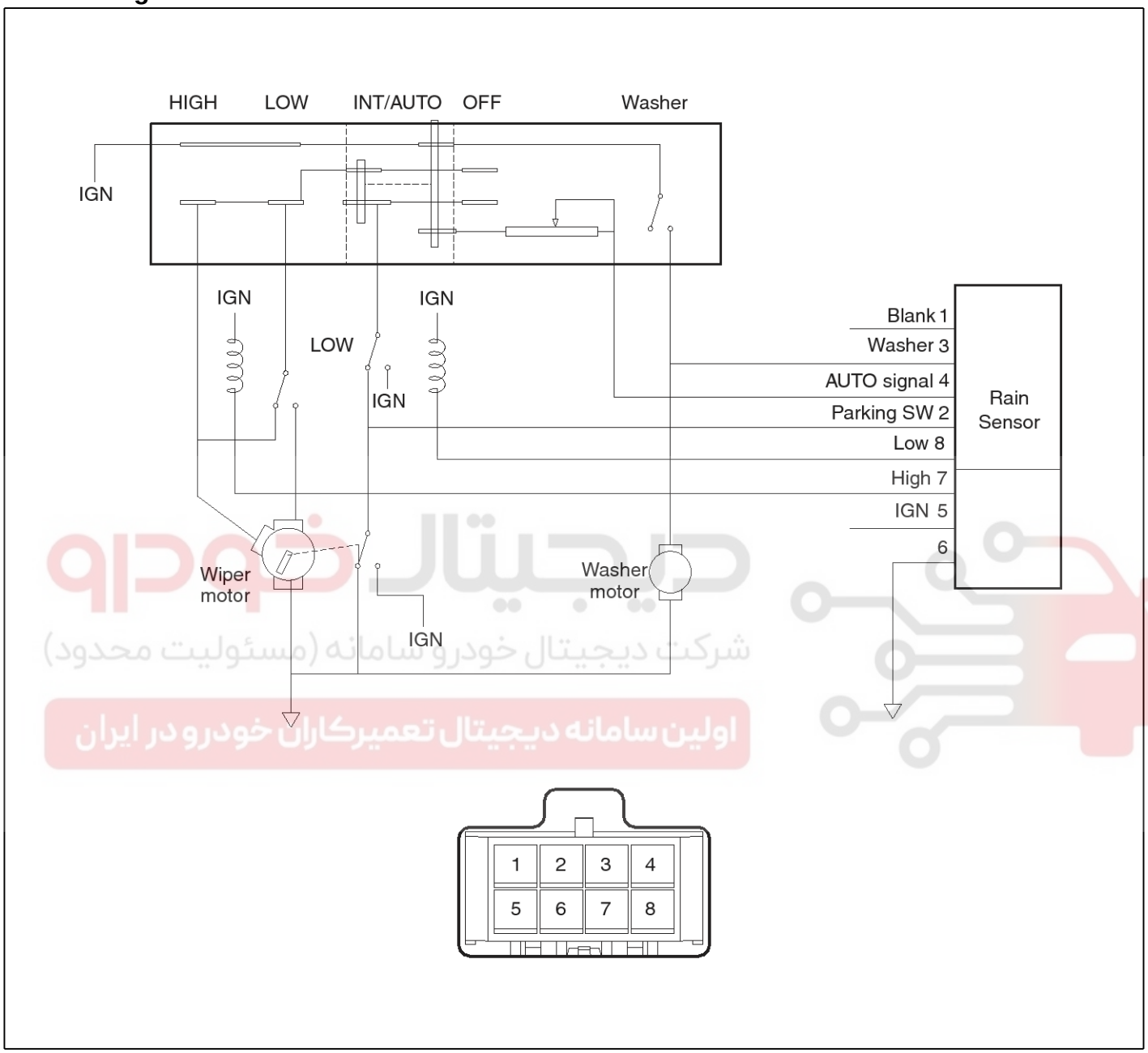


[Windshield washer motor]

LTIF363C

Rain Sensor

Circuit Diagram

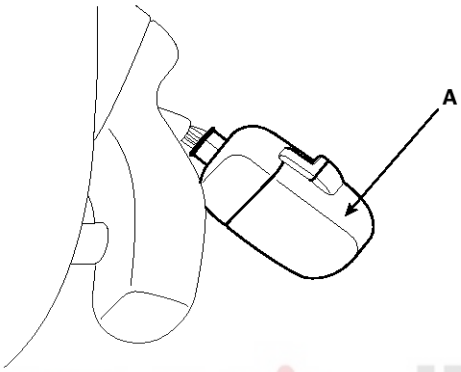


LTLG365C

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.



ATLG365A

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 seperates 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 operaion to inform the driver that the system is under AUTO.

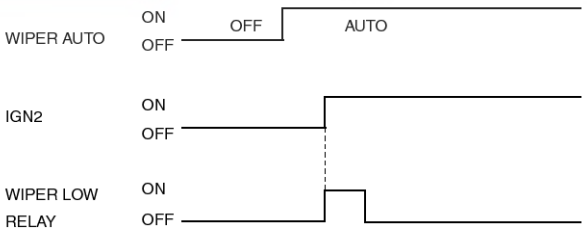
NOTICE

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

Inspection

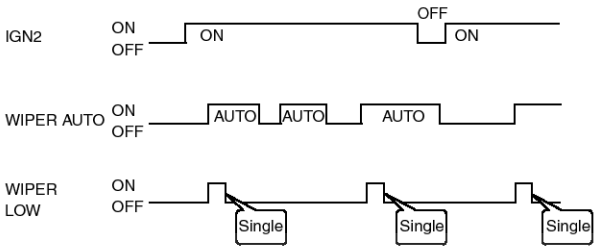
Rain Sensing Wiper

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.



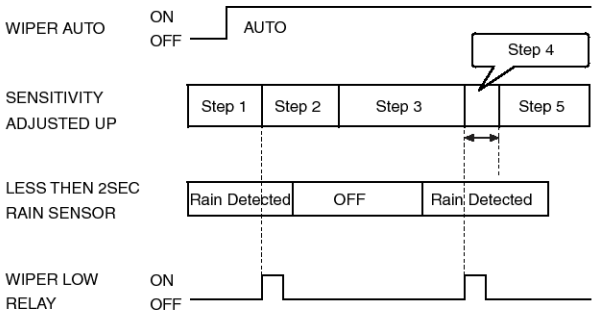
ETBF145E

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.



ETBF145F

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.



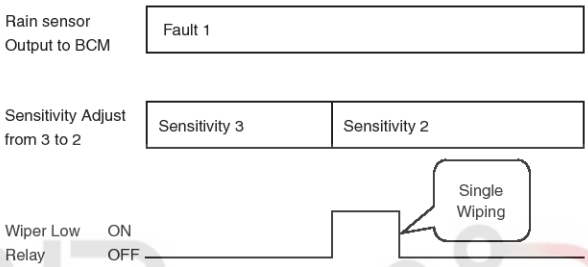
ETBF145G

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.

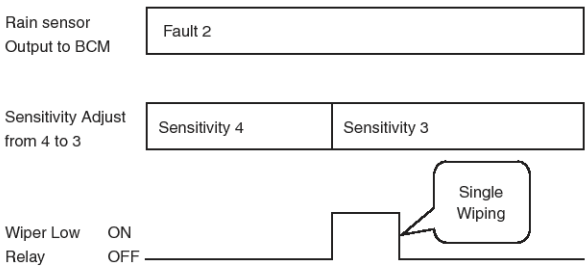


ETBF145H

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.



ETBF145I

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.

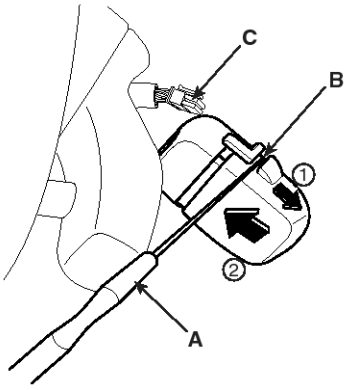
When this failure is detected, the wiper outputs are OFF.

Removal

CAUTION

The rain sensor may not operate proprly 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 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 (A).



ATIE365B

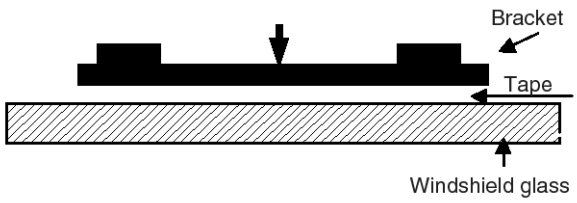
2. Remove the wiring harness connector from sensor.
3. Rain sensor module is attached to the front windshield by glue replacing the front windshield, remove the rain sensor module from the existing front windshield and install on the new front windshield.

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.



ETZE015I

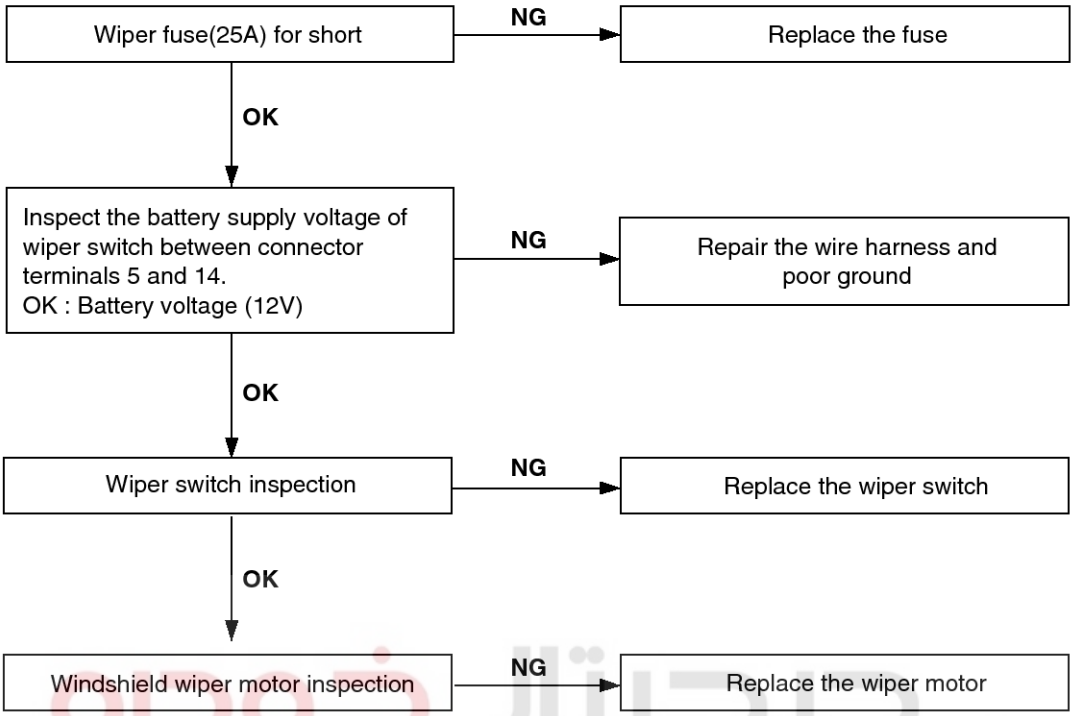
CAUTION

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.

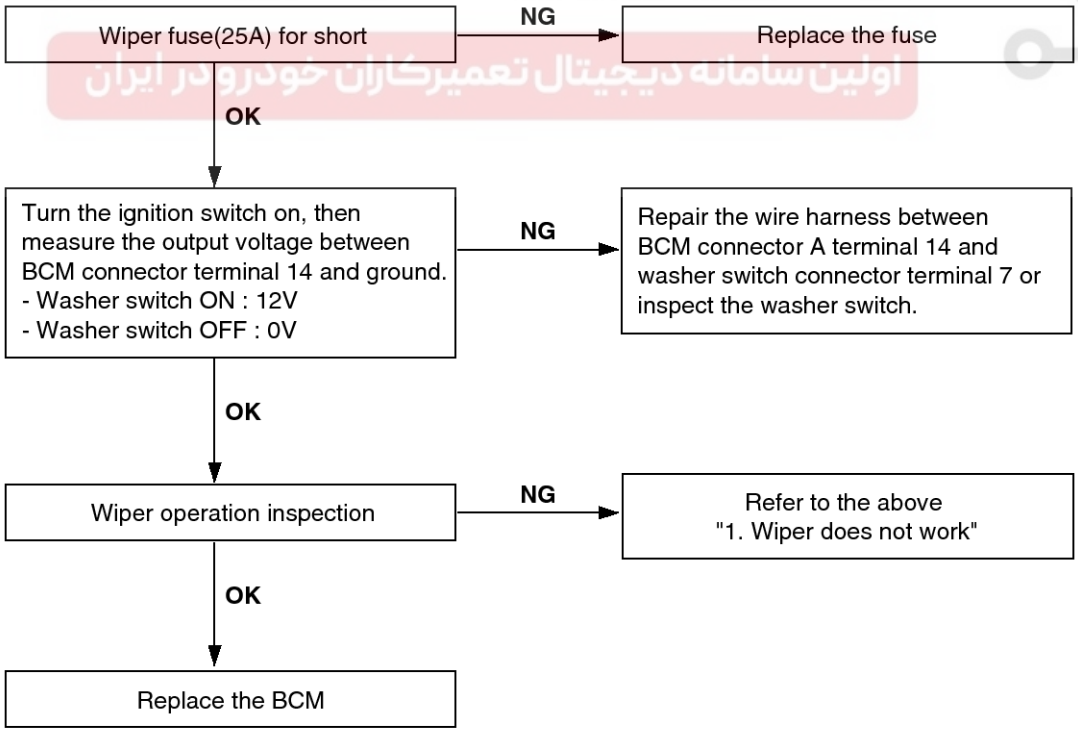
Troubleshooting

1. Wiper low and wiper high do not work.



LTLG900A

2. When washer switch is on, wiper does not work.



LTLG900B

Electro chromic Inside Rear View Mirror

Specification

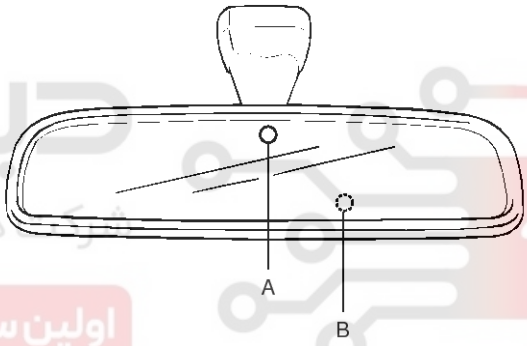
Items		Standard value
Rate voltage		+12V DC
Operating voltage range		+9 ~ +16V DC
Operating temperature range		-30°C ~ +65°C
Current consumption	Maintenance current	400mA max
	Ignition	1500mA max
	Reverse inhibit	15mA max
	Ground	1500mA max

Description

The electrochromatic rear view mirror detects the ambient light using a built-in sensor and adjusts the reflectability of the mirror to prevent excess light (such as the light emitted by a following vehicle's headlights) from reaching the driver's eyes during night driving. To allow for maximum vision while backing up, the electrochromatic functionality of the mirror is deactivated whenever the transaxle is in 'R' range.

LTLG410A

1. The front sensor (B) sees if the brightness of the surroundings is low enough for the mirror to operate its function.
2. The rear sensor (A) detects glaring of the reflecting light from a followint vehicle.
3. The ECM is darkened to the level as determined by the rear sensor (A). When the glaring is no longer detected, the mirror stops functioning.



ETRF410B

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.

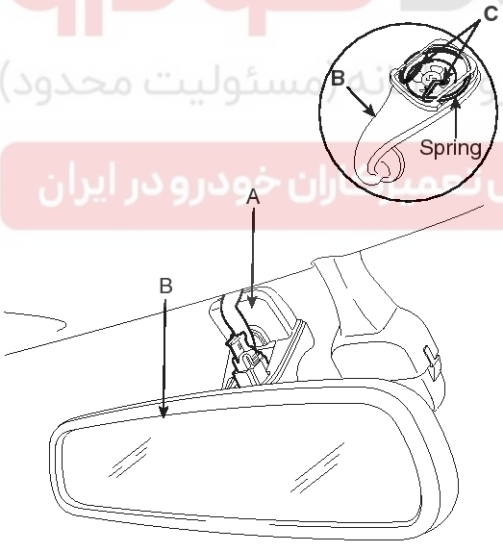
Removal

1. Push the inside rear view mirror base down to remove the inside rear view mirror assembly (A) after removing the mirror wire cover.

ATLG410C

NOTICE

Take care not to damage the mounting bracket during removal.



LTLG410D

Installation

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

Compass Mirror

Description

The compass feature is designed to be integrated into an electro chromic interior rearview mirror.

The mirror assembly shall display a compass heading.

The compass mirror then take the sensor information to determine static field strengths and rotating field information to determine an accurate compass heading.

Specification

Item	Standard value
Rate voltage	DC 12V
Operating voltage range	DC9 ~ 16V
Operating temperature range	-30 ~ +65°C
Direction display	8
Renewal time	2 sec.

Switch Point Accuracy

The compass module shall, while compensating for the vehicle magnetic fields, until the Earth's varying magnetic fields to determine direction.

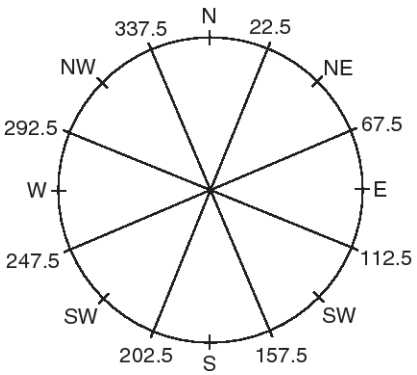
[Switch points]

Switch point	Heading ± 10°
N - NE	22.5
NE - E	67.5
E - SE	112.5
SE - S	157.5
S - SW	202.5
SW - W	247.5
W - NW	292.5
NW - N	337.5

NOTICE

There should be hysteresis at each switch point.

Switch points between the 8 cardinal directions, these switch points are ± 10°



ETQF241F

Compass Display Interval

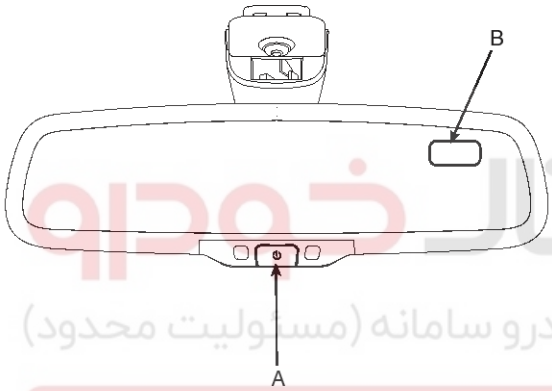
Compass display should be updated at every two seconds.

Function

The compass can be turned ON and OFF and will remember the last state when the ignition is cycled. To turn the display feature ON/OFF :

1. Press and release the feature control button (A) to turn the display feature OFF.
2. Press and release the feature control button (A) again to turn the display back ON.

   Additional options can be set with press and hold sequences of the feature control button (A) and are detailed below.



LTLG241C

There is a difference between magnetic north and true north. The compass in the mirror can compensate for this difference when it knows the magnetic zone in which it is operating. This is set either by the dealer or by the user.

Adjustment

Calibration Procedure

If the display read "C", calibrate the compass.

1. Driving the vehicle in a circle at less than 8km/h 3 times or until the compass heading appears.
2. Driving in a circle in right-handed direction and opposite direction are possible, and if the calibration is completed, the compass heading will appear.
3. Keep driving in a circle until a commpass heading appears.

To Adjust The Zone Setting :

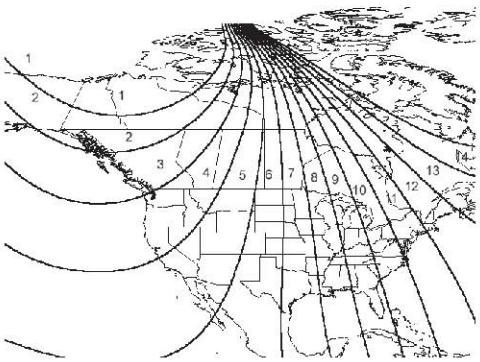
1. Determine the desired zone number based upon your current location on the zone maps.
2. Press and hold the Feature Control button for more than 6 but less than 9 seconds, the current zone number will appear on the display (B).
3. Pressing and holding the feature control button (A) again will cause the numbers to increment (Note: they will repeat …13, 14, 15, 1, 2,..). Releasing the button when the desired zone number appears on the display will set the new zone.
4. Within about 5 seconds the compass will start displaying a compass heading again.

To Re-calibrate The Compass :

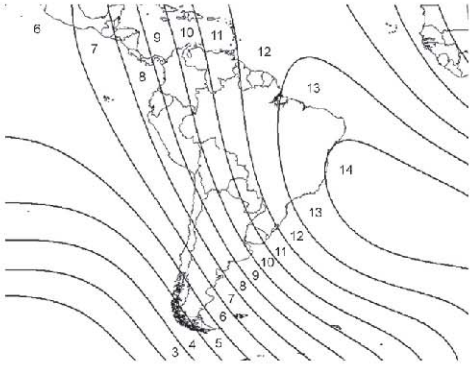
There are some conditions that can cause changes to the vehicle magnets. Items such as installing a ski rack or a antenna or even some body repair work on the vehicle can cause changes to the vehicle's magnetic field. In these situations, the compass will need to be re-calibrated to quickly correct for these changes.

1. Press and hold the feature control button (A) for more than 9 seconds. When the compass memory is cleared, a "C" will appear in the display (B).
2. To calibrate the compass, drive the vehicle is 2 complete circles at less than 8 KPH (5 MPH).

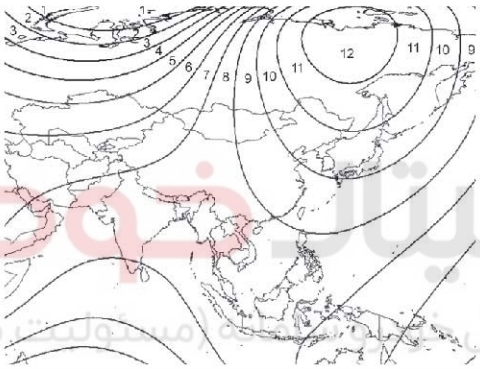
Zone Map



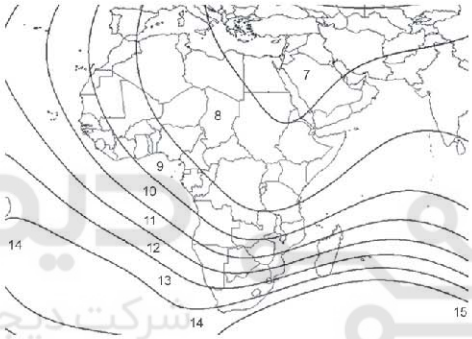
NORTH AMERICA



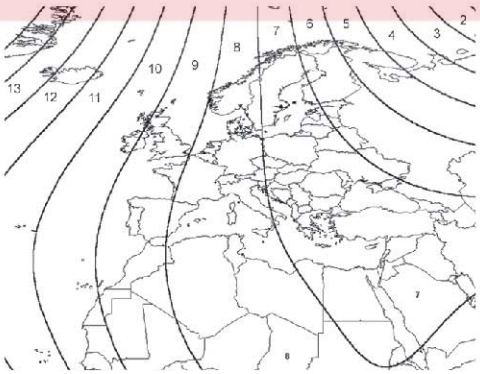
SOUTH AMERICA



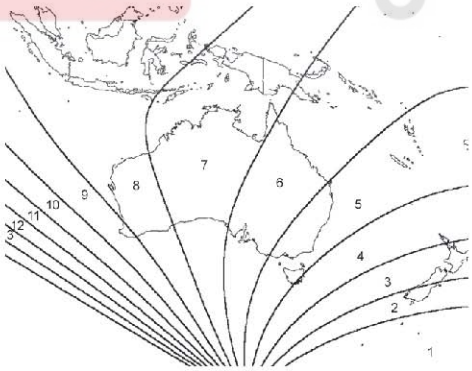
ASIA



AFRICA



EUROPE

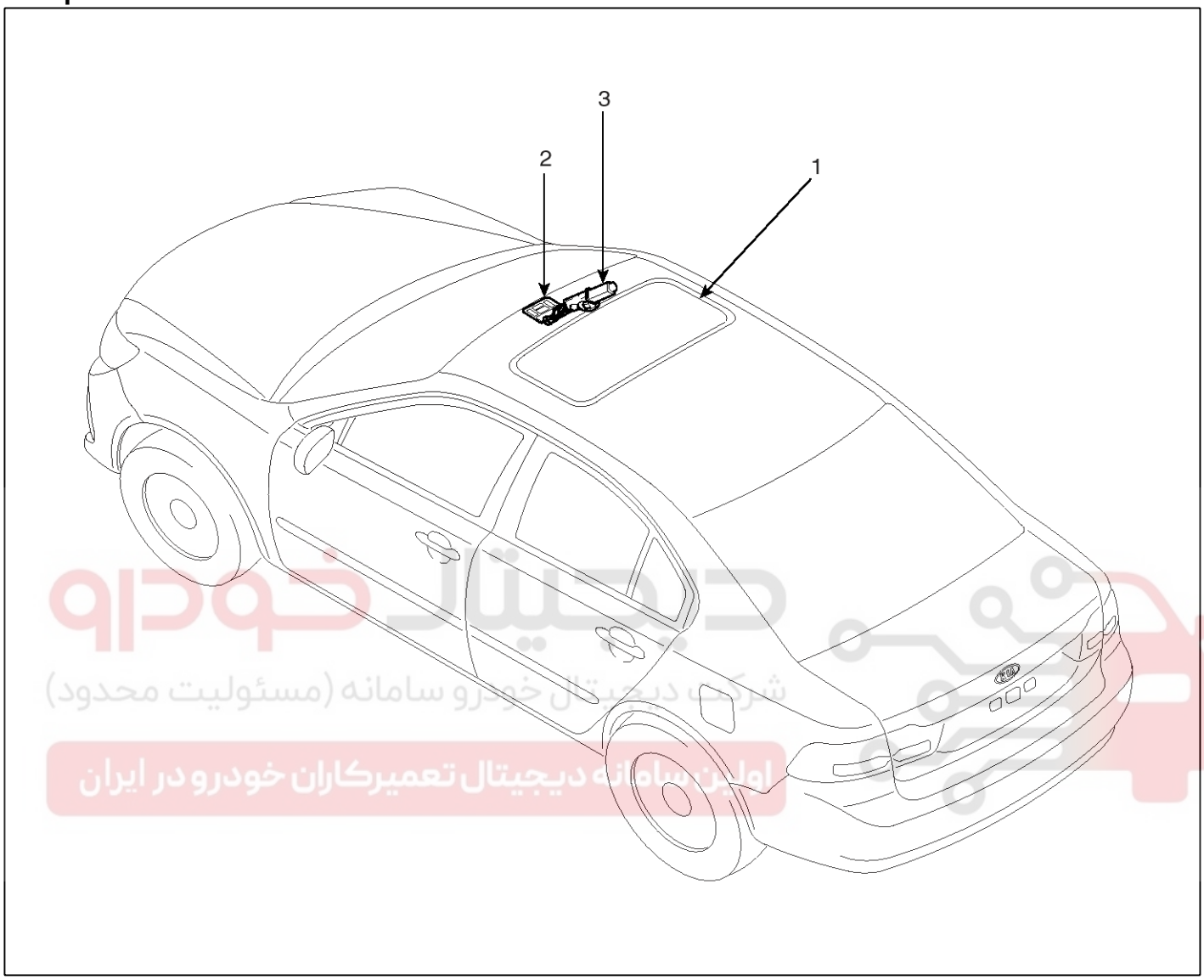


AUSTRALIA

ETQF241D

Sun Roof

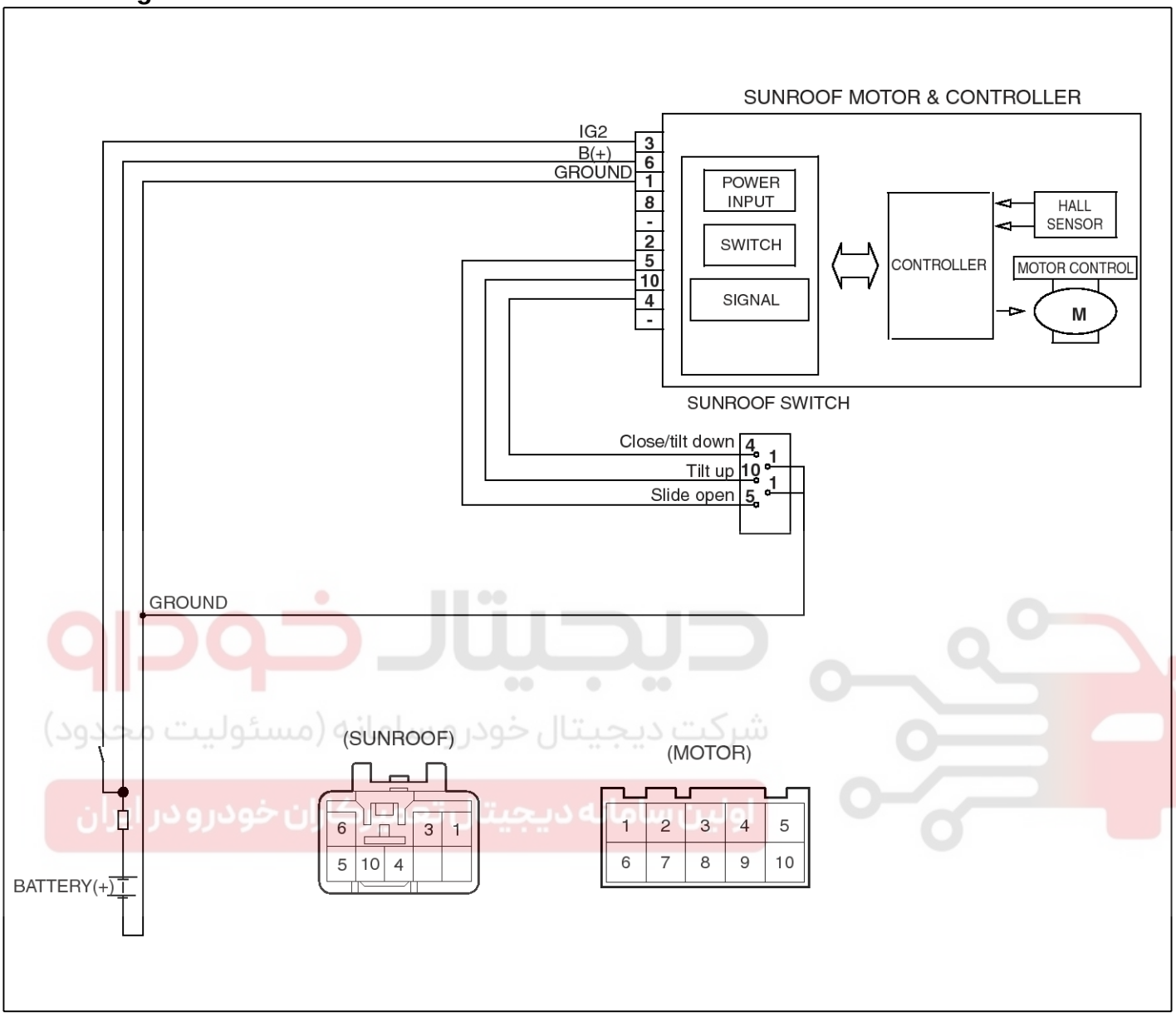
Component Location



SMGBE9027L

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

Circuit Diagram

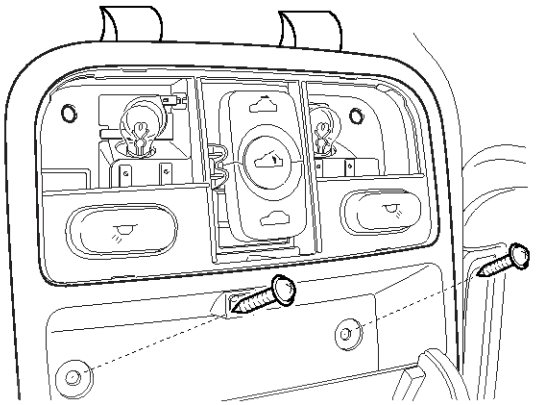


LTLG480B

Sunroof Switch

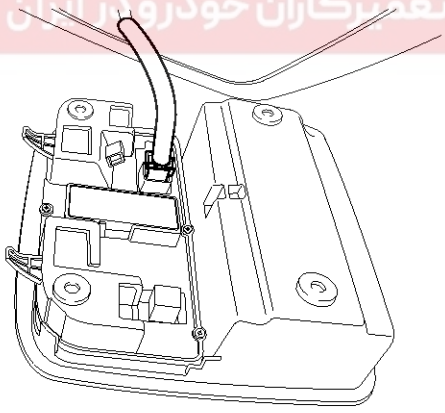
Inspection

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console.



ATLG481A

3. Disconnect the connector(16P) then remove the overhead console lamp assembly from the headliner. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.



ATLG481B

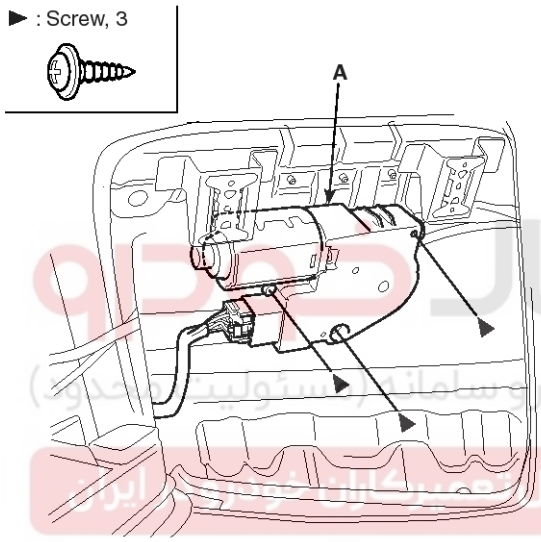
Position \ Terminal	1	4	5	10
Slide open	○		○	
Tilt down	○	○		
Tilt up	○			○

LTLG481D

Sunroof Motor

Removal

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console. Disconnect the connector then remove the overhead console lamp assembly from the headliner.
3. Remove the head lining. (Refer to Body group - sunroof)
4. Remove the sunroof motor (A) after removing 3 screws and disconnect.



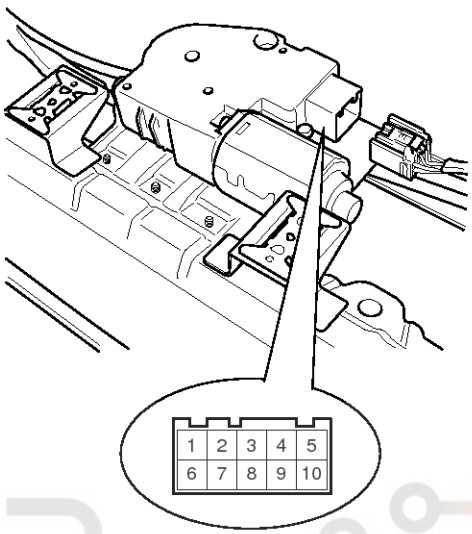
ETRF481D

Installation

1. Installation is the reverse of removal.

Inspection

1. Disconnect the negative (-) battery terminal.
2. Apply the battery voltage to terminal 3, 6 and ground the terminal 1.



KTQE460A

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

Position \ Terminal	1	4	5	10
Slide close/Tilt down	⊖	⊕		
Slide open	⊖		⊕	
Tilt up	⊖			⊕

LTLG483A

4. Make these input tests at the connector

   If any test indicates a problem, find and correct the cause, then recheck the system.

   If all the input tests prove OK, the sunroof motor must be faulty; replace it.

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

Resetting The Sunroof

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

1. Turn the ignition key to the ON position.
2. According to the position of the sunroof, do as follows.
   1) In case that the sunroof has closed completely or been tilted :

      Press the TILT UP button until the sunroof has tilted upward completely.
   2) In case that the sunroof has slide-opened:

      Press and hold the CLOSE button for more than 5 seconds until the sunroof has closed completely.

      Press and hold the CLOSE button for more than 5 seconds after the sunroof has closed completely. Press the TILT UP button until the sunroof has tilted upward completely.
3. Release the TILT UP button.
4. Press and hold the TILT UP button once again until the sunroof has raised above and returned to the maximum TILT UP position.

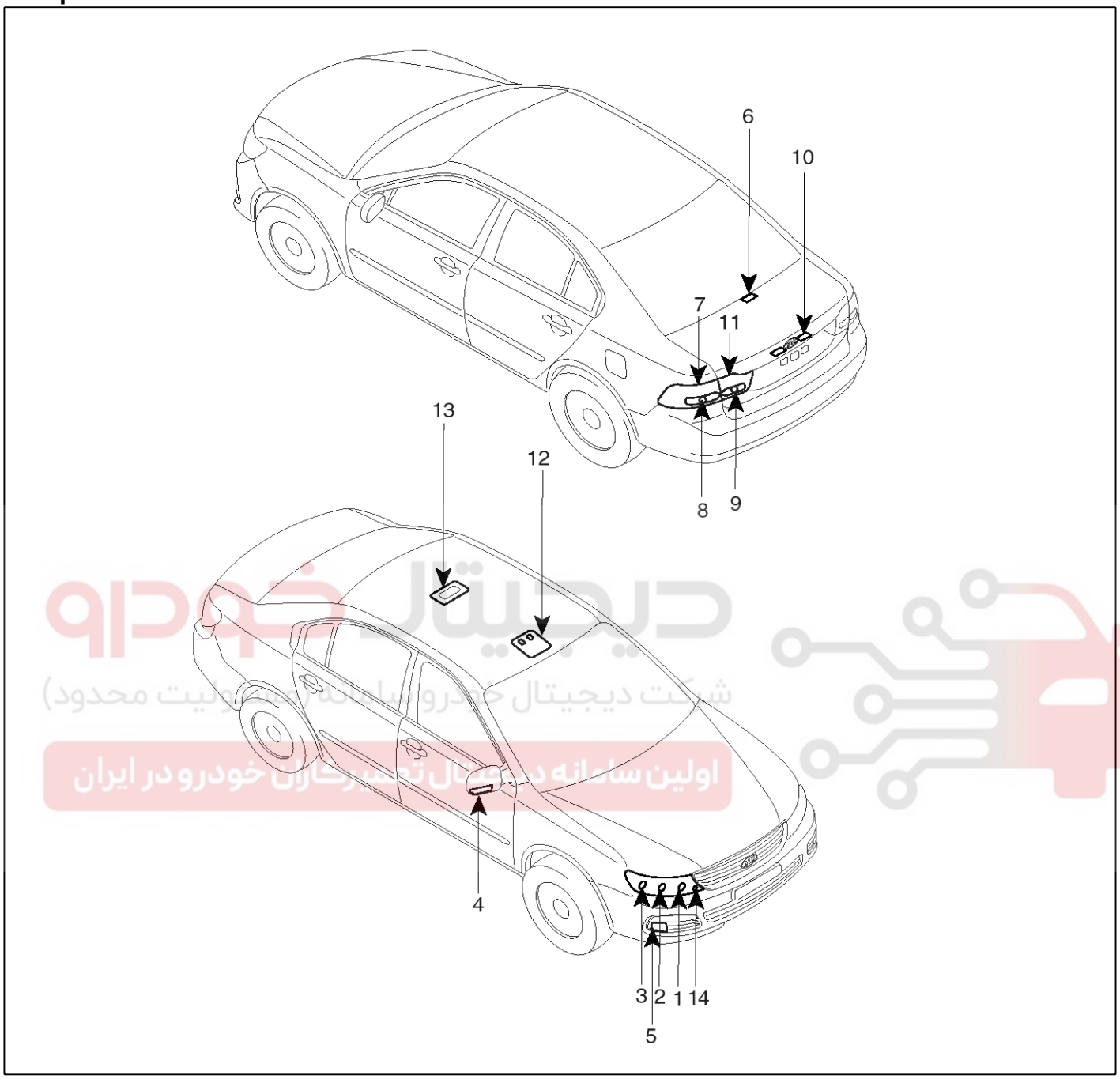
   When this is complete, the sunroof system is reset.

Lighting System

Specification

Items	Bulb Watt (W)
Head lamp (High/Low)	55/55
Front turn signal lamp	21
Front position lamp	5
Side repeater lights (If equipped)	5
Front fog lamp	27
Rear tail/stop lamp (Outside)	LED or 21/5
Rear tail lamp (Inner) - General	LED or 5
Back up lamp	16
Rear turn signal lamp	21
Rear fog lamp - Europe	21
License plate lamp	5
Side repeater	5
Room lamp	10
Overhead console lamp	10 x 2
High mounted stop lamp	LED or 16
Luggage lamp	5
Door courtesy lamp	5
Vanity lamp	5

Component Location



SMGBE9028L

1. Head lamp (High)
2. Head lamp (Low)
3. Front turn signal lamp
4. Side turn signal lamp
5. Front fog lamp
6. Luggage lamp
7. Tail/stop lamp
8. Rear turn signal lamp
9. Back up lamp
10. License plate lamp
11. Tail lamp
12. Overhead console lamp (Map lamp)
13. Room lamp
14. Position lamp

Head Lamps

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.

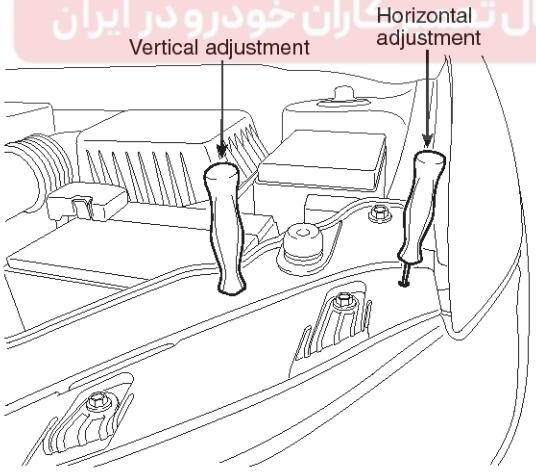
NOTICE

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.

   Make vertical and horizontal adjustments to the lower beam using the adjusting wheel.

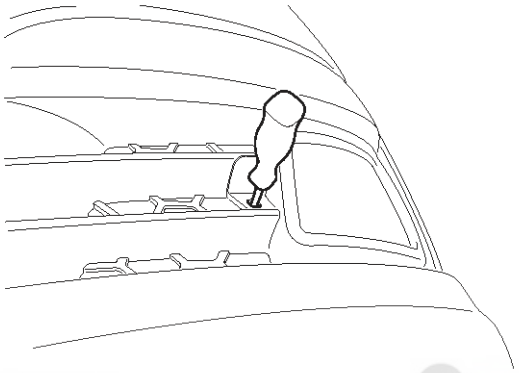


SMGBE9029L

Front Fog Lamp Aiming

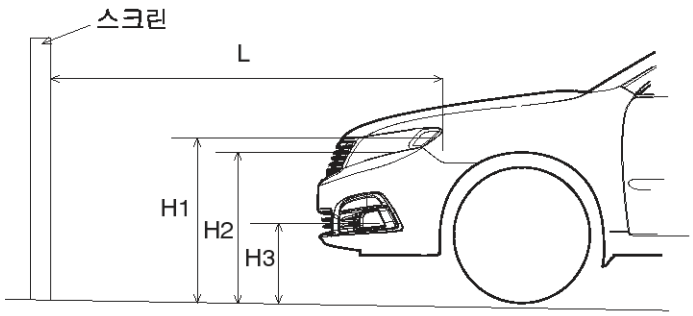
The front fog lamps should be aimed as the same manner of the head lamps aiming.

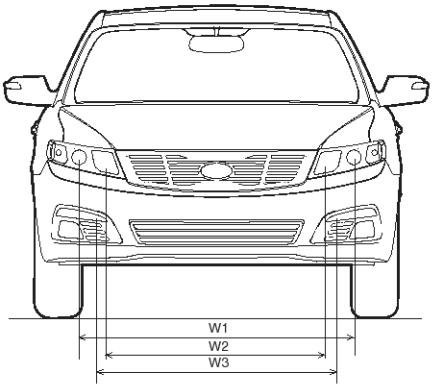
With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting screw with a driver (A).



SMGBE9108D

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

SMGBE9030L

Unit : in(mm)

Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	28.5(725)	27.8(706)	14.4(366)	52.8(1342)	43.5(1106)	56.6(1438)	Refer to aiming condition
With driver	28.2(717)	27.5(698)	14.1(358)	52.8(1342)	43.5(1106)	56.6(1438)	Refer to aiming condition

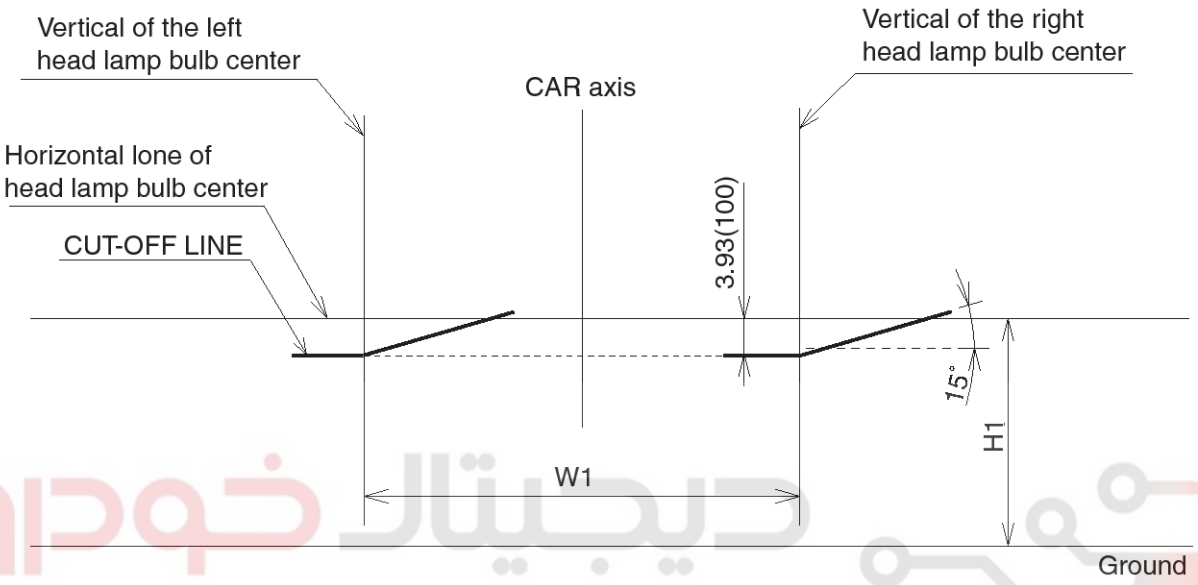
SMGBE9031L

1. Turn the low beam on without driver aboard.

   The cut-off line should be projected in the allowable range (shaded region).

   If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.

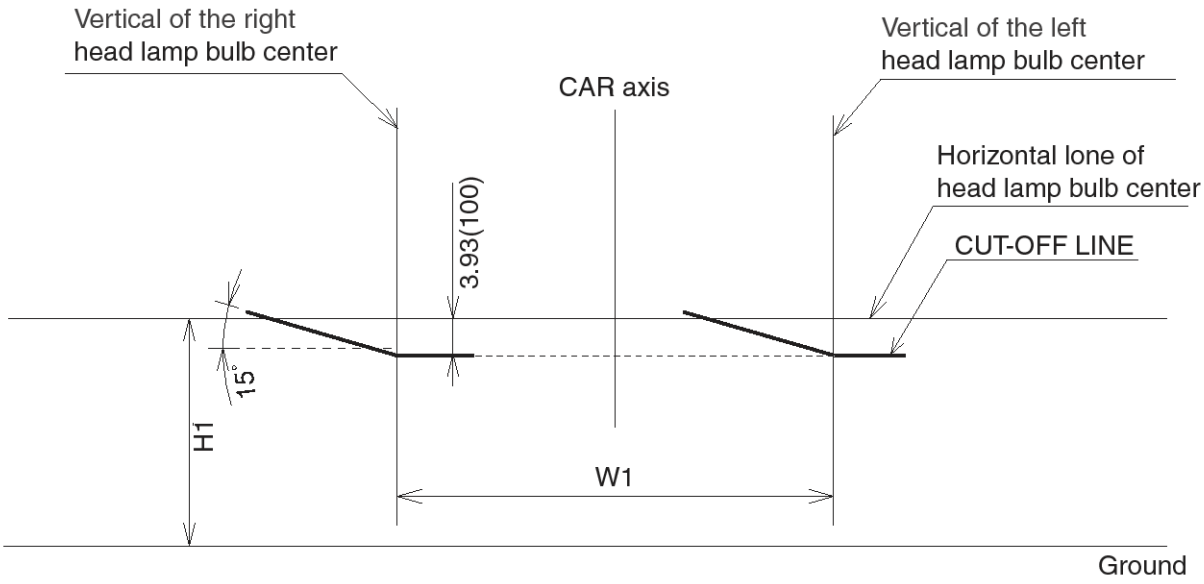
[LHD]



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

SMGBE9032L

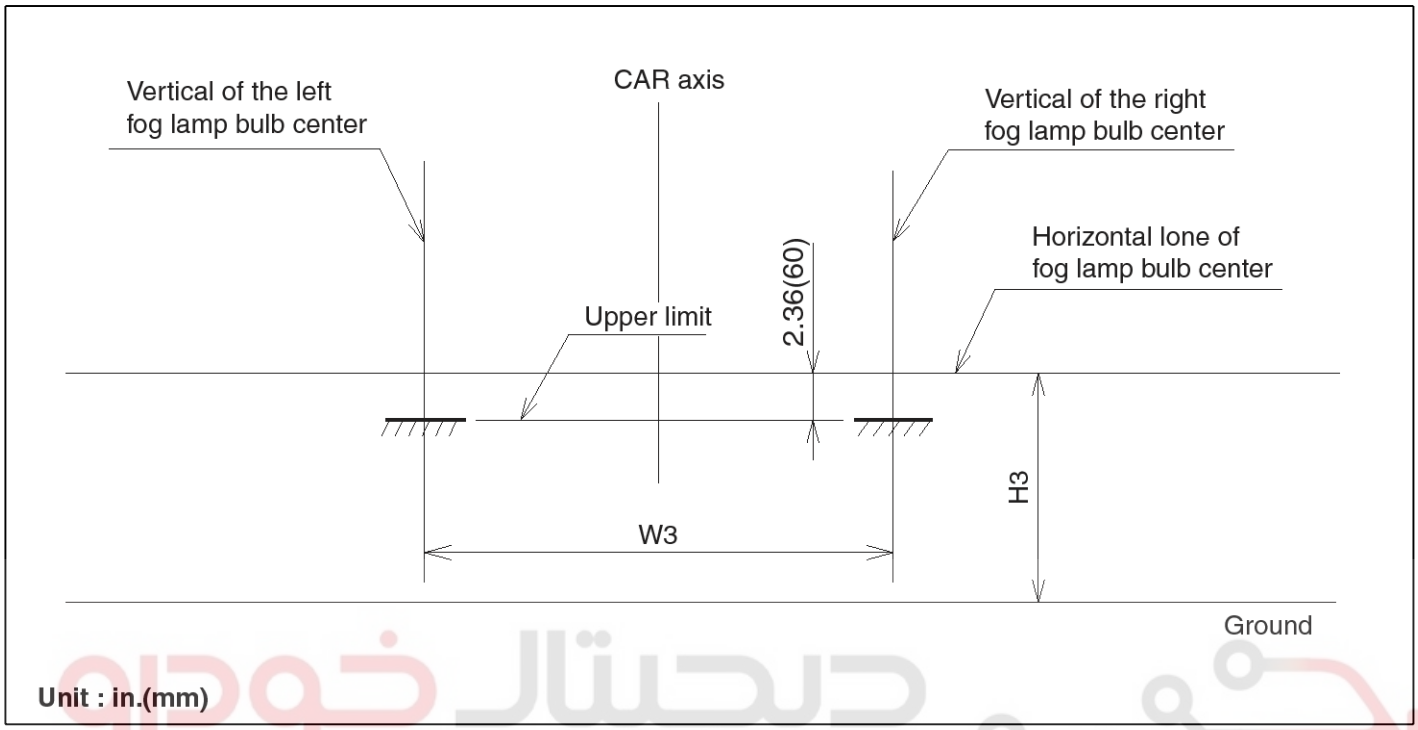
[RHD]



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

SMGBE9033L

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

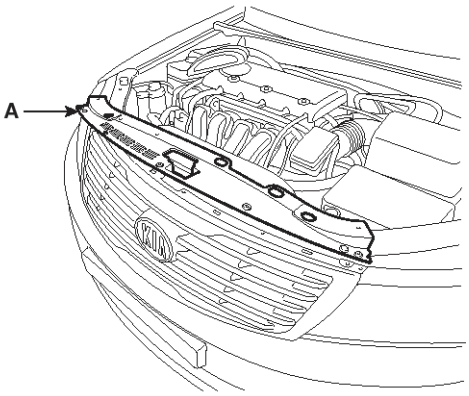


Unit : in.(mm)

SMGBE7495L

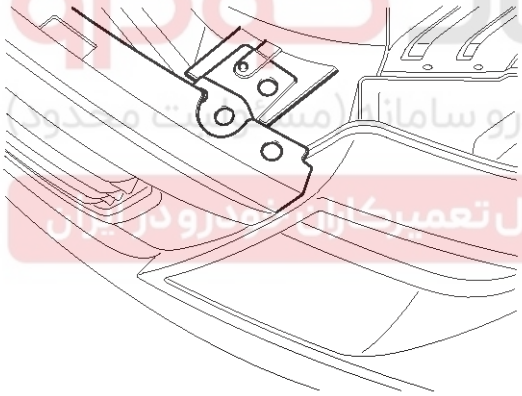
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the radiator under cover (A). (Refer to body group - front bumper)

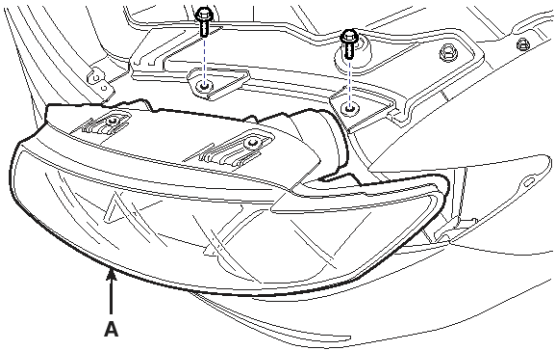


SMGBE9042D

3. Remove the head lamp (A) after loosening the interfered radiator grill bolt.



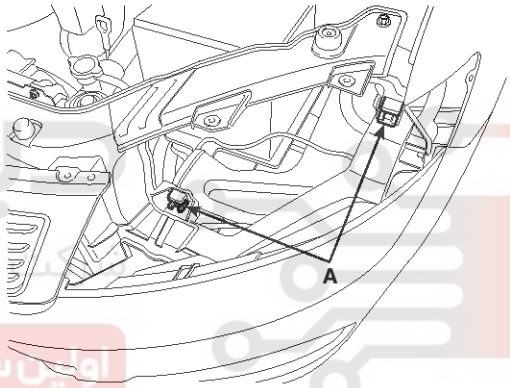
SMGBE9043D



SMGBE9101D

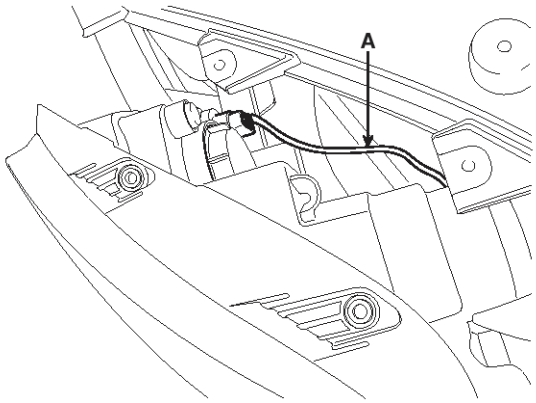
NOTICE

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



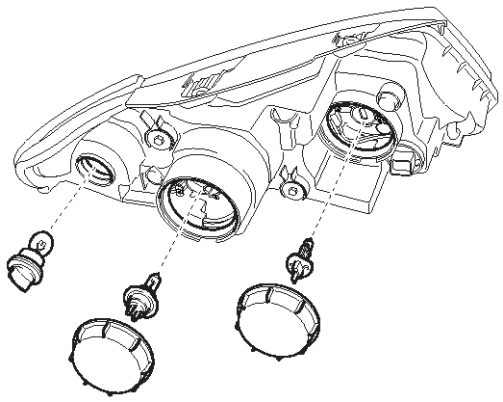
SMGBE9102D

4. Disconnect the head lamp connector.



SMGBE9104D

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



SMGBE9103D

Installation

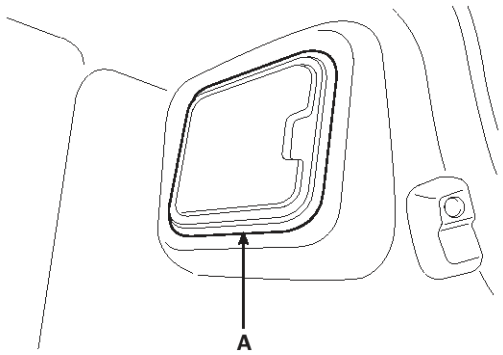
1. Install the head lamp assembly after connecting the connector.
2. Install the radiator under cover.
3. Connect the negative (-) battery terminal.

Rear combination lamp

Removal

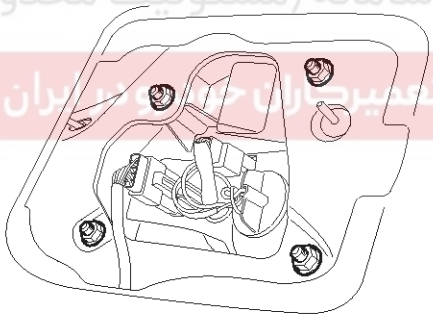
Rear Combination Outside Lamp

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



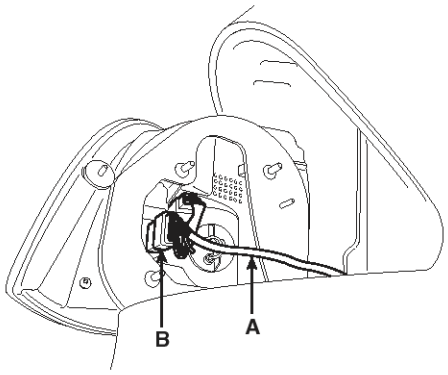
SMGBE9104L

3. Remove the rear combination lamp (Outside) fixing nuts (4EA).



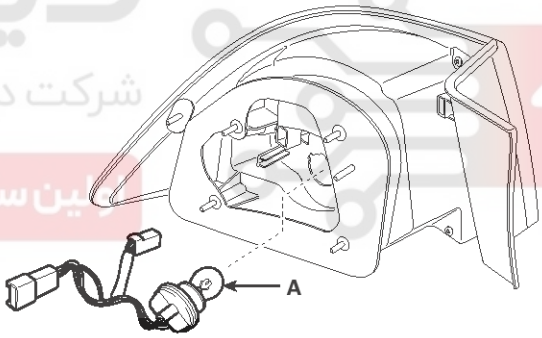
SMGBE9110D

4. Remove the outside rear combination lamp (A) and connector (B).



SMGBE9111D

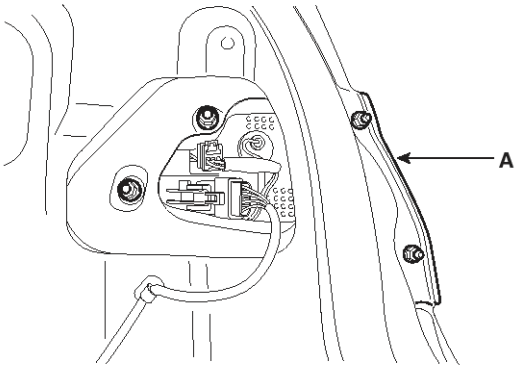
5. Replace the bulbs (A). (Replace the lamp assembly when the LED is out of order)



SMGBE9112D

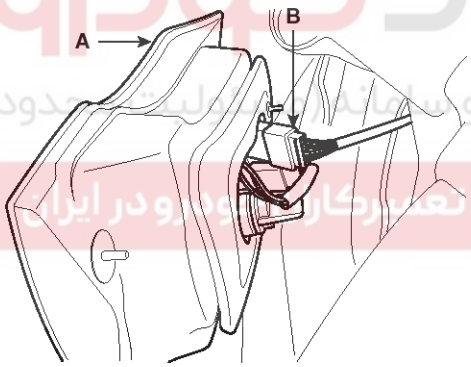
Rear Combination Inside Lamp

1. Disconnect the negative (-) battery terminal.
2. Loose the bolts holding the rear combination inside lamp (A).



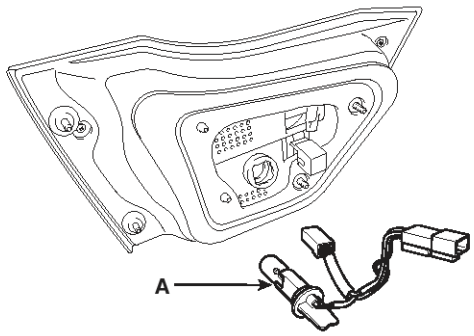
SMGBE9103L

3. Remove the connector (B) and rear combination inside lamp (A).



SMGBE9114D

4. Replace the bulbs (A). (Replace the lamp assembly when the LED is out of order)



SMGBE9105L

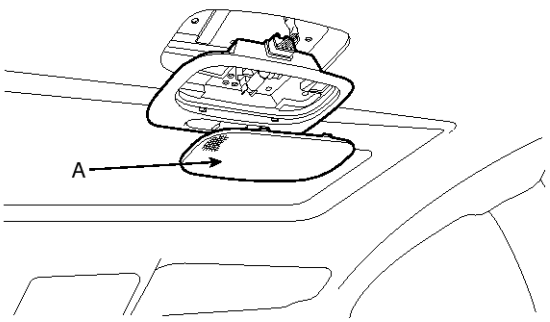
Installation

1. Install the rear combination outside lamp assembly.
2. Install the rear combination inside lamp assembly.

Room Lamp

Removal

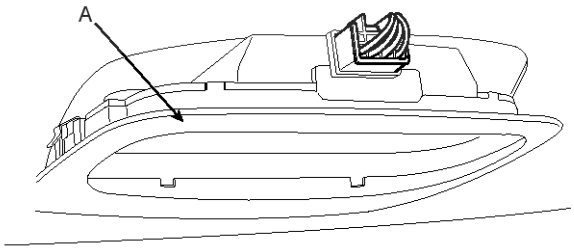
1. Disconnect the negative (-) battery terminal.
2. Detach the lamp lens (A) from the room lamp with a flat-tip screwdriver then replace the bulb.



ATLG491N

3. Remove the room lamp assembly after removing 2 bolts and disconnecting the 4P connector (Standard type).

   Remove the room lamp assembly (A) by using the scraper and then disconnect the 4P connector (Sunroof type).



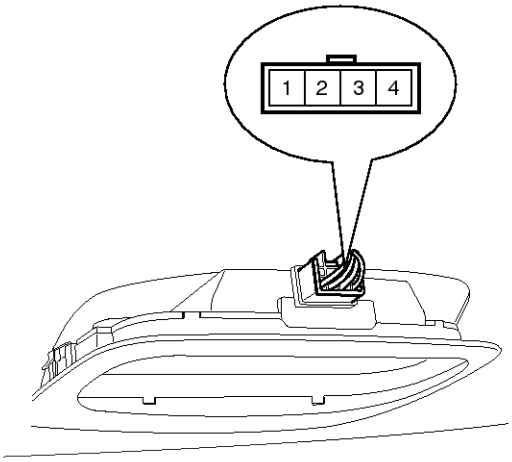
ATLG491O

Installation

1. Connect the connector and install the room lamp.
2. Install the lamp lens.

Inspection

Remove the room lamp assembly then check for continuity between terminals.



ATLG491P

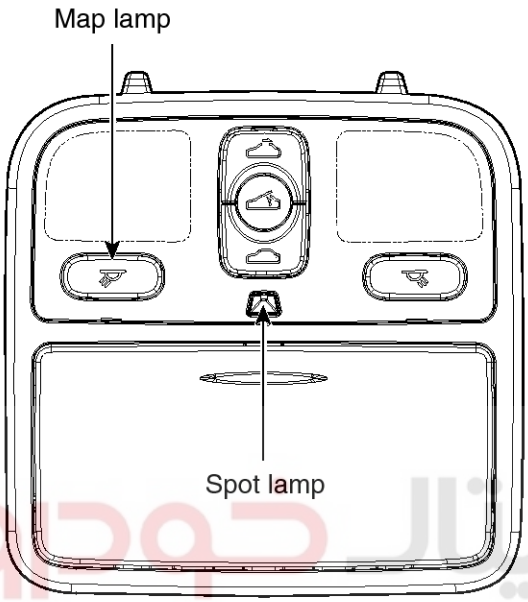
Terminal / Position	1	2	3
ON		●	●
DOOR	●	●	
OFF			

LTIF491K

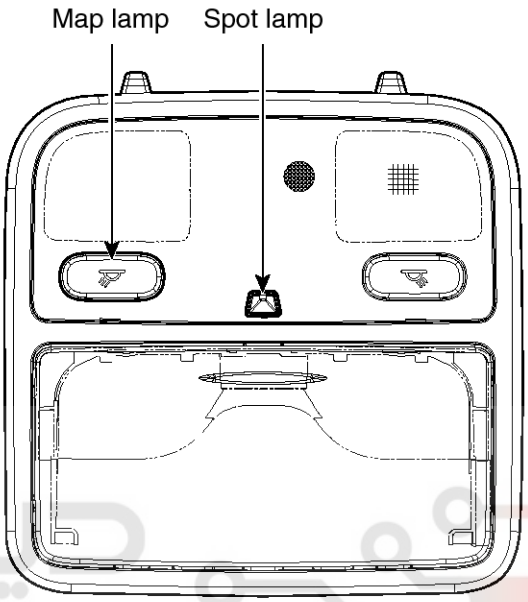
Overhead Console Lamp

Components

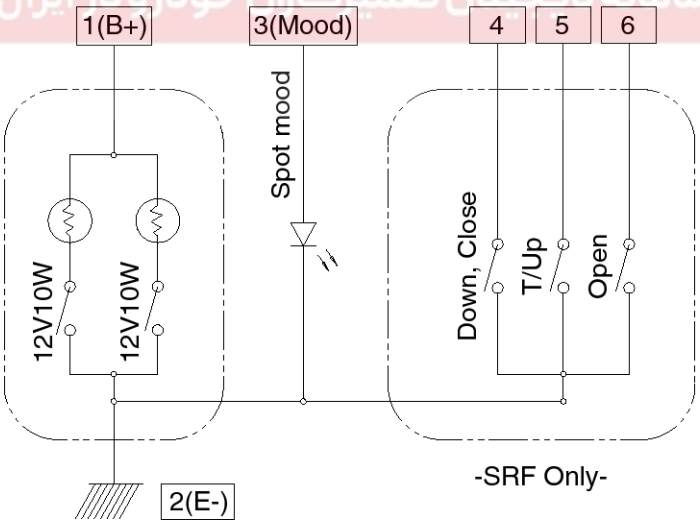
[With Sunroof]

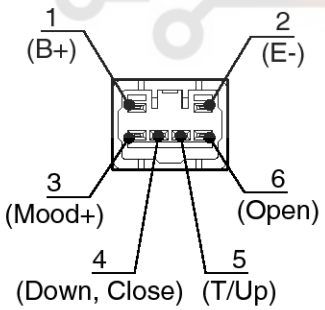


[Without Sunroof]



[Circuit diagram]



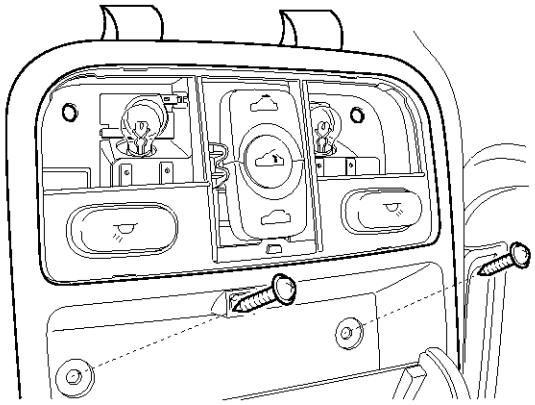


Pin no.	1	2	3	4	5	6
N/S/Roof	O	O	O	–	–	–
S/Roof	O	O	O	O	O	O

SMGBE0002L

Removal

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover then remove the 2 screws holding the overhead console.



SMGBE0001D

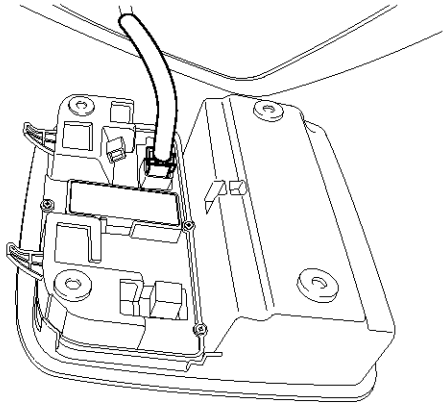
3. Disconnect the connector (8P) of sunroof switch then remove the overhead console lamp assembly from the headliner.

Installation

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

Inspection

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



ATLG481B

Description / Position / Terminal	Map lamp switch			
	Left		Right	
	ON	OFF	ON	OFF
1	●		●	
2	●		●	

LTLG007M

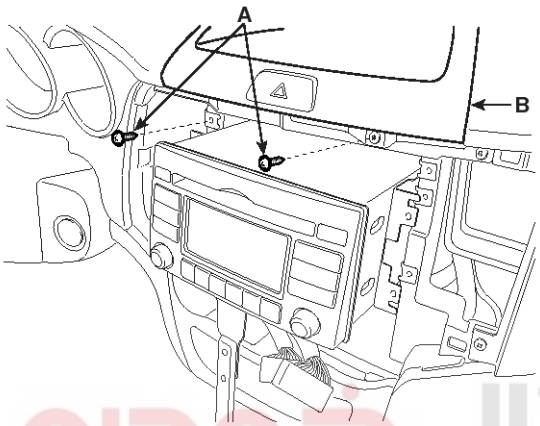
※ Spot lamp is alway ON in ACC position.
(Regardless of Day/Night)

Hazard Lamp Switch

Inspection

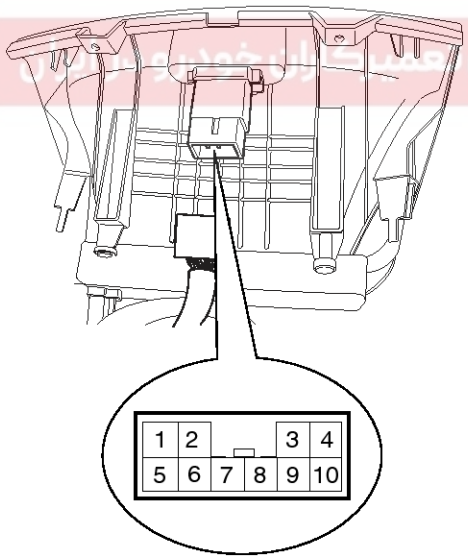
Hazard Lamp Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel. (Refer to Body group - crash pad).
3. Remove the center facia upper panel (B) after loosening the screws (A).



SMGBE9010D

4. Disconnect the connectors.



ATLG495A

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

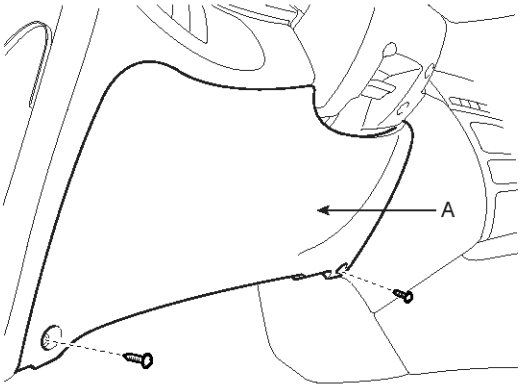
Terminal / Position	2	3	6	9	10	5	7	8
OFF						○	○	○
ON	Illumination		○	○	○		○	○

LTIF491M

Flasher Unit

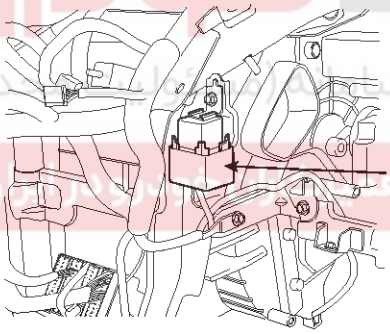
Inspection

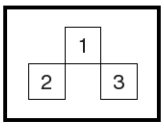
1. Disconnect the negative (-) battery terminal.
2. Remove the driver crash pad lower panel (A).



SMGBE9035D

3. Remove the flasher unit (A) after loosening the bolt and disconnecting the connector.





ATLG495E

4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.
5. Connect the two turn signal lamps in parallel to terminals 1 and 3. Check that the bulbs turn on and off.

NOTICE

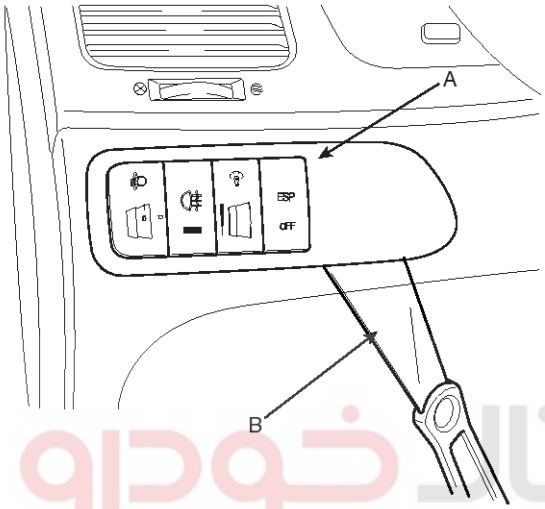
The turn signal lamps should flash 60 to 120 times per minute. If one of the front or rear turn signal lamps has an open circuit, the number of flashes will be more than 120 per minute. If operation is not as specified, replace the flasher unit.

Rheostat

Inspection

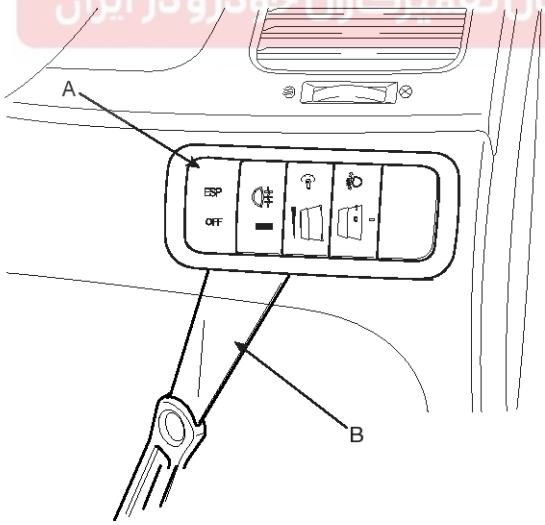
1. Disconnect the negative (-) battery terminal.
2. Remove the lower crash pad switch (A) from the side crash pad cover by using the scraper (B) and then disconnect the connectors.

[LHD]



LTLG453A

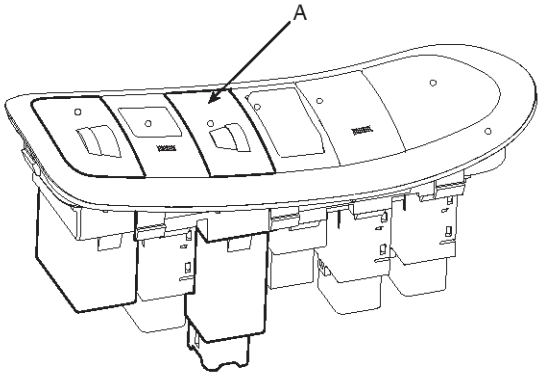
[RHD]



LTLG453B

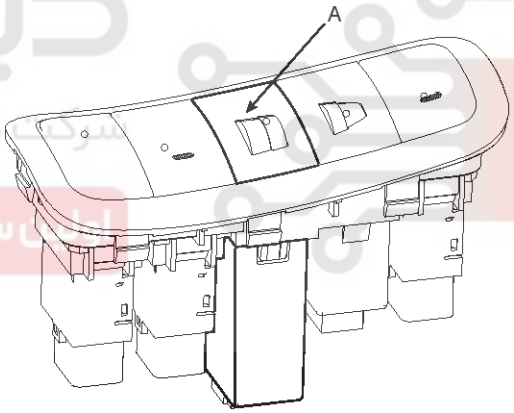
3. Remove the rheostat (A) from lower crash pad switch.

[LHD]



LTLG453C

[RHD]



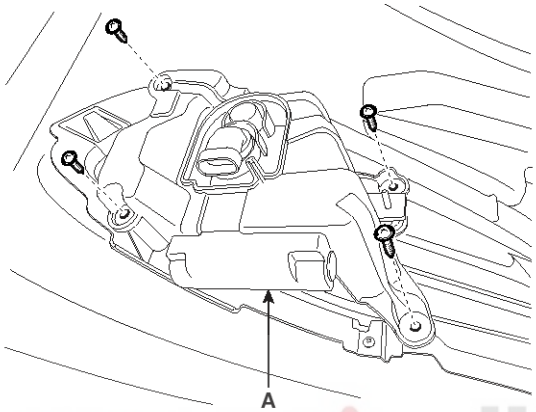
LTLG453D

4. Check for intensity. If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is normal.

Front Fog Lamps

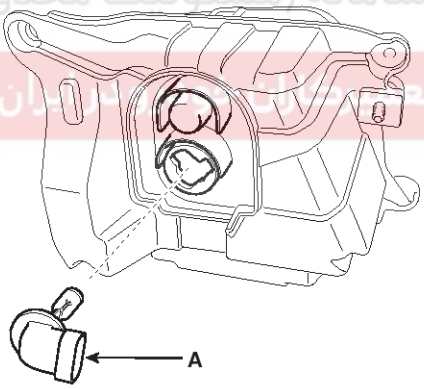
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper (Refer to the body group - front bumper).
3. Remove the front fog lamp (A) after loosening the screws and disconnecting the fog lamp connector.



SMGBE9106D

4. Replace the front fog bulb(A).



SMGBE9107D

5. Installation is the reverse of removal.

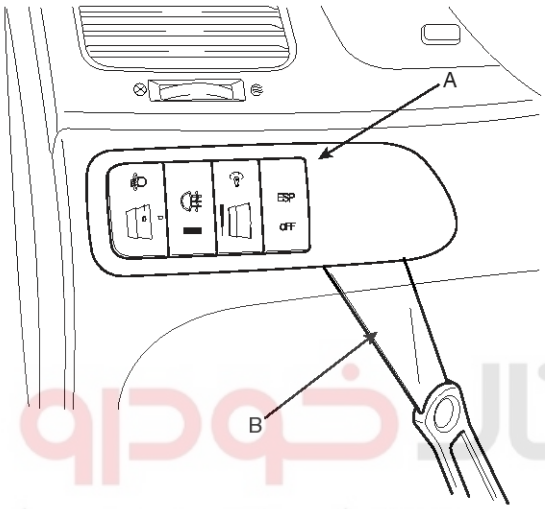
Rear Fog Lamps

Inspection

Rear Fog Lamp Switch

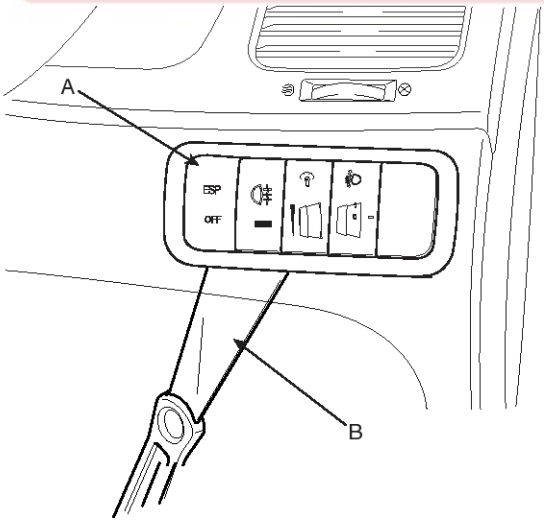
1. Disconnect the negative (-) battery terminal.
2. Remove the lower crash pad switch (A) from the side crash pad cover (B) by using the scraper (C) and then disconnect the connectors.

[LHD]



LTLG453A

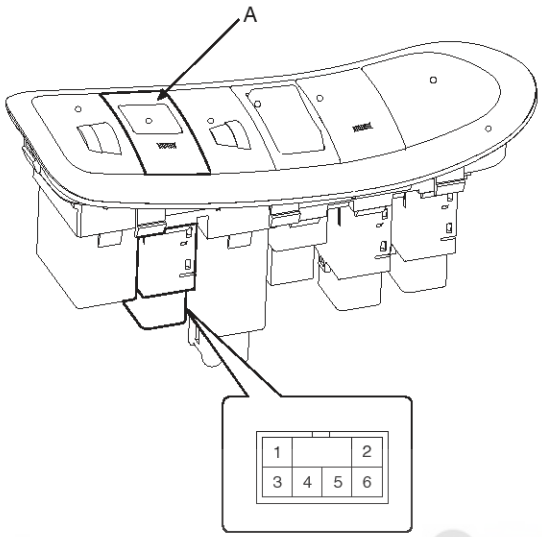
[RHD]



LTLG453B

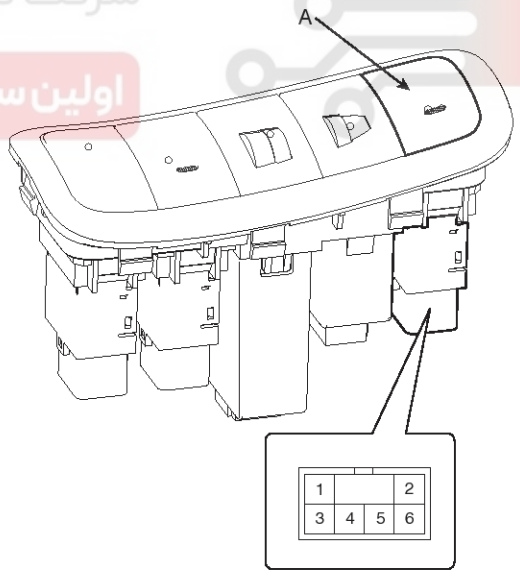
3. Remove the rear fog lamp switch (A) from lower crash pad switch.

[LHD]



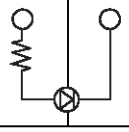
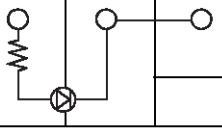
LTLG497B

[RHD]



LTLG497C

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

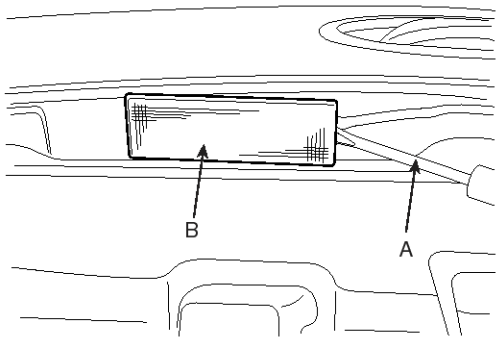
Terminal / Position	2	5	1	4	3
ON(PUSH)					
OFF(FREE)					

LTLG441B

License Lamps

Removal

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



KTRE498A

3. Replace the bulb.

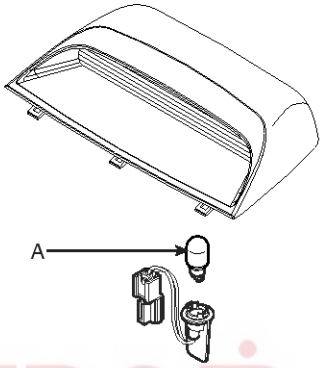
Installation

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

High Mounted stop lamp

Removal

1. Disconnect the negative(-) battery terminal.
2. Open the trunk lid and then disconnect the connector of high mounted stop lamp.
3. Remove the package tray (Refer to the Body group-package tray).
4. Replace the bulb(A) from the package tray.



ETRF499A

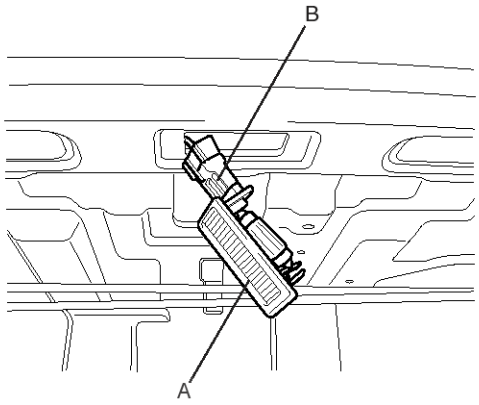
Installation

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

Trunk Lamps

Removal

1. Disconnect the negative (-) battery terminal.
2. Open the trunk lid, then remove the trunk room lamp (A) with a flat-tip screwdriver and disconnect the 2P connector (B).



ATGE499B

3. Replace the bulb.

Installation

1. Install the bulb.
2. Install the trunk lamp lens.

Troubleshooting

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

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

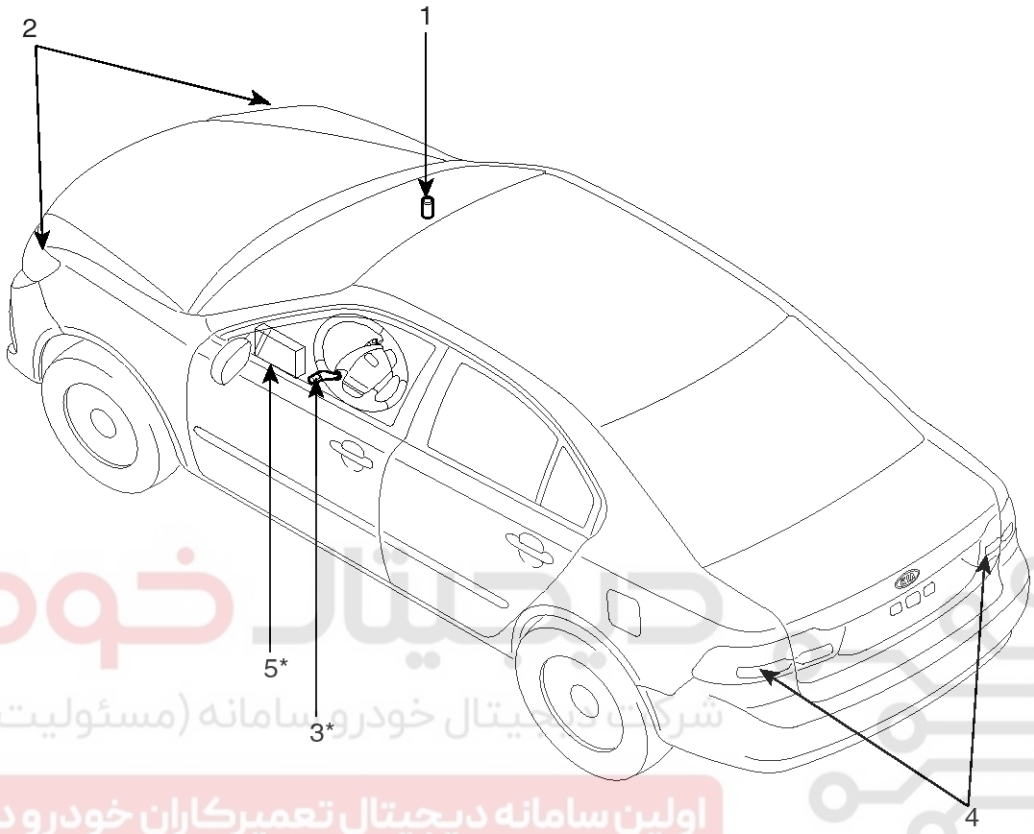
Auto Lighting Control System

Specifications

Items		Specifications
Rated voltage		5V
Load		Max. 1mA
Detection illuminations	Tail lamp	ON : 0.81 ±0.08 (V) OFF : 1.41 ±0.10 (V)
	Head lamp	ON : 0.81 ±0.08 (V) OFF : 1.41 ±0.10 (V)

Component Location

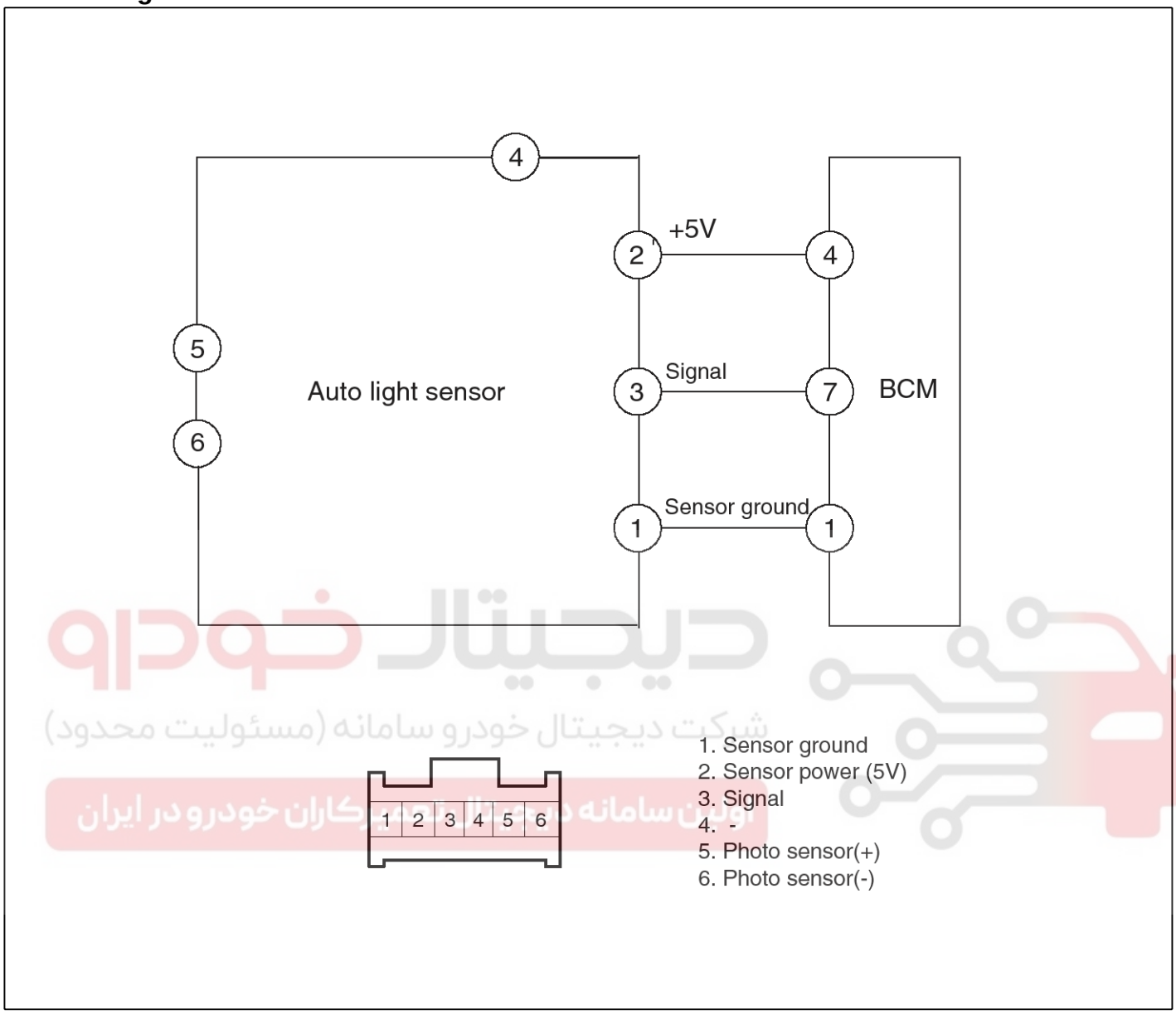
The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE9034L

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

Circuit Diagram



ETRF510B

Description

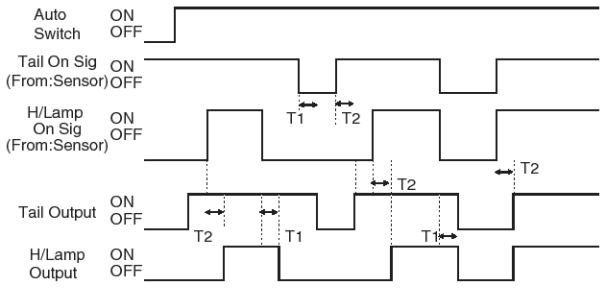
The auto light control system operates by using the auto light switch.

If you set the multi-function switch to "AUTO" position, the tail lamp and head lamp will be turned automatically on or off according to external illumination.

Inspection

1. While operating the auto light switch, check if the operations are normal as shown in the timing chart.
2. If operations are abnormal, check the body control module.
   1) AUTO LIGHT SENSOR value is always read at IGN1 ON.
   2) LIGHT is turned ON after 2.5sec±0.2sec when AUTO LIGHT SENSOR value is same as LIGHT ON input value.
   3) LIGHT is turned OFF after 2.5sec±0.2sec when SENSOR valueis same as LIGHT OFF input value.
   4) Tail Lamp Signal & H/LAMP signal is output when HEAD LAMP OUTPUT is ON.
   5) When HEAD LAMP is turned OFF, HEAD LAMP signal output is immediately stopped if Tail switch off condition is met at AUTO LIGHT SW ON.
   6) When it's HEAD LAMP ON furniture condition at movement in AUTO SW ON location at HEAD LAMP SW ON location, HEAD LAMP output is maintained with the pear which is carelessly.
   7) The case that HEAD LAMP twinkles and isn't when moving SW during HEAD LAMP ON operation to the HEAD LAMP SW location at the AUTO location by AUTO LIGHT.

	Tail Lamp	Head Lamp
ON	0.81V±0.08V	Same as tail sensor value
OFF	1.41V±0.10V	Same as tail sensor value



SMGBE9089L

T1 : 2.5s ± 0.2s

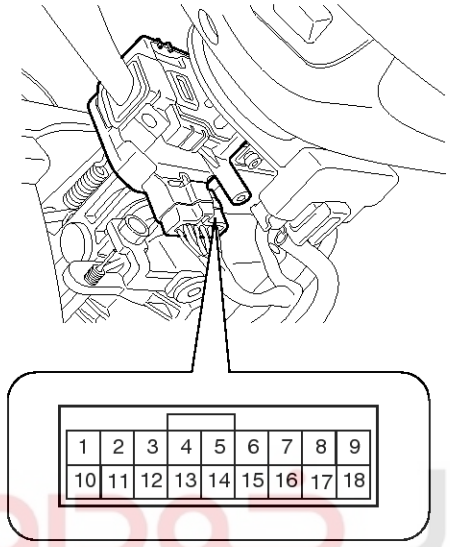
T2 : 2.5s ± 0.2s

Auto Light Switch

Inspection

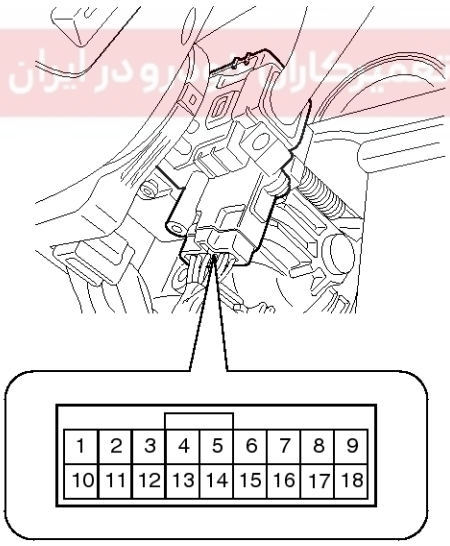
Operate the auto light switch, then check for continuity between terminals of 18P multi-function switch connector.

[LHD]



KTRE031E

[RHD]



KTRE031M

[LHD]

Terminal / Position	14	15	16	17
OFF				
I	○			○
II	○	○		○
AUTO			○	○

LTGE031E

[RHD]

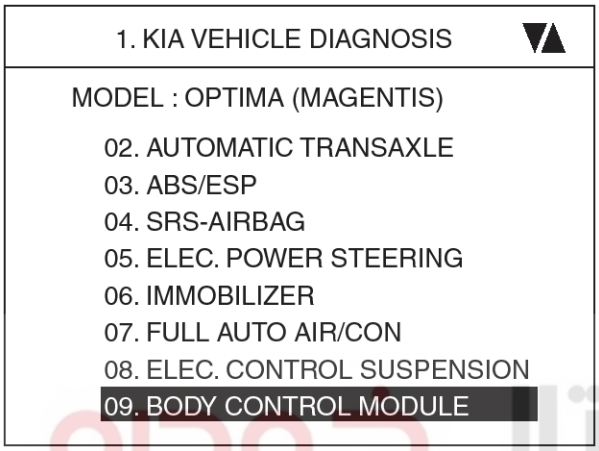
Terminal / Position	13	14	15	16
OFF				
I	○			○
II	○	○		○
AUTO			○	○

ETRF031N

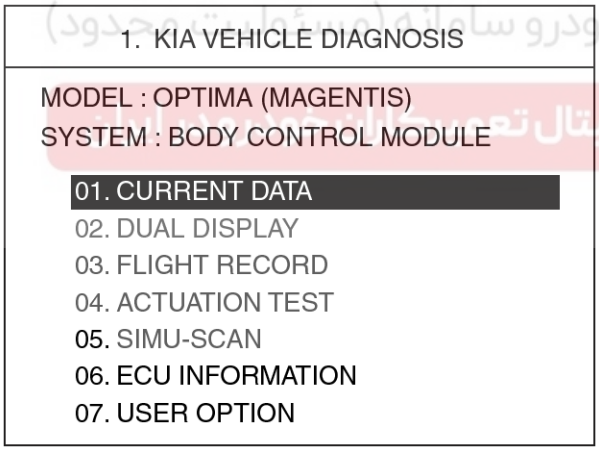
Auto Light Sensor

Inspection

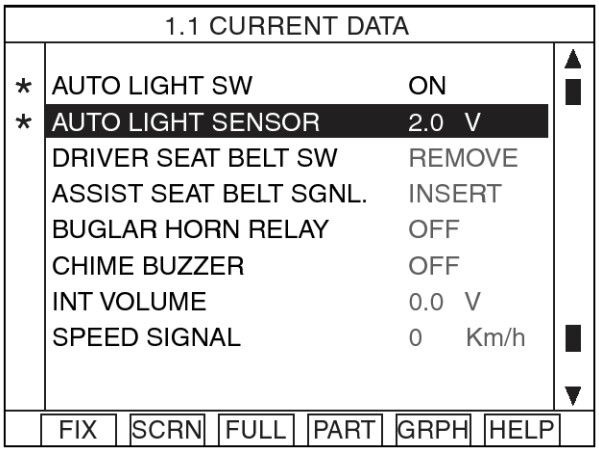
1. Ignition "ON"
2. Using the scan tool.
3. Emit intensive light toward auto light sensor using sunshine, and check the output voltage change.
4. The voltage will rise with higher intensive light and reduce with lower intensive light.



LTLG144A



LTLG144B

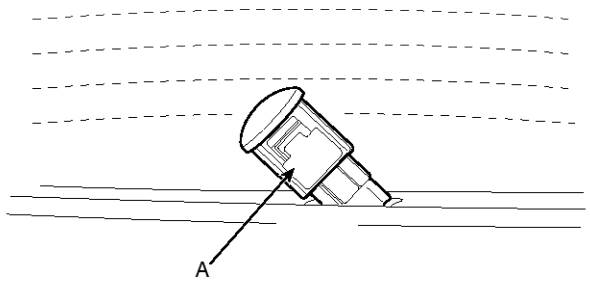


ETRF513C

NOTICE

When checking auto light sensor, select a place where sun shines directly on it.

5. If the measured resistance is not specification, substitute with a known-good auto light sensor and check for proper operation.
6. If the problem is corrected, replace the auto light sensor.
7. Remove the photo & auto light sensor (A) from the upper crash pad.



ATLG973A

8. Disconnect the 6P connector from the auto light sensor then inspect the connector on the wire harness side, as shown in the chart.

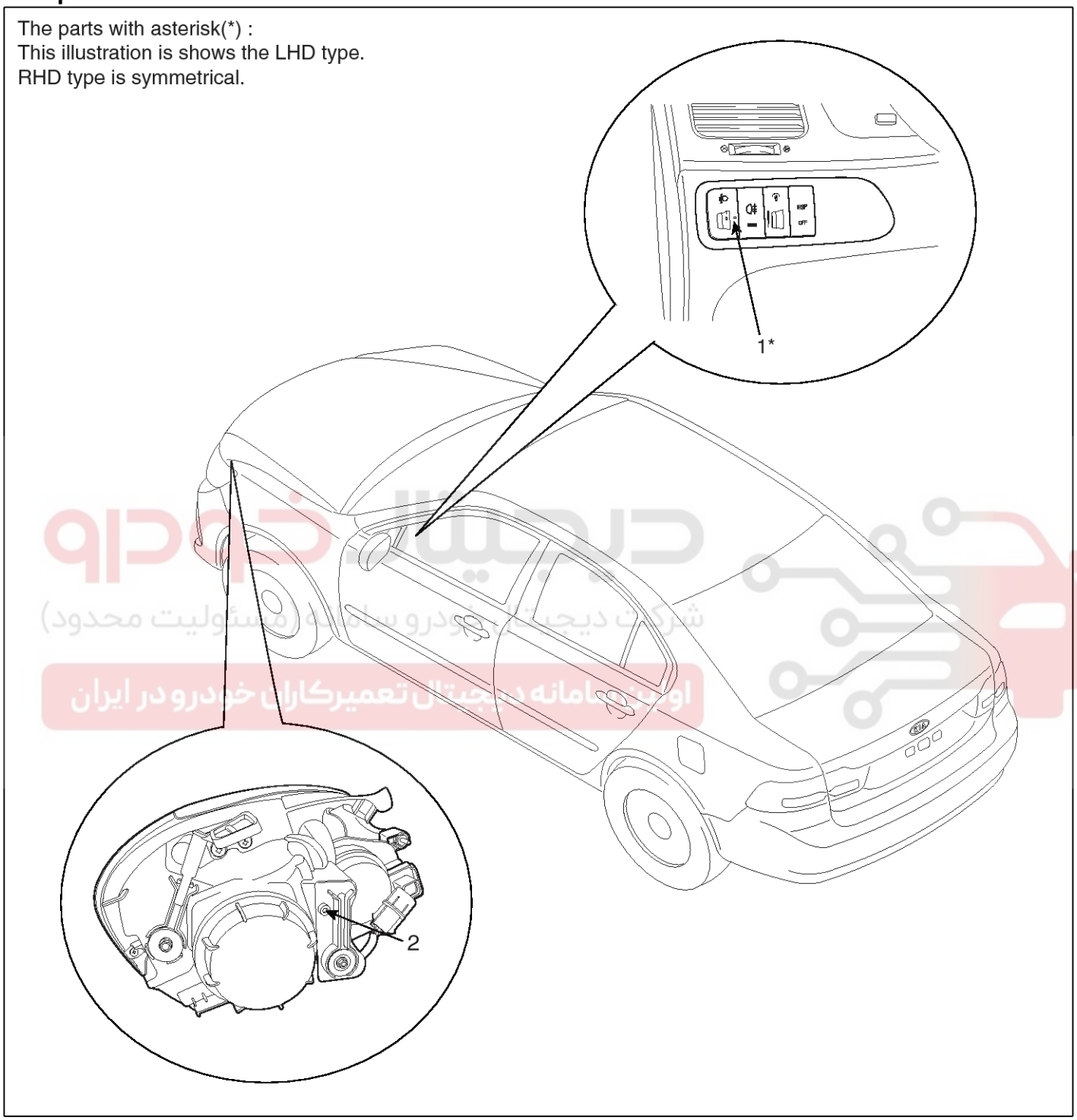
Tester connection	Condition	Specified condition
1-Ground	Auto light switch ON	Continuity
2-Ground	Sensor power	5V

9. If the circuit is not as specified, inspect the circuits connected to other parts.

Head lamp leveling Device

Component Location

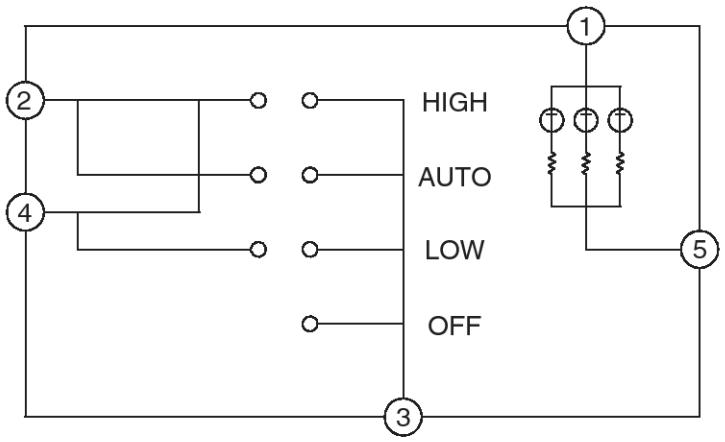
The parts with asterisk(*) :
This illustration is shows the LHD type.
RHD type is symmetrical.



SMGBE9035L

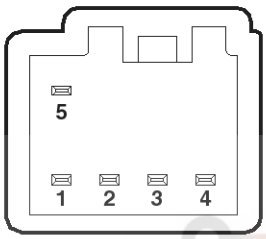
1. Head lamp leveling switch
2. Head lamp leveling actuator

Circuit Diagram



PIN CONNECTION

PIN NO	Description
1	Illumination(+)
2	Rheostat
5	Actuator (+)
3	Ground
4	IGN

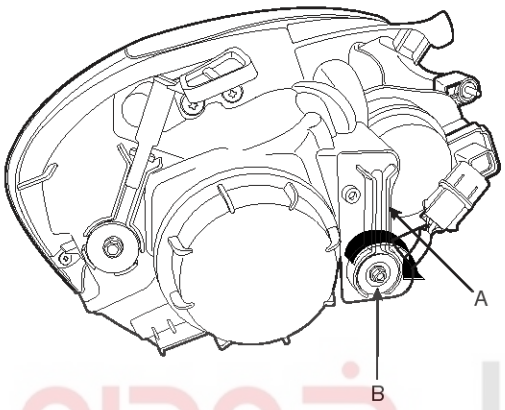


LTLG542A

Head lamp leveling Actuator

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the head lamp assembly (Refer to the head lamp).
3. Remove the head lamp leveling actuator (A) by loosening the adjusting bolt (B) after rotating it to an arrow direction.



LTLG540B

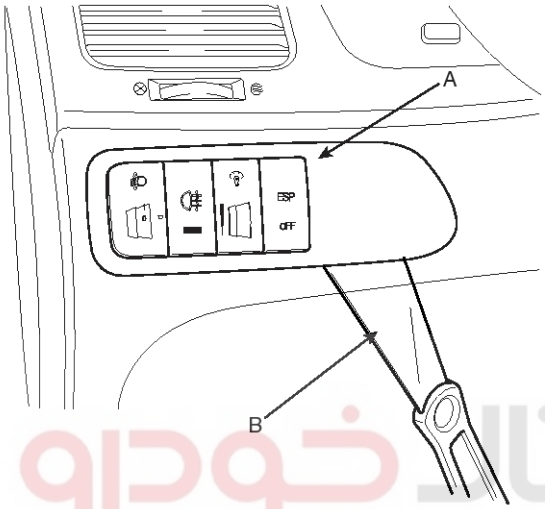
4. Installation is the reverse of removal procedure.

Head Lamp Leveling Switch

Inspection

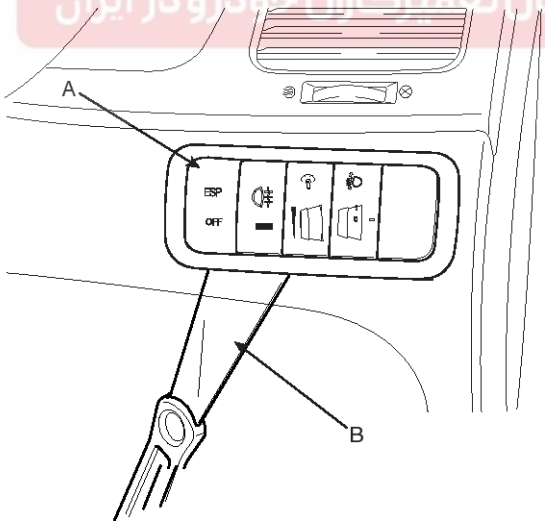
1. Disconnect the negative (-) battery terminal.
2. Remove the lower crash pad switch (A) from the side crash pad cover (B) by using the scraper (C) and then disconnect the connectors.

[LHD]



LTLG453A

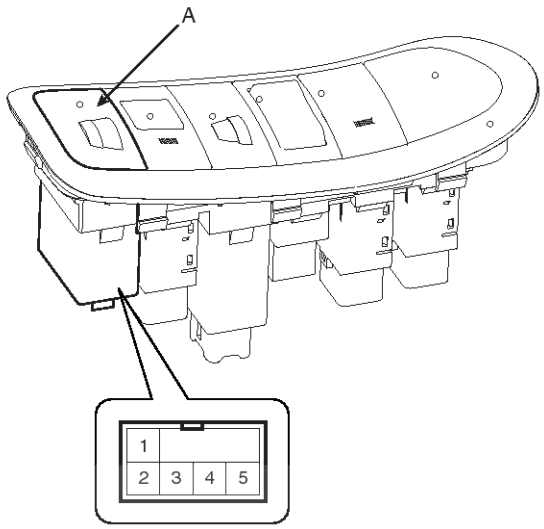
[RHD]



LTLG453B

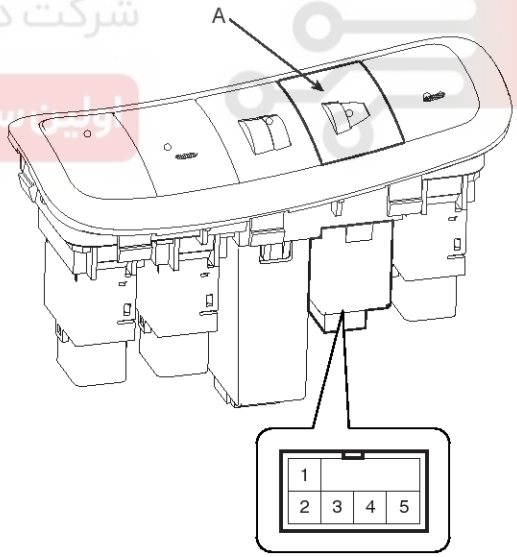
3. Remove the head lamp leveling switch (A) from the lower crash pad switch.

[LHD]



LTLG542B

[RHD]



LTLG497E

4. Connect the battery voltage between terminals 3 and 2.
5. Measure the voltage between terminals 2 and 4 (V) at each position.

Position No.	Rotation	Voltage (V)
0	0°	12.06 ± 0.5V
1	20°	9.67 ± 0.5V
2	40°	7.70 ± 0.5V
3	60°	6.60 ± 0.5V

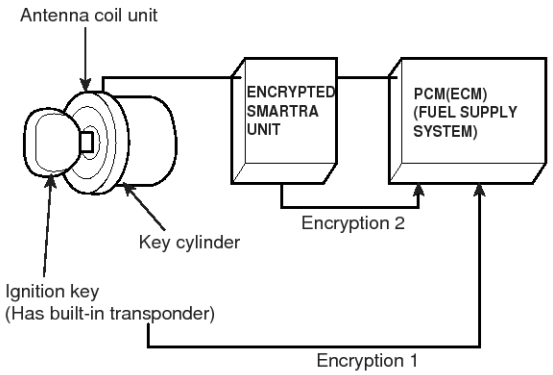
6. If the voltage is not as specified, replace the head lamp leveling switch.

Immobilizer System

Description

The immobilizer system will disable the vehicle unless the proper ignition key is used, in addition to the currently available anti-theft systems such as car alarms, the immobilizer system aims to drastically reduce the rate of auto theft.

1. Encrypted SMARTRA type immobilizer
   - The SMARTRA system consists of a passivie challenge - response (mutual authentication)transponder located in the ignition key, an antenna coil, a encoded SMARTRA unit, an indicator light and the PCM(ECM).
   - 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.
   - 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).
   - 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.
   - 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.
   - If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
   - The immobilizer system can store up to eight key codes.
   - If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



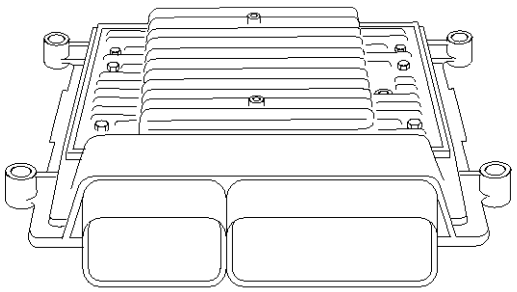
SFDBE8404L

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.



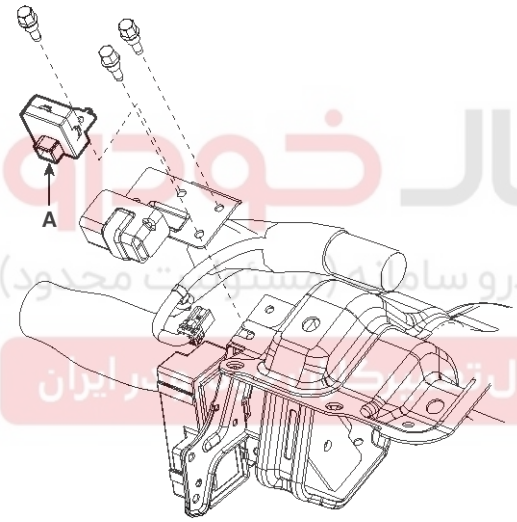
KTME741C

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.

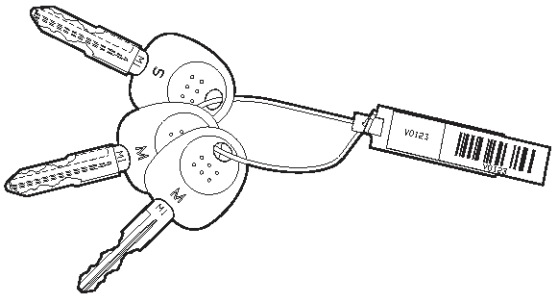
The SMARTRA does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the PCM(ECM) and vice versa.



SMGBE9013D

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.



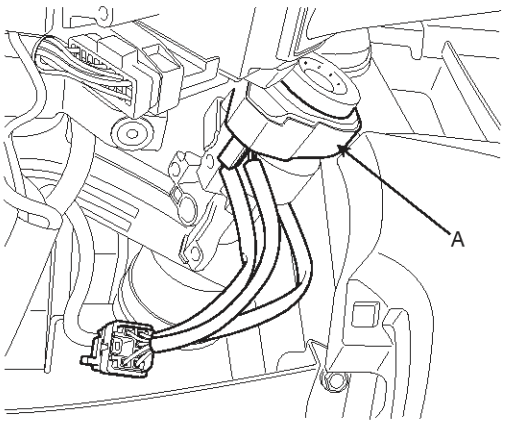
ATLG741A

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.



ATLG781B

Replacement

Problems And Replacement Parts:

Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

Replacement Of Ecm And Smartra

In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching procedure). The vehicle specific data have to be left unchanged due to the unique programming of transponder.

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

1. Things to remember before a replacement (PCM(ECM))

When installing PCM(ECM) of car "A" on car "B"
※ All non-virgin PCM(ECM)`s need to be neutralized before installing on the other vehicles.
↓
Neutralize the PCM(ECM) of car "A"
↓
Installing the PCM(ECM) of car "A" on car "B"
↓
Register the keys with the PIN code of car "B"
↓
Register additional keys (Maximum of keys)
※ All phases of key registration should be completed in under 10 seconds
↓
Registration completed

ETBF746A

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

Replace keys & additional registration
※ **You must know the PIN code before executing this procedure**
↓
Turn the key to the IG ON position
↓
Initialize the PCM(ECM) (Under the Neutral Mode)
↓
Insert the key you want to register and turn it to the IG ON position
↓
Register the key (Under the Teaching Mode)
↓
Register additional keys (Maximum of 4 keys)
※ All phases of key registration should be completed in under 10 seconds
↓
Registration completed

ETBF746B

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.*

Neutralising 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

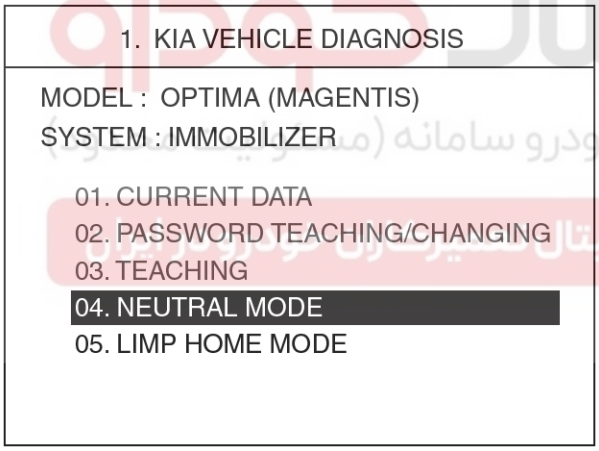
- *Neutralizing setting condition*
  - *In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"*
  - *Input correct PIN code by scanner.*
  - *Neutralizing meaning .*

    : PIN code (6) & user password (4) deletion.

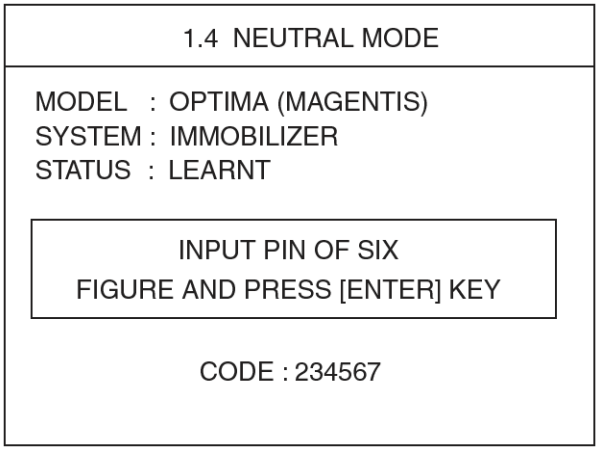
    : Locking of ECM (except key teaching permission)
- *Neutralizing meaning:*
  - *PIN Code(6) & User P/Word(4) deletion*
  - *Locking of EMS(except Key Learning permission)*

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

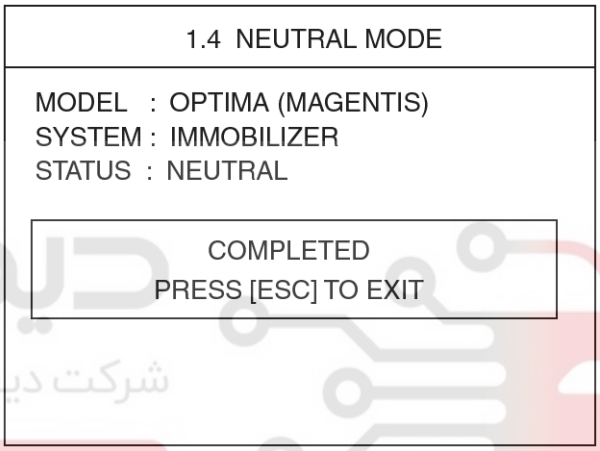
SFDBE8407L



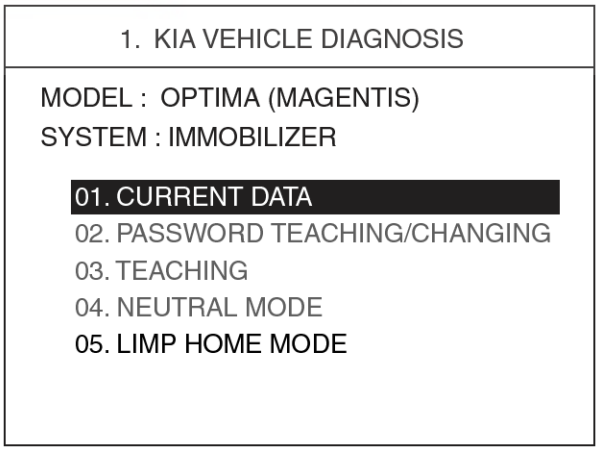
LTLG745A



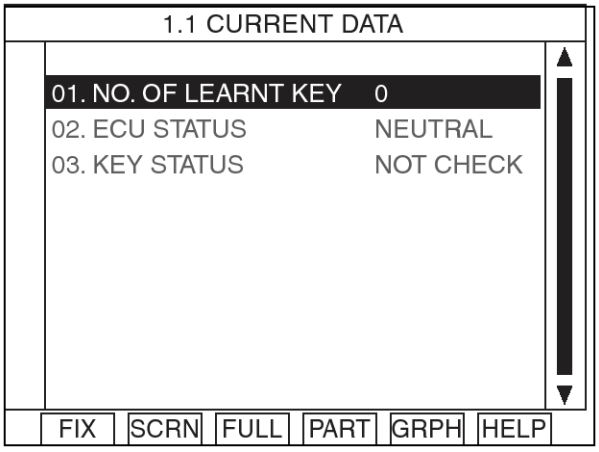
LTLG745E



LTLG745B



LTLG745C



LTLG745D

Neutralising Of SMARTRA

The EMS can be set to the status "neutral" by tester

Ignition key (regardlss 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 chaging 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.

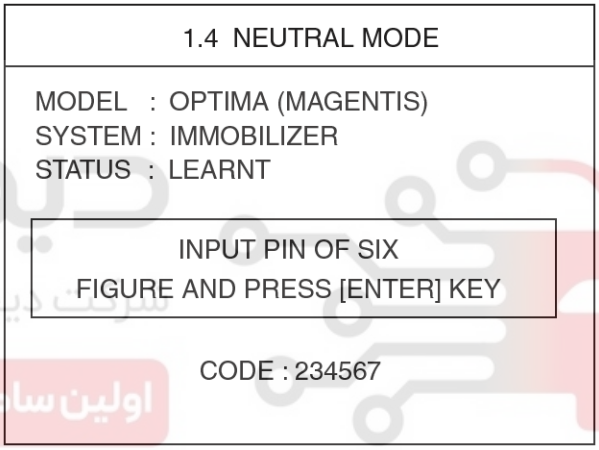
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one 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

SFDBE8408L



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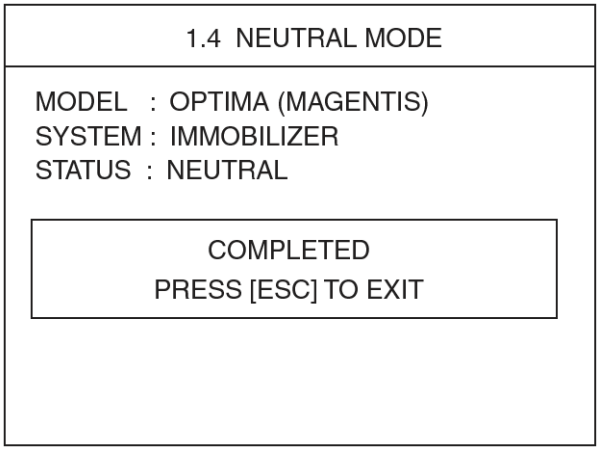
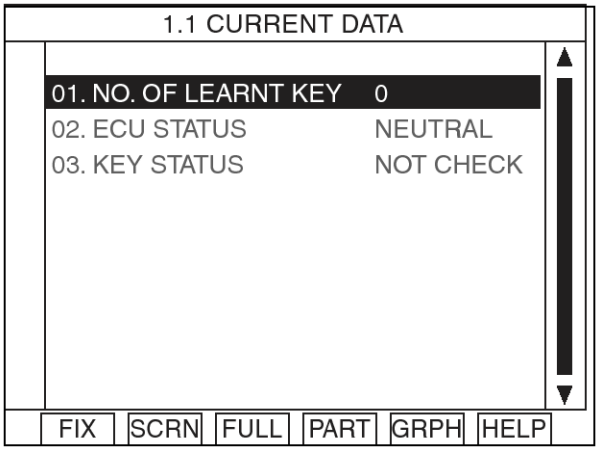


LTLG745B



LTLG745D

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.

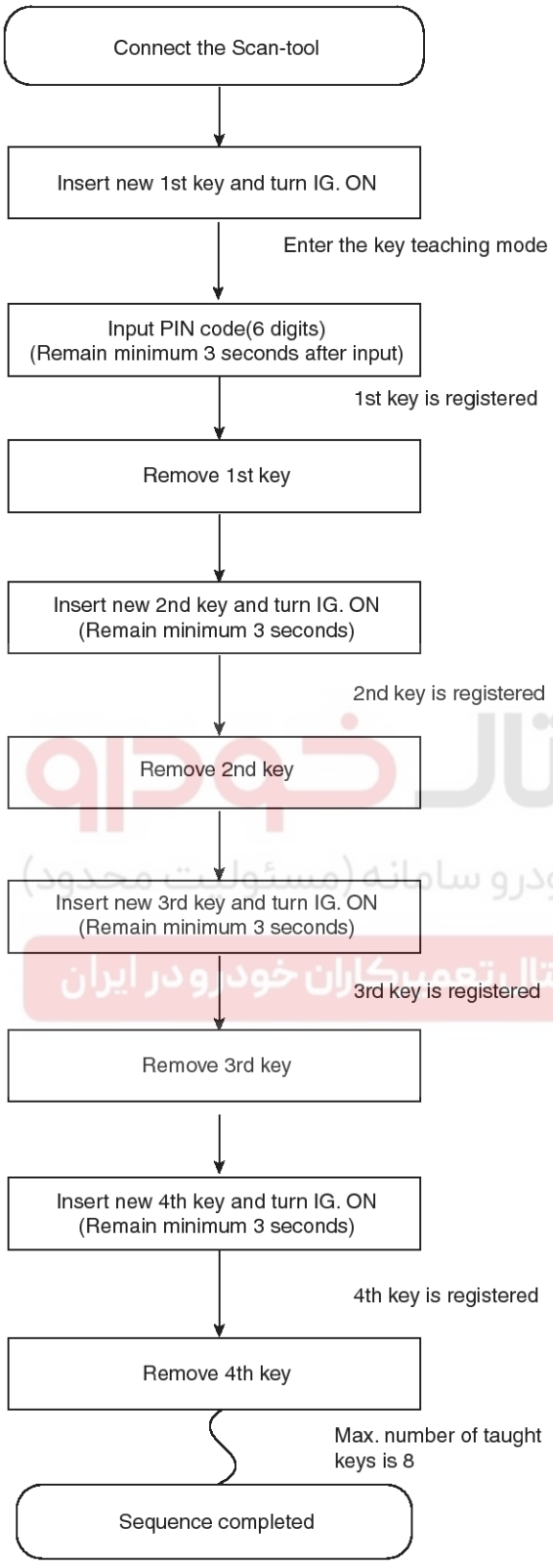
   The maximum number of taught keys is 8

   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

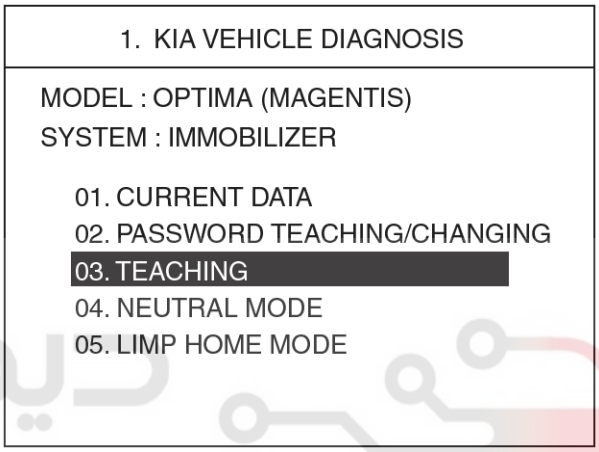
   When teaching the 1st key, Smartra regists at the same time.



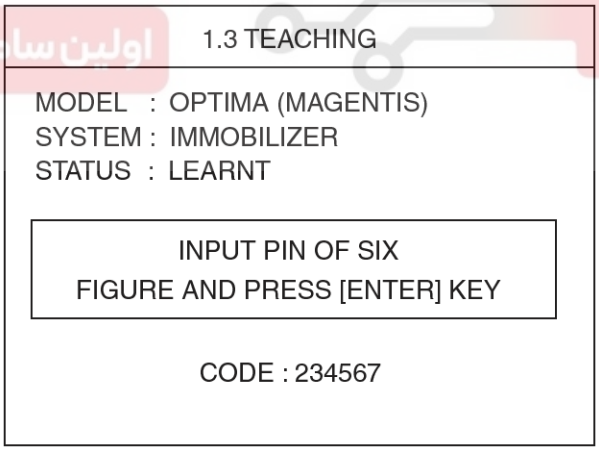
SFDBE8405L

1) PCM(ECM) learnt status.

LTLG741A



LTLG741B



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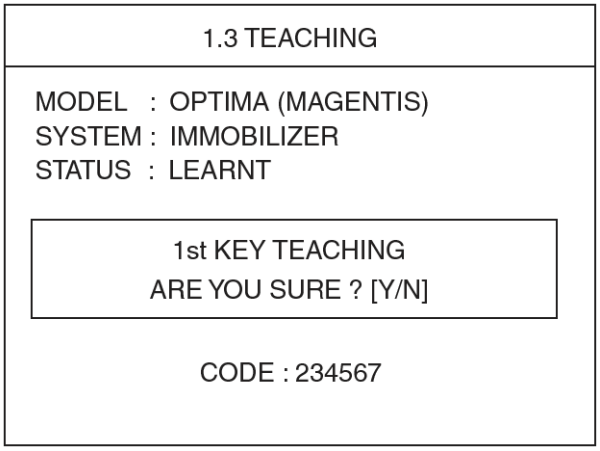
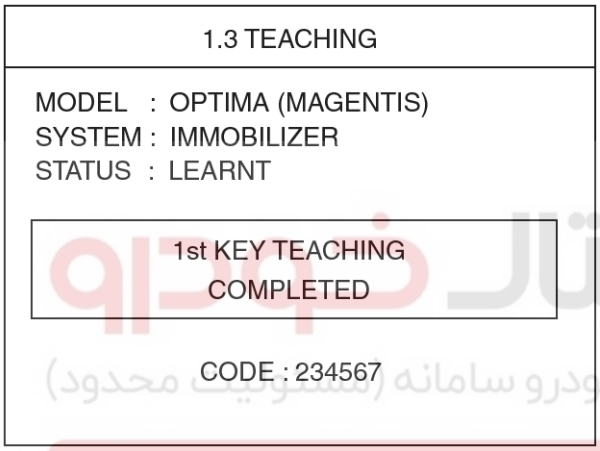


LTLG741D



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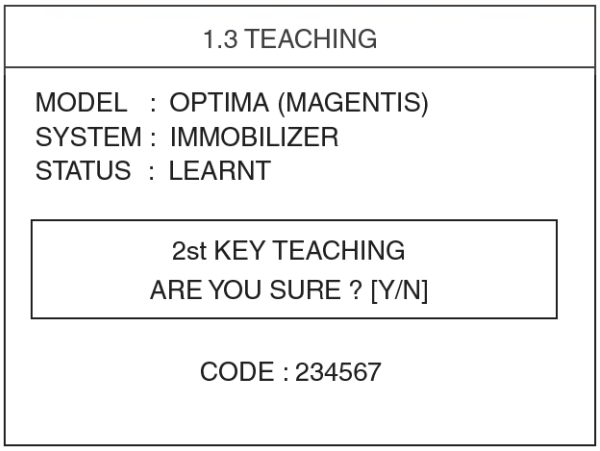
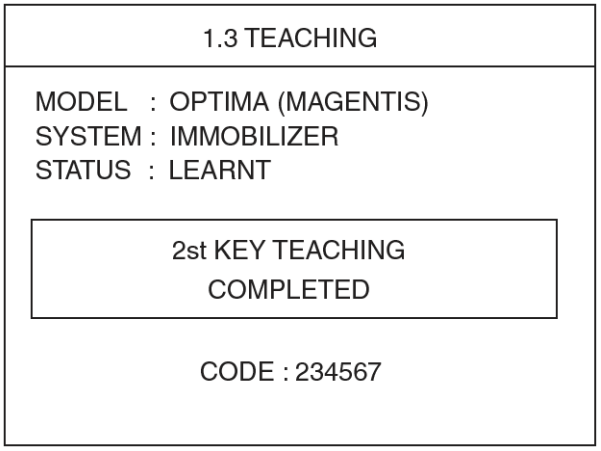


LTLG741F

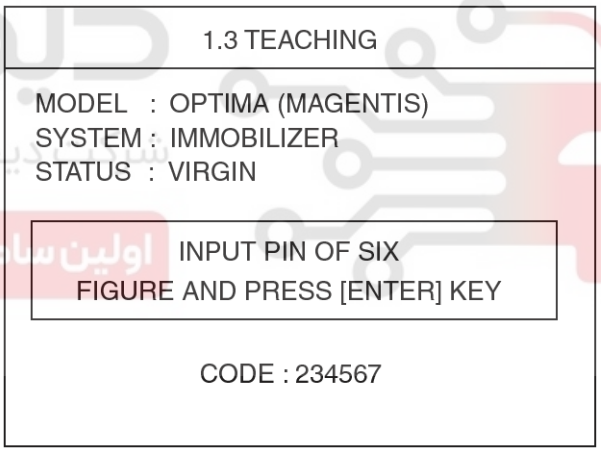


LTLG741G

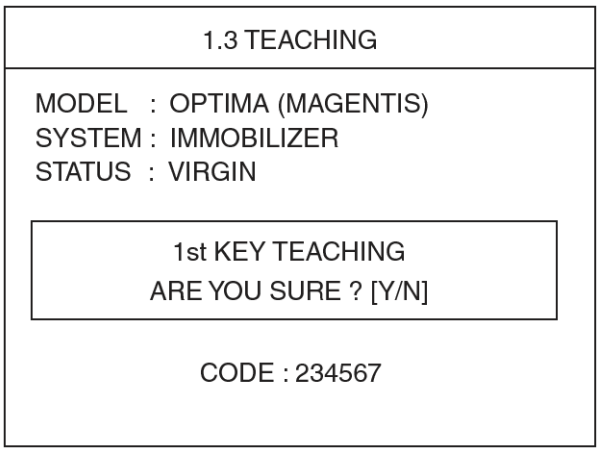
2) PCM(ECM) virgin status.

After replacing new "PCM(ECM)" scantool displays that PCM(ECM) is virgin status in Key Teaching mode.

"VIRGIN" status means that PCM(ECM) has not matched any PIN code before.



LTLG741H



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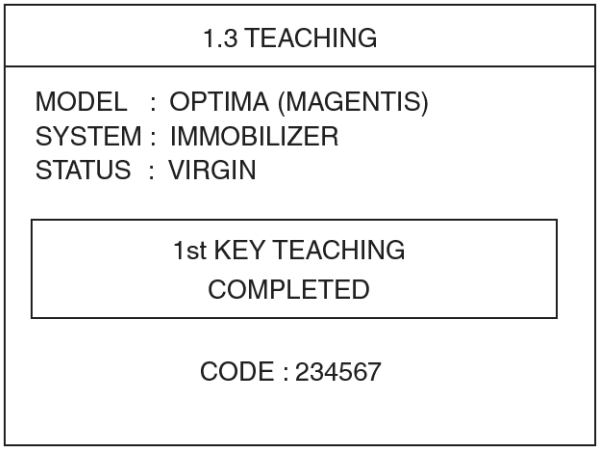

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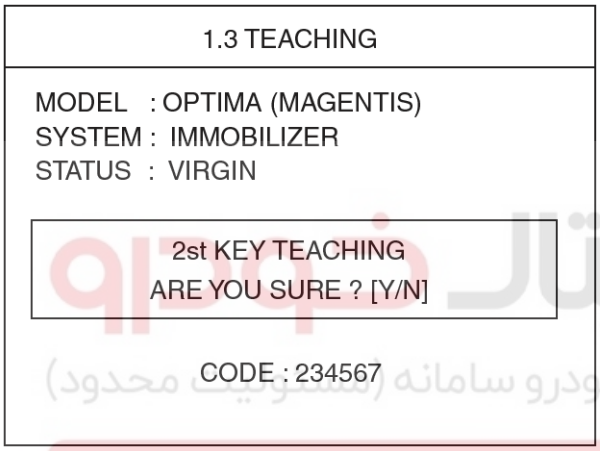
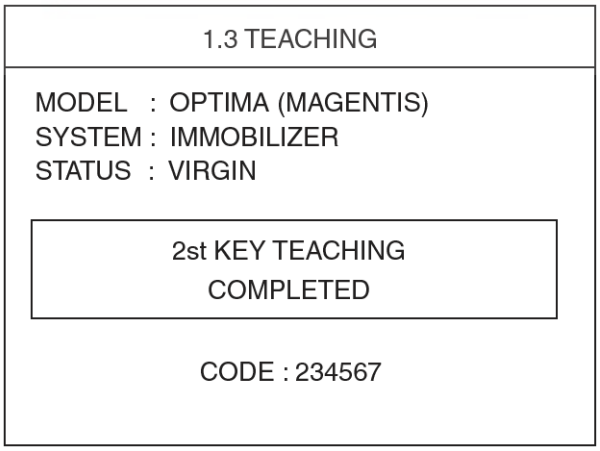


LTLG741K



LTLG741L

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.

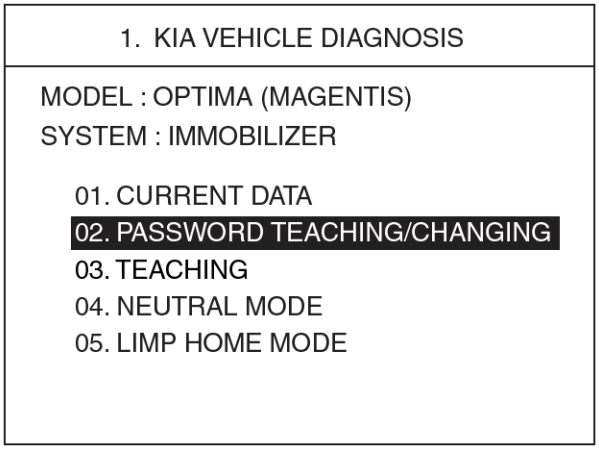
The user password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to an PCM(ECM), the status of the password is "virgin" No limp home function is possible.

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



LTLG741M

1.2 PASSWORD TEACHING/CHANGING

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

INPUT NEW PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY

NEW PASSWORD :

LTLG741N

1.2 PASSWORD TEACHING/CHANGING

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

INPUT NEW PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY

NEW PASSWORD : 2345

LTLG741O

1.2 PASSWORD TEACHING/CHANGING

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

ARE YOU SURE ? [Y/N]

NEW PASSWORD : 2345

LTLG741P

1.2 PASSWORD TEACHING/CHANGING

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

COMPLETED
PRESS [ESC] TO EXIT

NEW PASSWORD : 2345

LTLG741Q

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

2) User password changing

1. KIA VEHICLE DIAGNOSIS

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER

01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE

LTLG741M

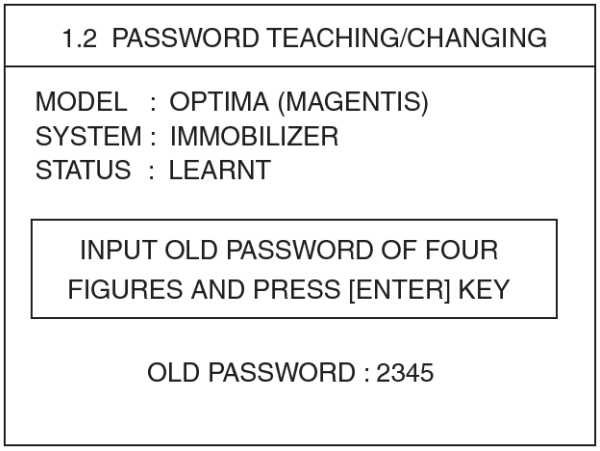
1.2 PASSWORD TEACHING/CHANGING

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER
STATUS : LEARNT

INPUT OLD PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY

OLD PASSWORD :

LTLG741R



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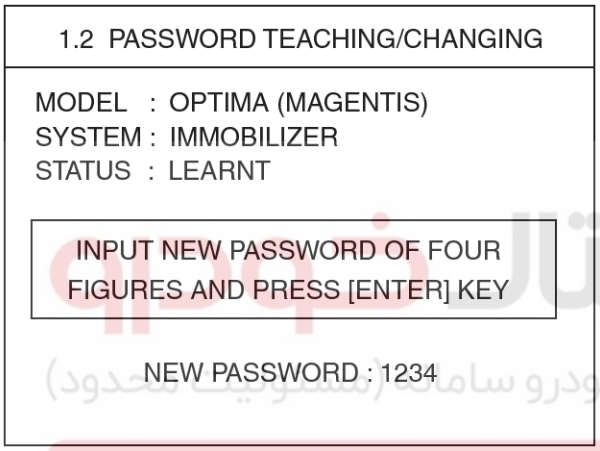
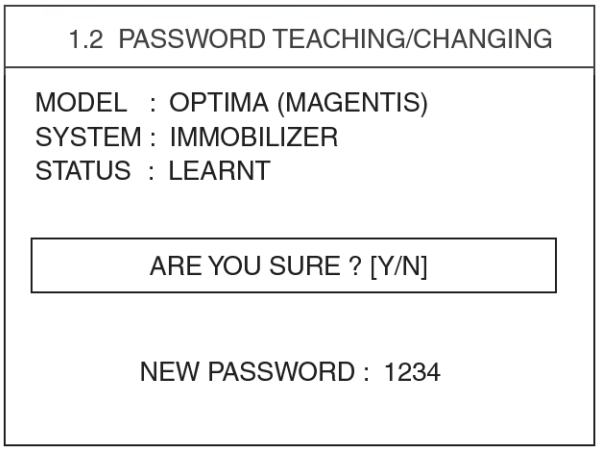
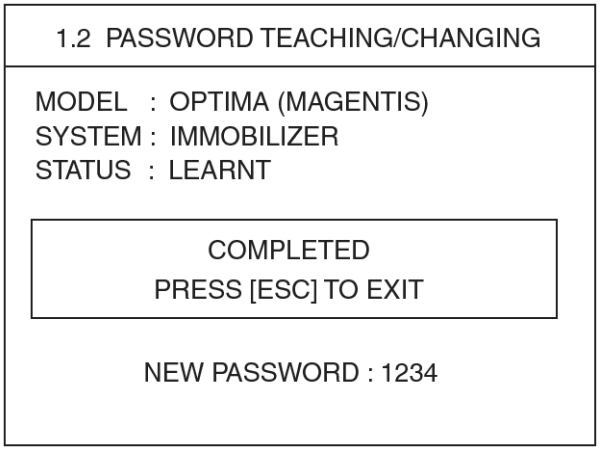


LTLG741T



LTLG741U



LTLG741V

Limp Home Function

1. LImp Home By Tester

   If the PCM(ECM) detects the fault of the SMARTRA or transponder, the PCM(ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service station.

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

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

   If the wrong user password is sent, the PCM(ECM) will reject the request of limp home for one hour. Disconnecting the battery or any other action cannot reduce this time. After connecting the battery to the PCM(ECM), the timer starts again for one hour.

1. KIA VEHICLE DIAGNOSIS

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER

01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE

LTLG741W

1.5 LIMP HOME MODE

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER

INPUT PASSWORD OF FOUR
FIGURES AND PRESS [ENTER] KEY

PASSWORD :

LTLG741X

1.5 LIMP HOME MODE

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER

INPUT PASSWORD OF FOUR
FIGURES AND PRESS [ENTER] KEY

NEW PASSWORD : 2345

LTLG741Y

1.5 LIMP HOME MODE

MODEL : OPTIMA (MAGENTIS)
SYSTEM : IMMOBILIZER

COMPLETED
PRESS [ESC] TO EXIT

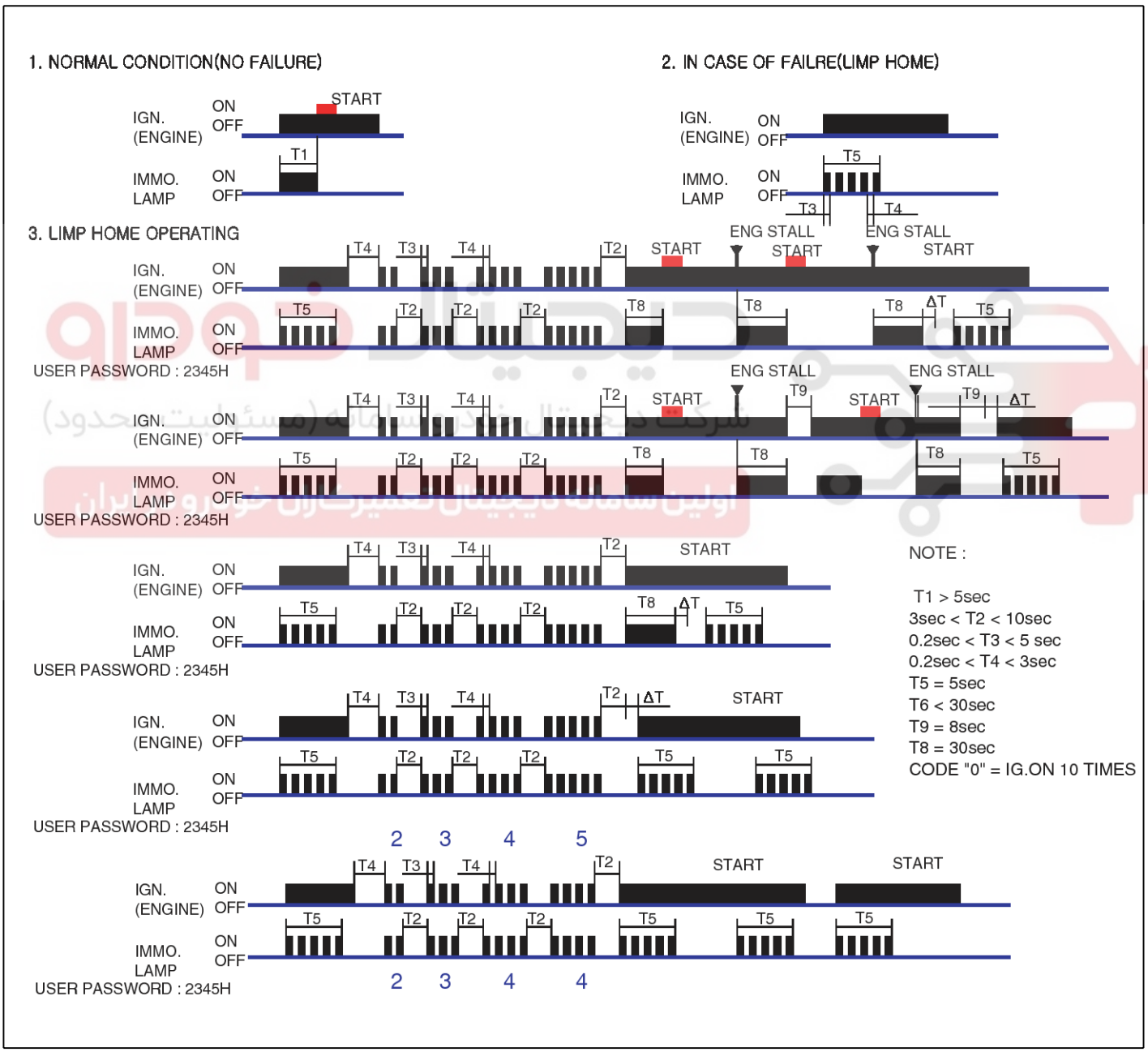
LTLG741Z

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.



LTIF740N

Diagnosis Of Immobilizer Faults

- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.
- Data (stored in the ECM related to the immobilizer function.

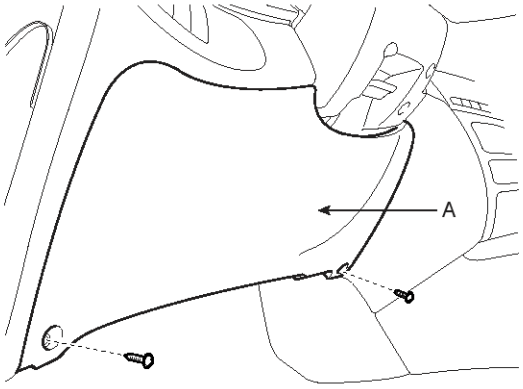
The following table shows the assignment of immobilizer related faults to each type:

Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1. Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1. Transponder not in password mode 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Transponder programming error	P1675 (Transponder programming error)
SMARTRA fault	1. Invalid message from SMARTRA to PCM(ECM)	P1676 (SMARTRA message error)
SMARTRA fault	1. Virgin SMARTRA at learnt EMS 2. Neutral SMARTRA at learnt EMS 3. Incorect the Authentication of EMS and SMARTRA 4. Locking of SMARTRA	P169A (SMARTRA Authentication fail)
SMARTRA fault	1. No response from SMARTRA 2. Antenna coil error 3. Communication line error (Open/Short etc.) 4. Invalid message from SMARTRA to PCM(ECM)	P1690 (SMARTRA no response)
Antenna coil fault	1. Antenna coil open/short circuit	P1691 (Antenna coil error)
Immobilizer indicator lamp fault	1. Immobilizer indicator lamp error (Cluster)	P1692 (Immobilizer lamp error)
Transponder key fault	1. Corrupted data from transponder 2. More than one transponder in the magnetic field (Antenna coil) 3. No transponder (Key without transponder) in the magnetic field (Antenna coil)	P1693 (Transponder no response error/invalid response)
PCM(ECM) fault	1. Request from PCM(ECM) is invalid (Protocol layer violation- Invalid request, check sum error etc.)	P1694 (PCM(ECM) message error)
PCM(ECM) internal permanent memory (EEPROM) fault	1. PCM(ECM) internal permanent memory (EEPROM) fault 2. Invalid write operation to permanent memory (EEPROM)	P1695 (PCM(ECM) memory error)
Invalid key fault	1. Virgin transponder at PCM(ECM) status "Learnt"Learnt (Invalid) Transponder at PCM(ECM) status "Learnt"(Authentication fail)	P1696 (Authentication fail)
Hi-Scan fault	1. Hi-Scan message error	P1697
Locked by timer	1. Exceeding the maximum limit of Twice IGN ON (≧ 32 times)	P1699 (Twice IG ON over trial)

Immobilizer Control Unit

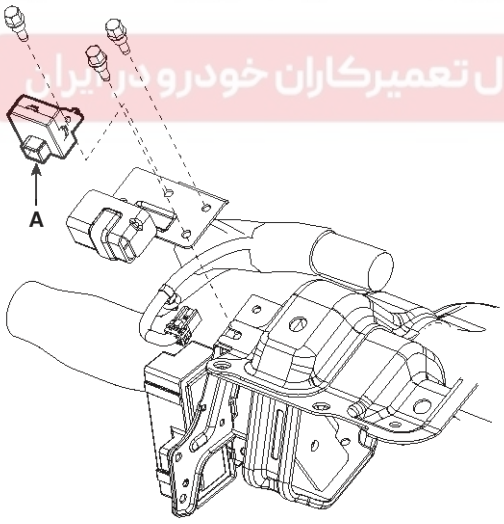
Replacement

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



SMGBE9035D

3. Remove the steering column shaft (Refer to the ST group).
4. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) after loosening the screw.



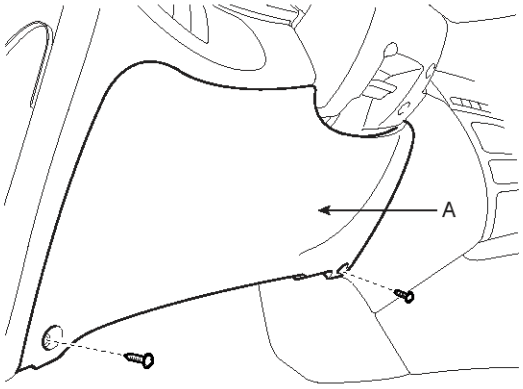
SMGBE9013D

5. Installation is the reverse of removal procedure.

Antenna Coil

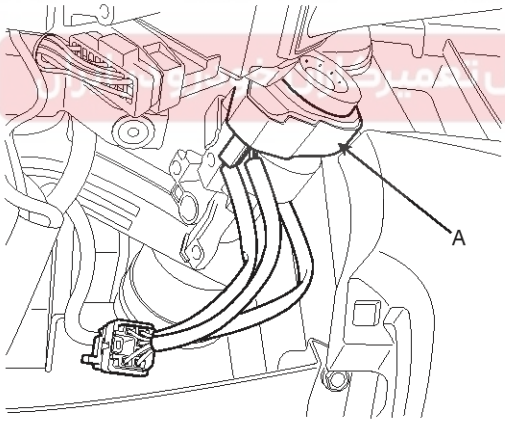
Replacement

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



SMGBE9035D

3. Remove the steering column shaft (Refer to the ST group).
4. Disconnect the 6P connector of the coil antenna and then remove the coil antenna (A) after loosening the screw.



ATLG781B

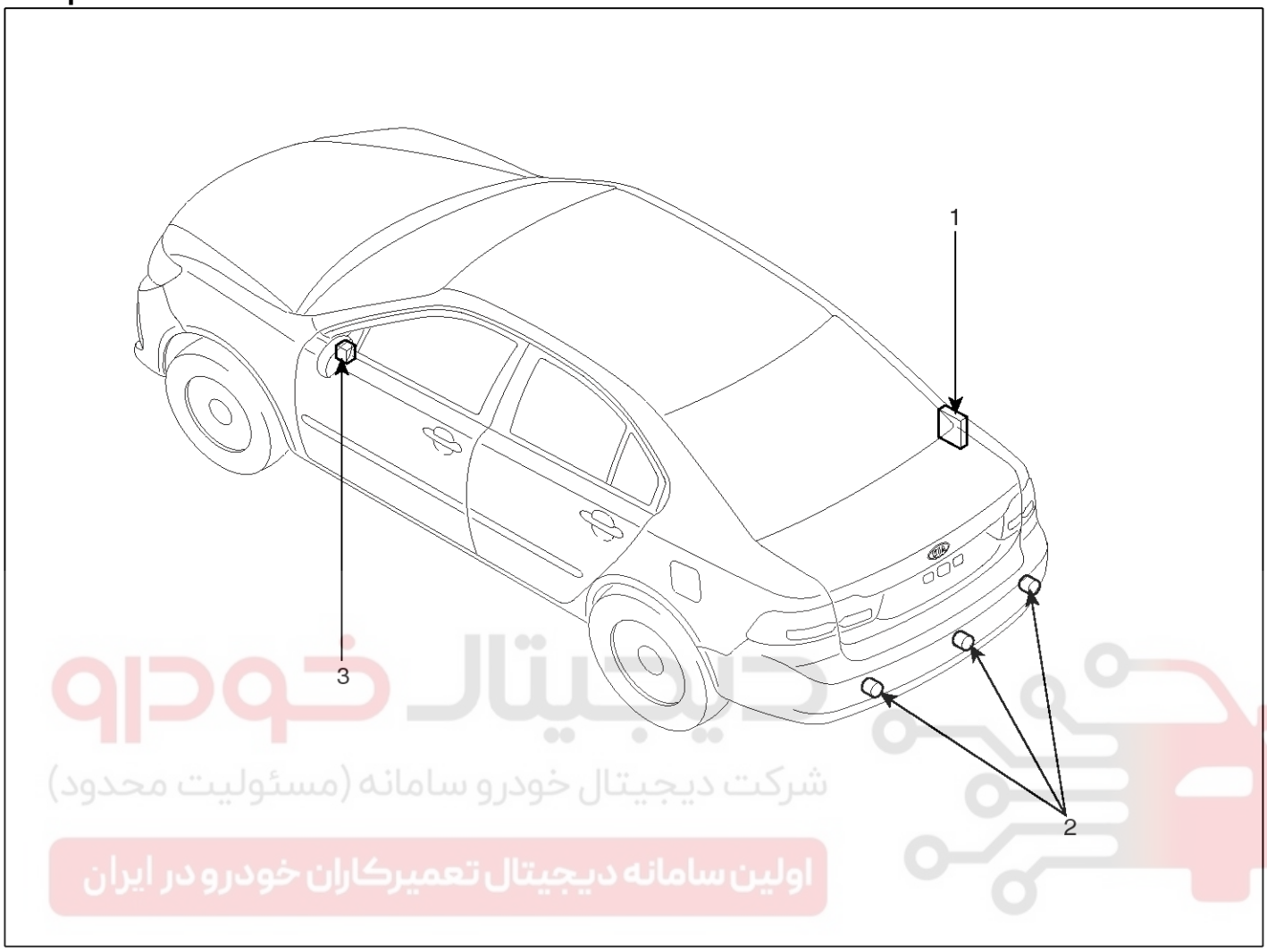
5. Installation is the reverse of removal procedure.

Rear Parking Assist System

Specification

Item		Specification
Back warning control unit	Voltage rating	DC 12V
	Operation voltage	DC 9 ~ 16 V
	Operation temperature	-30°C ~ + 80°C
	Operation current	MAX 600 mA
	Operation frequency	40 ± 5 KHz
	Detective method	Direct and indirect detection
Ultrasonic sensor	Voltage rating	DC 8 V
	Detecting range	40 cm ~ 120 cm
	Operation voltage	DC 7.5 ~ 8.5 V
	Operation current	MAX 20 mA
	Operation temperature	-30°C ~ + 80°C
	Beam width	Horizontal : 40±5°, Vertical : 60±5°
	Number of sensors	3 (Right, Center, Left)
Piezo buzzer	Voltage rating	DC 12 V
	Operation voltage	DC 9 ~ 16 V
	Operation temperature	-30°C ~ + 80°C
	Operation current	MAX 60 mA
	Sound, tone	Oscillation frequency : 2.2±0.5 KHz
		Sound level : 70 dB (DC 13V /m)

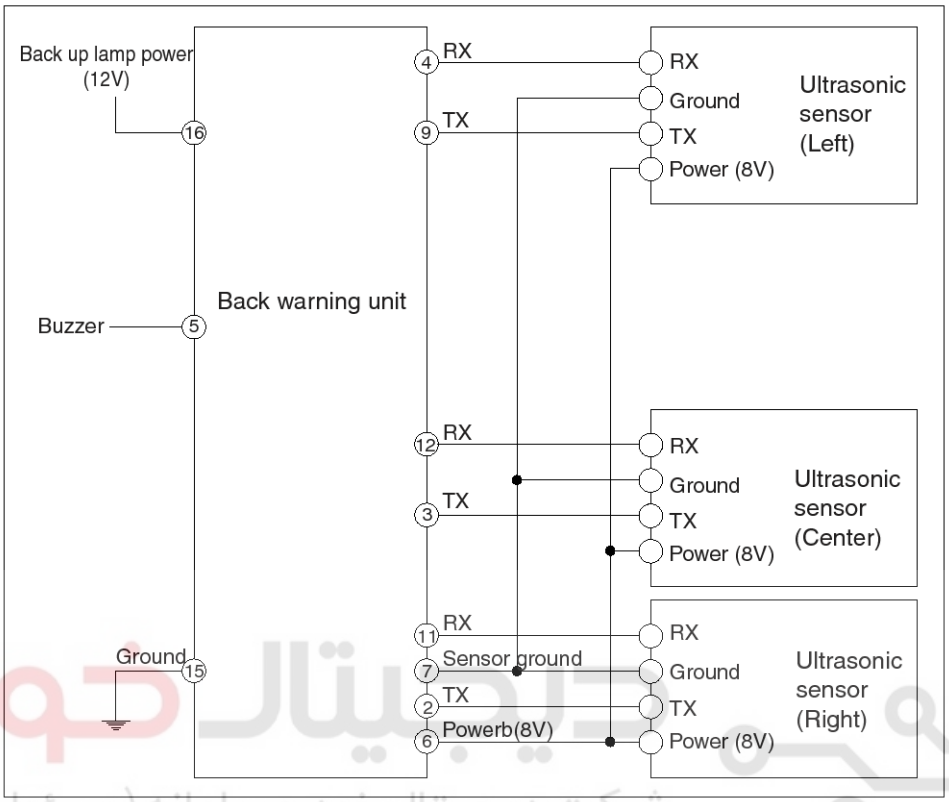
Component Location

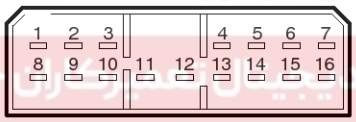


SMGBE9036L

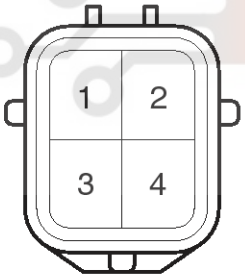
1. Back warning control unit
2. Ultrasonic sensor
3. Buzzer

Circuit Diagram





(Back warning control unit connector)



(Ultrasonic sensor connector)

Pin configuration

Pin No.	Signal	Test : Desired result
2	TX - Sensor(Right)	0~3V voltage change (Inspect waveform)
3	TX - Sensor(Center)	0~3V voltage change (Inspect waveform)
4	RX - Sensor(Left)	0~1V voltage change (Inspect waveform)
5	Buzzer	0V (While operating)
6	Sensor power	8V (While operating)
7	Sensor ground	0V
9	TX - Sensor(Left)	0~3V voltage change (Inspect waveform)
11	RX - Sensor(Right)	0~1V voltage change (Inspect waveform)
12	RX - Sensor(Center)	0~1V voltage change (Inspect waveform)
15	Ground	0V
16	Back up lamp power	12V (While shifting to "R")

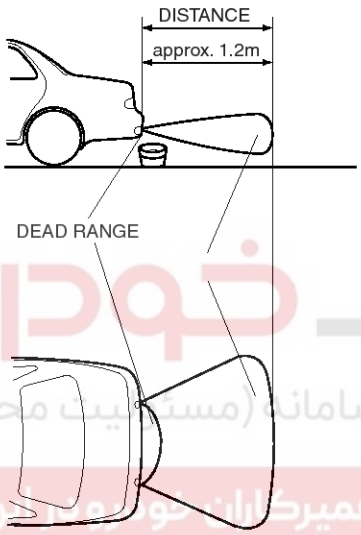
PIN NO	SIGNAL
1	TX
2	RX
3	8V
4	GND

SMGBE9051L

Warning

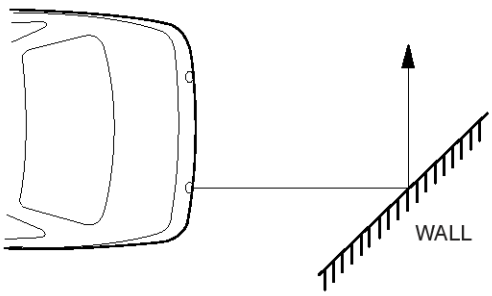
1. Range detected by back sensors is limited.

   Watch back before reversing.
2. There is a blind spot below the bumper. Low objects (for example boundary barrier) may be detected from minimum 1.5m away unable to detect at nearer.
3. Besides there are some materials unable to be detected even in detection range as follows.
   1) Needles, ropes, rods, or other thin objects.
   2) Cotton, snow and other material absorbing ultrasonic wave(for example, fire extinguisher device covered with snow)



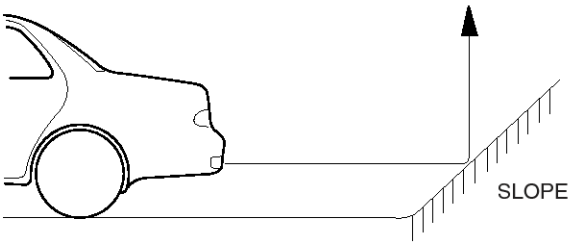
LT8C218A

4. Reversing toward the sloped walls.



LT8C218B

5. Reversing toward the sloped terrain.



LT8C218C

6. False alarm may operate in the following condition: irregular road surface, gravel road, sloped road and grass. Upon alarm generation by grass the alarm may be generated by rock behind grass. Be sure to check for the safety.

   The sensors cannot discriminate between materials.
7. Sensors may not operate correctly in the below conditions.

   Ensure sensors are clean from mud or dirt.
   1) When spraying the bumper, the sensor opening is covered with something in order not to be contaminated. If sensor opening is contaminated with mud, snow, or dirt, detection range will be reduced and alarm may not be generated under the crash condition. Dirt accumulated on the sensor opening shall be removed with water.

      Do not wipe or scrape sensor with a rod or a hard object.
   2) If the sensor is frozen, alarm may not operate until sensor thaws.
   3) If a vehicle stays under extremely hot or cold environment, the detection range may be reduced. It will be restored at the normal temperature.
   4) When heavy cargo is loaded in trunk, it changes the vehicle balance, which reduces the detection range.
   5) When other vehicle's horn, motor cycle engine noise, or other ultra-sonic wave sources are near.

6) Under heavy rain.
7) When reversing towards a vertical wall and the gap between the vehicle and the wall is 15cm. (Alarm may sound despite the absence of a barrier)
8) If radio antenna is installed at the rear.
9) If the vehicle rear wiring is re-routed or electrical component is added at the rear part.
10) Vehicle balance is changed due to the replacement of the rear spring.
11) The unit will operate normally when the vehicle speed is 5km/h or less. Above this speed, the unit may not operate normally.

8. Check the rear bumper for installation condition and deformation. If installed improperly or the sensor orientation is deviated, it may cause malfunction.
9. Be careful not to apply shock during sensor installation on the transmission or reception unit.
10. When adding electrical devices or modifying harness at the rear body of the vehicle, ensure not to change the transmission and reception unit wiring. Tagging the transmission side and reception side, it may cause malfunction.
11. High power radio transmitter (above 10W) may cause malfunction. Do not install it on the vehicle.
12. Be careful that excessive heat or sharp objects shall not touch ultrasonic sensor surface.
    Do not cover the sensor opening or press the sensor.

Description

When reversing, the driver is not easy to find objects in the blind spots and to determine the distance from the object. In order to provide the driver safety and convenience, back warning system will operate upon shifting to "R" Ultrasonic sensor will emit ultrasonic wave rearward and detect the reflected wave. Control unit will calculate distance to the object using the sensor signal input and output buzzer alarm in three steps (first, second and third alarm).

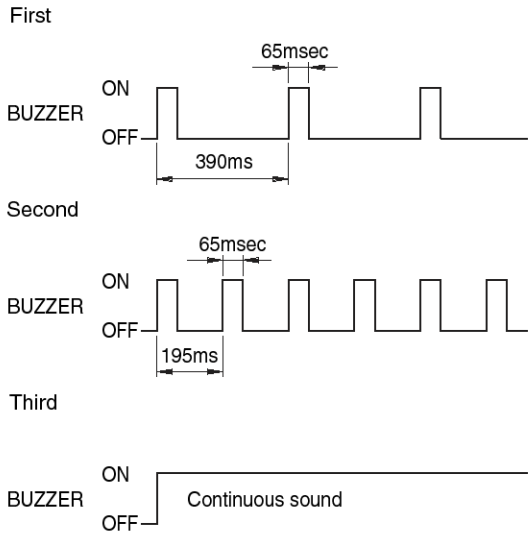
Alarm Range

Upon detecting an object at each range out of 3 ranges as stated below within the operation range, it will generate alarm.

First alarm : Object comes near to the sensor located at the rear of vehicle, within 81-120cm ± 15cm

Second alarm : Object comes near to the sensor located at the rear of vehicle, within 41-80cm ± 10cm

Third alarm : Object comes near to the sensor located at the rear of vehicle, within 40cm ± 10cm



ETRF976C

NOTICE

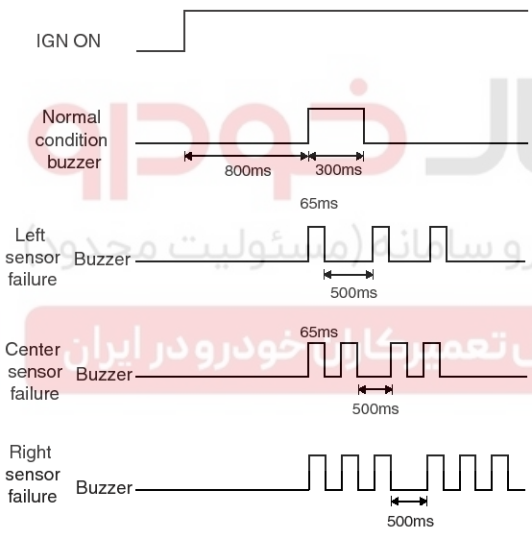
1. *Time tolerance of the above waveform : Time ± 10%*
2. *At nearer distance than 40cm, detection may not occur.*
3. *Alarm will be generated with vehicle reversing speed 10km/h or less.*
   For moving target, maximum operation speed shall be target approach speed of 10km/h.
4. *When the vehicle or the target is moving, sequential alarm generation or effective alarm may be failed.*
5. *Misalarm may occur in the following conditions.*
   - *Irregular road surface, gravel road, reversing toward grass.*
   - *Horn, motor cycle engine noise, large vehicle air brake, or other object generating ultrasonic wave is near.*
   - *When a wireless transmitter is used near to the sensor.*
   - *Dirt on the sensor.*
   - *Sequential alarm may not occur due to the reversing speed or the target shape.*

Diagnosis

1. Operate with ignition switch on and shift the lever to position "R"
2. Then it checks the system condition.

   If no trouble, it generates buzzer alarm sound for 0.3 seconds after 0.8 seconds from power approval. In case of system failure, then it indicates the failed point as follows.

   - Left sensor failure : beep-beep-beep
   - Center sensor failure : beep beep-beep beep-beep beep
   - Right sensor failure: beep beep beep-beep beep beep-beep beep beep
3. Alarm is generated 3 times sequentially.
4. Effective operation range is 10km/h or less for the vehicle speed.

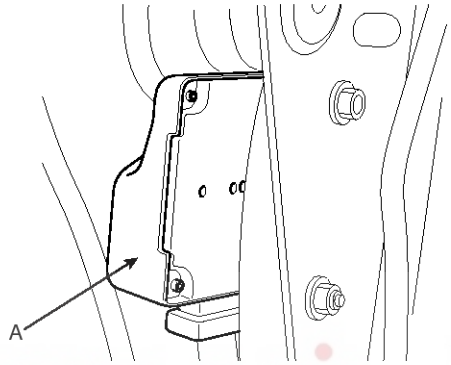


ETRF976A

Rear Parking Assist System Control Unit

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the right side trim of the trunk
3. Loosen the mounting nuts and disconnect the connector.
4. Remove the rear parking assist system control unit (A).



KTRE761A

Installation

1. Install the rear parking assist system control unit.
2. Install the right side trim of the trunk.

Parking Assist Sensor

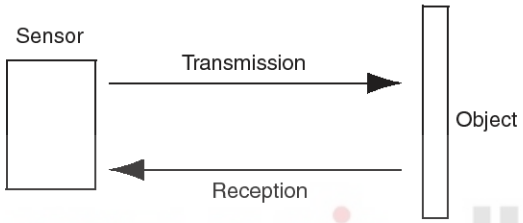
Operation Principle

The sensor emits ultrasonic wave to the objects, and it measures the time until reflected wave returns, and calculates the distance to the object.

Distance Detection Type

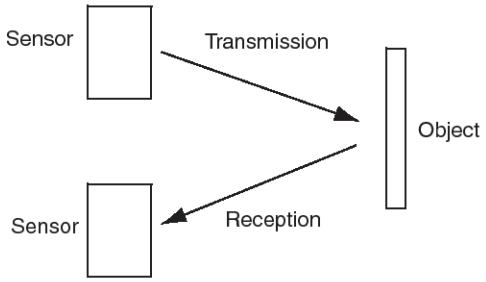
Direct detection type and indirect detection type are used together for improving effectiveness of the detection.

1. Direct detection type: One sensor transmits and receives signals to measure the distance.



ETRF762A

2. Indirect detection type: One sensor transmits signals and the other sensor receives the signals to measure the distance.



ETRF762B

Measurement Principle

Back warning system (BWS) is a complementary device for reversing. BWS detects objects behind vehicle and provides the driver with buzzer alarm finding objects in a certain area, using ultrasonic wave propagation speed and time.

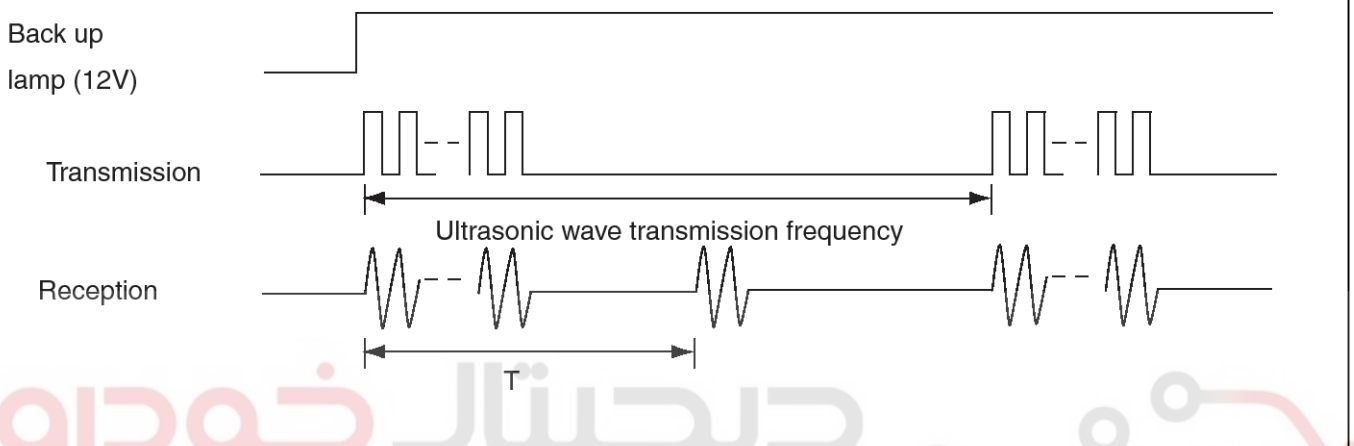
The propagation speed formula of ultrasonic wave in air is following :

v=331.5 + 0.6t (m/s)

v=ultrasonic wave propagation speed

t=ambient temperature

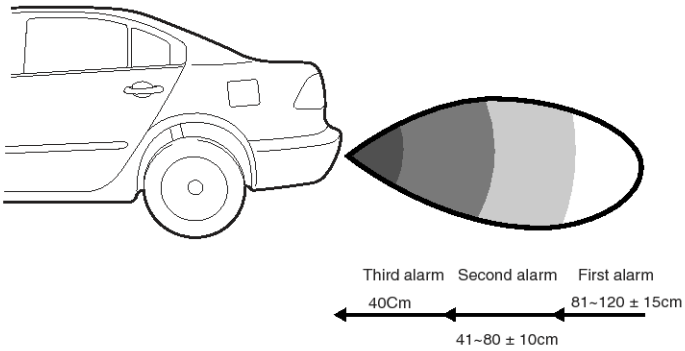
The basic principle of distance measurement using ultrasonic wave is :



LTLG762C

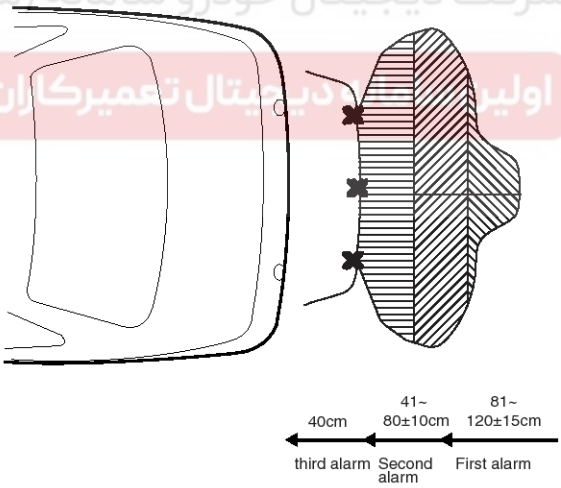
Sensor Detection Range

[Vertical range]



1. Distance tolerance(Messured at the front of sensor)
   - 81~120cm : ±15cm
   - 41~80cm : ±10cm
   - 40cm : ±10Cm
2. Detection tolerance
   - At 40cm :45° ± 15°
   - At 80cm : 30° ± 15°
   - At 120cm : 20° ± 15°
3. At nearer distance than 40cm detection may occur.
4. Measurement condition : Room temperature (20℃), 90mm diameter, 3m length rod.

[Horizontal range]



1. Distance tolerance(Messured at the front of sensor)
   - 81~120cm : ±15cm
   - 41~80cm : ±10cm
   - 40cm : ±10cm
2. Detection tolerance
   - At 80cm : 90° ± 20°
   - At 120cm : 10° ± 20°
3. At nearer distance than 40Cm detection may occur.
4. Measurement condition : Room temperature (20℃), 90mm diameter, 3m length rod.

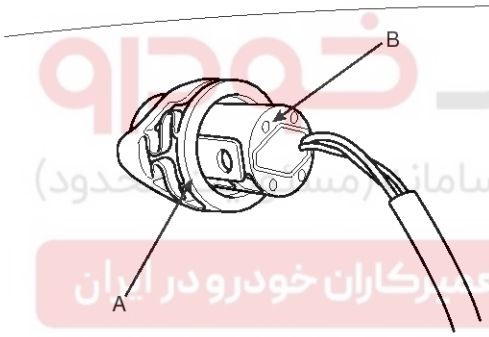
LTLG978A

NOTICE

1. *14cm (dia.) plastic rod is used for the test target.*
2. *The test result may differ by a different target object.*
3. *Detection range may be reduced by dirt accumulated on sensor, and extremely hot or cold weather.*
4. *The following object may not be detected.*
   - *Sharp object or thin object like rope.*
   - *Cotton sponge, snow or other materials absorbing sonic wave.*
   - *Smaller objects than 14cm (dia.), 1m length.*

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper (Refer to the Body group - "Rear bumper")
3. Disconnect the sensor connector at the inside of the rear bumper, and then remove the sensor (B) from the housing (A).



KTRE762A

Installation

1. Connect the connector, and then install the sensor.
2. Install the rear bumper.

Buzzer

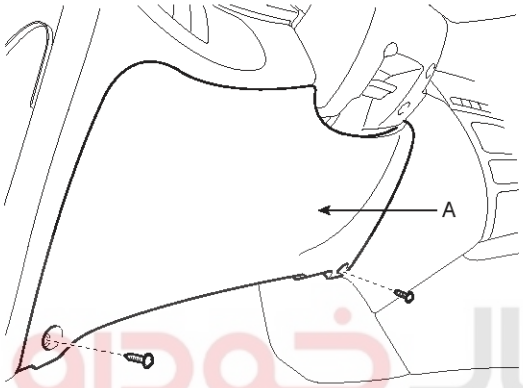
Inspection

Test the buzzer by connecting battery voltage to terminal 1, and ground terminal 2.

The buzzer should make a sound. If the buzzer fails to make a sound, replace it.

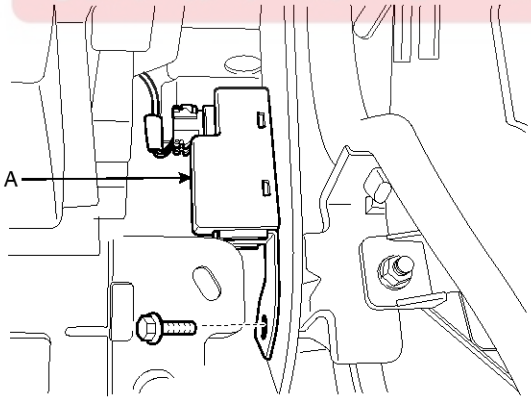
Removal

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



SMGBE9035D

3. Remove the buzzer (A) after loosening the nut and disconnecting the 2P connector.



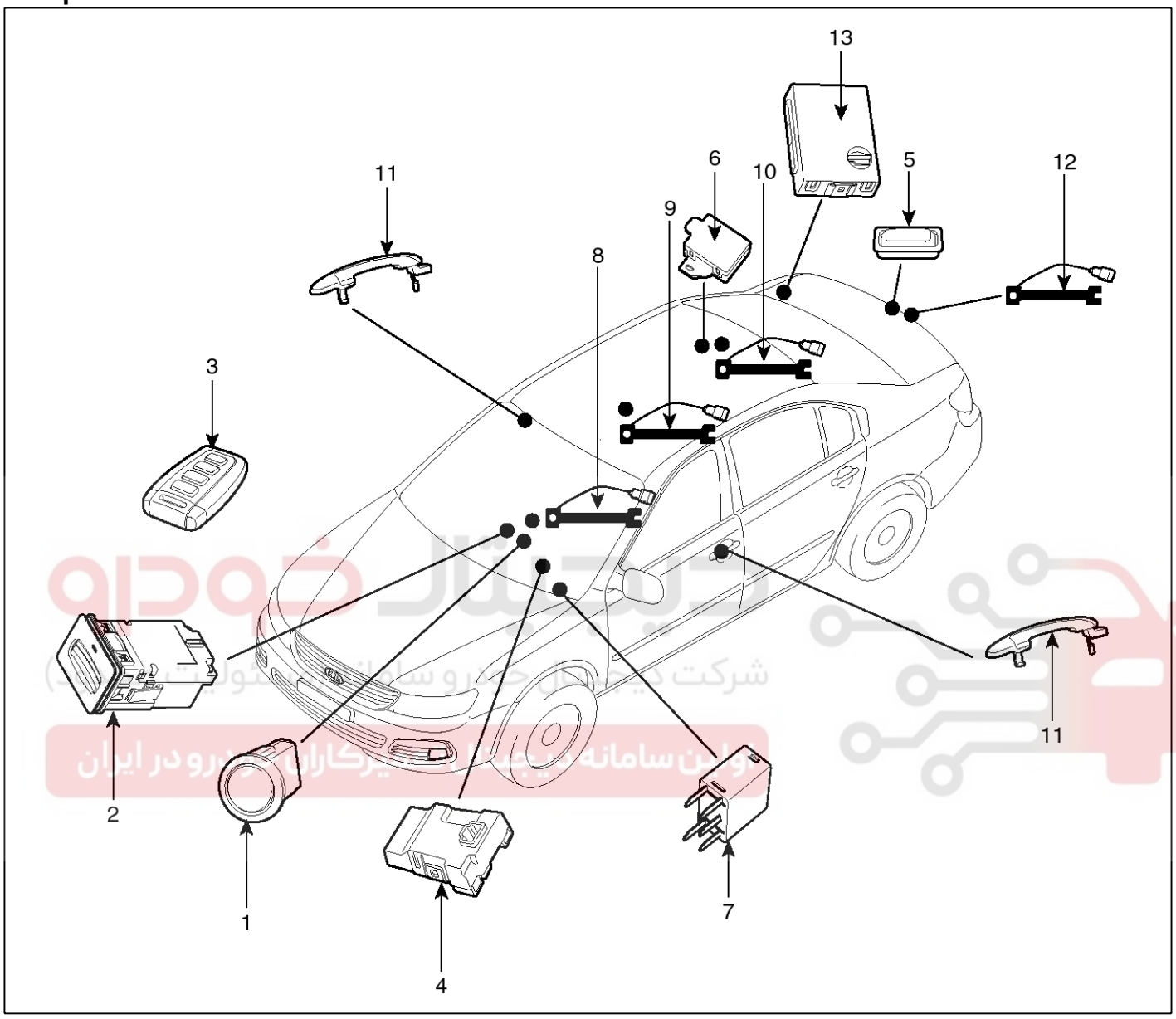
ATLG763A

Installation

1. Install the buzzer and connector.
2. Install the lower crash pad panel.

Button Engine Start System

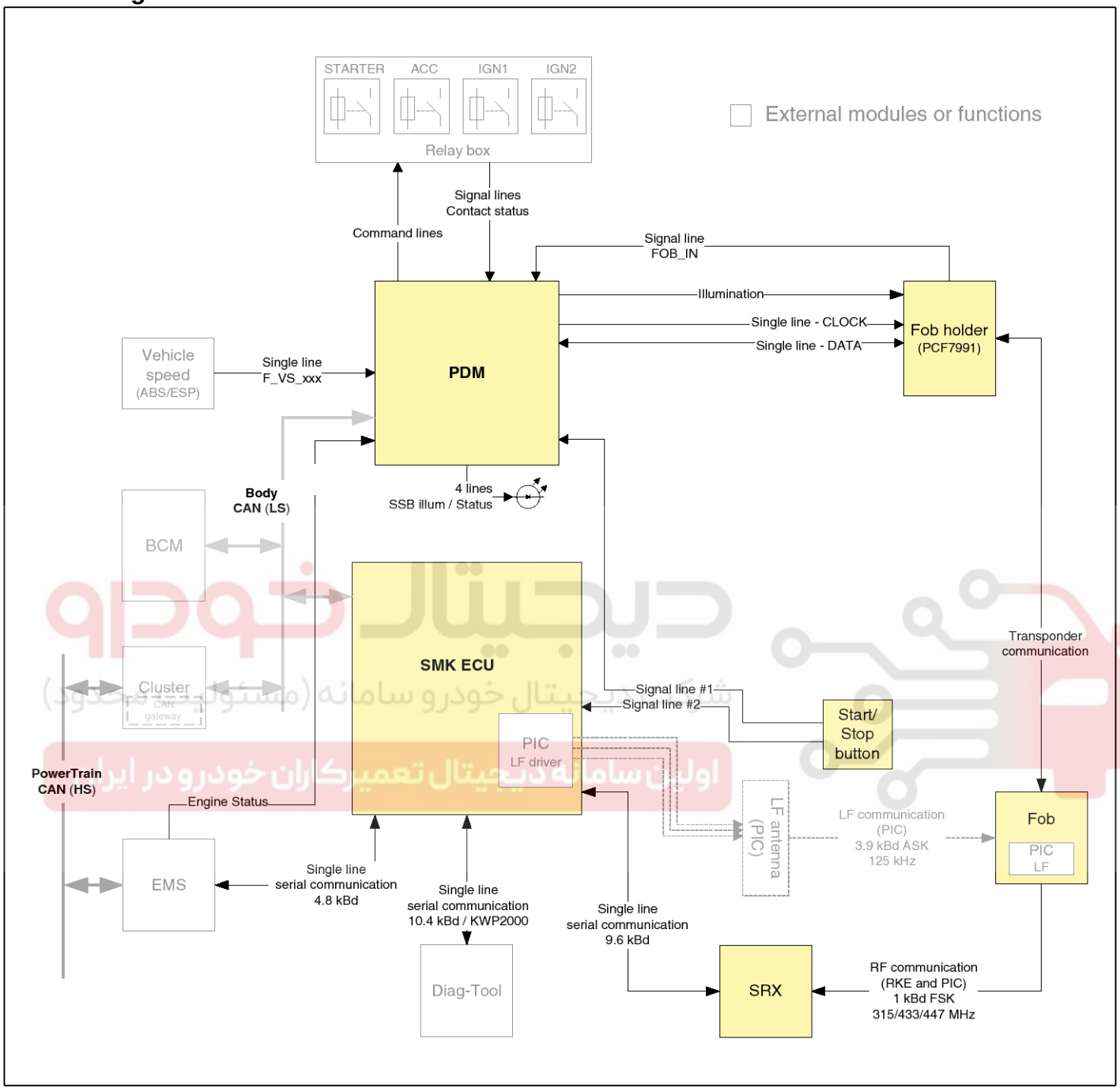
Component Location



SMGBE0007D

1. Start Stop Button(SSB)
2. FOB key holder
3. FOB key
4. PDM(Power Distribution Module)
5. Trunk lid switch
6. RF receiver
7. Power distribution relay
8. Interior antenna 1
9. Interior antenna 2
10. Interior antenna 3
11. Door handle & door antenna
12. Bumper antenna
13. IPM(Instrument Panel Module)

Circuit Diagram



SMGBE0003L

Description

System Overview

The System offers the following features:

- Human machine interface through a 1-stage button, for terminal switching and engine start.
- Control of external relays for ACC / IGN1 / IGN2 terminal switching and STARTER, without use of mechanical ignition switch.
- Indication of vehicle status through LED or explicit messages on display.
- Immobilizer function by LF transponder communication between fob and fob holder.
- Redundant architecture for high system dependability .
- Interface with Low Speed CAN vehicle communication network.
- Interface with LIN vehicle communication network depending on platform.

The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in separated system.

System Main Function

- Switching of ACC / IGN1 / IGN2 terminals.
- Control of the STARTER relay BAT line (high side) based on communication with EMS ECU.
- Management of the Immobilizer function.
- Management of BES warning function.

Button Engine Start System

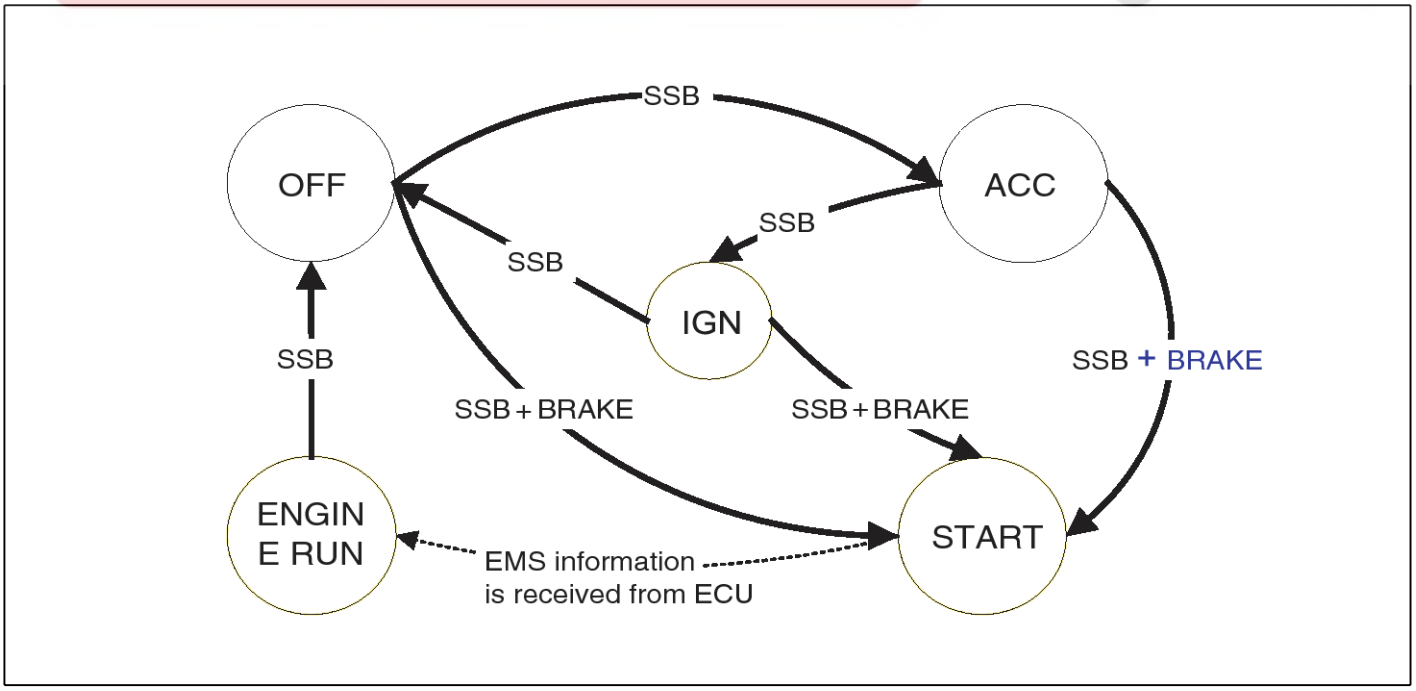
The Button Start System allows the driver to operate the vehicle by simply pressing a button (called as SSB) instead of using a standard mechanical key.

If the driver press the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the 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.

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.



SMGBE9048L

- Control Ignition and engine ON/OFF by Sending signal to IPM and PDM.
- Display status by LED Lamp ON/OFF. (Amber or Blue)

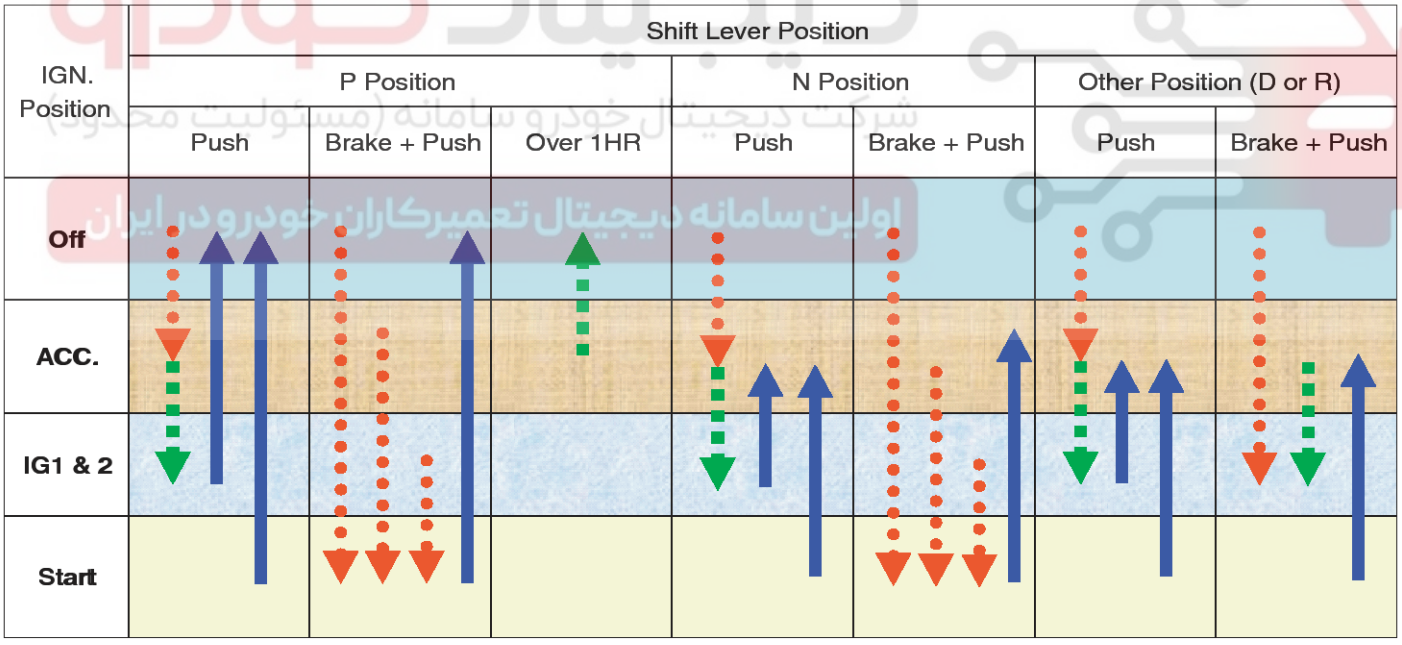
Indicator ON/OFF Condition At Ignition Key Off Condition

No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

Indicator ON/OFF Condition According To Ignition Key's Position

No.	Ignition conditions	Start Button LED status
1	IG OFF	LED OFF
2	IG ACC	Amber color LED ON
3	IG ON (Engine OFF)	Blue color LED ON
4	Cranking	Maintain LED status before cranking
5	Engine running	LED OFF

The shift of Ignition Position



Transfer possibility, after Smart key certification

Transfer possibility without Smart key certification

Transfer possibility without Smart key certification

● **Condition of stop engine while driving**

- Press 3 times button within 3 seconds.
- Press button more than 2 seconds

SBHBE9474L

Wireless Communication

Electromagnetic waves are used to exchange information between the vehicle and the FOB. Two types of RKE Key can supplement the BES system:

- Non-smart key RKE
- SMART KEY FOB

Currently the BES system comprises with SMART KEY FOB always.

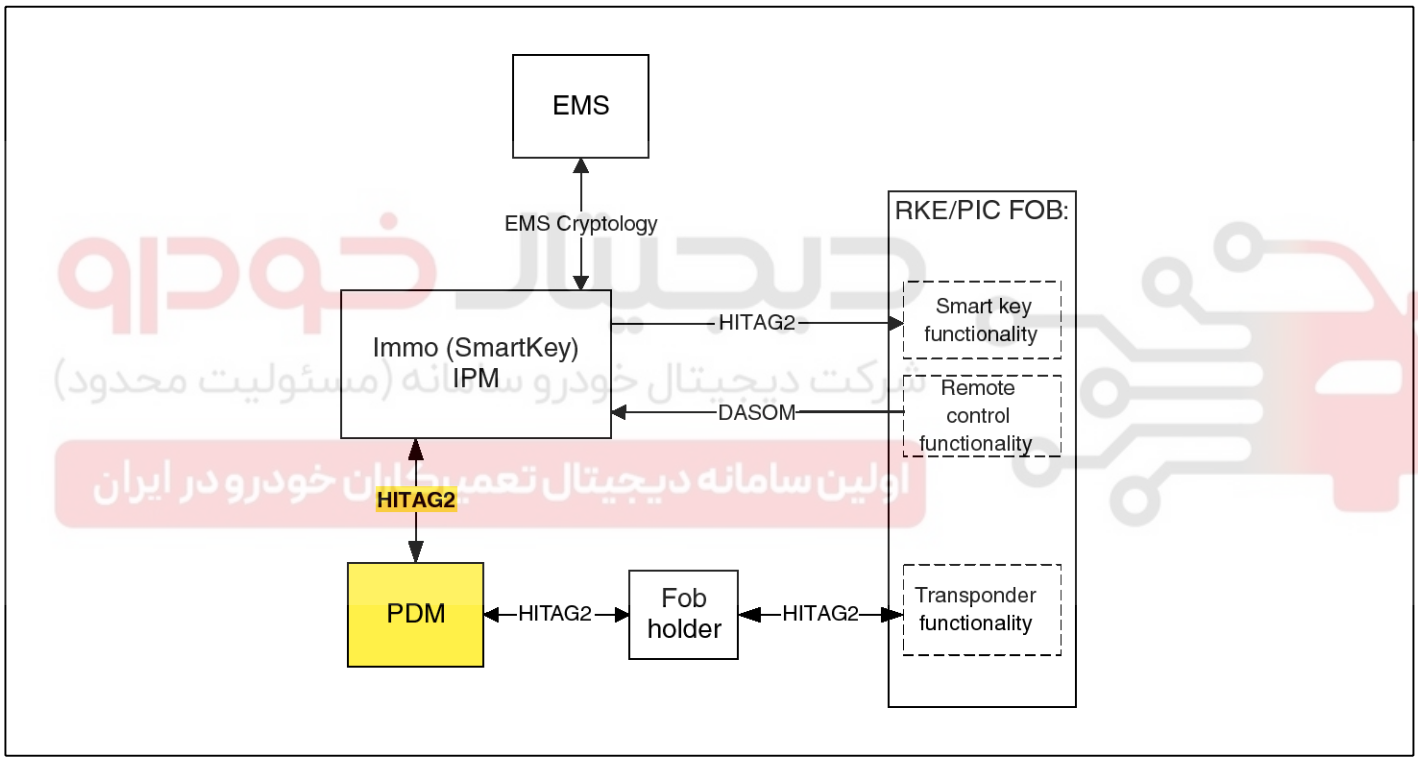
The transmitter, receiver and antennas required for the communication between the fob and the vehicle will differ depending on functionalities and regional areas.

The RKE and SMART KEY functions are in separated documents. Refer to Smart key system for more detailed information about SMART KEY function.

Smart Key

The SMK manages all function related to:

- "Start Stop Button (SSB) monitoring",
- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication),
- "System consistency monitoring",
- "System diagnosis",
- Control of display message / warning buzzer.



SMGBE0004L

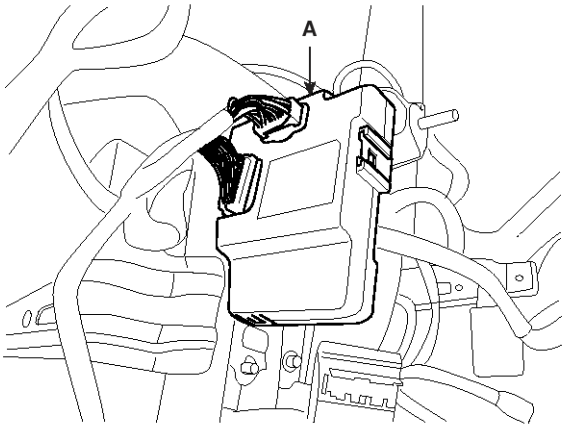
The unit behaves as Master role in the whole system.

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, Lock Button, PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates with others devices via the CAN network as well as a single line interfaces.

The diagnosis and learning of the components of the BES System are also handled by the SMK.

PDM



SBHBE8442D

The PDM (A) manages the functions related to the "terminal control" by activating external relays for ACC, IGN1 and IGN2. This unit is also responsible for the control of the STARTER relay.

The PDM is also controlling the illumination of the SSB as well as the "system status indicator", which consists of 2 LEDs of different color. The illumination of the fob holder is also managed by the PDM.

The PDM reads the inputs (Engine fob_in, vehicle speed, relays contact status), controls the outputs (Engine relay output drivers), and communicates with others devices via the CAN.

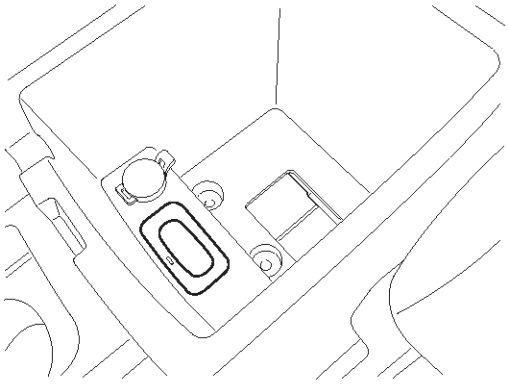
The IGN1 and IGN2 terminals relays shall be maintained in the state memorized before the failure and the driver shall be able to switch those IGN terminals off by pressing the SSB with EMERGENCY_STOP pressing sequence. However, engine restart will not be allowed. The state of the ACC relay will depend on the type of failure.

The PDM is diagnosed through theSMK MUT service, using the CAN network.

The main functions of the PDM are:

- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/ESP ECU.
- Control of SSB LEDs (illumination, clamp state) and FOB HOLDER illumination.
- Control of the base station located in fob holder through direct serial interface.
- System consistency monitoring to diagnose SMK failure and to switch to relevant limp home mode.
- Providing vehicle speed information

Fob Holder



SMGBE9077D

This unit is used for transponder authentication. In case of a vehicle equipped with Smart key, this transponder authentication is necessary in case of failure of the passive fob authentication (Engine loss of RF or LF link with the fob).

The Fob holder module integrates a slot where to insert the fob. The fob is maintained in position with a push-push mechanical locking (not electrically driven) and a signal (FOB_IN) is sent back to the PDM as soon as its insertion is detected.

The power supply of the fob holder is active only if a communication is initiated by the PDM.

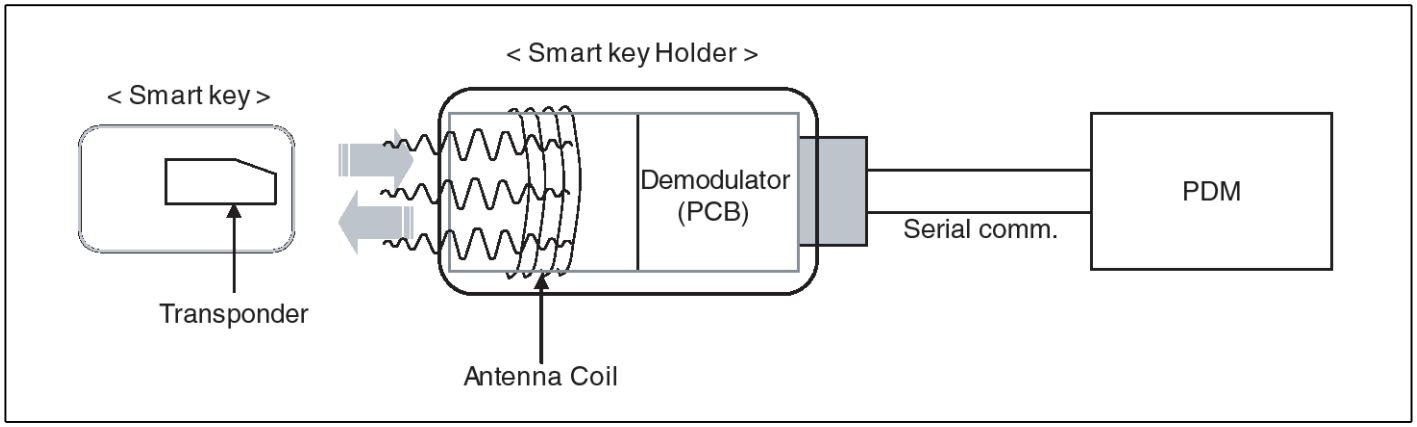
The insertion of the fob into the holder and the communication with the transponder should be possible regardless of the insertion direction of fob to the holder (buttons facing up or bottom).

A lighting device is also integrated for illumination of the Fob Holder and it is driven directly by the PDM,

The main functions of the Fob holder are:

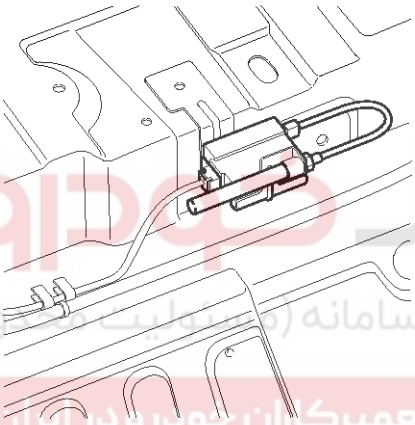
- Transponder base station
- Fob mechanical lock
- Illumination

Transponder



SHMBE9005L

External Receiver(SRX)



SMGBE9086D

The data transmitted by the RKE or Smart key Fob is received by an external RF receiver called as SRX. This receiver will be same as that one for the SMK applications, with respect to electronics, housing, connector and software.

This receiver is connected to the SMK via a serial communication line.

Terminal And Starter Relays

Relays will be used to switch the terminals ACC / IGN1 / IGN2. Those normally-open relays will be driven by the PDM and located either in the passenger or engine compartment depending on the vehicle architecture.

Only one relay coil is connected to the terminal outputs of the PDM.

Those relays should integrate a resistor connected in parallel to the coil in order to reduce the transients during commutation.

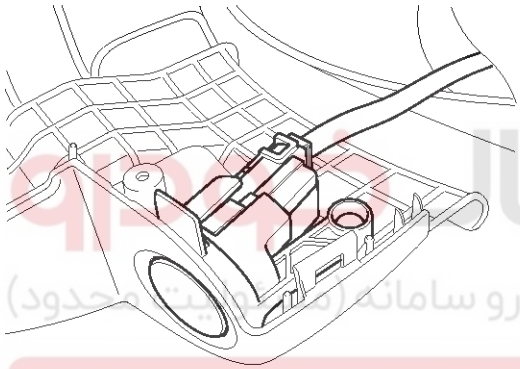
Start/Stop Button(SSB)

A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes ‘Off’, ’Accessory’, ‘Ignition’ and 'Start' by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.

Two (2) LED colors are located in the center of the button to display of the status of the system. Another illumination LED is also integrated into the SSB for the lighting of the "Engine Start/Stop" characters.



SMGBE9078D

BES System State Chart

System STATES in LEARNT MODE

In learnt mode, the BES System can be set in 6 different sates, depending on the status of the terminals, ESCL and Engine status:

System State	Terminal Status	Engine status
1. OFF - Locked	OFF	Stopped
2. OFF - Unlocked	OFF	Stopped
3. ACC	ACC	Stopped
4. IGN	IGN1, IGN2, ACC	Stopped
5. Start	IGN1, Start	Cranking
6. IGN - Engine	IGN1, IGN2, ACC	Running
		(means "self-running")

Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch. The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

System STATES IN VIRGIN MODE

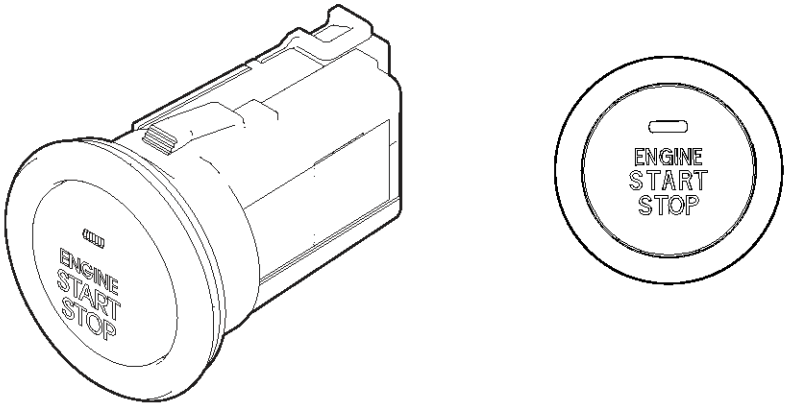
The BES System can be set in 5 different states (OFF LOCKED is not available in virgin mode), depending on the status of the terminals and Engine status :

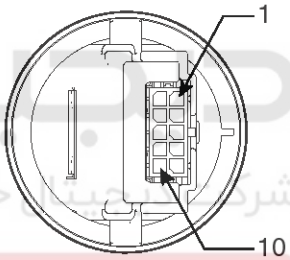
System State	Terminal Status	Engine status
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation see Chap 6.2.1 for details	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running
		(means "self-running")

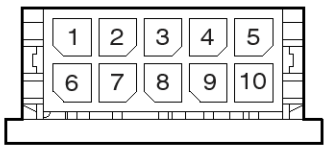
Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch. The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

Start/Stop Button

Component



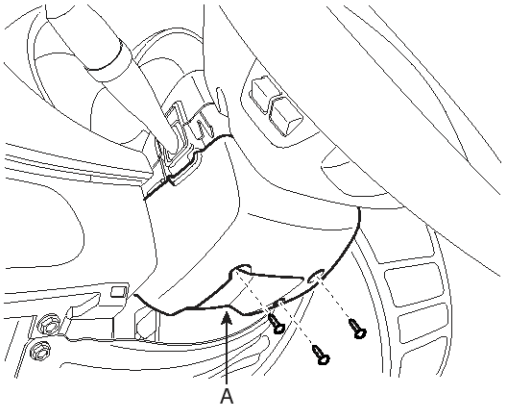


Connector (10 pins)			
Pin No.	Description	Pin No.	Description
1	Start/Stop button switch1(PDM)	6	Battery
2	Battery illumination	7	Start/Stop button switch2(IPM)
3	Start/Stop button LED Amber(PDM)	8	Start/Stop button LED Blue(PDM)
4	Start/Stop button illum. GND(PDM)	9	Rheostat
5	Start/Stop button illum. power	10	-

SBHBE9333L

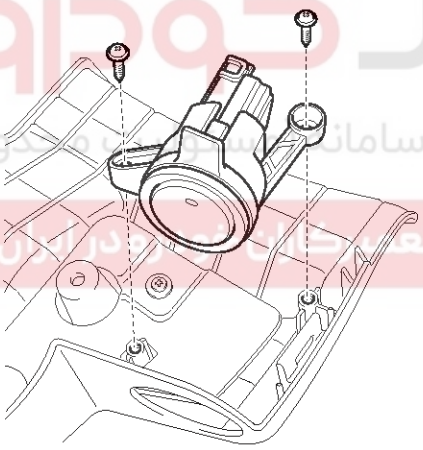
Removal

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



SMGBE9080D

3. Remove the start/stop button (A) after loosening a mounting screw and connector.



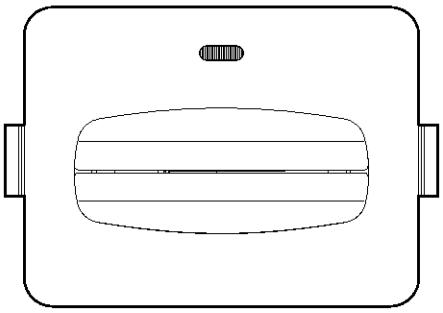
SMGBE9118D

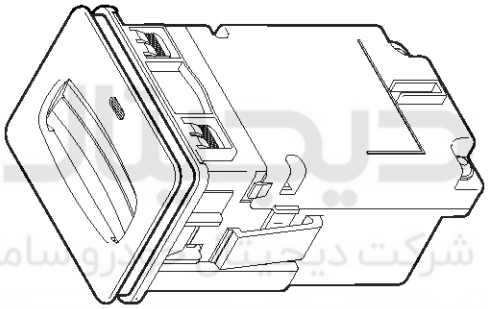
Installation

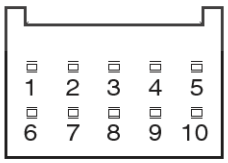
1. Install the connector.
2. Install the start/stop button.
3. Install the steering column upper and lower shrouds.

Fob Holder

Component



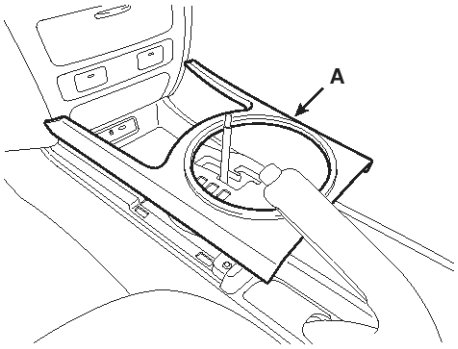


Connector (10 pins)			
Pin No.	Description	Pin No.	Description
1	-	6	Battery
2	Immobilizer clock	7	Immobilizer data
3	Holder illumination(PDM)	8	Illumination battery
4	-	9	Fob in (PDM)
5	GND	10	-

SMGBE9038L

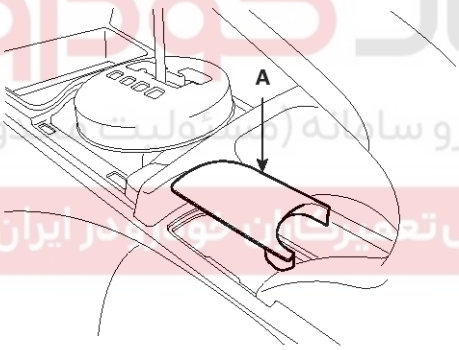
Removal

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



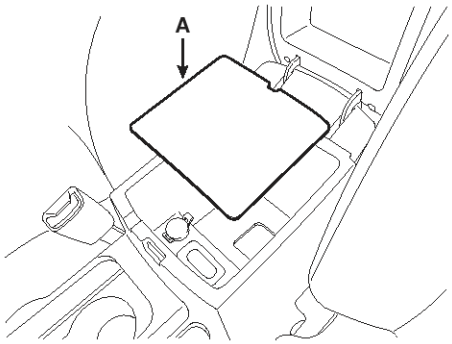
SMGBE9088D

3. Remove the parking brake cover (A).



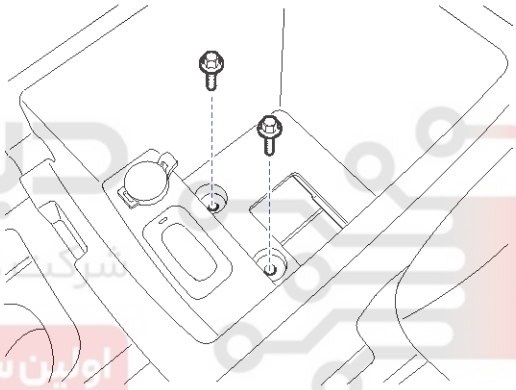
SMGBD8052D

4. Remove the mat (A).



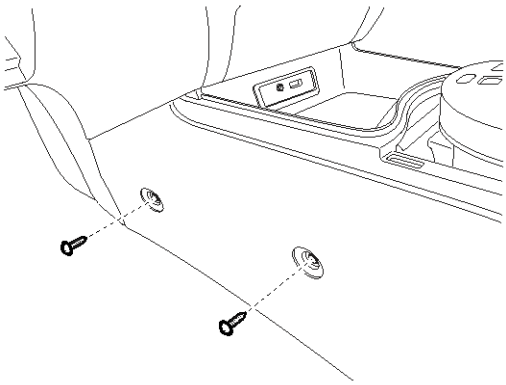
SMGBE9089D

5. Loosening the console mounting bolt.



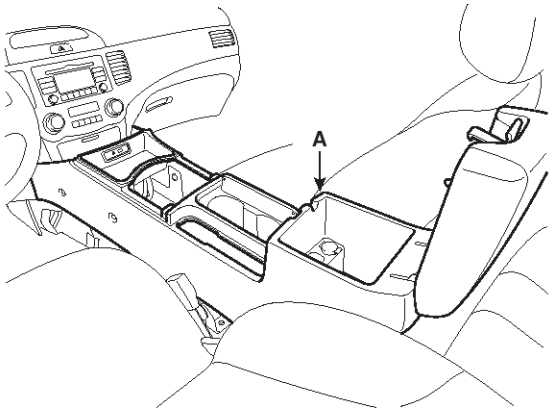
SMGBE9090D

6. Loosening the console mounting screws.



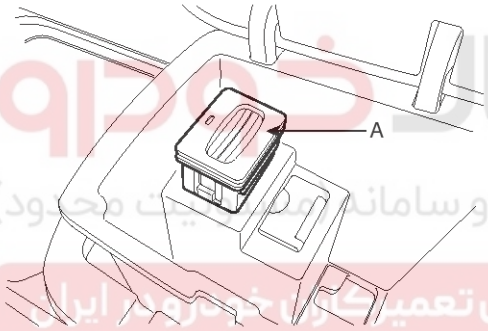
SMGBE9091D

7. Remove the floor console assembly (A).



SMGBE9092D

8. Disconnect the connector (A) and remove the fob holder.



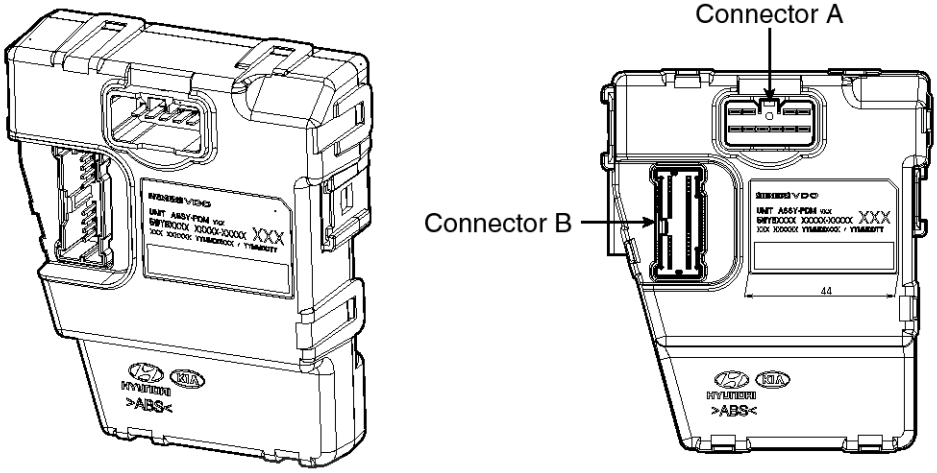
SGHBE9036D

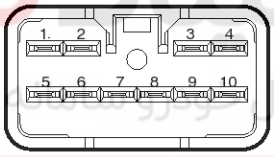
Installation

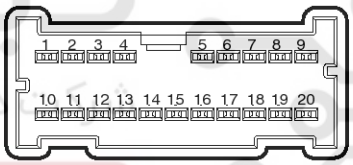
1. Install the fob hoder assembly.
2. Install the floor console.

PDM(Power Distribution Module)

Component





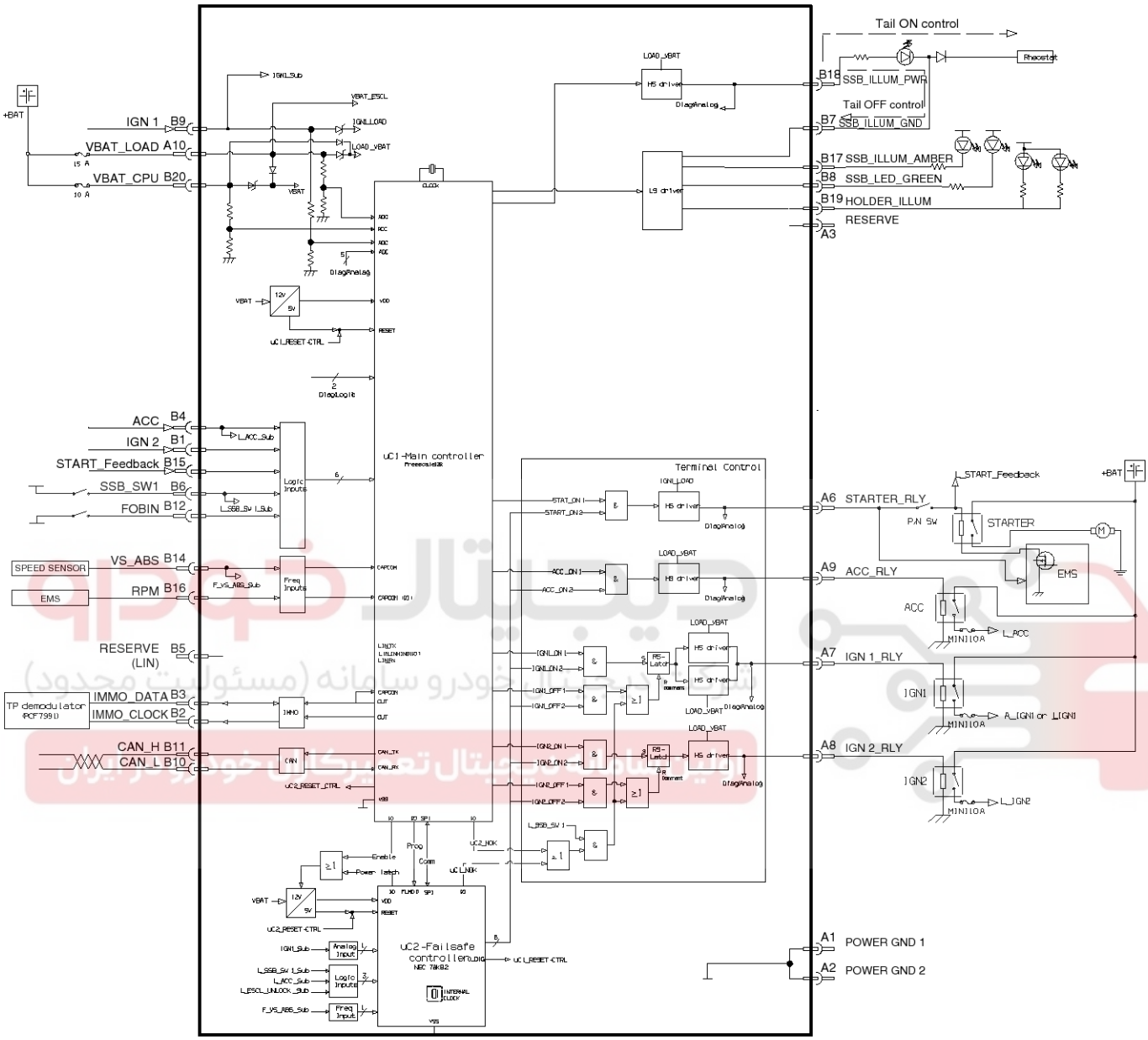


Pin No.	Connector A (10 pin)	Connector B (20 pin)
1	Power ground 1	IGN2
2	Power ground 2	Immobilizer clock
3	-	Immobilizer data
4	-	ACC
5	-	-
6	Starter relay	SSB switch1
7	IGN1 relay	SSB illumination ground
8	IGN2 relay	SSB LED blue
9	ACC relay	IGN1
10	Battery load	CAN L
11		CAN H
12		Fob in
13		-
14		Vehicle speed
15		Start Feed back
16		RPM data (EMS)
17		SSB LED amber
18		SSB illumination power
19		Holder illumination
20		CPU battery

SMGBE0005L

System Circuit Diagram

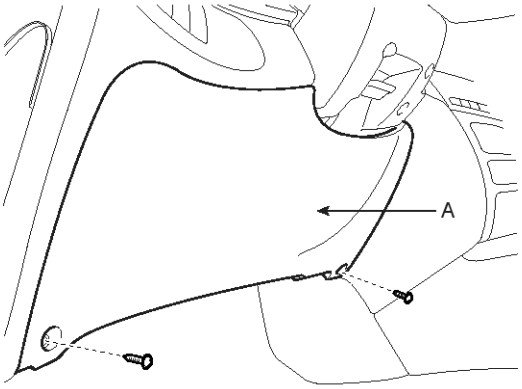
[PDM]



SMGBE0009D

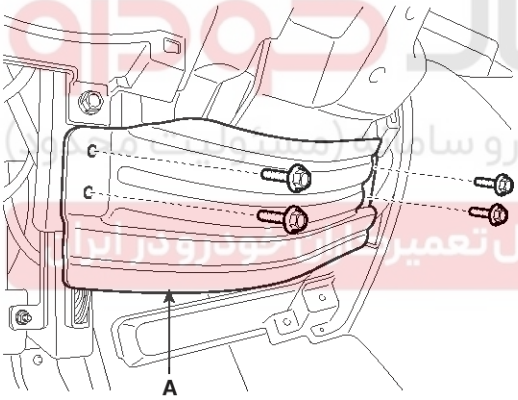
Removal

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



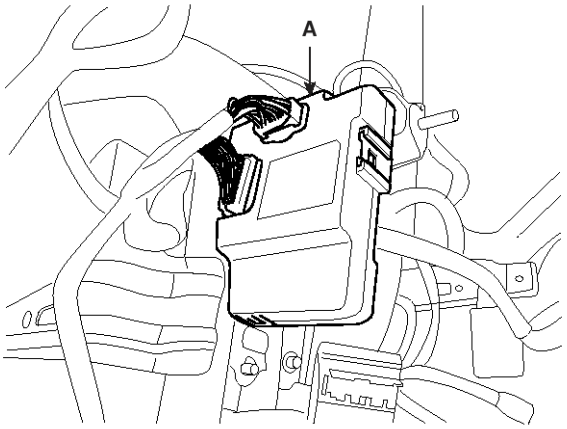
SMGBE9035D

3. Remove the reinforcing panel (A).



SMGBE9117D

4. Remove the power distribution module(A) after loosening nuts.



SBHBE8442D

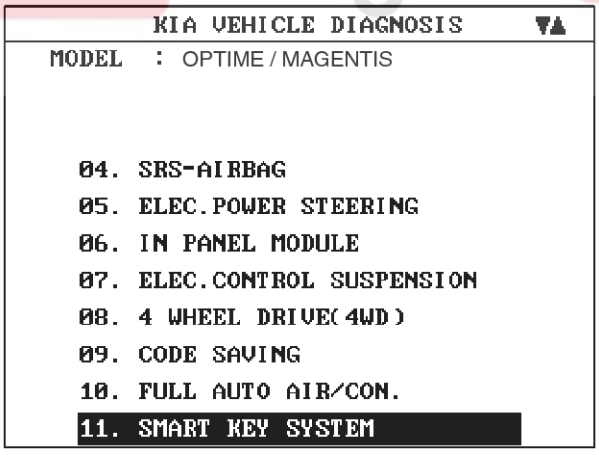
Installation

1. Install the power distribution module.
2. Install the crash pad lower panel.

Inspection

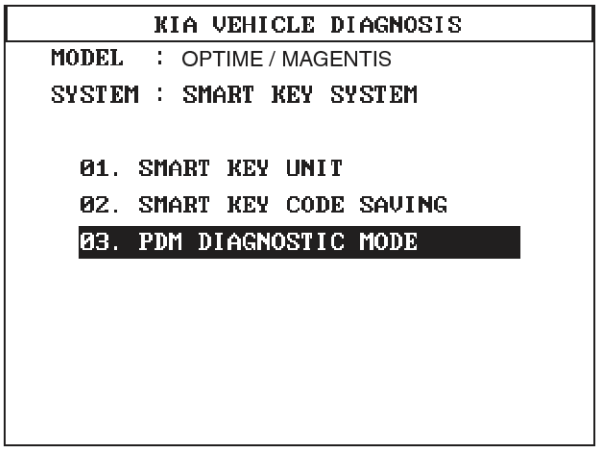
PDM Diagnosis With Scan Tool

1. It will be able to diagnose defects of Smart key with scan tool quickly. Scan tool can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and "Smart key system(Button start)" menu if you want to check PDM.



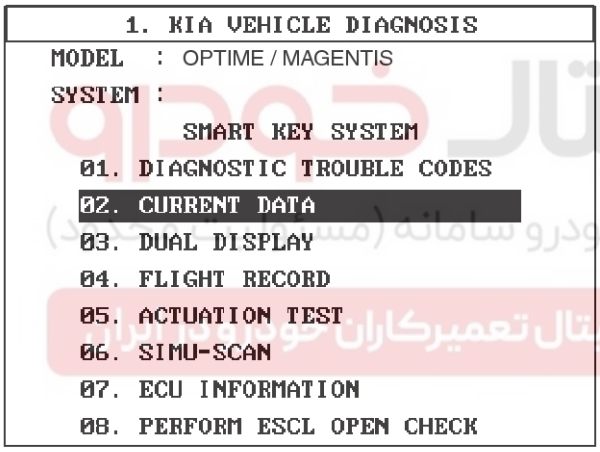
SMGBE9099L

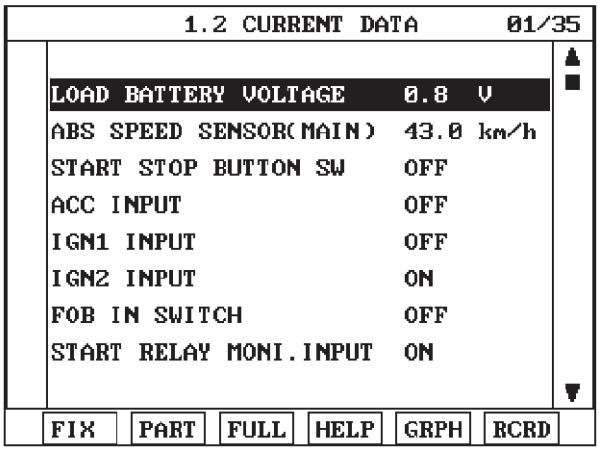
3. Select "PDM" in the manu.



SMGBE9100L

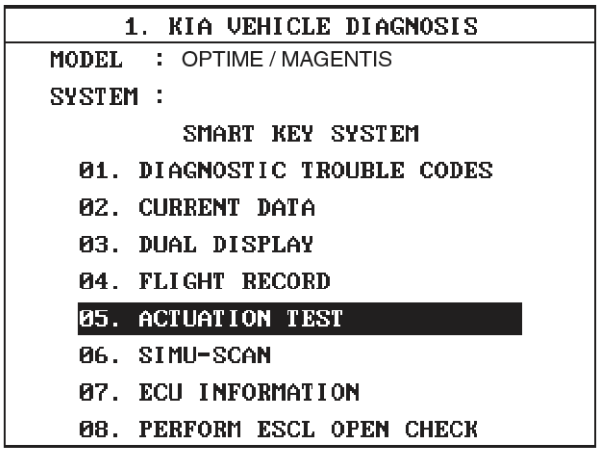
4. Select "Current data", if you want to check current data of PDM. It provides the input/output status of each module.

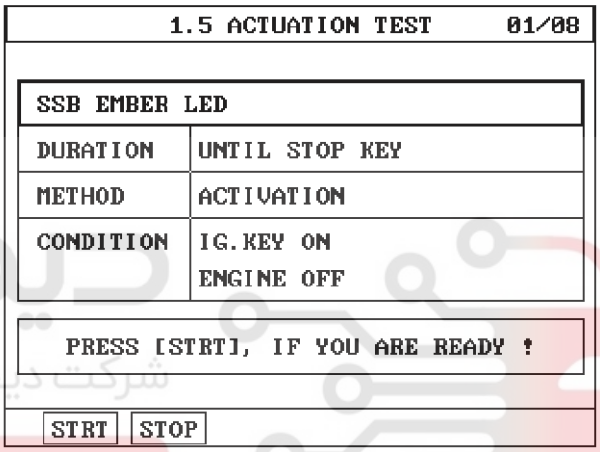




SMGBE9101L

5. If you want to check PDM data operation forcefully, select "Actuation test".





SMGBE9102L

Button Engine Start System BE-281

Input/output Current Data

NO	Description	Unit
1	Load Battery Voltage	V
2	Abs Speed Sensor(main)	Km/h
3	Start Stop Button SW	OFF/ON
4	ACC input	OFF/ON
5	IGN1 Input	OFF/ON
6	IGN2 Input	OFF/ON
7	Fob In Switch	RELEASE/INSERT
8	Start Relay Monitoring Input	
9	SSB Ember LED Output	OFF/ON
10	SSB Blue LED Output	OFF/ON
11	Fob Holder Illumination Output	OFF/ON
12	SSB Illumination Output	OFF/ON
13	ACC Relay Output	OFF/ON
14	IGN1 Relay Output	OFF/ON
15	IGN2 Relay Output	OFF/ON
16	Start Relay S1 Output	OFF/ON
17	-	OFF/ON
18	-	OFF/ON
19	CPU Battery Voltage	V
20	Engine Speed	DATA*1.0
21	ACC Relay SCB	OFF/ON
22	IGN1 Relay SCB	OFF/ON
23	IGN2 Relay SCB	OFF/ON
24	Start Relay SCB	OFF/ON
25	SCC Relay Open	OFF/ON
26	IGN1 Relay Open	OFF/ON
27	IGN2 Relay Open	OFF/ON
28	ACC Output SCB	OFF/ON
29	IGN1 Output SCB	OFF/ON
30	IGN2 Output SCB	OFF/ON
31	Start Output SCB	OFF/ON
32	ACC Output SCG	OFF/ON
33	IGN1 Output SCG	OFF/ON
34	IGN2 Output SCG	OFF/ON

35	Start Output SCG	OFF/ON

Actuation Test

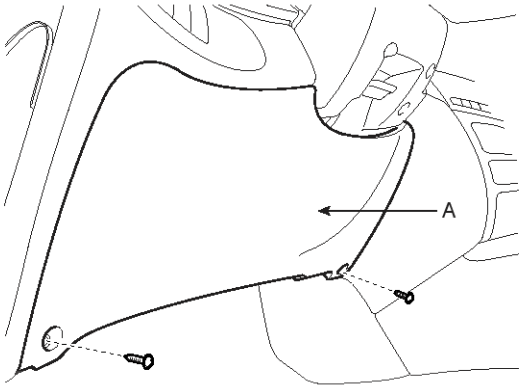
No.	Description
1	SSB Ember LED
2	SSB Blue LED
3	Fob Holder Illumination
4	SSB Illumination
5	ACC Output
6	ING1 Output
7	ING2 Output
8	Start Output

Ignition Switch Assembly

Ignition Switch

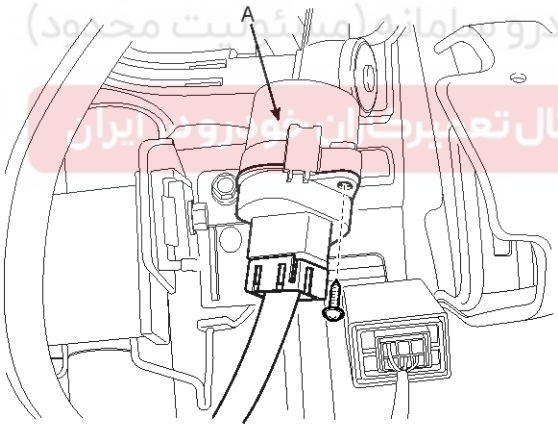
Replacement

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



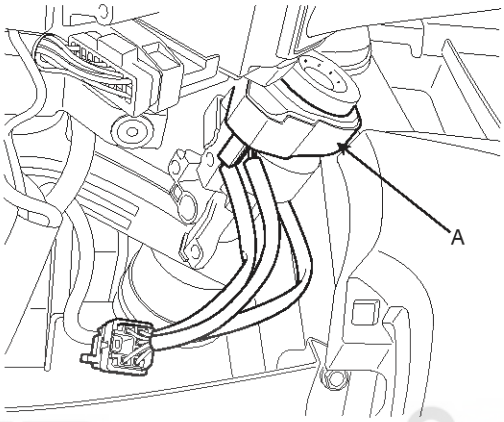
SMGBE9035D

3. Remove the ignition switch (A) after loosening the screw and disconnecting the 6P connector.



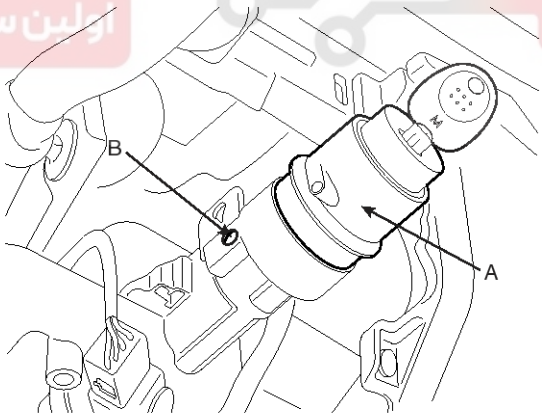
ATLG781A

4. Remove the steering column shaft (Refer to the ST group).
5. Remove the key warning switch and key illumination lamp (A) after loosening the screws and disconnecting the 6P connector.



ATLG781B

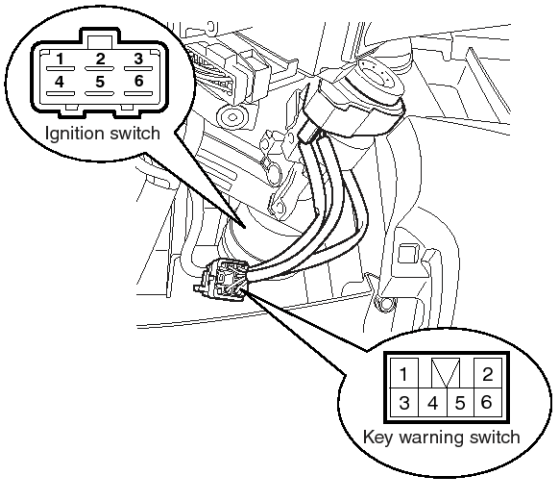
6. If it is necessary to remove the key lock cylinder (A), Remove the key lock cylinder (A) after pushing lock pin (B) with key ON.



ATLG781C

7. Installation is the reverse of removal procedure.

Inspection



LTLG781D

1. Disconnect the ignition switch connector and key warning switch connector from under the steering column.
2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

TERMINAL / POSITION / KEY	IGNITION SWITCH 2	4	6	5	3	1	STEERING TRAVEL	TRAVEL	KEY WARNING SWITCH 5	6	KEY HOLE ILLUMINATION 3	4
LOCK / REMOVAL							LOCK					
LOCK							LOCK	UNLOCK				
ACC / INSERT	○—○						UNLOCK		○—○		○ ○	
ON	○—○	○—○	○—○	○—○	○—○							
START	○—○	○—○	○—○	○—○	○—○	○—○						

LTIF781E