Body Electrical System

GENERAL

GENERAL TROUBLESHOOTING INFORMATION E60BE67C

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.

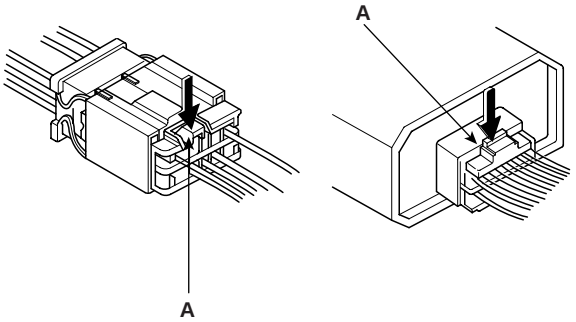
NOTE

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

3. Check the alternator belt tension.

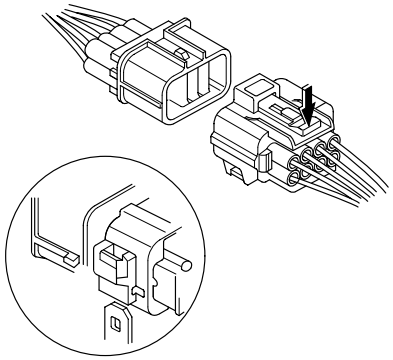
HANDLING CONNECTORS

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



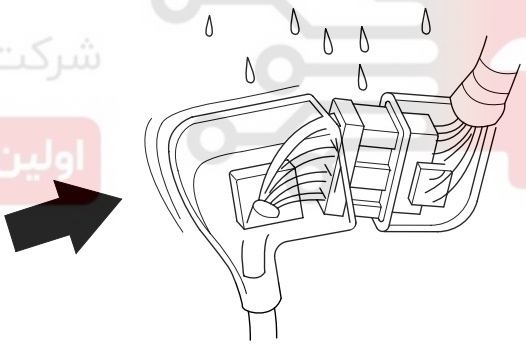
ETKD150A

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).



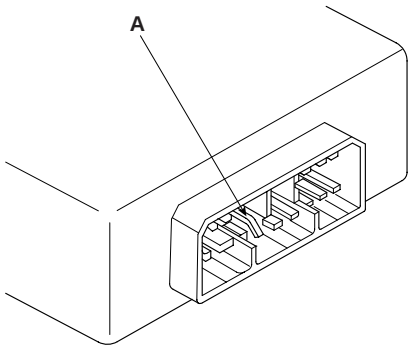
ETKD150B

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



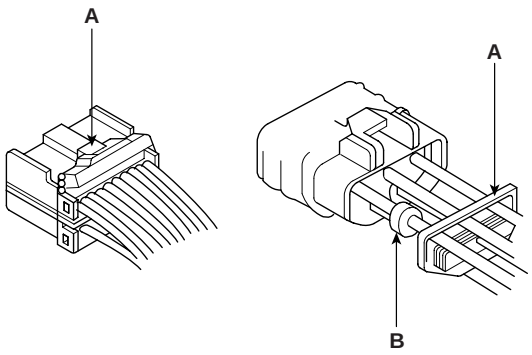
ETKD150C

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



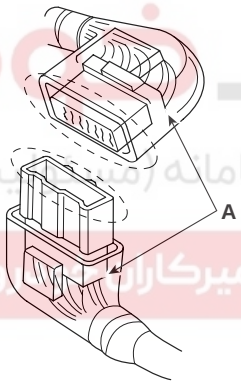
ETKD150D

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



ETKD150E

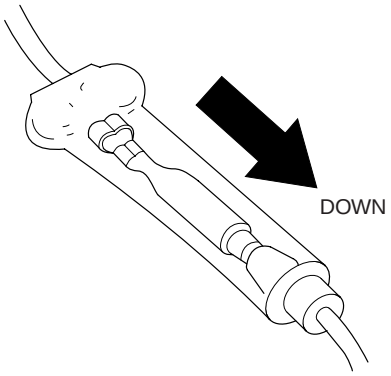
10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



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.

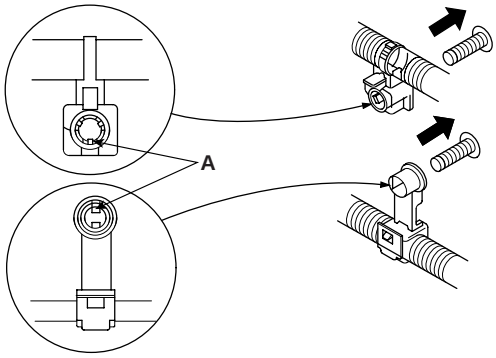


ETKD150G

HANDLING WIRES AND HARNESSES

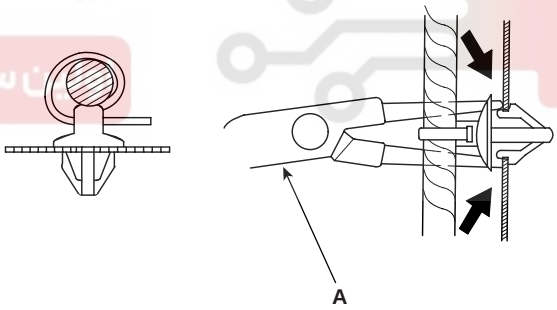
1. Secure wires and wire harnesses to the frame with their respective wire ties at the designated locations.

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.

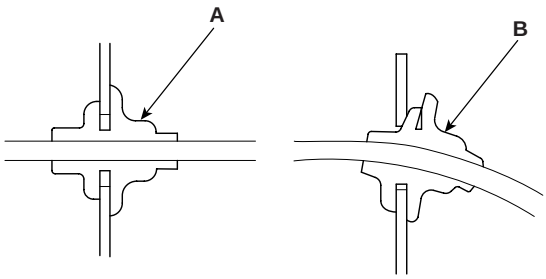


ETKD150I

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.

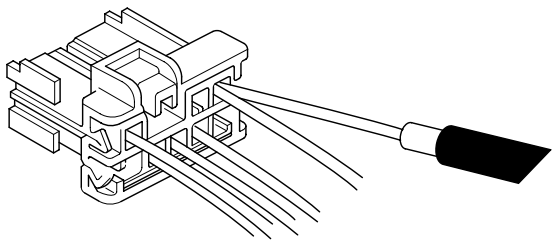
6. Seat grommets in their grooves properly (A). Do not leave grommets distorted (B).



ETKD150J

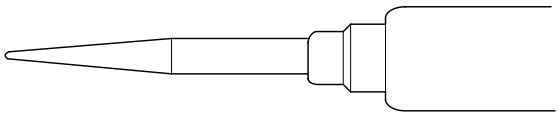
TESTING AND REPAIRS

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 probe of the tester from the wire side (except waterproof connector).



ETKD150K

5. Use a probe with a tapered tip.



ETKD150L

FIVE-STEP TROUBLESHOOTING

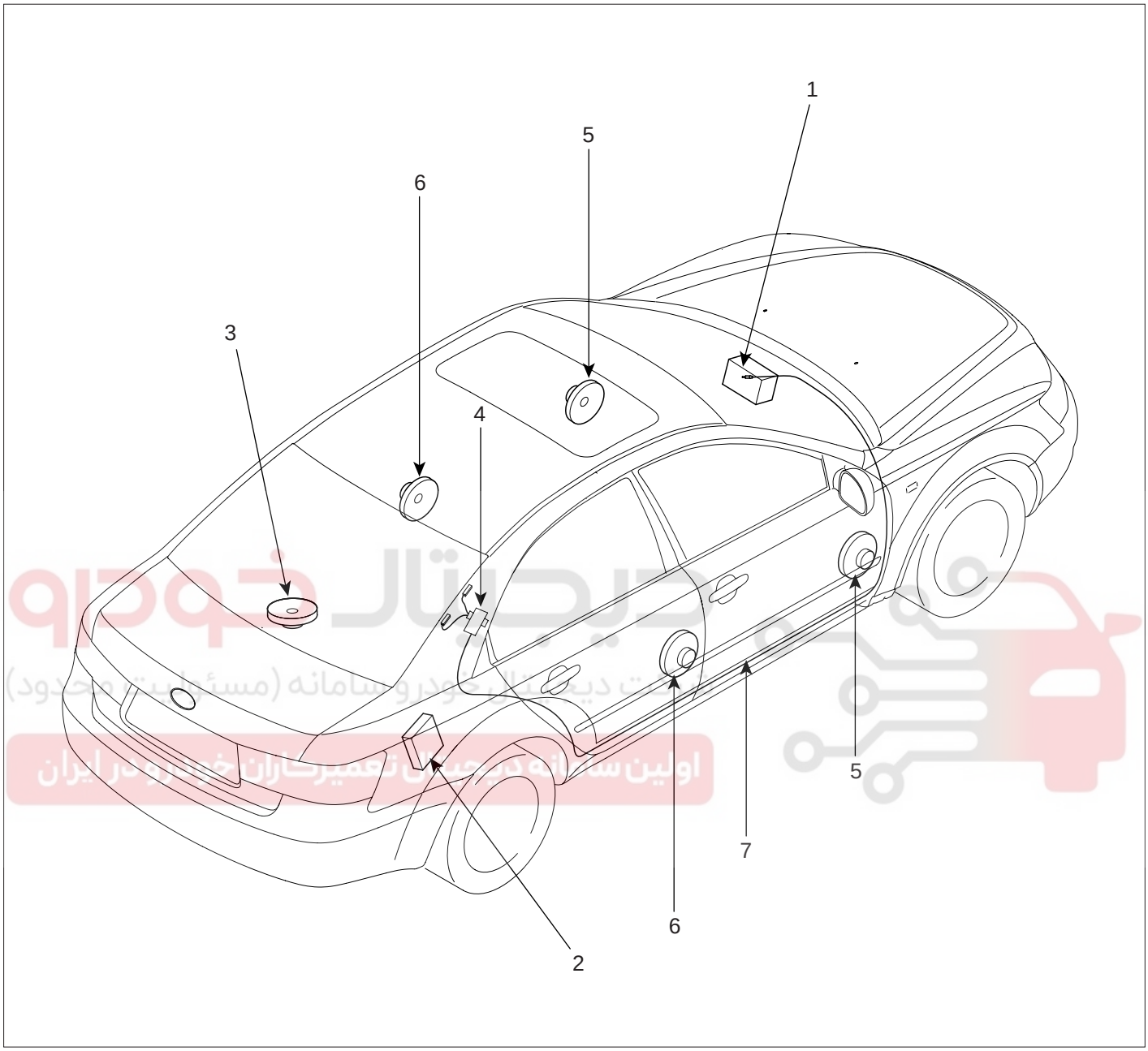
1. Verify the complaint
   Turn on all the components in the problem circuit to verify the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.
2. Analyze the schematic
   Look up the schematic for the problem circuit. Determine how 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.

AUDIO SYSTEM

SPECIFICATION EEAFCDBF

Item		Specification		
Model		AM/FM/Cassette (M440)	AM/FM/Cassette /MP3 (M455)	AM/FM/Cassette /6CDC (M465)
Power supply		DC 14.4V		
Rated output		Max 43W x 4		Maw 50W x 4
Speaker impedance		4Ω x 4		2Ω x 4
Antenna		80PF 75Ω		
Tuning type		PLL synthesized type		
The others		-		External amp, woofer speaker
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)		

COMPONENT LOCATION ED97CCA8



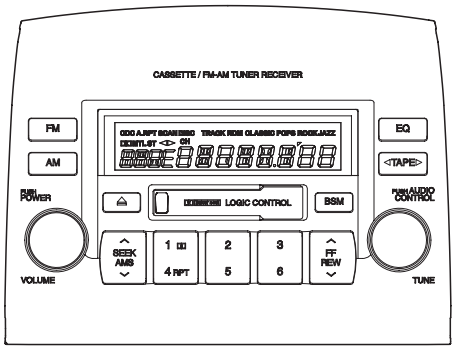
1. Audio unit
2. External amp
3. Woofer speaker
4. Glass antenna
5. Front door speaker
6. Rear door speaker
7. Antenna feeder cable

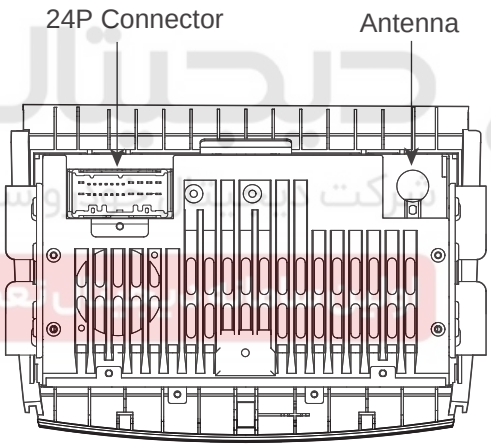
ETRF020A

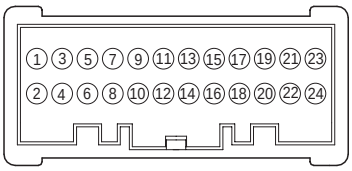
AUDIO UNIT

COMPONENT EF935C55

[AM/FM/Cassette-M440]

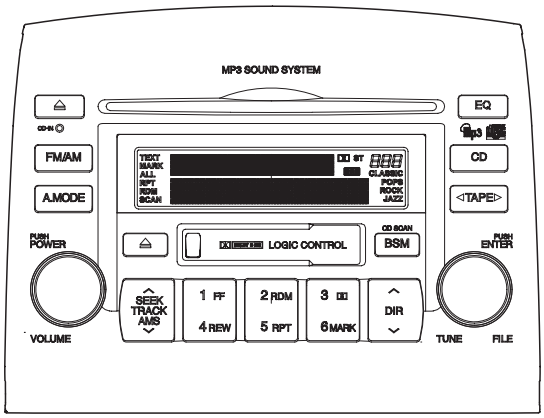


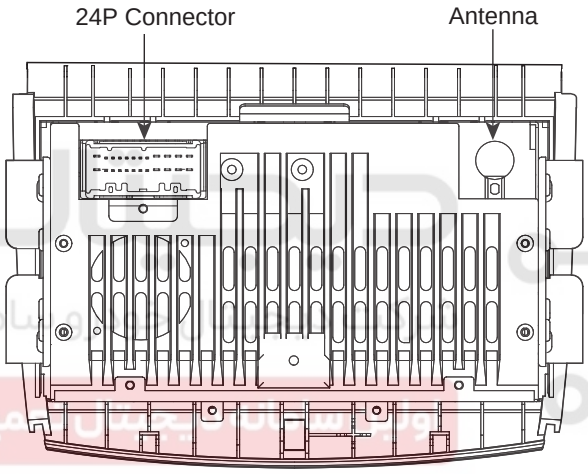


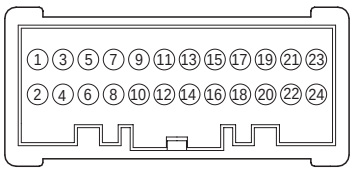
Audio connector	Terminal	Description	Terminal	Description
	1	Ground	13	Remote control ground
	2	Battery	14	Steering remote control
	3	Antenna B+	15	Illumination (-)
	4	ACC	16	Illumination (+)
	5	-	17	Rear left speaker (-)
	6	-	18	Rear left speaker (+)
	7	Tweeter in (R)	19	Rear right speaker (-)
	8	Tweeter in (L)	20	Rear right speaker (+)
	9	Ground	21	Front right speaker (-)
	10	Twiter ground	22	Front right speaker (+)
	11	MUTE	23	Front left speaker (-)
	12	Rear-arm remote control	24	Front left speaker (+)

ETRF010A

[AM/FM/Cassette/MP3-M455]

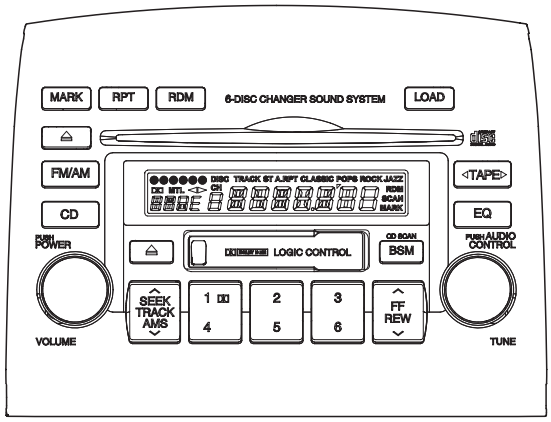


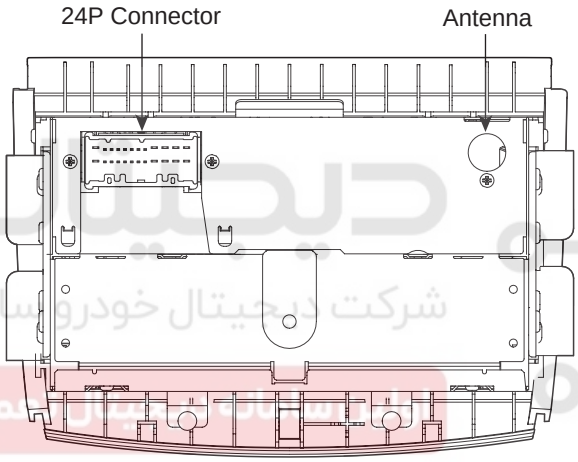


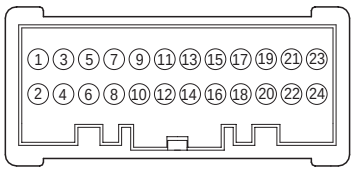
Audio connector	Terminal	Description	Terminal	Description
	1	Ground	13	Remote control ground
	2	Battery	14	Steering remote control
	3	Antenna B+	15	Illumination (-)
	4	ACC	16	Illumination (+)
	5	-	17	Rear left speaker (-)
	6	-	18	Rear left speaker (+)
	7	Tweeter in (R)	19	Rear right speaker (-)
	8	Tweeter in (L)	20	Rear right speaker (+)
	9	Ground	21	Front right speaker (-)
	10	Twiter ground	22	Front right speaker (+)
	11	MUTE	23	Front left speaker (-)
	12	Rear-arm remote control	24	Front left speaker (+)

ETRF010B

[AM/FM/Cassette/6CDC-M465]





Audio connector	Terminal	Description	Terminal	Description
	1	Ground	13	Remote control ground
	2	Battery	14	Steering remote control
	3	Antenna B+	15	Illumination (-)
	4	ACC	16	Illumination (+)
	5	-	17	Rear left speaker (-)
	6	-	18	Rear left speaker (+)
	7	Tweeter in (R)	19	Rear right speaker (-)
	8	Tweeter in (L)	20	Rear right speaker (+)
	9	Ground	21	Front right speaker (-)
	10	Twiter ground	22	Front right speaker (+)
	11	MUTE	23	Front left speaker (-)
	12	Rear-arm remote control	24	Front left speaker (+)

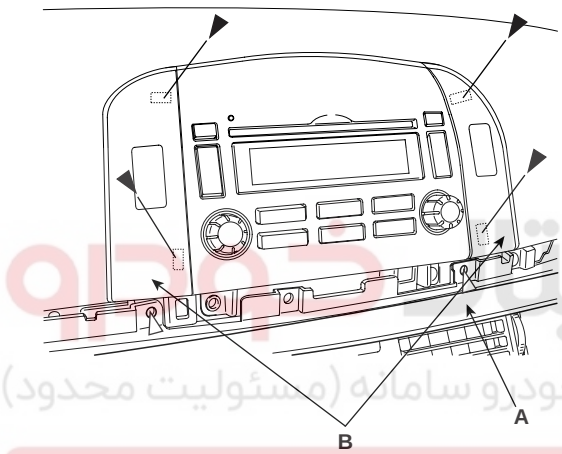
ETRF010C

REPLACEMENT E4A99BCB

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad garnish (A) after pulling it by using regular screw driver (-). Take care of fixing clips.
3. Remove the center facia panel (B) after loosening the screws.

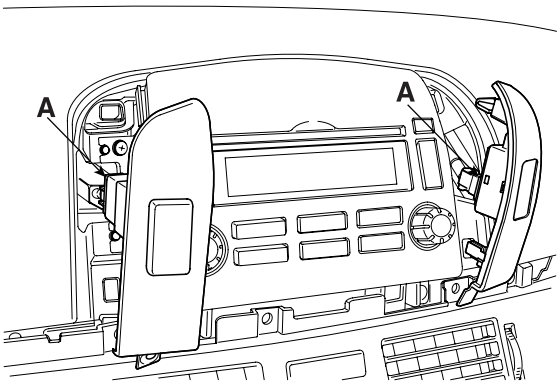
Fastener Locations

▷ : Screw, 2 ► : Clip, 4



ETRF021A

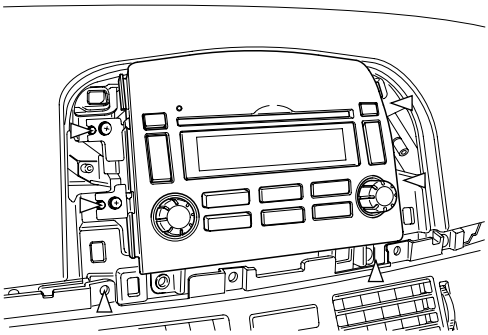
4. Remove the connectors(A).



LSRE170G

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

▷ : Screw location, 6



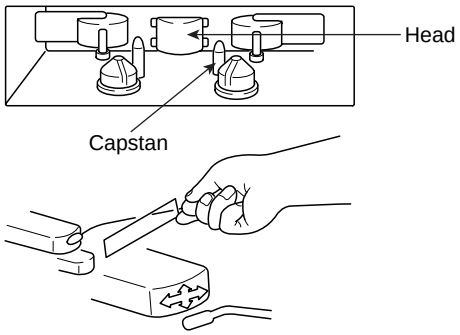
ETRF021E

6. Installation is the reverse of removal.

INSPECTION E06AC3AC

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.



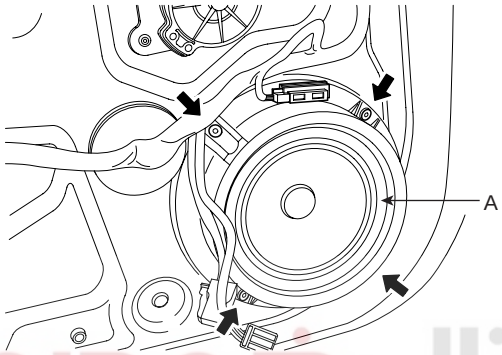
LTAC005A

SPEAKERS

REPLACEMENT E27DDFBF

FRONT SPEAKER

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

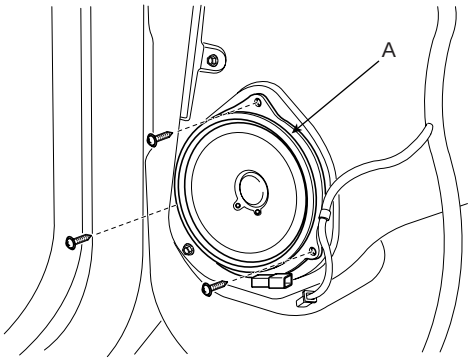


KTRE022B

3. Installation is the reverse of removal.

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.

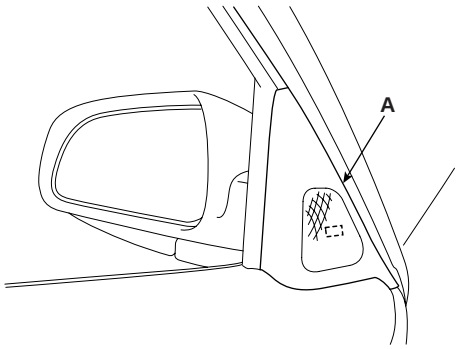


ATIE022C

3. Installation is the reverse of removal.

TWEETER SPEAKER

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

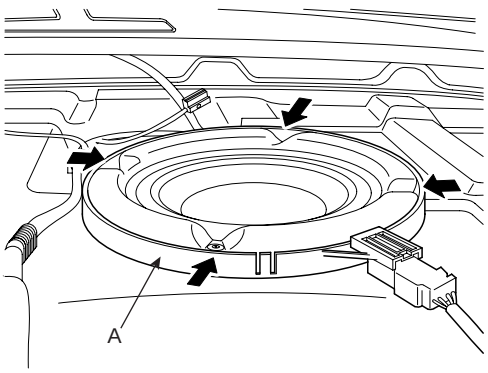


KTRE022D

3. Installation is the reverse of removal.

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 - package tray)
3. Remove the woofer speaker (A) after removing 4 bolts.

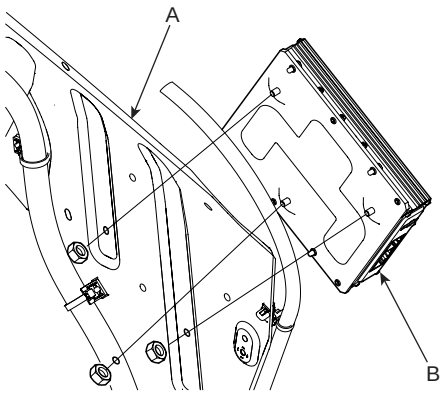


KTRE022E

4. Installation is the reverse of removal.

EXTERNAL AMP

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

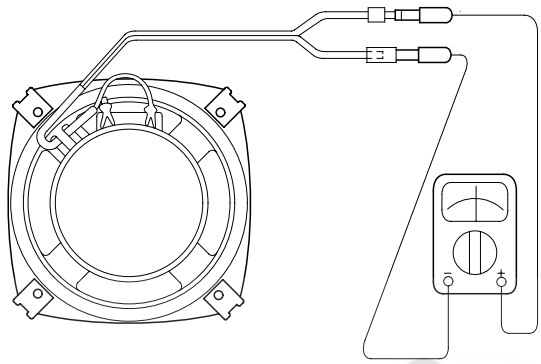


KTRE022F

3. Installation is the reverse of removal.

INSPECTION E4B4BBA0

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.



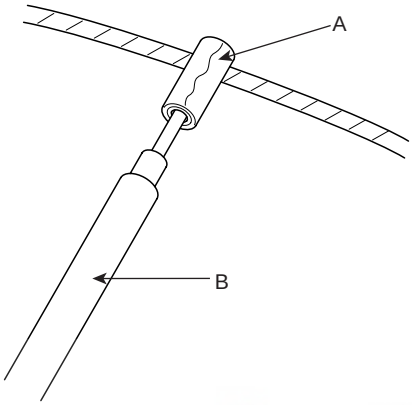
KTMB060A

ANTENNA

INSPECTION ED0ACAFA

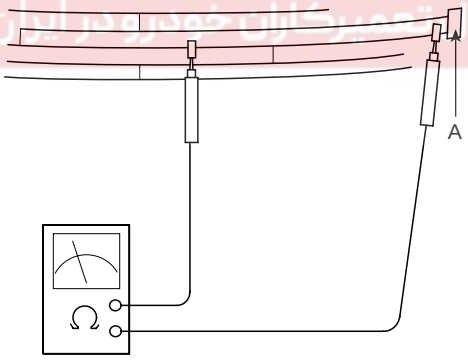
GLASS ANTENNA TEST

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) hear, and move the other tester probe along the antenna wires to check that continuity exists.



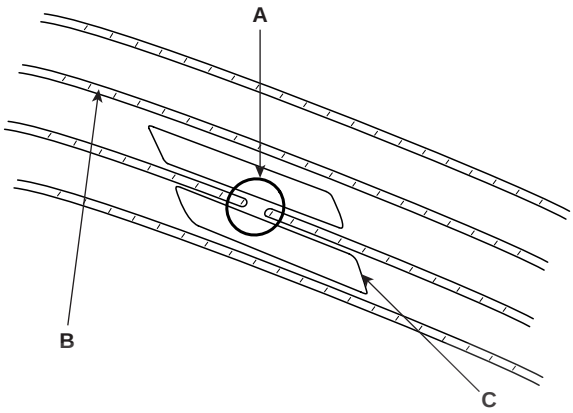
ETRF023D

GLASS ANTENNA REPAIR

NOTE

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

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



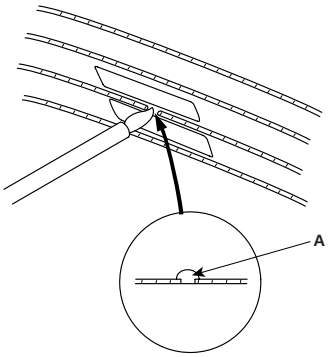
ETKD004K

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.

NOTE

Thoroughly mix the paint before use.



KTKD006Z

4. Check for continuity in the repaired wire.

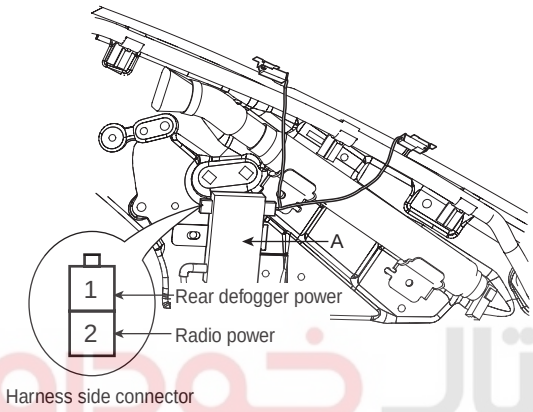
5. Apply a second coat of paint in the same way. Let it dry three hours before removing the tape.

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 (A) and body ground.

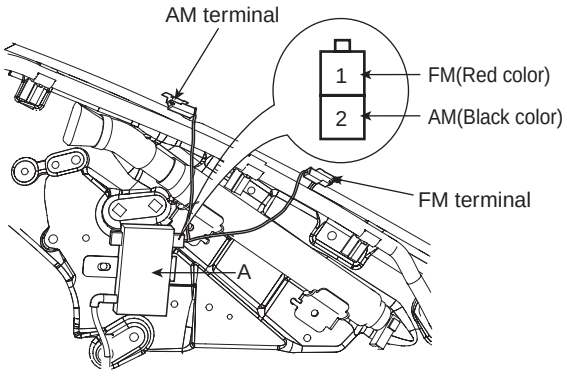
OK : approximately 12V (ACC+)



ETRF023A

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).



ETRF023B

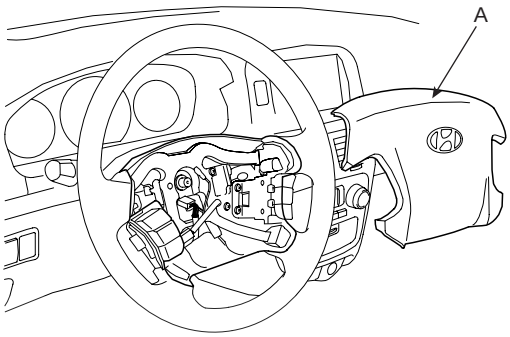
5. Check the grid lines that continuity exists.

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

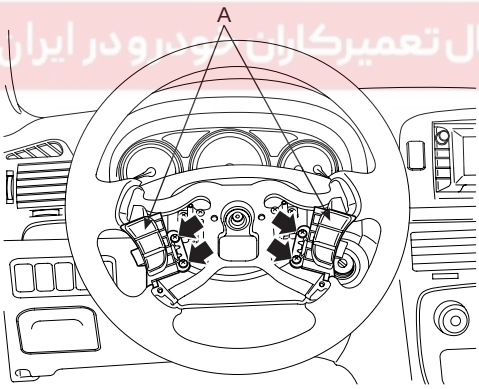
REPLACEMENT EBF43BD0

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



KPRE201C

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

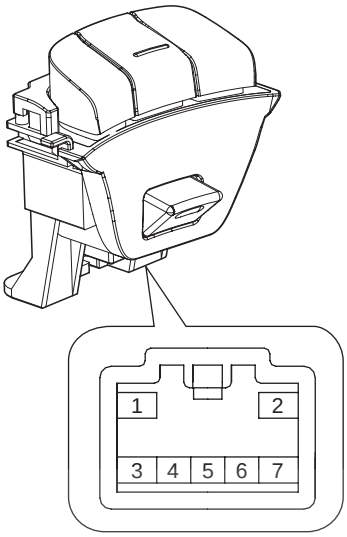


KTRE024A

4. Installation is the reverse of removal.

INSPECTION E5DFFC6A

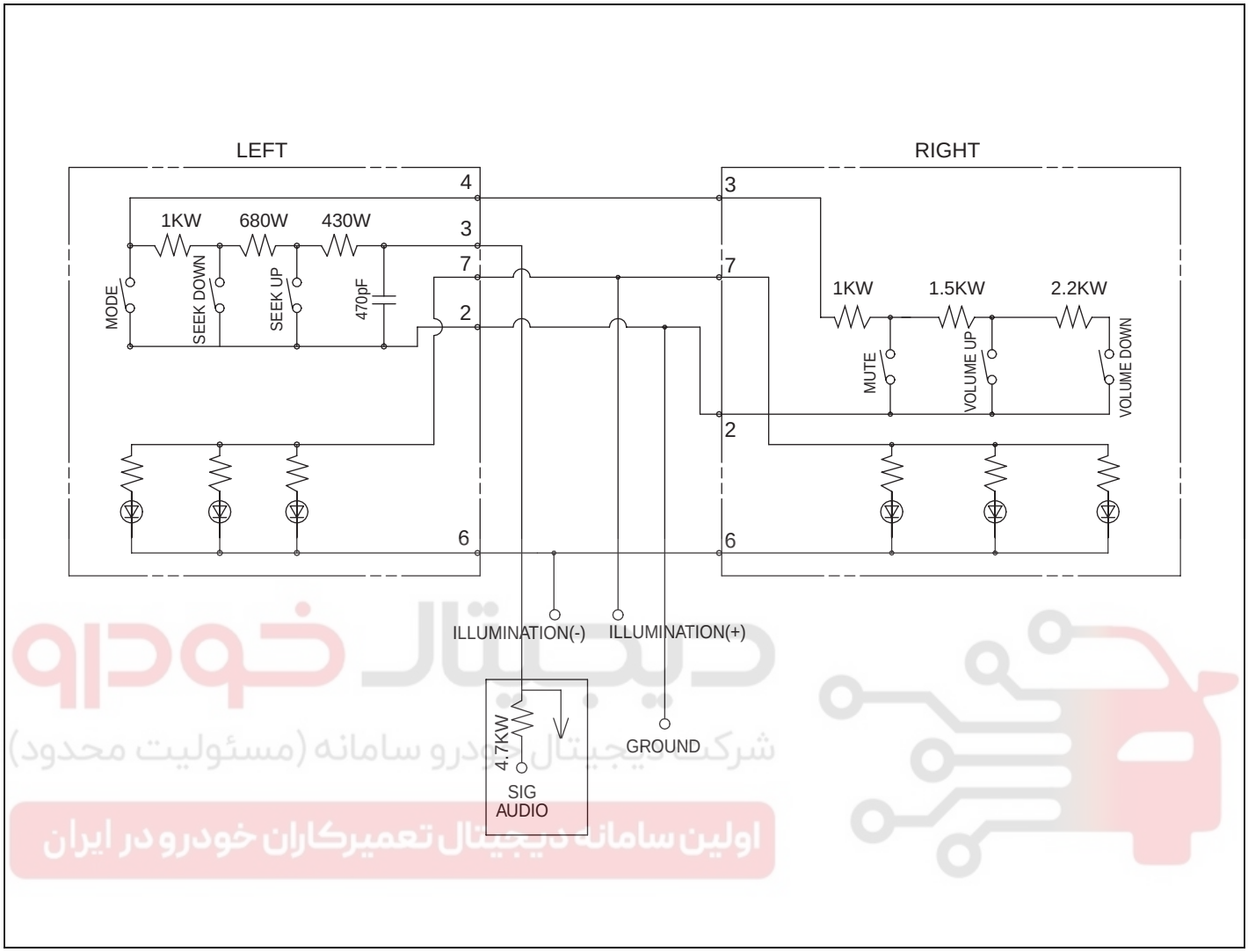
1. Check for resistance between No.2 and No.3 terminals in each switch position.



KTRE024B

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

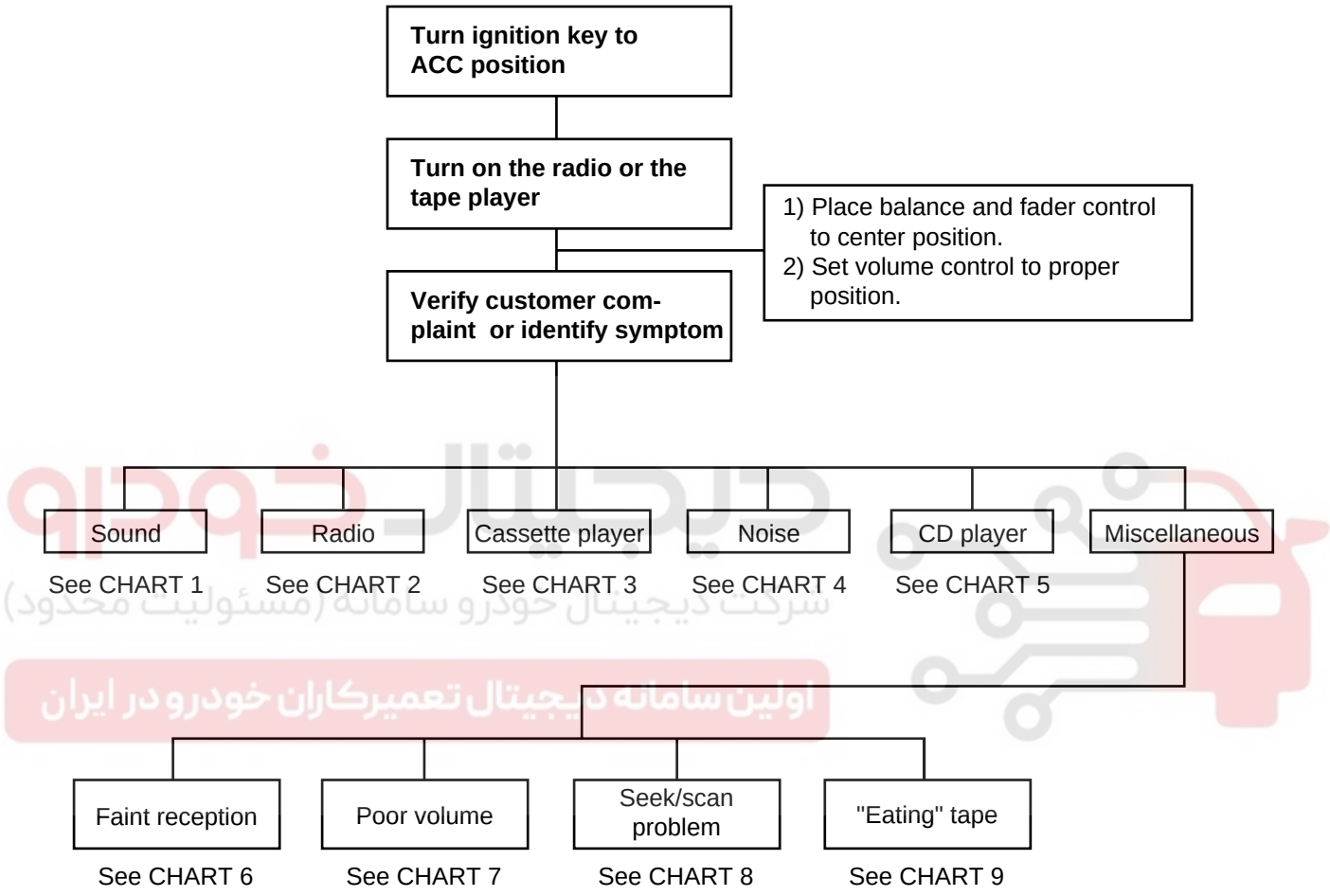
CIRCUIT DIAGRAM EA6859EE



ETRF024C

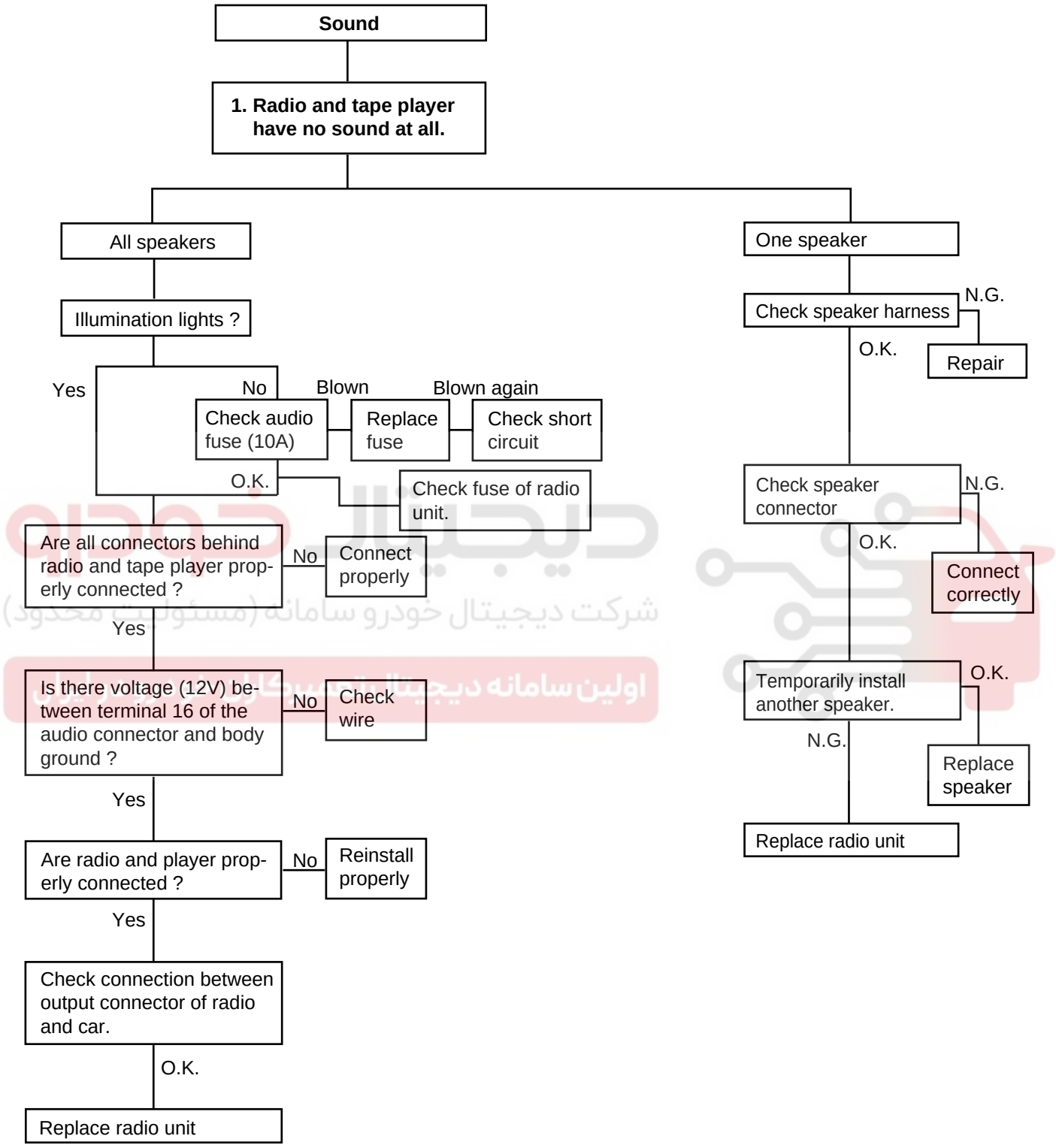
TROUBLESHOOTING ED6221A9

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

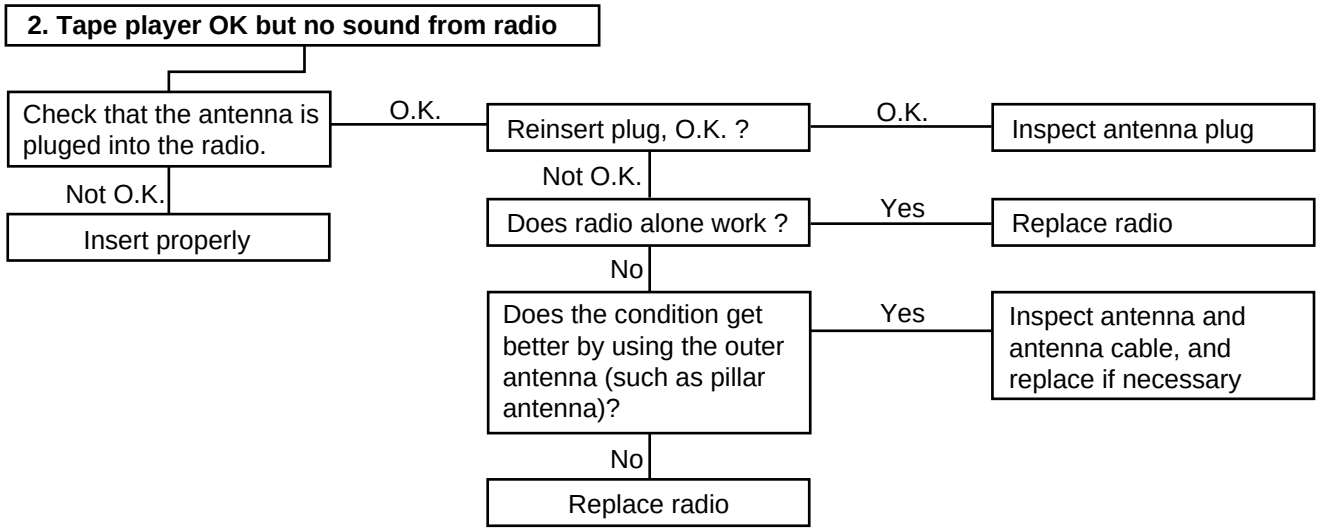


LTIF001A

CHART 1

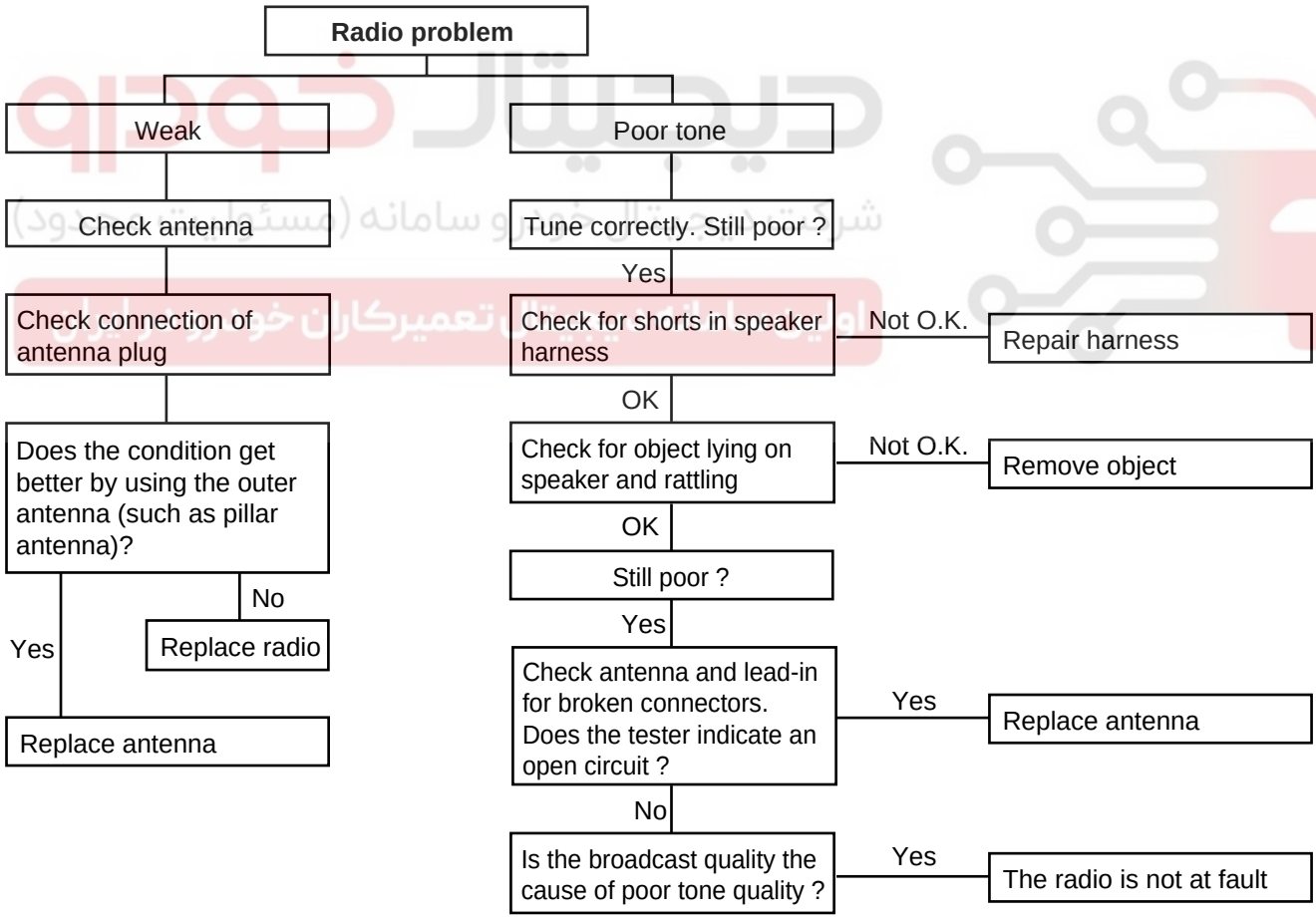


ETRF001B



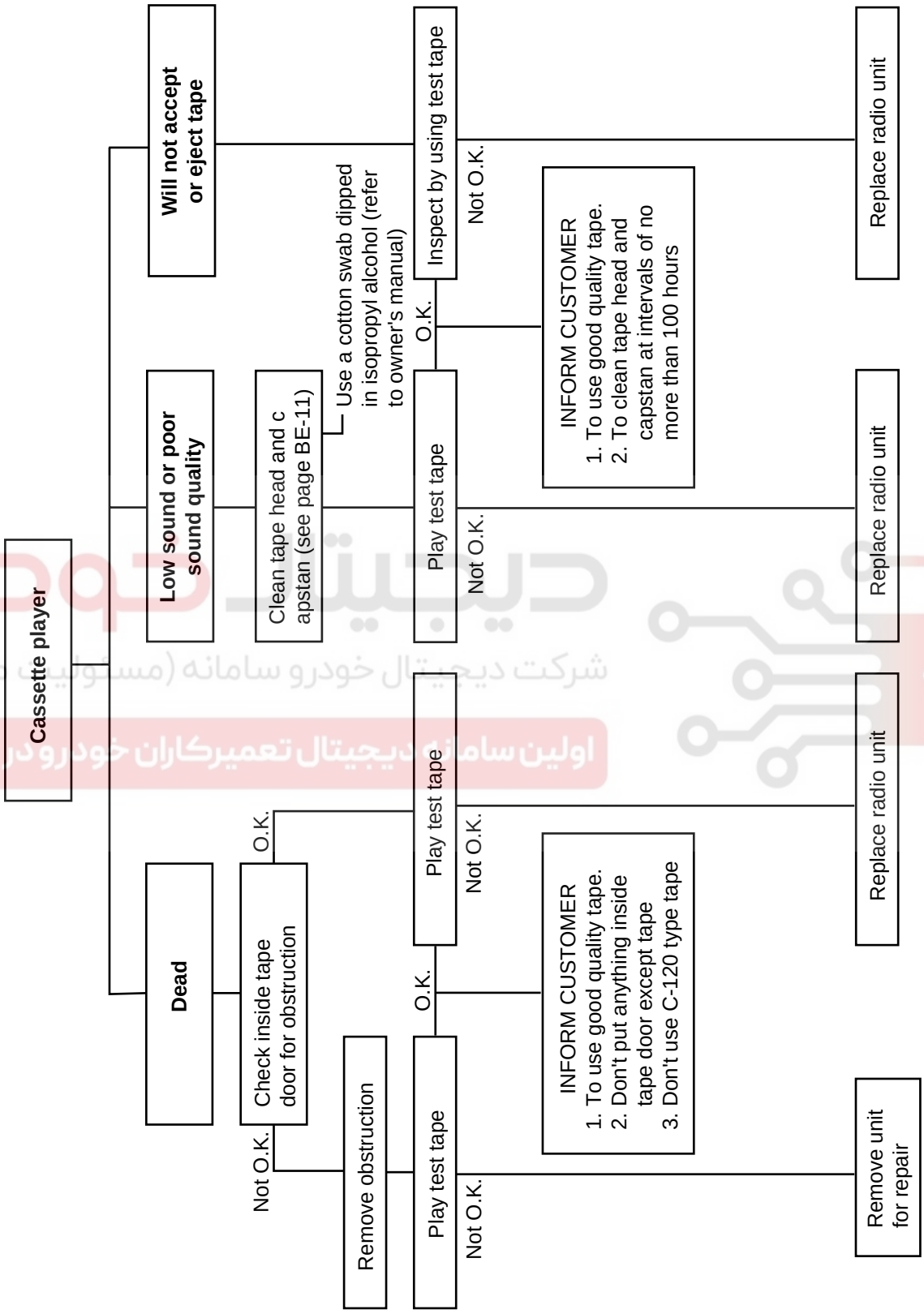
LTIF001C

CHART 2



BTIF001D

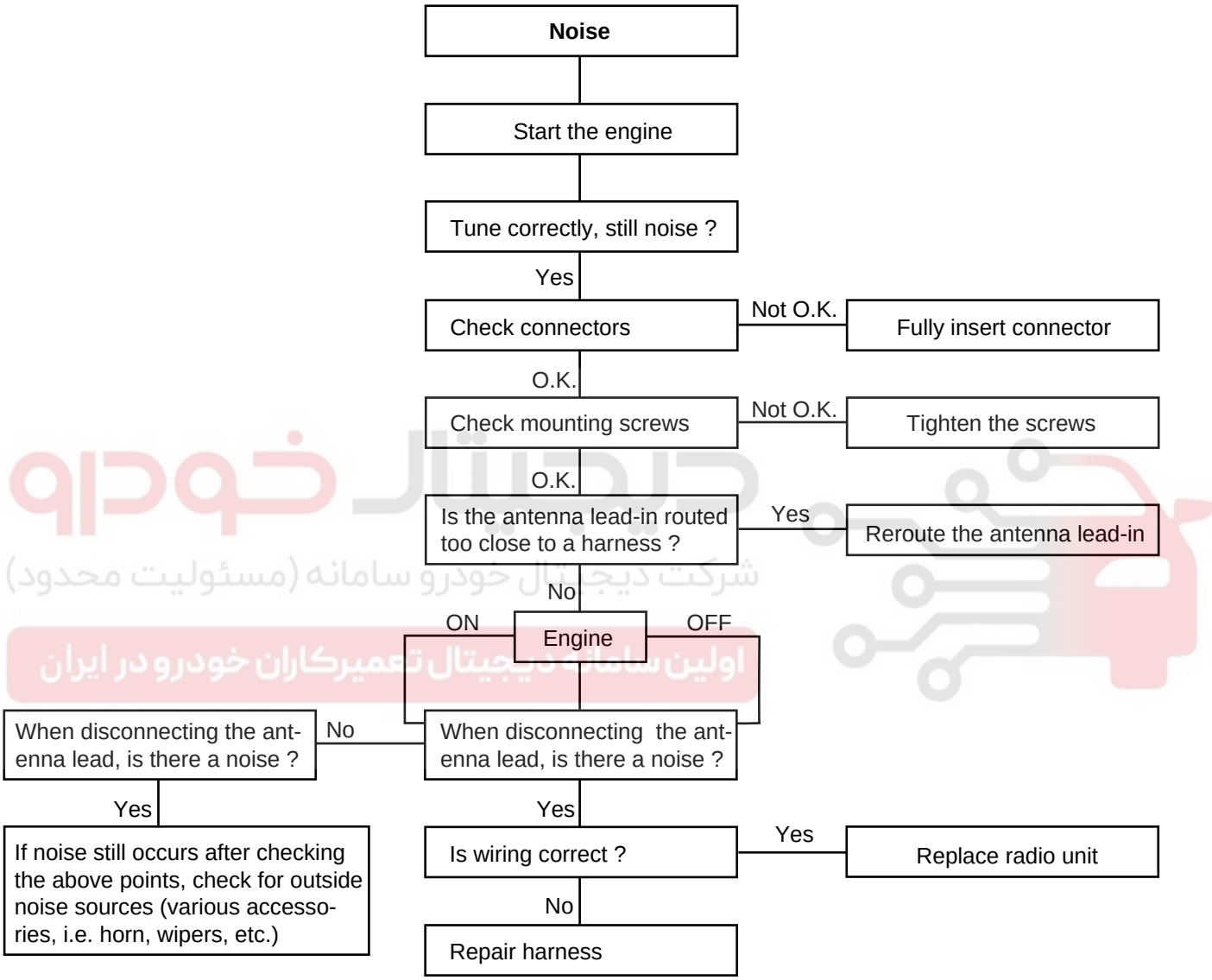
CHART 3



ETRF001E

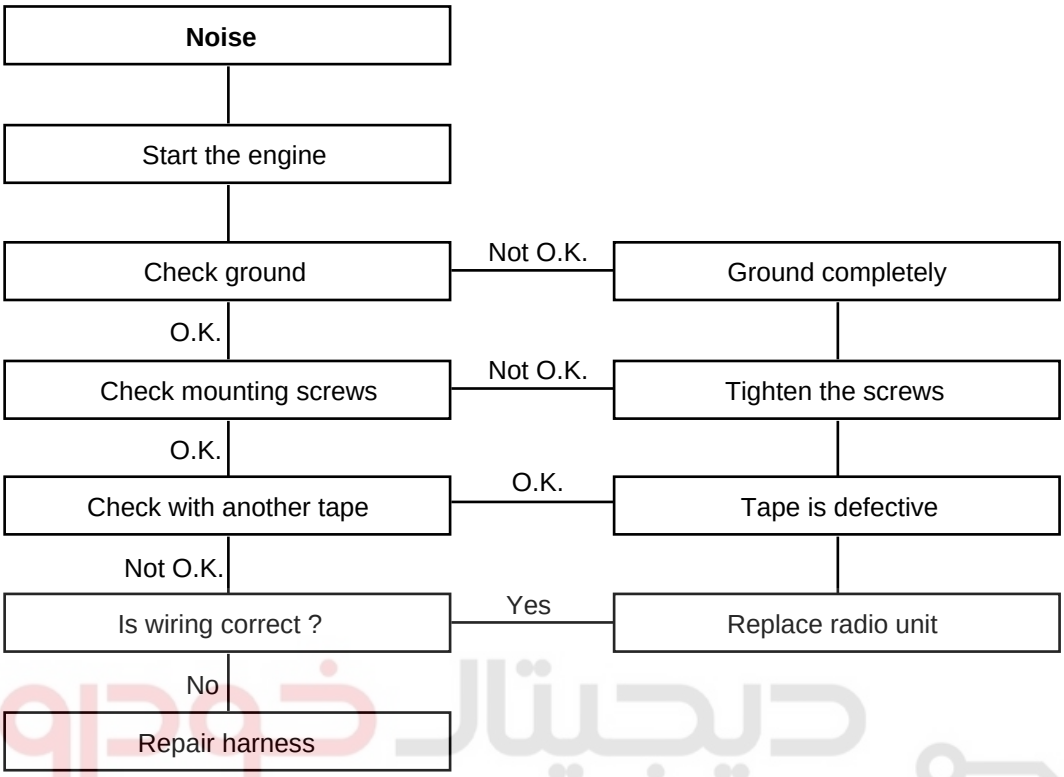
CHART 4

1. RADIO



LTIF001F

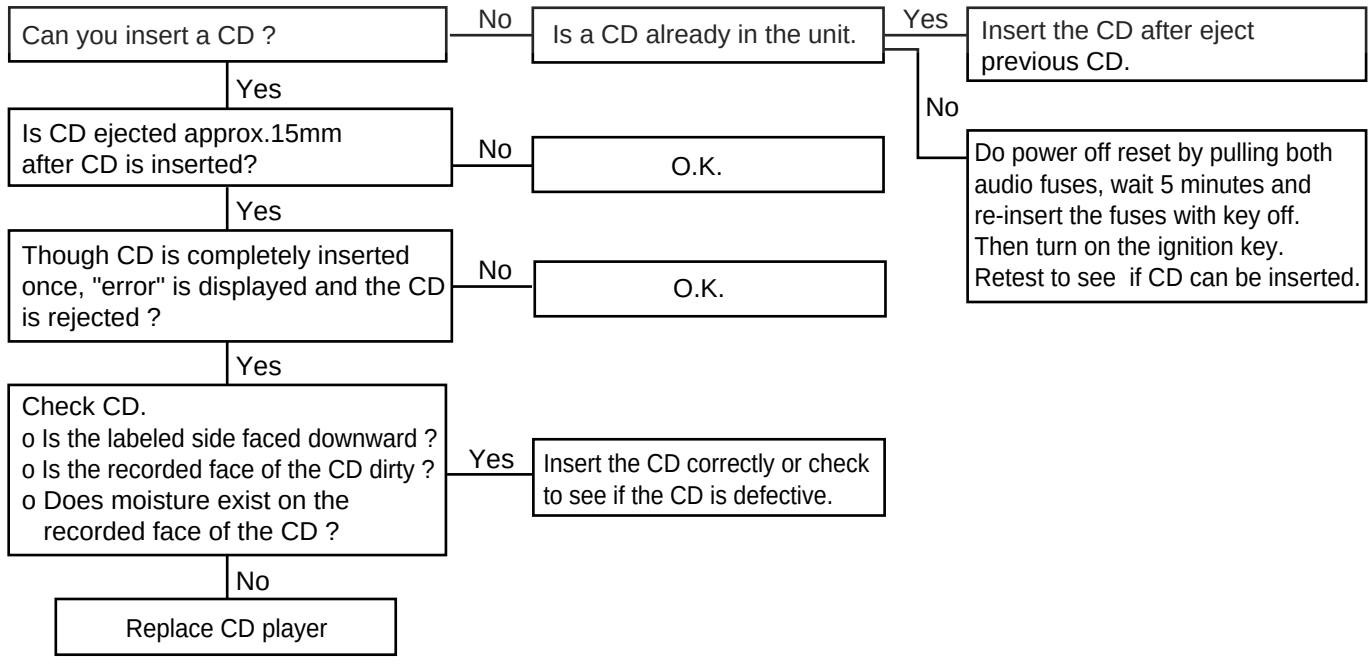
2. TAPE



LTIF001G

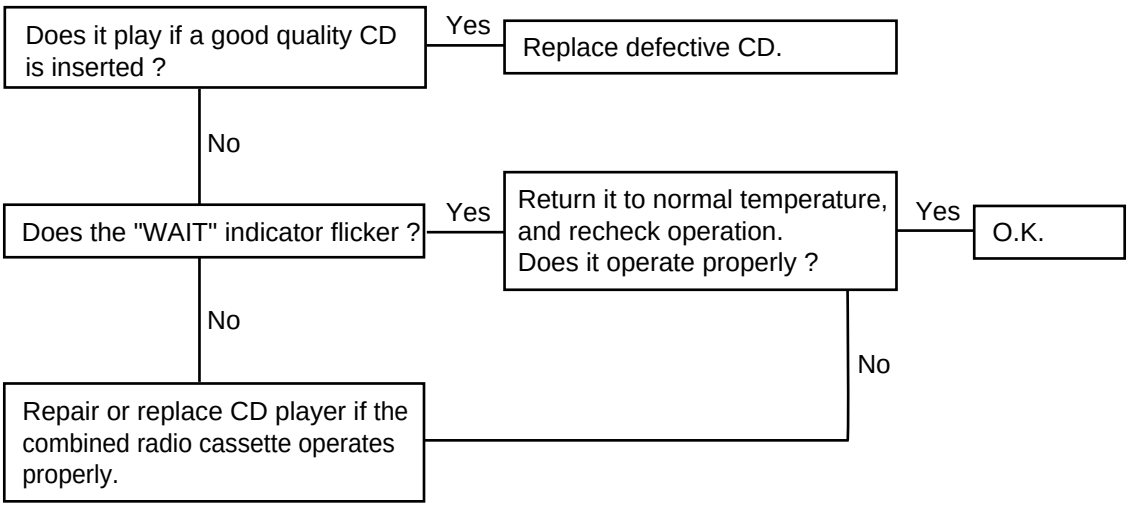
CHART 5

1. CD WILL NOT BE ACCEPTED



BTIF001H

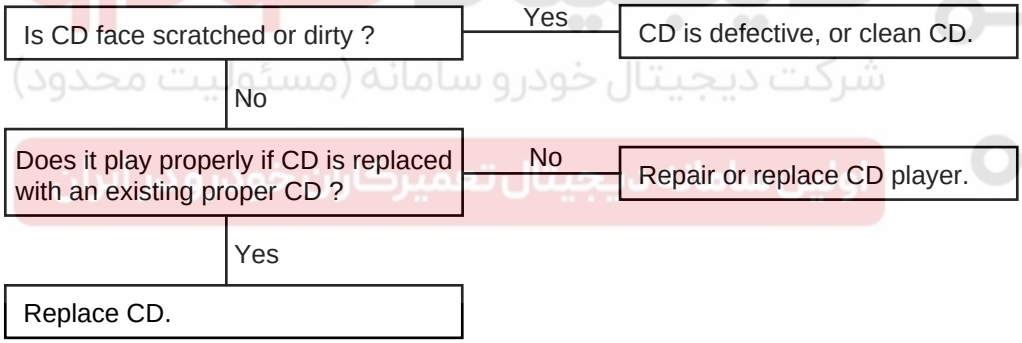
2. NO SOUND



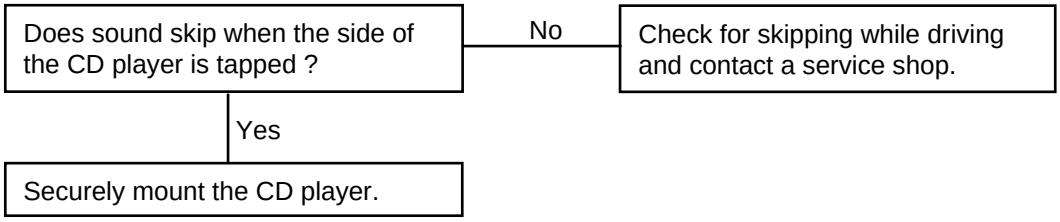
LTIF001I

3. CD SOUND SKIPS

1) Sound sometimes skips when parking.

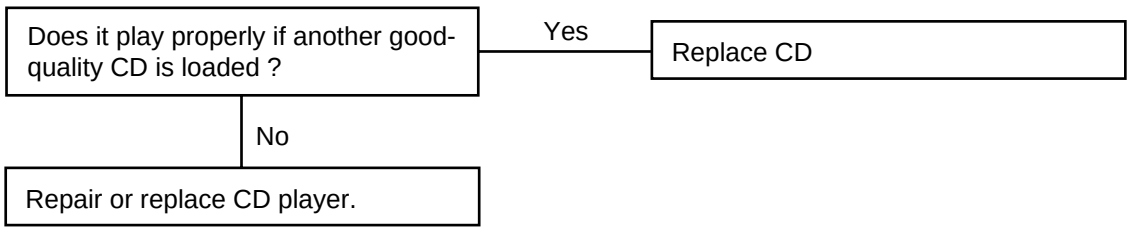


2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)

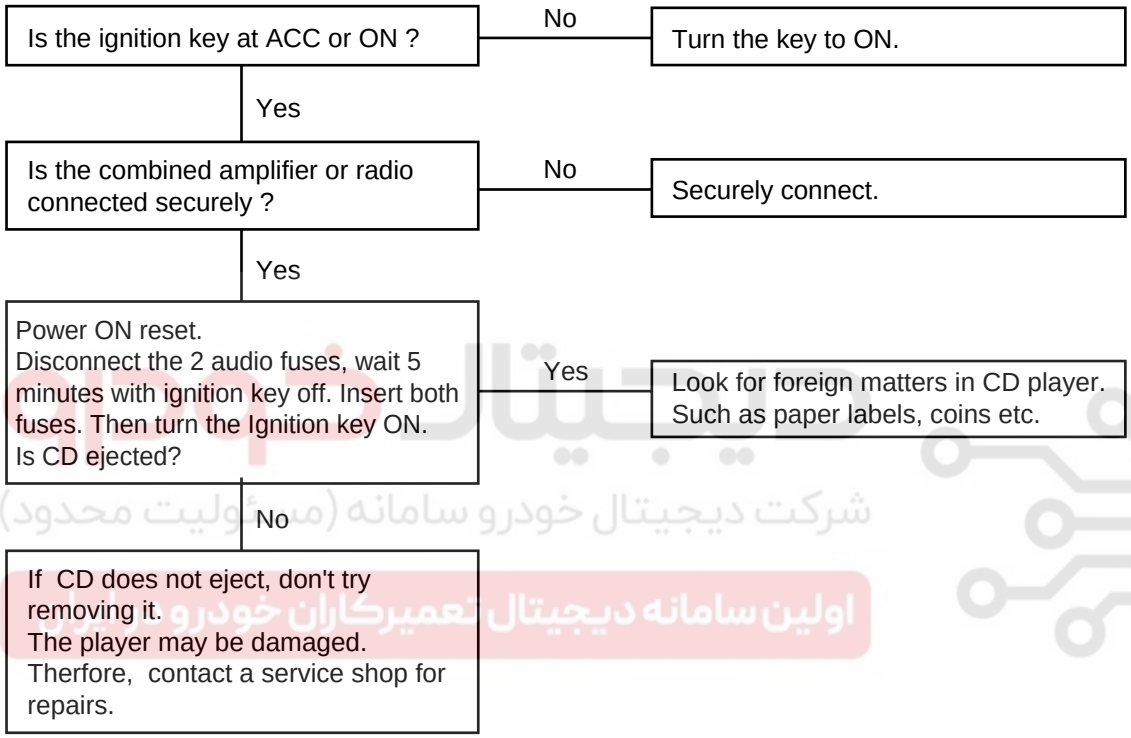


LTIF001J

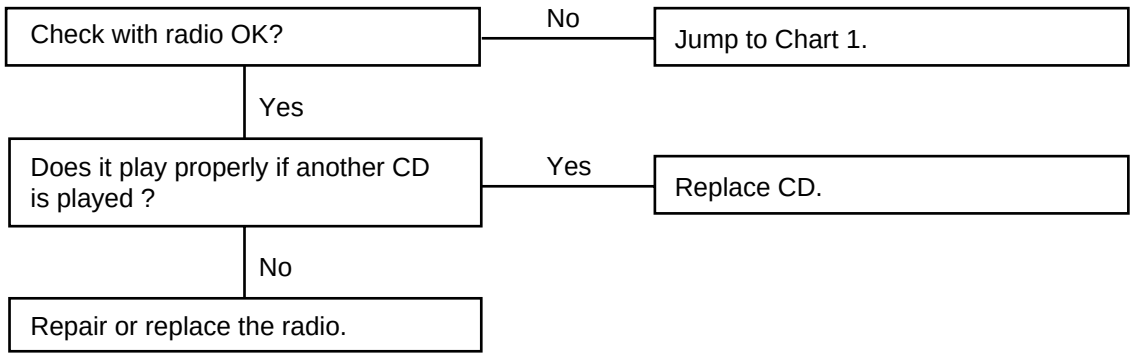
4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT

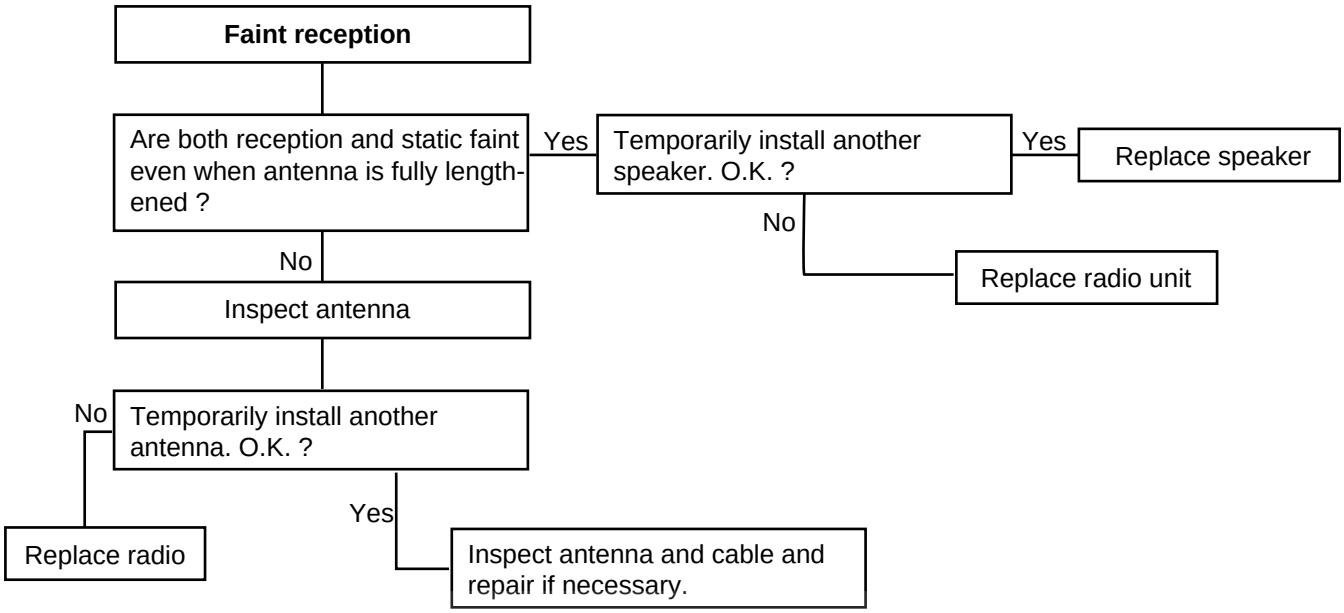


6. NO SOUND FROM ONE SPEAKER



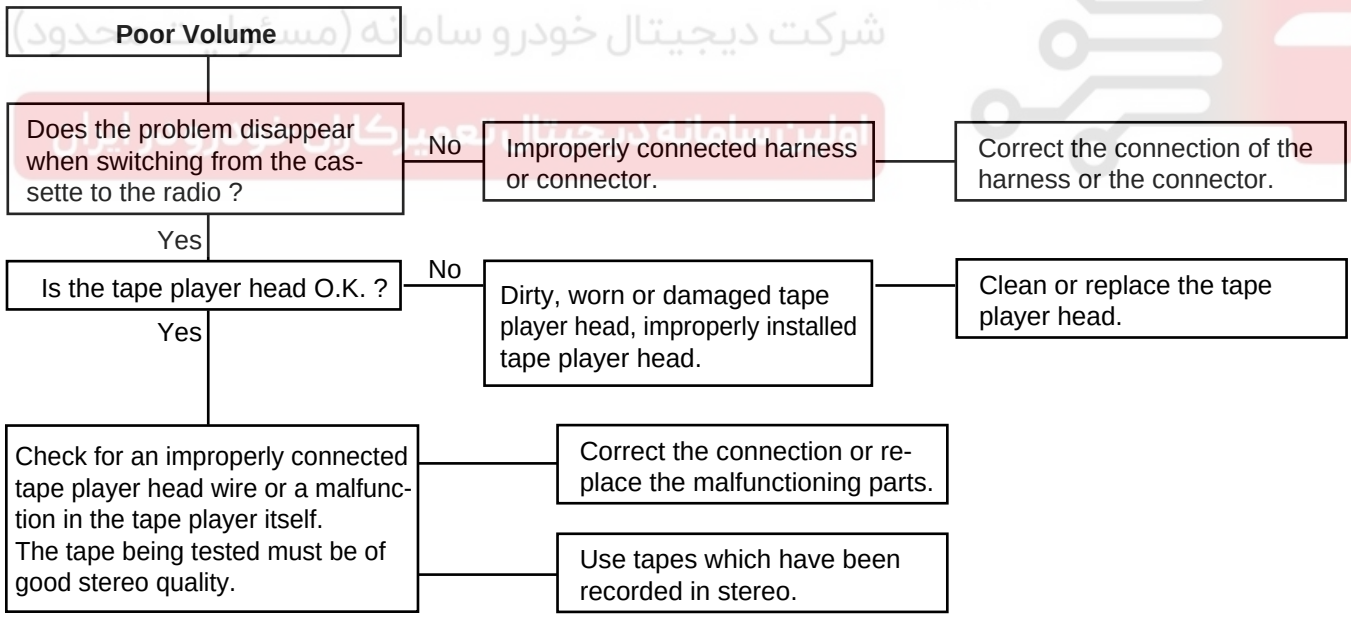
LTIF001K

CHART 6



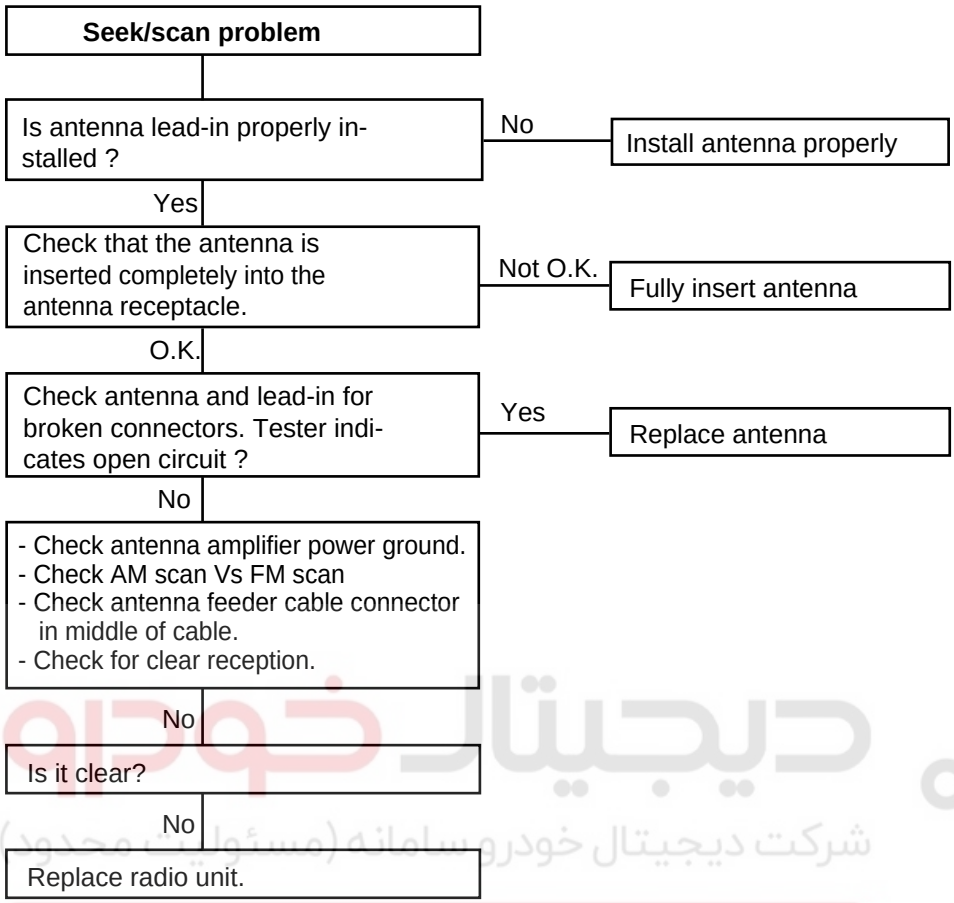
LTIF001L

CHART 7



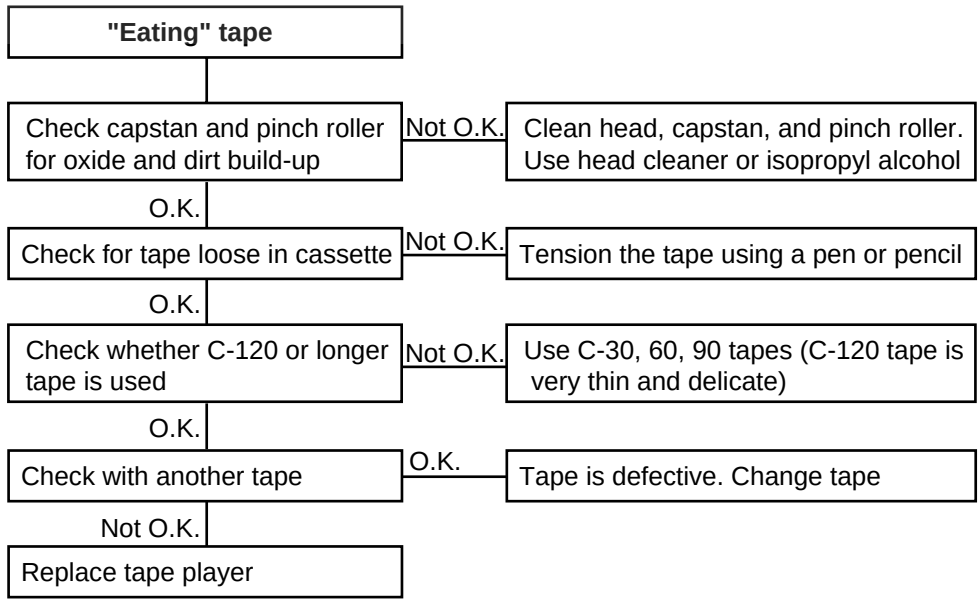
LTIF001M

CHART 8



LTIF001N

CHART 9



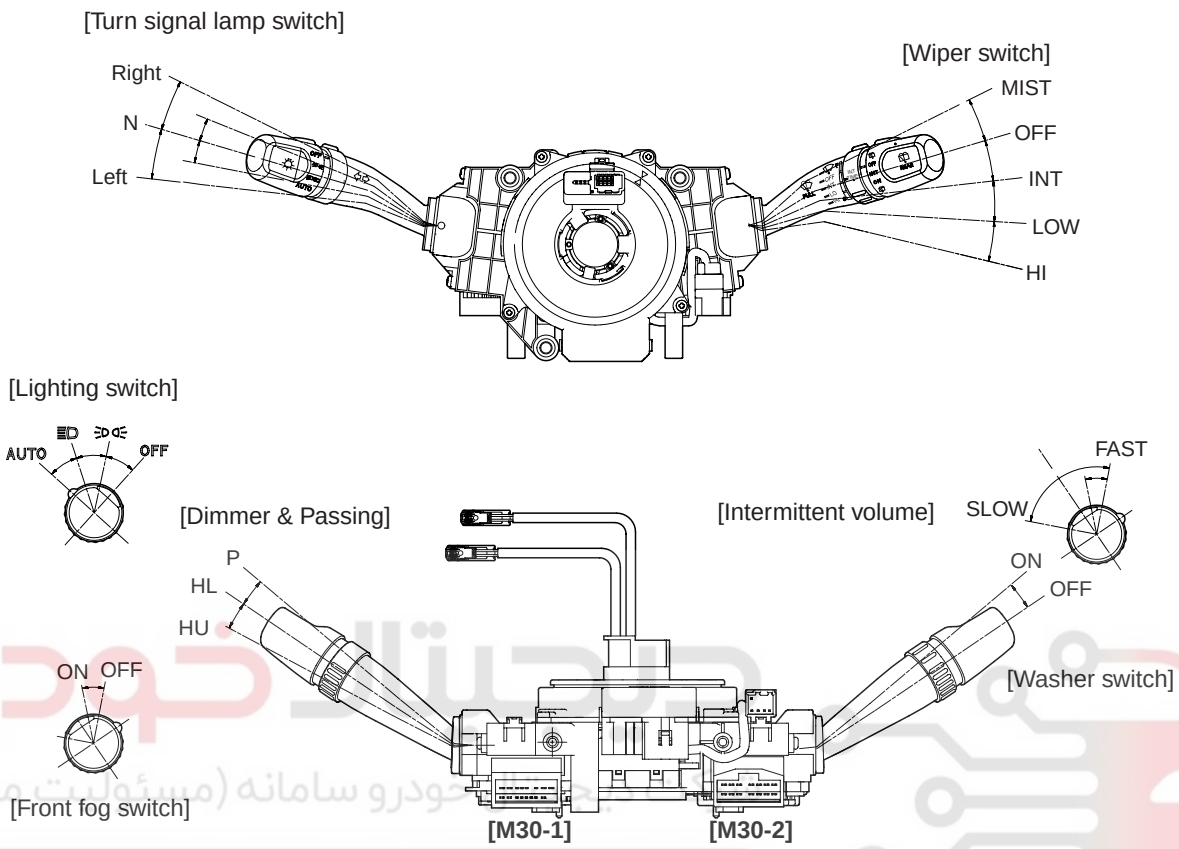
LTIF001O

MULTI FUNCTION SWITCH

SPECIFICATIONS E96C68DE

Items	Specifications
Rated voltage	DC 12 V
Operating temperature range	-30°C ~ +80°C (-22 ~ +176°F)
Rated load Dimmer & passing switch Lighting switch Turn signal & lane change switch Front fog lamp switch Wiper & mist switch Washer switch Variable intermittent volume switch	 High : 1A (Relay load) Low : 1A (Relay load) Passing : 1A (Relay load) Lighting : 1A (Relay load) 6.6±0.5A (Lamp load) 1A (Relay load) Low, High : 4.5A (Motor load) Intermittent : 0.22±0.05A (Relay load) Lock : Max. 28A (Motor load) Mist: 4A (Motor load) 4A (Motor load) Max. 25mA

COMPONENTS EF735BCC



[M30-1]

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

[M30-2]

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

Circuit connection

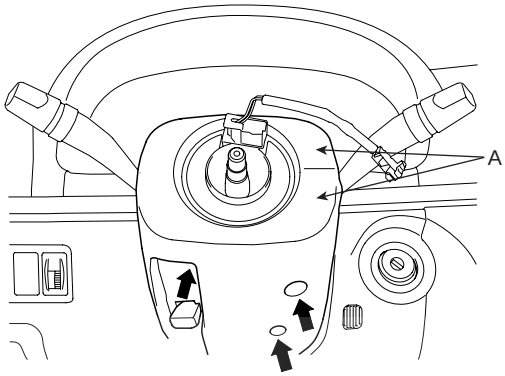
Connector No.	Terminal No.	Description	Connector No.	Terminal No.	Description
M30-1	1	Head lamp passing	M30-2	1	Wiper high speed
	2	Head lamp high beam power		2	Wiper low speed
	7	Turn signal lamp (RH)		3	Wiper parking
	8	Flasher unit power		4	Mist switch
	9	Turn signal lamp (LH)		5	Wiper & washer power
	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

ETRF031A

MULTI FUNCTION SWITCH

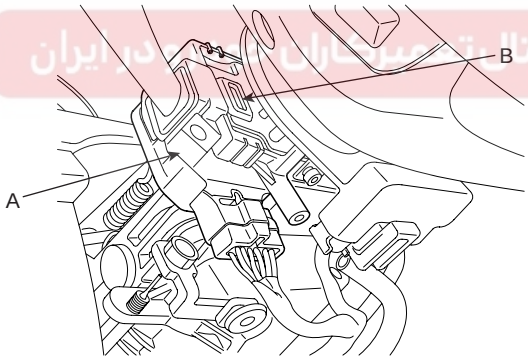
REPLACEMENT EC9A84E8

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



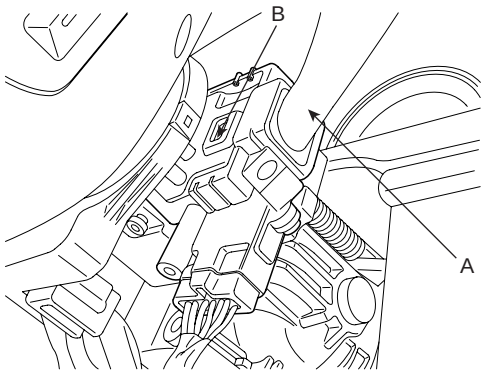
KTRE031B

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



KTRE031C

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



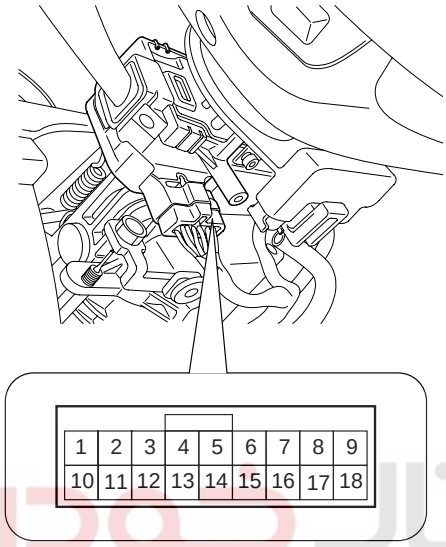
KTRE031D

5. Installation is the reverse of removal.

INSPECTION E35DB10C

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.



KTRE031E

LIGHTING SWITCH (AUTO LIGHT)

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

LTGE031E

LIGHTING SWITCH

Position \ Terminal	14	15	16	17
OFF				
I	○			○
II	○	○	○	○

ETRF031F

DIMMER AND PASSING SWITCH

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

TURN SIGNAL SWITCH

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

LTGE031G

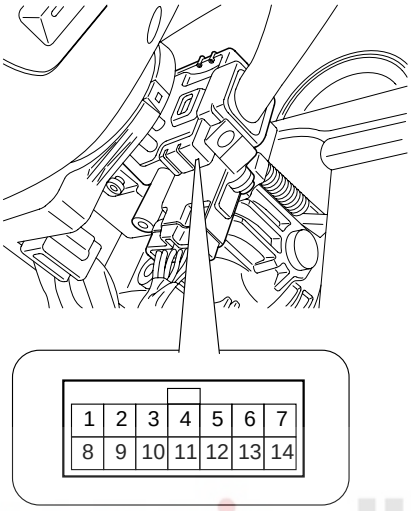
FRONT FOG LAMP SWITCH

Position \ Terminal	12	13
OFF		
ON	○	○

LTGE031H

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.



KTRE031G

WIPER SWITCH

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

LTGE031I

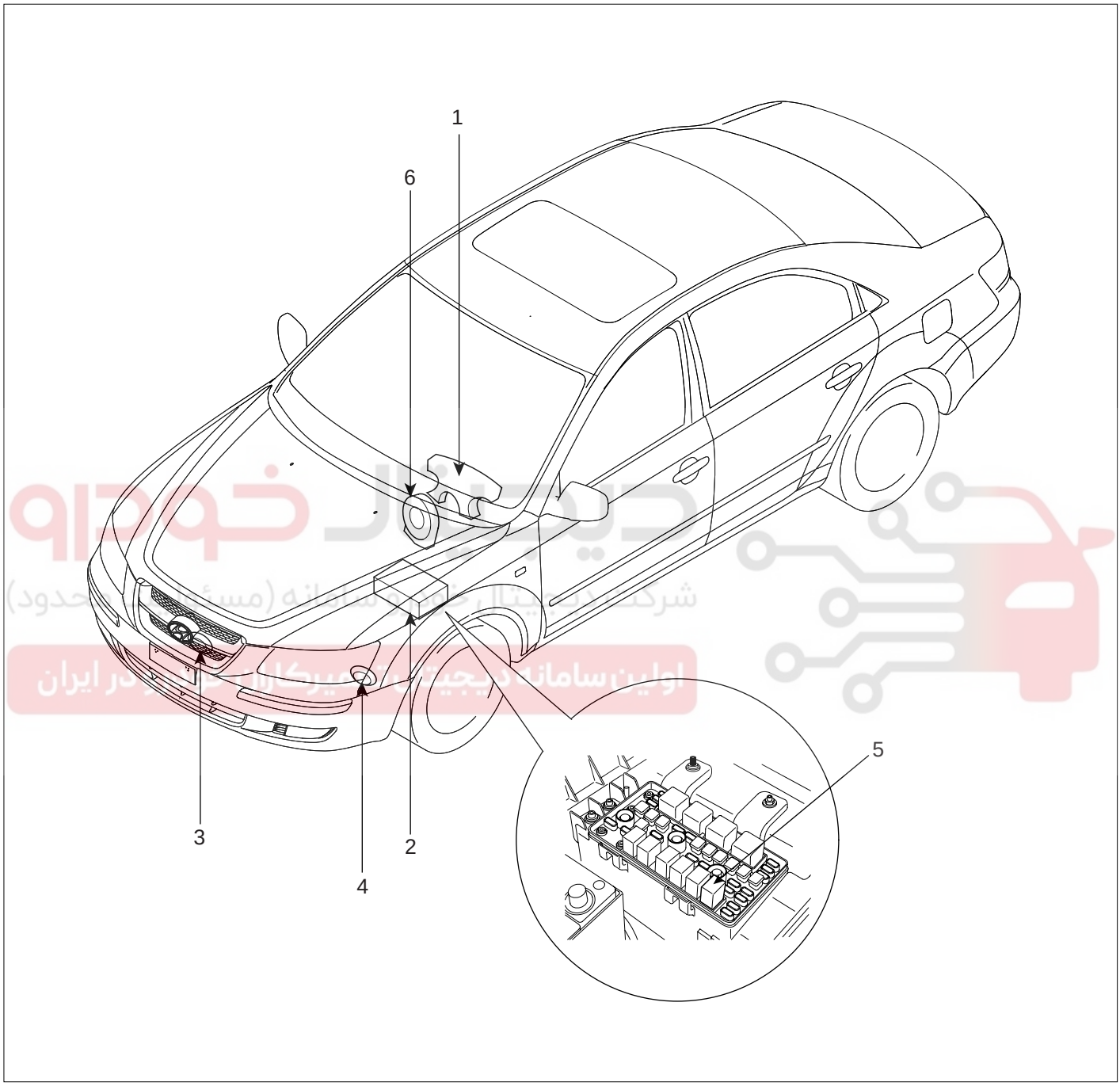
WASHER SWITCH

Terminal / Position	5	7
OFF		
ON	○	○

LTGE031J

HORNS

COMPONENT LOCATION E5AE0FDD

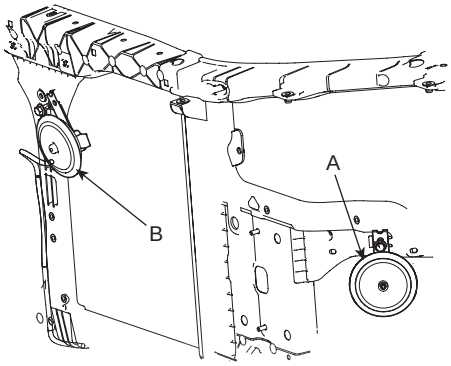


1. Horn switch
2. Relay box (Engine room compartment)
3. Horn (Low pitch)
4. Horn (High pitch)
5. Horn relay
6. Clock spring

ETRF051A

REPLACEMENT EFC2EFD0

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



KTRE051B

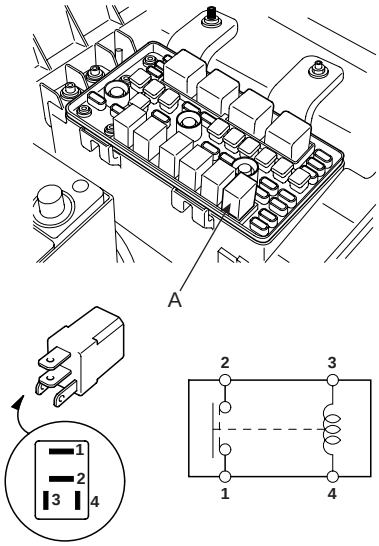
3. Installation is the reverse of removal.

INSPECTION E22A37E5

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



KTRE051C

Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected				
Connected	○	○	⊖	⊕

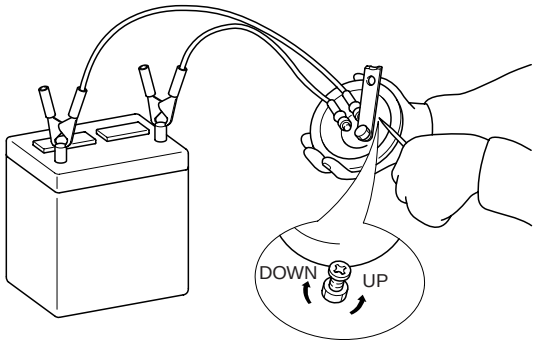
ETKE215E

ADJUSTMENT E6BEA9EB

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

NOTE

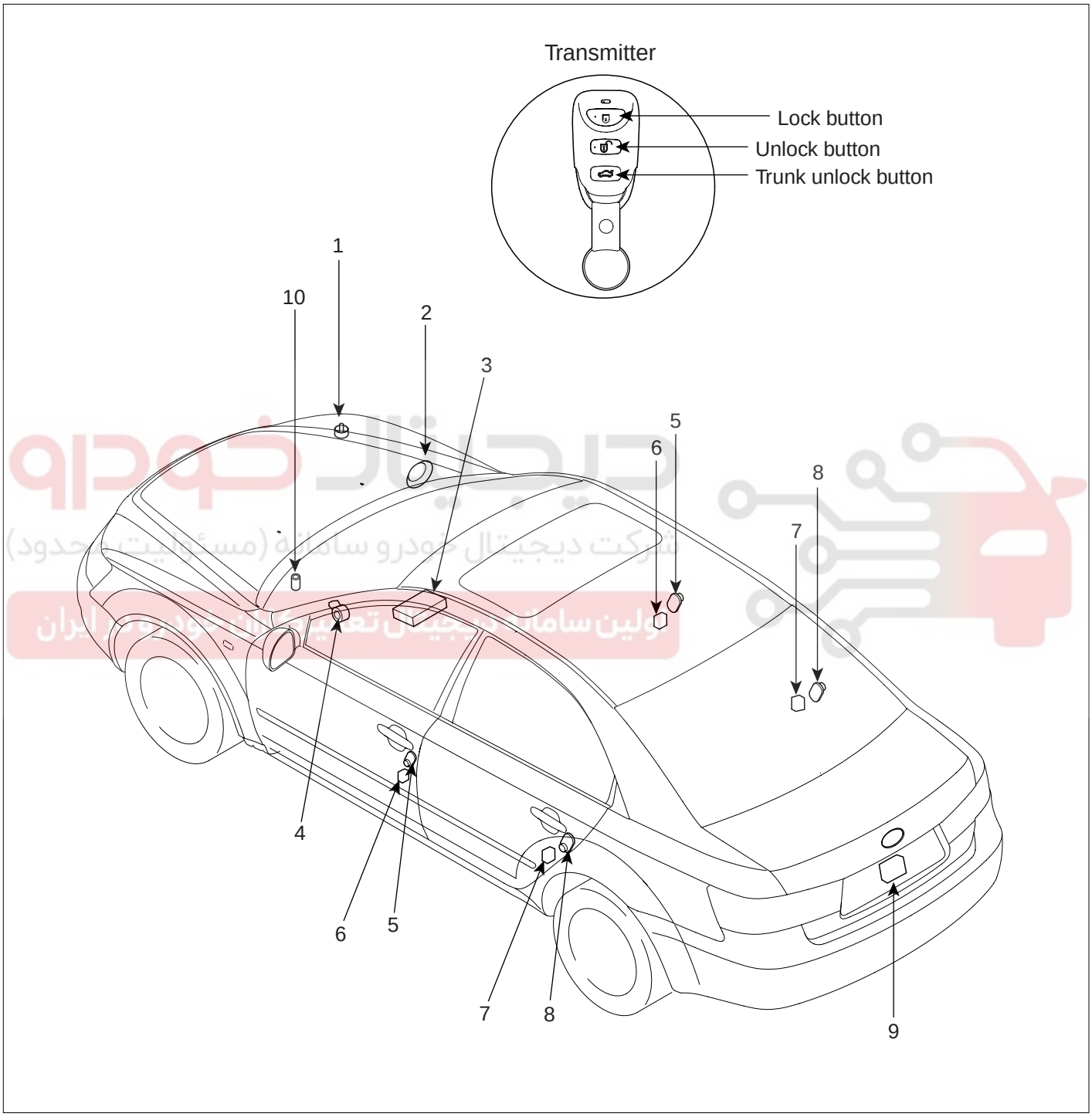
After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



ETDA050A

KEYLESS ENTRY AND BURGLAR ALARM

COMPONENT LOCATION E5F508DF



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
10. Security indicator

ETRF120A

DESCRIPTION E9A2B60B

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 EEB26B58

ANTI-THEFT FUNCTION

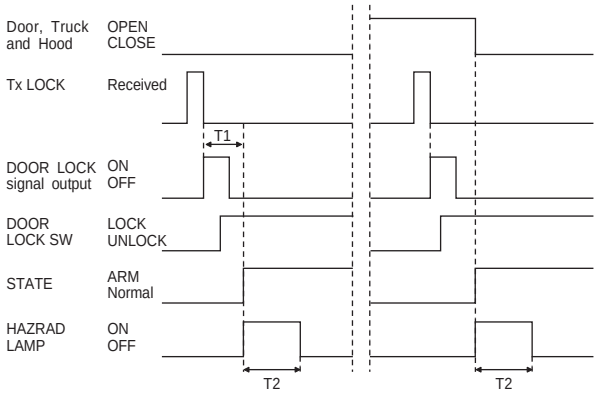
1. ARM Function

   1) When using LOCK on the RKE (Remote Keyless Entry) the doors will lock, the hazard lamp will blink once within .06 seconds (MAX 0.06seconds) and the Anti-Theft System will ARM, if the following conditions have been met.
      - The ignition key is removed from the ignition switch.
      - All entry points are closed (doors, trunk, and hood)

   2) If either the door or trunk or hood is open when activating LOCK using the RKE, the doors will lock, however the hazard lamp will not flash and the Anti-Theft System will not arm.

   3) In Step 2) if the opened entry points are subsequently closed··· the door will lock, the hazard lamp will blink once and the Anti-Theft System will ARM.

   4) If the UNLOCK signal is sent by the RKE, and either the ignition key is not inserted or entry (door, trunk, hood) to the vehicle is not made within 30 seconds, the LOCK mode will be automatically reset, the hazard lamps will blink, and the Anti-Theft System will rearm. (Key IN = Key Insertion)
      (Provided that there is no automatic lock function at a period of 30 seconds, when the UNLOCK is done by the RKE with an entry being open).



ETRF121A

T1 : 0.6 sec,
T2 : 1.0 ±0.2 sec.

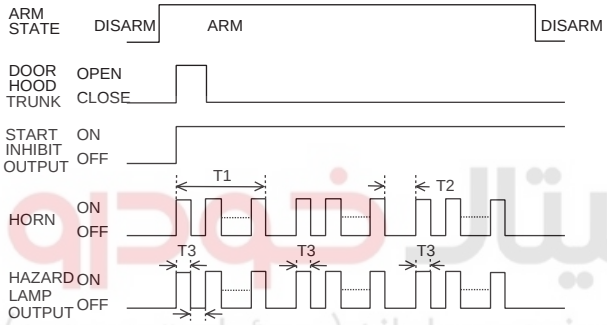
2. ALARM Function

1) GENERAL AREA

a. When a point of entry is opened while the Anti-Theft System is in the ARM mode, the hazard lamp and horn alarm will activate (ON/OFF 3 times each) for a period of 27 seconds.

b. Output intervals for the horn alarm and hazard lamps are identical.

c. The alarm sequence, when activated will continue for the duration of the alarm period even when the entry point is closed. (The alarm will reactivate if entry port is reopened after the initial alarm sequence completes.)



ETRF121B

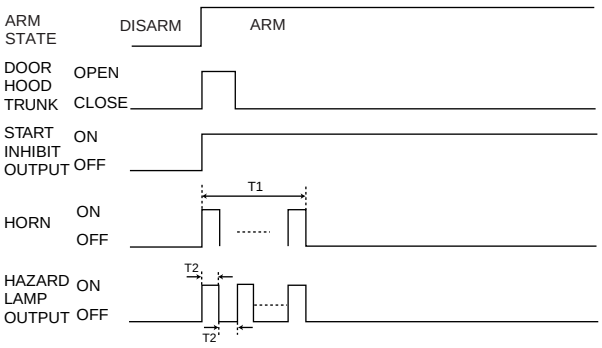
T1 : 27 ± 2 sec,
T2 : 10 ± 1 sec,
T3 : 0.5 ± 0.1 sec.

2) EUROPE AREA

a. When a point of entry is opened while the Anti-Theft System is in the ARM mode, the hazard lamp and horn alarm will activate (ON/OFF 1 time each) for a period of 27 seconds.

b. Output intervals for the horn alarm and hazard lamps are identical.

c. The alarm sequence, when activated will continue for the duration of the alarm period even when the entry point is closed. (The alarm will reactivate if entry port is reopened after the initial alarm sequence completes.)



ETRF121G

T1 : 27 ± 2 sec,
T2 : 10 ± 1 sec.

3. ALARM CLEARANCE

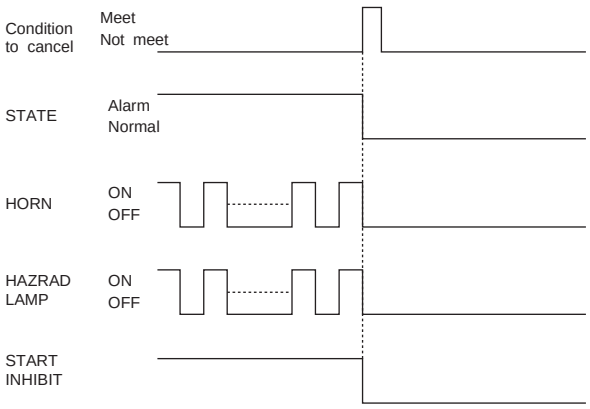
1) When choosing LOCK on the RKE (Remote Keyless Entry) either during or after alarm activation, the alarm is cleared.

2) When choosing UNLOCKS on the RKE either during or after alarm activation, the alarm is cleared.

3) When choosing TRUNK OPEN on the RKE either during or after alarm activation, the alarm is cleared.

4) If the ignition key is turned to ON for 30 seconds either during or after alarm activation the alarm will be cleared and the start inhibitor reset.

5) If during an alarm sequence the ignition key is turned ON and then OFF within 30 seconds, the alarm will continue.



ETRF121C

4. Battery Separation

1) When the battery is reconnected after having been disconnected/removed while in ARM mode. ARM mode continues.

2) When the battery is reconnected after having been disconnected/removed, and after the alarm completes, the alarm will restart.

3) When battery is reconnected after having been disconnected/ removed during an active alarm, the alarm sequence will restart from the beginning.

5. SECURITY INDICATOR

1) Security indicator: 0.3s ON, 2s OFF under key off.

2) After entering to ARM, security indicator: 0.3s ON, 0.5s OFF in first 8s.

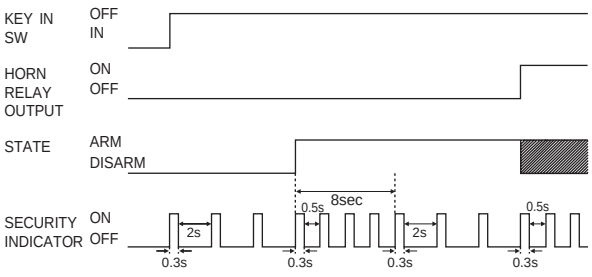
3) After entering to ARM, the first 8s-TIMER is not reset when receiving RKE LOCK signal during the cycle: 0.3s ON, 0.5s OFF in the first 8s.

4) 0.3s ON, 2s OFF if ARM is canceled during the cycle 0.3s ON, 0.5s OFF in the first 8s after entering to ARM.

5) After entering to ARM, 0.3s ON, 2s OFF after the first 8s.

6) Security indicator is OFF under key insert to key cylinder.

7) 0.3s ON 0, 5s OFF during ALARM mode.



ETRF121D

6. DOOR UNLOCK AND TRUNK OPEN INHIBITION FUNCTIONS

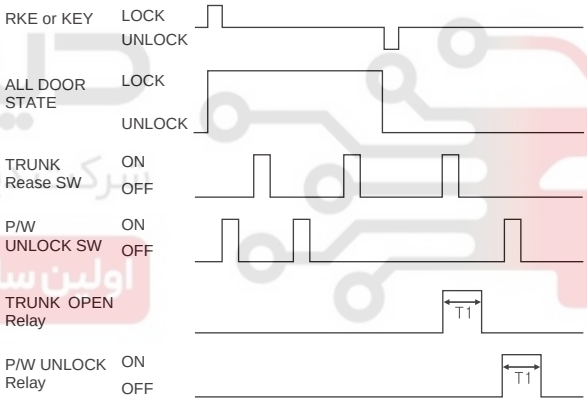
1) Unlock signal output with door unlock switch and trunk switch is prohibited in case of all door lock & closed at RKE LOCK under ignition key off.

2) Unlock signal output with door unlock switch and trunk switch is inhibited in case of door lock & closed at door lock with door key under ignition key off.

3) Unlock inhibition function is cancelled in case of RKE UNLOCK while door unlock inhibition function activates.

4) Unlock inhibition function is cancelled in case of door unlock with door key while door unlock inhibition function activates.

5) Unlock inhibition function is cancelled at ignition key in & on.



ETRF121E

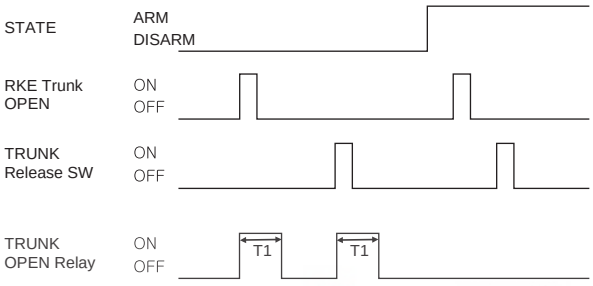
T1 : 0.5 ± 0.1 sec.

7. TRUNK OPEN WITH RKE

1) Trunk release relay is turned ON for 0.5s if trunk signal of RKE is received. (Hold mode under ARM)

2) Trunk release relay is turned ON for 0.5s in case of Trunk release switch OFF→ON.

3) In ARM mode, signal by Trunk release switch input is not output.



ETRF121F

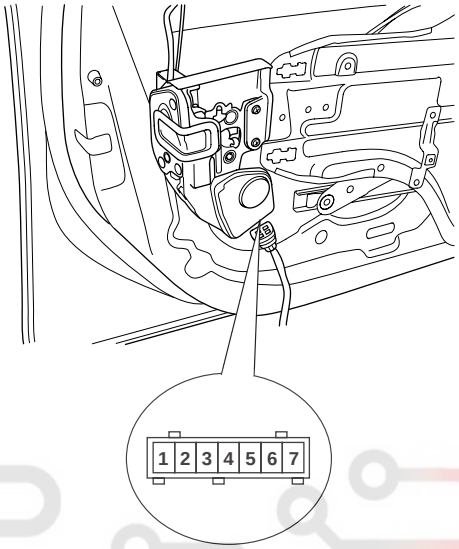
T1 : 0.5 ± 0.1 sec.

INSPECTION EDFE44AE

FRONT DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (Refer to the Body group - front door)

2. Disconnect the 7P connector from the actuator.



KTRE122A

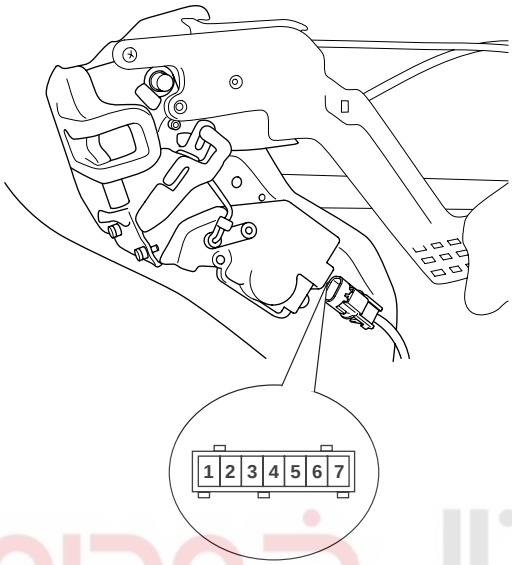
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		5	3	6	2
Front left	Lock	⊕		⊖	
	Unlock	⊖		⊕	
Front right	Lock		⊕		⊖
	Unlock		⊖		⊕

ETRF122B

REAR DOOR LOCK ACTUATOR INSPECTION

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 7P connector from the actuator.



KTRE122C

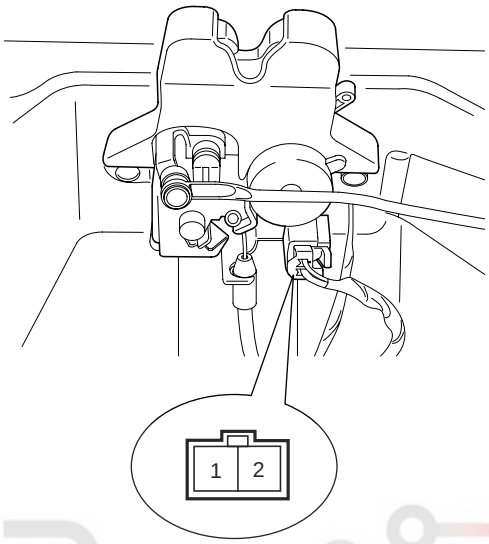
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		5	3	6	2
Rear left	Lock	⊕		⊖	
	Unlock	⊖		⊕	
Rear right	Lock		⊕		⊖
	Unlock		⊖		⊕

ETRF122D

TRANK LID RELEASE ACTUATOR INSPECTION

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



KTRE122E

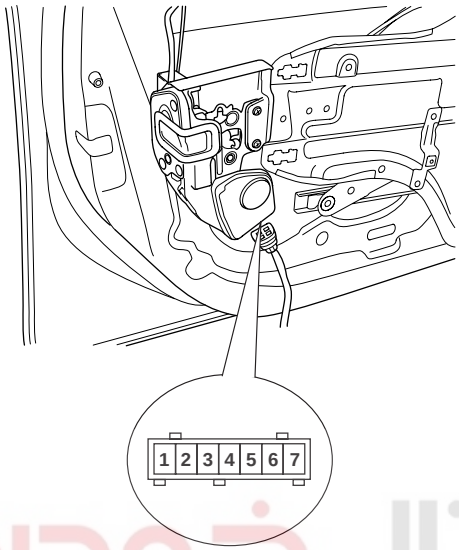
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	2	Chassis ground
Open	⊕	⊖

ETRF122I

FRONT DOOR LOCK SWITCH INSPECTION

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 7P connector from the actuator.



KTRE122A

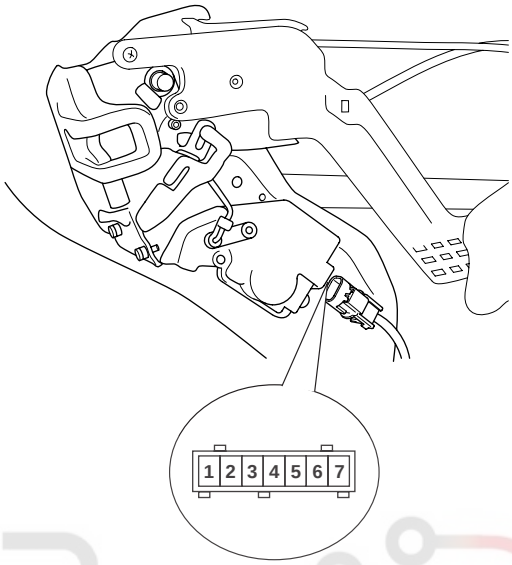
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	5	3	7
Front left	Lock				
	Unlock	○	—	○	
Front right	Lock				
	Unlock		○	—	○

ETRF122G

REAR DOOR LOCK SWITCH INSPECTION

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 7P connector from the actuator.



KTRE122C

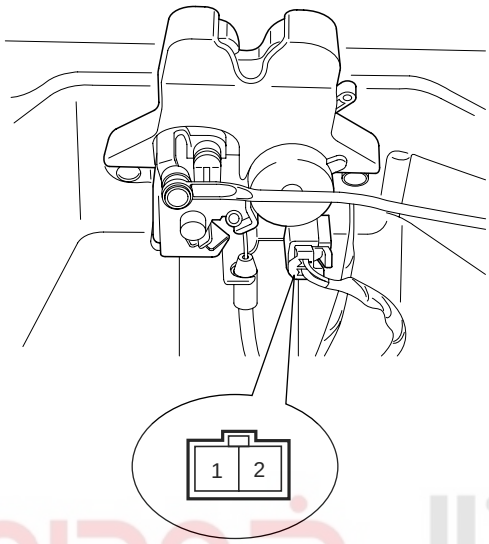
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	5	3	7
Rear left	Lock				
	Unlock	○	—	○	
Rear right	Lock				
	Unlock		○	—	○

ETRF122H

TRANK LID OPEN SWITCH INSPECTION

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



KTRE122E

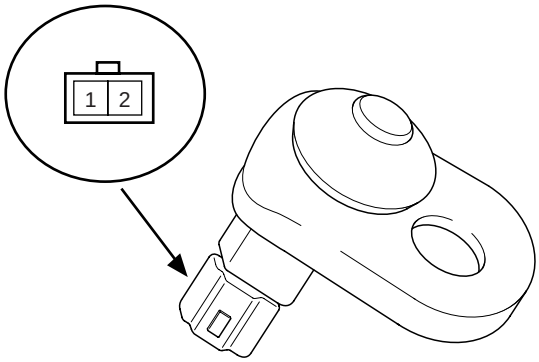
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	Chassis ground
Open	⊕	⊖

ETRF122F

DOOR SWITCH INSPECTION

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



ATIE121Q

[FRONT DOOR SWITCH]

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

ETQF180D

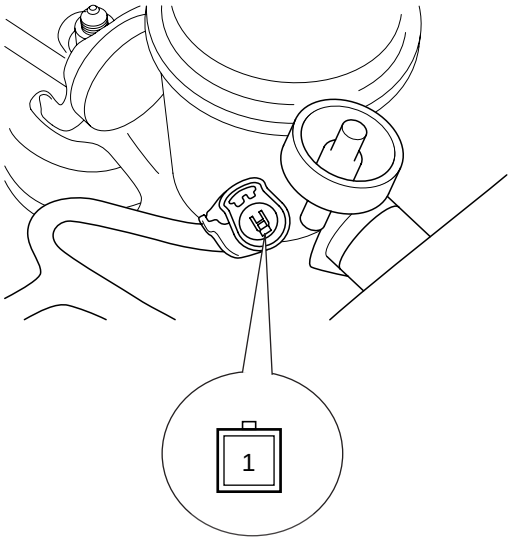
[REAR DOOR SWITCH]

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

ETRF262E

HOOD SWITCH INSPECTION

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



KTKD026A

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

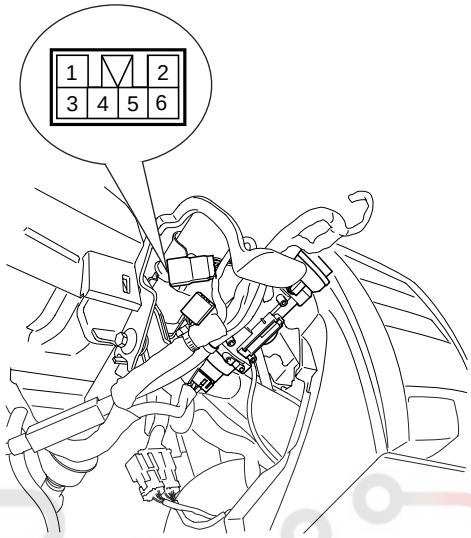
Terminal / Position	Ground (Body)	1
Hood open (Free)	○	○
Hood close (Push)		

ETPD180B

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.



KTQE280G

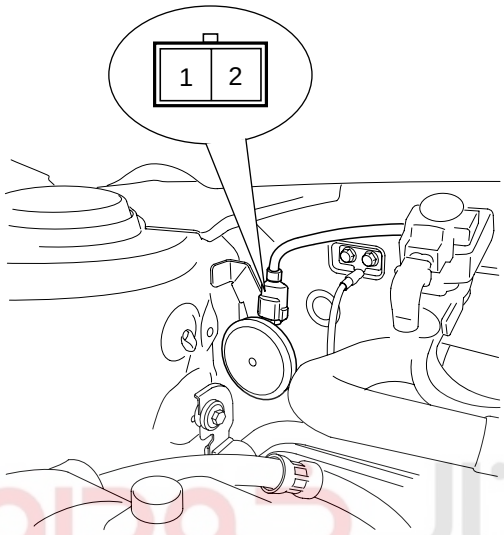
3. Check for continuity between the terminals in each position according to the table.

Terminal / Key position	5	6
Insert	○	○
Removal		

ETQF180F

BURGLAR HORN INSPECTION

1. Remove the burglar horn after removing 2 bolts 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.



KTQE530D

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

TRANSMITTER

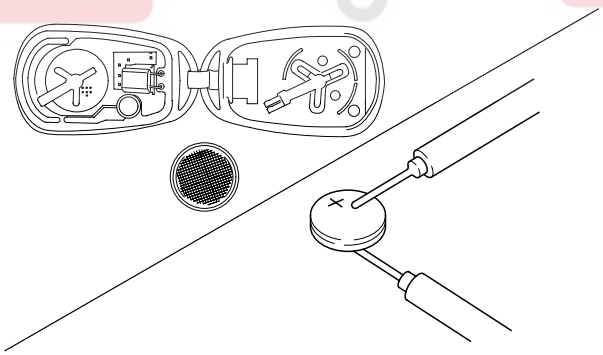
SPECIFICATIONS EE1ACAAB

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 ED82CA9A

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

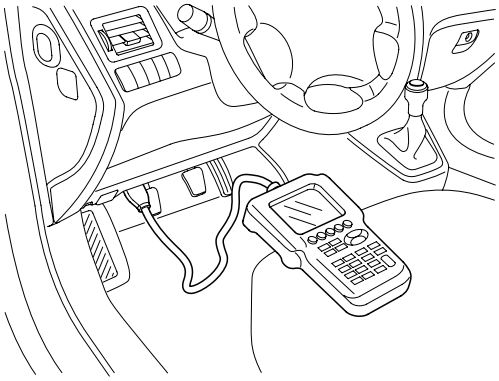


KTKD029A

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.

TRANSMITTER CODE REGISTRATION ED806B14

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



KRQE900A

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

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

ETOF211B

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

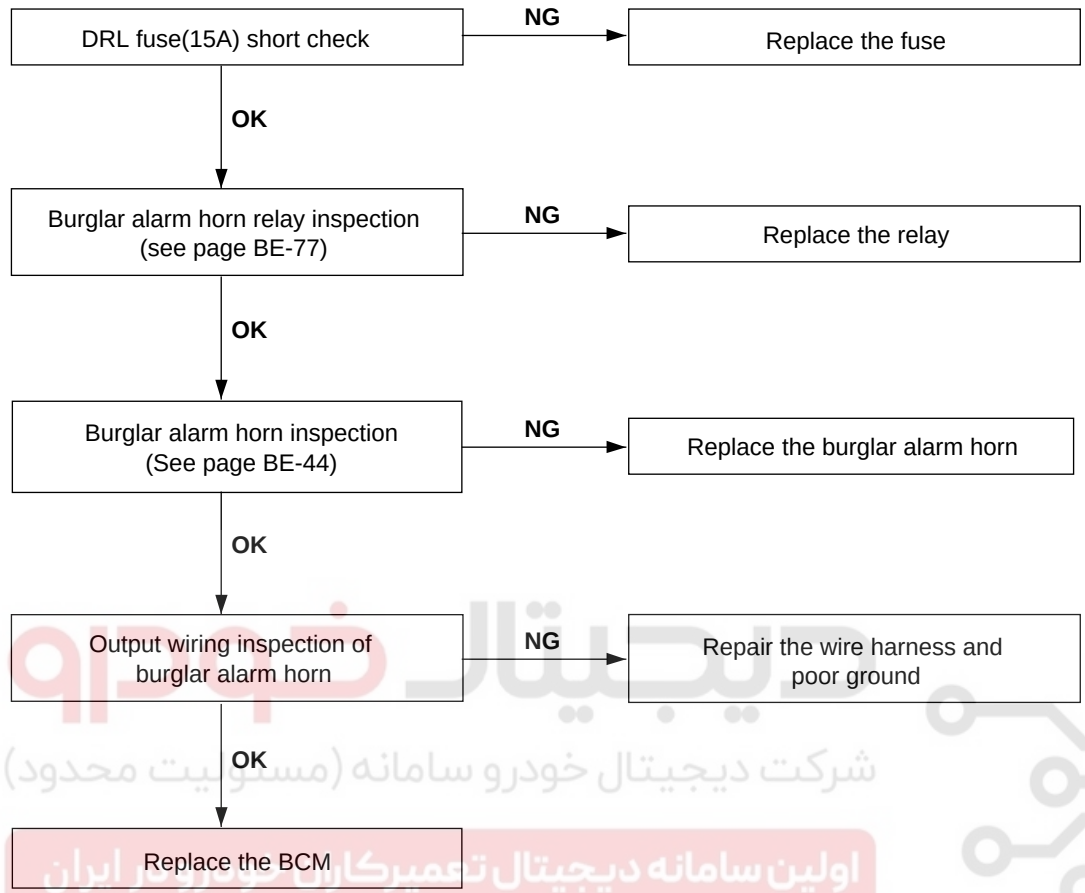
ETRF065P

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

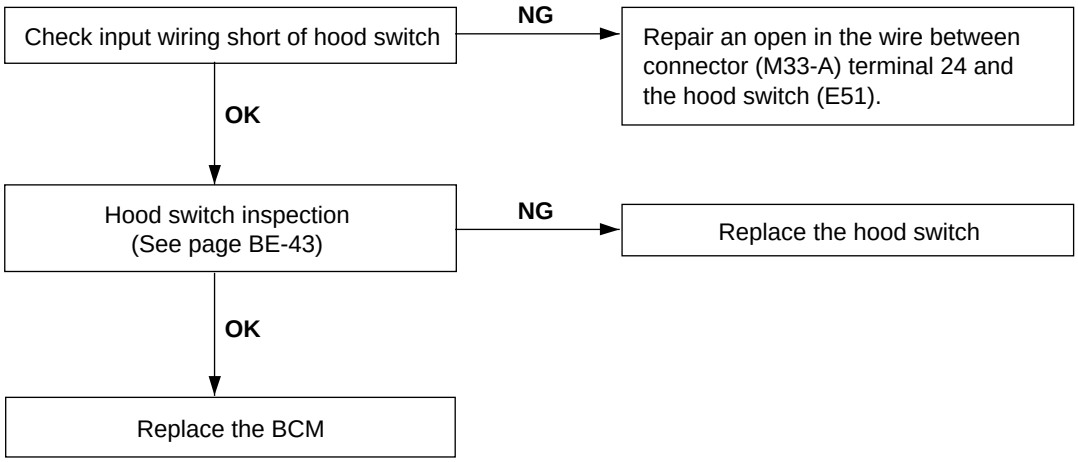
TROUBLESHOOTING E5FE3E6C

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



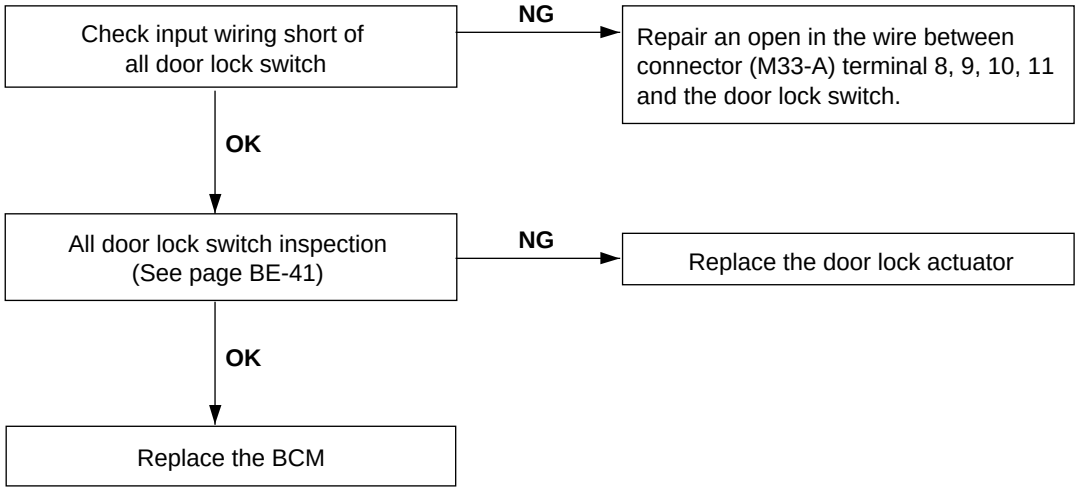
ETRF900I

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



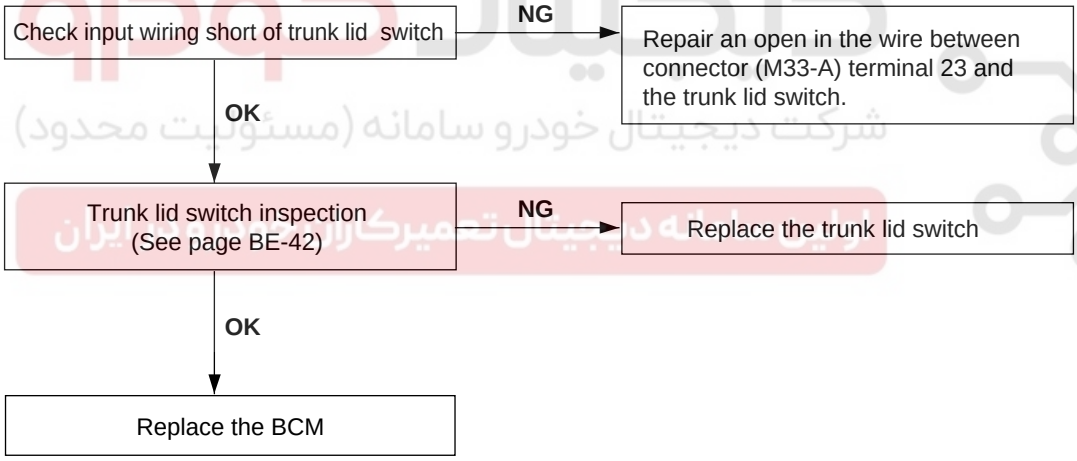
ETRF900J

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



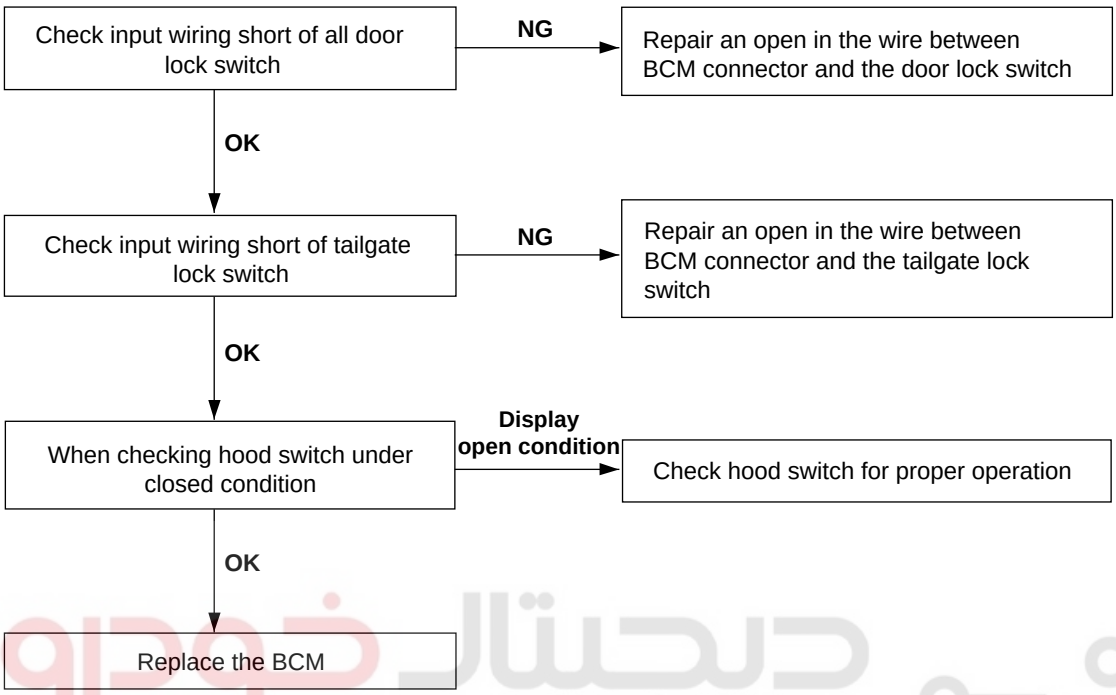
ETRF900K

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



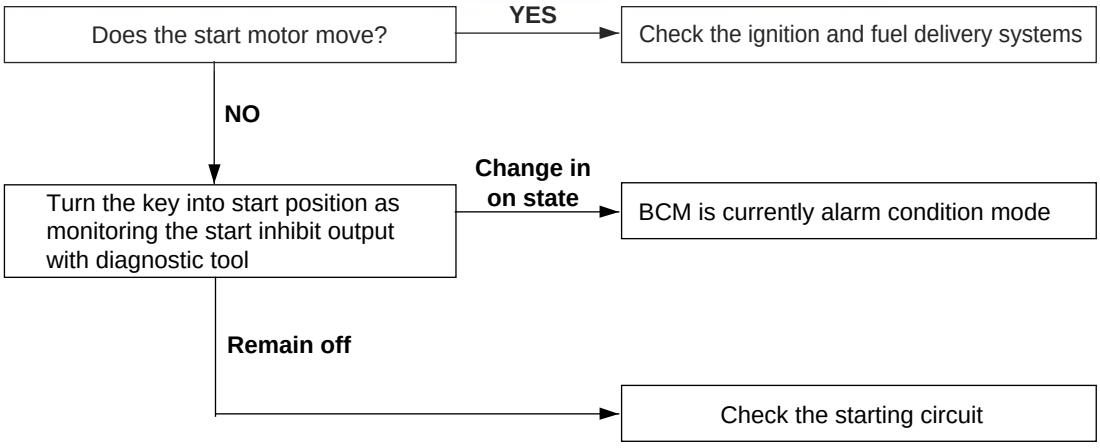
ETRF900L

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



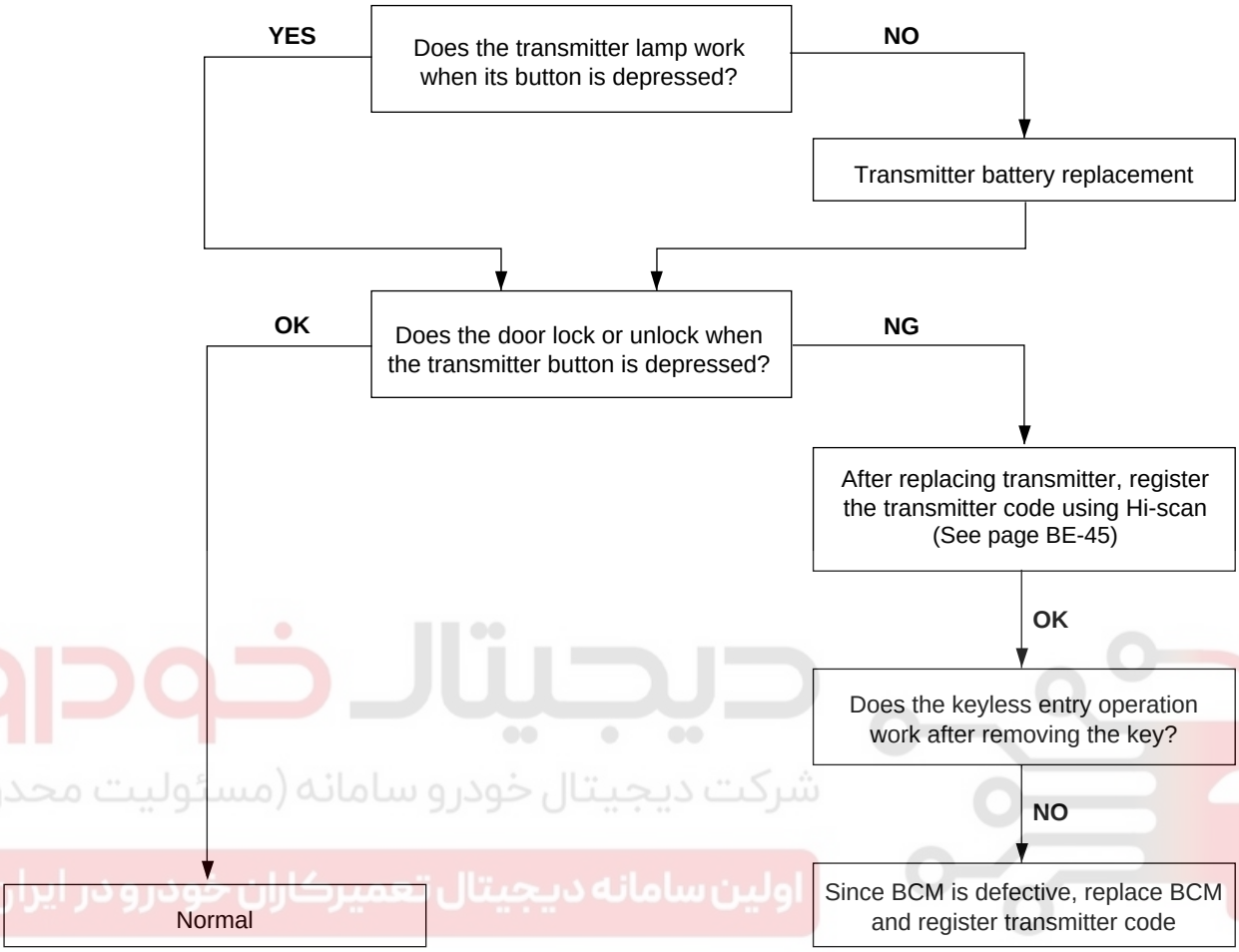
ETRF900M

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



ETRF900N

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

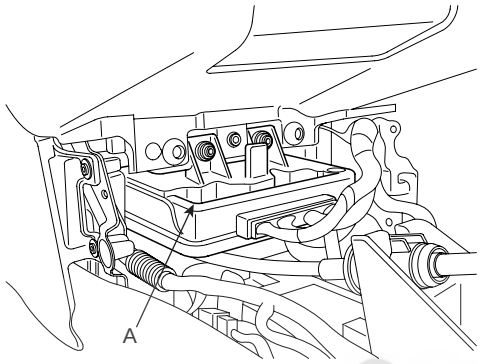


ETRF900O

ETACS (ELECTRONIC TIME AND ALARM CONTROL SYSTEM)

BODY CONTROL MODULE

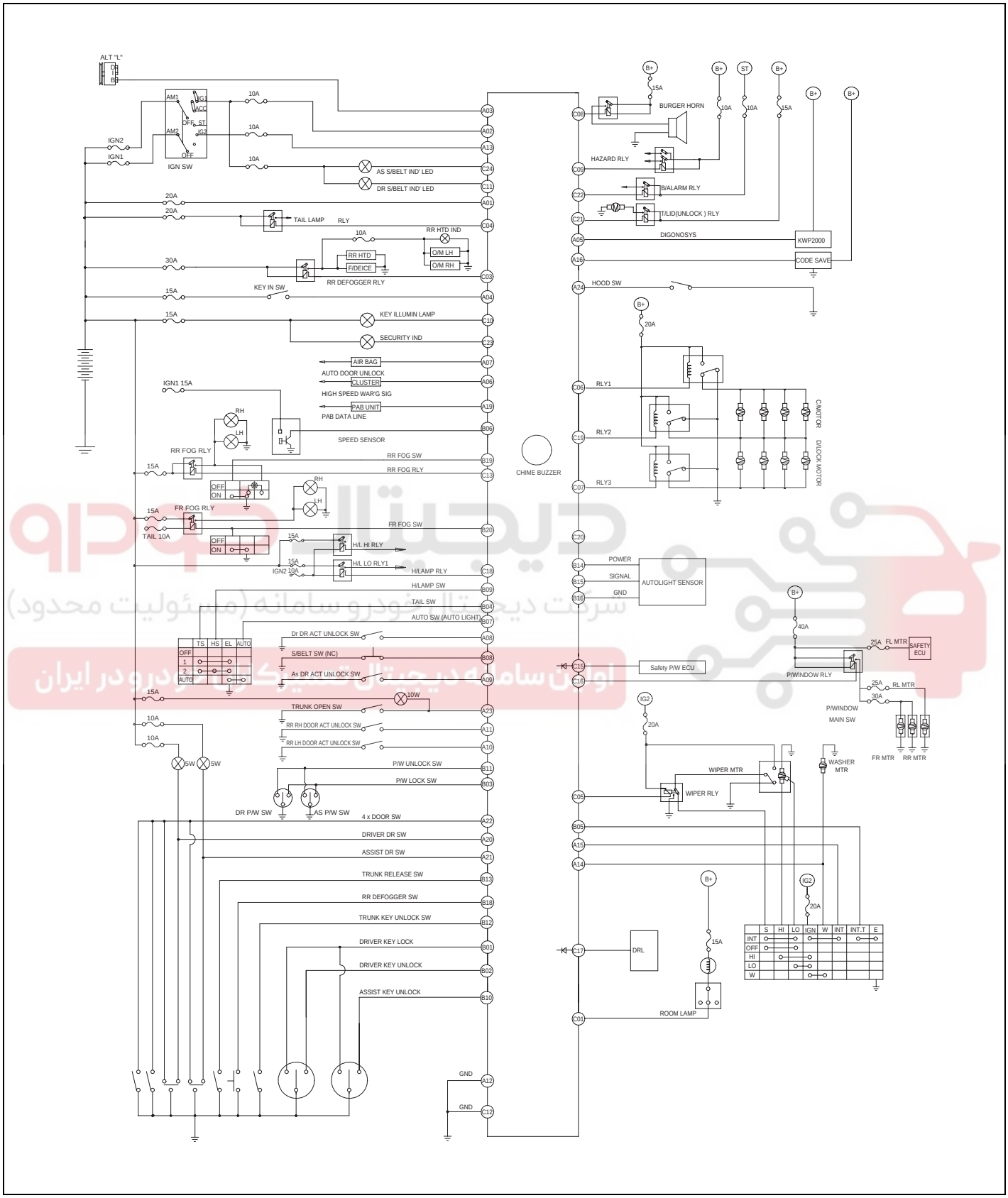
DESCRIPTION EB1E20E9

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.	 KTRE140A

SPECIFICATIONS E44CA976

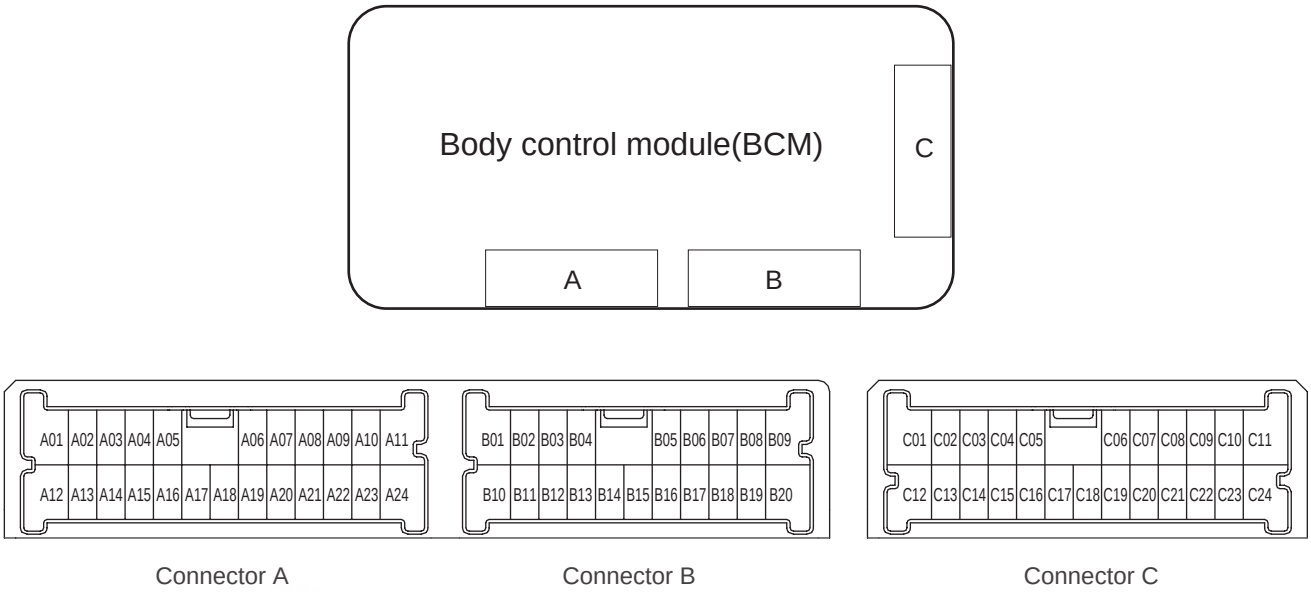
Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F~176°F(-30°C~ 80°C)
Insulation resistance	100MΩ or more
Dark current	Less than 5.5mA (12.8 V) - BCM & Receiver Less than 4mA (12.8V) - BCM
Rated load	
Burglar relay	DC 12V, 200mA (Inductance load)
Horn relay	DC 12V, 200mA (Inductance load)
Tail lamp relay	DC 12V, 200mA (Inductance load)
Security indicator	DC 12V, 1W (LED 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, 21W (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 E5178D16



ETRF140B

BCM CONNECTOR TERMINALS EFB3BA8C



Connector A Connector B Connector C

ETRF140C

Terminal No.	Connector A	Connector B	Connector C
1	B+ [For ETACS]	Driver door key lock switch	Room lamp
2	IGN 1	Driver door key unlock switch	-
3	Alternator (L)	Central door key lock switch	Rear defogger relay
4	Key warning switch	Tail lamp switch	Tail lamp relay
5	Diagnosis	Intermittent wiper volume	Wiper relay
6	Over speed (Cluster)	Speed sensor	Door lock relay 1
7	Crash unlock (Air bag)	Auto light switch	Door lock relay 3
8	Driver door unlock switch	Driver seat belt switch	Horn relay
9	Assist door unlock switch	Head lamp switch	Hazard lamp relay
10	Rear left unlock switch	Assist door key unlock switch	Key hole illumination
11	Rear right unlock switch	Central door key unlock switch	Driver seat belt indicator
12	Ground	Trunk key unlock switch	Ground
13	IGN 2	Trunk open switch	Rear fog lamp relay
14	Washer switch	Auto light (Power)	-
15	Intermittent wiper switch	Auto light (signal)	Safety power window ECU
16	Code saving	Auto light (Ground)	Power window relay
17	-	-	-
18	-	Rear defogger switch	Head lamp relay
19	Seat belt reminder signal	Rear fog lamp switch	Door lock relay 2
20	Driver door switch	Front fog lamp switch	-
21	Assist door switch		Trunk lid open relay

Terminal No.	Connector A	Connector B	Connector C
22	4 door open switch		Start inhibit relay
23	Trunk open switch		Security indicator
24	Hood switch		Assist seat belt indicator

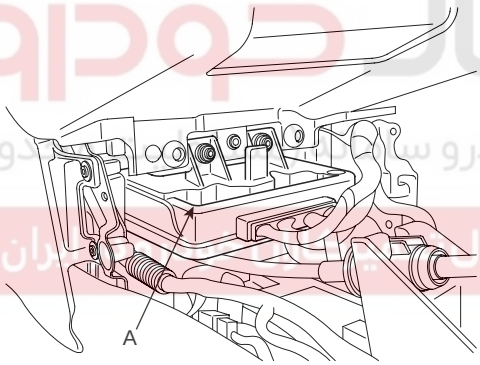
BCM MODULE INPUT SIGNAL TEST

Pin No.	Input signal name	Test condition	Measured value	Ordinary
A1	B+ [For BCM]	Constant	Battery voltage	10V or more
A2	IGN1	Ignition switch ON	Battery voltage	1V or less
A3	Alternator (L)	Engine start condition	Battery voltage	1V or less
A4	Key warning switch	Key is inserted into the ignition switch	10V or more	1V or less
A7	Crash unlock (Air bag)	Crash sensor signal input	1V or less	10V or more
A8	Driver door unlock switch	Driver door unlock	1V or less	4V or more (Lock)
A9	Assist door unlock switch	Assist door unlock	1V or less	4V or more (Lock)
A10	Rear left unlock switch	Rear left unlock	1V or less	4V or more (Lock)
A11	Rear right unlock switch	Rear right unlock	1V or less	4V or more (Lock)
A13	IGN2	Ignition switch ON	Battery voltage	1V or less
A14	Washer switch	Washer switch ON	10V or more	1V or less
A15	Intermittent wiper switch	Intermittent wiper switch ON	10V or more	1V or less
A16	Code saving	Code saving	1V or less	4V or more
A20	Driver door switch	Driver door open	1V or less	4V or more
A21	Assist door switch	Driver door open	1V or less	4V or more
A22	4 door open switch	4 door close	4V or more	1V or less
A23	Trunk open switch	Trunk open	1V or less	4V or more
A24	Hood switch	Hood open	1V or less	4V or more
B1	Driver door key lock switch	Driver door key lock switch ON	1V or less	4V or more
B2	Driver door key unlock switch	Driver door key unlock switch ON	1V or less	4V or more
B3	Central door key lock switch	Central door key lock switch ON	1V or less	4V or more
B4	Tail lamp switch	Tail lamp switch ON	1V or less	4V or more
B5	Intermittent wiper volume	-	0 ~ 2.5V	-
B6	Speed sensor	Ignition switch ON	0~5V (Pulse)	-
B8	Driver seat belt switch	Fasten (Open), Unfasten (Ground)	4V or more (Fasten)	1V or less
B9	Head lamp switch	Head lamp switch ON	1V or less	4V or more
B10	Assist door key unlock switch	Assist door key unlock switch ON	1V or less	4V or more

Pin No.	Input signal name	Test condition	Measured value	Ordinary
B11	Central door key unlock switch	Central door key unlock switch ON	1V or less	4V or more
B12	Trunk key unlock switch	Trunk key unlock switch ON	1V or less	4V or more
B13	Trunk open switch	Trunk open switch ON	1V or less	4V or more
B18	Rear defogger switch	Rear defogger switch ON	1V or less	4V or more
B19	Rear fog lamp switch	Rear fog lamp ON	1V or less	4V or more
B20	Front fog lamp switch	Front fog lamp switch ON	1V or less	4V or more

REPLACEMENT ECFCDADB

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



KTRE140A

4. Installation is the reverse of removal.

INSPECTION E3BDFDD3

Verify each components operation using related timing charts.

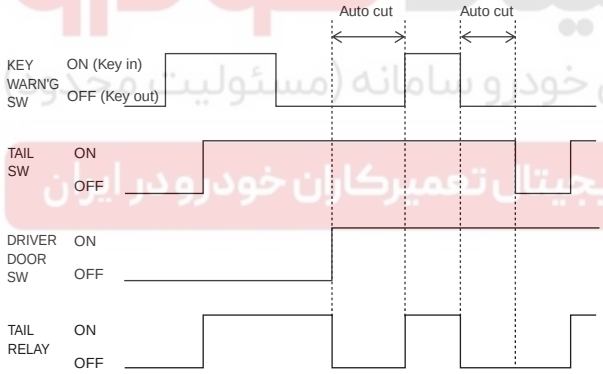
1. TAIL LAMP AUTO CUT

   1) With the tail lamp switched ON, if the ignition Is switched OFF and the driver’ s door opened, the tail lamp should be automatically turned OFF.

   2) With the ignition switch ON, if the driver’ s door is opened and the ignition is switched to OFF, the tail lamp should be automatically turned OFF.

   3) When the tail lamp is cut automatically and the tail lamp switch is turned OFF and ON, the tail lamp illuminates and auto cut function is cancelled.

   4) When the tail lamp is cut automatically and the ignition key is inserted, the tail lamp illuminates and auto cut function is canceled.



LTGE141A

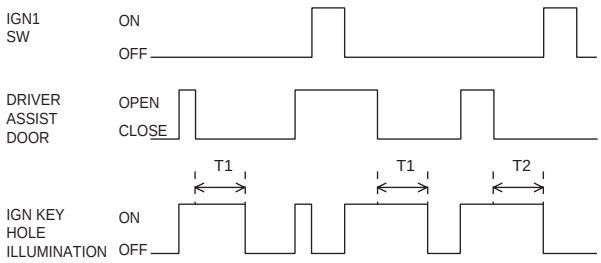
2. IGNITION KEYHOLE ILLUMINATION

   1) Ignition keyhole illumination is turned ON when the driver or passenger door is opened.

   2) The "ON" state for ignition keyhole illumination is delayed 10 seconds when the door is closed as in Step 1).

   3) Ignition keyhole illumination is turned off if the ignition switch is turned ON as in Step 1) & 2).

   4) Ignition keyhole illumination is turned off if ARM state is entered. See Steps 1) & 2).



LTGE141B

T1 : 10 ± 1 sec.
T2 : 0 ~ 10 sec.

3. DELAYED ROOM LAMP

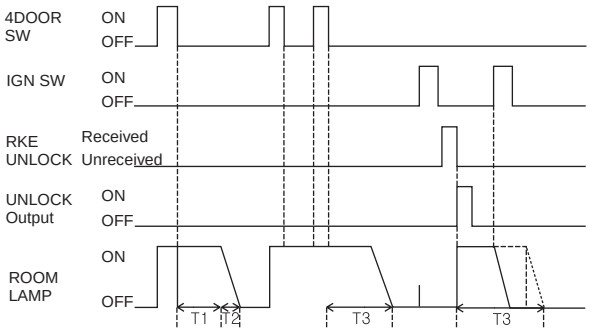
   1) When the first door (driver, or assist or 4doors) is opened, room lamp is turned on.

   2) When the door is closed, the room lamp is faded out for 2 seconds after there is on for 30 seconds.

   3) Regardless of ignition ON/OFF in door open state, room lamp output is ON.

   4) When remote control unlock is received, room lamp is turned on for 30 seconds.

   5) While room lamp is on due to Remote control unlock, if another remote control unlock is received, then room lamp is again on for 30 sec.



ETRF141C

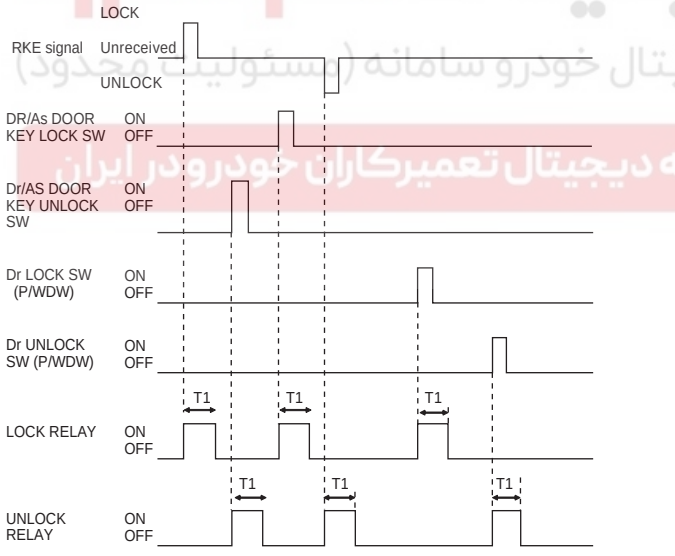
T1 : 30 ± 3 sec.,
T2 : 2 ± 0.2 sec.,
T3 : 32 ± 3.2sec.

4. CENTRAL DOOR LOCK/UNLOCK

1) Central door lock/unlock

Function \ Option		Centeral door Lock	Transmitter (RKE)
Door key UNLOCK	Driver	All unlock	All unlock
	Assist	All unlock	All unlock
Door key LOCK	Driver	All lock	All lock
	Assist	All lock	All lock
Transmitter (RKE)	Lock	–	All lock
	Unlock	–	All unlock
Driver's knob	Lock	Driver lock	Driver lock
	Unlock	Driver unlock	Driver unlock
Assist knob	Lock	Assist lock	Assist lock
	Unlock	Assist unlock	Assist unlock
Door Lock switch	Lock	All lock	All lock
	Unlock	All unlock	All unlock

ETRF141U



ETRF141D

T1 : 0.5 ±0.1 sec.

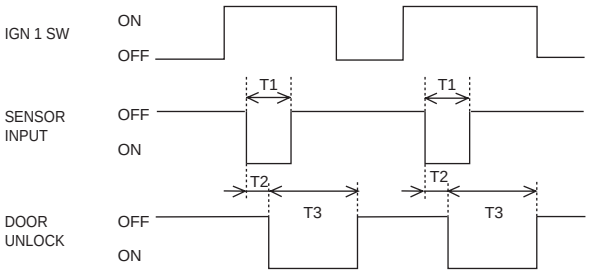
5. CRASH DOOR UNLOCK

1) If IG1 is on and a crash signal is received, send an unlock pulse to the door locks.

2) This function is prior in all door lock functions.

3) If door lock switch is locked in door lock switch is unlocked state, after the first crash unlock output, issue unlock pulse for again 5 sec.

4) Only one crash unlock can occur during one ignition on cycle.

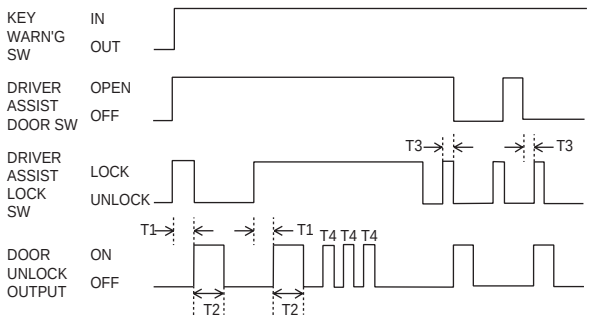


LTIF141F

T1 : 0.2 ± 0.02 sec.,
T2 : 0.04 sec.,
T3 : 5 ± 0.5 sec.

6. IGNITION KEY REMINDER

1) If the key is in the key cylinder, with either the driver's door or assist door open, and then the vehicle is locked using the driver's lock switch or assist lock switch, the central locking system will issue an unlock pulse (1 sec. duration) to all doors preventing locking of the vehicle. (When a lock switch remains locked, if the switch in the actuator is not changed, the central locking will issue 1 pulse (1 sec. duration) and then 3 pulses (0.5 sec.) to unlock the vehicle.)



LTIF141G

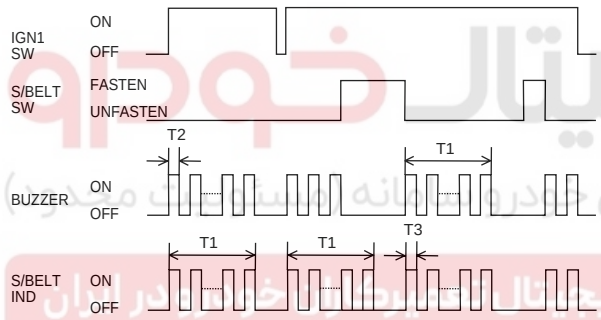
T1 : MAX 0.1 sec.
T2 : 1.0 sec.
T3 : 0 sec. < T3 < 0.5 sec.
T4 : 0.5 sec.

7. SEAT BELT WARNING TIMER

1) When the ignition is switched ON, the seat belt warning indicator will illuminate (period: 0.6 sec., duty rate: 50%) and the chime bell will sound (period: 1.0 sec., duty rate: 50%) for total of 6 seconds.

2) If the ignition is switched off while the seat belt warning indicator and chime bell are active (Step 1) the indicator and chime bell will be switched OFF. If the seat belt is sensed as fastened during indicator and chime bell output, the chime bell will switch OFF however the seat belt warning indicator will stay illuminated for the remaining seconds.

3) If the seat belt is removed, with the ignition switched ON, the seat belt warning indicator and chime bell will activate for 6 seconds.



LTGE141H

T1 : 6±1 sec.
T2 : 0.5 ± 0.1 sec. (ON TIME).
T3 : 0.3 ± 0.1 sec. (ON, OFF TIME)

8. SEAT BELT REMINDER FUNCTION

1) Warning lamp is turned ON when ignition is ON in the state that seat belt is not fastened.

2) In the above (1), the warning lamp is turned OFF after fastening seat belt. (Warning lamp continues to light for 6sec if seat belt is fastened within 6sec.)

3) In the above (2), seat belt reminder is cancelled when seat belt is unfastened within 9sec after fastening seat belt.

4) In the above (3), the warning lamp continues to flash and 55sec-timer is counted in case seat belt is unfastened after 9sec passes under fastening seat belt and vehicle speed becomes 9KPH or less. (Warning lamp continues to flash for 6sec if seat belt is fastened within 6sec.) Buzzer output follows the pattern once when seat belt is still unfastened after 55sec.

5) In the above (3), the warning lamp continues to flash and buzzer output follows the pattern once in case seat belt is still unfastened after 9sec passes under fastening seat belt and vehicle speed becomes 9KPH or more.

6) In the above (4) and (5), seat belt reminder output is cancelled if the warning lamp are turned OFF and buzzer OFF when belt is fastened within 9sec.

7) In case of ignition OFF in the above (4) and (5), buzzer and the warning lamp are turned OFF and 55sec- timer is counted.

8) In case of ignition ON seat belt ON in the above (7), indicator is turned ON for 6sec. seat belt reminder is cancelled when seat belt is unfastened within 9sec after indicator is turned ON.

9) After the above (7), indicator flashes and 55sec-timer is counted in case of ignition ON & seat belt OFF within 55sec. buzzer out put follows the pattern once when seat belt is unfastened after 55sec.

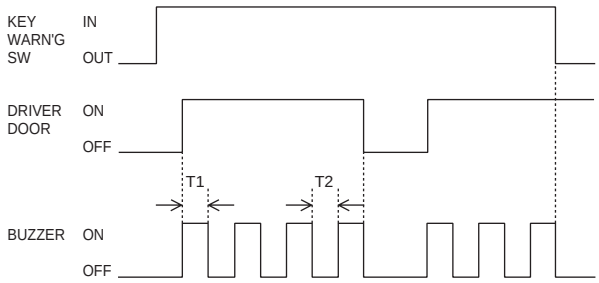
10) In the above (1), the warning lamp flashes and 55sec- timer is counted if vehicle speed becomes 9KPH or more under unfastened seat belt.

11) In case of ignition OFF in the above (10), buzzer and the warning lamp are turned OFF and 55sec-timer is counted.

9. KEY OPERATED WARNING

1) If the key is in the ignition and the driver’ s door is opened, the buzzer is sounded (period: 0.7 sec., duty rate: 50%).

2) If the ignition key is removed, or the door is closed, the buzzer is switched OFF immediately.



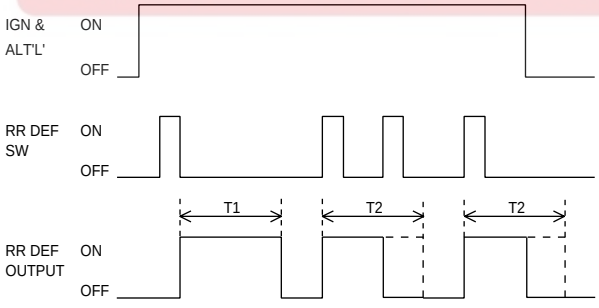
LTGE141I

T1, T2 : 0.35 ± 0.1sec.

10. WINDSHIELD DEICER & DEFOGGER TIMER

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

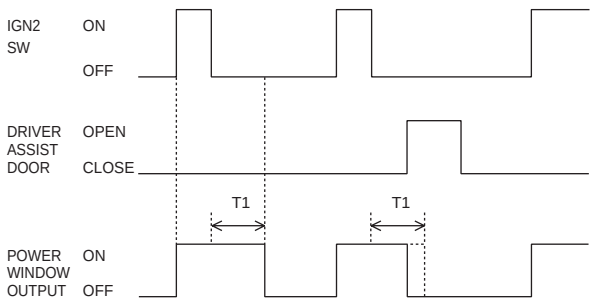
T1 : 20 ± 1 min.
T2 : MAX 20 ± 1 min.

11. POWER WINDOW TIMER

1) When the ignition is switched OFF, power window output remains ON for 30 seconds and then turns OFF.

2) Related to Step 1), if the driver's door or assist door is opened, window power output is turned OFF immediately.

3) When the driver's door or assist door is opened, the power window relay output is turned OFF immediately.



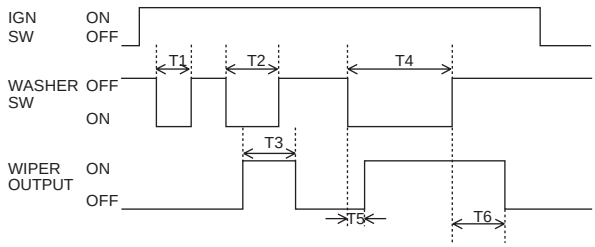
LTGE141K

T1 : 30 ± 3 sec.

12. WIPER RELATED TO WASHER

1) When the ignition switch is turned ON :
- If washer switch is turned on, wiper output is ON after 0.3 sec. (T5)
- If washer switch is turned OFF, wiper output is OFF after 3.8 sec. (T6)

2) If the washer switch is turned OFF within 0.6 sec. (T2), the wiper will remain ON for up to 0.7 sec. (T3) from the moment that washer switch is turned OFF.



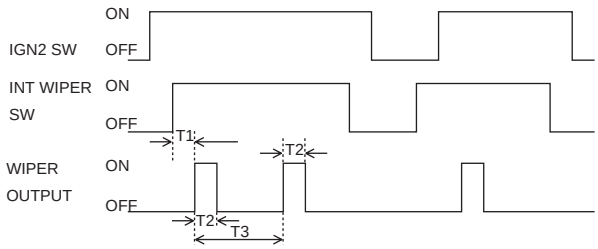
LTIF141N

T1 : Less than 0.2 sec.
T2 : 0.2 ~0.6 sec. (MIST Function)
T3 : 0.7 ± 0.1sec.
T4 : More than 0.6 sec.
T5 : 0.3 sec.
T6 : 2.5 ~3.8 sec.

13. VARIABLE INTERMITTENT WIPER (WINDSHIELD WIPER)

1) With the ignition switch ON, if the intermittent wiper switch is turned on, wiper output is ON according to the setting.

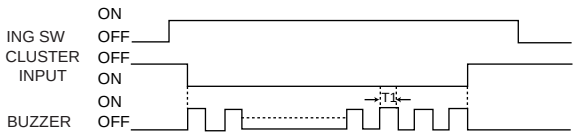
2) When the intermittent wiper switch is ON, if the ignition switch is turned ON, wiper output is ON.



LTIF141O

T1 : MAX 0.5 sec.
T2 : 0.7 ± 0.1sec.
T3 : 2.6 ± 0.7 sec. (FAST),
T3 : 18.0 ± 1.0sec. (SLOW) vehicle speed 0 km/h

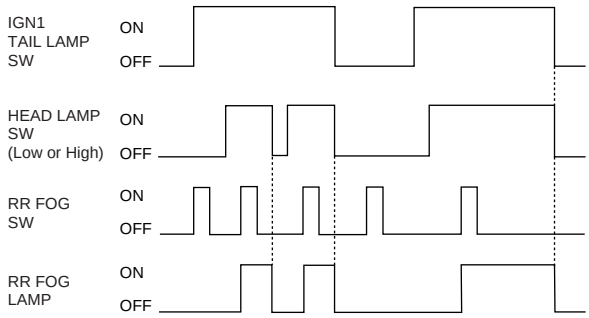
14. OVER SPEED WARNING (Middle East area)
If vehicle runs over 120km/h, the cluster input is to be set.
When the cluster input indicates that vehicle runs over 120km/h, the over speed warning starts.



LTGE141T

T1 : 0.5 ± 0.1sec.

15. REAR FOG LAMP CONTROL
In case of (Ignition & tail output) and [(Head lamp low output) and (Front fog lamp output) is turned ON], if rear fog switch is pushed, rear fog lamp is turned ON.



LTGE141S

16. DEAD LOCK (UNITED KINGDOM, AUSTRALIA ONLY)

1) Central door lock signal is output for 0.5s if central door lock is performed with driver/assist key or RKE. 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 central door lock switch of power window switch.

3) Dead unlock signal is output for 0.5sec if central door unlock is performed with driver/assist key or RKE. And, central door unlock signal is output for 0.5sec after 200msec from then.

4) Only central door unlock is performed and dead unlock is not performed if central door unlock is performed with central door unlock switch of power window switch (In case of driver/assist, the relevant door is mechanically door unlock & dead unlock if unlock is performed with key.)

5) Dead lock/unlock is performed regardless of door open/close.

6) Output at that time is immediately finished and the new input condition is output after 200msec when central door lock/unlock order is input during C central door lock/unlock signal output with key or RKE.

7) After central door lock/unlock signal output with key or RKE, output at that time is immediately finished and the new input condition is output after 200msec when central door lock/unlock order is input during dead lock/unlock signal output.

8) LOCK function is performed first when both LOCK/UNLOCK functions are performed at the same time.

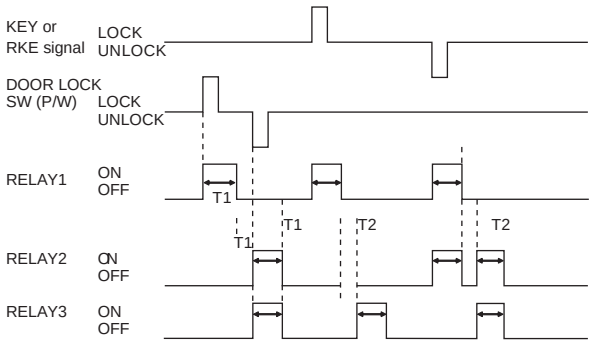
9) Priority is decided in order of RKE > key > door lock switch in case of simultaneous input with key/RKE/ door lock switch.

10) If (8), (9) is happened simultaneously, priority is given to (9).

11) Dead lock is canceled (dead unlock signal output for 0.5SEC) at key IN & IGN ON after dead lock.

12) Only central door signal is output for 0.5sec at door key LOCK when key IN & IGN ON condition is met.
Relay output condition in each function

Relay Output / Function	Relay 1	Relay 2	Relay 3
Central door lock	ON	OFF	OFF
Dead lock	OFF	OFF	ON
Dead unlock	ON	ON	OFF
Central door unlock	OFF	ON	ON



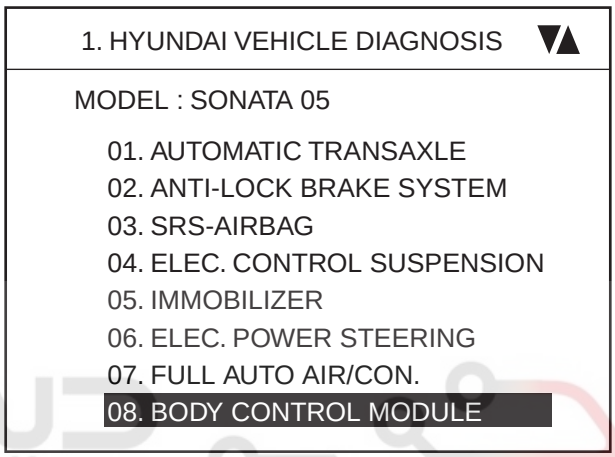
ETRF141W

T1 : 0.5 ± 0.1sec,
T2 : 0.2 ± 0.05sec.

TROUBLE DIAGNOSTICS WHEN USING DIAGNOSIS TOOL E8D3E1D4

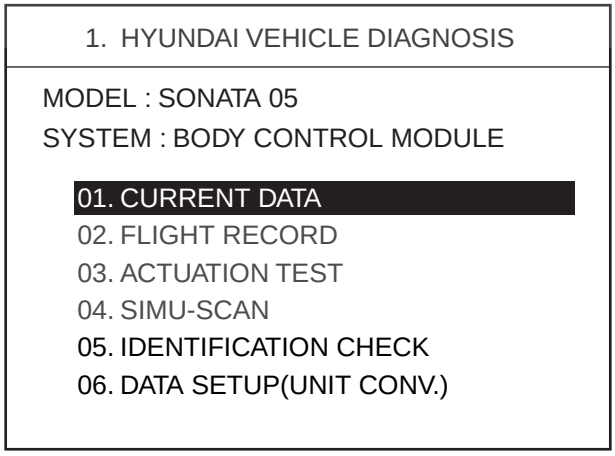
1. The body control module can diagnose by using the diagnosis tool more quickly.
The BCM communicates with the diagnosis tool and then reads the input/output value and drives the actuator.

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

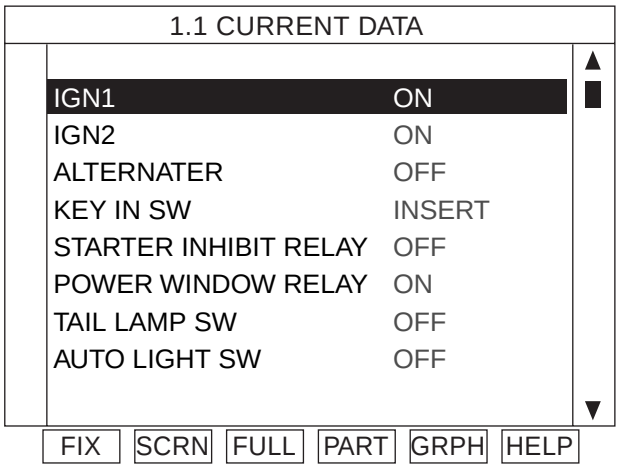


ETRF144A

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.

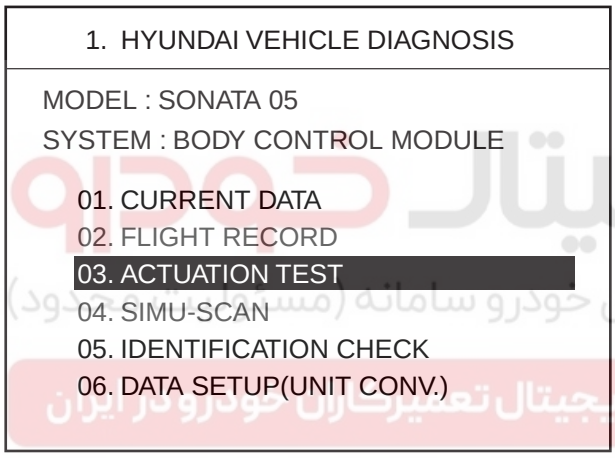


ETRF144B

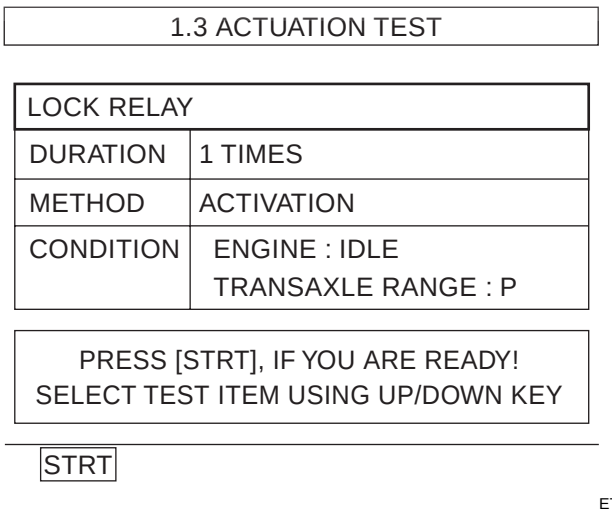


ETRF144C

4. To perform compulsory operation on BCM input factors, select "03. ACTUATION TEST"



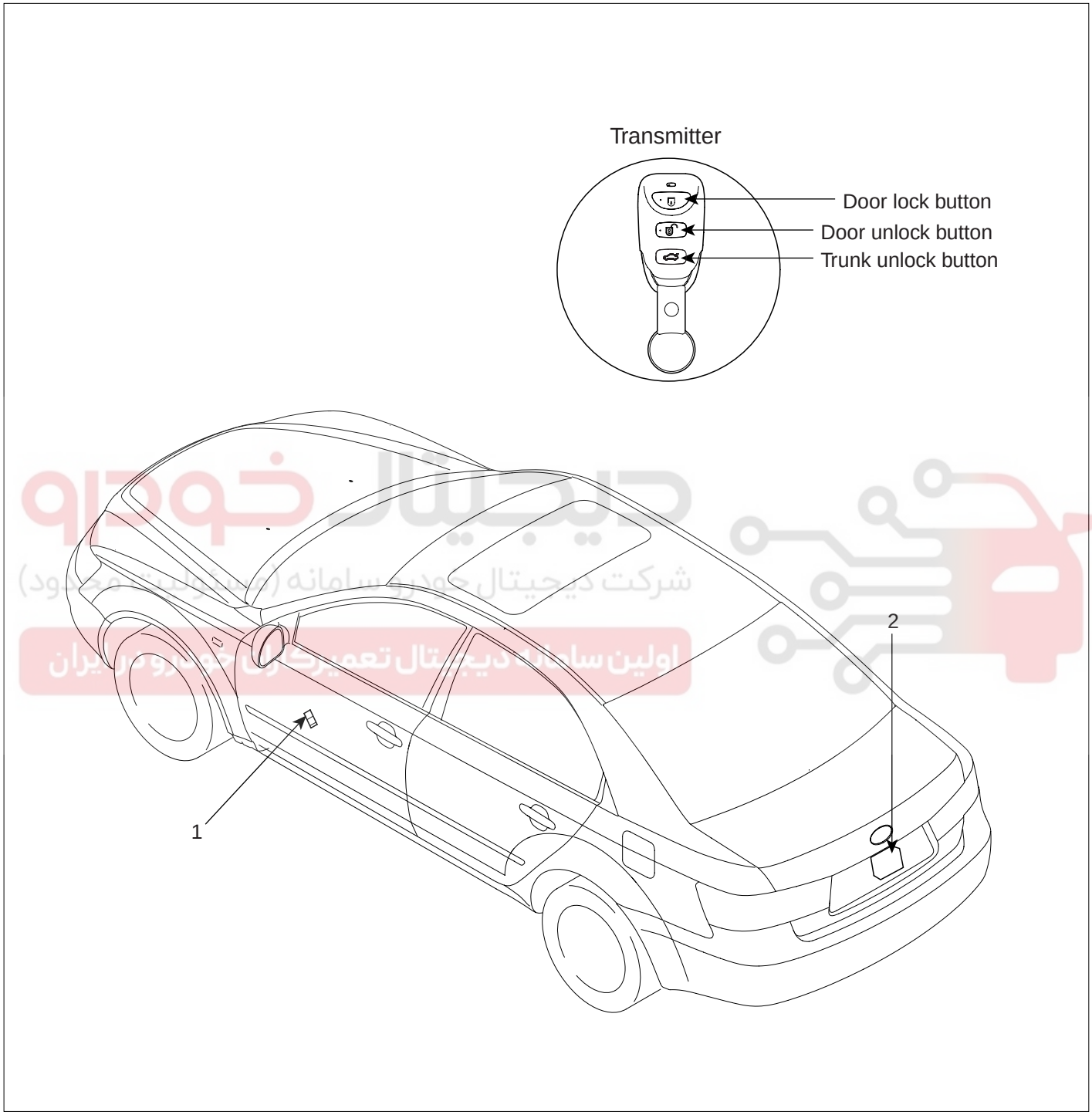
ETRF144D



ETRF144E

TRUNK LID OPENER

COMPONENT LOCATION E09D9152



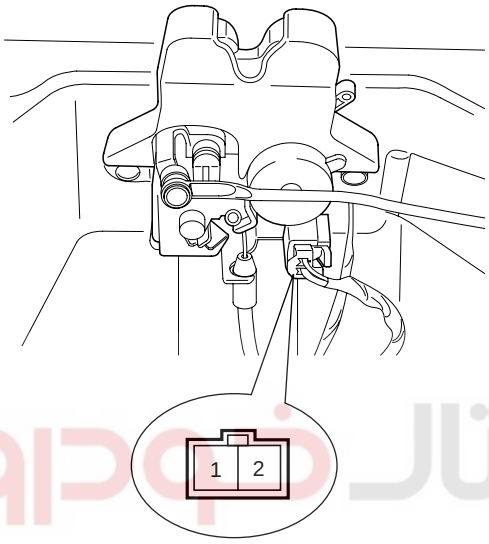
1. Trunk lid open switch
2. Trunk lid release actuator

ETRF160A

TRUNK LID RELEASE ACTUATOR

INSPECTION EBC1A1EF

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



KTRE122E

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

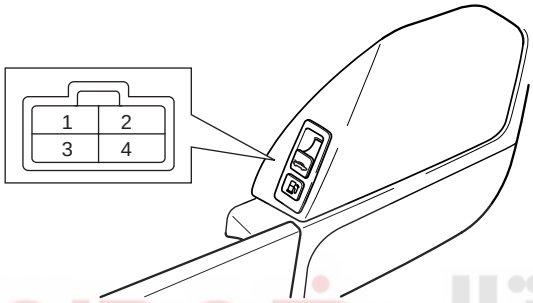
Terminal / Position	2	Chassis ground
Open	⊕	⊖

ETRF122I

TRUNK LID OPEN SWITCH

INSPECTION EB6DE92A

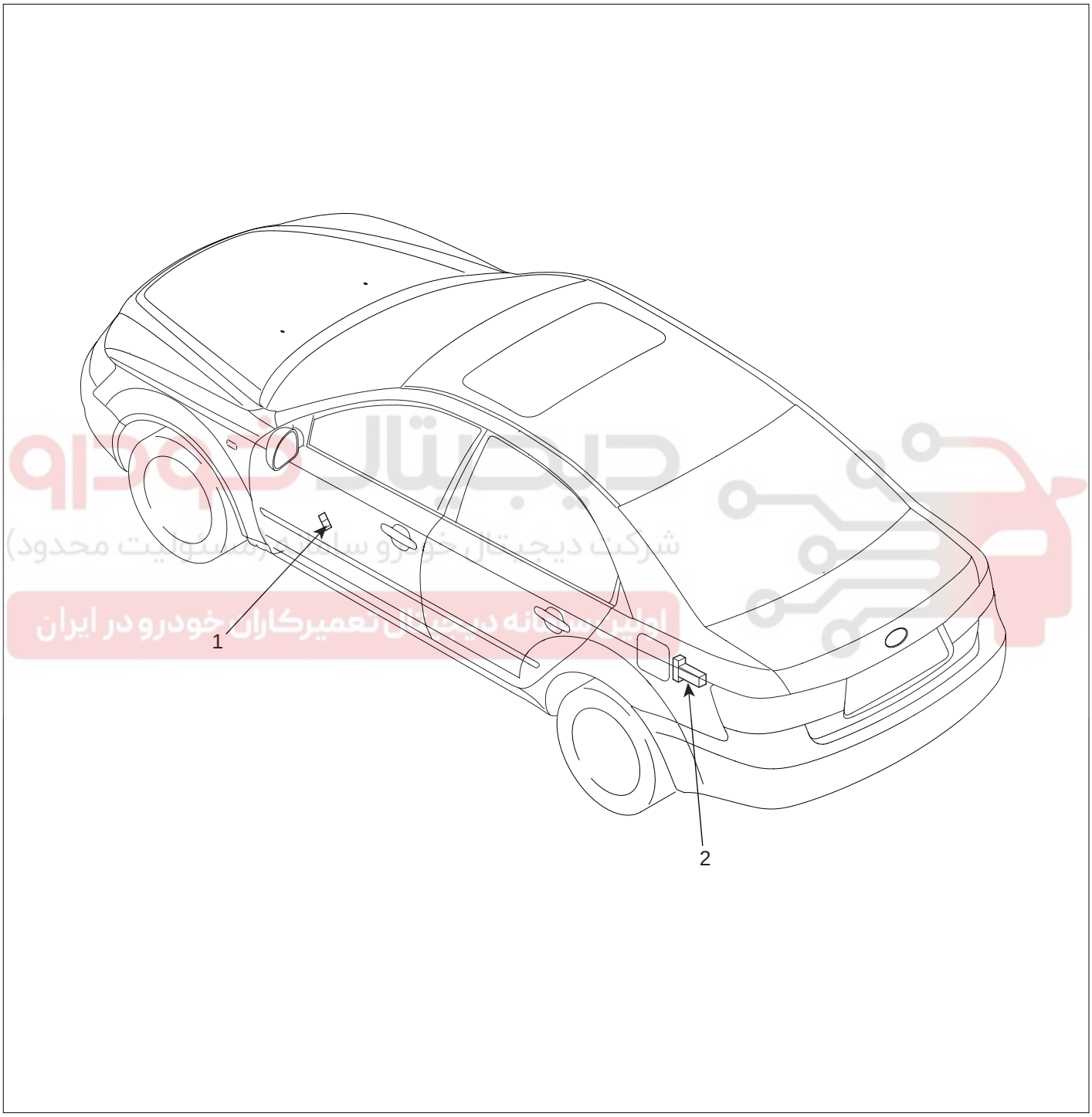
1. Remove the front door trim panel. (Refer to the Body group-front door)
2. Check the switch for continuity between the No. 3 and No. 4 terminals.
3. If the continuity is not as specified, replace the switch.



KTRE162A

FUEL FILLER DOOR OPENER

COMPONENT LOCATION EF1F9DCD



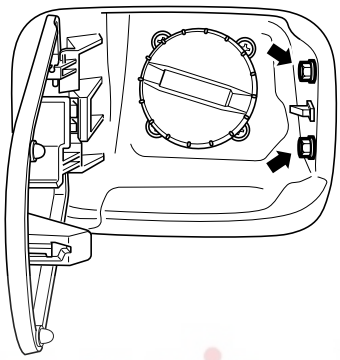
1. Fuel filler door open switch
2. Fuel filler door release actuator

ETRF180A

FUEL FILLER DOOR RELEASE ACTUATOR

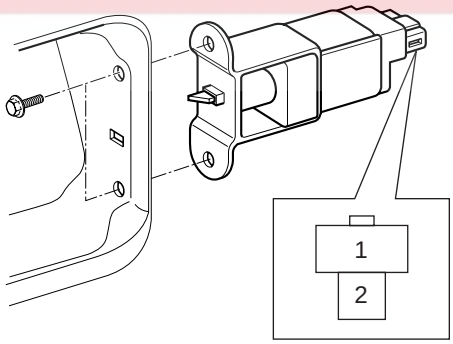
INSPECTION ECD2B97B

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.

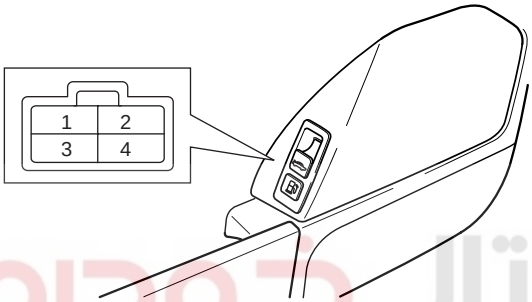


KTRE181A

FUEL FILLER DOOR OPEN SWITCH

INSPECTION EB9153CD

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.

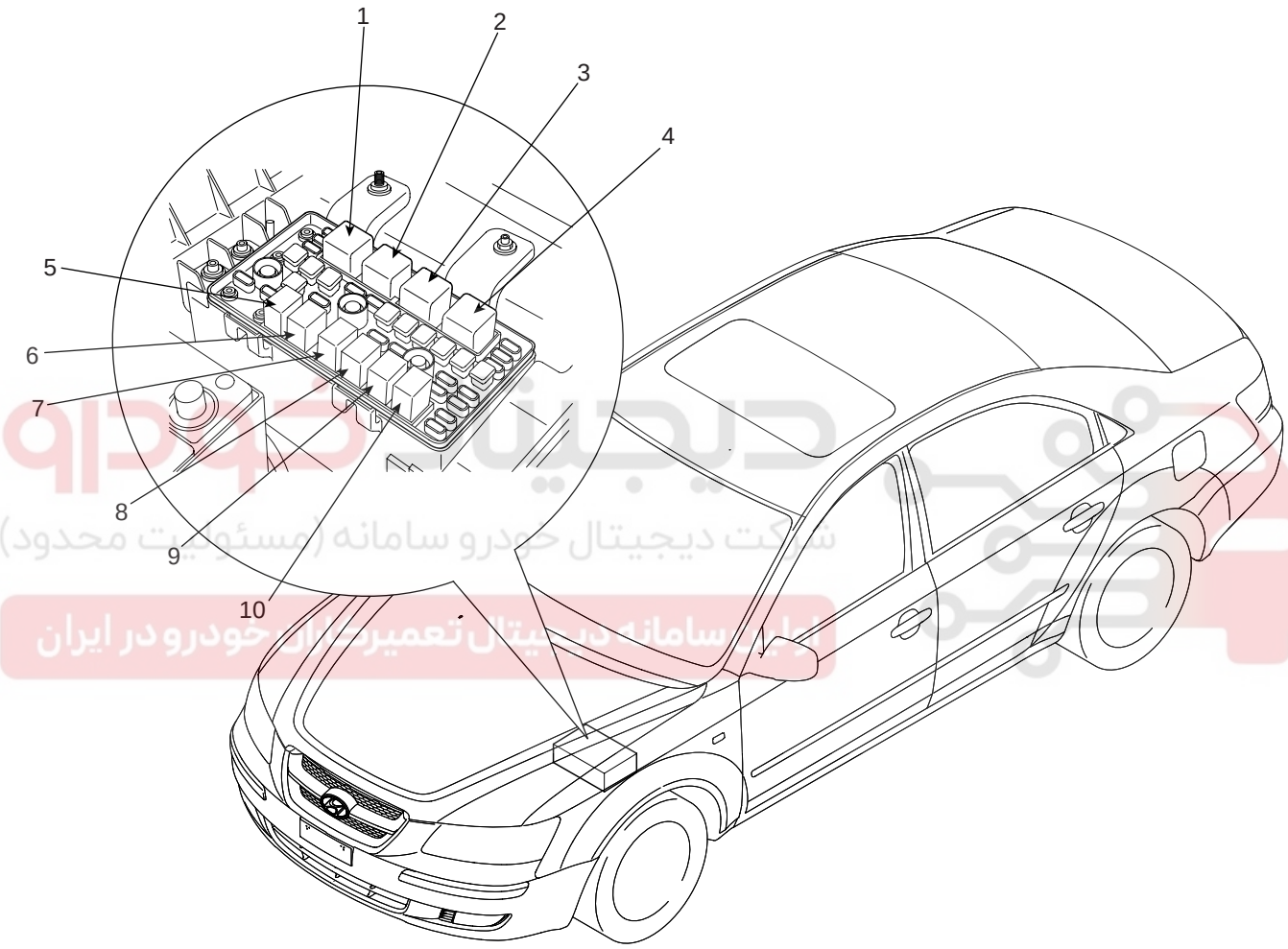


KTRE162A

FUSES AND RELAYS

COMPONENT LOCATION EB5DE2AF

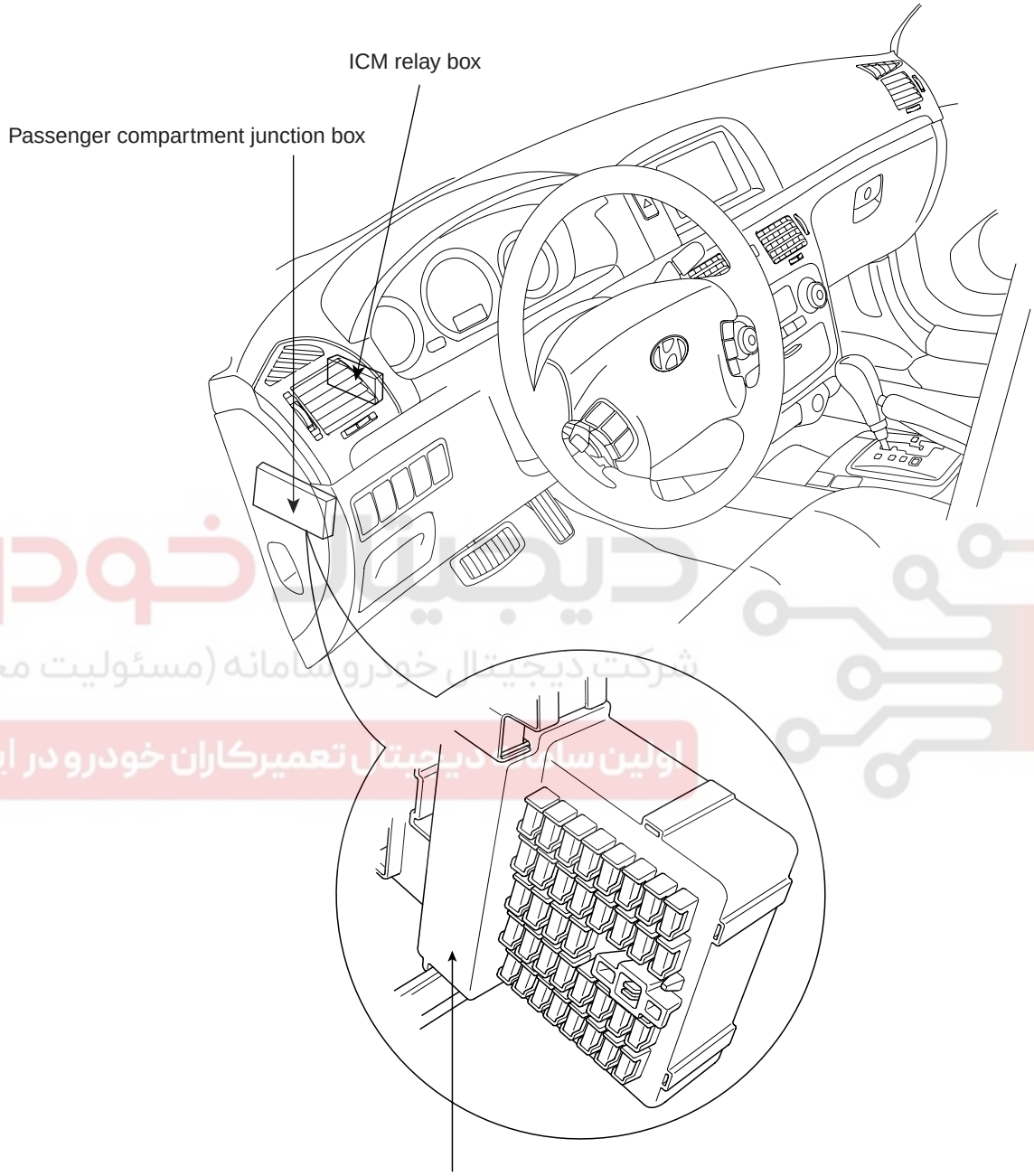
[Engine room relay box]



1. Head lamp relay (Low)
2. Head lamp relay (High)
3. Start relay
4. E/G control relay
5. A/T relay
6. Fuel pump relay
7. Wiper relay
8. Air conditioning relay
9. Front fog relay
10. Horn relay

ETRF220A

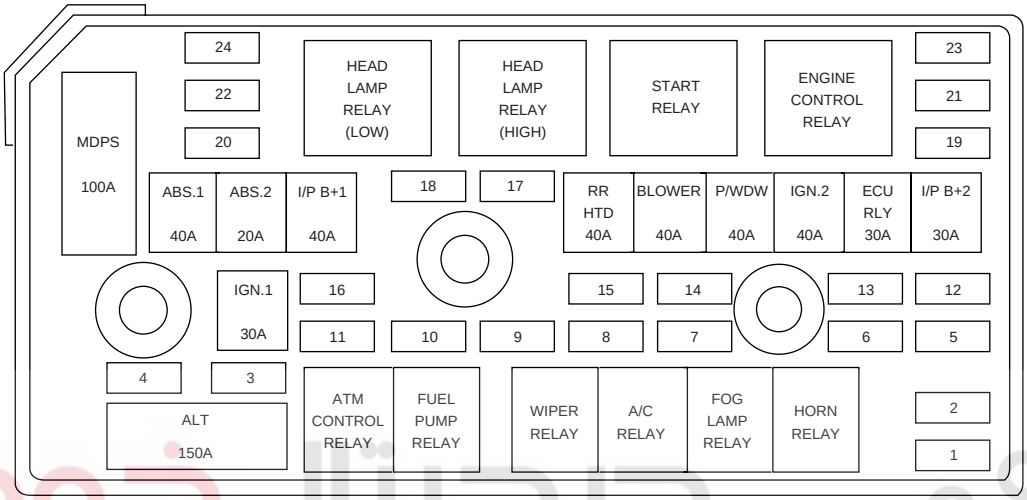
[Passenger compartment relay box]



ETRF220B

RELAY BOX (ENGINE COMPARTMENT)

COMPONENTS E2BF95A9



	Description		(A)	Circuit Protected
FUSIBLE LINK	ABS.1		40A	ABS/ESP control module, Multipurpose check connector
	ABS.2		20A	ABS/ESP control module, Multipurpose check connector
	I/P B+1		40A	Fuse 23, 24, 30, 31, 32, 33, 34, 35
	RR HTD		40A	Defogger relay
	BLOWER		40A	Blower relay
	P/WDW		40A	Power window relay, Fuse 16
	IGN.2		40A	Start relay, Ignition switch (IG2, START)
	ECU RLY		30A	Engine control relay
	I/P B+2		30A	Power connector. 1/2, Fuse 21, 22
	IGN.1		30A	Ignition switch (ACC, IG1)
	ALT		150A	FUSEBLE LINK (ABS.1, ABS.2, RR HTD, BLOWER)
	MDPS		100A	(SPARE)
FUSE	1	HORN	15A	Horn relay
	2	TAIL LAMP	20A	Tail lamp relay
	3	ECU	10A	PCM
	4	MDPS	10A	(SPARE)
	5	DRL	15A	Siren relay, DRL control module
	6	FR FOG	15A	Front fog lamp relay
	7	A/CON	10A	A/C relay
	8	F/PUMP	20A	Fuel pump relay
	9	DIODE	-	(SPARE)
	10	ATM	20A	ATM control relay
	11	STOP	15A	Stop lamp switch
	12	H/LP LO RH	15A	(SPARE)
	13	SUN ROOF	15A	Sunroof control module
	14	H/LP WASHER	20A	Head lamp washer motor
	15	H/LP HI	20A	Head lamp relay (High)
	16	ECU	10A	(SPARE)
	17	SNSR.2	15A	Oxygen sensor, Fuel pump relay
	18	SNSR.1	15A	Mass air flow sensor, Crankshaft/Camshaft position sensor, Oil control valve, SMATRA
	19	SNSR.3	10A	A/C relay, Cooling fan relay, Injectors
	20	B/UP	10A	Back-up lamp switch, Pulse generator, Vehicle speed sensor
	21	IGN COIL	20A	Ignition coils, condenser
	22	ECU	10A	PCM
	23	H/LP LO	20A	Head lamp relay (Low)
	24	ABS	10A	ABS/ESP control module, Multipurpose check connector

※ USE THE DESIGNATED FUSE ONLY

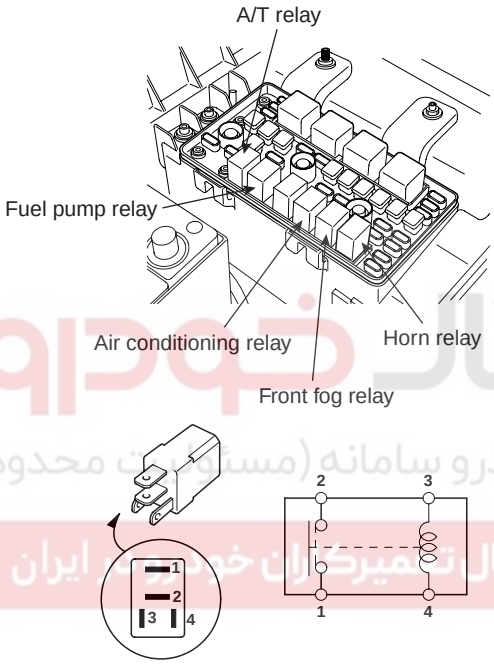
ETRF220C

INSPECTION EFF0DEC8

POWER RELAY TEST (TYPE A)

Check for continuity between the terminals.

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



ETRF201A

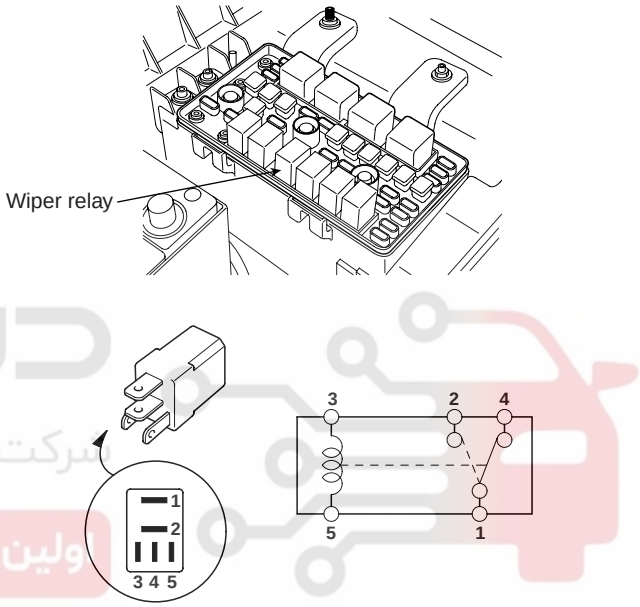
Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

ETKE903A

POWER RELAY TEST (TYPE B)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.



ETRF201B

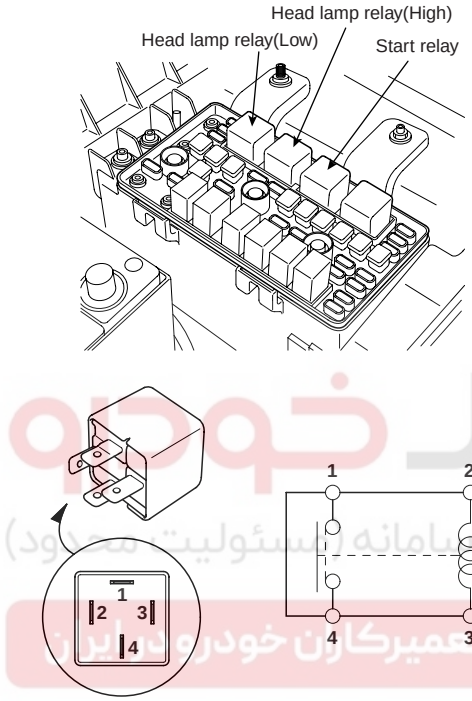
Terminal / Power (No.3-No.5)	3	5	1	2	4
Disconnected			○		○
Connected	⊖	⊕	○	○	

ETKE215H

POWER RELAY TEST (TYPE C)

Check for continuity between the terminals.

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



ETRF201C

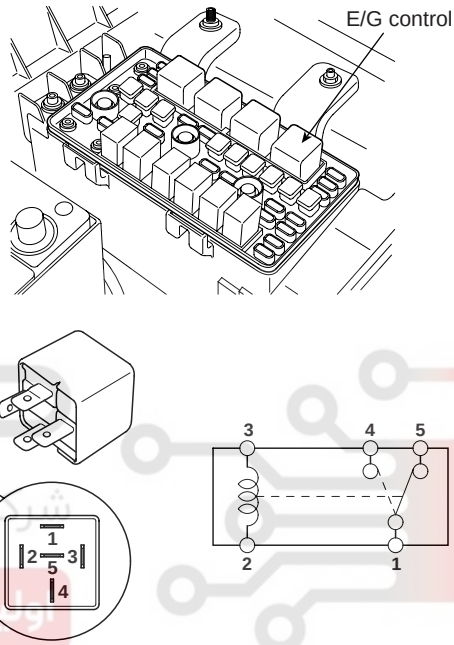
Terminal / Power (No.2-No.3)	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

ETKE215B

POWER RELAY TEST (TYPE D)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.4 terminals when power and ground are connected to the No.2 and No.3 terminals.
2. There should be continuity between the No.1 and No.5 terminals when power is disconnected.



ETRF201D

Terminal / Power (No.2-No.3)	2	3	1	4	5
Disconnected			○		○
Connected	⊖	⊕	○	○	

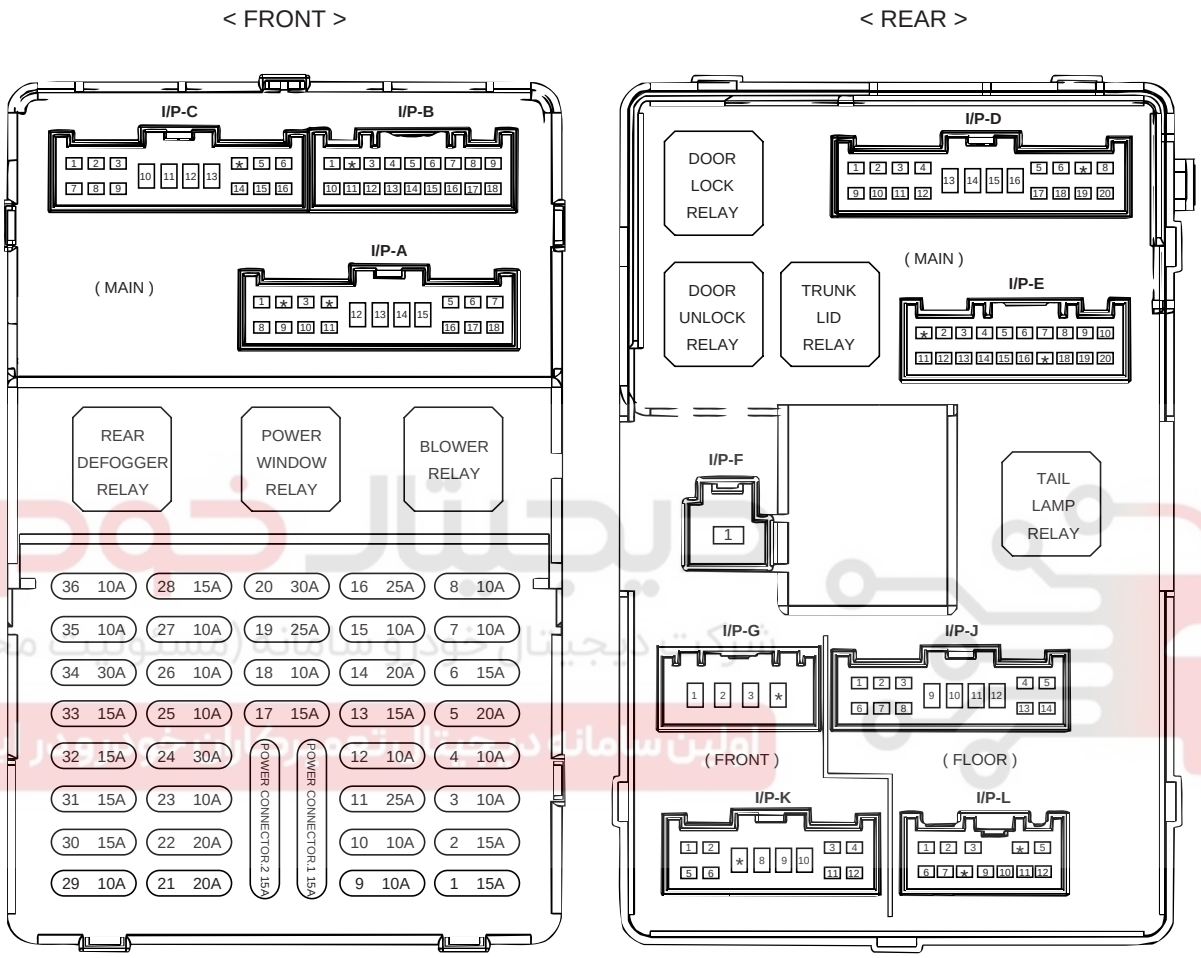
ETRF201E

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 EA1C9FBB



※ USE THE DESIGNATED FUSE ONLY

ETRF220D

CIRCUIT

FUSE	(A)	Circuit Protected
1	15A	(SPARE)
2	15A	Seat warmer switch
3	10A	BCM, Sunroof control module, Electro chrome mirror
4	10A	EPS module, High blower relay, Active incar & humidity sensor
5	20A	Cigarette lighter
6	15A	(SPARE)
7	10A	Illumination lamps, Right : License lamp, Rear combination lamp, Head lamp, Glove box lamp
8	10A	Front fog lamp relay, Left : License lamp, Rear combination lamp, Head lamp
9	10A	Head lamp washer relay, Right head lamp leveling actuator
10	10A	DRL control module, Head lamp relay, AQS & ambient sensor, Left head lamp leveling actuator
11	25A	Wiper & washer
12	10A	A/C control module
13	15A	SRS control module, PAB switch
14	20A	Front accessory socket, Rear power outlet
15	10A	Digital clock, Audio, ATM key lock control module, Power outside mirror & mirror folding
16	25A	Safety window module
17	15A	(SPARE)
18	10A	ATM key lock control module
19	25A	Power window main switch, Left rear power window switch
20	30A	Power window main switch, Right power window switch
21	20A	Audio amp
22	20A	Door lock/unlock relay
23	10A	Hazard switch, Hazard relay
24	30A	Power seat manual switch (RHD)
25	10A	Instrument cluster
26	10A	Hazard switch
27	10A	BCM, Instrument cluster, Yaw rate sensor, ESP switch
28	15A	(SPARE)
29	10A	Burglar alarm relay
30	15A	(SPARE)
31	15A	Rear fog lamp relay
32	15A	Trunk lid relay, Fuel filler door & turnk lid switch
33	15A	(SPARE)
34	30A	Power seat manual switch
35	10A	Sport mode switch, Key solenoid
36	10A	A/C control module, Outside mirror & mirror folding motor
POWER CONNECTOR.1	15A	Audio
POWER CONNECTOR.2	15A	BCM, Digital clock, Instrument cluster, A/C control module, Courtesy lamps

※ USE THE DESIGNATED FUSE ONLY

ETRF220E

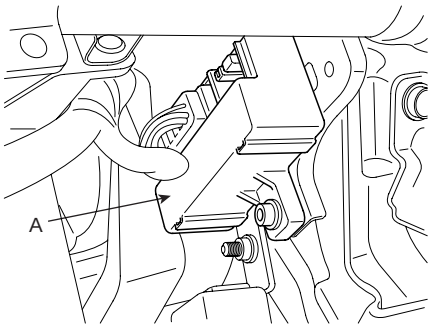
FUSE INSPECTION EDFBBBD9

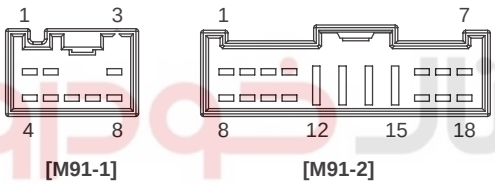
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely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

ICM (INTEGRATED CIRCUIT MODULE) RELAY BOX

DESCRIPTION E9D22CDF

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





KTRE220F

INSPECTION E6C37B29

HAZARD LAMP RELAY

Check for continuity between the terminals.

1. There should be continuity between the No.12 and No.13 terminals when power and ground are connected to the No.13 and No.3 in the M91-2 terminals.
2. There should be no continuity between the No12 and No.13 terminals when power is disconnected.

BURGLAR ALARM HORN

Check for continuity between the terminals.

1. There should be continuity between the No.8 and No.9 terminals when power and ground are connected to the No.1 and No.8 in the M91-2 terminals.
2. There should be no continuity between the No.8 and No.9 terminals when power is disconnected.

BURGLAR ALARM

Check for continuity between the terminals.

1. There should be no continuity between the No.11 and No.10 terminals when power and ground are connected to the No.11 and No.4 in the M91-2 terminals.
2. There should be continuity between the No.11 and No.10 terminals when power is disconnected.

DOOR DEAD LOCK

Check for continuity between the terminals.

1. There should be continuity between the No.7 and No.4 terminals when power and ground are connected to the No.6 and No.4 in the M91-1 terminal.
2. There should be continuity between the No.7 and No.5 terminals when power is disconnected.

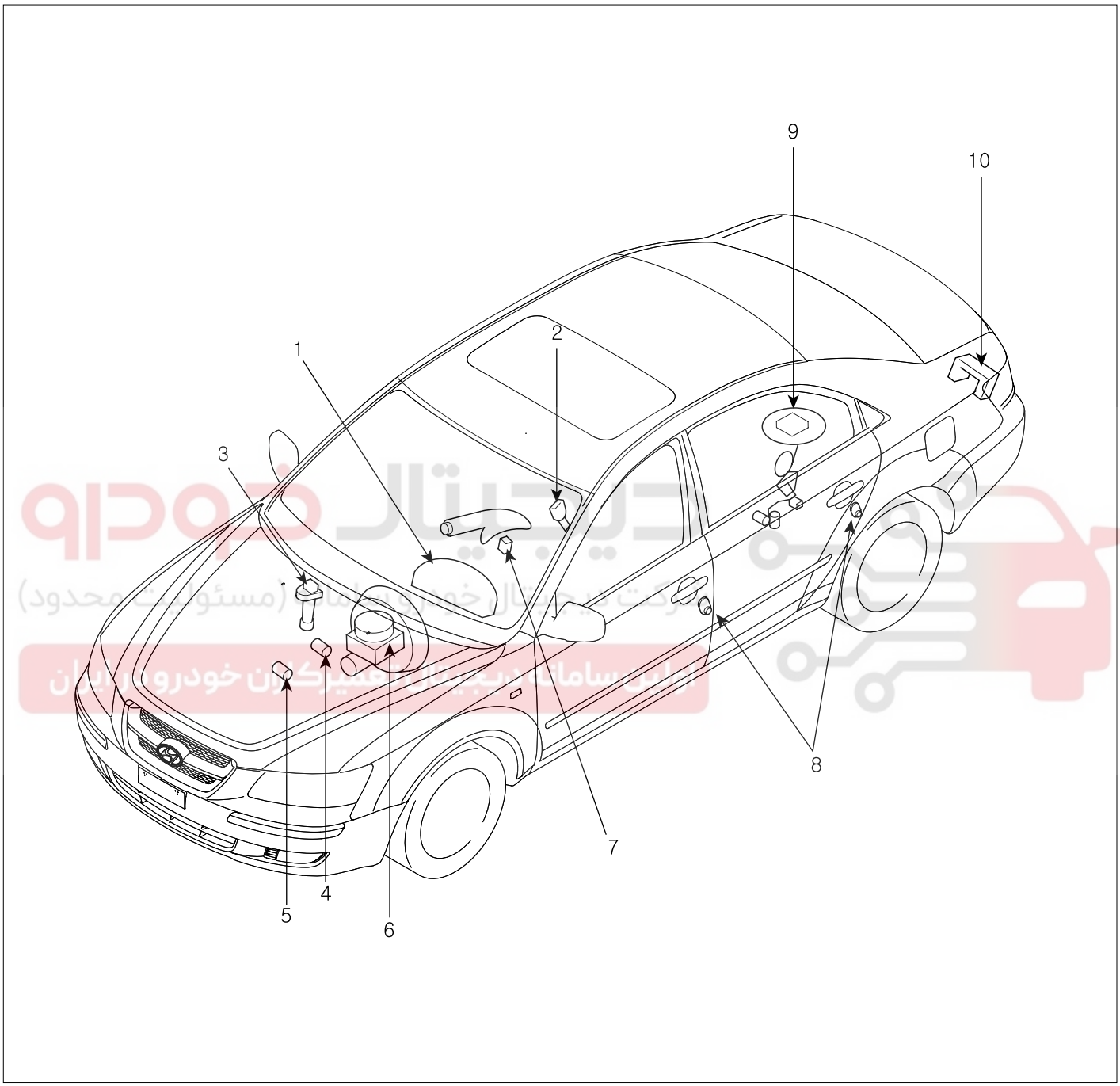
REAR FOG RELAY

Check for continuity between the terminals.

1. There should be continuity between the No.3 and No.8 terminals when power and ground are connected to the No.1 and No.3 in the M91-1 terminals.
2. There should be no continuity between the No.3 and No.8 terminals when power and ground are disconnected.

INDICATORS AND GAUGES

COMPONENT LOCATION EECD8FFD

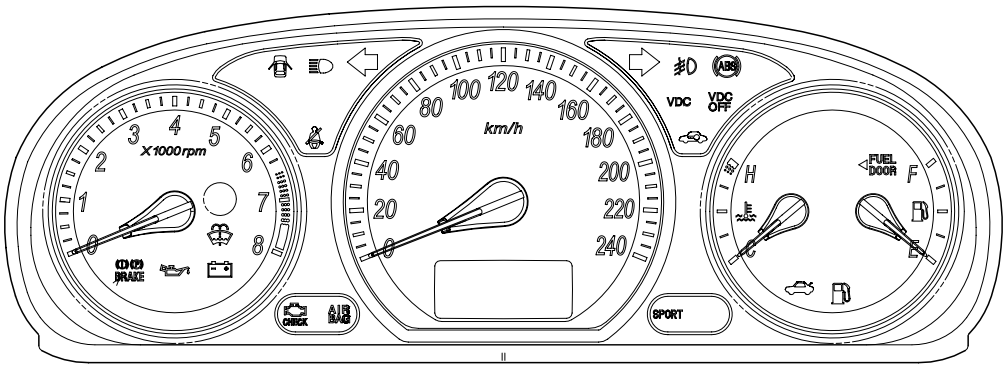


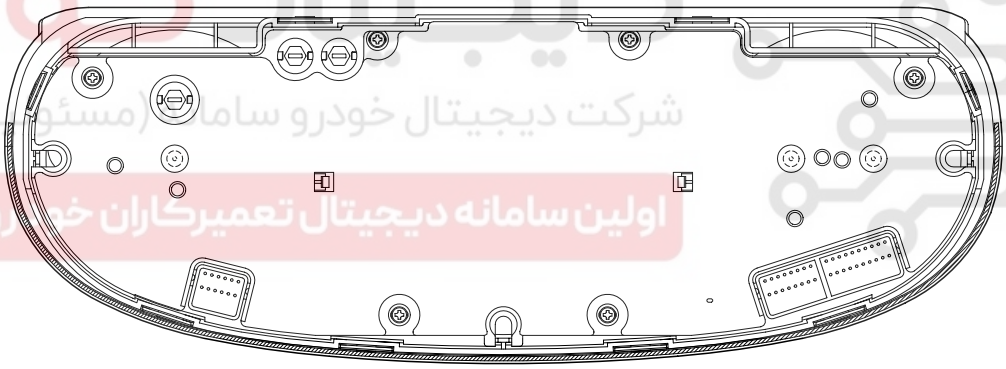
1. Cluster assembly
2. Seat belt switch
3. Vehicle speed sensor
4. Engine coolant temperature sender
5. Oil pressure switch
6. Brake fluid level warning switch
7. Parking brake switch
8. Door switch
9. Fuel gauge sender
10. Trunk lid open actuator

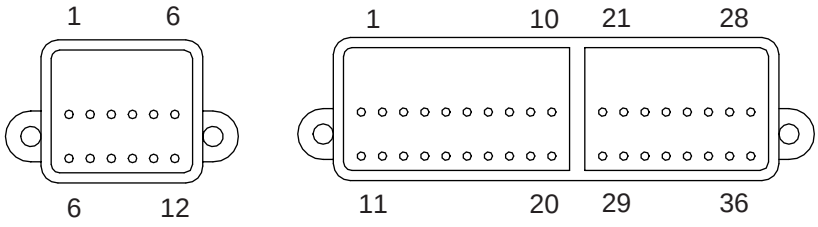
ETRF260A

INSTRUMENT CLUSTER

COMPONENTS E18C7505



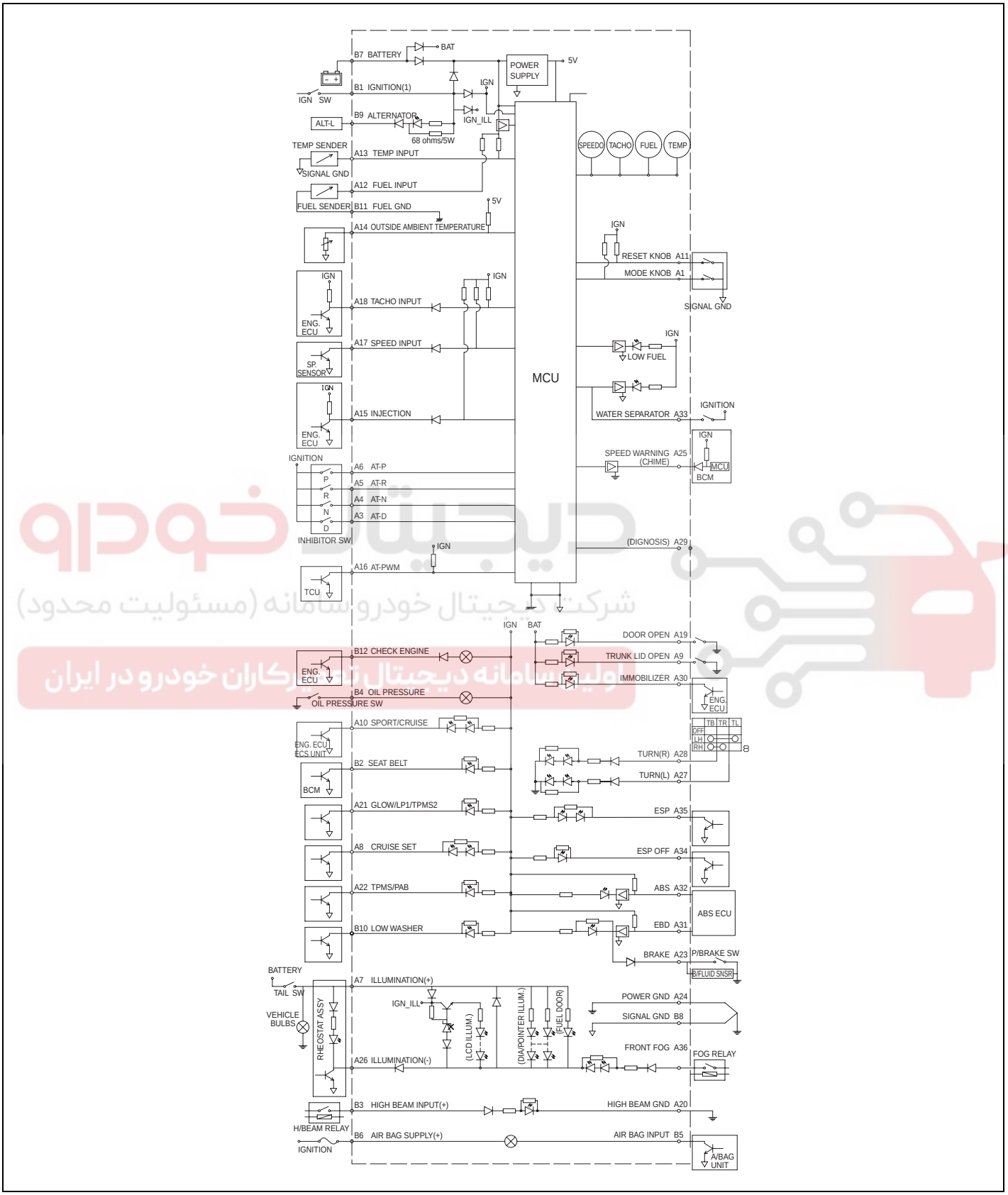




[M08-3(B)] [M08-1(A)] [M08-2(A)]

ETRF260B

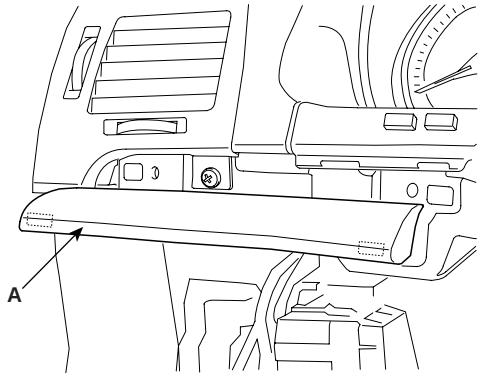
CIRCUIT DIAGRAM ECFD6DD0



ETRF260C

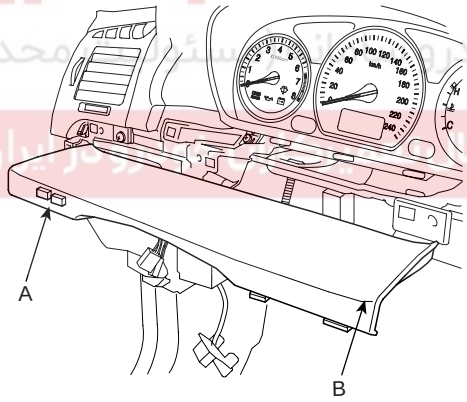
REPLACEMENT E8633BD4

1. Disconnect the negative (-) battery terminal.
2. Remove the center garnish (A) (Refer to Body group-crash pad)



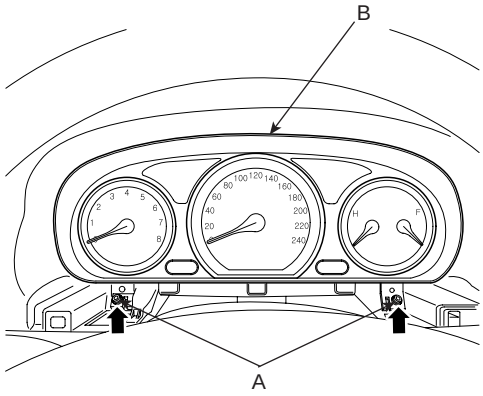
KTRE261A

3. Remove the cluster facia panel (B) after disconnecting the connector of trip switch (A).



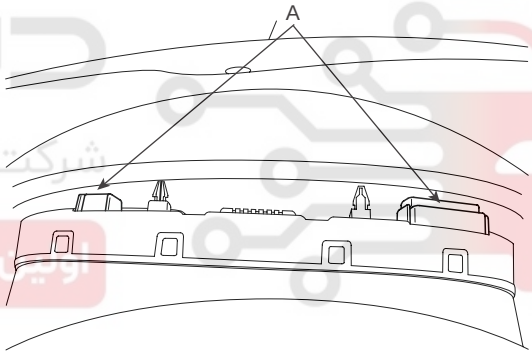
KTRE261B

4. Remove the cluster from the housing (B) after removing 2 screws (A).



KTRE261C

5. Disconnect the cluster connecter (A) and then remove the cluster.



KTRE261D

6. Installation is the reverse of removal.

INSPECTION E1959A7A

SPEEDOMETER

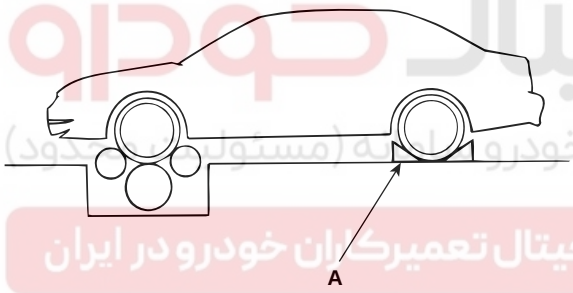
1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.
3. Check if the speedometer indicator range is within the standard values.

CAUTION

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

NOTE

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
Tolerance (km/h)	+7.0 +2.5	+8.0 +2.0	+10.0 +2.5	+12.5 +3.5	+15 +4.0
Velocity (km/h)	120	140	160	180	200
Tolerance (km/h)	+16 +4.5	+17 +5.0	+18 +5.5	+19 +6.0	+20 +6.5

[AUSTRALIA- KM/H]

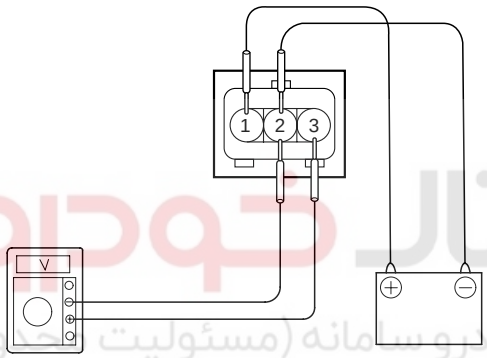
Velocity (km/h)	20	40	60	80	100
Tolerance (km/h)	+3.9 -0.9	+4.4 -0.4	+4.8 0	+6.2 +0.4	+6.2 +0.8
Velocity (km/h)	120	140	160	180	220
Tolerance (km/h)	+7.4 +1.0	+7.4 +1.0	+8.4 +1.0	+8.4 +1.0	+8.8 +1.0

[MPH]

Velocity (MPH)	10	20	40	60
Tolerance (MPH)	+4.0 +1.0	+4.5 +1.0	+6.5 +2.0	+9.0 +2.5
Velocity (MPH)	80	100	120	140
Tolerance (MPH)	+11.0 +3.5	+13.0 +4.5	+15.5 +5.0	+18.0 +6.0

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.

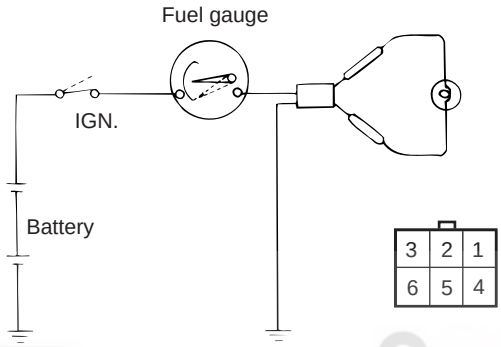
CAUTION

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
Tolerance(rpm)	±120	±140	±170
Revolution(rpm)	4,000	5,000	6,000
Tolerance(rpm)	±170	±200	±200

FUEL GAUGE

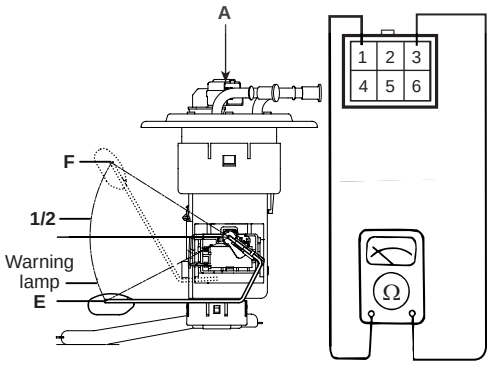
1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 wattages, 12V test bulb to terminals 1 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



LTIF986A

MAIN FUEL GAUGE SENDER

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



ETRF262B

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

Position	Resistance(Ω)
Sender (E)	184 ± 2
Warning lamp	170 ± 2
1/2	66 ± 2
Sender (F)	15 ± 2

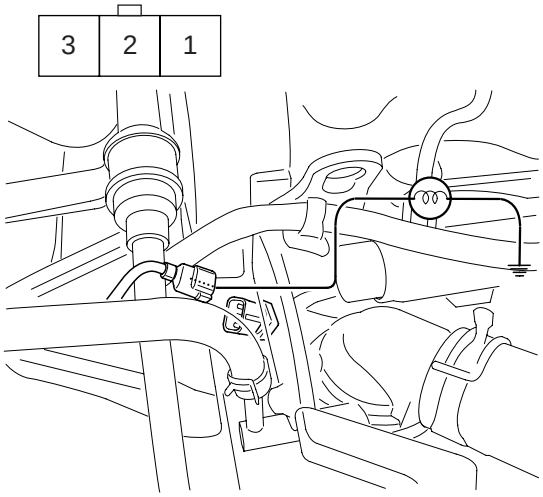
3. If the height resistance is unsatisfied, replace the fuel sender as an assembly.

CAUTION

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

ENGINE COOLANT TEMPERATURE GAUGE

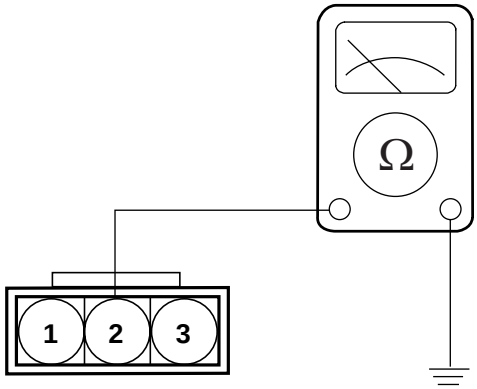
1. Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
2. Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
3. Connect a 12V, 3.4 wattages test bulb between the harness side connector and ground.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



ETRF262C

ENGINE COOLANT TEMPERATURE SENDER

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



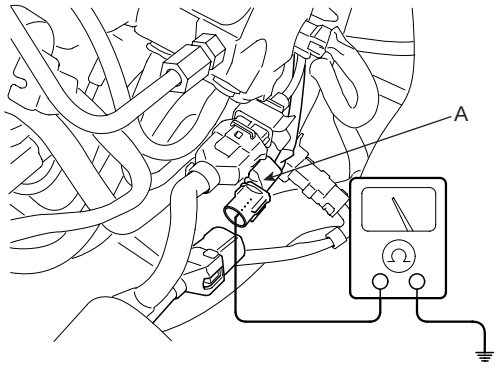
ETKE110I

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

Temperature [°F(°C)]	140(60)	185(85)	230(110)	257(125)
Gauge angle (°)	0	33	33	75
Resistance (Ω)	125±1	48.4±1	24±1	15.2±1

OIL PRESSURE SWITCH

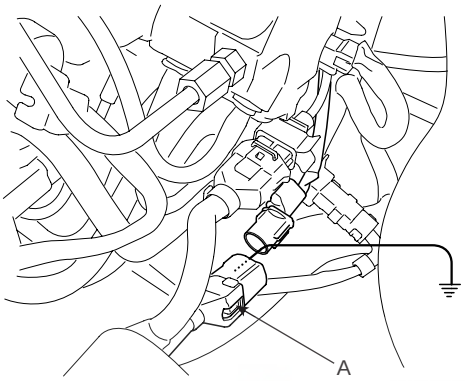
1. Check that there is continuity between the oil press switch terminal (A) and ground with the engine off.
2. Check that there is no continuity between the terminal and ground with the engine running.
3. If operation is not as specified, replace the switch.



KTQE530A

OIL PRESSURE WARNING LAMP

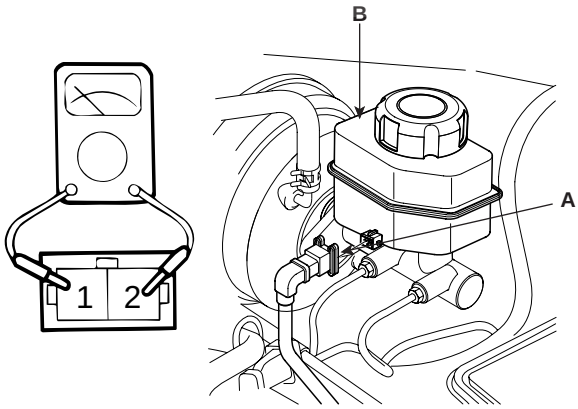
1. Disconnect the connector (A) from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up. If the warning lamp doesn't light, test the bulb or inspect the wire harness.



KTQE530B

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.



V5BE060M

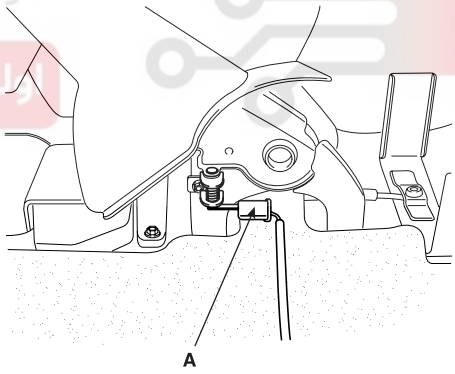
BRAKE FLUID LEVEL WARNING LAMP

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.

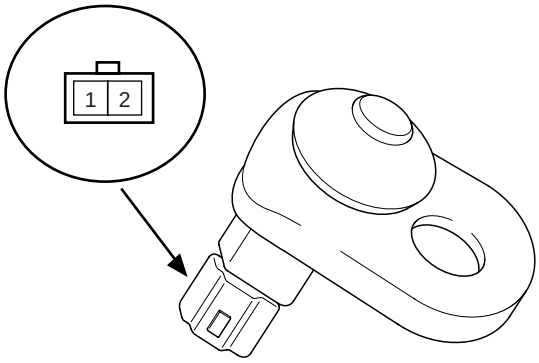
1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
2. Check that there is no continuity between the terminal and switch body with the switch OFF (Lever is released).
   If continuity is not as specified, replace the switch or inspect its ground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



AJGE038B

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]

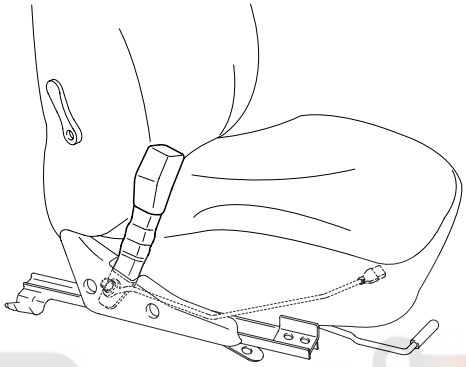
Terminal / Position	1	Ground
Free(Door open)	○	○
Push(Door close)		

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.

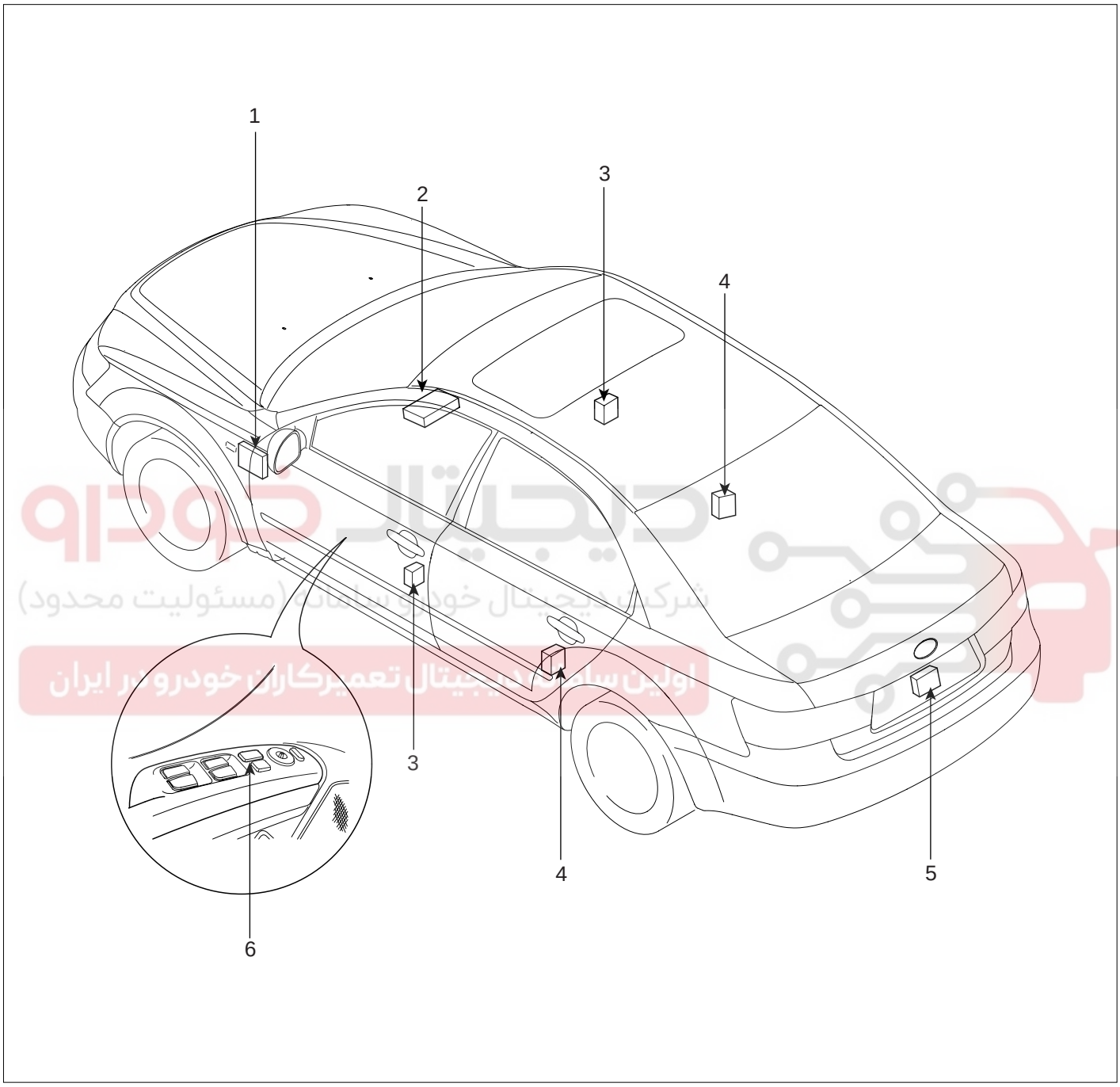
Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

TROUBLESHOOTING EA7AD34E

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
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 E4EC58DF



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

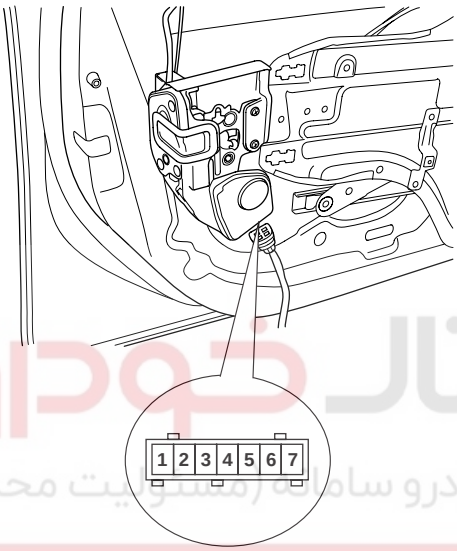
ETRF280A

POWER DOOR LOCK ACTUATORS

INSPECTION E3419A7C

FRONT DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 7P connector from the actuator.



KTRE122A

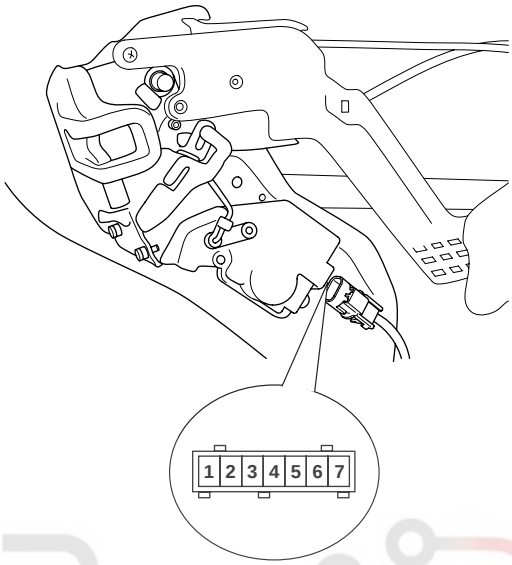
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		5	3	6	2
Front left	Lock	⊕		⊖	
	Unlock	⊖		⊕	
Front right	Lock		⊕		⊖
	Unlock		⊖		⊕

ETRF122B

REAR DOOR LOCK ACTUATOR INSPECTION

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 7P connector from the actuator.



KTRE122C

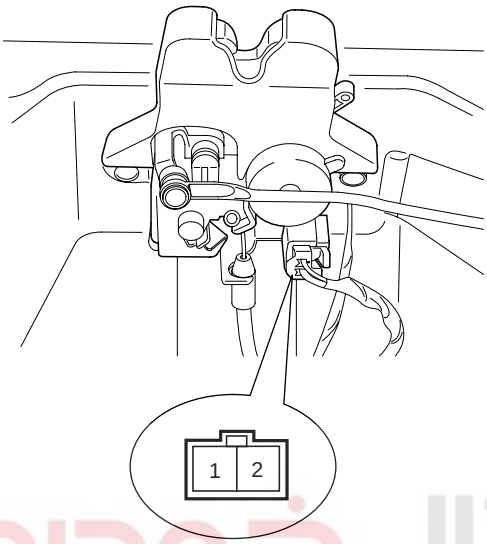
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		5	3	6	2
Rear left	Lock	⊕		⊖	
	Unlock	⊖		⊕	
Rear right	Lock		⊕		⊖
	Unlock		⊖		⊕

ETRF122D

TRANK LID RELEASE ACTUATOR INSPECTION

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



KTRE122E

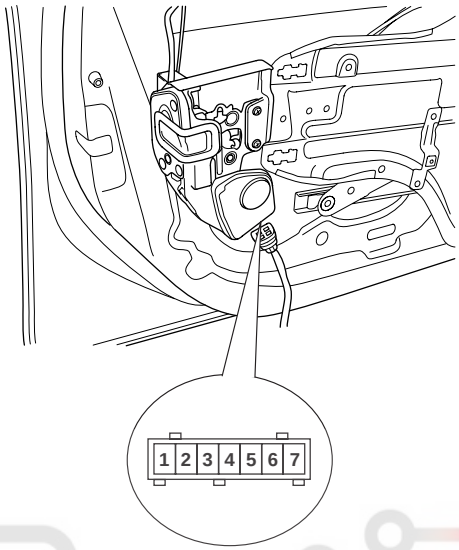
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	2	Chassis ground
Open	⊕	⊖

ETRF122I

FRONT DOOR LOCK SWITCH INSPECTION

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 7P connector from the actuator.



KTRE122A

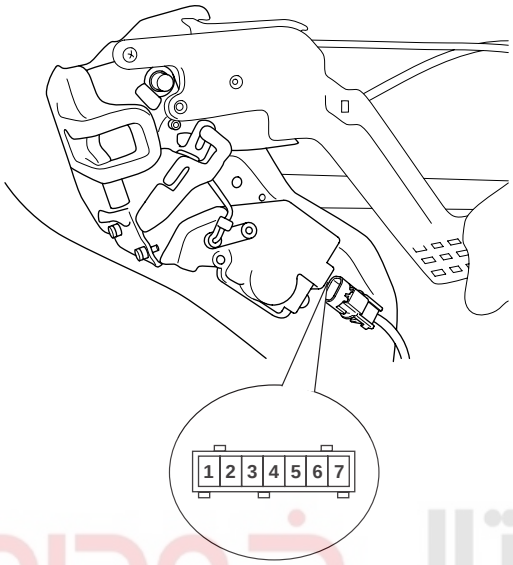
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	5	3	7
Front left	Lock				
	Unlock	○		○	
Front right	Lock				
	Unlock		○		○

ETRF122G

REAR DOOR LOCK SWITCH INSPECTION

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 7P connector from the actuator.



KTRE122C

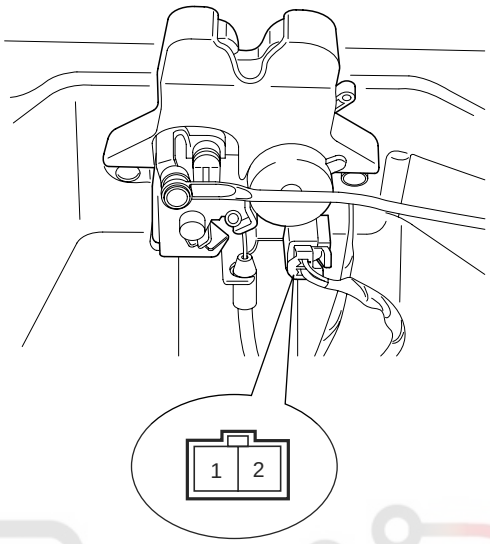
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	5	3	7
Rear left	Lock				
	Unlock	○		○	
Rear right	Lock				
	Unlock		○		○

ETRF122H

TRANK LID OPEN SWITCH INSPECTION

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



KTRE122E

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

Position \ Terminal	1	Chassis ground
Open	⊕	⊖

ETRF122F

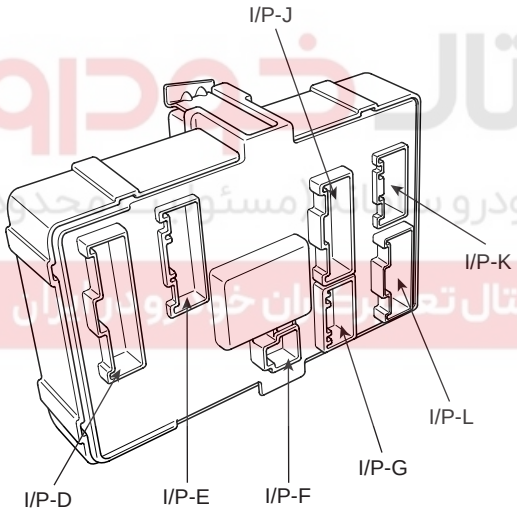
POWER DOOR LOCK RELAY

INSPECTION E10F0C67

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.



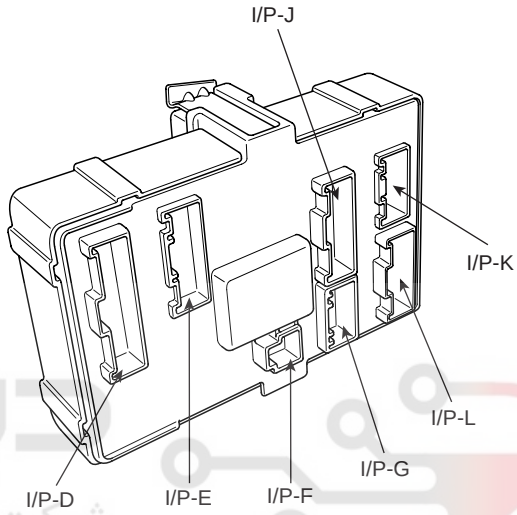
KTRE323A

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.



KTRE323A

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

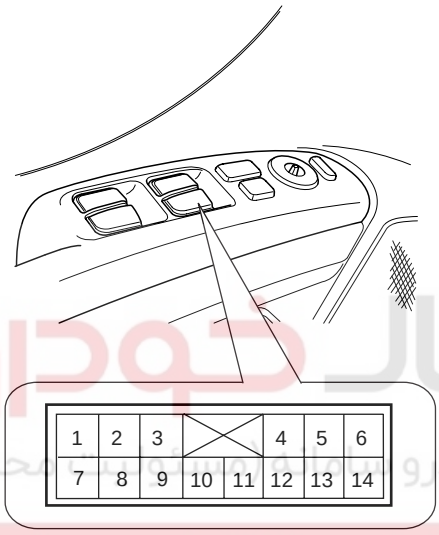
ETRF323C

POWER DOOR LOCK SWITCH

INSPECTION E92748CF

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.



KTRE284A

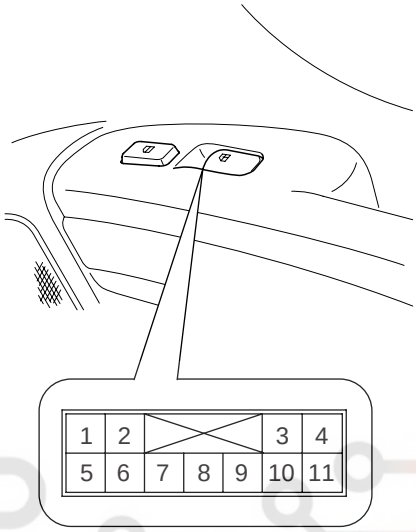
4. Check for continuity between the terminals in each switch position according to the table.

Terminal / Position	8	12	7
Lock		○	○
Unlock	○	○	

ETRF284C

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.



KTRE284D

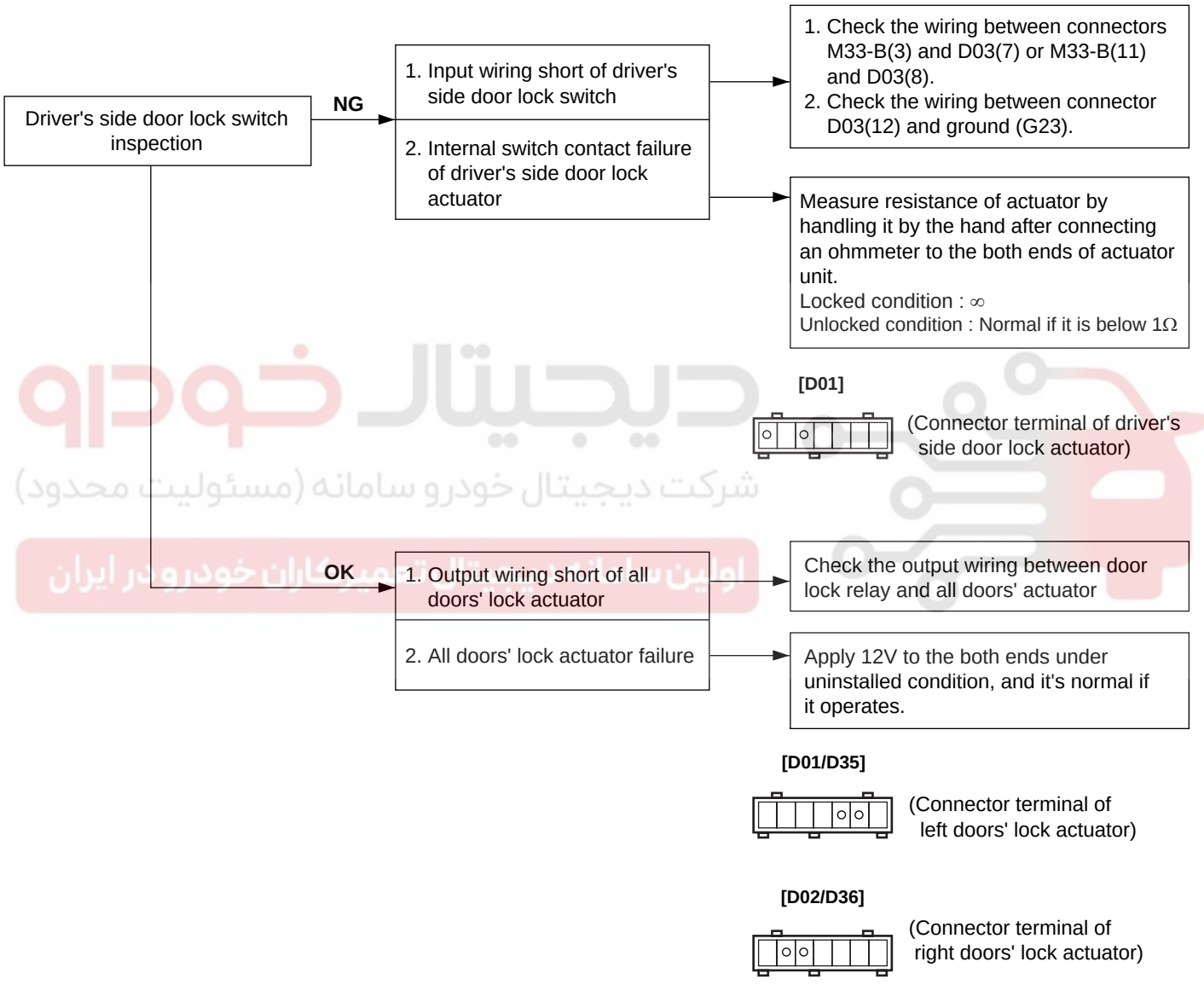
4. Check for continuity between the terminals in each switch position according to the table.

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

ETRF284E

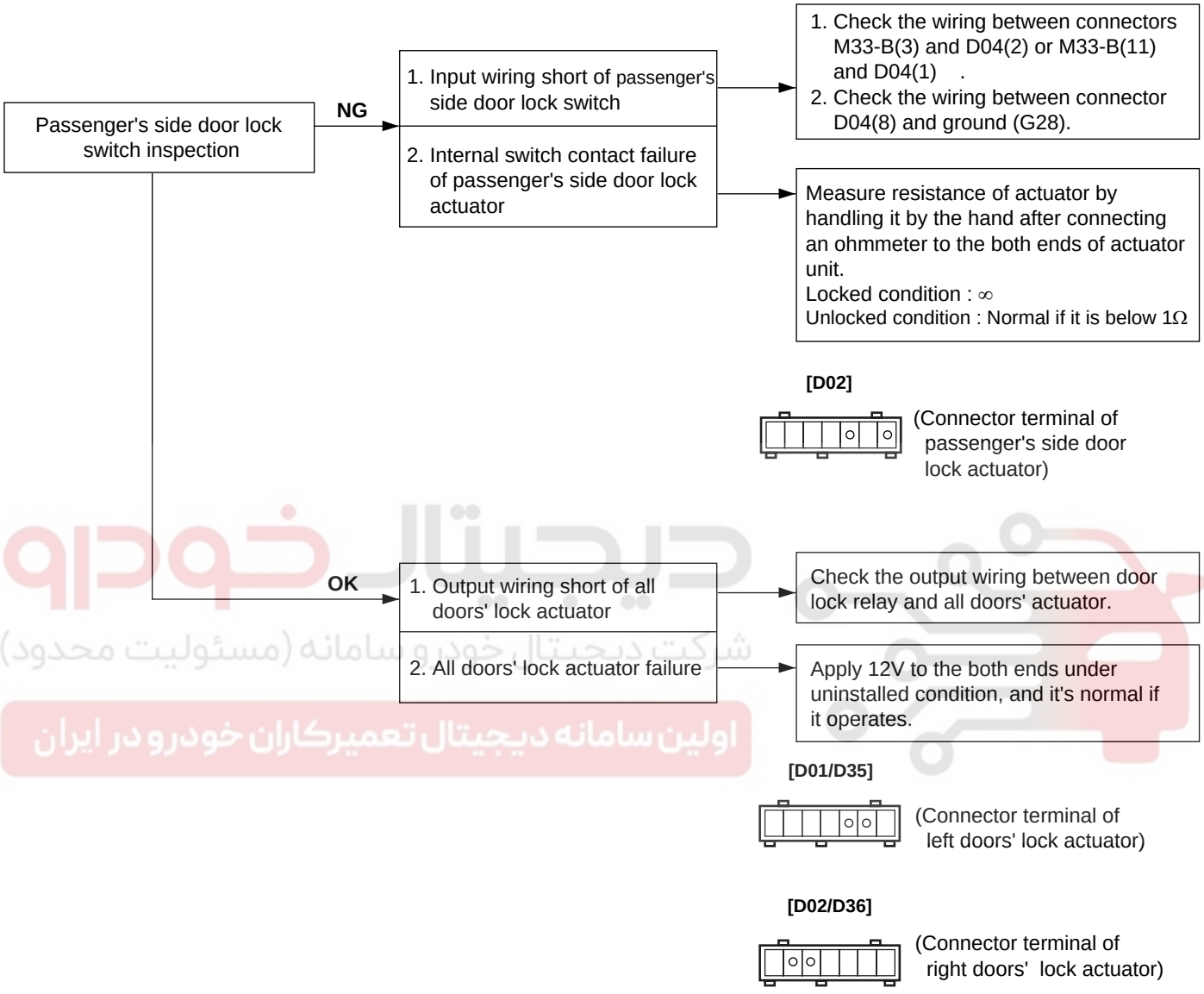
TROUBLESHOOTING EDDD5CB6

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.



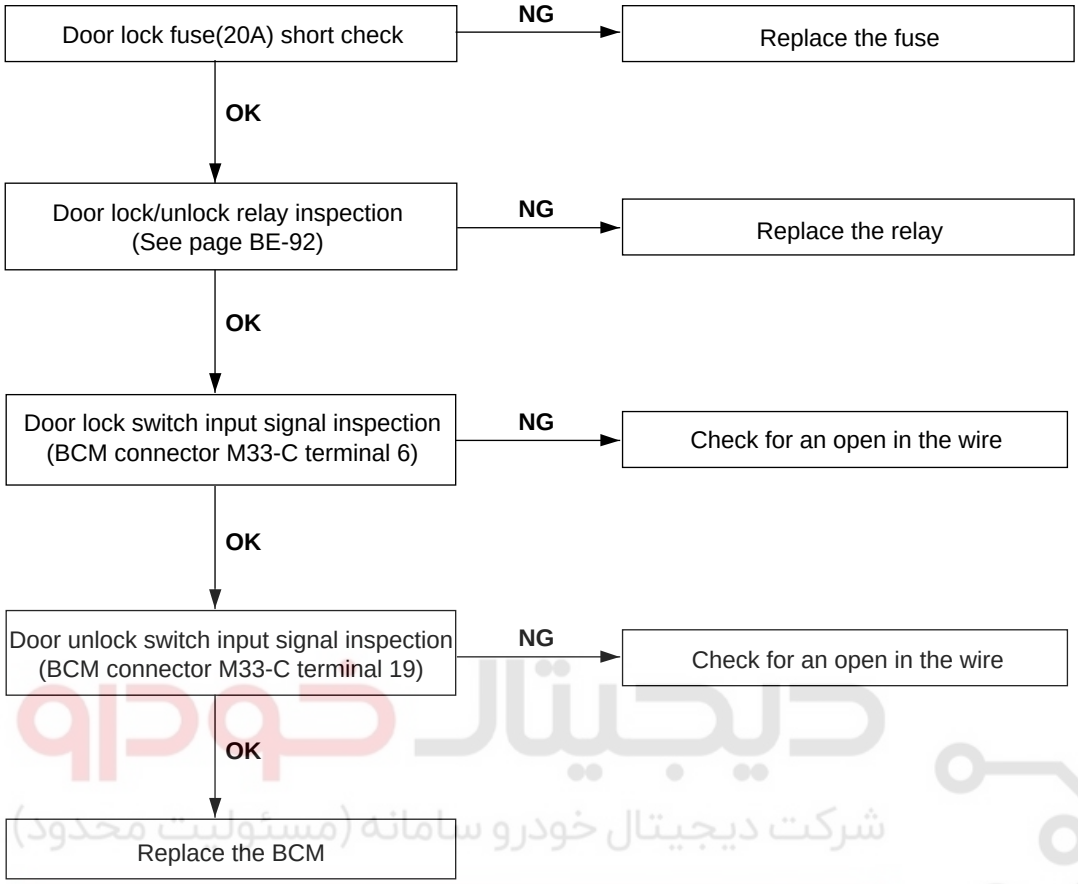
ETRF900F

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



ETRF900G

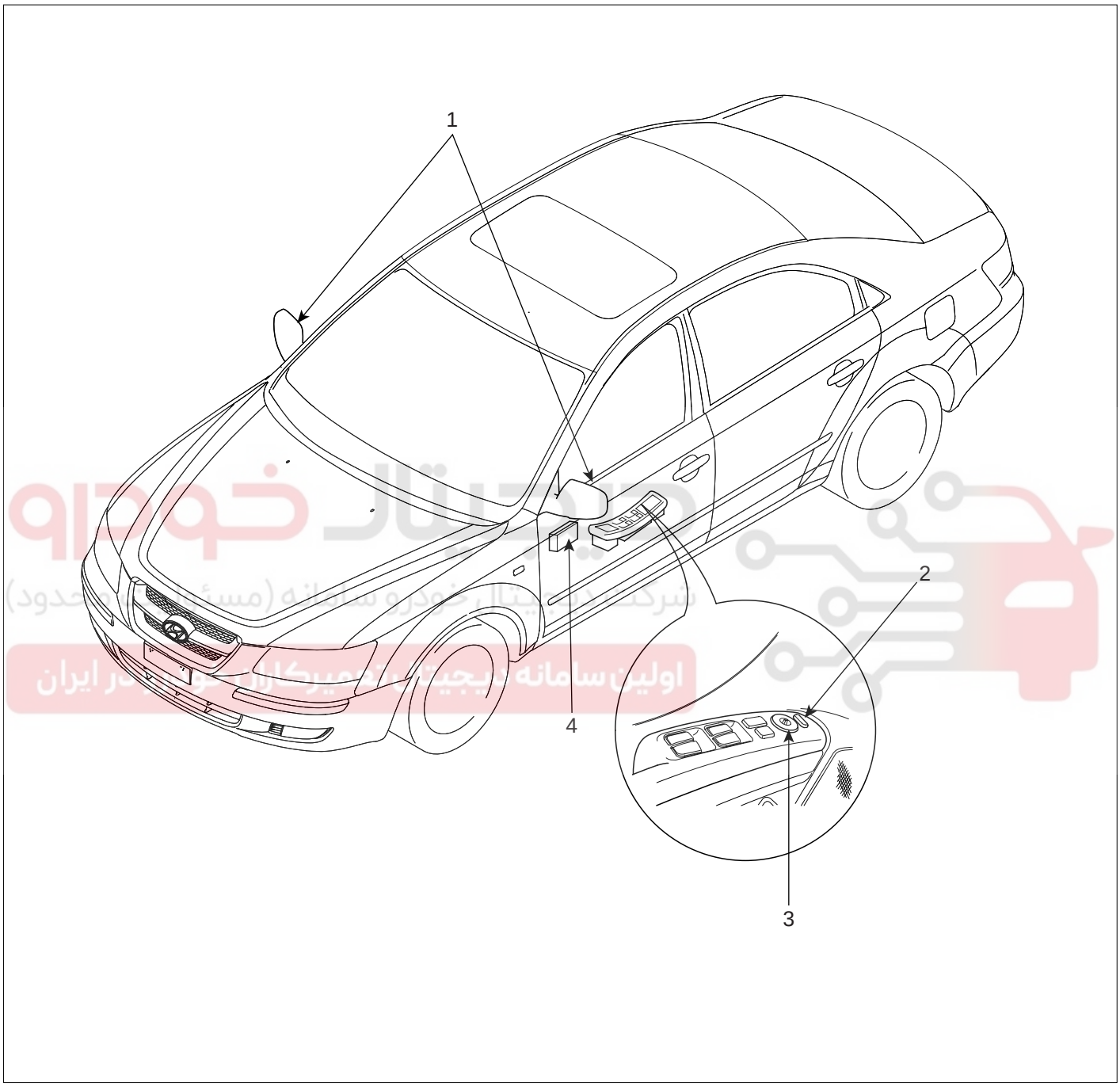
5. Both sides do not lock either.



ETRF900H

POWER DOOR MIRRORS

COMPONENT LOCATION EE60349F

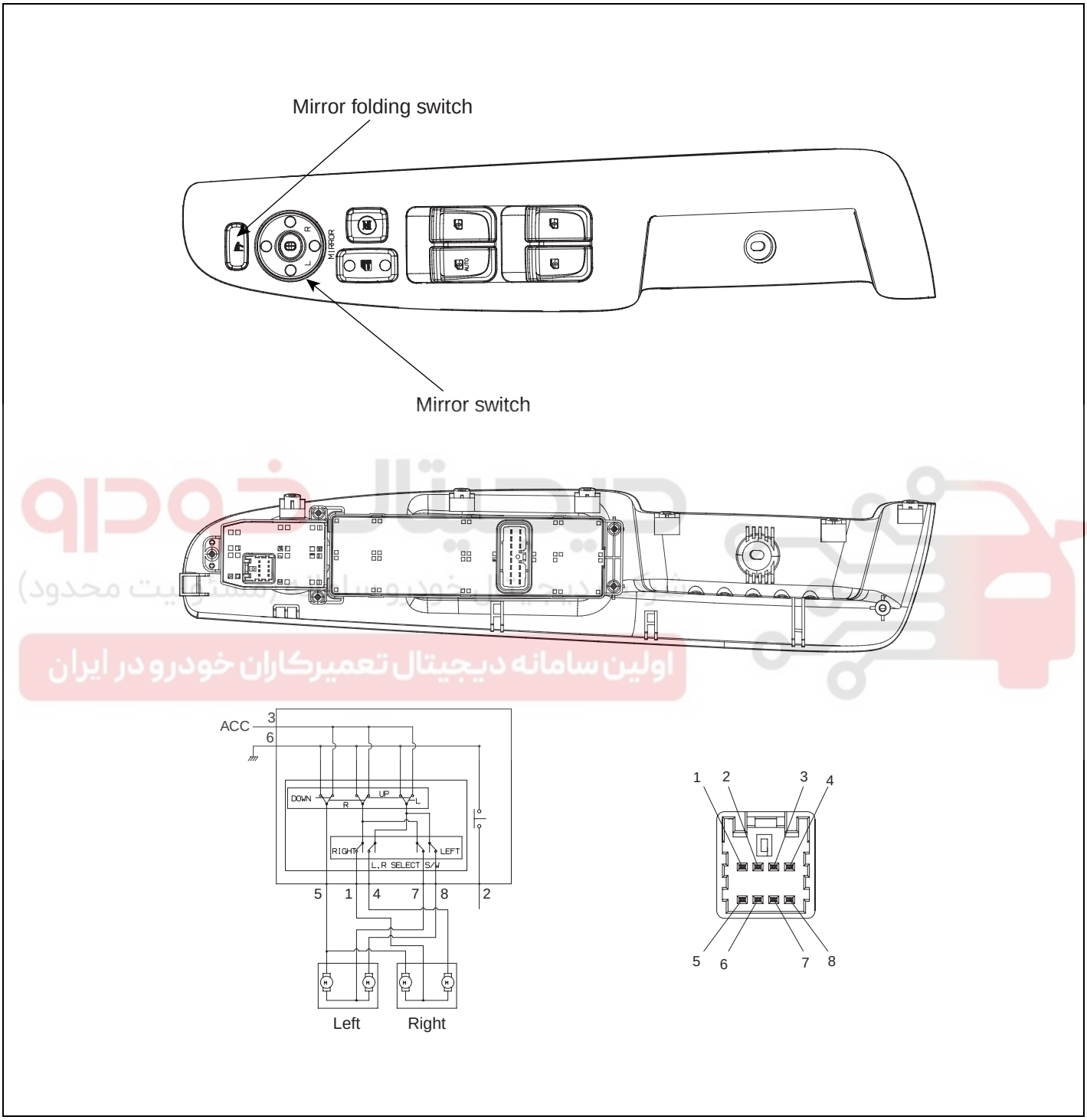


1. Power door mirror
2. Power door mirror switch
3. Mirror folding switch
4. Mirror folding control unit

ETRF300C

POWER DOOR MIRROR SWITCH

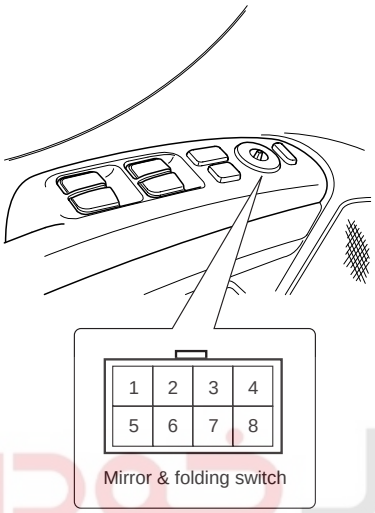
CIRCUIT DIAGRAM ECD338BF



ETRF300A

INSPECTION E88ACFF3

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



ETRF301A

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

Class	Terminal / Direction	1	3	4	5	6	7	8
LEFT	UP		○		○	○	○	○
	DOWN		○		○	○	○	○
	OFF		○		○		○	○
	LEFT		○		○	○	○	
	RIGHT		○		○	○	○	○
RIGHT	UP	○	○	○	○	○		
	DOWN	○		○	○	○		
	OFF	○	○	○	○			
	LEFT	○			○	○		
	RIGHT	○	○		○	○		

<Mirror & folding switch>

ETRF301B

MIRROR FOLDING SWITCH INSPECTION

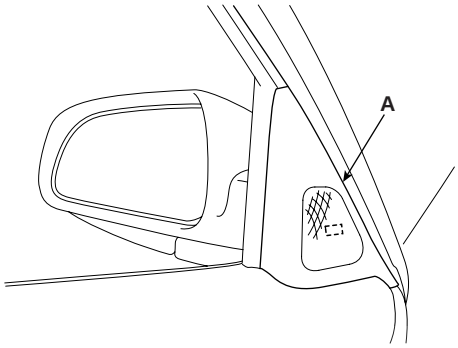
Position / Terminal	2	6
ON(PUSH)	○	○
OFF(FREE)		

ETRF301C

POWER DOOR MIRROR ACTUATOR

INSPECTION EFF7DEFF

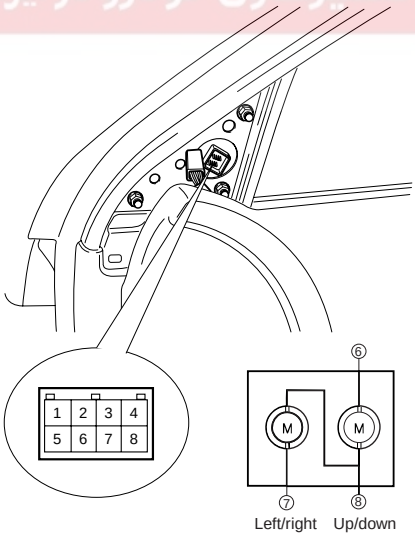
1. Remove the front door quadrant inner cover (A) (Refer to the Body group - front door)



KTRE022D

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.



ETRF302B

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

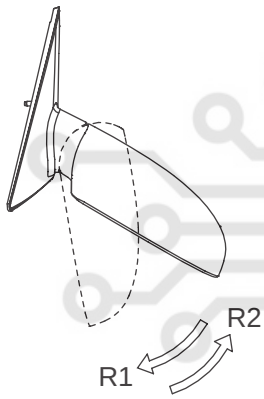
ETKE195B

MIRROR HEATER INSPECTION

Position \ Terminal	1	2
Heater	○———	———○

ETRF302D

MIRROR FOLDING INSPECTION



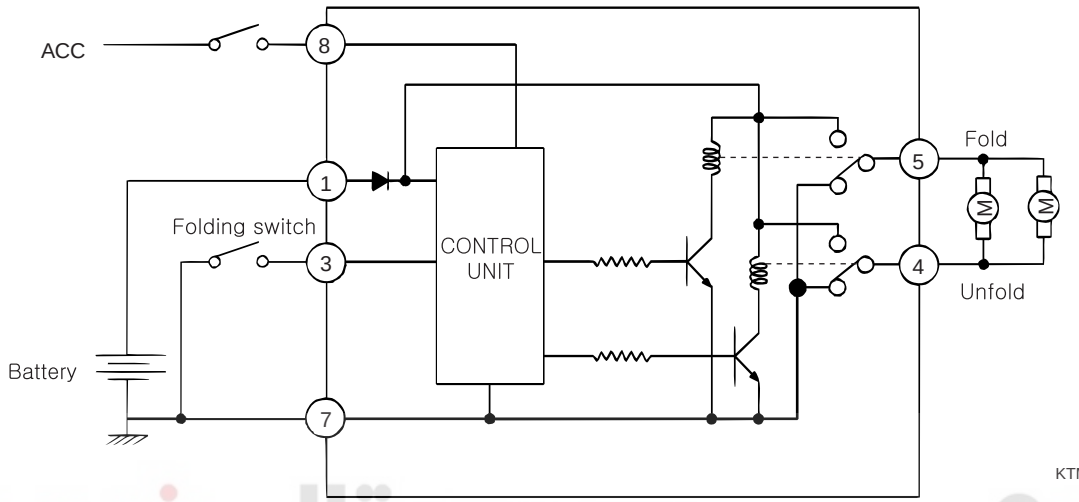
ETJA055B

Direction \ Terminal	3	4
R1	⊖ ——— M ——— ⊕	
R2	⊕ ——— M ——— ⊖	

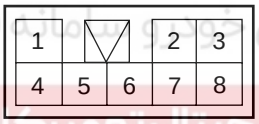
ETKE055A

DOOR MIRROR FOLDING CONTROL MODULE

CIRCUIT DIAGRAM E9EE8592



KTMB001Z



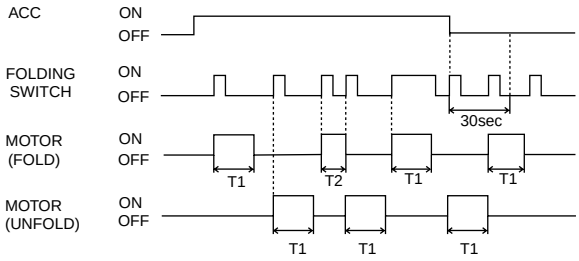
PIN CONNECTION

Pin No.	Description
1	B+
2	-
3	Folding switch
4	Unfold
5	Fold
6	-
7	Ground
8	ACC+

ETKE099A

INSPECTION EFB7A363

1. While operating the folding mirror switch, check if the operations are normal as shown in the timing chart.



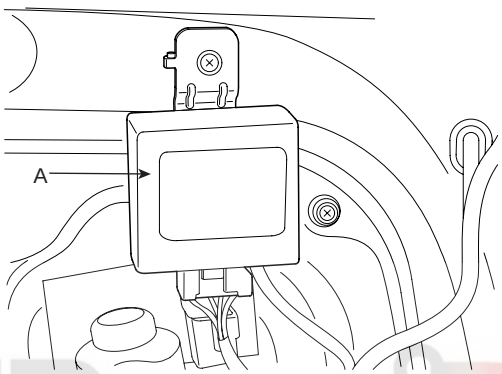
LTGE304B

T1 : 16 ± 6 sec.
T2 < T1

2. If operations are abnormal, check the control module from the door trim after removing the driver’ s door panel.

REPLCEMENT E6B9E7E2

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)
3. Disconnect the 8P connector from the wire harness.
4. Remove the mirror folding control unit (A) from the door trim after loosening the screw.

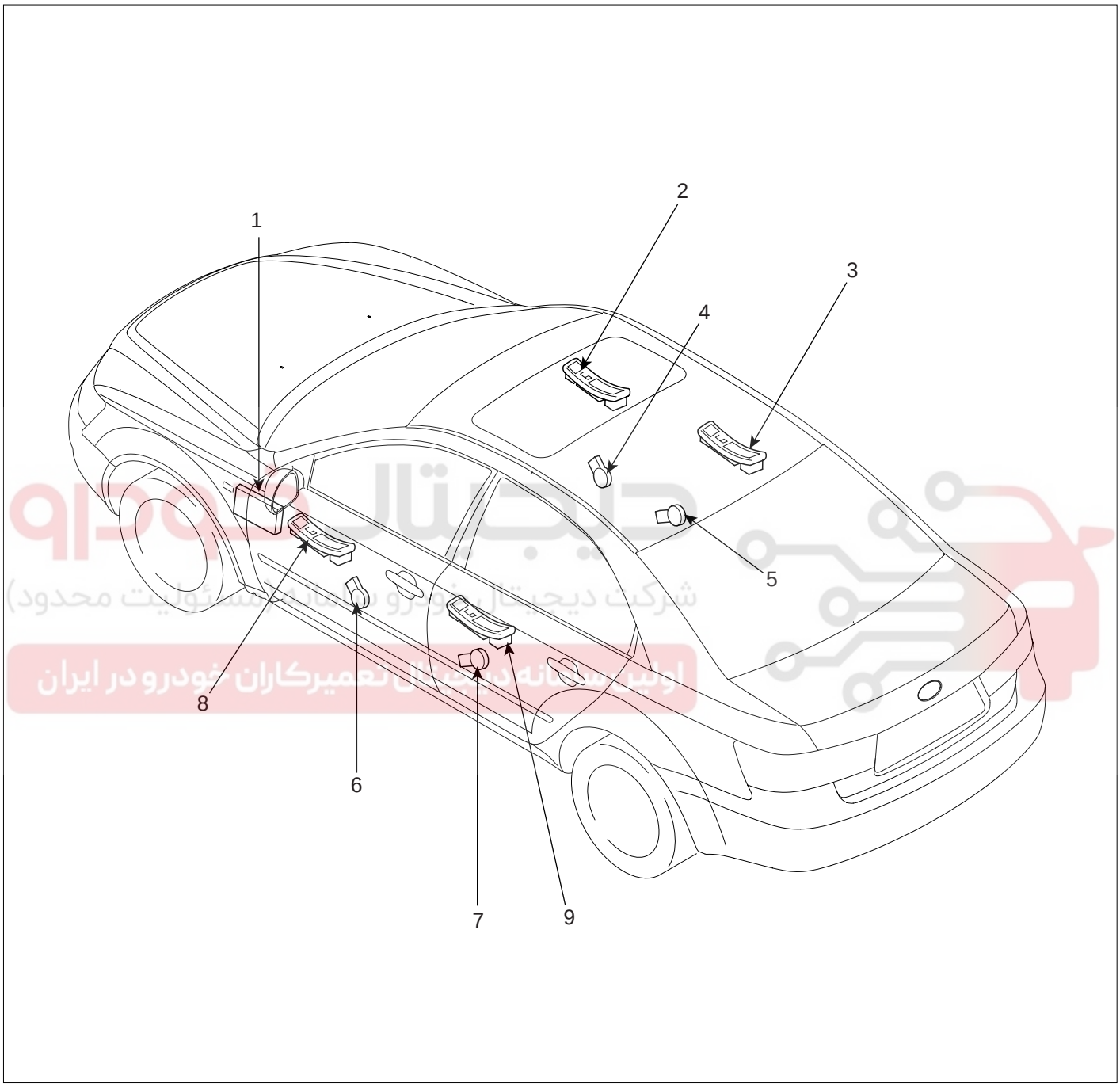


KTRE304A

5. Installation is the reverse of removal.

POWER WINDOWS

COMPONENT LOCATION E1790325



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

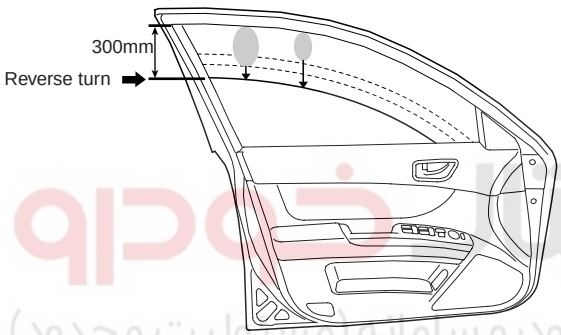
ETRF320A

FUNCTION OF SAFETY POWER WINDOW E58DA34A

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.

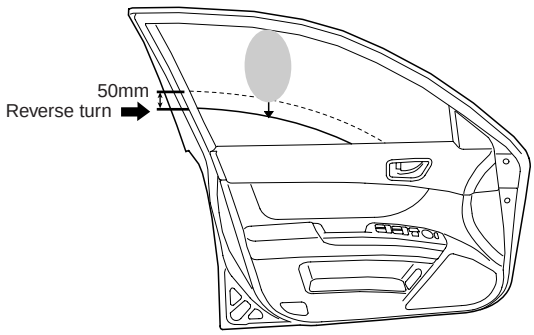
2. Length of window reversing (except holding the auto-up switch)
   - When detect the jamming during the 4mm ~ 250mm from top of the door.
     → Window is reversed until 300mm from top of the door.



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

ETRF320B

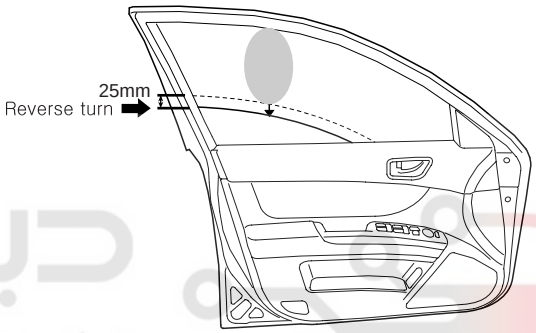
   - When detect the jamming over the 250mm from top of the door.
     → Window is reversed until 50mm from jamming position.



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.



When holding the auto-up switch

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.)

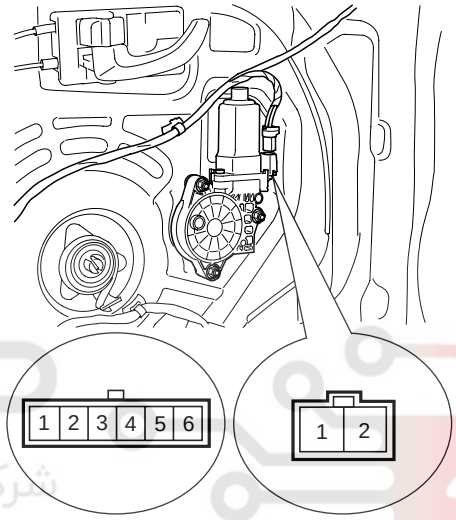
POWER WINDOW MOTOR

INSPECTION E01E9CA8

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]

ETRF321A

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

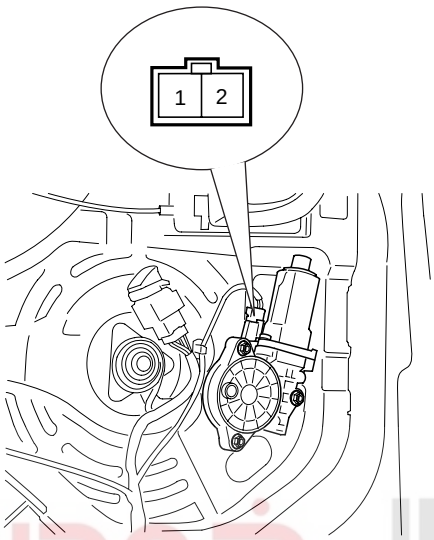
[WITH DRIVER'S SIDE SAFETY WINDOW]

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.



KTRE321C

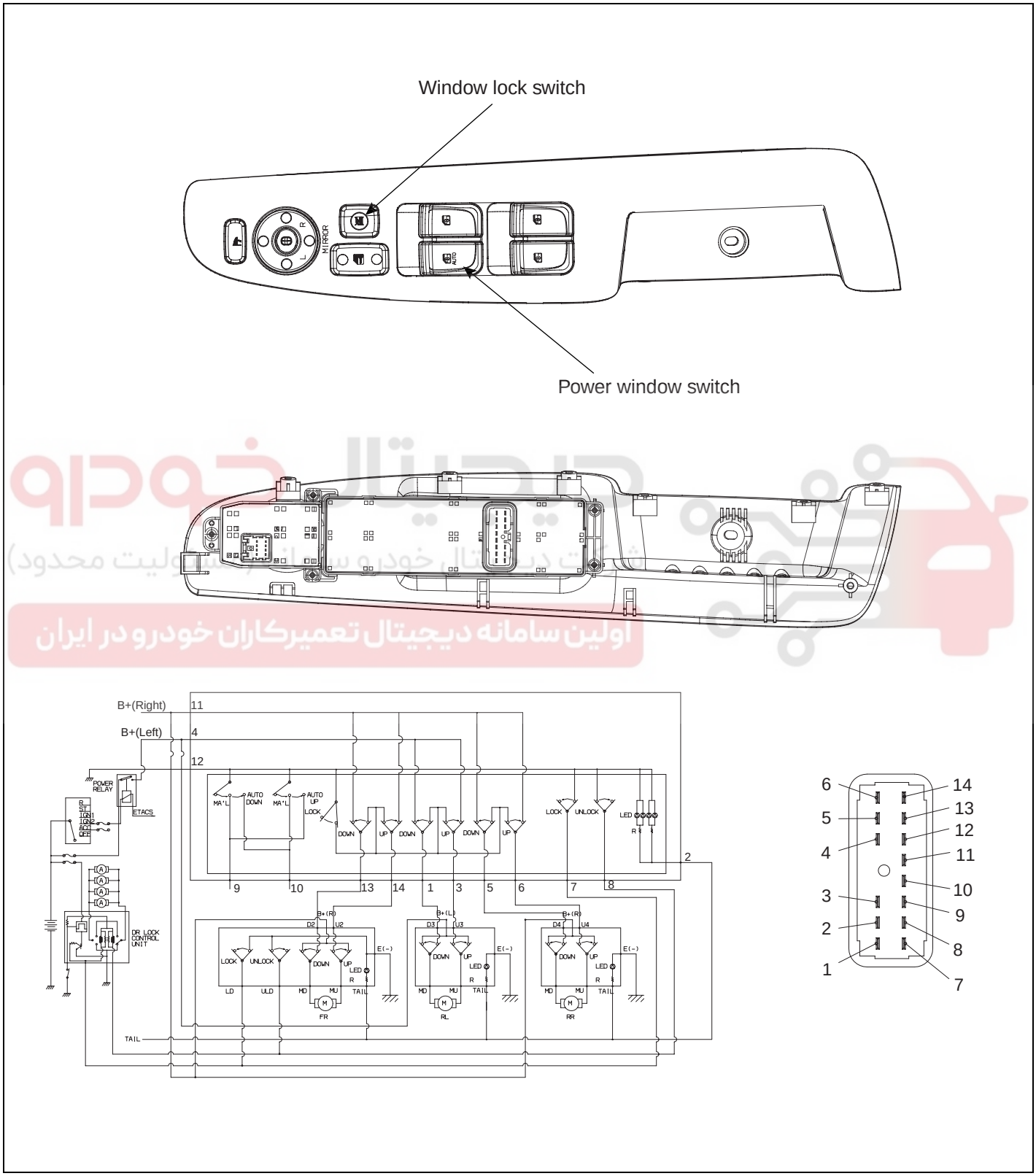
3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

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

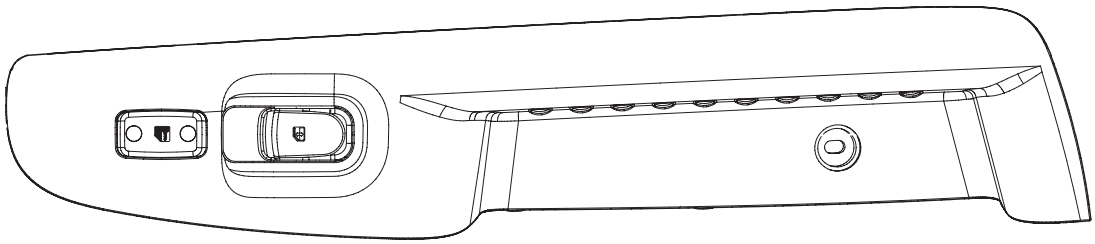
ETQF057A

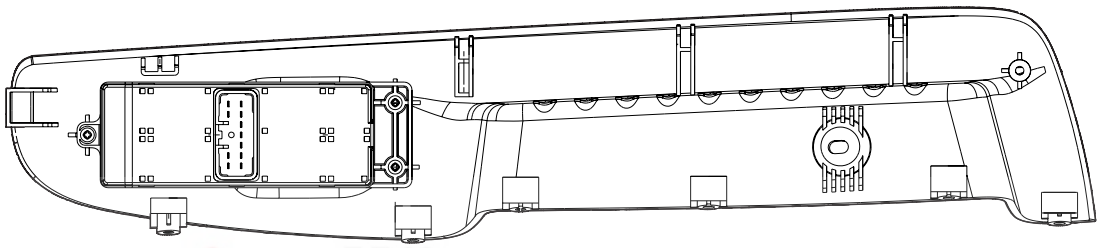
POWER WINDOW SWITCH

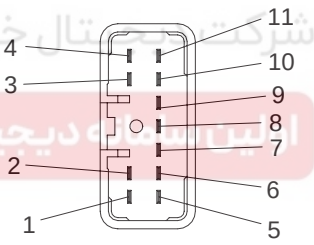
CIRCUIT DIAGRAM E0C9DCE2

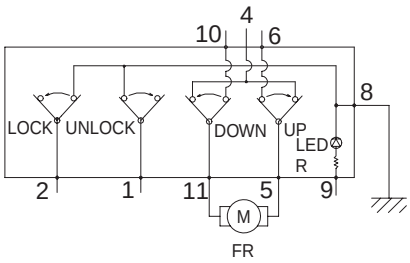


ETRF322A

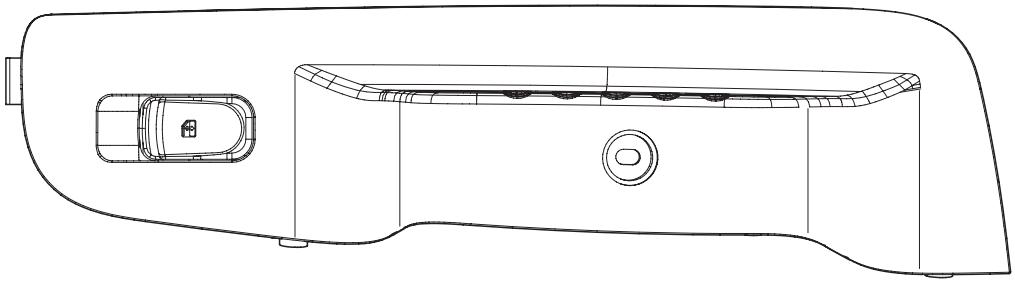


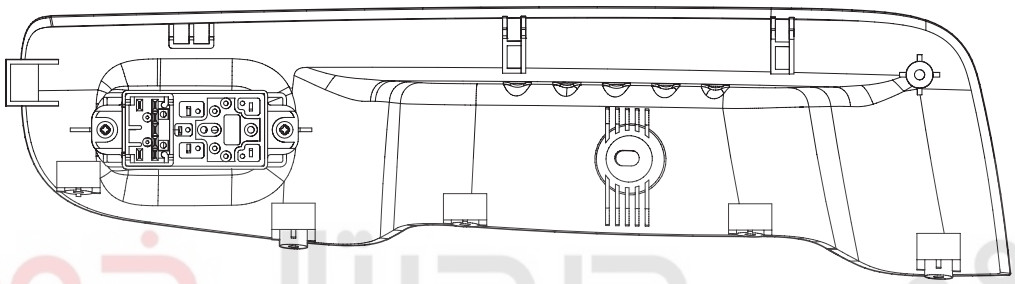


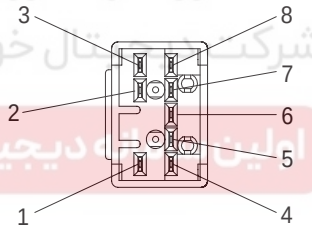


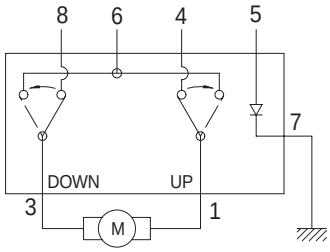


KTRE322C







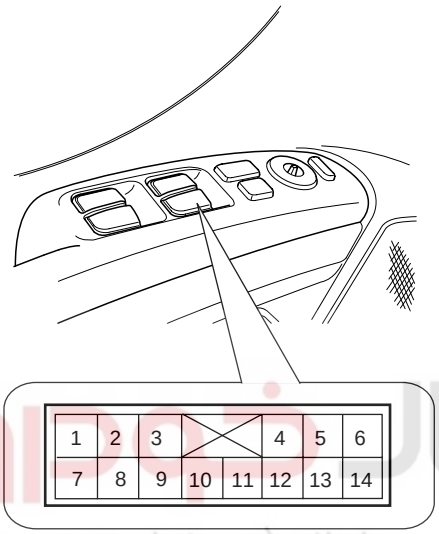


KTRE322D

INSPECTION E4D2B084

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.



KTRE284A

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

Terminal / Position	Front left				Front right			
	4	9	10	12	11	12	13	14
UP			○—○		○———○	○—○	○—○	
OFF		○———○				○—○	○—○	○
DOWN	○———○			○	○———○	○—○		○

Terminal / Position	Rear left				Rear right			
	1	3	4	12	5	6	11	12
UP	○	○—○	○	○	○	○—○	○	○
OFF	○	○	○	○	○	○	○	○
DOWN	○	○———○		○	○	○———○		○

ETRF322F

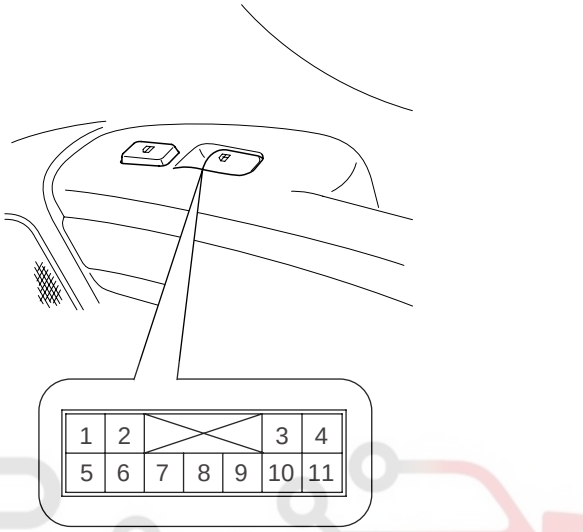
POWER WINDOW LOCK SWITCH

Terminal / Position	1	12
NORMAL	○———○	
LOCK		

ETRF322E

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 11P connector from the switch.



KTRE284D

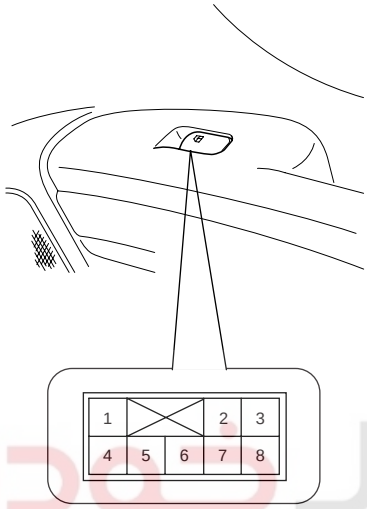
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Terminal / Position	4	5	6	10	11
UP	○———○			○———○	
OFF		○———○	○———○	○———○	○
DOWN	○	○———○			○

ETRF322G

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.



KTRE322H

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

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

ETRF322I

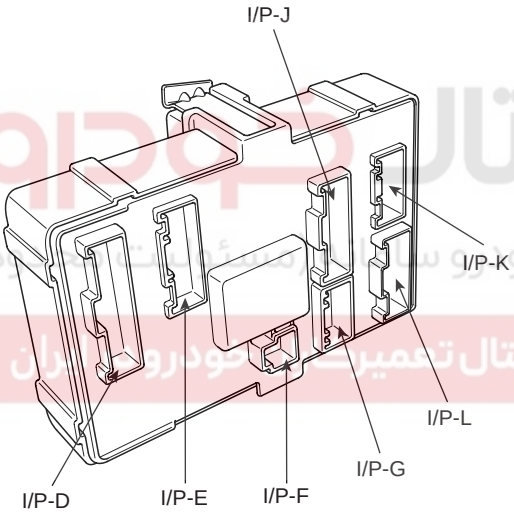
POWER WINDOW RELAY

INSPECTION EA6CBF03

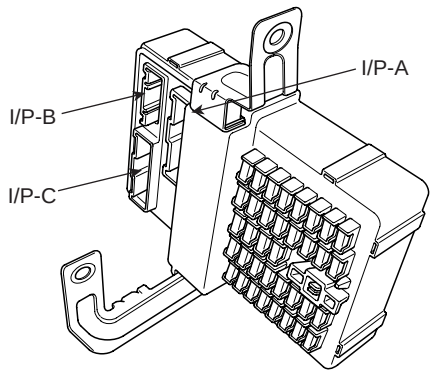
1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.1 in the I/P-G and No.12 terminal in the I/P-A when power and ground are connected to the No.1 terminal in the I/P-G and No.2 terminal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

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

ETRF323E



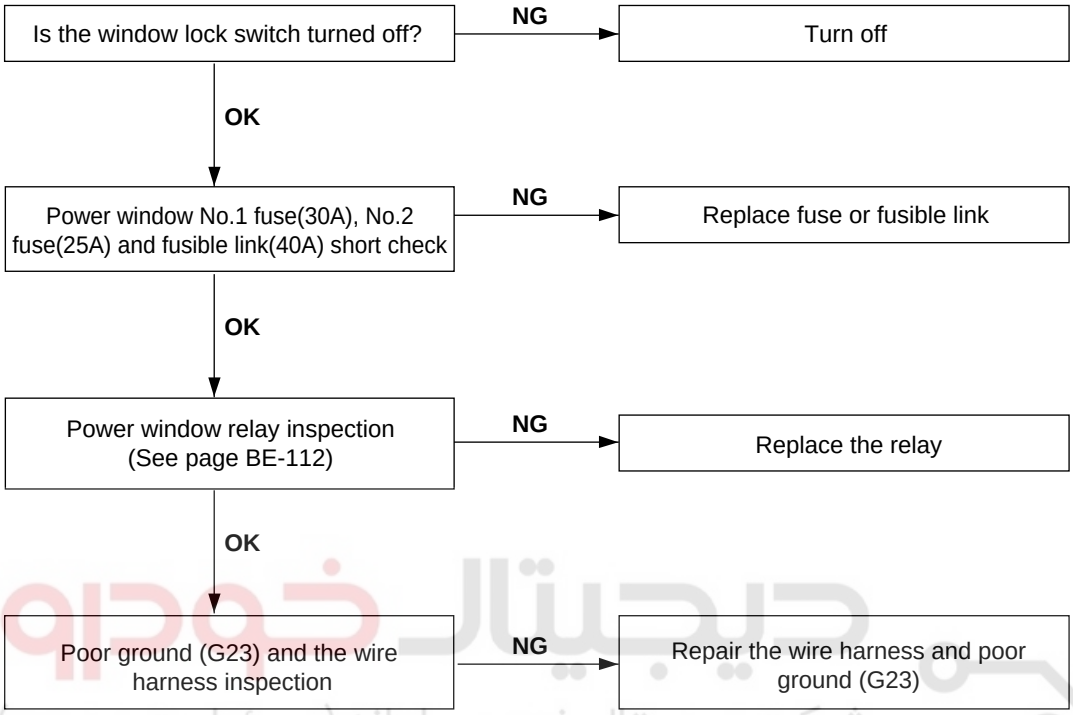
KTRE323A



KTRE323D

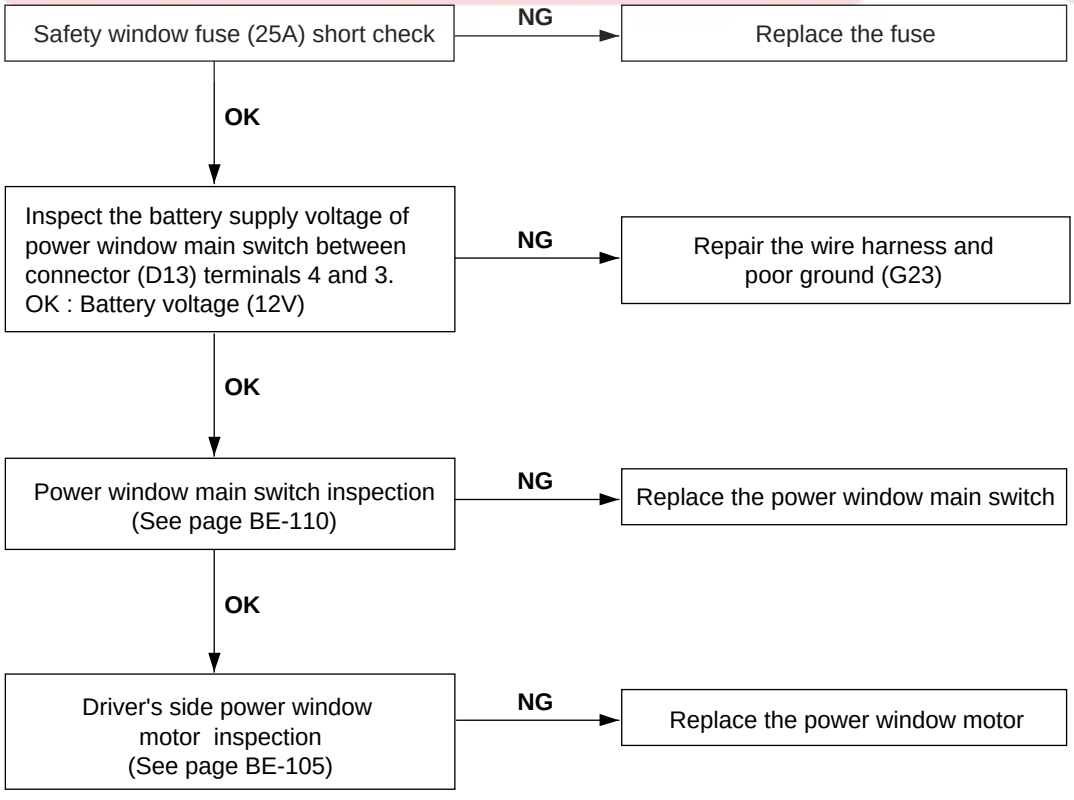
TROUBLESHOOTING E4A5F8F8

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



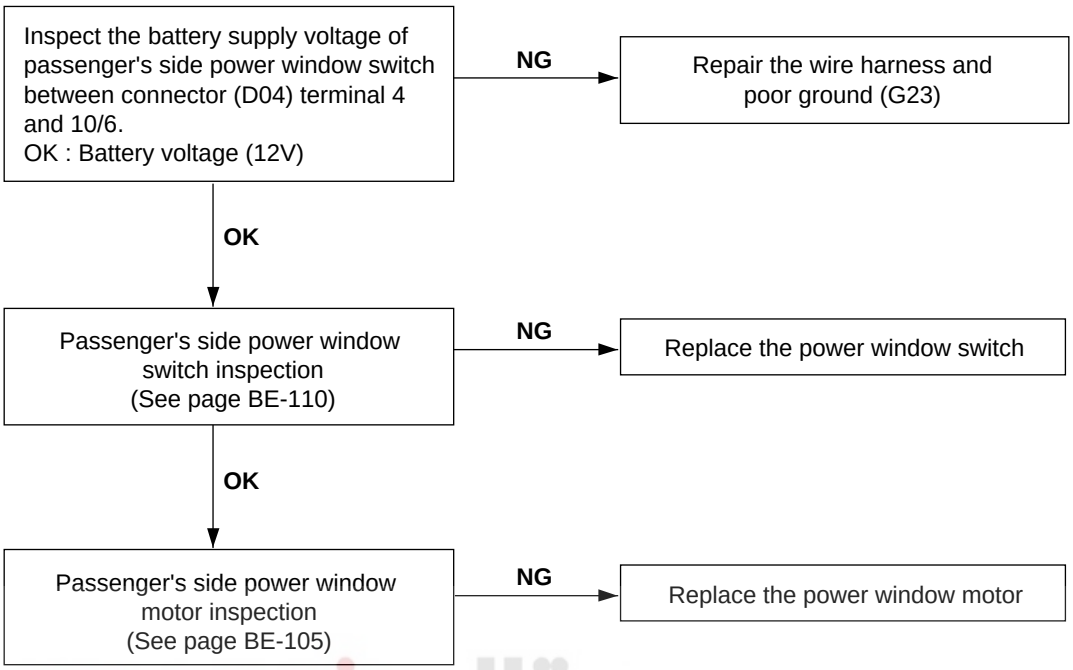
ETRF900C

2. Driver's side window does not operate.



ETRF900D

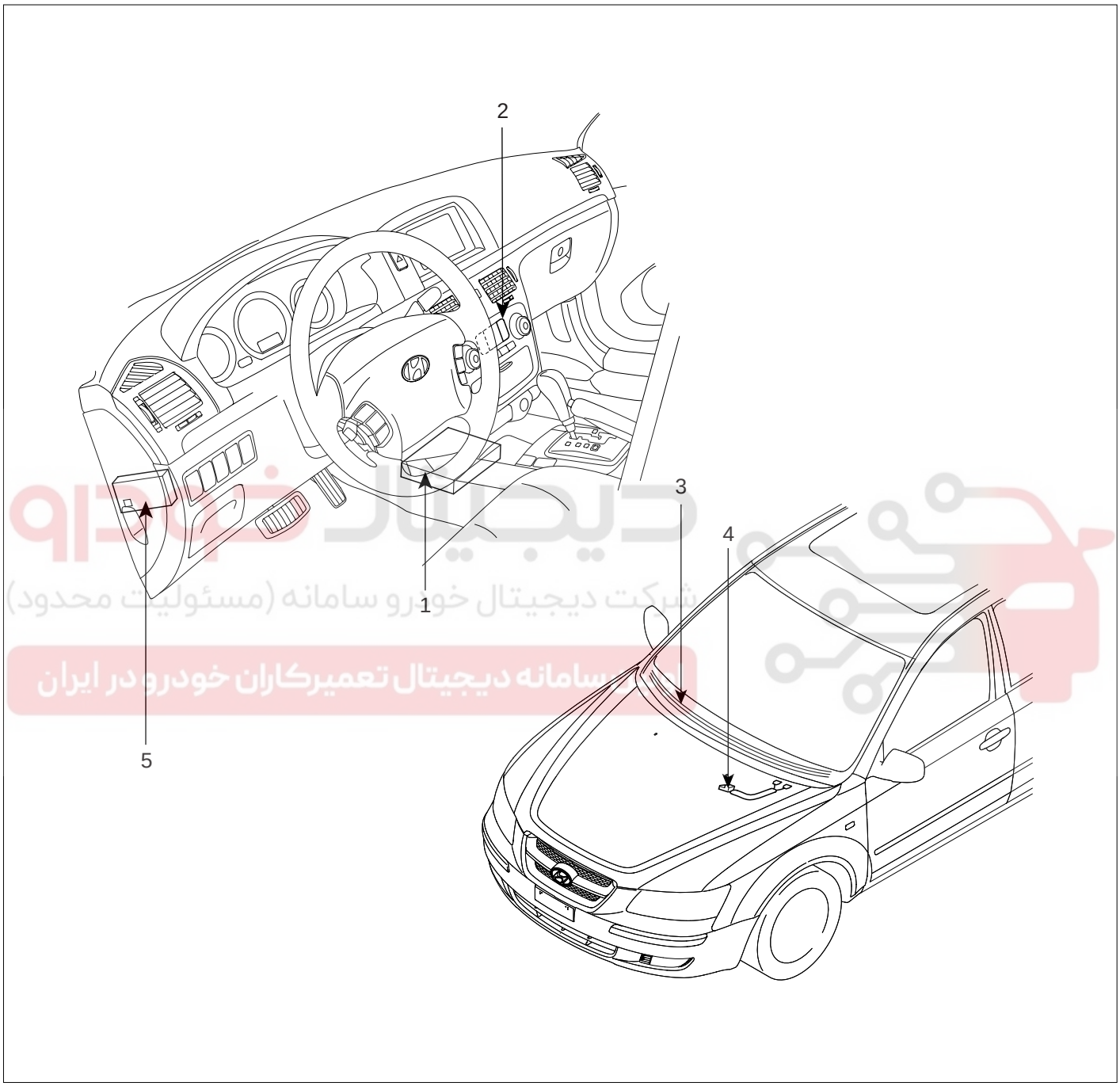
3. Passenger's side window does not operate.



ETRF900E

WINDSHIELD DEICER

COMPONENT LOCATION E4460BCC



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

ETRF330A

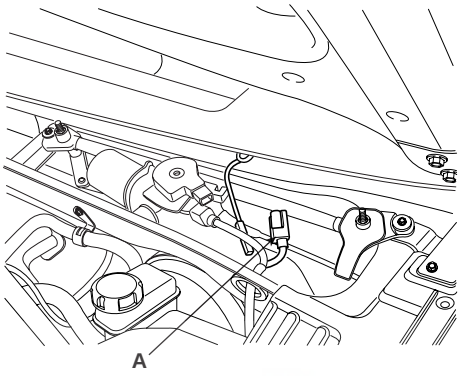
DESCRIPTION E34CCC9A

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

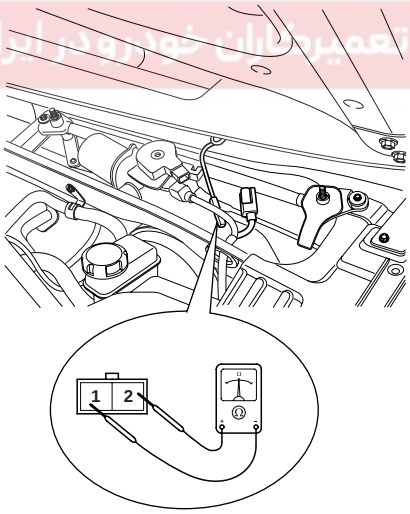
INSPECTION EEEAEC6B

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



KTRE331A

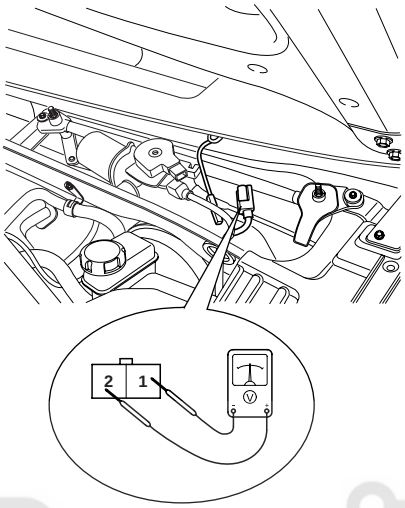
3. Check for continuity between the terminals of deicer lines.



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

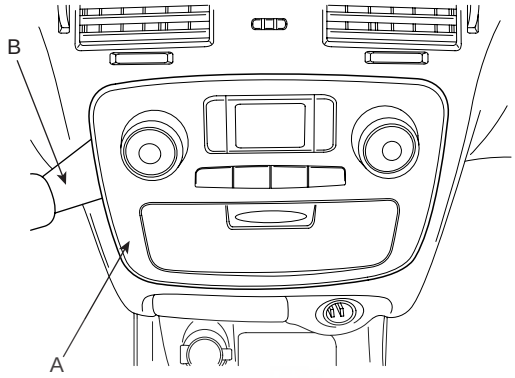


KTRE331C

WINDSHIELD DEICER SWITCH

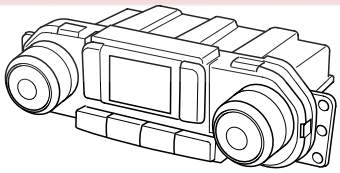
INSPECTION E8B96EE7

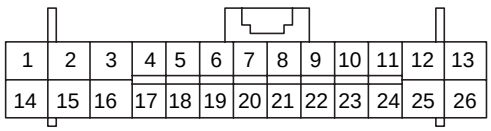
1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel(A) by using a scraper (B). Take care of fixing clip.



KTRE071F

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





M21-1/M22-2

KTRE332A

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

ETRF332B

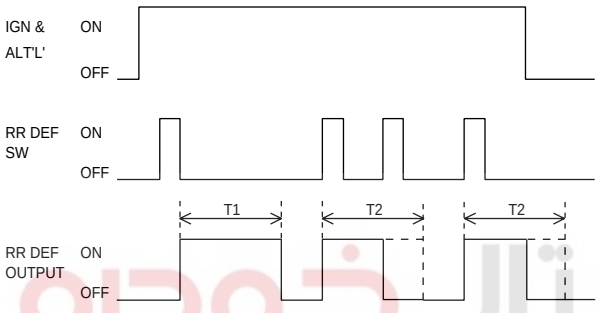
WINDSHIELD DEICER TIMER

INSPECTION E51C1ED7

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.

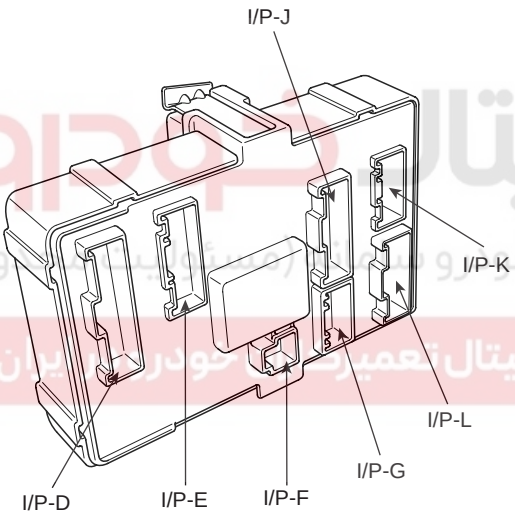
WINDSHIELD DEICER RELAY

INSPECTION E97BCB9B

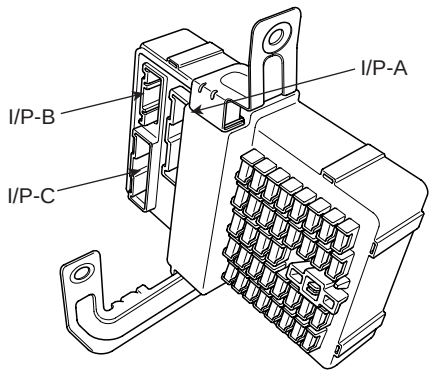
1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.2 in the I/P-G and No.8 terminal in the I/P-K when power and ground are connected to the No.2 terminal in the I/P-G and No.8 terminal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

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

ETRF334A



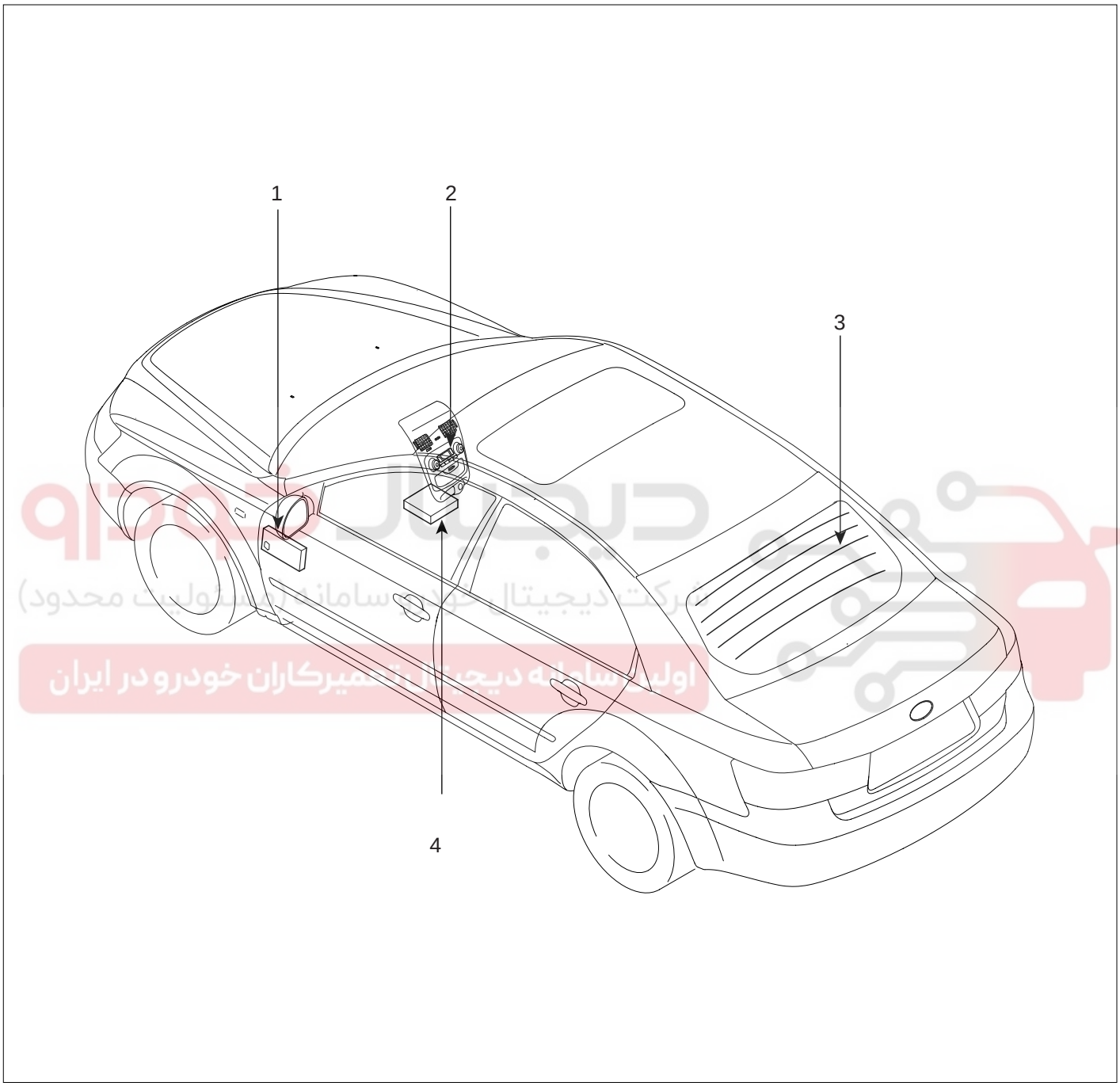
KTRE323A



KTRE323D

REAR WINDOW DEFOGGER

COMPONENT LOCATION E3AAEA36



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

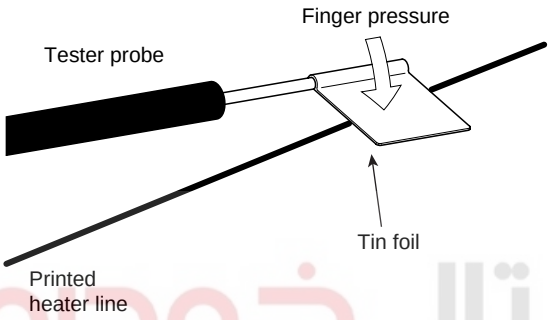
ETRF340B

REAR WINDOW DEFOGGER PRINTED HEATER

INSPECTION E65938B5

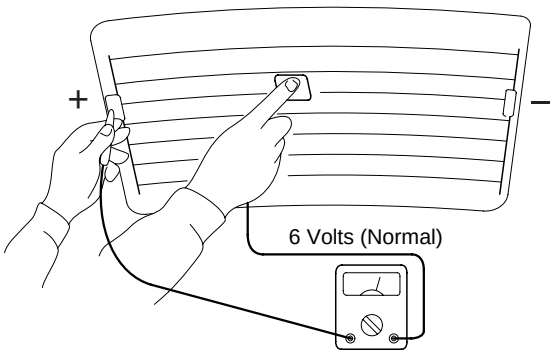
CAUTION

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.



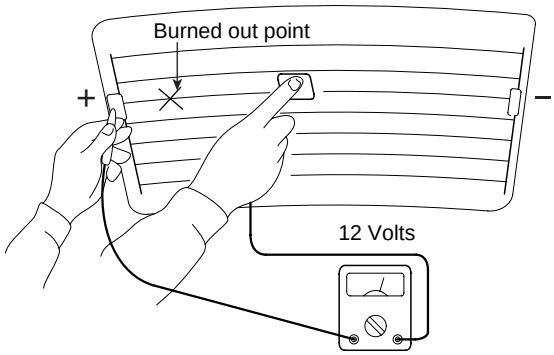
ETA9165A

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.



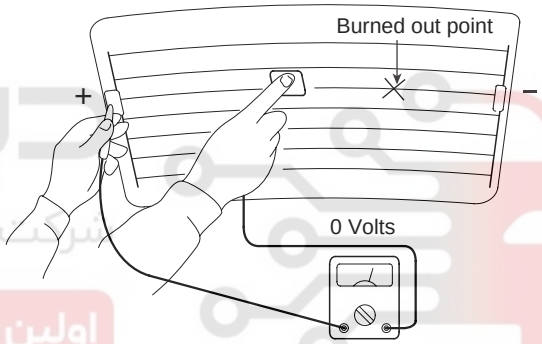
ETA9165B

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



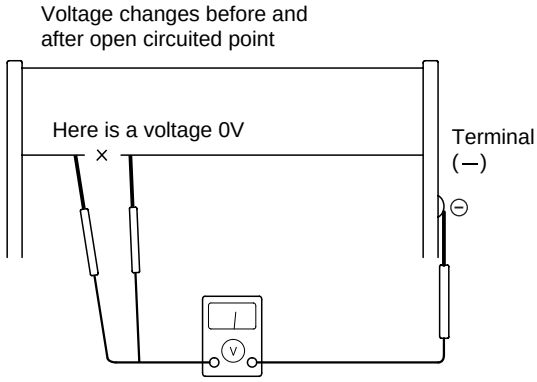
ETA9165C

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



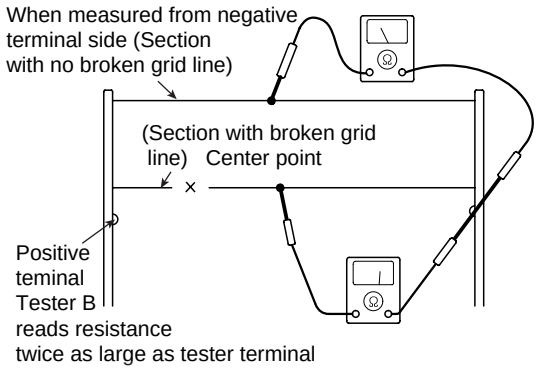
ETA9165D

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.

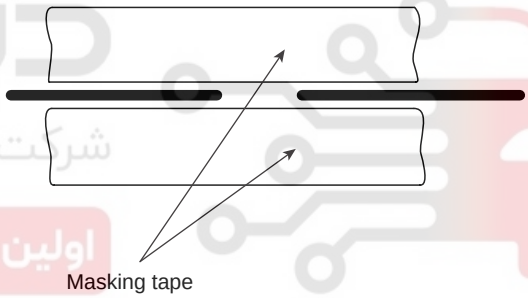


ETA9165F

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).

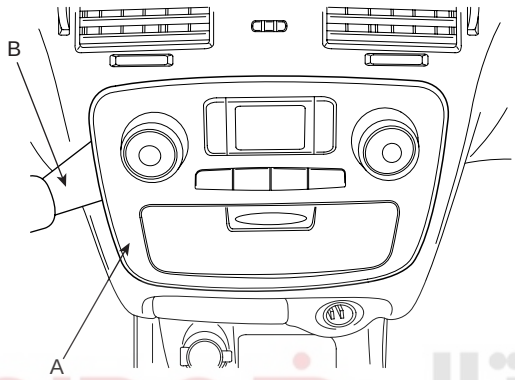


ETA9165G

REAR WINDOW DEFOGGER SWITCH

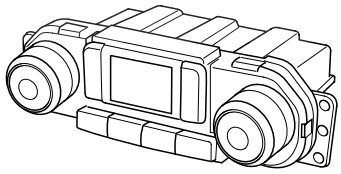
INSPECTION ED1B245C

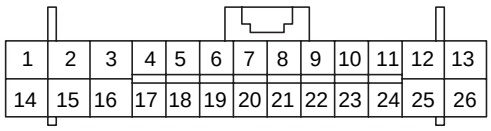
1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel(A) by using a scraper (B). Take care of fixing clip.



KTRE071F

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





M21-1/M22-2

KTRE332A

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

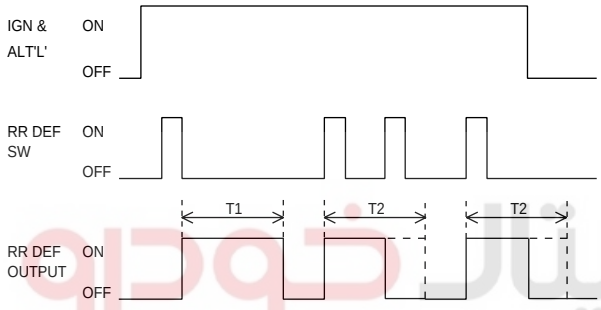
ETRF332B

REAR WINDOW DEFOGGER RELAY

INSPECTION E1765E77

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.

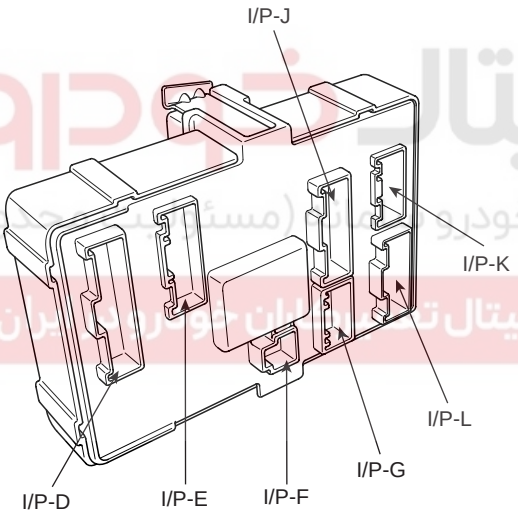
REAR WINDOW DEFOGGER TIMER

INSPECTION E6EFFA8D

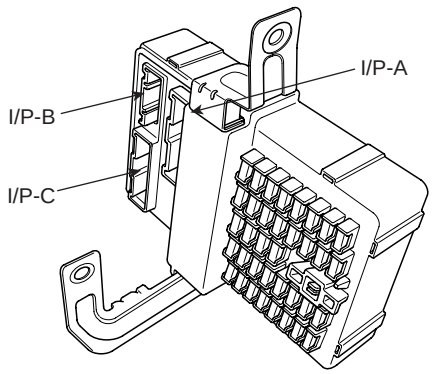
1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.2 in the I/P-G and No.7 terminal in the I/P-C when power and ground are connected to the No.2 terminal in the I/P-G and No.8 terminal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

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

ETRF343A



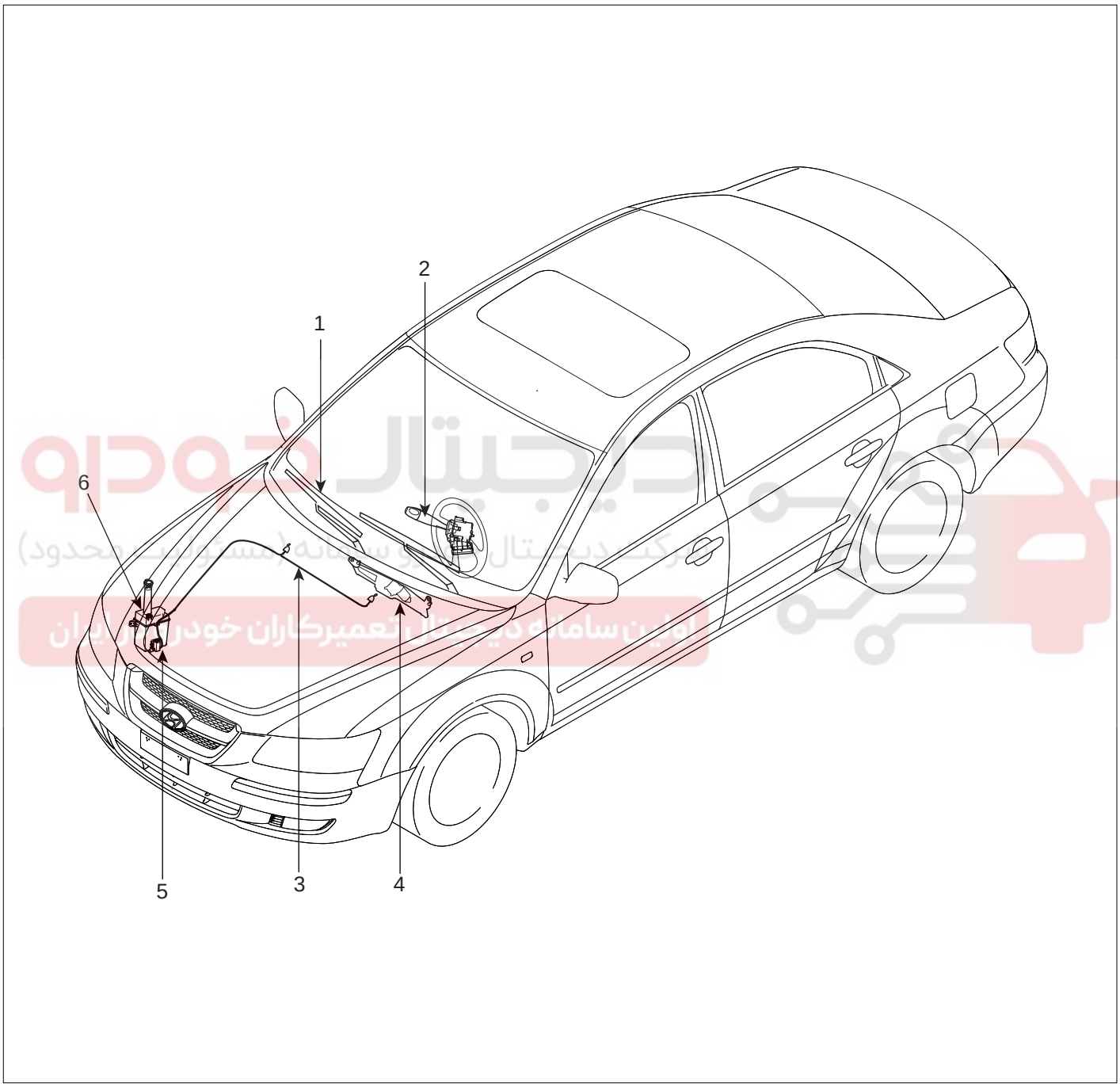
KTRE323A



KTRE323D

WINDSHIELD WIPER / WASHER

COMPONENT LOCATION E9632AED



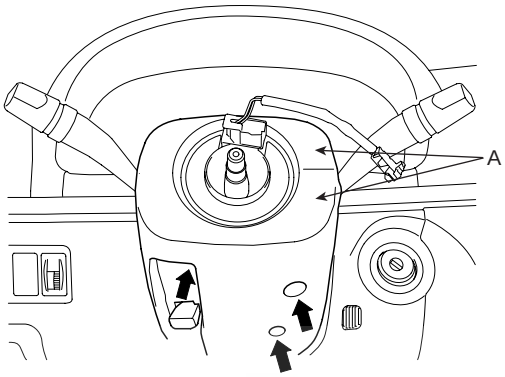
1. Windshield wiper arm & blade
2. Wiper & washer switch
3. Windshield washer hose
4. Windshield wiper motor & linkage
5. Washer motor
6. Washer reservoir

ETRF360A

WINDSHIELD WIPER／WASHER SWITCH

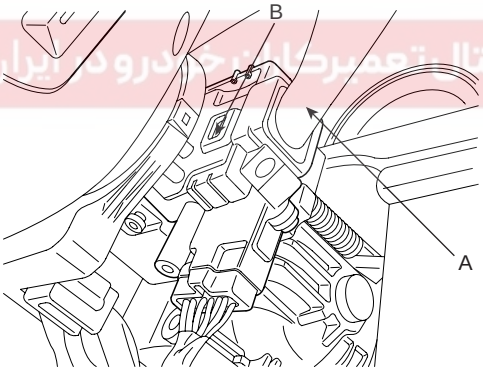
REPLACEMENT E0DA6DAE

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



KTRE031B

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

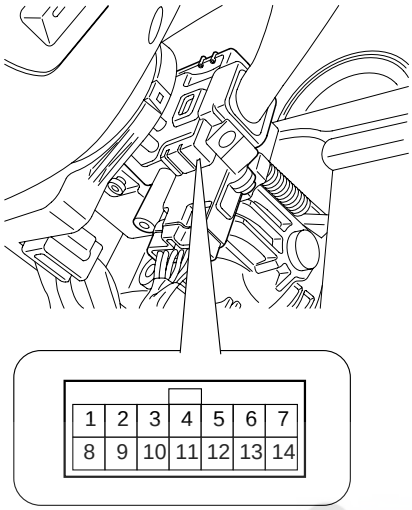


KTRE031D

3. Installation is the reverse of removal.

INSPECTION EFCCE8A4

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



KTRE031G

WIPER SWITCH

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

LTGE031I

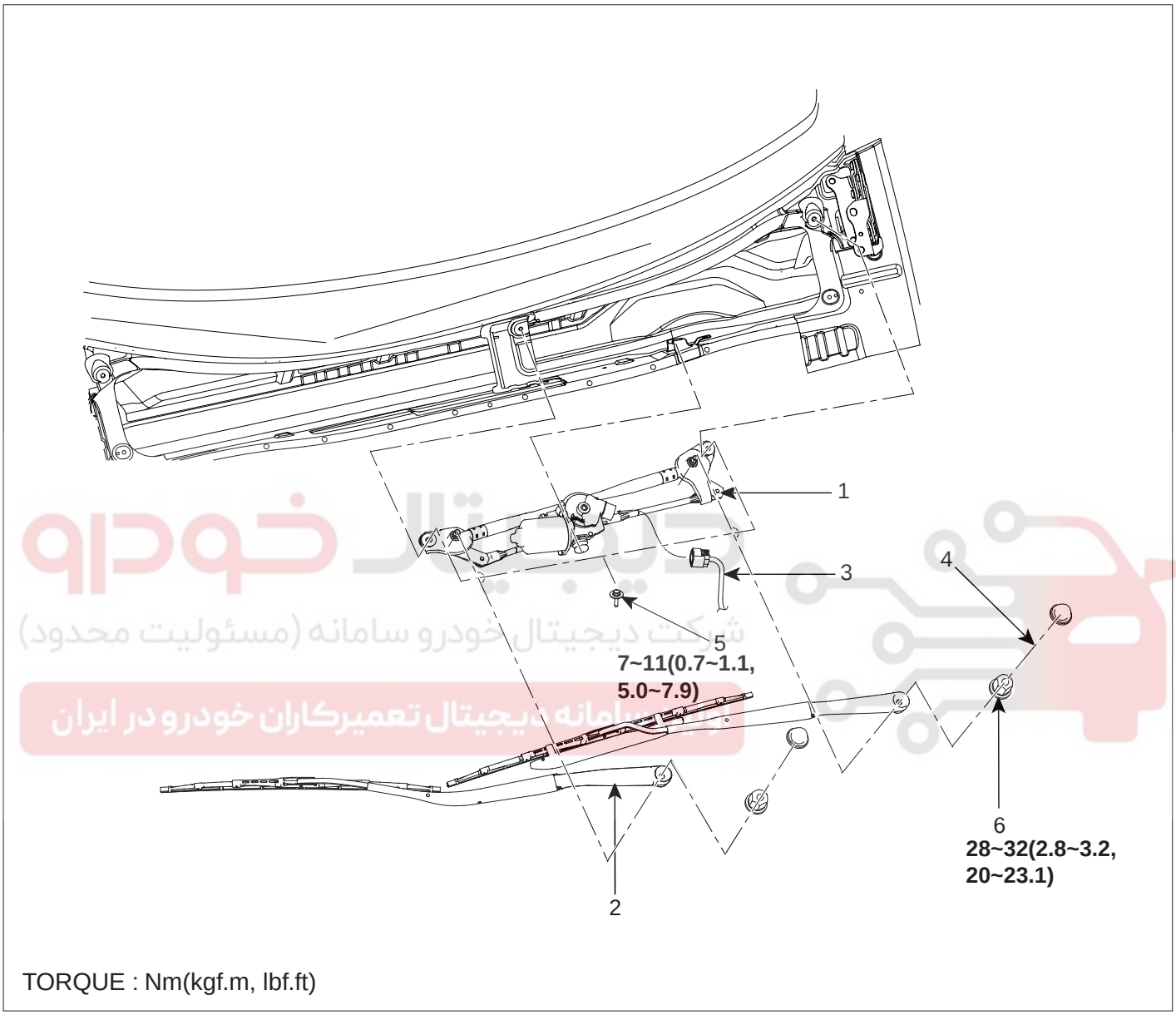
WASHER SWITCH

Position \ Terminal	5	7
OFF		
ON	○	○

LTGE031J

FRONT WIPER MOTOR

COMPONENT LOCATION EC8DE8CD



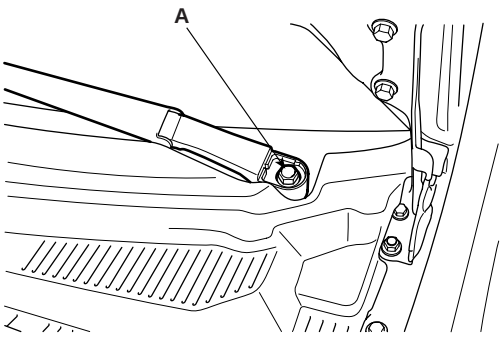
1. Wiper motor & linkage assembly
2. Wiper arm & blade
3. Wiper motor connector
4. Cap
5. Bolt
6. Nut

ETRF362A

REMOVAL EEFA1B7C

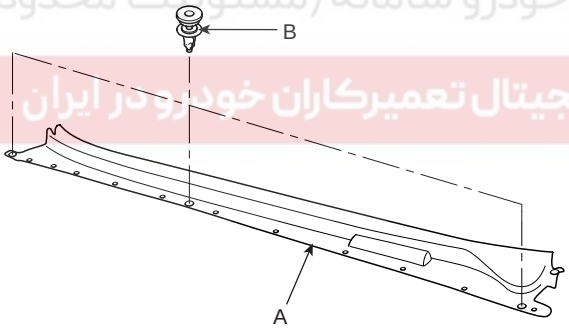
1. Remove the windshield wiper arm and blade after removing a nut (A).

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



ETKE365A

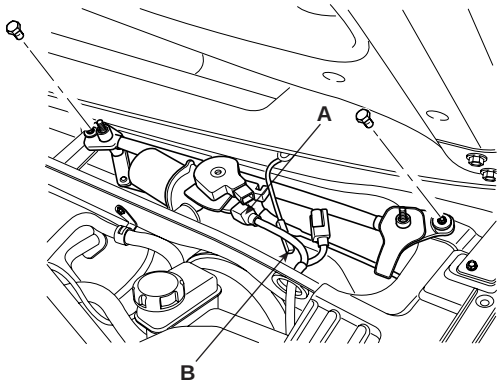
2. Remove the weather strip then remove the cowl top cover (A) after removing 3 clips (B).



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)



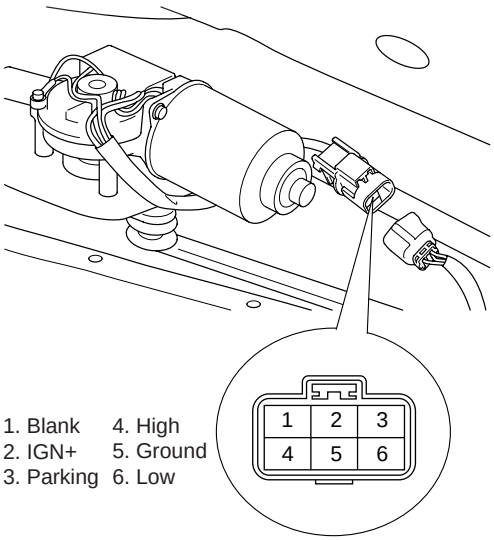
KTRE362C

4. Installation is the reverse of removal.

INSPECTION EFBFD4BA

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.

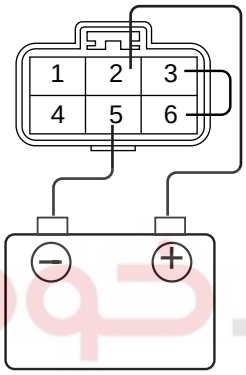


1. Blank
2. IGN+
3. Parking
4. High
5. Ground
6. Low

ETRF310B

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.

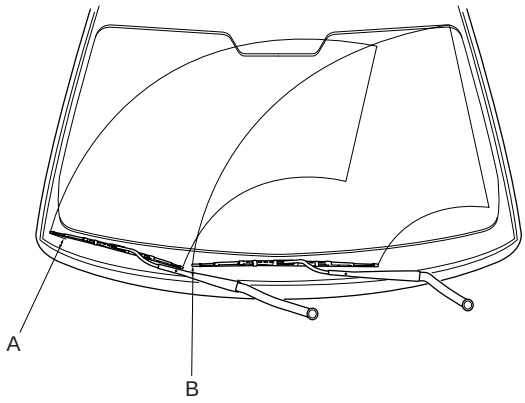


KTRE362D

INSTALLATION EAF1B8BD

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

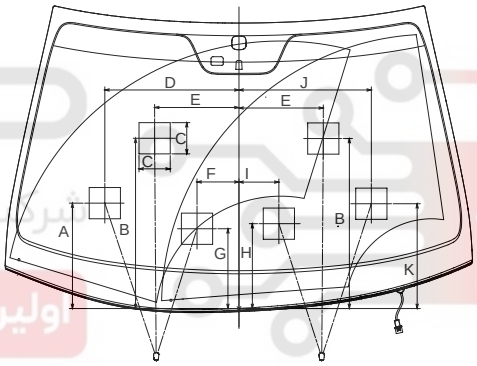
Specified position	A	B
Distance [in (mm)]	1.26+0.2/0 (32+5/0)	0.98+0.2/0 (25+5/0)



ATGE362C

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

Specified position	Distance [in (mm)]
A	13.3 (337.5)
B	21.5 (545)
C	3.9 (100)
D	16.9 (429.5)
E	10.6 (270)
F	5.3 (134)
G	10.1(255.5)
H	10.7(271.5)
I	5.0(128)
J	16.7(424)
K	13.2(335.5)



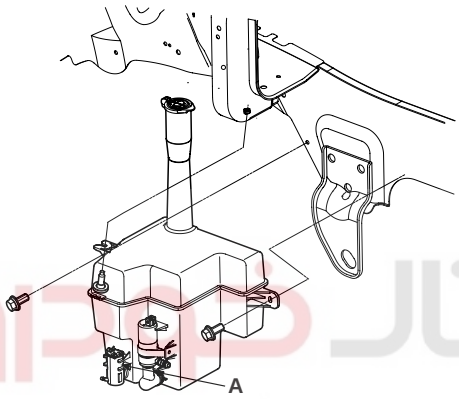
Unit : mm

ETRF362E

FRONT WASHER MOTOR

REPLACEMENT E7335FF5

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover. (Refer to Body group-Front bumper)
3. Remove the washer hose and the washer motor connector (A).
4. Remove the washer reservoir after removing 3 bolts.

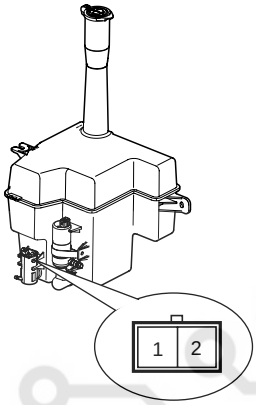


ETRF363A

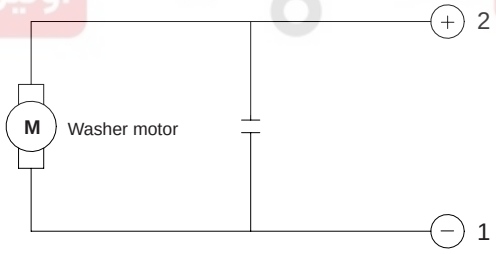
5. Installation is the reverse of removal.

INSPECTION E8555EFF

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.



ETRF363B

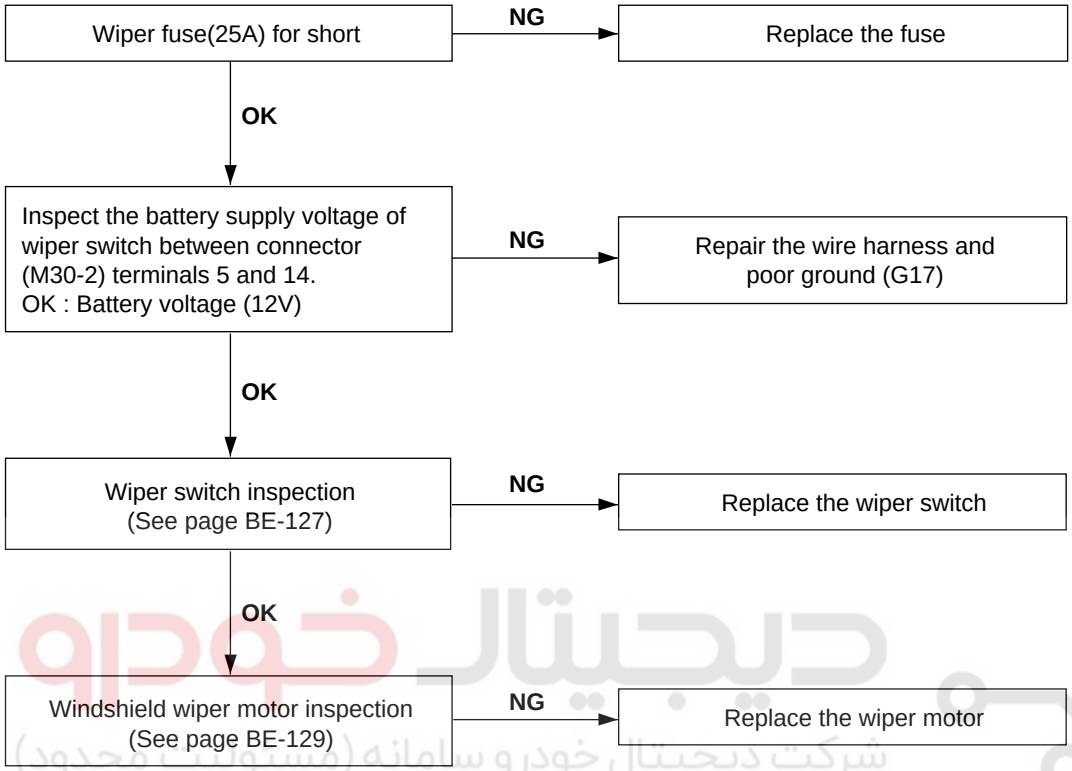


[Windshield washer motor]

LTIF363C

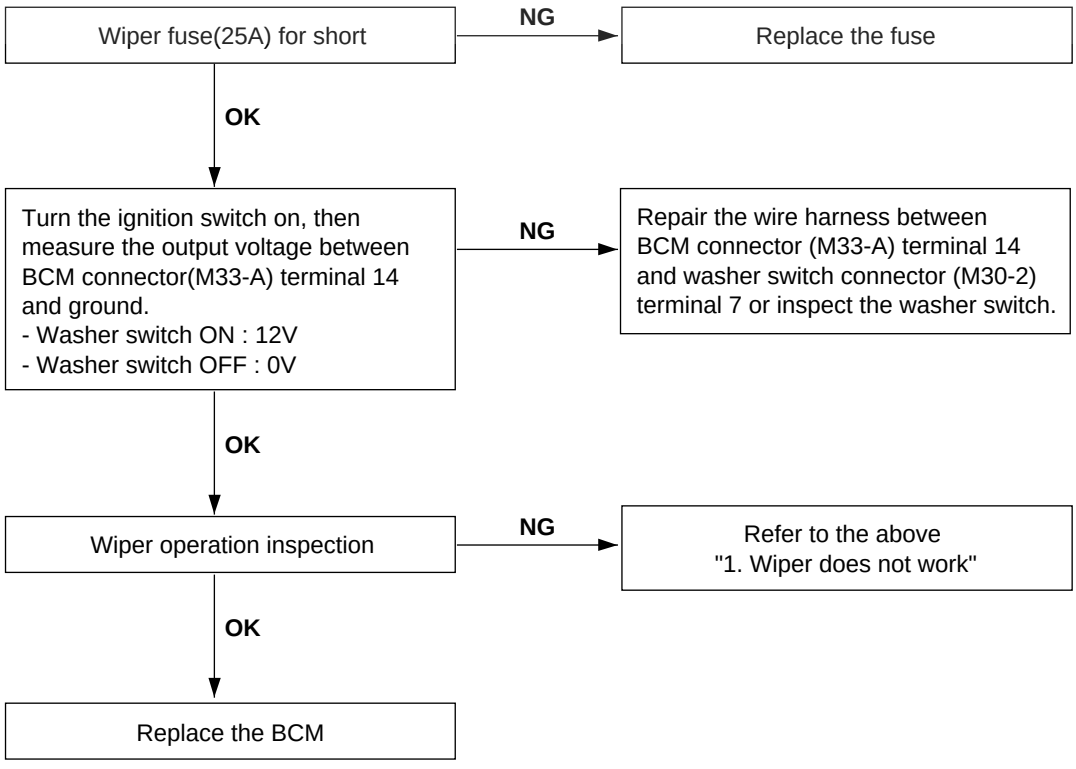
TROUBLESHOOTING E51CC2AA

1. Wiper low and wiper high do not work.



ETRF900A

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

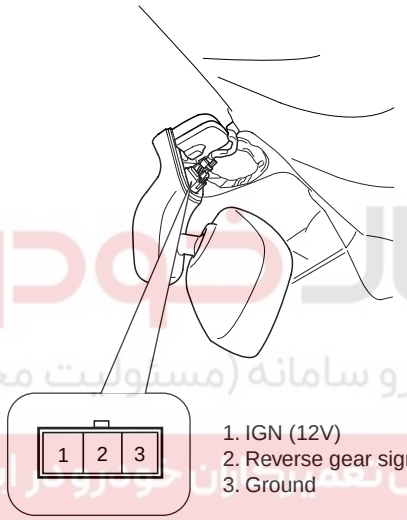


ETRF900B

ELECTRO CHROMIC INSIDE REAR VIEW MIRROR

DESCRIPTION EBAAA21D

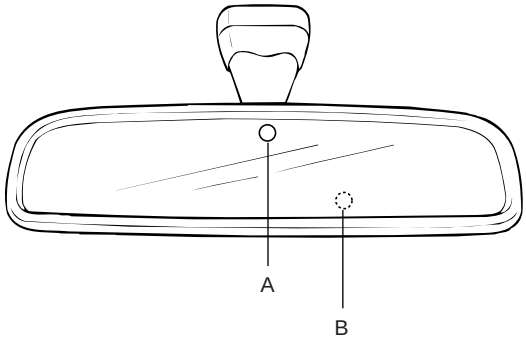
The ECM (Electro Chromic inside rear view Mirror) is for dimming the reflecting light from a vehicle behind at night, in order the user not to be dazzled by the light. The front looking sensor detects brightness of the surroundings, while the rearward looking sensor the strength of the reflecting light so that adjusts the reflexibility of the mirror in the range of 10~70%. But, when the reverse gear is engaged, it stops functioning.



1. IGN (12V)
2. Reverse gear signal
3. Ground

ETRF410A

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



ETRF410B

INSPECTION EC17CFA6

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 looking sensor to stop functioning.
3. Head a light to the rearward looking sensor.
4. The ECM should be darkened as soon as the rearward looking sensor detects the light.

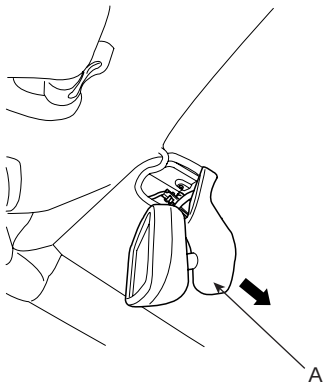
NOTE

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

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

REPLACEMENT E68B9B6B

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



KTRE410C

NOTE

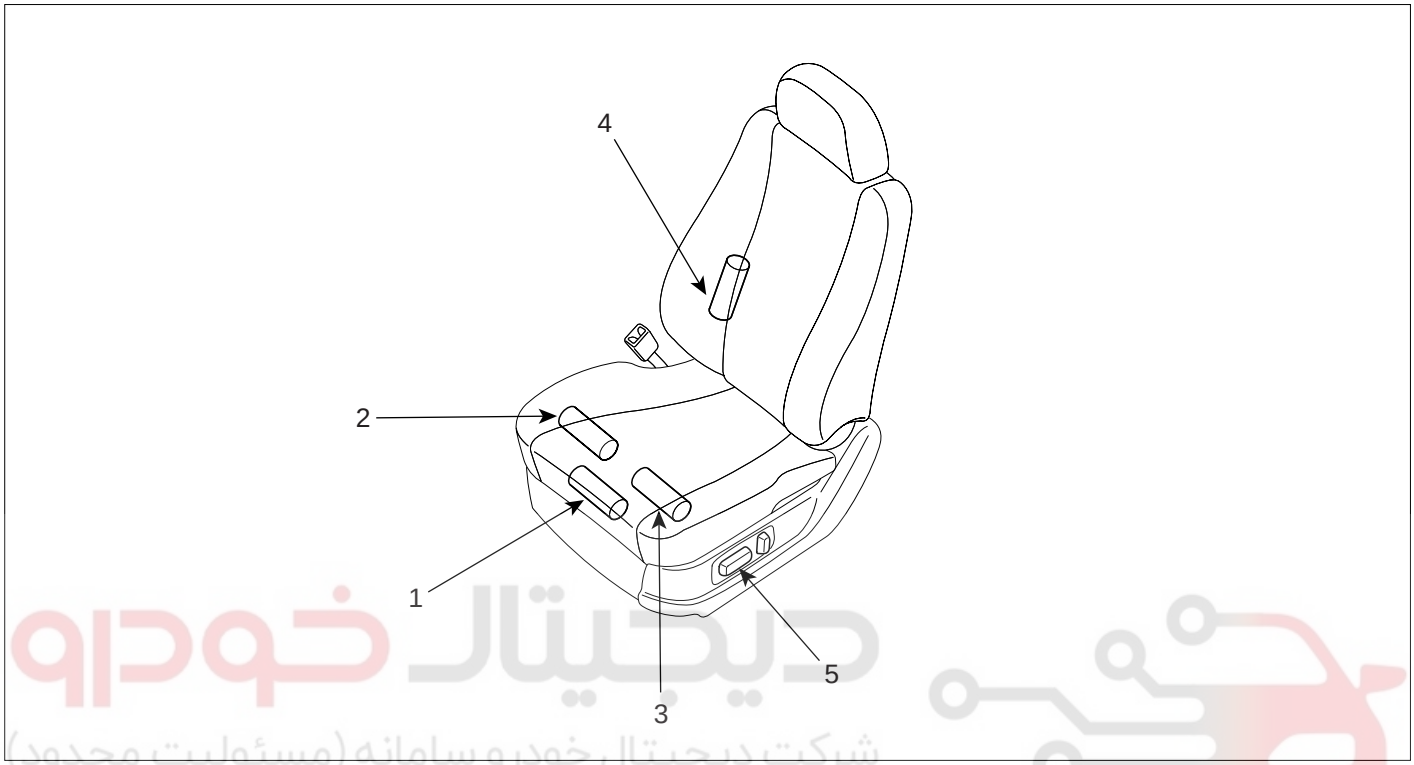
Mirror it adheres closely in the mirror base (A) and it separates while removing the mirror (B).
Make sure the spring mounting bracket (C) of the mirror not to be damaged.

ETRF410D

2. Installation is the reverse of removal.

POWER SEAT

COMPONENT LOCATION EFA4AA23



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

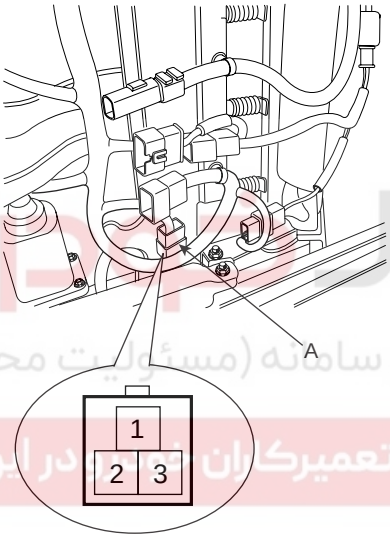
ETRF440A

POWER SEAT MOTOR

INSPECTION E0EF5A08

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.



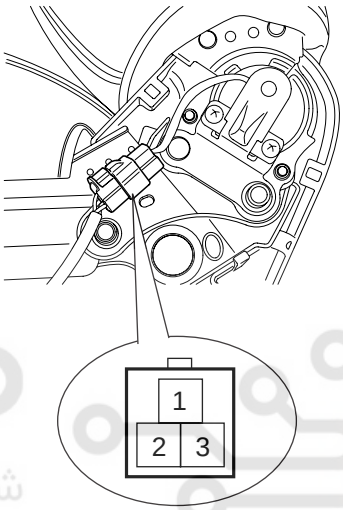
KTRE421A

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.



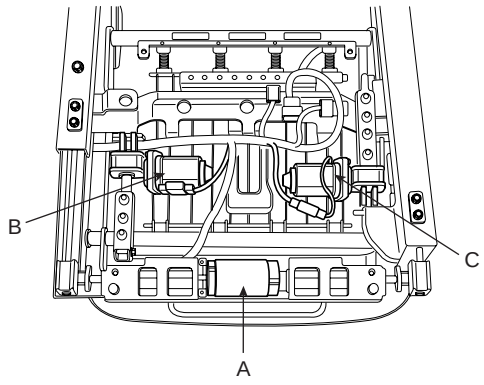
KTRE421C

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	⊖	⊕

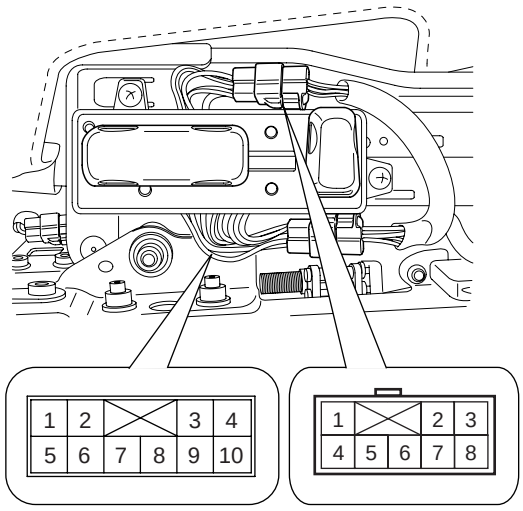
<Driver>

ETRF421F

POWER SEAT SWITCH

INSPECTION E56D1A62

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

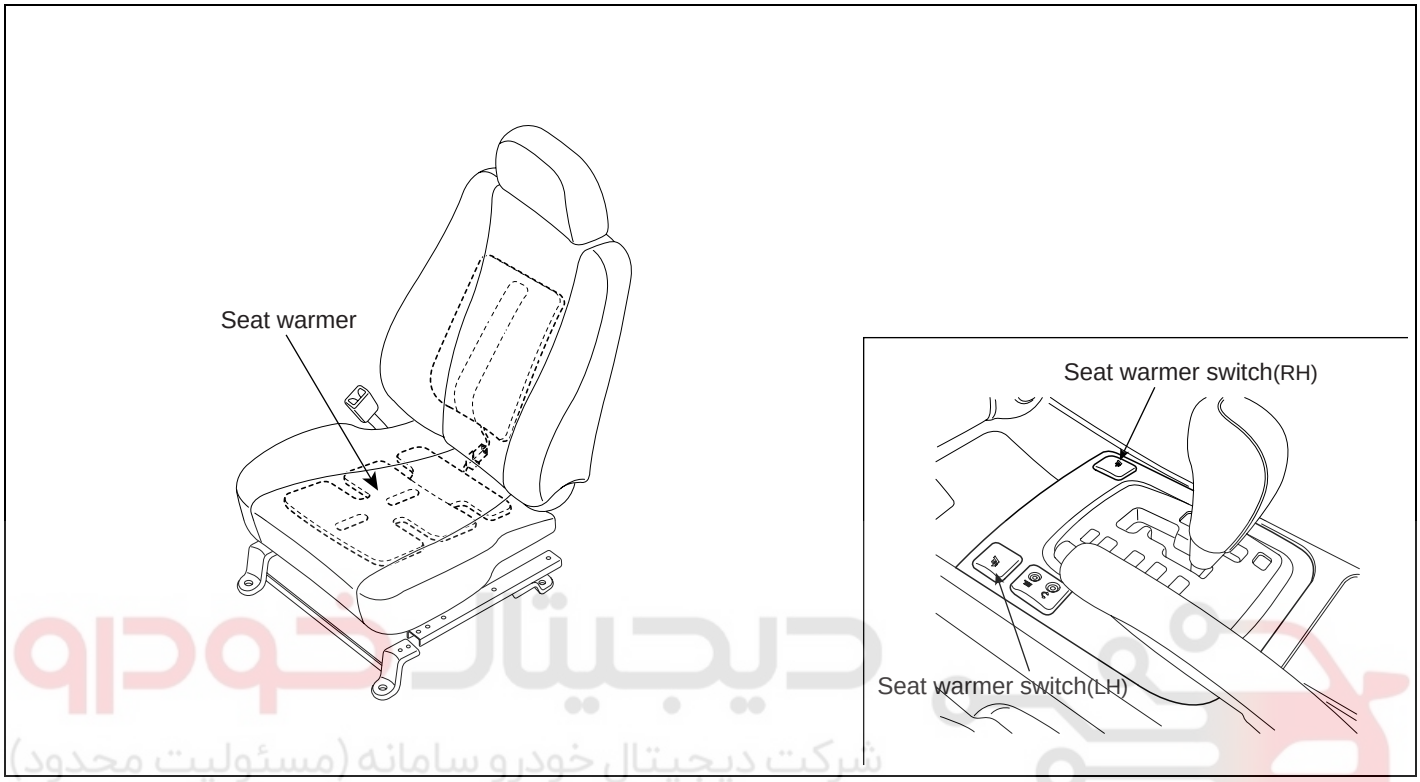
Position		Terminal NO. A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Slide switch	Frontward				○	○		○	○		
	Backward					○	○	○	○		
Reclining switch	Frontward	○	○						○	○	
	Backward	○	○						○		○

<Assist>

ETRF421I

SEAT WARMER

COMPONENT LOCATION E40E72F8

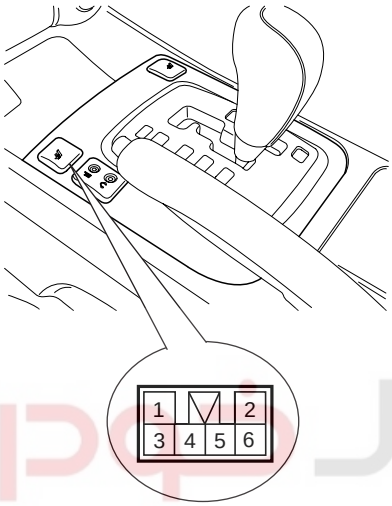


ETRF440B

SEAT WARMER SWITCH

INSPECTION EE69321D

1. Disconnect the negative (-) battery terminal.
2. Remove the seat warmer switch from the floor console upper cover with scraper.



KTRE441A

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

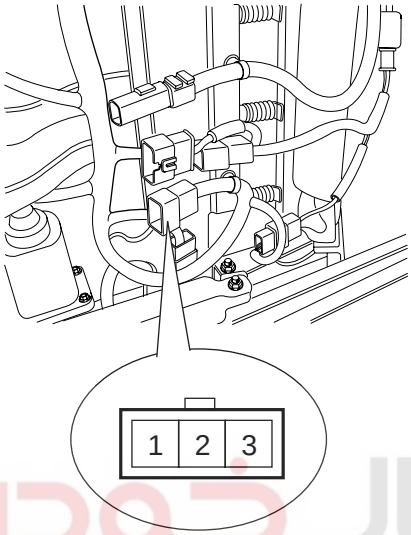
Terminal / Position	2	6	3	4	1
ON	Illumination		IND.		
OFF					

ETRF441B

SEAT WARMER

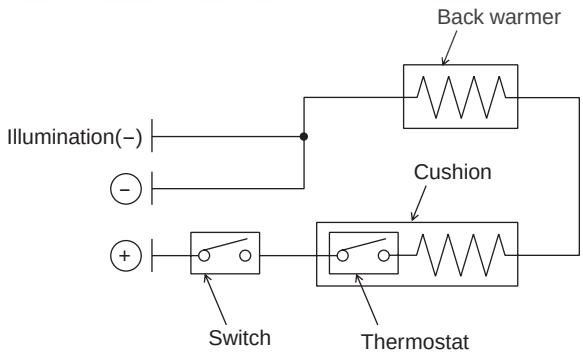
INSPECTION E97BBCC8

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

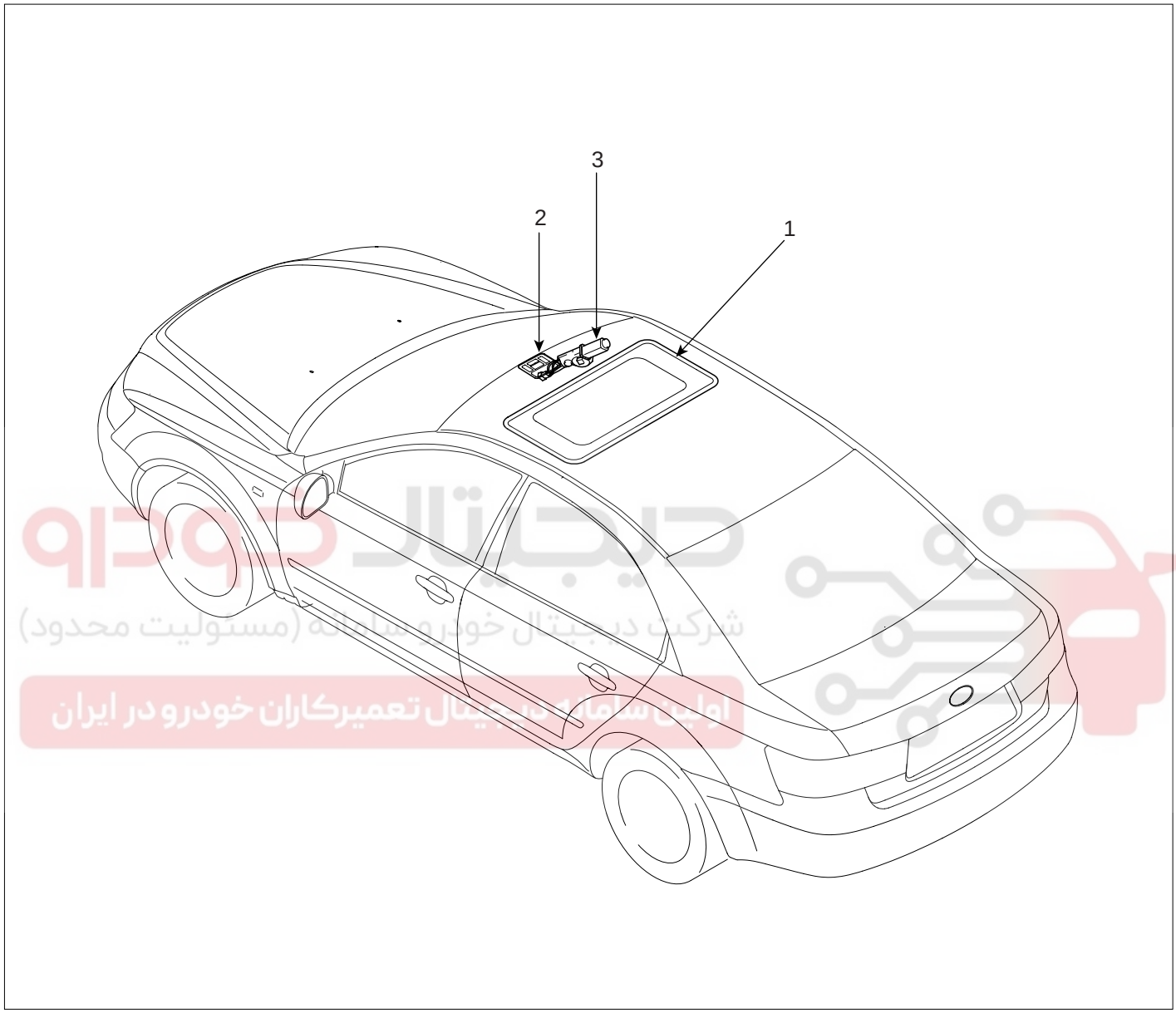
2. Operate the seat warmer after connecting the 3P connector, and then check for the thermostat by measuring the temperature of seat surface.

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

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

SUNROOF

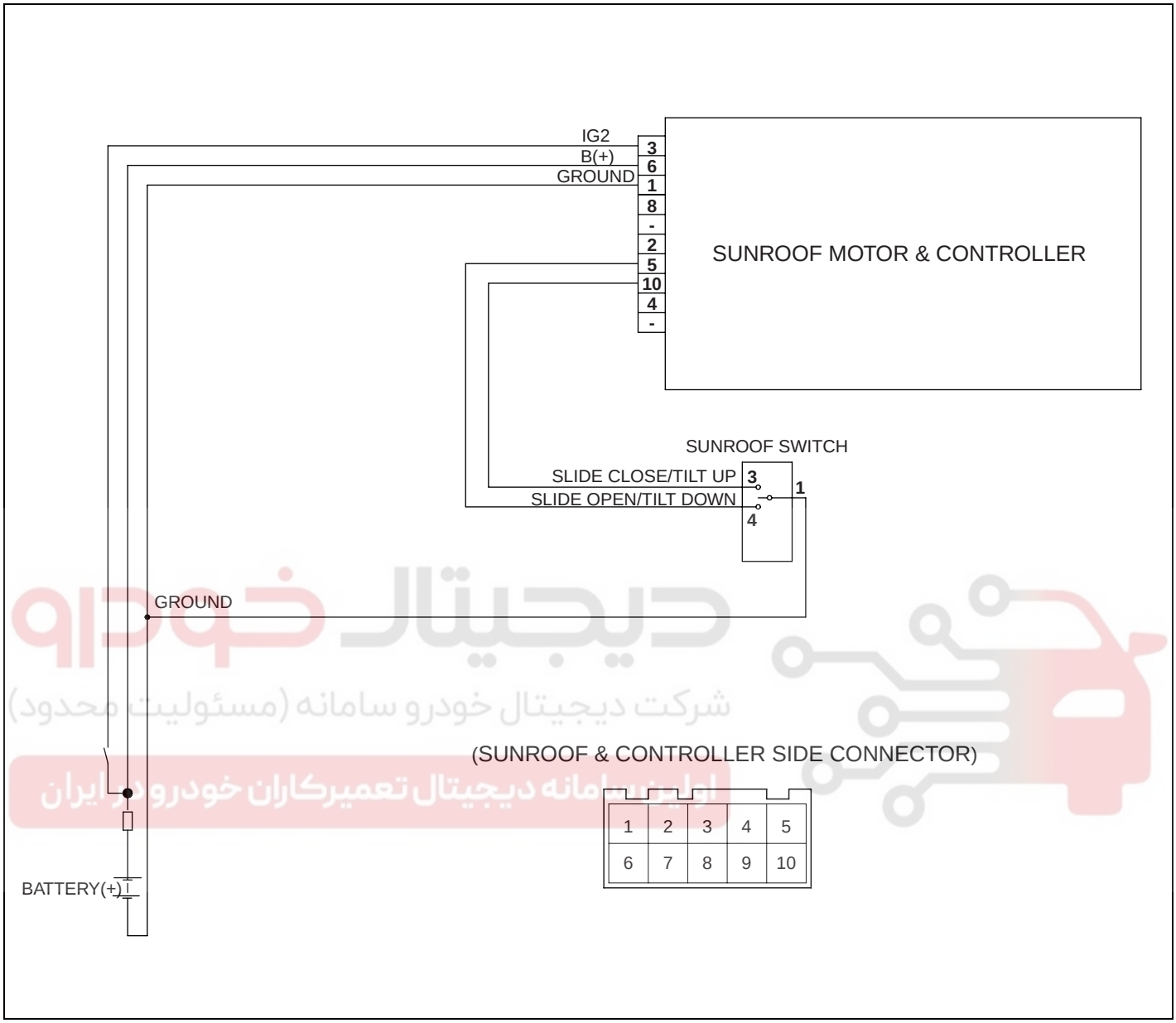
COMPONENT LOCATION EA4DE9C9



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

ETRF480A

CIRCUIT DIAGRAM ED5DACFB

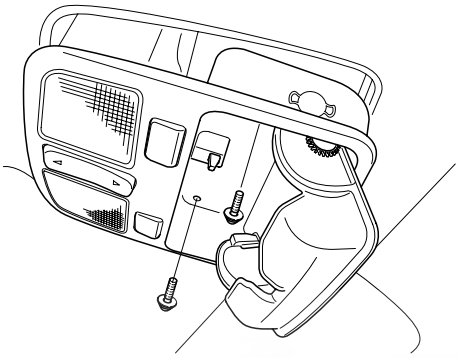


ETRF480B

SUNROOF SWITCH

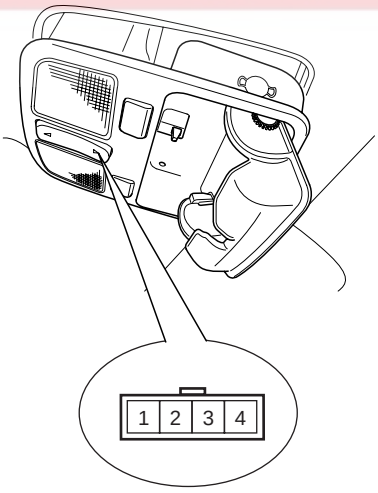
INSPECTION E6F088B7

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



KTRE481A

3. Disconnect the connector 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.



[Switch side connector]

ETRF481B

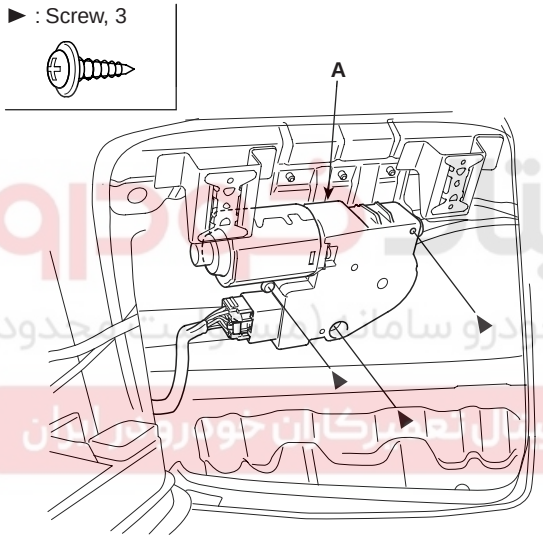
Terminal / position	1	3	4
Slide open	○		○
Tilt down	○		○
Tilt up	○	○	

ETRF481C

SUNROOF MOTOR

REPLACEMENT E7BBD9B2

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.

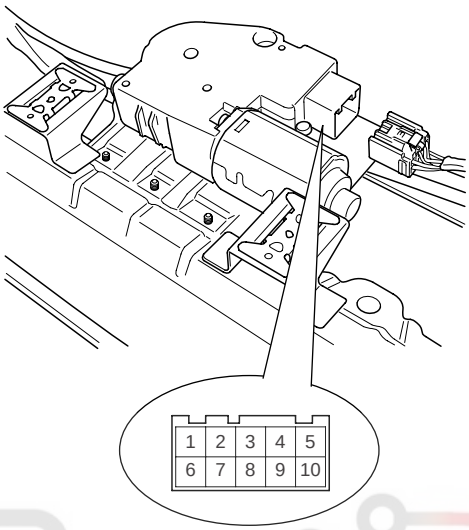


ETRF481D

5. Installation is the reverse of removal.

INSPECTION E48F8D6B

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.

Terminal / position	3	4	5	10
Slide close/Tilt up	⊕			⊖
Slide open/Tilt down	⊕		⊖	

ETRF483A

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.

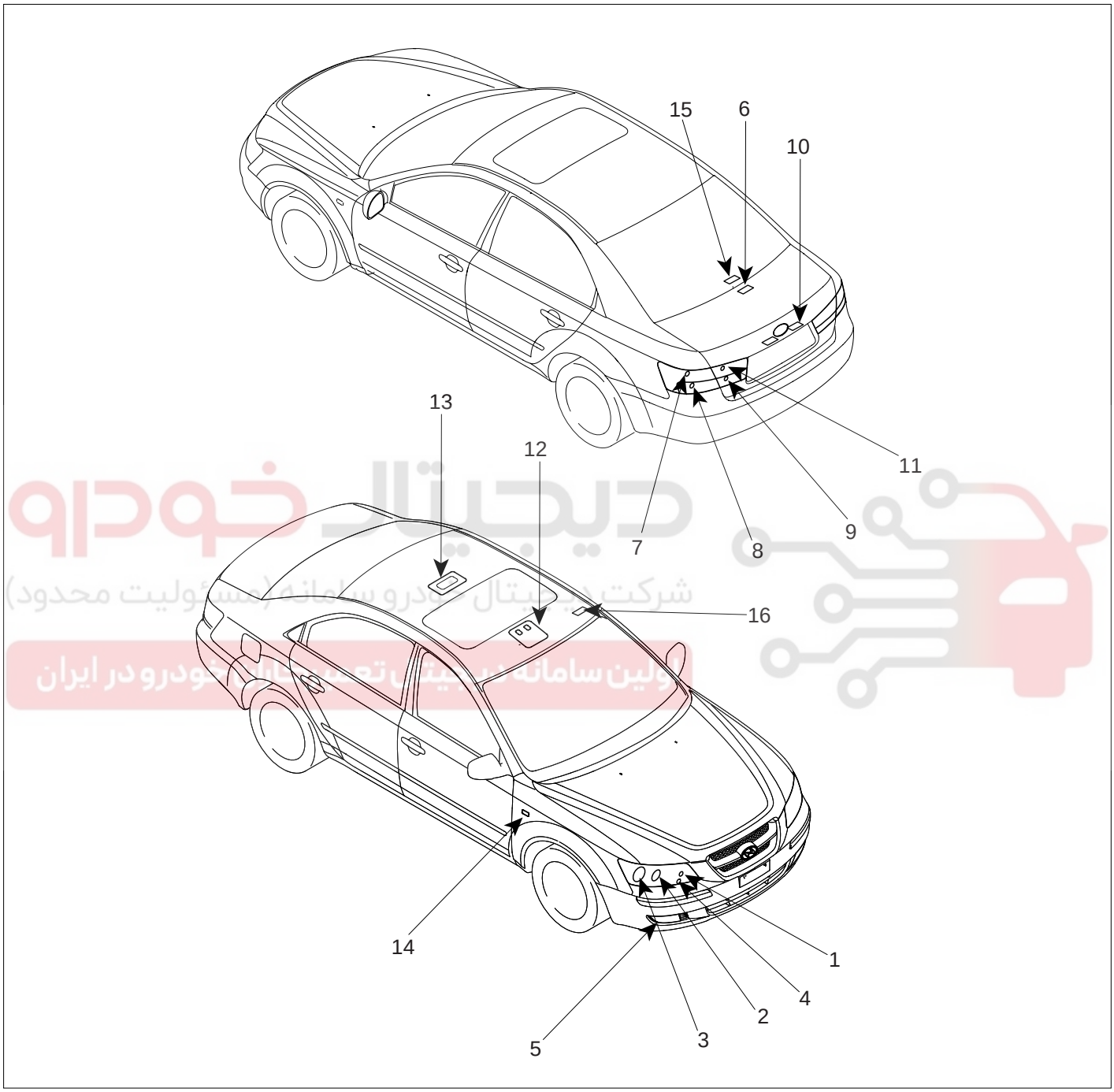
RESETTING THE SUNROOF EBE2AA0F

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 returned to the original position of TILT UP after it is raised a little higher than the maximum TILT UP position.
   When this is complete, the sunroof system is reset.

LIGHTING SYSTEM

COMPONENT LOCATION EB602EA5



1. Head lamp (High)
2. Head lamp (Low)
3. Front turn signal lamp
4. Position 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. Rear fog lamp(Europe)/Tail lamp(General)
12. Overhead console lamp (Map lamp)
13. Room lamp
14. Side repeater
15. High mounted stop lamp
16. Vanity lamp

ETRF490A

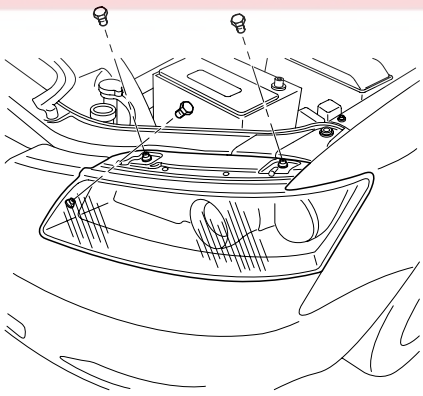
SPECIFICATION EBCA62E3

Items	Bulb Wattage (W)
Head lamp (High/Low)	55/55
Front turn signal lamp	21
Front position lamp	5
Front fog lamp	27
Rear tail/stop lamp (Outside)	21/5
Rear tail lamp (Inner) - General	21/5
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	16
Glove box lamp	5
Luggage lamp	5
Door courtesy lamp	5
Vanity lamp	5

HEAD LAMPS

REPLACEMENT E6439AD1

1. Disconnect the negative (-) battery terminal.
2. Loose the mounting bolts (3EA) of head lamp.

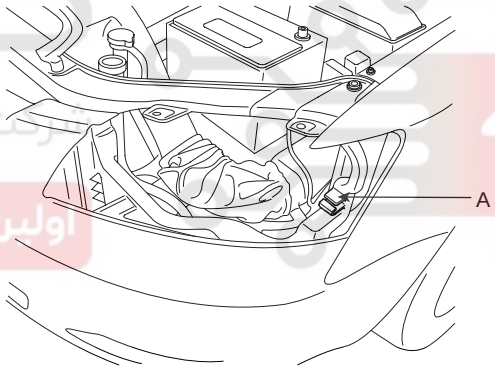


KTRE491A

3. Remove the head lamp assembly after disconnecting the lamp connectors.

NOTE

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

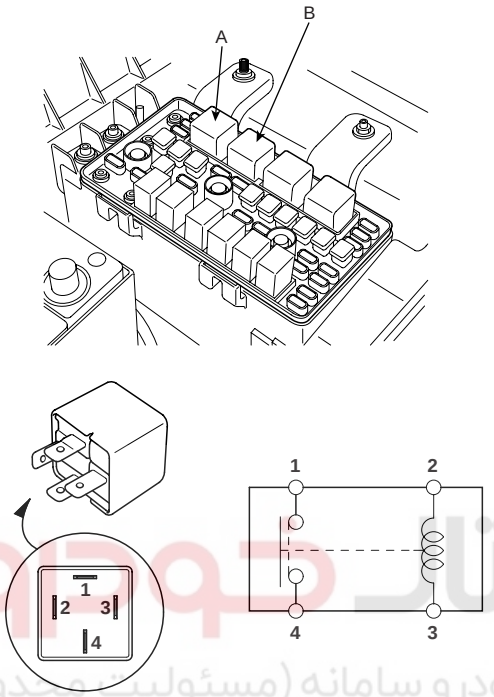


KTRE491C

4. Installation is the reverse of removal.

HEAD LAMP RELAY INSPECTION E5016149

1. Pull out the head lamp relay (Low) (A) and head lamp relay (High) (B) from the engine compartment relay box.



ETRF491K

2. Check for continuity between terminals. There should be continuity between the No.1 and No.4 terminals when power and ground are connected to the No.2 and No.3 terminals.

3. There should be no continuity between the No.1 and No.4 terminals when power is disconnected.

Terminal / Power (No.2-No.3)	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

ETKE215B

HEAD LAMP AIMING INSTRUCTIONS E9A87524

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

NOTE

If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

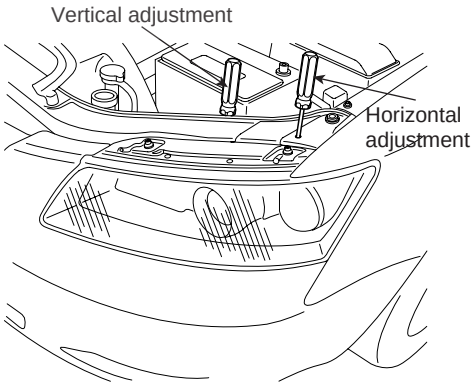
Alternately turn the adjusting gear to adjust the head lamp aiming. If beam-setting equipment is not available, proceed as follows:

1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.

2. The vehicle should be placed on a flat floor.

3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.

4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the horizontal and vertical lines.
Make vertical and horizontal adjustments to the lower beam using the adjusting wheel.

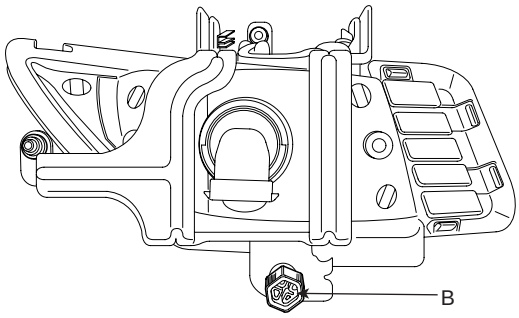


ETRF491D

FRONT FOG LAMP AIMING

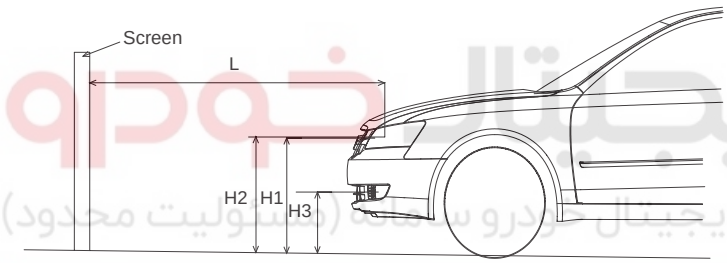
The front fog lamps should be aimed as the same manner of the head lamps aiming.

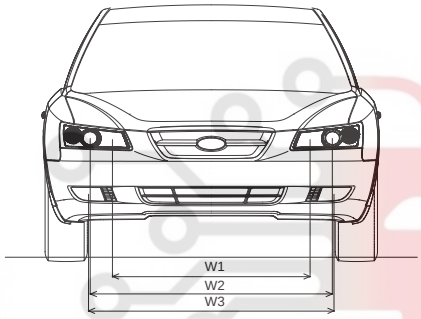
With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting gear.



KTRE491E

HEAD LAMP AND FOG LAMP AIMING POINT





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

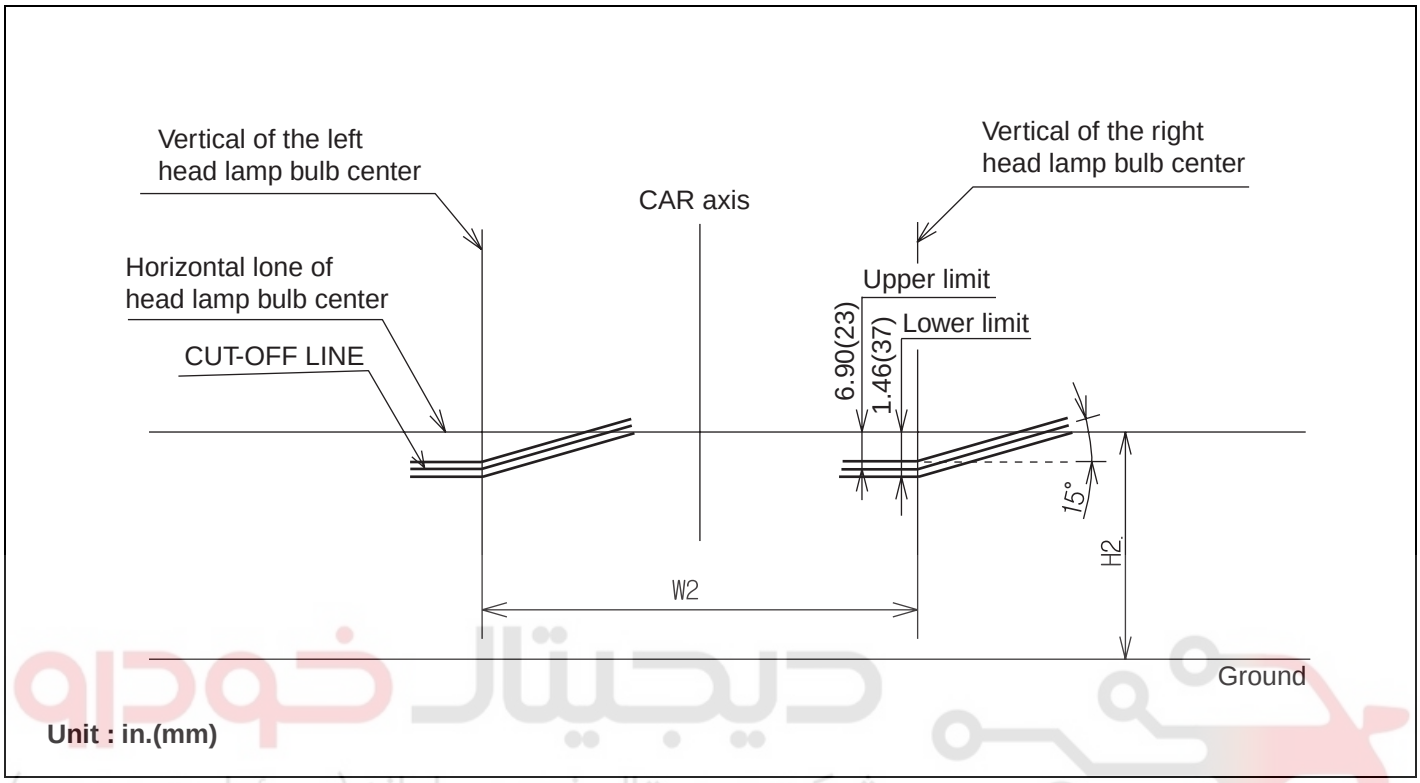
ETRF491F

Unit : in(mm)

Vehicle condition	H1	H2	H2	W1	W2	W3	L
Without driver	26.7(679)	27.0(686)	14.3(362)	42.0(1,066)	51.4(1,306)	52.1(1,324)	118.1(3,000)
With driver	26.5(672)	26.7(679)	14.0(355)				

ETRF491G

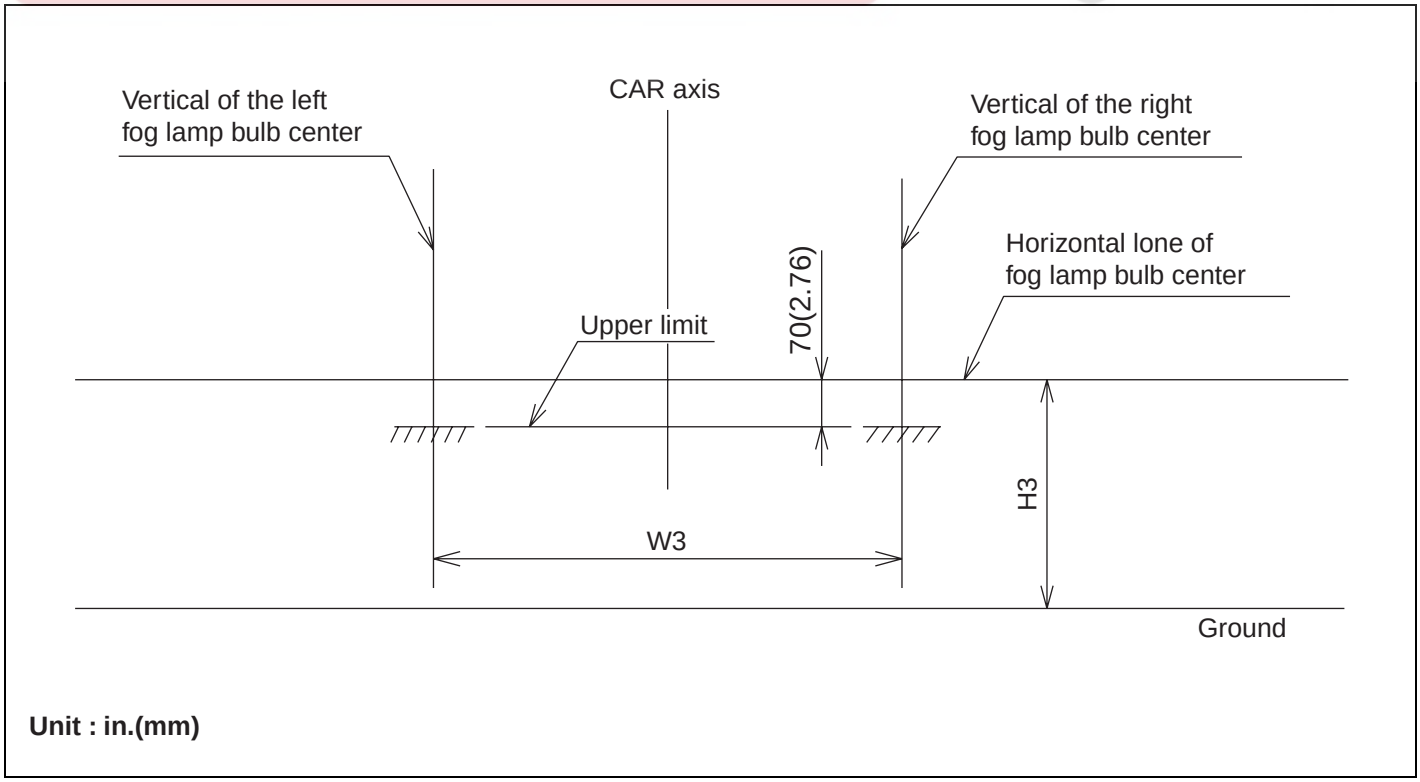
1. Turn the low beam on without driver aboard.
   The cut-off line should be projected in the allowable range (shaded region).
   If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.



Unit : in.(mm)

ETRF491H

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



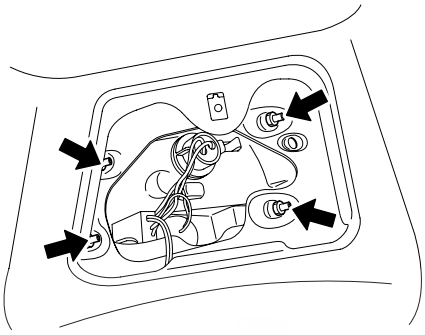
Unit : in.(mm)

ETRF491J

TURN SIGNAL LAMP

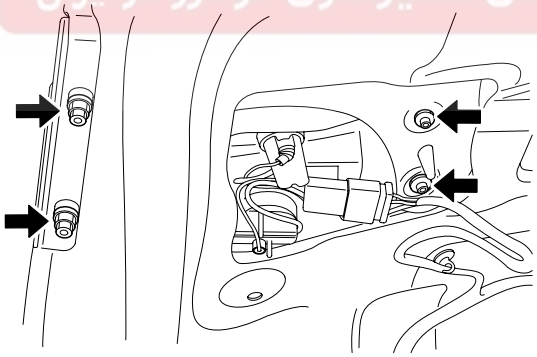
REPLACEMENT E9F41F79

1. Disconnect the negative (-) battery terminal.
2. Loose the nuts holding the rear combination lamp then disconnect the 4P connector then remove the outside rear combination lamp.



KTRE491L

3. Loose the nuts holding the rear combination lamp then disconnect the 4P connector then remove the inner rear combination lamp.



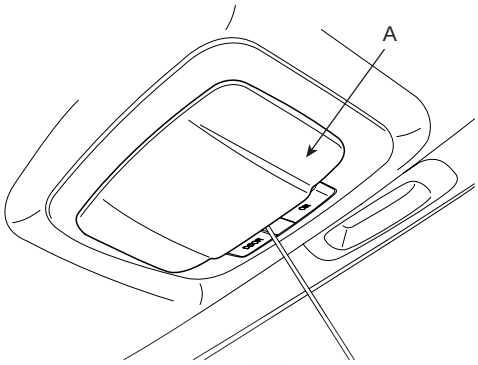
KTRE491M

4. Installation is the reverse of removal.

ROOM LAMP

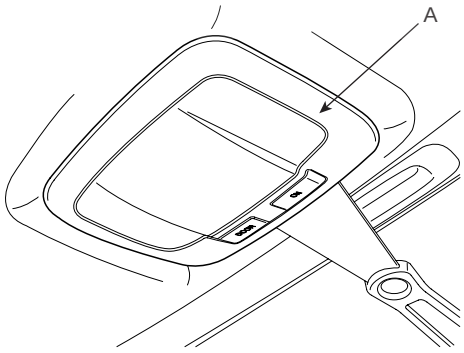
REPLACEMENT E3AEE1DB

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 (B).



KTRE491N

3. Remove the room lamp assembly after removing 2 screws and disconnecting the 3P connector (Standard type).
   Remove the room lamp assembly by using the scraper and then disconnect the 3P connector (Sunroof type).

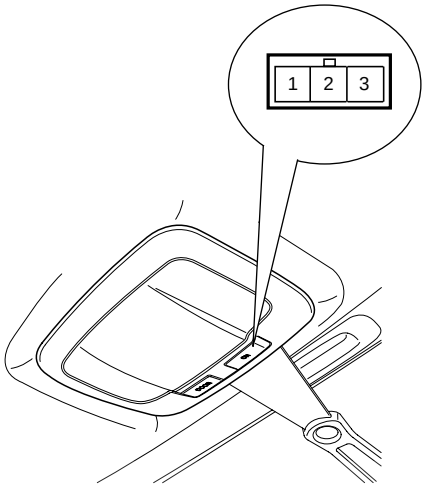


KTRE491O

4. Installation is the reverse of removal.

INSPECTION E16F91DF

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



KTRE491P

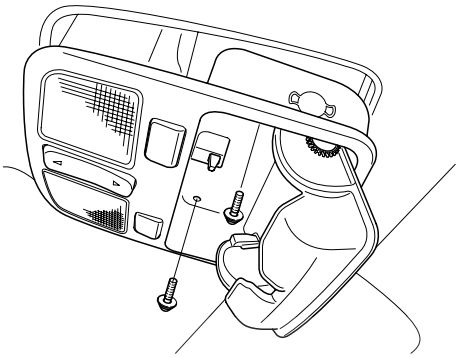
Terminal / Position	1	2	3
ON			
DOOR			
OFF			

LTIF491K

OVERHEAD CONSOLE LAMP

REPLACEMENT EC91128B

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

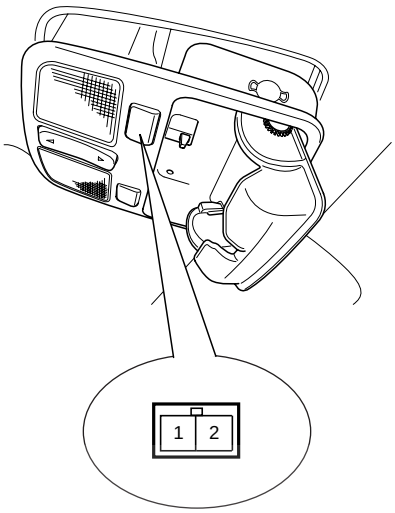


KTRE481A

3. Disconnect the connector (4P) of sunroof switch and the connector (2P) of map lamp then remove the overhead console lamp assembly from the headliner.
4. Installation is the reverse of removal.

INSPECTION EBB4BF6F

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



[Switch side connector]

ETRF491Q

TURN ／ HAZARD LAMPS

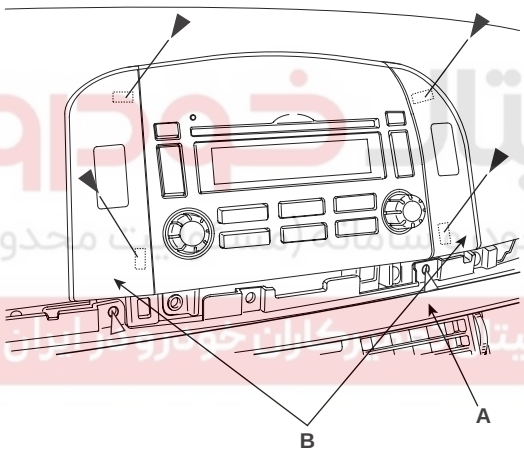
INSPECTION EAC26D91

HAZARD LAMP SWITCH

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad garnish (A) after pulling it by using regular screw driver (-). Take care of fixing clips.
3. Remove the center facia panel (B) after loosening the screws.

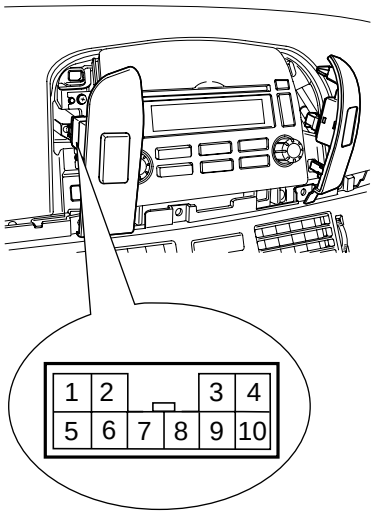
Fastener Locations

▷ : Screw, 2 ► : Clip, 4



ETRF021A

4. Disconnect the connectors(A).
5. Remove the hazard lamp switch from the center facia panel.



ETRF495A

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

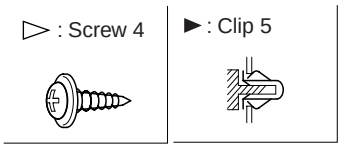
Terminal / Position	2	3	6	9	10	5	7	8
OFF						○		○
ON	Illumination		○	○	○		○	○

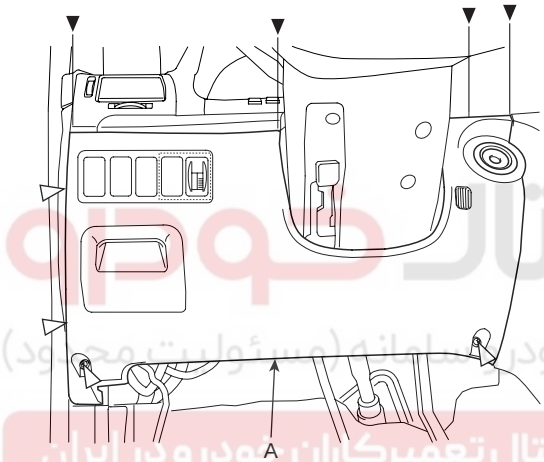
LTIF491M

FLASHER UNIT

INSPECTION ECF9EE5C

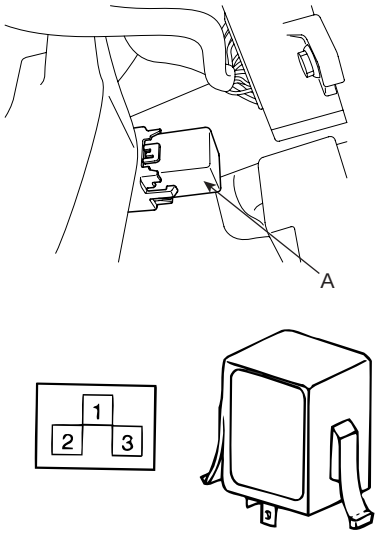
1. Disconnect the negative (-) battery terminal.
2. Disconnect the hood release cable from the hood release handle.
3. Remove the crash pad side cover (A).





ETRF495D

4. Remove the flasher unit (A) after loosening the nut and disconnecting the connector.



KTRE495E

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

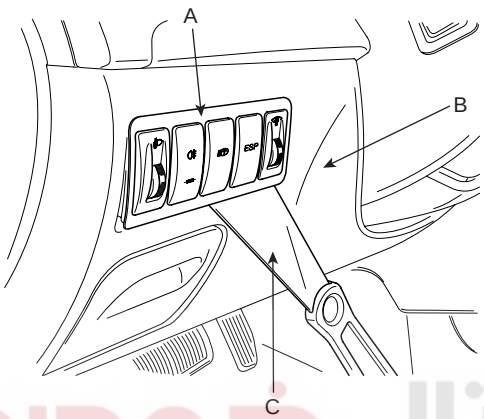
NOTE

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

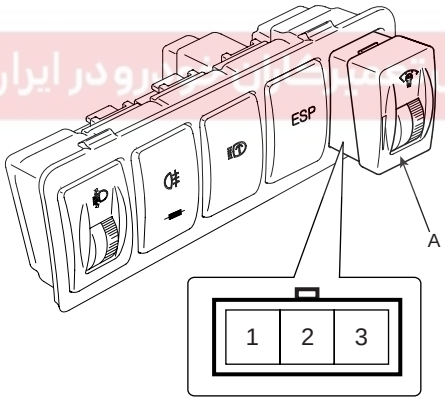
INSPECTION EB69645F

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.



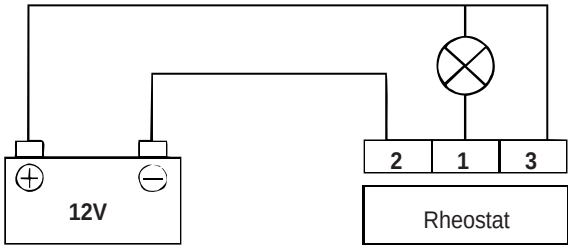
ETRF497A

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



ETRF495E

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.

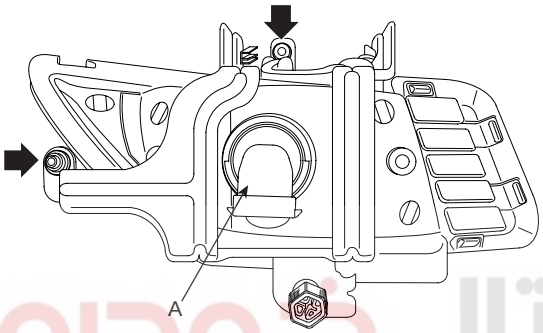


ETRF495G

FRONT FOG LAMPS

REPLACEMENT EFE7BFB8

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

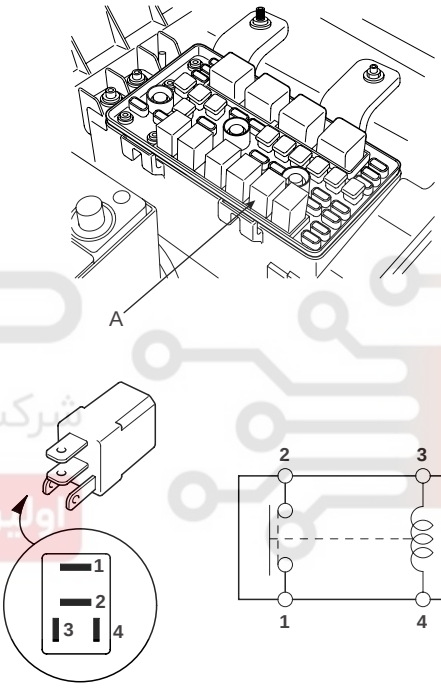


KTRE495F

4. Installation is the reverse of removal.

FRONT FOG LAMP RELAY INSPECTION E1B1508B

1. Pull out the front fog lamp (A) relay from the engine compartment relay box.
2. Check for continuity between terminals. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.
3. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.



ETRF496A

Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

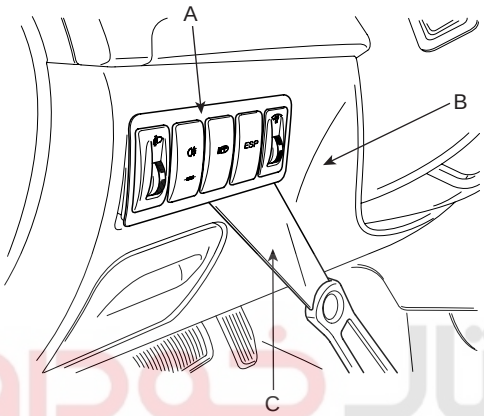
ETKE903A

REAR FOG LAMPS

INSPECTION E633BED6

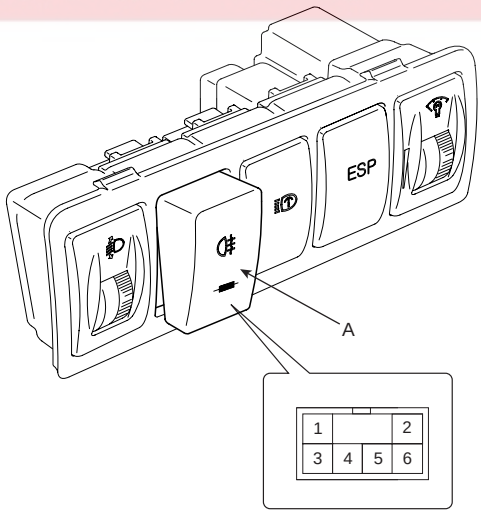
REAR FOG LAMP SWITCH

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.



ETRF497A

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



ETRF497B

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

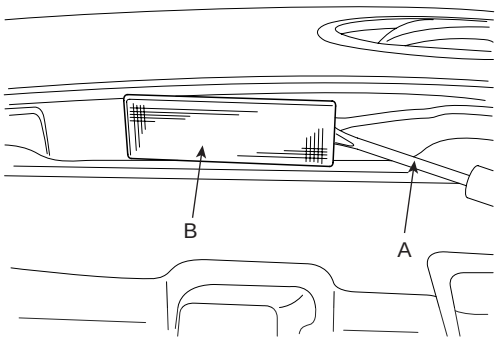
Terminal / Position	2	5	1	4	3
ON		Illumination		IND.	
OFF					

LTGE441B

LICENSE LAMPS

REPLACEMENT EC59412D

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



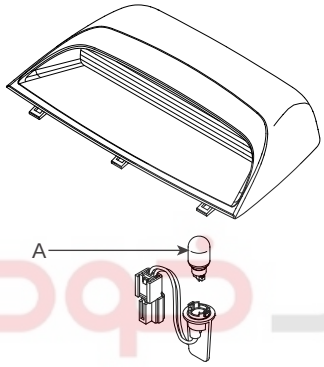
KTRE498A

3. Replace the bulb.
4. Installation is the reverse of removal.

STOP LAMPS

REPLACEMENT E7BDD9A9

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.



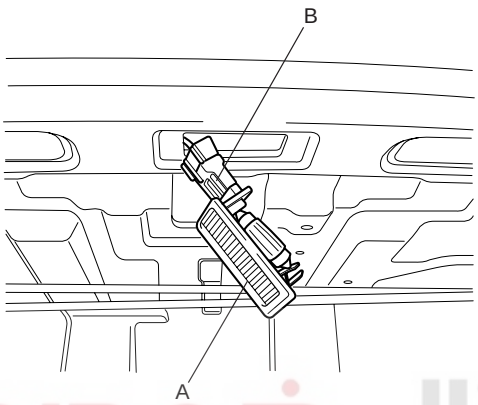
ETRF499A

5. Installation is the reverse of removal.

TRUNK LAMPS

REPLACEMENT EEEBCDD7

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

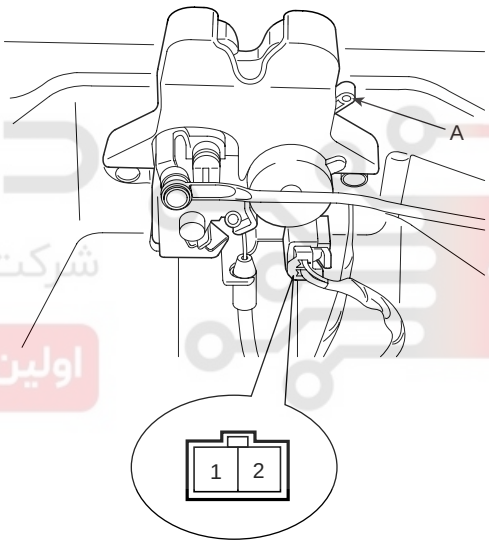
3. Replace the bulb.
4. Installation is the reverse of removal.

INSPECTION ED561E5B

TRUNK ROOM LAMP SWITCH

1. Disconnect the negative (-) battery terminal.
2. Remove the trunk lid trim panel. (Refer to the Body group - trunk lid)
3. Disconnect the 2P connector from the actuator.
4. Check for continuity between the terminal No. 1 and body while pushing the rod (A).

Switch rod condition	Continuity
Pushed (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



ETRF499C

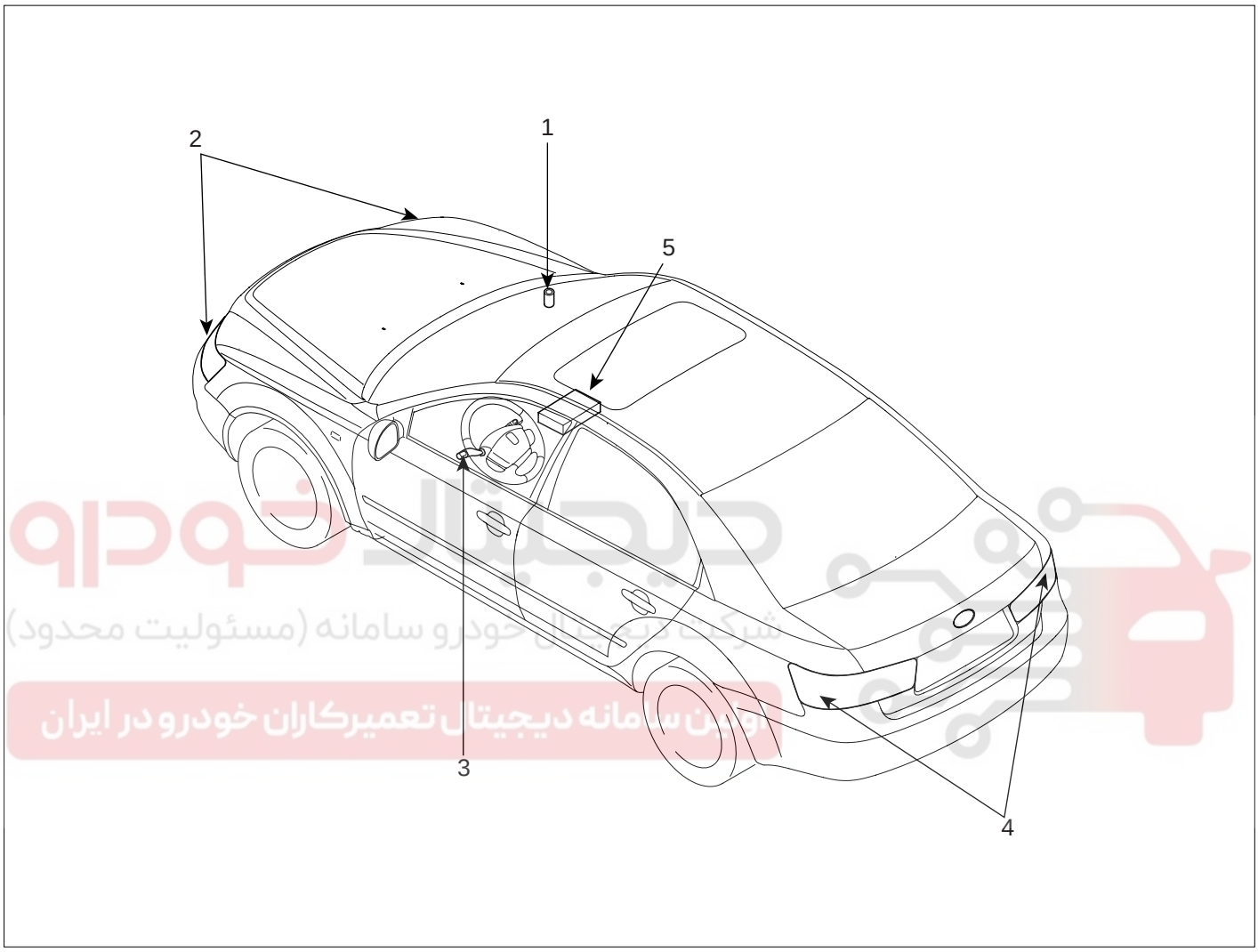
TROUBLESHOOTING EA42DDA3

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:20A, HIGH:20A) blown	Check for short and replace fuse
	Head lamp fuse (10A) 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 (10A) blown	Check for short and replace fuse
	Flasher unit faulty	Check Flasher unit
	Hazard switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps
	Flasher unit faulty	Check Flasher unit

Symptom	Possible cause	Remedy
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

COMPONENT LOCATION EBA551DC



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

ETRF510A

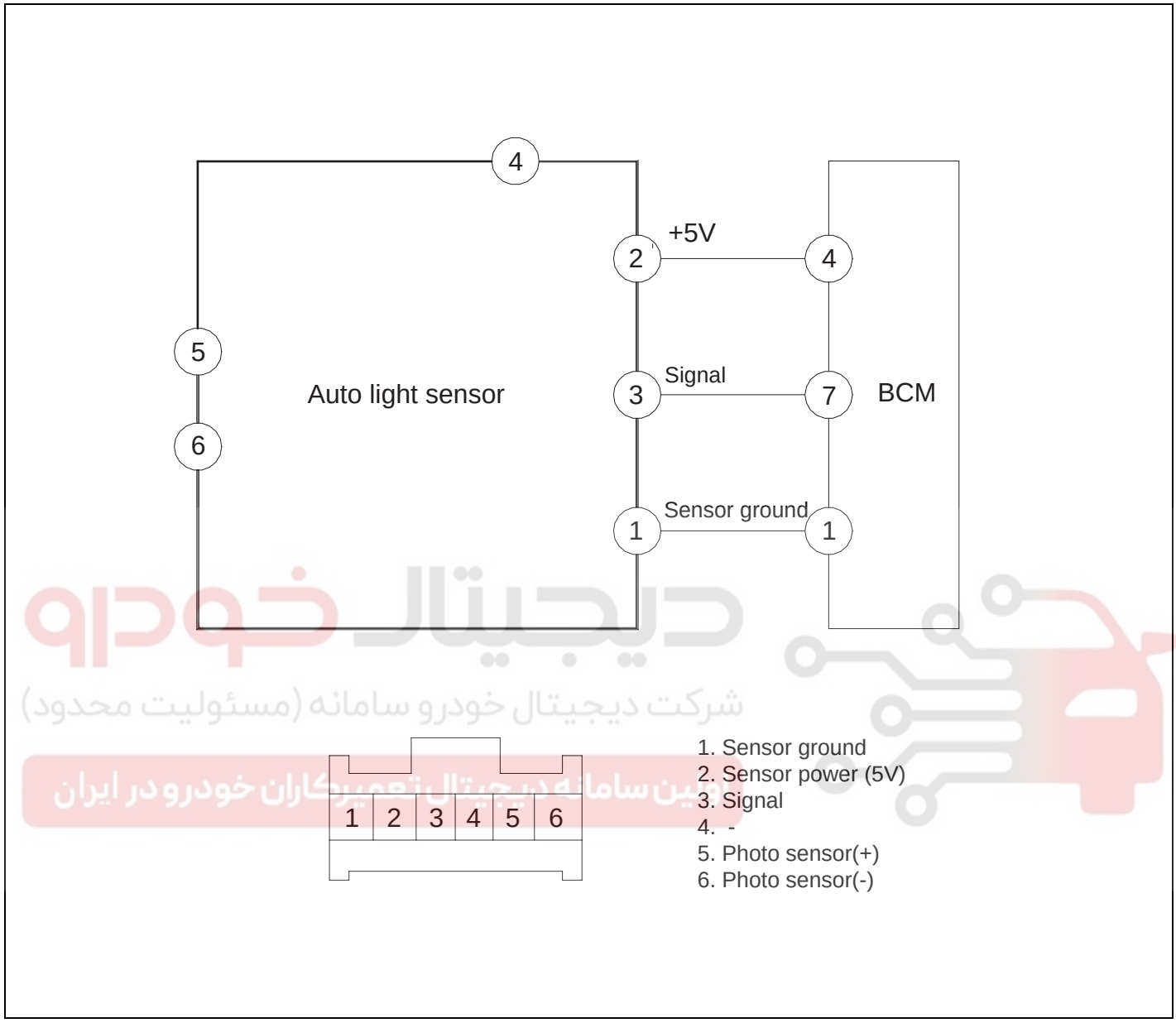
DESCRIPTION EAC2634B

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.

SPECIFICATIONS E7808213

Items	Specifications
Rated voltage	12V
Load	Max. 1mA
Detection illuminations Tail lamp / Head lamp	ON : 24 ± 5.2 (Lux), 0.81 ±0.08 (V) OFF : 48 ± 10.5 (Lux), 1.41 ±0.10 (V)

CIRCUIT DIAGRAM EBA1E44E

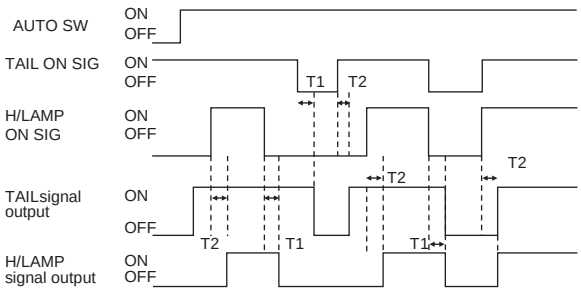


ETRF510B

INSPECTION E7E6CDE2

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 IGN ON.
   2) Light is turned ON after 2sec±0.2sec when auto light sensor value is same as light ON input value.
   3) Light is turned OFF after 2sec±0.2sec when sensor value is same as light OFF input value.
   4) Tail lamp and head lamp are turned ON when sensor value is same as tail lamp ON input value.
   5) Light ON value of sensor is based on the below table.
   6) Head lamp signal is output when head lamp switch is ON.
   7) After head lamp is turned OFF, head lamp signal output is kept if head lamp ON luminance condition is met at auto light switch ON.
   8) After head lamp is turned OFF, head lamp signal output is immediately stopped if head lamp OFF luminance condition is met at auto light switch ON.
   9) After head lamp is turned OFF, head lamp signal output is immediately stopped at tail switch signal input.
   10) After head lamp is turned OFF, head lamp signal output is stopped after 0.7s if there is no input of auto light switch or tail switch. (Shall be no flashing of head lamp)
   11) Head lamp signal output is stopped when switch position is changed from AUTO to head lamp switch during head lamp ON with auto light. (Shall be no flashing of head lamp)
   12) The condition of head lamp ON/OFF is same as the one of tail lamp ON/OFF at auto light switch ON. Light ON value of the input sensor is based on the table.

	TAIL LAMP	HEAD LAMP
ON	0.81V±0.08V	Same as tail sensor value
OFF	1.41V±0.10V	Same as tail sensor value



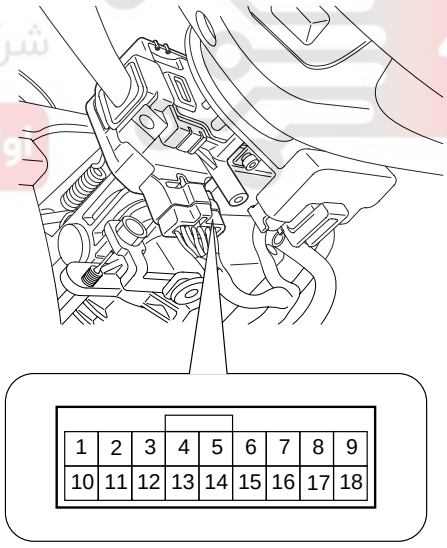
ETRF141X

T1/T2 : 2.0 ± 0.2sec.

AUTO LIGHT SWITCH

INSPECTION E76A5486

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



KTRE031E

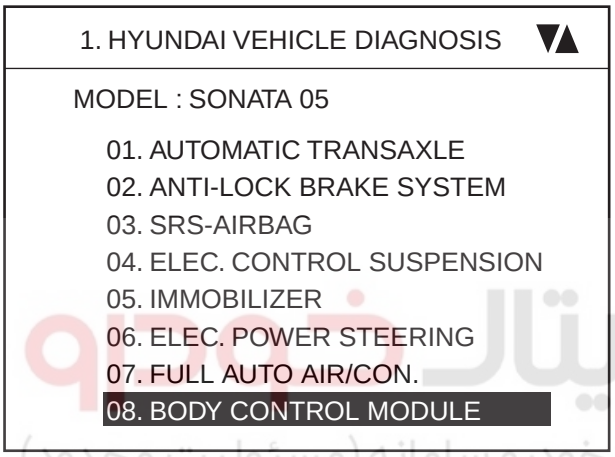
Terminal / Position	14	15	16	17
OFF				
I	○			○
II	○	○		○
AUTO			○	○

LTGE031E

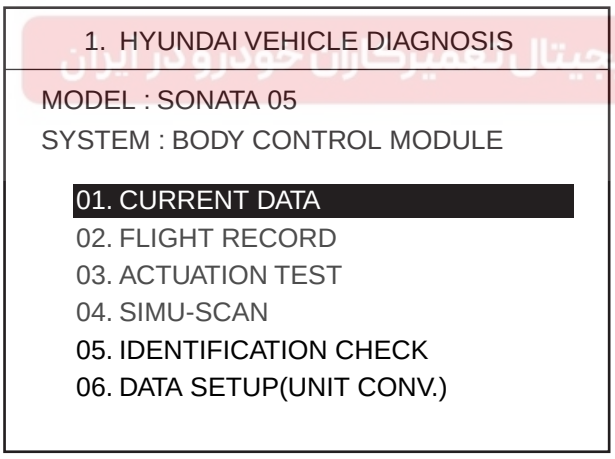
AUTO LIGHT SENSOR

INSPECTION E486DEE8

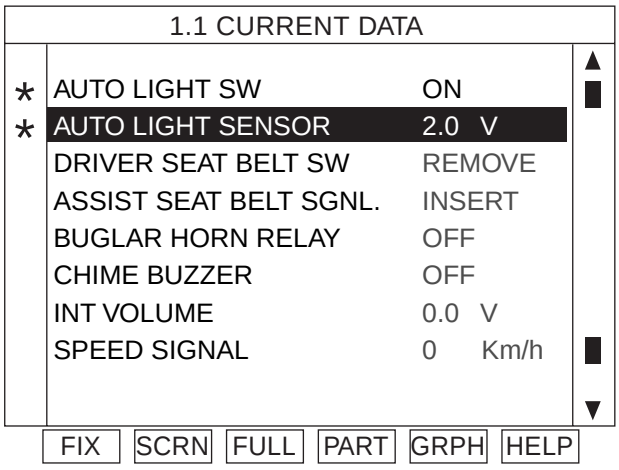
1. Ignition "ON"
2. Using the scan tool.
3. Emit intensive light toward auto light sensor using sunshine, and check the output voltage change.
4. The voltage will rise with higher intensive light and reduce with lower intensive light.



ETRF144A



ETRF144B

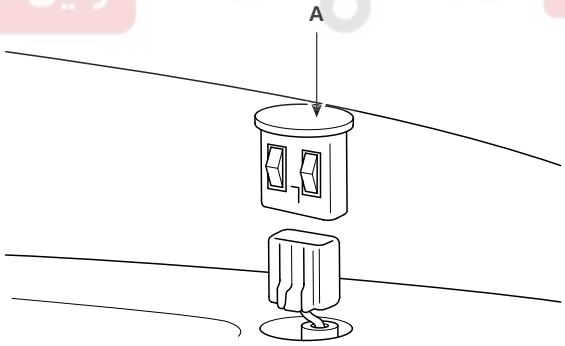


ETRF513C

NOTE

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.



ATIE510B

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

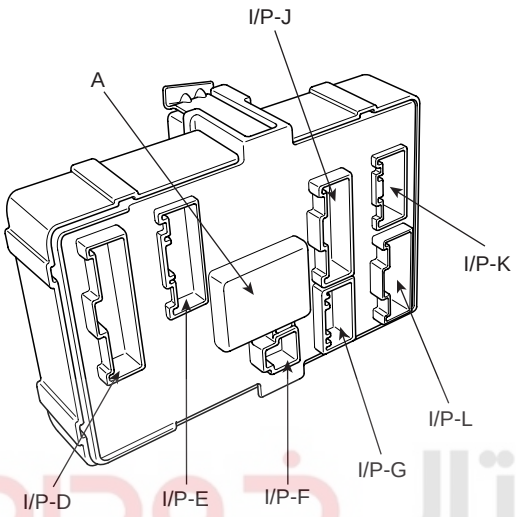
Tester connection	Condition	Specified condition
1-Ground	Auto light switch ON	Continuity
2-Ground	Sensor power	5V

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

DAYTIME RUNNING LIGHTS

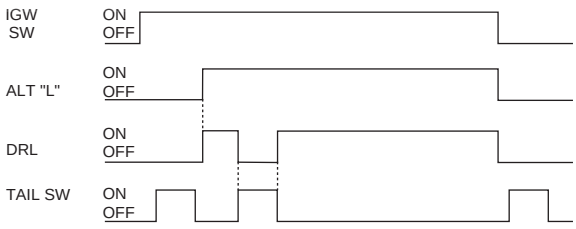
INSPECTION EA77BFF3

1. The daytime running unit (A) is integrated in the junction box.



ETRF521A

2. Check that the light operate according to the following timing chart.



ETRF521B

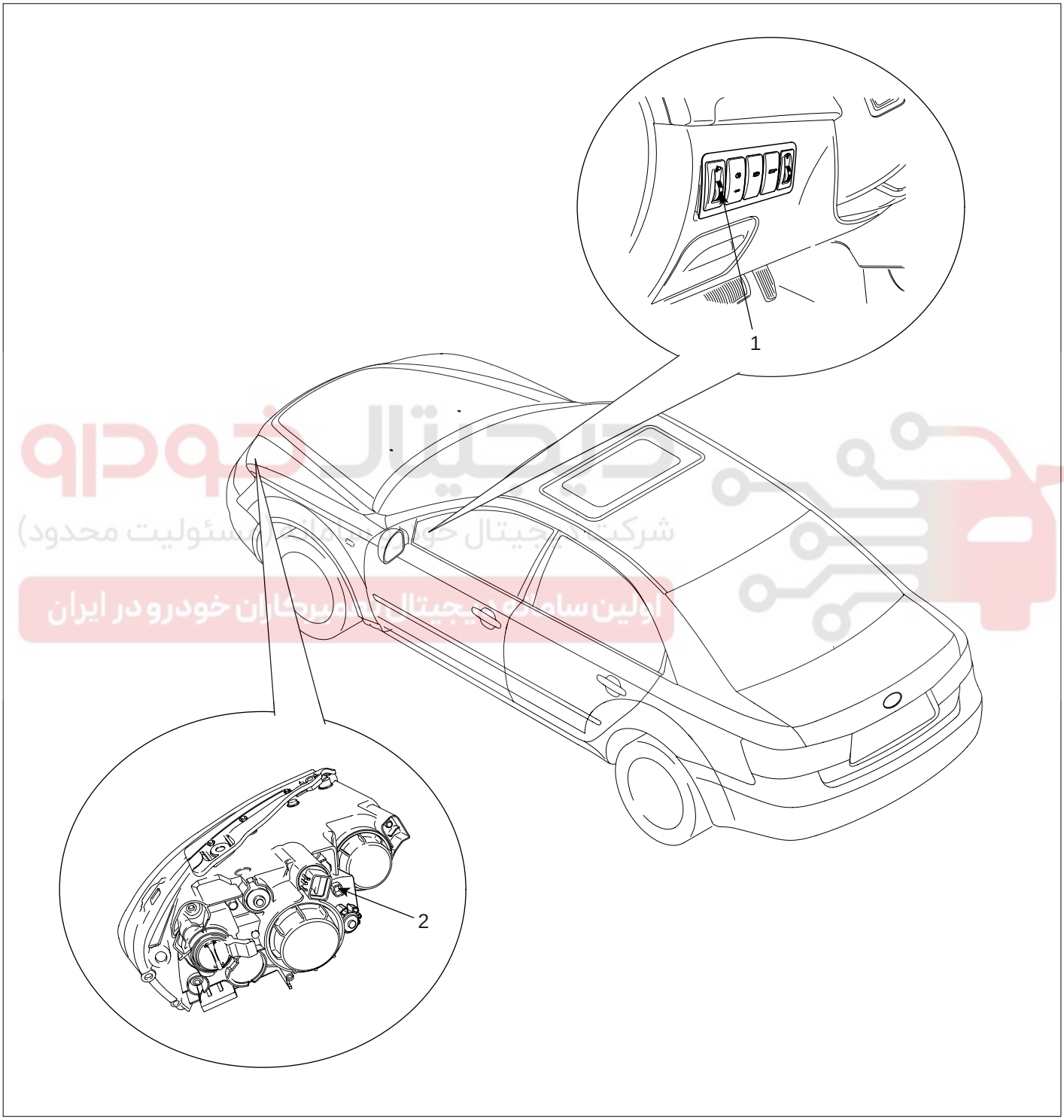
3. Inspect the connector and terminals to be sure they are all making good contact.
   If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system.
   If the terminals look OK, go to step 4.

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 junction box must be faulty; replace it.

Terminal	Test condition	Test : Desired result
I/P-K (3)	Under all conditions	Check for voltage to ground : There should be battery voltage.
I/P-K (6)	Engine running	Check for voltage to ground : There should be battery voltage.
I/P-K (11)	Under all conditions	Check for voltage to ground : There should be battery voltage.
I/P-E (13)	Under all conditions	Check for voltage to ground : There should be continuity.

HEAD LAMP LEVELING DEVICE

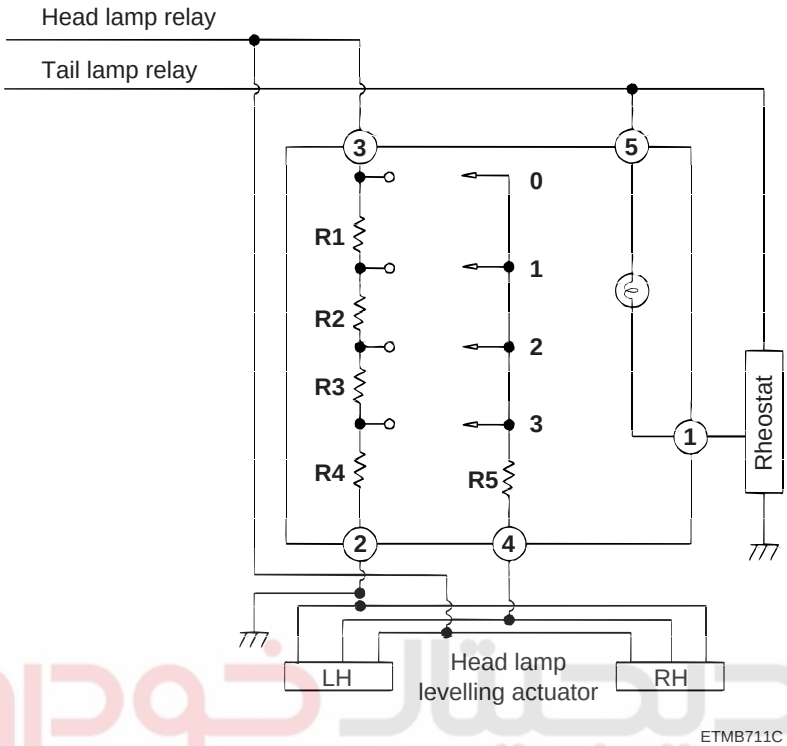
COMPONENT LOCATION EC298CBD



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

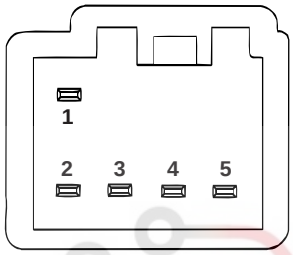
ETRF540A

CIRCUIT DIAGRAM E33E7EBC



PIN CONNECTION

PIN NO	Description
5	Illumination(+)
1	Rheostat
4	Actuator (+)
2	Ground
3	Head lamp relay

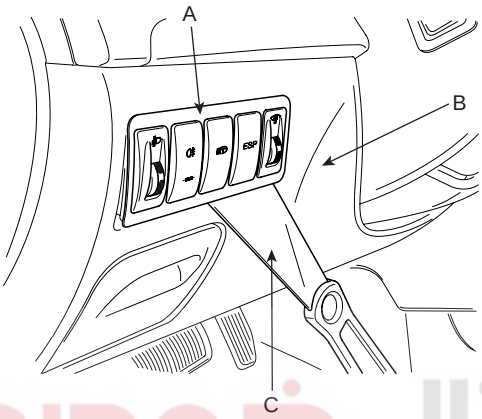


ETRF542A

HEAD LAMP LEVELING SWITCH

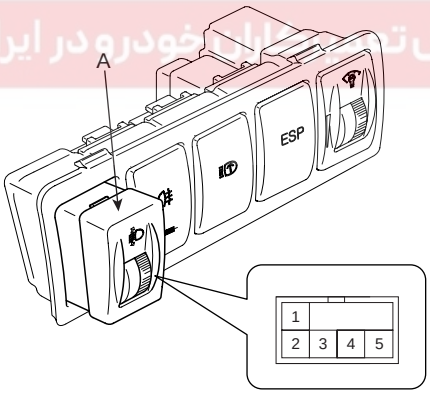
INSPECTION EA2CB3CC

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.



ETRF497A

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



ETRF542B

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

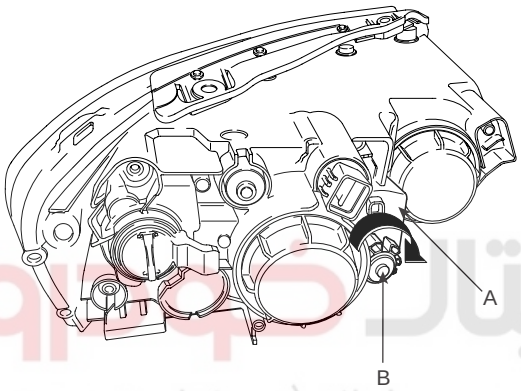
Position No.	Rotation	Voltage (V)
0	0°	12.06 ± 0.5V
1	20°	9.67 ± 0.5V
2	40°	7.70 ± 0.5V
3	60°	6.60 ± 0.5V

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

HEAD LAMP LEVELING ACTUATOR

REPLACEMENT EE72A6CF

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.

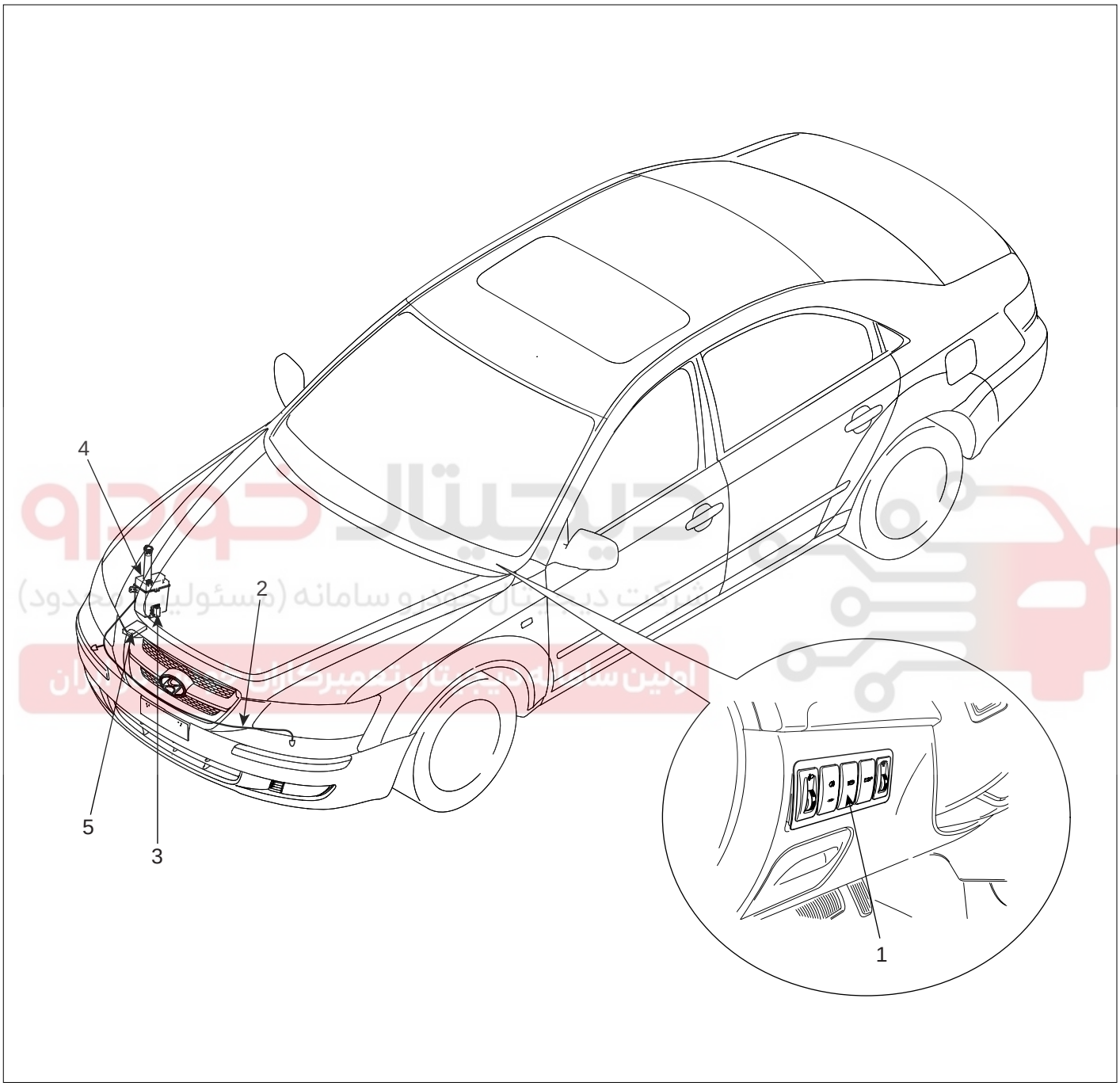


ETRF541A

4. Installation is the reverse of removal procedure.

HEAD LAMP WASHER

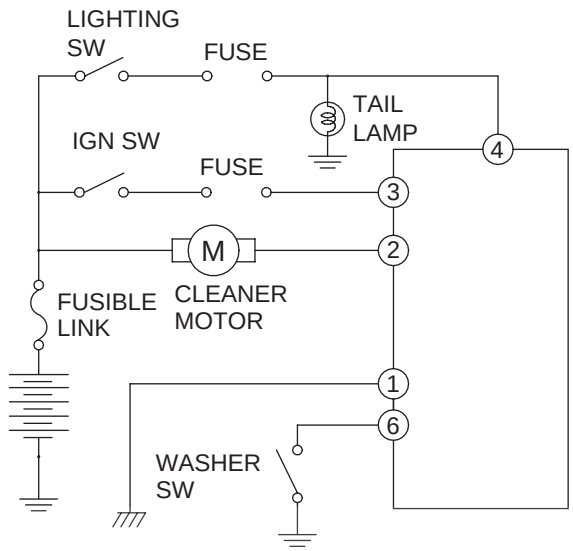
COMPONENT LOCATION E0BD791C



1. Head lamp washer switch
2. Head lamp washer hose
3. Head lamp washer motor
4. Washer reservoir
5. Head lamp washer relay

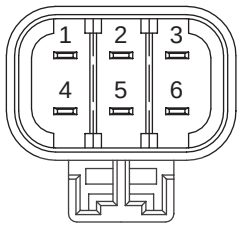
ETRF560A

CIRCUIT DIAGRAM EC167FEE



PIN CONNECTION

PIN NO	Description
1	Ground
2	Washer motor
3	IG2
4	Lighting switch
5	-
6	Washer switch

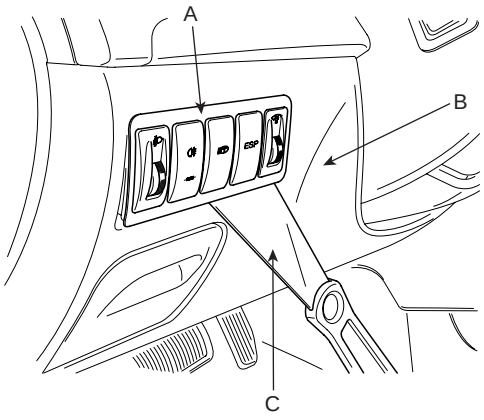


ETRF560B

HEAD LAMP WASHER SWITCH

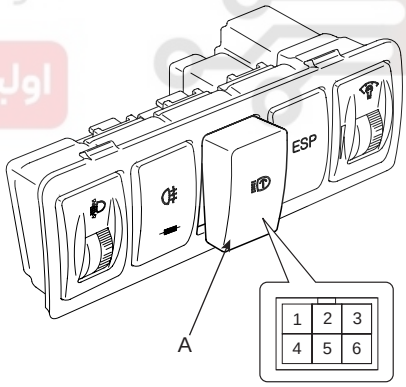
INSPECTION E78C38C2

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.



ETRF497A

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



ETRF561A

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

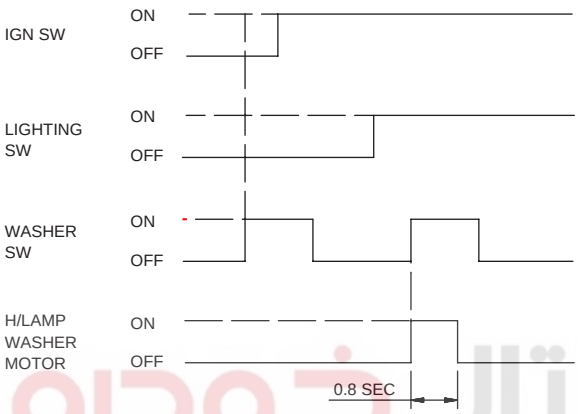
Terminal / Position	2	5	4	3
ON		Illumination		
OFF				

ETRF561B

HEAD LAMP WASHER RELAY

INSPECTION EB55B777

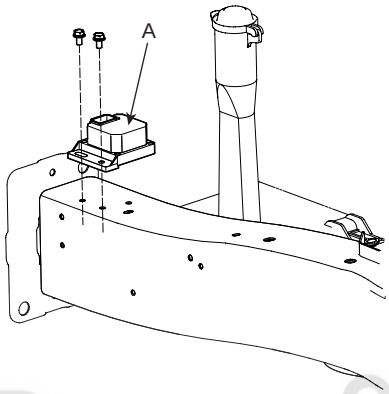
1. While operating the head lamp washer switch, check if the operations are normal as shown in the timing chart.
2. If operations are abnormal, check the head lamp washer relay.



ETRF562A

REPLACEMENT E7A0DB9E

1. Disconnect the negative (-) battery terminal.
2. Remove the right head lamp assembly (Refer to the head lamp).
3. Disconnect the connector and then remove the head lamp washer relay (A) under the right head lamp after loosening the bolts (2EA).



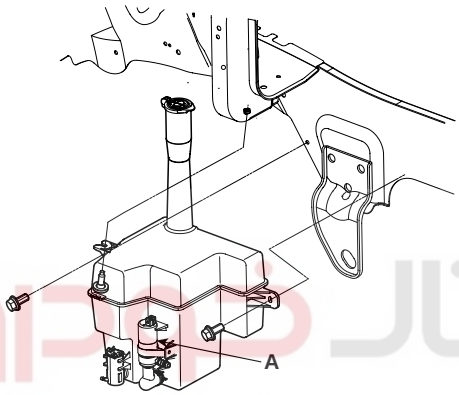
ETRF562B

4. Installation is the reverse of removal procedure.

HEAD LAMP WASHER MOTOR

REPLACEMENT E069016B

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover. (Refer to Body group - Front bumper)
3. Remove the washer hose and the washer motor connector (A).
4. Remove the washer reservoir after removing 3 bolts.

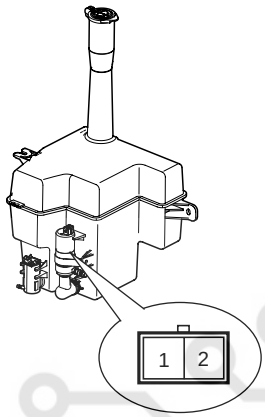


ETRF563A

5. Installation is the reverse of removal.

INSPECTION EF1EBEFD

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.



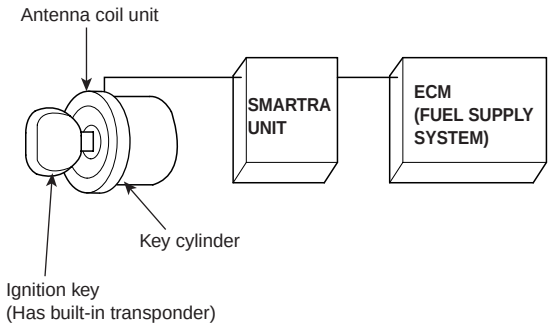
ETRF563B

IMMOBILIZER CONTROL SYSTEM

DESCRIPTION E32D2076

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. SMARTRA type immobilizer
   - The SMARTRA system consists of a transponder located in the ignition key, an antenna coil, a SMARTRA unit, an indicator light and the ECM.
   - The SMARTRA communicates to the 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 ECM.
   - If the proper key has been used, the 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 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 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 four key codes.
   - If the customer has lost his key, and cannot start the engine, contact HMC motor service station.

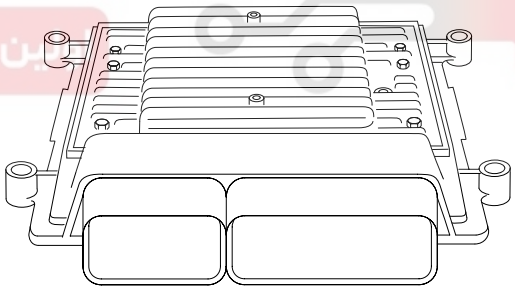


LTIF740B

COMPONENTS OPERATIONS EEAB6FC8

ECM (ENGINE CONTROL MODULE)

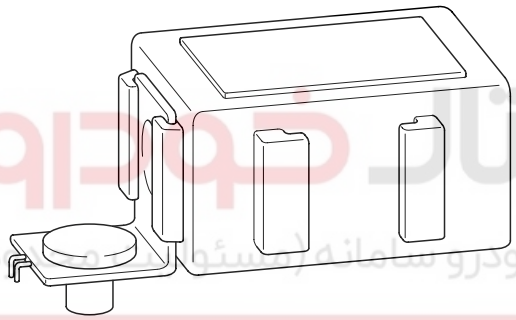
1. The ECM carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the ECM simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the ECM.



KTME741C

SMARTRA UNIT

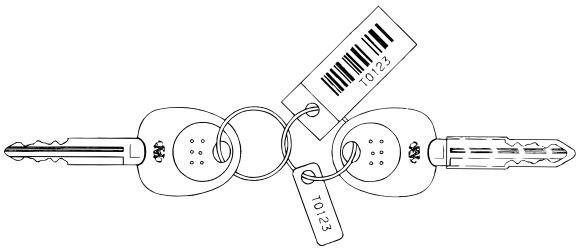
The SMARTRA carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The SMARTRA is mounted behind of the crush pad under panel close to the antenna coil for RF transmission and receiving.
The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the SMARTRA device. And, the received messages from the 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 ECM and vice versa.



KTME741B

TRANSPONDER (BUILT-IN KEYS)

The transponder 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.

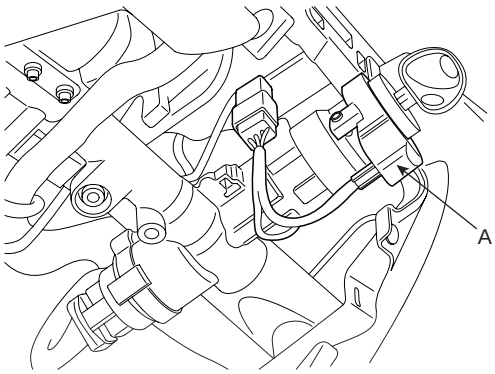


KTME741A

ANTENNA COIL

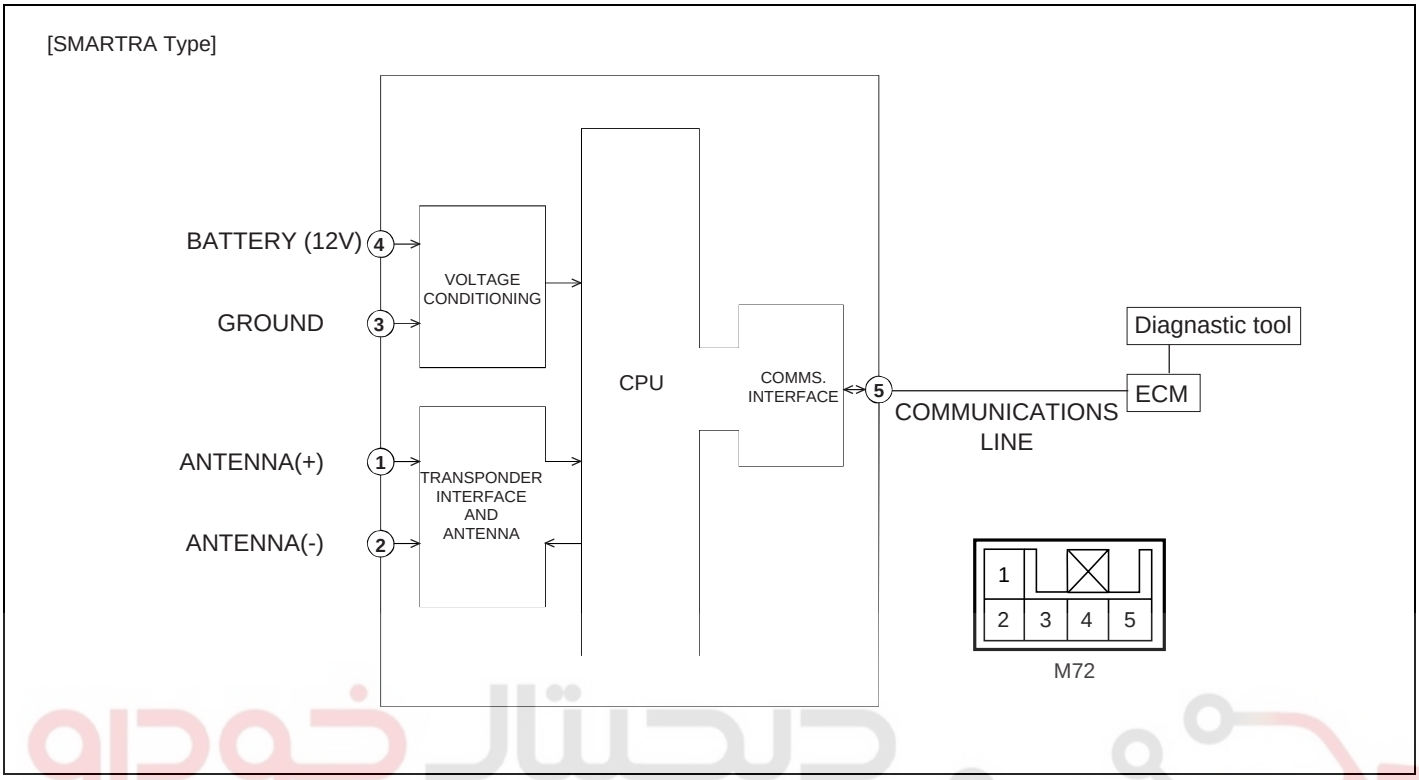
The antenna coil (A) has the following functions.
- The antenna coil supplies energy to the transponder.
- The antenna coil receives signal from the transponder.
- The antenna coil sends transponder signal to the SMARTRA.

It is located directly in front of the steering handle lock.

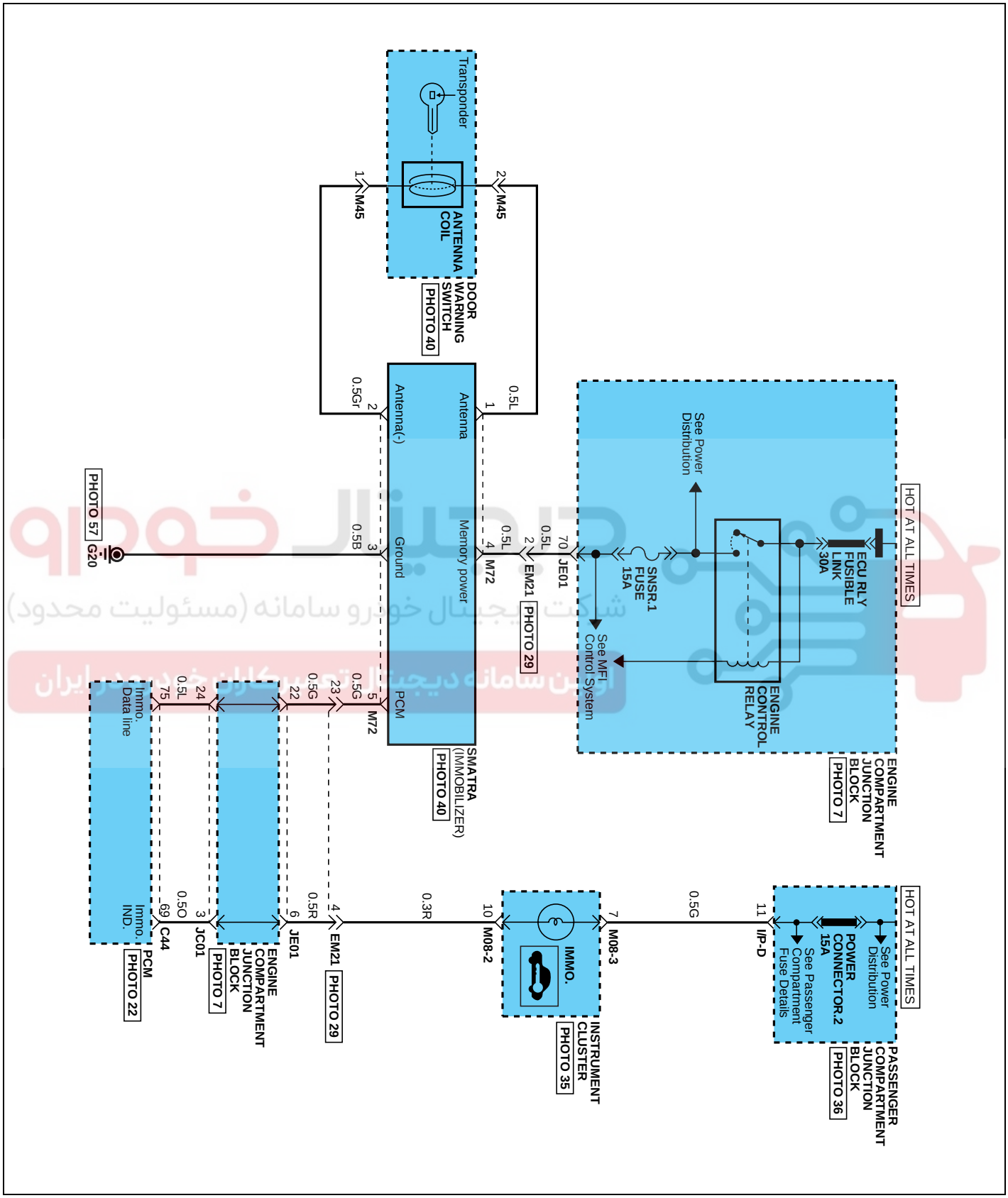


KTRE781B

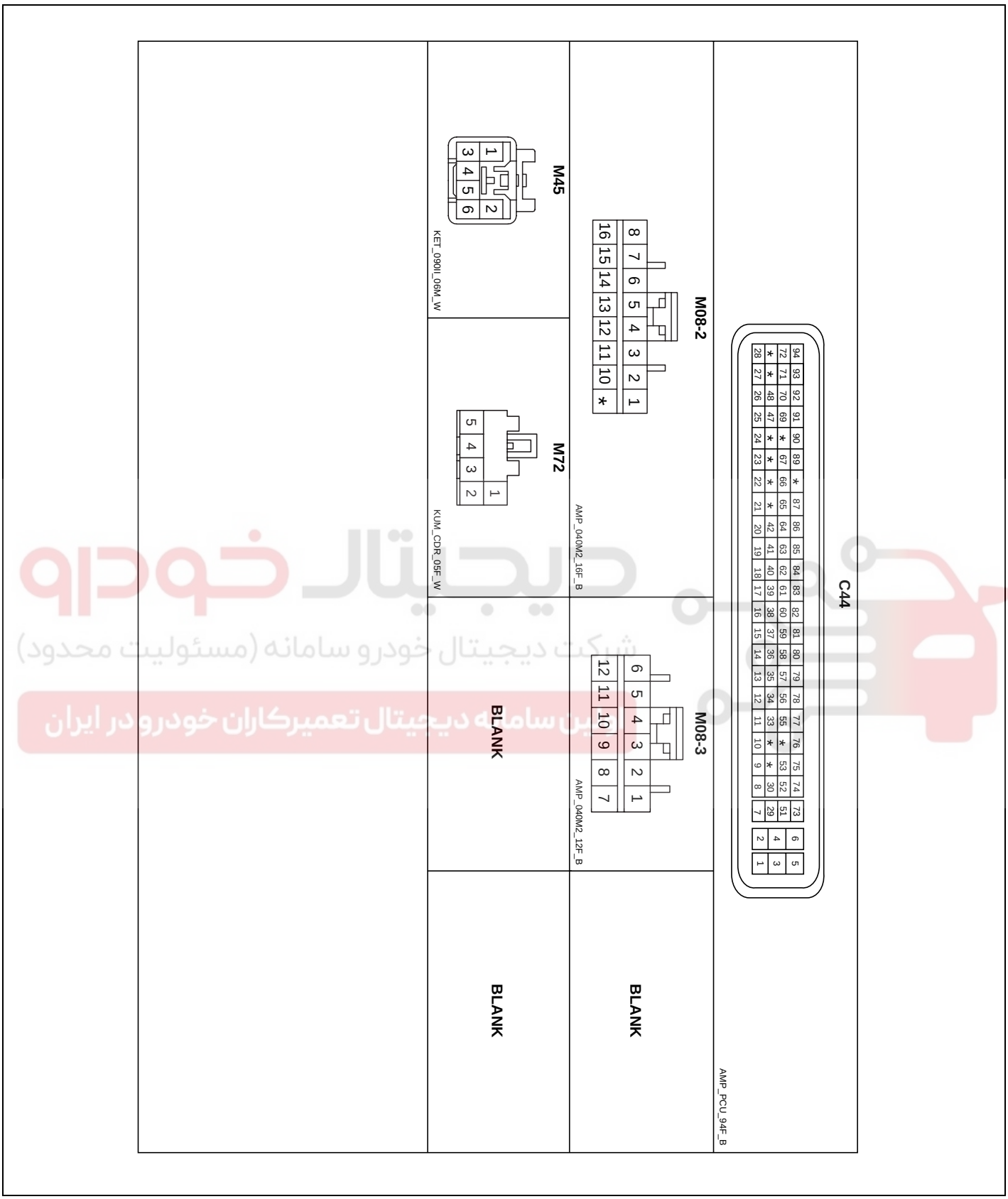
SYSTEM BLOCK DIAGRAM E702AAF4



CIRCUIT DIAGRAM



ETRF740J



ETRF740L

TEACHING PROCEDURES E2BDF5EA

1. Key Teaching Procedure
   Key teaching must be done after replacing a defective ECM or when providing additional keys to the vehicle owner.

   The procedure starts with an ECM request for vehicle specific data (PIN code: 6digits) from the tester. The "virgin" ECM stores the vehicle specific data and the key teaching can be started. The "learnt" ECM compares the vehicle specific data from the tester with the stored data. If the data are correct, the teaching can proceed.

   If incorrect vehicle specific data have been sent to the ECM three times, the ECM will reject the request of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation. After reconnecting the battery, the timer starts again for one hour.

   The key teaching is done by ignition on with the key and additional tester commands. The ECM stores the relevant data in the EEPROM and in the transponder. Then the ECM runs the authentication required for confirmation of the teaching process. The successful programming is then confirmed by a message to the tester.

   If the key is already known to the ECM from a previous teaching, the authentication will be accepted and the EEPROM data are updated. There is no changed transponder content (this is impossible for a learnt transponder).

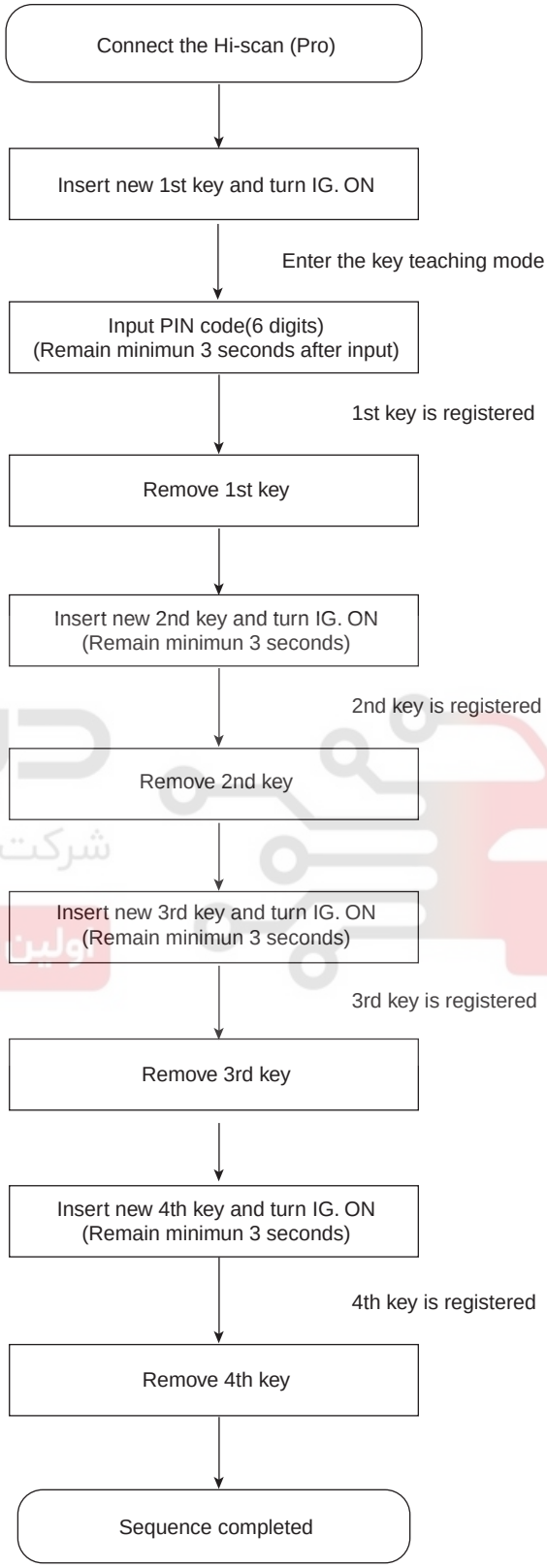
   The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognized by the ECM. This rejects the key and a message is sent to the tester.

   The ECM rejects invalid keys, which are presented for teaching. A message is sent to the tester. The key can be invalid due to faults in the transponder or other reasons, which result from unsuccessful programming of data. If the ECM detects different authenticators of a transponder and an ECM, the key is considered to be invalid.

   The maximum number of taught keys is 4

   If an error occurs during the Immobilizer Service Menu, the ECM status remains unchanged and a specific fault code is stored.

   If the ECM status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at ECM.



LTIF740M

1) ECM learnt status.

1. HYUNDAI VEHICLE DIAGNOSIS ▼

MODEL : SONATA 05

01. ENGINE
02. AUTOMATIC TRANSAXLE
03. ANTI-LOCK BRAKE SYSTEM
04. SRS-AIRBAG
05. ELEC. CONTROL SUSPENSION
06. IMMOBILIZER
07. ELEC. POWER STEERING
08. FULL AUTO AIR/CON.

ETRF741A

1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : SONATA 05
SYSTEM : IMMOBILIZER

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

ETRF741B

1.3 TEACHING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

INPUT PIN OF SIX
FIGURE AND PRESS [ENTER] KEY

CODE : 234567

ETRF741C

1.3 TEACHING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

1st KEY TEACHING
ARE YOU SURE ? [Y/N]

CODE : 234567

ETRF741D

1.3 TEACHING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

1st KEY TEACHING
COMPLETED

CODE : 234567

ETRF741E

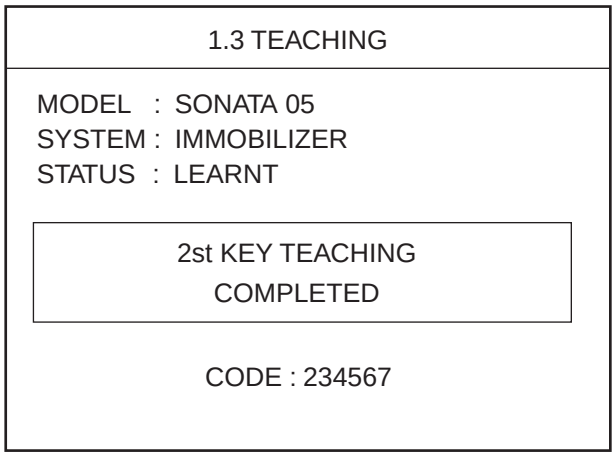
1.3 TEACHING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

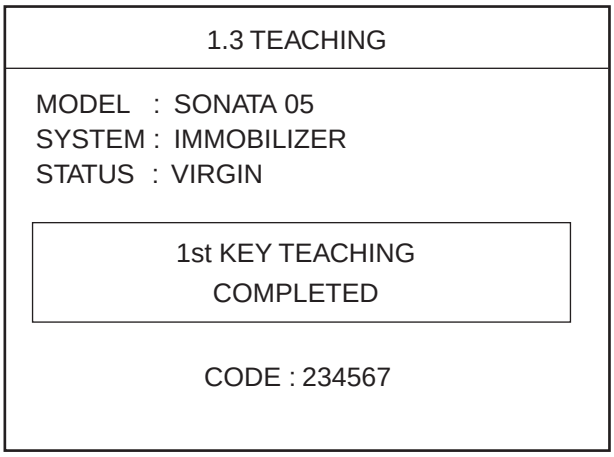
2st KEY TEACHING
ARE YOU SURE ? [Y/N]

CODE : 234567

ETRF741F

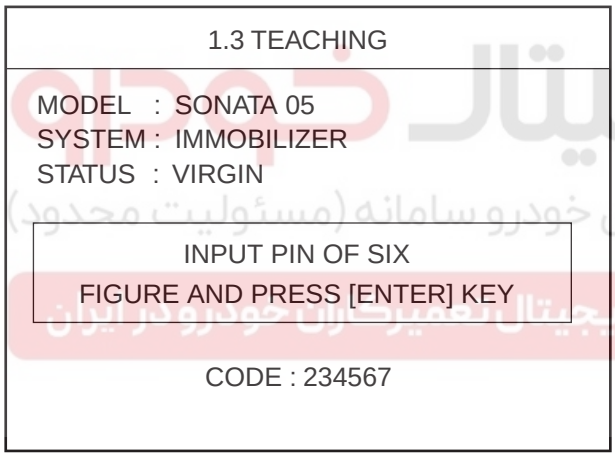


ETRF741G

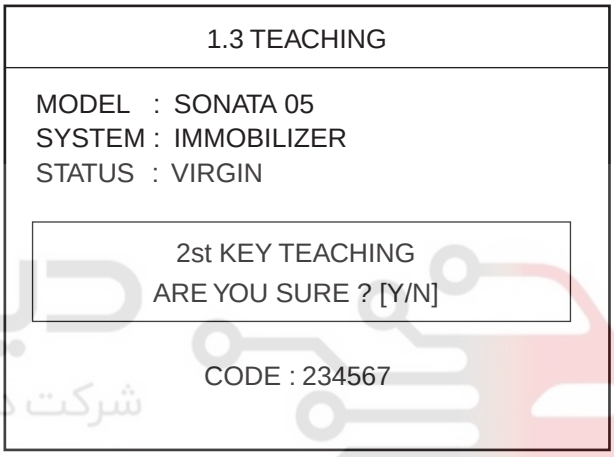


ETRF741J

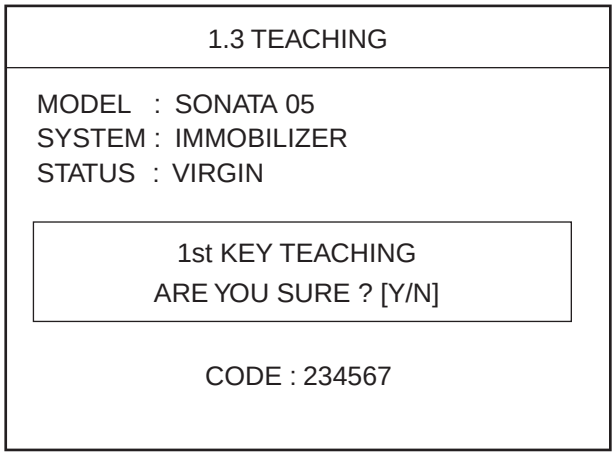
2) ECM virgin status.
After replacing new "ECM" scantool displays that ECM is virgin status in Key Teaching mode.
"VIRGIN" status means that ECM has not matched any PIN code before.



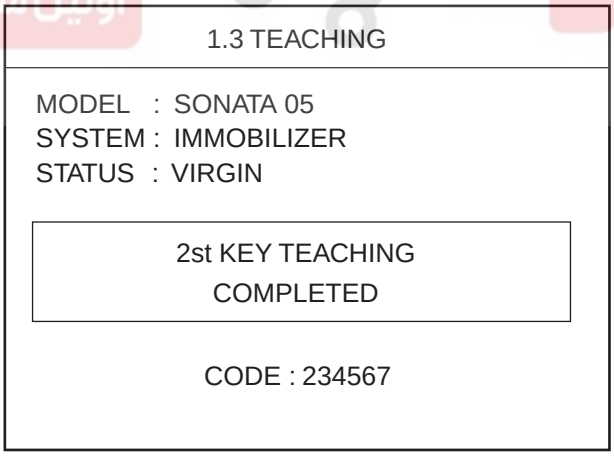
ETRF741H



ETRF741K



ETRF741I



ETRF741L

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.

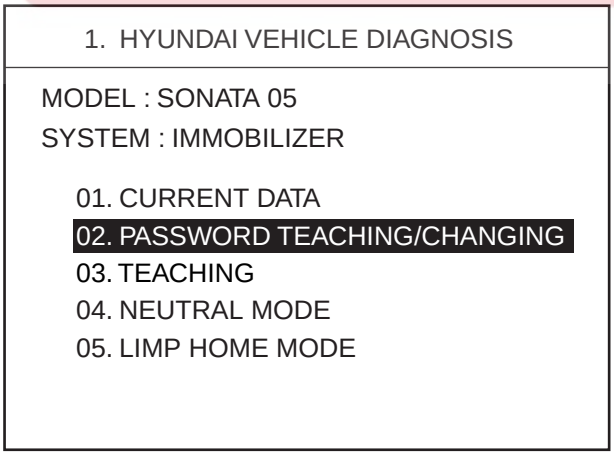
User password teaching is only accepted by a "learnt" ECM. Before first teaching of user password to an ECM, the status of the password is "virgin" No limp home function is possible.

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

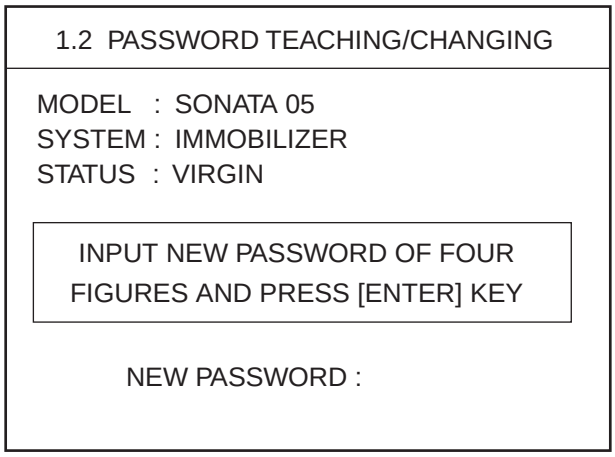
The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the ECM requests the new user password. The status remains "learnt"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

If incorrect user passwords or wrong vehicle specific data have been sent to the ECM three times, the ECM will reject the request to change the password for one hour. This time cannot be reduced by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hour.

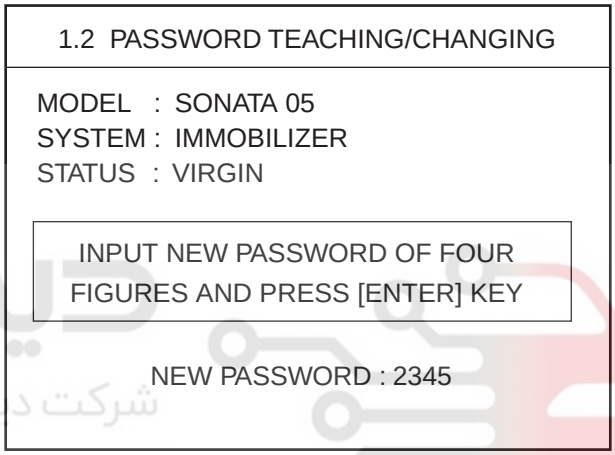
1) User password teaching



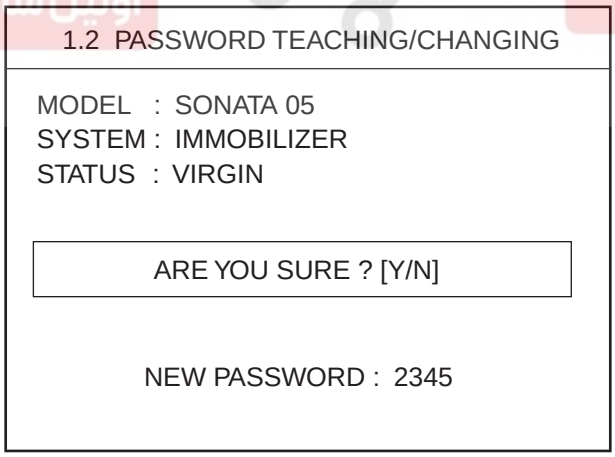
ETRF741M



ETRF741N



ETRF741O



ETRF741P

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

COMPLETED
PRESS [ESC] TO EXIT

NEW PASSWORD : 2345

ETRF741Q

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

2) User password changing

1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : SONATA 05
SYSTEM : IMMOBILIZER

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

ETRF741M

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

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

OLD PASSWORD :

ETRF741R

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

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

OLD PASSWORD : 2345

ETRF741S

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

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

NEW PASSWORD : 1234

ETRF741T

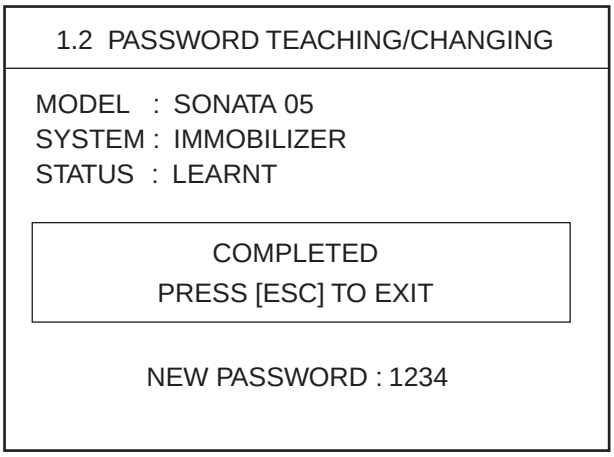
1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

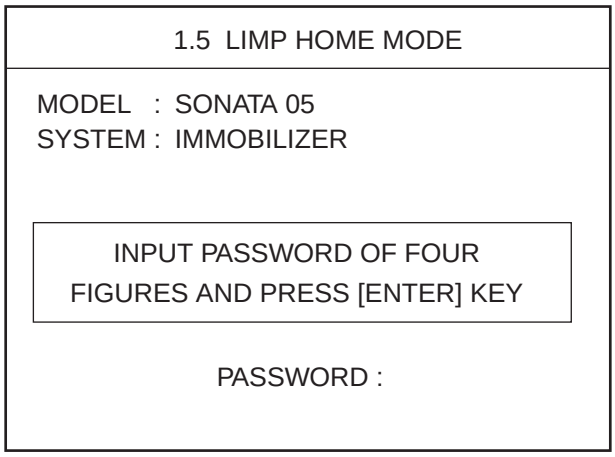
ARE YOU SURE ? [Y/N]

NEW PASSWORD : 1234

ETRF741U



ETRF741V



ETRF741X

LIMP HOME FUNCTION ED81E13D

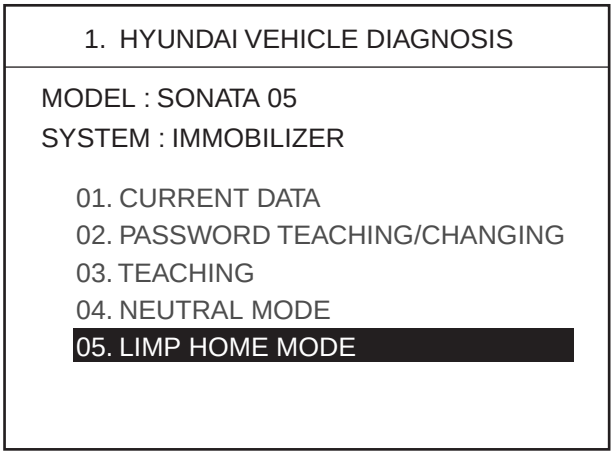
1. LIMP HOME BY TESTER

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

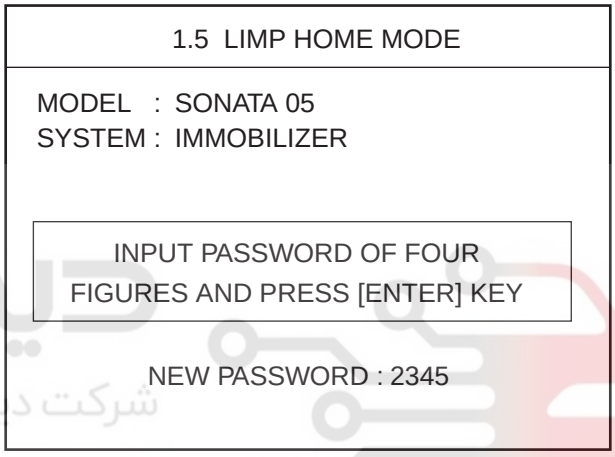
The user password can be sent to the ECM via the special tester menu.

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

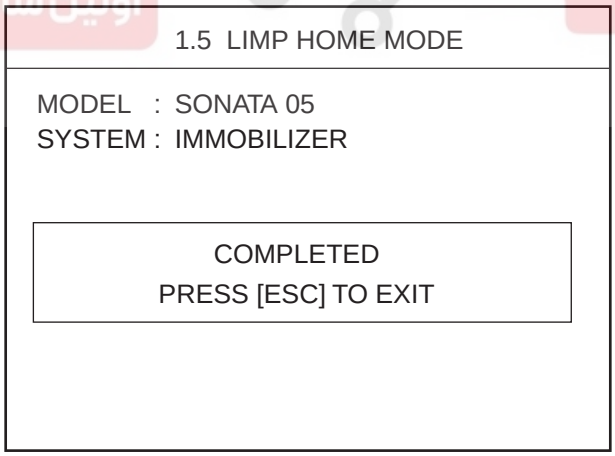
If the wrong user password is sent, the ECM will reject the request of limp home for one hour. Disconnecting the battery or any other action cannot reduce this time. After connecting the battery to the ECM, the timer starts again for one hour.



ETRF741W



ETRF741Y



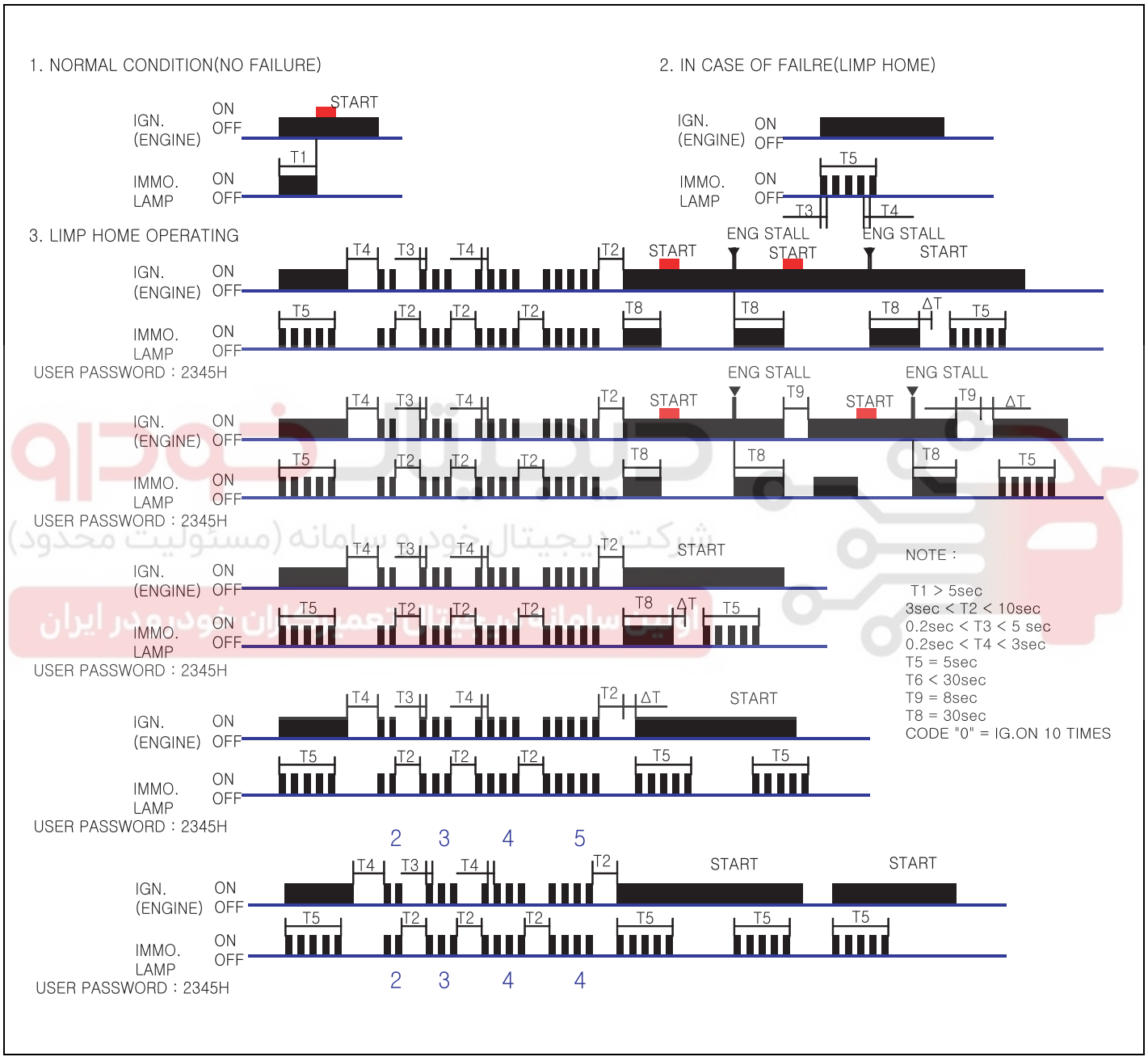
ETRF741Z

2. LIMP HOME BY IGNITION KEY

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

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

After ignition off, the ECM is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.



LTIF740N

DIAGNOSIS OF IMMOBILIZER FAULTS EFEDC5FD

- 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
Transponder key fault	1. Transponder not in password mode. 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Corrupted data from transponder 2. More than one transponder in the magnetic field (Antenna coil)	P1675 (Transponder programming error)
SMARTRA fault	1. Invalid message from SMARTRA to ECM.	P1676 (SMARTRA message error)
SMARTRA fault	1. No response from SMARTRA (Communication Line Error - Open or Short etc.)	P1690 (SMARTRA no response)
Antenna coil fault	1. Antenna coil open/short circuit	P1691 (Antenna coil error)
Transponder key fault	1. Corrupted data from transponder 2. More than one transponder in the magnetic field (Antenna coil)	P1693 (Transponder no response error/invalid response)
ECM fault	1. Request from ECM is invalid (Protocol layer violation- Invalid request, check sum error etc.)	P1694 (ECU signal error)
ECM internal permanent memory (EEPROM) fault	1. ECM internal permanent memory (EEPROM) fault 2. Invalid write operation to permanent memory (EEPROM)	P1695 (EMS memory error)
Invalid key fault	1. Virgin transponder at EMS status "Learnt" 2. Learnt (Invalid) Transponder at EMS status "Learnt"(Authentication fail)	P1696 (Authentication fail)
Locked by timer	1. Exceeding the maximum limit of Twice IGN ON (⊇ 32 times)	P1699 (Twice IG ON over trial)

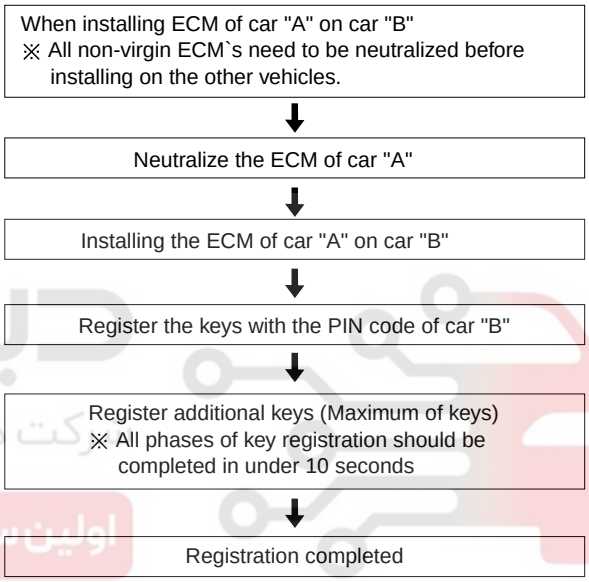
PROBLEMS AND REPLACEMENT PARTS: EC8EF16B

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

REPLACEMENT OF ECM AND SMARTRA

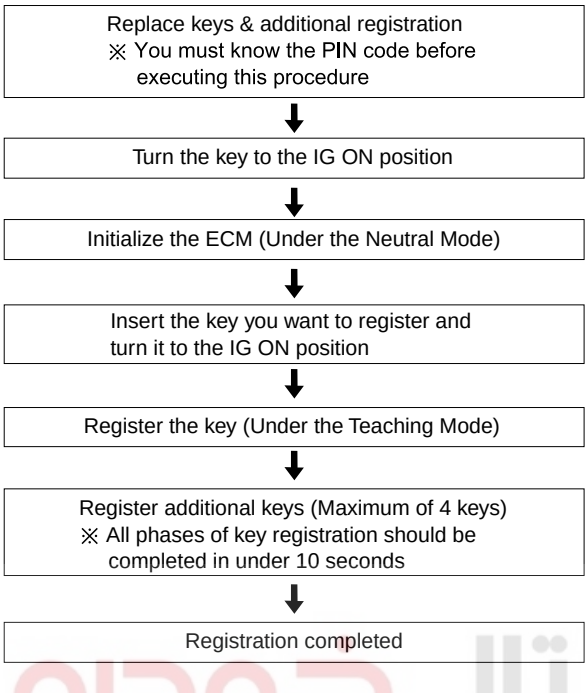
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching procedure). The vehicle specific data have to be left unchanged due to the unique programming of transponder.
In case of a defective SMARTRA, there is no special procedure required. A new SMARTRA device simply replaces the old one. There are no transponder-related data stored in this device.

1. Things to remember before a replacement (ECM)



ETRF746A

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



ETRF746B

NOTE

1. *When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.*
2. *When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2.*
   (Note that key #2 must be used within 10 seconds of removing key #1)
3. *When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.*
   The engine cannot be started even with the registered key #1.
4. *When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.*
   Always remember the 10 seconds zone.
5. *If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.*
6. *Be cautious not to overlap the transponder areas.*
7. *Problems can occur at key registration or vehicle starting if the transponders should overlap.*

NEUTRALISING OF ECM

The ECM can be set to the "neutral" status by a tester.

A valid ignition key is inserted and after ignition on is recorded, the ECM requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the ECM is neutralized.

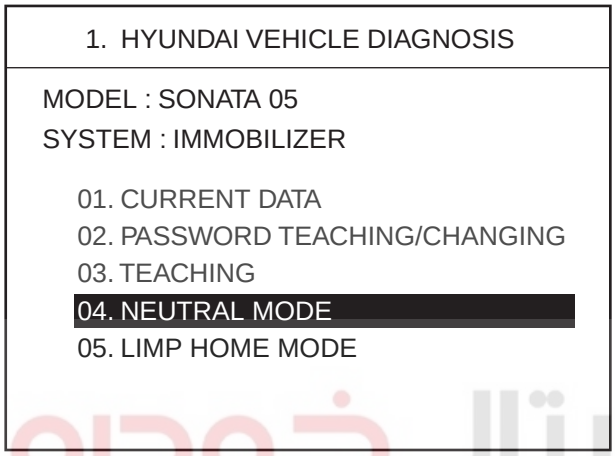
The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function, is accepted by the ECM.

The teaching of keys follows the procedure described for the virgin ECM. The vehicle specific data have to be unchanged due to the unique programming of the transponder. If data should be changed, new keys with a virgin transponder are requested.

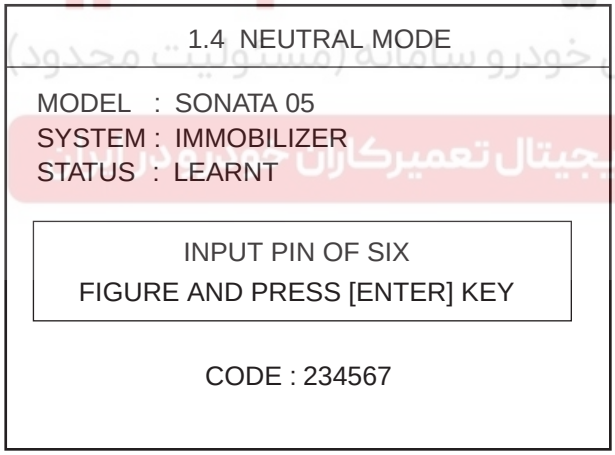
This function is for neutralizing the ECM and Key. Ex) when lost key, Neutralize the ECM then teach keys.
(Refer to the Things to do when Key & PIN Code the ECM can be set to the "neutral" status by a scanner. A valid ignition key is inserted and after ignition on is recorded, the ECM requests the vehicle specific data from the scanner. The communication messages are described at" Neutral Mode". After successfully receiving the data, the ECM is neutralized.
The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function is accepted by ECM.
The teaching of keys follows the procedure described for virgin ECM. The vehicle specific data have to be unchanged due to the unique programming of transponder. If data should be changed, new keys with virgin transponder are requested.

NOTE

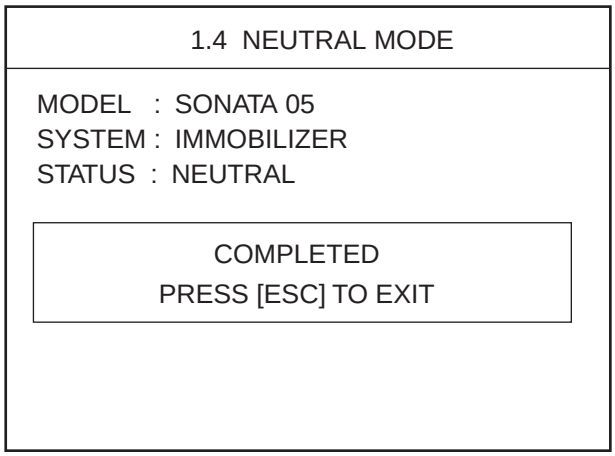
- *Neutralizing setting condition*
  - *In case of ECM status "Learnt" regardless of user password "Virgin or Learnt"*
  - *Input correct PIN code by scanner.*
  - *Neutralizing meaning .*
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)



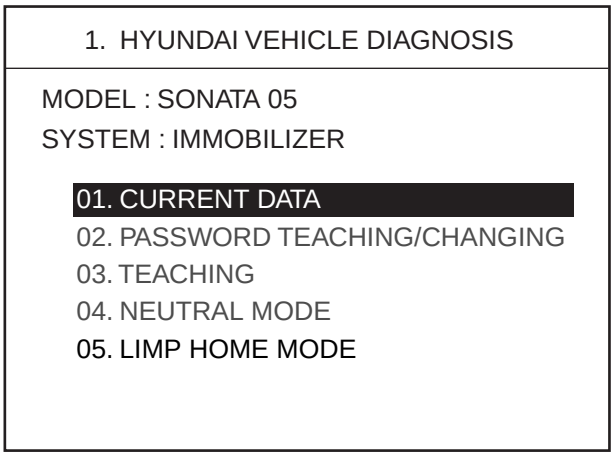
ETRF745A



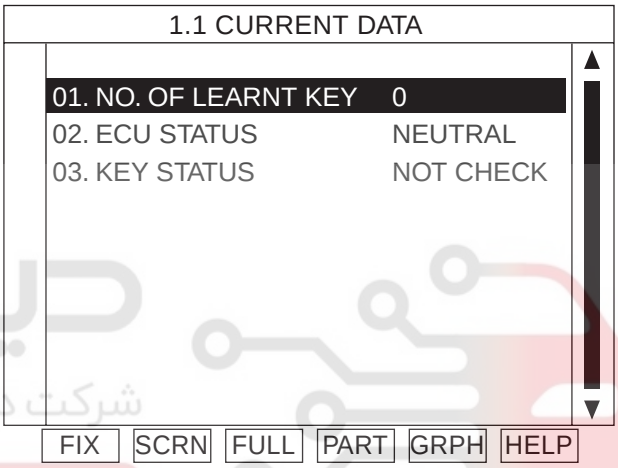
ETRF745E



ETRF745B



ETRF745C

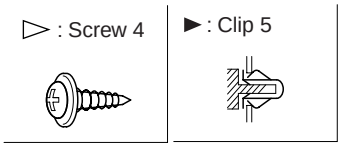


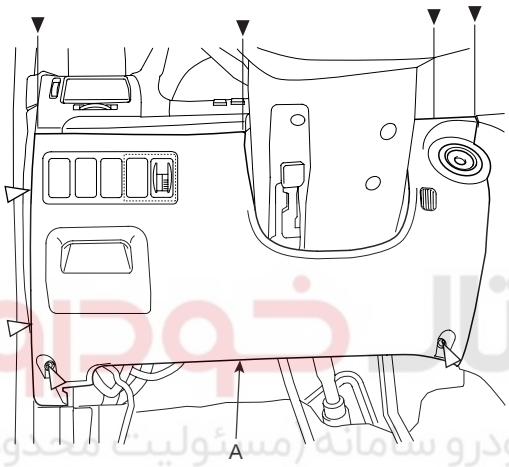
ETRF745D

IMMOBILIZER CONTROL UNIT

REPLACEMENT EE14BA2F

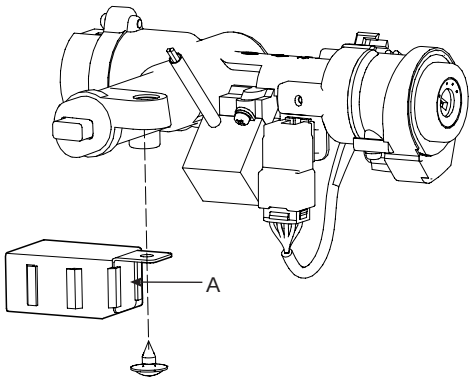
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).





ETRF495D

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.



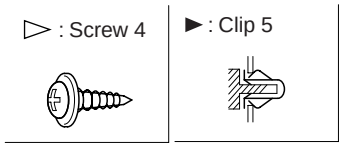
KTRE741A

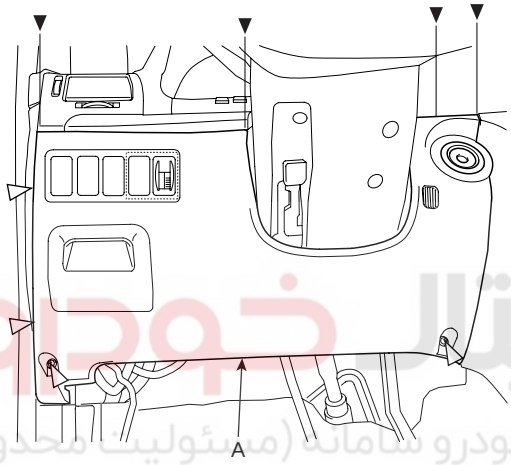
5. Installation is the reverse of removal procedure.

COIL ANTENNA

REPLACEMENT E6BD9F24

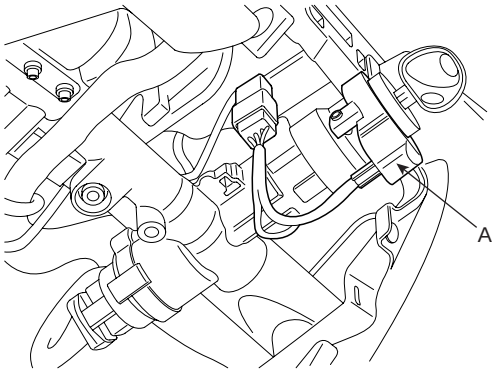
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).





ETRF495D

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.



KTRE781B

5. Installation is the reverse of removal procedure.

DTC P1674 TRANSPONDER STATUS ERROR

GENERAL DESCRIPTION E38FD213

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 unique; therefore the content of transponder can never be modified or changed. The data are a string of 9 bytes defined by vehicle manufacturer.
The transponder memory is split into two strings called authenticator and key password after this programming the transponder memory is locked and the data (PIN code) cannot be read or changed respectively. The transponder status changes from "virgin" to "learnt" Additionally every transponder includes a unique IDE (Identifier number) of 32 bit. Unique means that the IDE of all transponder is different from each other. The IDE is programmed by the transponder manufacturer and is a read-only value. The authenticator and the key password are not transferred from ECM to transponder or vice versa. Only the results from the encryption algorithm are transferred. It is almost impossible to calculate the vehicle specific data from the encryption result.
For teaching of keys and special purposes the ECM is connected to the tester device.

When IG is ON, the coil supplies energy to the transponder which in turn accumulates energy in the condenser.
Once the energy supply from the coil has stopped, using the stored energy in the condenser, the transponder transmits the ID CODE (stored within the ASIC).

DTC DESCRIPTION E18EDA0A

This DTC is defined as TP not in password mode, or Transponder transport data has been changed.

DTC DETECTING CONDITION E2E4AA7D

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Transponder Key
Detecting Factors	• Password mode invalid	
Detecting Window	• During Transponder Write or Read EEPROM Page	
Detecting Criteria	• TP not in password mode, or Transponder transport data has been changed	

MONITOR SCANTOOL DATA E0D2DDCB

Refer to DTC P1690.

COMPONENT INSPECTION E82DC5EF

1. Check Transponder

   1) Ignition "ON" & Engine "OFF".

   2) Perform neutral mode, key teaching and password teaching/changing.
   (Refer to "Reference Data in General Information")

   NOTE

   Be sure that PIN code is prepared before performing neutral mode.

   3) Is the neutral, teaching and password teaching/changing mode possible?

   YES

   Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to " Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known-good virgin Transponder and monitor CURRENT DATA.
   If the key status is displayed as "Virgin", replace Transponder.
   Perform key teaching mode in " Reference Data"
   Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR ED7ABBAB

Refer to DTC P1690.

DTC P1675 TRANSPONDER PROGRAMMING ERROR

GENERAL DESCRIPTION E8E22F7A

Refer to DTC P1674.

DTC DESCRIPTION EAA730DF

This DTC is defined as Invalid Transponder Data.

DTC DETECTING CONDITION EA0D9C81

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Transponder Key
Detecting Factors	• TP programming error	
Detecting Window	• During Transponder Write EEPROM Page request while Transponder is in authorized state.	
Detecting Criteria	• Corrupted data form Transponder (Tp), or more than one TP in the field, or no TP in the magnetic field.	

MONITOR SCANTOOL DATA E013C8C3

Refer to DTC P1690.

COMPONENT INSPECTION E0F2C732

Refer to DTC P1674.

VERIFICATION OF VEHICLE REPAIR EB8EBBFD

Refer to DTC P1690.

DTC P1676 SMARTRA MESSAGE ERROR

GENERAL DESCRIPTION ED63EC01

Refer to DTC P1690.

DTC DESCRIPTION E71DFCD5

This DTC defines Invalid message from SMARTRA to ECM.

DTC DETECTING CONDITION E9ADA22B

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Open or Short in SMARTRA Circuit • Faulty SMARTRA
Detecting Criteria	• No response from SMARTRA Invalid message from SMARTRA to ECM	

MONITOR SCANTOOL DATA E3E2F5D1

Refer to DTC P1690.

TERMINAL AND CONNECTOR INSPECTION EC8ABDBC

Refer to DTC P1690.

POWER SUPPLY CIRCUIT INSPECTION ECC8DC2F

Refer to DTC P1690.

SIGNAL CIRCUIT INSPECTION E6C4EE0A

Refer to DTC P1690.

GROUND CIRCUIT INSPECTION EA5FDC23

Refer to DTC P1690.

COMPONENT INSPECTION EE5D4ACE

Refer to DTC P1690.

VERIFICATION OF VEHICLE REPAIR EE89FACC

Refer to DTC P1690.

DTC P1690 SMARTRA NO RESPONSE

GENERAL DESCRIPTION E8D805AA

The SMARTRA carries out communication with the built-in transponder of the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The SMARTRA is mounted at the ignition lock close to the antenna coil for RF transmission and receiving.

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 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 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 ECM and vice versa.

SMARTRA : SMARt TRansponder Antenna

DTC DESCRIPTION E095CABC

This DTC is defined as No answer from SMARTRA because of communication line error(Open or short etc.)

DTC DETECTING CONDITION E0AEA67D

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Open or Short in SMARTRA Circuit • Faulty SMARTRA
Detecting Criteria	• No response from SMARTRA (Communication Line Error - Open or Short etc.)	

SIGNAL WAVEFORM E632CDF7

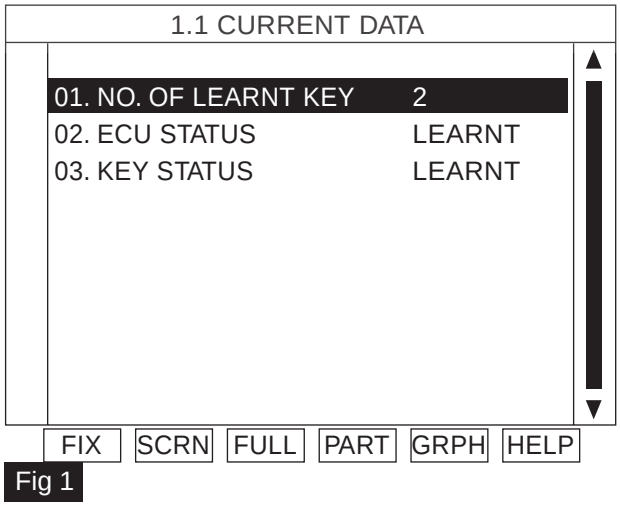


Fig 1

LTIF742A

EMS Status	Engine start with valid key	Engine start by limp home	Teaching of key	Teaching or changing of user password	Twice ignition of function
Not yet checked	No	No	No	No	No
Virgin	No	No	Yes	No	Yes, with virgin key
Learnt	Yes	Yes, with learnt user password	Yes	Yes	No
Neutral	No	No	Yes	No	No
Locked by timer	No	No	No	No	No

Fig 2

ETRF742B

1. ECM :

   1) Virgin(This is status at the end of ECM production line before delivery to customer)

   2) Neutral (This is a status that is erased all data regarding immobilizer by special command from scanner)

   3) Not Check (The status is stored in permanent memory (EEPROM or Flash etc.)
   In case of not plausible data from this circuit the ECM cannot check the status.

   4) Locked by timer (After a certain number of incorrect user Password(4) or PIN Code(6) the ECM is locked for one hour and no inputs are accepted during this time)

2. KEY :

   1) Virgin (It means the key in the key cylinder has not matched with ECM yet)

   2) Invalid (It means that data is mismatched between ECM and transponder)

   3) Not Checked (It means that ECM cannot check the transponder data in the key cylinder)
      - ECM cannot check the transponder data because of SMARTRA error or antenna coil error.
      - ECM cannot check the transponder data because of communication circuit problem between ECM and SMARTRA.
      - Key with NO Transponder
      - More than 1(One) Transponder in the magnetic field
      - No Transponder in the magnetic field
      - TP data blocked
      - TP data does not exist
      - TP data changed
      - TP Teaching error
      - Multiple TP data input

Current Data from Immobilizer will show the numbers of Key learnt, ECM status, and Key status as Fig 1. The current data provides an indication of the probable cause.
Fig 2. shows possibility of Engine start, Teaching or changing of user password according to ECM status.

MONITOR SCANTOOL DATA E5C4BAC3

1. Ignition "ON" & Engine "OFF".
2. Connect Scan tool and clear the DTCs.
3. If the DTCs are retrieved again, monitor "CURRENT DATA" to check No. of Learnt key, ECM and KEY status.

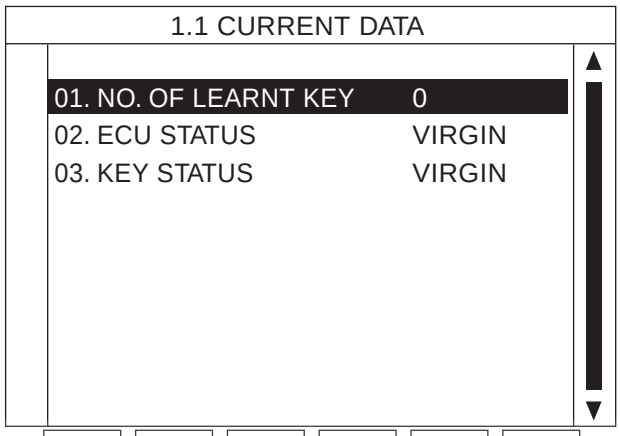


Fig 1

LTIF742C

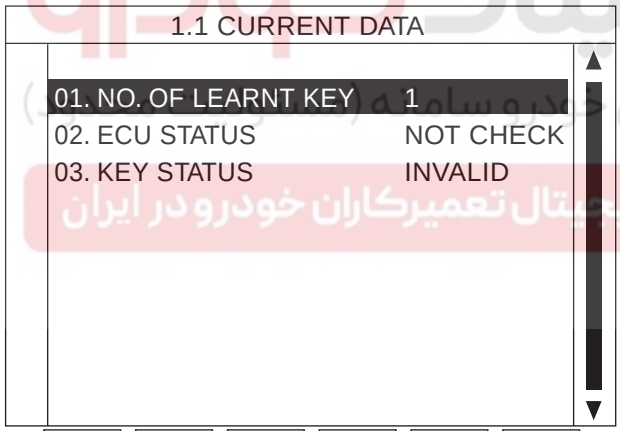


Fig 2

LTIF742D

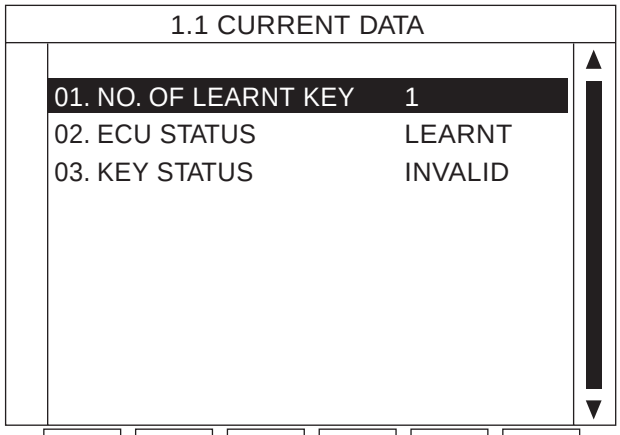


Fig 3

LTIF742E

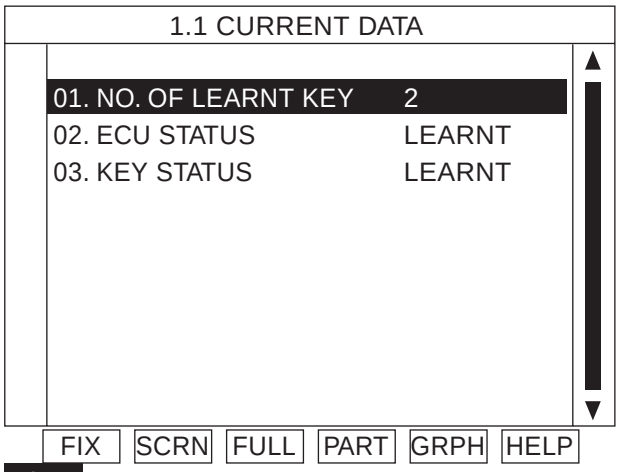


Fig 4

LTIF742F

Fig 1 : ECM has not matched with any Key yet.
Fig 2 : ECM Internal Failure.
Fig 3 : IG On with unmatched key.
Fig 4 : 2(two) Keys have been matched with ECM.

4. Are both Key and ECM status learnt?

YES

Fault is intermittent caused by poor contact in the SMARTRA's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION EAC45FC4

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

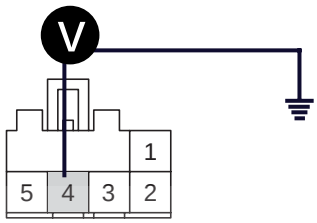
NO

Go to " Power Circuit Inspection " procedure.

POWER SUPPLY CIRCUIT INSPECTION EADB8ACD

1. Ignition "OFF".
2. Disconnect SMARTRA connector.
3. Ignition "ON" & Engine "OFF".
4. Measure voltage between terminal 4 of the SMARTRA harness connector and chassis ground.

Specification : B+



3. Ground
4. Power

LTIF742G

5. Is the measured voltage within specifications?

YES

Go to "Signal Circuit Inspection" procedure.

NO

Check open or short in power harness.
Check that 15A SENSOR fuse located between Main relay and Smartra is open or blown off.
Repair as necessary and go to "Verification of Vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION E94BD131

1. Check for short in harness.

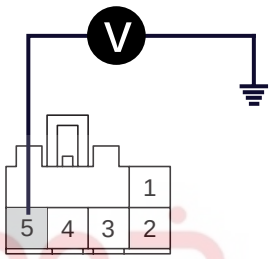
   1) Ignition "OFF".

   2) Disconnect SMARTRA connector.

   3) Ignition "ON" & Engine "OFF".

   4) Measure voltage between terminal 5 of the SMARTRA harness connector and chassis ground.

Specification : Approx. 10.2V



5. Signal

LTIF742H

   5) Is the measured voltage within specifications?

YES

Go to "Check for open in harness" as below.

NO

Check short in signal harness.
Repair as necessary and go to "Verification of Vehicle repair" procedure.

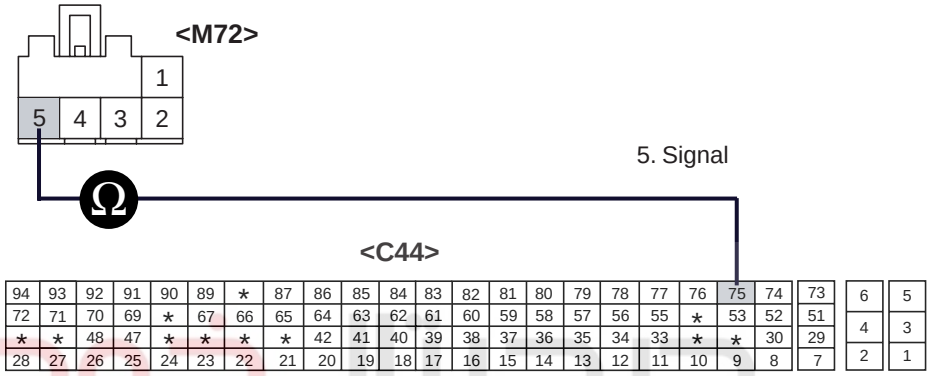
2. Check for open in harness

1) Ignition "OFF".

2) Disconnect SMARTRA connector.

3) Measure resistance between terminal 5 of the SMARTRA harness connector and terminal 75 of ECM harness connector.

Specification : Approx. below 1Ω



ETRF742I

4) Is the measured resistance within specifications?

YES

Go to "Ground Circuit Inspection" procedure.

NO

Check for open in signal harness.
Repair as necessary and go to "Verification of Vehicle repair" procedure.

GROUND CIRCUIT INSPECTION E8EBBF1F

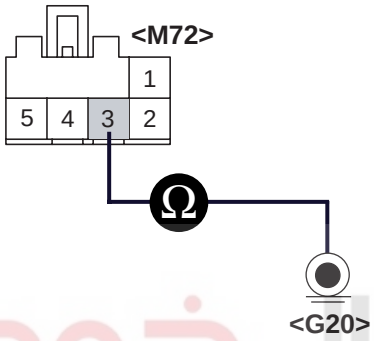
1. Check for open in harness between SMARTRA and Chassis ground.

   1) Ignition "OFF".

   2) Disconnect SMARTRA connector.

   3) Measure resistance between terminal 3 of the SMARTRA harness connector and Chassis ground.

Specification : Approx. below 1Ω



3. Ground

ETRF742J

4) Is the measured resistance within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for open in ground harness.
Make sure that Chassis ground G20 is firmly tightened properly.
Repair as necessary and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION ED5ADD73

1. Check SMARTRA

   1) Ignition " ON" & Engine "OFF".

   2) Perform the Neutral, Teaching, and Password teaching/ changing mode according to 2. ECM neutralization, 3.Key Teaching Procedure, 4. Password teaching/Changing in "Reference Data" described in General Information.

   NOTE

   Be sure that PIN code is prepared before performing neutral mode.

   3) Is Key teaching completed?

   YES

   Fault is intermittent caused by poor contact in the SMARTRA and/or EMC's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known-good SMARTRA and check for proper operation. If the problem is corrected, replace SMARTRA and go to "Go to "Verification of Vehicle Repair" procedure.

   NOTE

   In case of faulty SMARTRA, there are no special procedures required. A new SMARTRA device simply replaces the old one. (There are no transponder-related data stored in this device.)

VERIFICATION OF VEHICLE REPAIR E7C8CC0F

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and monitor CURRENT DATA to check No. of Learnt key, ECM and KEY status.
2. Select Diagnostic Trouble Codes(DTCs)" mode and Clear the DTCs.
3. Are any DTCs present?

   YES

   Go to the applicable troubleshooting procedure.

   NO

   System is performing to specification at this time.

DTC P1691 ANTENNA COIL ERROR

GENERAL DESCRIPTION EE9B9AB9

This wireless communication runs on RF . The SMARTRA is mounted at the ignition lock close to the antenna coil for RF transmission and receiving. 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 EMS are converted into an RF signal, which is transmitted, to the transponder by the antenna.

DTC DESCRIPTION E13520FD

This DTC is defined as Antenna coil open or short circuit.

DTC DETECTING CONDITION EC84DDAE

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Open or short in coil circuit • Faulty Antenna Coil • Faulty SMARTRA
Detecting factors	• Antenna signal error	
Detecting Window	• Before transponder communications	
Detecting Criteria	• Antenna open/short circuit	

MONITOR SCANTOOL DATA EA273BE4

Refer to DTC P1690.

TERMINAL AND CONNECTOR INSPECTION ECC4F2D1

Refer to DTC P1690.

POWER SUPPLY CIRCUIT INSPECTION E44D62FC

Refer to DTC P1690.

SIGNAL CIRCUIT INSPECTION EDAF4EA7

Refer to DTC P1690.

GROUND CIRCUIT INSPECTION E2D0E590

Refer to DTC P1690.

COMPONENT INSPECTION E9A0B4A7

1. Check Antenna Coil

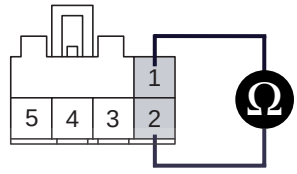
   1) Ignition " OFF".

   2) Disconnect SMARTRA connector.

   3) Measure resistance between terminal 1 and 2 of the SMARTRA connector (Component side)

Specification : Approx. 9Ω

<M72>



1. Antenna coil(+)
2. Antenna coil(-)

ETRF743F

4) Is the measured resistance within specifications?

YES

Go to " Check SMARTRA" as below.

NO

Check for open in harness between SMARTRA and Antenna coil, repair or replace as necessary.
Substitute with a known-good Antenna Coil and check for proper operation. If the problem is corrected, replace Antenna Coil. And then, go to "Verification of Vehicle Repair" procedure.

2. Check SMARTRA

   1) Ignition " ON" & Engine "OFF".

   2) Perform neutral mode, key teaching/changing and password teaching according to description in "System inspection" procedure.

   NOTE

   Be sure that PIN code is prepared before performing neutral mode.

   3) Is Key teaching completed?

      YES

      Fault is intermittent caused by poor contact in the SMARTRA and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

      NO

      Substitute with a known-good SMARTRA and check for proper operation. If the problem is corrected, replace SMARTRA and Go to "Verification of Vehicle Repair" procedure.

   NOTE

   In case of faulty SMARTRA, there are no special procedures required. A new SMARTRA device simply replaces the old one. (There are no transponder-related data stored in this device.)

VERIFICATION OF VEHICLE REPAIR ED1B0A4C

Refer to DTC P1690.

DTC P1693 TRANSPONDER NO RESPONSE ERROR / INVALID RESPONSE

GENERAL DESCRIPTION EAFD20AC

Refer to DTC P1674.

DTC DESCRIPTION EA5378BC

This DTC is defined as Invalid Transponder Data.

DTC DESCRIPTION EAA42B33

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Transponder Key
Detecting factors	• Invalid Transponder Data	
Detecting Window	• During Transponder IDE • During Transponder Authentication requests • During Transponder Write EEPROM page requests • During Transponder Read EEPROM page requests	
Detecting Criteria	• Corrupted data form Transponder (Tp), or more than one TP in the field, or no TP in the magnetic field.	

MONITOR SCANTOOL DATA EDAB2DBA

Refer to DTC P1690.

COMPONENT INSPECTION EEB1C5AE

Refer to DTC P1674.

VERIFICATION OF VEHICLE REPAIR E6F9926F

Refer to DTC P1690.

DTC P1694 EMS MESSAGE ERROR

GENERAL DESCRIPTION E1E9CC2D

The ECM and the SMARTRA communicate by dedicated line. During this communication of ECM and SMARTRA the K line of ECM cannot be used for communication. The ECM controls the communication either to SMARTRA or to other devices(e.g. scanner) on K line by switching of a multiplexer and specific communication procedures. The multiplexer is a part of ECM hard ware.

DTC DESCRIPTION EEF61E45

This DTC is defined as invalid request from ECM or corrupted data.

DTC DETECTING CONDITION E5CFCCF5

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Faulty ECM
Detecting factors	• Request from Control unit is invalid	
Detecting Window	• End of CM request message	
Detecting Criteria	• Protocol layer violation - Invalid request, Invalid check sum.)	

MONITOR SCANTOOL DATA E448A345

Refer to DTC P1690.

COMPONENT INSPECTION EDFDCE6C

1. Check ECM

   1) Ignition " ON" & Engine "OFF".

   2) Perform Key Teaching Procedure in "Reference Data" described in General Information.

   3) Is the Key teaching completed?

      YES

      Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to " Verification of Vehicle Repair" procedure.

      NO

      Substitute with a known-good ECM and check for proper operation. If the problem is corrected, replace ECM and then go to " Verification of Vehicle repair" procedure.

NOTE

1. *Don't forget to prepare for the PIN of the vehicle before removing ECM from the vehicle.*
2. *Remember that substituting with a known-good ECM should be followed "The things to remember before repair(1)" in "Reference Data in General Information".*
   (In case of faulty ECM, it has to be replaced with "VIRGIN" or " NEUTRAL" ECM.)
3. *Ensure that the correct PIN is entered when replacing a new ECM.*

VERIFICATION OF VEHICLE REPAIR EA01A5F5

Refer to DTC P1690.

DTC P1695 EMS MEMORY ERROR

GENERAL DESCRIPTION EEDD61BE

The relevant data for the immobilizer function are stored at permanent memory (EEPROM or Flash etc.).
The immobilizer data are stored by three independent entries.
The data from EEPROM are evaluated by "2 of 3 decision". That means all three entries are read and the content is compared before authentication process.
If the contents of all entries are equal, the authentication will run without additional measures.
If only the contents of two entries are equal, the authentication will run and fault code "EEPROM defective“ is stored at ECM.
If the contents of all three entries are different from each other, no authentication will be possible and the fault code "EEPROM defective“ will be stored. The limp home function cannot be activated. The ECM shall be replaced if the EEPROM related fault occurs again after new teaching of all keys.

DTC DESCRIPTION EF6DEAFE

This DTC is defined as not only ECM have inconsistent data of EEPROM for number of keys taught, user password state and invalid write operation to EEPROM but ECM can not recognize the unique PIN code during Key Authentication.

DTC DETECTING CONDITION E176040F

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Faulty ECM
Detecting Criteria	• ECM internal permanent memory(EEPROM or Flash etc.) fault. • Invalid write operation to permanent memory(EEPROM or Flash etc.) fault.	

MONITOR SCANTOOL DATA ECE62100

Refer to DTC P1690.

COMPONENT INSPECTION EBB48FA3

Refer to DTC P1694.

VERIFICATION OF VEHICLE REPAIR E2C6D7ED

Refer to DTC P1690.

DTC P1696 AUTHENTICATION FAIL

GENERAL DESCRIPTION E7D6BDC0

Refer to DTC P1695.

DTC DESCRIPTION E70C57C5

This DTC is defined as Virgin TP or Invalid TP with “ Learnt” ECM status (Authentication fail).

DTC DETECTING CONDITION EB81A7FA

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Faulty TP(Virgin or Invalid)
Detecting Criteria	• Virgin TP at EMS STATUS "Learnt" • Learnt(Invalid) TP at EMS status "Learnt"(Authentication fail)	

MONITOR SCANTOOL DATA ED8FD4ED

Refer to DTC P1690.

COMPONENT INSPECTION EF58D8CC

Refer to DTC P1674.

VERIFICATION OF VEHICLE REPAIR EAAD7AE5

Refer to DTC P1690.

DTC P1699 TWICE OVERTRIAL

GENERAL DESCRIPTION E2EB5254

This is a special function for engine start by vehicle manufacturer. The engine can be started for moving from the production line to an area where the key teaching is proceeded.

DTC DESCRIPTION E55EBB6D

This DTC is defined as exceeding the maximum limit of twice ignition On.

DTC DETECTING CONDITION E59AFAEB

Item	Detecting Condition	Possible cause
Enable Condition	• IG ON	• Locked by timer
Detecting Criteria	• Exceeding the maximum limit of Twice IGN ON (⊇ 32 times)	

MONITOR SCANTOOL DATA EE05BDE5

1. Ignition "ON" & Engine "OFF".
2. Connect Scan tool and clear the DTCs.
3. Monitor Current Data for Immobilizer System.
4. Retry to communication from the vehicle selection menu although once communication is failed.

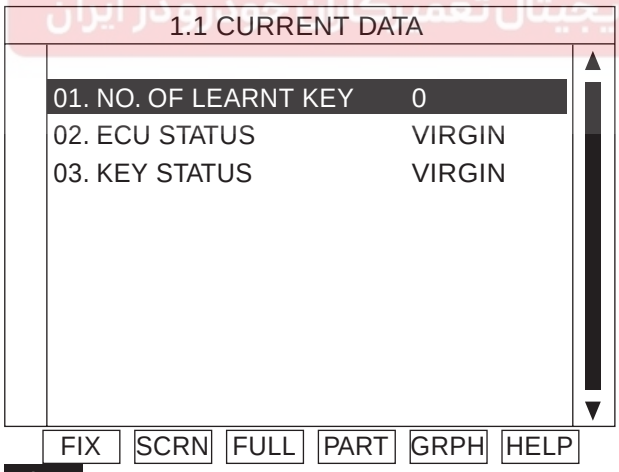


Fig 1

LTIF742C

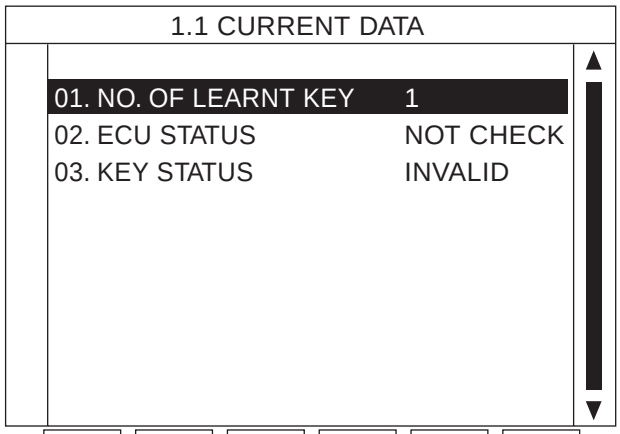


Fig 2

LTIF742D

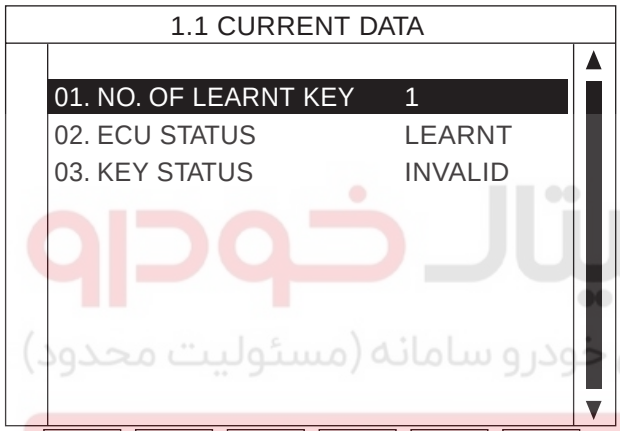


Fig 3

LTIF742E

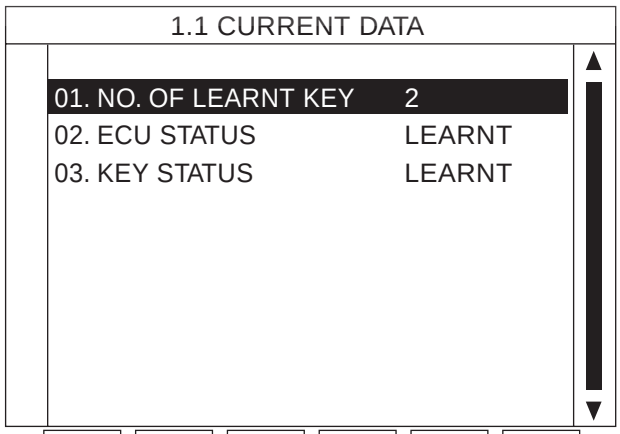


Fig 4

LTIF742F

Fig 1 : ECM has not matched with any Key yet.
Fig 2 : ECM Internal Failure.
Fig 3 : IG On with unmatched key.
Fig 4 : 2(two) Keys have been matched with ECM.

5. Is the communication possible between scan tool and Immobilizer system?

YES

Wait for one hour with IG Key On. Be sure that the battery is fully enough to stay for an hour with IG ON.
Disconnecting battery or others manipulation can not reduce this time. After connecting the battery the timer starts again for one hour.
And then, reperform key teaching procedure(Refer to "Reference Data" in General Information")

Go to " Verification of Vehicle Repair" procedure

NO

Fault is intermittent caused by poor contact in the SMARTRA and/or ECM connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination. deterioration, or damage.

Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR E8FA7FF1

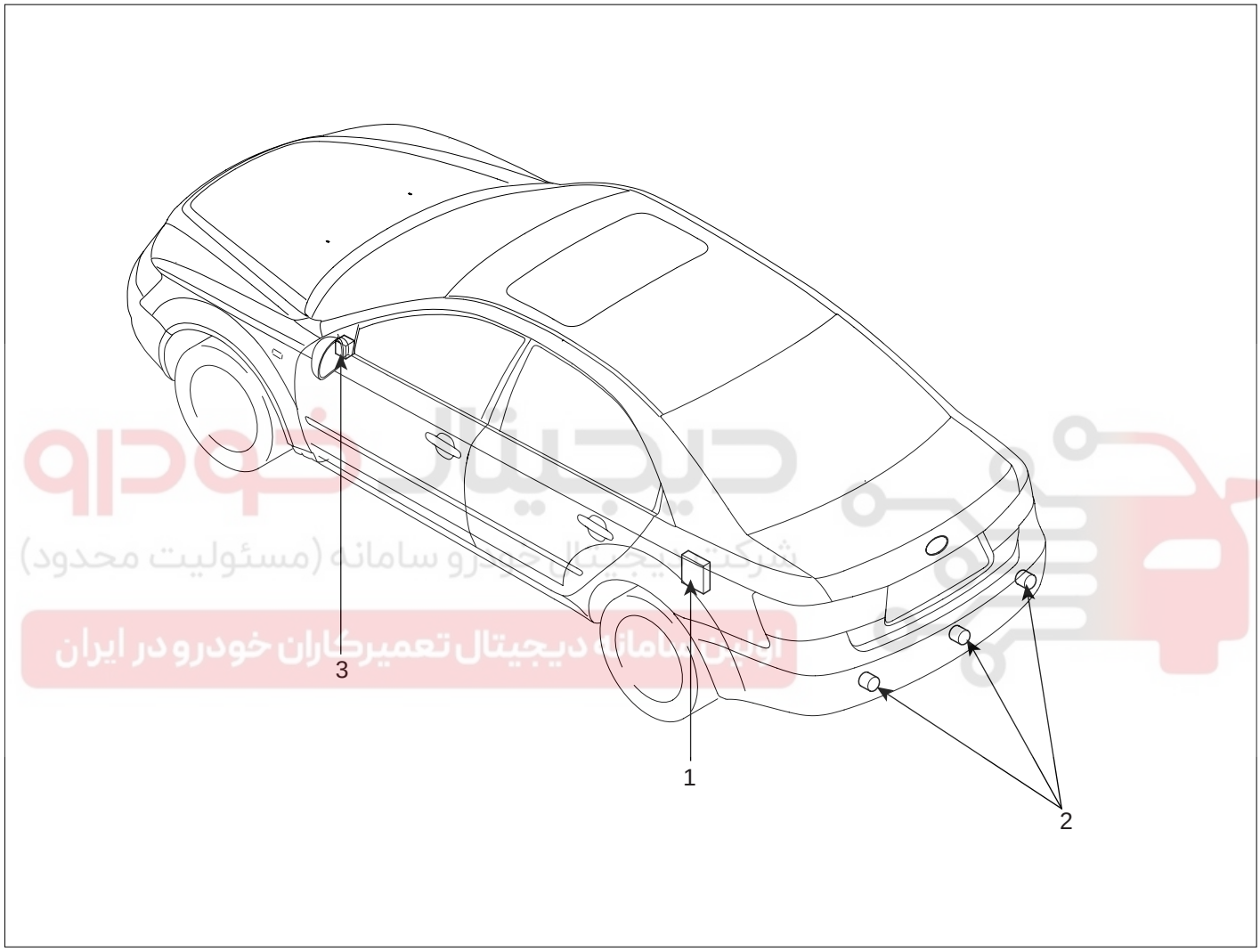
Refer to DTC P1690.

BACK WARNING SYSTEM

DESCRIPTION E55E20B2

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).

COMPONENT LOCATION E3E3BAA9



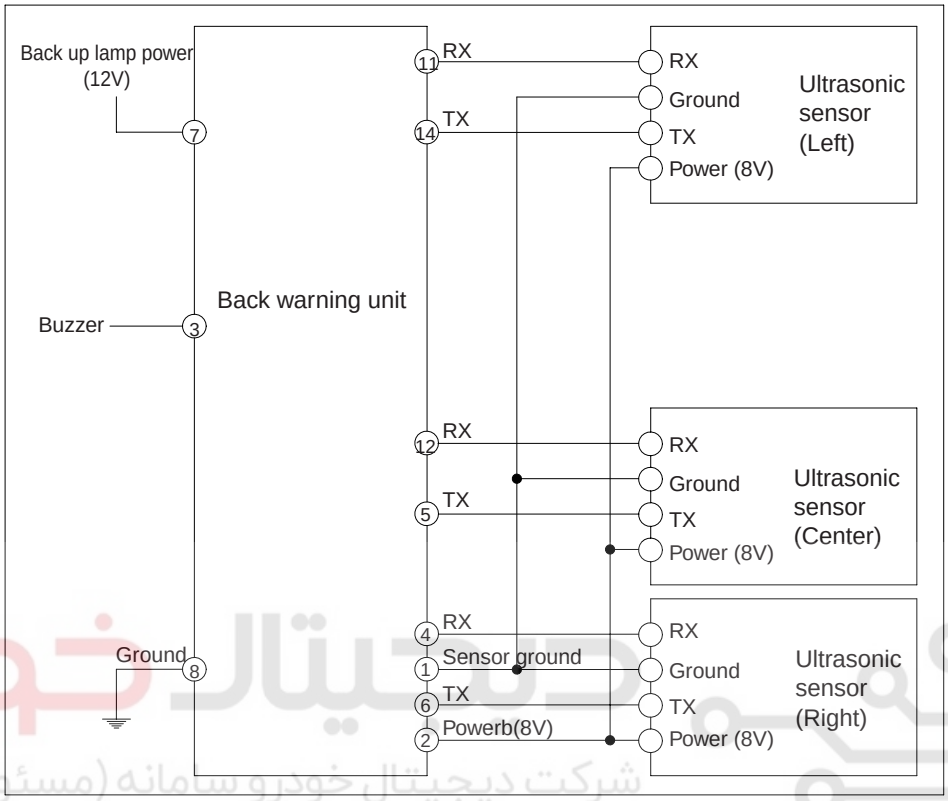
1. Back warning control unit
2. Ultrasonic sensor
3. Buzzer

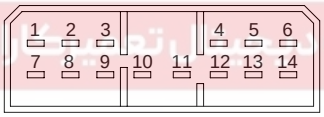
ETRF760A

SPECIFICATION E9CE26BA

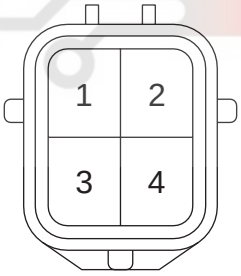
Item		Specification
Back warning control unit	Voltage rating	DC 12V
	Operation voltage	DC 9 ~ 16 V
	Operation temperature	-30°C ~ + 80°C
	Operation current	MAX 600 mA
	Operation frequency	40 ± 5 KHz
	Detective method	Direct and indirect detection
Ultrasonic sensor	Voltage rating	DC 8 V
	Detecting range	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)

CIRCUIT DIAGRAM EBE7C5A7





(Back warning control unit connector)



(Ultrasonic sensor connector)

Pin configuration

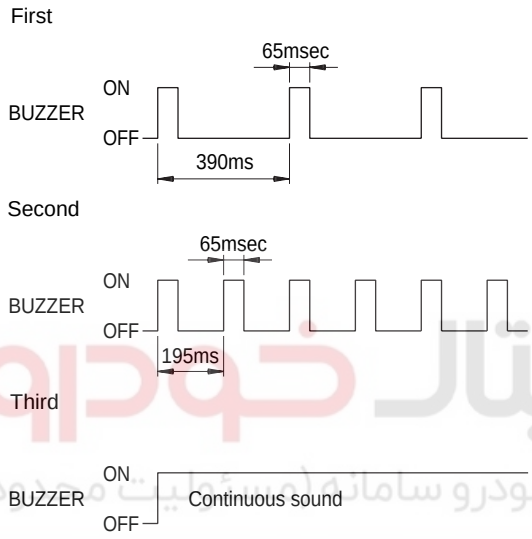
Pin No.	Signal	Test : Desired result
1	Sensor ground	0V
2	Sensor power	8V (While operating)
3	Buzzer	0V (While operating)
4	RX - Sensor(Right)	0~1V voltage change (Inspect waveform)
5	TX - Sensor(Center)	0~3V voltage change (Inspect waveform)
6	TX - Sensor(Right)	0~3V voltage change (Inspect waveform)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

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

ETRF270A

ALARM RANGE E7C6CCCE

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

NOTE

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.*

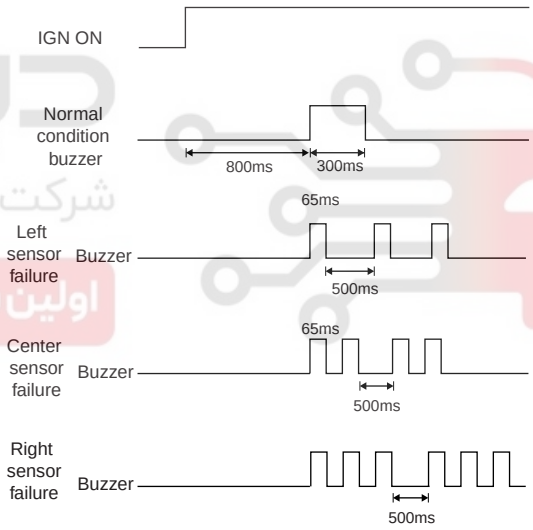
DIAGNOSIS EFBAE650

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

WARNING EAD06AC6

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.

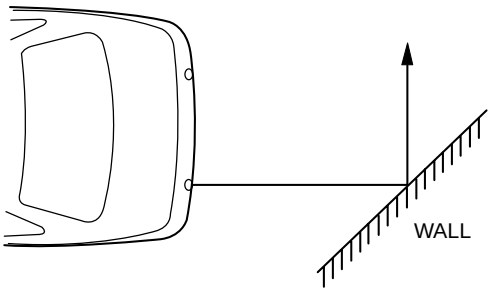
3. Besides there are some materials unable to be detected even in detection range as follows.

   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)

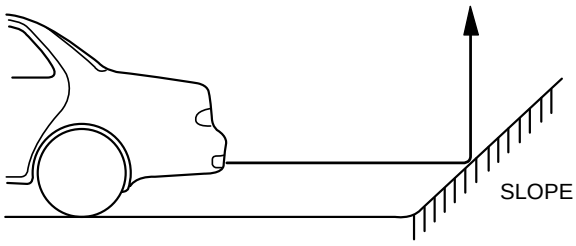
LT8C218A

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.
   Back warning sensor cannot discriminate among glass, stake, and rock.

7. Sensors may not operate correctly in the below conditions.
   Ensure sensors 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 of no 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 the 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 the change the transmission and reception unit wiring. Tagging the transmission side and reception side, it may cause malfunction.

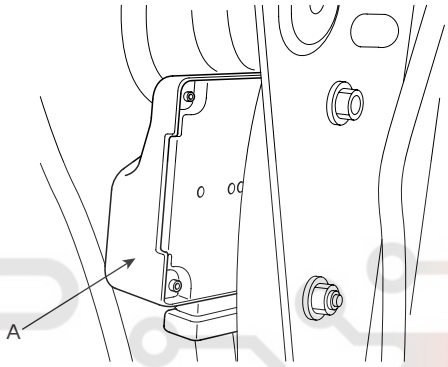
11. High power radio transmitter (above 10W) may cause malfunction. Do not install it on the vehicle.

12. Be careful that heating or sharp objects shall not touch ultrasonic sensor surface.
Besides do not cover the sensor opening or press the sensor.

BACK WARNING CONTROL MODULE

REPLACEMENT EE8D0F92

1. Disconnect the negative (-) battery terminal.
2. Remove the left side trim of the trunk
3. Loosen the mounting nuts and disconnect the connector.
4. Remove the back warning control unit (A).



KTRE761A

5. Installation is the reverse of removal procedure.

ULTRASONIC SENSOR

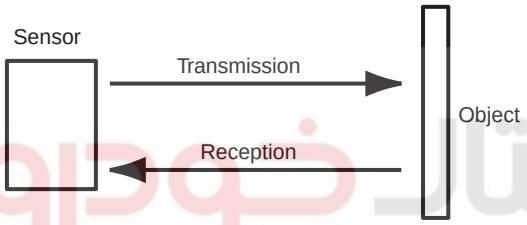
OPERATION PRINCIPLE E0146B80

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

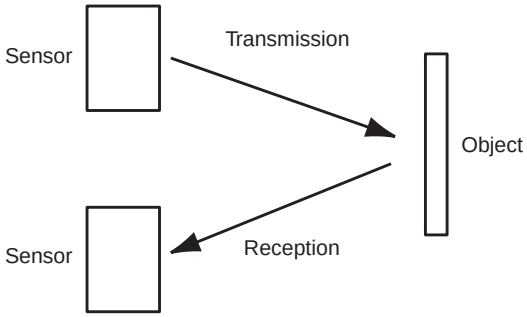
Direct detection type and indirect detection type are used together for improving effectiveness of the detection.

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.



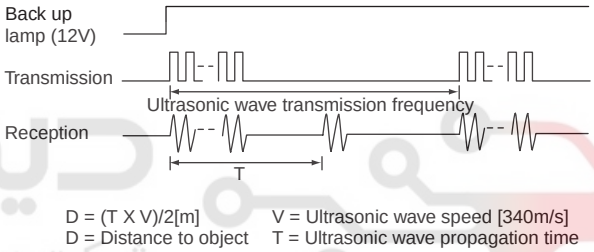
ETRF762B

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

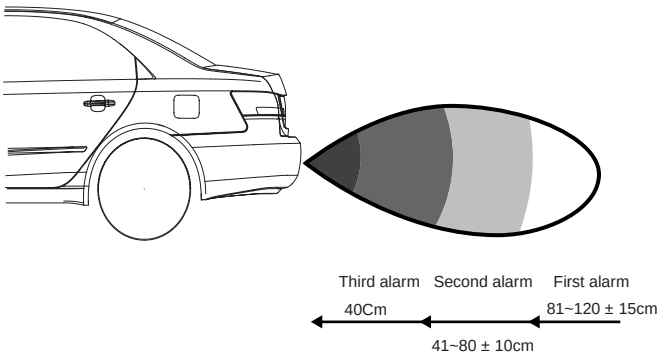
The basic principle of distance measurement using ultrasonic wave is :



ETRF762C

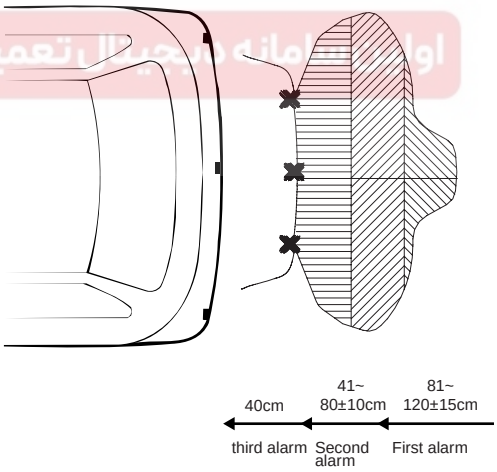
SENSOR DETECTION RANGE

[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.

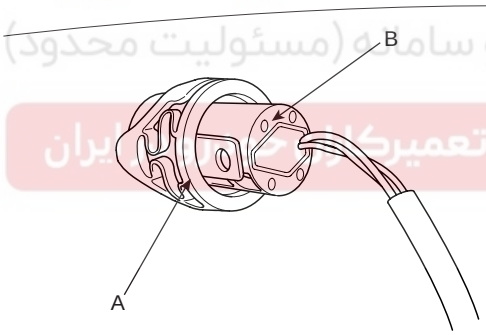
ETRF978A

NOTE

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.*

REPLACEMENT EBDA6DD0

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

4. Installation is the reverse of removal procedure.

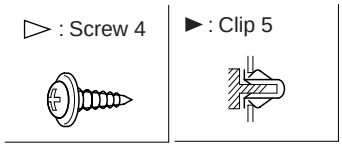
BUZZER

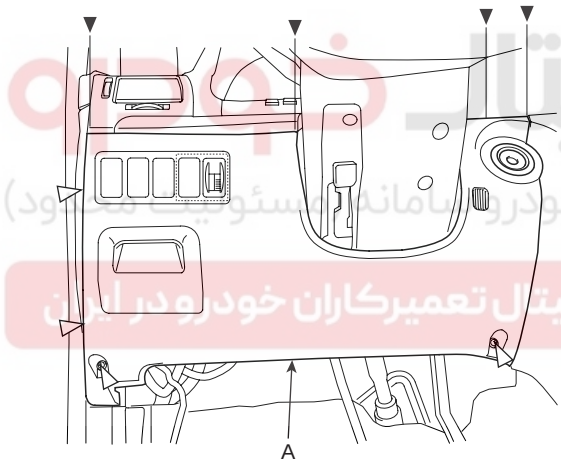
INSPECTION EB42614A

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

REPLACEMENT EE0D4AD3

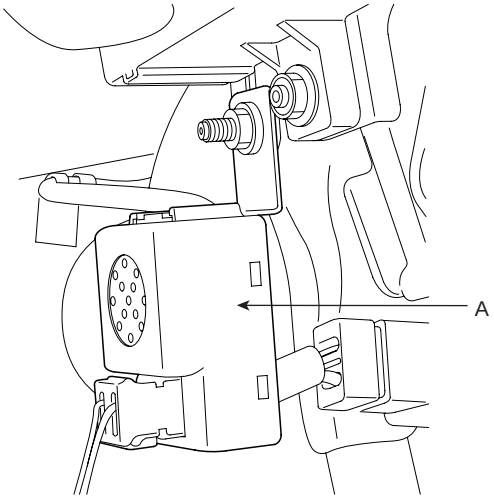
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).





ETRF495D

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



KTRE763A

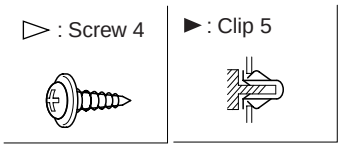
4. Installation is the reverse of removal procedure.

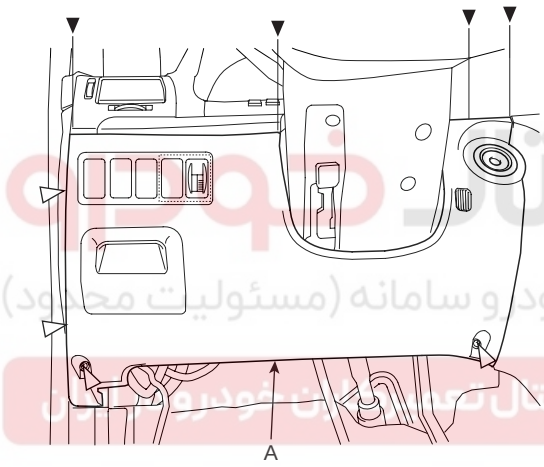
IGNITION SYSTEM

IGNITION SWITCH

REPLACEMENT E8EA8EAA

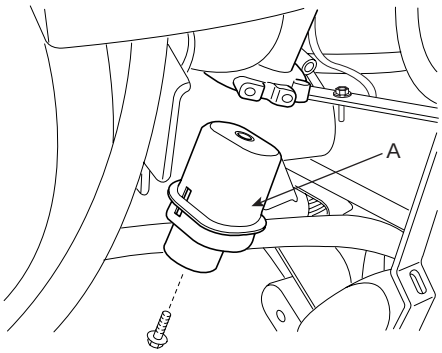
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).





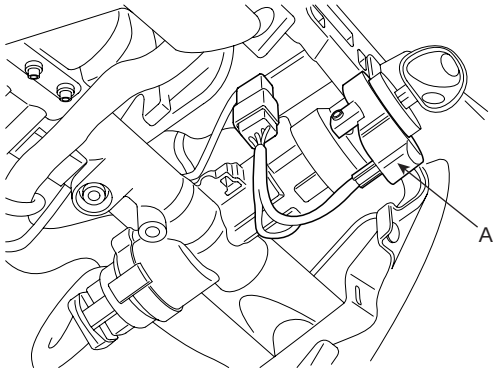
ETRF495D

3. Remove the ignition switch (A) after loosening the screw and disconnecting the 6P connector.



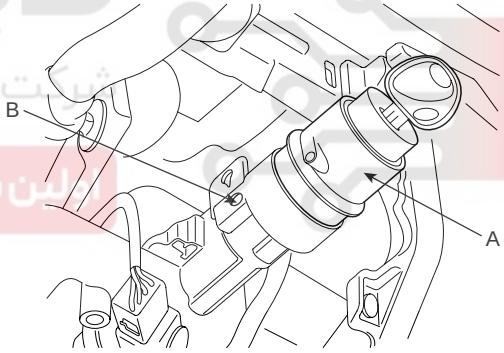
ATIE781A

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.



KTRE781B

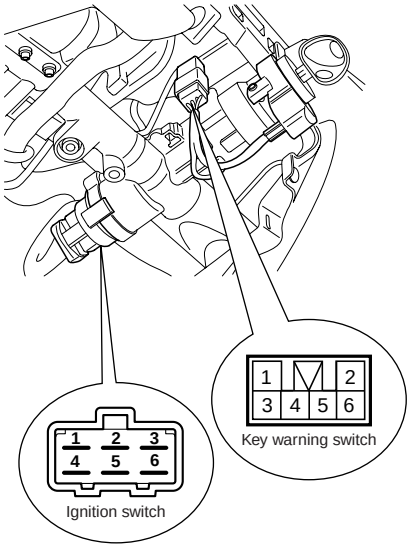
6. If it is necessary to remove the key lock cylinder (A), Remove the key lock cylinder (A) after pushing lock pin (B) with key ON.



KTRE781C

7. Installation is the reverse of removal procedure.

INSPECTION EF5AF1E2



ETRF781D

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					
	INSERT							LOCK	UNLOCK				
ACC		○ — ○											
ON		○ — ○	○ — ○	○ — ○	○ — ○			UNLOCK		○ — ○			
START		○ — ○		○ — ○	○ — ○	○ — ○	○ — ○						

LTIF781E