

Body Electrical System

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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.



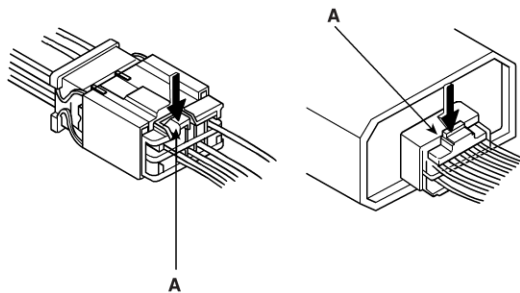
NOTE

- 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

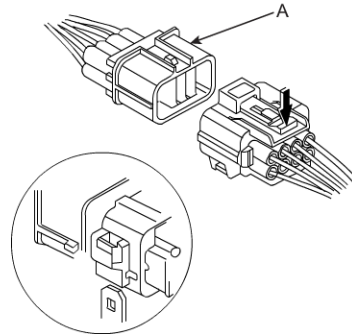
1. Make sure the connectors are clean and have no loose wire terminals.
2. Make sure multiple cavity connectors are packed with grease (except watertight connectors).
3. All connectors have push-down release type locks (A).



ETKD150A

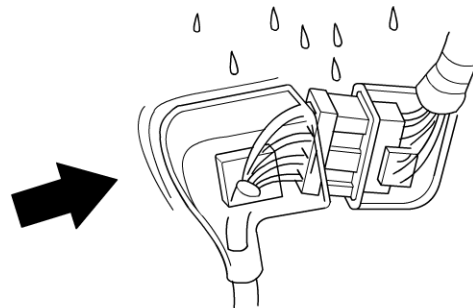
4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.

5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).



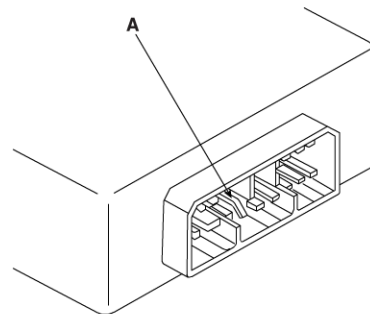
ETKD150B

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



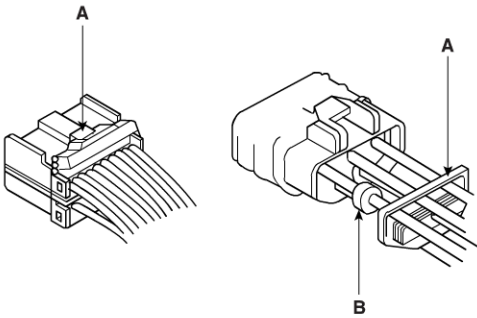
ETKD150C

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



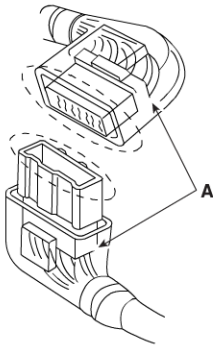
ETKD150D

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



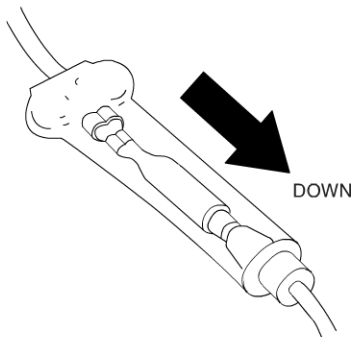
ETKD150E

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



ETKD150F

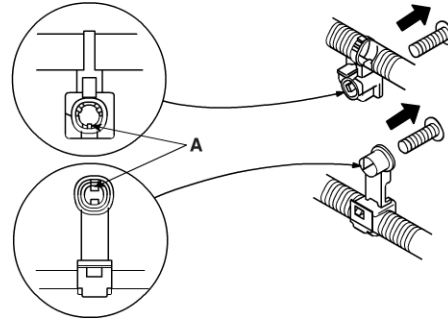
11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.



ETKD150G

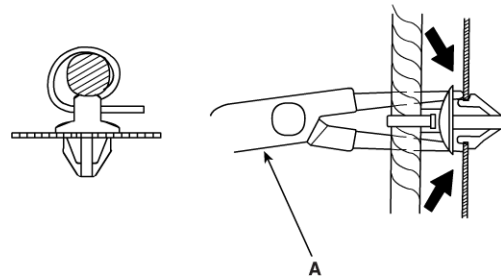
HANDLING WIRES AND HARNESSSES

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

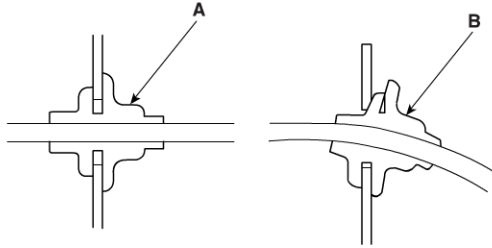
3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



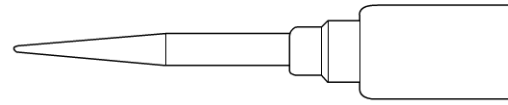
ETKD150I

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).
5. Use a probe with a tapered tip.



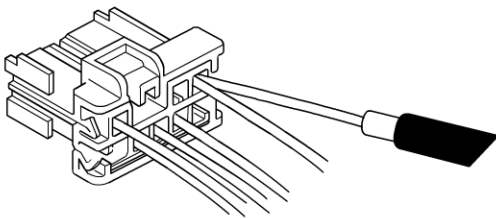
ETKD150J



ETKD150L

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

FIVE-STEP TROUBLESHOOTING

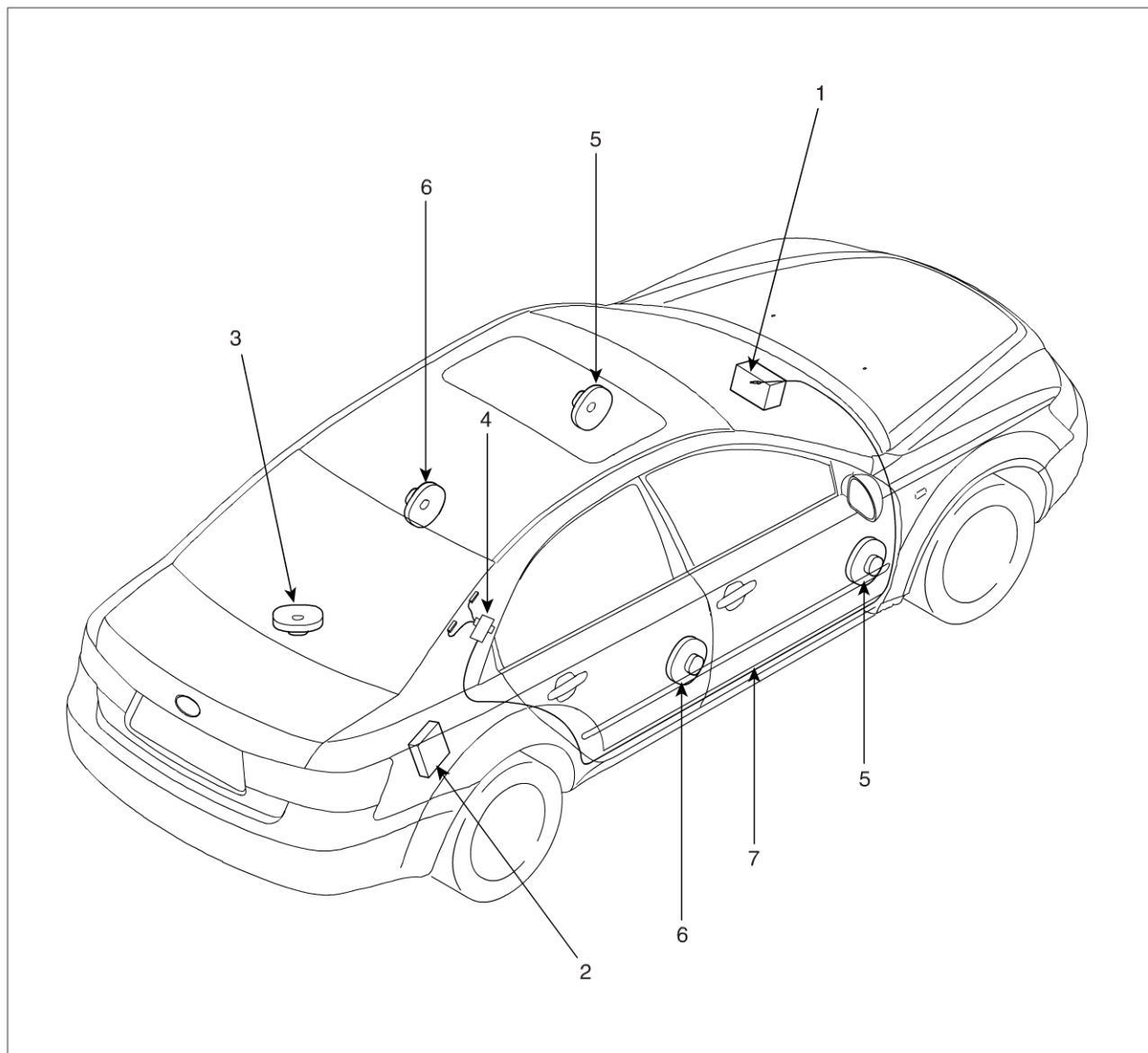
1. **Verify the complaint**
Turn on all the components in the problem circuit to verify the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.
2. **Analyze the schematic**
Look up the schematic for the problem circuit. Determine how 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 EEAFCD8F

Item		Specification	
Model		AM/FM/CD /MP3 (V480)	AM/FM/MP3 /6CDC (V490)
Power supply		DC 14.4V	
Rated output		Max 38W x 4	5.4 Vrms
Speaker impedance		4Ω x 4	4Ω x 4
Antenna		90PF 100Ω	
Tuning type		PLL synthesized type	
The others		-	External amp, woofer speaker
Frequency range / Channel space	FM	87.9~107.9 MHz/ 220KHz	
	AM	530~1710 KHz/ 10KHz	

COMPONENT LOCATION ED97CCA8

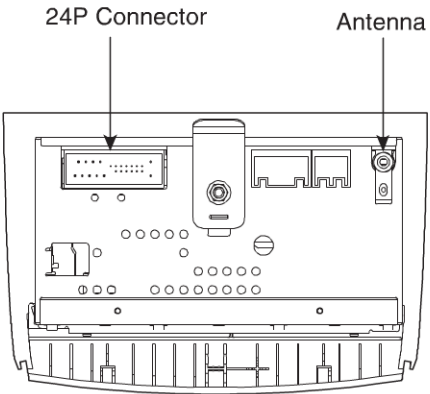
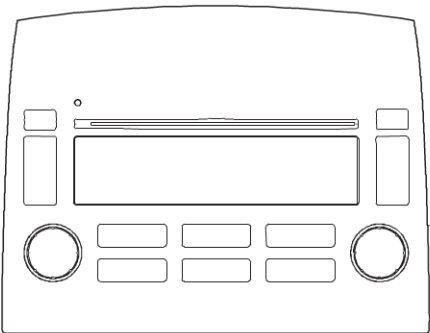


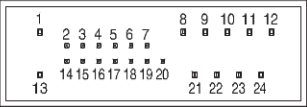
- 1. Audio unit
- 2. External amp
- 3. Woofer speaker
- 4. Glass antenna

- 5. Front door speaker
- 6. Rear door speaker
- 7. Antenna feeder cable

AUDIO UNIT

COMPONENT EF935C55

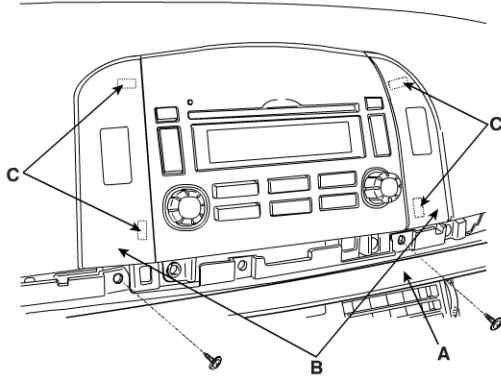


Audio connector	Terminal	Description	Terminal	Description
	1	Battery	13	Ground
	2	ACC	14	-
	3	Illumination (+)	15	-
	4	Illumination (-)	16	-
	5	External amp	17	-
	6	-	18	Steering remote control
	7	MUTE	19	Remote control ground
	8	Front left speaker (+)	20	-
	9	Rear left speaker (+)	21	Front left speaker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

REPLACEMENT

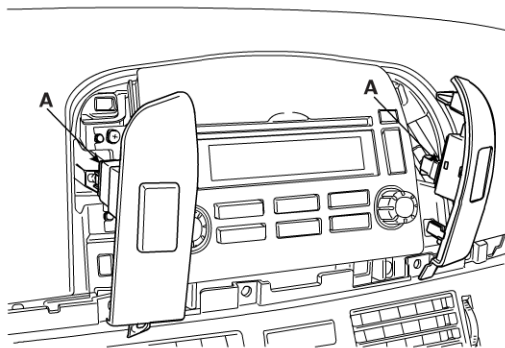
E4A99BCB

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(C).
3. Remove the center facia panel (B) after loosening the screws.



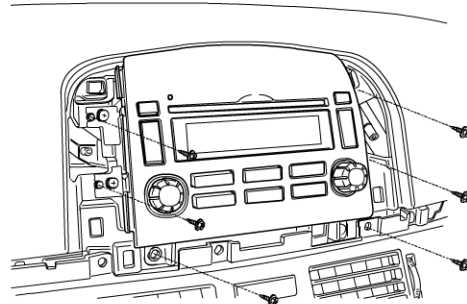
ETRF021B

4. Remove the connectors(A).



LSRE170G

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



ETRF021C

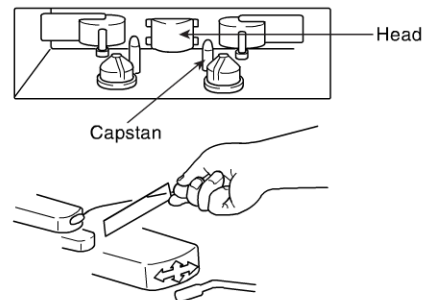
6. Installation is the reverse of removal.

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 cleanliness.
2. To clean the tape head and capstan, use a cotton swab dipped in ordinary rubbing an alcohol. Wipe the head and capstan.



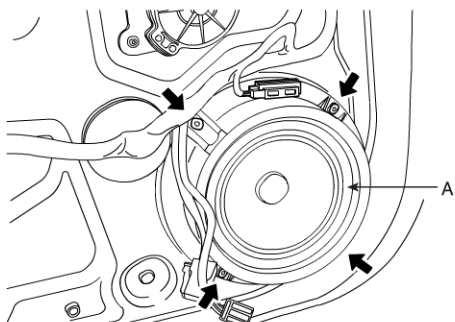
LTAC005A

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.

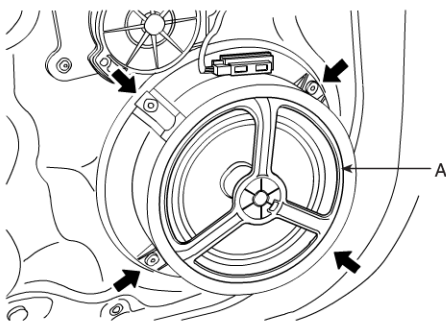


KTRE022B

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.

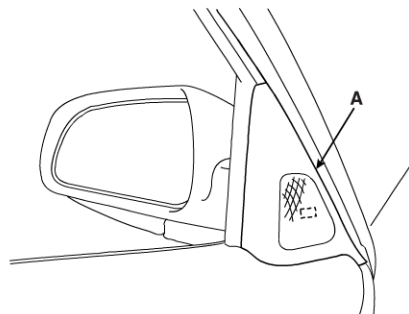


KTRE022C

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.

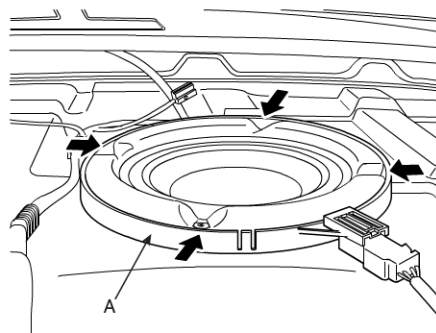


KTRE022D

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.

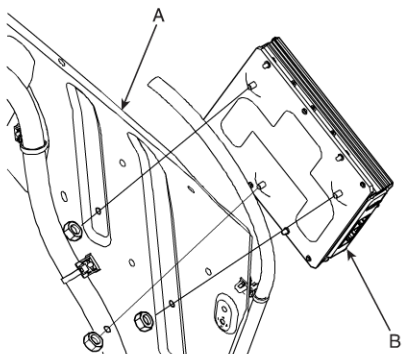


KTRE022E

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 (A) after removing 3 nuts.



KTRE022F

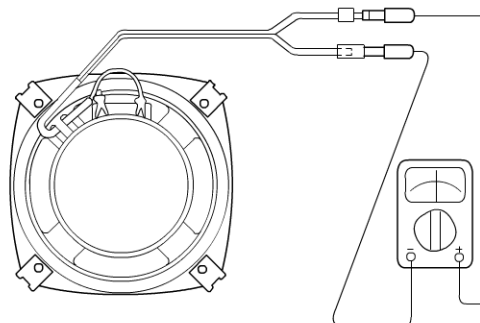
3. Installation is the reverse of removal.

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.

Specified impedance : 4Ω



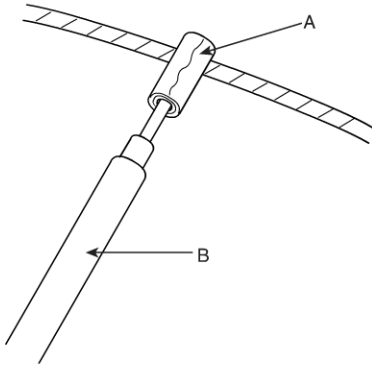
KTMB060A

ANTENNA

INSPECTION ED0ACAFA

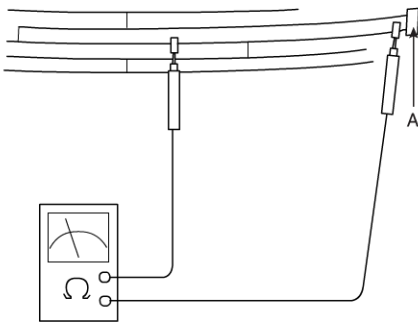
GLASS ANTENNA TEST

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

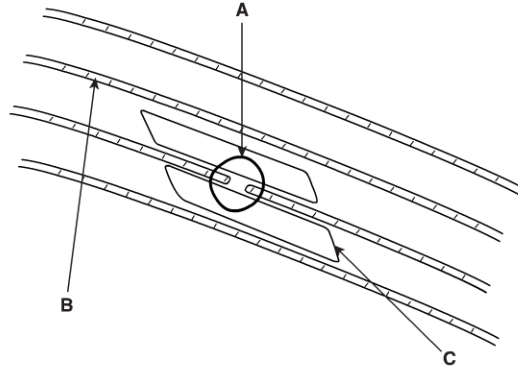
GLASS ANTENNA REPAIR



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.



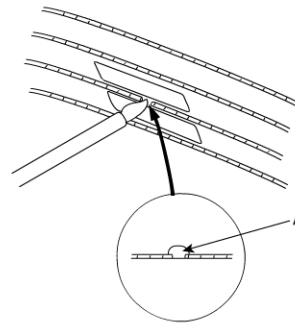
ETKD004K

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.



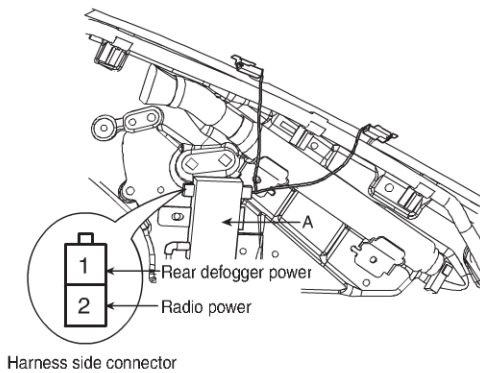
KTKD006Z

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

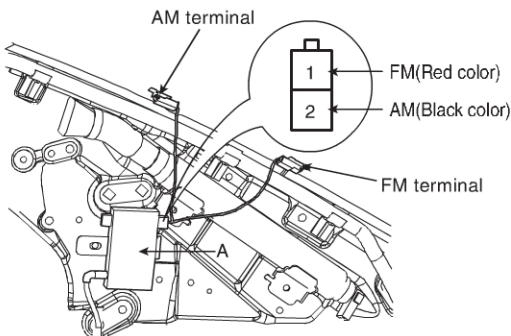
1. Remove the right side rear pillar trim. Then disconnect the 2P power connector from the glass antenna amp (A).
2. Turn the radio ON.
Measure the voltage between terminal 2 of the harness side power connector (A) and body ground.

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

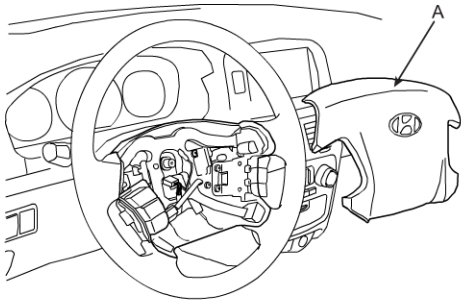
5. Check the grid lines that continuity exists.
6. When a poor radio reception is not repaired through the above inspection methods, replace the amp.
If the radio reception is still poor, check the radio cable for short and radio head unit for failure.

AUDIO REMOTE CONTROL

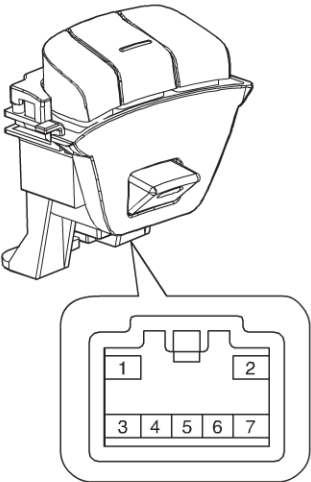
INSPECTION E5DFFC6A

REPLACEMENT EBF43BD0

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

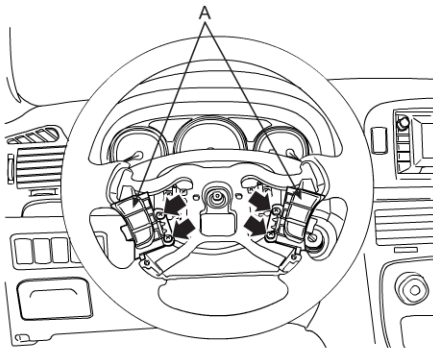


KPRE201C



KTRE024B

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



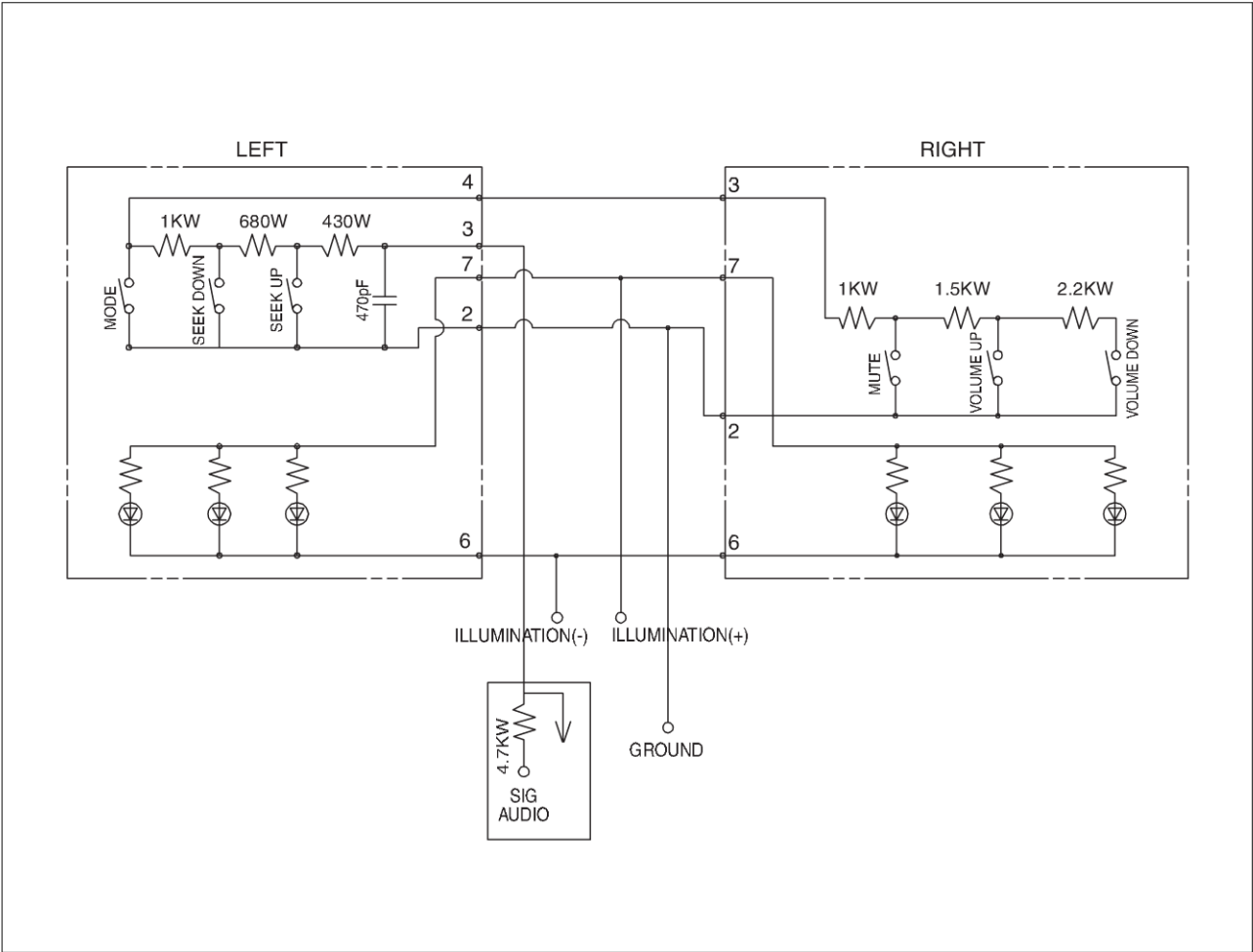
KTRE024A

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

- 4. Installation is the reverse of removal.

CIRCUIT DIAGRAM

EA6859EE



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.

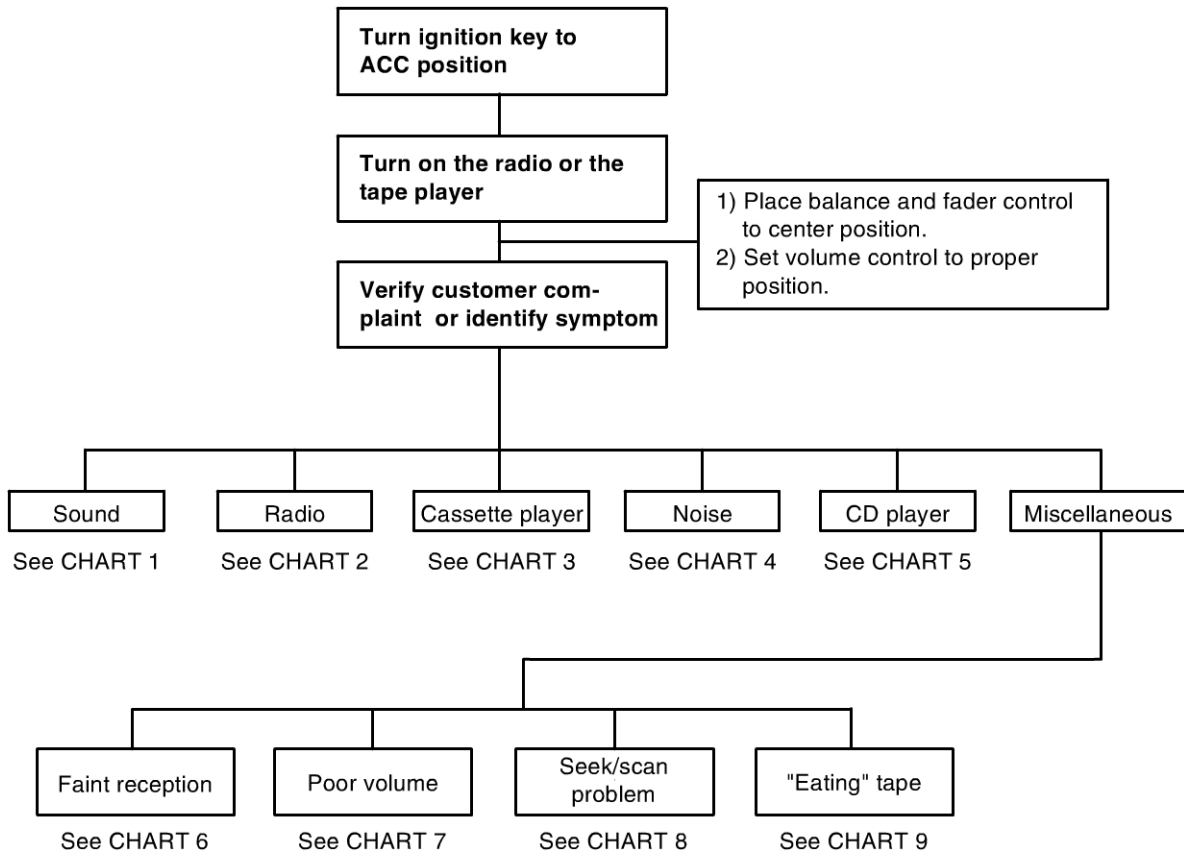
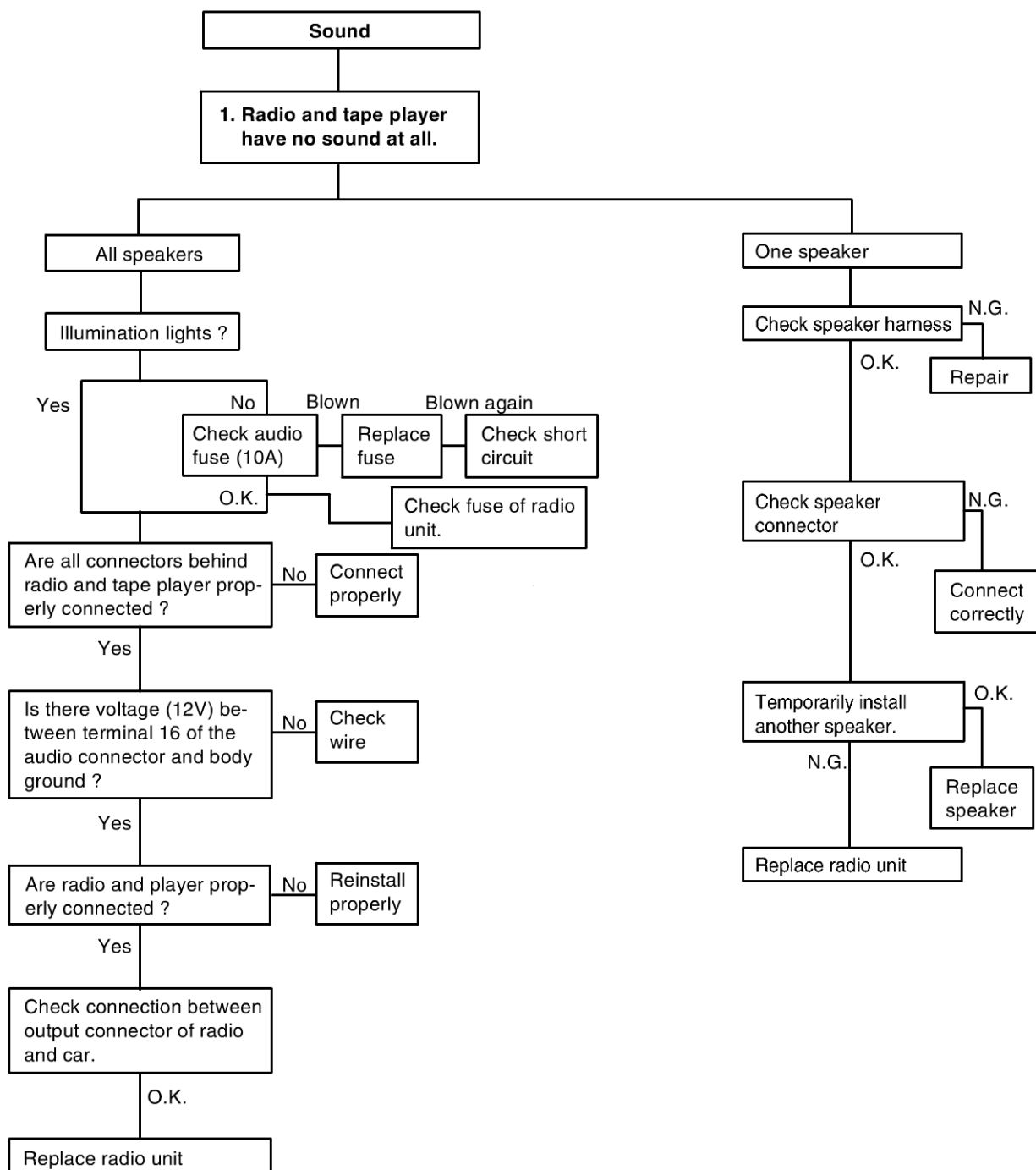
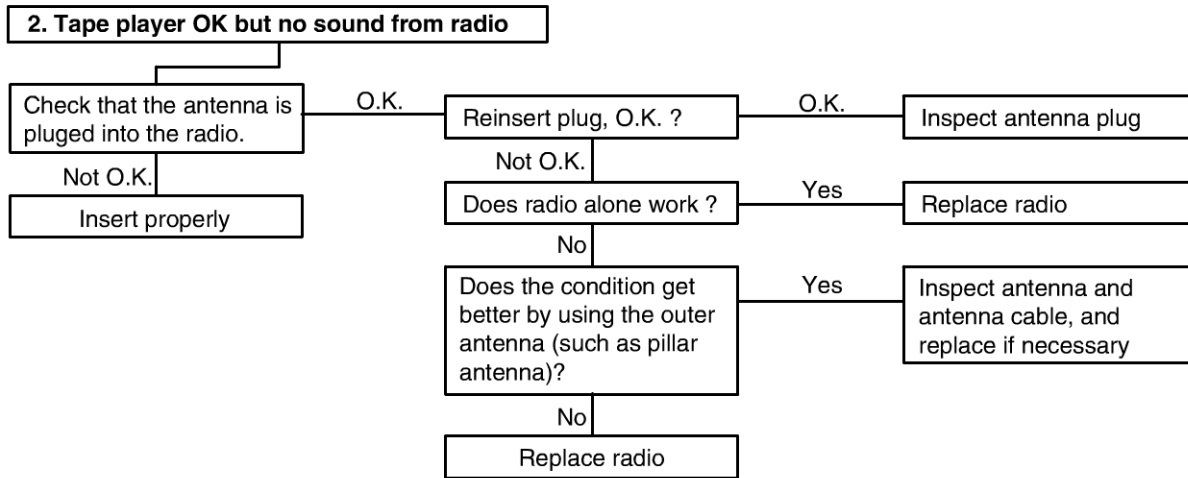


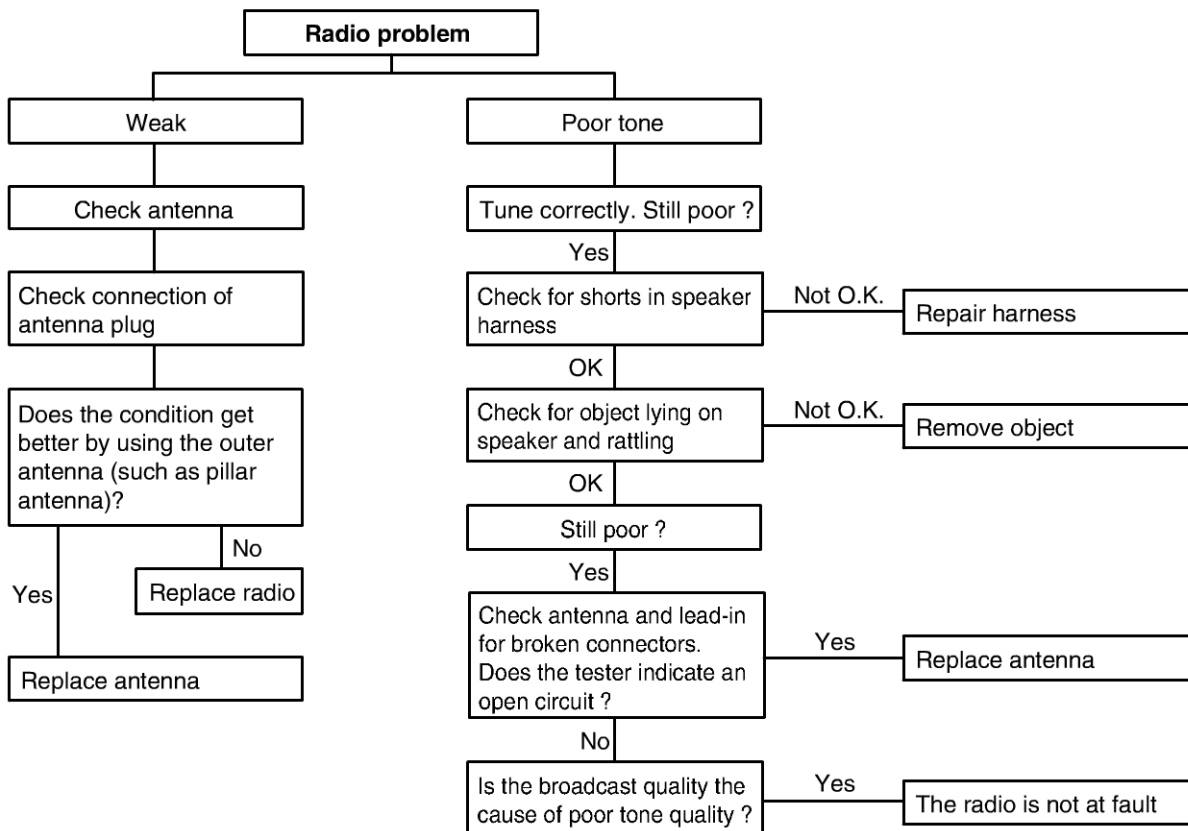
CHART 1





LTIF001C

CHART 2



BTIF001D

CHART 3

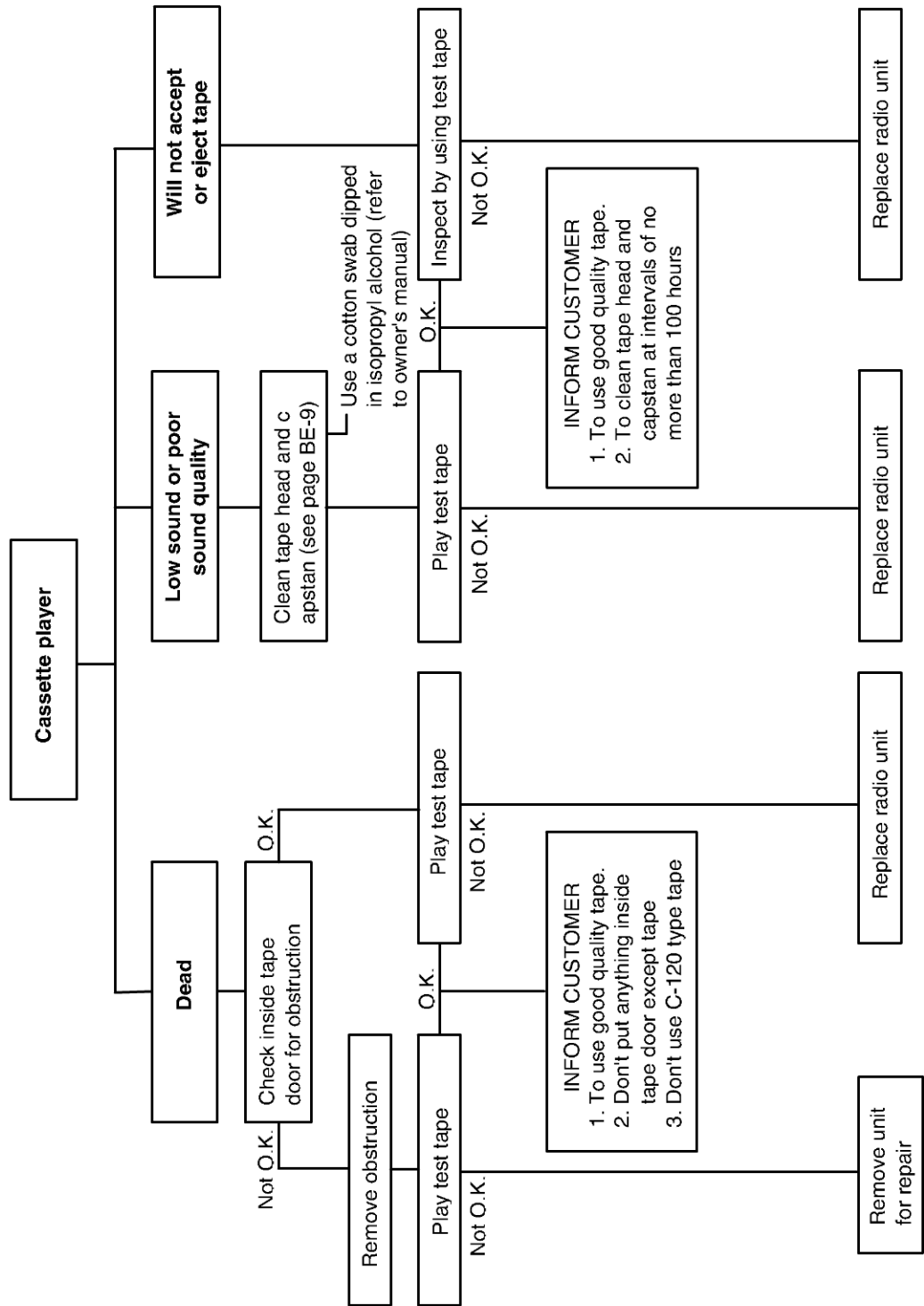
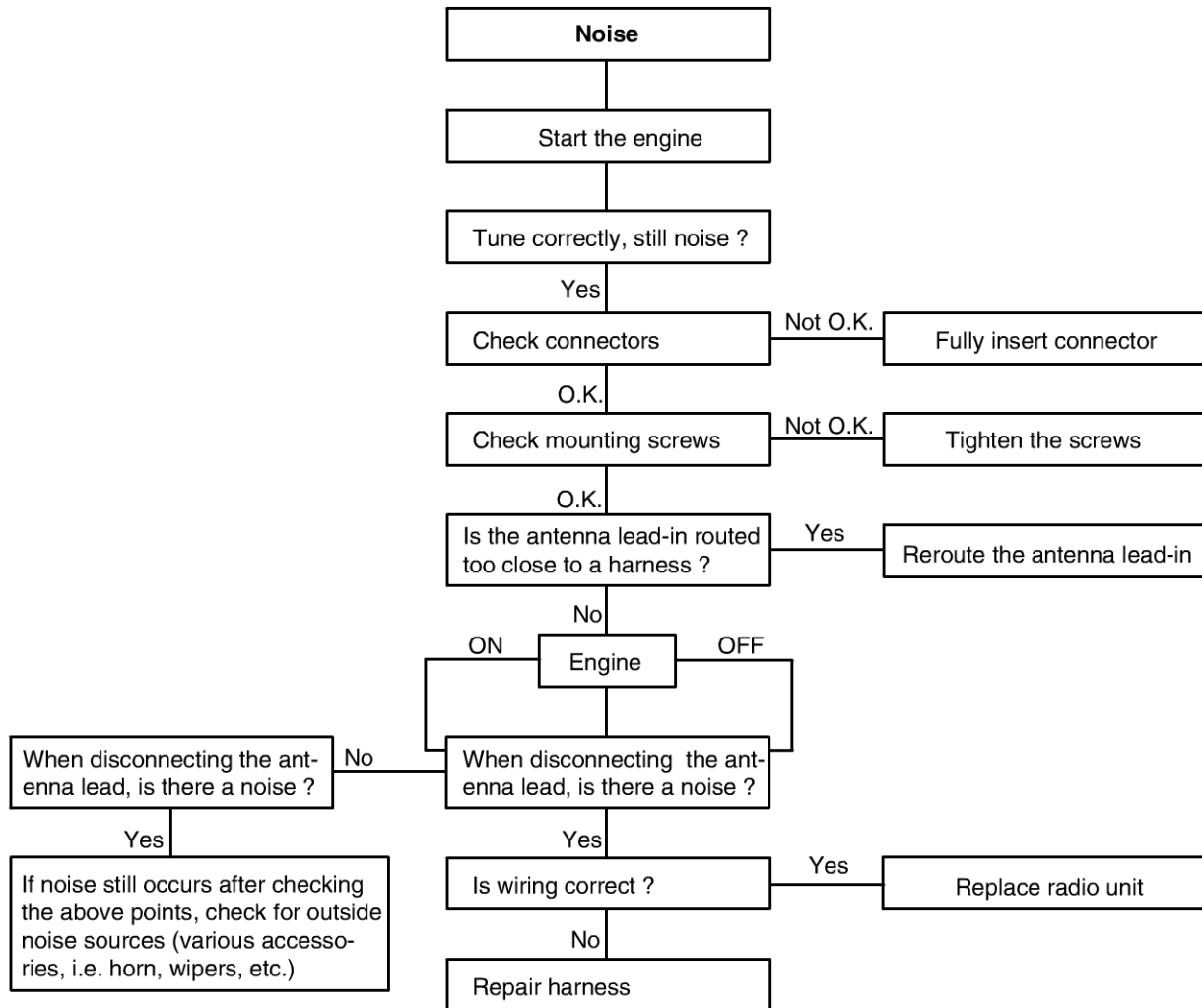
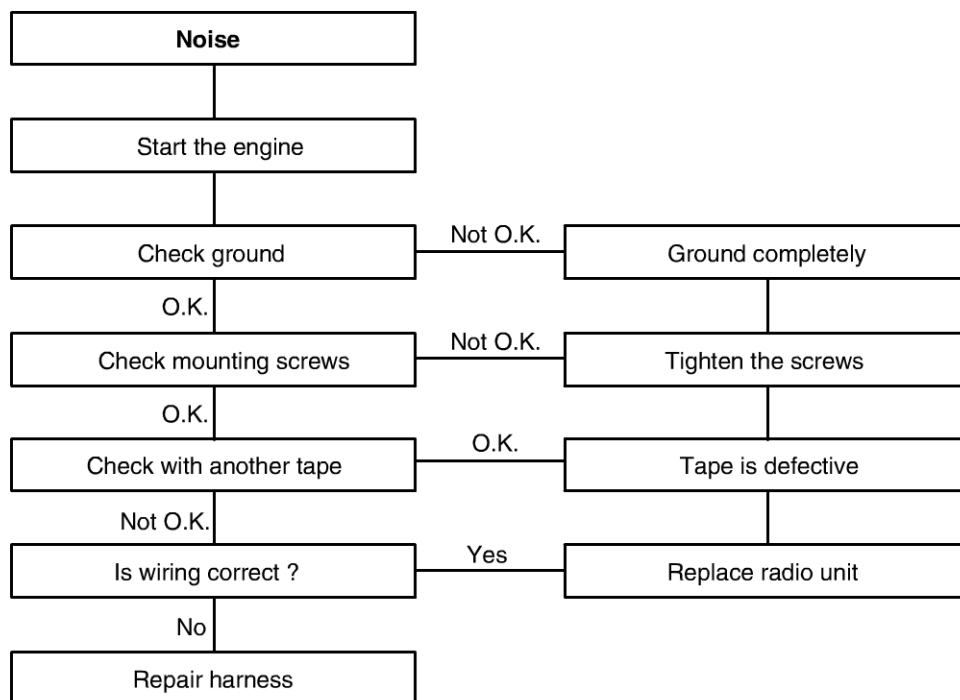


CHART 4

1. RADIO



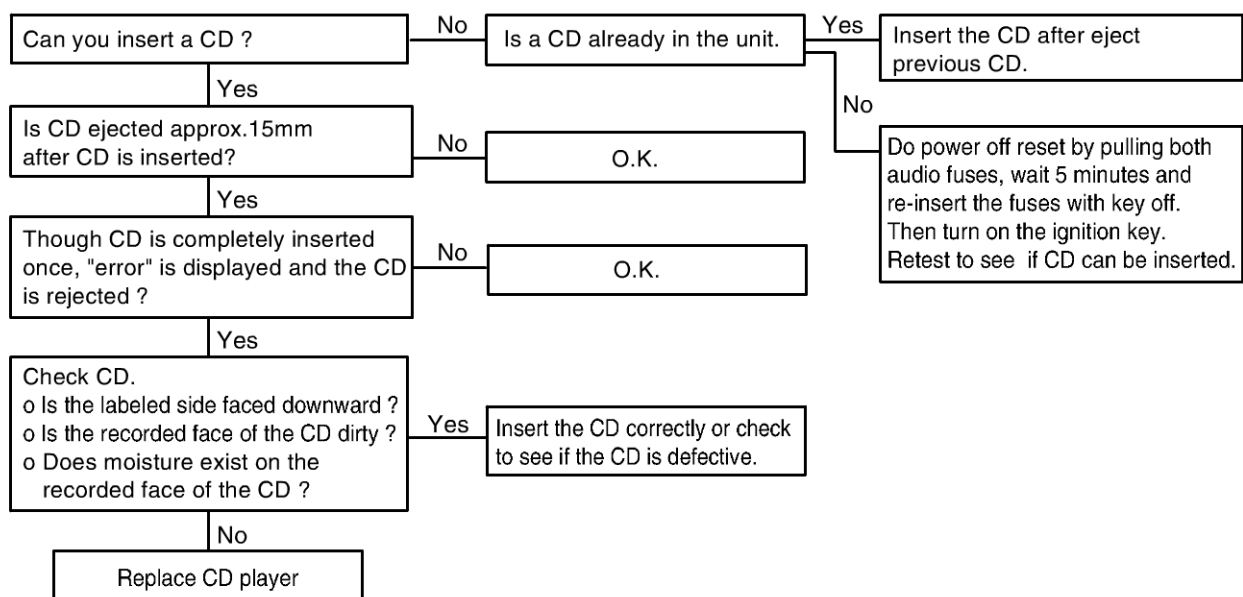
2. TAPE



LTIF001G

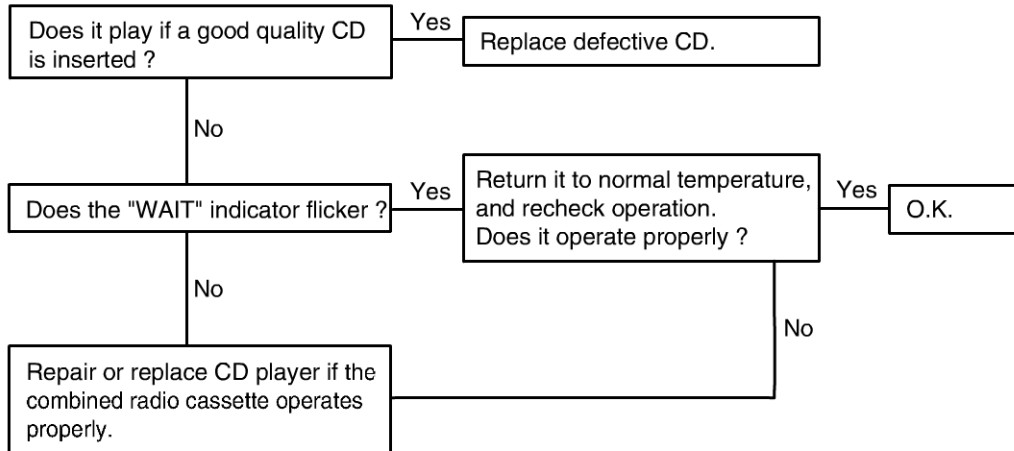
CHART 5

1. CD WILL NOT BE ACCEPTED



BTIF001H

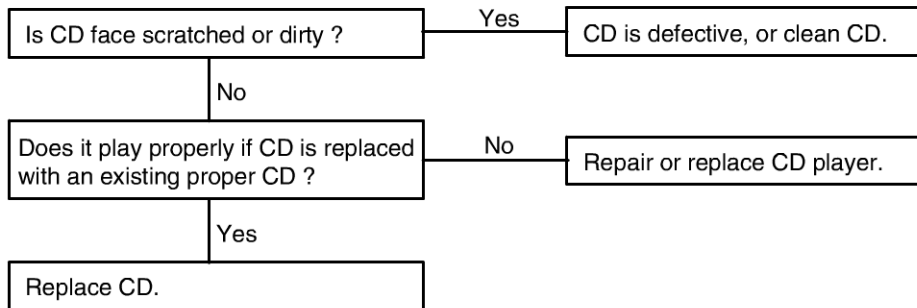
2. NO SOUND



LTIF001I

3. CD SOUND SKIPS

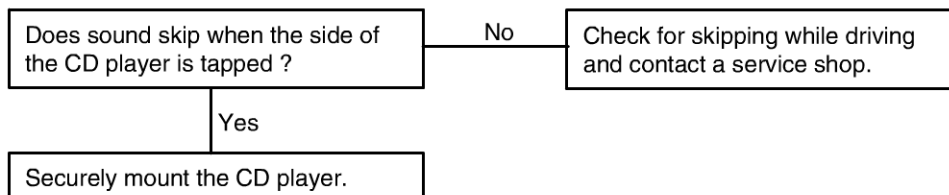
1) Sound sometimes skips when parking.



2) Sound sometimes skips when driving.

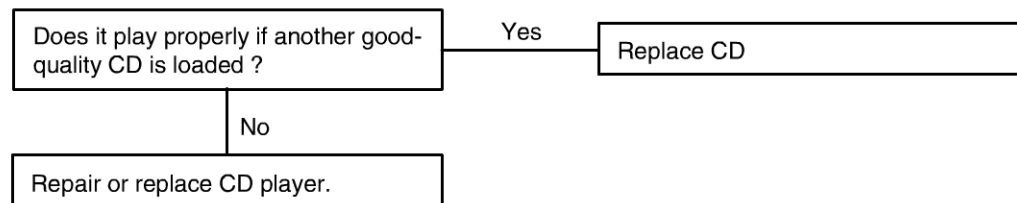
(Stop vehicle, and check it.)

(Check by using a CD which is free of scratches, dirt or other damage.)

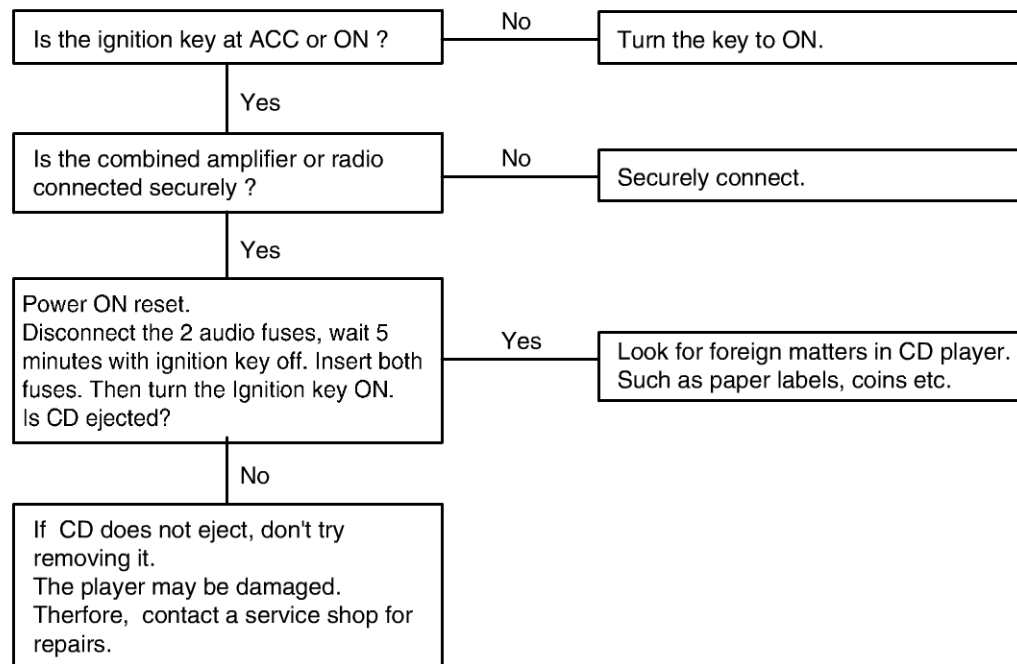


LTIF001J

4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT



6. NO SOUND FROM ONE SPEAKER

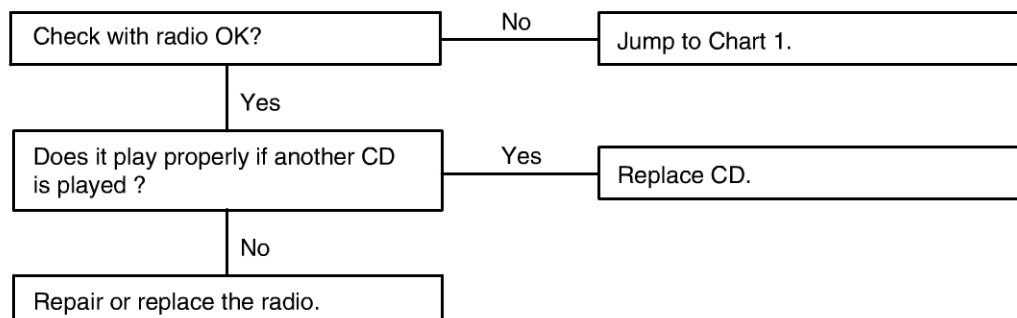
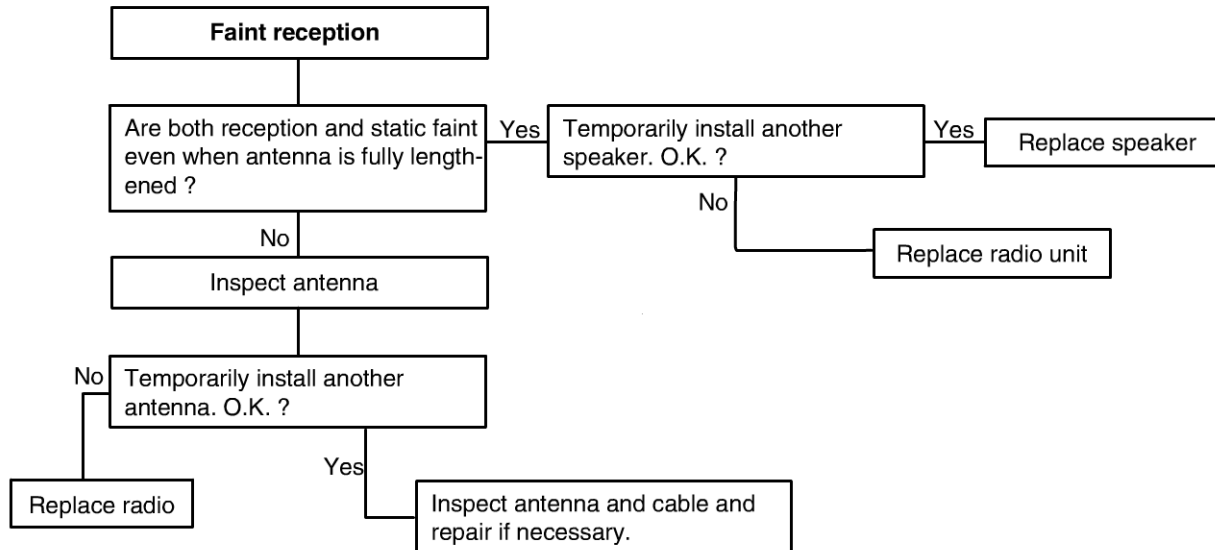
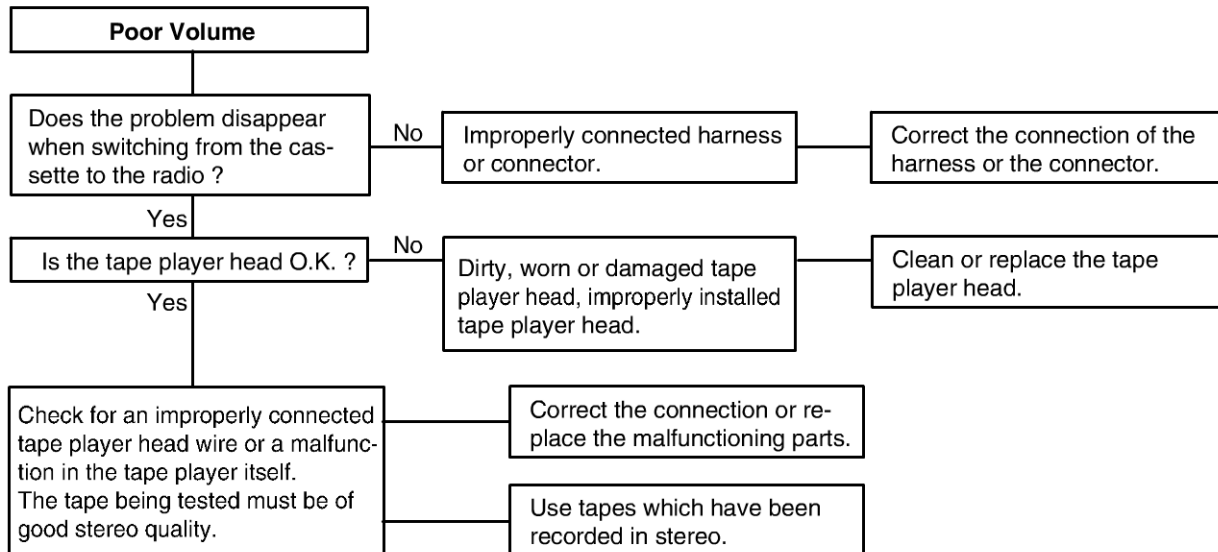


CHART 6



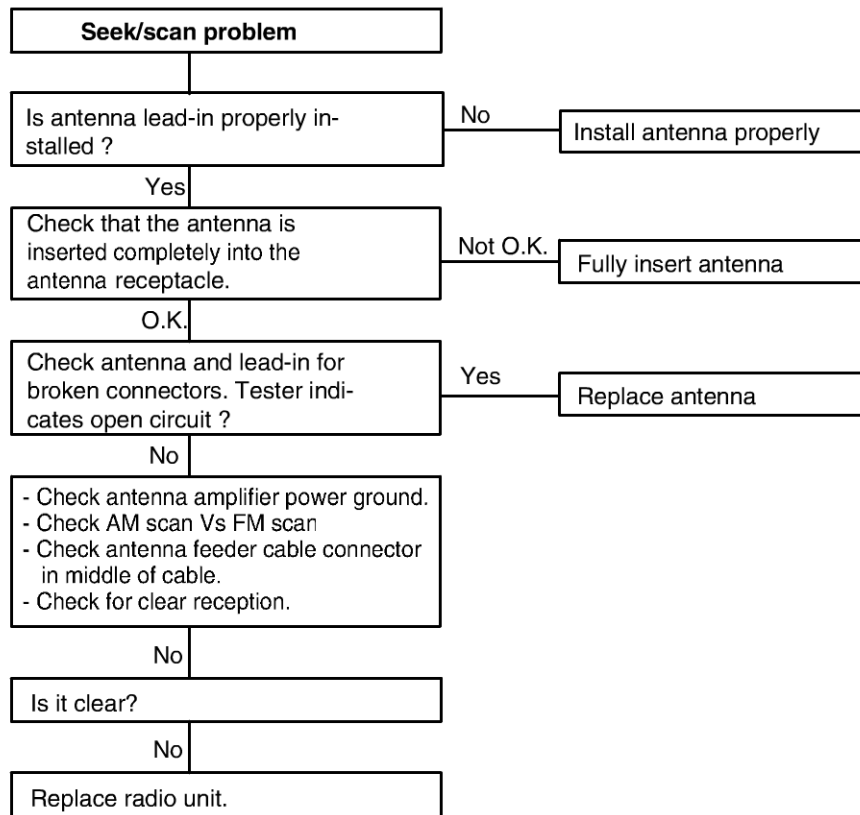
LTIF001L

CHART 7



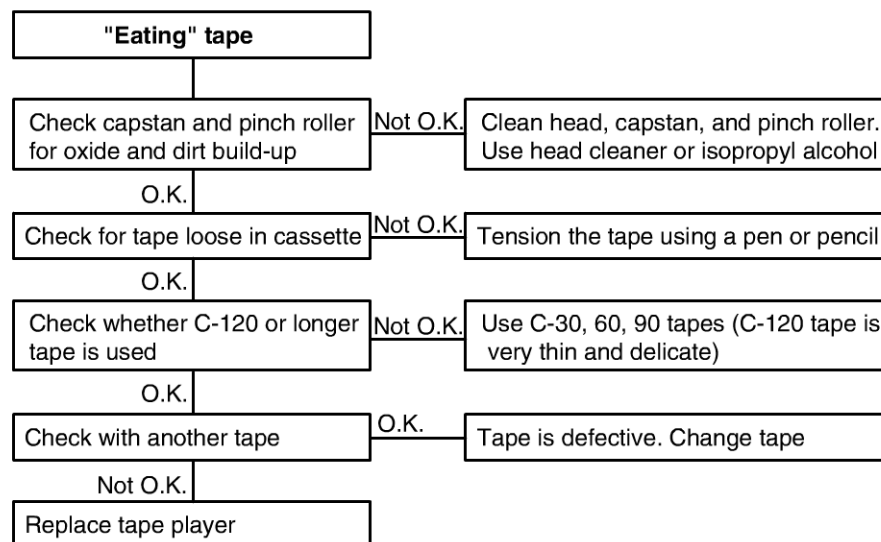
LTIF001M

CHART 8



LTIF001N

CHART 9



LTIF001O

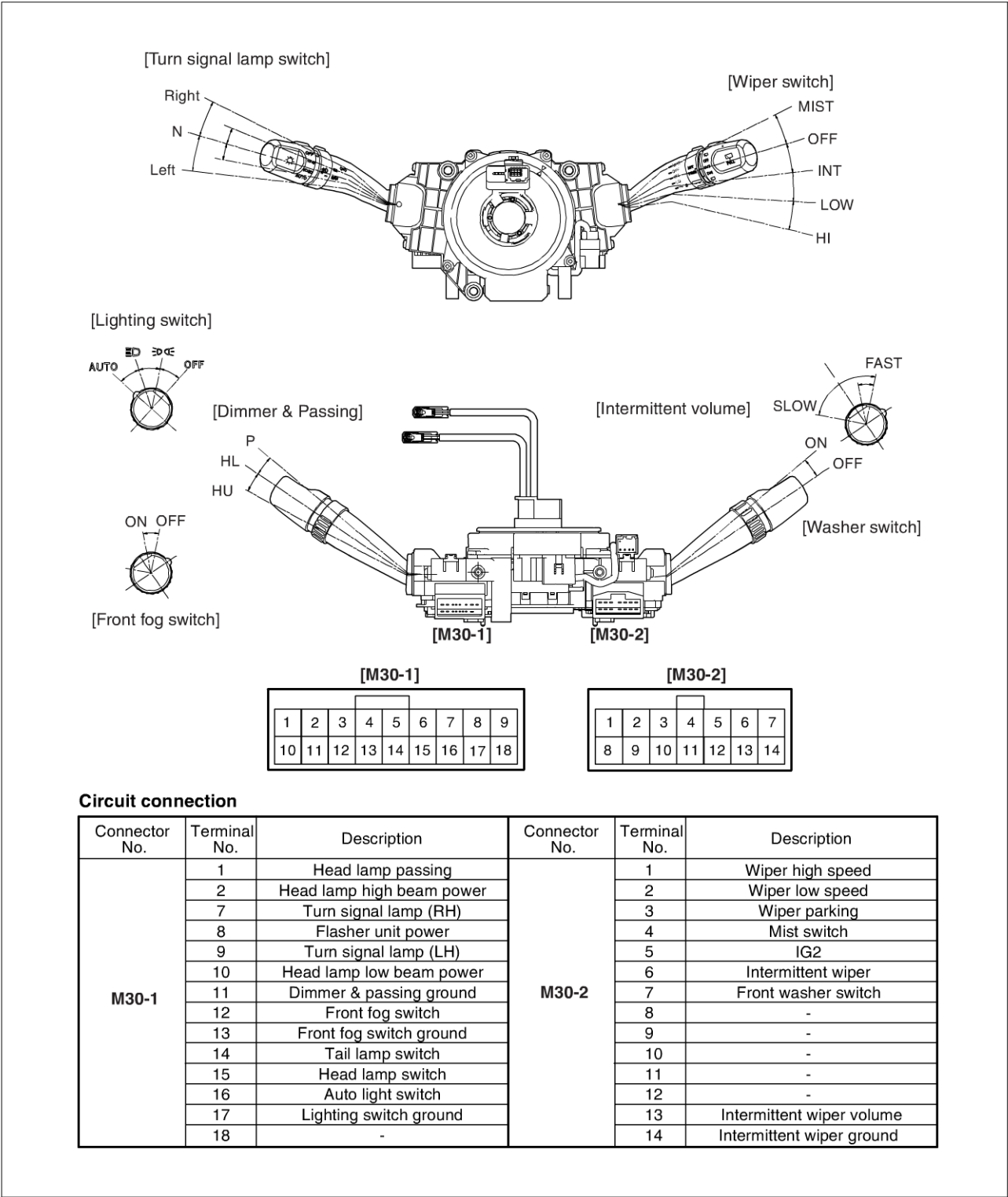
MULTI FUNCTION SWITCH

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

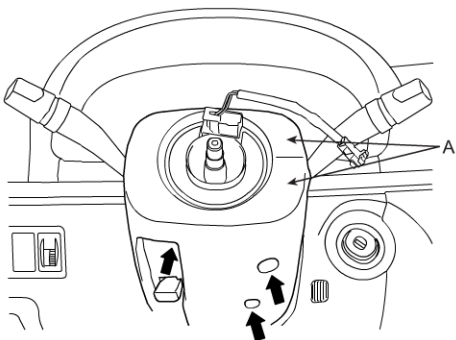
COMPONENTS EF735BCC



MULTI FUNCTION SWITCH

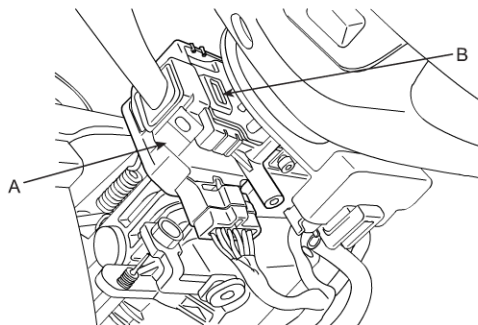
REPLACEMENT EC9A84E8

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



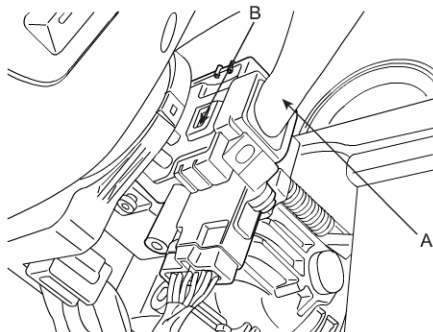
KTRE031B

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.

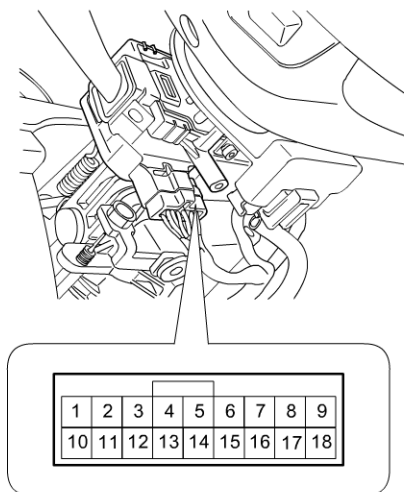


KTRE031D

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)

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

LTGE031E

LIGHTING SWITCH

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

ETRF031F

DIMMER AND PASSING SWITCH

Terminal Position	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	Turn signal switch	Terminal	7	8	9
OFF	L			○	○
	N				
	R	○	○		

LTGE031G

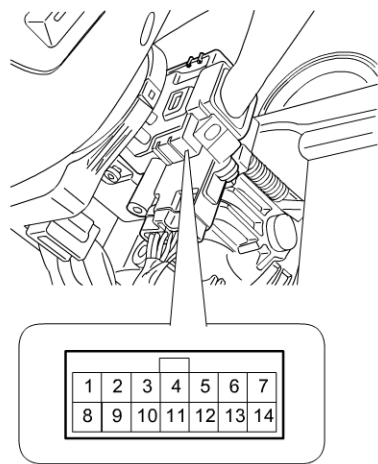
FRONT FOG LAMP SWITCH

Terminal Position	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

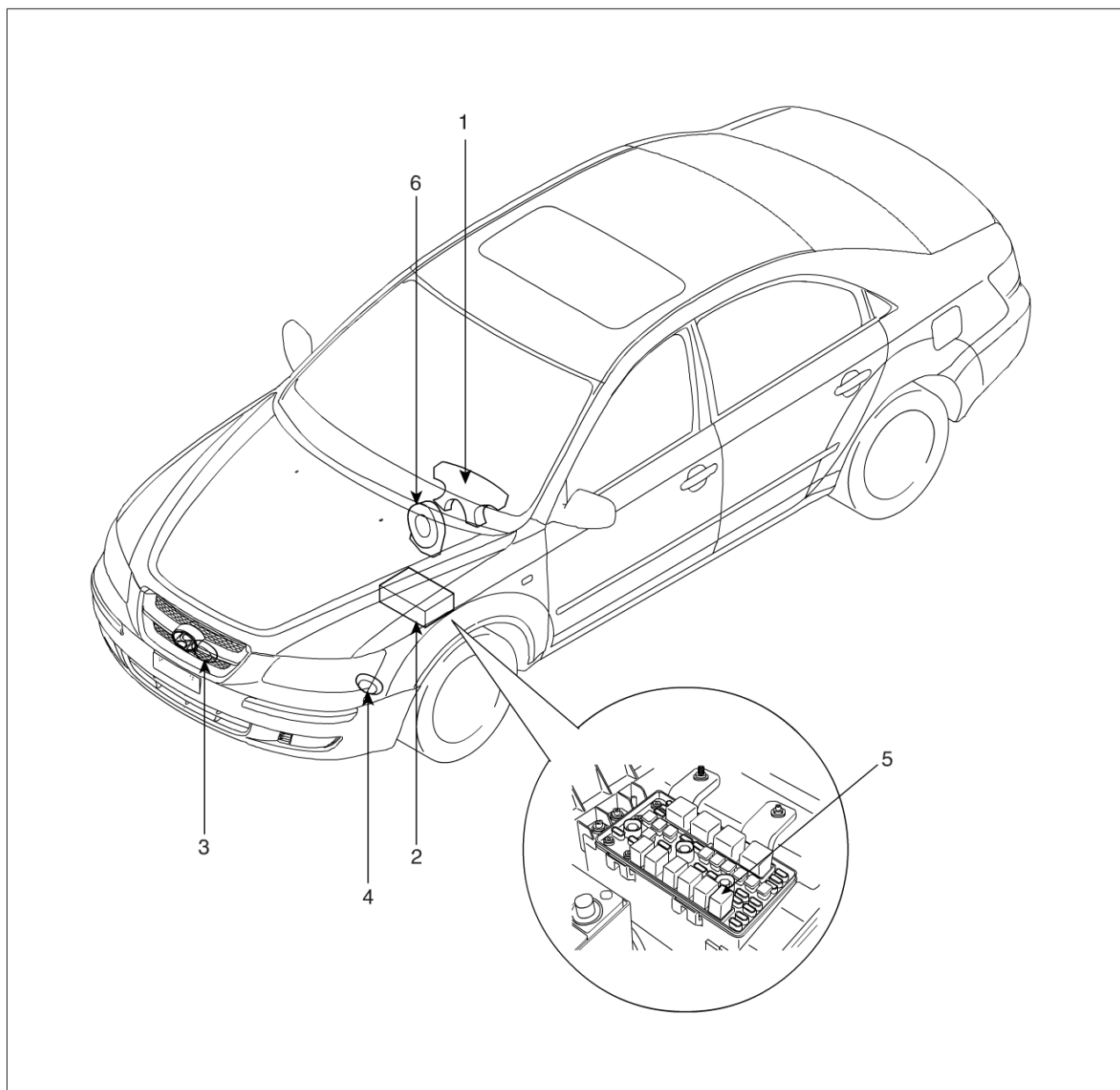
WASHER SWITCH

Terminal Position	5	7
OFF		
ON	○—	—○

LTGE031J

HORNS

COMPONENT LOCATION E5AE0FDD



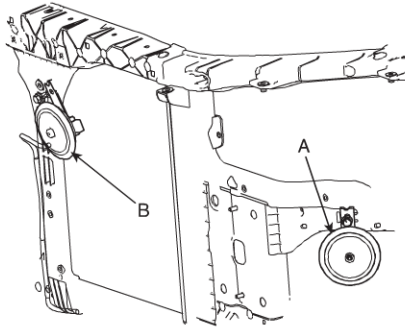
- 1. Horn switch
- 2. Relay box (Engine room compartment)
- 3. Horn (Low pitch)

- 4. Horn (High pitch)
- 5. Horn relay
- 6. Clock spring

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.

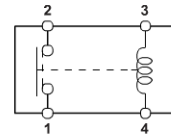
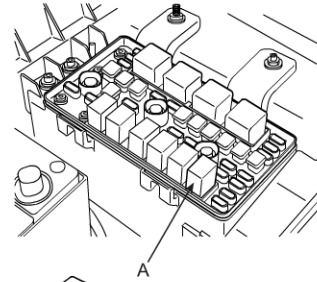
INSPECTION

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

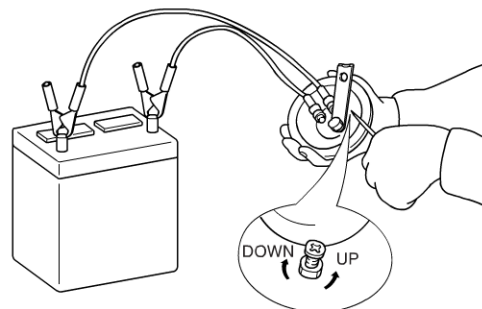
ADJUSTMENT

E6BEA9EB

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

**NOTE**

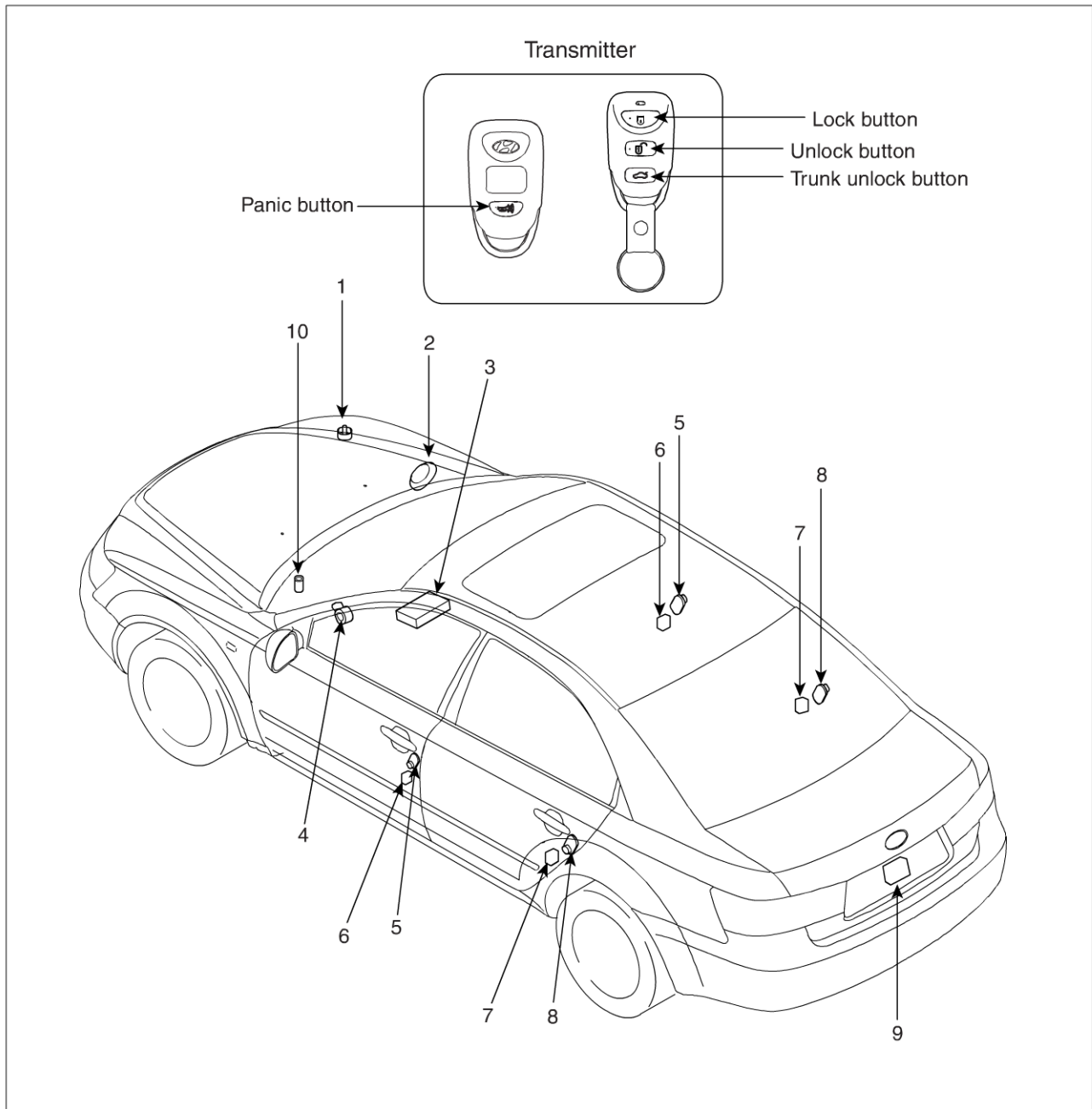
After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



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

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

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

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

The door switches, hood switch and trunk lid switch are all close and lock the doors with the remote transmitter and then the system arms 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, driver door unlock. If the unlock button is pressed a second time right away, the remain 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.

PANIC MODE

The panic mode causes the BCM to sound the alarm with the remote transmitter in order to attract attention. When the PANIC button is pressed and held for 2 seconds, the alarm will sound and exterior lights will flash for about 30 seconds.

The panic mode can be canceled at any time by pressing any button on the remote transmitter or by turning the ignition switch ON. The panic mode will not function if the key in.

The panic mode can be canceled by lock or unlock with the key.

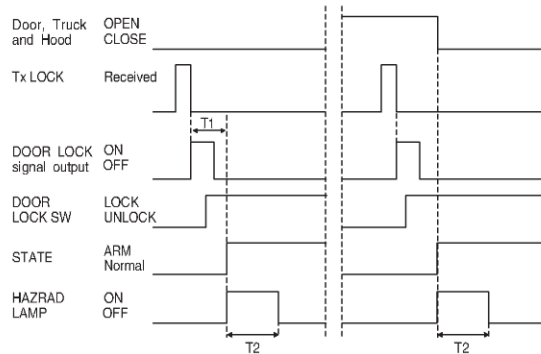
FUNCTIONS EEB26B58**ANTI-THEFT FUNCTION****1. ARM Function**

- 1) When using LOCK on the RKE (Remote Keyless Entry) or DOOR KEY the doors will lock, the hazard lamp will blink once within 0.6 seconds 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)

* Hazard lamp will not blink when driver door key lock switch transits to ARM mode by OFF → ON.

- 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 or DOOR KEY, 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).

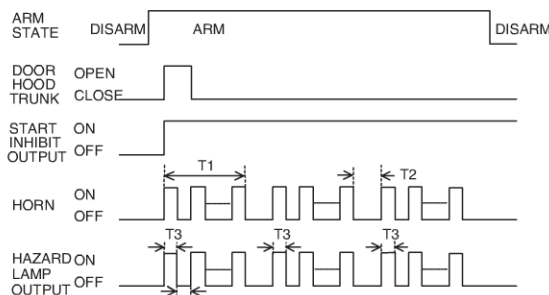


ETRF121A

T1 : 0.6 sec,
T2 : 1.0 ± 0.2 sec.

2. ALARM Function

- When a point of entry is opened without RKE or DOOR KEY unlock signal 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.
- Output intervals for the horn alarm and hazard lamps are identical.
- 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.)



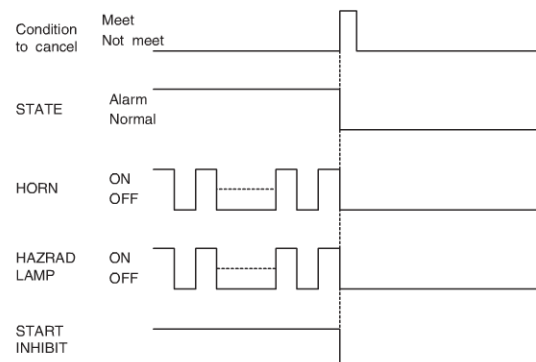
ETRF121B

T1 : 27 ± 2 sec,

T2 : 10 ± 1 sec,
T3 : 0.45 ± 0.1 sec.

3. ALARM CLEARANCE

- UNLOCK signal is output for 0.5s, alarm and start inhibit signal output become OFF when RKE UNLOCK signal is received or DOOR KEY UNLOCK signal is received.
- LOCK signal is output for 0.5s, and alarm and start inhibit signal output become OFF when RKE LOCK signal is received or DOOR KEY LOCK signal is received.
- Alarm and start inhibit signal output become OFF and the state becomes DISARM if "KEY IN SW=ON & IGN1 SW=ON & IGN2 SW=ON" is continued for 30s.
In ARM mode, the state becomes DISARM in case of "KEY IN SW=ON & IGN1 SW=ON & IGN2 SW=ON".
- In ARM mode, the state becomes DISARM at FRONT DOOR KEY UNLOCK ON and the state becomes Alarm Hold state at TRUNK KEY UNLOCK ON.
- Under ALARM, FRONT DOOR or TRUNK KEY UNLOCK is turned ON, start inhibit signal output becomes OFF, then the state becomes DISARM.
- If trunk is not opened after TRUNK UNLOCK signal is received with RKE or KEY, the mode enters into ARM mode 30s later after that.
- If trunk is opened and closed again after TRUNK UNLOCK signal is received with RKE or KEY, the mode enters into ARM mode 30s later after that.



ETRF121C

4. Battery Separation

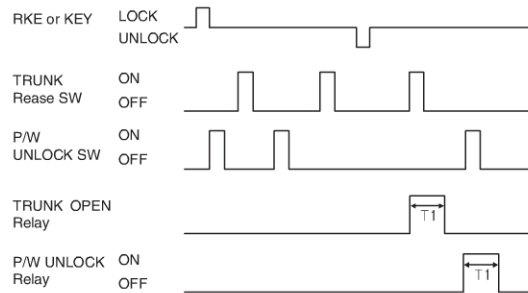
- 1) When the battery is reconnected after having been disconnected/removed while in ARM mode. ARM mode continues.
- 2) When the battery is reconnected after having been disconnected/removed, and after the alarm completes, the alarm will restart.
- 3) When battery is reconnected after having been disconnected/ 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 or KEY 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 and PANIC mode.

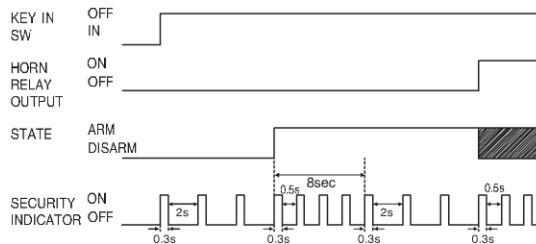
6. DOOR UNLOCK BY P/WINDOW AND TRUNK OPEN INHIBITION FUNCTIONS

- 1) Unlock signal output with door unlock switch by P/window and trunk switch is prohibited in case of RKE LOCK under ignition key off.
- 2) Unlock signal output with door unlock switch by P/window and trunk switch is inhibited in case of 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 by P/window is cancelled in case of door unlock with door key while door unlock inhibition function activates.
- 5) Unlock inhibition function by P/window is cancelled at ignition key in & on.
- 6) In ARM mode, unlock signal by P/window input is not output.



ETRF121J

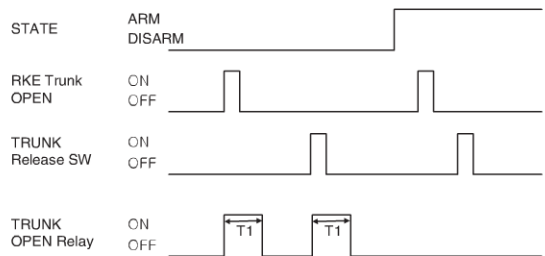
T1 : 0.5 ± 0.1 sec.



ETRF121D

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.

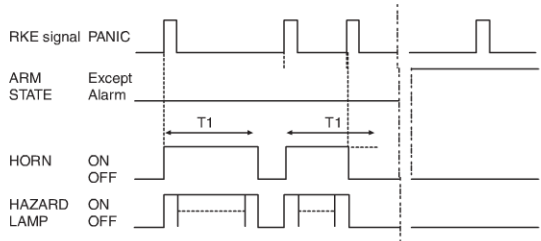


ETRF121F

T1 : 0.5 ± 0.1 sec.

8. PANIC alarm

- 1) PANIC alarm is turned ON for T1 by using horn and hazard if RKE PANIC signal is received.
- 2) PANIC alarm is turned OFF if (RKE LOCK/UNLOCK/PANIC/TRUNK UNLOCK /KEY IN /DOOR KEY LOCK/DOOR KEY UNLOCK / TRUNK KEY UNLOCK) signals are received during PANIC alarm.
- 3) PANIC signal output is immediately turned OFF and the state becomes ARM state if the condition for ARM is met during PANIC alarm.
- 4) The below is about antitheft alarm.
 - a. Antitheft alarm does not stop even when PANIC signal of RKE is received during the alarm. (PANIC signal reception is ignored)
 - b. Antitheft alarm signal is output when the condition for antitheft is met during PANIC alarm. (PANIC signal output: OFF)
 - c. PANIC alarm is turned ON with continuing antitheft function when PANIC signal is received in ARM stand-by / ARM / Alarm end / RELOCK stand-by mode.

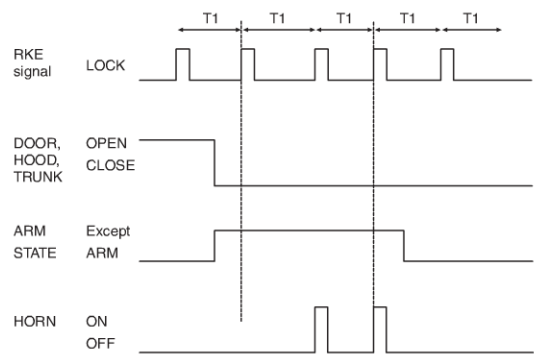


ETRF121H

T1 : 30 ± 3 sec.

9. HORN ANSWER BACK

- 1) Under DOOR, TRUNK or HOOD: closed, horn and hazard(1s-output) signals are output if RKE LOCK signal is received again within T1 from the moment when the mode transits to ARM mode by RKE LOCK operation and ARM mode is kept.
- 2) Horn and hazard signals are not output if ARM mode is cancelled for T1.
- 3) Horn and hazard signal are output even when other LOCK signals of RKE, registered during T1, are received.



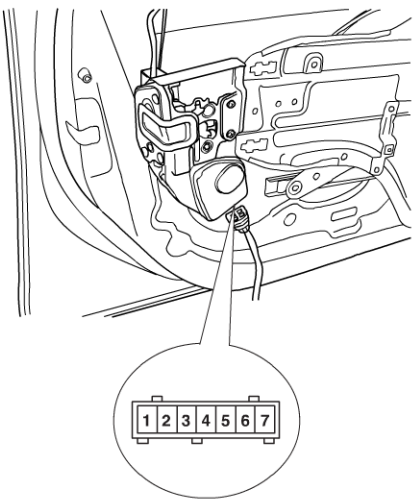
T1 : within 4sec

ETRF1211

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

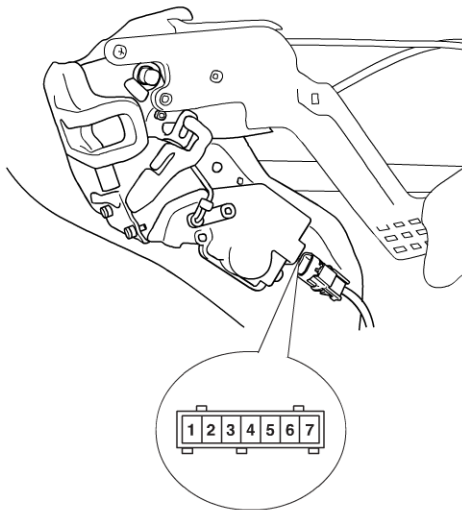
- 3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

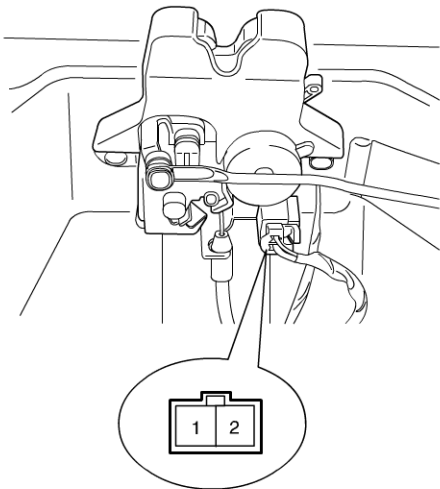
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

ETRF122D

TRUNK 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

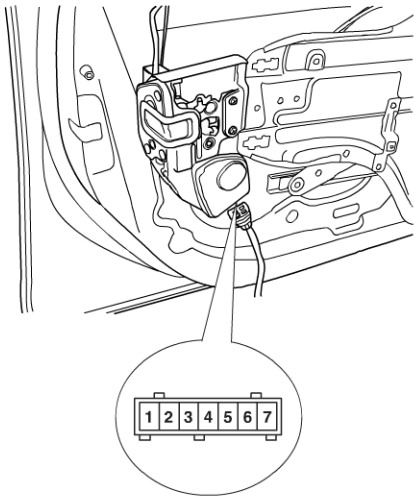
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal		2	Chassis ground
Position	Open	⊕	⊖

ETRF122I

FRONT DOOR LOCK SWITCH INSPECTION

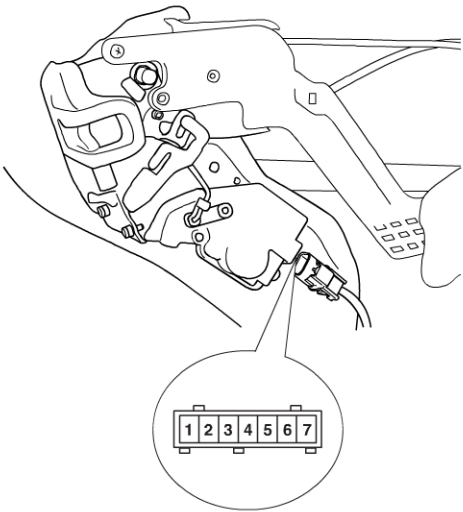
- 1. Remove the front door trim panel. (Refer to the Body group - front door)
- 2. Disconnect the 7P connector from the actuator.



KTRE122A

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.

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

ETRF122G

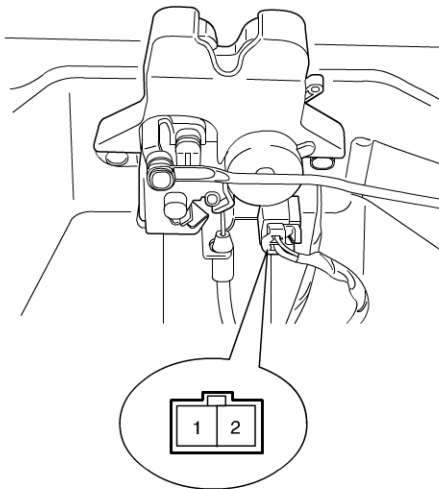
- 3. Check for continuity between the terminals in each switch position according to the table.

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

ETRF122H

TRUNK 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

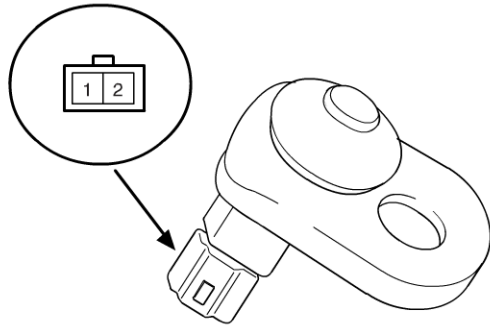
3. Check for continuity between the terminals in each switch position according to the table.

Terminal Position	1	Chassis ground
Open	⊕	⊖

ETRF122F

DOOR SWITCH INSPECTION

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



ATIE121Q

[FRONT DOOR SWITCH]

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

ETQF180D

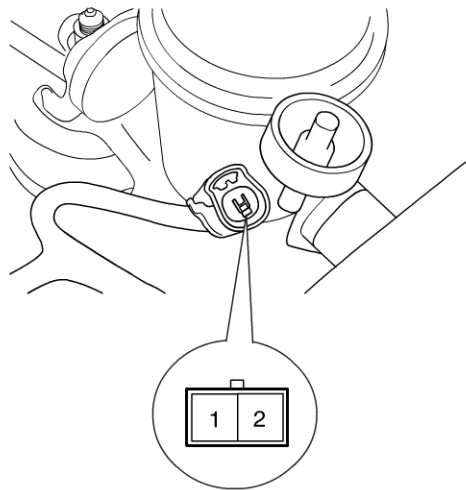
[REAR DOOR SWITCH]

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

ETRF262E

HOOD SWITCH INSPECTION

1. Disconnect the 2P connector from the hood switch.



ETRF122J

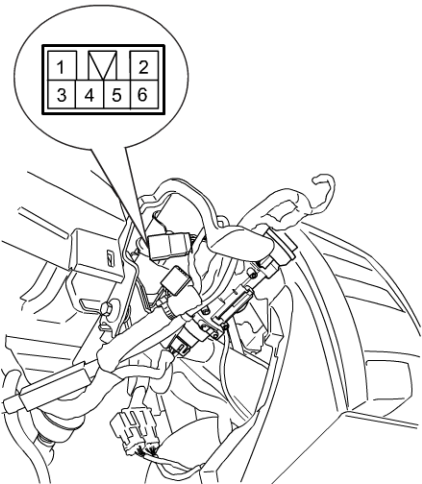
2. Check for continuity between the terminals and ground according to the table.

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

ETRF122K

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

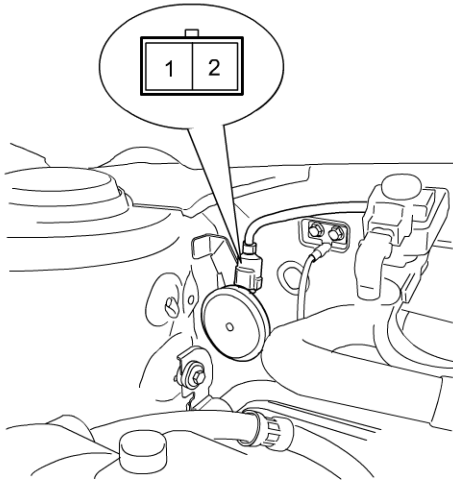
3. Check for continuity between the terminals in each position according to the table.

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

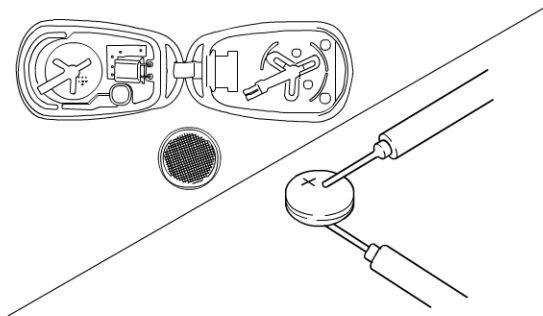
SPECIFICATIONS EE1ACAAB

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, Panic
Transmission frequency	313.85 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



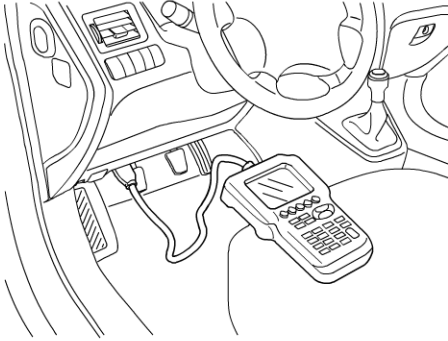
KTKD029A

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, push "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!

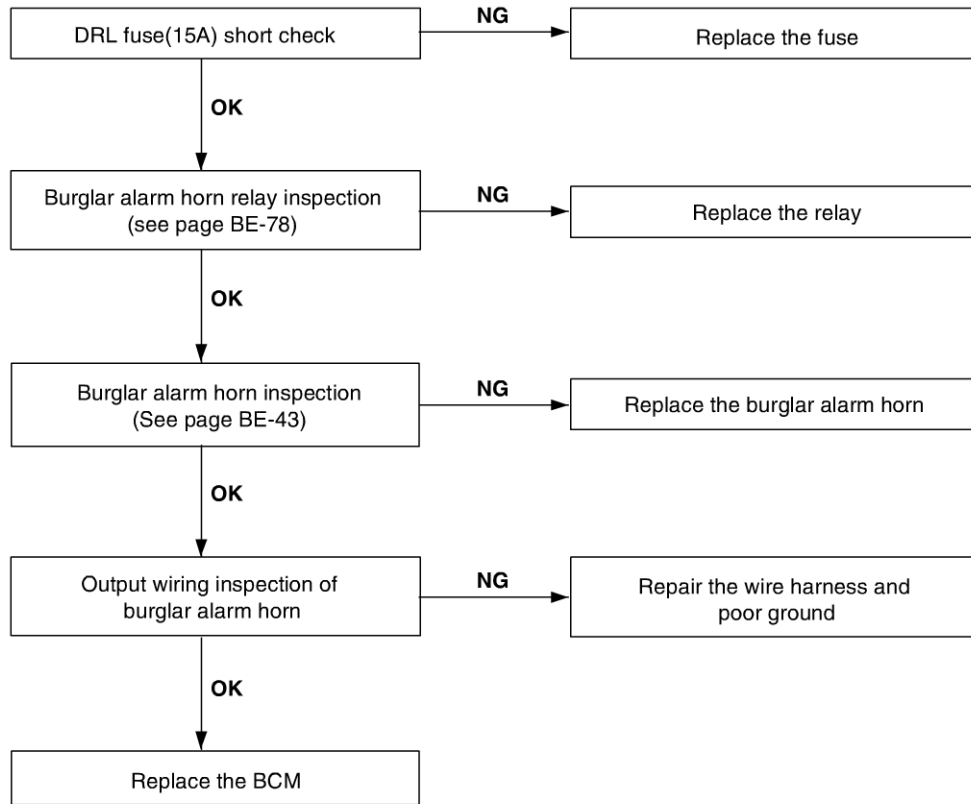
CODE SAVING IS COMPLETED!
IF YOU STOP, PRESS [ESC] KEY!!!

* NO. OF CODED KEY : 2 EA

ETRF065Q

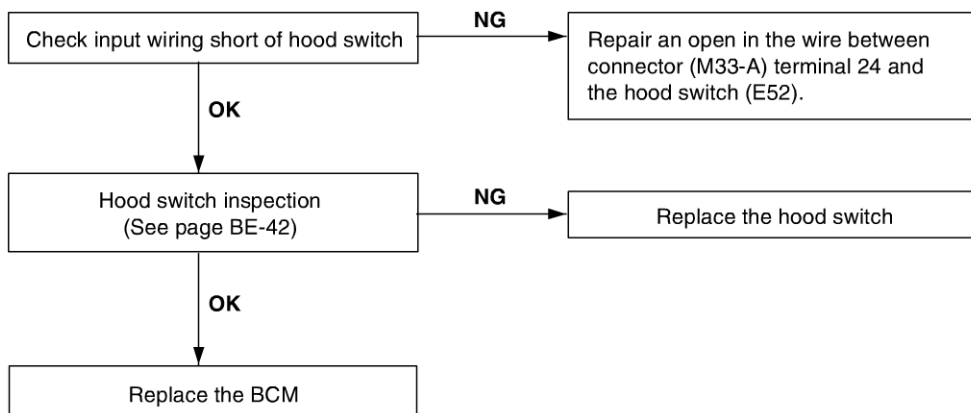
TROUBLESHOOTING E5FE3E6C

1. Alarm does not work. (Hazard lamps work)



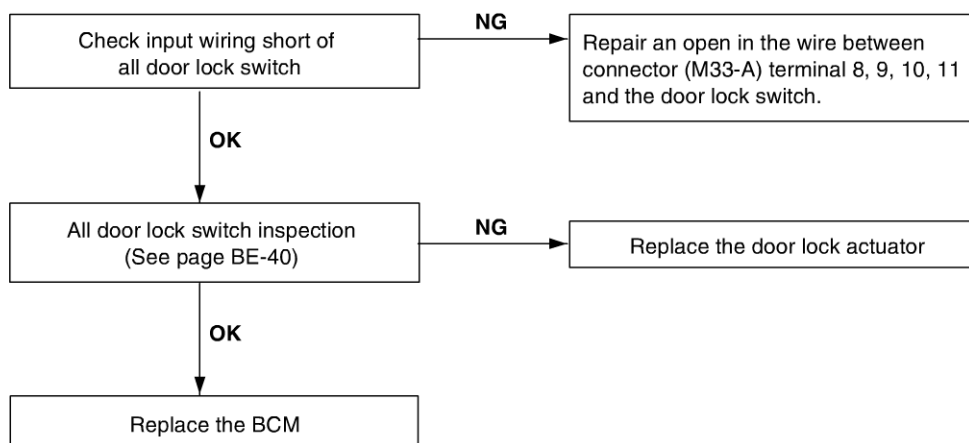
ETRF901I

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



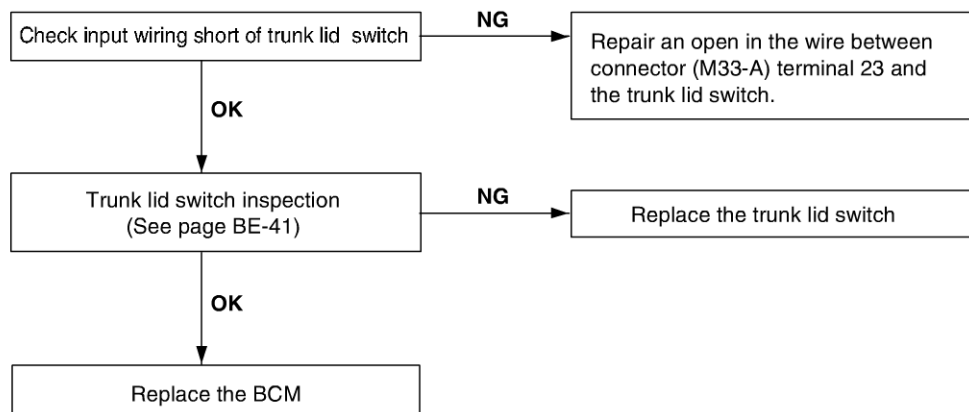
ETRF901J

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



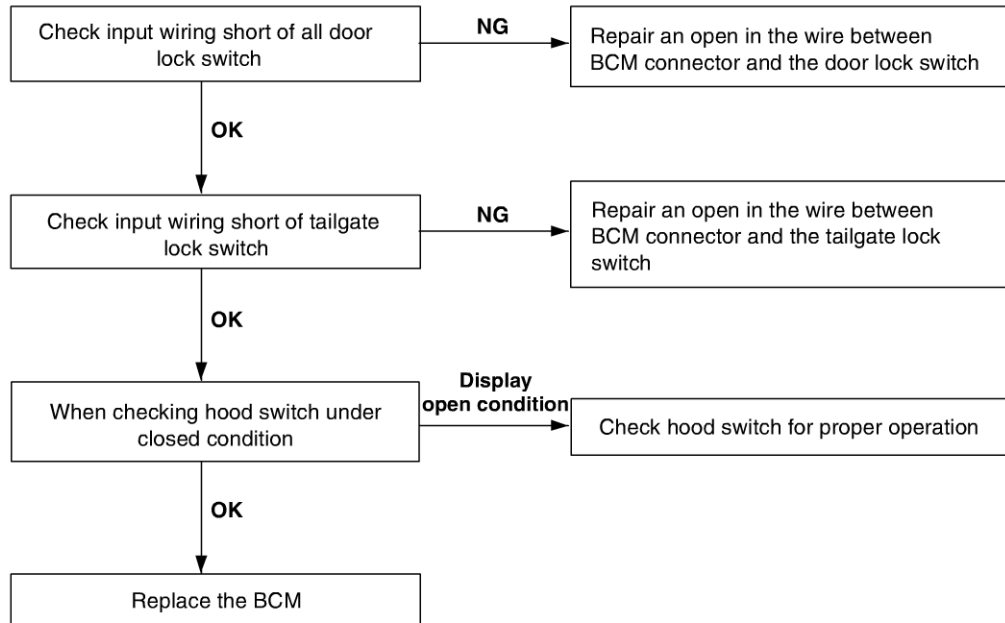
ETRF901K

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



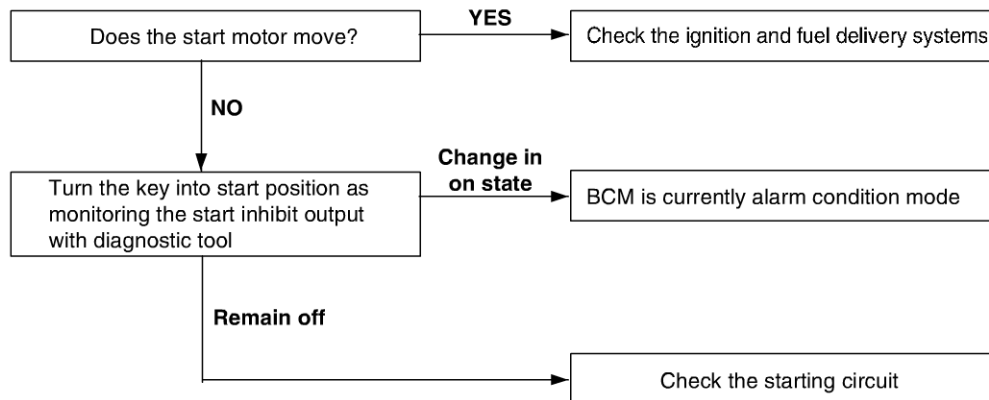
ETRF901L

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



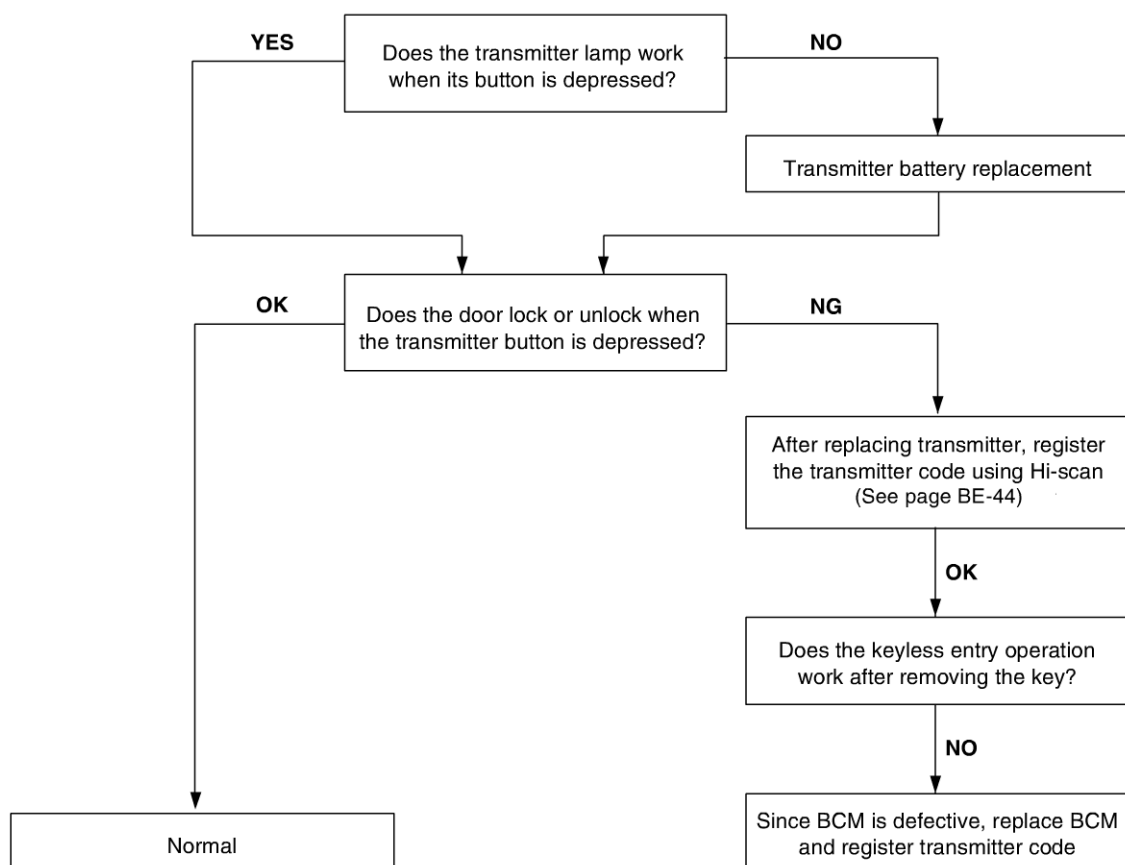
ETRF900M

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



ETRF900N

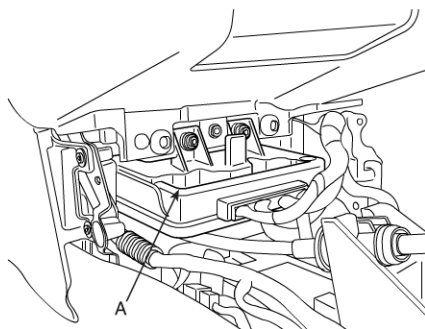
7. Central door lock function works, but keyless entry system does not work.



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 belt reminder, delayed out room lamp, central door lock, ignition key reminder, power window timer, door warning, tail lamp auto cut, crash door unlock, auto door lock, 2-turn unlock, ignition key hole illumination control and keyless entry & burglar alarm.



KTRE140A

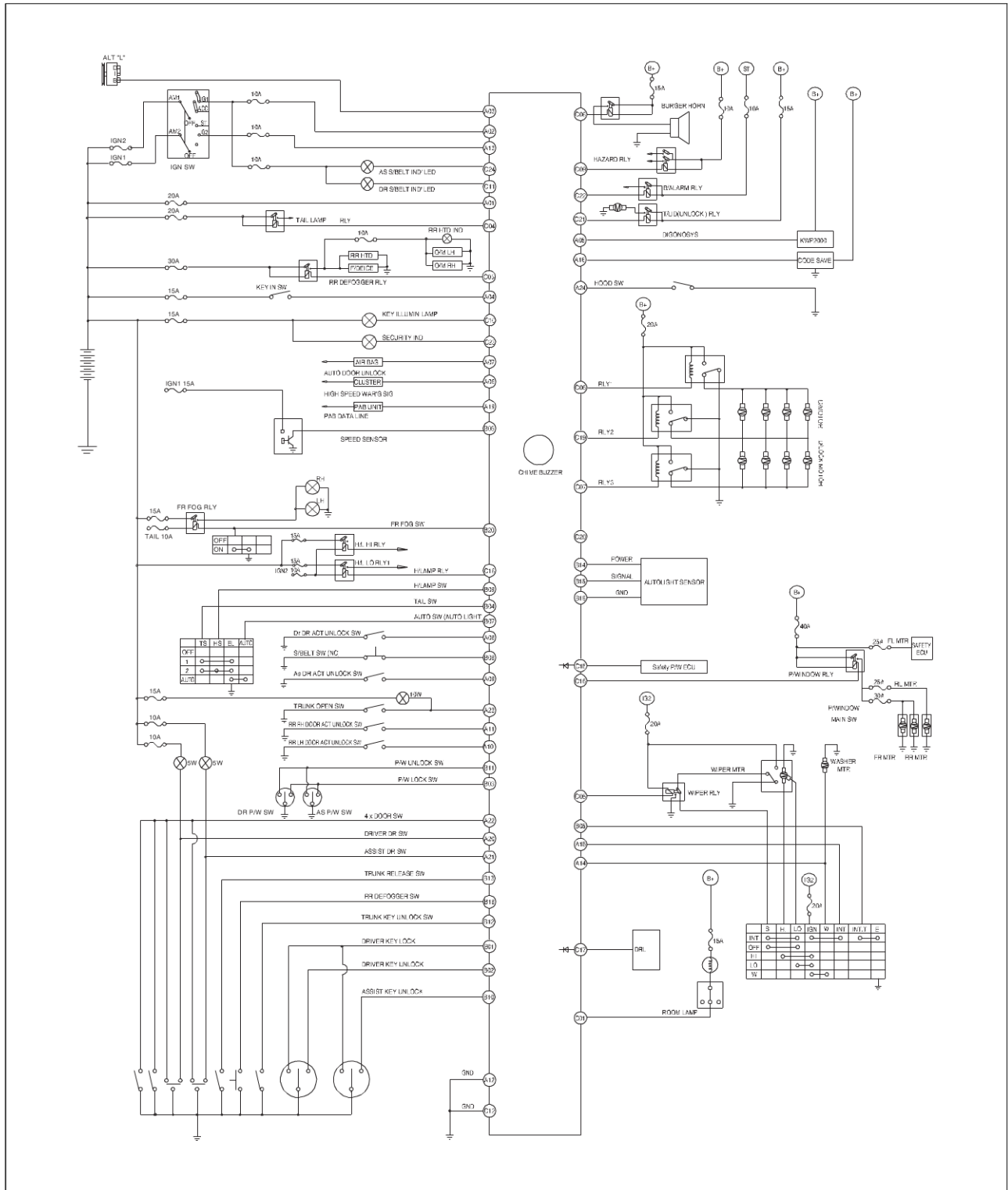
SPECIFICATIONS

E44CA976

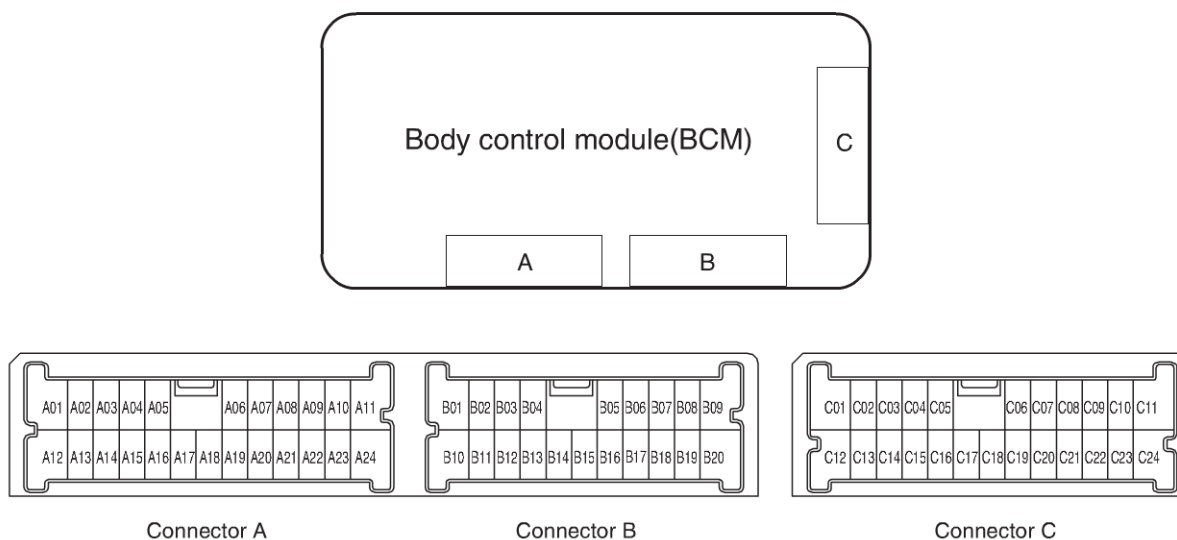
Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F~167°F(-30°C~ 75°C)
Insulation resistance	100M Ω or more
Dark current	Less than 5.5mA (12.8 V) - BCM & Receiver Less than 4mA (12.8V) - BCM
Rated load	
Burglar relay	DC 12V, 200mA (Inductance load)
Horn 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 (For CANADA)	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)

CIRCUIT DIAGRAM

E5178D16



BCM CONNECTOR TERMINALS EFB3BA8C



ETRF140C

Terminal No.	Connector A	Connector B	Connector C
1	B+ [For BCM]	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 unlock switch	Driver seat belt indicator
12	Ground	Trunk key unlock switch	Ground
13	IGN 2	Trunk open switch	-
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	-	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

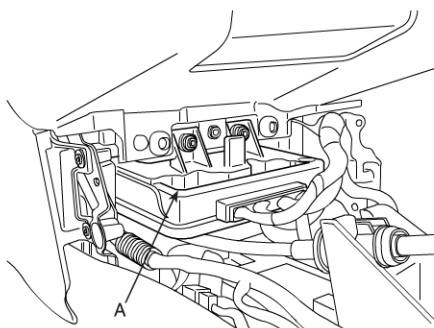
BCM MODULE INPUT SIGNAL TEST

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	-	-	-	-
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

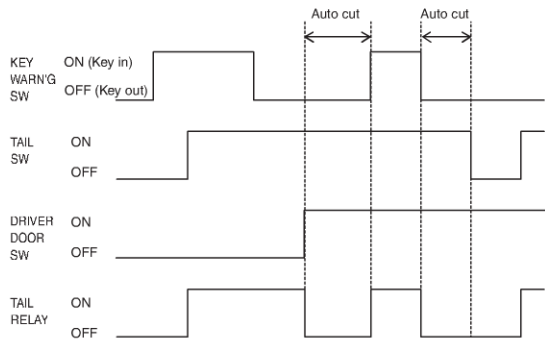
4. Installation is the reverse of removal.

INSPECTION E3BDFDD3

Verify each components operation using related timing charts.

1. TAIL LAMP AUTO CUT

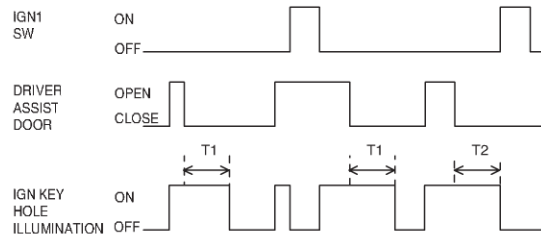
- 1) With the tail lamp switched ON, if the ignition is switched OFF and the driver's door opened, the tail lamp should be automatically turned OFF.
- 2) With the ignition switch ON, if the driver's door is opened and the ignition is switched to OFF, the tail lamp should be automatically turned OFF.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

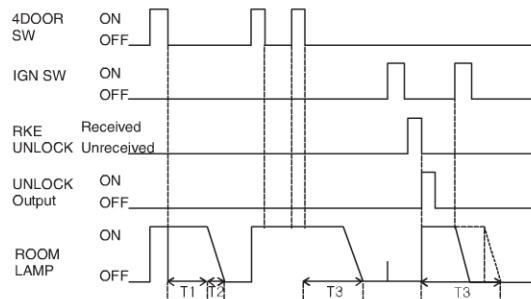


LTGE141B

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

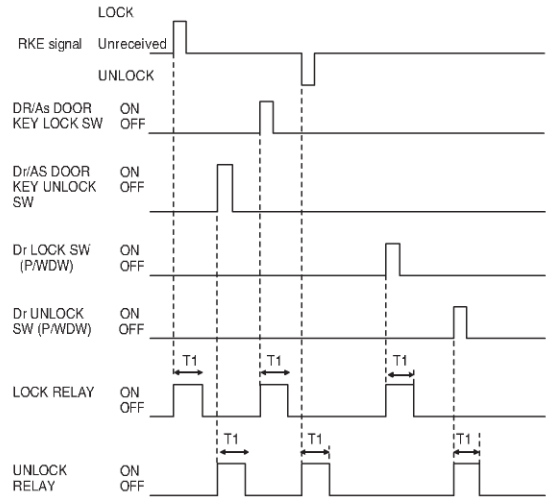
T1 : 30 ± 3 sec.,
T2 : 2 ± 0.2 sec.,
T3 : 32 ± 3.2 sec.

4. CENTRAL DOOR LOCK/UNLOCK

1) Central door lock/unlock

Function \ Option		Central door Lock	Transmitter (RKE)
Door key UNLOCK	Driver	2-Turn unlock	2-Turn unlock
	Assist	2-Turn unlock	2-Turn unlock
Door key LOCK	Driver	All lock	All lock
	Assist	All lock	All lock
Transmitter (RKE)	Lock	–	All lock
	Unlock	–	2-Turn 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

ETRF141Y

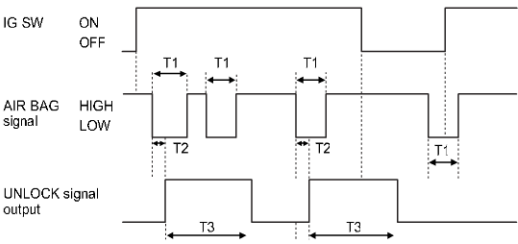


ETRF141D

T1 : 0.5 ± 0.1 sec.

5. CRASH DOOR UNLOCK

- 1) UNLOCK signal is always output when AIR BAG signal is input under IG SW = ON.
- 2) UNLOCK signal is output for the remaining time even when IG SW ON is turned to OFF during UNLOCK output.
- 3) UNLOCK signal is not output when IG SW OFF is turned to ON after AIR BAG signal is input in advance.
- 4) UNLOCK signal is output for T3 when driver, Assist or rear DOOR LOCK SW is locked from UNLOCK after UNLOCK signal is output.
- 5) AUTO DOOR LOCK function is not performed when CRASH UNLOCK condition is met.
- 6) CENTRAL DOOR LOCK function is not performed during or after CRASH UNLOCK signal output. But, CENTRAL DOOR LOCK function is performed normally if CRASH UNLOCK function is reset after IG OFF.

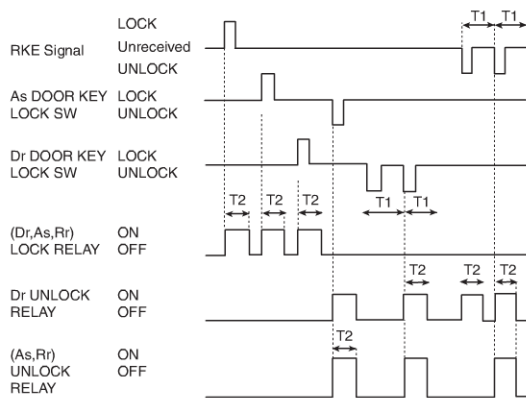


ETRF141F

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

6. 2-TURN UNLOCK

- 1) All door unlock signals are output for T2 if driver door key unlock switch is turned ON within T1 after changing driver door key unlock switch from OFF to ON (mechanically, driver door key unlock switch is unlocked and BCM signal is not output). (All door unlock signals are output even within T1 after RKE UNLOCK signal is received.)
- 2) Driver door unlock signal is output for T2 when RKE UNLOCK signal is received. But, all door unlock signals are output for T2 if RKE UNLOCK signal is received within T1. (All door unlock signals are output for T2 even when RKE UNLOCK signal in T1 is received after changing driver door key unlock switch from OFF to ON.



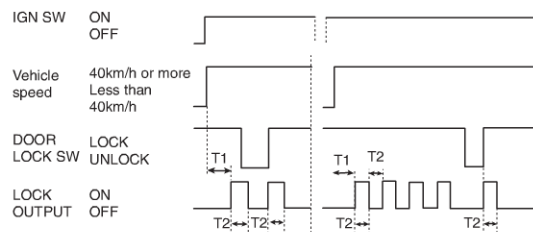
ETRF142A

T1: within 4±1sec.

T2: 0.5±0.1sec.

7. AUTO DOOR LOCK(USER OPTION)

- 1) This does not activate when vehicle speed is less than 5km/h.
- 2) Lock signal is output if vehicle speed is 5km/h or more for at least 1s under ALT" L" ON, IGN SW = ON. But, lock signal is not output if all doors are locked or all doors are fail in advance.
- 3) Lock signal is output 3 times as Max ((2) is ignored) if either one door is unlocked after lock signal output in (2). (1s cycle) But, door, which is locked from unlock state during 3-time output, is ignored.
- 4) Relevant door is fail if the state is unlock after 3-time output.
- 5) Lock signal is output once if the fail door is unlocked again after the door is locked.
- 6) Lock signal is output once if locked doors, which are lock state after lock signal output in (2), are unlocked again. But, lock signal is output once for the relevant door even when unlock state continues after lock signal output.
- 7) Fail door is cleared at IGN SW = OFF.
- 8) Auto door lock function is not performed when crash unlock condition is met



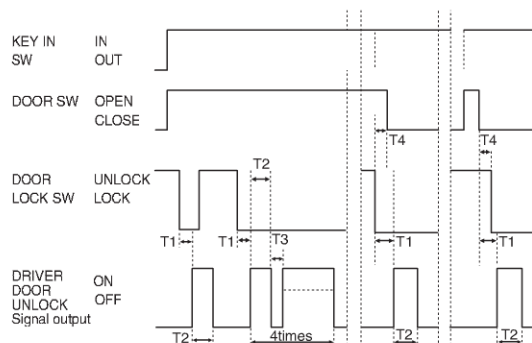
ETRF142B

T1: 1±0.1sec.

T2: 0.5±0.1sec.

8. IGNITION KEY REMINDER

- 1) This function is not performed when vehicle speed is 3km/h or more.
- 2) DRIVER UNLOCK signal is output for 1s after 0.5s from when the state becomes KEY IN SW = IN & DRIVER DOOR = OPEN & DRIVER DOOR LOCK SW = LOCK.
- 3) ALL DOOR UNLOCK signals are output for 1s after 0.5s from when the state becomes KEY IN SW = IN & ASSIST DOOR = OPEN & ASSIST DOOR LOCK SW = LOCK.
- 4) UNLOCK signal is output 3times as Max (1s-output is excluded) in case LOCK state is held even when UNLOCK signal is output for 1s in (2),(3). (1s cycle: 0.5s ON/OFF)

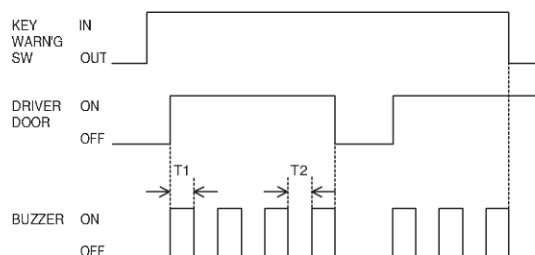


ETRF141G

T1 : 0.5±0.1sec.
T2 : 1.0±0.1sec.
T3 : 0.5±0.1sec.
T4 : 0.5 sec.

9. KEY OPERATED WARNING

- 1) If the key is in the key cylinder and the driver 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.

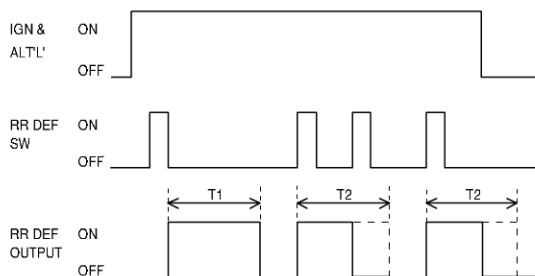


LTGE141I

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.

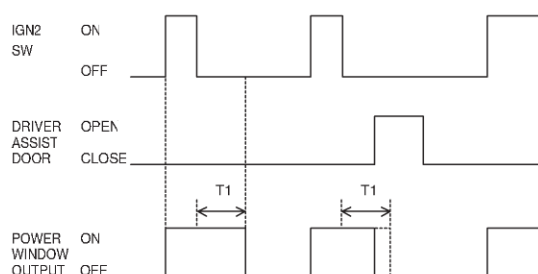


LTGE141J

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.

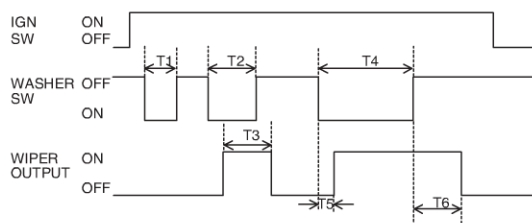


LTGE141K

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.

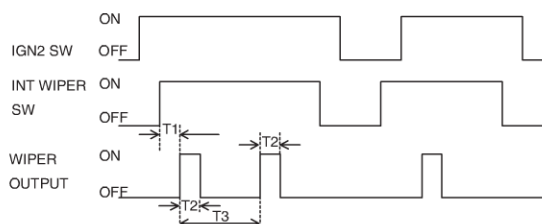


LTIF141N

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.



LTIF1410

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

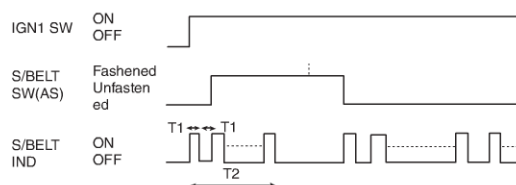
14. SEAT BELT REMINDER FUNCTION(DRIVER)

- 1) Warning lamp lights every 0.6sec and buzzer sounds every 1sec for 6sec when IGN is ON under unfastened seat belt.
 (Warning lamp continues to light for 6sec if seat belt is fastened within 6sec) 30sec- time count starts at ALT" L" ON under this state.(30sec-time count starts after 6sec. if ALT" L" is ON within initial 6sec)
- 2) Buzzer stops and the warning lamp is turned OFF when IGN is turned OFF within 6sec-output.
- 3) Buzzer stops and the warning lamp is turned OFF and 30sec- time count also stops when seat belt is fastened after IGN ON.
- 4) If unfastened seat belt state continues after 60sec- time count from ALT" ON, the warning lamp flashes and buzzer sounds 11 times in 30sec-cycle (6sec ON/ 24sec OFF) after 30sec from ALT" L" ON.
- 5) Warning lamp & buzzer are turned OFF when IGN is OFF or seat belt is fastened during (4).

- 6) Operation in (1) is performed when seat belt is unfastened again under ALT" L" ON and fastened seat belt.
- 7) Operation in (4) is performed when ALT" L" is turned ON again after turning OFF under unfastened seat belt.

15. SEAT BELT REMINDER FUNCTION(ASSIST)

- 1) Warning lamp lights continuously every 0.6sec when IGN is turned ON under unfastened seat belt.
- 2) Warning lamp is turned OFF when IGN is turned OFF within 0.6sec.
- 3) When IGN is ON under unfastened seat belt, the warning lamp lights. The lamp continues to light for remaining time of 6sec when seat belt is fastened within 6sec. The lamp is OFF if seat belt is fastened after 6sec.
- 4) After 6 sec from IGN ON, warning lamp continues to flash when S/BELT is unfastened and stop immediately when S/BELT is fastened.



ETRF 142C

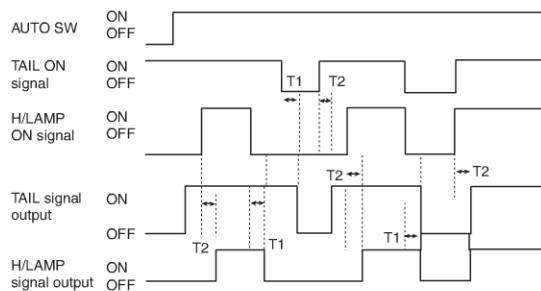
T1: 0.3 ± 0.1 sec.
 T2: 6 ± 1 sec.

16. AUTO LIGHT CONTROL

- 1) Auto light sensor value is always read at IGN ON.
- 2) Light is turned ON after $2\text{sec} \pm 0.2\text{sec}$ when auto light sensor value is same as light ON input value.
- 3) Light is turned OFF after $2\text{sec} \pm 0.2\text{sec}$ 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



ETRF142D

T1/T2: 2.0 ± 0.2sec

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.

1. HYUNDAI VEHICLE DIAGNOSIS ▼▲	
MODEL : SONATA 05	
01. AUTOMATIC TRANSAXLE 02. ANTI-LOCK BRAKE SYSTEM 03. SRS-AIRBAG 04. ELEC. CONTROL SUSPENSION 05. IMMOBILIZER 06. ELEC. POWER STEERING 07. FULL AUTO AIR/CON. 08. 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.

1. HYUNDAI VEHICLE DIAGNOSIS	
MODEL : SONATA 05	
SYSTEM : BODY CONTROL MODULE	
01. CURRENT DATA 02. FLIGHT RECORD 03. ACTUATION TEST 04. SIMU-SCAN 05. IDENTIFICATION CHECK 06. USER OPTION 07. DATA SETUP(UNIT CONV.)	

ETRF144H

1.1 CURRENT DATA	
IGN1	ON
IGN2	ON
ALTERNATER	OFF
KEY IN SW	INSERT
STARTER INHIBIT RELAY	OFF
POWER WINDOW RELAY	ON
TAIL LAMP SW	OFF
AUTO LIGHT SW	OFF
FIX SCRN FULL PART GRPH HELP	

ETRF144C

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

1. HYUNDAI VEHICLE DIAGNOSIS	
MODEL : SONATA 05	
SYSTEM : BODY CONTROL MODULE	
01. CURRENT DATA 02. FLIGHT RECORD 03. ACTUATION TEST 04. SIMU-SCAN 05. IDENTIFICATION CHECK 06. DATA SETUP(UNIT CONV.)	

ETRF144D

1.3 ACTUATION TEST	
LOCK RELAY	
DURATION	1 TIMES
METHOD	ACTIVATION
CONDITION	ENGINE : IDLE TRANSAXLE RANGE : P
PRESS [STRT], IF YOU ARE READY! SELECT TEST ITEM USING UP/DOWN KEY	

STRT

ETRF144E

USER OPTION MODE

The BCM offers 3 items user option mode for a user convenience (Auto door lock, door key burglar alarm, door lock state inform horn)

- It is able to set up the enable or disable of AUTO DOOR LOCK function or AUTO DOOR LOCK operation vehicle speed when using it.
- It is able to set up the enable or disable of enter the burglar alarm mode when using door lock by the key.
- It is able to set up the enable or disable of horn inform function when using door lock by the key or RKE.

1. Select option "SONATA(NF)" and press ENTER.
2. Select option "BODY CONTROL MODULE" and press ENTER.

1. HYUNDAI VEHICLE DIAGNOSIS ▼▲
MODEL : SONATA 05
01. AUTOMATIC TRANSAXLE
02. ANTI-LOCK BRAKE SYSTEM
03. SRS-AIRBAG
04. ELEC. CONTROL SUSPENSION
05. IMMOBILIZER
06. ELEC. POWER STEERING
07. FULL AUTO AIR/CON.
08. BODY CONTROL MODULE

ETRF144A

3. Select option "USER OPTION" and press ENTER.

1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : SONATA 05
SYSTEM : BODY CONTROL MODULE
01. CURRENT DATA
02. FLIGHT RECORD
03. ACTUATION TEST
04. SIMU-SCAN
05. IDENTIFICATION CHECK
06. USER OPTION
07. DATA SETUP(UNIT CONV.)

ETRF144G

4. Select option "AUTO DOOR LOCK STATUS" by using the direction button(▲ / ▼).
5. Select the parameter by using the direction button(◀ / ▶) and press ENTER to save it.
(Disable / 5km/h / 10km/h / 15km/h / 20km/h / 25km/h / 30km/h / 35km/h / 40km/h)

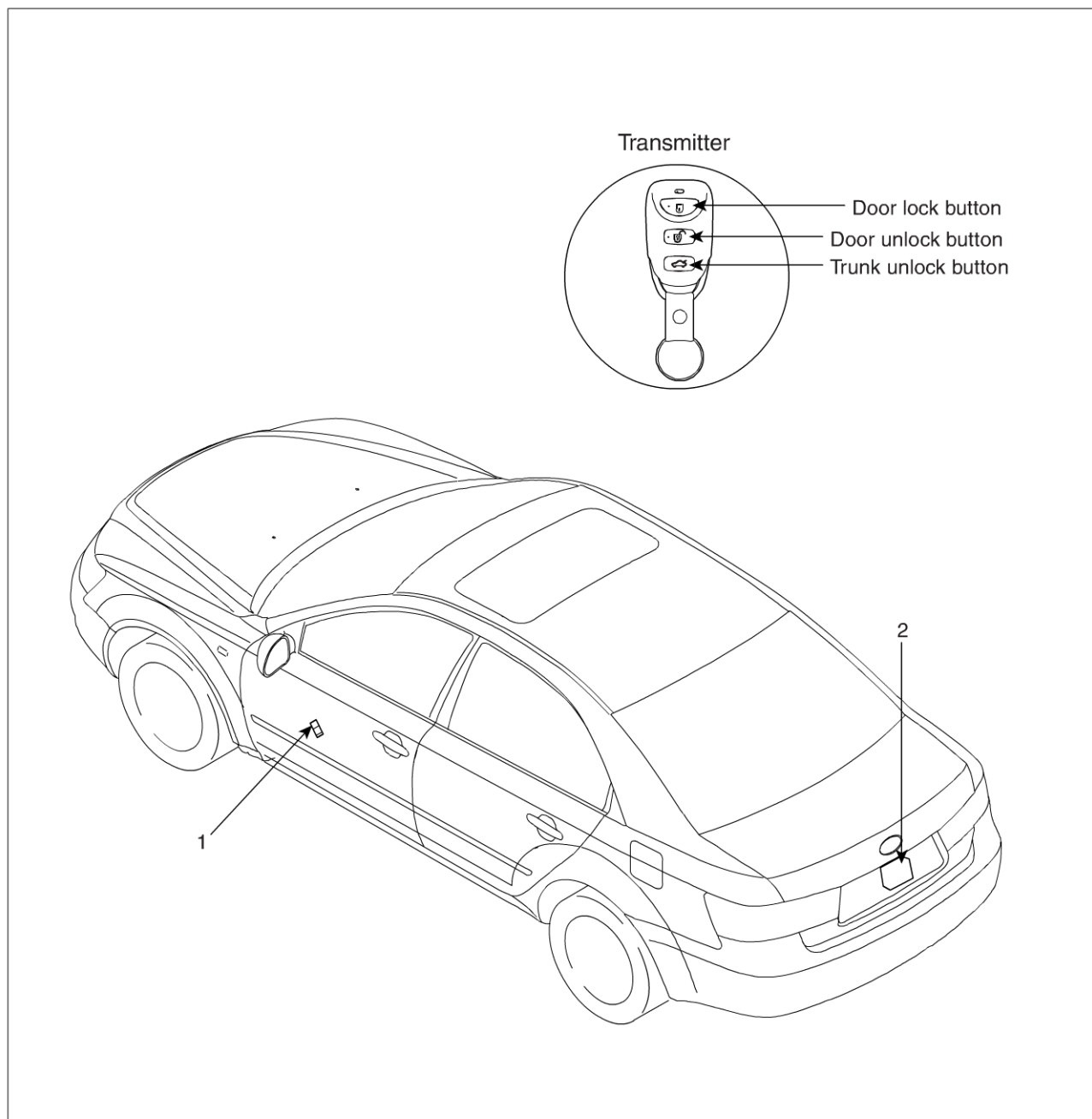
1.6 USER OPTION	
AUTO DOOR LOCK STATUS	DISABLE
ARM/DISARM BY KEY(+RK)	DISABLED
DATA WRITE	
DISABLE	
AFTER SELECT (◀/▶)KEY, PRESS [ENTER].	

ETRF144F

6. Select option "ARM/DISARM BY KEY(+RKE)" by using the direction button(▲ / ▼).
7. Select the parameter by using the direction button(◀ / ▶) and press ENTER to save it.
(Disable / Enable)

TRUNK LID OPENER

COMPONENT LOCATION E09D9152



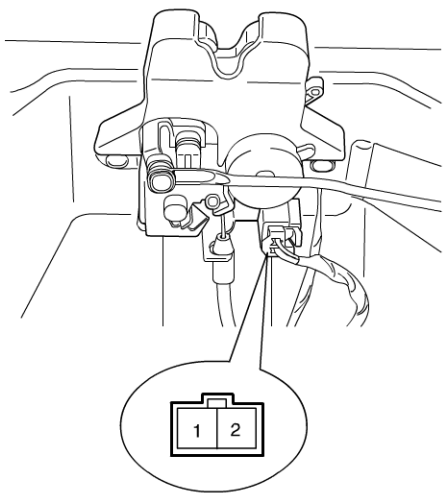
1. Trunk lid open switch

2. Trunk lid release actuator

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.

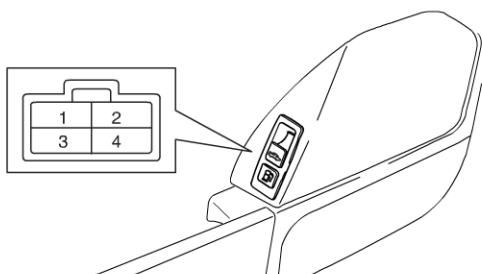
Terminal Position	2	Chassis ground
Open	⊕	⊖

ETRF122I

TRUNK LID OPEN SWITCH

INSPECTION EB6DE92A

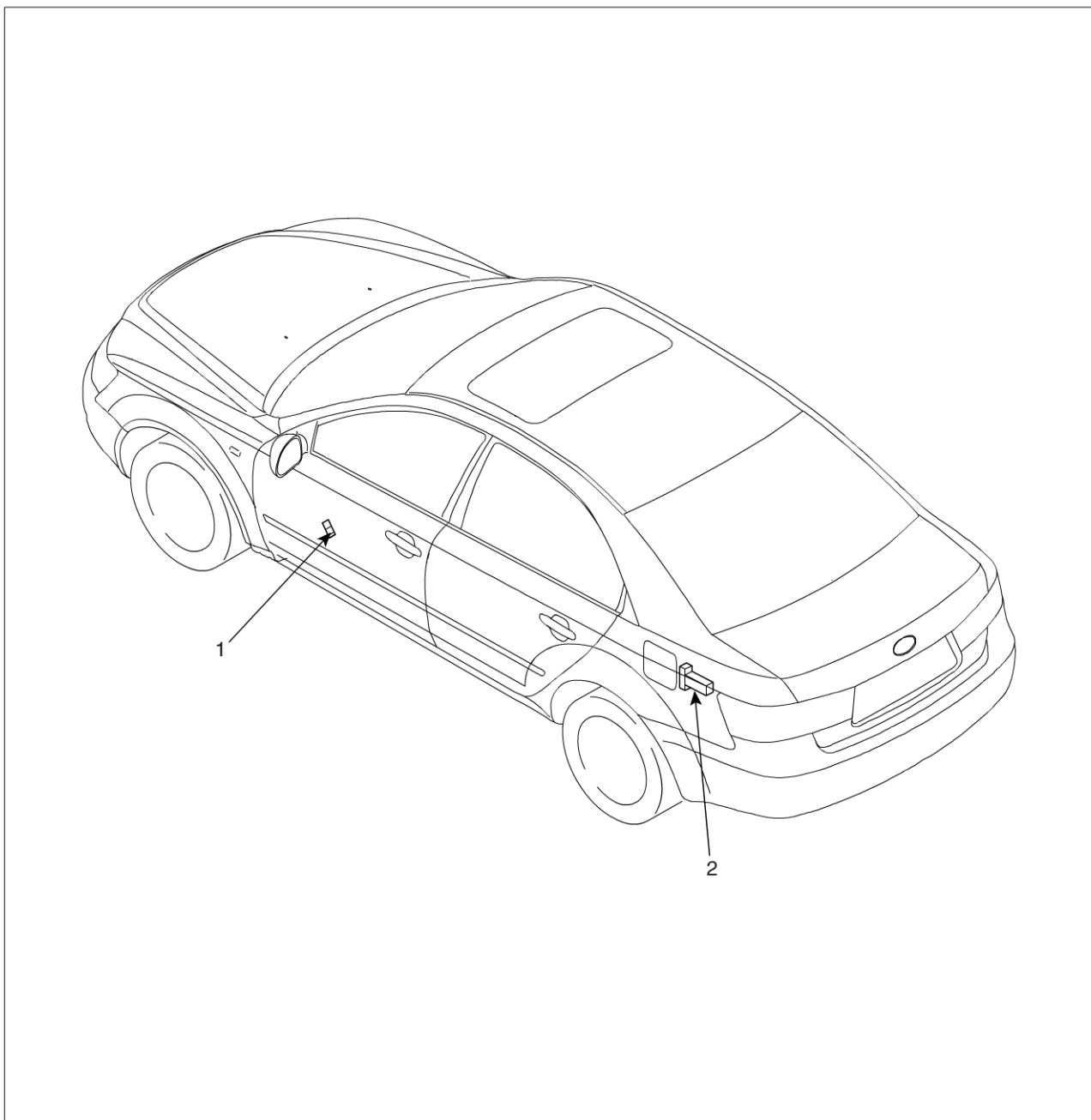
1. Remove the front door trim panel. (Refer to the Body group-front door)
2. Check the switch for continuity between the No. 3 and No. 4 terminals.
3. If the continuity is not as specified, replace the switch.



KTRE162A

FUEL FILLER DOOR OPENER

COMPONENT LOCATION EF1F9DCD



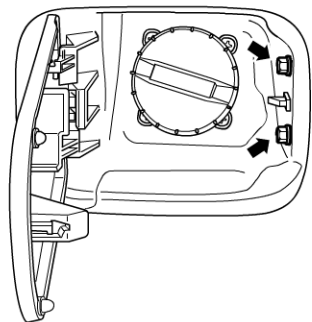
1. Fuel filler door open switch

2. Fuel filler door release actuator

FUEL FILLER DOOR RELEASE ACTUATOR

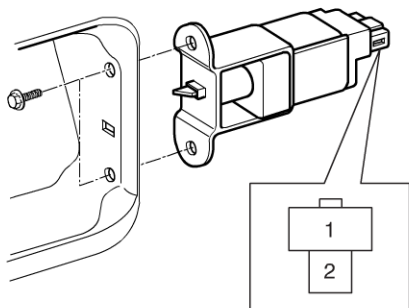
INSPECTION ECD2B97B

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.

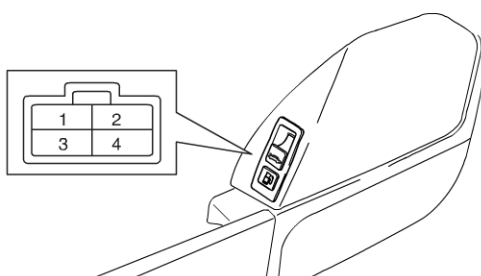


KTRE181A

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.



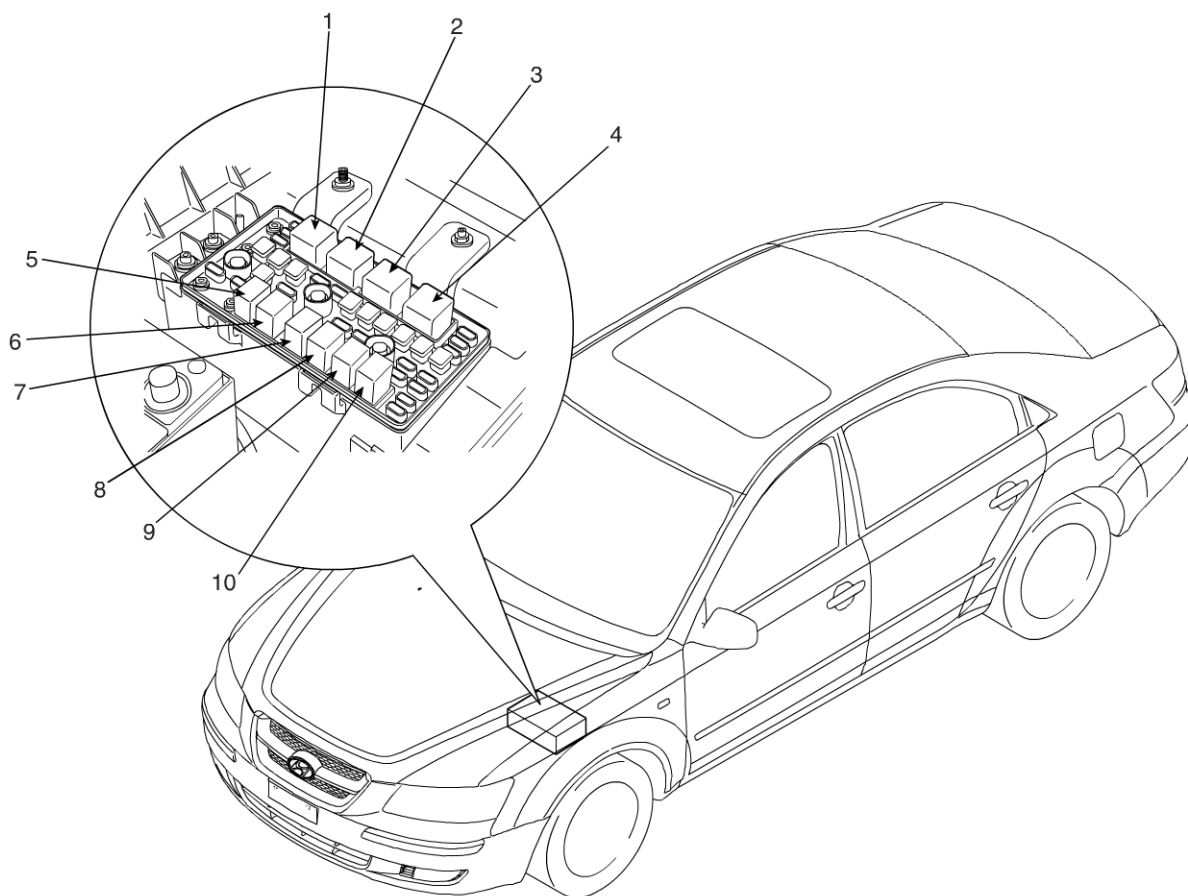
KTRE162A

FUSES AND RELAYS

COMPONENT LOCATION

EB5DE2AF

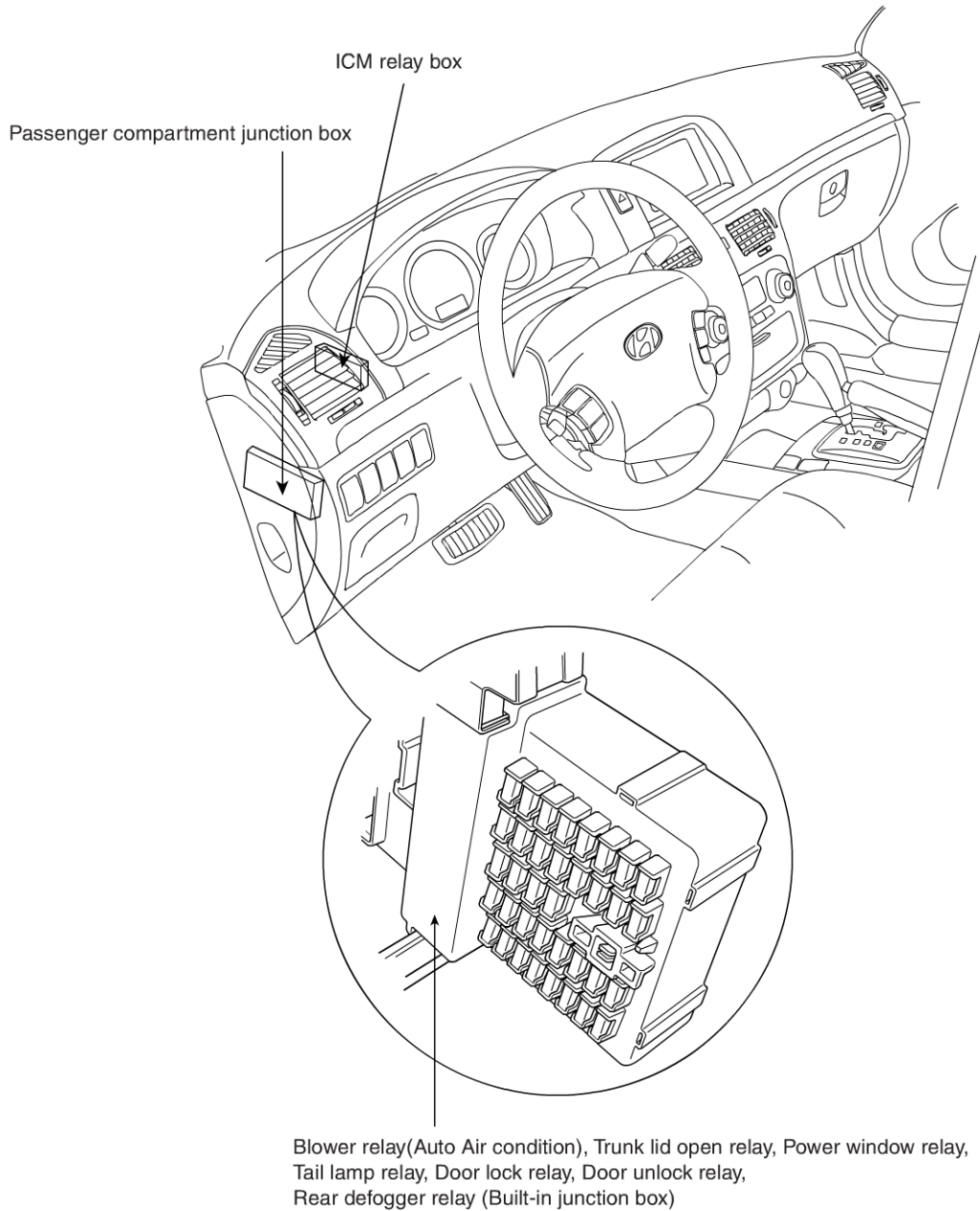
[Engine room relay box]



- 1. Head lamp relay (Low)
- 2. Head lamp relay (High)
- 3. Start relay
- 4. E/G control relay
- 5. A/T relay

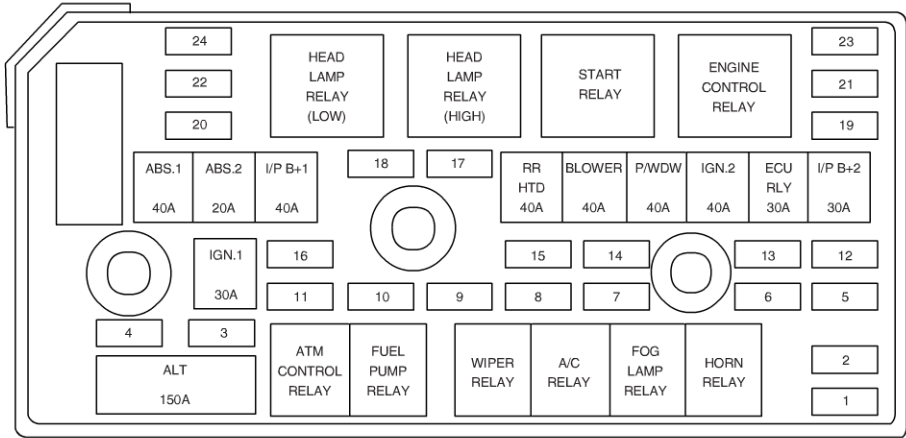
- 6. Fuel pump relay
- 7. Wiper relay
- 8. Air conditioning relay
- 9. Front fog relay
- 10. Horn relay

[Passenger compartment relay box]



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)
FUSE	ALT	150A	FUSIBLE LINK (ABS.1, ABS.2, RR HTD, BLOWER)
	1	HORN	15A Horn relay
	2	TAIL LAMP	20A Tail lamp relay
	3	ECU	10A PCM
	4	IGN.1	10A (SPARE)
	5	DRL	15A 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 (SPARE)
	15	H/LP HI	20A Head lamp relay (High)
	16	ECU	10A PCM (3.3L)
	17	SNSR.3	10A A/C relay, Cooling fan relay, Injectors
	18	SNSR.1	15A Mass air flow sensor, Oil control valve, SMATRA, Canister close valve
	19	SNSR.2	15A Oxygen sensor, Fuel pump relay
	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

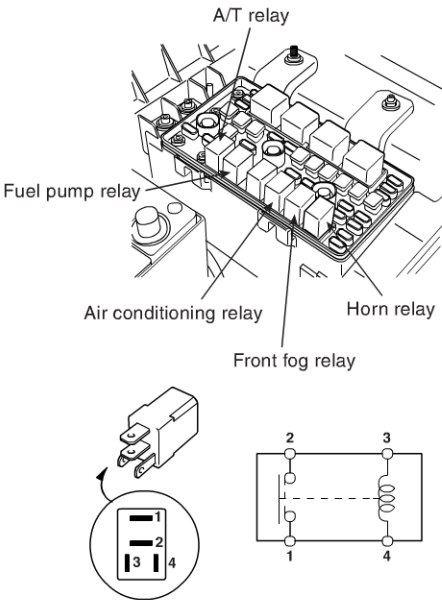
✳ USE THE DESIGNATED FUSE ONLY

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

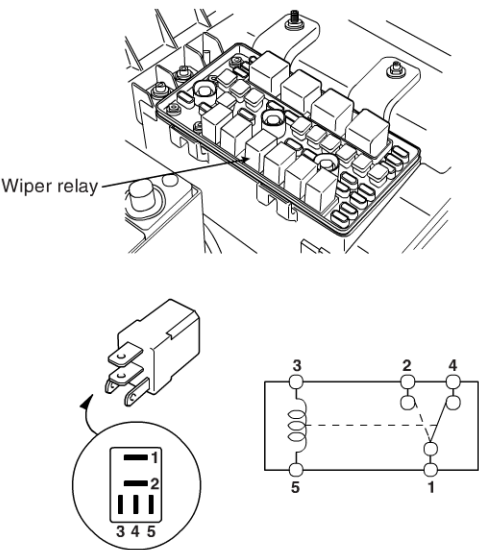
Terminal	1	2	3	4
Power (No.3-No.4)				
Disconnected			○	○
Connected	○	○	⊖	⊕

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 no continuity between the No.1 and No.4 terminals when power is disconnected.



ETRF201B

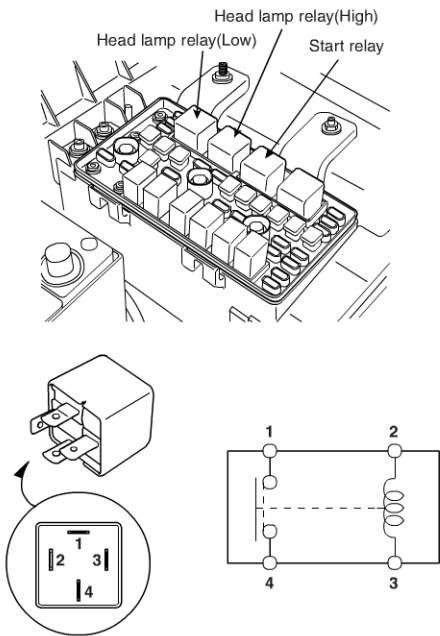
Terminal	3	5	1	2	4
Power (No.3-No.5)					
Disconnected			○	○	○
Connected	⊖	⊕	○	○	

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

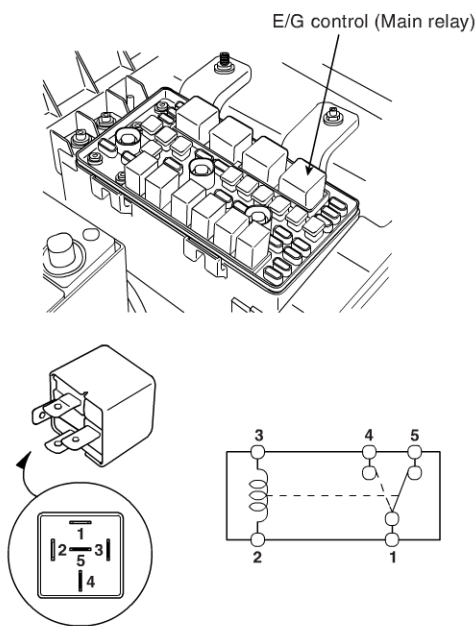
Terminal	2	3	1	4
Power (No.2-No.3)				
Disconnected	○	○		
Connected	⊖	⊕	○	○

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

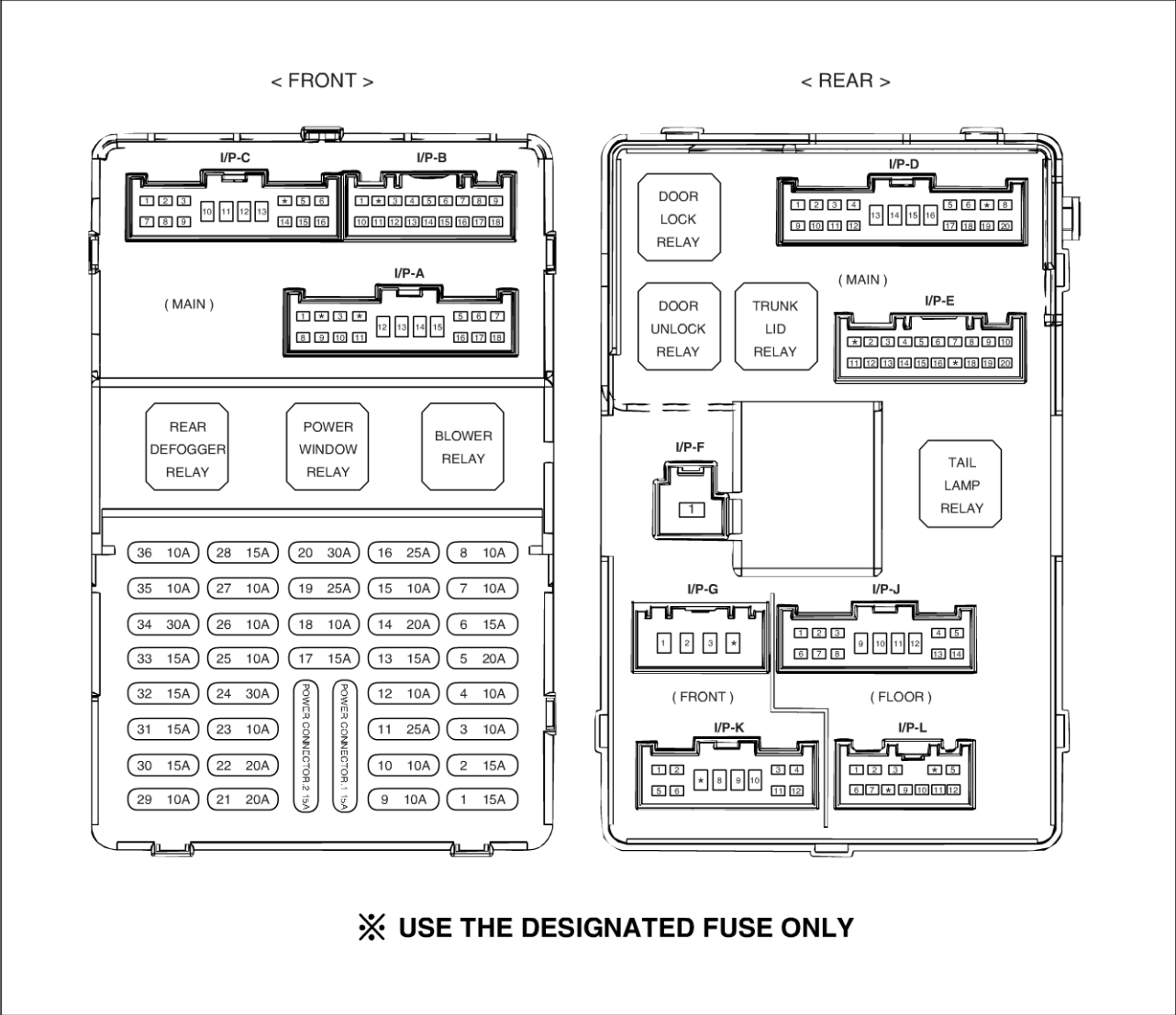
ETRF201E

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



CIRCUIT

FUSE	(A)	Circuit Protected
1	15A	(SPARE)
2	15A	Seat warmer switch
3	10A	BCM, Sunroof control module, Home link connector
4	10A	Active incar & humidity sensor, Instrument cluster
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	(SPARE)
10	10A	DRL control module, Head lamp relay, AQS & ambient sensor
11	25A	Wiper & washer
12	10A	A/C control module
13	15A	SRS control module, Telltale lamp, Passenger seat track position sensor
14	20A	Front accessory socket, Rear power outlet
15	10A	Digital clock, Audio, ATM key lock control module, Power outside mirror switch
16	25A	Safety window module
17	15A	(SPARE)
18	10A	ATM key lock control module, Tire pressure monitoring 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, JBL amp
22	20A	Door lock/unlock relay
23	10A	Hazard switch, Hazard relay
24	30A	(SPARE)
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	Adjustable pedal relay
31	15A	(SPARE)
32	15A	Trunk lid relay, Fuel filler door & trunk lid switch
33	15A	(SPARE)
34	30A	Power seat manual switch (LH)
35	10A	Sport mode switch, Key solenoid
36	10A	A/C control module, Outside mirror 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

ETRF220G

FUSE INSPECTION

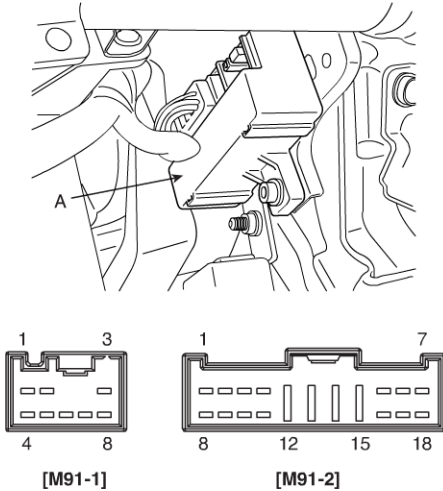
EDFBBBD9

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 relays and installed below the relay box (passenger compartment).



KTRE220F

INSPECTION E6C37B29

HAZARD LAMP

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 No.12 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.

ADJUST PEDAL

Check for continuity between the terminals.

1. There should be continuity between the No.15 and No.5 terminals when power and ground are connected to the No.15 and No.2 in the M91-2 terminals.
2. There should be no continuity between the No.15 and No.5 terminals when power is disconnected.

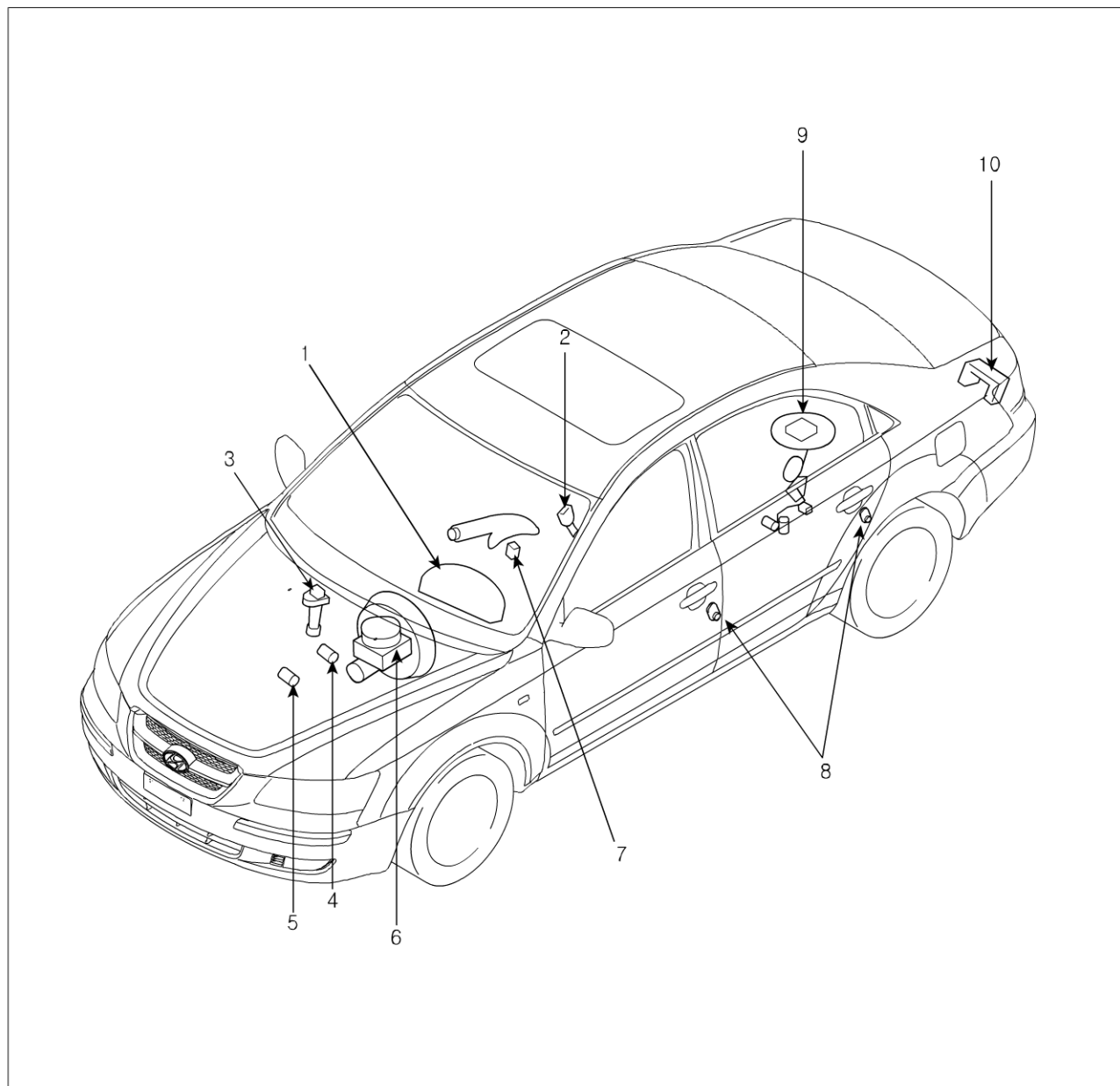
DRIVER DOOR TWO TURN UNLOCK

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 terminals.
2. There should be continuity between the No.7 and No.5 terminals when power and ground are disconnected.

INDICATORS AND GAUGES

COMPONENT LOCATION EECD8FFD

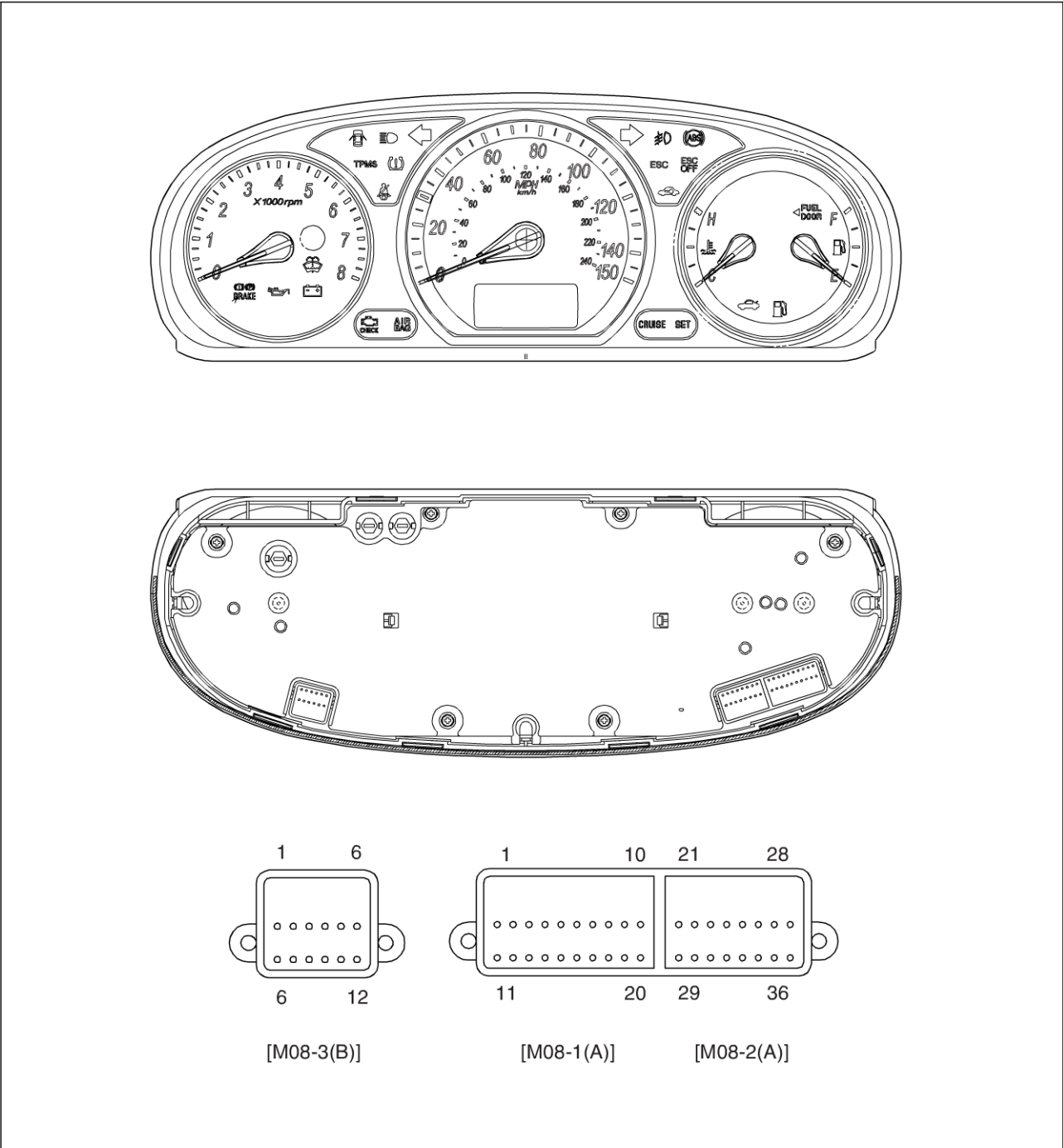


- 1. Cluster assembly
- 2. Seat belt switch
- 3. Vehicle speed sensor
- 4. Engine coolant temperature sender
- 5. Oil pressure switch

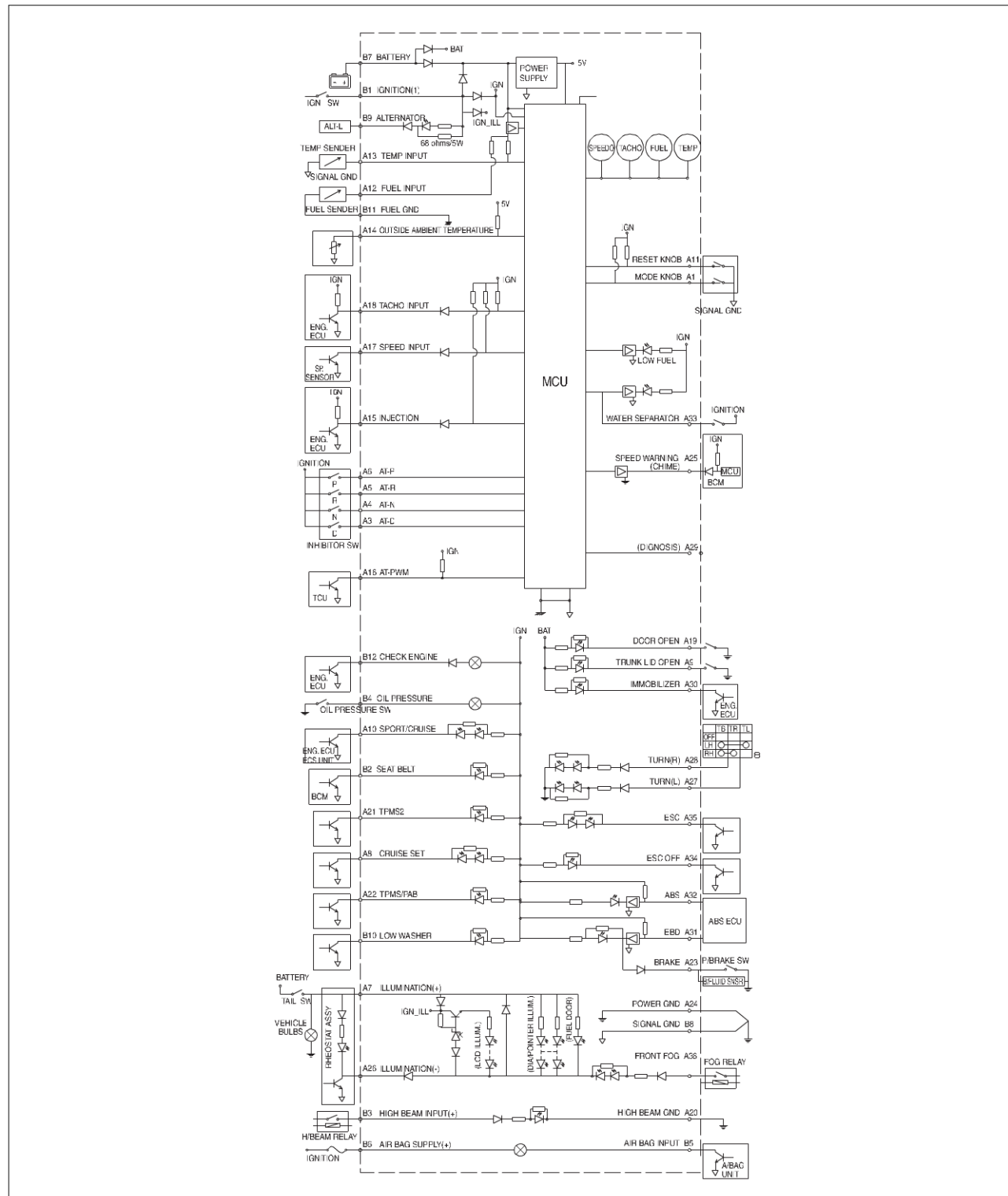
- 6. Brake fluid level warning switch
- 7. Parking brake switch
- 8. Door switch
- 9. Fuel gauge sender
- 10. Trunk lid open actuator

INSTRUMENT CLUSTER

COMPONENTS E18C7505



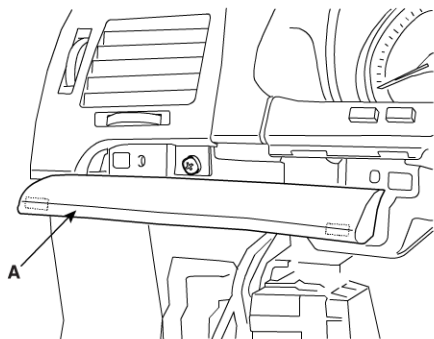
CIRCUIT DIAGRAM ECFD6DD0



REPLACEMENT

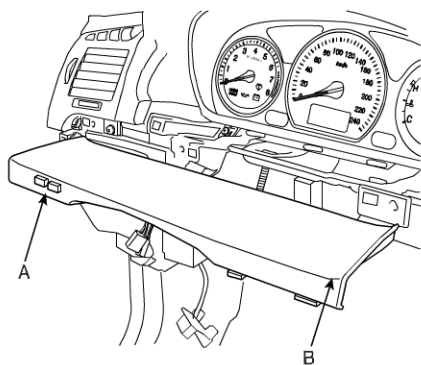
E8633BD4

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



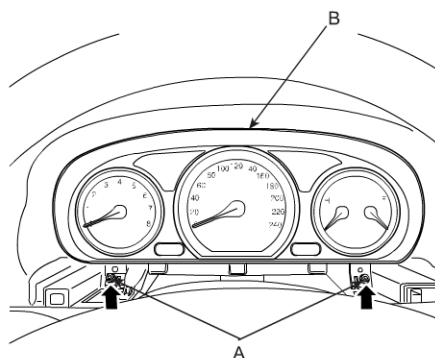
KTRE261A

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



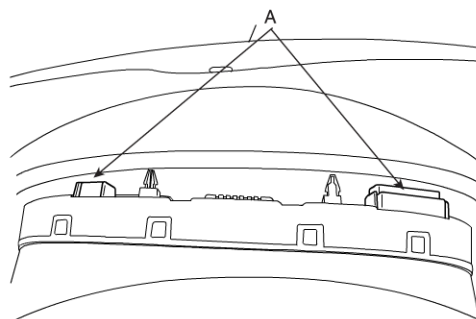
KTRE261B

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



KTRE261C

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



KTRE261D

6. Installation is the reverse of removal.

INSPECTION E1959A7A

SPEEDOMETER

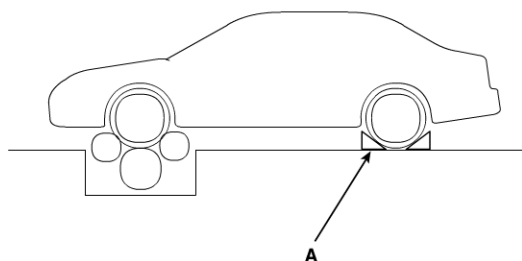
1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.
3. Check if the speedometer indicator range is within the standard values.

**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.

**[CANADA - KM/H]**

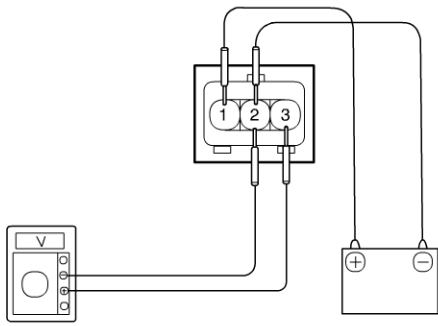
Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	+5.0 +0.2	+5.0 +0.2	+5.8 +0.2	+6.5 +0.5	+7.0 +1.5	+8.5 +1.5
Velocity (km/h)	140	160	180	200	220	240
Tolerance (km/h)	+10 +1.5	+11 +2.0	+12 +2.5	+13 +2.5	+14 +2.5	+15 +2.5

[USA MPH]

Velocity (MPH)	10	20	40	60	80
Tolerance (MPH)	+2.5 -1.0	+2.5 -1.0	+3.5 -1.0	+4.0 -1.0	+4.5 -1.0
Velocity (MPH)	100	120	140	150	-
Tolerance (MPH)	+5.0 -1.0	+6.0 -1.0	+6.5 -1.0	+7.0 -1.0	-

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.

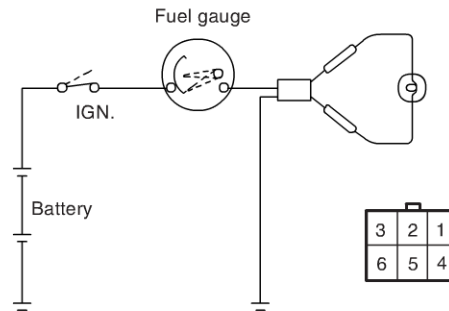
**CAUTION**

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.**

Revolu- tion(rpm)	1,000	2,000	3,000
Toler- ance(rpm)	±120	±140	±170
Revolu- tion(rpm)	4,000	5,000	6,000
Toler- ance(rpm)	±170	±200	±200

FUEL GAUGE

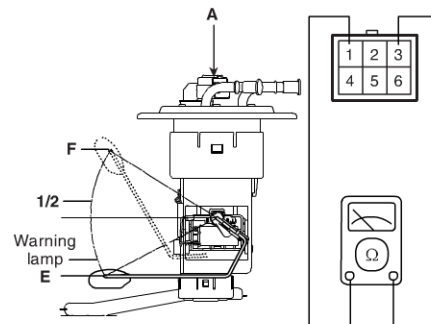
1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 watt, 12V test bulb to terminals 1 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



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

- 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

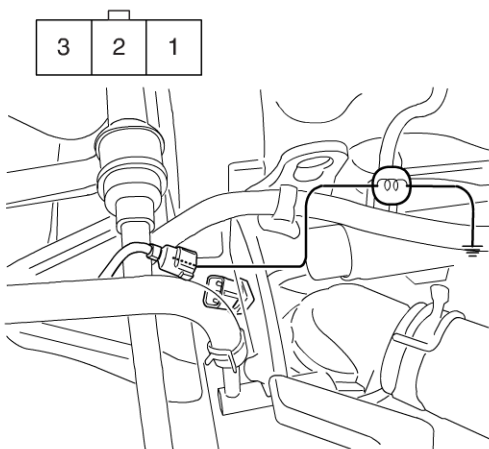
- If the height resistance is unsatisfactory, replace the fuel sender as an assembly.

! CAUTION

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

ENGINE COOLANT TEMPERATURE GAUGE

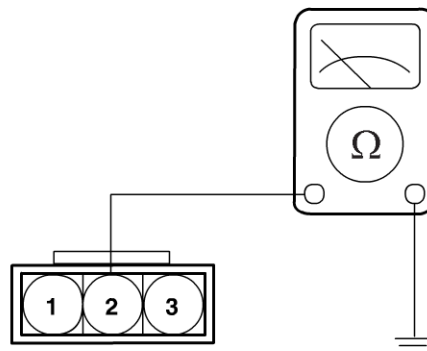
- Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
- Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
- Connect a 12V, 3.4 wattages test bulb between the harness side connector and ground.
-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

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



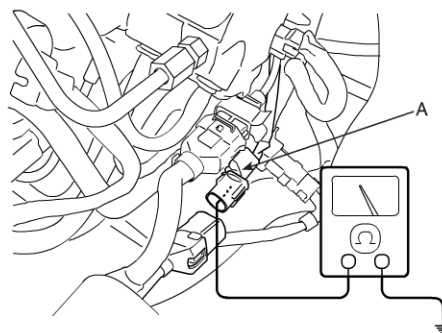
ETKE110I

- 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)	142 ± 1	58 ± 1	26 ± 1	17.5 ± 1

OIL PRESSURE SWITCH

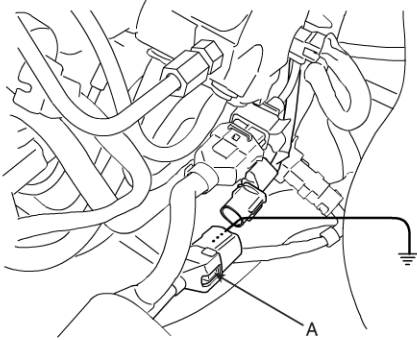
- Check that there is continuity between the oil press switch terminal (A) and ground with the engine off.
- Check that there is no continuity between the terminal and ground with the engine running.
- If operation is not as specified, replace the switch.



KTQE530A

OIL PRESSURE WARNING LAMP

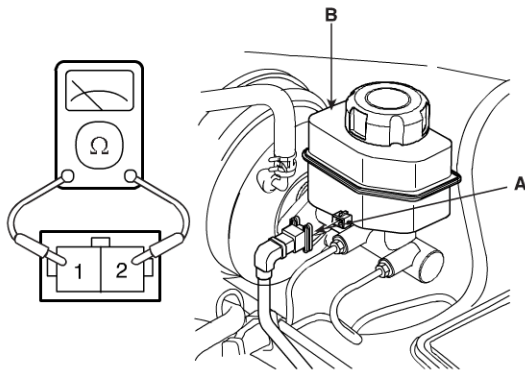
1. Disconnect the connector (A) from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up. If the warning lamp doesn't light, test the bulb or inspect the wire harness.



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

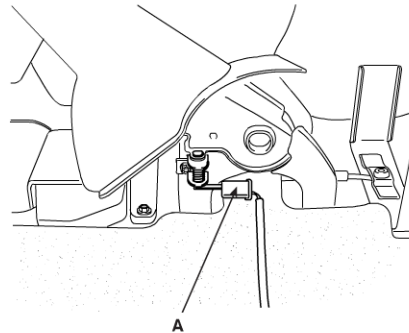
BRAKE FLUID LEVEL WARNING LAMP

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.

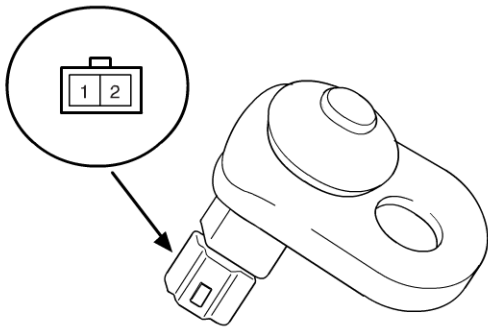
1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
 2. Check that there is no continuity between the terminal and switch body with the switch OFF (Lever is released).
- If continuity is not as specified, replace the switch or inspect its ground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

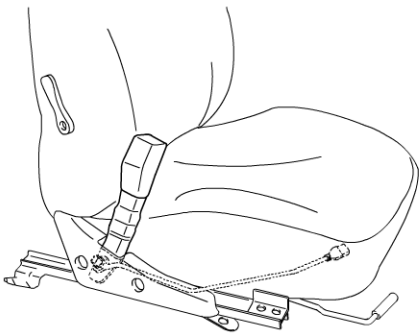
Terminal Position	1	Ground
Free(Door open)	○	○
Push(Door close)		

ETRF262E

SEAT BELT SWITCH

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

Seat belt condition	Continuity
Fastened	Non-conductive ($\infty \Omega$)
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

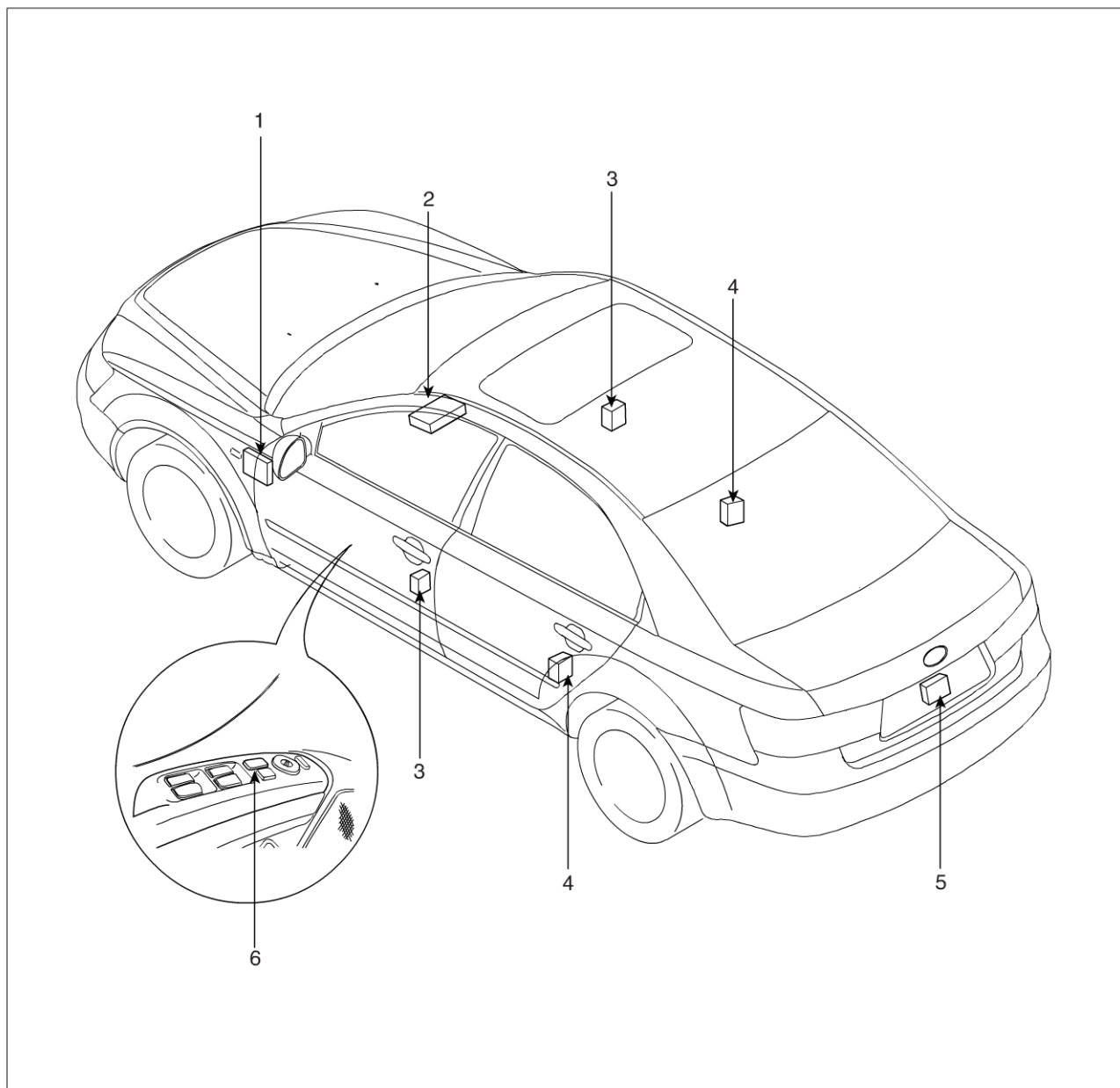
TROUBLESHOOTING

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

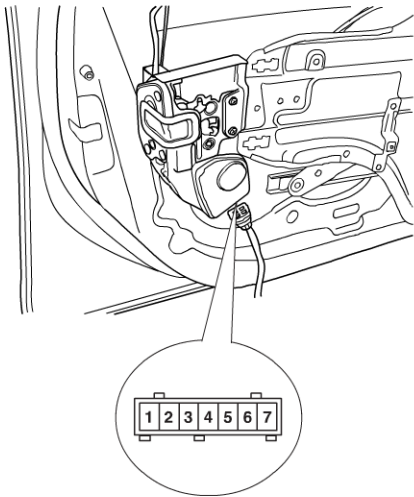
- 4. Rear door lock actuator & switch
- 5. Trunk lid release actuator
- 6. Door lock switch

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

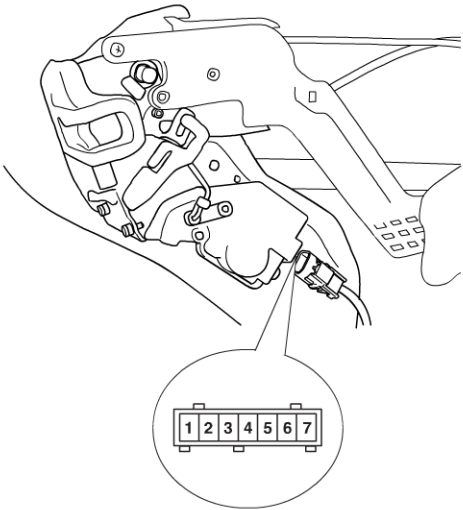
- 3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

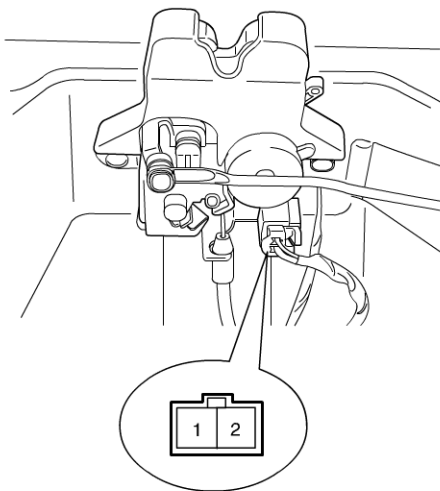
- 3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

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

ETRF122D

TRUNK 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

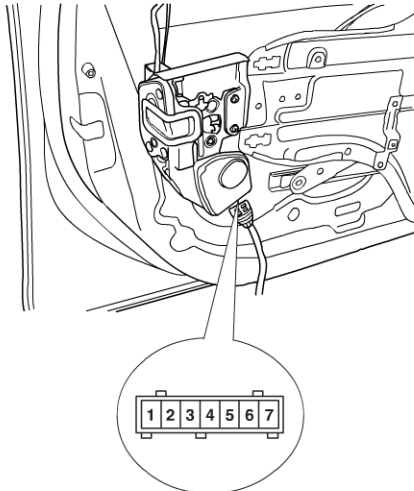
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal	2	Chassis ground
Position		
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

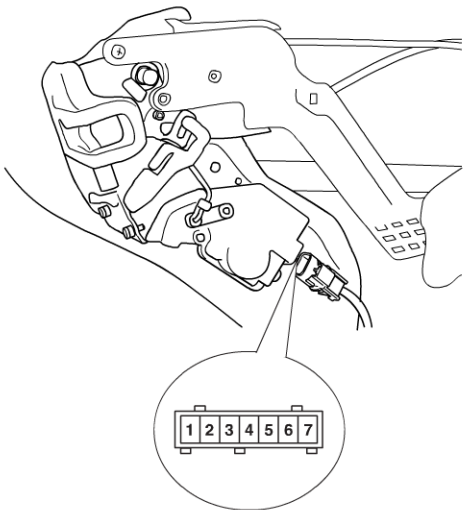
3. Check for continuity between the terminals in each switch position according to the table.

Terminal		1	5	3	7
Position					
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

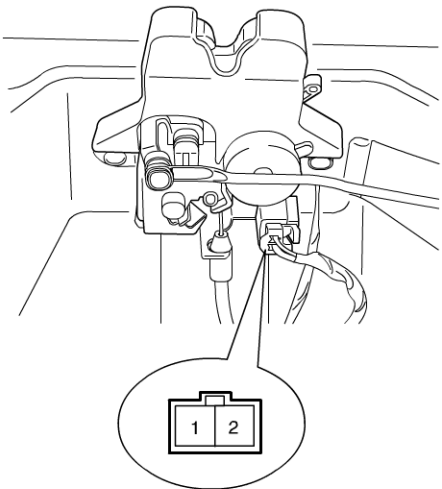
- 3. Check for continuity between the terminals in each switch position according to the table.

Terminal		1	5	3	7
Position					
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.

Terminal	1	Chassis ground
Position		
Open	⊕	⊖

ETRF122F

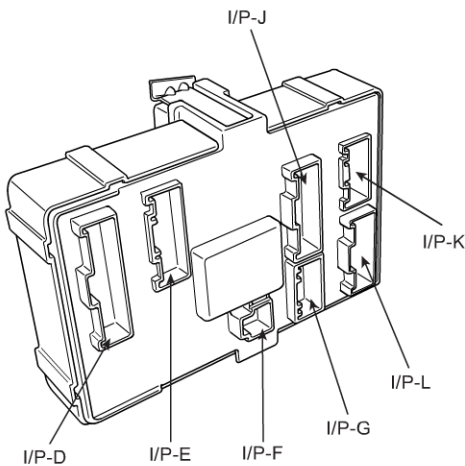
POWER DOOR LOCK RELAY

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.



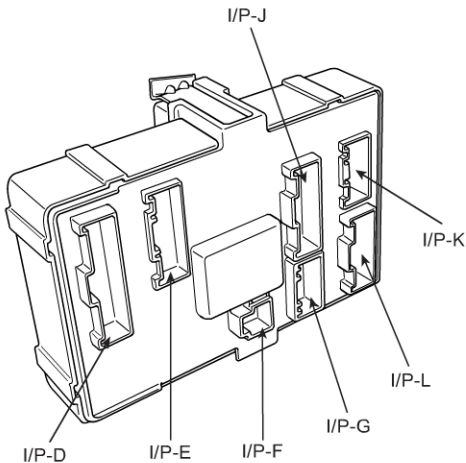
KTRE323A

Terminal	I/P-D (9)	I/P-E (12)	I/P-D (12)	I/P-D (9)
Power				
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	I/P-D (9)	I/P-E (11)	I/P-E (3)	I/P-D (9)
Power				
Disconnected				
Connected				

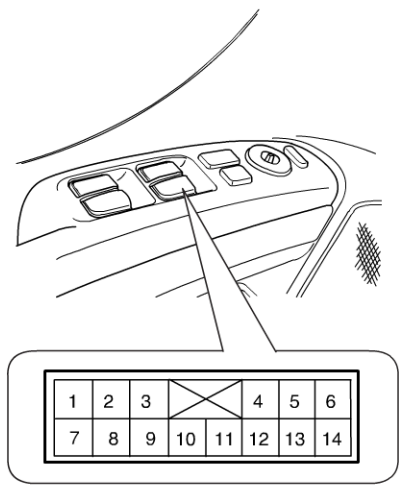
ETRF323C

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

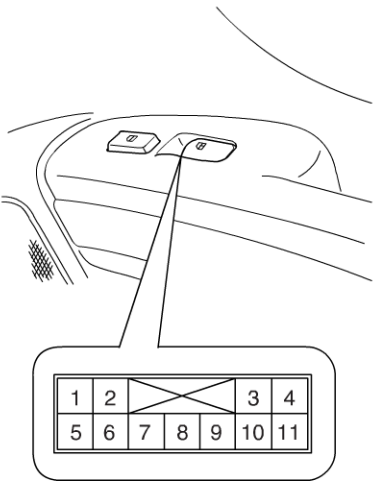
- 4. Check for continuity between the terminals in each switch position according to the table.

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			

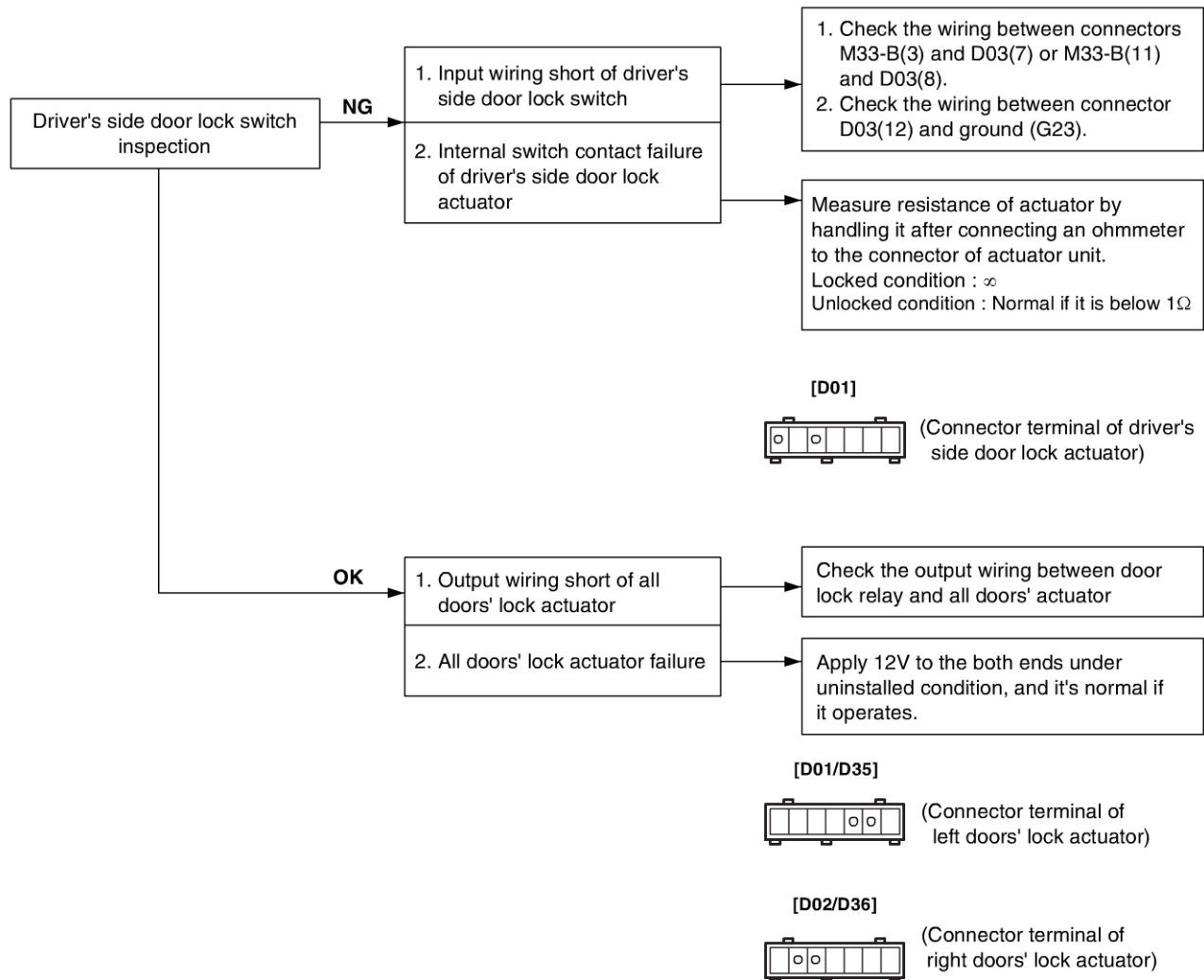
ETRF284E

TROUBLESHOOTING

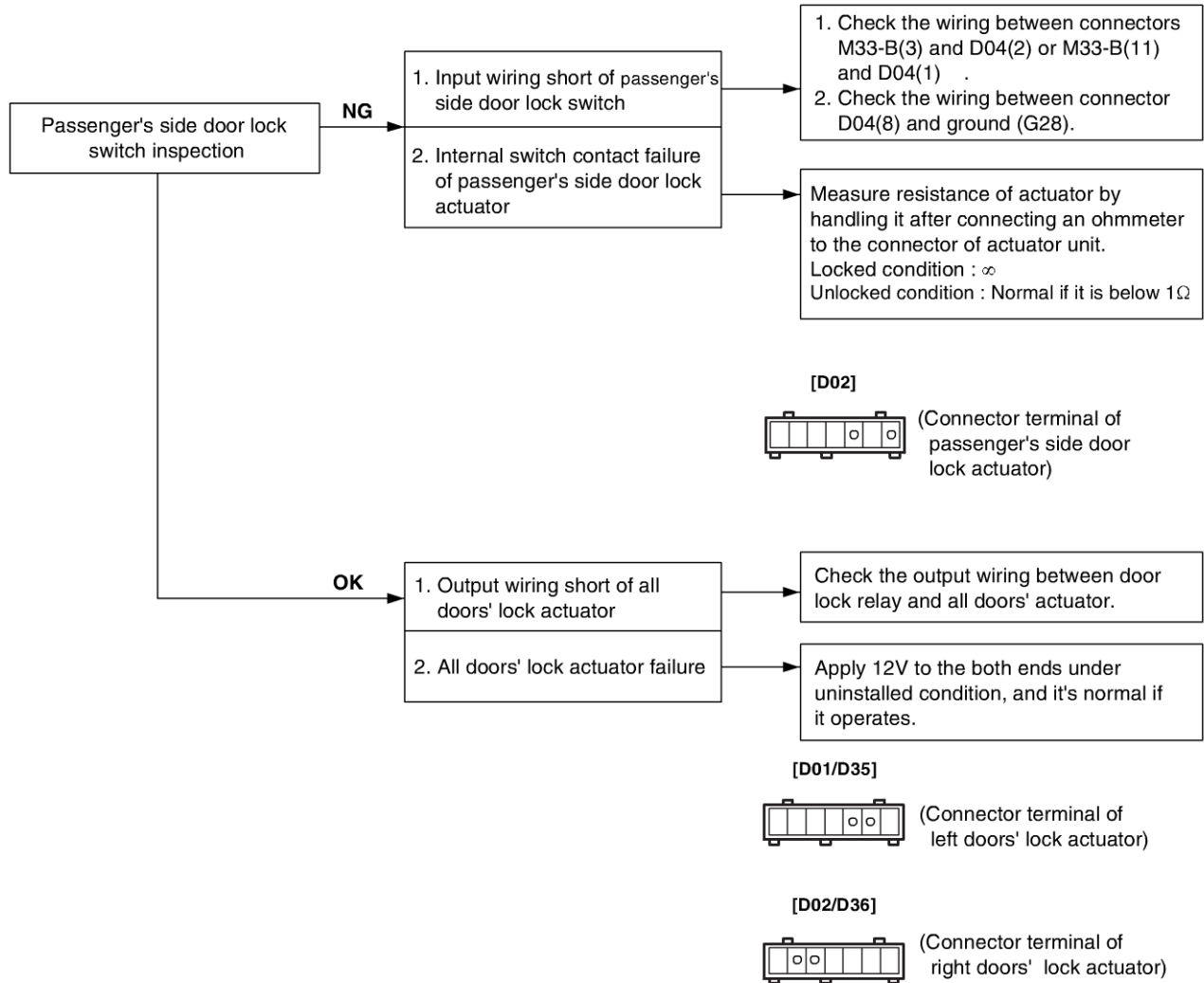
EDDD5CB6

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.

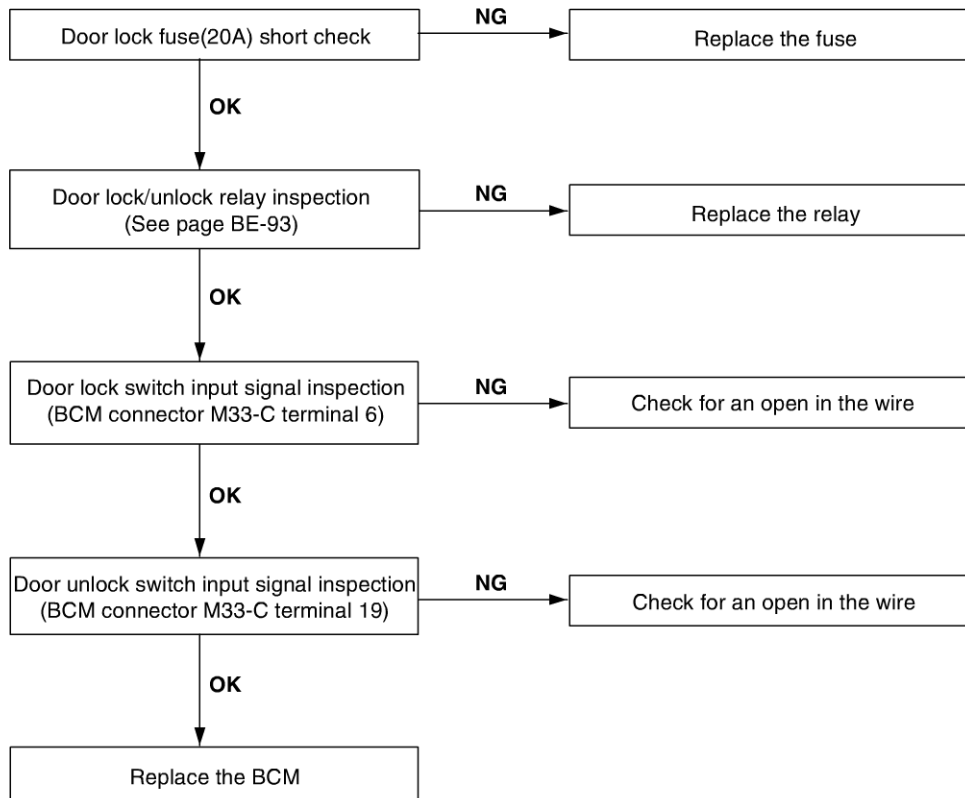
3. When passenger side knob is controlled, all doors locks, but when driver side knob is controlled, all doors do not lock.



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

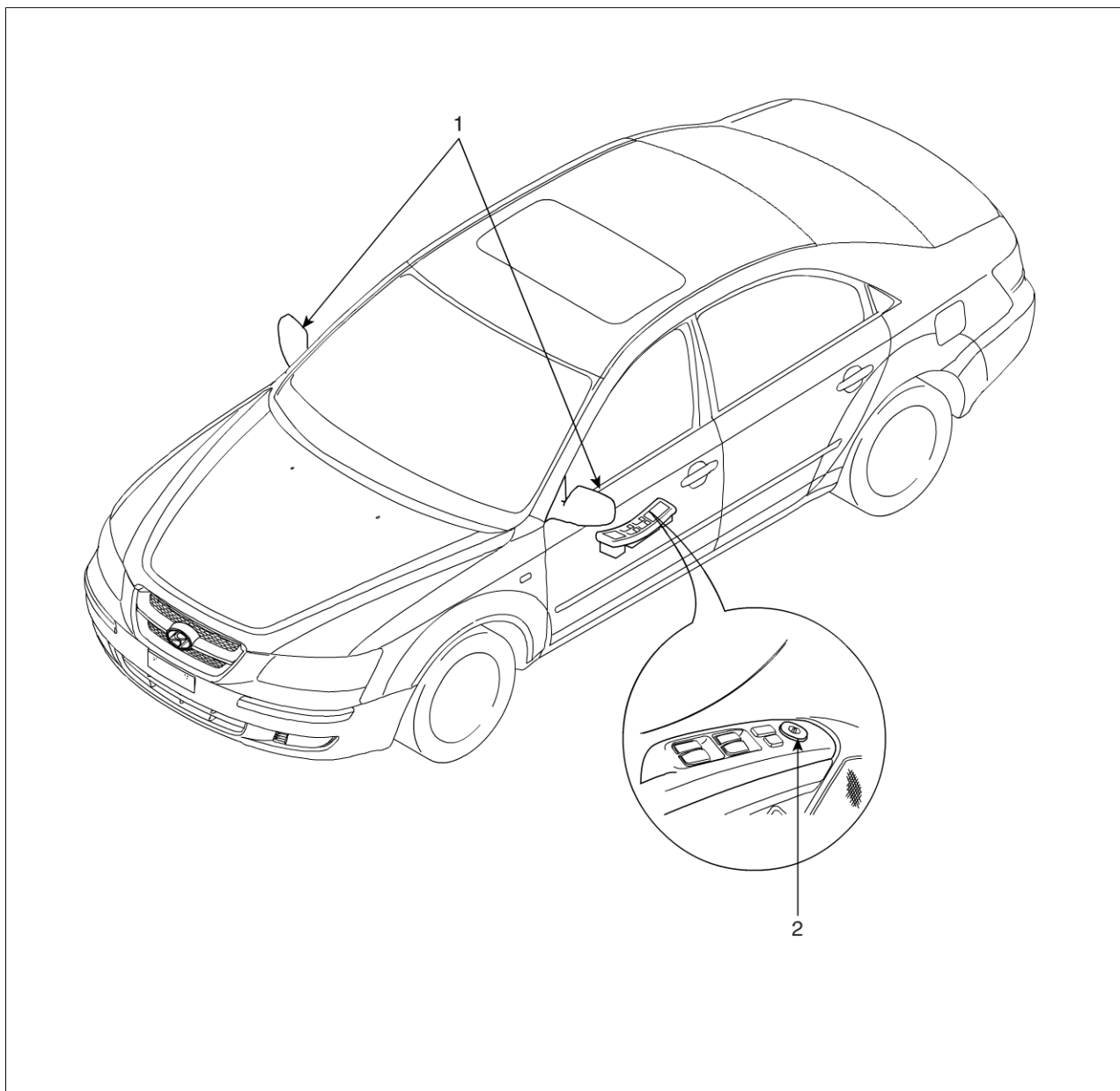


5. Both sides do not lock either.



POWER DOOR MIRRORS

COMPONENT LOCATION EE60349F

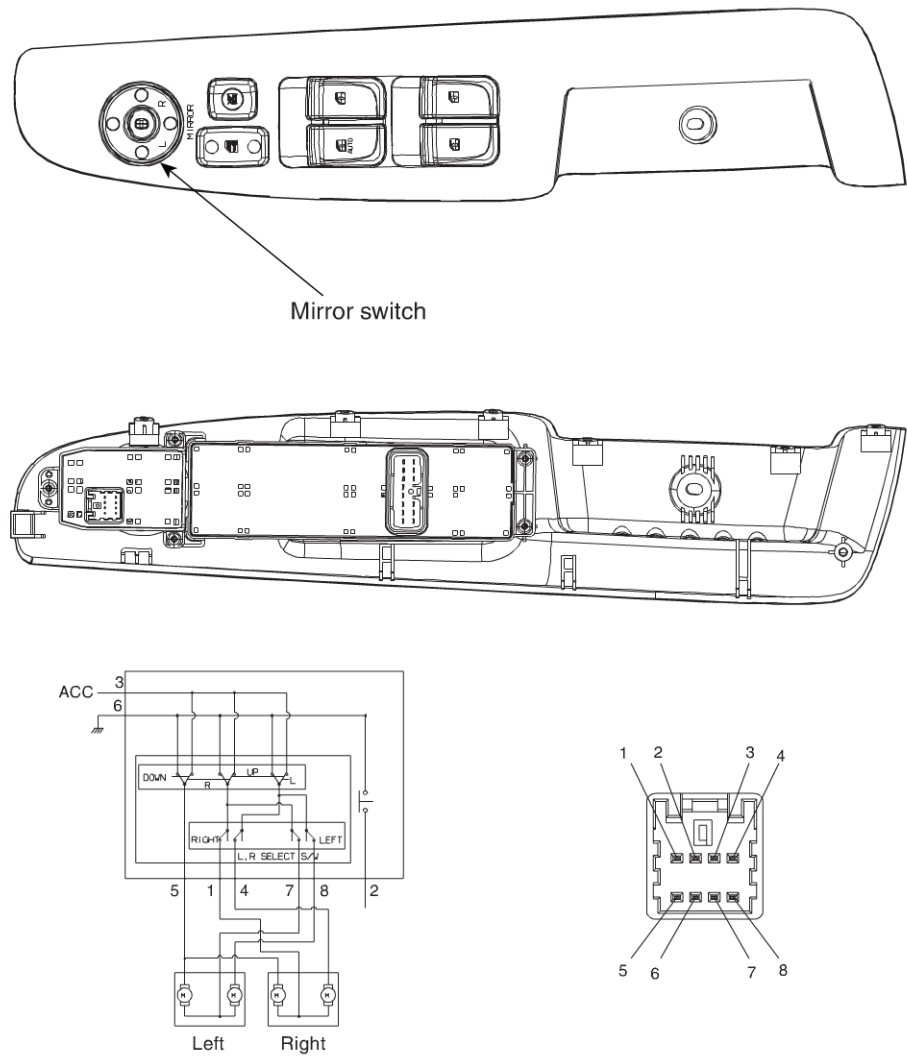


1. Power door mirror

2. Power door mirror switch

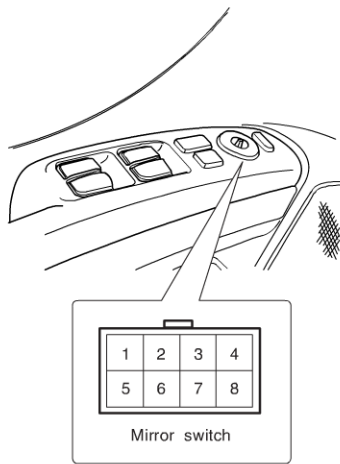
POWER DOOR MIRROR SWITCH

CIRCUIT DIAGRAM ECD338BF



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.



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

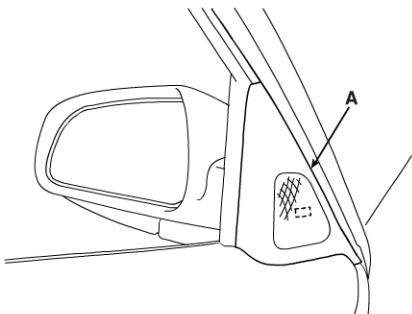
Class	Terminal							
	Direction	1	3	4	5	6	7	8
LEFT	UP		○		○	○	○	○
	DOWN		○		○	○	○	○
	OFF		○		○	○	○	○
	LEFT		○		○	○	○	○
	RIGHT		○		○	○	○	○
RIGHT	UP	○	○	○	○	○		
	DOWN	○	○	○	○	○		
	OFF	○	○	○	○	○		
	LEFT	○	○	○	○	○		
	RIGHT	○	○	○	○	○		

<Mirror switch>

POWER DOOR MIRROR
ACTUATOR

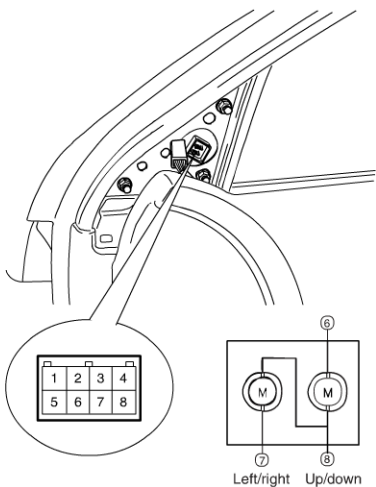
INSPECTION EFF7DEFF

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

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

ETKE195B

MIRROR HEATER INSPECTION

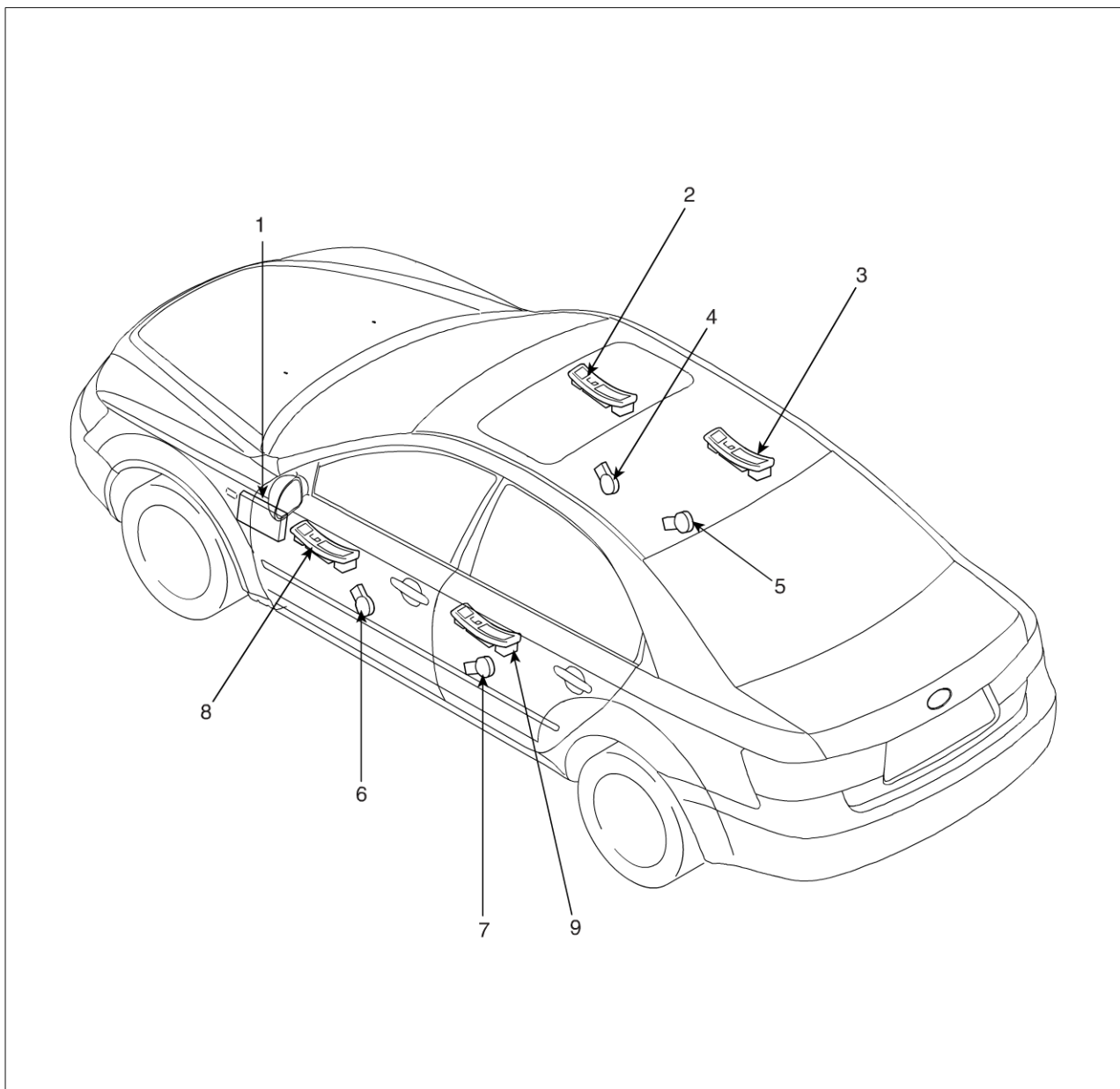
Terminal Position	1	2
Heater	○	○

ETRF302D

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

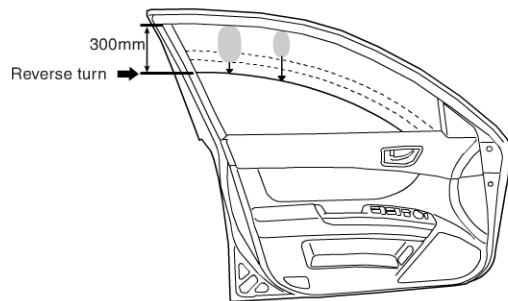
9. Rear window switch

FUNCTION OF SAFETY POWER WINDOW

E58DA34A

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

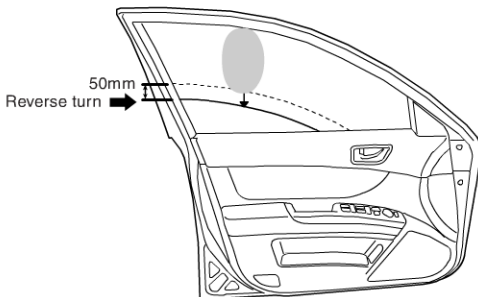
1. Safety function condition
When detect the force of 100N during the window rising, window is reversed.
2. Length of window reversing (except holding the auto-up switch)
 - When detect the jamming during the 4mm ~ 250mm from top of the door.
→ Window is reversed until 300mm from top of the door.



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

ETRF320B

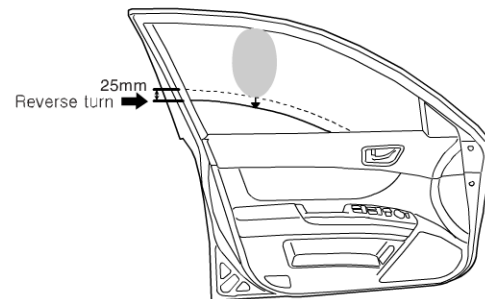
- When detect the jamming over the 250mm from top of the door.
→ Window is reversed until 50mm from jamming position.



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 reversed 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

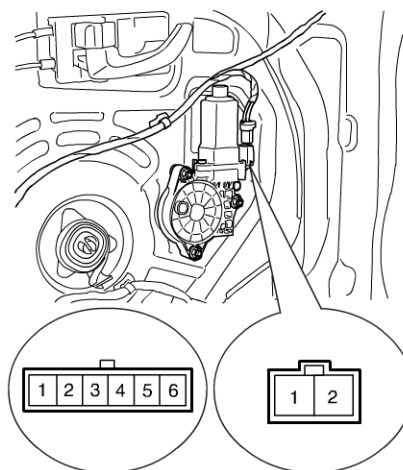
4. Safety function is not available area
Safety function is not available during the 4mm from top of the door.

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.

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

ETQF057A

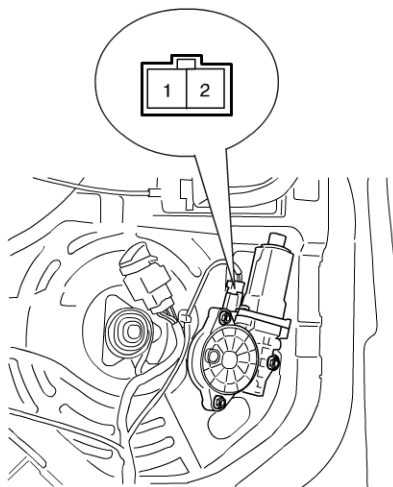
[WITH DRIVER'S SIDE SAFETY WINDOW]

Terminal			1	2	3	4	6
Position							
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

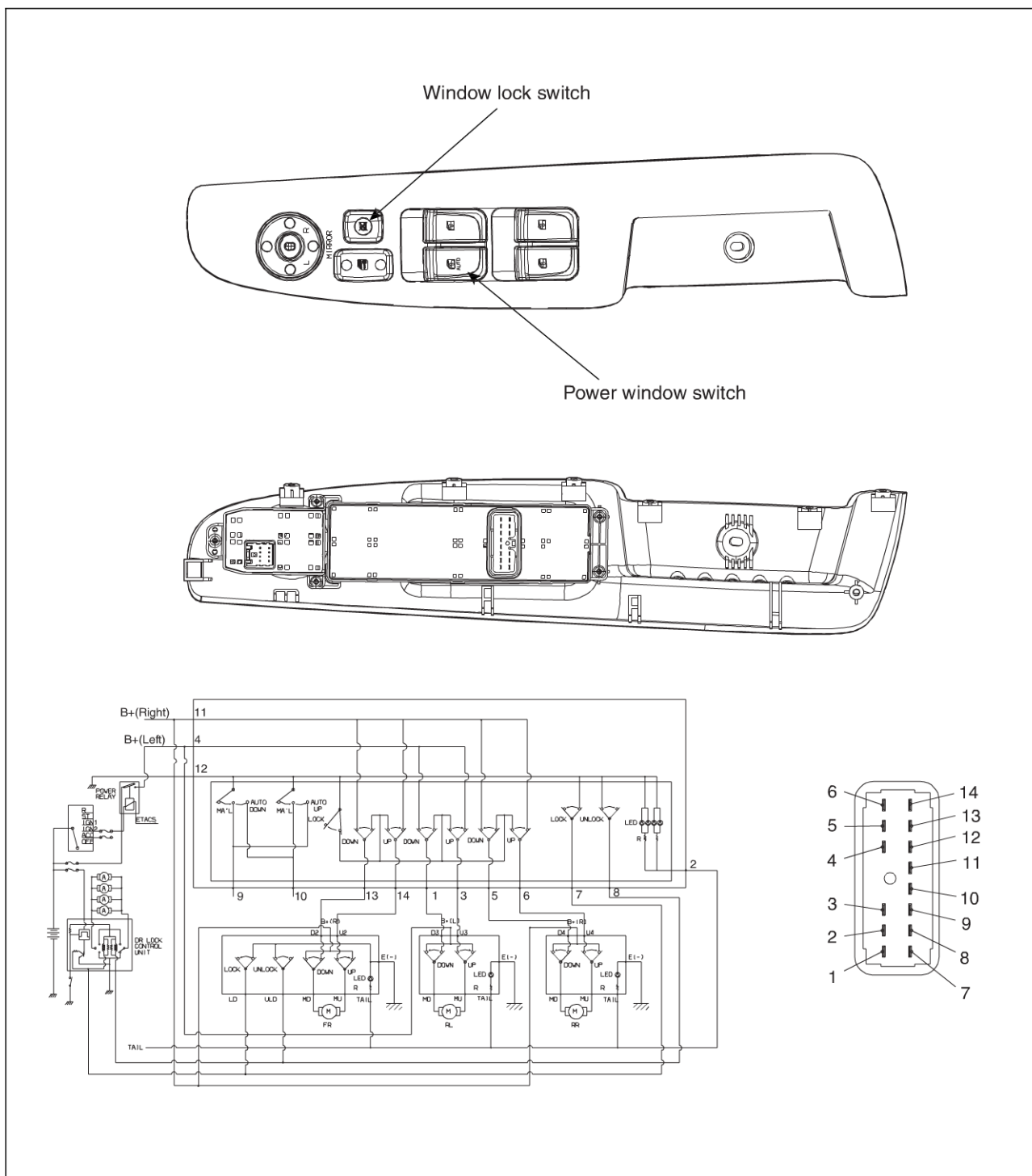
- 3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

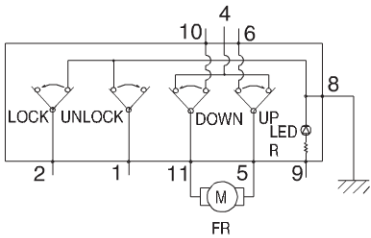
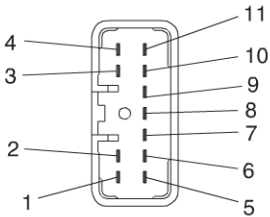
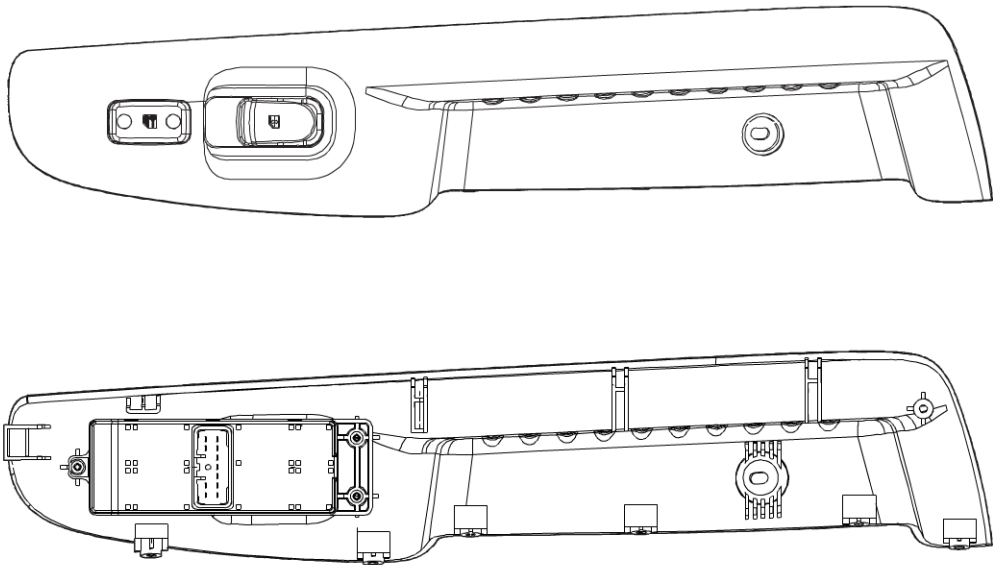
Position		Terminal	1	2
LH	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖
RH	DOWN	Clockwise	⊕	⊖
	UP	Counter-clockwise	⊖	⊕

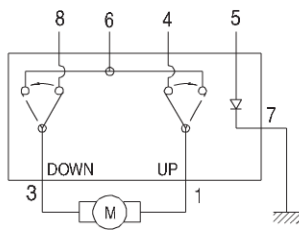
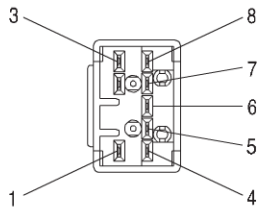
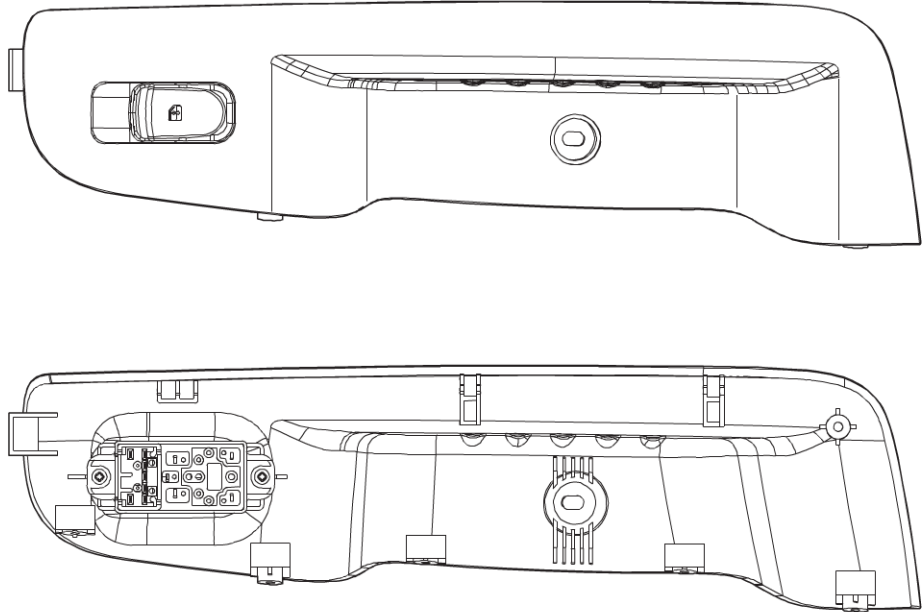
ETQF057A

POWER WINDOW SWITCH

CIRCUIT DIAGRAM E0C9DCE2



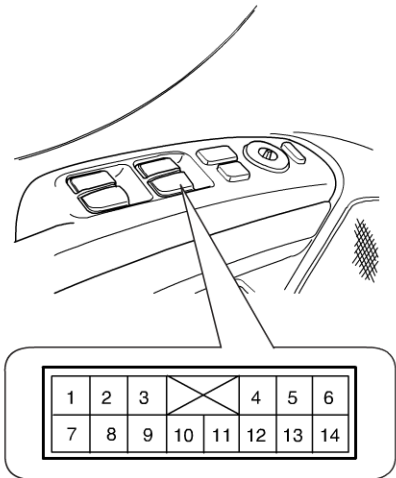




INSPECTION E4D2B084

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		Front left				Front right			
Position		4	9	10	12	11	12	13	14
UP				○	○	○	○	○	○
OFF			○	○	○		○	○	○
DOWN		○	○	○	○	○	○	○	○
Terminal		Rear left				Rear right			
Position		1	3	4	12	5	6	11	12
UP		○	○	○	○	○	○	○	○
OFF		○	○	○	○	○	○	○	○
DOWN		○	○	○	○	○	○	○	○

ETRF322F

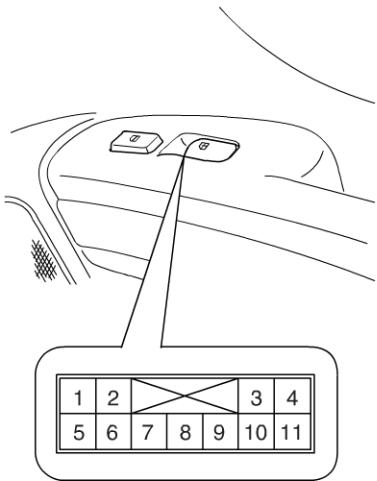
POWER WINDOW LOCK SWITCH

Terminal		1	12
Position			
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

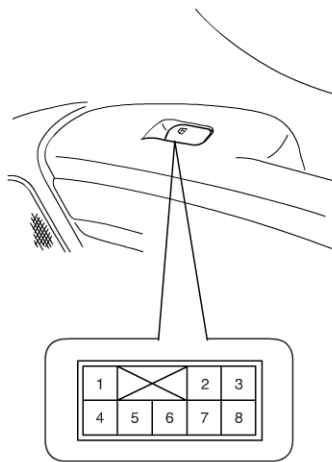
- 4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Terminal		4	5	6	10	11
Position						
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

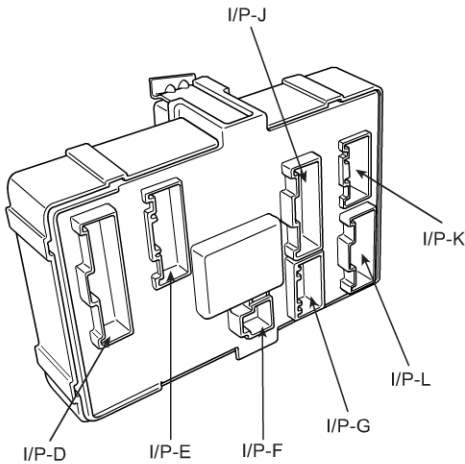
POWER WINDOW RELAY

INSPECTION EA6CBF03

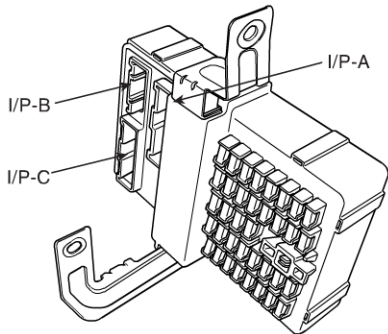
- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the junction box.
- 3. Check for continuity between the terminals.
- 4. There should be continuity between the No.1 in the I/P-G and No.12 terminal in the I/P-A when power and ground are connected to the No.1 terminal in the I/P-G and No.2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

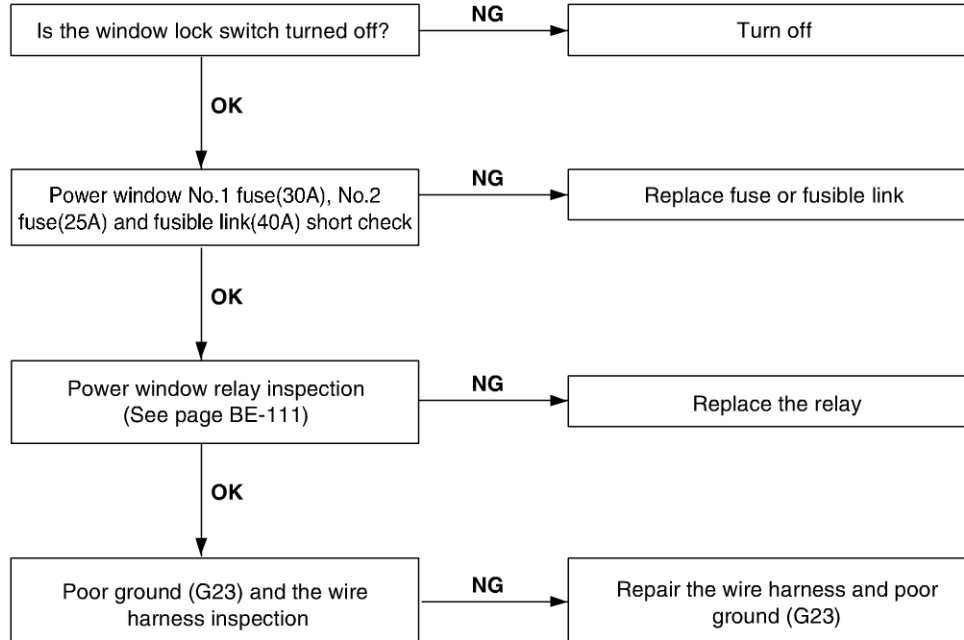


KTRE323D

TROUBLESHOOTING

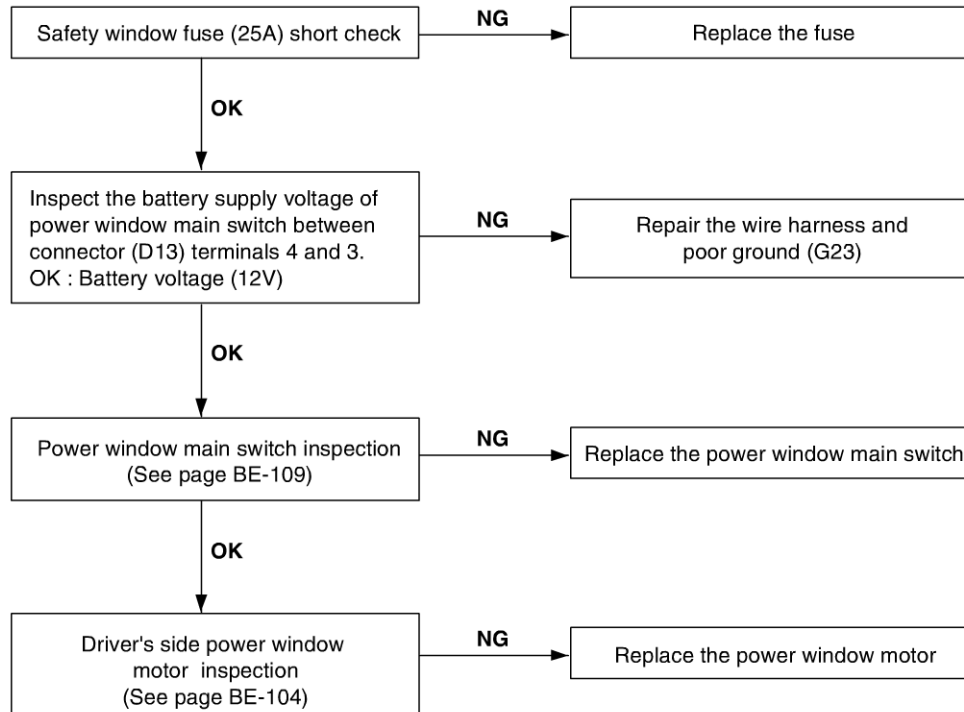
E4A5F8F8

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



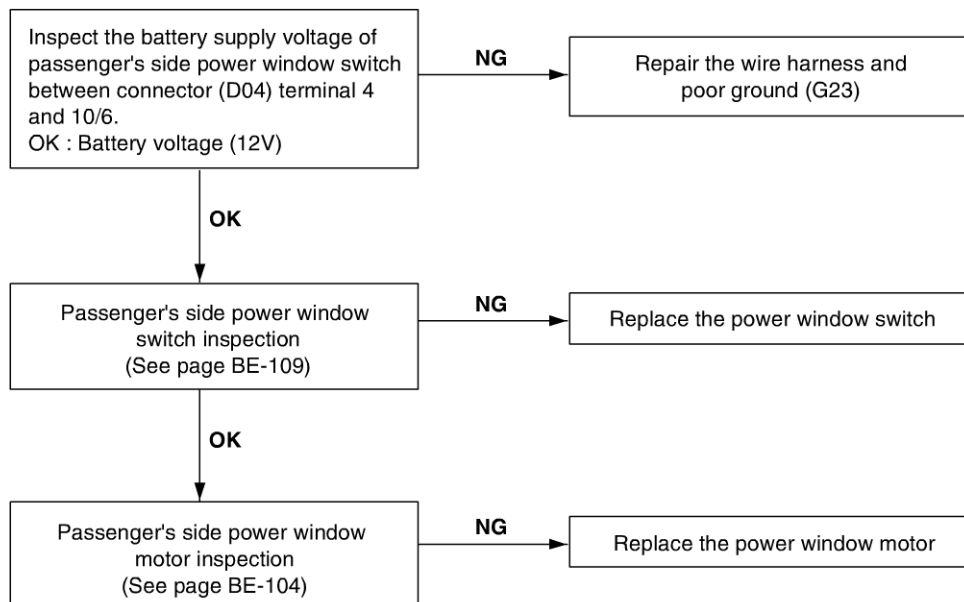
ETRF901C

2. Driver's side window does not operate.



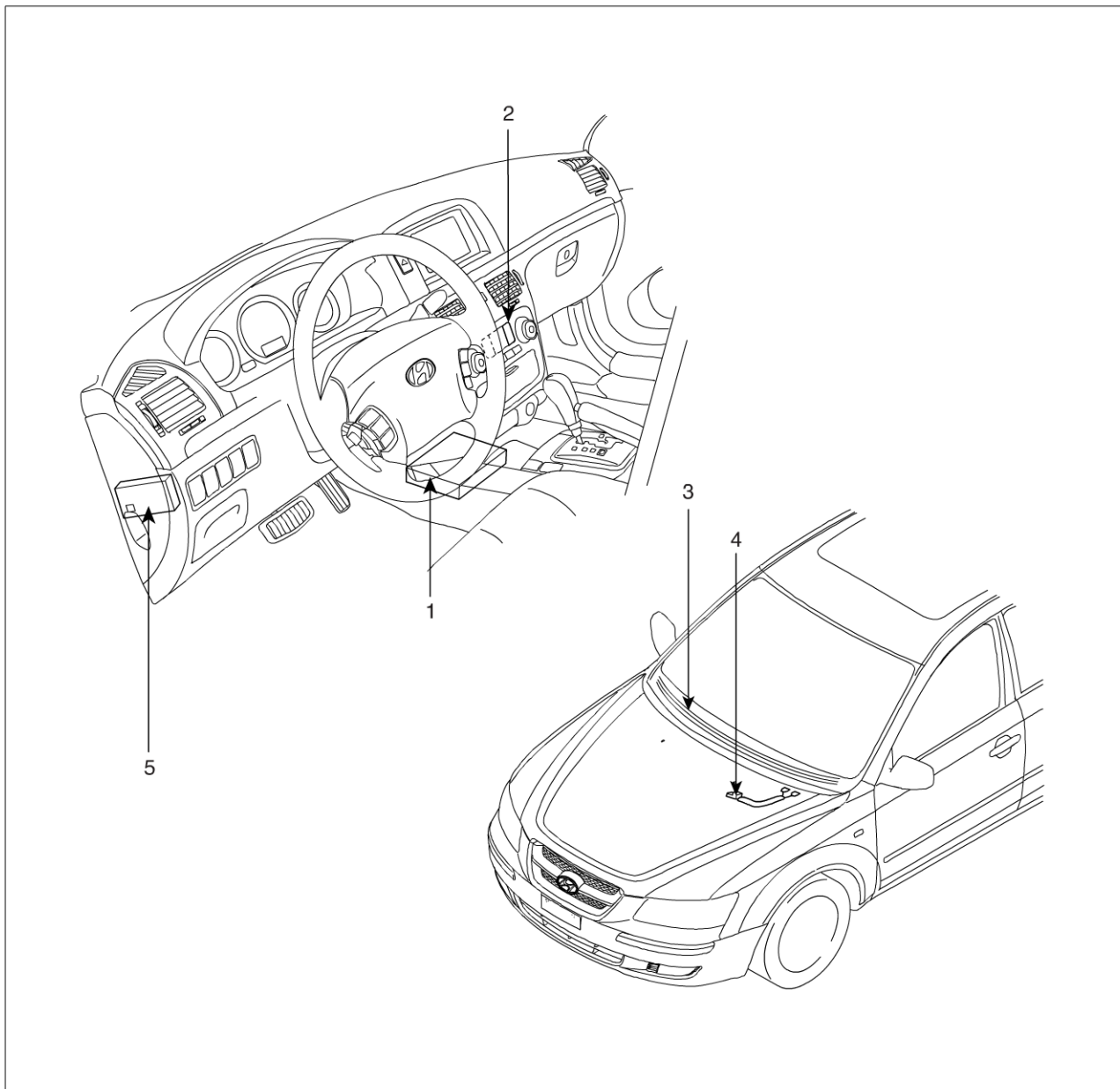
ETRF901D

3. Passenger's side window does not operate.



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.

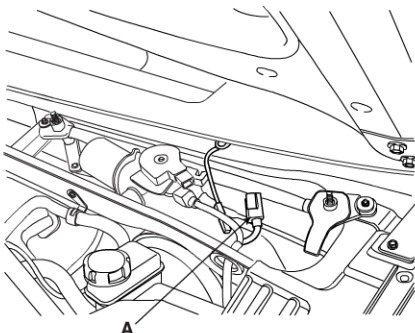
Since the generator "L" is switched ON, if the deicer switch is ON, then deicer output is ON for 20 minutes.

WINDSHIELD DEICER

INSPECTION

EEEEAC6B

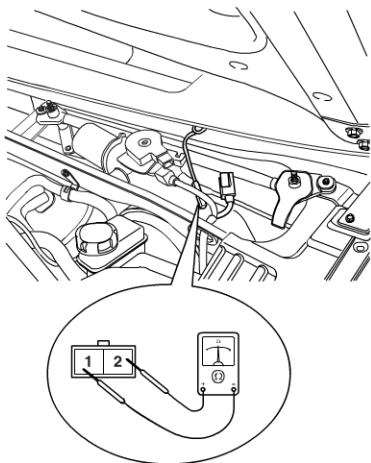
1. Remove the cowl top cover.(Refer to the wiper)
2. Disconnect the windshield deicer connector (A) from the wiper motor linkage.



KTRE331A

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

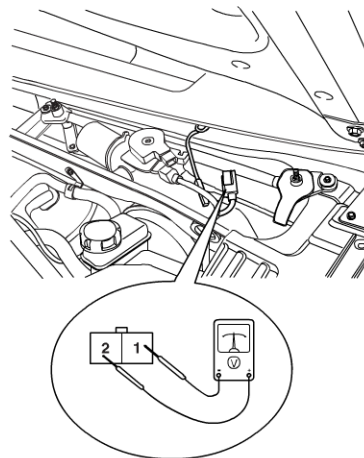
KTRE331C



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.

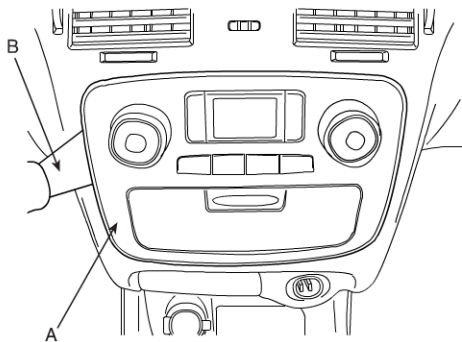
OK: approx. Battery voltage



WINDSHIELD DEICER SWITCH

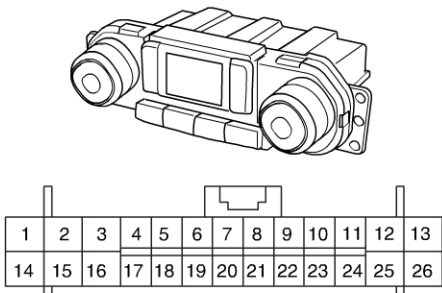
INSPECTION E8B96EE7

- 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

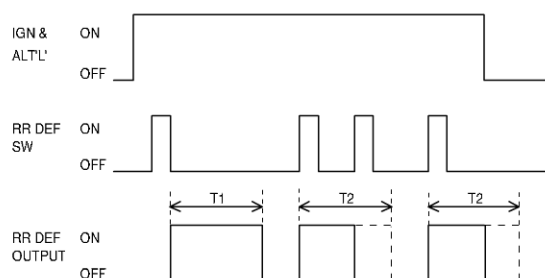
KTRE332A

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

ETRF332B

INSPECTION E51C1ED7

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.

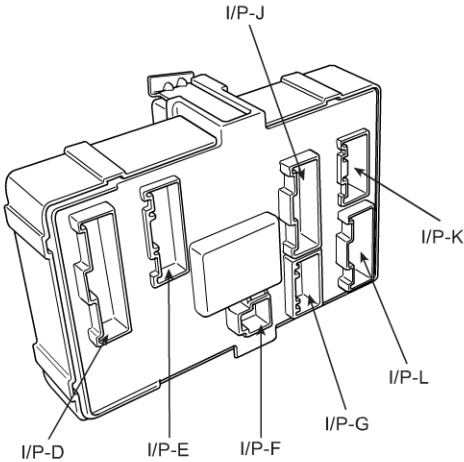
WINDSHIELD DEICER RELAY

INSPECTION E97BCB9B

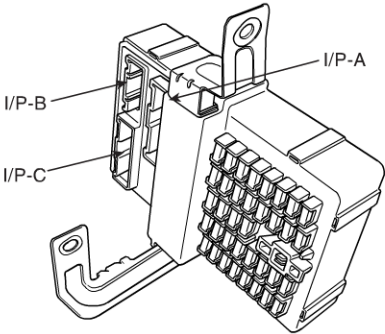
- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the junction box.
- 3. Check for continuity between the terminals.
- 4. There should be continuity between the No.2 in the I/P-G and No.8 terminal in the I/P-K when power and ground are connected to the No.2 terminal in the I/P-G and No.8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

ETRF334A



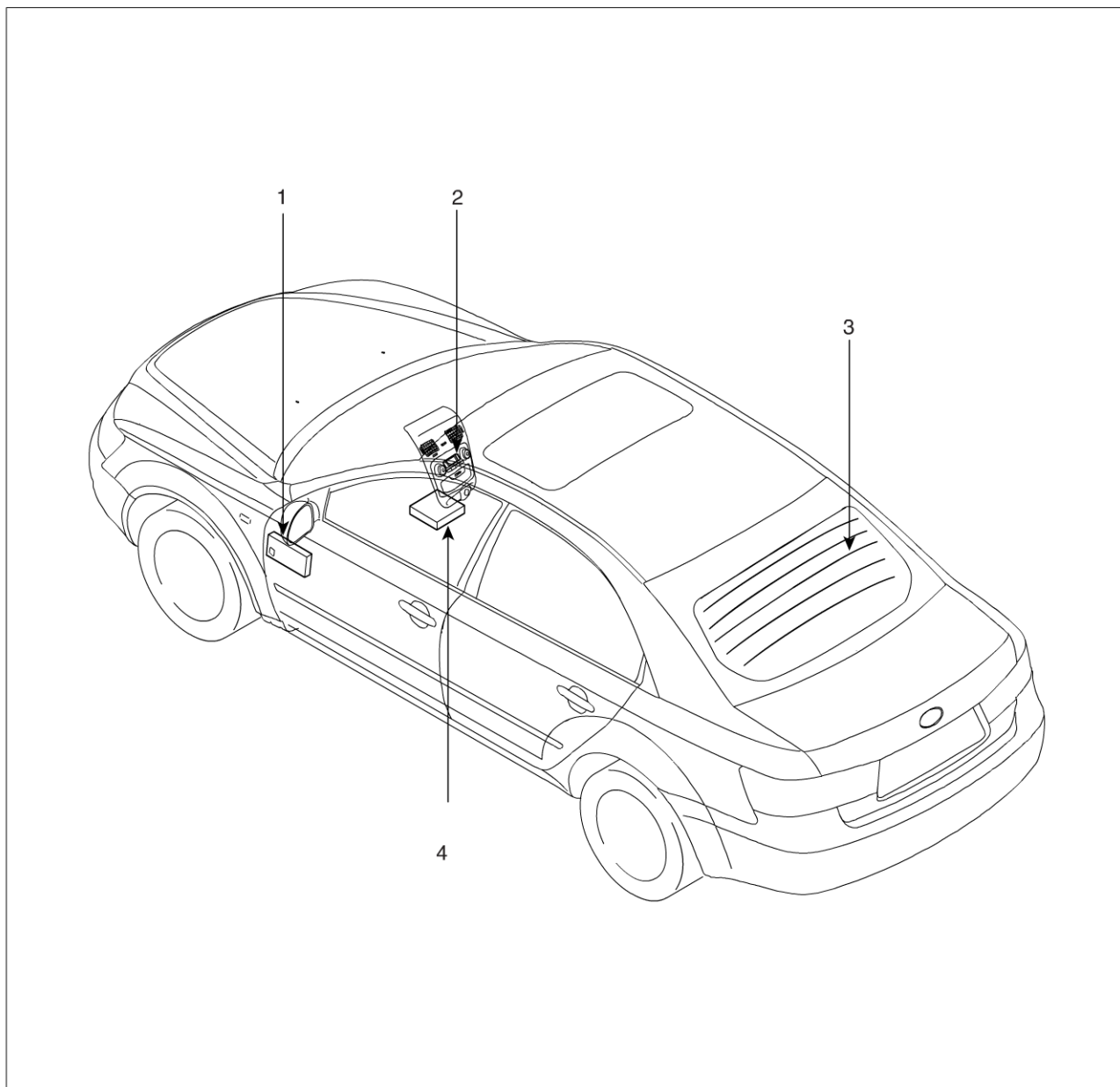
KTRE323A



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

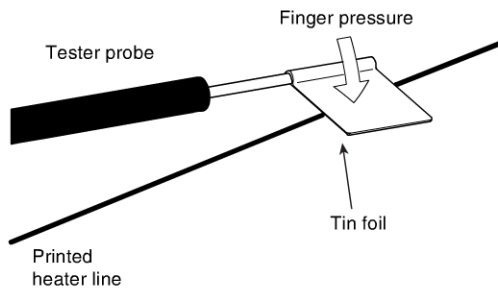
REAR WINDOW DEFOGGER PRINTED HEATER

INSPECTION E65938B5



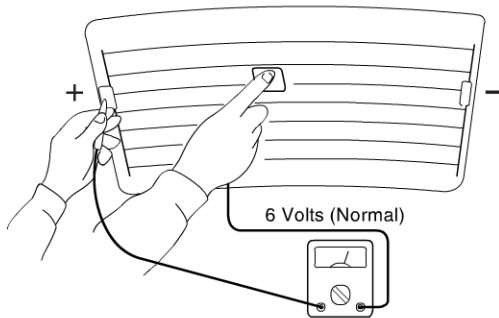
CAUTION

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.



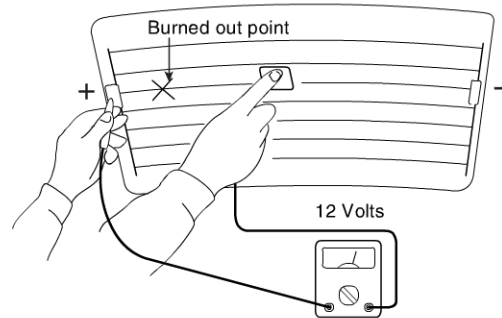
ETA9165A

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.



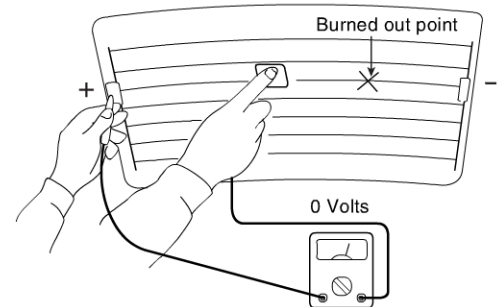
ETA9165B

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



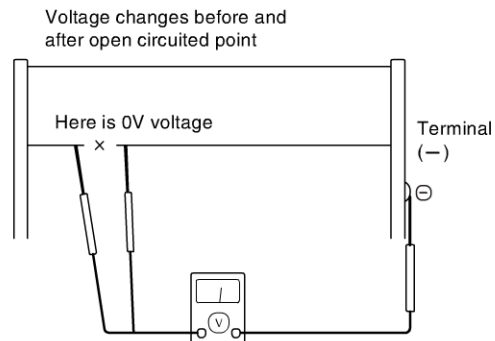
ETA9165C

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



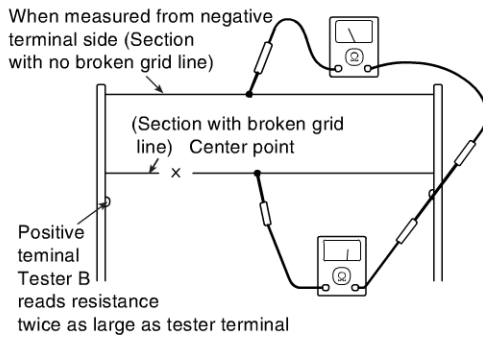
ETA9165D

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.



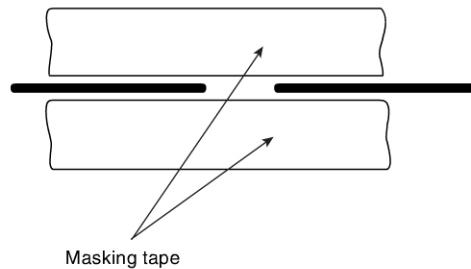
ETA9165F

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).

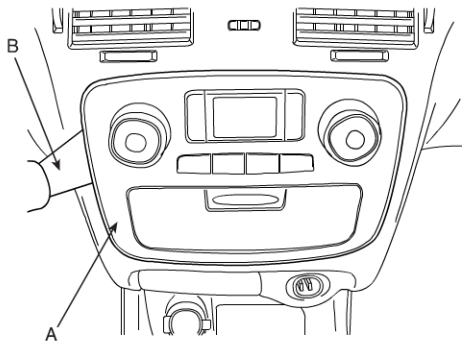


ETA9165G

REAR WINDOW DEFOGGER SWITCH

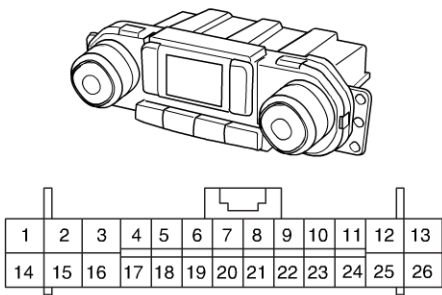
INSPECTION ED1B245C

- 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				

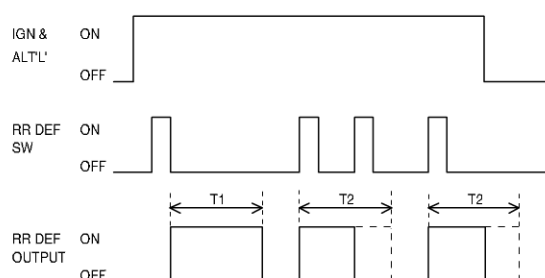
ETRF332B

REAR WINDOW DEFOGGER TIMER

INSPECTION E1765E77

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

- Once ALT "L" is ON, if the defogger is switched ON, the defogger will stay ON for 20 minutes duration.
- 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.

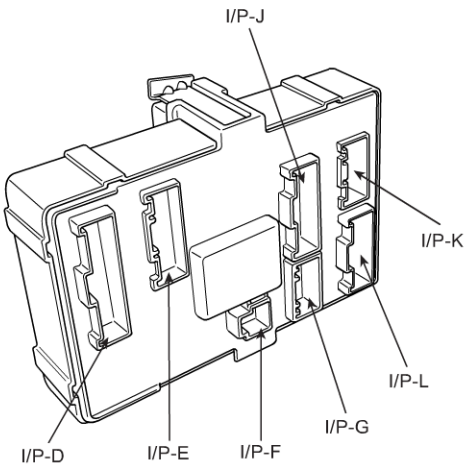
REAR WINDOW DEFOGGER
RELAY

INSPECTION E6EFA8D

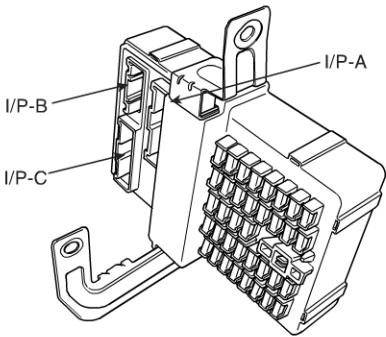
- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the junction box.
- 3. Check for continuity between the terminals.
- 4. There should be continuity between the No.2 in the I/P-G and No.7 terminal in the I/P-C when power and ground are connected to the No.2 terminal in the I/P-G and No.8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

ETRF343A



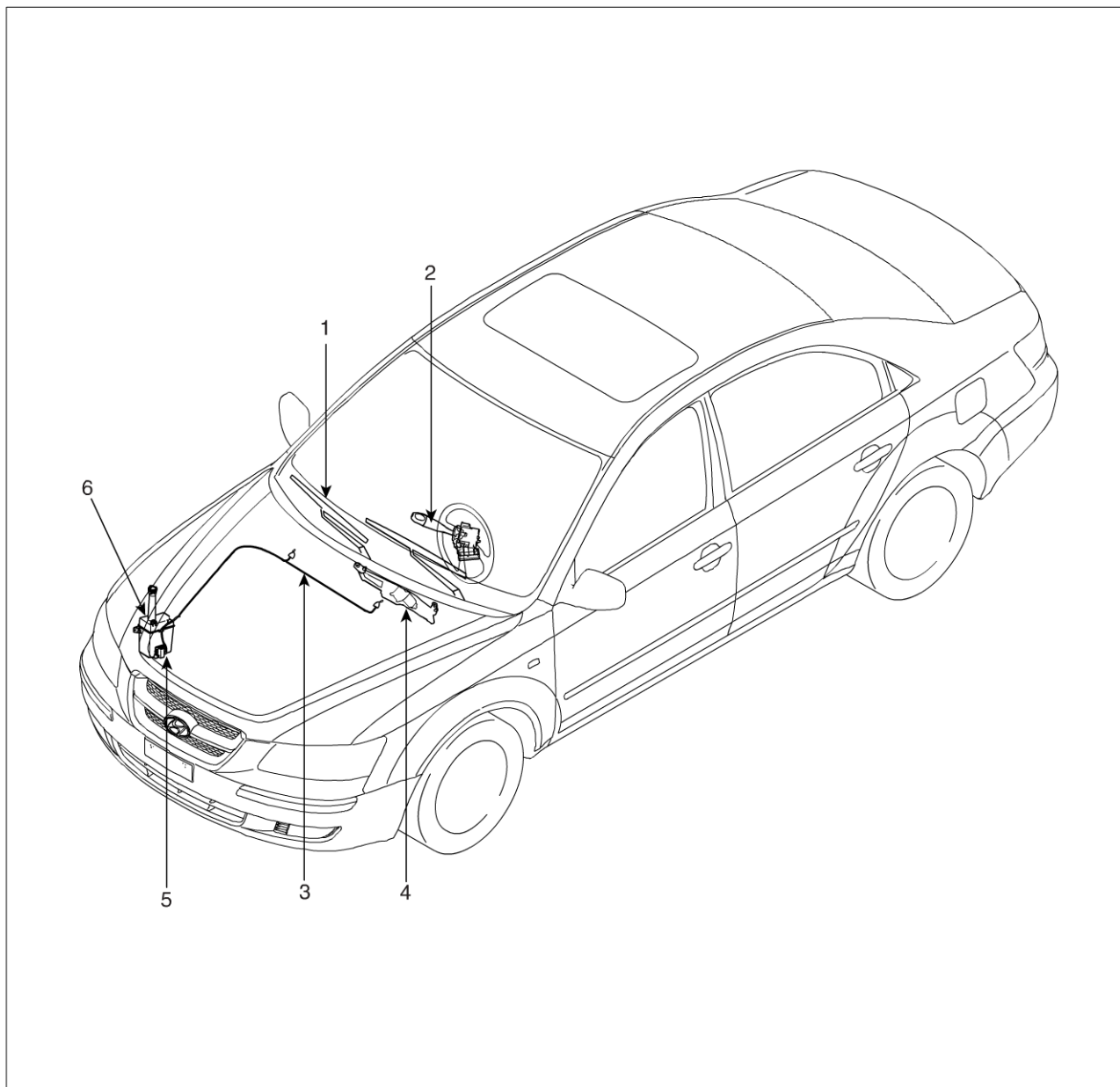
KTRE323A



KTRE323D

WINDSHIELD WIPER / WASHER

COMPONENT LOCATION E9632AED



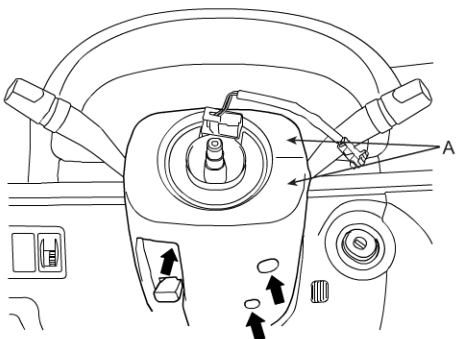
- 1. Windshield wiper arm & blade
- 2. Wiper & washer switch
- 3. Windshield washer hose

- 4. Windshield wiper motor & linkage
- 5. Washer motor
- 6. Washer reservoir

WINDSHIELD WIPER / WASHER SWITCH

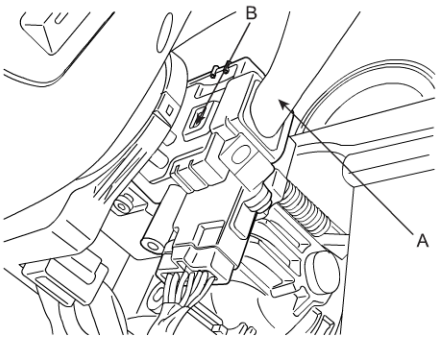
REPLACEMENT E0DA6DAE

- 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.

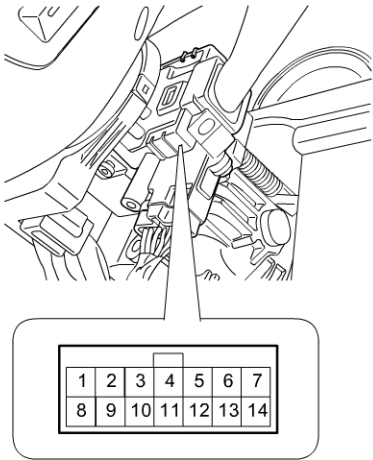


KTRE031D

- 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

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

LTGE031I

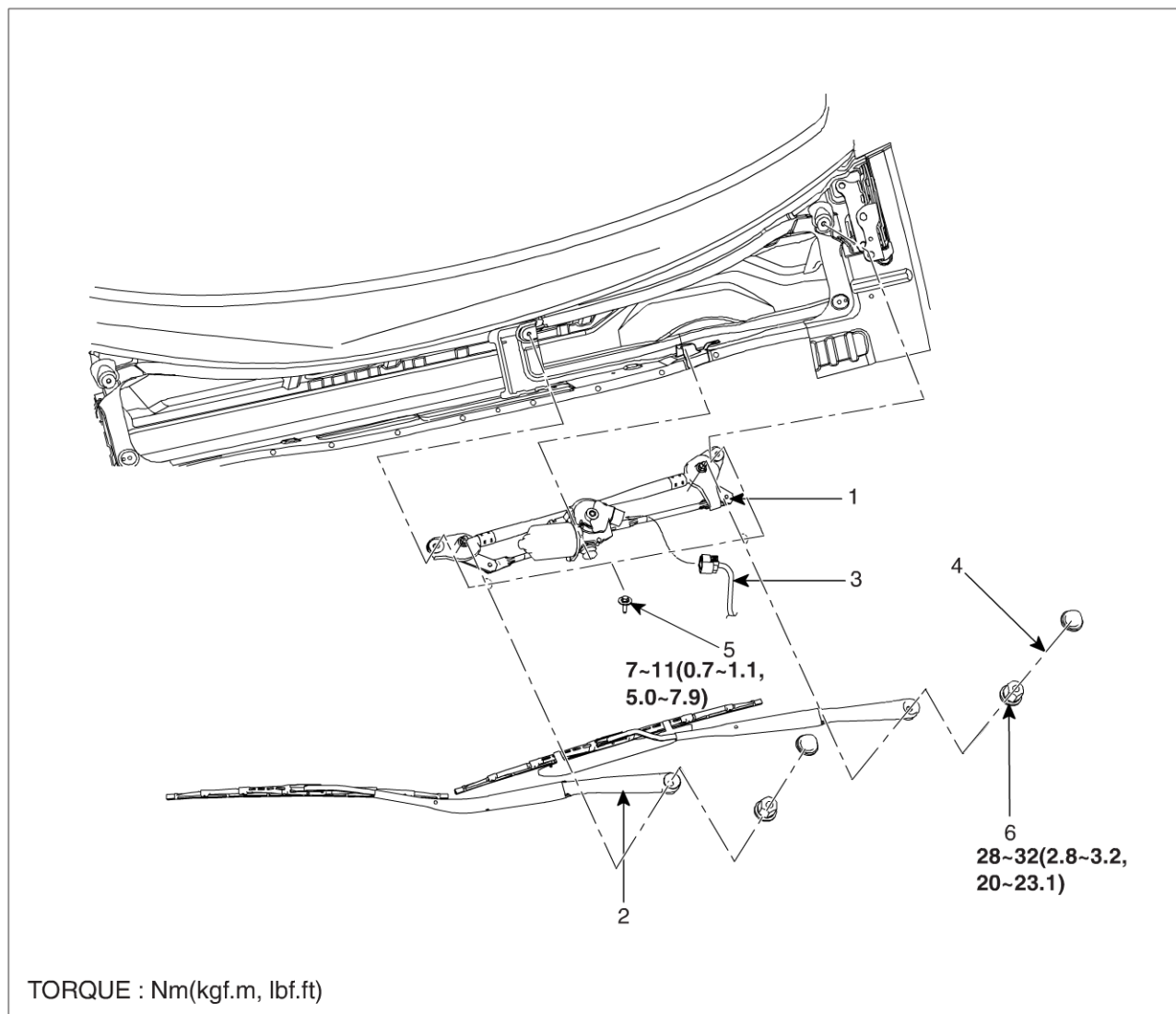
WASHER SWITCH

Terminal Position	5	7
OFF		
ON	○	○

LTGE031J

FRONT WIPER MOTOR

COMPONENT LOCATION EC8DE8CD



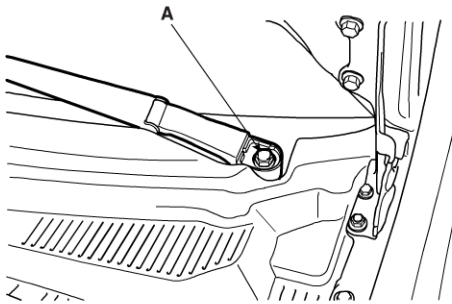
- 1. Wiper motor & linkage assembly
- 2. Wiper arm & blade
- 3. Wiper motor connector

- 4. Cap
- 5. Bolt
- 6. Nut

REMOVAL EEFA1B7C

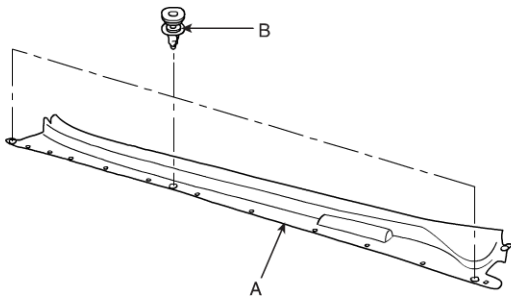
1. Remove the windshield wiper arm and blade after removing a nut (A).

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



ETKE365A

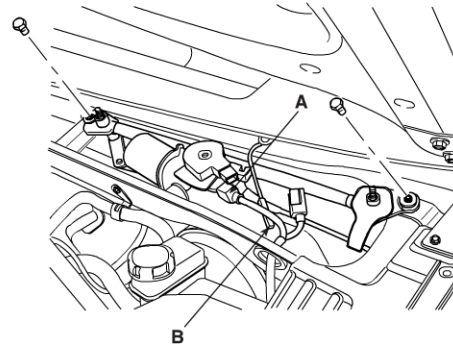
2. Remove the weather strip then remove the cowl top cover (A) after removing 3 clips (B).



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)

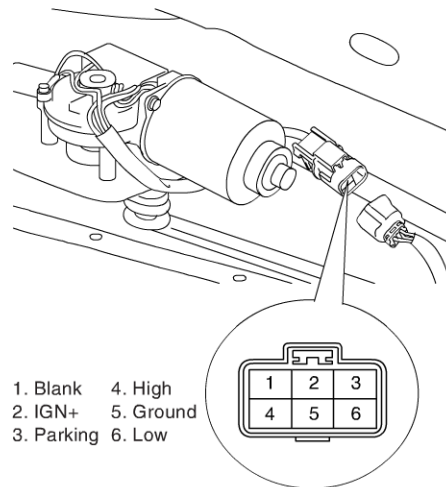


KTRE362C

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.

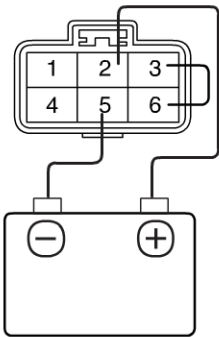


1. Blank
2. IGN+
3. Parking
4. High
5. Ground
6. Low

ETRF310B

AUTOMATIC STOP OPERATION CHECK

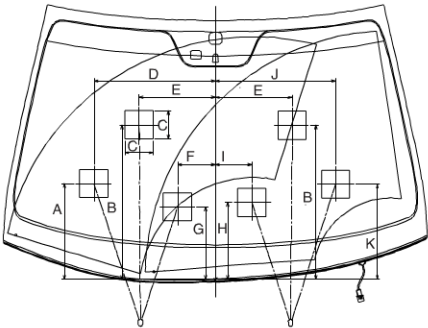
- 1. Operate the motor at low speed using the stalk control.
- 2. Stop the motor operation anywhere except at the off position by disconnecting terminal 6.
- 3. Connect terminals 3 and 6.
- 4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 5.
- 5. Check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



KTRE362D

- 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)



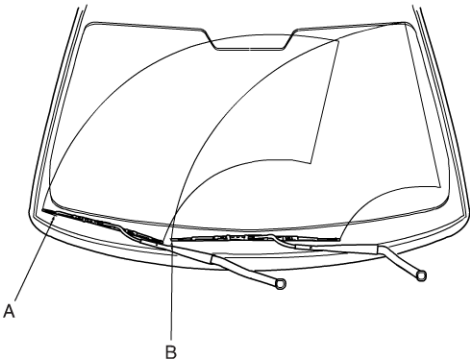
Unit : mm

ETRF362E

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)



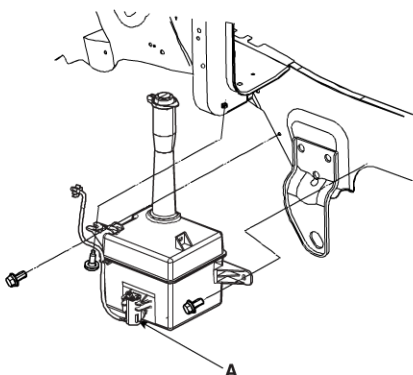
ATGE362C

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.



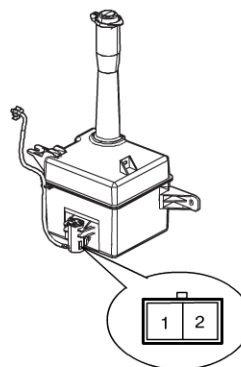
ETRF363C

5. Installation is the reverse of removal.

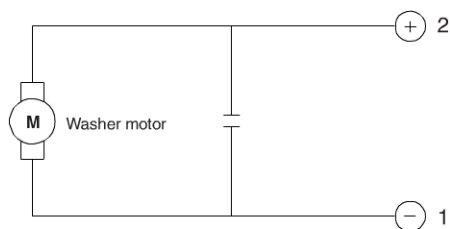
INSPECTION

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.



ETRF363D

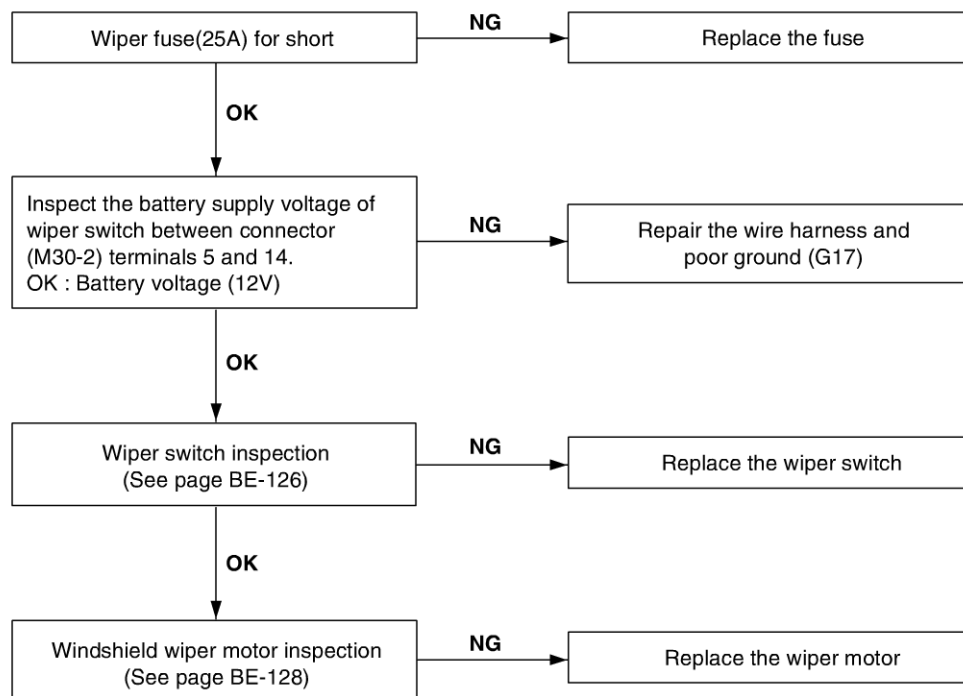


[Windshield washer motor]

LTIF363C

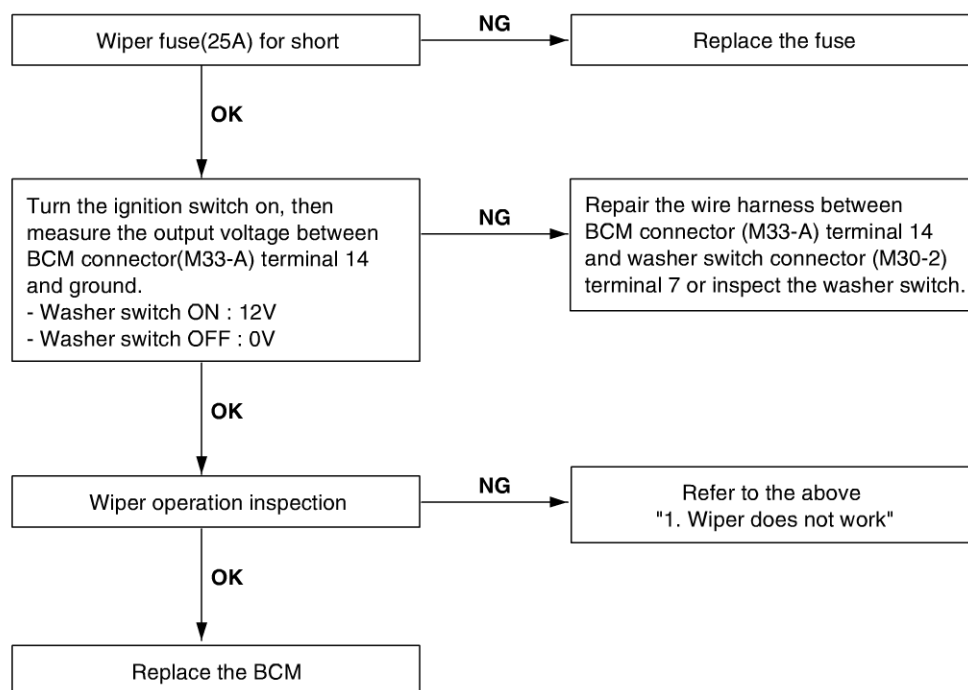
TROUBLESHOOTING E51CC2AA

1. Wiper low and wiper high do not work.



ETRF902A

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



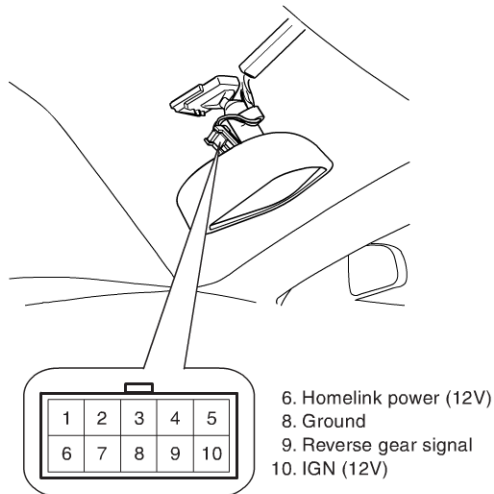
ETRF900B

ELECTRO CHROMIC INSIDE REAR VIEW MIRROR

ELECTRO CHROMIC INSIDE REAR VIEW MIRROR

DESCRIPTION EBAAA21D

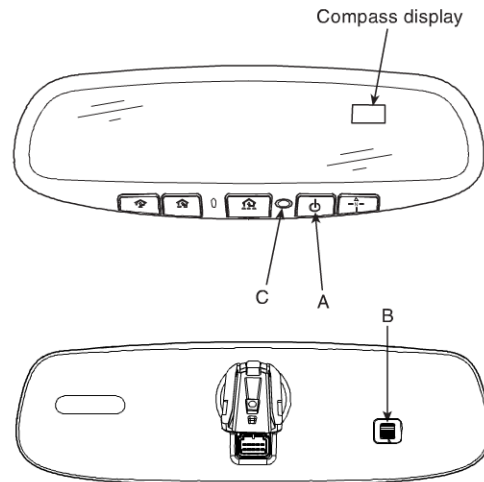
The ECM (Electro Chromic inside rear view Mirror) is for dimming the reflecting light from a vehicle behind at night, in order the user not to be dazzled by the light. The front looking sensor detects brightness of the surroundings, while the rearward looking sensor the strength of the reflecting light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



ETRF410K

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.



ETRF410N

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. Press the A button to turn to automatic dimming function ON/OFF.
3. Cover the front looking sensor (B) to stop functioning.
4. Head a light to the rearward looking sensor(C).
5. The ECM should be darkened as soon as the rearward looking sensor detects the light.

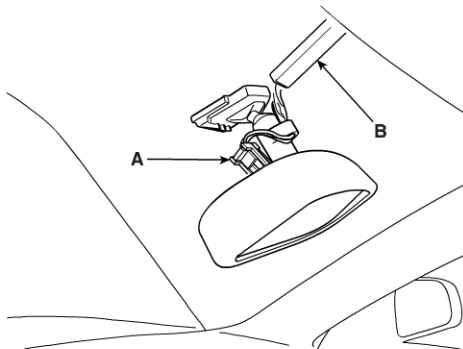
NOTE

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

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

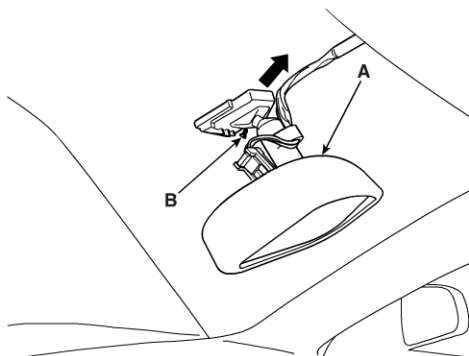
REPLACEMENT E68B9B6B

1. Remove the connector(A) and honelink cover(B).



ETRF410L

2. Push the ECM base up to remove the ECM assembly (A) after loosening the mounting screw (B).



ETRF410M

3. Installation is the reverse of removal.

COMPASS MIRROR

FUNCTION EBC401FE

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

CALIBRATION PROCEDURE EBCFF13F

If the compass has been calibrated or set to variance zone number incorrectly, or you are driving in specific places (tunnel, parking lot in building, underground parking lot, near transformer substation, etc.), some phenomenon is occur as follows:

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

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

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

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



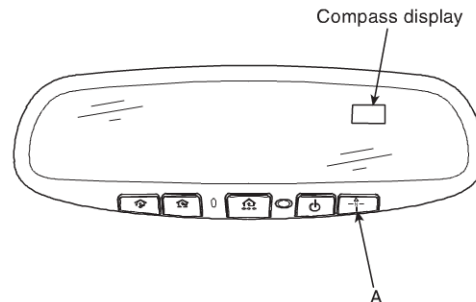
NOTE

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

SETTING THE COMPASS ZONE

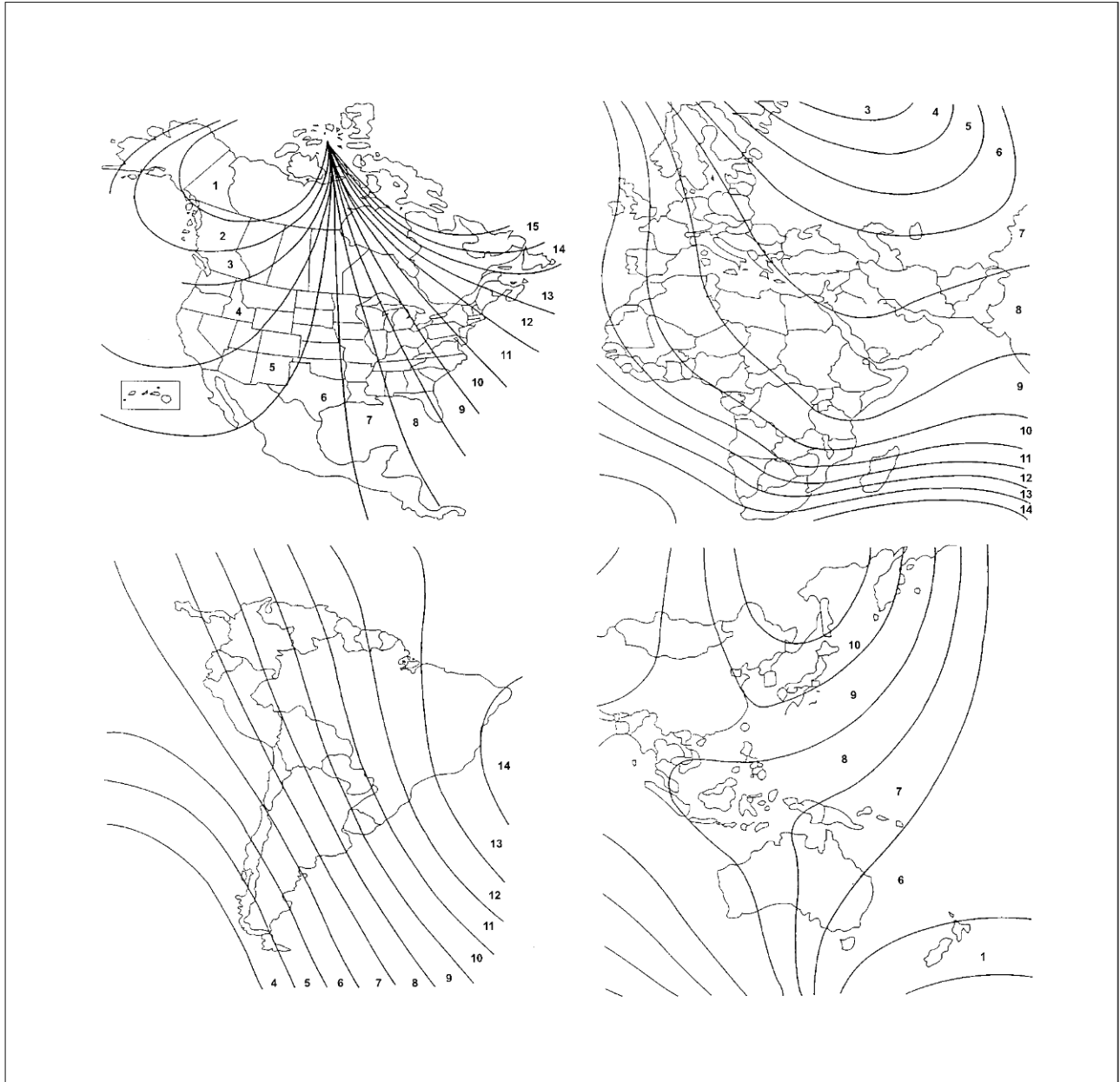
This compass must be set to compensate for the variation between true north and magnetic north. To set variation:

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



ETRF410J

ZONE MAP



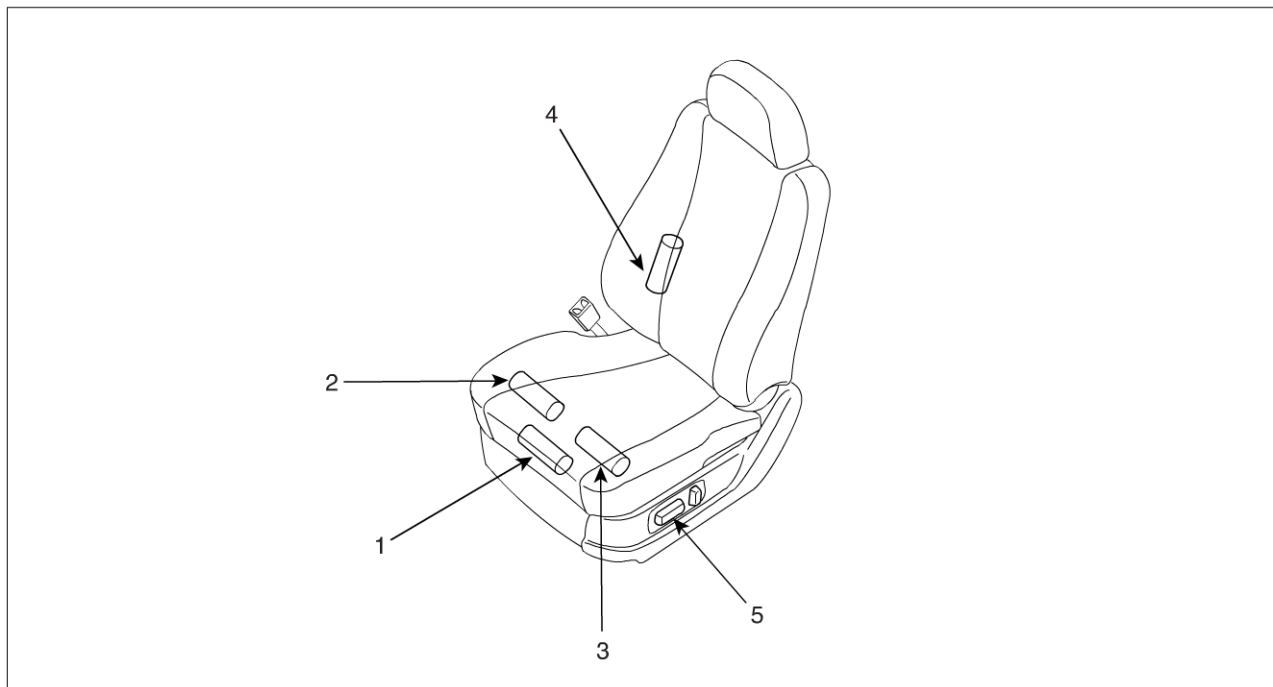
BTIF430A

⊗ WARNING

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

POWER SEAT

COMPONENT LOCATION EFA4AA23



- 1. Slide motor
- 2. Front height motor
- 3. Rear height motor

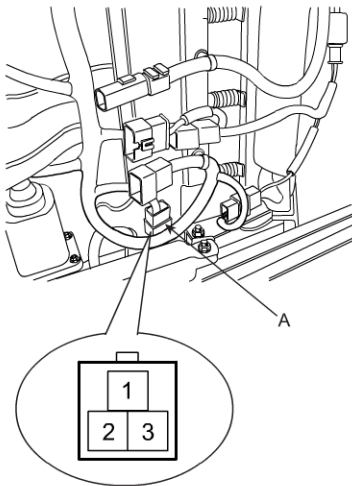
- 4. Reclining motor
- 5. Power seat switch

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.



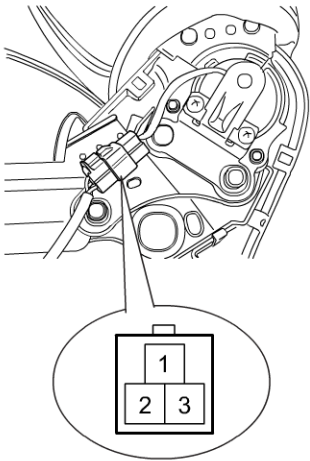
KTRE421A

Terminal NO.	1	2	3
Position			
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.



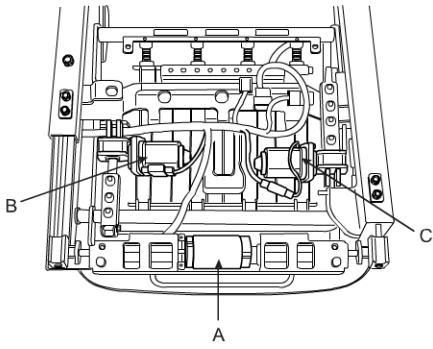
KTRE421C

Terminal NO.	1	2	3
Position			
Frontward			
Backward			

ETRF421B

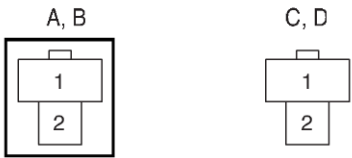
POWER SEAT MOTOR

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.



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

<Driver>

ETRF421J

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

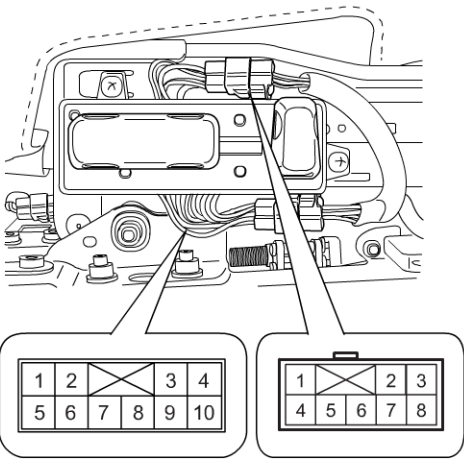
<Driver>

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

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

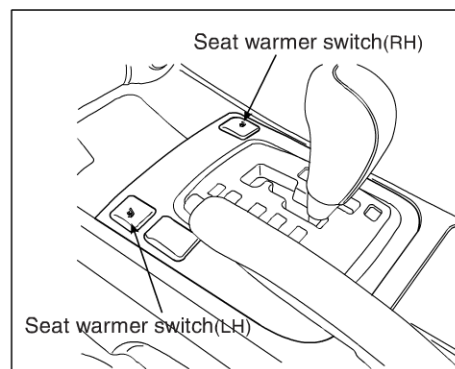
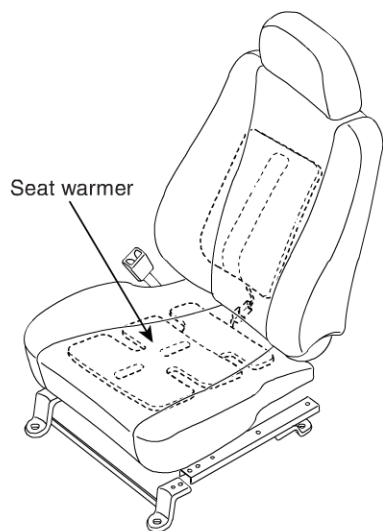
<Driver>

ETRF421H

SEAT WARMER

COMPONENT LOCATION

E40E72F8

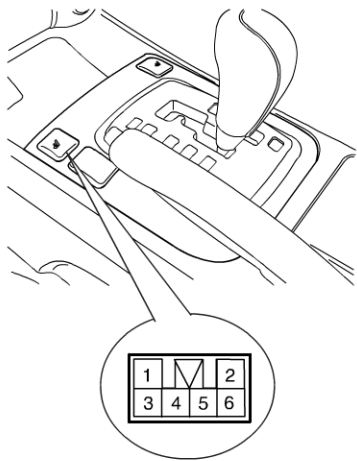


ETRF440B

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.

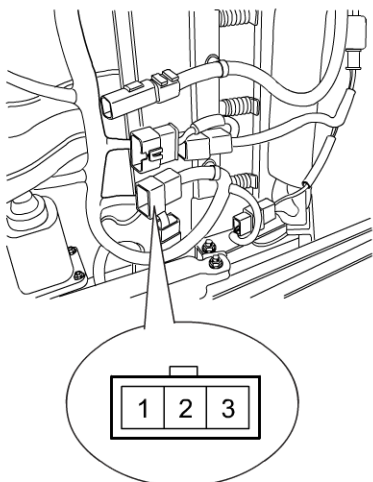
Terminal Position	2	6	3	4	1
ON					
OFF					

ETRF441B

SEAT WARMER

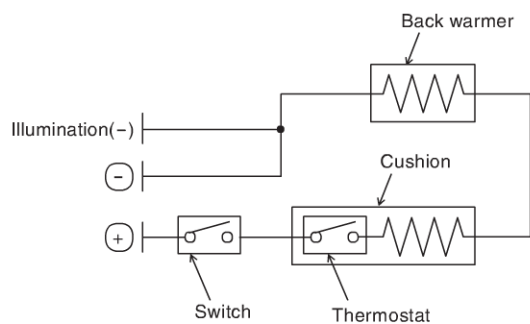
INSPECTION E97BBCC8

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



KTRE441D

Standard value: $2.45\Omega \pm 10\%$
 (Cushion: $1.2\Omega \pm 10\%$, Back: $1.2\Omega \pm 10\%$)



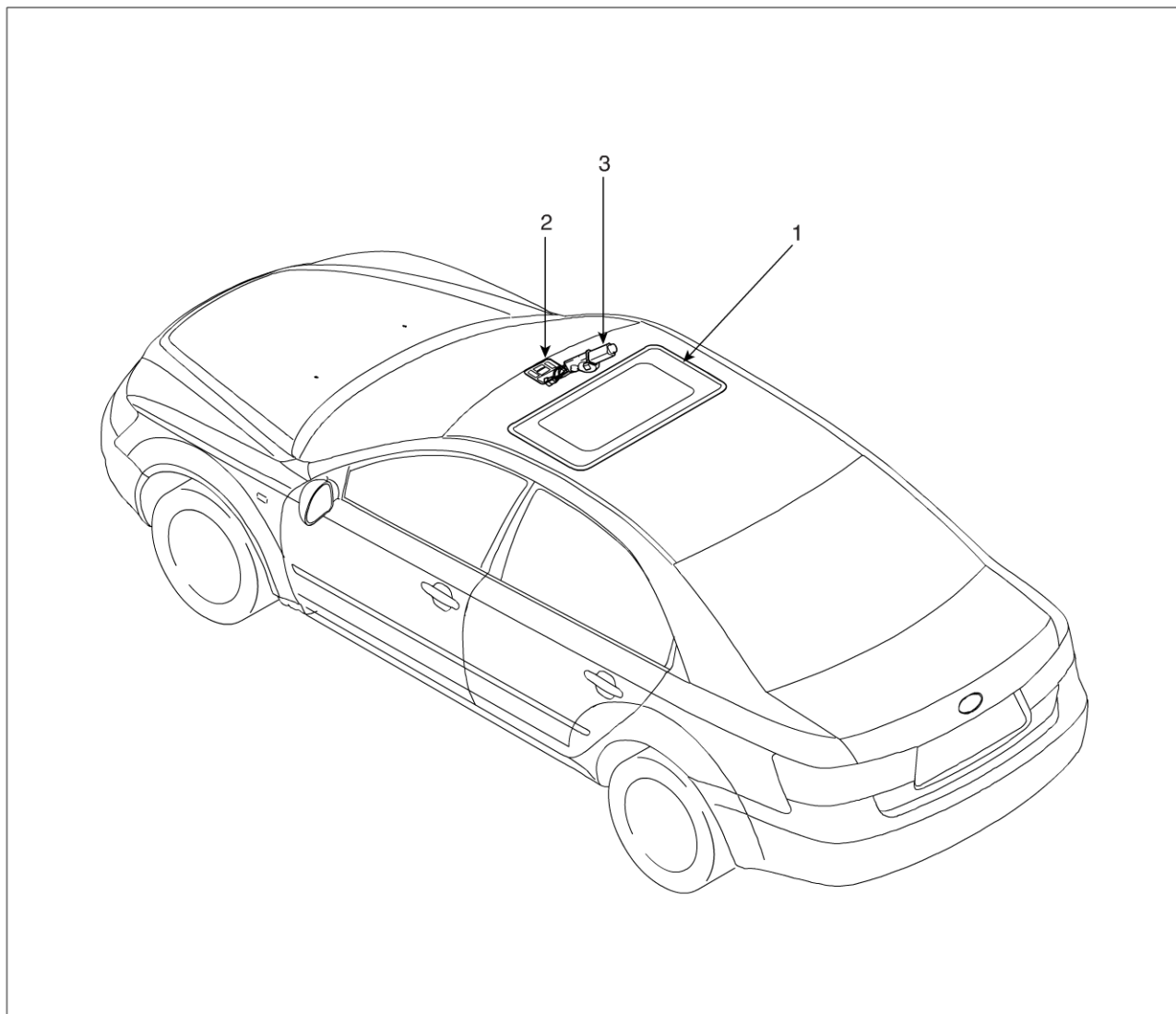
ETRF441C

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

Standard value :
 $28 \pm 3.5^{\circ}\text{C}$ (Continuity), $37 \pm 3.0^{\circ}\text{C}$ (Short)

SUNROOF

COMPONENT LOCATION EA4DE9C9

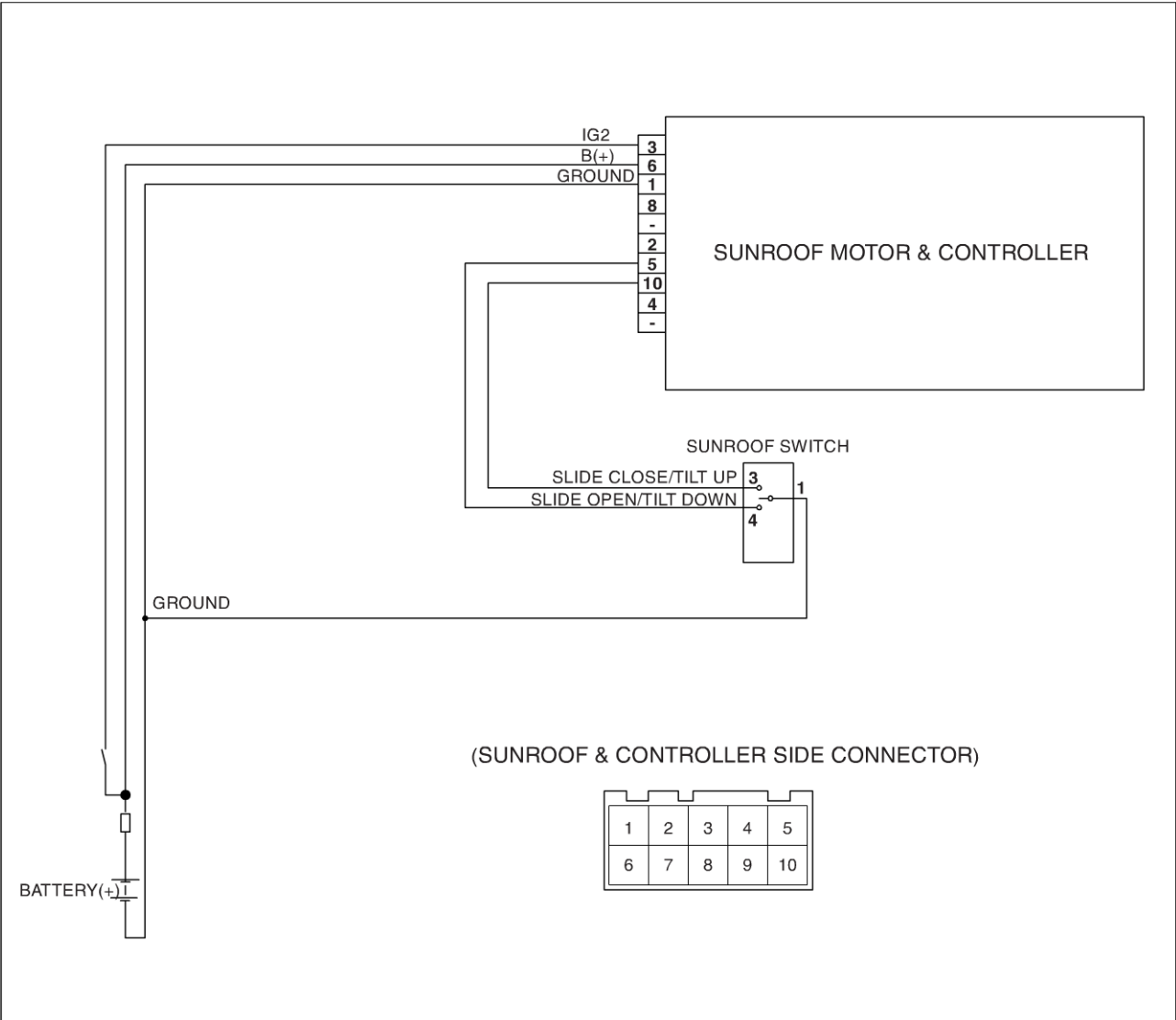


1. Sunroof

2. Sunroof switch

3. Sunroof motor & controller












CIRCUIT DIAGRAM ED5DACFB



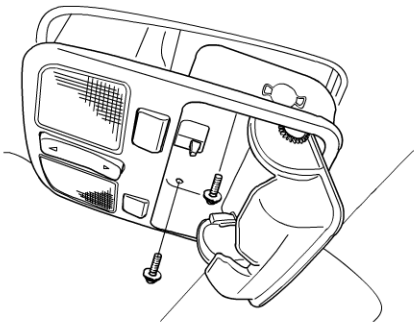
SUNROOF SWITCH

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.

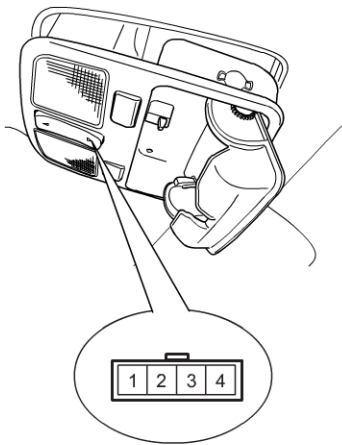
Terminal position	1	3	4
			
Slide open			
Tilt down			
Tilt up			

ETRF481C



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]

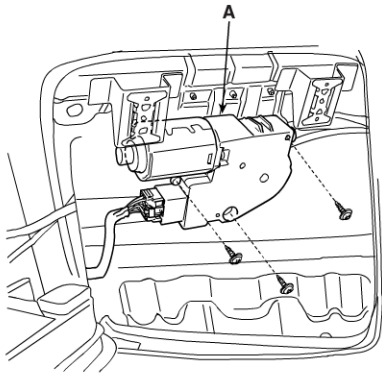
ETRF481B

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 - sun-roof)
4. Remove the sunroof motor (A) after removing 3 screws and disconnect.



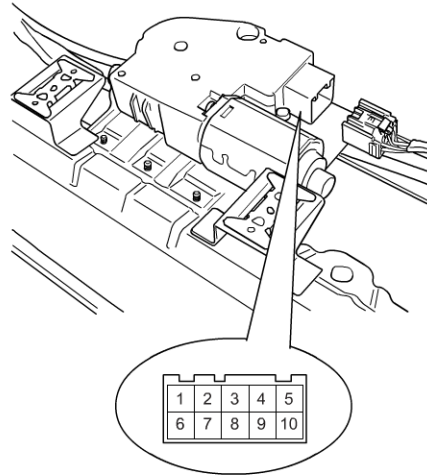
LTJF483A

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

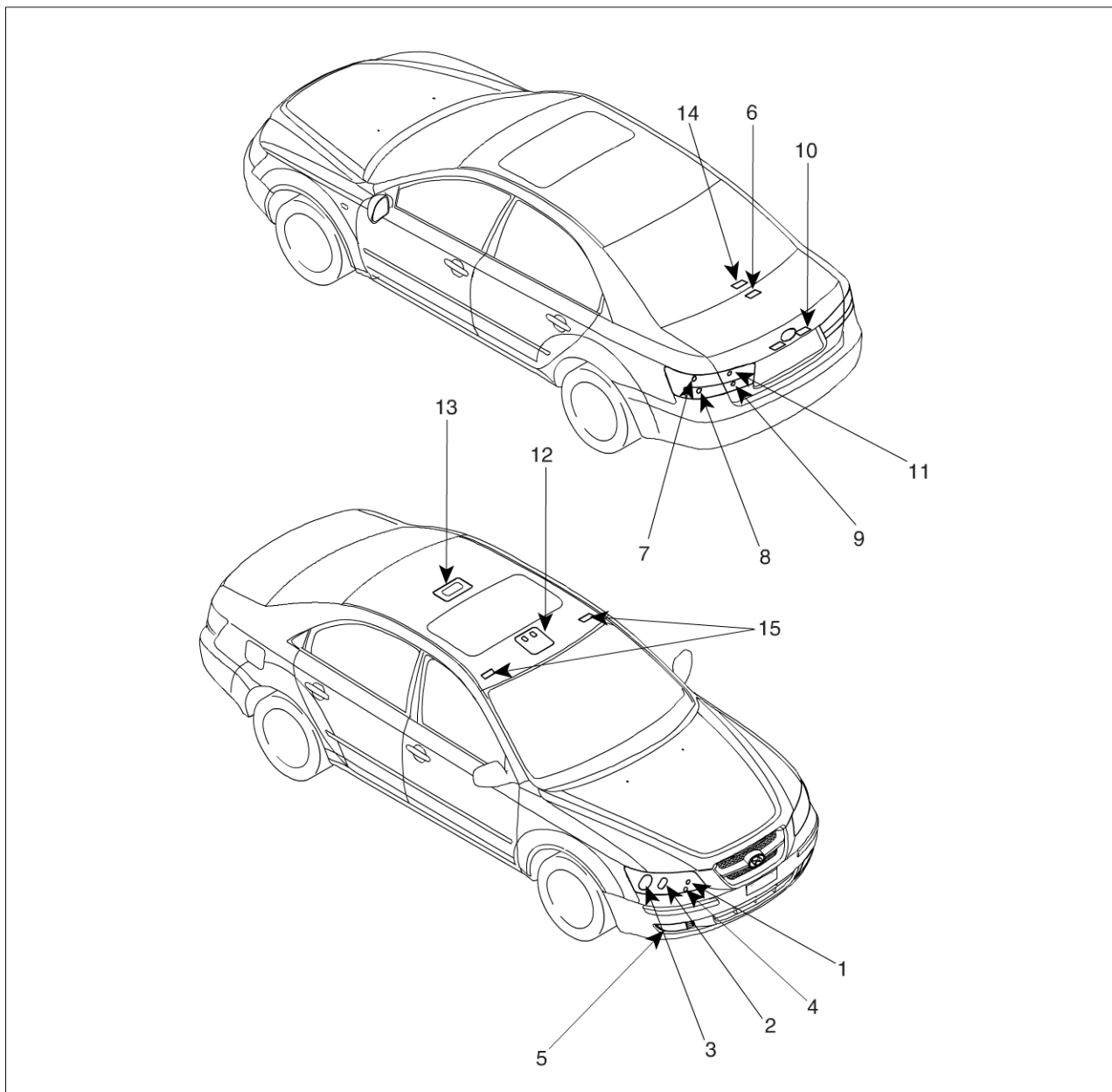
Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the sunroof, you have to reset your sunroof system as follows :

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/Side marker
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. Tail lamp
12. Overhead console lamp (Map lamp)
13. Room lamp
14. High mounted stop lamp
15. Vanity lamp

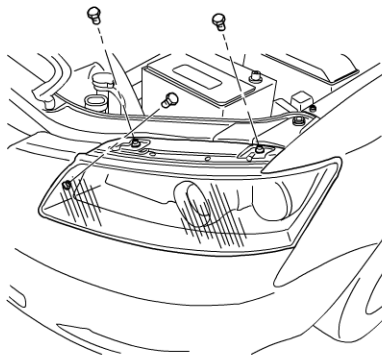
SPECIFICATION EBCA62E3

Items	Bulb Wattage (W)
Head lamp (High/Low)	55/55
Front turn signal lamp/Side marker	28/8
Front position lamp	8
Front fog lamp	27
Rear tail/stop lamp (Outside)	28/8
Rear tail lamp (Inner)	8
Back up lamp	16
Rear turn signal lamp	27
License plate lamp	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
Rear side marker	5

HEAD LAMPS

REPLACEMENT E6439AD1

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



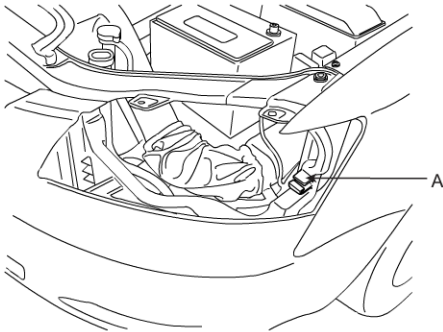
KTRE491A

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



NOTE

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

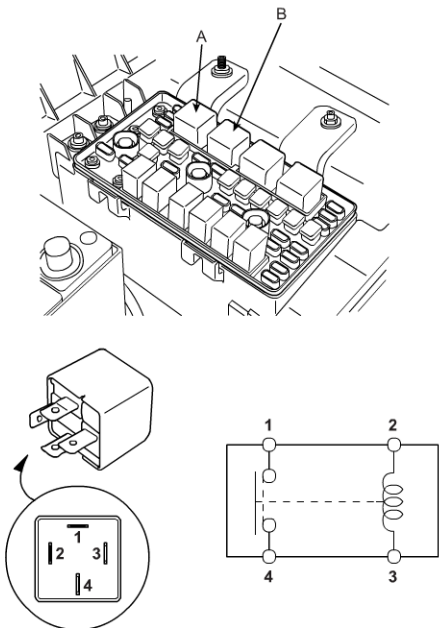


KTRE491C

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

ETKE215B

HEAD LAMP AIMING INSTRUCTIONS E9A87524

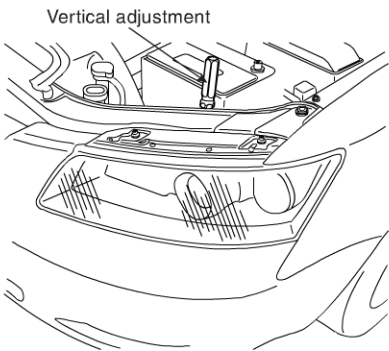
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

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 adjustment to the lower beam using the adjusting wheel.

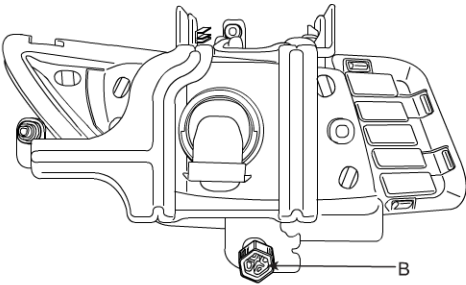


ETRF491C

FRONT FOG LAMP AIMING

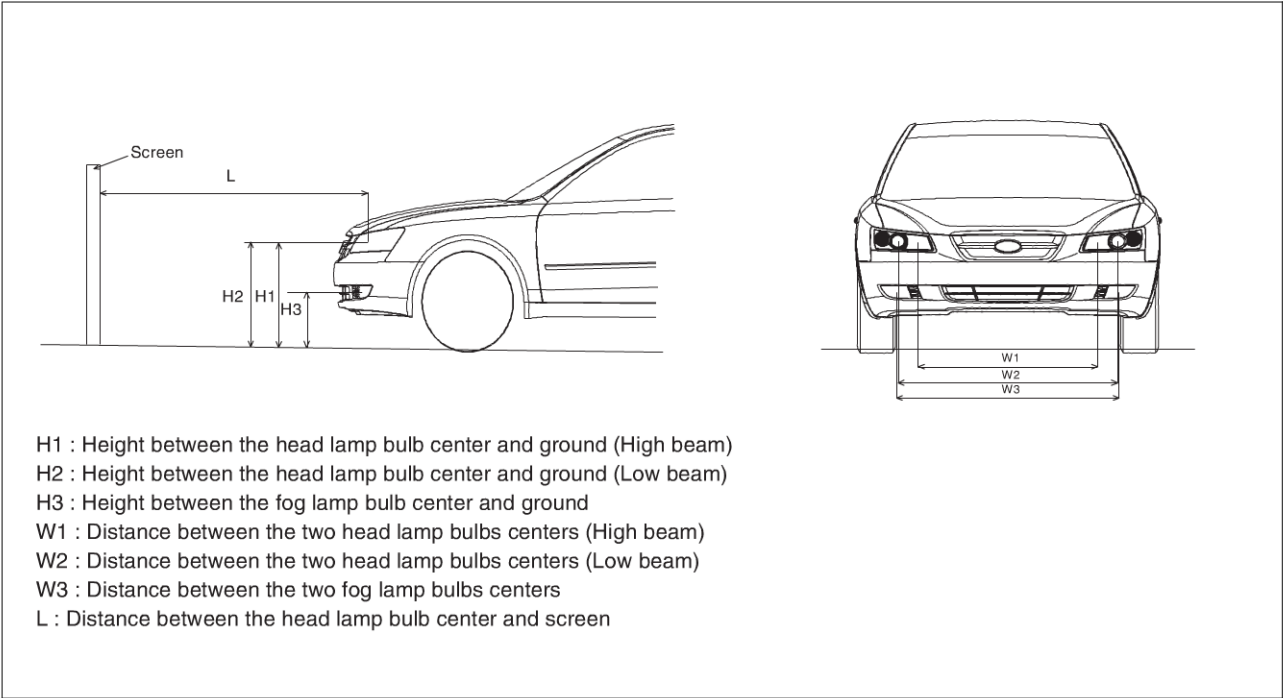
The front fog lamps should be aimed as the same manner of the head lamps aiming.

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



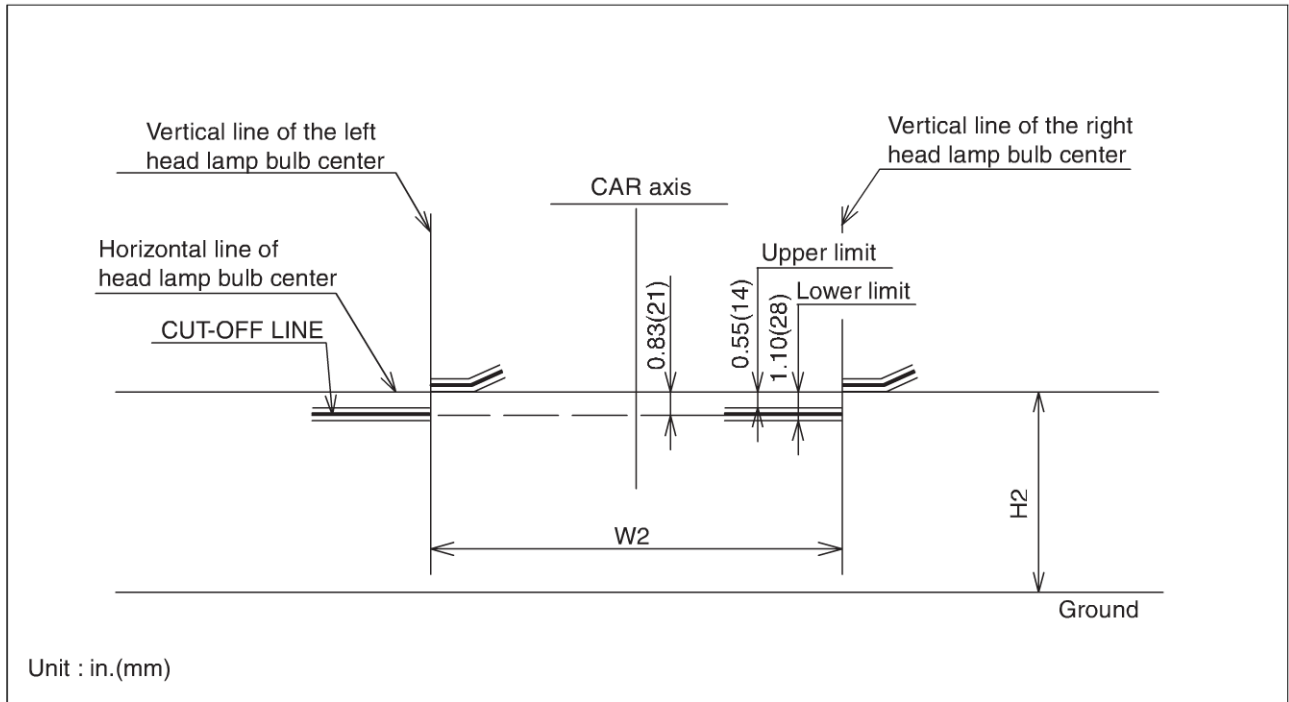
ETRF491F

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)				

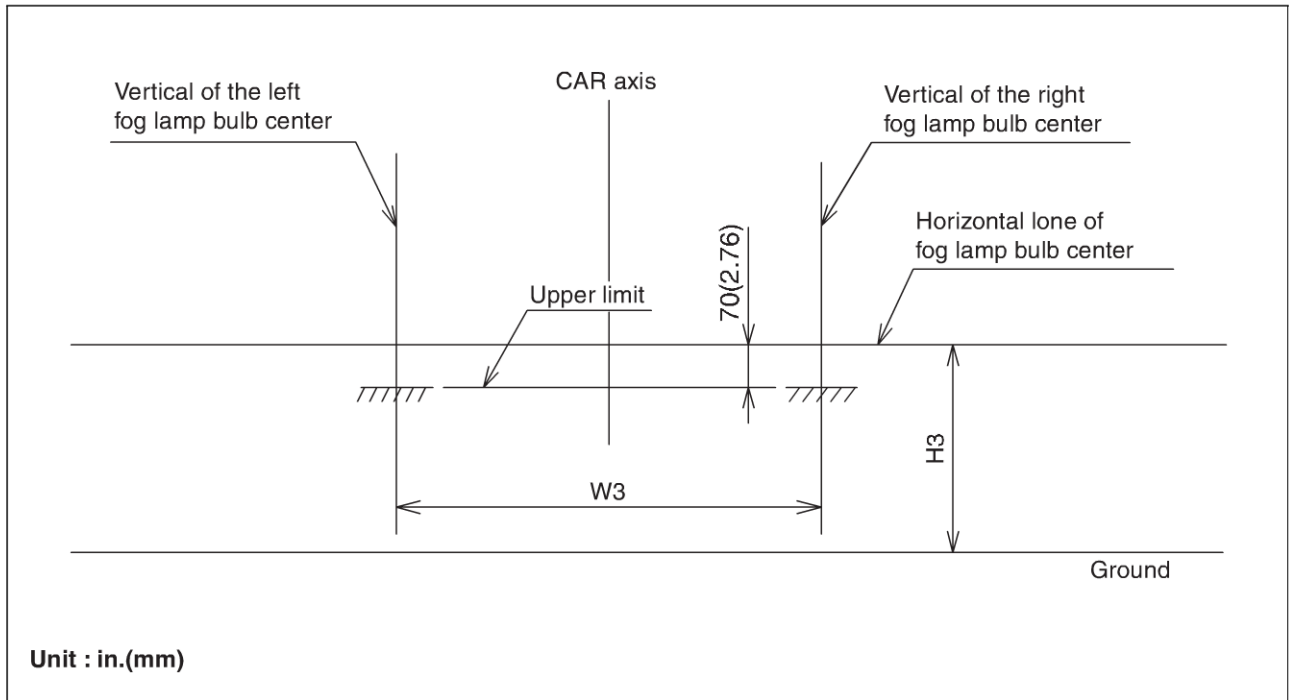
ETRF491G

1. Turn the low beam on without driver aboard.
The cut-off line should be projected in the allowable range (shaded region).



ETRF491I

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



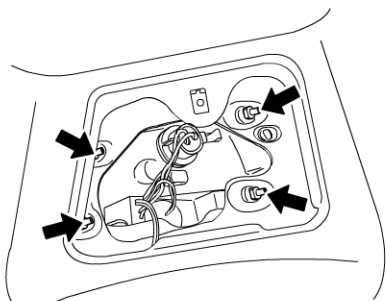
ETRF491J

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.

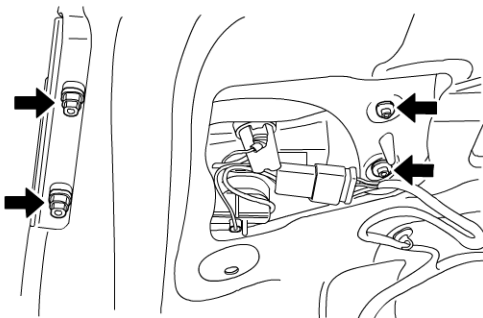
[OUTSIDE LAMP]



ETRF491L

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

[INSIDE LAMP]



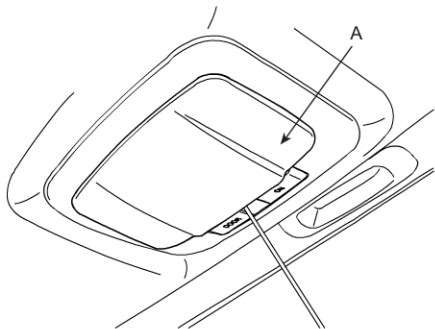
ETRF491M

4. Installation is the reverse of removal.

ROOM LAMP

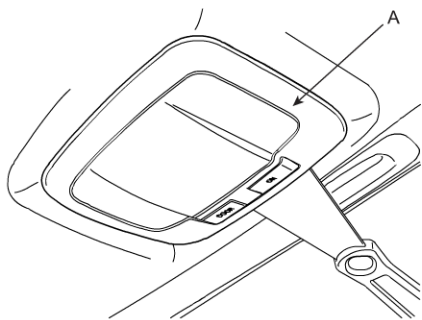
REPLACEMENT E3AEE1DB

- 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 (Sun-roof type).

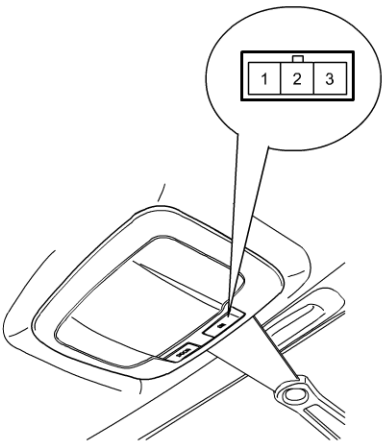


KTRE491O

- 4. Installation is the reverse of removal.

INSPECTION E16F91DF

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



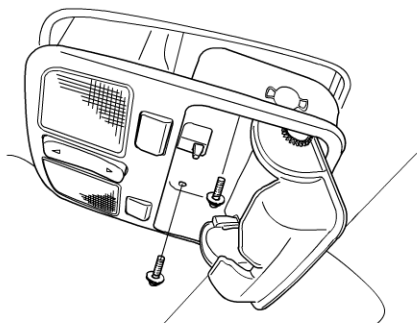
KTRE491P

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.

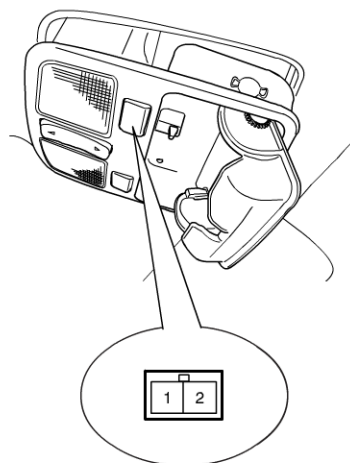


KTRE481A

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]

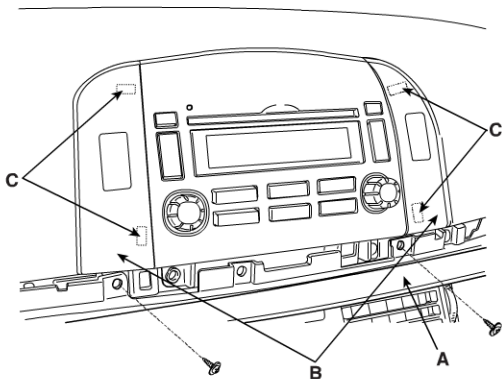
ETRF491Q

TURN / HAZARD LAMPS

INSPECTION EAC26D91

HAZARD LAMP SWITCH

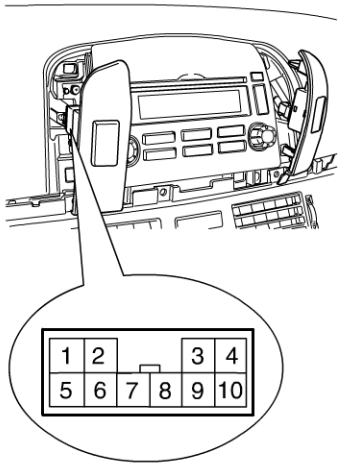
- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the crash pad garnish (A) after pulling it by using regular screw driver (-). Take care of fixing clips(C).
- 3. Remove the center facia panel (B) after loosening the screws.



ETRF021B

- 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.

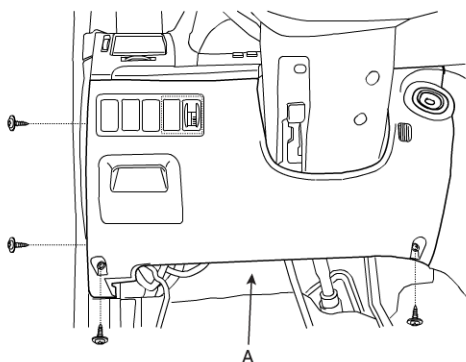
Terminal Position	2	3	6	9	10	5	7	8
OFF								
ON								

LTIF491M

FLASHER UNIT

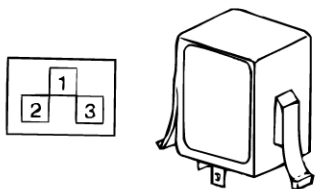
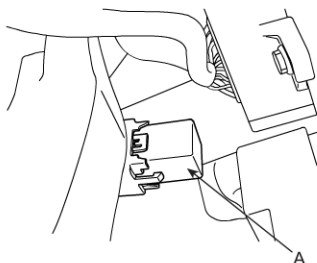
INSPECTION ECF9EE5C

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).



ETRF495F

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.

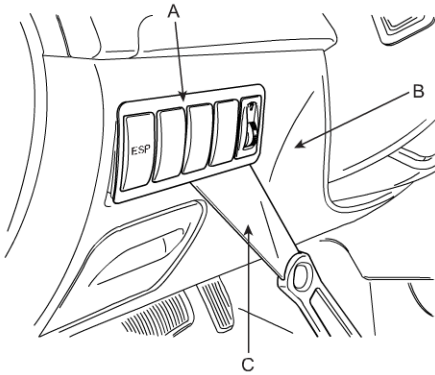
NOTE

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

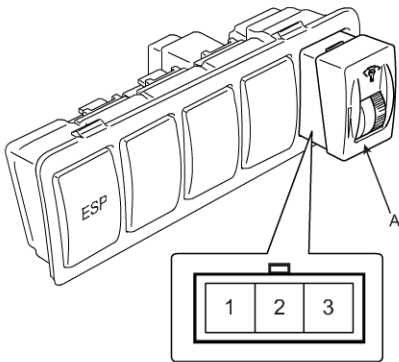
INSPECTION EB69645F

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.



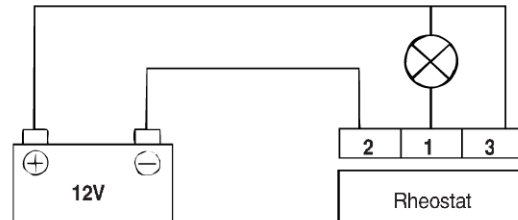
ETRF497C

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



ETRF497D

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.

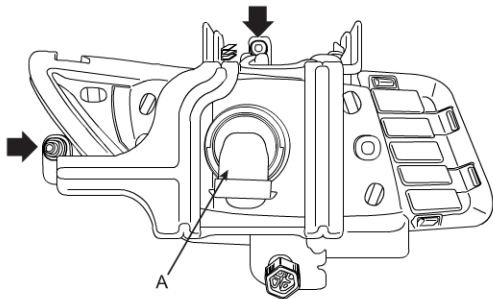


ETRF495G

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.

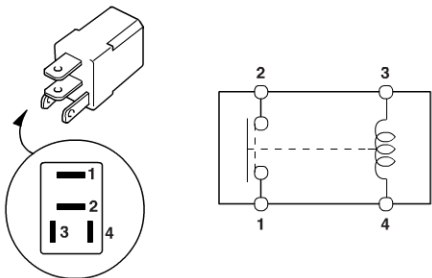
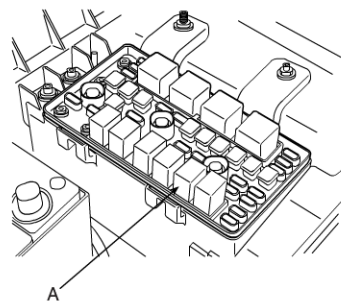


KTRE495F

- 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

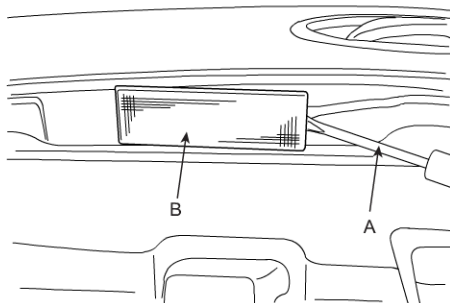
Terminal	1	2	3	4
Power (No.3-No.4)				
Disconnected			○	○
Connected	○	○	○	○

ETKE903A

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

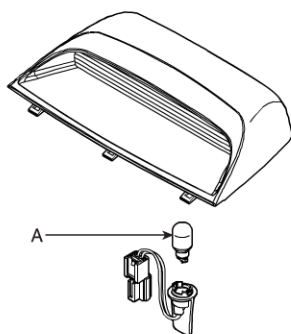
3. Replace the bulb.
4. Installation is the reverse of removal.

STOP LAMPS

REPLACEMENT E7BDD9A9

HIGH MOUNTED STOP LAMP

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.



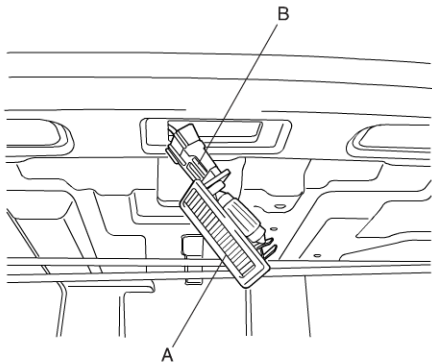
ETRF499A

5. Installation is the reverse of removal.

TRUNK LAMPS

REPLACEMENT EEEB CDD7

- 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

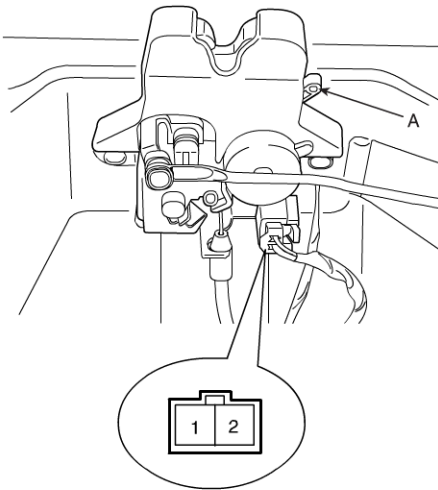
- 3. Replace the bulb.
- 4. Installation is the reverse of removal.

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 ($\infty \Omega$)
Released (ON)	Conductive (0Ω)



ETRF499C

TROUBLESHOOTING

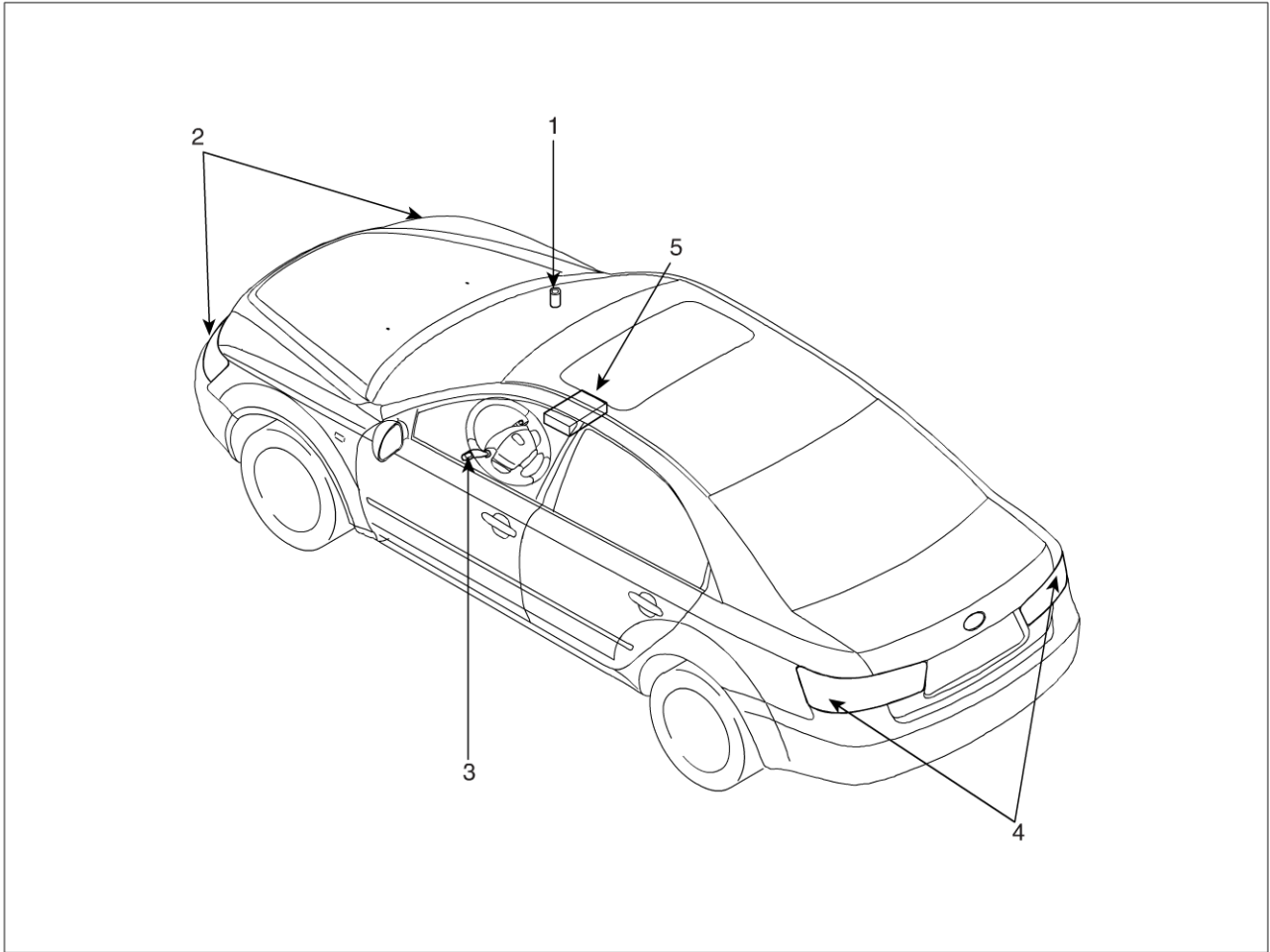
EA42DDA3

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
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

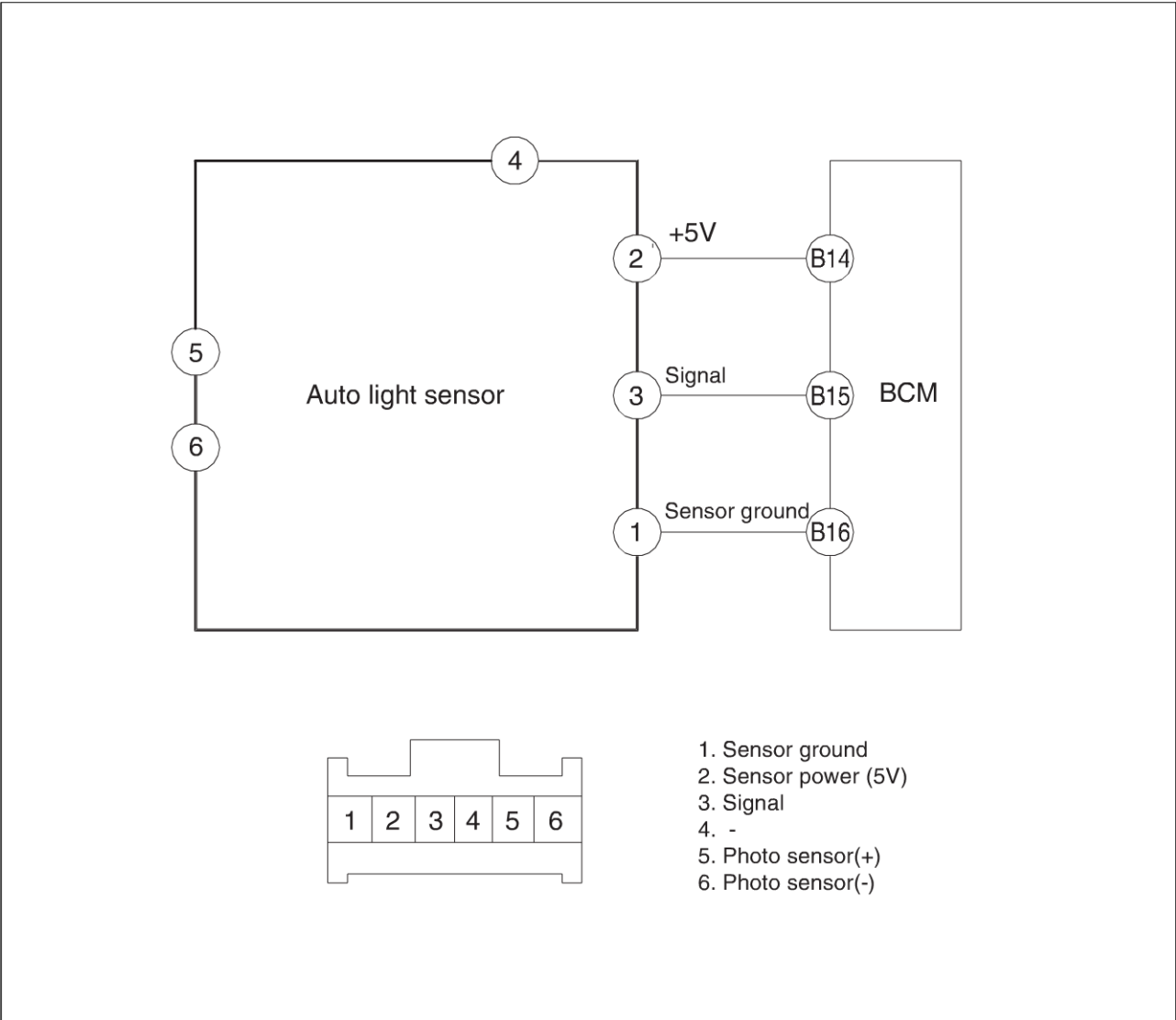
DESCRIPTION EAC2634B

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

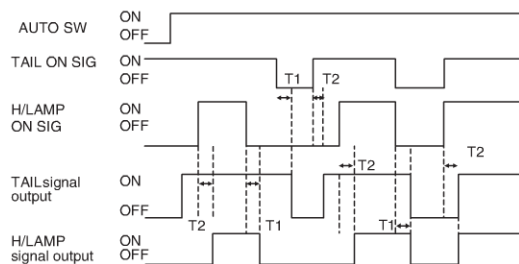
Items	Specifications
Rated voltage	12V
Load	Max. 1mA
Detection illuminations Tail lamp / Head lamp	ON : 24 ± 5.2 (Lux), 0.81 ±0.08 (V) OFF : 48 ± 10.5 (Lux), 1.41 ±0.10 (V)

CIRCUIT DIAGRAM EBA1E44E



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 $2\text{sec} \pm 0.2\text{sec}$ when auto light sensor value is same as light ON input value.
 - 3) Light is turned OFF after $2\text{sec} \pm 0.2\text{sec}$ 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.



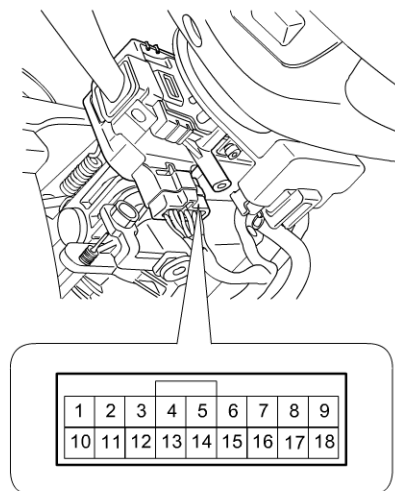
ETRF141X

T1/T2 : 2.0 ± 0.2 sec.

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

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

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.

1. HYUNDAI VEHICLE DIAGNOSIS ▼▲	
MODEL : SONATA 05	
01. AUTOMATIC TRANSAXLE 02. ANTI-LOCK BRAKE SYSTEM 03. SRS-AIRBAG 04. ELEC. CONTROL SUSPENSION 05. IMMOBILIZER 06. ELEC. POWER STEERING 07. FULL AUTO AIR/CON. 08. BODY CONTROL MODULE	

ETRF144A

1. HYUNDAI VEHICLE DIAGNOSIS	
MODEL : SONATA 05	
SYSTEM : BODY CONTROL MODULE	
01. CURRENT DATA 02. FLIGHT RECORD 03. ACTUATION TEST 04. SIMU-SCAN 05. IDENTIFICATION CHECK 06. DATA SETUP(UNIT CONV.)	

ETRF144B

1.1 CURRENT DATA		
★	AUTO LIGHT SW	ON
★	AUTO LIGHT SENSOR	2.0 V
	DRIVER SEAT BELT SW	REMOVE
	ASSIST SEAT BELT SGNL.	INSERT
	BUGLAR HORN RELAY	OFF
	CHIME BUZZER	OFF
	INT VOLUME	0.0 V
	SPEED SIGNAL	0 Km/h
FIX SCRN FULL PART GRPH HELP		

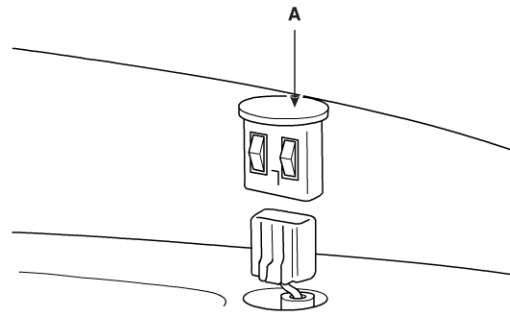
ETRF513C



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

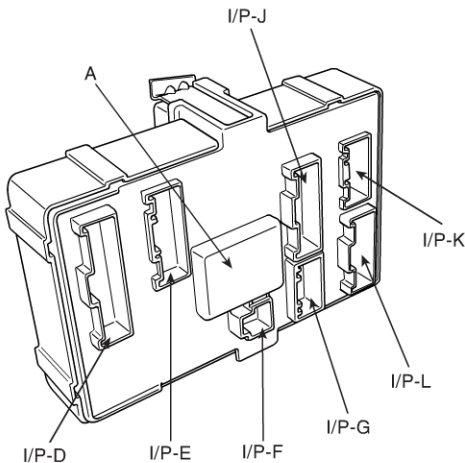
9. If the circuit is not as specified, inspect the circuits connected to other parts.

DAYTIME RUNNING LIGHTS

DRL CONTROL MODULE

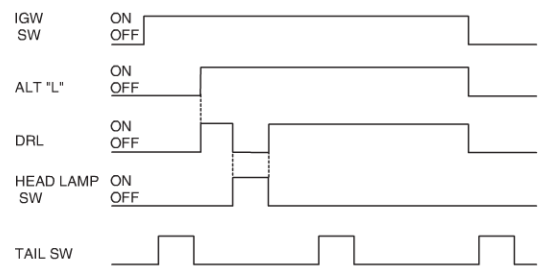
INSPECTION EA77BFF3

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



ETRF521A

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



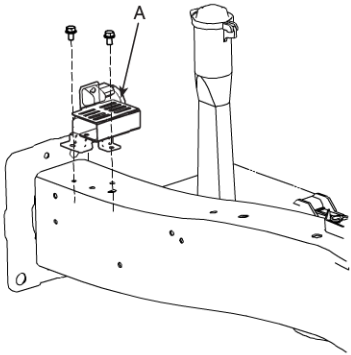
ETRF521C

3. If the daytime running light is not operated well, inspect the connector and terminals to be sure they are all making good contact. If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system. If the terminals look OK, go to step 4.
4. Make these input tests at the connector by using ETM. 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.

DRL RESISTOR

REPLACEMENT EF44D2A6

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 DRL resistor (A) under the right head lamp after loosening the bolts (2EA).



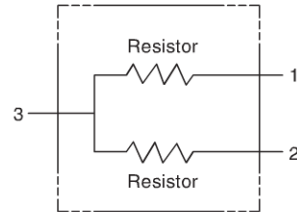
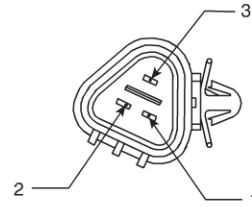
ETRF523A

4. Installation is the reverse of removal procedure.

INSPECTION E92B4D33

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

Standard value : $2.5\Omega \pm 5\%$



ETRF523B

2. If resistance is not as specified, replace the DRL resistor.

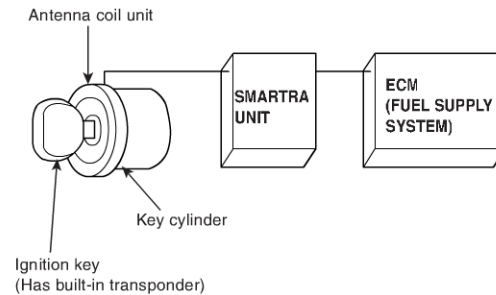
IMMOBILIZER CONTROL SYSTEM(FOR CANADA)

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.

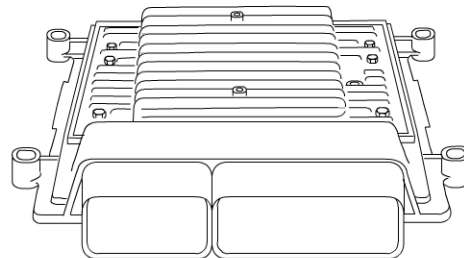


LTIF740B

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.

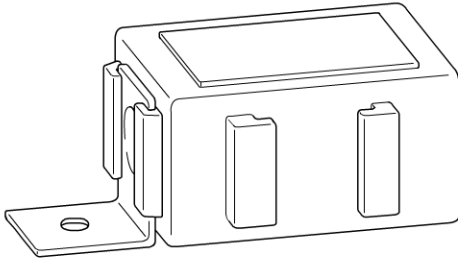


KTME741C

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.



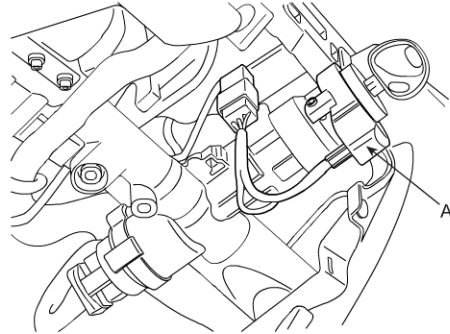
ETRF740B

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.

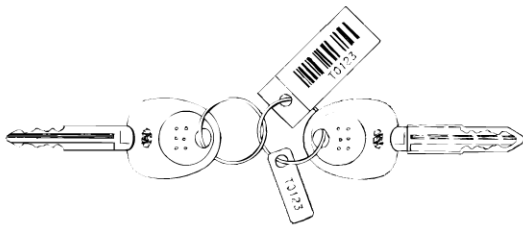
It is located directly in front of the steering handle lock.



KTRE781B

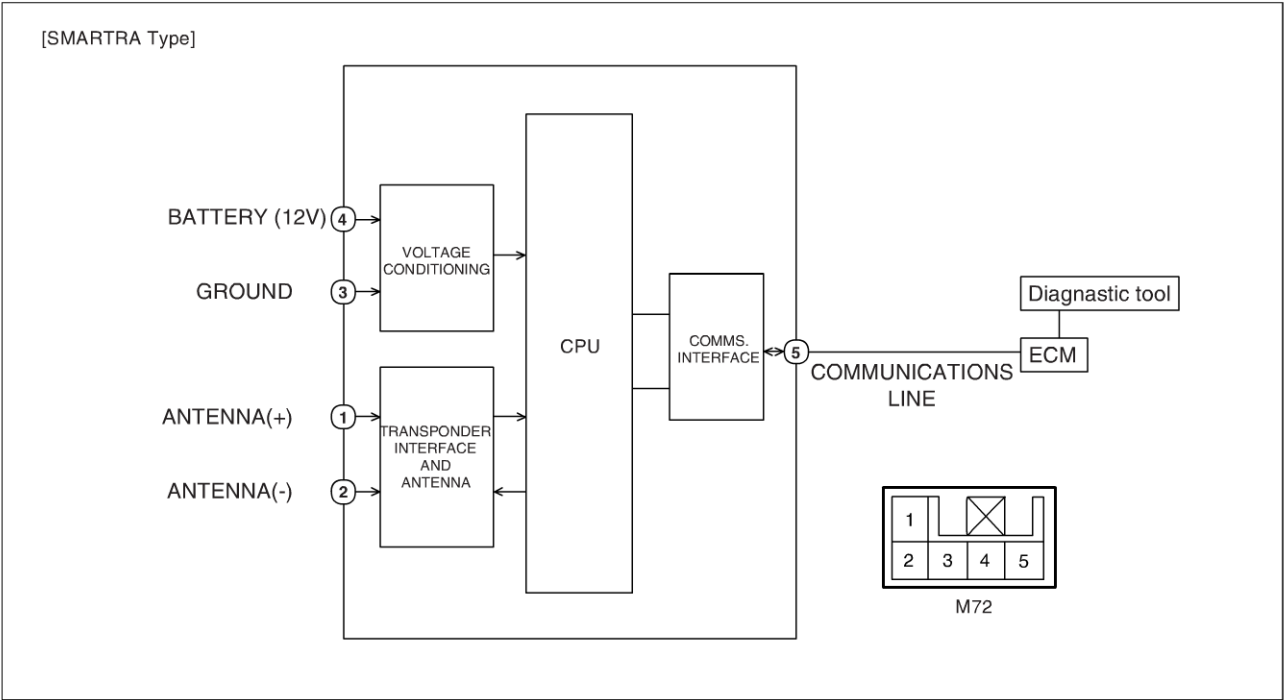
TRANSPONDER (BUILT-IN KEYS)

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

SYSTEM BLOCK DIAGRAM E702AAF4



The diagram illustrates the power distribution for the 2002 Ford Focus 1.8L, focusing on the engine compartment and passenger compartment. Key components and their connections are as follows:

- Engine Compartment:**
 - ECU RLY FUSIBLE LINK 30A:** Connected to the battery (+B) and the engine control relay.
 - ENGINE CONTROL RELAY:** Controls the engine.
 - DOOR WARNING SWITCH:** Controls the door warning system.
 - ANTENNA COIL:** Connected to the antenna.
 - Transponder:** Connected to the antenna coil.
 - Antenna (-):** Connected to the PCM.
 - Memory power:** Connected to the PCM.
 - PCM (Powertrain Control Module):** Controls the engine and transmission.
 - SMATRA (IMMOBILIZER):** Controls the immobilizer system.
- Passenger Compartment:**
 - POWER CONNECTOR 2:** Controls the power windows and other passenger compartment functions.
 - IMMO. CLUSTER:** Controls the immobilizer system.
 - IMMO. IND.:** Immobilizer indicator light.
- Wiring Details:**
 - Wires:** Various wires are shown, including the battery (+B), ground (GND), and specific wires like M45, M72, M21, M22, M23, M24, M25, M26, M27, M28, M29, M30, M31, M32, M33, M34, M35, M36, M37, M38, M39, M40, M41, M42, M43, M44, M45, M46, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60, M61, M62, M63, M64, M65, M66, M67, M68, M69, M70, M71, M72, M73, M74, M75, M76, M77, M78, M79, M80, M81, M82, M83, M84, M85, M86, M87, M88, M89, M90, M91, M92, M93, M94, M95, M96, M97, M98, M99, M100.
 - Fuses:** Various fuses are shown, including the 30A ECU RLY FUSIBLE LINK, 15A FUSE, and 15A FUSE.
 - Relays:** Various relays are shown, including the ENGINE CONTROL RELAY and POWER CONNECTOR 2.

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).

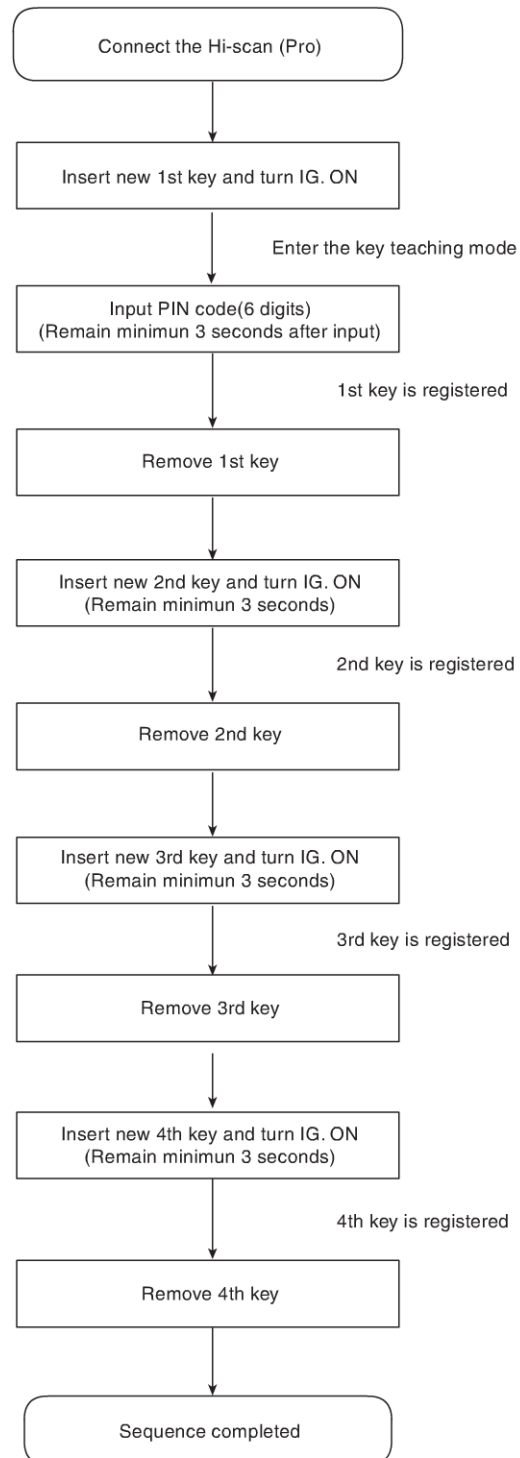
The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognized by the ECM. This rejects the key and a message is sent to the tester.

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.



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

1.3 TEACHING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : LEARNT
<div>2st KEY TEACHING COMPLETED</div>
CODE : 234567

ETRF741G

1.3 TEACHING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : VIRGIN
<div>1st KEY TEACHING COMPLETED</div>
CODE : 234567

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.

1.3 TEACHING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : VIRGIN
<div>INPUT PIN OF SIX FIGURE AND PRESS [ENTER] KEY</div>
CODE : 234567

ETRF741H

1.3 TEACHING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : VIRGIN
<div>2st KEY TEACHING ARE YOU SURE ? [Y/N]</div>
CODE : 234567

ETRF741K

1.3 TEACHING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : VIRGIN
<div>1st KEY TEACHING ARE YOU SURE ? [Y/N]</div>
CODE : 234567

ETRF741I

1.3 TEACHING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : VIRGIN
<div>2st KEY TEACHING COMPLETED</div>
CODE : 234567

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

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 : VIRGIN

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

NEW PASSWORD :

ETRF741N

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

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

NEW PASSWORD : 2345

ETRF741O

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

ARE YOU SURE ? [Y/N]

NEW PASSWORD : 2345

ETRF741P

1.2 PASSWORD TEACHING/CHANGING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : VIRGIN
<div>COMPLETED</div> <div>PRESS [ESC] TO EXIT</div>
NEW PASSWORD : 2345

ETRF741Q

1.2 PASSWORD TEACHING/CHANGING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : LEARNT
<div>INPUT OLD PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY</div>
OLD PASSWORD : 2345

ETRF741S

※ 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
<div>INPUT NEW PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY</div>
NEW PASSWORD : 1234

ETRF741T

1.2 PASSWORD TEACHING/CHANGING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : LEARNT
<div>INPUT OLD PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY</div>
OLD PASSWORD :

ETRF741R

1.2 PASSWORD TEACHING/CHANGING
MODEL : SONATA 05 SYSTEM : IMMOBILIZER STATUS : LEARNT
<div>ARE YOU SURE ? [Y/N]</div>
NEW PASSWORD : 1234

ETRF741U

1.2 PASSWORD TEACHING/CHANGING

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

COMPLETED
PRESS [ESC] TO EXIT

NEW PASSWORD : 1234

ETRF741V

1.5 LIMP HOME MODE

MODEL : SONATA 05
SYSTEM : IMMOBILIZER

INPUT PASSWORD OF FOUR
FIGURES AND PRESS [ENTER] KEY

PASSWORD :

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.

1.5 LIMP HOME MODE

MODEL : SONATA 05
SYSTEM : IMMOBILIZER

INPUT PASSWORD OF FOUR
FIGURES AND PRESS [ENTER] KEY

NEW PASSWORD : 2345

ETRF741Y

1.5 LIMP HOME MODE

MODEL : SONATA 05
SYSTEM : IMMOBILIZER

COMPLETED
PRESS [ESC] TO EXIT

ETRF741Z

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

ETRF741W

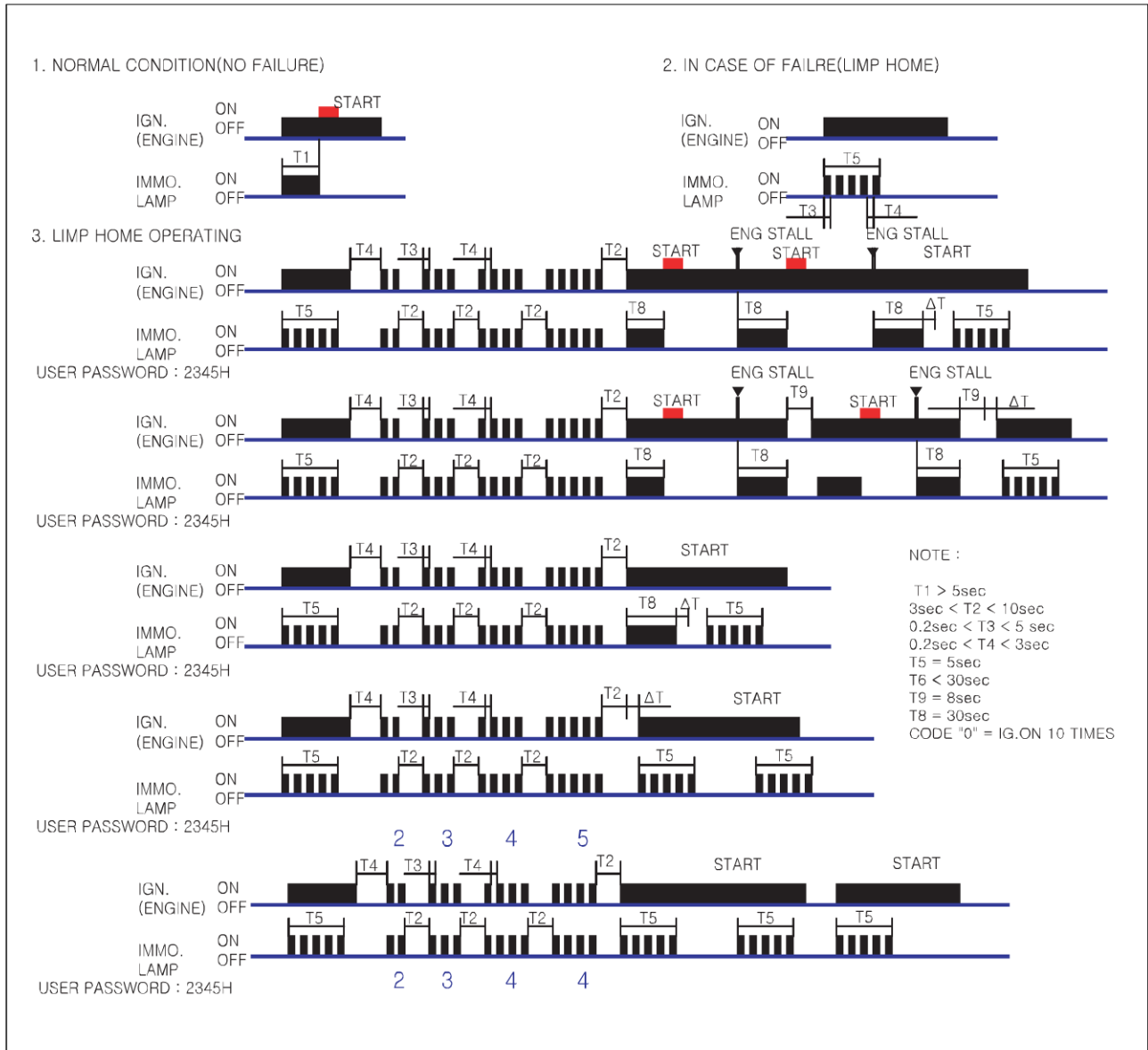
2. LIMP HOME BY IGNITION KEY

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.



DIAGNOSIS OF IMMOBILIZER FAULTS

EFEDC5FD

- Data (stored in the ECM related to the immobilizer function).

- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.

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. Transponder programming error	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) 3. No transponder (Key without 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 (ECM message error)
ECM internal permanent memory (EEPROM) fault	1. ECM internal permanent memory (EEPROM) fault 2. Invalid write operation to permanent memory (EEPROM)	P1695 (ECM memory error)
Invalid key fault	1. Virgin transponder at ECM status "Learnt" 2. Learnt (Invalid) Transponder at ECM 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
SMAR-TRA 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)

When installing ECM of car "A" on car "B"
 ※ All non-virgin ECM's need to be neutralized before installing on the other vehicles.



Neutralize the ECM of car "A"



Installing the ECM of car "A" on car "B"



Register the keys with the PIN code of car "B"

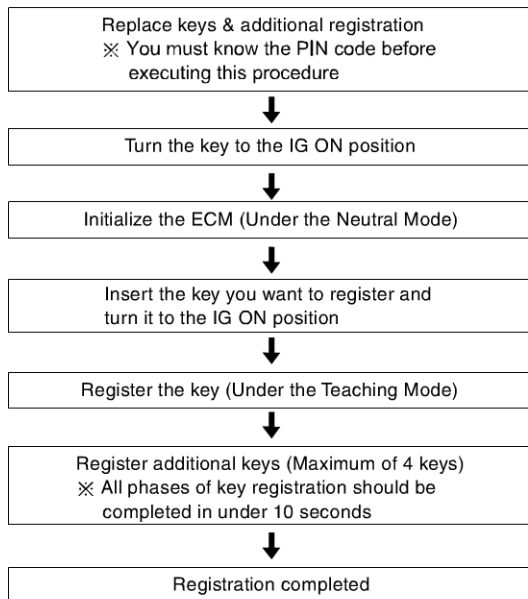


Register additional keys (Maximum of keys)
 ※ All phases of key registration should be completed in under 10 seconds



Registration completed

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 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.
(Note that key #1 must be used within 10 seconds of removing key #2)
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. 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)

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

ETRF745A

1.4 NEUTRAL MODE

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : LEARNT

INPUT PIN OF SIX
FIGURE AND PRESS [ENTER] KEY

CODE : 234567

ETRF745E

1.4 NEUTRAL MODE

MODEL : SONATA 05
SYSTEM : IMMOBILIZER
STATUS : NEUTRAL

COMPLETED
PRESS [ESC] TO EXIT

ETRF745B

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

ETRF745C

1.1 CURRENT DATA

- 01. NO. OF LEARNT KEY 0**
- 02. ECU STATUS NEUTRAL
- 03. KEY STATUS NOT CHECK

FIX SCRN FULL PART GRPH HELP

ETRF745D

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	<ul style="list-style-type: none">IG ON	<ul style="list-style-type: none">Transponder Key
Detecting Factors	<ul style="list-style-type: none">Password mode invalid	
Detecting Window	<ul style="list-style-type: none">During Transponder Write or Read EEPROM Page	
Detecting Criteria	<ul style="list-style-type: none">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	<ul style="list-style-type: none">IG ON	<ul style="list-style-type: none">Transponder Key
Detecting Factors	<ul style="list-style-type: none">TP programming error	
Detecting Window	<ul style="list-style-type: none">During Transponder Write EEPROM Page request while Transponder is in authorized state.	
Detecting Criteria	<ul style="list-style-type: none">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	<ul style="list-style-type: none">• IG ON	<ul style="list-style-type: none">• Open or Short in SMARTRA Circuit• Faulty SMARTRA
Detecting Criteria	<ul style="list-style-type: none">• No response from SMARTRAInvalid 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	<ul style="list-style-type: none"> IG ON 	<ul style="list-style-type: none"> Open or Short in SMARTRA Circuit Faulty SMARTRA
Detecting Criteria	<ul style="list-style-type: none"> No response from SMARTRA (Communication Line Error - Open or Short etc.) 	

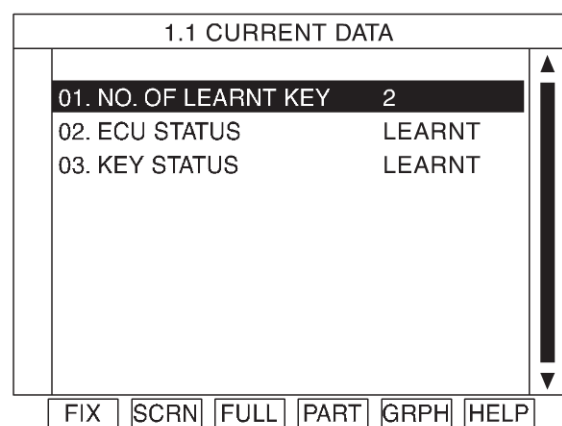
SIGNAL WAVEFORM E632CDF7

Fig 1

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.

1.1 CURRENT DATA	
01. NO. OF LEARNT KEY	0
02. ECU STATUS	VIRGIN
03. KEY STATUS	VIRGIN

FIX

SCRN

FULL

PART

GRPH

HELP

Fig 1

LTIF742C

1.1 CURRENT DATA	
01. NO. OF LEARNT KEY	1
02. ECU STATUS	NOT CHECK
03. KEY STATUS	INVALID

FIX

SCRN

FULL

PART

GRPH

HELP

Fig 2

LTIF742D

1.1 CURRENT DATA	
01. NO. OF LEARNT KEY	1
02. ECU STATUS	LEARNT
03. KEY STATUS	INVALID

FIX

SCRN

FULL

PART

GRPH

HELP

Fig 3

LTIF742E

1.1 CURRENT DATA	
01. NO. OF LEARNT KEY	2
02. ECU STATUS	LEARNT
03. KEY STATUS	LEARNT

FIX SCRN FULL PART GRPH HELP

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

- 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.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES

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

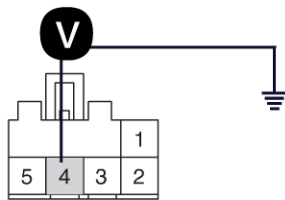
NO

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.

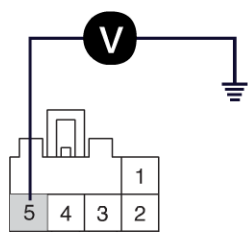
Repair as necessary and go to "Verification of Vehicle repair" procedure.

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.

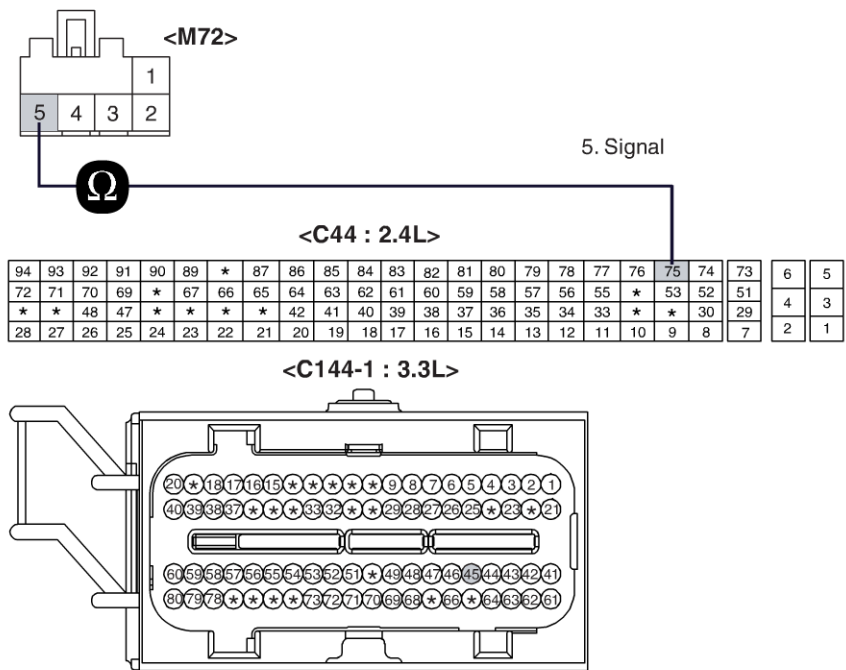
Repair as necessary and go to "Verification of Vehicle repair" procedure.

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(2.4L), 45(3.3L) of ECM harness connector.

Specification : Approx. below 1Ω



ETRF742K

- 4) Is the measured resistance within specifications?

YES

Go to "Ground Circuit Inspection" procedure.

NO

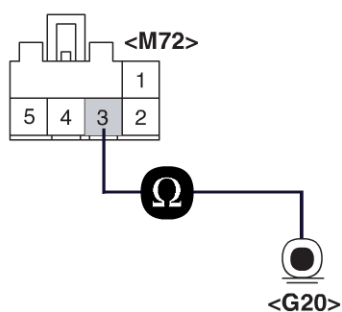
Check for open in signal harness.
Repair as necessary and go to "Verification of Vehicle repair" procedure.

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

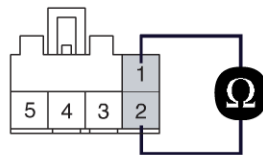
E9A0B4A7

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	<ul style="list-style-type: none">IG ON	<ul style="list-style-type: none">Transponder Key
Detecting factors	<ul style="list-style-type: none">Invalid Transponder Data	
Detecting Window	<ul style="list-style-type: none">During Transponder IDEDuring Transponder Authentication requestsDuring Transponder Write EEPROM page requestsDuring Transponder Read EEPROM page requests	
Detecting Criteria	<ul style="list-style-type: none">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 EE61E45

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

DTC DETECTING CONDITION E5CFCCF5

Item	Detecting Condition	Possible cause
Enable Condition	<ul style="list-style-type: none">IG ON	<ul style="list-style-type: none">Faulty ECM
Detecting factors	<ul style="list-style-type: none">Request from Control unit is invalid	
Detecting Window	<ul style="list-style-type: none">End of ECM request message	
Detecting Criteria	<ul style="list-style-type: none">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	<ul style="list-style-type: none">IG ON	<ul style="list-style-type: none">Faulty ECM
Detecting Criteria	<ul style="list-style-type: none">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	<ul style="list-style-type: none">IG ON	<ul style="list-style-type: none">Faulty TP(Virgin or Invalid)
Detecting Criteria	<ul style="list-style-type: none">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	<ul style="list-style-type: none"> IG ON 	<ul style="list-style-type: none"> Locked by timer
Detecting Criteria	<ul style="list-style-type: none"> Exceeding the maximum limit of Twice IGN ON (\geq 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.

1.1 CURRENT DATA	
01. NO. OF LEARNT KEY	0
02. ECU STATUS	VIRGIN
03. KEY STATUS	VIRGIN
<div> <div>FIX</div> <div>SCRN</div> <div>FULL</div> <div>PART</div> <div>GRPH</div> <div>HELP</div> </div>	

Fig 1

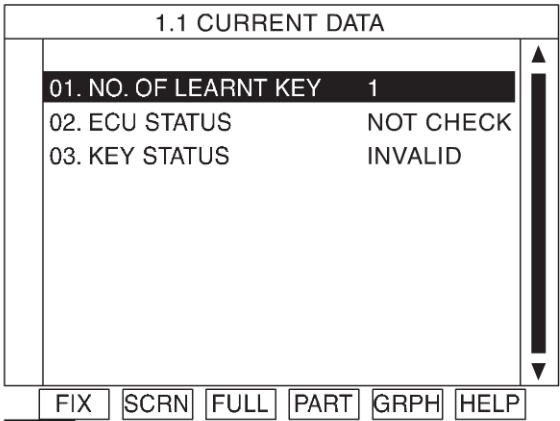


Fig 2

LTIF742D

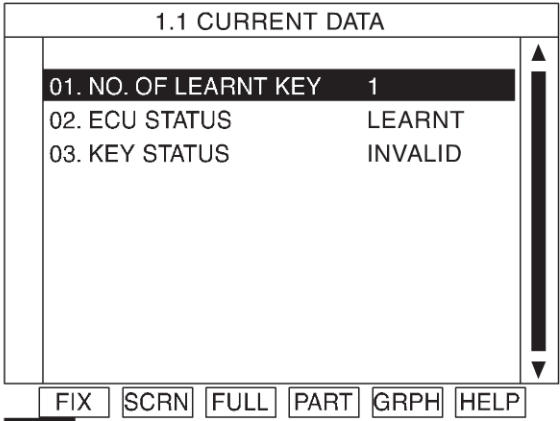


Fig 3

LTIF742E

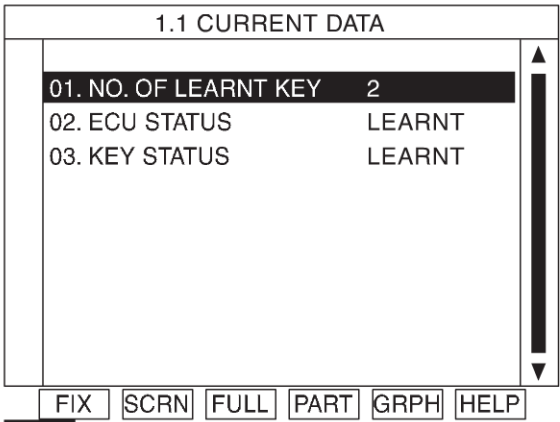


Fig 4

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.

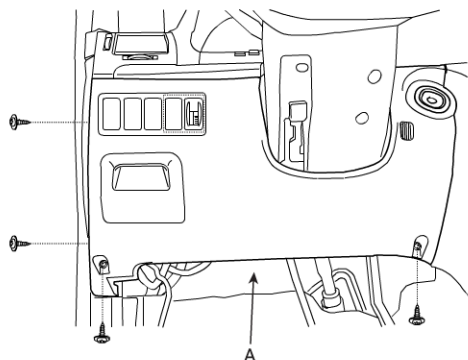
VERIFICATION OF VEHICLE REPAIR E8FA7FF1

Refer to DTC P1690.

IMMOBILIZER CONTROL UNIT

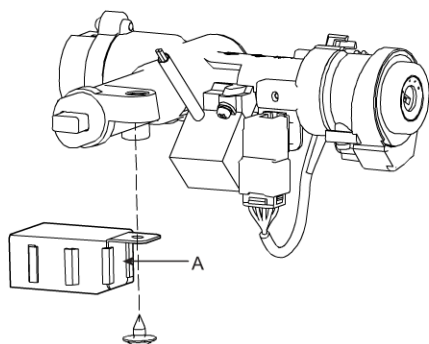
REPLACEMENT EE14BA2F

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



ETRF495F

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.



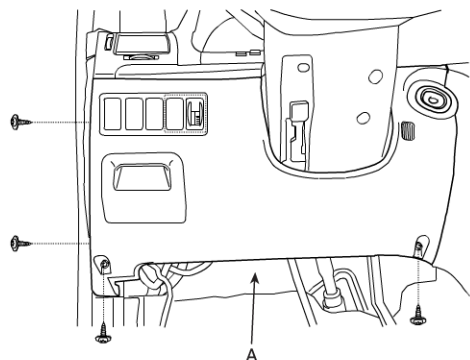
KTRE741A

5. Installation is the reverse of removal procedure.

COIL ANTENNA

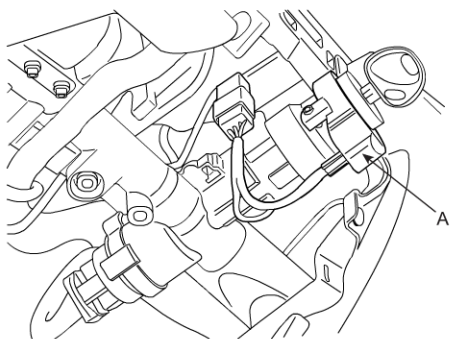
REPLACEMENT E6BD9F24

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



ETRF495F

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

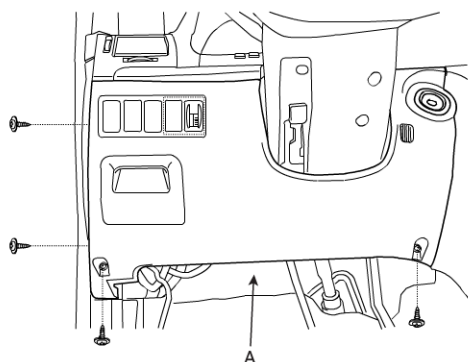
5. Installation is the reverse of removal procedure.

IGNITION SYSTEM

IGNITION SWITCH

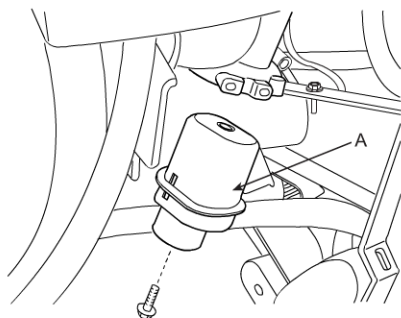
REPLACEMENT E8EA8EAA

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



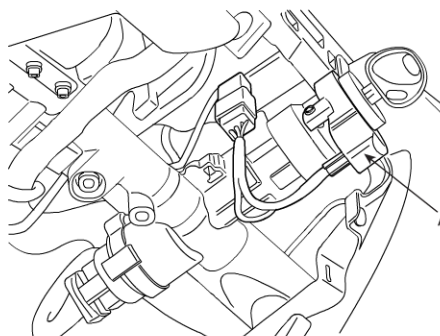
ETRF495F

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



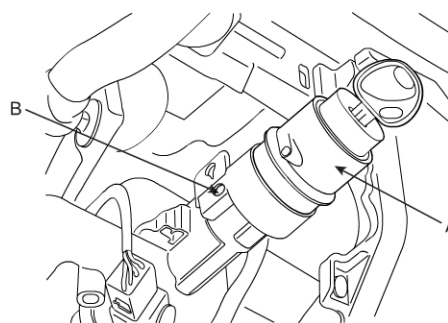
ATIE781A

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

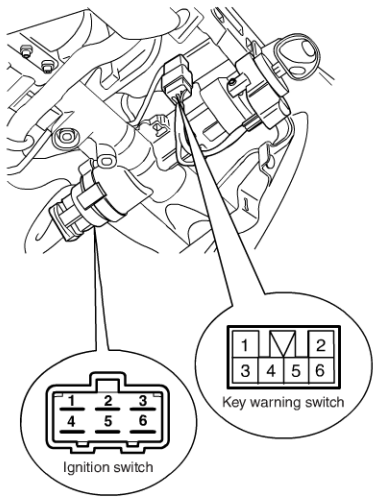
6. If it is necessary to remove the key lock cylinder (A), Remove the key lock cylinder (A) after pushing lock pin (B) with key ON.



KTRE781C

7. Installation is the reverse of removal procedure.

INSPECTION EF6AF1E2



- 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.

ETRF781D

TERMINAL		IGNITION SWITCH						STEERING		KEY WARNING SWITCH		KEY HOLE ILLUMINATION	
POSITION	KEY	2	4	6	5	3	1	TRAVEL	TRAVEL	5	6	3	4
LOCK	REMOVAL							LOCK					
	INSERT							LOCK	UNLOCK				
ACC								UNLOCK					
ON													
START													

LTIF781E