General Information

General Troubleshooting Information

Before Troubleshooting

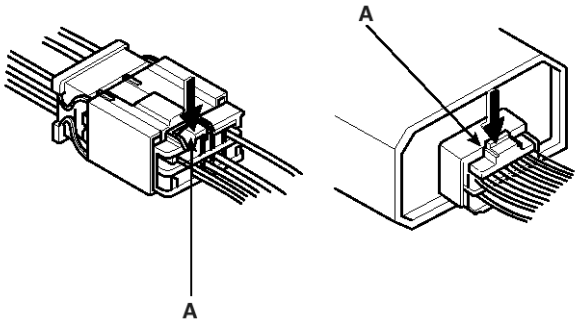
1. Check applicable fuses in the appropriate fuse/relay box.
2. Using the battery checker (MCR-570 KIT), check the battery for damage, state of charge, and clean and tight connections.

   (Refer to the Engine Electrical System - Battery)

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

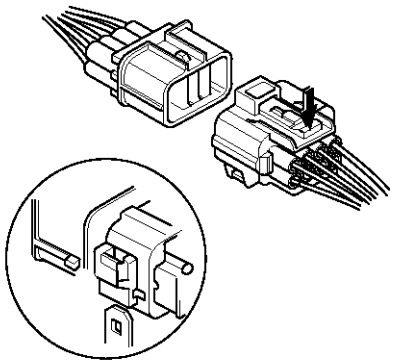
Handling Connectors

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



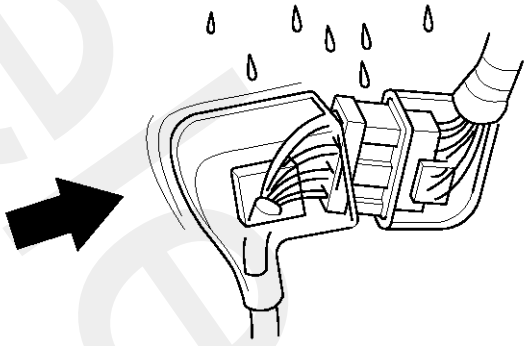
ETKD150A

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



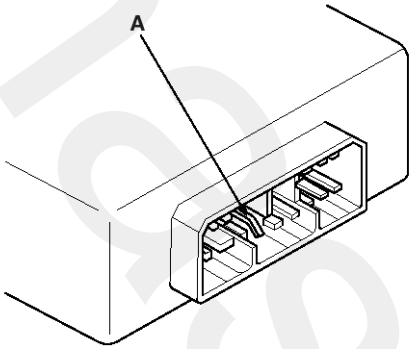
ETKD150B

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



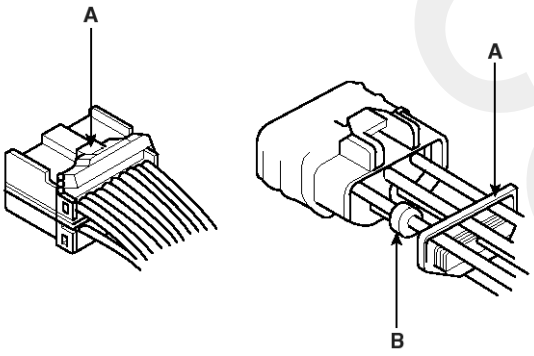
ETKD150C

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



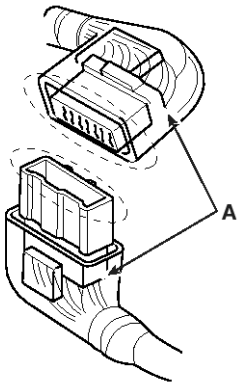
ETKD150D

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



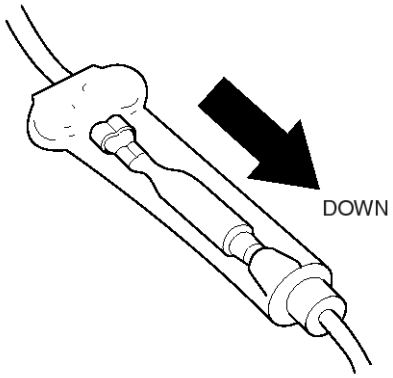
ETKD150E

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



ETKD150F

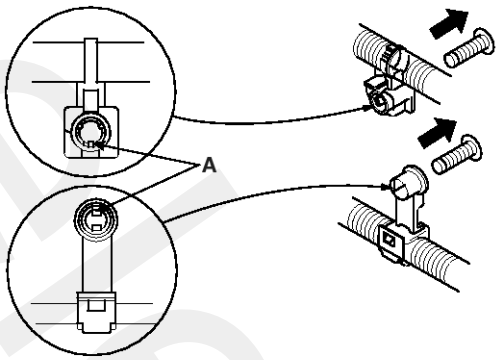
11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.



ETKD150G

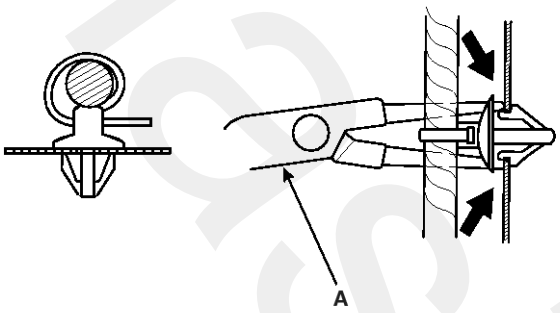
Handling Wires And Harnesses

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



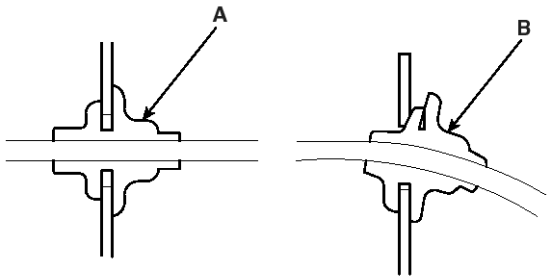
ETKD150H

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



ETKD150I

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

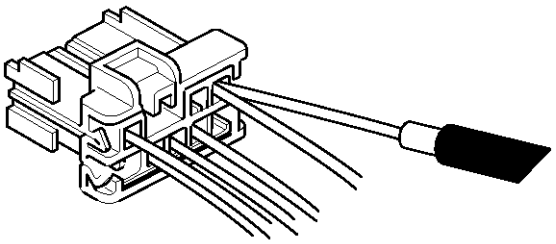


ETKD150J

Testing And Repairs

1. Do not use wires or harnesses with broken insulation.

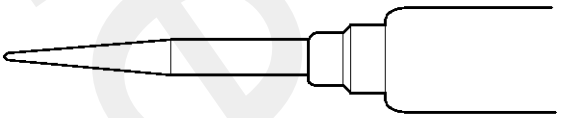
   Replace them or repair them by wrapping the break with electrical tape.
2. After installing parts, make sure that no wires are pinched under them.
3. When using electrical test equipment, follow the manufacturer's instructions and those described in this manual.
4. If possible, insert the remover tool from the wire side (except waterproof connector).



ETKD150K

5. Use a probe with a tapered tip.

   Refer to the user's guide in the wiring repair kit (Pub No. : TRK 015.)



ETKD150L

Five-step Troubleshooting

1. Verify the complaint

   Turn on all the components in the problem circuit to verify the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.

2. Analyze the schematic

   Look up the schematic for the problem circuit.

   Determine how the circuit is supposed to work by tracing the current paths from the power feed through the circuit components to ground. If several circuits fail at the same time, the fuse or ground is a likely cause.

   Based on the symptoms and your understanding of the circuit operation, identify one or more possible causes of the problem.

3. Isolate the problem by testing the circuit.

   Make circuit tests to check the diagnosis you made in step 2. Keep in mind that a logical, simple procedure is the key to efficient troubleshooting.

   Test for the most likely cause of failure first. Try to make tests at points that are easily accessible.

4. Fix the problem

   Once the specific problem is identified, make the repair. Be sure to use proper tools and safe procedures.

5. Make sure the circuit works

   Turn on all components in the repaired circuit in all modes to make sure you've fixed the entire problem. If the problem was a blown fuse, be sure to test all of the circuits on the fuse. Make sure no new problems turn up and the original problem does not recur.

Audio

Specification

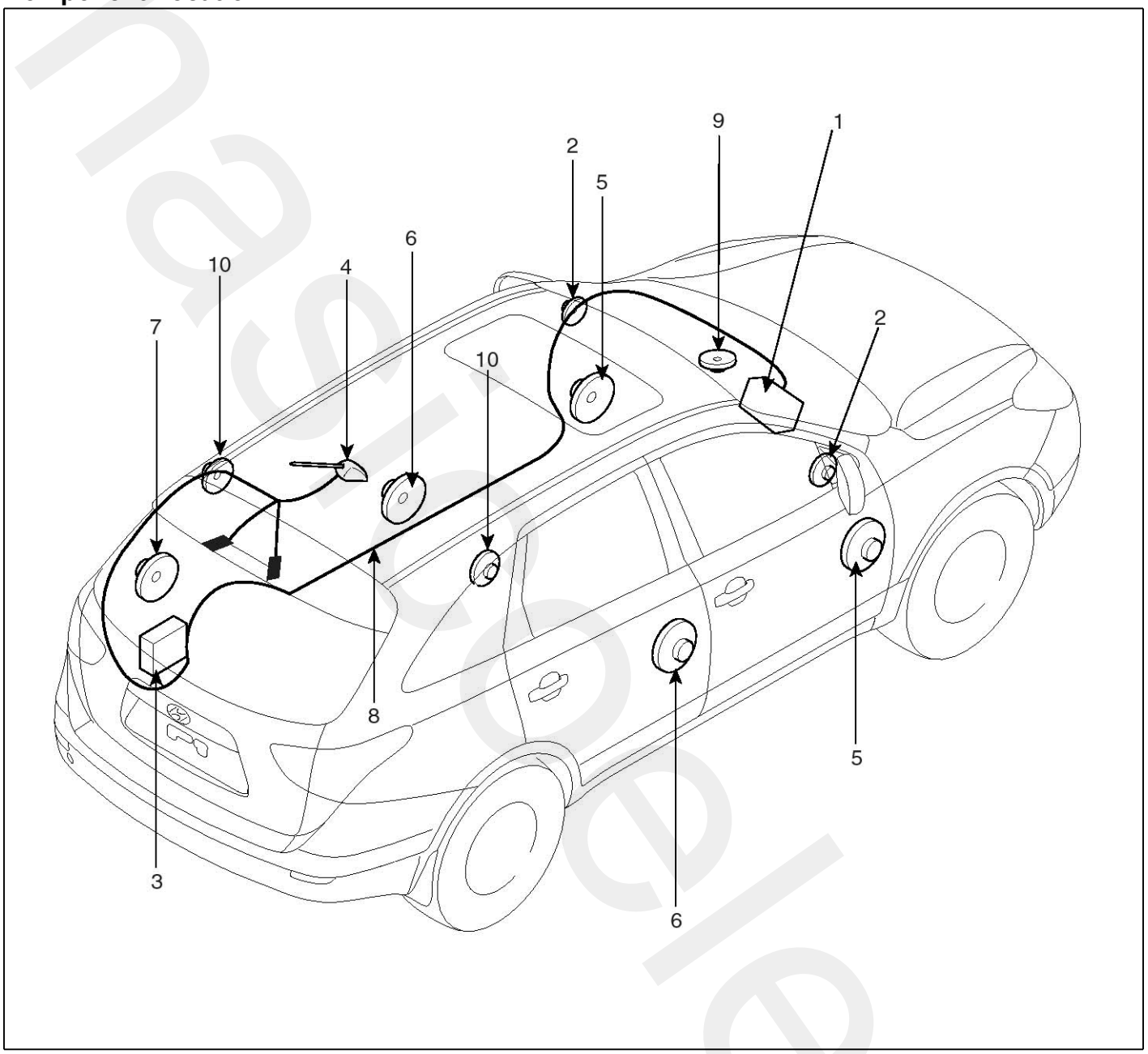
Audio

Item		Specification		
Model		RADIO/CD/MP3 (PA710/710R)	RADIO/CD/MP3 (PA715)	RADIO/6CDC/MP3 (PA760/760R)
Power supply		DC 14.4V		
Rated output		Max 43W x 4	Max 3.2Vrms	Max 3.2Vrms
Antenna		80PF 75Ω		
Tuning type		PLL synthesized type		
External amplifier & sub woofer		Internal amplifier	External amplifier & subwoofer	External amplifier & subwoofer
		-	-	-
Frequency range / Channel space	FM	87.5 ~ 108.0 MHz/100 KHz (General), 50KHz(Europe)		
	AM	531 ~ 1602 KHz/9 KHz (General)		
	MW	522 ~ 1602 KHz/9 KHz (Europe)		
	LW	153 ~ 279 KHz/1 KHz (Europe)		

Speaker & External Amplifier

Item		PA710/710R	PA715	PA760/760R
Input Power (W or V)	Front	MAX 50W	40	40
	Rear	MAX 50W	40	40
	Tweeter	MAX 40W	20	20
	Front center	-	32	32
	Surround	-	-	-
	Sub woofer	-	64	64
Speaker Impedance (Ω)	Front	3.4 ± 0.5	2 ± 0.4	2 ± 0.4
	Rear	3.4 ± 0.5	2 ± 0.4	2 ± 0.4
	Tweeter	3.4 ± 0.5	4 ± 0.8	4 ± 0.8
	Front center	-	2.15 ± 0.25	2.15 ± 0.25
	Surround	-	-	-
	Sub woofer	-	1.35 ± 0.25	1.35 ± 0.25
Speaker Number		6	8	8

Component Location



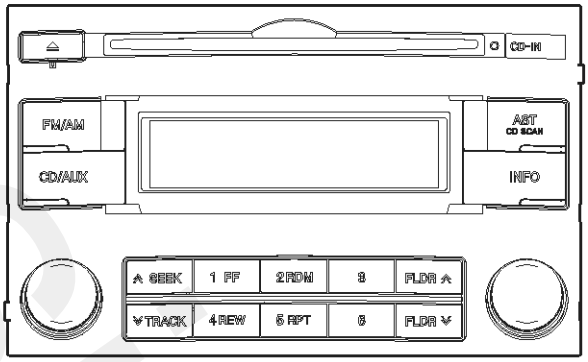
SENBE9004L

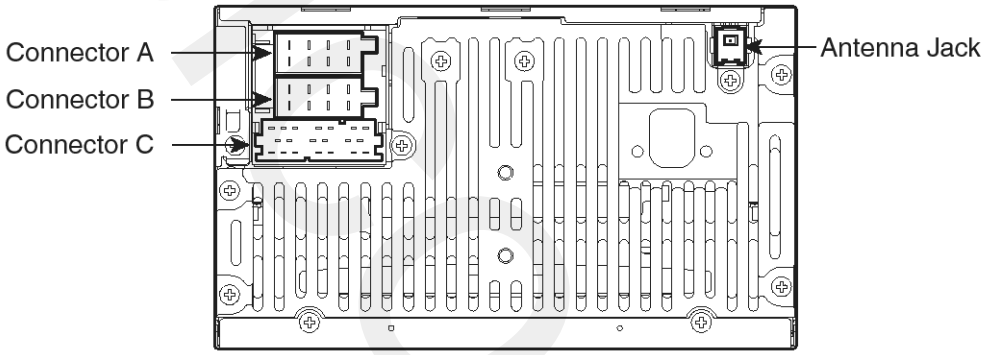
1. Audio unit
2. Tweeter speaker
3. External amplifier
4. Roof antenna
5. Front door speaker
6. Rear door speaker
7. Sub-woofer speaker
8. Antenna feeder cable
9. Crash pad center speaker
10. Surround speaker

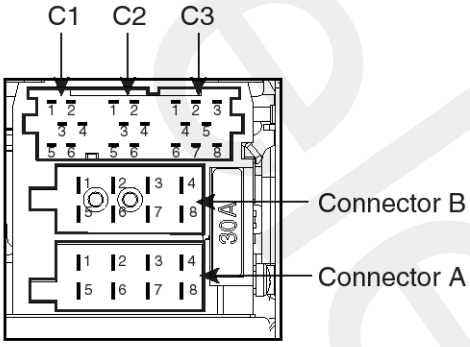
Audio Unit

Components

[RADIO/CD/MP3(PA710)]
[RADIO/CD/MP3/RDS(PA710R)]



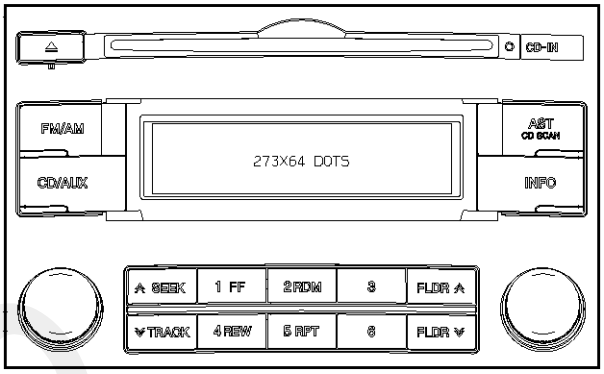


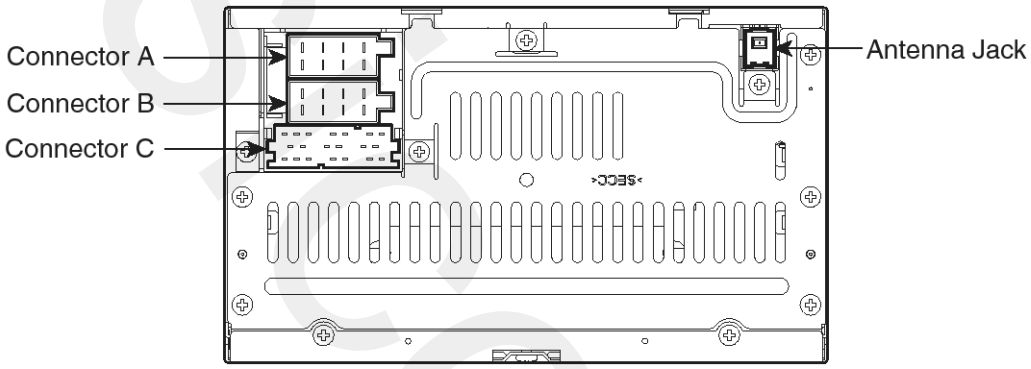


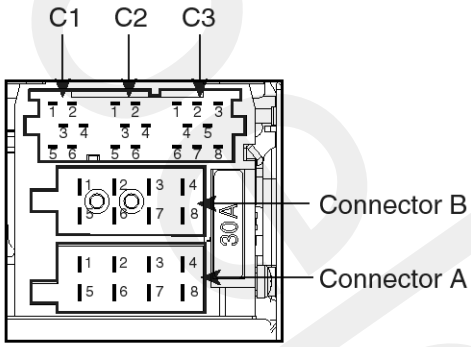
NO	Connector A	Connector B	Connector C1	Connector C2	Connector C3
1	Vehicle speed	Rear right speaker(+)	-	AUX input(R)	-
2	Illumination (+)	Front right speaker(+)	-	AUX input(L)	USB D-
3	Remote control antenna	Front left speaker(+)	-	AUX REF	-
4	Battery +	Rear left speaker(+)	-	AUX Detect	USB D+
5	-	Rear right speaker(-)	-	Remote control(+)	IPOD/USB GND
6	ACC	Front right speaker(-)	-	Remote Ground	-
7	Illumination (-)	Front left speaker(-)			USB/IPOD VDO
8	Ground(Power)	Rear left speaker(-)			-

SENBE9000L

[RADIO/CD/MP3(PA715)]



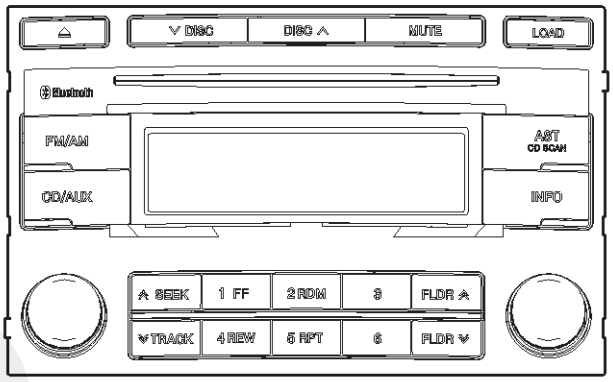


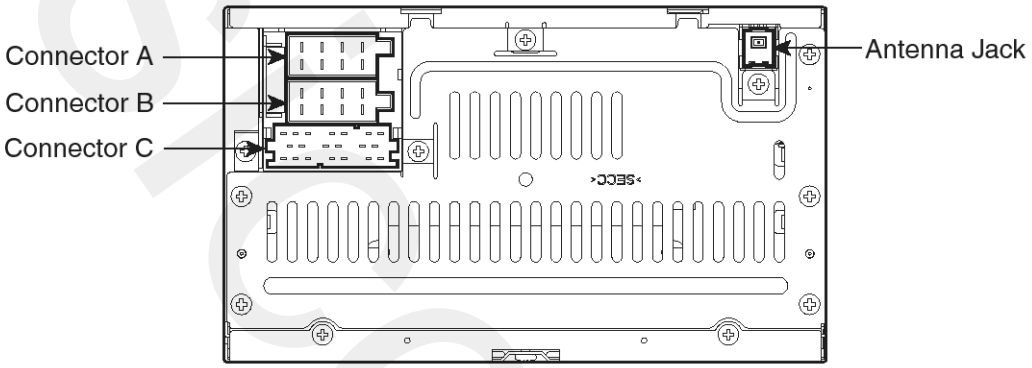


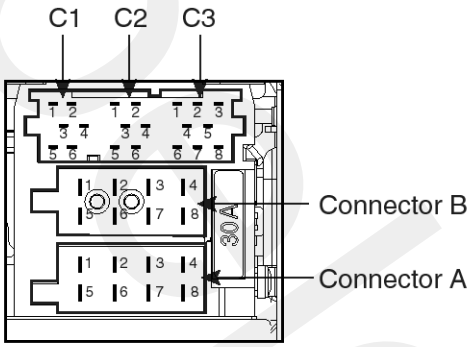
NO	Connector A	Connector B	Connector C1	Connector C2	Connector C3
1	Vehicle speed	Rear right AMP(+)	-	AUX input(R)	-
2	Illumination (+)	Front right AMP(+)	-	AUX input(L)	USB D-
3	Remote control antenna	Front left AMP(+)	EQ SEL	AUX REF	-
4	Battery +	Rear left AMP(+)	-	AUX Detect	USB D+
5	-	Rear right AMP(-)	-	Remote control(+)	IPOD/USB GND
6	ACC	Front right AMP(-)	-	Remote Ground	Amp. Remote
7	Illumination (-)	Front left AMP(-)			USB/IPOD VDO
8	Ground(Power)	Rear left AMP(-)			-

SENBE9001L

[RADIO/MP3/6CDC (PA760)]
[RADIO/MP3/6CDC/RDS (PA760R)]





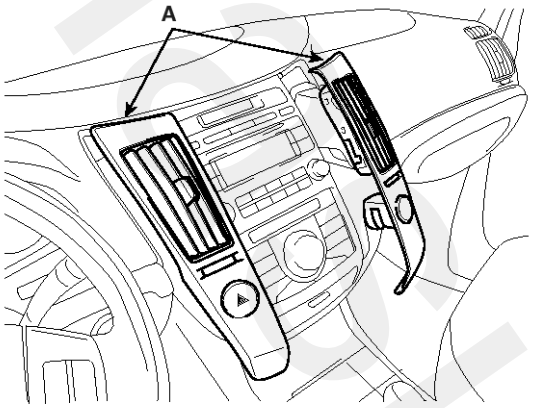


NO	Connector A	Connector B	Connector C1	Connector C2	Connector C3
1	Vehicle speed	Rear right speaker(+)	-	AUX input(R)	-
2	Illumination (+)	Front right speaker(+)	-	AUX input(L)	USB D-
3	Remote control antenna	Front left speaker(+)	EQ SEL	AUX REF	-
4	Battery +	Rear left speaker(+)	-	AUX Detect	USB D+
5	-	Rear right speaker(-)	-	Remote control(+)	IPOD/USB GND
6	ACC	Front right speaker(-)	-	Remote Ground	Amp. Remote
7	Illumination (-)	Front left speaker(-)			USB/IPOD VDO
8	Ground(Power)	Rear left speaker(-)			-

SENBE9002L

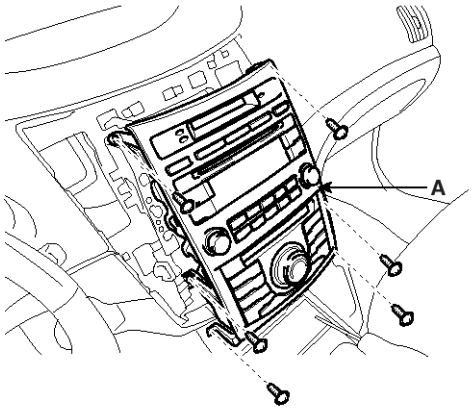
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the air vent pannel (A).
   (Refer to the BD group - "Crash pad")



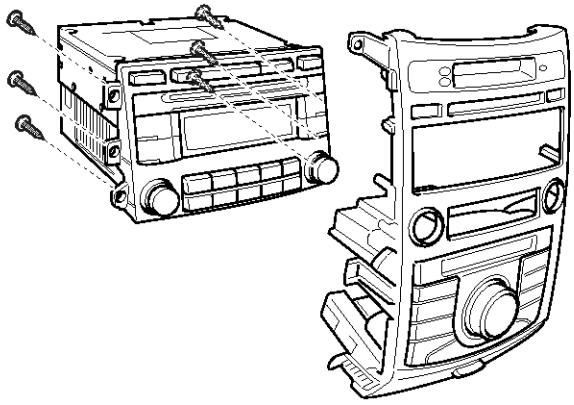
SENBE7012D

3. Remove the connectors (Hazard lamp connector, incar temperature sensor connector).
4. Remove the center facia panel (A) after loosening the screws(6EA).
   (Refer to the BD group - "Crash pad")



SENBE7013D

5. Remove the mounting screws(6EA) then remove the audio unit.



SENBE7018D

Installation

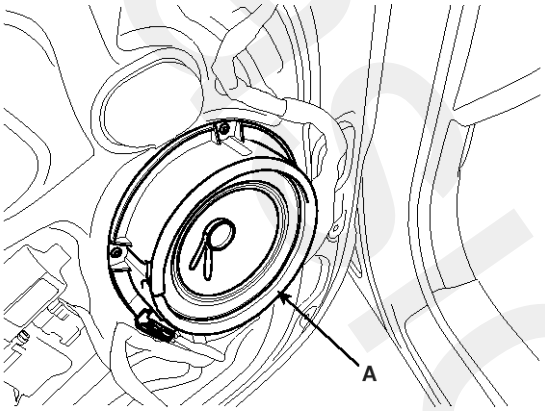
1. Connect the audio connectors and cable to the audio unit.
2. Reassemble the audio unit and the center facia panel.
3. Connector the connectors and reassemble the air vent pannel.
4. Connect the negative(-) battery terminal and then check the audio working.

Speakers

Removal

Front Speaker

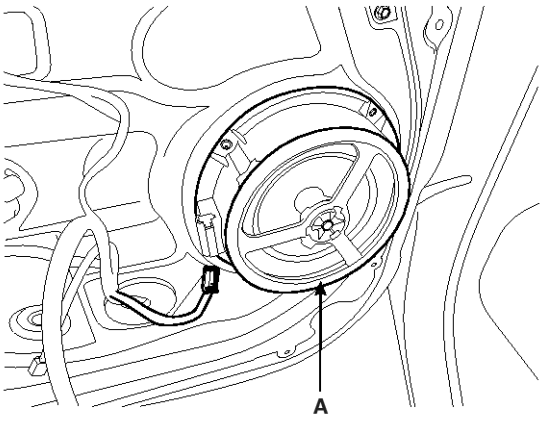
1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front speaker (A) after removing 4 rivets.



SENBE7020D

Rear Speaker

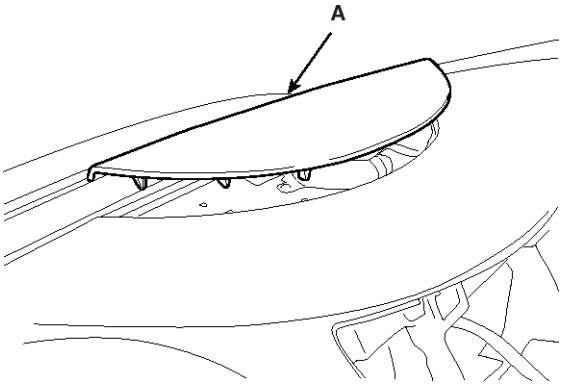
1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear speaker (A) after removing 4 rivets.



SENBE7021D

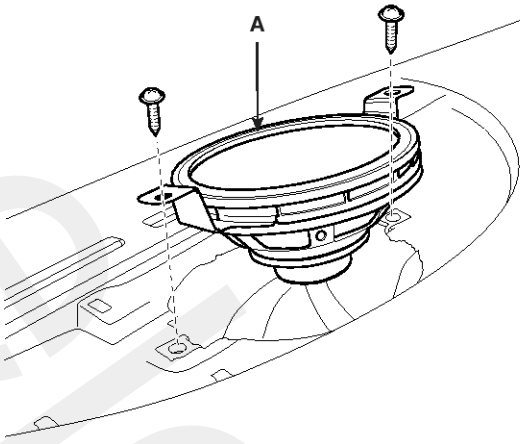
Crash Pad Center Speaker

1. Remove the crash pad center center speaker grill (A).



SENBE7014D

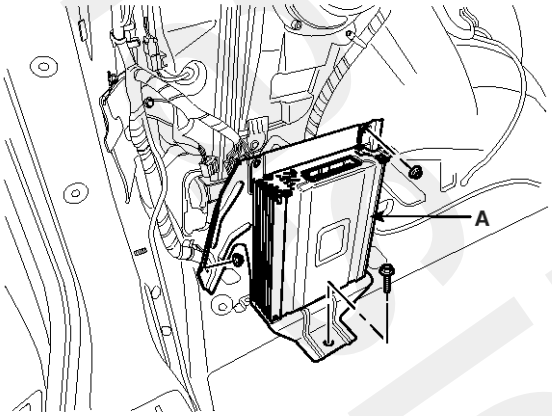
2. Remove the crash pad center speaker (A) after loosening the 2 mounting screws.



SENBE7015D

External Amplifier

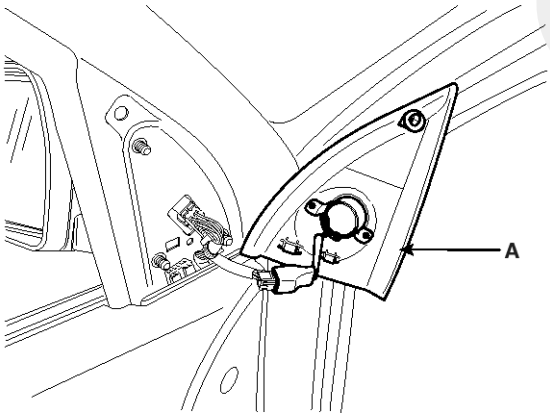
1. Remove the left luggage side trim.
   (Refer to the BD group - "Rear seat")
2. Remove the external amplifier (A) removing the bolts and nuts.



SENBE7029D

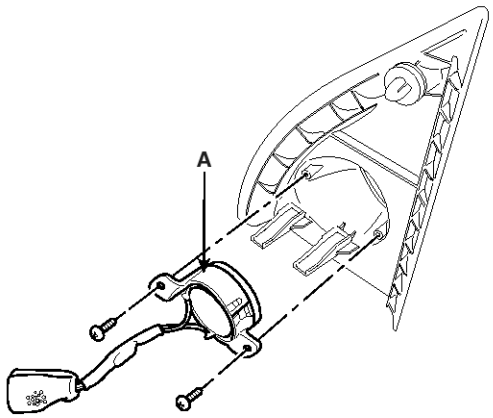
Tweeter Speaker

1. Remove the front door delta cover (A).
   (Refer to the BD group - "Front door")



SENBE7024D

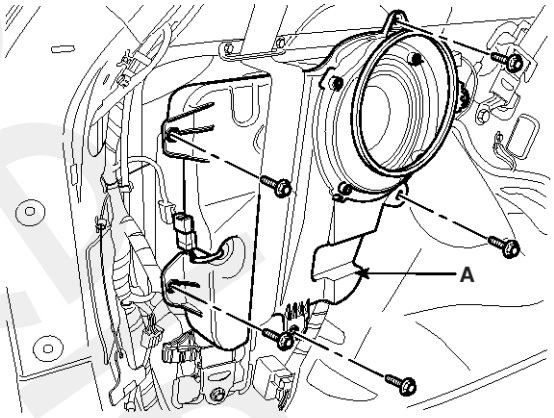
2. Remove the tweeter speaker (A) after loosening 2 screws and disconnecting the connector.



SENBE7025D

Woofer Speaker

1. Remove the left luggage side trim.
   (Refer to the BD group - "Rear seat")
2. Remove the woofer speaker (A) after removing 5 bolts and disconnecting the connector.



SENBE7026D

Installation

Crash Pad Center Speaker

1. Reassemble the crash pad center speaker after connecting the connector.
2. Reassemble the crash pad center speaker grill.

External Amplifier

1. Reassemble the external amplifier after connecting the connector.
2. Reassemble the left luggage side trim.

Tweeter Speaker

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

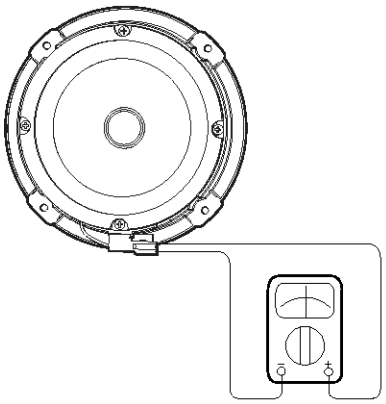
Woofer Speaker

1. Reassemble the woofer speaker after connecting the connector.
2. Reassemble the left luggage side trim.

Inspection

1. Check the speaker with an ohmmeter. If an ohmmeter indicates the correct impedance of the speaker when checking between the speaker (+) and speaker (-) of the same channel, the speaker is ok.

Specified impedance : 2~4 Ω



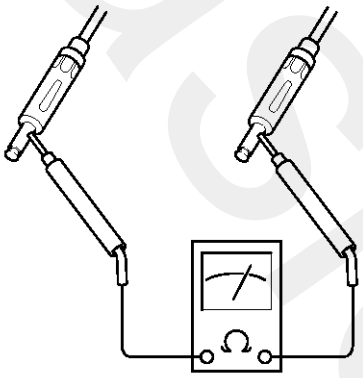
SENBE7019D

Antenna

Inspection

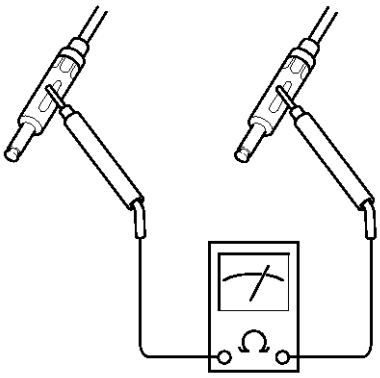
Antenna Cable

1. Remove the antenna jack from the audio unit and antenna.
2. Check for continuity between the center poles of antenna cable.



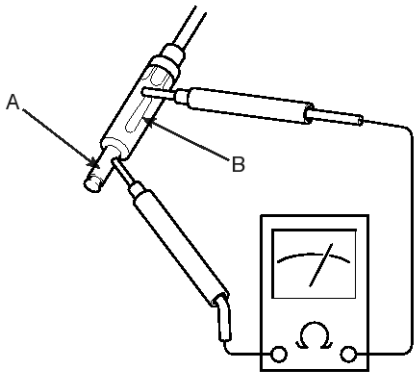
ATJF023C

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



ATJF023D

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



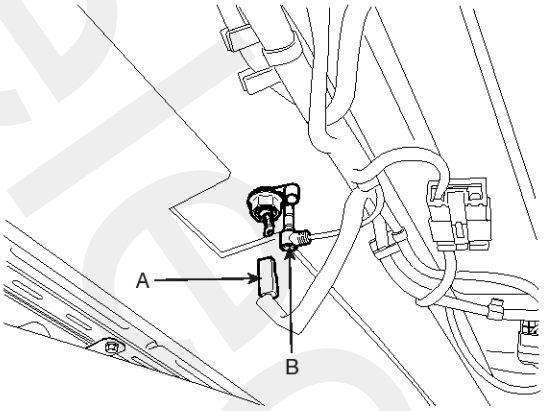
ATJF023F

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

Removal

Roof Antenna

1. Remove the rear roof trim.
   (Refer to the BD group - "Roof trim")
2. Disconnect the 1P power connector (A) and antenna jack (B) from the roof antenna.



SENBE7031D

3. Remove the roof antenna after removing a nut.

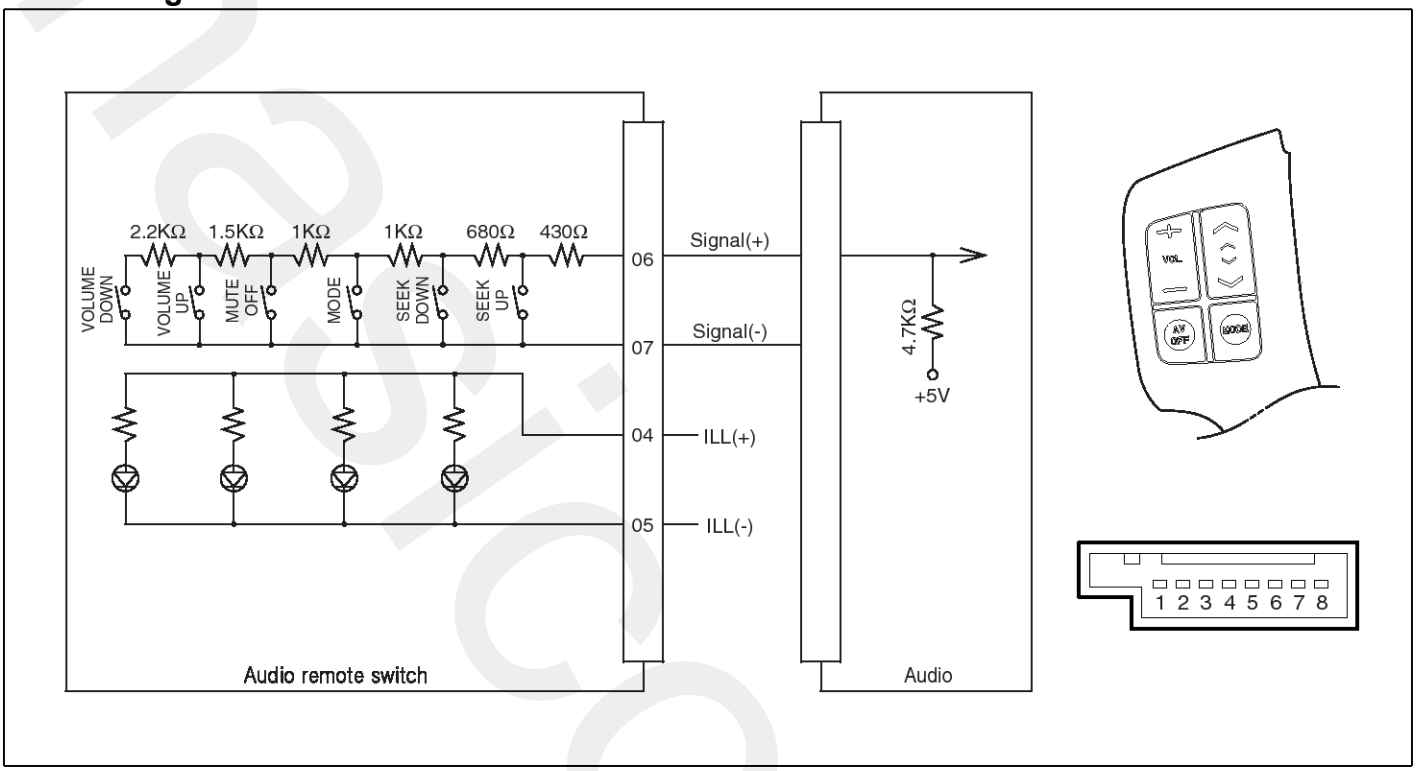
Installation

Roof Antenna

1. Reassemble the roof antenna and connect the connector and antenna jack.
2. Reassemble the rear roof trim.

Audio Remote control

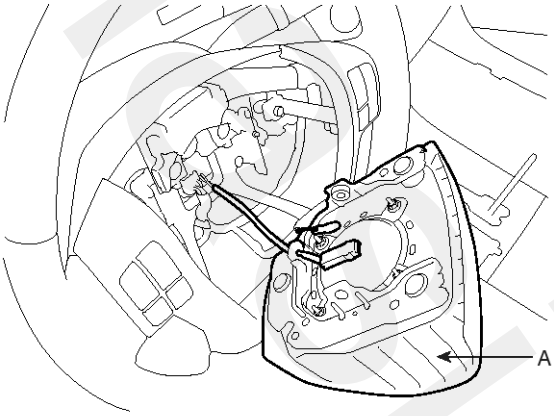
Circuit Diagram



SENBE7037L

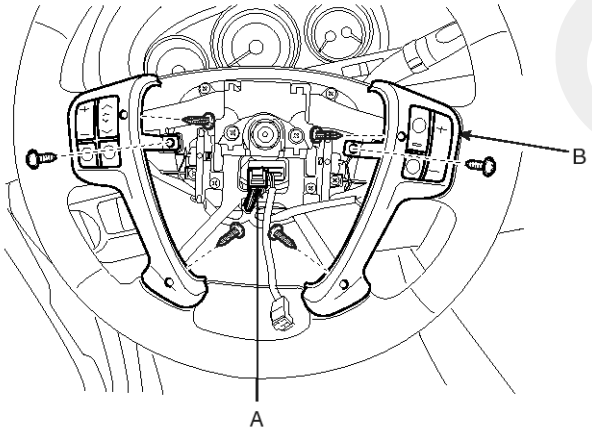
Removal

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



SENBE7034D

3. Remove the audio remote control switch (B) after remove the steering wheel remote control switch connector (A) and 6 screws.



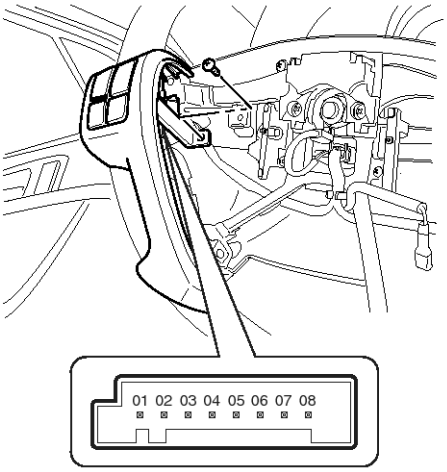
SENBE7035D

Installation

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

Inspection

1. Check for resistance between No.6 and No.7 terminals in each switch position.



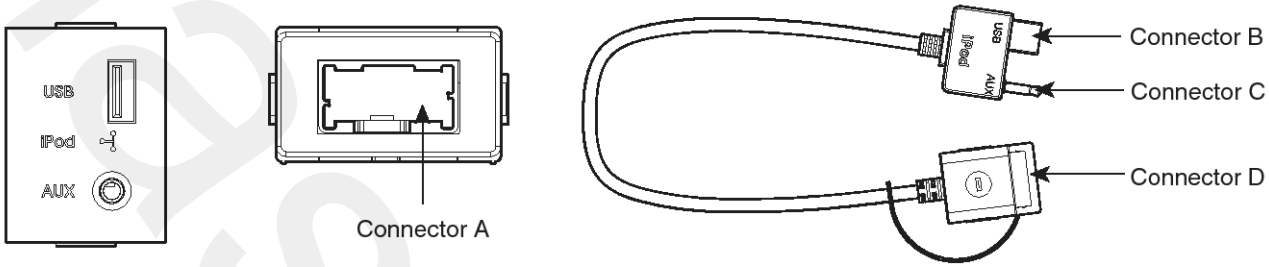
SENBE7036D

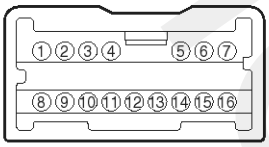
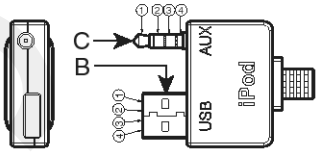
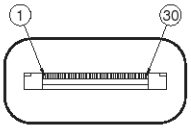
Switch	Connector terminal	Resistance (±5 %)
VOLUME DOWN	6 - 7	6.81 kΩ
VOLUME UP	6 - 7	4.61 kΩ
MODE	6 - 7	2.11 kΩ
SEEK DOWN	6 - 7	1.11 kΩ
SEEK UP	6 - 7	430 Ω
MUTE	6 - 7	3..11 kΩ

Multimedia jack

Components

[AUX, USB, IPOD] [Jack Connector] [IPOD Cable]

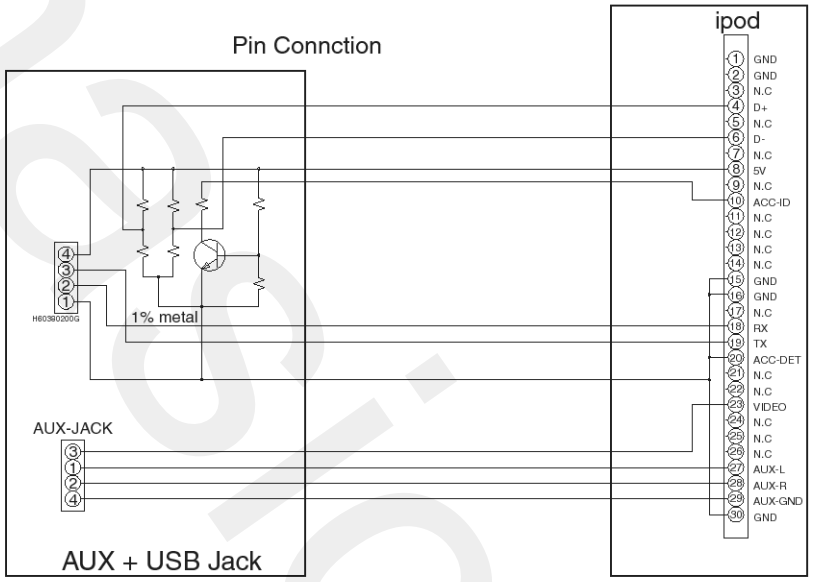


Name	Multi-media Jack Connector A (USB/AUX/IPOD)	USB Connector B	AUX Connector C	IPOD Connector D
Connector				
1	USB/IPOD 5V	USB/IPOD 5V	AUX1 L IN	-
2	USB D-/ IPOD TX	USB D-/IPOD TX	AUX1 R IN	-
3	USB D+/ IPOD RX	USB D+/ IPOD RX	Option/ Video	-
4	USB/ IPOD GND	USB/IPOD GND	AUX1 GND	D+
5	GND USB shield			-
6	AUX1 REF			D-
7	AUX1 L IN			-
8	ILL+			5V
9	ILL-			-
10	-			ACC ID
11	-			-
12	-			-
13	Main GND			-
14	AUX DET			-
15	AUX shield GND			GND
16	AUX1 R IN			GND
17				-
18				RX
19				TX
20				GND
21				-
22				-
23				Video
24				-
25				-
26				-
27				AUX1 L IN
28				AUX1 R IN
29				Audio REF
30				Signal wire GND

SENBE9008N

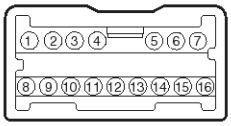
Circuit Diagram

[Aux + USB + iPod] Multimedia jack



Wire Connection Table

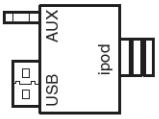
SHORT GND	15	POWER WIRE
	16	
	20	
	30	
8	5V	USB WIRE
4	D+	
6	D-	
29	AUDIO REF	AUDIO WIRE
28	AUDIO R	
27	AUDIO L	
18	RX	UART WIRE
19	TX	
23	VIDEO	VIDEO WIRE
10	ACC-ID	IPOD DET



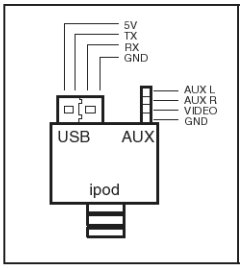
Multi-media jack

Front View

Top View



Pin Connction

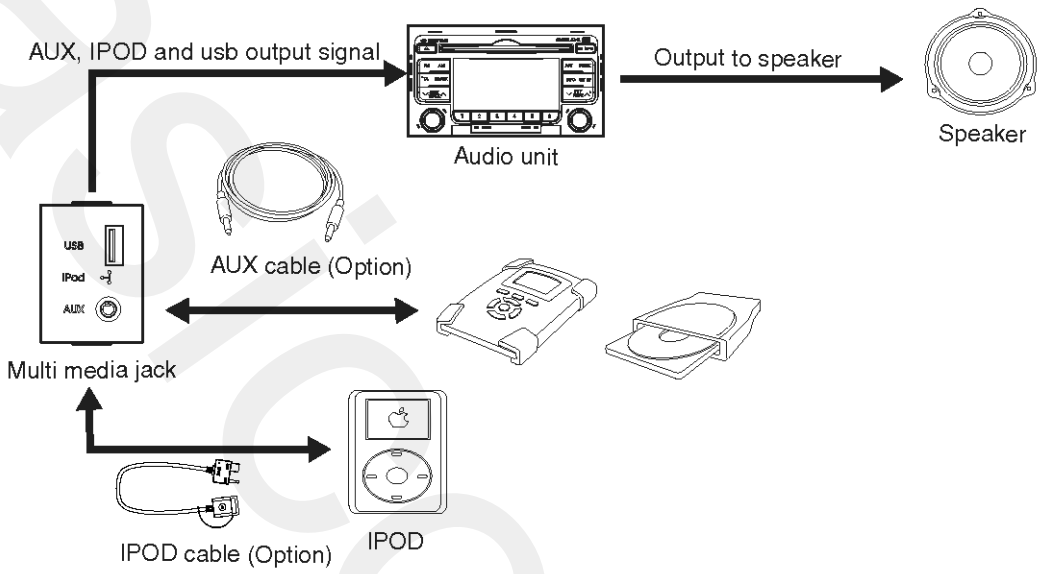


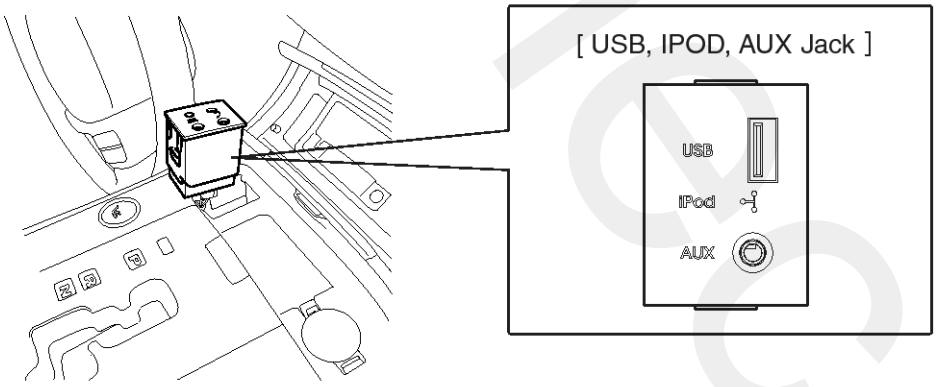
SHMBE9308N

Description

The AUX, iPod and USB JACK on the center console is for customers who like to listen to external portable music players like the MP3, iPod, USB memory stick, CD player and etc., through the vehicle's sound system when it is linked to this jack. The customer has this added option.

If audio distortion is present, check the volume settings on the device connected to Aux jack.

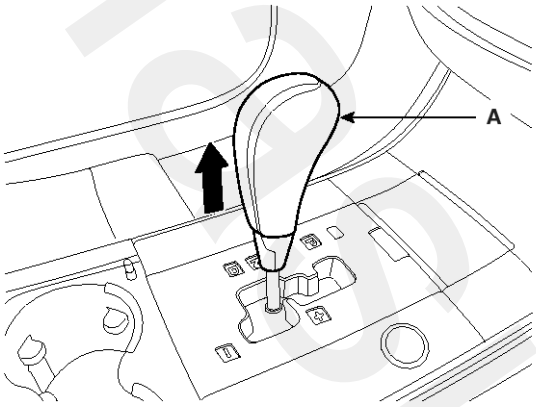




SENBE9007N

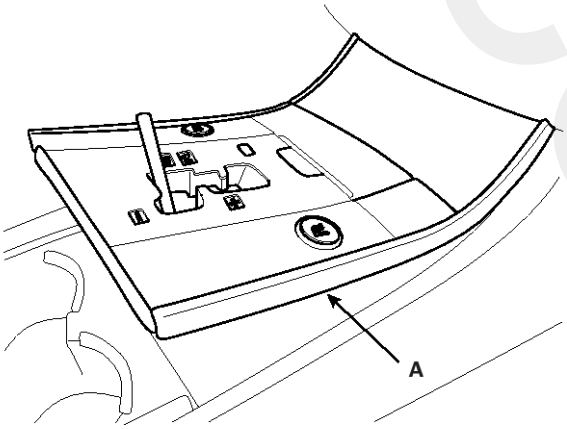
Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the shift lever knob (A) pulling up. (Refer to the BD Group - "Console")



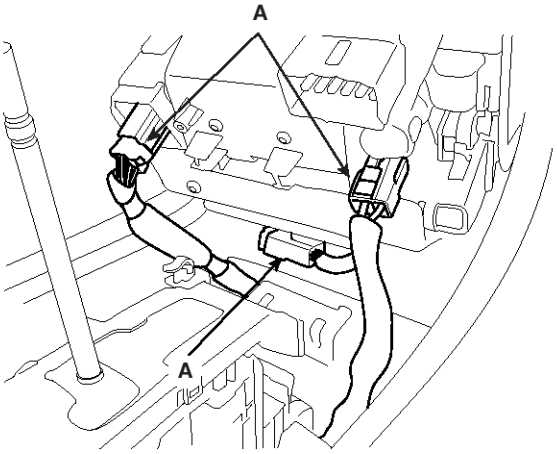
SENBD7054D

3. Remove the console under cover (A).



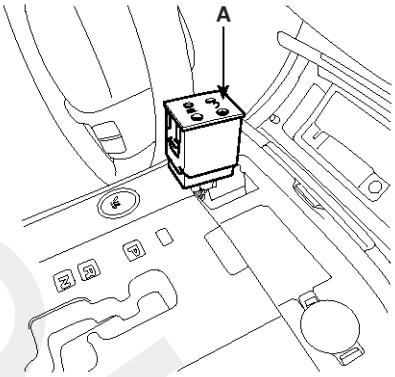
SENBD7055D

4. Disconnect the connectors (A) from the console under cover.



SENBD7057D

5. Remove the Multimedia Jack (A) from the console under cover.



SENBE9009N

Installation

1. Install the Multimedia jack to the console under cover.
2. Reconnect the connector
3. Install the console under cover.
4. Install the shift lever knob.

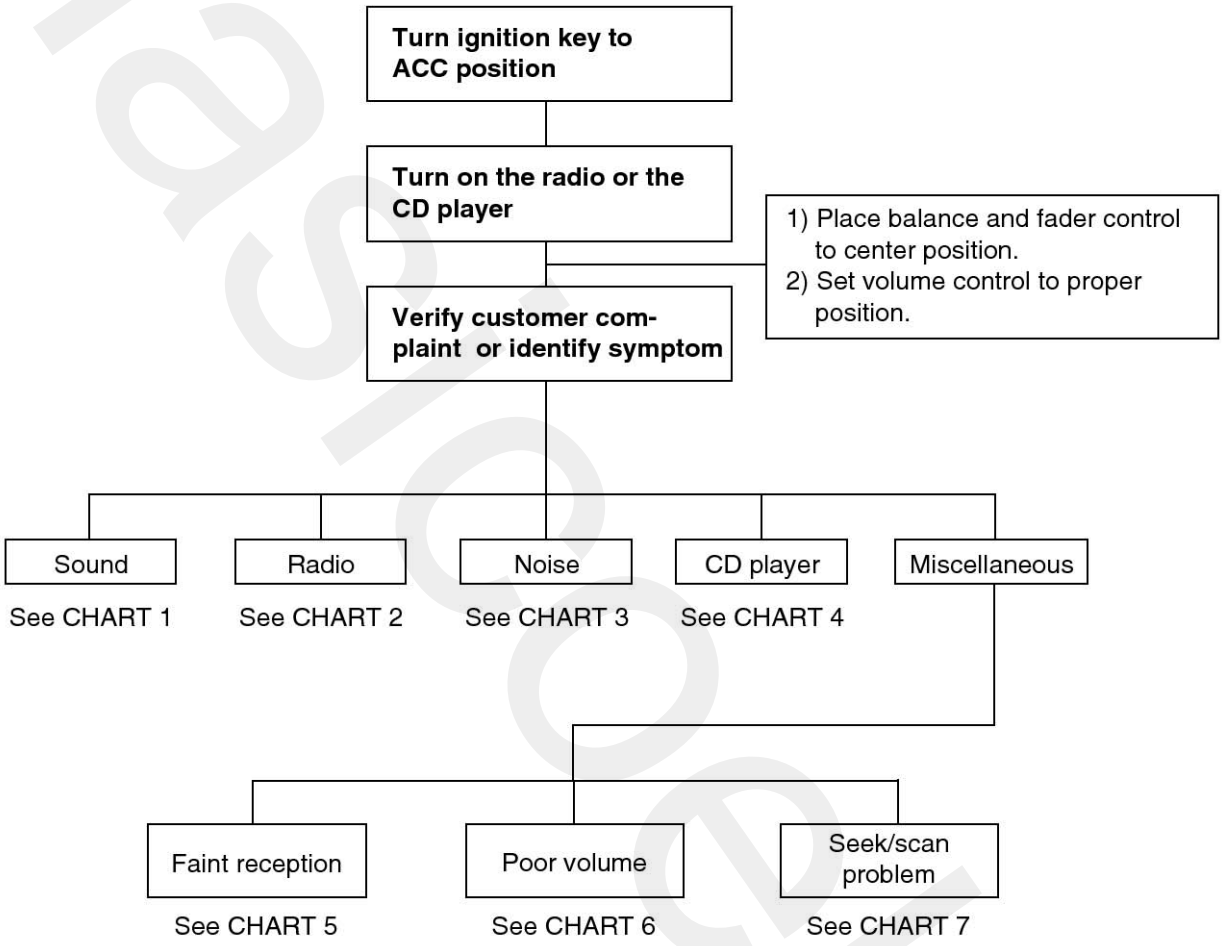
Troubleshooting

Customer Complaint Analysis Check Sheet

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

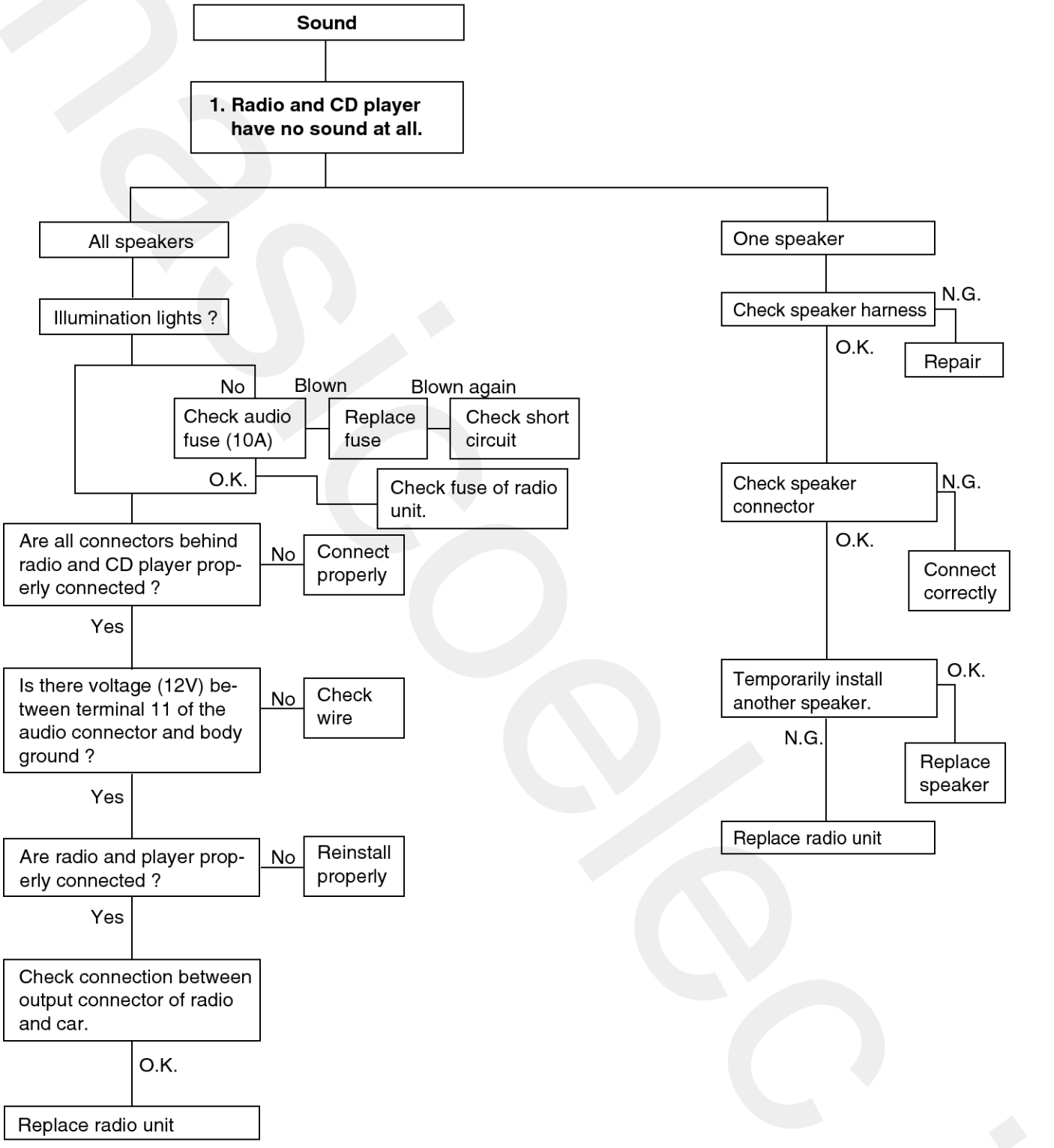
SENBE7046L

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

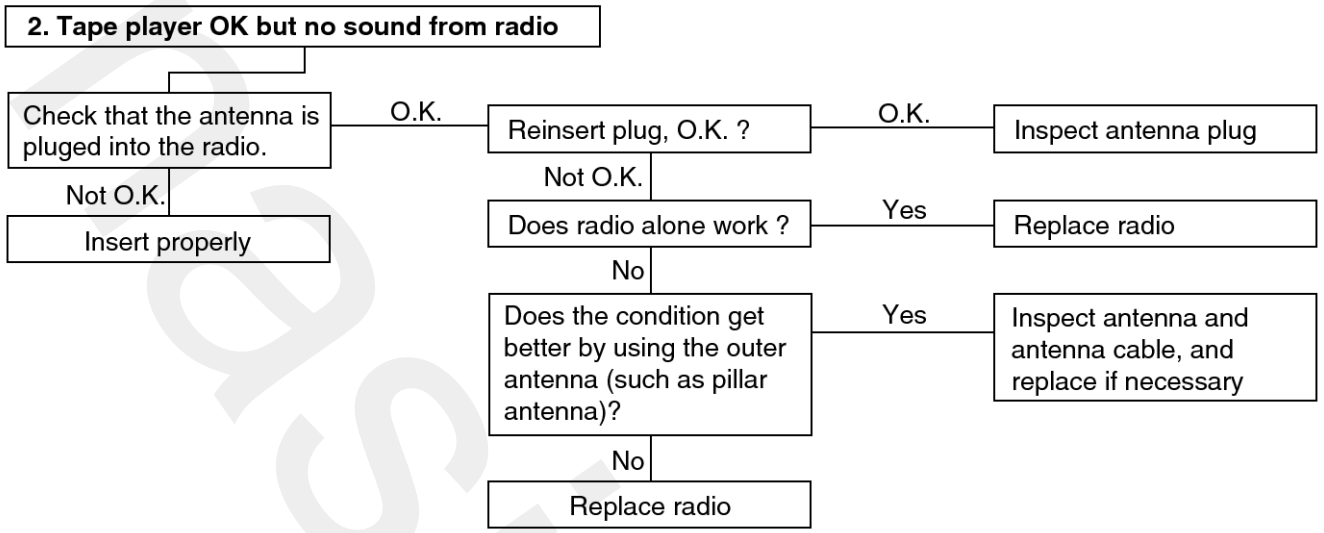


SENBE7047L

Chart 1

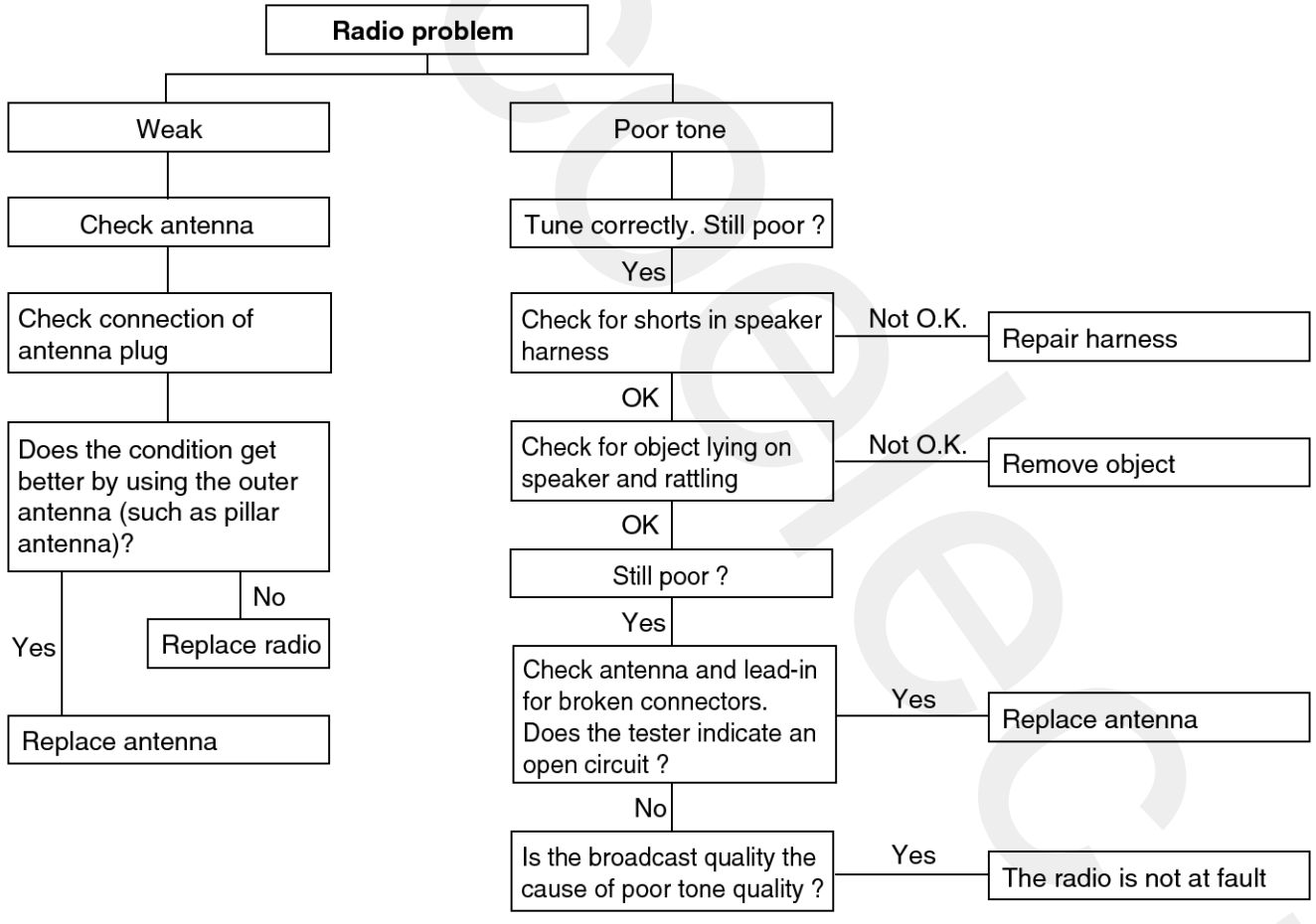


SENBE7048L



LTIF001C

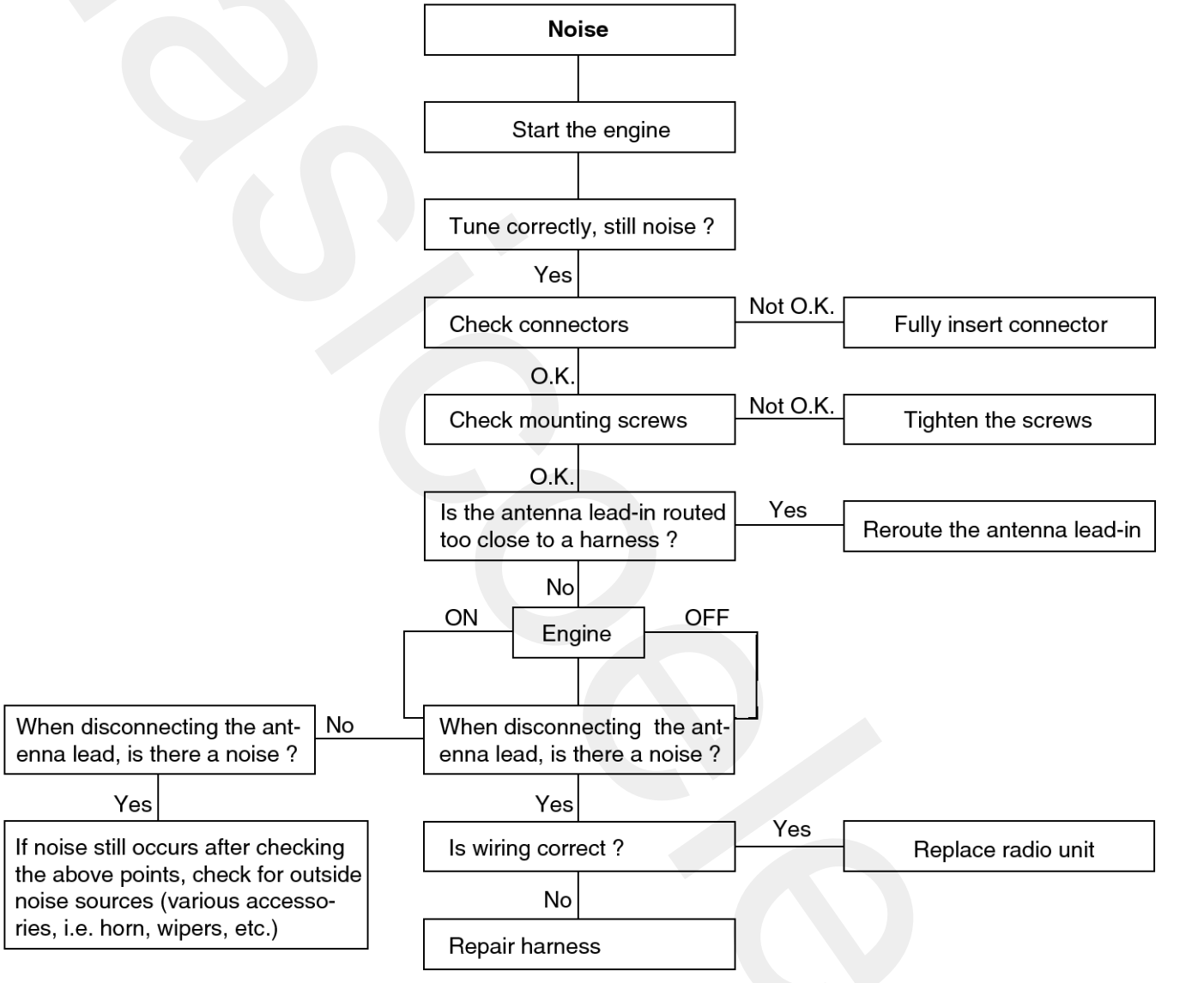
Chart 2



BTIF001D

Chart 3

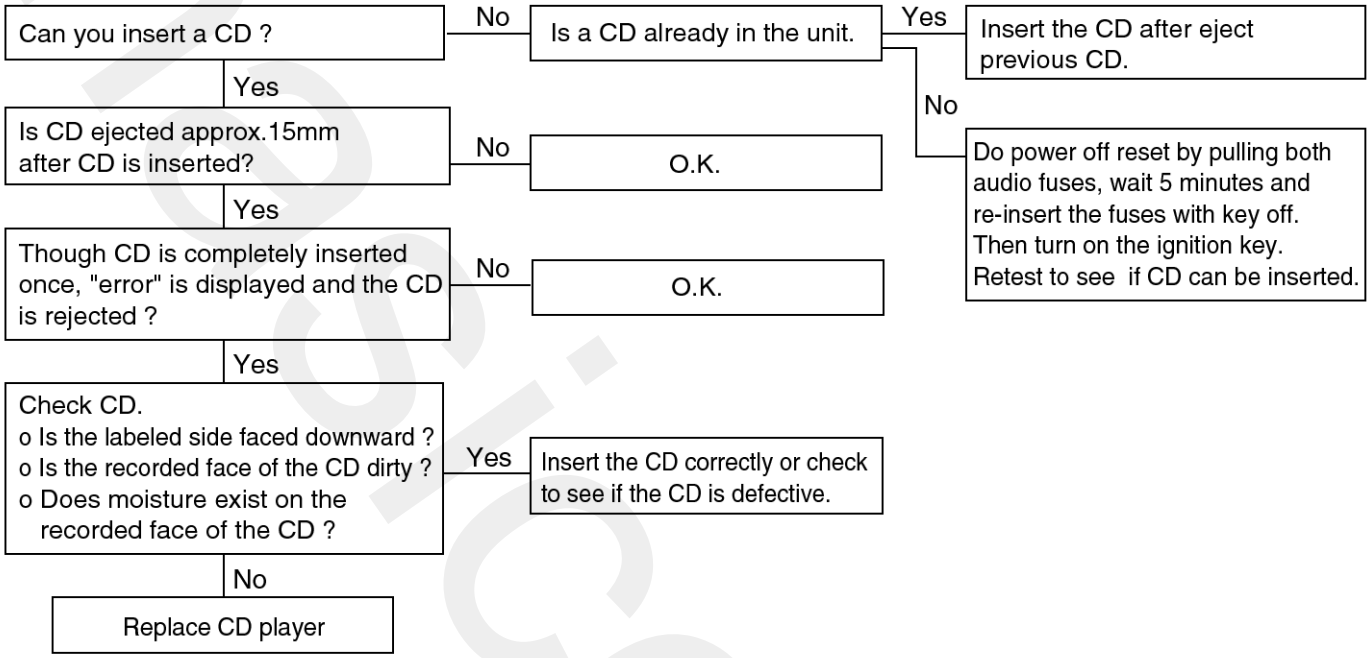
1. RADIO



LTIF001F

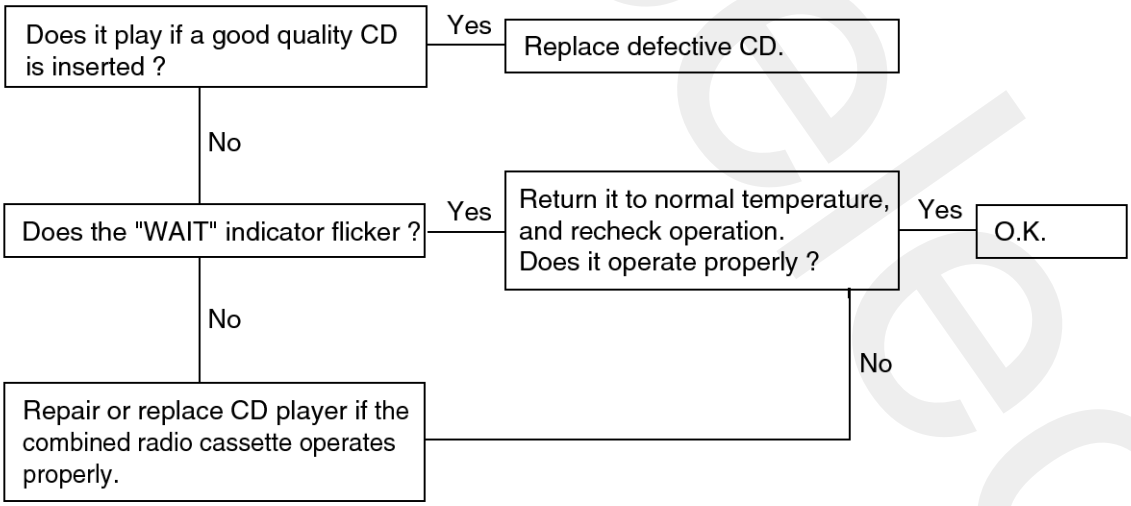
Chart 4

1. CD WILL NOT BE ACCEPTED



LTIF001H

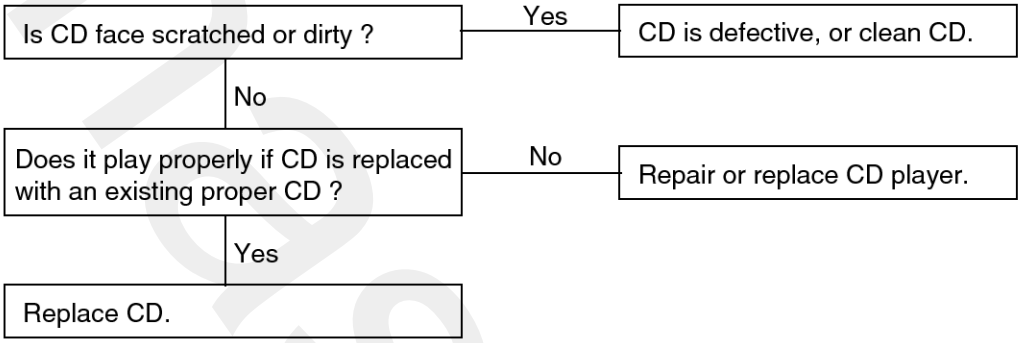
2. NO SOUND



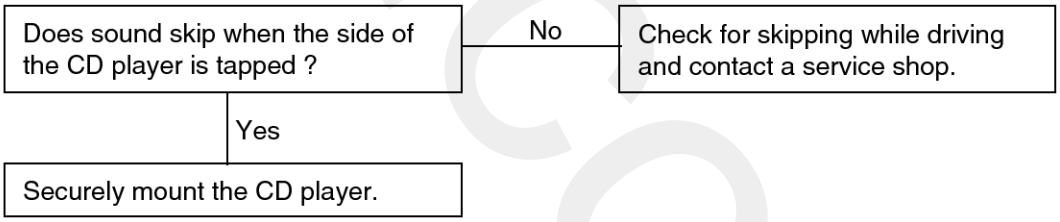
LTIF001I

3. CD SOUND SKIPS

1) Sound sometimes skips when parking.

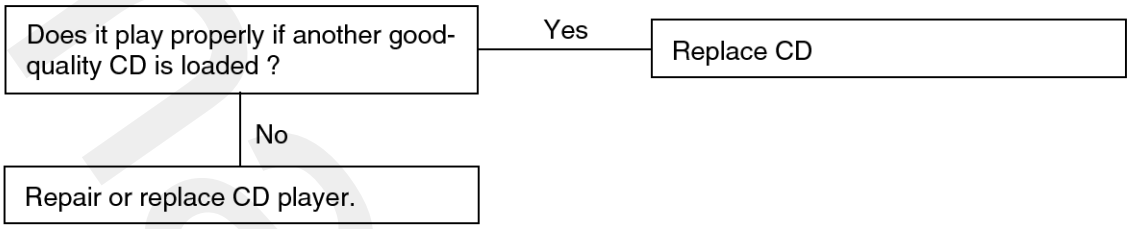


2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)

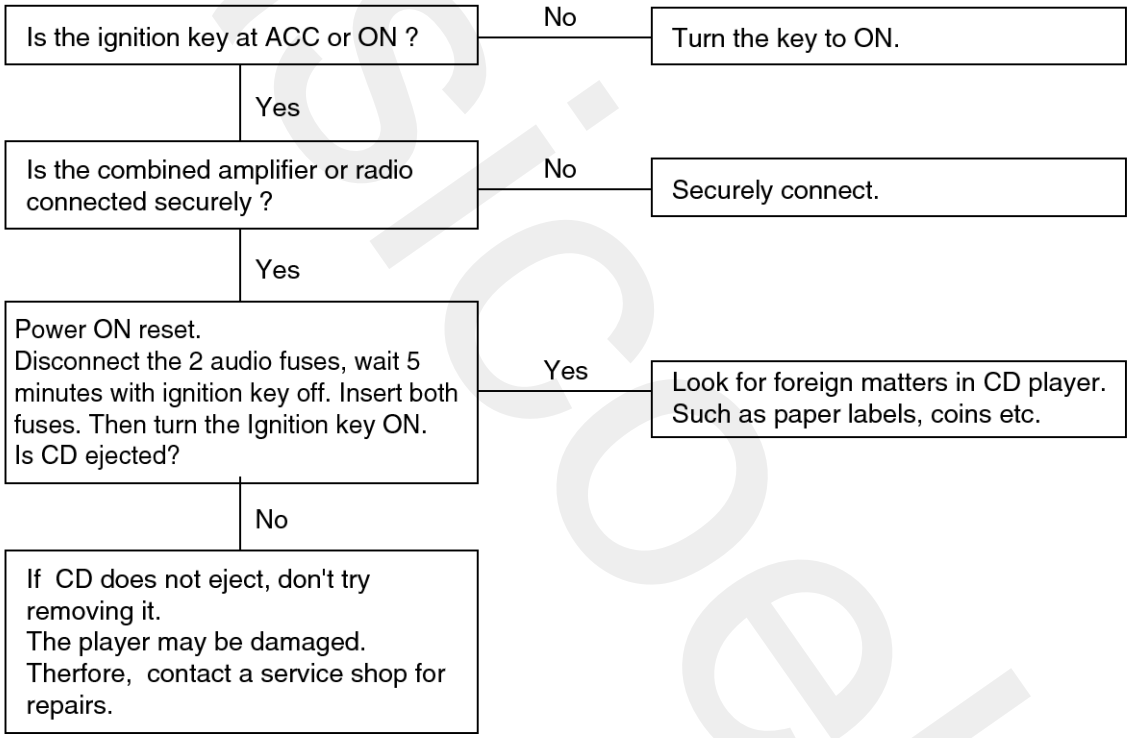


LTIF001J

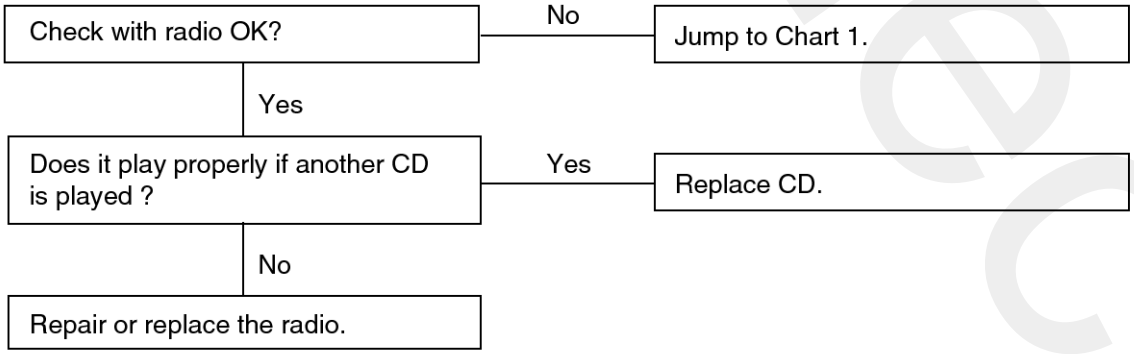
4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT

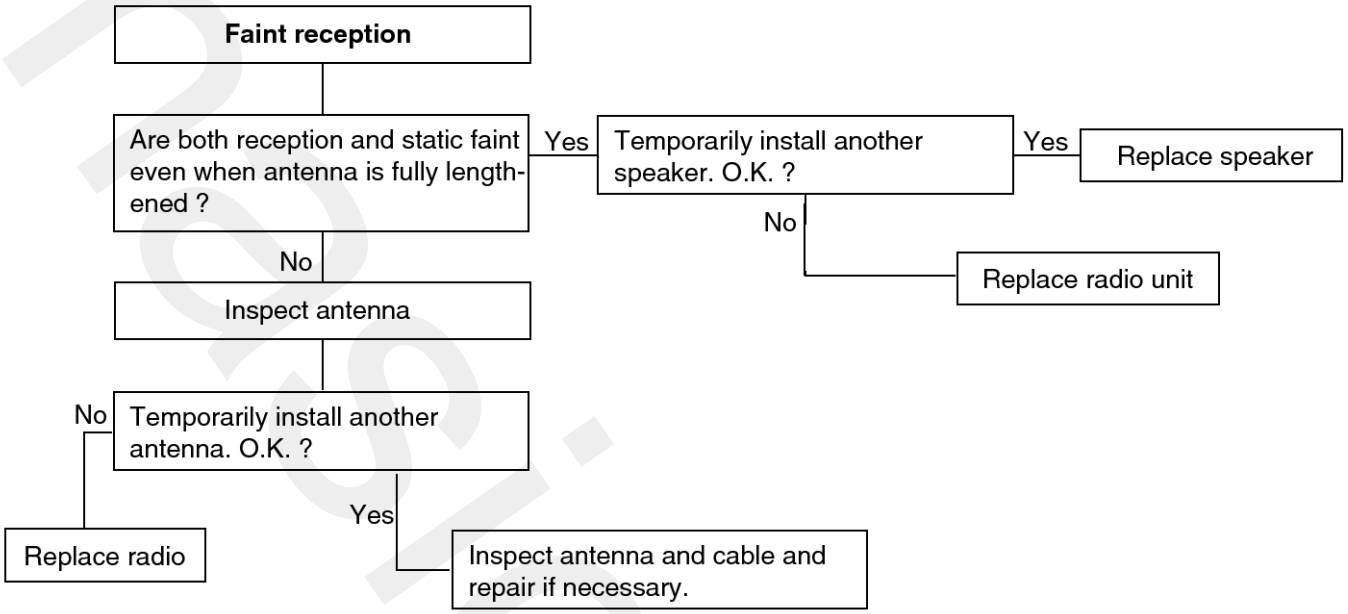


6. NO SOUND FROM ONE SPEAKER



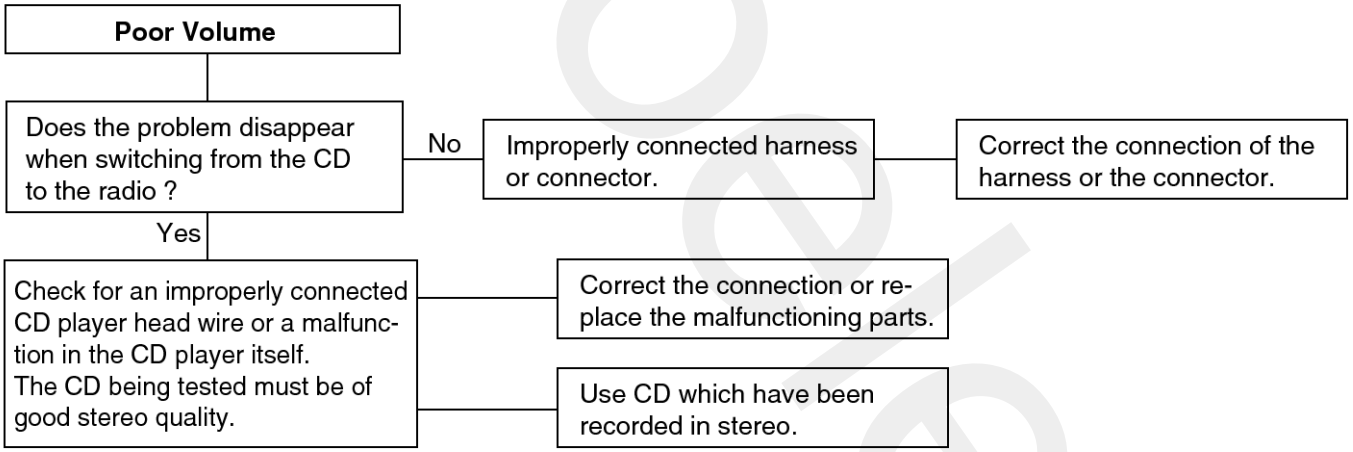
LTIF001K

Chart 5



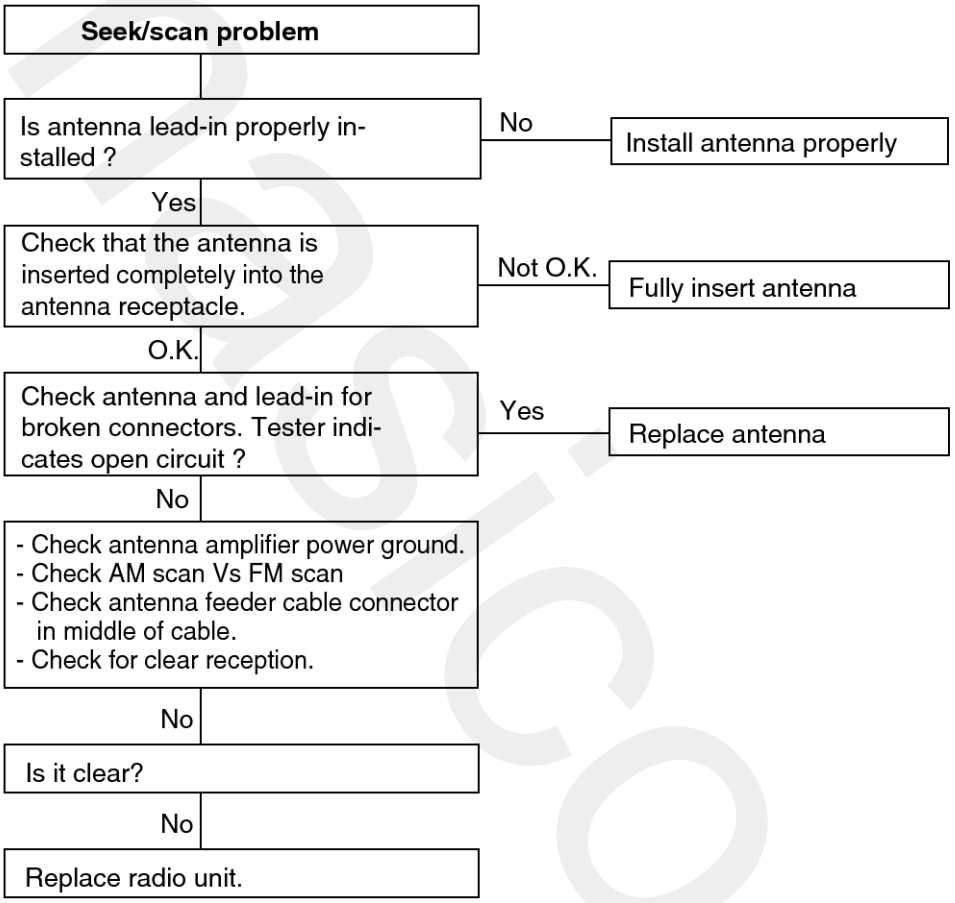
LTIF001L

Chart 6



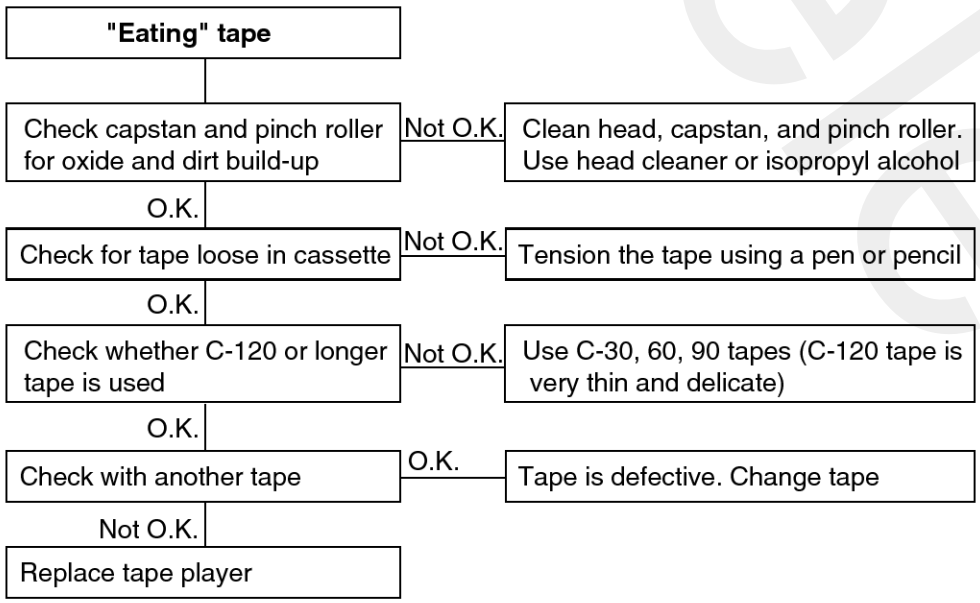
SENBE7039L

Chart 7



LTIF001N

Chart 8



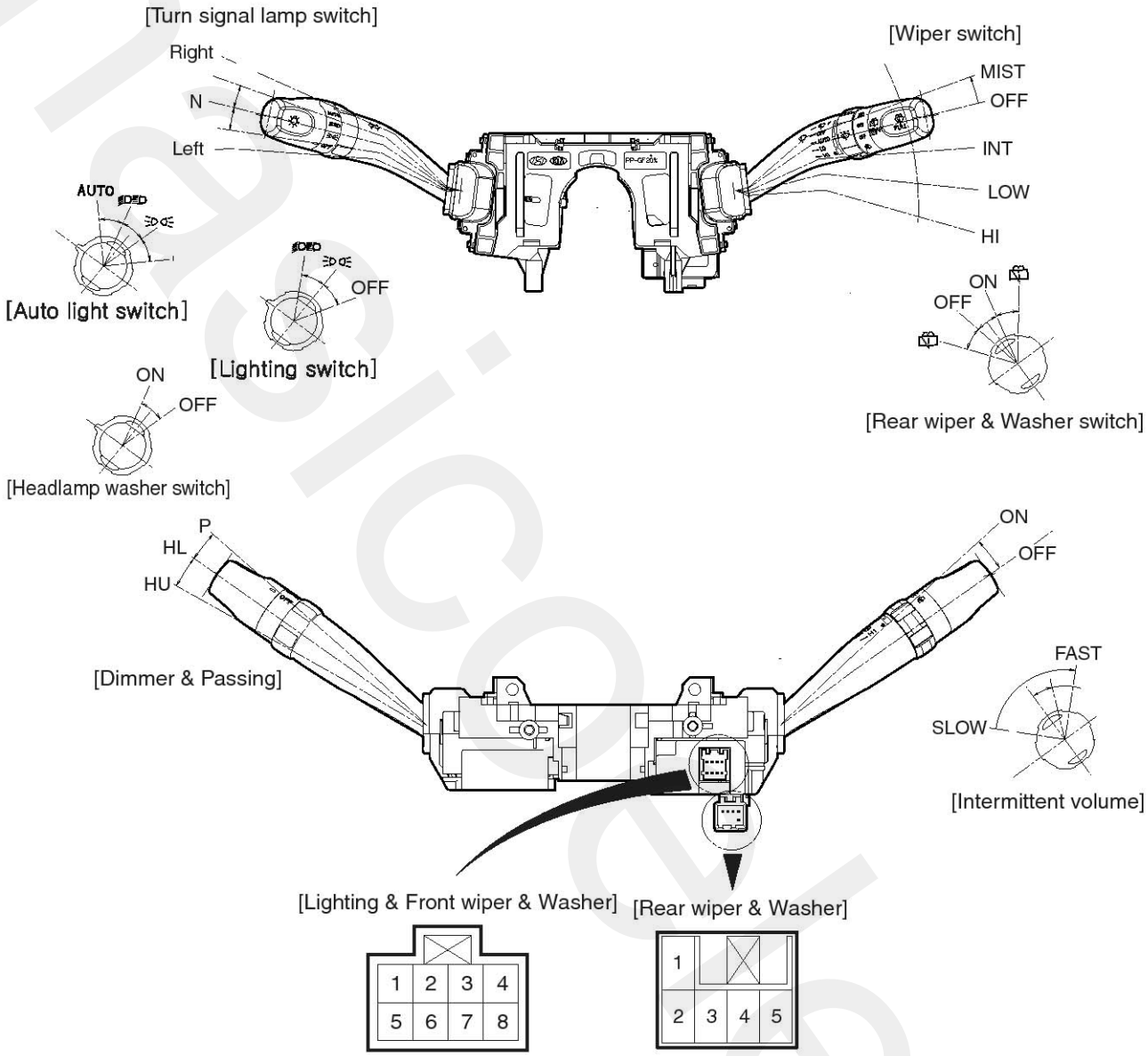
LTIF001O

Multifunction switch

Specifications

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-30˚C ~ +80˚C (-22 ~ +176˚F)
Rated load	Wiper	200mA, Signal line
	Washer	200mA (Relay load)
	Rear wiper & washer switch	Rear wiper : 200mA (Relay load) Rear washer : 4A (Motor load)

Component

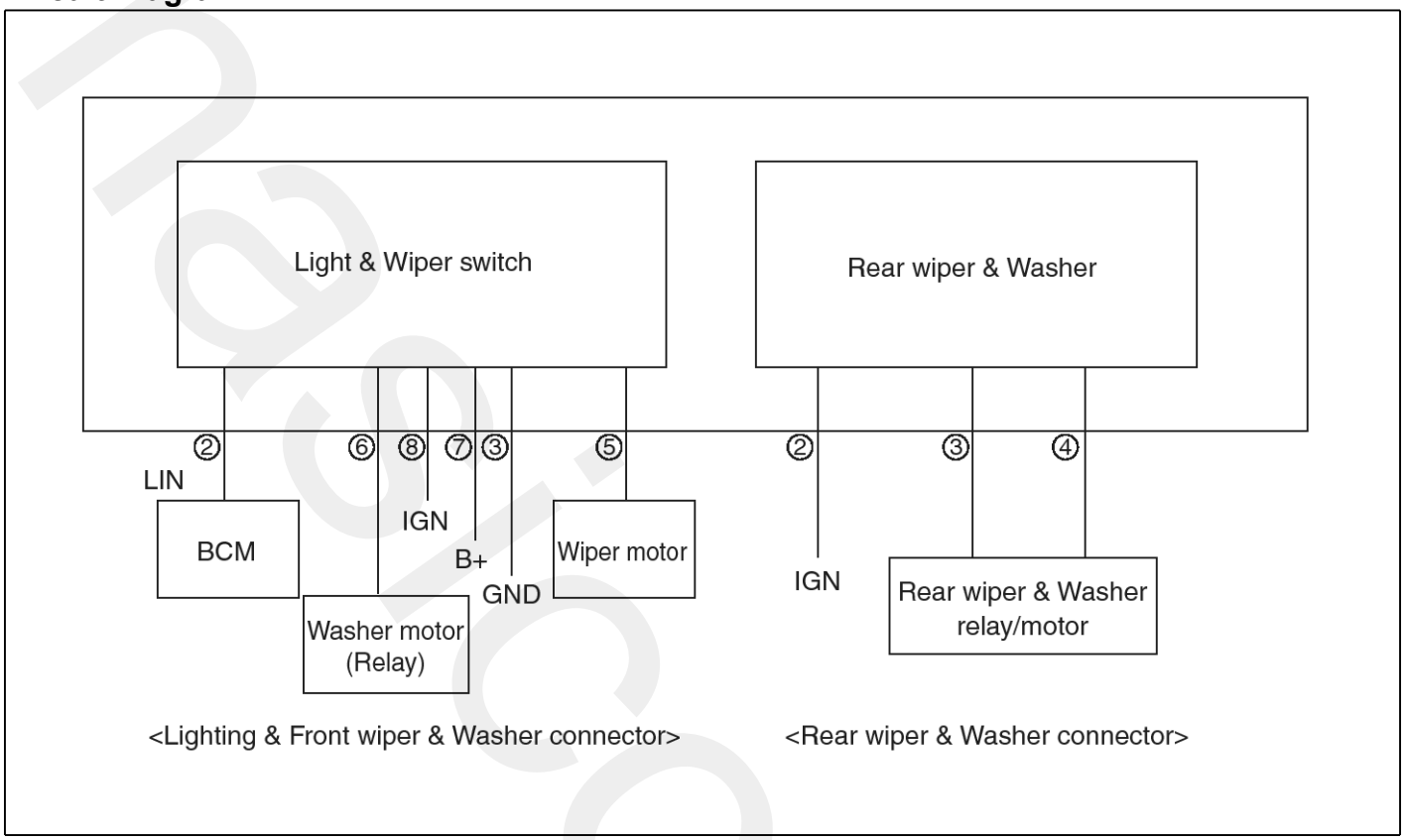


Circuit connection

Connector Name	Pin No.	Description	Connector Name	Pin No.	Description
Lighting & Front wiper & Washer	1	LIN	Rear wiper & Washer	1	-
	2	-		2	Rear wiper & Washer IGN
	3	IG1		3	Rear wiper
	4	B+		4	Rear washer
	5	-		5	-
	6	Washer low			
	7	Wiper low			
	8	Ground			

SENBE7040L

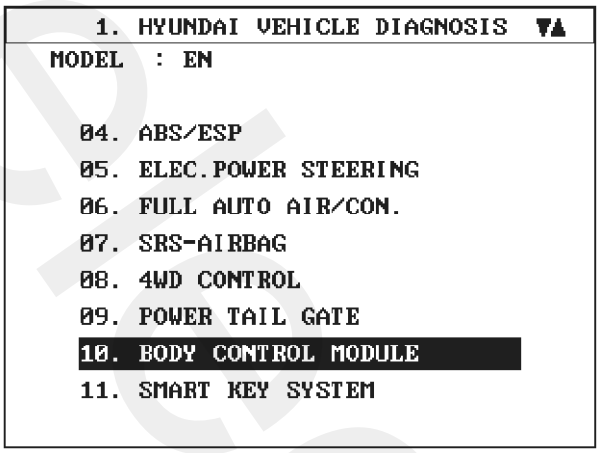
Circuit Diagram



SENBE7045L

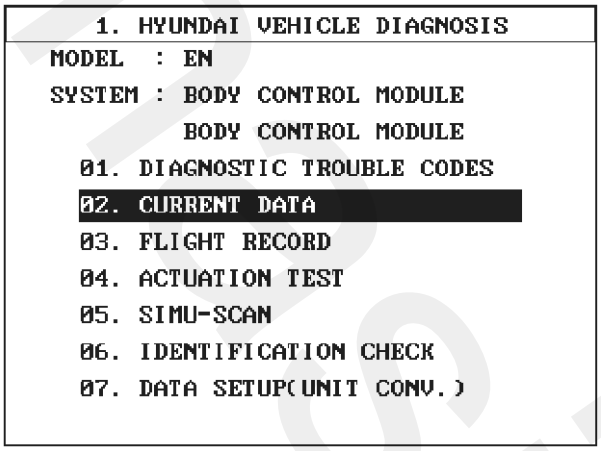
Inspection

1. Check BCM input/output specification of multifiction switch using the scan tool. If the specification is abnormal, replace the head lamp or wiper switch.
2. If diagnosis is required on the multifunction switch, select "VERACRUZ" and "BCM"

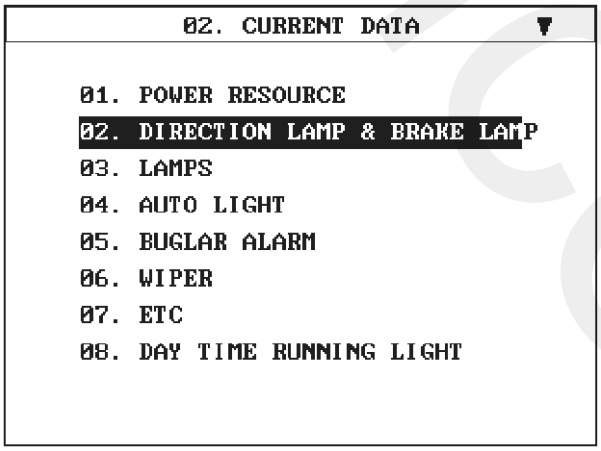


SENBE7201L

3. Select "CURRENT DATA" and " DIRECTION LAMP & BRAKE LAMP".

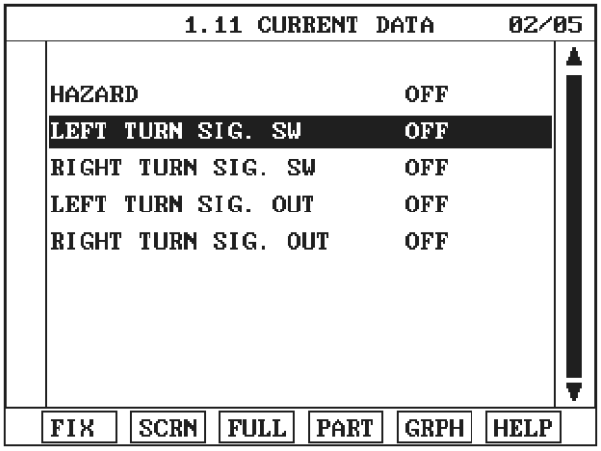


SENBE7203L



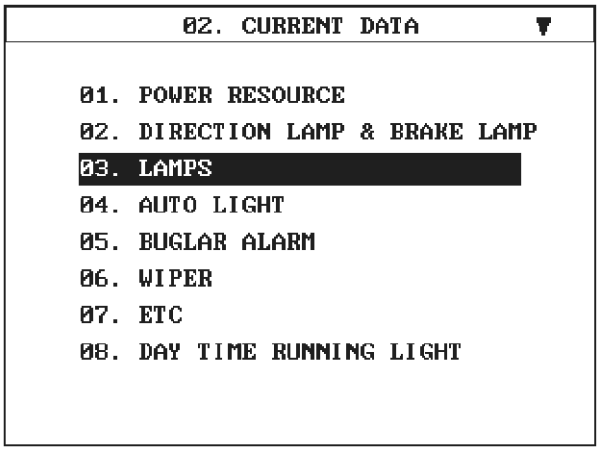
SENBE7204L

4. Check the input/output condition of "DIRECTION LAMP & BRAKE LAMP".

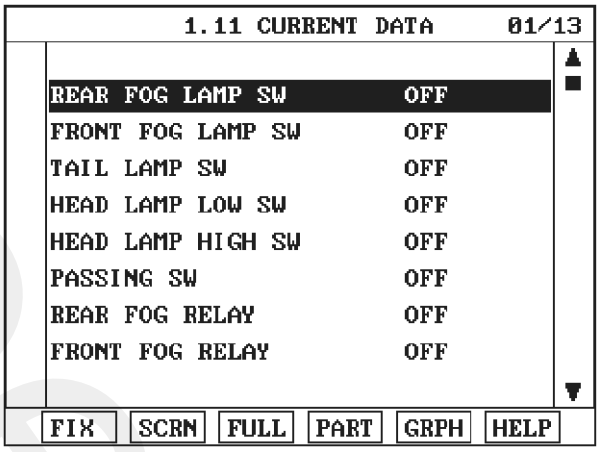


SENBE7205L

5. Check the input/output condition of "LAMPS".

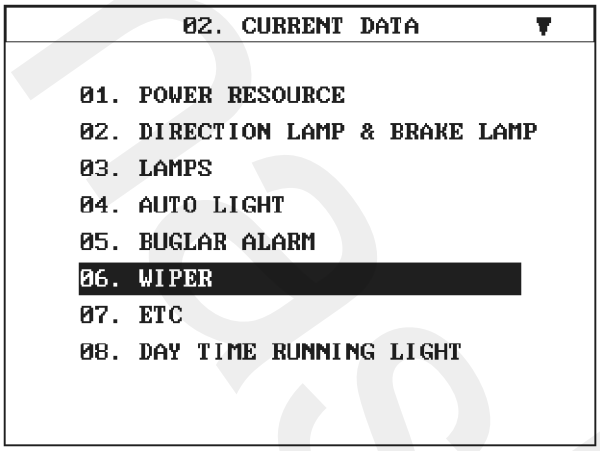


SENBE7206L

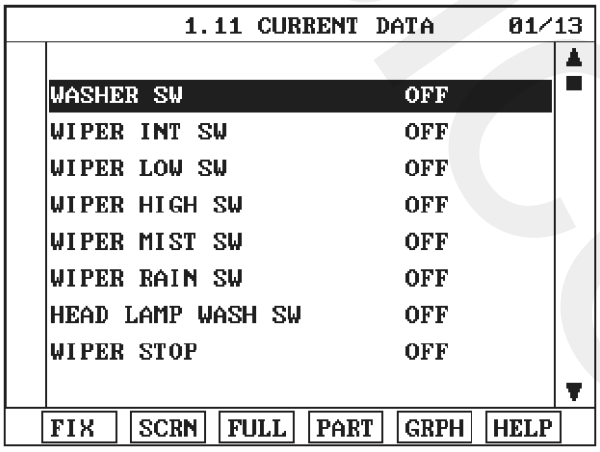


SENBE7207L

6. Check the input/output condition of "WIPER".

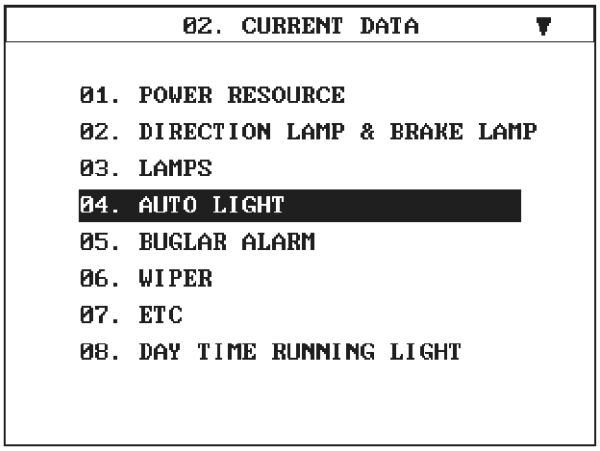


SENBE7208L

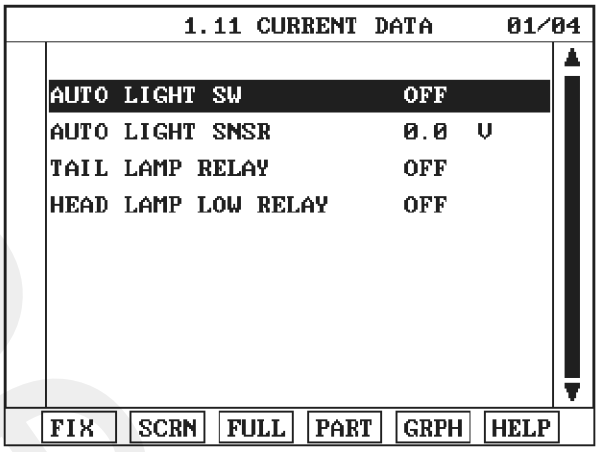


SENBE7209L

7. Check the input/output condition of "AUTO LIGHT".



SENBE7301L



SENBE7302L

8. Select "ACTUATION TEST".

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

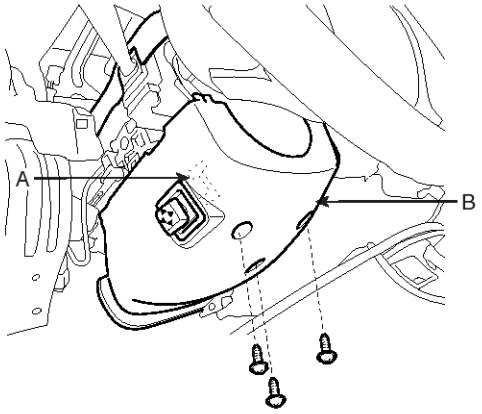
SENBE7303L

```
                1.4 ACTUATION TEST      01/31

 TAIL LAMP
 DURATION      5 SECONDS
 METHOD        ACTIVATION
 CONDITION     IG.KEY ON
               ENGINE RUNNING

   PRESS [STRT], IF YOU ARE READY !
   SELECT TEST ITEM USING UP/DOWN KEY

   STRT
```

SENBE7299L

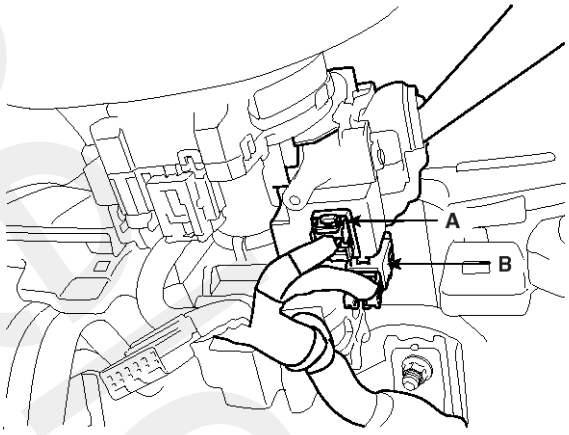
Removal

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



SENBE7041D

3. Remove the multifunction switch after disconnecting the light connector (A) and wiper connector (B).



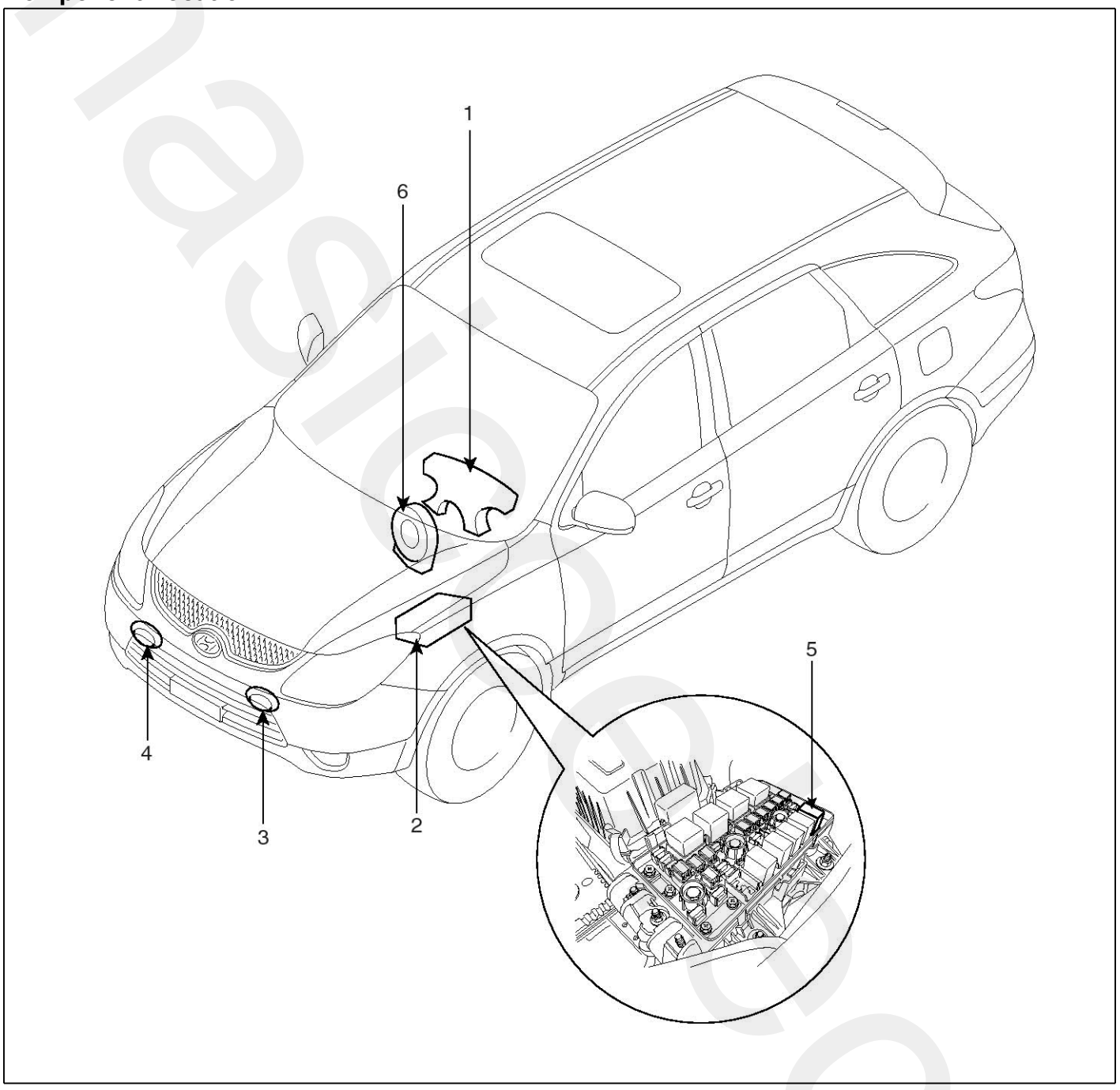
SENBE7042D

Installation

1. Reassemble the multifunction switch after connecting the connectors.
2. Reassemble the steering column upper and lower shrouds.

Horn

Component Location

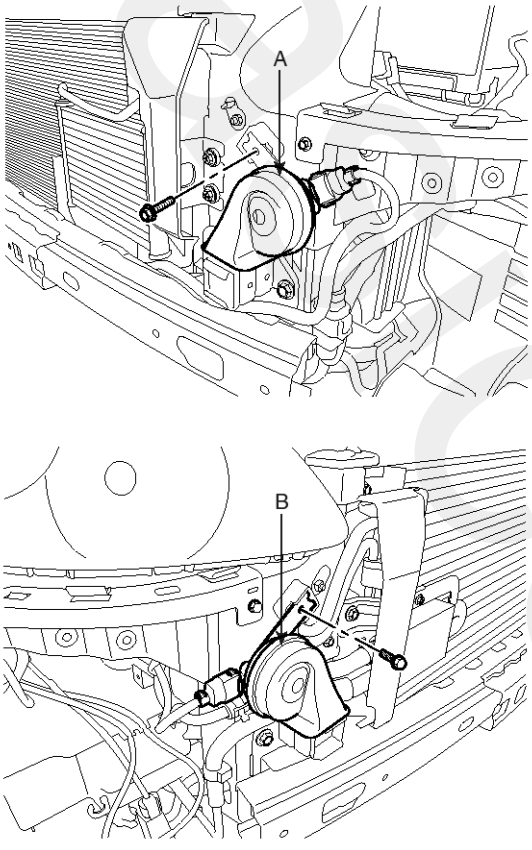


SENBE9005L

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

Removal

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



SENBE7061D

Installation

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

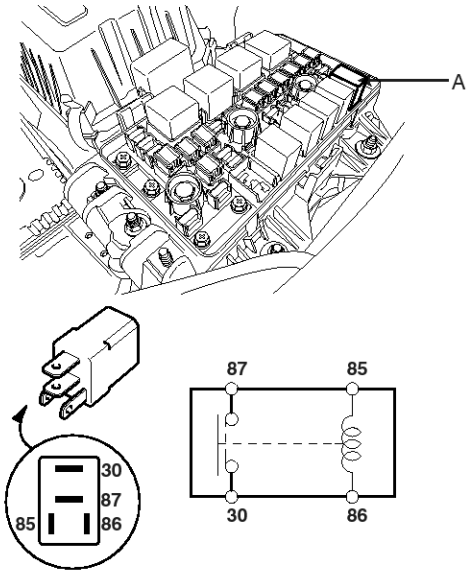
Inspection

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

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

Horn Relay Inspection

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



SENBE7062D

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

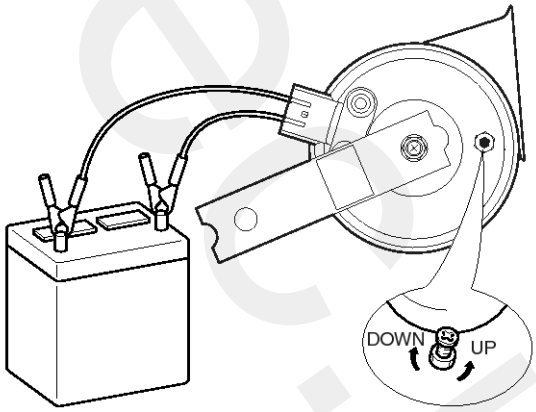
SCMBE6063L

Adjustment

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

NOTICE

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



SCMBE6064D

Smart key System

Specification

Smart Key Unit

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30˚C ~ 75˚C
Load	Max. 2mA

RF Receiver

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

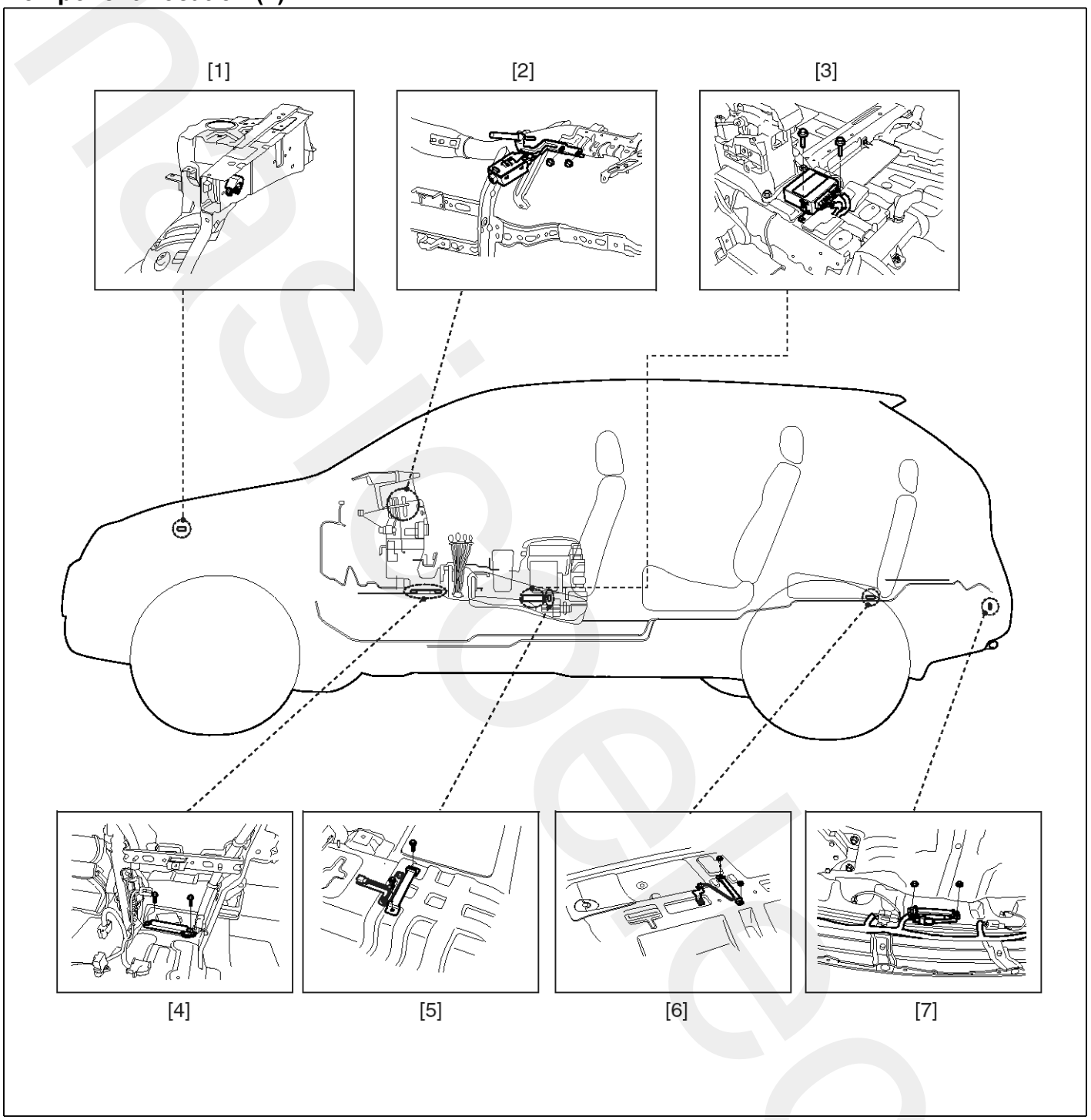
Smart Key FOB

Items	Specification
Battery	Lithium battery 3V
Distance	10m
Battery life	More than 2years
Push buttons	6 (Door lock / Open, Tailgate, Panic)
Frequency(Rx)	125 kHz
Frequency(Tx)	315 MHz
Numbers	2EA

Antenna

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

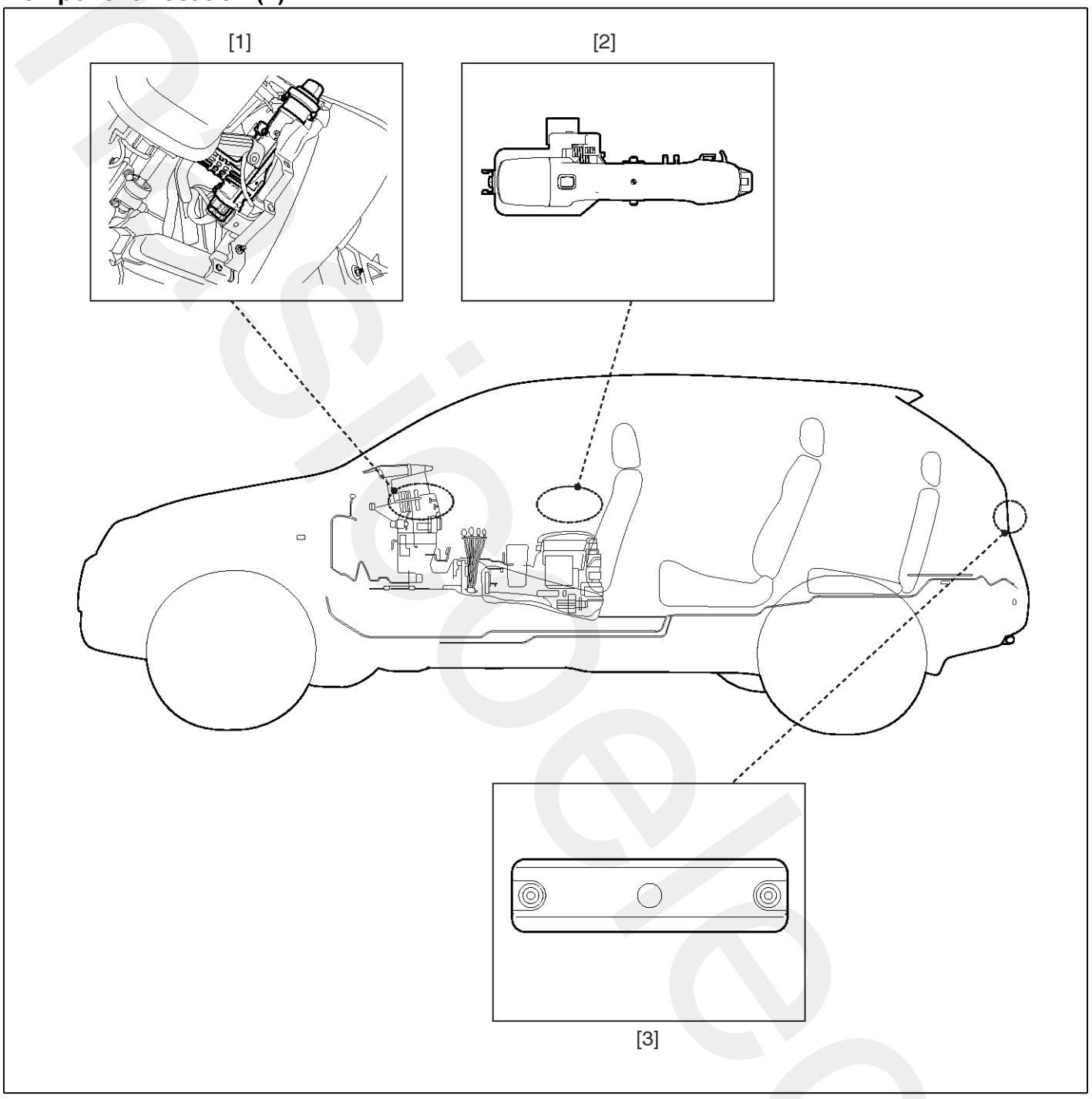
Component Location (1)



SENBE9024N

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

Component Location (2)



SENBE9025N

1. Mechatronic steering lock (MSL)
2. Door outside handle
3. Tailgate request switch

Description

The system is a system that allows the user to access and operate a vehicle in a very convenient way. To access the vehicle no traditional key or remote control unit is needed.The user carries a Smart K FOB which itself does not require any conscious actions by the user (e.g. operate a button). The SMART KEY system is triggered by pressing a push button in the door handle. After being triggered the vehicle sends out a request in a limited range. If the SMART KEY FOB receives this request, it automatically sends a response to the vehicle. Then the system decides whether to perform a particular action (unlocking, locking...) or remain inactive.In a similar manner the vehicle's Mechatronic Steering Lock (MSL) is released. Again, a communication between the vehicle and the SMART KEY FOB is needed before any actions will be performed.

Scope Of Smart Key System

The System offers the following features :

- passive access via door driver side and passenger side
- passive locking via door driver side and passenger side
- passive start
- passive access trunk/tailgate via the trunk lid switch at the trunk
- passive locking via tailgate
- max. 2 fobs can be handled by the system
- immobilizer backup antenna driver integrated into MSL for TP authentication (i.e. limp home mode)
- communication with engine management system via EMSCOM
- communication with MSL via MSLCOM
- communication with SRX via SRXCOM
- LF-RF communication (based on Siemens' SMART KEY system)
- block of the steering column by the MSL device.

Operation

Passive Functions

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

Passive Access (Passive Entry)

If user press Front left side push button, when all doors locked (that includes tail gate if tail lock bit set) indicates the operator's intent to access the vehicle and thus triggers the system for unlock and two steps timer is started. If user press Front left side push button one more time while the two steps timer is still running, then system is triggers for a second unlock.Pressing front right side push button in the door handle when all doors are locked indicates the operator's intent to access the vehicle and thus triggers the system for an unlock.Subsequently, the SMK ECU sends a LF-challenge to the SMART KEY FOB via the corresponding exterior antenna. The SMART KEY FOB answers with a RF-response. If the received response matches the expected answer, the SMK ECU issues an "unlock" message to the BCM module via the CAN/LIN network.

Passive Locking (Exit)

Pressing one of the push buttons in the door handles when (at least one door unlocked and two steps timer not running) or (two steps timer running and one of the push button except Front Left side is triggered) indicates the operator's intent to lock the vehicle and thus triggers the system for a lock.

Passive Access Trunk

Pressing the Trunk Lid Switch when trunk is closed indicates the operator's intent to open the trunk and thus triggers the system. Subsequently, the SMK ECU sends a LF-challenge to the SMART KEY FOB via the exterior bumper antenna. The SMART KEY FOB answers with a RF-response. If the received response matches the expected answer, the SMK ECU sends a "trunk open" message via the CAN/LIN network.Special case: If the car is locked, but the ATWS is not armed, LF strategy shall search for FOB at the bumper area excluding trunk and interior area.

Passive Open Tailgate

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

Smart Key Reminder 1

Preconditions : All terminals OFF and at least one door open and no Key-In and locking status is not locked (to be checked by SMK ECU periodically every 100ms, as long as CAN/LIN active)

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

Vehicle action : locking status changes from unlock to lock.

SMK ECU actions : the SMK ECU performs a search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication).If no fob has been found, no action is required.If any fob has been found, the SMK ECU unlocks the vehicle by sending a CAN/LIN passive unlock message with the fob number.

Smart Key Reminder 2

Preconditions : All terminals OFF and any door (including tail gate) open and no Key-In and locking status is not locked (to be checked by SMK ECU periodically every 100ms, as long as CAN/LIN active)

User action : All doors and tail gate closed.

Vehicle action : Closing last door or tail gate with knobs state locked, or with a locking in progress

SMK ECU actions : if within 500ms following the closing, all doors are locked then SMK ECU performs a search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication).If no fob has been found, no action is required.If any fob has been found, the SMK ECU unlocks the vehicle and activates ext. buzzer warning.

Smart Key Door Lock Warning

Door Lock Warning 1

If (TAIL BIT is not set) AND (TAIL BIT is set & TAIL LOCK BIT is not set), this warning can be triggered when below conditions are fulfilled.

Preconditions : (All doors are closed) and (ACC ON or IGN1 ON) and no Key in User action : user presses the door handle Push button.SMK ECU actions: the SMK ECU performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for Passive Access Door Unlock.

If TAIL LOCK BIT is set, this warning can be triggered when below conditions are fulfilled.Preconditions : (All doors are closed) AND (Tailgate is closed) and (ACC ON or IGN1 ON) and no Key in

User action : user presses the door handle Push button OR tailgate Push button.SMK ECU actions : the SMK ECU performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for Passive Access Door Unlock.

If no fob has been found, no action is required.If any fob has been found, the SMK ECU activates the external buzzer.If the preconditions are no longer valid during buzzer active time (3 seconds), the SMK ECU stops the buzzer immediately.

Door Lock Warning 2

Preconditions : Same as passive locking precondition but with at least one door openUser action : user presses the door handle Push button or (tailgate push button if TAIL LOCK BIT set)SMK ECU actions : the SMK ECU performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for Passive Access Door Unlock.

If no fob has been found, no action is required.If any fob has been found, the SMK ECU activates the external buzzer.If the preconditions are no longer valid during buzzer active time (3 seconds), the SMK ECU stops the buzzer immediately.

Door Lock Warning 3

Preconditions : Same as passive locking preconditionUser action : user presses the door handle Push button OR Tailgate push button if TAIL LOCK BIT setSMK ECU actions : If ATWS is DISARM, SMK ECU performs a search for the fobs inside of the vehicle (use "Door Lock Warning 3" scenario)If any fob has been found, SMK ECU activates the external buzzer.If the activity timer elapsed or ACC ON or IGN1 ON or NOT (All door closed) or Key IN, the SMK ECU stops the buzzer immediately. After searching of inside fob, SMK ECU also performs a search for fobs outside of the vehicle.

Smart Key Lamp Warning

Preconditions : (ACC ON or IGN1 ON) and no Key-In and CAN-Bit "3km" not setUser action : noneSMART KEY actions : as long as the preconditions are valid, the SMK ECU performs a periodical search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication); periodical means, the search has to be started all 3 seconds.If no fob has been found, the SMK ECU starts Key out indicator lamp activation as all preconditions are valid and will perform an other search 3 seconds later.If any fob has been found, the SMK ECU stops the Key out indicator lamp and will (if one door is open) perform an other search 3 seconds later; if no door is open then it's only at the next opening of one door if the condition are still valid that the search will be resumed.

Failsafe Functions (Backup For Limp Home)

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

- Unlocking / locking of doors or trunk (or tailgate depending of the vehicle configuration) : use of mechanical key.
- Release of the steering column : The SMART KEY FOB has to contain the transponder functionality. To release the steering column and to start the engine the driver has to insert the SMART KEY FOB into the MSL and then the driver has to push the MSL Knob. When the SMK ECU detects the active MSL Knob Push Switch and the active Key-In contact, it sends a command to the MSL to start a transponder authentication. The MSL communicates via the transponder antenna with the transponder. When the transponder code is correct the MSL releases the ignition switch.
- Engine Start : To start the engine the driver turns the rotary knob to 'IGN' (ignition) position. The EMS sends an immobilizer challenge to the SMK ECU which responds with a 'go' or a 'no go'. The EMS gives the definite release to start the engine.

User Information Functions

ID Out Warning

If at least one door open and the last door will be closed and the terminals are not 'Off', the SMK ECU searches for a SMART KEY FOB in the interior. If no valid SMART KEY FOB is found the SMK ECU generates a corresponding warning and sends by CAN/LIN request for internal buzzer activation (exterior buzzer warning and internal buzzer warning). If a door will be opened and closed again during terminals on and a valid fob will be found then within the vehicle, the SMK ECU re-enables the authentication and stops the warning.

NOTICE

If there is a LF error (LF overheating or LF antenna failure), the system will have the same behavior as it is with no fob found.

ID Not Found For Passive Start

For the passive start functionality (not for the limp home start), an ID has to be detected in the interior of the vehicle. If no valid SMART KEY FOB is found, the SMK ECU starts an immobilizer interrogation in the MSL; if also the immobilizer interrogation fails, the SMK ECU activates the immo lamp.

MSL Not Blocked Warning

If no fob is inserted and ACC off and IGN1 off and the MSL is not blocked (MSL blocked switch in MSL) or at the time of the MSL not block warning strategy the status is unknown while the last command was a block command and the driver door is open, the SMK ECU generates a corresponding warning via the interior buzzer.

NOTICE

MSL not blocked warning will appear as long as the driver door is open and the terminals are off only if a MSL block command has been issued but without result or without known result (MSL not blocked).

Immobilizer Lamp

Cases like releasing the MSL Knob in OFF position will switch off the immobilizer lamp. Removing the PIF from the MSL and reinserting the PIF and pushing the MSL Knob will switch the lamp on again.

FOB Battery Low Voltage Detection

To detect, if the voltage of the fob battery is no longer sufficient, a certain battery voltage measurement and low voltage detection strategy is implemented in the fob. The measurement of the battery voltage will be done, if a button is pressed or if a LF measurement command is received. To ensure a valid result, it is not sufficient to do only a measurement, if a button is pressed (e.g. if the driver only uses the passive mode and never presses a button). Therefore the SMK ECU sends a measurement command to the fob. This command is sent once during an IGN1 ON cycle, if the speed exceeds 40 km/h for the first time.If the PIF has detected a low battery voltage, the LED will not be switched on at button press.

Inspection

Self Diagnosis With Scan Tool

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

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

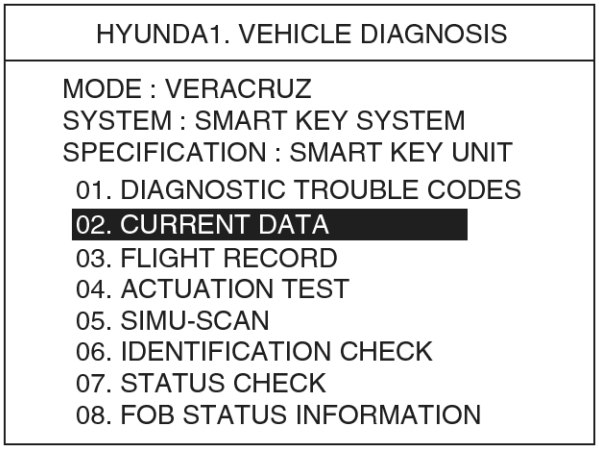
1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

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

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

Switch Diagnosis

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



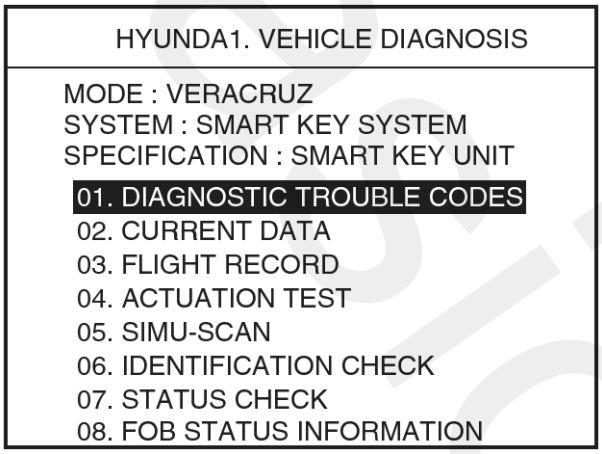
SENBE8013N

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

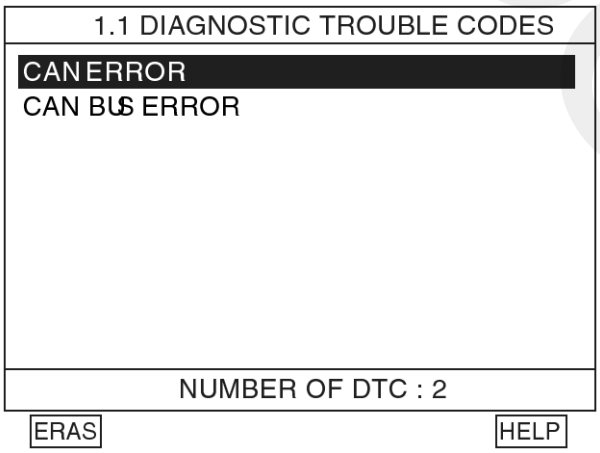
Display	Description
FL TOGGLE SW	ON : Push button is ON in the driver door handle.
FR TOGGLE SW	ON : Push button is ON in the assist door handle.
TRUNK/TAIL GATE SW	ON : Tailgate button is ON.
GEAR P POSITION	ON : Shift lever is P position.
IGN 1	ON : IGN switch is IG position.
ACC	ON : IGN switch is ACC position.
PUSH KNOB SW	ON : Push knob switch is ON.
EXTERNAL BUZZER	ON : Buzzer is ON.

Communication Diagnosis With Scan Tool (Self Diagnosis)

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



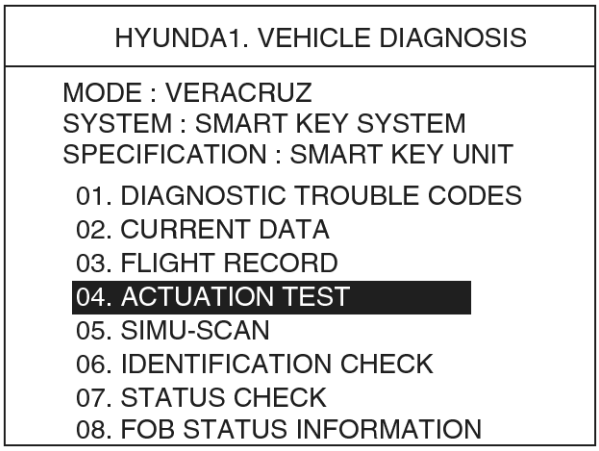
SENBE8014N



SENBE8015N

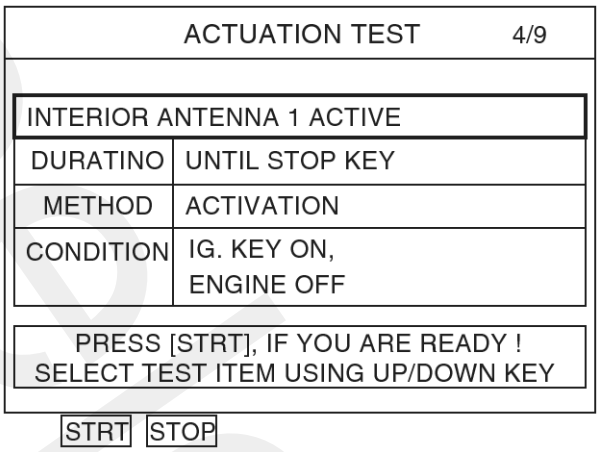
Antenna Actuation Diagnosis

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



SENBE8016N

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

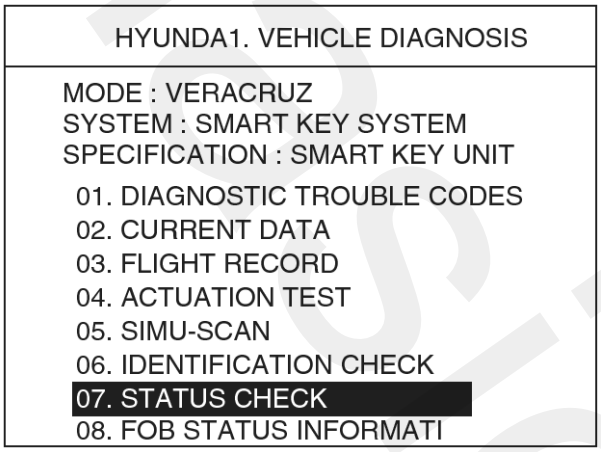


SENBE8017N

4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   - INTERIOR Antenna 1
   - INTERIOR Antenna 2
   - INTERIOR Antenna 3
   - BUMPER/ TAIL GATE Antenna
   - DRV_DR Antenna
   - AST_DR Antenna

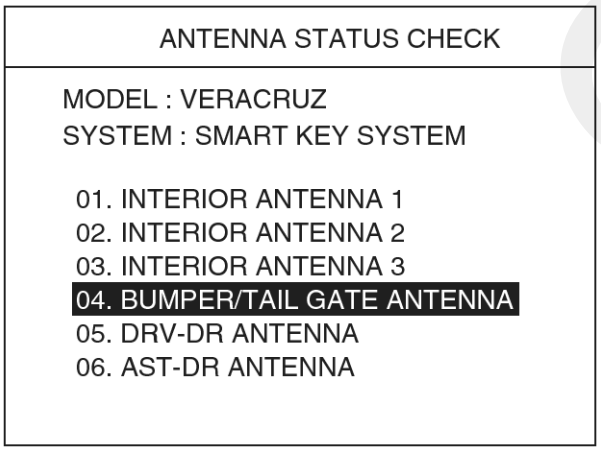
Antenna Status Check

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

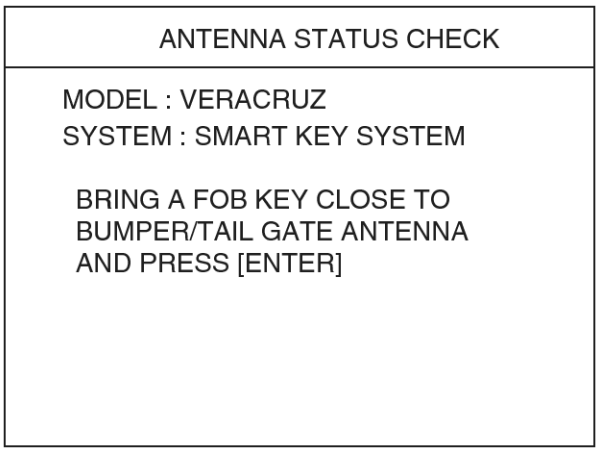


SENBE8018N

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



SENBE8019N

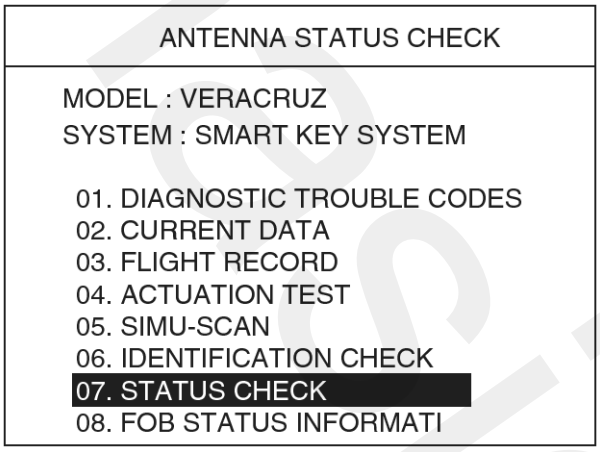


SENBE8020N

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

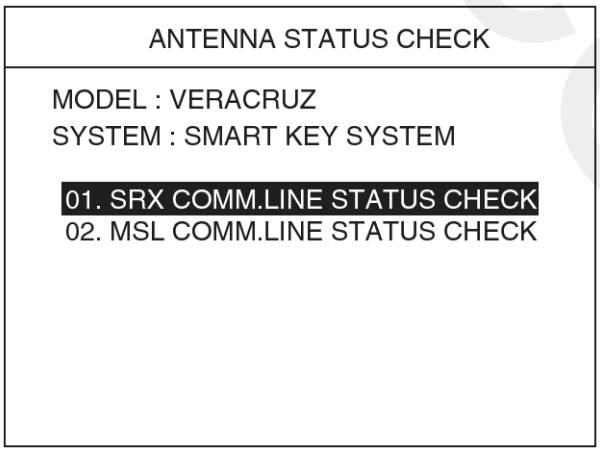
Serial Communication Status Check

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



SENBE8021N

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

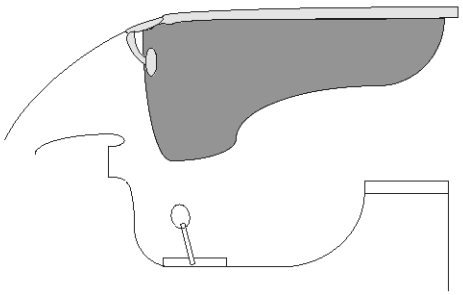


SENBE8022N

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

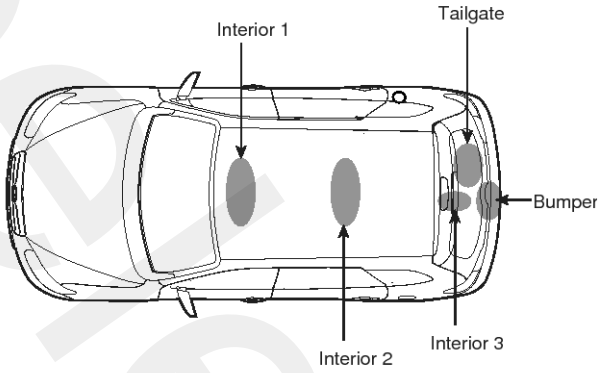
Interior Antenna Actuation Check

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



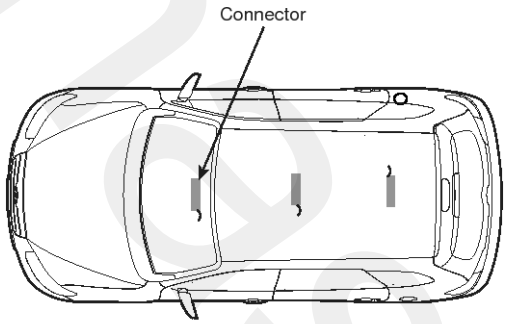
KTCF113A

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



SENBE8028N

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



SENBE8029N

Replacement

Starting After Replacing

Starting is possible by following process after replacing new smart key unit or MSL.

1. If IG OFF is done in P, IG ON will not be impossible because the MSL is locked.
   - If press a push knob switch twice in 3 seconds, IG ON will be done because MSL is unlocked.
2. Immobilizer lamp is ON after inserting a smart key.
   - If press a push knob switch twice in 3 seconds, IG ON will be done because MSL is unlocked.

NOTICE

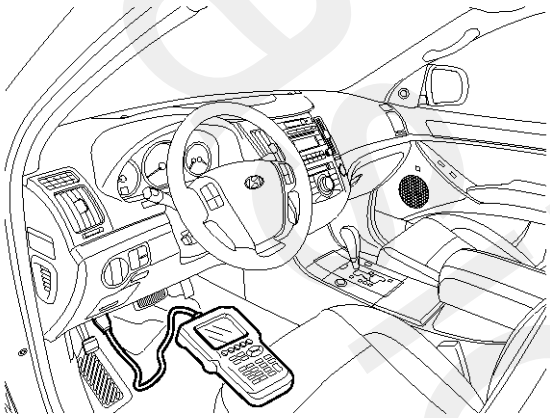
- *Starting is impossible when the lamp is not ON after inserting a smart key.*
- *Even if the solenoid is unlocked by pressing the brake pedal 3 times, check the steering column whether or no it is unlocked.*

Smart key

Smart Key

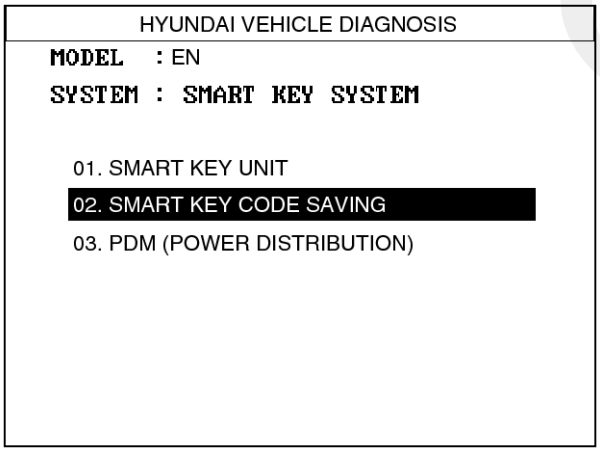
Smart Key Code Saving

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



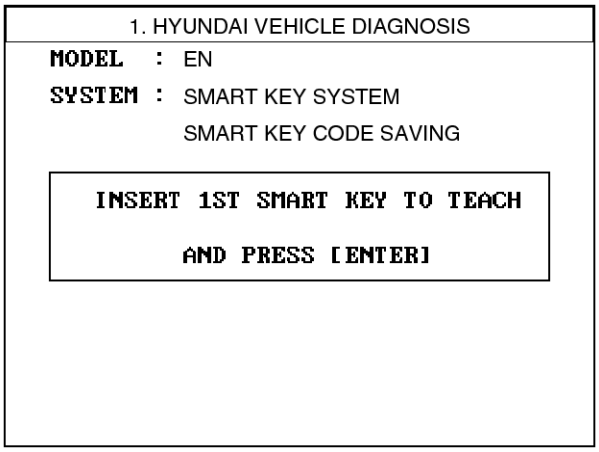
SENBE7119D

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



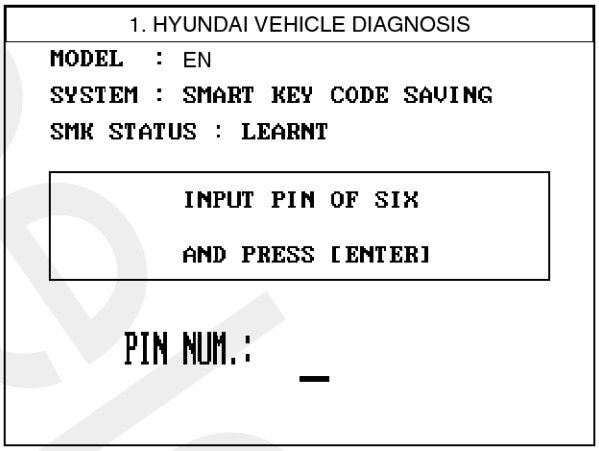
SENBE9027L

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

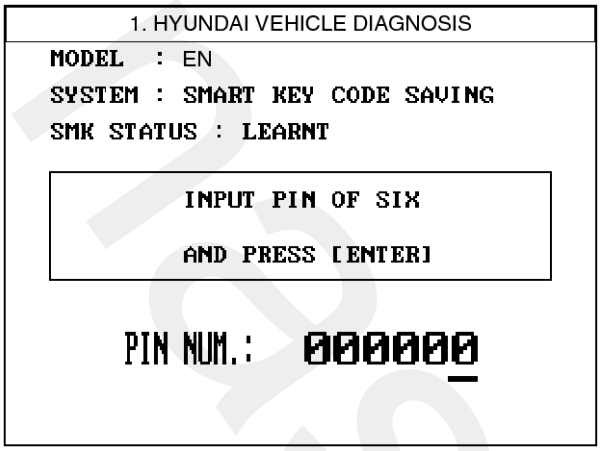


SENBE9028L

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

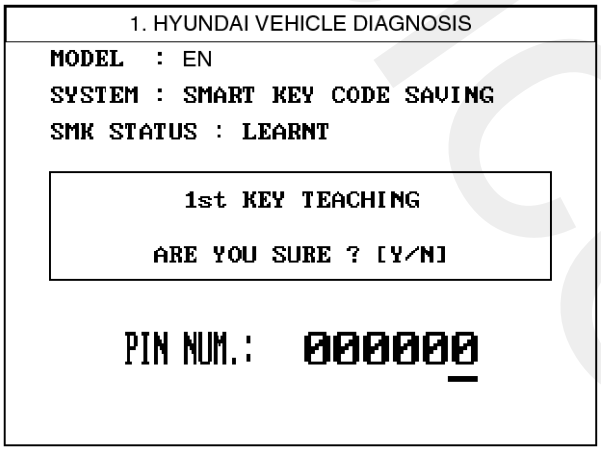


SENBE9029L



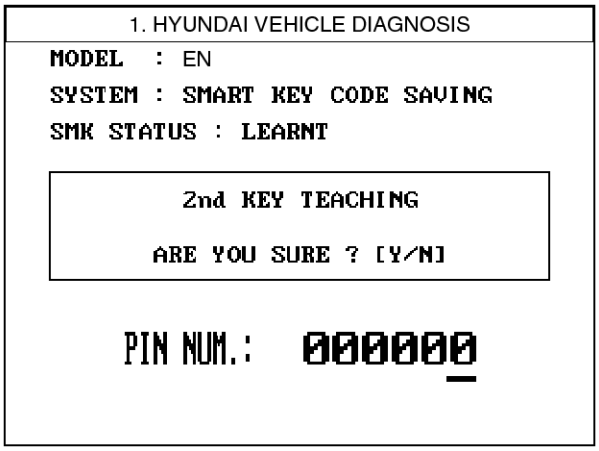
SENBE9030L

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



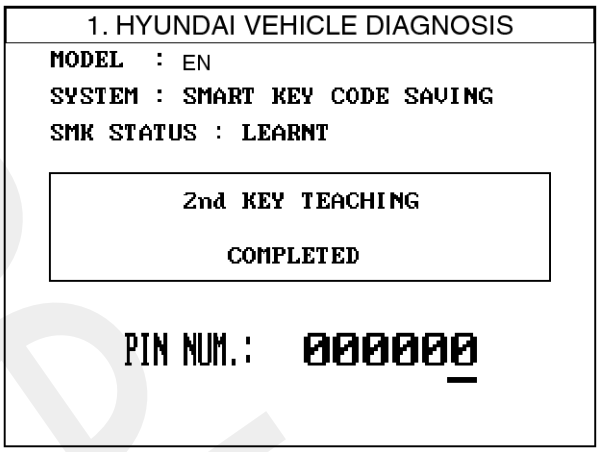
SENBE9031L

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



SENBE9032L

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

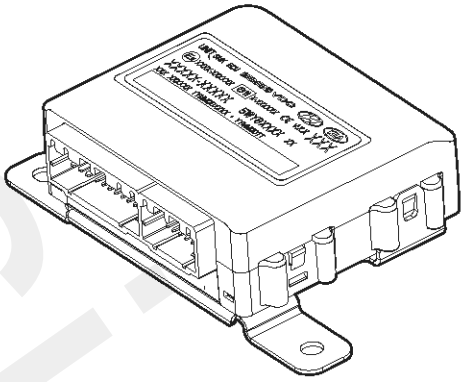


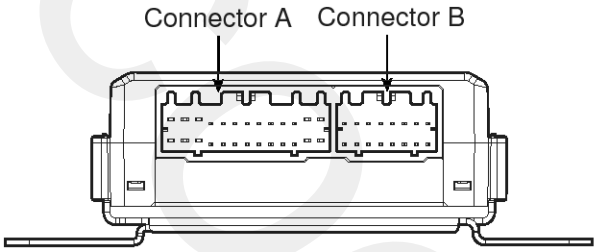
SENBE9033L

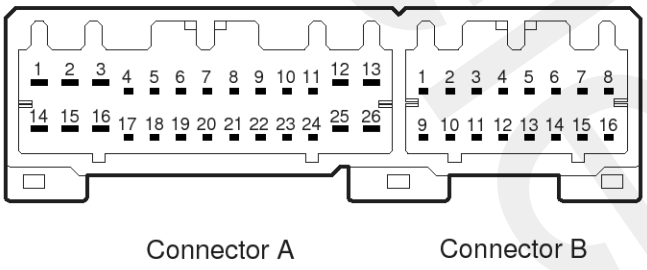
9. Then the screen will be shown as below when key teaching process is completed.

Smart key unit

Components





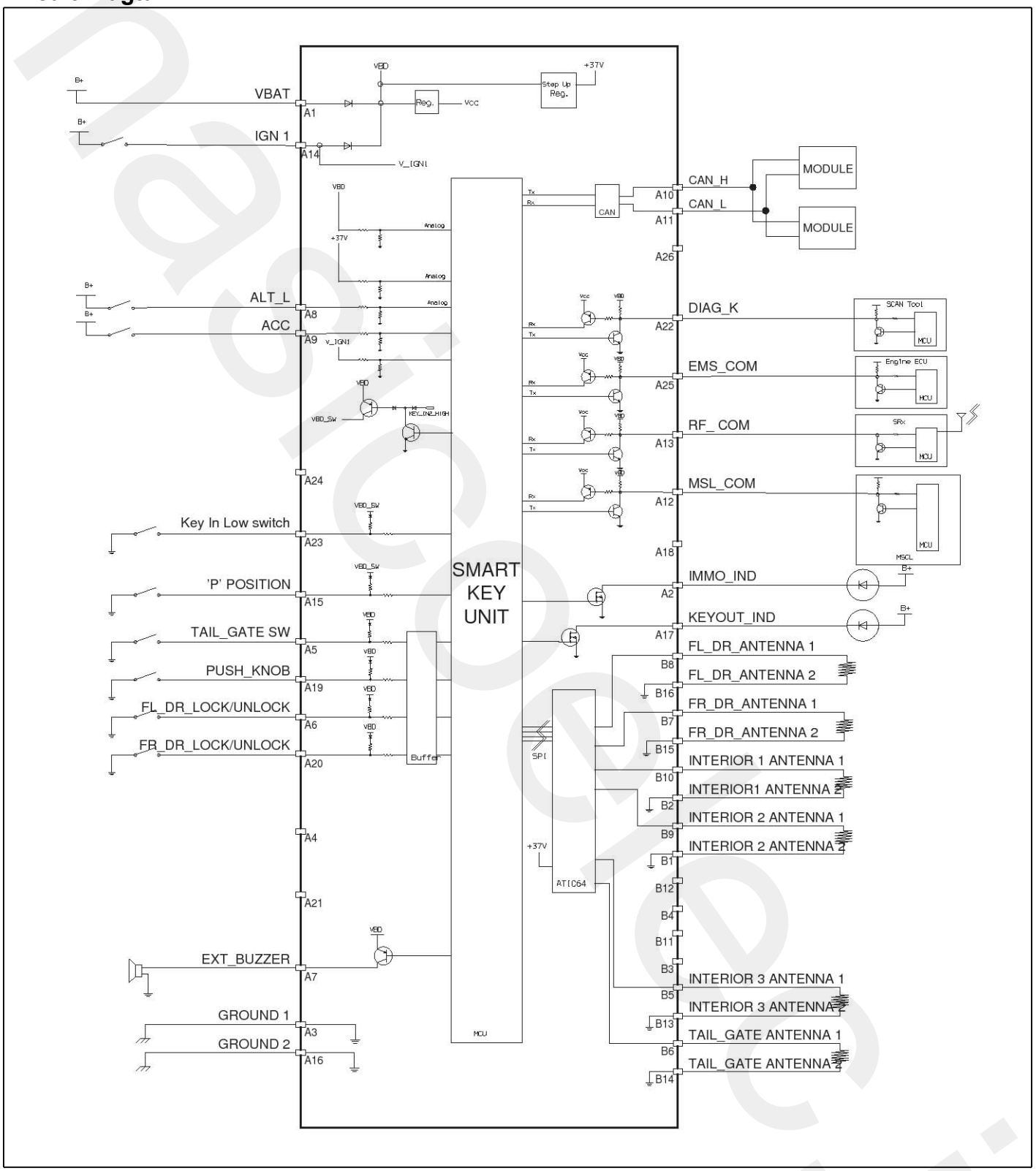


SENBE8023N

Connector Pin Information

NO	Connector A (26 Pin)			NO	Connector B (16 Pin)
1	BAT. Voltage	17	KEY OUT indicator	1	Interior2 Antenna2
2	IMMO indicator	18	-	2	Interior1 Antenna2
3	Ground 1	19	Push knob	3	-
4	-	20	Front-right door Lock/Unlock	4	-
5	Tail gate	21	-	5	Interior3 Antenna1
6	Front-left door Lock/Unlock	22	DIAGNOSIS	6	Tailgate Antenna1
7	Exterior	23	KEY IN	7	Front-right door Antenna1
8	ALT 'L	24	-	8	Front-left door Antenna1
9	ACC	25	EMS communication	9	Interior2 Antenna1
10	CAN HIGH	26	-	10	Interior1 Antenna1
11	CAN LOW			11	-
12	MSL communication			12	-
13	RF communication			13	Interior3 Antenna2
14	IGN1			14	Tailgate Antenna2
15	P position			15	Front-right door Antenna2
16	Ground 2			16	Front-left door Antenna2

Circuit Diagtam



SENBE8024N

Inspection

Smart Key Unit

- Refer to the BE group - inspection / self diagnosis with scan tool

Smart Key Switch

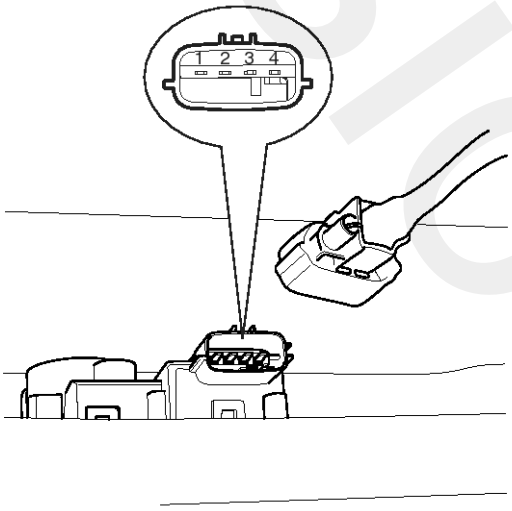
- Refer to the BE group - inspection / self diagnosis with scan tool

Antenna

- Refer to the BE group - inspection / self diagnosis with scan tool

Tailgate Switch

1. Check for continuity between the terminals.



SENBE7972D

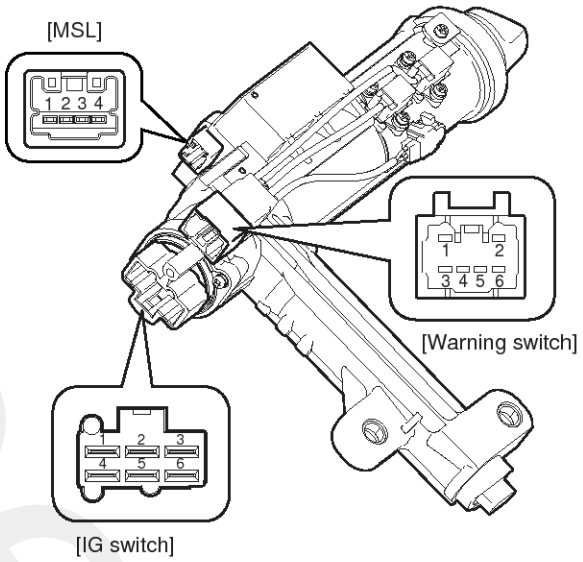
2. If continuity is not specified, inspect the switch

Terminal \ Position	OFF	ON(PUSH)
3		○
4		○

SENBE8025N

Mechatronic Steering Lock (MSL)

1. Check for continuity between the terminals of switch..
2. If continuity is not specified, inspect the switch



SENBE8026N

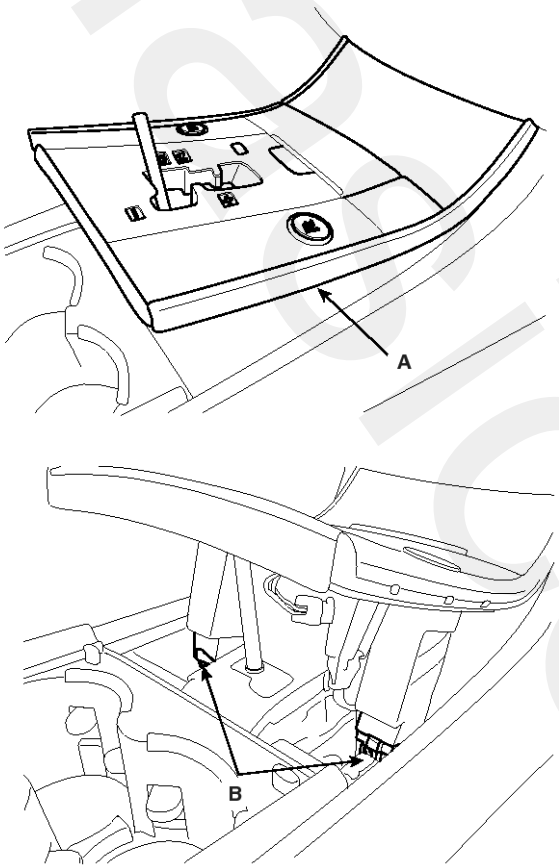
Knob position	Smark key position	Key in switch	IG switch 5	3	1	2	4	3	Illumination	Steering lock
LOCK	OUT	OFF							ON	Lock
	IN	ON								
ACC	OUT	OFF	○	○					OFF	Unlock
	IN	ON								
ON	OUT	OFF	○	○	○	○	○			
	IN	ON								
START	OUT	OFF	○		○	○		○		
	IN	ON								

SENBE8027N

Removal

Smart Key Unit

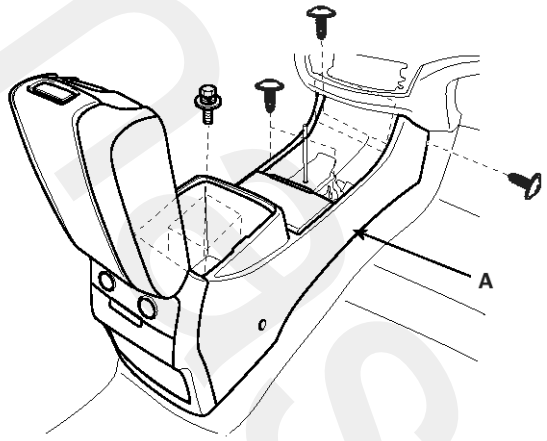
1. Disconnect the negative (-) battery terminal.
2. Remove the console under cover (A) and connectors (B). (Refer to the BD group - "Console")



SENBE7957D

3. After loosening the console mounting screws, remove the floor console assembly (A).

(Refer to the BD group - "Console")

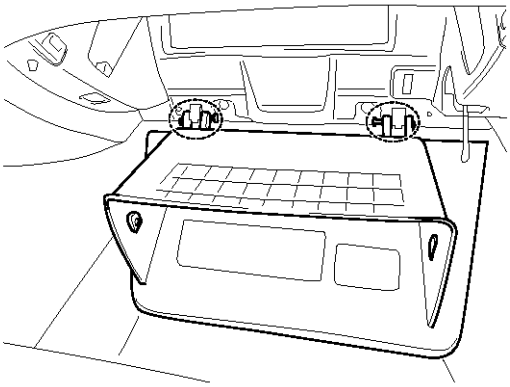


SENBE7958D

4. After loosening the smart key unit mounting bolts (B) and connector, remove the smart key unit (A).

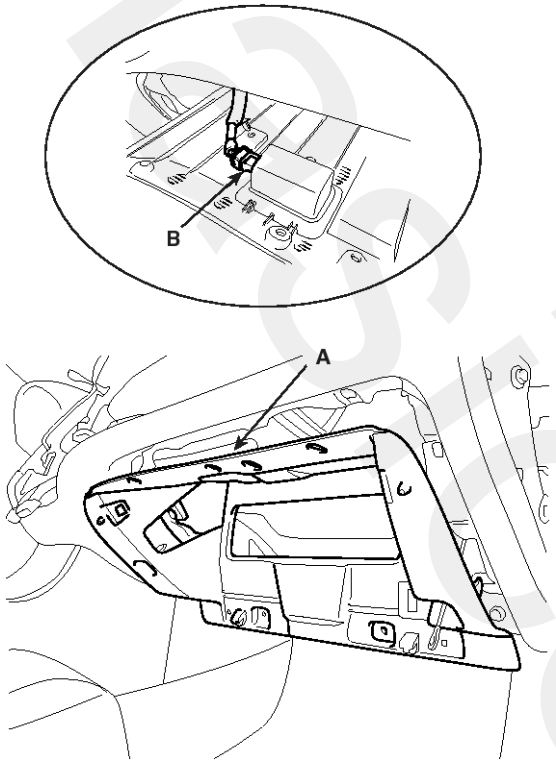
RF Receiver

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box.
   (Refer to the BD group - "Crash pad")



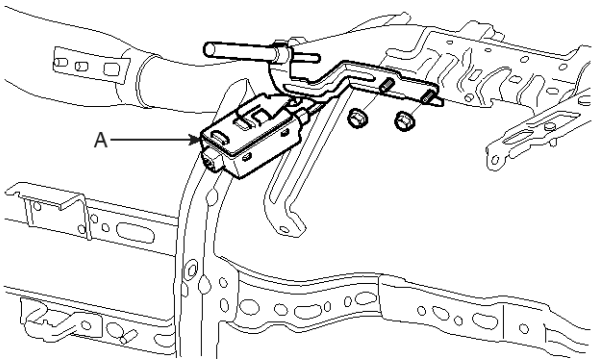
SENBE7386D

3. After loosening the mounting screws and bolts, then remove the glove box housing (A).
   Disconnect the connector (B).
   (Refer to the BD group - "Crash pad")



SENBE7387D

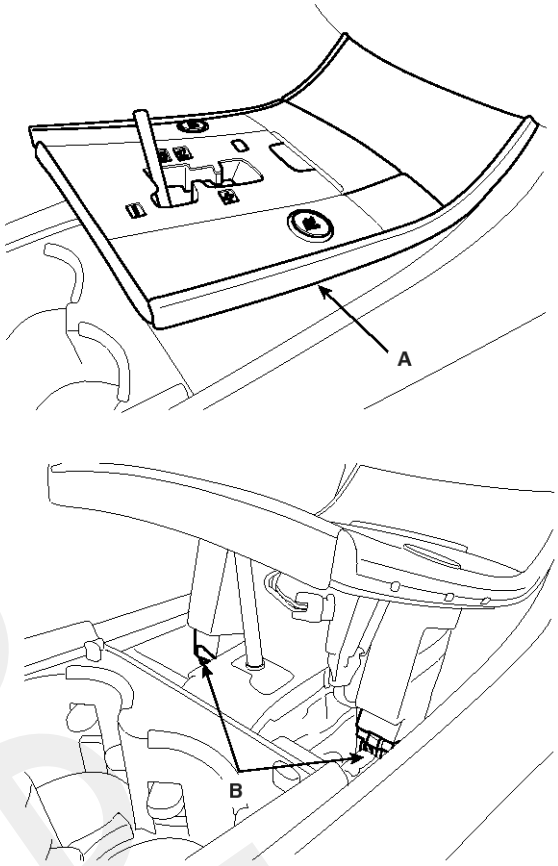
4. After loosening the mounting nuts(2EA), then remove the connector.



SENBE7960D

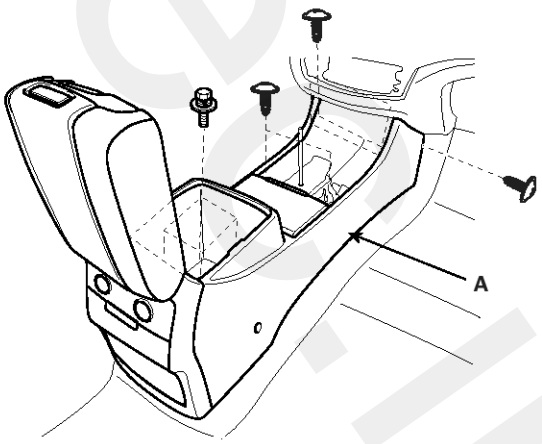
Interior 1 Antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the console under cover (A) and connectors (B).
   (Refer to the BD group - "Console")



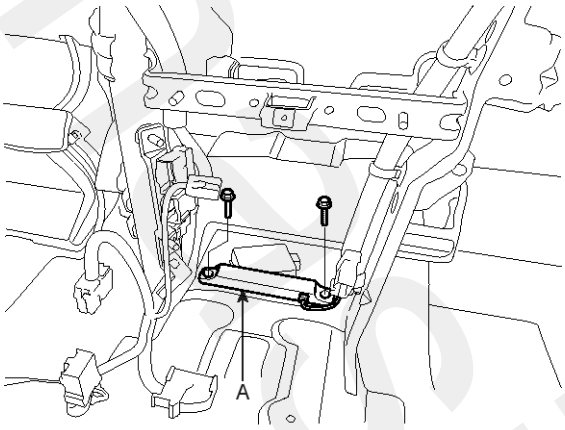
SENBE7957D

3. After loosening the console mounting screws, remove the floor console assembly (A). (Refer to the BD group - "Console")



SENBE7958D

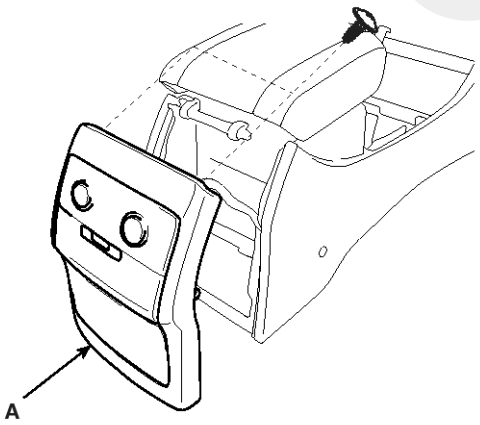
4. After loosening the antenna nuts (2EA) and connector, remove the interior 1 antenna (A).



SENBE7961D

Interior 2 Antenna

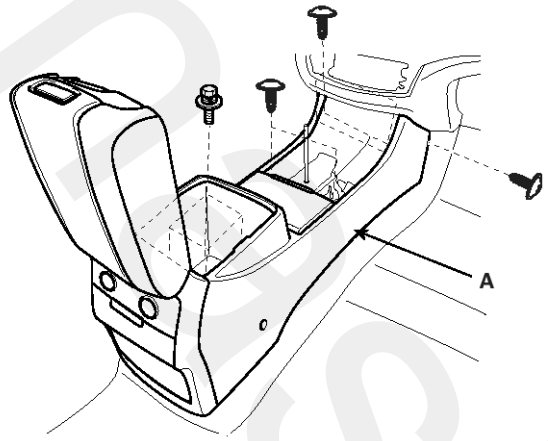
1. Disconnect the negative (-) battery terminal.
2. Remove the console rear cover (A) and connectors. (Refer to the BD group - "Console")



SENBE7962D

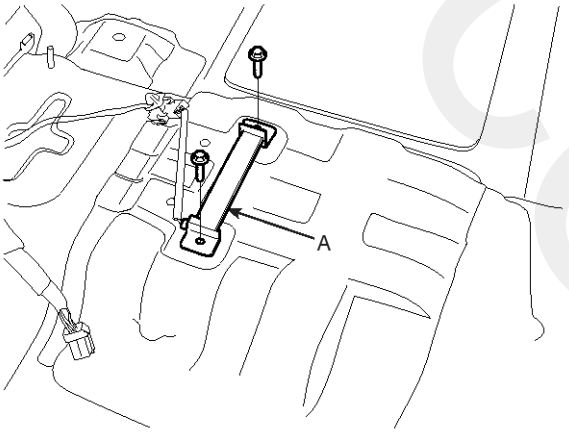
3. After loosening the console mounting screws, remove the floor console assembly (A).

(Refer to the BD group - "Console")



SENBE7958D

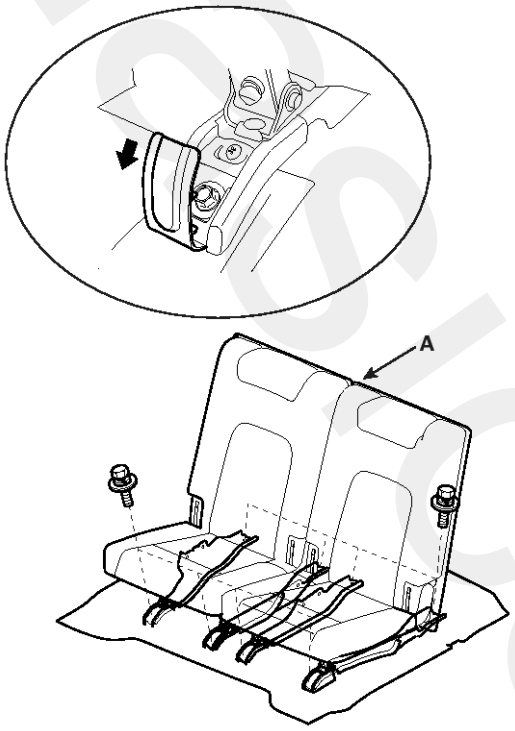
4. After loosening the antenna bolts (2EA) and connector, remove the interior 2 antenna (A).



SENBE7963D

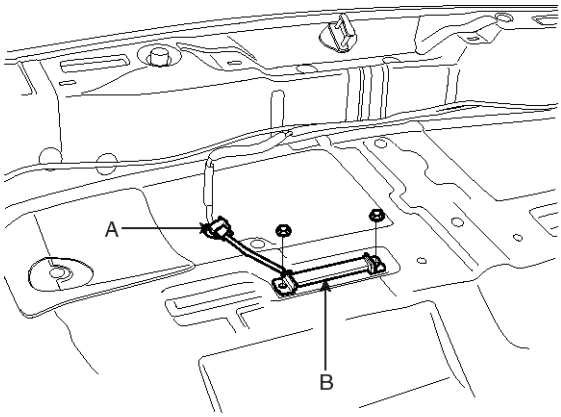
Interior 3 Antenna

1. Disconnect the negative (-) battery terminal.
2. After loosening the mounting bolts, then remove the third seat assembly (A).
   (Refer to the BD group - "Rear seat")



SENBE7964D

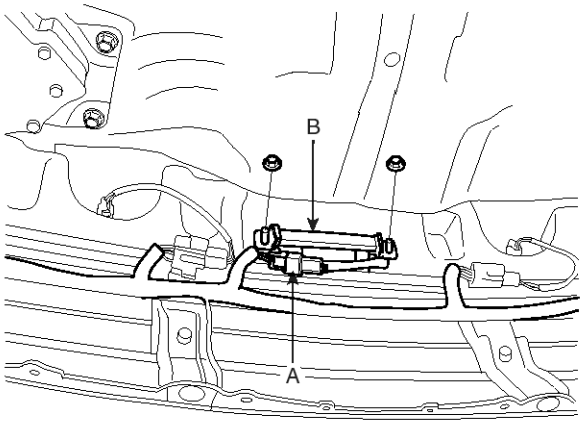
3. After loosening the antenna nuts (2EA) and connector (A), remove the interior 3 antenna (B).



SENBE7965D

Exterior Bumper Antenna

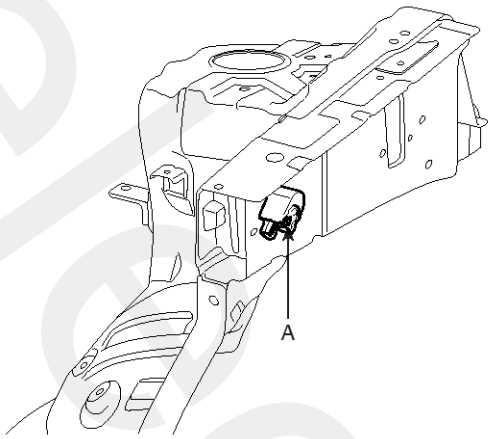
1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper.
   (Refer to the BD group - "Rear bumper")
3. After loosening the antenna connector (A) on the right side of rear bumper and nuts (2EA), remove the interior exterior bumper antenna (B).



SENBE7966D

Buzzer

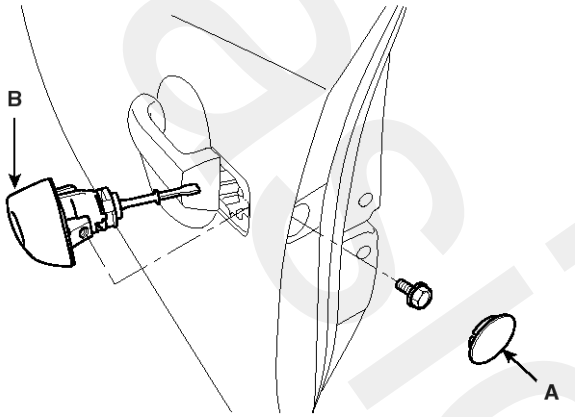
1. Disconnect the negative (-) battery terminal.
2. Remove the buzzer (A) in the clip hole after disconnecting the connector on the side rail panel



SENBE7967D

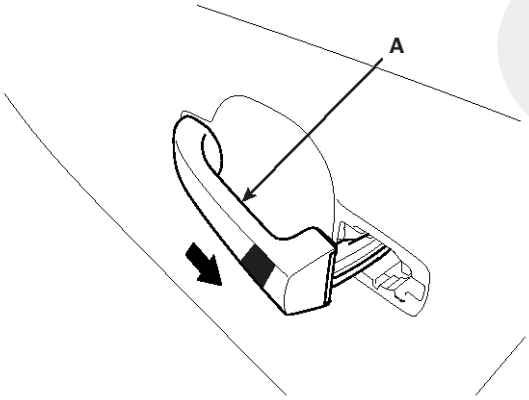
Door Outside Handle

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector after removing the door trim. (Refer to the BD group - "Front door")
3. After loosening the mounting bolt and cap (A), then remove the key holder (B).



SENBE7968D

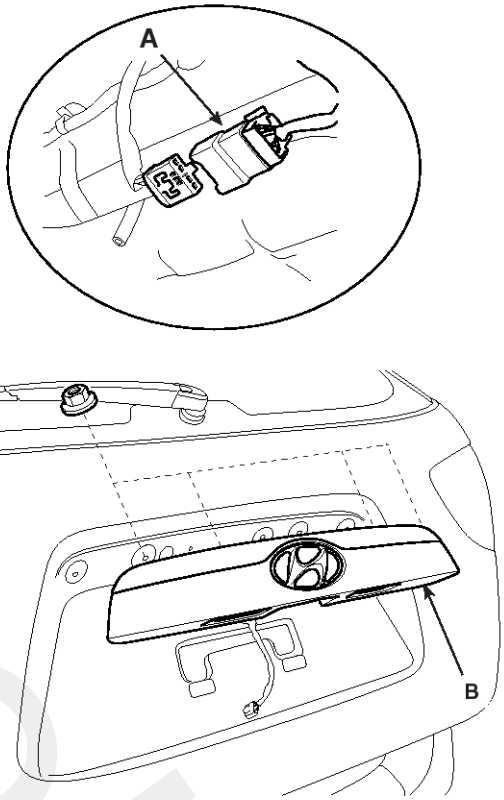
4. Remove the outside handle (A) by sliding it rearward.



SENBE7969D

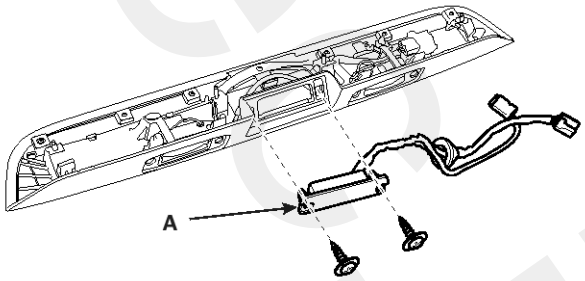
Tailgate Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate trim")
3. Disconnect the connector (A). After loosening the remove tailgate garnish mounting nuts, then tailgate garnish (B).



SENBE7970D

4. Remove the outside handle (A) after loosening the outside handle mounting screws.



SENBE7971D

Installation

Smart Key Unit

1. Install the smart key unit.
2. Install the smart key unit mounting bolt and connector.
3. Install the console assembly.
4. Install the console under cover after connecting the connector.
5. Install the negative (-) battery terminal and check the smart key system.

RF Receiver

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

Interior 1 Antenna

1. Install the interior 1 antenna.
2. Install the console assembly.
3. Install the console under cover after connecting the connector.
4. Install the negative (-) battery terminal and check the smart key system.

Interior 2 Antenna

1. Install the interior 2 antenna.
2. Install the connector mounting bracket..
3. Install the console assembly.
4. Install the console rear cover after connecting the connector.
5. Install the negative (-) battery terminal and check the smart key system.

Interior 3 Antenna

1. Install the interior 3 antenna.
2. Install the connector mounting bracket..
3. Install the third seat assembly.
4. Install the negative (-) battery terminal and check the smart key system.

Exterior Bumper Antenna

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

Buzzer

1. Install the buzzer.
2. Install the negative (-) battery terminal and check the smart key system.

Door Outside Handle

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

Tailgate Switch

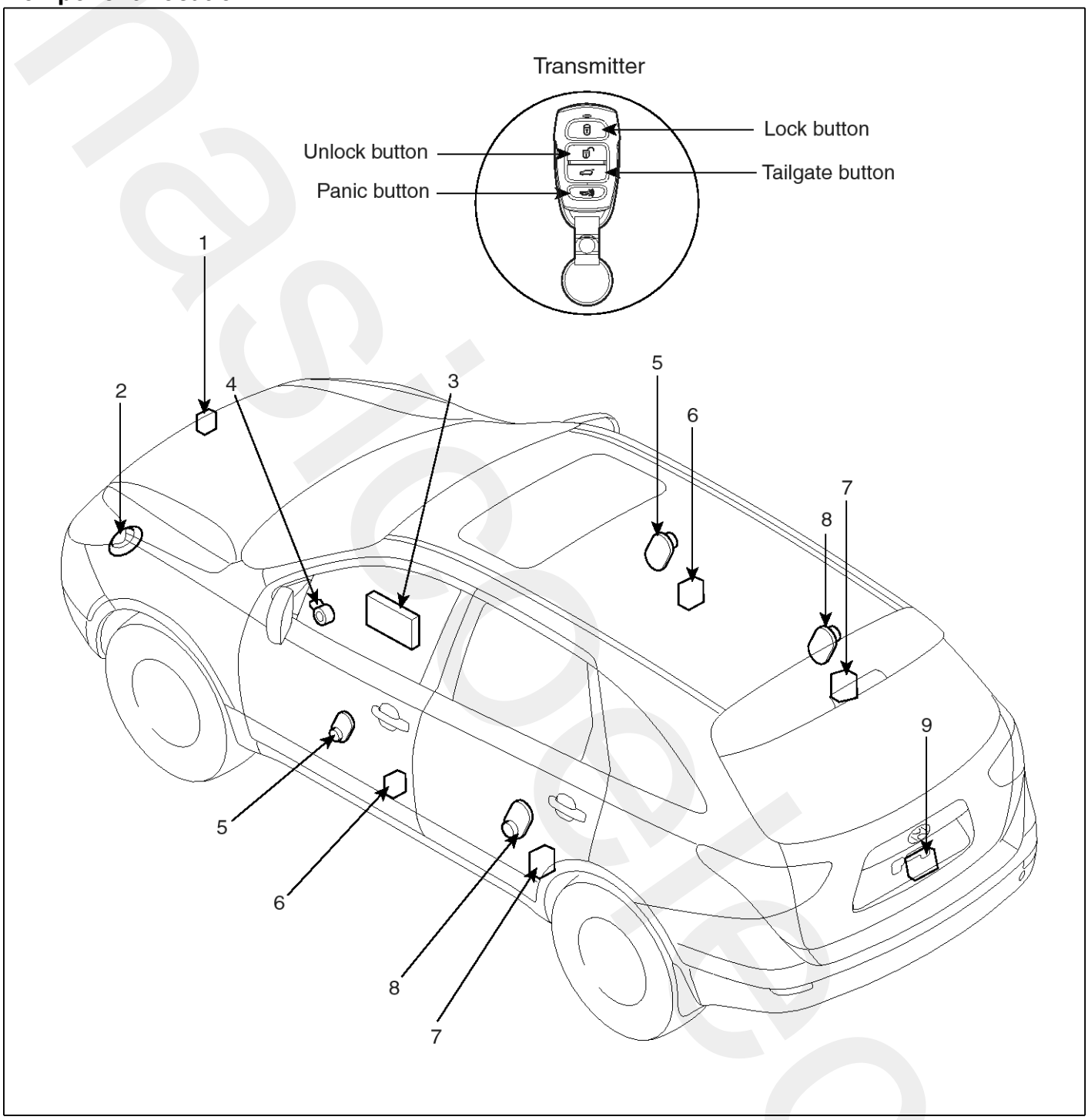
1. Install the tailgate switch.
2. Install the tailgate garnish.
3. Install the tailgate trim.
4. Install the negative (-) battery terminal and check the smart key system.

Keyless Entry And Burglar Alarm

Specification

Items	Specifications
Power source	3V
Operating temperature	-20˚C ~ +65˚C
Transmission frequency	447.725MHz
Indicator	LED
Button number	4
Button	Lock
	Unlock
	Panic
	Tail gate

Component Location



SENBE9006L

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. Powerlatch assembly

Description

Burglar Alarm System

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

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

- A door is forced open.
- The tailgate is opened without using the key.
- The hood is opened.

When the system is set off, the alarm sounds and the hazard lamp flash for about 30 seconds 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 tailgate are closed and locked. When everything is closed and locked, none of the control unit inputs are grounded.

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

If anything is opened 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.

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/UNLOCK button, all doors lock. When you push the LOCK/UNLOCK button again, all doors unlock.

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

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

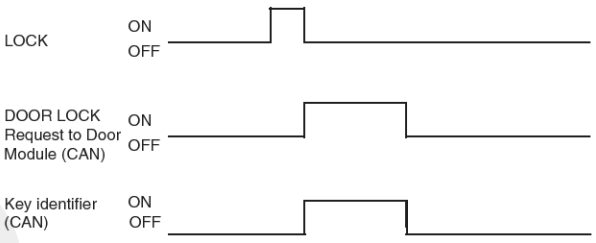
The system will signal you when the doors lock and unlock by flashing the hazard lamp once when they lock, and twice when they unlock.

Operation

1. DOOR LOCK FUNCTION

   In case of non SMK(Smart key) variant: If LOCK SWITCH on RF Key Transmitter(TX LOCK) is pushed, LOCK DATA is sent to DOOR MODULE.

   DOOR MODULE controls the Lock output.

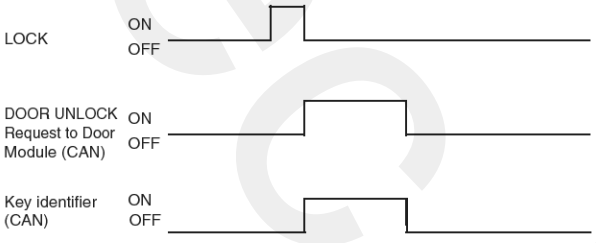


SENBE7122L

2. DOOR UNLOCK FUNCTION

   In case of non SMK(Smart key) variant: If UNLOCK SWITCH on RF Key (TX UNLOCK) is pushed, UNLOCK DATA is sent to DOOR MODULE.

   DOOR MODULE controls the Unlock output.



SENBE7123L

3. POWER TAILGATE OPEN FUNCTION

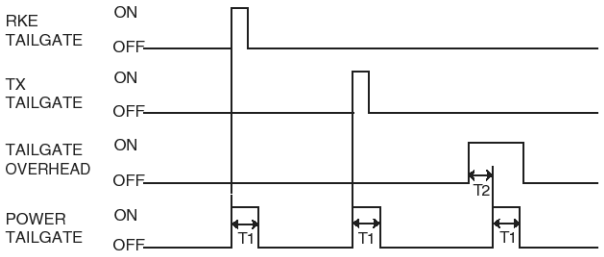
The BCM controls two outputs for TAILGATE function.

- POWER TAILGATE : command signal to PTGM triggered by TX or RKE or TAILGATE MASTER BUTTON.
- TAILGATE LATCH RELAY : Direct Output, triggered by O/S HANDLE switch or POWER TAILGATE.

TAILGATE open command can be issued versus configuration from different sources with the only status of all door unlock. :

- In case of SMK variant: from SMK ECU as a RKE command via CAN (RKE TAILGATE)
- In case of non SMK variant: from a RF RKE telegram (TX TAILGATE)
- External TGATE open switch (TAILGATE MASTER BUTTON)

If the TAILGATE opening command has been received by BCM, the POWER TGATE is driven for 500 msec ± 100 msec.



SENBE7124L

T1 : 500 msec. ± 50 msec.,

T2 : 500 msec. ± 50 msec.

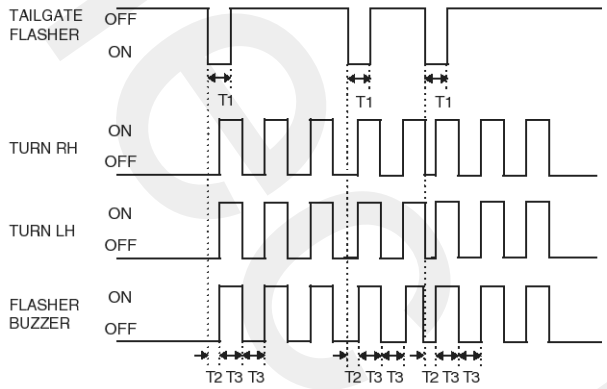
1) Table for the action taken when second command is requested during the delay / activation time by first co mmand

Condition when second command is requested		Action taken
RKE (In case of SMK option) / TX(Transmitter)	During the delay time(T2) by first command	Activate the second command immediately
	During the activation time by first command	Inhibit (disregard the second command)
TAILGATE MASTER BUTTON	During the activation time by first command	Inhibit (disregard the second command)

4. POWER TAILGATE CHIME WARNING CONTROL

When the BCM detects TAILGATE FLASHER then starts 3 times Hazard flashing with normal turn singal operaion period (85 ± 10 period/min).

During the FLASHER BUZZER output period, if another input of TAILGATE FLASHER is detected, stop the current output and begin the new output based on the new input of TAILGATE FLASHER.



SENBE7055L

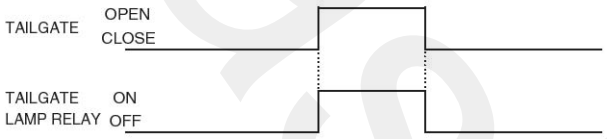
T1 : 500 msec. ± 50 msec.,

T2 : < 250 msec.,

T3 : Normal Flasher time

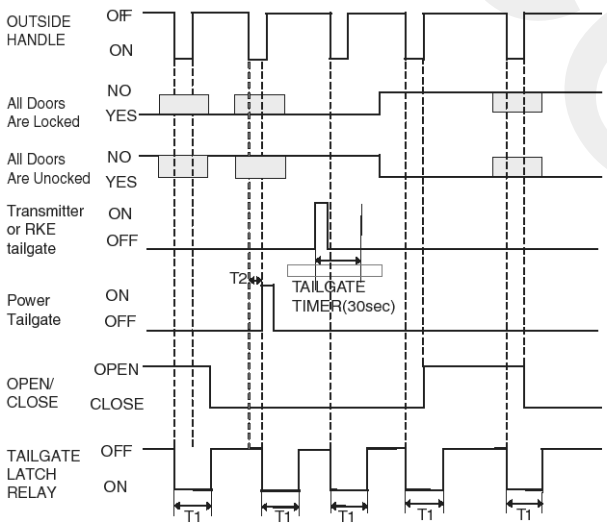
If the TAILGATE FLASHER is not received after 200 msec. at the output of POWER TAILGATE, flash Hazard two times.

5. TAILGATE LAMP CONTROL



SENBE7056L

6. TAILGATE LATCH CONTROL



SENBE7057L

T1 : 500 ± 50 msec.,

T2 : Fob search time

NOTICE

Scratched area in the timing diagram above means "Don't care" condition.

Summary for TAILGATE LATCH RELAY with the condition of either all door locked or all door unlocked.

- RKE TAILGATE

  Regardless of all door lock / unlock status, TAILGATE TIMER (30 sec.) begins with the input of RKE TAILGATE.

  When another input of RKE TAILGATE comes in during the TAILGATE TIMER (30 sec.), it is ignored.

- POWER TAILGATE

  This input signal controls TAILGATE LATCH RELAY under the only condition that is TAILGATE closed. Door lock / unlock status doesn't factor to operate TAILGATE LATCH RELAY by TAILGATE. There is no TAILGATE TIMER (30 sec.) running for this input. Other case, this signal doesn't control the TAILGATE LATCH RELAY.

- OUTSIDE HANDLE switch

  a. When all door is in unlock status with no concern of TGATE open/close status, TAILGATE LATCH RELAY is always ON with the input of O/S HANDLE.

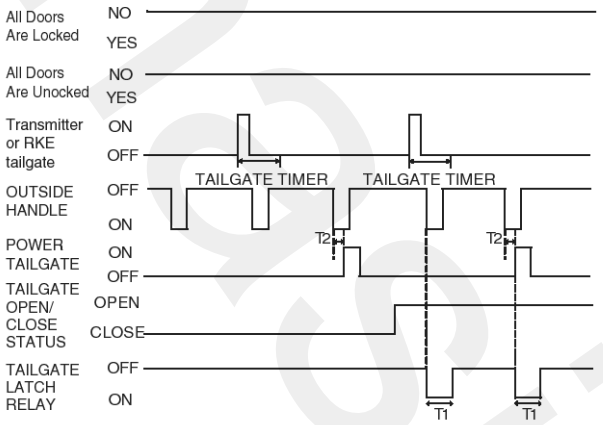
  b. When TAILGATE is open, TAILGATE LATCH RELAY is ON by OUTSIDE HANDLE regardless of lock/unlock status of doors.

  c. When all door is in lock status, there are three cases that make TAILGATE LATCH RELAY ON with the input of OUTSIDE HANDLE.

     1) TAILGATE is closed and OUTSIDE HANDLE input comes in during TAILGATE TIMER (30 sec.)

     2) TAILGATE is open

3) TAILGATE is closed and passive access TAILGATE (POWER TAILGATE) command is detected



SENBE7058L

T1 : 500 ± 50 msec.,

T2 : Fob search time

7. SUMMARY OF TAILGATE OPEN CONDITION

stands for TAILGATE LATCH RELAY.

stands for POWER TGATE.

stands for TAILGATE TIMER (30 sec.)

simply mean that output is ON or OFF with a certain input.

Variant	SMART KEY (SMK)						Non-SMK					
	PTGM			Non -PTGM			PTGM			Non -PTGM		
Output / Input	T (30s)	Latch	Power	T (30s)	Latch	Power	T (30s)	Latch	Power	T (30s)	Latch	Power
Transmitter(TX)	O	X	O	O	X	O	O	X	O	O	X	O
RKE (SMK)	O	X	O	O	X	O	X	X	X	X	X	X
POWER TAILGATE	X	O	X	X	O	X	X	X	X	X	X	X
MASTER BUTTON	X	X	O	X	X	X	X	X	O	X	X	X
OUTSIDE HANDLE	X	O	X	X	O	X	X	O	X	X	O	X

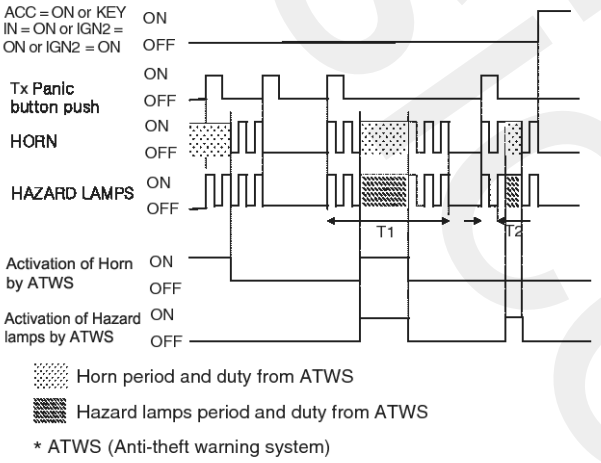
SENBE7059L

8. It is called Panic functionality to indicate the vehicle panic alarm status with Horn and flasher.

   This functionality is activated by Panic button of RF key during (KEY IN = OFF and IGN2 = OFF and IGN1 = OFF) and one of below mentioned conditions release the Panic alarm status:

   Panic alarm must be independent of the ATWS state (arm, disarm, alarm,...) but is stopped when entering in ARM mode.

   - If an ATWS alarm is in progress, a panic alarm function can be started and stopped.
   - If a Panic alarm function is in progress a ATWS Alarm can start.

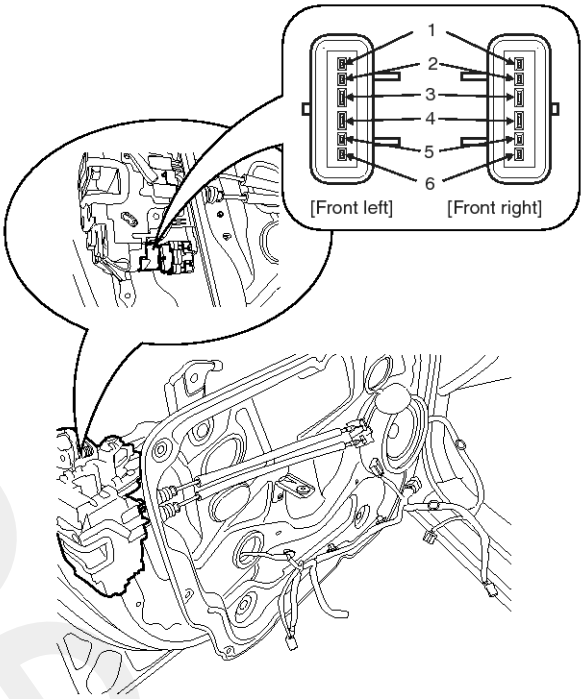


SENBE7065L

Inspection

Front Door Lock Actuator

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors (6P) from the actuator.



SENBE7130L

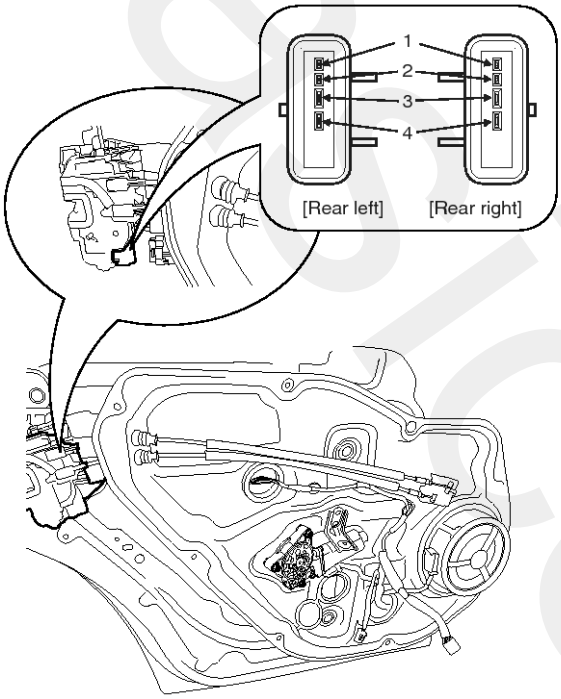
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		3	4
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

SENBE7131L

Rear Door Lock Actuator

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
3. Disconnect the connectors from the actuator.



SENBE7132L

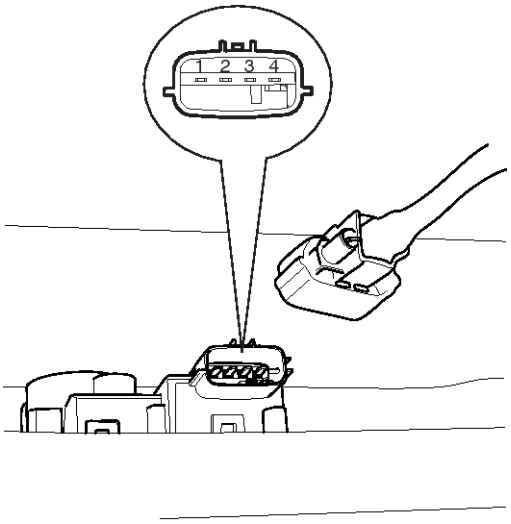
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		3	4
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

SENBE7133L

Tailgate Lock Actuator Inspection

1. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
2. Disconnect the 4P connector from the actuator.



SENBE7134D

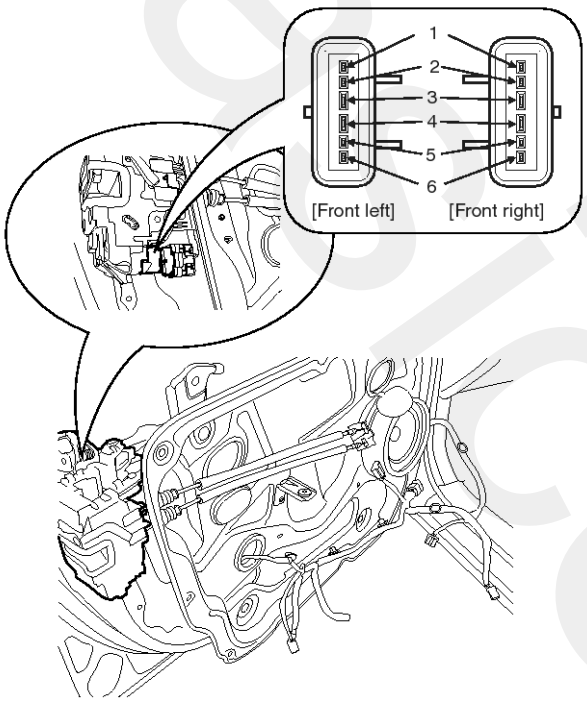
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	3	4
Lock → Unlock	⊕	⊖
Unlock → Lock		

SENBE7135L

Front Door Lock Switch

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors from the actuator.



SENBE7130L

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

Position		Terminal 2	5	6
Front left	Clockwise	○	○	
	Counter-clockwise	○		○
Front right	Clockwise	○		○
	Counter-clockwise	○	○	

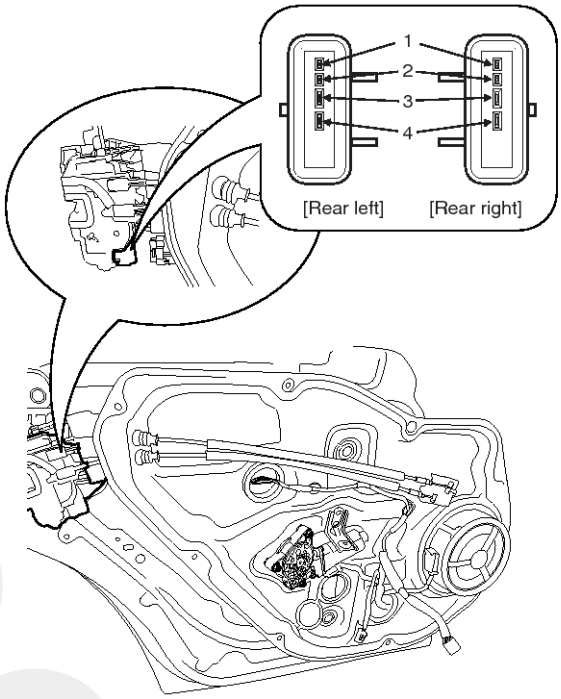
SENBE7136L

Position		Terminal 1	2
Front left	Unlock	○	○
Front right	Unlock	○	○

SENBE7148L

Rear Door Lock Switch

1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
3. Disconnect the connectors from the actuator.



SENBE7132L

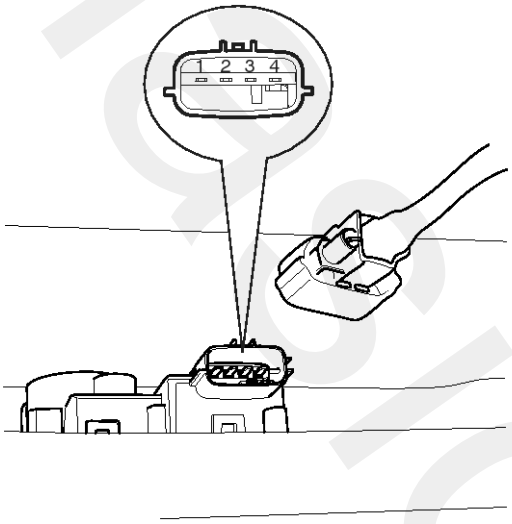
4. Check for continuity between the terminals in each switch position according to the table.

Position		Terminal 1	5
Rear left	Unlock	○	○
Rear right	Unlock	○	○

SENBE7137L

Tailgate Switch

1. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
2. Disconnect the 4P connector from the actuator.



SENBE7134D

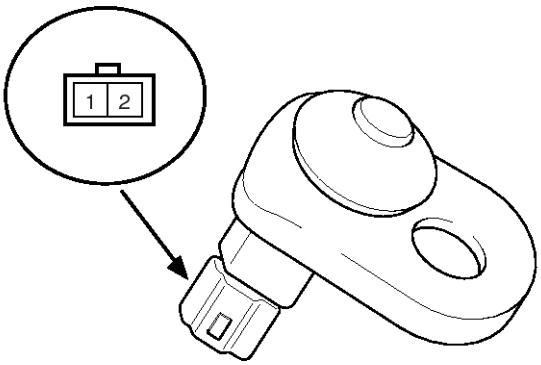
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	2
Lock → Unlock	○	○

SENBE7138L

Door Switch

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



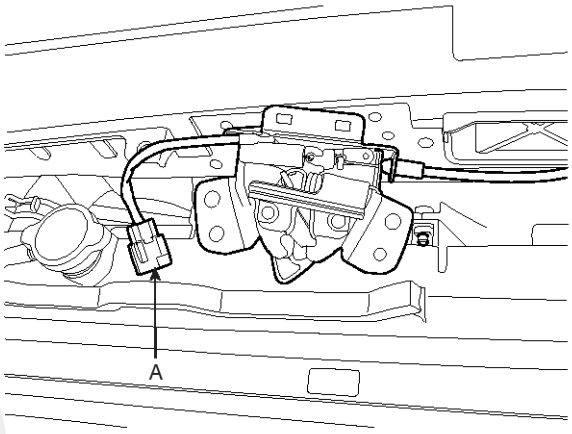
KTKD020A

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

ETQF180D

Hood Switch

1. Remove the hood latch.
   (Refer to the BD group - "Hood")
2. Disconnect the connector (A) from the hood switch.



SENBE7139D

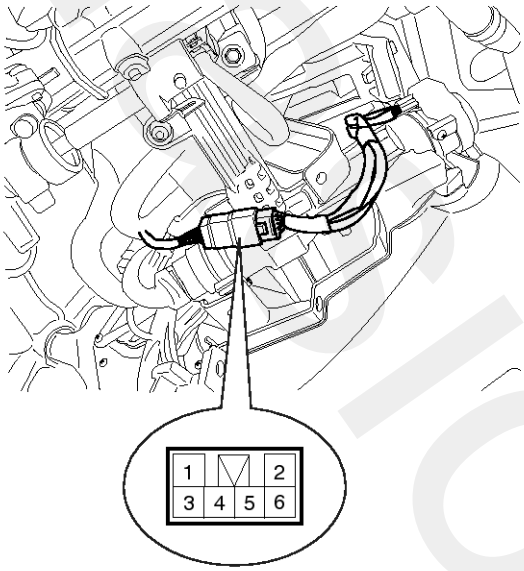
3. Check for continuity between the terminals and ground according to the table.

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

ETBF180B

Key Warning Switch

1. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
2. Disconnect the 6P connector from the key warning switch.



SENBE7141D

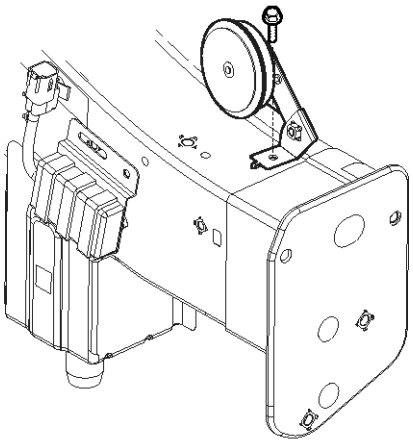
3. Check for continuity between the terminals in each position according to the table.

Terminal / Key position	5	6
Insert	○——○	
Removal		

ETQF180F

Burglar Horn

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.



SENBE7143D

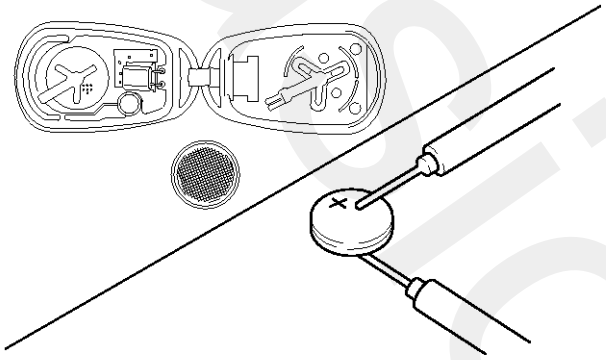
3. The burglar horn should make a sound. If the burglar horn fails to make a sound replace it.

Transmitter

Inspection

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

Standard voltage : 3V

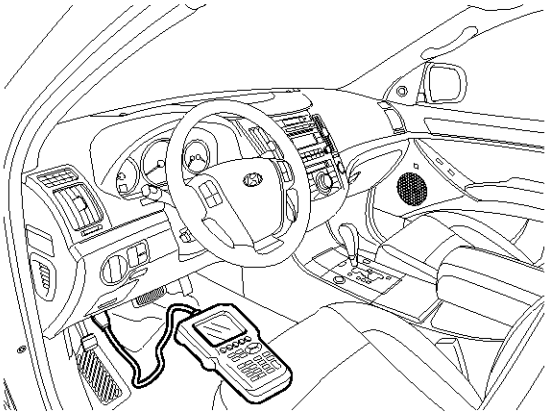


ATLG029A

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 transmitter is failure, replace only the transmitter (A).

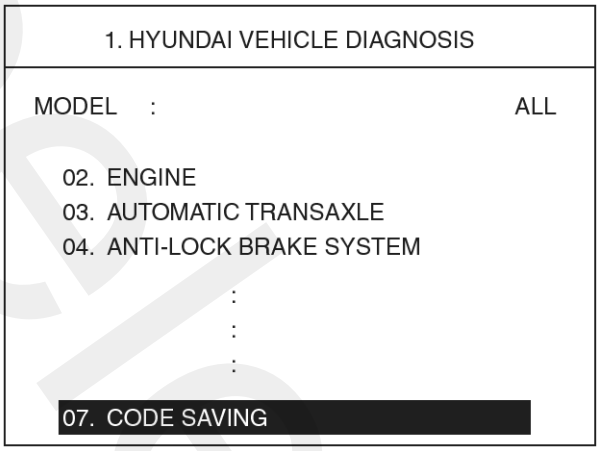
Transmitter Code Registration

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



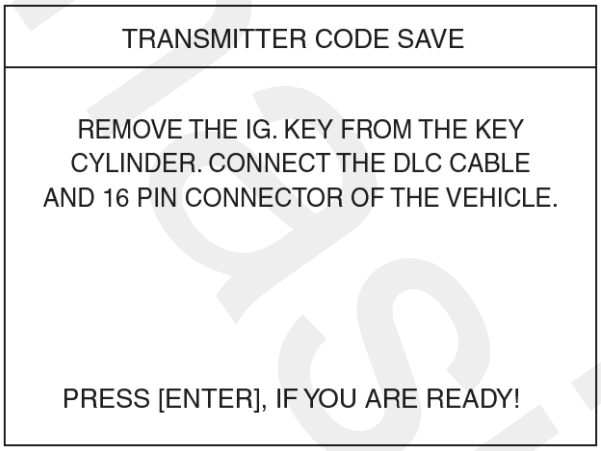
SENBE7119D

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



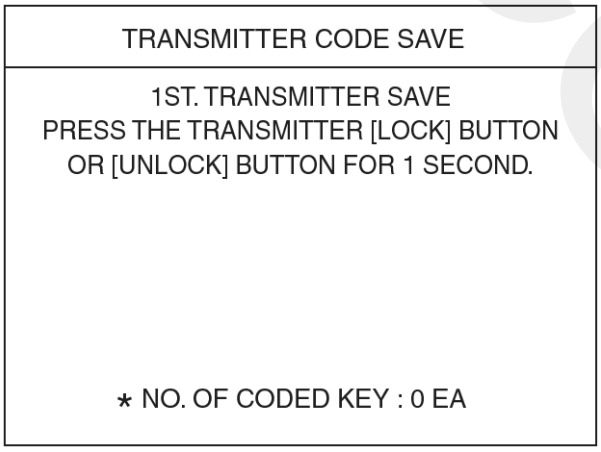
ETPD700I

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

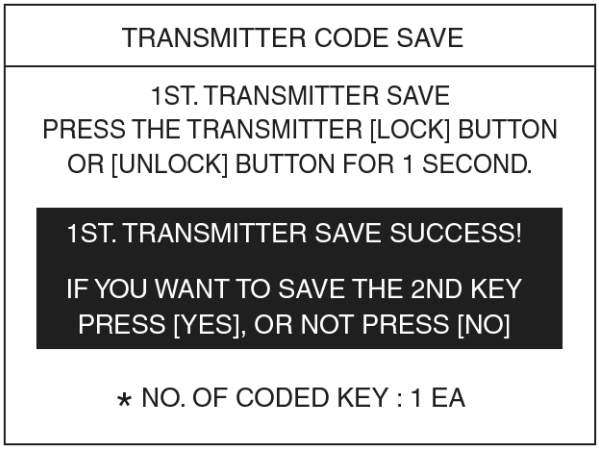


ETRF065M

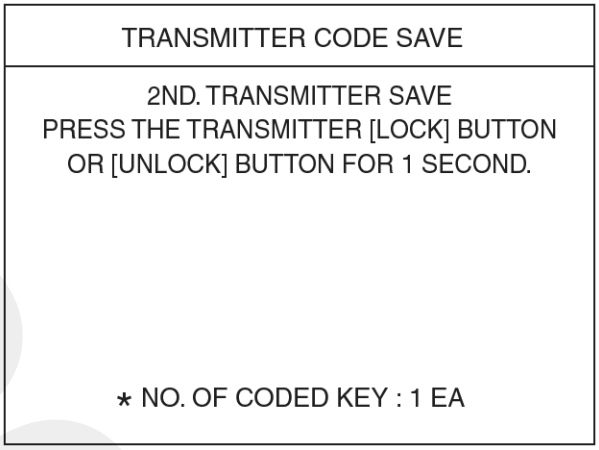
4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow steps 1 to 4 and then code saving is completed.



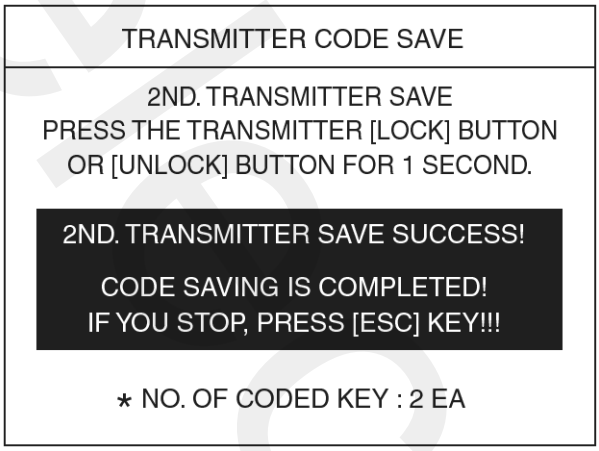
ETRF065N



ETRF065O



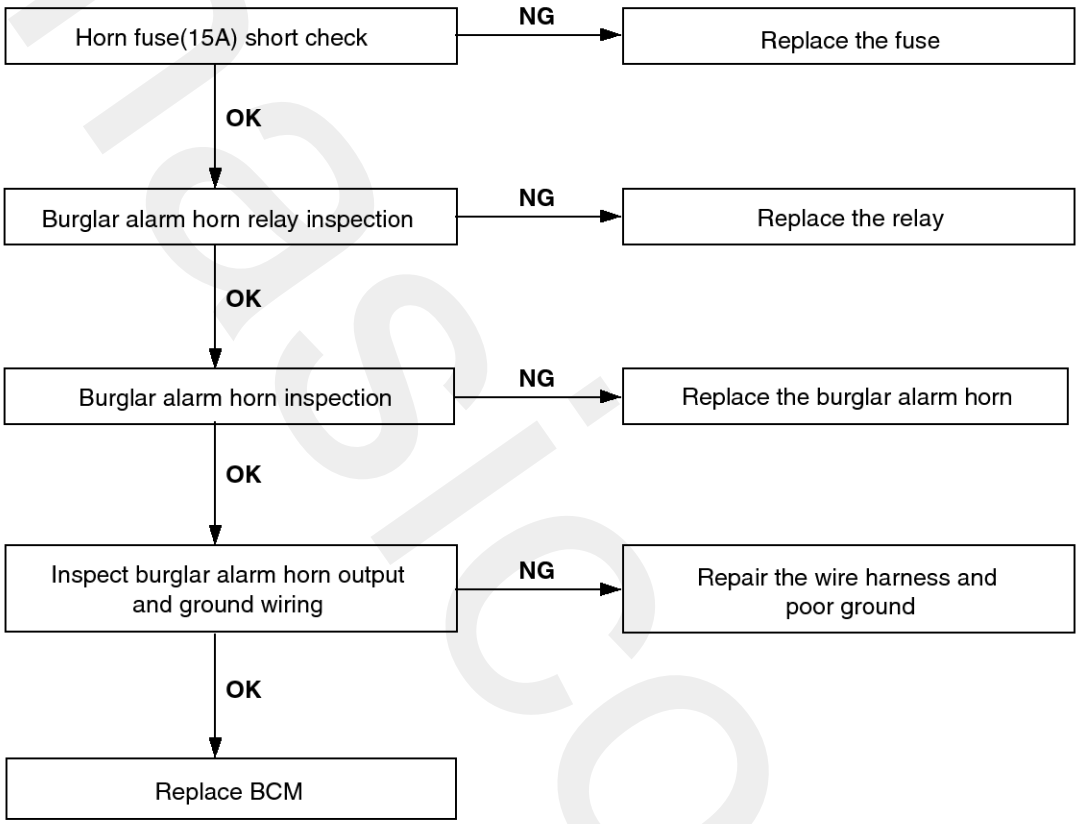
ETRF065P



ETRF065Q

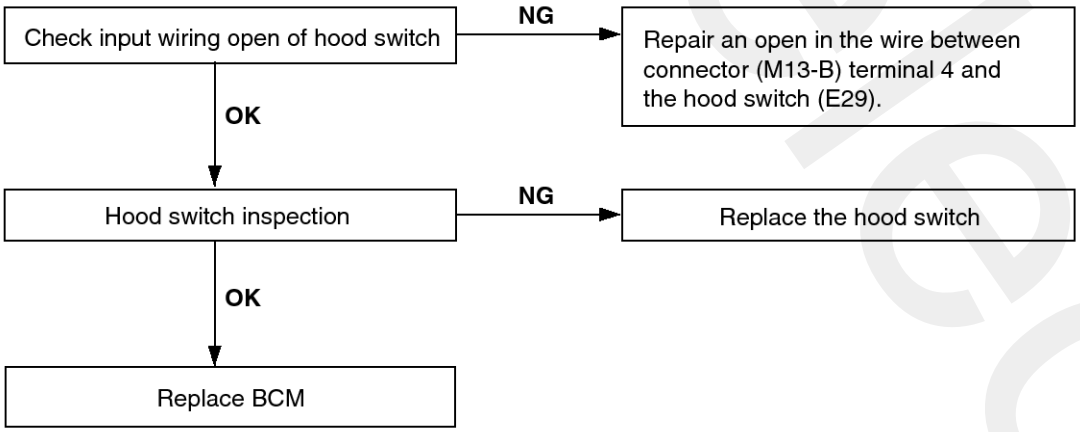
Troubleshooting

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



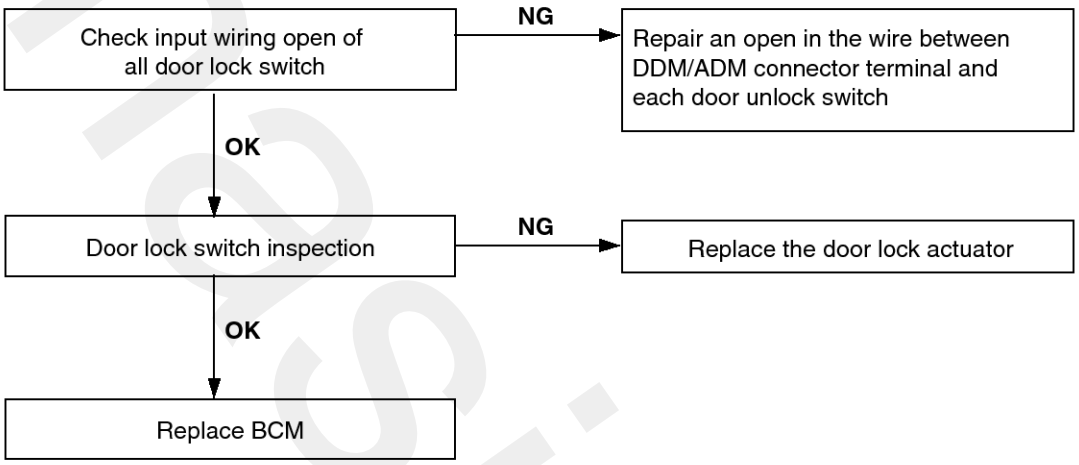
SCMBE6126L

2. When hood is opened in ARM mode, burglar horn does not work.



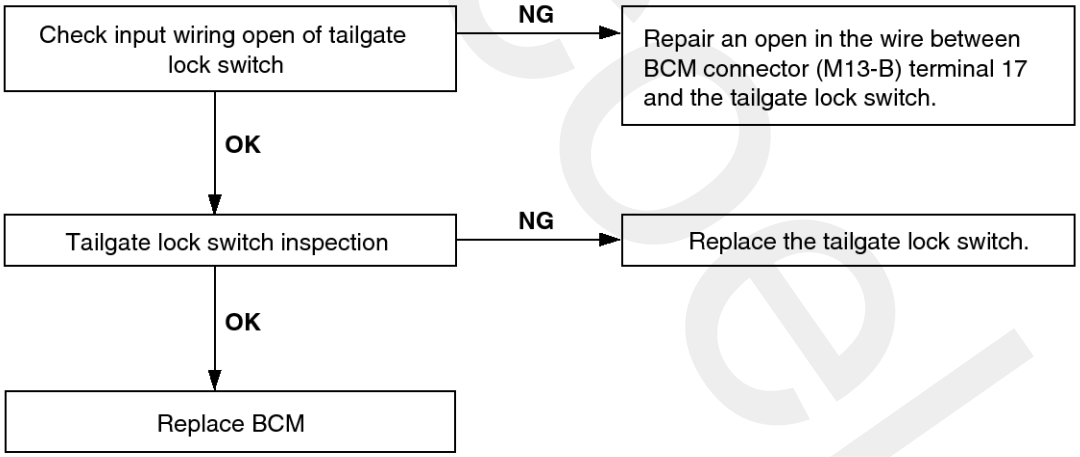
SCMBE6127L

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



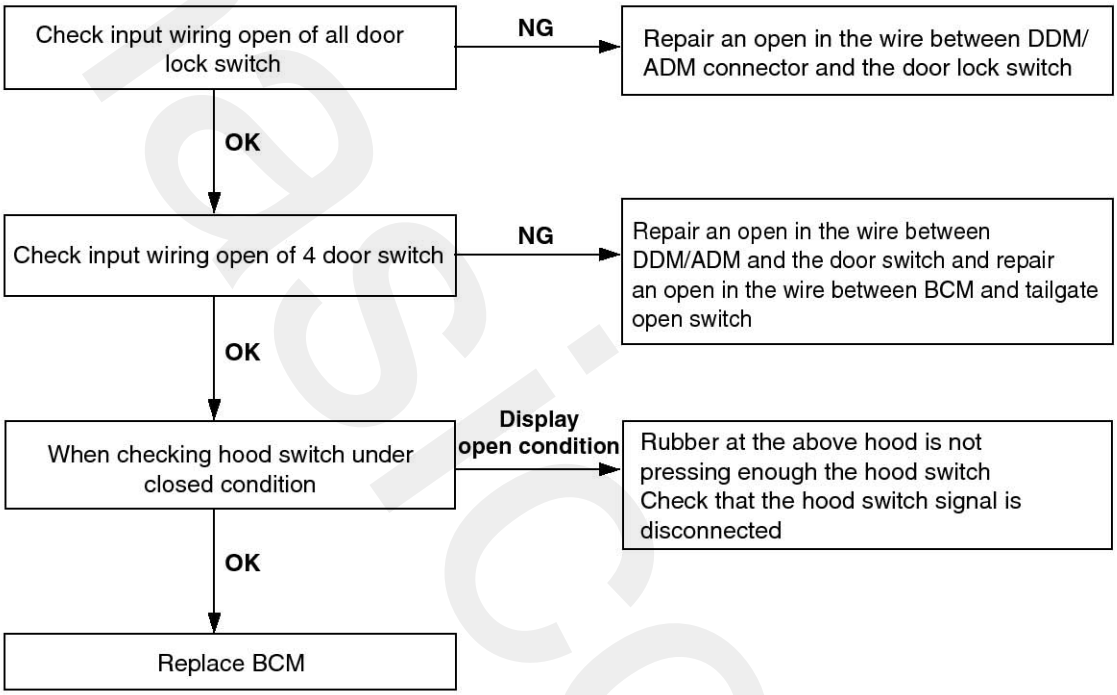
SENBE7128L

4. When tailgate is opened in ARM mode, burglar horn does not work.



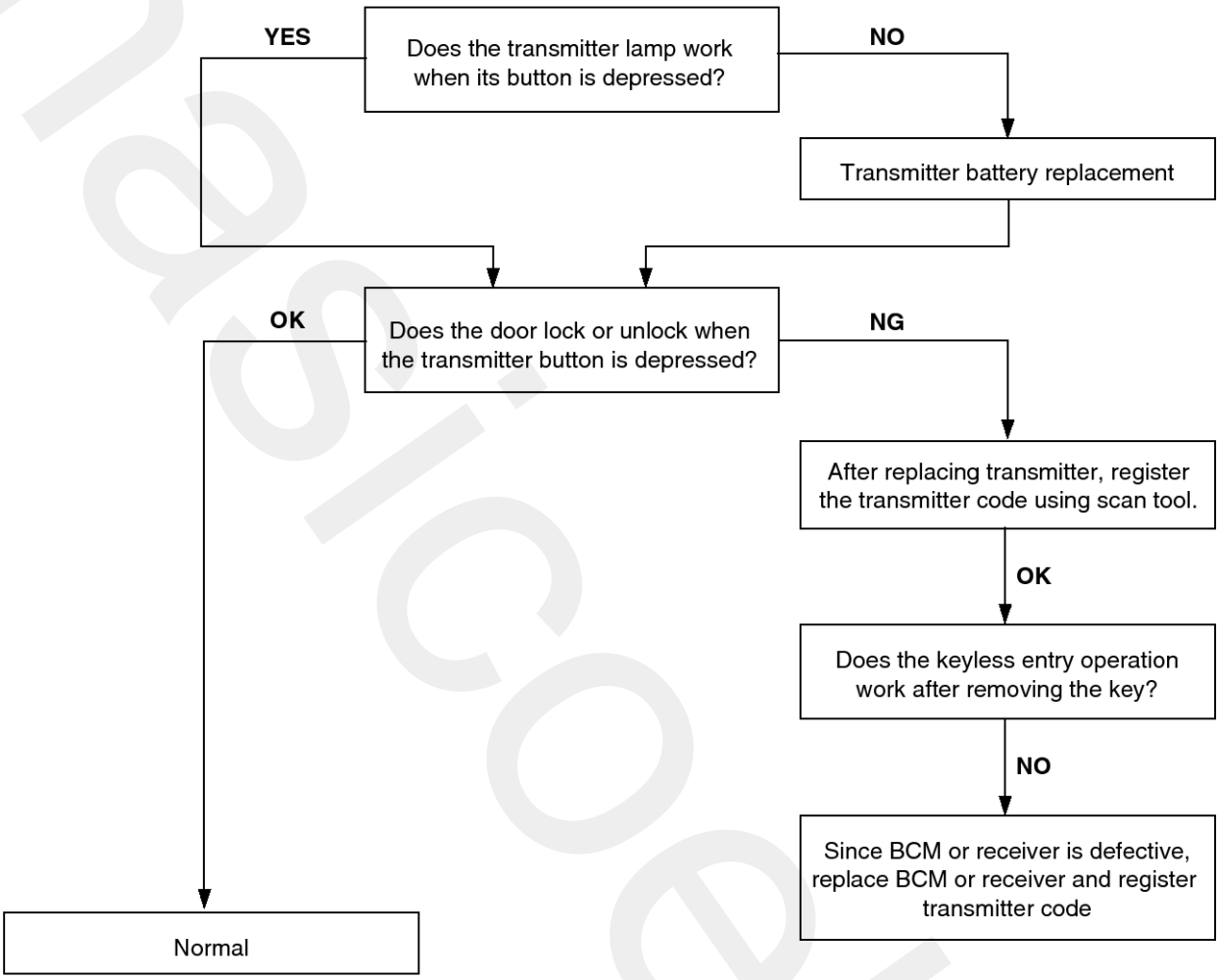
SCMBE6129L

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



SENBE7098L

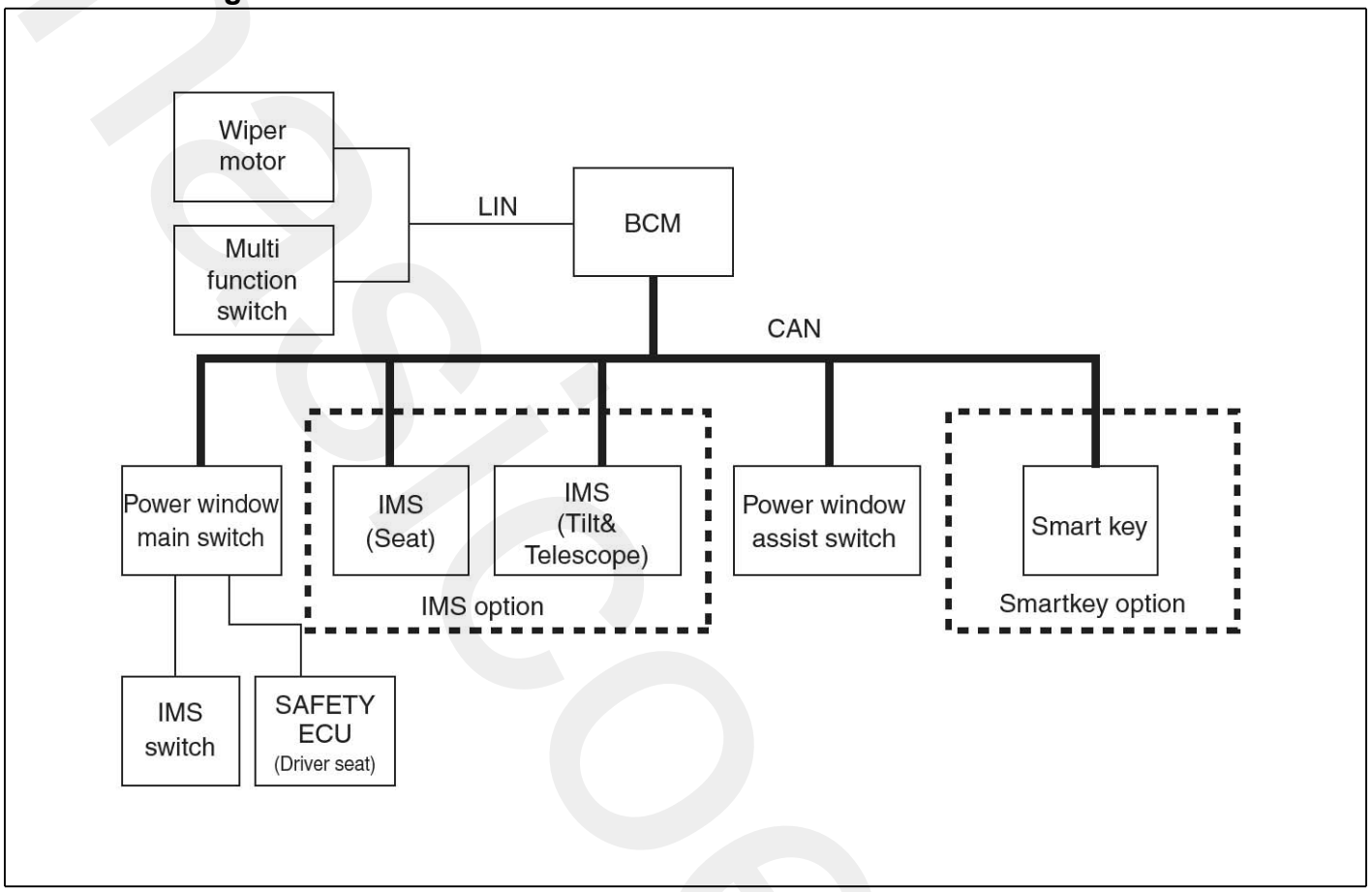
6. Central door lock function works, but keyless entry system does not work.



SENBE7099L

BCM (Body Control Module)

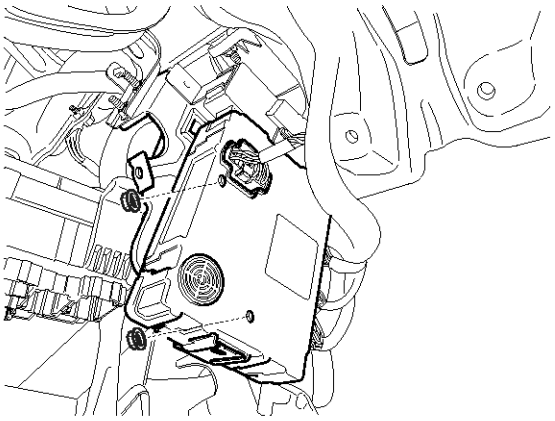
BCM Block Diagram



SENBE7142L

Description

Body control module receives various input switch signals controlling time and alarm functions for rear fog lamp, tail lamp auto cut, auto light, DRL, seat belt reminder warning, key operated warning, parking brake warning, over speed warning, ignition key hole illumination, room lamp control, power window delay time control, keyless entry control, burgular alarm control, auto door lock/crash door unlock, key reminder, front fog lamp, decayed room lamp.



SENBE7150D

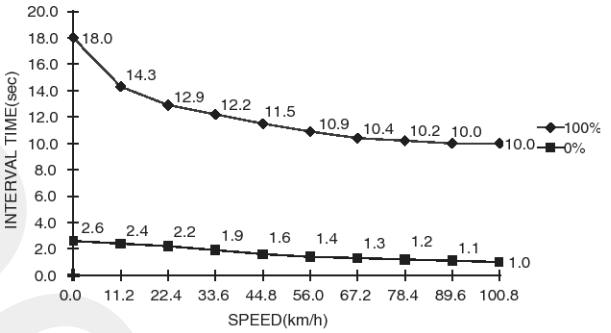
Operation

1. WIPER SYSTEM
   1) LOW SPEED CONTROL

      In IGN2 ON State, if there is WIPER LOW input (LIN COMMUNICATION), then set Low Speed Wiping(LIN COMMUNICATION).
   2) HIGH SPEED CONTROL

      In IGN2 ON State, if there is WIPER HIGH input (LIN COMMUNICATION), then set High Speed Wiping(LIN COMMUNICATION).
   3) SPEED SENSING INT. WIPER (WHITOUT RAIN SENSOR OPTION)
   4) VEHICLE SPEED AND INT. TIME VOLUME CONTROL THE INTERVAL TIME OF INT. WIPER.

      In IGN2 ON State, if there is WIPER INT. INPUT (LIN COMMUNICATION), then set IntermittentWiping(LIN COMMUNICATION) and send IntermittentTime(LIN COMMUNICATION).
   5) BASIC INTERVAL TIME
      - If the variance of basic interval time is less then 0.3sec, the interval time is not changed.
      - If the basic interval time is less than 1.5sec, the wiper moves continuously.
      - If the interval time is set (or has passed) more than 10sec, and in case vehicle runs (From vehicle stop to more than 7km/h), the wiper motor is driven.



SENBE7600D

Default Value For Non-na Variants

Step	1	2	3	4	5
Time at 0 Speed	2.6 sec	6.45 sec	10.3 sec	14.15 sec	18 sec

NOTICE

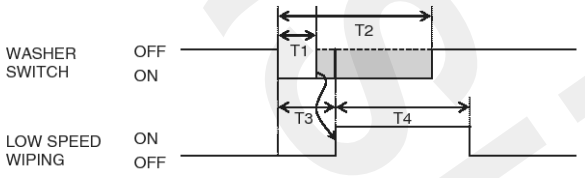
- *This diagram indicates desired interval time depending on vehicle speed. Due to dispersion on measurement of intermittent rheostat switch level, these curves are only representative of desired interval time depending on vehicle speed and not accurate interval time to comply with.*
- *To have a linear intermittent wiping interval time, the characteristic curve of intermittent rheostat switch level is matched to linear time interval.*

2. WIPER MOTOR CONTROL FOR WASHER

1) MIST MODE WASHING WIPER SWITCH INPUT : 0.16SEC ~ 0.56SEC)

Condition 1

State	Description
Initial condition	Washer switch is OFF
Event	If the duration of WASHER switch input is measured from 0.16sec to 0.56sec
Action	After T3, the Low Speed Wiping(LIN) is ON for 0.7sec. (For 1 Time wiping)



SENBE7601L

T1 : 0.16sec, T2 : 0.56sec,

T3 : 0.28sec, T4 : 0.7 ± 0.1

2) NOMINAL MODE WASHING (WIPER SW INPUT : MORE 0.56 SEC)

Condition 1

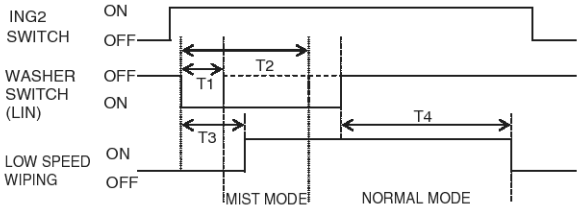
State	Description
Initial condition	Washer switch is OFF
Event	If WASHER switch is ON more than 0.56 sec.
Action	The Low Speed Wiping (LIN) is on after T3(0.28sec)

NOTICE

The WASHER SWITCH input is ignored during cranking (IGN2 is OFF during cranking)

Condition 2

State	Description
Initial condition	Nominal mode washing & WASHER switch on.
Event	If WASHER switch is OFF.
Action	The Low Speed Wiping (LIN) stops wiper after 3 ± 0.3 sec later. (Low Speed Wiping (LIN) is OFF after 3 ± 0.3 sec later)



SENBE7602L

T1 : 0.16sec, T2 : 0.56sec,

T3 : 0.28sec, T4 : 3 ± 0.3sec.

3) WASHER FUNCTION DURING WIPER INT. MODE

Condition 1

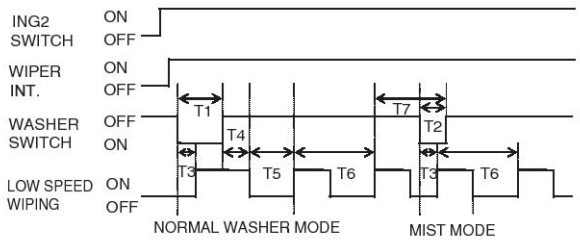
State	Description
Initial condition	IGN2 switch ON & WIPER INT. MODE
Event	If WASHER switch is ON more than 0.56sec.
Action	The Low Speed Wiping(LIN) is on after T3 (0.28 sec.)

Condition 2

State	Description
Initial condition	WASHER MODE (During WIPER INT.)
Event	If WASHER switch is OFF
Action	The Low Speed Wiping(LIN) will stop wiper after 3 ± 0.3 sec later. (Low Speed Wiping(LIN) is OFF after 3 ± 0.3sec later) (i.e. Resume WIPER INT. mode after 3 ± 0.3sec)

Condition 3

State	Description
Initial condition	WIPER INT. mode
Event	The duration of WIPER switch input is measured from 0.16sec to 0.56sec.
Action	After T3, the Low Speed Wiping(LIN) Output is ON for 0.7sec.



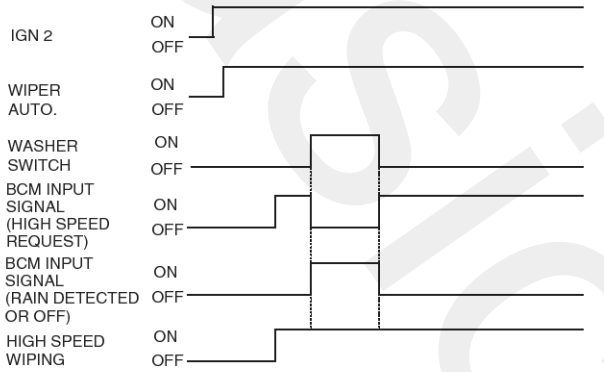
SENBE7603L

T1 : more than 0.56sec, T2 : 0.16sec ~ 0.56sec,
T3 : 0.28sec, T4 : 3 ± 0.3sec, T5 : T6~0.7sec,
T6 : INT. Time, T7 : Within T6.

4) WASHER FUNCTION DURING WIPER AUTO. MODE

Condition 1

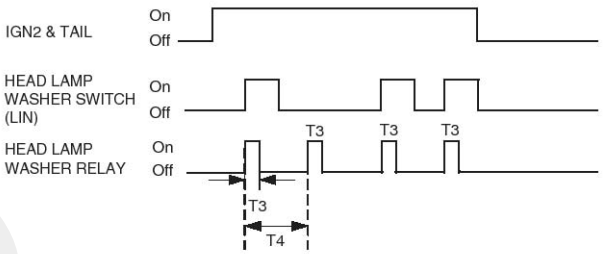
State	Description
Initial condition	IGN2 switch ON & WIPER AUTO. MODE & High Speed Wiping
Event	If WASHER input is detected regardless of duration of detection time
Action	Stay in High Speed Wiping(LIN)



SENBE7604L

3. HEAD LAMP WASHER FUNCTION

- In case of IGN2 ON & TAIL LAMP ON status, if head lamp washer switch input (LIN) is detected, head lamp washer output is turned ON.



SENBE7605L

If the IGN 2 & TAIL gets Off (IGN2 off or TAIL off) between the two shots, the second relay action is ignored.

4. RAIN SENSING WIPER

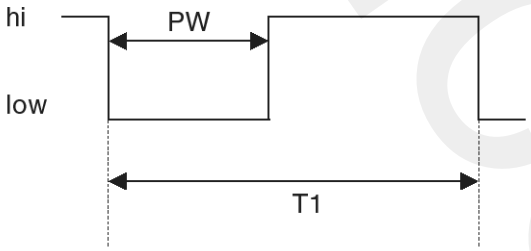
In IGN2 ON state, if AUTO switch input (LIN Communication) is ON then both Low Speed Wiping (LIN COMMUNICATION) and High Speed Wiping (LIN COMMUNICATION) are controlled by the RAIN SENSOR INPUT signal.

NOTICE

When RAIN SENSOR is mounted on vehicle, the RAIN Bit of LIN is 1. In this Vehicle, if AUTO switch of M/F is ON , then M/F is sent W INT 1 and INT. time combination(INT2, INT1, INT0) via LIN COMMUNICATION.

1) BCM OUTPUT SIGNAL(BCM TO RAIN SENSOR)

The BCM sends to the rain sensor a pulse width modulated waveform. The total period of the waveform is greater than 10 milliseconds.

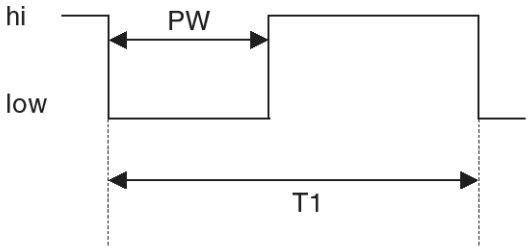


PW is defined at the sensor input pin.
(T1 = 17.5+/-1mS)

SENBE7608L

2) BCM INPUT SIGNAL(RAIN SENSOR TO BCM)

The Rain Sensor sends back to the BCM a pulse width modulated waveform with one distinct period (see diagram below):



PW is defined at the sensor input pin.
(T1 = 17.5+/-1mS)

SENBE7608L

3) AUTOMATIC MODE

When the wiper switch is moved to AUTO position and the Ignition switch is in IGN2 position, the Rain sensor is considered to be in "AUTOMATIC" mode.

5. TAIL LAMP AUTO CUT

1) GENERAL CONTROL

In BATTERY ON State, if (TAIL SW INPUT is ON and AUTO CUT is not activity), TAIL LAMP RELAY OUTPUT is ON.

The BCM memorizes the AUTO CUT state in EEPROM.

2) TAIL LAMP AUTOCUT IN NON-SMK OPTION

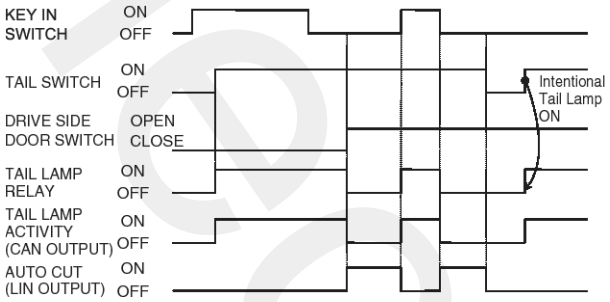
The auto-cut strategy ensures that tail lamps are turned off even if the driver forgets to turn them off.

The tail lamp is turned ON by tail switch after KEY IN switch ON, then after if the user KEY IN switch OFF and opens the driver side door, the TAIL lamp is automatically cut.

Also at the state KEY IN switch ON, when KEY IN switch is turned OFF after opens the Diver Side DOOR, the TAIL lamp is automatically cut.

(The switch detection sequence of KEY IN switch and DRIVER DOOR switch is ignored.)

After "AUTO CUT", the "AUTO CUT" function is disabled and TAIL LIGHTS are turned ON if the driver turns ON again the TAIL switch or KEY IN becomes ON.



SENBE7606L

3) TAIL LAMP AUTO CUT FUNCTION IN PIC SMK OPTION

- The case of without Limp Home condition

  The state of (ACC OFF & IGN1 OFF & IGN2 OFF), and Tail Lamp output On, if Driver side Door is opened, the TAIL lamp is automatically cut.

  Also after Driver side Door is opened, (ACC OFF & IGN1 OFF & IGN2 OFF), the TAIL lamp is automatically cut.

- The case of Limp Home condition

  TAIL lamp auto cut function is operated the same method of Non-PIC SMK Option.

NOTICE

BCM has same behavior between SMK and Non-SMK option in tail lamp autocut function. So, for active autocut, it is need to off the key IN and ACC signal.

6. HEAD LAMP CONTROL

1) HEAD LAMP LOW CONTROL

In IGN2 ON State, if there is HEAD LAMP LOW SW input (LIN COMMUNICATION), HEADLAMP LOW RELAY OUTPUT is turned ON.

IGN 2	HEAD LAMP LOW S-W	HEAD LAMP LOW R-ELAY
OFF	Don't care	OFF
ON	OFF	OFF
ON	ON	ON

In IGN1 ON and IGN2 ON status, If the LIN Communication failure is detected, turn on the head Lamp Low. (LIMPHOME strategy)

2) HEAD LAMP HIGH CONTROL

In IGN2 ON State, If HEAD LAMP HIGH SW INPUT and HEAD LAMP LOW RELAY (LIN COMMUNICATION) is detected then HEAD LAMP HIGH RLY OUTPUT is turned ON, which means the O HL HIGH RELAY and also the O HL HIGH IND the indicator on the dashboard.

3) PASSING CONTROL

In IGN2 ON State, If HEAD LAMP PASSING INPUT (LIN COMMUNICATION) is detected then HEAD LAMP HIGH RLY OUTPUT (O HL HIGH RELAY and O HL HIGH IND) is turned ON and also at the same time HEAD LAMP LOW RLY OUTPUT.

7. AUTO LIGHT CONTROL

In the state of IGN1 ON and IGN2 ON, when MULTI FUNCTION switch module detects AUTO LIGHT switch ON, TAIL LAMP RELAY output and HEAD LAMP LOW RELAY output are controlled according to AUTO LIGHT Sensor's INPUT. In the state of IGN1 ON, when MULTI FUNCTION switch module detects AUTO LIGHT switch ON, TAIL LAMP RELAY output is controlled according to AUTO LIGHT Sensor's INPUT.

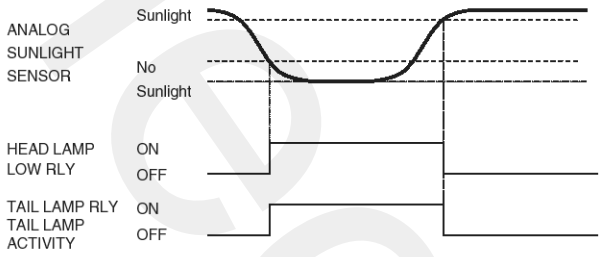
If IGN1 ON (for cranking) or ACC ON (for AV TAIL Function activity), the BCM supplies the power to Auto light sensor and monitors the range of this supply and raises up a failure as the supply's voltage is out of range (that is.: less than 4 Volts, more than 6 Volts).

The filtering of the error is 300ms to raise up this one, and also 300ms to clear this one.

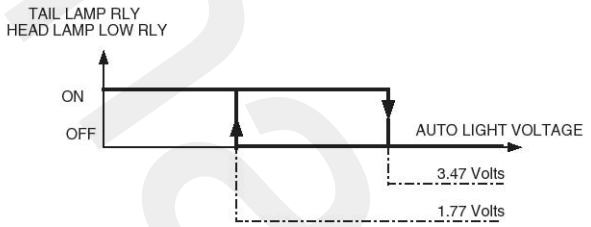
Then this failure occurs and as long as this is present, the head lamp must be turned on without taking care about the sunlight level provided by the sensor.

This is designed to prevent any head lamp cut off when the failure occurs during the night.

1) EXPORT VERSION



SENBE7609L



SENBE7610L

NOTICE

At export version HEAD LAMP LOW RELAY is turned ON/OFF at the time TAIL LAMP RELAY is turned ON/OFF.

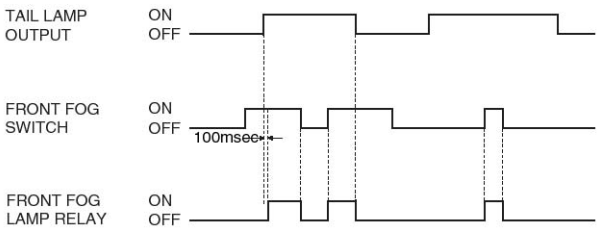
2) THRESHOLD VALUE TABLE

In IGN2 ON State, according to AUTO LIGHT Sensor's INPUT, TAIL and HEADLAMP is ON/OFF.

	TAIL	HEAD LAMP
ON	1.77 ± 0.08[V] (Tail On SunL Threshold) below	0.61 ± 0.06[V] (Head On SunL Threshold) below
OFF	3.47 ± 0.10[V] (Tail Off SunL Threshold) upper	1.00 ± 0.06[V] (Head Off SunL Threshold) upper

8. FRONT FOG LAMP CONTROL

In case of TAIL LAMP OUTPUT ON status, if FRONT FOG SWITCH input is detected FRONT FOG RELAY OUT(O FOG FRONT RELAY) is turned ON.



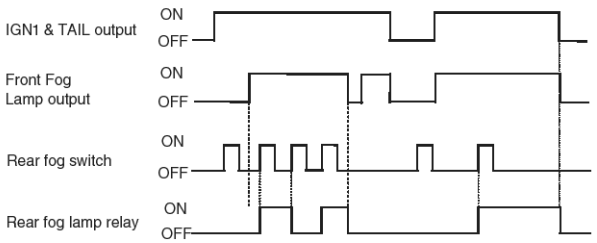
SENBE7607L

NOTICE

Front Fog Lamp Relay has special delay time. Refer to time chart.

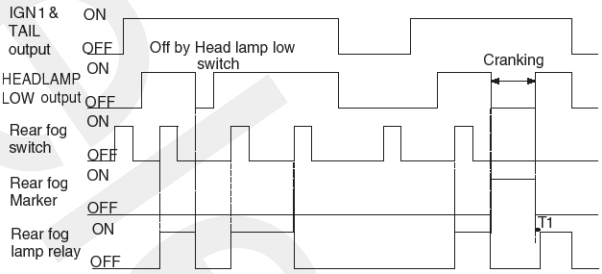
9. REAR FOG LAMP CONTROL

In case of (IGN1 & TAIL OUTPUT) and (FRONT FOG LAMP OUTPUT) are turned ON, if REAR FOG SWITCH is pushed, REAR FOG LAMP is turned ON.



SENBE7611L

In case of (IGN1 & TAIL OUTPUT) and (HEAD LAMP LOW OUTPUT) are turned ON, if REAR FOG SWITCH is pushed, REAR FOG LAMP is turned ON.



SENBE7612L

T1 : 160msec. (Delay time before the decision of NOn condition)

10. FLASHER BUZZER OPERATION

When the BCM detects the TURN LEFT SIGNAL or TURN RIGHT SIGNAL transition, then starts flasher buzzer outputs depend on transition.

SENBE7635L

T1 : 2KHz, 50% Duty

11. TURN SIGNAL NORMAL OPERATING CONDITION

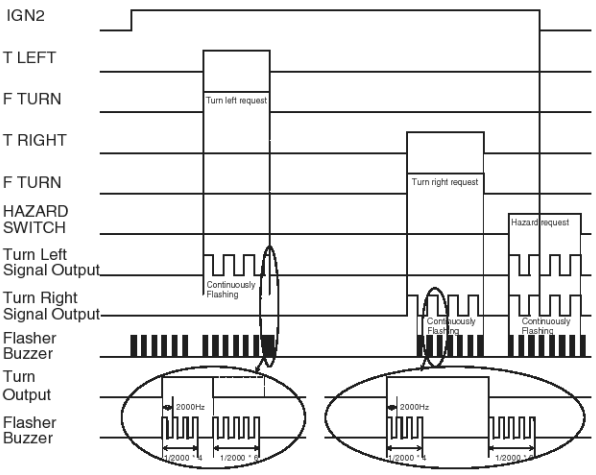
(Turn signal period : 85 ± 10 period/min)

While IGN2 is ON, if FULL TURN SIGNAL or TURN SIGNAL LEFT or TURN SIGNAL RIGHT or HAZARD input is detected, then turn signal outputs are turned ON TURN LAMPs following as switch input state (FULL LEFT, FULL RIGHT or HAZARD).

- Full Turn Left(T LEFT = 1 and F TURN = 1) : Continuously flashing turn left lamp
- Full Turn Right(T RIGHT = 1 and F TURN = 1) : Continuously flashing turn right lamp

NOTICE

Priority : HAZARD > TURN SIGNAL



SENBE7636L

Normal : 85 ± 10 Period/min

12. DOUBLE BLINKING CONDITION

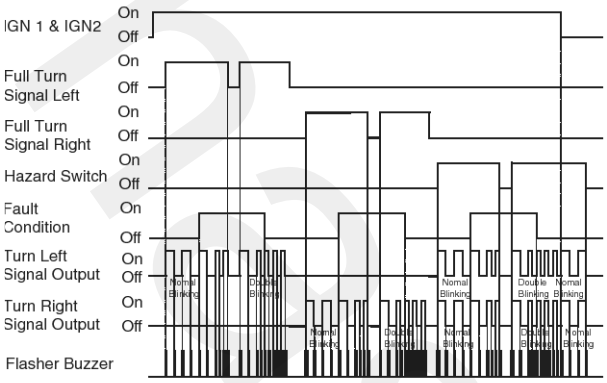
In case of activation of hazard the fault detection will be able to detect the failure only if 3 bulbs are broken-down. This bulb failure can be tested by the diagnostic specification.

In case of turn signal activation when one of the FRONT or REAR is broken-down (Lamp failure), the turn signal blinks with double frequency. Lamp failure condition as below.

1) Flasher fault detection should be inhibited according to Battery voltage status When the VBAT voltage is lower than 9V → this threshold for flasher fault detection should be configured as the calibration variable (EEPROM variable)
2) The fault detection is carried out continuously, until fault condition is detected by BCM and once fault is detected, BCM keep the fault condition until flasher triggering condition is released(Turn Right or Left switch off/ IGN1 & IGN2 or Hazard switch off)

The double blinking works at IGN1 ON & IGN2 ON condition, double blinking for Hazard: Except side lamp, if any error condition is detected then triggered the double blinking.

Period: 140 ±10 period/min

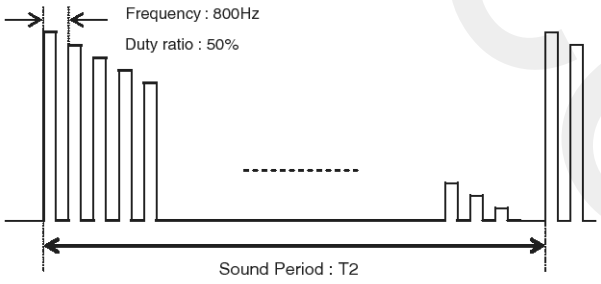


SENBE7613L

13. MAGNETIC BUZZER SOUND

Sound Period : T2 (0.6 s or 0.25 s or 0.730s)

Sound duration : T1 (fix value or infinite)



SENBE7614L

1) SOUND PRIORITY
   - 1st : Diagnostic sound (provided to test the Buzzer by way of Diagnostic tool)
   - 2nd : Seatbelt warning
   - 3rd : Overspeed warning
   - 4th : Key operated warning
   - 5th : Parking Brake warning
   - 6th : "MSL not blocked" warning (SMK option only)
   - 7th : Key learning sound (Sound period : 600 m sec.) (Learning with High SCAN tool) (non SMK option only)
   - 8th : Key learning sound (Sound period : 600 m sec.) (Learning with Code Saving tool) (non SMK option only)
   - 9th : Warnings for SMK systems (ID Deactivation warning) (SMK option only)

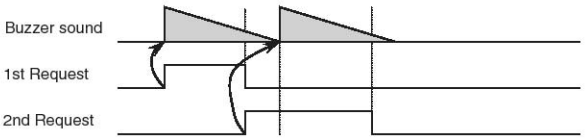
NOTICE

A buzzer ending restores the activity of a buzzer previously interrupted.

2) BUZZER SOUND ENDING

NOTICE

After any buzzer sound block ends, another buzzer sound block can start. During warning sound, the other high priority warning can't interrupt current activating one before the end of the previous sound block.



SENBE7615L

14. Seat Belt Reminder

The SBR(Seat Belt Reminder) includes the SBR Indicator warning and SBR Buzzer warning.

1) This functional descripotion will be applied only to Driver SBR(Seat Belt Reminder).
2) PATTERN = FINAL SIGNAL(in EURO-NCAP PROTOCOL)
3) Basic warning mode
   - Indicator blinking mode : indicator "ON" for 0.5 second/"OFF" for 0.5 second.
   - Buzzer mode : decremental sound(1Hz)
   - Indicator Blinking & Buzzer sound will be synchronized.

15. SEAT BELT WARNING FUNCTION

A calibration bit Seat belt warning buzzer sound option is defined to disable /enable the seat belt reminder buzzer, this calibration bit is by default set to True.

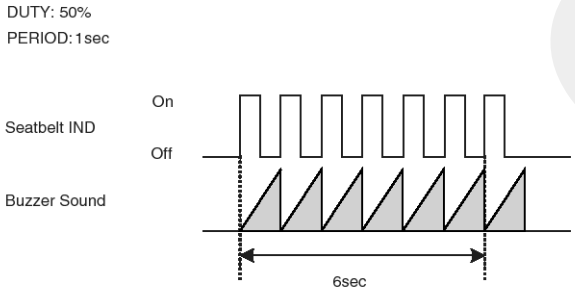
A calibration bit AssistantSeatBeltReminder option is defined to enable/disable the Assistant side Seat Belt Reminder function, this calibration bit is by default set to False.

BCM area setting:

A calibration bit domestic option is defined to configure BCM as a Korean domestic variant, this one is by default set to True.

A calibration bit EC option is defined to set the BCM as an EC variant, this one is by default set to False.

1) SEAT BELT WARNING LAMP DRIVING CONDITION



SENBE7637L

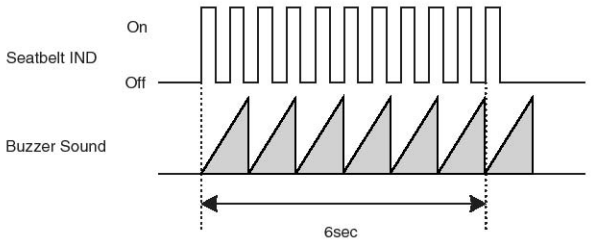
2) SEAT BELT WARNING SOUND

Frequency : 800 Hz

Sound period : T2 = 1sec

Sound duration : T1 = (see following chapters)

In case of 6sec blinking case, following as seatbelt lamp blinking, buzzer warning sound. So if lamp is blinking over 6sec, buzzer warning sound one more time.



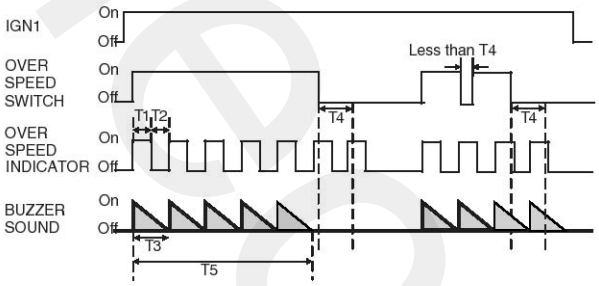
SENBE7616L

16. OVERSPEED WARNING FUNCTION DESCRIPTION

1) Europe

If vehicle runs over 120km/h, the cluster input is to be set.

When the cluster input indicates that vehicle runs over 120km/h and IGN1 is on state, the OVER SPEED WARNING starts.



SENBE7638L

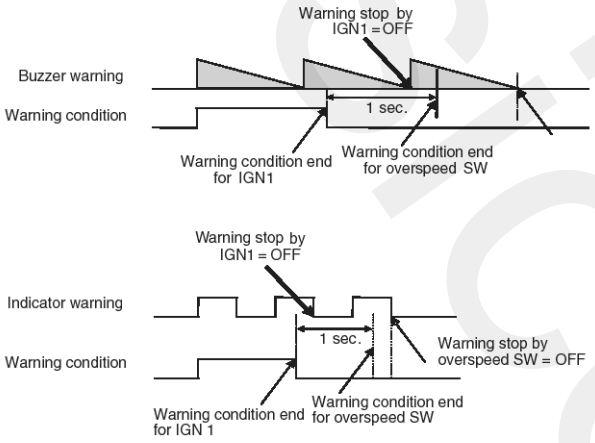
T1 : 0.5 ± 0.1sec, T2 : 0.5 ± 0.1sec, T3 : 1 ± 0.1sec

T4 (Off-filtering time) : 1 ± 0.1sec, T5 : 5 ± 0.1 sec.

NOTICE

- *The measured vehicle speed and the cluster input are actually independent. This warning goes lasts for 5 sec. if vehicle speed is not decreased below 120km/h.*
- *Variant control*

  The main reason to have cluster input is to reduce BCM part number. So, even if the Vehicle runs over 120km/h, but if there is no cluster input, the BCM should not activate over-speed warning.

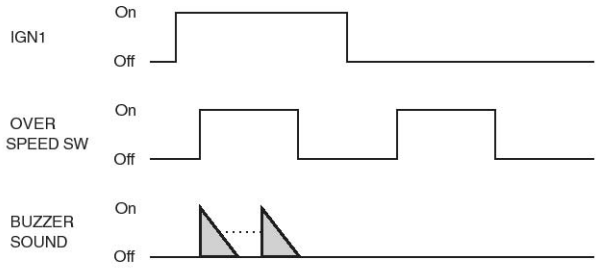


SENBE7639L

2) Non - Europe

If vehicle runs over 120km/h, the cluster input is to be set.

When the cluster input indicates that vehicle runs over 120km/h and IGN1 is on state, the OVER SPEED WARNING starts.



SENBE7618L

NOTICE

- *The measured vehicle speed and the cluster input are actually independent. This warning goes permanently if vehicle speed is not decreased below 120km/h.*
- *Variant control*

  The main reason to have cluster input is to reduce BCM part number. So, even if the Vehicle runs over 120km/h, but if there is no cluster input, the BCM should not activate over-speed warning.
- *All variants are equipped with this function.*

17. KEY LEARNING INTERNAL SOUND

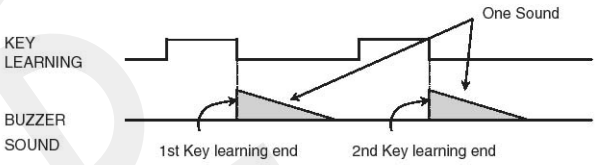
Key Learning sound :

Frequency: 800 Hz

Sound period: 600msec

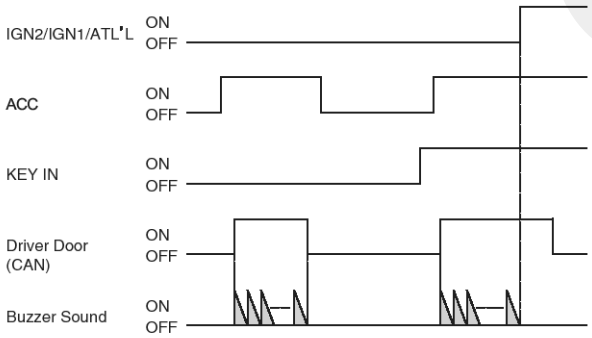
Sound duration: 600msec

When each Key's learning is ended, magnetic buzzer is operated, every one time.



SENBE7619L

18. KEY OPERATED WARNING
    1) KEY OPERATED WARNING SOUND
       Frequency : 800 Hz
       Sound period : T2 = 0.6sec
       Sound duration : infinite
    2) KEY OPERATED WARNING ALGORITHM
       - (While IGN KEY is inserted into the KEY CYLINDER (*) Or ACC is ON) & (IGN1 = IGN2 = ALT'L = OFF) if DRIVER SIDE DOOR is opened. KEY OPERATED WARN'G starts.
         (*) if non PIC SMK, or PIC SMK option : KEY IN = TRUE
       - (If the KEY is pulled out from key cylinder & ACC = OFF)
         Or IGN2 = ON
         Or IGN1 = ON
         Or ALT'L = ON
         or if DRIVER SIDE DOOR is closed, then the key operated warning stops immediately.
       - DURATION: Permanent (The KEY OPERATED WARNING continues permanently if the condition has not changed)



SENBE7620L

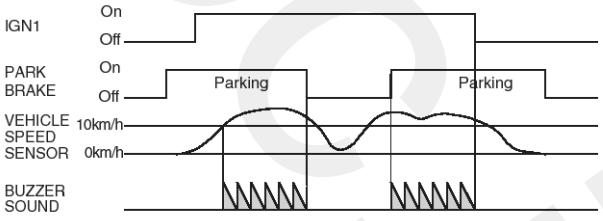
NOTICE

- *The same definition is used for PIC SMK and non PIC SMK option.*
- *The activation and deactivation must be made in the states. When an event with a higher priority interrupts the key reminder and when this event finishes, the key reminder must be reactivated.*

19. SMART KEY SYSTEM WARNINGS (SMART KEY OPTION ONLY)
    1) SMK(Smart Key) system warning sounds
       In case of MEGNETIC BUZZER :
       Frequency: 800 Hz
       Sound period: T2 = 0.25 s
       Number of period : 1
       TON : 3 secs
       TOFF : 0 secs
       The frequency is fixed at 2khz.
    2) 2 warning sounds are necessary for the PIC SMK system in the following cases :

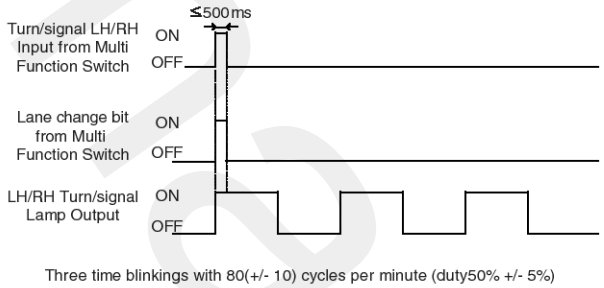
       When receiving the "ID out warning" command from PIC SMK ECU via CAN (meaning that ID is found outside the vehicle), the warning sound (MEGNETIC BUZZER and External BUZZER) starts.
       MEGNETIC BUZZER Sound duration : T1 = 5 s

20. PARKING BRAKE BUZZER WARNING
    1) PARKING BRAKE WARNING SOUND
       Frequency : 800 Hz
       Sound period : T2 = 0.6sec
       Sound duration : infinite
    2) OPERATION
       - In state of IGN1 ON, this warning sound is start when vehicle speed is over 10Km/h and PARK BRAKE switch is ON.
       - This activity is stop if :
         • IGN1 OFF.
         • Vehicle speed is under 10kmh (with filtering as same method with CAN bit 20Kmh)
         • PARK BRAKE switch is OFF



SENBE7621L

21. Lane Change



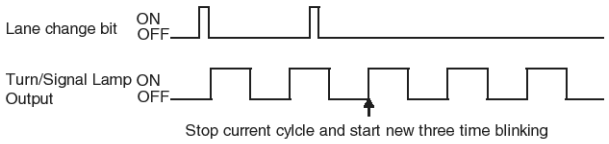
SENBE9024L

If the duration of Turn signal switch input is less than 500 msec, Multi-Function sets "Lane change" bit with either Turn signal-LEFT or Turn signal-RIGHT to BCM. Then, BCM turns ON the corresponding signal lamp output three times after receiving the bits. If the duration of Turn signal switch input is over 500 msec, Multi-Function disables "Lane change" bit, but keeps either Turn signal-LEFT or Turn signal-RIGHT.

In other words, if BCM receives 'Turn signal-LEFT' bit and 'Lane change' bit from Multi-Function, it does turn on Left signal lamp three times. For the right signal lamp, BCM receives 'Turn signal-RIGHT' bit and 'Lane change' bit.

If BCM receives only 'Turn signal-RIGHT' bit, it does turn on Right signal lamp until the bit is cleared.

While blinking, another 'Lane change' bit comes in, stop the current blinking and re-start three time blinking.



SENBE9025L

While blinking for lane change, cancel conditions are as follows;

1. Opposite direction turn signal switch input is ON.
2. Hazard switch is ON.
3. ACC or IGN becomes OFF.

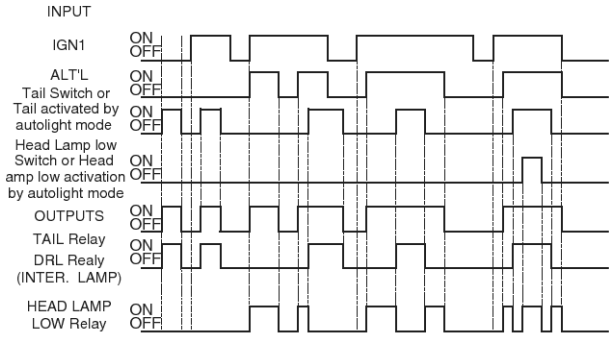
If reset occurs during the Lane change output, does not start the lane change output again. Depeding on the data of Multi-Function, do output.

22. DRL for Europe

- The DRL Relay is to manage the Interior lamp when tail activity activated by tail Multi-Function switch is set or autolight is set (out of DRL activating the Tail). Bi_EC_Variant must be set to '1'.

Release condition:

- TAIL LAMP activated by Multi function switch or Auto-Light Sensor or
- Head lamp Low activated by Multi function switch or Auto-Light Sensor



SENBE9026L

23. IGN KEY HOLE ILLUMINATION

1) FUNCTION DESCRIPTION

Turn On Condition

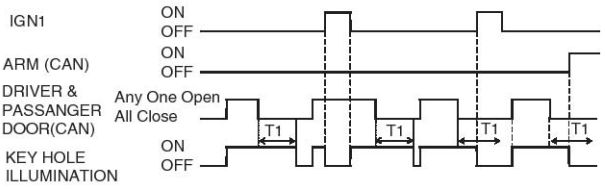
State	Description
Initial condition	IGN1 OFF
Event	DOOR open ((FRONT LEFT DOOR SW= ON) OR (FRONT RIGHT DOOR SW = ON))
Action	IGN KEY HOLE illumination is turned on. KEY HOLE ILLUMINATION = ON

30 sec Illumination Condition

State	Description
Initial condition	Turn On Condition
Event	DOOR close ((FRONT LEFT DOOR SW= OFF) AND (FRONT RIGHT DOOR SW = OFF))
Action	The IGN keyhole is illuminated for 30 sec. If DOORS Open again during 30 sec illumination, the turn ON condition starts again.

Illumination stops condition

State	Description
Initial condition	IGN KEY HOLE is illuminated
Event	IGN1 ON or Entered ARM MODE
Action	IGN KEY HOLE illumination is turned off immediately. KEY HOLE ILLUMINATION = OFF.



SENBE7622L

T1 : 30 ± 1sec.

24. DEFOGGER AND DEICER TIMER

1) FUNCTION DESCRIPTION

Condition 1

State	Description
Initial condition	IGN1 ON & Alternator level High & Defogger is OFF (DEFOGGER RELAY = OFF, and DEFOGGER ACTIVITY = OFF)
Event	Defogger is activated (DEFOGGER SW = ON)
Action	Defogger Outputs is turned ON (DEFOGGER RELAY = ON , and DEFOGGER ACTIVITY = ON)

Condition 2

State	Description
Initial condition	IGN1 ON & Alternator level High & Defogger is ON
Event	Defogger SWITCH Input pushed again OR T1 delay has elapsed since Defogger has been turned on
Action	Defogger Outputs are turned OFF : (DEFOGGER RELAY = OFF, and DEFOGGER ACTIVITY = OFF)

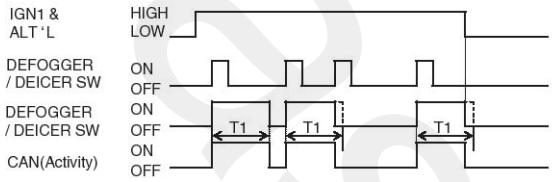
Condition 3

State	Description
Initial condition	IGN1 ON & Alternator level High & DEICER is OFF (DEICER RELAY = OFF)
Event	DEICER is activated (DEICER SW = ON)
Action	Deicer output is turned ON (DEICER RELAY = ON)

Condition 4

State	Description
Initial condition	IGN1 ON & Alternator level High & DEICER is ON
Event	DEICER SWITCH input pushed again OR T1 delay has elapsed since DEICER has been turned on
Action	Deicer output is turned OFF (DEICER RELAY = OFF)

If alternator input is changed to low or IGN1 input is changed to Off, Defogger output and DEICER output should be turned OFF immediately.



SENBE7623L

T1 : 20min ± 1min

NOTICE

The delay between DEFOGGER SWITCH INPUT and DEFOGGER OUTPUT: Less than 100msec., Outside mirror DOOR MODULE via CAN controls heated function. It is the same for DEICER SWITCH input and DEICER output.

DEICER and DEFOGGER output is turned on independently by DEICER SWITCH input and DEFOGGER SWITCH input.

25. DECAYED ROOM LAMP

1) Transitions from Room lamp OFF state:

Condition 1

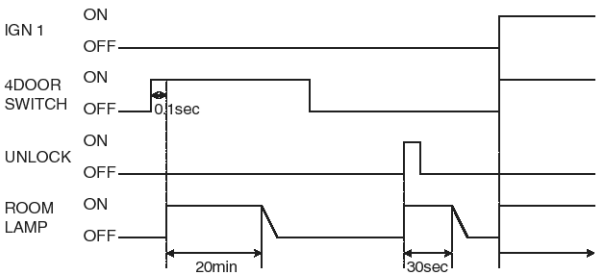
State	Description
Initial condition	Room lamp OFF & IGN1=OFF & ALL DOOR CLOSED
Event	Transition of ALL DOORS CLOSED to NOT(ALL DOORS CLOSED) for more than 0.1sec
Action	State changed to ROOM LAMP ON for 20 min Turn ROOM LAMP for a duration of 20 ±1minutes

Condition 2

State	Description
Initial condition	Room lamp OFF & IGN1=OFF & ALL DOOR CLOSED
Event	- UNLOCK by RKE - if SMK variant :UNLOCK by SMK RKE
Action	State changed to ROOM LAMP ON for 30s ROOM LAMP is turned ON for 30sec.

Condition 3

State	Description
Initial condition	Room lamp OFF & IGN1=OFF & ALL DOOR CLOSED
Event	IGN1 = ON and NOT(ALL DOORS CLOSED)
Action	State changed to ROOM LAMP ON The room lamp is turned ON without time limitation



SENBE7624L

2) Transitions from Room lamp ON for 30s state:

Condition 1

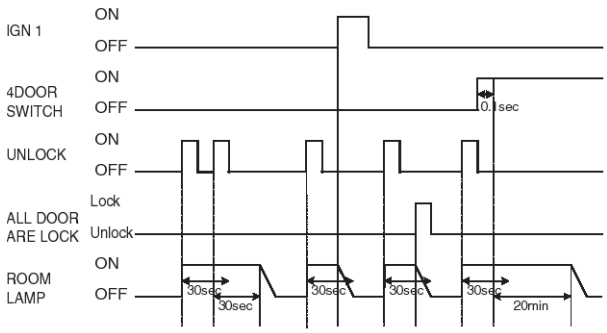
State	Description
Initial condition	ROOM LAMP ON for 30s & IGN1=OFF
Event	At least 1 door is opened more than 0.1sec (ALL DOOR NOT CLOSED = ON)
Action	State changed to ROOM LAMP ON for 20min ROOM LAMP is kept ON for 20 ±1minutes

Condition 2

State	Description
Initial condition	ROOM LAMP ON for 30s & IGN1=OFF
Event	- UNLOCK by RKE - if SMK variant :UNLOCK by SMK RKE
Action	State remains ROOM LAMP ON for 30s ROOM LAMP ON 30sec timer is re-initialized for an other 30sec duration

Condition 3

State	Description
Initial condition	ROOM LAMP ON for 30s & IGN1=OFF
Event	IGN1=ON Or 30s timer elapsed Or ATWS (The BCM goes to ARM)= 1 Or ALL DOOR LOCKED (ALL DOOR LOCKED = REAR LEFT KNOB UNLOCK = 0, REAR RIGHT KNOB UNLOCK = 0, FRONT LEFT KNOB UNLOCK = 0 and FRON RIGHT KNOB UNLOCK = 0 via CAN communication)
Action	State changed to ROOM LAMP DECAYING ROOM LAMP is slowly decayed off during 2±0.2sec



SENBE7625L

3) Transitions from Room lamp ON for 20min state:

Condition 1

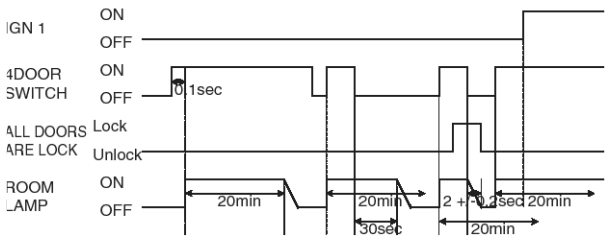
State	Description
Initial condition	ROOM LAMP ON for 20min & IGN1=OFF
Event	IGN1 = ON
Action	State changed to ROOM LAMP ON The room lamp remains ON without time limitation

Condition 2

State	Description
Initial condition	ROOM LAMP ON for 20min & IGN1=OFF & All door unlocked
Event	ALL DOOR CLOSED
Action	State changed to ROOM LAMP ON for 30s ROOM LAMP is turned ON for 30sec

Condition 3

State	Description
Initial condition	ROOM LAMP ON for 20min & IGN1=OFF
Event	ALL DOOR CLOSED & ALL DOOR LOCKED Or 20min timer elapsed
Action	State changed to ROOM LAMP DECAYING ROOM LAMP is slowly decayed off during 2±0.2sec



SENBE7626L

4) Transitions from Room lamp Decaying state:

Condition 1

State	Description
Initial condition	ROOM LAMP DECAYING & IGN1=OFF
Event	Transition of ALL DOORS CLOSED to NOT(ALL DOORS CLOSED) for more than 0.1sec
Action	State changed to ROOM LAMP ON for 20min ROOM LAMP is kept ON for 20±1minutes

Condition 2

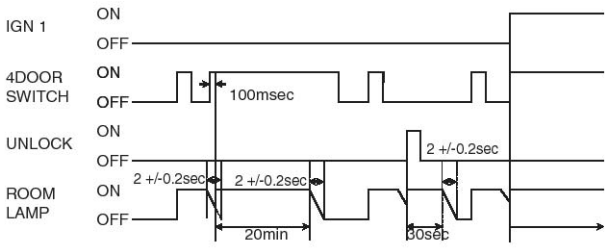
State	Description
Initial condition	ROOM LAMP DECAYING & IGN1=OFF & ALL DOOR CLOSED
Event	- UNLOCK by RKE or MTS - if SMK variant :UNLOCK by SMK RKE
Action	State changed to ROOM LAMP ON for 30s ROOM LAMP is turned ON for 30sec

Condition 3

State	Description
Initial condition	ROOM LAMP DECAYING
Event	Room lamp decaying completed
Action	State changed to ROOM LAMP OFF Turn OFF the room lamp

Condition 4

State	Description
Initial condition	ROOM LAMP DECAYING
Event	IGN1 = ON and NOT(ALL DOORS CLOSED)
Action	State changed to ROOM LAMP ON The room lamp remains ON without time limitation



SENBE7627L

5) Transitions from Room lamp ON state:

Condition 1

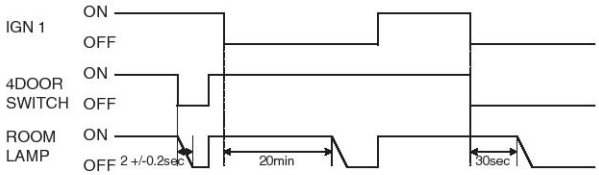
State	Description
Initial condition	ROOM LAMP ON & IGN1=ON & At least 1 door is opened
Event	ALL DOORS CLOSED
Action	State changed to ROOM LAMP DECAYING ROOM LAMP is slowly decayed off during 2±0.2sec

Condition 2

State	Description
Initial condition	ROOM LAMP ON & IGN1=ON & At least 1 door is opened
Event	IGN1=OFF
Action	State changed to ROOM LAMP ON for 20min ROOM LAMP is kept ON for 20 ±1minutes

Condition 3

State	Description
Initial condition	ROOM LAMP ON & IGN1=ON & At least 1 door is opened
Event	ALL DOOR CLOSED & IGN1=OFF
Action	State changed to ROOM LAMP ON for 30s ROOM LAMP ON 30sec timer is re-initialized for an other 30sec duration



SENBE7628L

26. DECAYED FOOT LAMP

1) Transitions from Foot lamp OFF state:

Condition 1

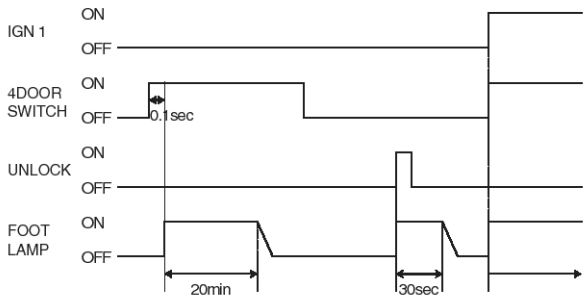
State	Description
Initial condition	Foot lamp OFF & IGN1=OFF & ALL DOOR CLOSED
Event	Transition of ALL DOORS CLOSED to NOT(ALL DOORS CLOSED) for more than 0.1sec
Action	State changed to FOOT LAMP ON for 20 min Turn FOOT LAMP for a duration of 20 ± 1minutes

Condition 2

State	Description
Initial condition	Foot lamp OFF & IGN1=OFF & ALL DOOR CLOSED
Event	- UNLOCK by RKE - if SMK variant :UNLOCK by SMK RKE
Action	State changed to FOOT LAMP ON for 30s FOOT LAMP is turned ON for 30sec

Condition 3

State	Description
Initial condition	Foot lamp OFF & IGN1=OFF & ALL DOOR CLOSED
Event	(IGN1 = ON) and [(ALL DOORS NOT CLOSED) or (P position = ON)]
Action	State changed to FOOT LAMP ON The Foot lamp is turned ON without time limitation



SENBE7629L

2) Transitions from Foot lamp ON for 30s state:

Condition 1

State	Description
Initial condition	FOOT LAMP ON for 30s & IGN1=OFF
Event	At least 1 door is opened more than 0.1sec (ALL DOOR NOT CLOSED = ON)
Action	State changed to FOOT LAMP ON for 20min FOOT LAMP is kept ON for 20 ± 1minutes

Condition 2

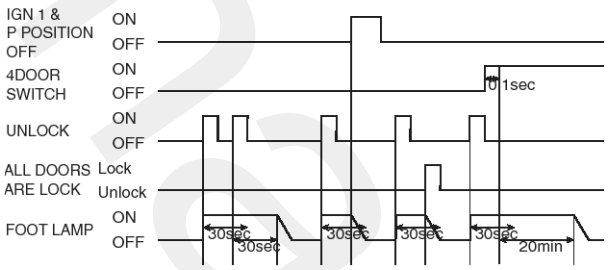
State	Description
Initial condition	FOOT LAMP ON for 30s & IGN1=OFF
Event	- UNLOCK by RKE - if SMK variant :UNLOCK by SMK RKE
Action	State remains FOOT LAMP ON for 30s FOOT LAMP ON 30sec timer is re-initialized for an other 30sec duration

Condition 3

State	Description
Initial condition	FOOT LAMP ON for 30s & IGN1=OFF
Event	IGN1=ON & P position = Off & FL Inhibit Timer12 elapsed (1 sec.) Or 30s timer elapsed Or ATWS (The BCM goes to ARM) = 1 Or ALL DOOR LOCKED (ALL DOOR LOCKED = REAR LEFT KNOB UNLOCK = 0, REAR RIGHT KNOB UNLOCK = 0, FRONT LEFT KNOB UNLOCK = 0 and FRON RIGHT KNOB UNLOCK = 0 via CAN communication)
Action	State changed to FOOT LAMP DECAYING FOOT LAMP is slowly decayed off during 2±0.2sec

Condition 4

State	Description
Initial condition	FOOT LAMP ON for 30s & IGN1=OFF
Event	IGN1=ON & P position = On & FL Inhibit Timer12 elapsed (1 sec.)
Action	State changed to FOOT LAMP ON The Foot lamp is turned ON without time limitation.



SENBE7630L

3) Transitions from Foot lamp ON for 20min state:

Condition 1

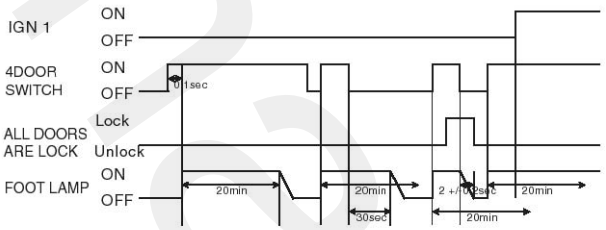
State	Description
Initial condition	FOOT LAMP ON for 20min & IGN1=OFF
Event	IGN1 = ON
Action	State changed to FOOT LAMP ON The Foot lamp remains ON without time limitation.

Condition 2

State	Description
Initial condition	FOOT LAMP ON for 20min & IGN1=OFF & All door unlocked
Event	ALL DOOR CLOSED & All door unlocked
Action	State changed to FOOT LAMP ON for 30s FOOT LAMP is turned ON for 30sec.

Condition 3

State	Description
Initial condition	FOOT LAMP ON for 20min & IGN1=OFF
Event	ALL DOOR CLOSED & ALL DOOR LOCKED Or 20min timer elapsed
Action	State changed to FOOT LAMP DECAYING FOOT LAMP is slowly decayed off during 2±0.2sec.



SENBE7631L

4) Transitions from Foot lamp Decaying state:

Condition 1

State	Description
Initial condition	FOOT LAMP DECAYING & IGN1=OFF
Event	Transition of ALL DOORS CLOSED to NOT(ALL DOORS CLOSED) for more than 0.1sec
Action	State changed to FOOT LAMP ON for 20min FOOT LAMP is kept ON for 20 ±1minutes.

Condition 2

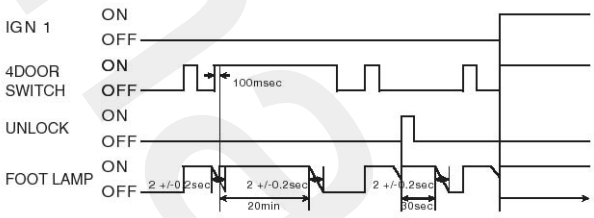
State	Description
Initial condition	FOOT LAMP DECAYING & IGN1=OFF & ALL DOOR CLOSED
Event	- UNLOCK by RKE or MTS - if SMK variant :UNLOCK by SMK RKE
Action	State changed to FOOT LAMP ON for 30s FOOT LAMP is turned ON for 30sec.

Condition 3

State	Description
Initial condition	FOOT LAMP DECAYING
Event	Foot lamp decaying completed
Action	State changed to FOOT LAMP OFF Turn OFF the room lamp.

Condition 4

State	Description
Initial condition	FOOT LAMP DECAYING
Event	(IGN1 = ON) and [(ALL DOORS NOT CLOSED) or (P position = ON)]
Action	State changed to FOOT LAMP ON The Foot lamp remains ON without time limitation



SENBE7632L

5) Transitions from Foot lamp ON state:

Condition 1

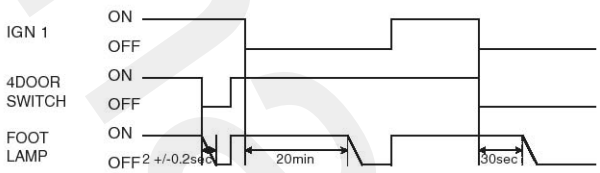
State	Description
Initial condition	FOOT LAMP ON & IGN1=ON & At least 1 door is opened
Event	ALL DOORS CLOSED & P position = Off
Action	State changed to FOOT LAMP DECAYING FOOT LAMP is slowly decayed off during 2±0.2sec

Condition 2

State	Description
Initial condition	FOOT LAMP ON & IGN1=ON & At least 1 door is opened
Event	IGN1 = OFF
Action	State changed to FOOT LAMP ON for 20min FOOT LAMP is kept ON for 20±1minutes

Condition 3

State	Description
Initial condition	FOOT LAMP ON & IGN1=ON & At least 1 door is opened
Event	ALL DOOR CLOSED & IGN1=OFF
Action	State changed to FOOT LAMP ON for 30s FOOT LAMP ON 30sec timer is re-initialized for an other 30sec duration



SENBE7633L

NOTICE

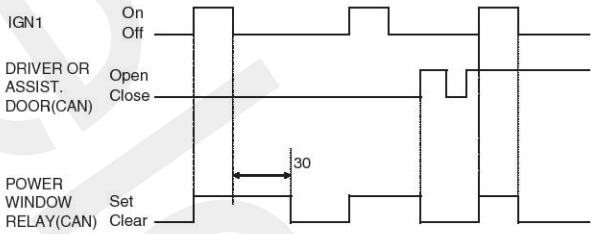
- *Following as INHIBIT P Logic value, BCM sends the INH P state via CAN.*
- *Foot lamp's brightness can be changed by diagnostic values.*

27. POWER WINDOW TIMER

Function	Characteristic	Name	
		Hardware Label	Spec. Designation
INPUT	CAN COMMUNICATION	FRONT LEFT DOOR FRONT RIGHT DOOR	FRONT LEFT DOOR SWITCH FRONT RIGHT DOOR SWITCH
	ANALOG	IG1	IGN1
OUTPUT	CAN COMMUNICATION	POWER RELAY	POWER WINDOW RELAY

1) FUNCTION DESCRIPTION

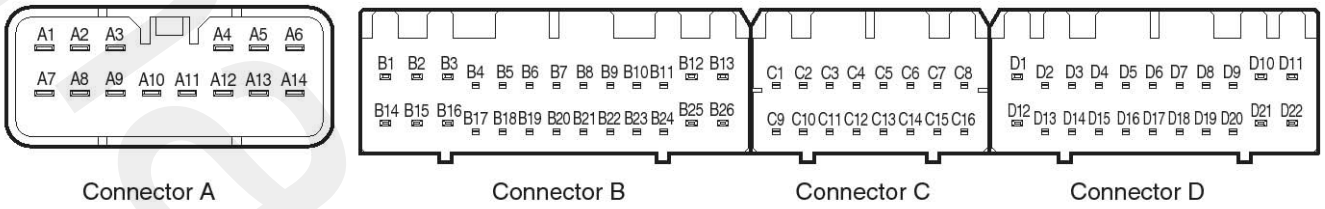
- POWER WINDOW RELAY CAN signal is switched ON(1) when IGN1 SWITCH On.
- When IGN1 SWITCH is turned Off, the POWER WINDOW RELAY CAN signal remains On for 30sec and then is turned OFF(0).
- During the operation(2), if driver or assistant side door is opened, the POWER WINDOW RELAY CAN signal is turned OFF(0) immediately.



SENBE7634L

Inspection

BCM Connectors



SCMBE6152L

Pin No.	Connector A	Connector B	Connector C	Connector D
1	Battery Voltage	Burglar alarm relay output	LIN network line	All 4-door open switch signal input
2	Room lamp output with decay	Rear right power window up relay output	Rain sensor data signal input	Hazard switch signal input
3	Ignition 1 voltage	Rear left power window up relay output	Rain sensor data output	
4			Diagnostic Communication line K	Seatbelt status signal input
5		Horn relay signal output	Accessory signal input	Rear fog lamp switch signal input
6	Foot lamp output	Overspeed Indicator output	Hood open status signal input	DRL switch signal input
7	GROUND1	Rear fog lamp relay signal output	Inhibition P signal Input	Alternator voltage monitoring signal input
8	GROUND2	Tail lamp relay signal output	Key remainder signal input	Power T/GATE signal output
9	Supply ground to sunlight		Code saving data signal input	Head lamp high status indicator output
10	Sunlight sensor signal input	Tail lamp relay signal output	Vehicle speed data input	
11	Power supply to sun light sensor	Tail lamp relay signal output	Communication with external receiver	Security Led output
12	Power supply to turn lamp	CAN low	T/GATE flasher switch signal input	TGATE open / close status signal input
13	Turn right relay output	CAN high	Ignition 2 signal input	Parking brake status signal input
14	Turn left relay output	Drive side Seatbelt Indicator signal output	T/GATE overhead open/close switch signal input	
15		AV TAIL control output related to autolight sensor		Front Fog lamp switch signal input

Pin No.	Connector A	Connector B	Connector C	Connector D
16		Rear right power window down relay output	TGATE outside Handle	Defogger switch signal input
17		Rear left power window down relay output		Over speed signal input
18		Front fog lamp relay signal output		
19		Key illumination lamp signal output		DEICER switch signal input
20		Head lamp high relay signal output		Buzzer control output related to RF Key
21				Flasher sound buzzer control output
22		T/GATE latch relay output		TGATE latch signal output (Signal output)
23		Head lamp low relay signal output		
24		T/GATE lamp relay signal output		
25		Head lamp washer relay output		
26		Rear Window Lock output		

BCM Input/output Specification

Connector A

Pin No.	Pin Name	Input Acquisition Threshold Voltage (Operating Voltage 9V To 16V At Normal Temperature / Output Type)
1	Battery Voltage	Operating Voltage 9V ~ 16V
2	Room lamp output with decay	Low side / FET
3	Ignition 1 voltage	Analog input
4		
5		
6	Foot lamp output	Low side / FET
7	GROUND 1	GND
8	GROUND 2	GND
9	Supply ground to sunlight	GND
10	Sunlight sensor signal input	Analog input
11	Power supply to sun light sensor	Power supply (5V)
12	Power supply to turn lamp	Bypass Voltage
13	Turn right relay output	High side / bypass
14	Turn left relay output	High side / bypass

Connector B

Pin No.	Pin Name	Input Acquisition Threshold Voltage (Operating Voltage 9V To 16V At Normal Temperature / Output Type)
1	Burglar alarm relay output	Low side / FET
2	Rear right power window up relay output	Low side / FET
3	Rear left power window up relay output	Low side / FET
4		
5	Horn relay signal output	Low side / FET
6	Overspeed Indicator output	Low side / FET
7	Rear fog lamp relay signal output	Low side / FET
8	Tail lamp relay signal output	Low side / FET
9		Low side / FET
10	Defogger relay signal output	Low side / FET
11	Deicer relay signal output	Low side / FET
12	CAN low	Communication line
13	CAN high	Communication line
14	Drive side Seatbelt Indicator signal output	Low side / FET

Pin No.	Pin Name	Input Acquisition Threshold Voltage (Operating Voltage 9V To 16V At Normal Temperature / Output Type)
15	AV TAIL control output related to autolight sensor	Low side / FET
16	Rear right power window down relay output	Low side / FET
17	Rear left power window down relay output	Low side / FET
18	Front fog lamp relay signal output	Low side / FET
19	Key illumination lamp signal output	Low side / FET
20	Head lamp high relay signal output	Low side / FET
21		Low side / FET
22	T/GATE latch relay output	Low side / FET
23	Head lamp low relay signal output	Low side / FET
24	T/GATE lamp relay signal output	Low side / FET
25	Head lamp washer relay output	Low side / FET
26	Rear Window Lock output	High side / FET

Connector C

Pin No	Pin Name	Input Acquisition Threshold Voltage (Operating Voltage 9V To 16V At Normal Temperature / Output Type
1	LIN network line	Communication line
2	Rain sensor data signal input	PWM input
3	Rain sensor data output	PWM output
4	Diagnostic Communication line K	Communication line
5	Accessory signal input	Switch on 5V above
6	Hood open status signal input	Switch off 2V below
7	Inhibition P signal Input	Hood close 5V above
8	Key remainder signal input	Hood open 2V below
9	Code saving data signal input	Switch on 5V above
10	Vehicle speed data input	Switch off 2V below
11	Communication with external receiver	Key out 5V above
12	T/GATE flasher switch signal input	Key in 2V below
13	Ignition 2 signal input	Communication line
14	T/GATE overhead open/close switch signal input	Freq. input
15		Communication line
16	TGATE outside Handle	Switch on 5V above

Connector D

Pin No	Pin Name	Input Acquisition Threshold Voltage (Operating Voltage 9V To 16V At Normal Temperature / Output Type
1	All 4-door open switch signal input	Switch on 5V above Switch off 2V below
2	Hazard switch signal input	Switch on 5V above Switch off 2V below
3		-
4	Seatbelt status signal input	Belt 5V above Unbelt 2V below
5	Rear fog lamp switch signal input	Switch on 5V above Switch off 2V below
6	DRL switch signal input	Switch on 5V above Switch off 2V below
7	Alternator voltage monitoring signal input	Analog input
8	Power T/GATE signal output	Low side / TR
9	Head lamp high status indicator output	High side / TR
10		
11	Security Led output	Low side / TR
12	TGATE open / close status signal input	Switch on 5V above Switch off 2V below
13	Parking brake status signal input	Switch on 5V above Switch off 2V below
14		
15	Front Fog lamp switch signal input	Switch on 5V above Switch off 2V below
16	Defogger switch signal input	Switch on 5V above Switch off 2V below
17	Over speed signal input	Switch on 5V above Switch off 2V below
18		
19	DEICER switch signal input	Switch on 5V above Switch off 2V below
20	Buzzer control output related to RF Key	High side / TR
21	Flasher sound buzzer control output	High side / TR
22	TGATE latch signal output (Signal output)	Low side / TR

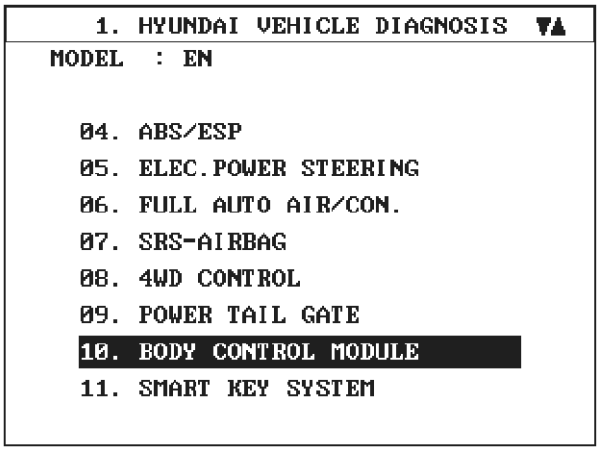
BCM Actuator Operation

SCAN tool can operates all actuators controlled by BCM by force.

No.	BCM Display
1	Tail lamp
2	Head lamp low
3	Head lamp high
4	Head lamp high indicator
5	Front fog lamp
6	Front fog lamp indicator
7	Rear fog lamp
8	Day Running light
9	Low speed wiping relay
10	High speed wiping relay
11	Defroster relay
12	Trunk release
13	B/A Horn
14	Room Lamp
15	Hazard Lamp
16	Left turn signal
17	Right turn signal
18	Internal buzzer
19	Key illumination
20	Seat Belt Indicator(Driver side and Assist side)
21	Head Lamp Washer
22	Start Inhibition output
23	External Buzzer output
24	Security Led output
25	Rear RH Power window Up
26	Rear RH Power Window Down
27	Rear LH Power window Up
28	Rear LH Power Window Down
29	Foot lamp
30	AV TAIL

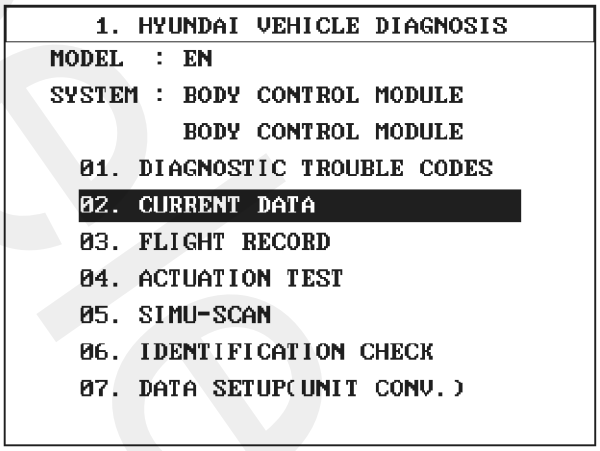
BCM Diagnosis With Scan Tool

1. It will be able to diagnose defects of BCM with scan tool quickly. Scan tool can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and "BCM".



SENBE7201L

3. Select "Current data", if you will check current data of BCM. It provides power supply status, multi function status, lamp status, door status, lock system status, wiper, auto light status and so on.



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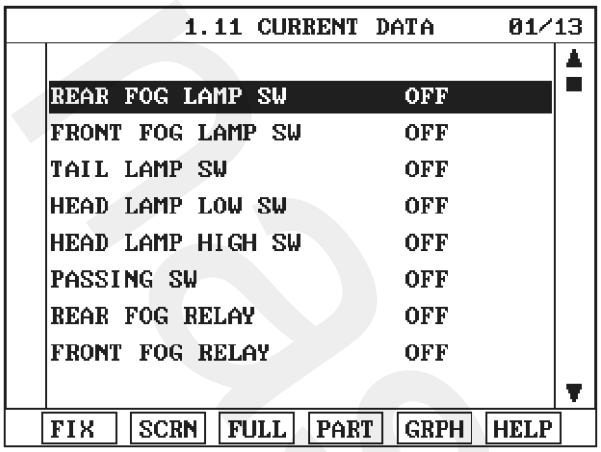
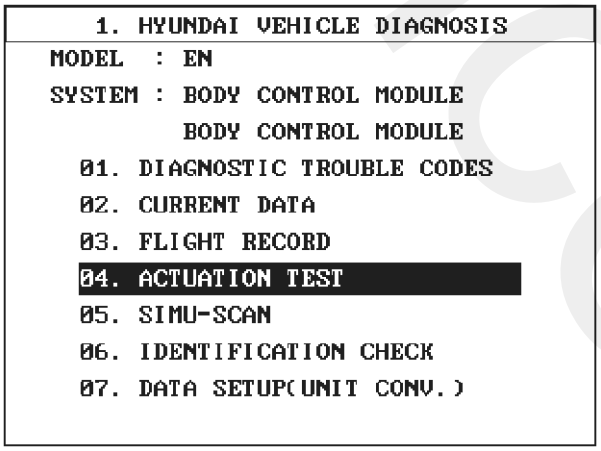
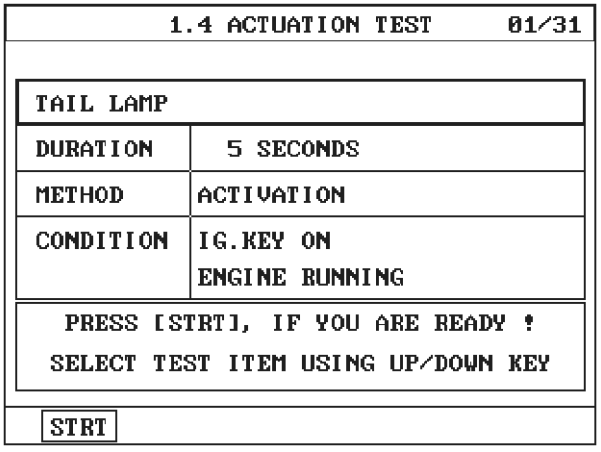


SENBE7207L

4. If you will check BCM data operation forcefully, select "Actuation test".



SENBE7303L



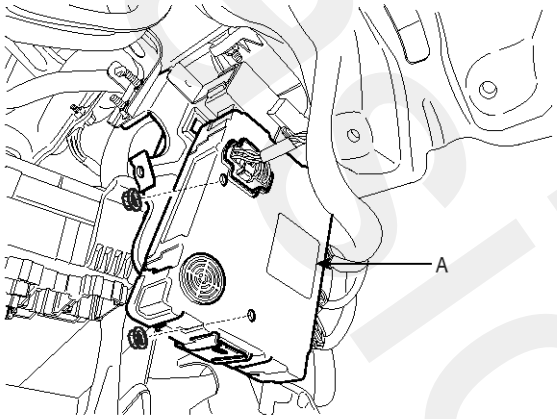
SENBE7299L

5. You can turn ON/OFF as below option function with the user option program.
   1) LOCK / UNLOCK comfirming alarm: Alarm sound ON/OFF control when you LOCK/UNLOCK doors with transmitter.
   2) Mechanical LOCKING system: Arm/Disarm ON/OFF when you lock the door with the mechanical key.
   3) AUTO DOOR LOCK/UNLOCK system ON/OFF.
      - Vehicle speed gearing AUTO DOOR LOCK (more than 20km/h)
      - AUTO DOOR LOCK non application
      - Shift lever gearing AUTO DOOR LOCK
      - Driver seat AUTO DOOR LOCK
      - AUTO DOOR UNLOCK non application
      - All doors UNLOCK in the case of driver door UNLOCK
      - All doors UNLOCK in the case of IGN key seperation.
   4) Riding & Getting off gearing
      - Seat installation state ON/OFF
      - Seat riding & getting off gearing ON/OFF
      - Column installation state ON/OFF
      - Column riding & getting off gearing ON/OFF

Removal

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

   (Refer to the BD group - "Crash pad")
3. Remove the body control module (A) and after loosening 2 nuts and disconnecting connector.



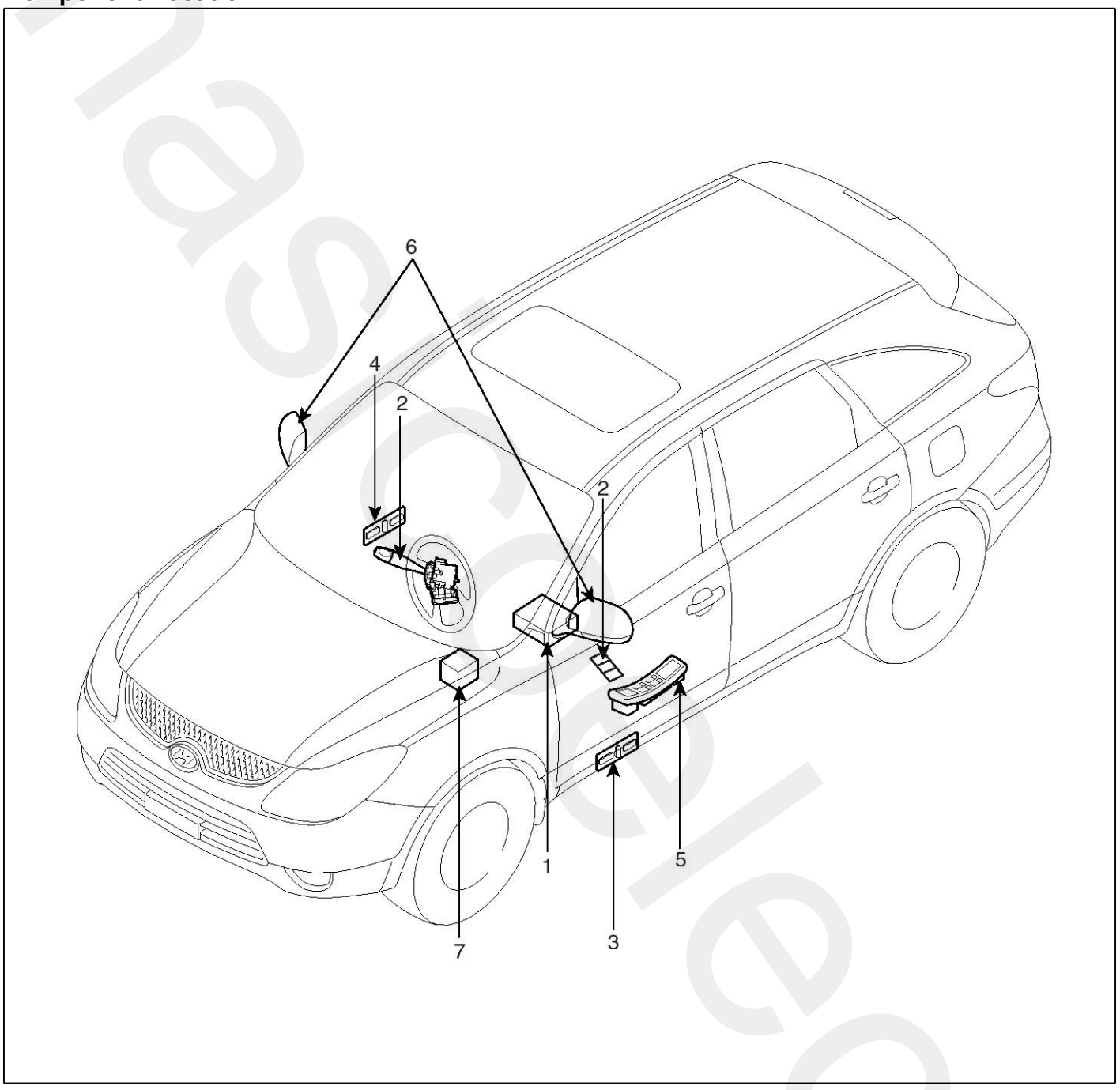
SENBE7145D

Installation

1. Connect the connector and reassemble the body control module.
2. Reassemble the crash pad lower panel.

IMS (Integrated Memory System)

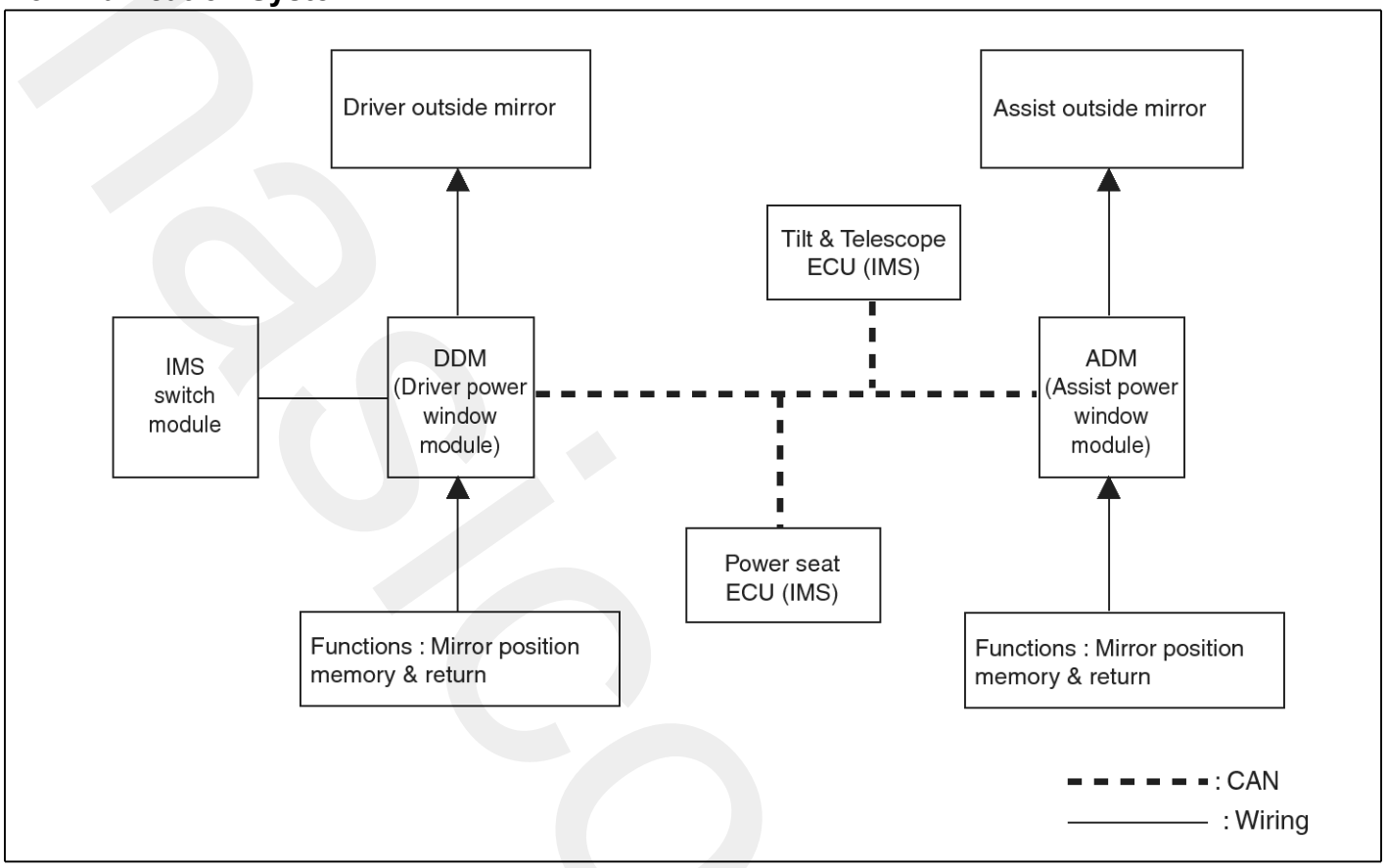
Component Location



SENBE9007L

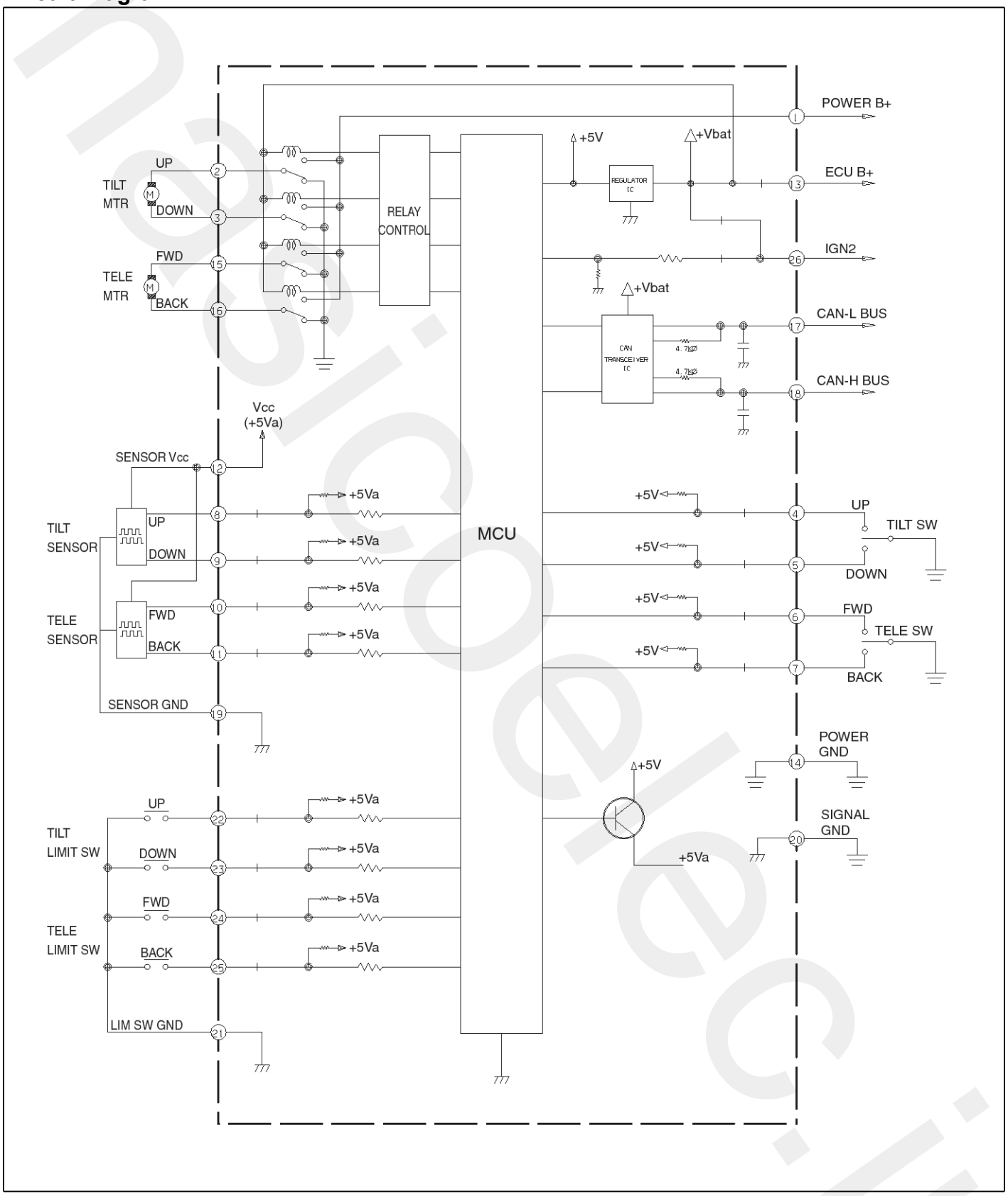
1. IMS
2. IMS Control switch
3. IMS Driver seat control
4. IMS Assist seat control
5. IMS Mirror control
6. Outside mirror
7. Tile-Telescope unit

Communication System



SENBE7102L

Circuit Diagram

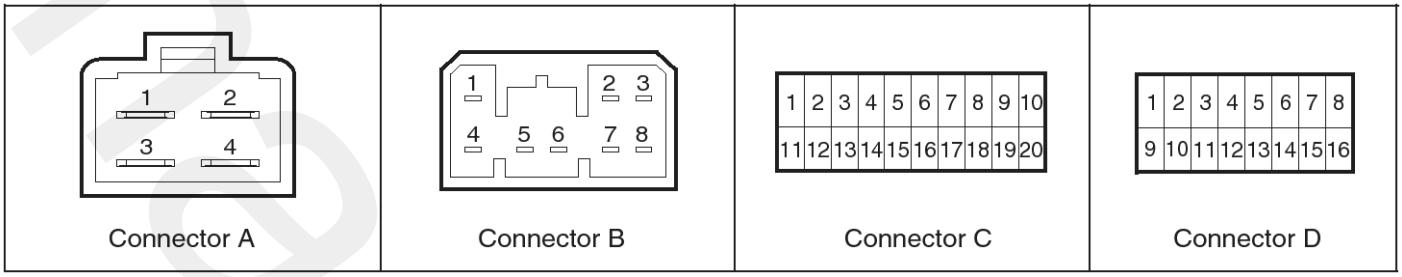


SENBE7101L

Description

Seat, steering column and mirror positions set by the driver are memorized in the IMS control unit by the position sensors. So, those positions can be returned to the memorized positions by the IMS control switch and keyless control even when the seat, steering column and mirror positions are changed. (This is called replay operation). In addition, LIN communication is performed between power seat control unit and power window. For the sake of safety, replay is prohibited during driving and replay operation can be stopped immediately.

Inspection
IMS Connectors



SENBE7104L

Connector Pin Name

No.	Connector A	Connector B	Connector C	Connector D
1	RECLINE MOTOR BACK	-	RECLINE FWD SENSOR	RECLINE BACK LIM SW
2	RECLINE MOTOR FWD	SLIDE MOTOR FWD	-	RECLINE FWD LIM SW
3	POWER GND	FRT HEIGHT MOTOR D-OWN	FRT HEIGHT UP SENSO-R	RR HEIGHT UP SW
4	POWER B+	-	FRT HEIGHT DOWN SE-NSOR	RR HEIGHT DOWN SW
5		RR HEIGHT MOTOR UP	"P" POSITION	SLIDE FWD LIM SENSO-R
6		RR HEIGHT MOTOR DO-WN	FRT HEIGHT UP SW	SLIDE BACK LIM SW
7		SLIDE MOTOR BACK	SLIDE FWD SENSOR	SLIDE BACK SENSOR
8		FRT HEIGHT MOTOR UP	RR HEIGHT UP SENSOR	RECLINE BACK SENSOR
9			RR DEIGHT DOWN SEN-SOR	SENSOR GND
10			FRT HEIGHT DOWN SW	SIGNAL GND
11			RECLINE BACK LIM SW	-
12			RECLINE FWD LIM SW	-
13			RR HEIGHT UP SW	-
14			RR HEIGHT DOWN SW	-
15			SLIDE BACK LIM SW	-
16			ECU POWER+	-
17			IGN2	
18			SLIDE FWD SW	
19			LIMIT SWITCH GND	
20			SENSOR POWER	

IMS Input/output Specification

Connector A

No.	Pin Name	Voltage
1	RECLINE MOTOR BACK	Relay operating current : 20A
2	RECLINE MOTOR FORWARD	Relay operating current : 20A
3	POWER GND	Operating current (MAX) : 11A Locked rotor connector (MAX) : 65A
4	B+	Operating current (MAX) : 11A Locked rotor connector (MAX) : 65A

Connector B

No.	Pin Name	Voltage
1	-	-
2	SLIDE MOTOR FORWARD	
3	FRONT HEIGHT MOTOR DOWN	Relay operating current : 20A
4	-	-
5	REAR HEIGHT MOTOR UP	Relay operating current : 20A
6	REAR HEIGHT MOTOR DOWN	Relay operating current : 20A
7	SLIDE MOTOR BACK	Relay operating current : 20A
8	FRONT HEIGHT MOTOR UP	Relay operating current : 20A

Connector C

No.	Pin Name	Voltage
1	RECLINE FORWARD SENSOR	HALL sensor
2	-	-
3	FRONT HEIGHT UP SENSOR	HALL sensor
4	FRONT HEIGHT DOWN SENSOR	HALL sensor
5	"P" POSITION	ON : GND OFF : OPEN
6	FRONT UP SWITCH	ON : GND OFF : OPEN
7	SLIDE FORWARD SENSOR	HALL sensor
8	REAR HEIGHT UP SENSOR	HALL sensor
9	REAR HEIGHT DOWN SENSOR	HALL sensor
10	FRONT HEIGHT DOWN SWITCH	ON : GND OFF : OPEN
11	RECLINE BACK SWITCH	NOMAL CLOSE
12	RECLINE FORWARDSWITCH	NOMAL CLOSE
13	CAN LOW BUS	ON : GND OFF : OPEN

14	CAN HIGH BUS	ON : GND OFF : OPEN
15	SLIDE BACK SWITCH	NOMAL CLOSE
16	ECU POWER+	NOMAL CLOSE
17	IGN 2	HALL sensor
18	SLIDE FWD SWITCH	HALL sensor
19	LIMIT SWITCH GND	ON : GND OFF : OPEN
20	SENSOR POWER	ON : GND OFF : OPEN

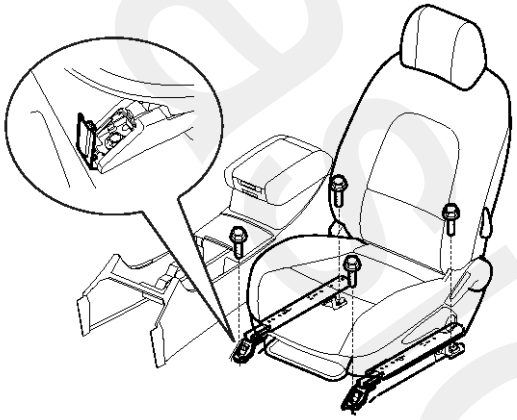
Connector D

No.	Pin Name	Voltage
1	RECLINE BACK LIM SWITCH	
2	RECLINE FORWARD LIM SWITCH	
3	REAR HEIGHT UP SWITCH	ON : GND OFF : OPEN
4	REAR HEIGHT DOWN SWITCH	Dark current : 2mA (MAX)
5	SLIDE FORWARD LIM SENSOR	B+
6	SLIDE BACK LIM SENSOR	ON : GND OFF : OPEN
7	SLIDE FORWARD SENSOR	+12V
8	RECLINE BACK SWITCH	+5V
9	SENSOR GND	
10	SIGNAL GND	

IMS (Integrated Memory System) module

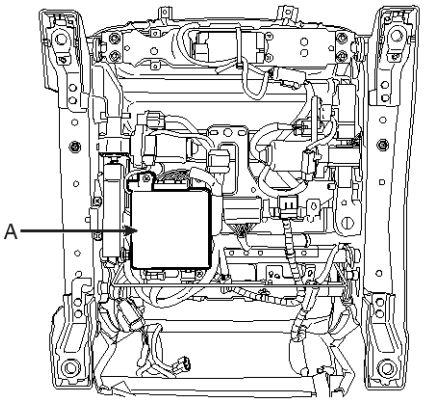
Removal

1. Remove the negative(-) battery terminal.
2. Remove the seats in the car.
   (Refer to the BD group - "Front seat")



SENBE7109D

3. Remove the IMS module (A) after loosening 4 screws and 4 connectors in the botton of seat.



SENBE7110D

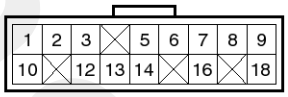
Installation

1. Reassemble the IMS module after connecting the connectors.
2. Reassemble the seats in the car.

IMS Power Seat Control

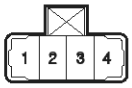
Circuit Diagram

Power seat control switch



Connector A

Driver lumbar support switch



Connector B

No.	Connector A	Connector B
1	GND	B(+)
2	FRONT RECLINE	LUMBER MOTOR REAR
3	HEIGHT MOTOR REAR(UP)	GND
4	-	LUMBER MOTOR FRONT
5	HEIGHT LIMIT FRONT(DOWN)	
6	HEIGHT LIMIT REAR(UP)	
7	-	
8	HEIGHT MOTOR FRT(UP)	
9	-	
10	REAR RECLINE	
11	-	
12	HEIGHT LIMIT REAR(DOWN)	
13	HEIGHT MOTOR REAR(DOWN)	
14	SLIDE REAR	
15	-	
16	HEIGHT LIMIT FRONT(UP)	
17	-	
18	HEIGHT LIMIT FRONT(DOWN)	

SENBE7117L

Description

Driver may choose and store the best seat position at the memory power seat unit using the memory switch and the position sensor, in order to restore the seat position at once.

There are CAN communication for data transmission and reception between the memory power seat unit and the driver side door module. The operation is inhibited for safety during driving.

Feature

1. Manual operation of the seats by the manual switch. (Manual operation)
2. Memory and regeneration operation of the seats by memory switch. (Memory and replay operation) : for 2 persons.
3. Auto memory upon the keyless LOCK and regeneration upon the UNLOCK. (Keyless memory and regeneration operation): for 2 persons.
4. Function description
   1) Driver power seat, sliding control, forward and backward
   2) Driver power seat, reclining control, forward and backward
   3) Driver power seat, height control, up and down

Operation

Manual Operation

1. Motor operation by the seat manual switch (Slide, reclining, front height and rear height control)
2. Seat position setting and 4-way simultaneous operation can be made by the manual switch operation.
3. Seat slide and reclining operation can be made directly in case of communication failure.

Memory Registration

1. Data related to the registration are received through the CAN communication from the power window main on the CAN line.
2. If any of the following conditions is met, memory permit status is released.

   When the ignition is OFF.

   When the manual switch is ON.
3. If 2 position switches are pressed ON simultaneously (within time interval of 50 ms) in memory registration, none of the switches are valid, and the first pressed switch is valid if the time interval is greater than 50 ms.
4. If the vehicle speed is over the limit speed of 3km/h or shift lever is at the position other than P, registration cannot be performed.
5. Registration can be revised without any limitation.
6. Memory will be cleared if the battery is removed.
7. If the memory registration is permitted (memory switch is ON), it sounds the buzzer.

Memory Replay Operation

1. Data related to the memory replay are received through the CAN communication from the power window main on the CAN line.
2. Seat is set to the registered position as each position switch is pressed when the ignition is ON.
3. Memory replay will not be performed unless it is registered.
4. If the position switch is pressed while the memory replay is in operation, the final switch is effective. Though, if the switches are pressed within the time interval of 50 ms, replay will not be performed.
5. When the replay is in operation (position switch is ON), buzzer will sounds once.
6. If any of the following conditions is met, replay is prohibited and operation will stop if it is in replay.

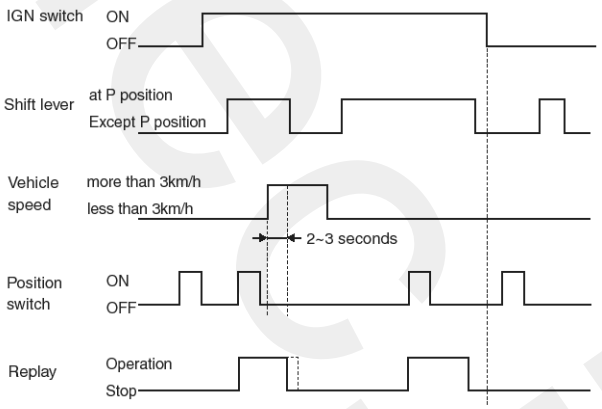
   When the ignition is OFF.

   When the "P" position switch is OFF (when the shift lever is at the position other than "P")

   When the vehicle speed is over 3 km/h (when it last more than 2 or 3 seconds)

   When the manual switch in relation to the seat is in operation. (Seat related replay operation stops)

   When the stop switch is ON.



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7. Control in reverse operation

   When the motor is driven reverse during the operation, it performs reverse operation after 60 ± 10 ms and 100 ± 10 ms from completing the current operation in slide, reclining and front/rear height respectively.

8. Determining operational priority

   In order to prevent overlapping of rushing current when the motor starts up, motor start-up is delayed for 100 ± 10 ms respectively and its operational priority is as follows.

   Slide > Reclining > Front height > Rear height

9. Sequential timer settings for motor start-up.

   Slide : 20 ± 2 seconds (in memory replay)

   Reclining : 35 ± 3 seconds (in memory replay)

   Front /Rear height : 10 ± 1 seconds

   ※ Slide, Reclining: It operates depending on the switch input time in manual switch input (direct drive type)

Registration And Replay By The Keyless

1. Keyless registration operation
   1) Ignition ON and OFF positions are registered corresponding to the keyless codes.
   2) Keyless codes are determined by the keyless door lock operation.
2. Keyless replay operation
   1) Upon door unlock operation when the ignition is OFF, it automatically set the registered positions corresponding to the keyless code. However, seat slide is automatically set to the following positions.
   2) If any of the following conditions is met, keyless replay operation is prohibited and operation stops if it is in operation.
      - When the P position switch is OFF.
      - When the switch is in manual operation.
      - When the stop switch is ON.

Buzzer Output

1. In case of memory permit status (memory switch is ON) : once
2. When memory registration is complete (position switch is ON) : twice
3. When the memory replay is in operation (position switch is ON) : once
4. When error is detected due to the sensor failure : 10 times

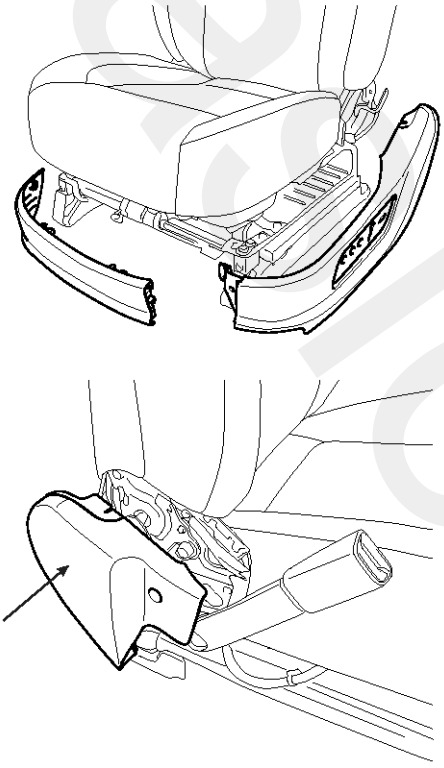
Error Detection

1. If the sensor fluctuations of slide and front/rear height for one second after motor start-up are less than 6 pulses and 4 pulses respectively, and if the sensor fluctuation of reclining for 3.5 seconds is less than 50mV, it is determined that the harness is short or sensor is fail.
2. Countermeasure when error is detected.

   Stop the operation if it is in auto replay. Though, it should be operable manually. When the failure is completely repaired, it can be automatically adjusted from the stop of auto replay. If the position sensor senses the pulse from the position sensor by the manual operation, we judge it is complete. This is called stop release of automatic operation.

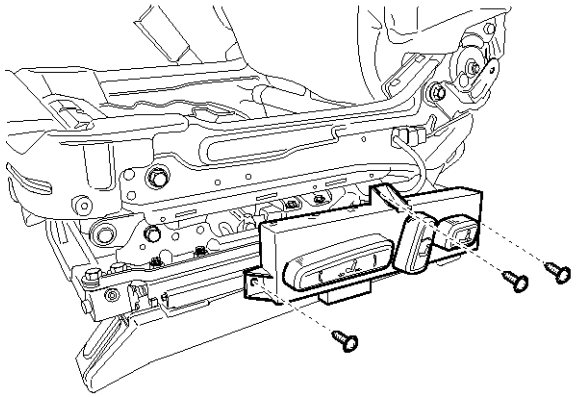
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the seat front cover.
   (Refer to the BD group - "Front seat")
3. After loosening the mounting screws and crip, then remove the recliner cover (A).

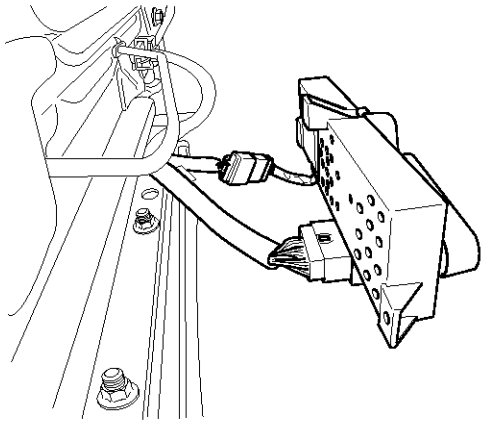


SENBE7112D

4. Loosen the power seat control switch screws(3EA), then remove the connectors (2EA).



SENBE7113D



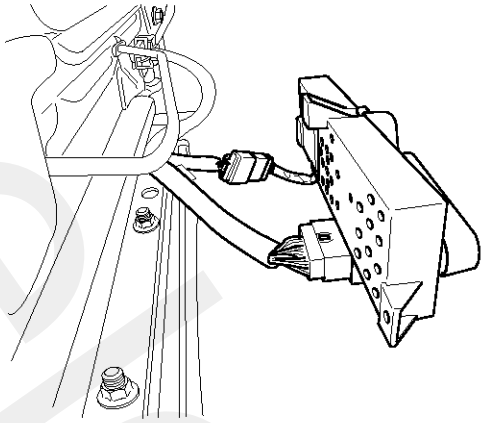
SENBE7114D

Installation

1. Connect the connectors and reassemble the power seat control switch.
2. Reassemble the recliner cover and seat front cover.

Inspection

1. Remove the seat control switch.



SENBE7114D

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

Power seat connector switch A

	HEI FRONT		HEI REAR		RECLINE		SLIDE		PIN NAME
	UP	DOWN	UP	DOWN	FRONT	REAR	FRONT	REAR	
1					●	●	●	●	GND
14								●	SLIDE REAR
5							●		HET LIMIT FRT(DOWN)
2					●				RECLINE FRONT
10						●			RECLINE REAR
18		●							HET MOTOR FRT(DOWN)
8	●								HET MOTOR FRONT(UP)
5		●							HET LIMIT FRT(DOWN)
16	●								HET LIMIT FRT(UP)
3			●						HET MOTOR REAR(UP)
13				●					HET MOTOR REAR(DOWN)
6			●						HET LIMIT REAR(UP)
12				●					HET LIMIT REAR(DOWN)

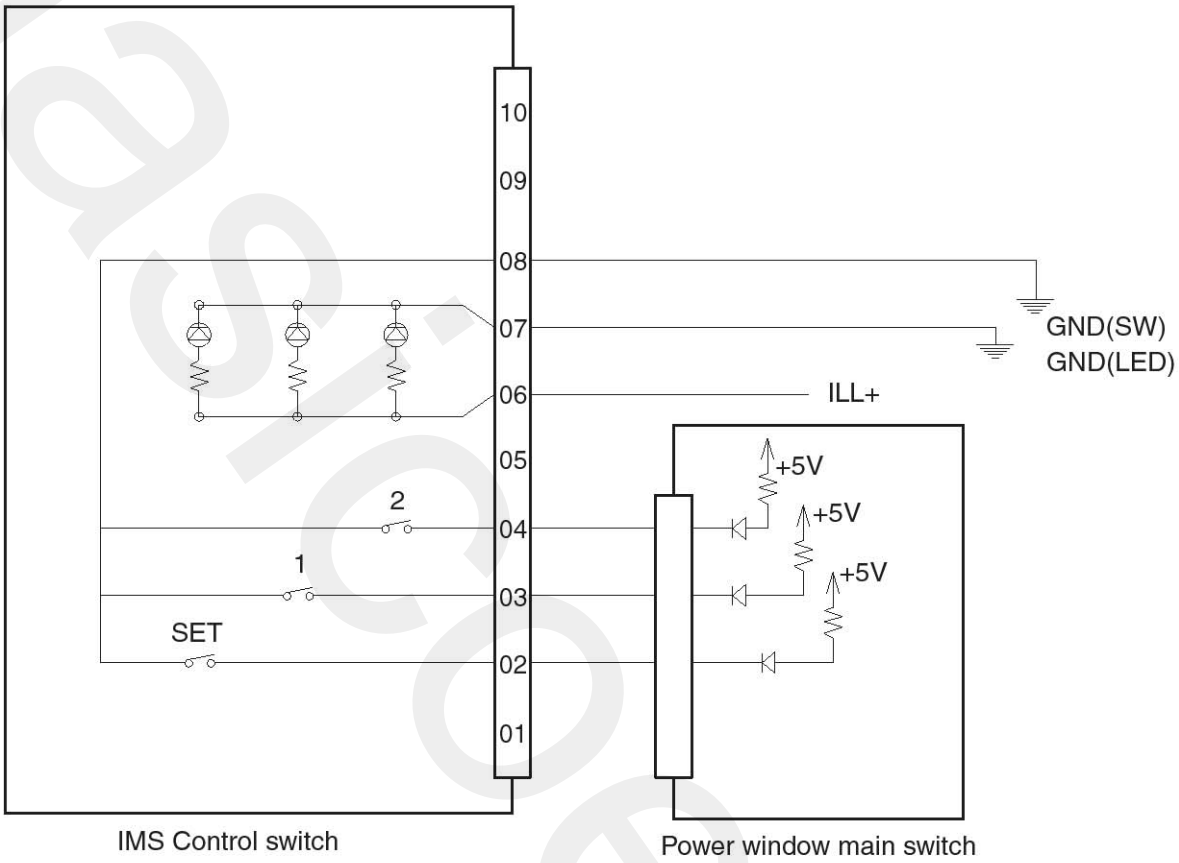
Driver lumbar connector B

	Driver lumbar support switch		
	REAR	N	FRONT
1	●		●
2	●	●	●
3		●	●
4		●	●

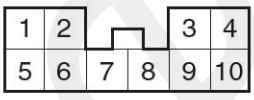
SENBE7116L

IMS Control Switch

Circuit Diagram



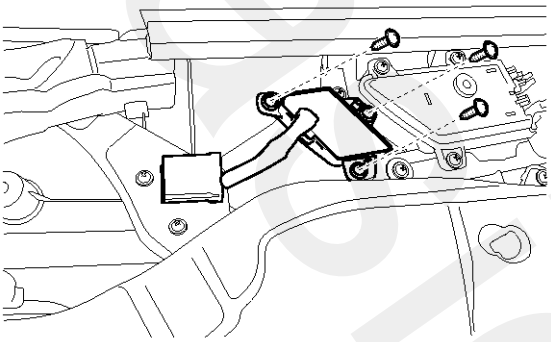
No.	Specification
1	-
2	SET switch
3	M1 switch
4	M2 switch
5	-
6	ILL (+)
7	ILL (LED)
8	GND
9	-
10	-



SENBE7108L

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel.
   (Refer to the BD group - "Front door")
3. After removing the mounting screws (3EA) and switch connector, then remove the IMS control switch.



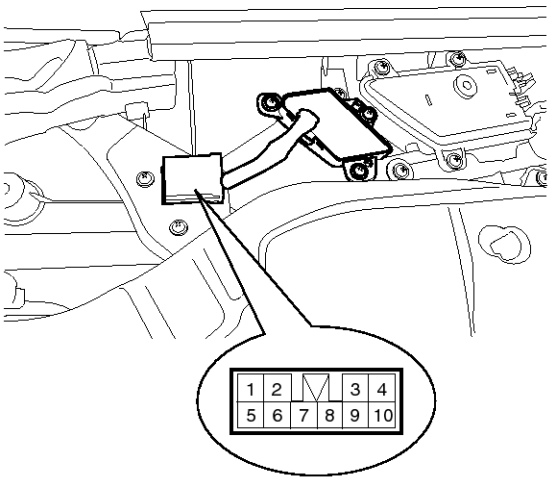
SENBE7105D

Installation

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

Inspection

1. Remove the IMS control switch.



SENBE7106D

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

Terminal / Position	8	2	3	4
SET	○——	——○		
1	○——		——○	
2	○——			——○

SENBE7107L

IMS Tilt & Telescope Control

Description

Driver may choose and store the best steering column position at the tilt & telescope unit using the memory switch and the position sensor, in order to restore the steering column position at once.

There are CAN communication for data transmission and reception between the memory power seat unit and the driver side door module. The operation is inhibited for safety during driving.

Feature

1. Manual operation of the tilt & telescope by the manual switch. (Manual operation)
2. Memory and regeneration operation of the tilt & telescope by memory switch. (Memory and replay operation): for 2 persons.
3. Auto memory upon the keyless LOCK and regeneration upon the UNLOCK. (Keyless memory and regeneration operation): for 2 persons.

Operation

Manual Operation

1. Motor operation by the manual switch (Tilt & telescope steering column tilt up & down, telescope forward & backward)
2. Manual switch operation auto stop by limit switch OFF.

Memory Registration

1. Data related to the registration are received through the CAN communication from DDM.
2. If any of the following conditions is met, memory permit status is released.

   When the ignition is OFF.

   When the manual switch is ON.
3. If 2 position switches are pressed ON simultaneously (within time interval of 50 ms) in memory registration, none of the switches are valid, and the first pressed switch is valid if the time interval is greater than 50 ms.
4. If the vehicle speed is over the limit speed of 3km/h or shift lever is at the position other than P, registration cannot be performed.
5. Registration can be revised without any limitation.
6. Memory will be cleared if the battery is removed.
7. If the memory registration is permitted (memory switch is ON), it sounds the buzzer.

Memory Replay Operation

1. Data related to the memory replay are received through the CAN communication from DDM.
2. Memory replay will not be performed unless it is registered.
3. If the position switch is pressed while the memory replay is in operation, the final switch is effective. Though, if the switches are pressed within the time interval of 50 ms, replay will not be performed.
4. When the replay is in operation (position switch is ON), buzzer will sounds once.
5. If any of the following conditions is met, replay is prohibited and operation will stop if it is in replay.

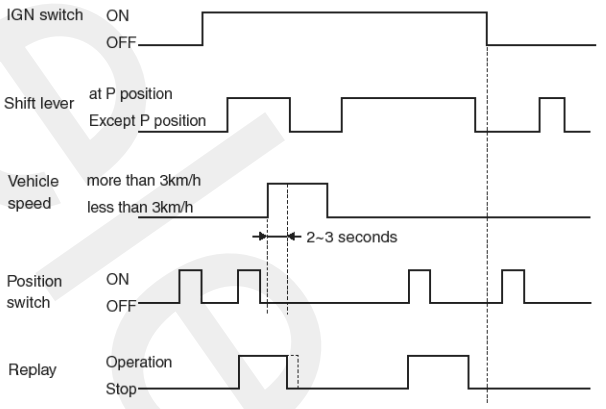
   When the ignition is OFF.

   When the "P" position switch is OFF (when the shift lever is at the position other than "P")

   When the vehicle speed is over 3 km/h (when it last more than 2 or 3 seconds)

   When the manual switch in relation to the tilt & telescope is in operation. (Tilt & telescope related replay operation stops)

   When the stop switch is ON.



ETBF155A

6. Determining operational priority

   In order to prevent overlapping of rushing current when the motor starts up, motor start-up is delayed for 100 ± 10 ms respectively and its operational priority is as follows.

   Tilt > Telescope

Registration And Relay By The Keyless

1. Keyless registration operation
   1) Ignition ON and OFF positions are registered corresponding to the keyless codes.
   2) Keyless codes are determined by the keyless door lock operation.
2. Keyless replay operation
   1) Upon door unlock operation when the ignition is OFF, it automatically set the registered positions corresponding to the keyless code.
   2) If any of the following conditions is met, keyless replay operation is prohibited and operation stops if it is in operation.
      - When the P position switch is OFF.
      - When the switch is in manual operation.
      - When the stop switch is ON.

Buzzer Output

1. In case of memory permit status (memory switch is ON) : once
2. When memory registration is complete (position switch is ON) : twice
3. When the memory replay is in operation (position switch is ON) : once
4. When error is detected due to the sensor failure : 10 times

Error Detection

1. If the sensor fluctuations of tilt & telescope for one second after motor start-up are less than 4 pulses respectively (Limit switch ON/CLOSE), the harness is short or sensor is fail.
2. Countermeasure when error is detected.

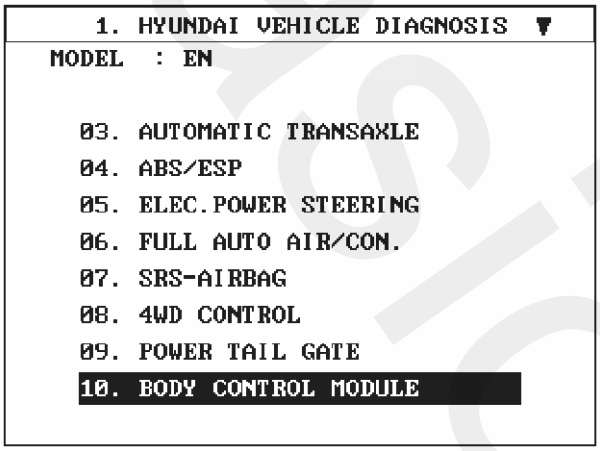
   Stop the operation if it is in auto replay. Though, it should be operable manually. When the failure is completely repaired, it can be automatically adjusted from the stop of auto replay. If the position sensor senses the pulse from the position sensor by the manual operation (in case of sensor fluctuation for 1 seconds is greater than 4 pulses), we judge it is complete. This is called stop release of automatic operation.

Inspection

Diagnosis With Scan Tool

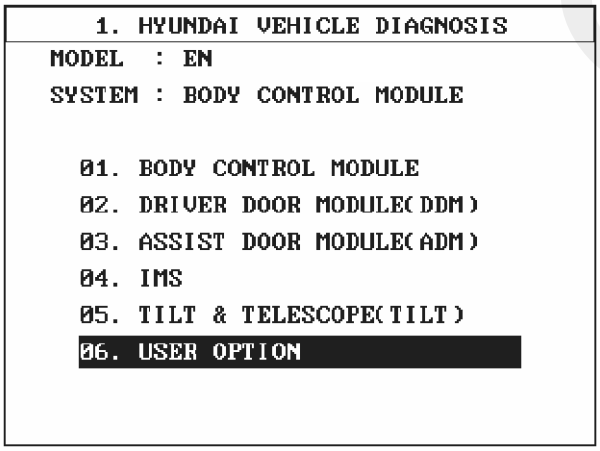
You can turn ON/OFF as below "GET IN & GET DOWN LINKAGE" option function with the user option program.

1. It will be able to change SEAT / COLUMN LINKAGE mode with scan tool.
2. Select "BODY CONTOROL MODULE", if you will check "GET IN & GET DOWN LINKAGE" of BCM.



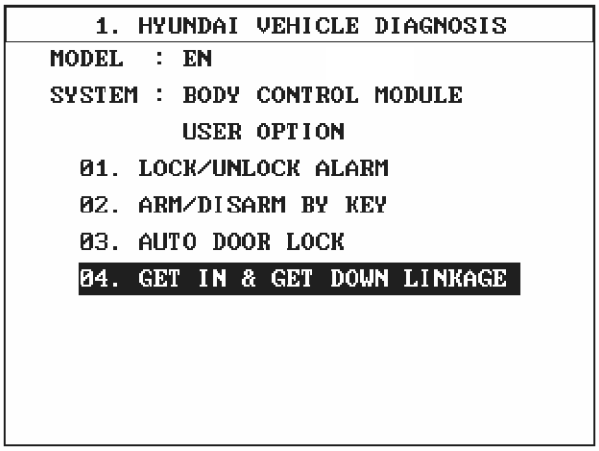
SENBE7242L

3. Select "USER OPTION".



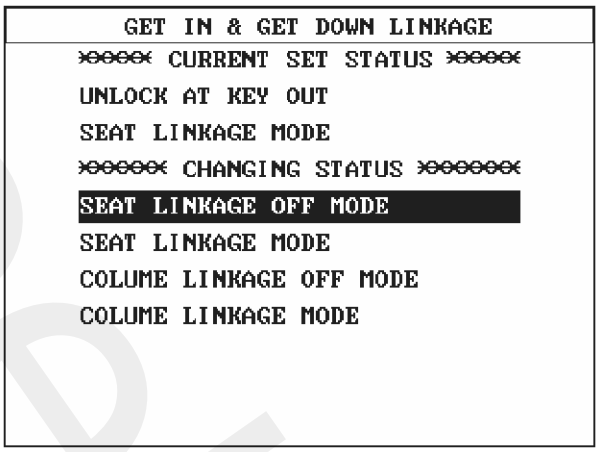
SENBE7243L

4. Select "GET IN & GET DOWN LINKAGE".



SENBE7244L

5. Select the changing ON/OFF mode of seat and column linkage mode.

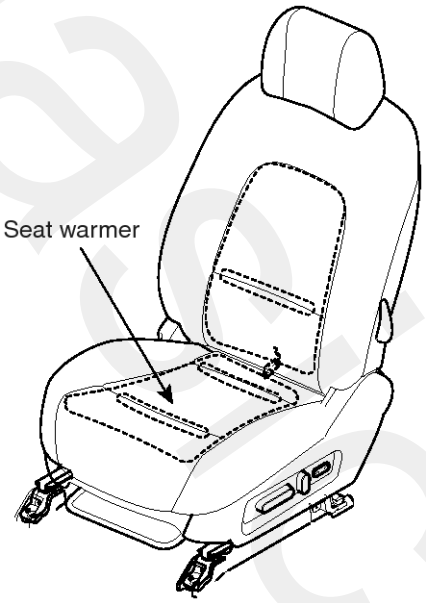


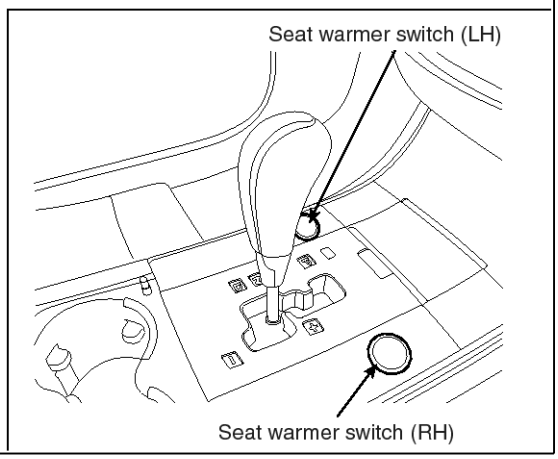
SENBE7245L

Seat Electrical

Component Location

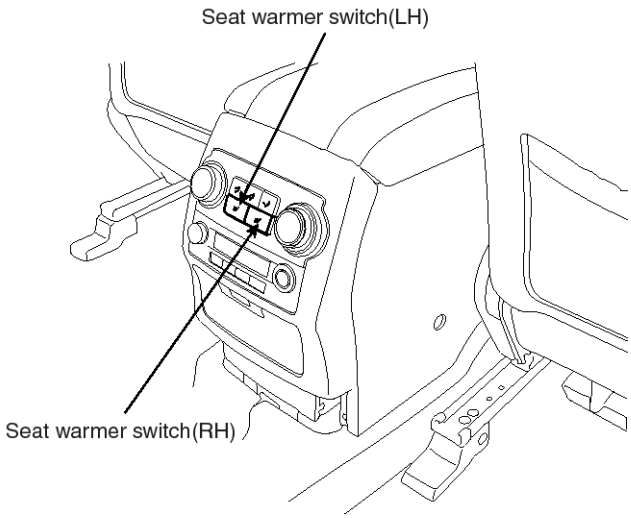
[DRIVER/ASSIST SEAT]



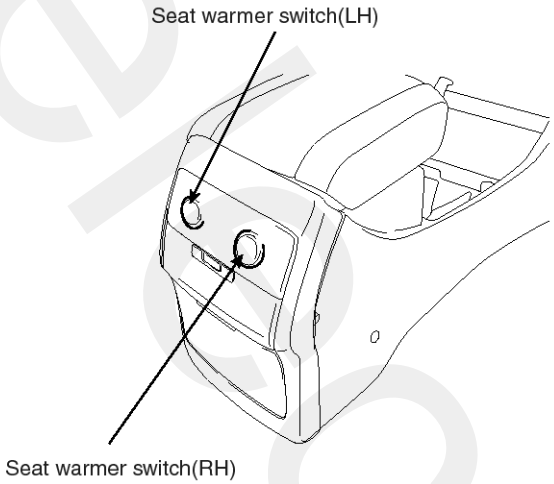


SENBE7380L

[REAR SEAT]



<MODULE TYPE>



<SWITCH TYPE>

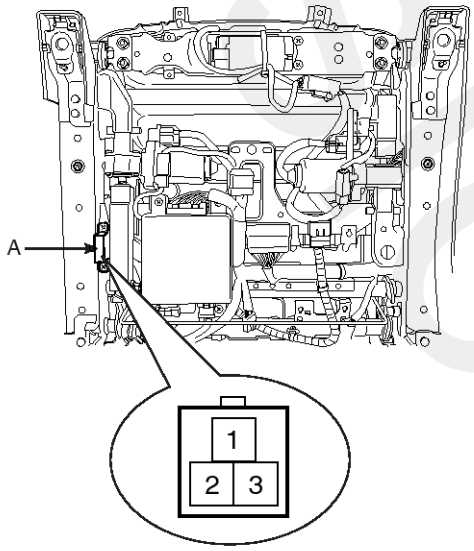
SENBE7381L

Power Seat Motor

Inspection

Slide Motor Limit Switch

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



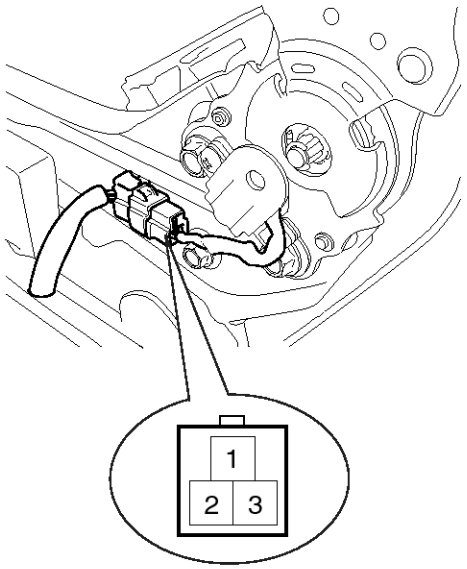
SENBE7391D

Position \ Terminal	1	2	3
Frontward	○		○
Backward	○	○	

SENBE7392L

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.



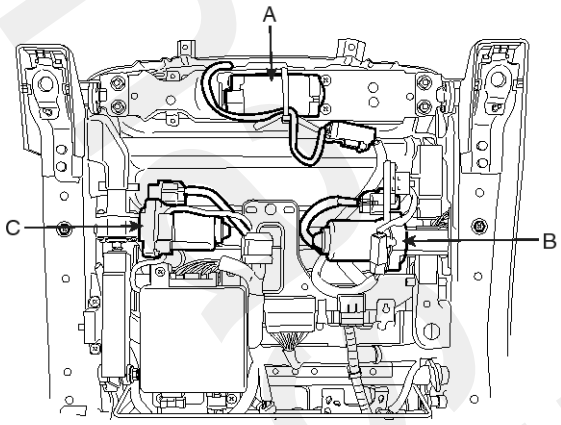
SENBE7393D

Position \ Terminal	1	2	3
Frontward	○	○	
Backward	○		○

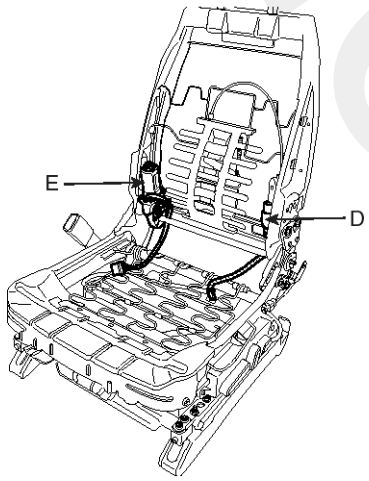
SENBE7394L

Power Seat Motor

1. Disconnect the connectors for each motor.

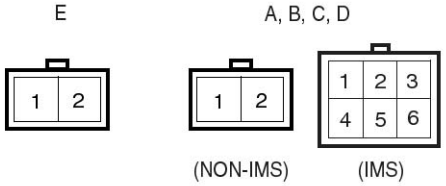


SENBE7395D



SENBE7396D

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.



SCMBE6397L

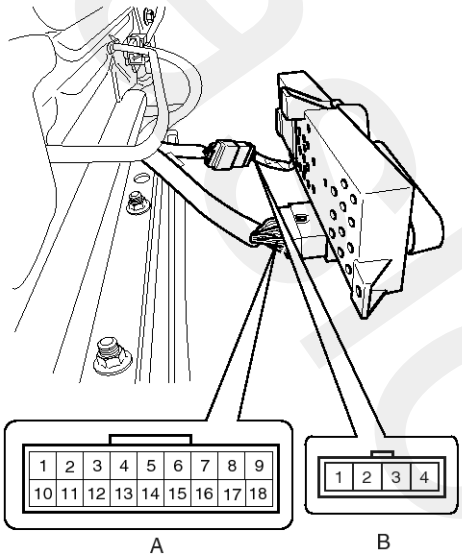
Position	Terminal	1	2
Slide motor A	Frontward	⊕	⊖
	Backward	⊖	⊕
Front height motor B	UP	⊖	⊕
	DOWN	⊕	⊖
Rear height motor C	UP	⊕	⊖
	DOWN	⊖	⊕
Reclining motor D	Forward	⊖	⊕
	Rearward	⊕	⊖
Lumbar support E	Forward	⊕	⊖
	Rearward	⊖	⊕

SCMBE6398L

Power Seat Control Switch

Inspection

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



SENBE7400D

Power seat switch connector A

	Front height switch			Slide switch			Rear height switch			Reclining switch			PIN NAME
	UP	N	DOWN	Front	N	Rear	UP	N	DOWN	Front	N	Rear	
12	●		●	●		●	●		●	●		●	B+
16				●	●	●							Rear slide motor
7					●	●							Front slide motor
15					●	●							Rear slide limit
6				●	●								Front slide limit
2										●	●	●	Front recline motor
10										●	●	●	Rear recline motor
1										●	●		Front recline limit
11											●	●	Rear recline limit
9	●	●	●										Front height motor (UP)
17	●	●	●										Rear height motor (DOWN)
8	●	●											Front height limit(UP)
18		●	●										Front height limit(DOWN)
4							●	●	●				Rear height motor(UP)
14							●	●	●				Rear height motor(DOWN)
13							●	●					Rear height limit(UP)
3								●	●				Rear height limit(DOWN)

Driver lumbar connector B

	Lumbar support switch		
	RR	N	FR
1	●		●
2	●	●	●
3		●	●
4		●	●

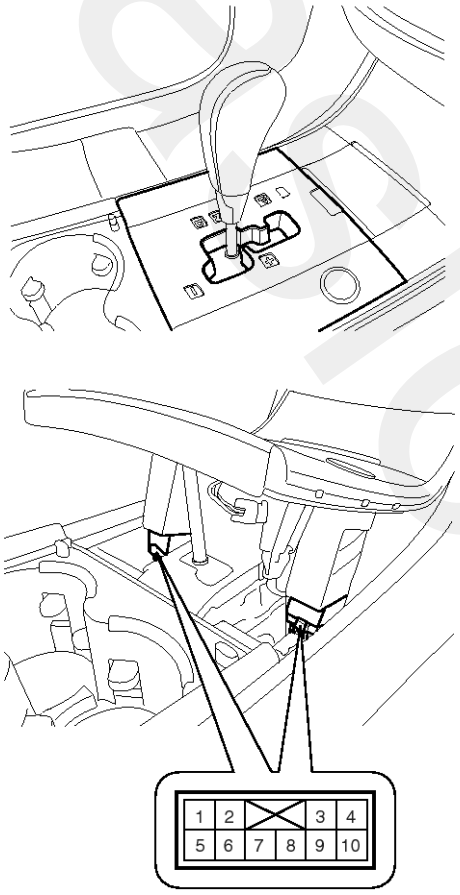
SENBE7401L

Seat Heater Switch

Inspection

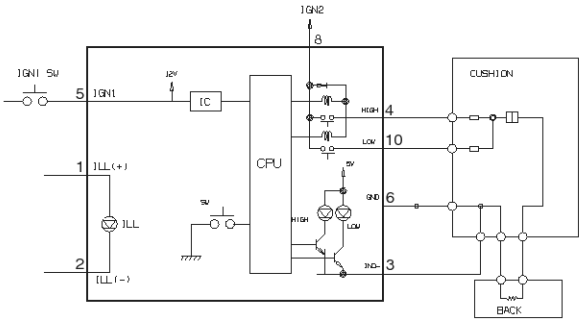
Front Seat Warmer Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the seat warmer switch with scraper.



SENBE7384D

3. Check that continuity exists between the terminals.

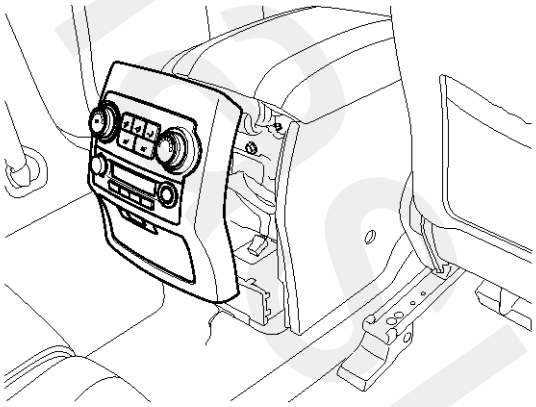


1. ILL(+)
2. ILL(-)
3. Indicator(-)
4. HIGH
5. IGN
6. GND
10. LOW

SENBE7385L

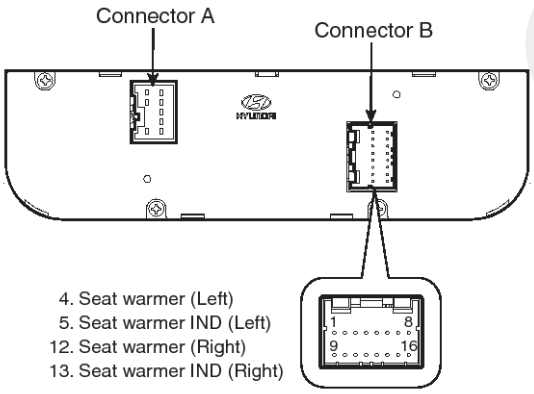
Rear Seat Warmer Switch

1. Module type
   1) Disconnect the negative (-) battery terminal.
   2) Remove the console rear cover.



SENBE7367D

   3) Check that continuity exists between the terminals. If continuity is not normal, replace the switch module.

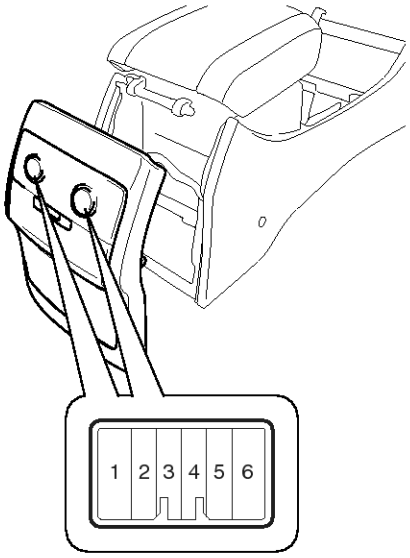


SENBE7353L

Terminal / Position	4	12
ON	0.7V or more	0.7V or more

SENBE7354L

2. Switch type
   1) Disconnect the negative (-) battery terminal.
   2) Remove the console rear cover.



SENBE7369D

   3) Check that continuity exists between the terminals.

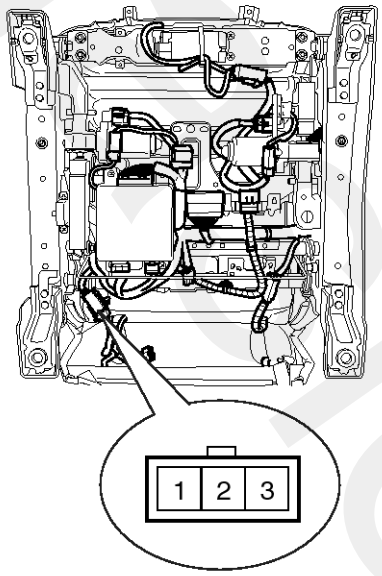
Terminal / Position	1	2	3	4	5	6
ON		ILL.				ILL.
OFF						

SENBE7389L

Seat Heater

Inspection

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



SENBE7383D

Standard value

Cushion : 4.73Ω ± 10%, Back : 4.97Ω ± 10%

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 connector.

Standard value

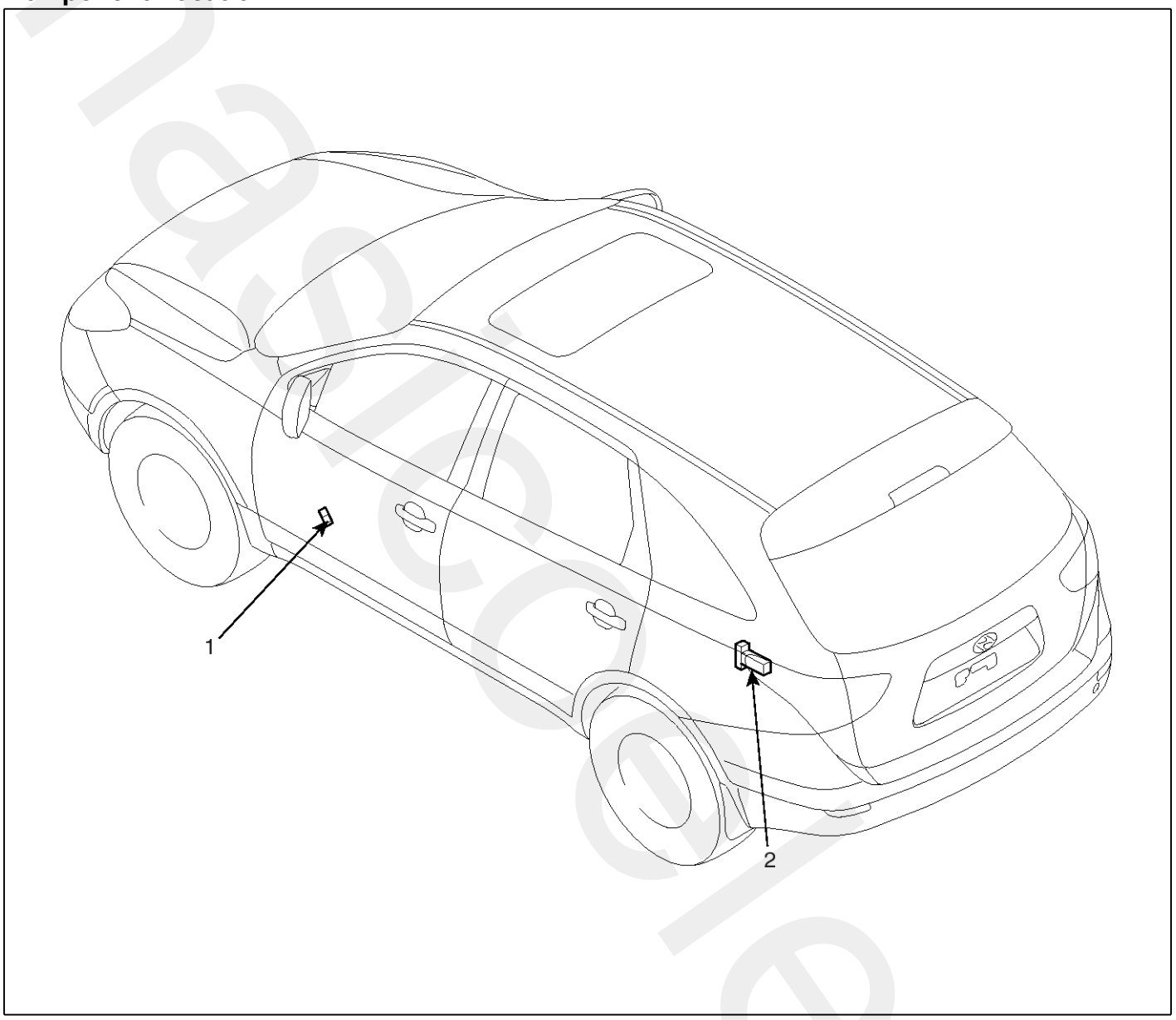
HI : 42 ± 2°C (Cushion), 52 ± 2°C (Back)

Terminal / Position	1	2	3
HIGH	⊕	⊖	⊖
LOW		⊕	⊖

SCMBE6384L

Fuel Filler Door

Component Location



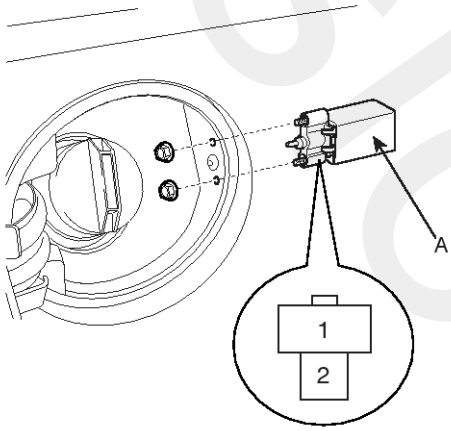
SENBE9008L

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

Fuel Filler Door Release Actuator

Inspection

1. Remove the rear seat.
   (Refer to the BD group - "Rear seat")
2. Remove the luggage side trim.
   (Refer to the BD group - "Internal trim")
3. Open the fuel filter door and disconnect the wiring connector after loosening 2 nuts.
4. Check for continuity between terminal No. 1 and No. 2. If there is no continuity replace the fuel filler door release actuator (A).

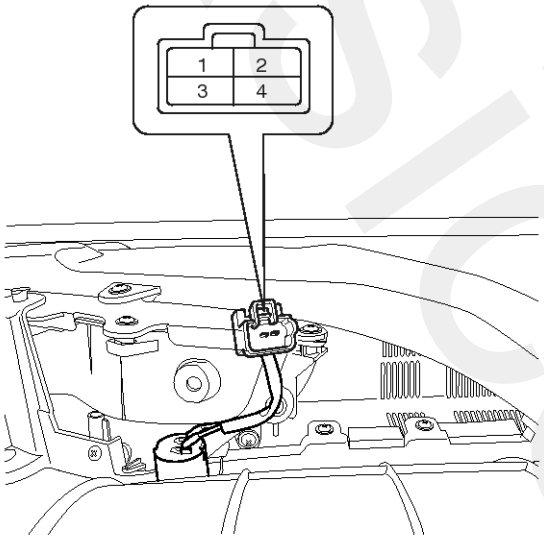


ATKF181A

Fuel Filler Door Open Switch

Inspection

1. Remove the front door trim panel.
   (Refer to the BD group - "Front door")
2. Disconnect the switch connector (4P) from wiring.
3. Check the switch for continuity between the No. 1 and No. 2 terminals.
4. If the continuity is not as specified, replace the switch.

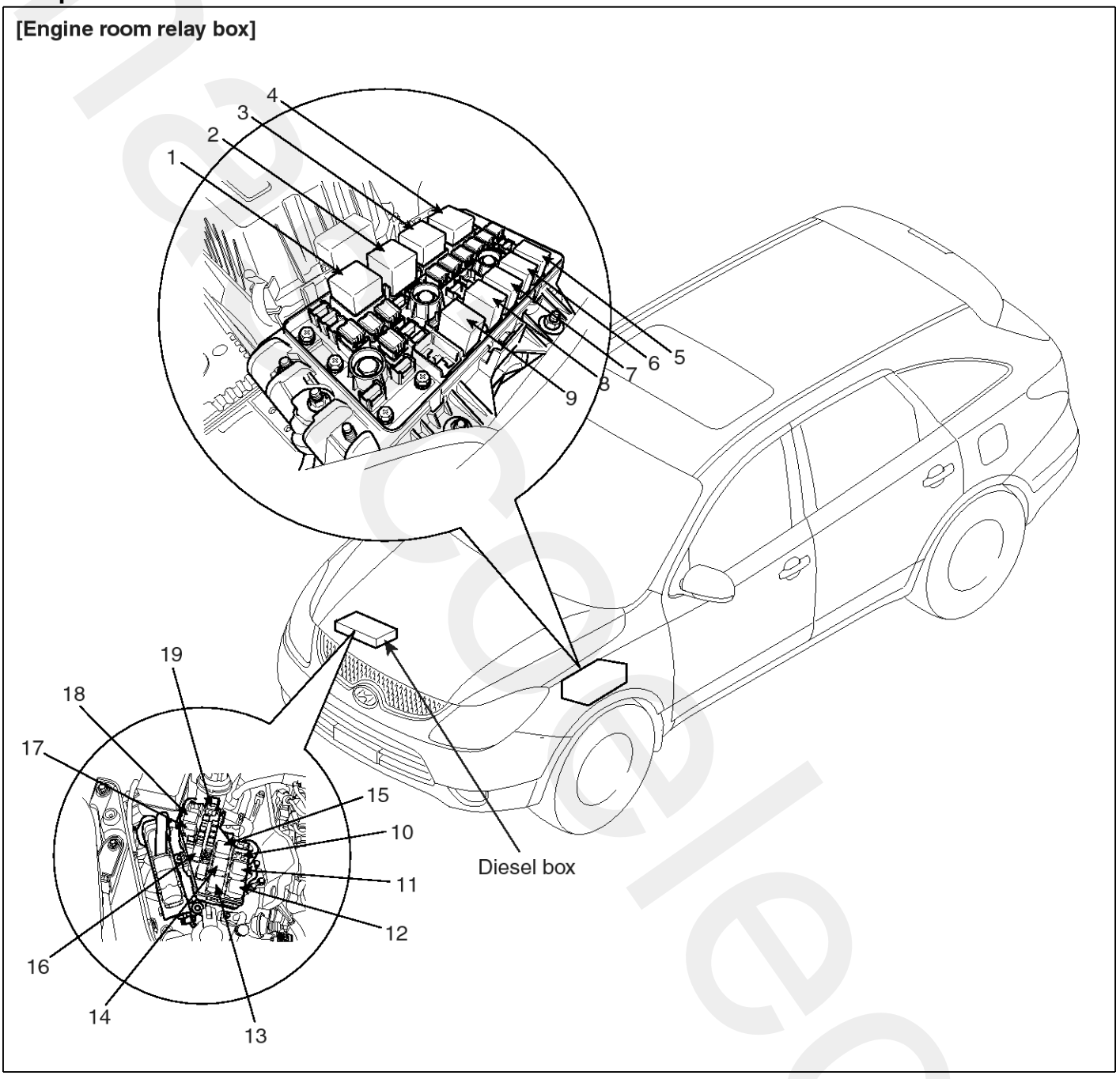


SENBE7182D

Fuses And Relays

Component Location

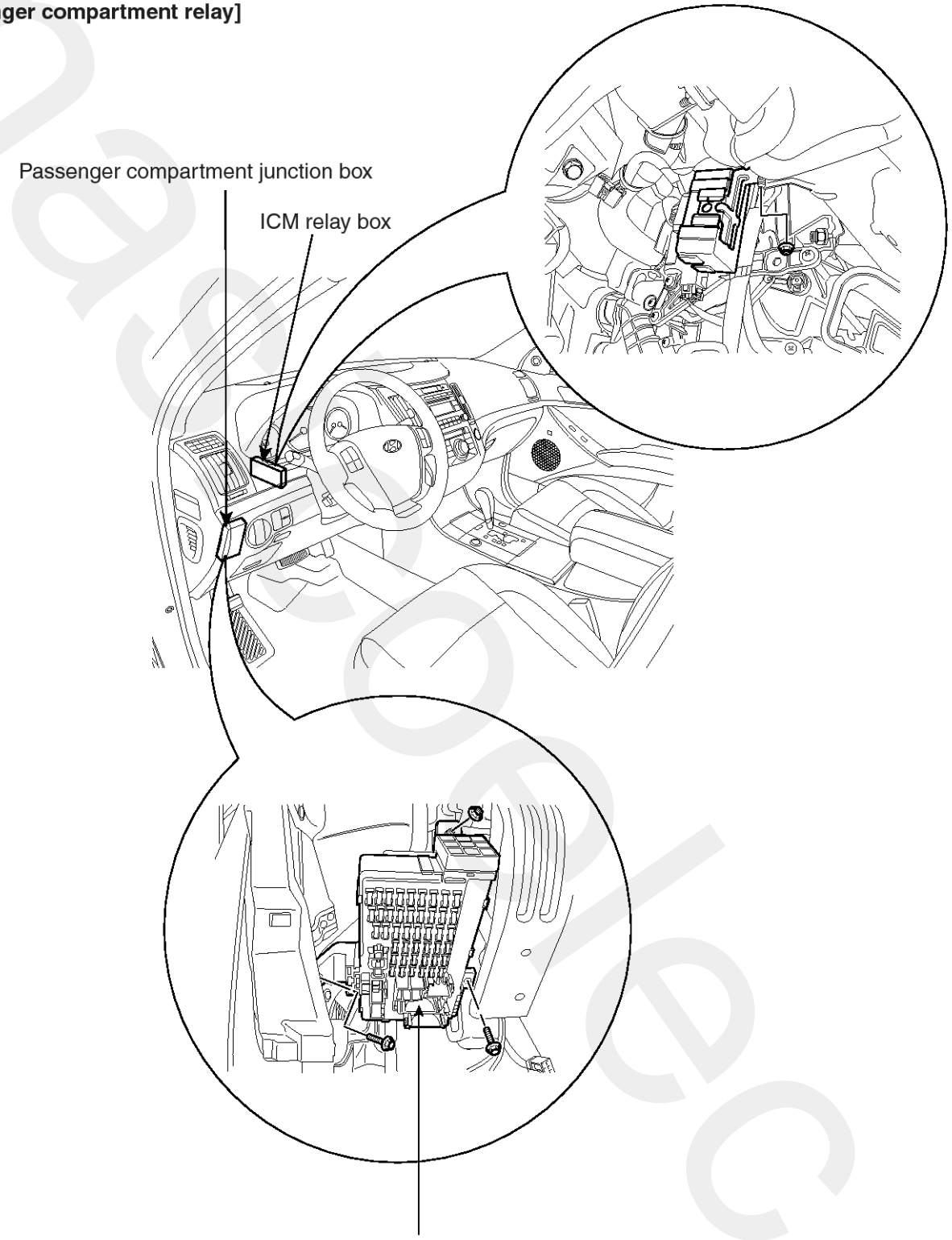
[Engine room relay box]



SENBE9009L

1. Head lamp relay (Low-left side)
2. Head lamp relay (High)
3. Start relay
4. Main relay
5. Horn relay
6. Front fog lamp relay
7. A/C relay
8. Buglar alarm horn relay
9. Fuel pump relay
10. Rear A/C relay
11. Condenser fan 1 relay
12. Radiator fan relay
13. PTC heater relay #1
14. PTC heater relay #2
15. PTC heater relay #3
16. Fuel filter heater relay
17. Head lamp relay (Low-right side)
18. Condenser fan 2 relay
19. Glow relay

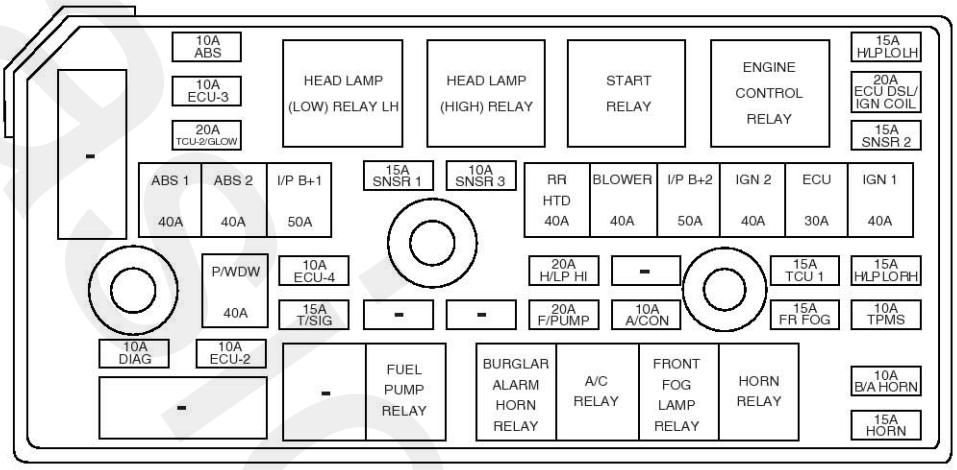
[Passenger compartment relay]



SENBE7191L

Relay Box (Engine Compartment)

Component Location



CIRCUIT

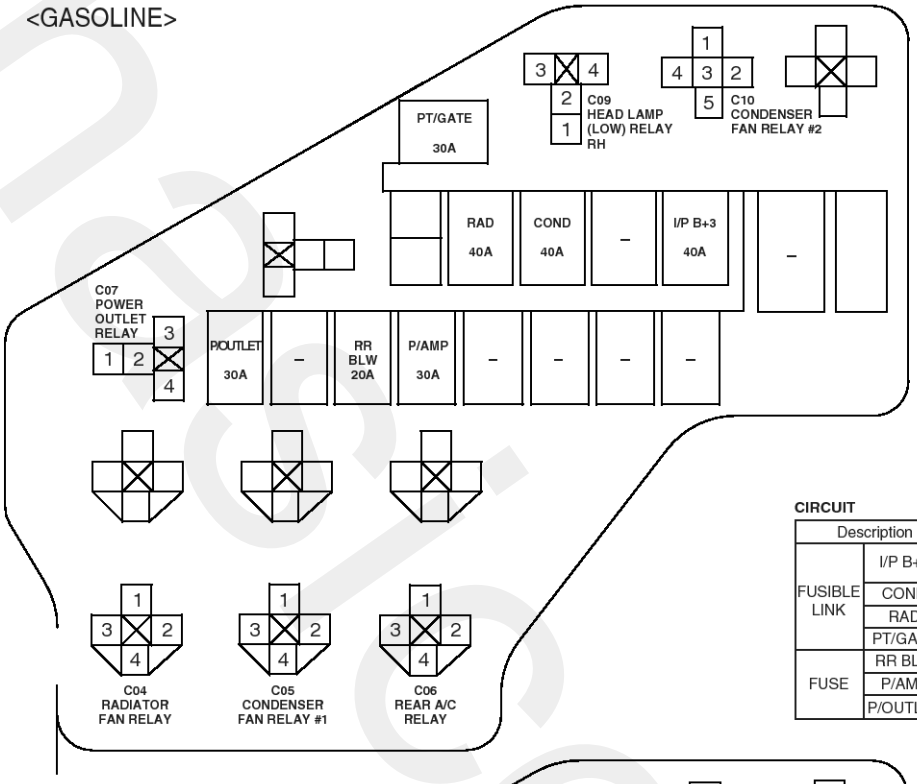
Description		(A)	Circuit Protected
FUSIBLE LINK	IGN 1	40A	Ignition switch(ACC, IG1)
	IGN 2	40A	Start relay, Ignition switch(IG2, START)
	I/P B+1	50A	Fuse(DR LOCK 20A, STOP LP 15A, TAIL LH/RH 10A, ADJ-PEDAL 15A)
	I/P B+2	50A	Fuse(P/SEAT 30A, KEY SOL 10A, SUNROOF 15A, RSE/SMART KEY 10A, DEICER 15A), Power connector(AUDIO1 15A, ROOM LP 15A)
	P/WDW	40A	Fuse(P/WDW LH/RH 25A)
	BLOWER	40A	Blower relay
	RR HTD	40A	Rear defogger relay, Fuse(MIRR HTD 10A)
	ECU	30A	Engine control relay, Fuse(ECU DSL 20A(DSL), SNSR2 15A, SNSR1 15A, SNSR3 10A, ECU-2 10A, IGN COIL 20A(GSL))
	ABS 1	40A	ABS/ESP control module, Multipurpose check connector
	ABS 2	40A	ABS/ESP control module, Multipurpose check connector
FUSE	TCU1	15A	TCM
	TPMS	10A	Semi active engine mounting solenoid
	B/A HORN	10A	Burglar alarm horn relay
	F/PUMP	20A	Fuel pump relay
	T/SIG	15A	BCM(Hazard lamp)
	A/CON	10A	A/C relay
	ECU-1	10A	ECM(GSL)

Description		(A)	Circuit Protected
FUSE	IGN COIL	20A	Ignition coil #1~#6(GSL), Condenser(GSL)
	SNSR1	15A	ECM(GSL), Mass air flow sensor(GSL), Oil control valve(GSL), Fuel metering unit(DSL), EGR actuator(DSL), EVGT actrutor(DSL), Immobilizer module, PCSV(GSL), VIV(GSL)
	SNSR2	15A	Fuel pump relay, Oxygen sensor #1~#4(GSL), Rail pressure control valve(DSL)
	SNSR3	10A	A/C relay, Injector #1~#6(GSL), Condenser fan relay,Radiator fan relay, Lambda sensor(DSL)
	ECU-2	10A	ECM(GSL), Stop lamp switch(DSL)
	ECU DSL	20A	ECM(DSL), PTC heater relay #1(DSL)
	H/LP LO RH	15A	Head lamp(Low) relay RH
	H/LP LO LH	15A	Head lamp(Low) relay LH
	H/LP HI	20A	Head lamp(High) relay
	FR FOG	15A	Front fog lamp relay
	HORN	15A	Horn relay
	ABS	10A	ABS/ESP control module, ESP switch
	DIAG	10A	Multipurpose check connector
	ECU-3	10A	ECM
	TCU-2/ GLOW	10A	TCM, Stop lamp switch(GSL), Glow control module(DSL), Fuel filter warning sensor(DSL), Air flow sensor(DSL)

※ USE THE DESIGNATED FUSE AND RELAY ONLY

SENBE7192L

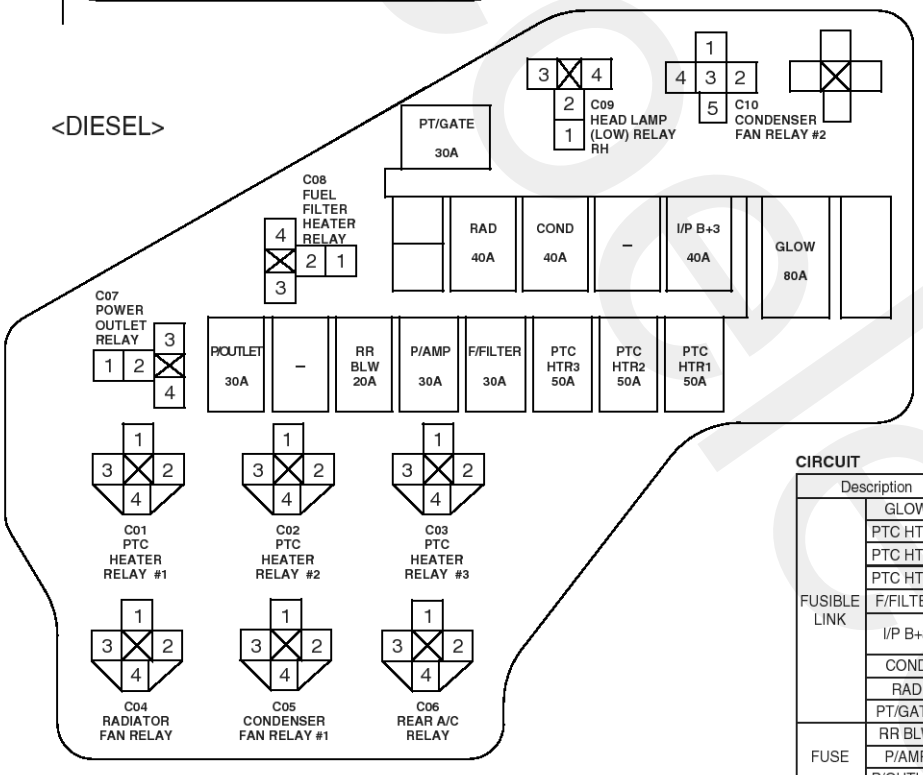
<GASOLINE>



CIRCUIT

Description		(A)	Circuit Protected
FUSIBLE LINK	I/P B+3	40A	Fuse(RR FOG 15A, FUEL LID 15A, FR WIPER 30A, TILT & TELE 15A)
	COND	40A	Condenser fan relay #1
	RAD	40A	Radiator fan relay
	PT/GATE	30A	Power tail gate control module
FUSE	RR BLW	20A	Rear A/C relay
	P/AMP	30A	JBL amp
	P/OUTLET	30A	Console & Rear power outlet

<DIESEL>



CIRCUIT

Description		(A)	Circuit Protected
FUSIBLE LINK	GLOW	80A	Glow control module
	PTC HTR1	50A	PTC heater relay #1
	PTC HTR2	50A	PTC heater relay #2
	PTC HTR3	50A	PTC heater relay #3
	F/FILTER	30A	Fuel filter heater relay
	I/P B+3	40A	Fuse(RR FOG 15A, FUEL LID 15A, FR WIPER 30A, TILT & TELE 15A)
	COND	40A	Condenser fan relay #1
	RAD	40A	Radiator fan relay
	PT/GATE	30A	Power tail gate control module
FUSE	RR BLW	20A	Rear A/C relay
	P/AMP	30A	JBL amp
	P/OUTLET	30A	Console & Rear power outlet

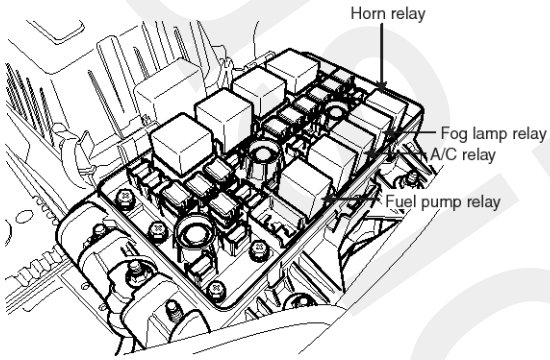
※ USE THE DESIGNATED FUSE AND RELAY ONLY

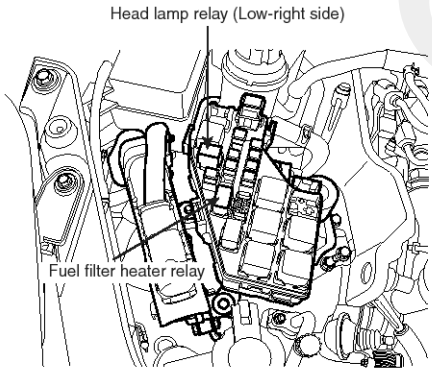
Inspection

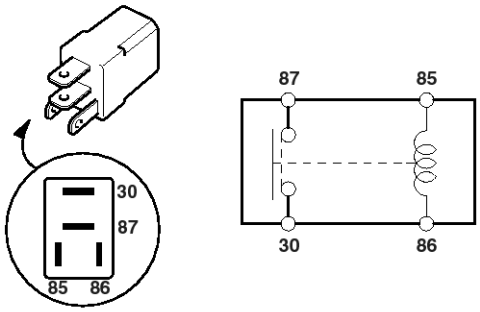
Power Relay (Type A)

Check for continuity between the terminals.

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







SENBE7194L

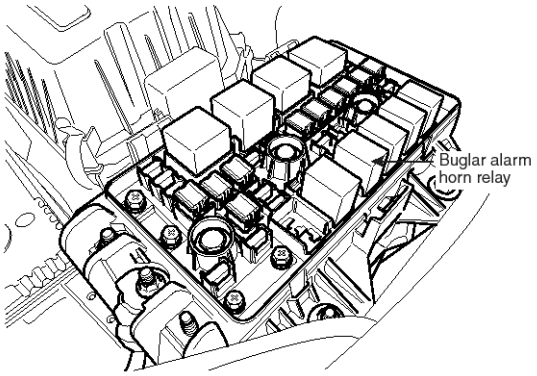
Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

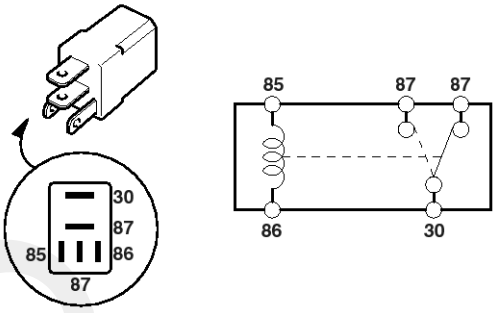
SCMBE6195L

Power Relay (Type B)

Check for continuity between the terminals.

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





SENBE7196L

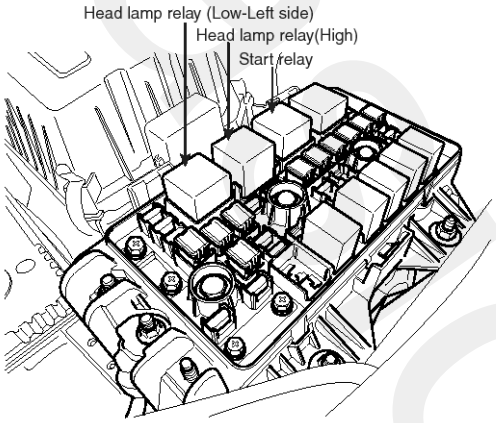
Terminal / Power	85	86	30	87	87
Disconnected			○		○
Connected	⊖	⊕	○	○	

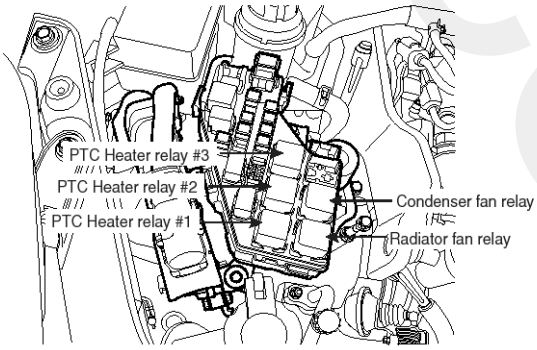
SCMBE6197L

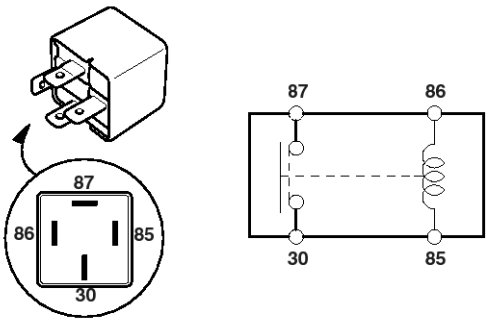
Power Relay (Type C)

Check for continuity between the terminals.

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







SENBE7198L

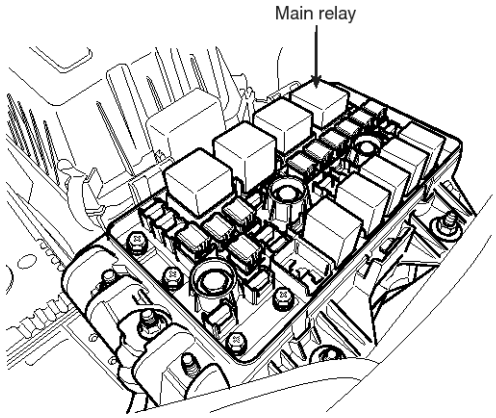
Terminal / Power	86	85	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

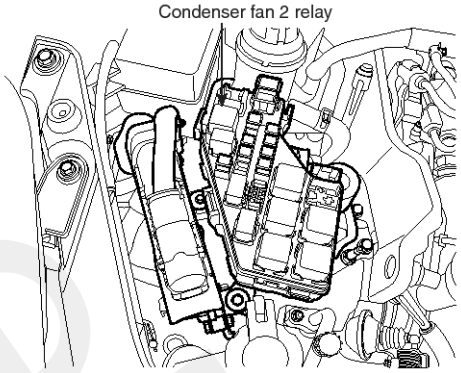
SCMBE6199L

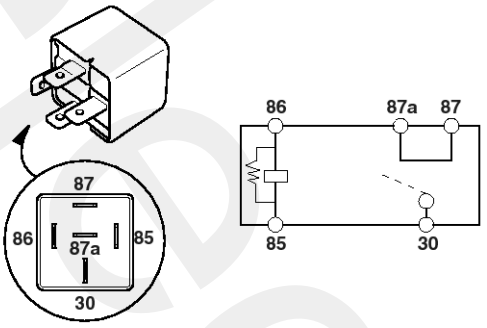
Power Relay (Type D)

Check for continuity between the terminals.

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







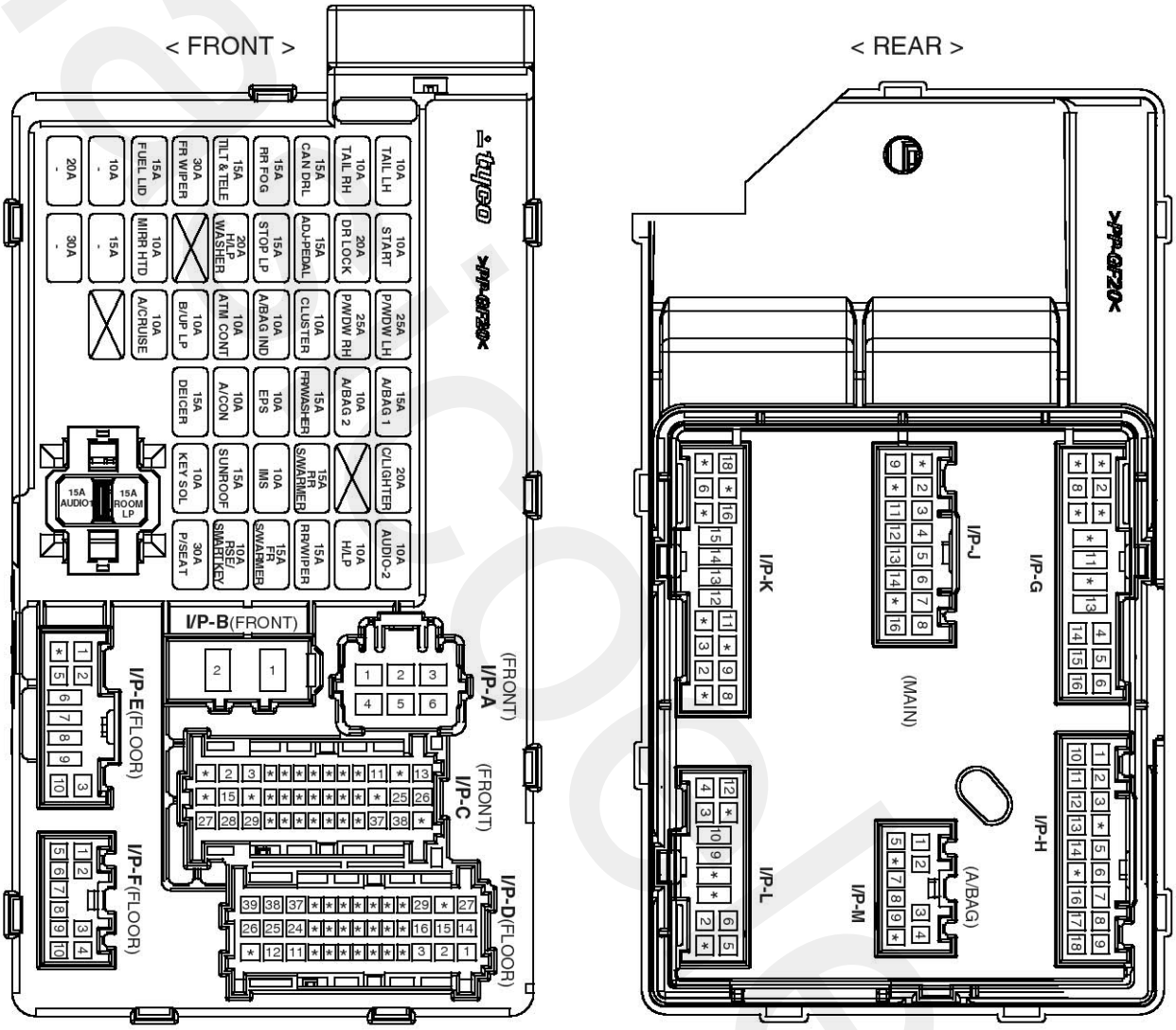
SENBE7200L

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

SCMBE6201L

Relay Box (Passenger Compartment)

Component Location



SENBE7210L

CIRCUIT

FUSE	(A)	Circuit Protected
AUDIO-2	10A	Audio, Console & Rear power outlet, Digital clock, BCM, PIC immobilizer module
C/LIGHTER	20A	Front cigarette lighter & Power outlet
A/BAG 2	10A	-
A/BAG 1	15A	SRS control module
A/BAG IND	10A	Instrument cluster(AIR BAG IND.)
B/UP LP	10A	Back-up lamp relay, TCM, Electro chromic mirror, Back warning control module, Rear combi lamp LH/RH
A/CRUISE	10A	Multifunction switch(Cruise remocon switch), PIC immobilizer module, Driver/Passenger seat warmer switch
ATM CONT	10A	4WD ECM, BCM, Multifunction switch, Semi active engine mounting control module
CLUSTER	10A	Instrument cluster, Generator, BCM, Semi active engine mounting control module, PIC immobilizer module
START	10A	Burglar alarm relay, Power tail gate control module
EPS	10A	BCM, Rheostat, Power window main switch, Front power window switch RH
A/CON	10A	Front/Rear A/C control module, Blower relay, Rear A/C relay,Rain sensor, Electro chromic mirror, Sunroof control module
FR S/WARMER	15A	Driver/Passenger Seat warmer switch
RR S/WARMER	15A	-
IMS	10A	IMS control module, Tilt & Telescopic module, PTC heater relay, Power tail gate control module
H/LP	10A	AQS sensor, Head lamp(low) relay LH/RH, Head lamp(high) relay
FR WASHER	15A	Front wiper relay, Front washer relay
RR WIPER	15A	Rear wiper control module, Rear wiper motor

FUSE	(A)	Circuit Protected
TAIL LH	10A	Head lamp LH, Rear combi lamp LH, Front fog lamp relay, Tail gate handle switch & license lamp
TAIL RH	10A	Head lamp RH, Rear combi lamp RH, Glove box lamp, Illuminations, Tail gate handle switch & license lamp
DR LOCK	20A	Power window main switch, Tail gate lock actuator realy, Power tail gate relay
STOP LP	15A	Stop lamp switch
ADJ-PEDAL	15A	-
H/LP WASHER	20A	-
FUEL LID	15A	Fuel lid switch
RR FOG	15A	Rear fog lamp relay
FR WIPER	30A	Front wiper motor
TILT & TELE	15A	Tilt & Telescopic module
CAN DRL	15A	-
P/WDW LH	25A	Driver safety window ECM, Rear power window switch LH
P/WDW RH	25A	Front/Rear power window switch RH
MIRR HTD	10A	Power outside mirror motor & Defogger LH/RH(deffoger), Front A/C control module(Defogger switch)
P/SEAT	30A	IMS control module, Driver/Passenger seat manual switch, Front lumbar support switch
KEY SOL	10A	4WD ECM, Back warning buzzer, PIC MSCL
DEICER	15A	Windshield defogger relay
SUNROOF	15A	Sunroof control module
RSE/SMART KEY	10A	PIC immobilizer module
AUDIO 1 (POWER CONNECTOR)	15A	Audio
ROOM LP (POWER CONNECTOR)	15A	Instrument cluster, Power window main switch, Door lamp, Room lamp, Data link connector, BCM, Door warning switch, IMS control module, Front/Rear A/C control module, Foot lamp, Map lamp, Electro chromic mirror

※ USE THE DESIGNATED FUSE AND RELAY ONLY

SENBE7211L

Inspection

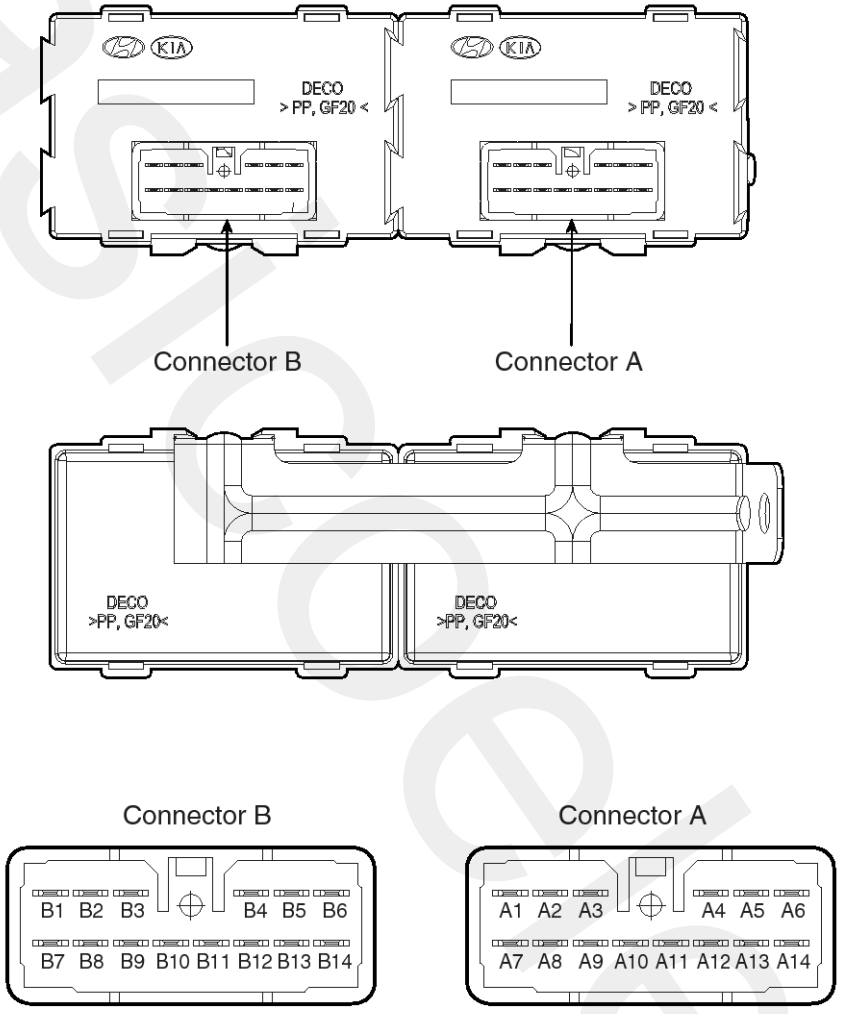
Fuse

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

Component Location

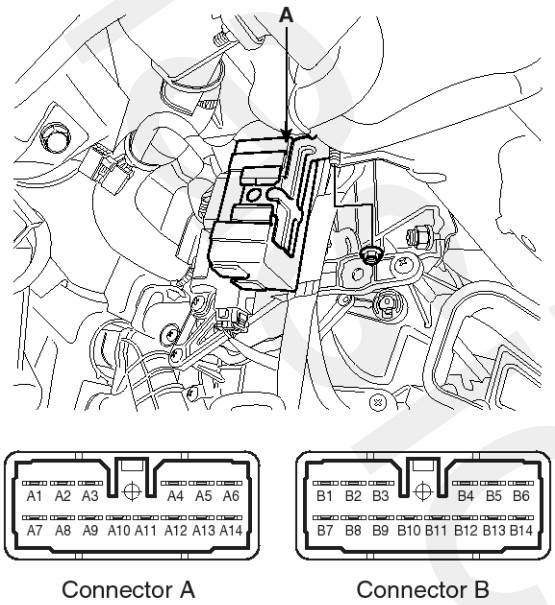


SENBE7199L

Description

The ICM is united with many kinds of relays and installed below the body control module.

relay box (Assist compartment).



SENBE7212L

Inspection

Head Lamp Washer

Check for continuity between the terminals.

1. There should be continuity between the No.6 and No.14 terminals when power and ground are connected to the No.13 and No.14 in the ICM-A.
2. There should be no continuity between the No.6 and No.14 terminals when power is disconnected.

Adjust Pedal Twin Relay

Check for continuity between the terminals.

1. There should be no continuity between the No.11 and No.12 terminals or between the No.5 and No.12 terminals when power and ground are connected to the No.13 and No.14 in the ICM-B.
2. There should be continuity between the No.11 and No.12 terminals or between the No.5 and No.12 terminals when power is disconnected.

Front Wiper Washer

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.7 terminals when power and ground are connected to the No.1 and No.10 in the ICM-A.
2. There should be no continuity between the No.1 and No.7 terminals when power is disconnected.

Front Wiper

Check for continuity between the terminals.

1. There should be continuity between the No.2 and No.3 terminals when power and ground are connected to the No.1 and No.9 terminals in the ICM-A.
2. There should be no continuity between the No.2 and No.3 terminals when power is disconnected.

Power Tail Gate

Check for continuity between the terminals.

1. There should be continuity between the No.5 and No.11 terminals when power and ground are connected to the No.12 and No.4 terminals in the ICM-A.
2. There should be no continuity between the No.5 and No.11 terminals when power is disconnected.

Rear Seat Warmer (Left)

Check for continuity between the terminals.

1. There should be continuity between the No.3 and No.10 terminals when power and ground are connected to the No.2 and No.10 terminals in the ICM-B.
2. There should be no continuity between the No.2 and No.10 terminals when power is disconnected.

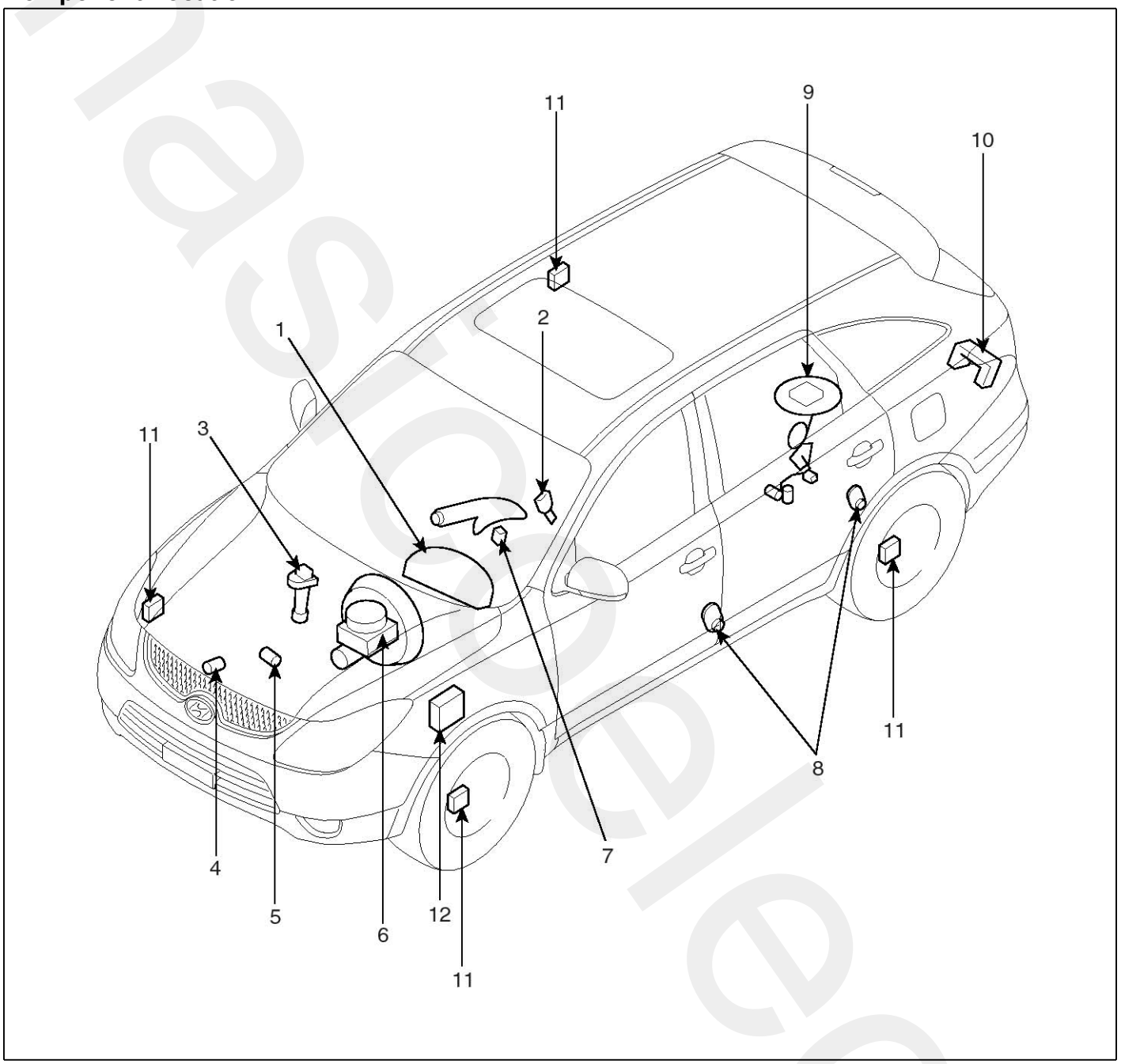
Rear Seat Warmer (Right)

Check for continuity between the terminals.

1. There should be continuity between the No.9 and No.8 terminals when power and ground are connected to the No.7 and No.8 terminals in the ICM-B.
2. There should be no continuity between the No.7 and No.8 terminals when power is disconnected.

Indicators And Gauges

Component Location

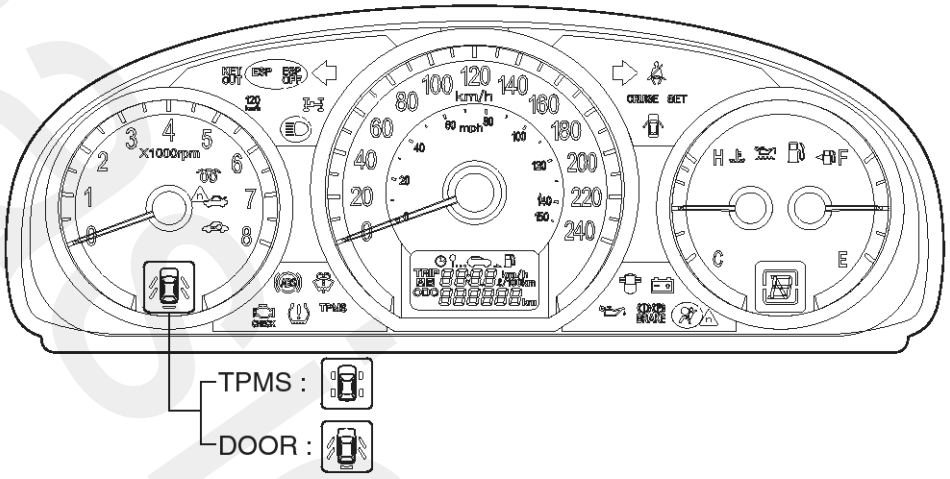


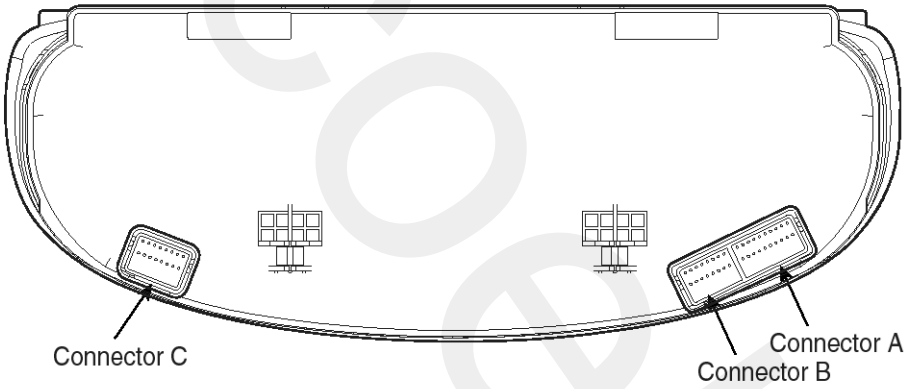
SENBE9010L

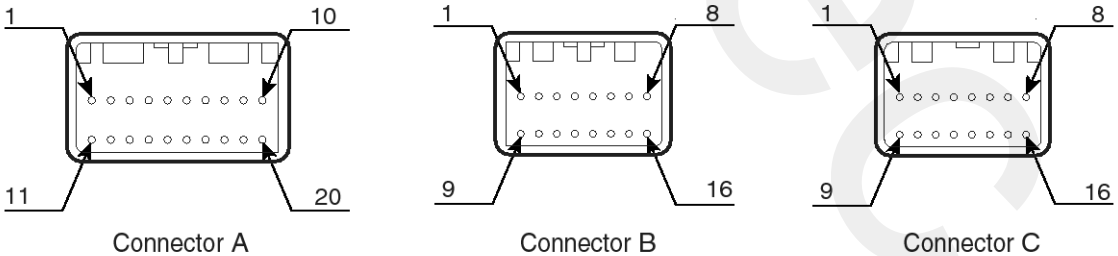
1. Cluster assembly
2. Seat belt switch
3. Vehicle speed sensor
4. Engine coolant temperature sender
5. Oil pressure switch
6. Brake fluid level warning switch
7. Parking brake switch
8. Door switch
9. Fuel gauge sender
10. Power tailgate switch
11. Wheel speed sensor
12. ABS ECU

Instrument Cluster

Components





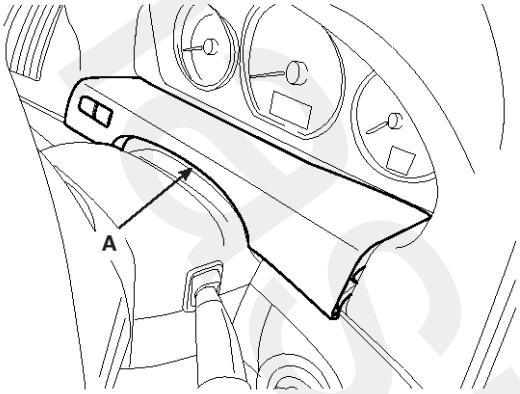


SENBE9003L

No	Connector A	Connector B	Connector C
1	PARKING BRAKE	TPMS / DOOR(FRONT-LH)	FUEL LOW
2	CHECK ENGINE	TPMS / DOOR(FRONT-RH)	WASHER LOW
3	OIL PRESSURE	TPMS / DOOR(REAR-LH)	TURN SIGNAL-LH
4	AIR BAG (+)	TPMS / DOOR(REAT-RH)	HIGH BEAM(+)
5	AIR BAG (-)	-	HIGH BEAM(-)
6	OVER SPEED (120Km/h)	TRUNK LID OPEN INPUT	TPMS TREAD
7	GND	-	TPMS DIAGNOSIS
8	KEY OFF	TURN SIGNAL-RH	FUEL INPUT
9	-	SPARE 1	SGND
10	ILL(+)	CAN-HIGH	BATT(+)
11	DOOR OPEN	CAN-LOW	IGN1(+)
12	OVER SPEED OUTPUT	AT P OUT	BUZZER INPUT
13	BATTERRY CHARGE	-	GLOW
14	-	SEAT BELT	TRUNK LID OPEN
15	IGN2(+)	4PULSE OUTPUT	IMMOBILIZER
16	ILL(-)	WATER SEPARATOR	-
17	DIAGNOSIS		
18	-		
19	RESET SWITCH		
20	MODE SWTICH		

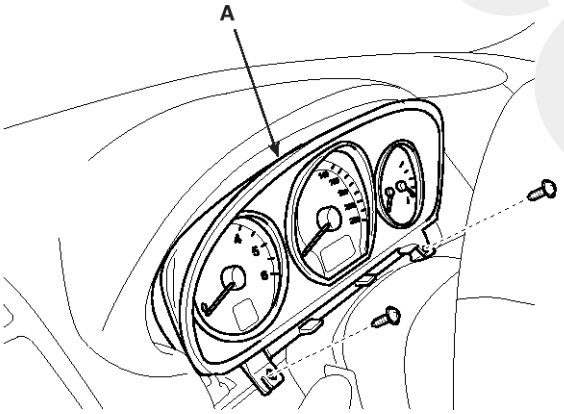
Removal

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



SENBE7223D

3. Disconnect trip switch connector (6P).
4. Pull out the cluster (A) from the housing after removing 2 screws.



SENBE7224D

5. Disconnect the cluster connecters and then remove the cluster.

Installation

1. Connect the cluster connectors and reassemble the cluster.
2. Connect the connectors to the cluster facia lower panel and reassemble it.

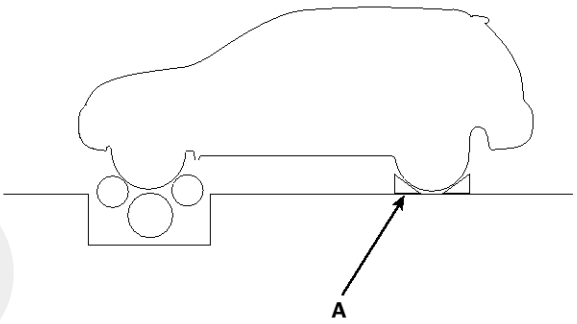
Inspection

Speedometer

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

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

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



SCMBE6203L

[km/h]

Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	+5.8 +1.8	+5.8 +1.8	+8.5 +3.5	+10.0 +4.5	+11.5 +5.5	+13.0 +6.0
Velocity (km/h)	140	160	180	200	220	240
Tolerance (km/h)	+15.0 +7.5	+16.5 +8.5	+18.0 +9.5	+20.0 +10.5	+21.5 +11.5	+22.3 +12.0

[MPH]

Velocity (MPH)	10	20	40	60	80
Tolerance (MPH)	+3.0 +0.5	+4.5 +1.5	+6.0 +02.0	+7.0 +3.0	+8.5 +4.0
Velocity (MPH)	100	120	140	150	-
Tolerance (MPH)	+10.5 +5.0	+12.0 +6.0	+13.0 +6.5	+13.0 +6.5	-

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

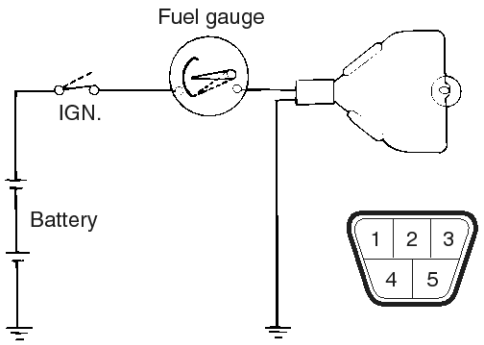
a. Reversing the connections of the tachometer will damage the transistor and diodes inside.

b. When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution (rpm)	1,000	2,000	3,000	4,000	Remark
Tolerance (rpm)	±100	±125	±150	±170	Gasoline
Tolerance (rpm)	±100	±125	±150	±170	Diesel
Revolution (rpm)	5,000	6,000	7,000	8,000	Remark
Tolerance (rpm)	±200	±240	±280	±280	Gasoline
Tolerance (rpm)	±200	±240	-	-	Diesel

Fuel Gauge

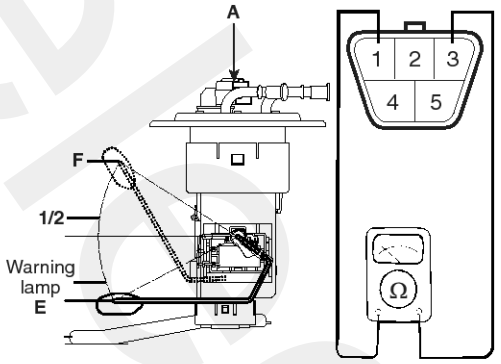
1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 wattages, 12V test bulb to terminals 1 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



SCMBE6226L

Fuel Gauge Sender

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



SCMBE6227L

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

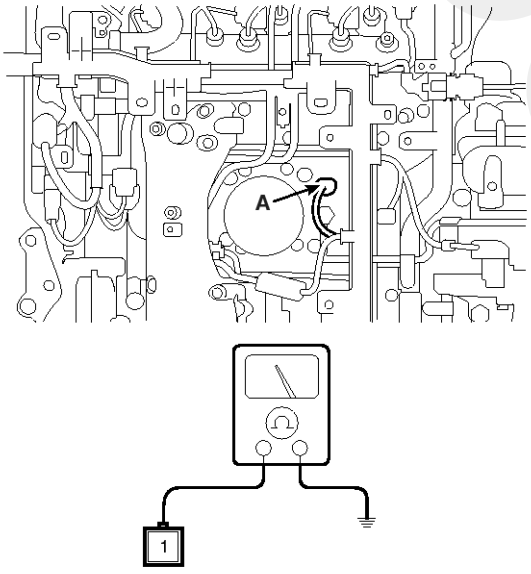
Position	Resistance(Ω)
E	183Ω
Warning lamp	174.6Ω
1/2	99Ω
Sender (F)	15Ω

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

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

Oil Pressure Switch

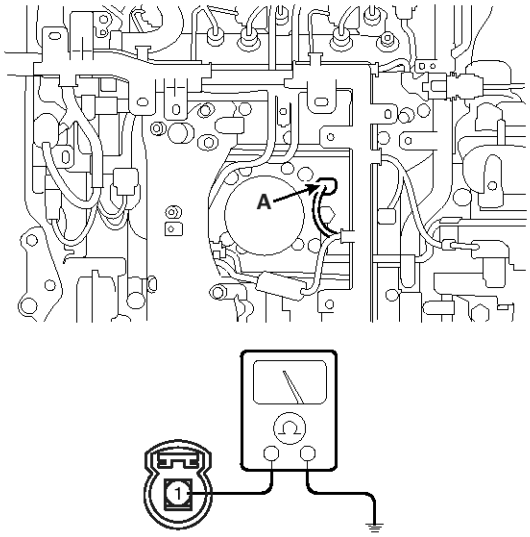
1. Check that there is continuity between the oil press switch terminal and ground with the engine off.
2. Check that there is no continuity between the terminal (A) and ground with the engine running.
3. If operation is not as specified, replace the switch.



SENBE7229D

Oil Pressure Warning Lamp

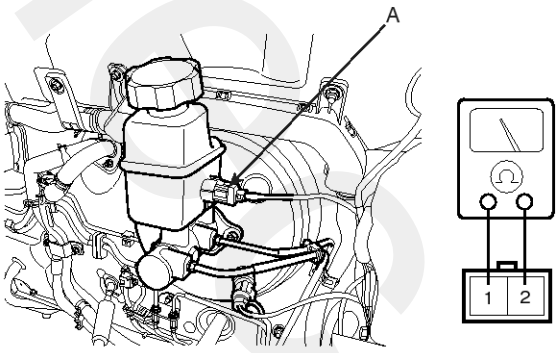
1. Disconnect the connector (A) from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up. If the warning lamp doesn't light, test the bulb or inspect the wire harness.



SENBE7230D

Brake Fluid Level Warning Switch

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



SENBE7231D

Brake Fluid Level Warning Lamp

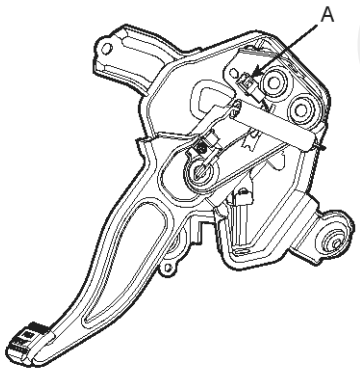
1. Ignition "ON".
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

Parking Brake Switch

The parking brake switch is a push type. It is located at the side of the parking brake pedal.

1. Check that there is continuity between the terminal and switch body with the switch (A) ON.
2. Check that there is no continuity between the terminal and switch body with the switch OFF.

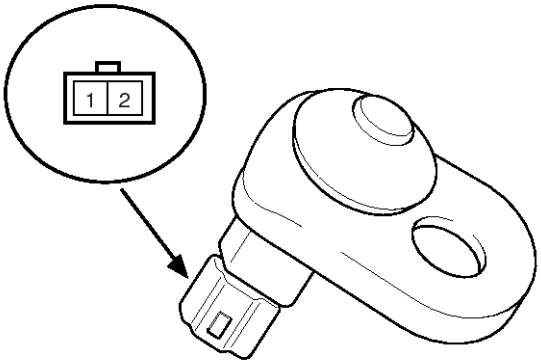
   If continuity is not as specified, replace the switch or inspect its ground connection.



SENBE7232D

Door Switch

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



ATIE121Q

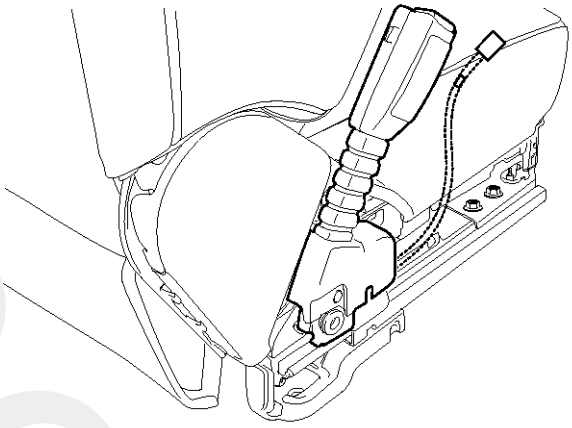
Terminal / Position	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

ETQF180D

Seat Belt Switch

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

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



ETBF260G

Seat Belt Warning Lamp

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

Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

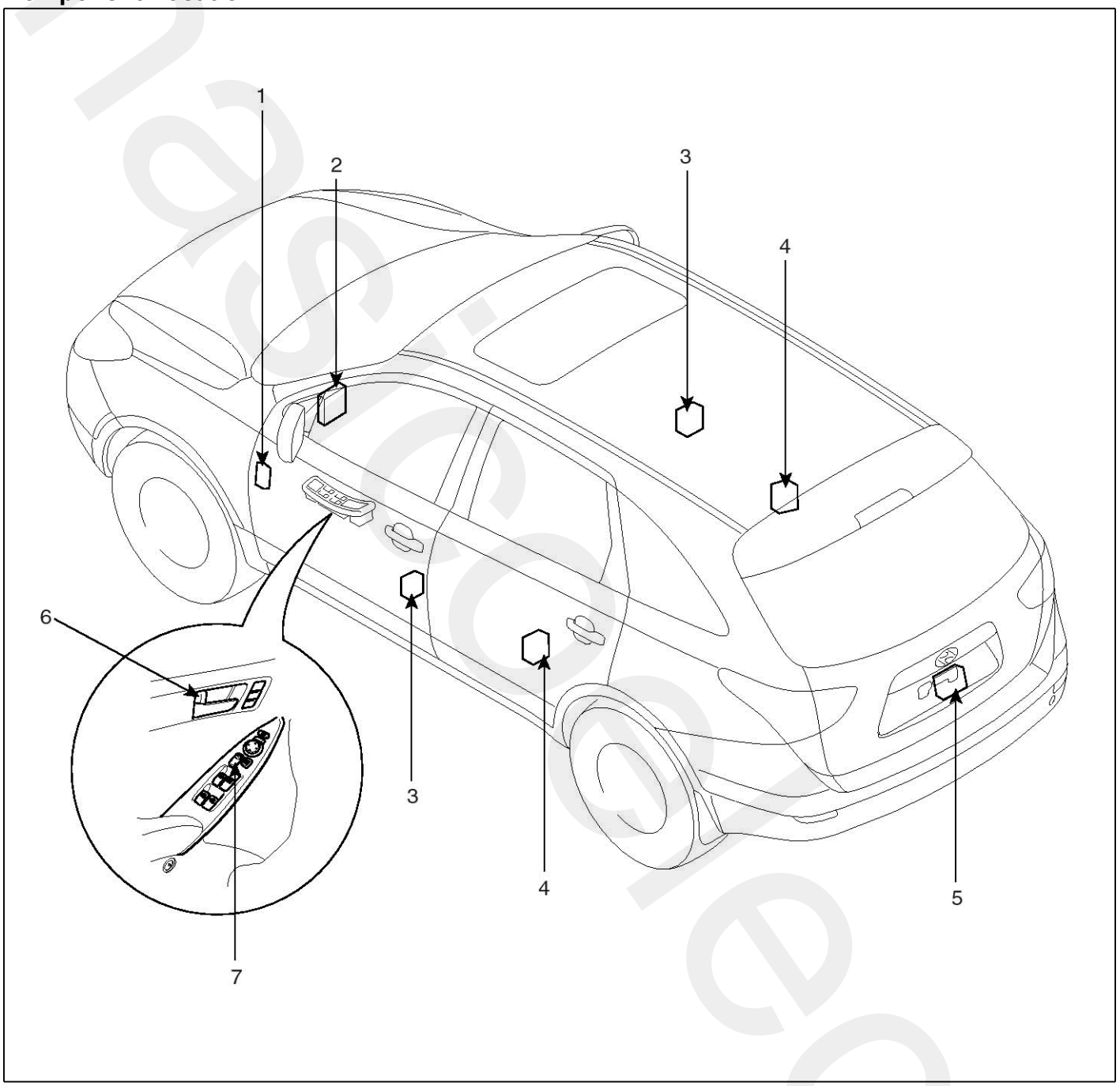
Troubleshooting

Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	CAN line faulty	Check the EMS
	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
	CAN line faulty	Check the EMS
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Brake fluid level warning switch faulty	Check switch
	Parking brake switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Open door warning lamp and trunk lid warning lamp do not light up	Memory fuse (15A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

Symptom	Possible cause	Remedy
Seat belt warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Speedmeter and odometer does not operate	CAN line faulty	Check the ABS ECU
	Wheel speed sensor faulty	Check the wheel speed sensor

Power Door Locks

Component Location



SENBE9011L

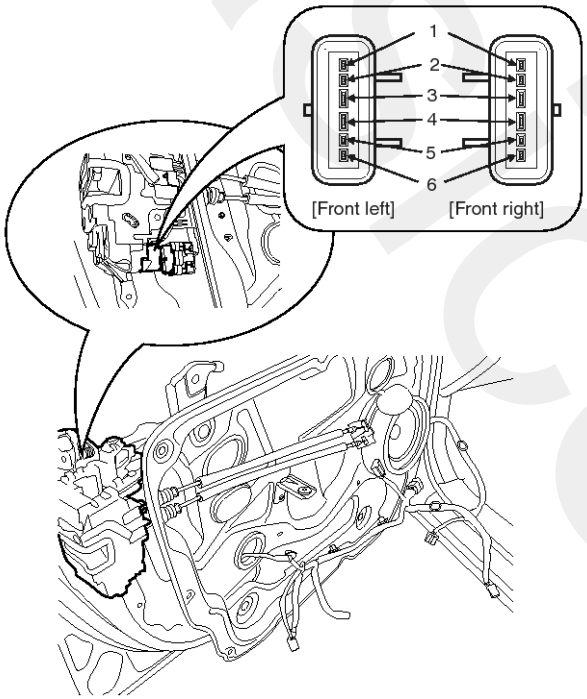
1. ICM relay box (Door lock/unlock relay)
2. Body control module (BCM)
3. Front door lock actuator & switch
4. Rear door lock actuator & switch
5. Power tailgate latch
6. Door lock knob
7. Door lock switch

Power Door Lock Actuators

Inspection

Front Door Lock Actuator

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors from the actuator.



SENBE7130L

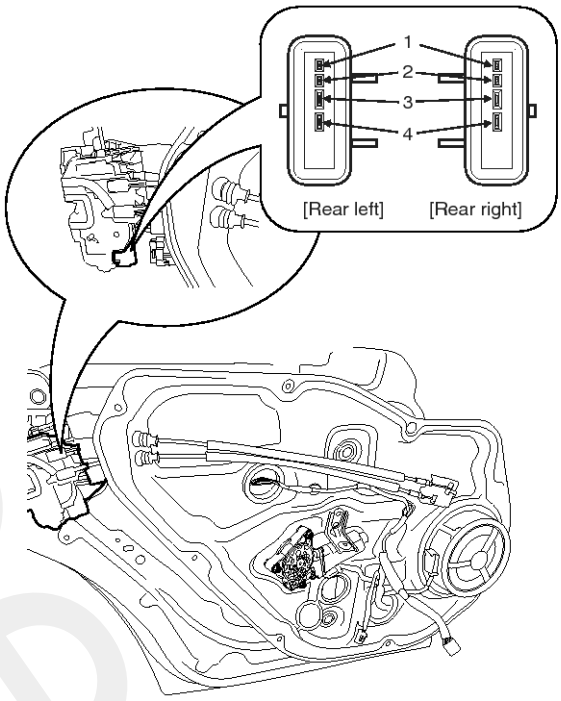
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		3	4
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

SENBE7131L

Rear Door Lock Actuator

1. Remove the rear door trim panel.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
3. Disconnect the connectors from the actuator.



SENBE7132L

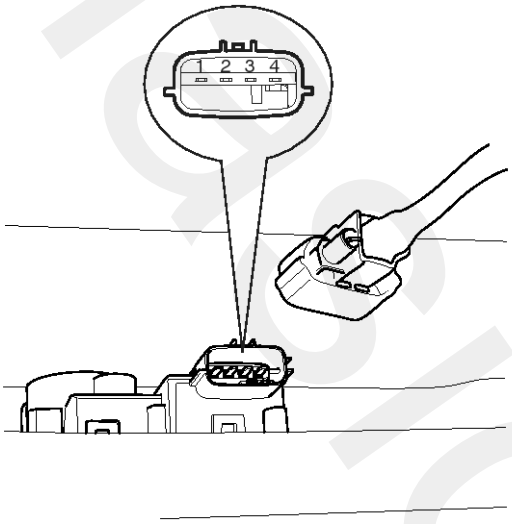
4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		3	4
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

SENBE7133L

Tailgate Lock Actuator

1. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
2. Disconnect the 4P connector from the actuator.



SENBE7134D

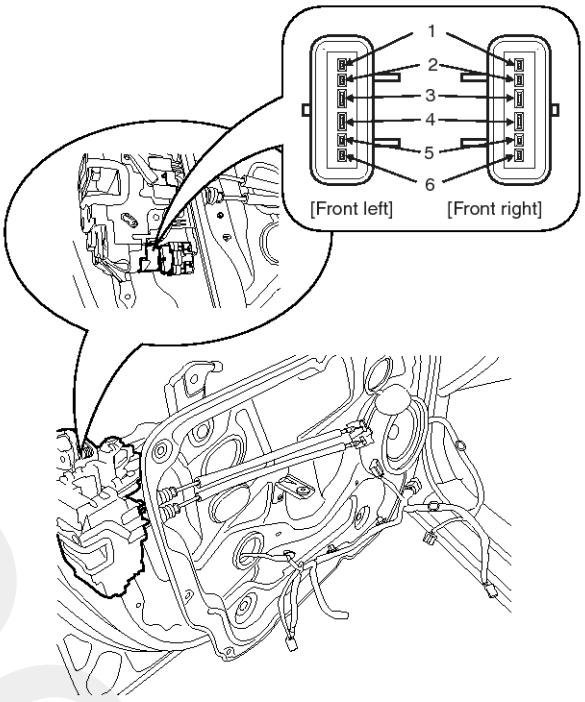
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	3	4
Lock → Unlock	⊕	⊖
Unlock → Lock		

SENBE7135L

Front Door Lock Switch

1. Remove the front door trim.
   (Refer to the BD group - "Front door")
2. Remove the front door module.
   (Refer to the BD group - "Front door")
3. Disconnect the connectors from the actuator.



SENBE7130L

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

Position \ Terminal		2	5	6
Front left	Clockwise	○	○	
	Counter-clockwise	○		○
Front right	Clockwise	○		○
	Counter-clockwise	○	○	

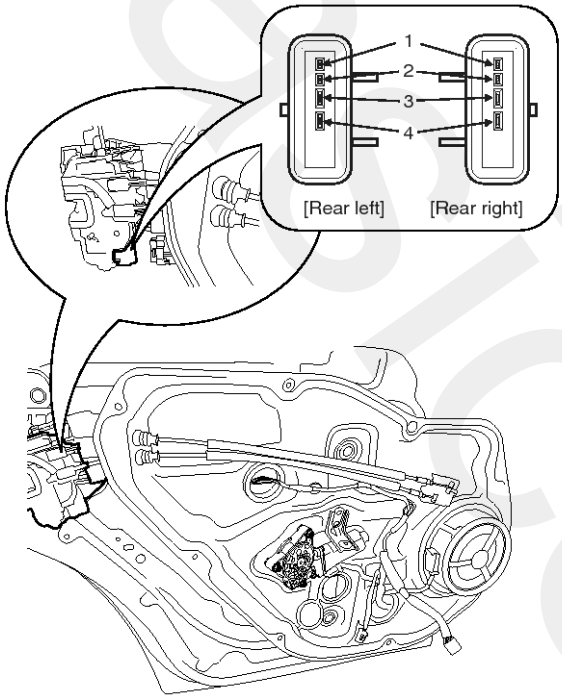
SENBE7136L

Position \ Terminal		1	2
Front left	Unlock	○	○
Front right	Unlock	○	○

SENBE7148L

Rear Door Lock Switch

1. Remove the rear door trim panel.
   (Refer to the BD group - "Rear door")
2. Remove the rear door module.
   (Refer to the BD group - "Rear door")
3. Disconnect the connectors from the actuator.



SENBE7132L

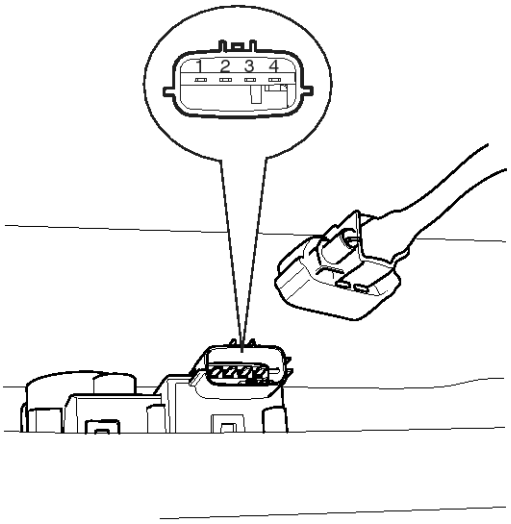
4. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	5
Rear left	Unlock	○——	——○
Rear right	Unlock	○——	——○

SENBE7137L

Tailgate Lock Switch

1. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
2. Disconnect the 4P connector from the actuator.



SENBE7134D

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

Position \ Terminal	1	2
Lock → Unlock	○——	——○

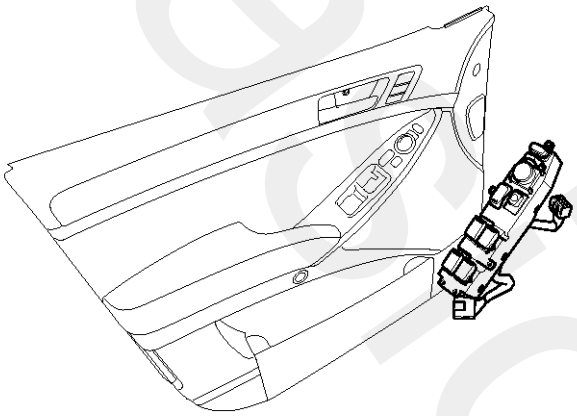
SENBE7138L

Power Door Lock Switch

Removal

Driver Door Lock Switch

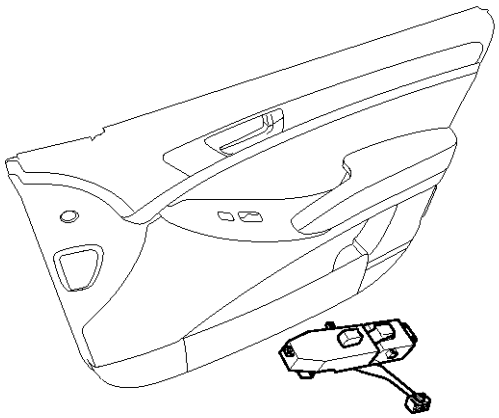
1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch module. (Refer to the BD group - "Front door")



SENBE7246D

Assist Door Lock Switch

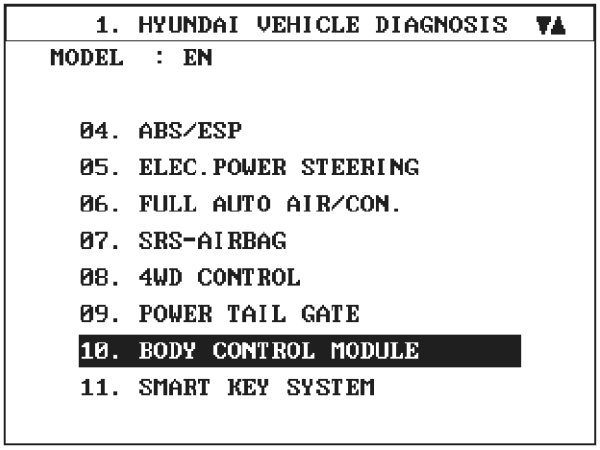
1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch module. (Refer to the BD group - "Front door")



SENBE7249D

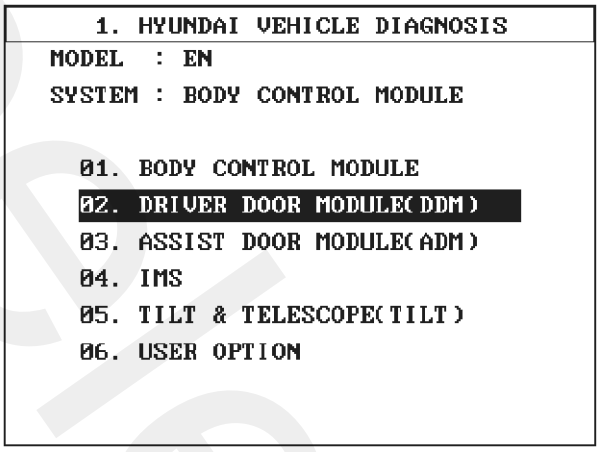
Inspection

1. The DDM inputs can be checked using the scan tool.
2. To check the input value of door lock switch, select option "BODY CONTROL MODULE".



SENBE7201L

3. Select option "DRIVER DOOR MODULE".



SENBE7312L

4. Select option "CURRENT DATA".

```
1. HYUNDAI VEHICLE DIAGNOSIS
MODEL  : EN
SYSTEM : BODY CONTROL MODULE
         DRIVER DOOR MODULE(DDM)
  01. DIAGNOSTIC TROUBLE CODES
  02. CURRENT DATA
  03. FLIGHT RECORD
  04. ACTUATION TEST
  05. SIMU-SCAN
  06. IDENTIFICATION CHECK
  07. DATA SETUP(UNIT CONV.)
```

SENBE7313L

```
1.2 CURRENT DATA                31/34

IMS 1 SW                 1811OFF
IMS 2 SW                 1813OFF
CRUSH INPUT SIGNAL       1815OFF
DR. DOOR OPEN            1817OPEN
DOOR LOCK SW             0000OFF
DOOR UNLOCK SW           0000OFF
MIRROR HORI. POS.        00000.00 V
MIRROR VERT. POS.        00000.00 V

FIX  SCRN  FULL  PART  GRPH  HELP
```

SENBE7314L

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

```
1. HYUNDAI VEHICLE DIAGNOSIS
MODEL  : EN
SYSTEM : BODY CONTROL MODULE
         DRIVER DOOR MODULE(DDM)
  01. DIAGNOSTIC TROUBLE CODES
  02. CURRENT DATA
  03. FLIGHT RECORD
  04. ACTUATION TEST
  05. SIMU-SCAN
  06. IDENTIFICATION CHECK
  07. DATA SETUP(UNIT CONV.)
```

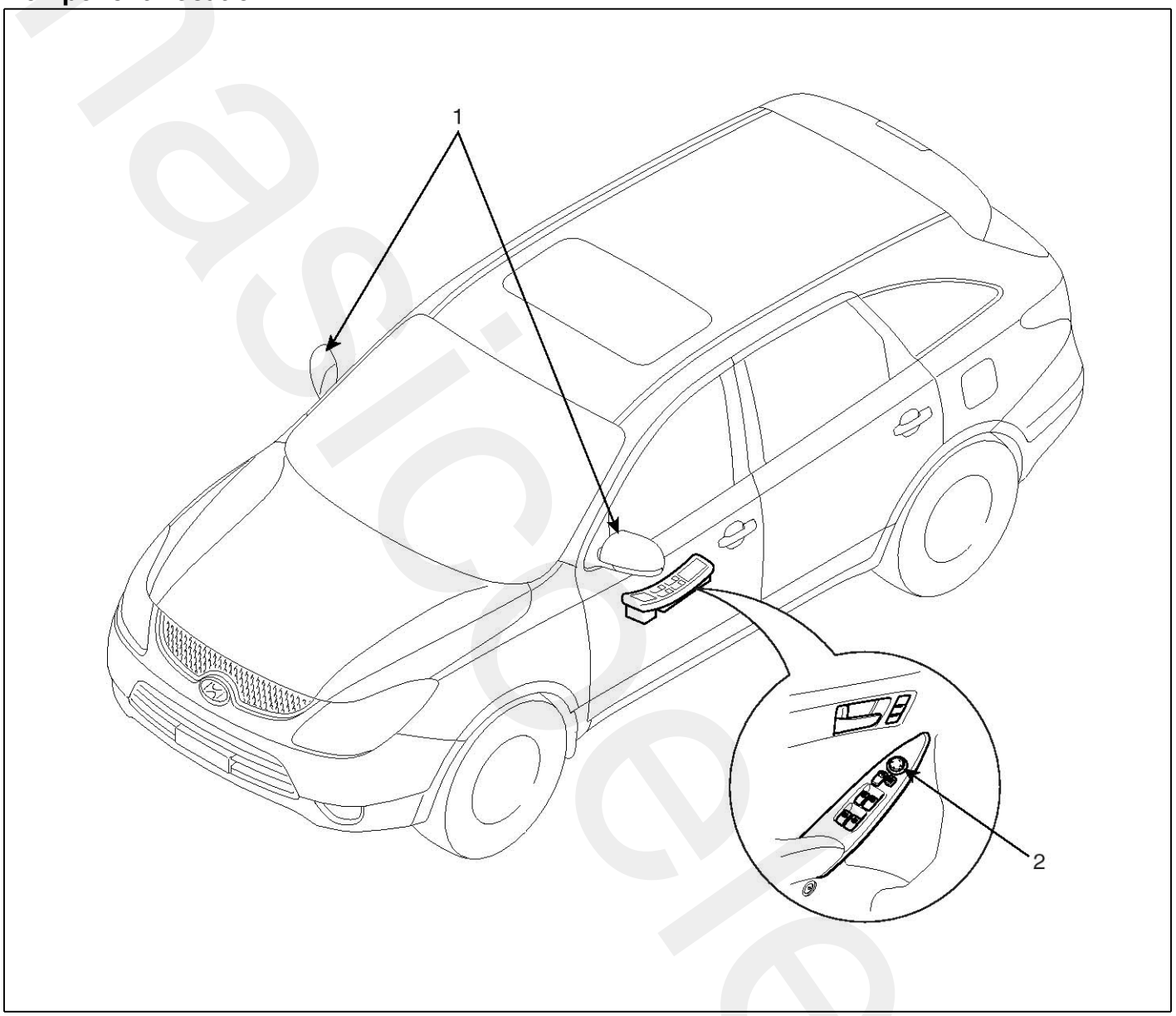
SENBE7315L

```
1.4 ACTUATION TEST              01/11

DOOR LOCK
DURATION    UNTIL IG OFF
METHOD      ACTIVATION
CONDITION   IG.KEY ON
            ENGINE OFF

PRESS [STRT], IF YOU ARE READY !
SELECT TEST ITEM USING UP/DOWN KEY

STRT
```

SENBE7316L

Power Door Mirrors

Component Location

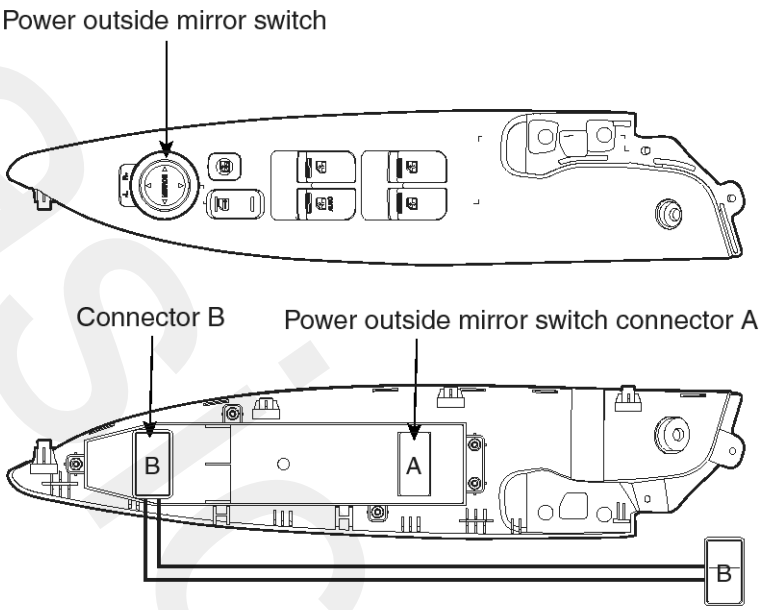


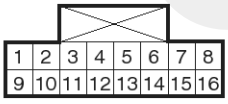
SENBE9012L

1. Power door mirror
2. Power door mirror switch

Power Out Side Mirror Switch

Components





Connector A

No.	DESCRIPTION
1	MIRROR RIGHT
2	MIRROR LEFT
3	MIRROR UP
4	MIRROR DOWN
5	SIGNAL GND
6	ECU B+
7	IGN 2 (BACK UP)
9	-
10	DOOR UNLOCK MOTOR
11	DOOR LOCK MOTOR
12	B+ (MIRROR)
13	POWER GND
14	-

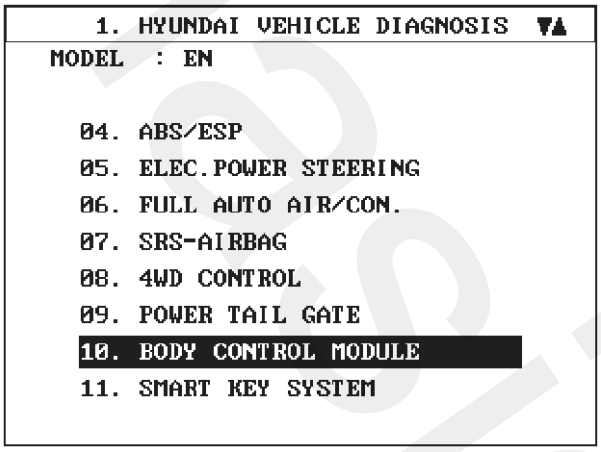
Connector B

No.	DESCRIPTION
1	IMS SET (M)
2	IMS 1
3	IMS 2
4	FL UP/D AT
5	FL D/UP AT
6	PWD
8	CAN HIGH
9	CAN LOW
11	MIRROR SENSOR Vcc
12	CRASH INPUT
13	RL DOOR KNOB UNLOCK SWITCH
14	FL DOOR KNOB UNLOCK SWITCH
15	FL DOOR SWITCH
16	FL DOOR KNOB LOCK SW
17	FL DOOR KNOB UNLOCK SW
19	MIRROR SENSOR H
20	MIRROR SENSOR V
23	MIRROR SENSOR GND

SENBE7259L

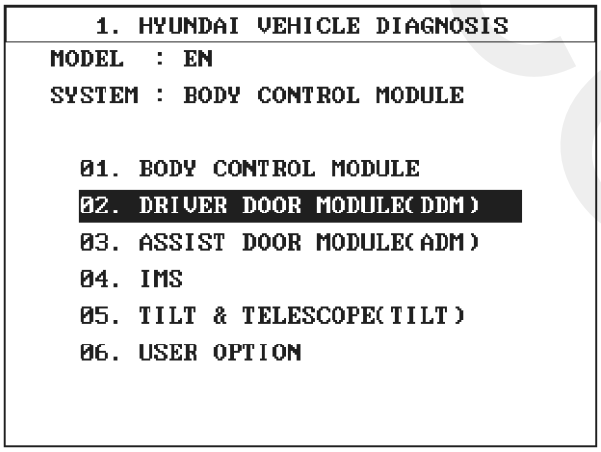
Inspection

1. The DDM inputs can be checked using the scan tool.
2. To check the input value of door lock switch, select option "BODY CONTROL MODULE".



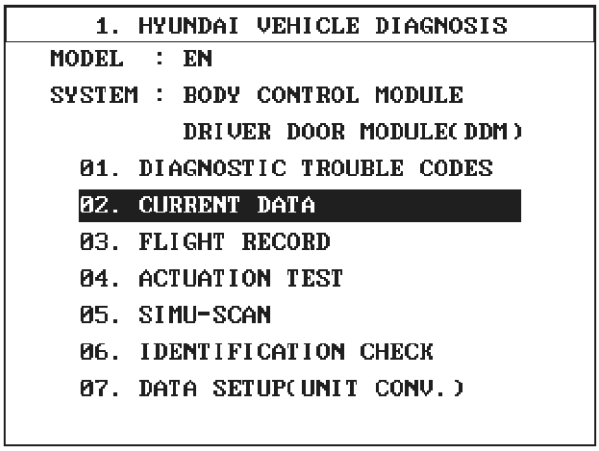
SENBE7201L

3. Select option "DRIVER DOOR MODULE".

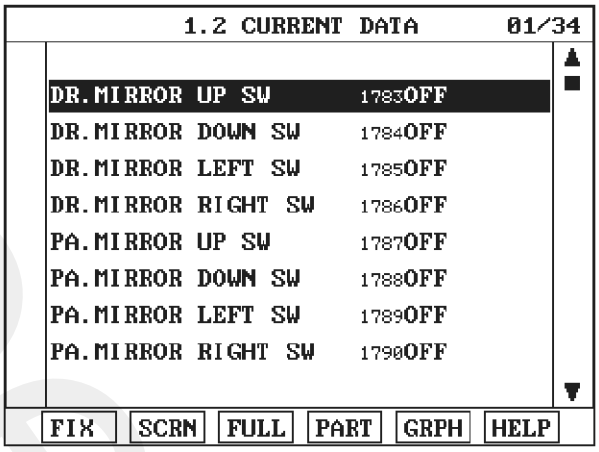


SENBE7312L

4. Select option "CURRENT DATA".



SENBE7313L



SENBE7317L

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

```
    1. HYUNDAI VEHICLE DIAGNOSIS
 MODEL  : EN
 SYSTEM : BODY CONTROL MODULE
          DRIVER DOOR MODULE(DDM)
   01. DIAGNOSTIC TROUBLE CODES
   02. CURRENT DATA
   03. FLIGHT RECORD
   04. ACTUATION TEST
   05. SIMU-SCAN
   06. IDENTIFICATION CHECK
   07. DATA SETUP(UNIT CONV.)
```

SENBE7315L

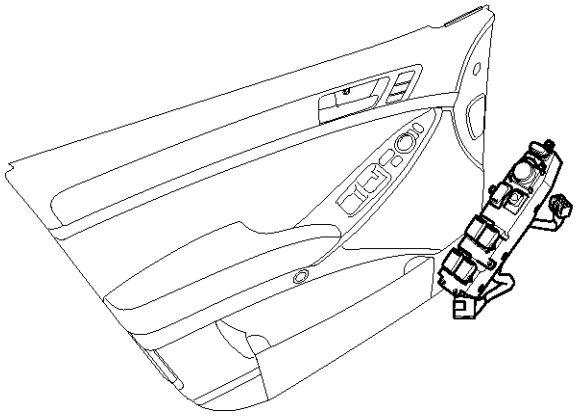
```
                1.4 ACTUATION TEST      06/11

 DR.SIDE MIRROR HIGH
 DURATION    UNTIL IG OFF
 METHOD      ACTIVATION
 CONDITION   IG.KEY ON
             ENGINE OFF

   PRESS [STRT], IF YOU ARE READY !
   SELECT TEST ITEM USING UP/DOWN KEY

   STRT  STOP
```

SENBE7318L

Removal

Driver Door Lock Switch

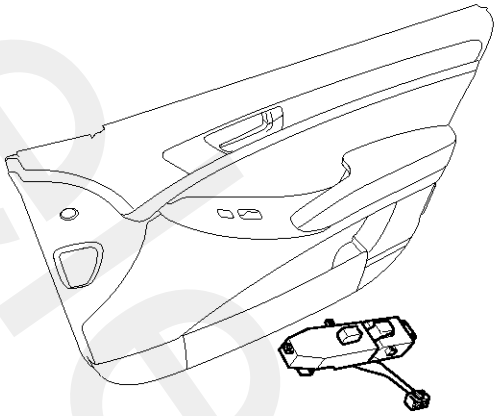
1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch module. (Refer to the BD group - "Front door")



SENBE7246D

Assist Door Lock Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch module. (Refer to the BD group - "Front door")

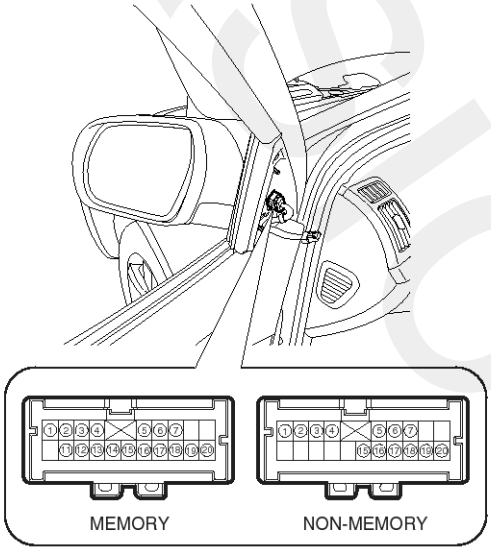


SENBE7249D

Power Door Mirror Actuator

Inspection

1. Remove the front door quadrant inner cover. Take care not to damage fixing clips.
   (Refer to the BD group - "Front door")
2. Disconnect the power door mirror connector from the harness.
3. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.



SENBE7263L

	DIR	B+	GND	17	18	20	19
LH	UP	○		○			
			○		○	○	○
	DOWN	○			○		
			○	○		○	○
	OFF		○	○	○	○	○
	RIGHT	○				○	
			○	○	○		○
	LEFT		○	○	○	○	
		○					○
RH	UP	○		○			
			○		○	○	○
	DOWN	○			○		
			○	○		○	○
	OFF		○	○	○	○	○
	RIGHT	○				○	
			○	○	○		○
	LEFT		○	○	○	○	
		○					○

SENBE7264L

Mirror Heater

Terminal / Position	1	2
Heater	○	○

SCMBE6265L

Mirror Puddle Lamp

Terminal / Position	15	16
Mirror lamp	⊕	⊖

SENBE7267L

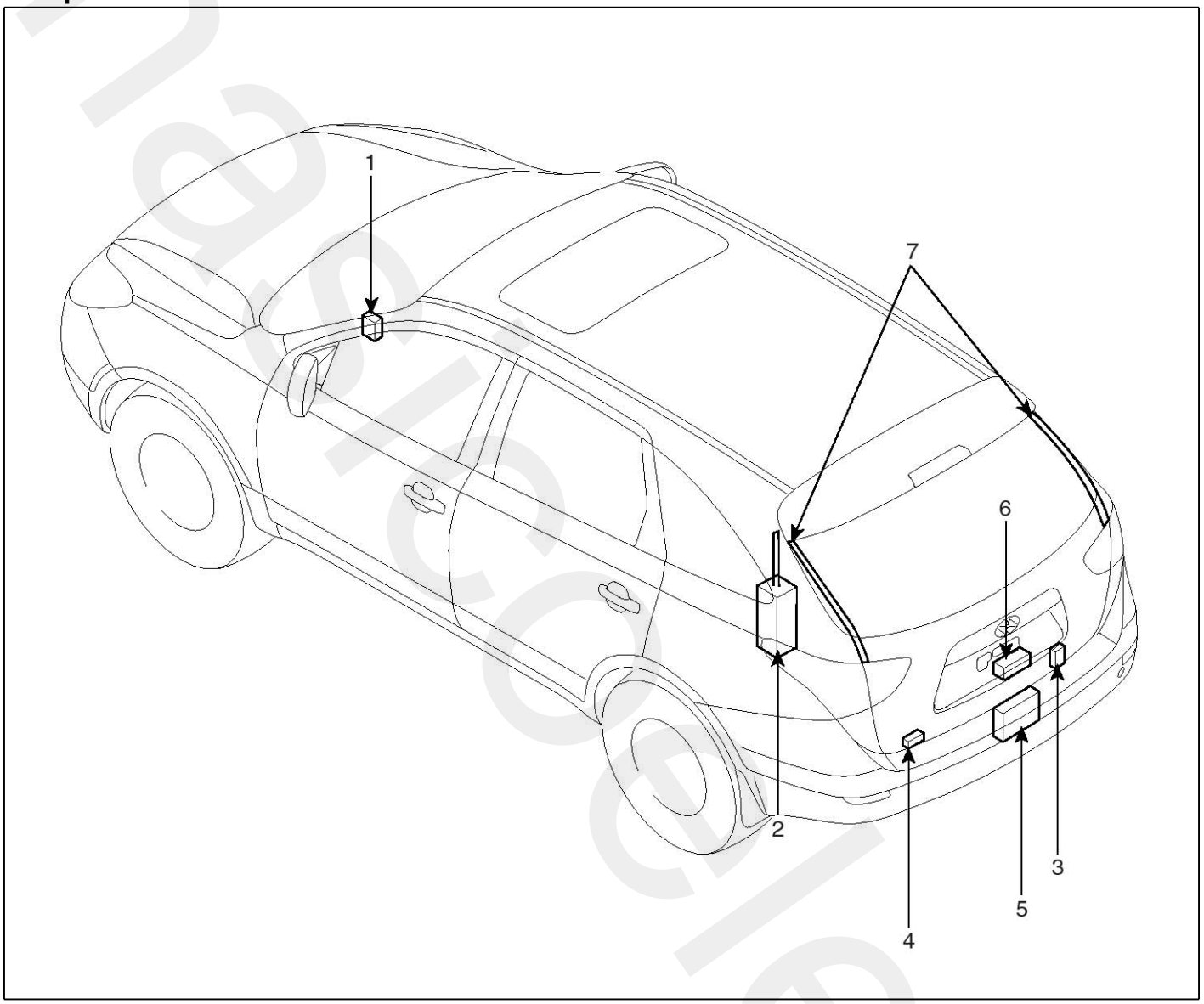
Turn Signal Lamp

Terminal / Position	3	1
Turn signal lamp	⊕	⊖

SENBE7268L

Power Tail Gate System

Component Location



SENBE9013L

1. Master switch
2. Power tail gate drive unit (Including control module)
3. Power tail gate chime
4. Power tail gate switch
5. Power latch assembly
6. Power tail gate handle
7. Anti pinch strip

Description

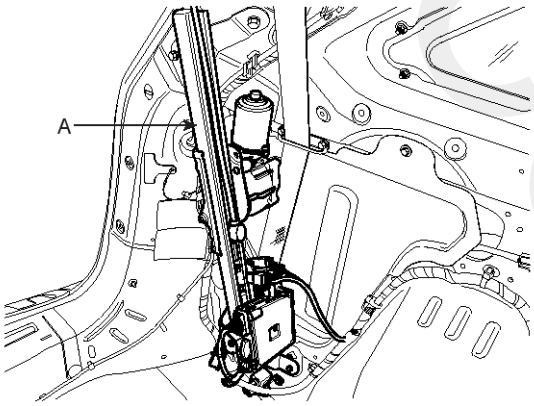
Power tail gate is an electro-mechanical system designed to provide power opening and closing of a vehicle's tail gate through the push of a button of the transmitter key or tail gate handle or the lower crash pad switch or switch of the tail gate.

The power tail gate will reverse direction of travel if resistance to movement is detected while the tail gate is being closed. If resistance to movement is detected while the power tail gate is being opened, the tail gate will stop moving.

1. PTG DRIVE UNIT

   Power tailgate drive unit consists of a DC motor, optical sensor, clutch, push rod, rack and wire harness.

   PTG drive unit is located in rear left on D-pillar panel. PTG drive unit opens and closes the tail gate connected push rod automatically.

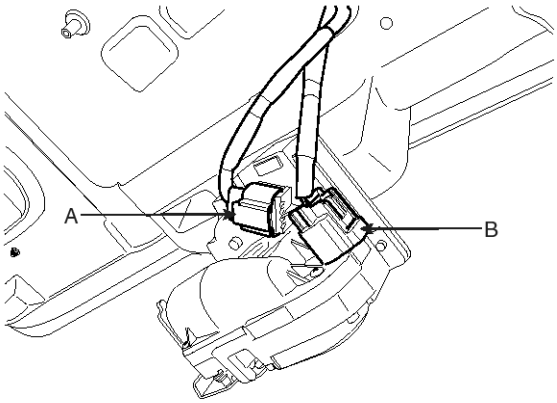


SENBE7551D

- Optical sensor : Provides tail gate velocity and position information
- Drive unit clutch : Transmit motor power to push rod through pinion gear.

2. POWER LATCH

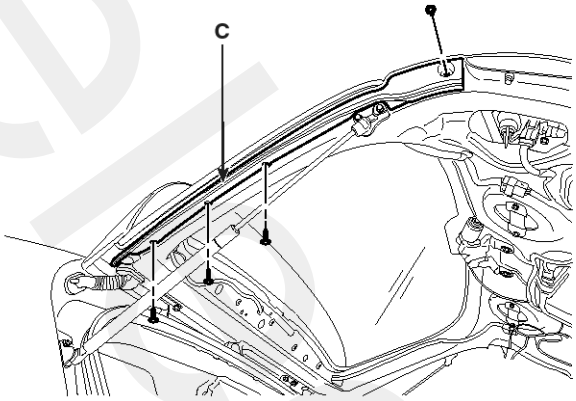
   Power latch is located in the lower part of tail gate panel. When tail gate located latching position, cinching motor (A) has a cinch electrically. And unlatch motor (B) unlatch the latch electrically when receive the open signal.



SENBE7552D

3. ANTI PINCH STRIP (C)

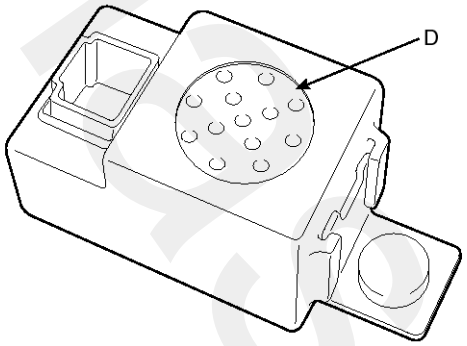
   During power closing or cinching, the PTG system shall reverse to full open if an anti-pinch strip signal is received. However, the anti-pinch strips will not work when the Tailgate is idle in the full closed, full open, or stopped positions.



SENBE7553D

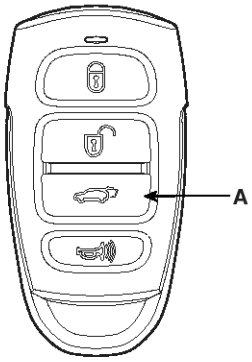
4. PTG CHIME (D)

   When a power operation cannot be performed as requested or an obstacle has been detected.



ATKF231D

5. REMOTE KEYLESS ENTRY (A)



SENBE7555D

   Push the power tail gate (A) of the remote keyless entry more than 0.5s to open the power tail gate. Power Open operation shall be reversed when an additional Open/Close signal is received during power opening.

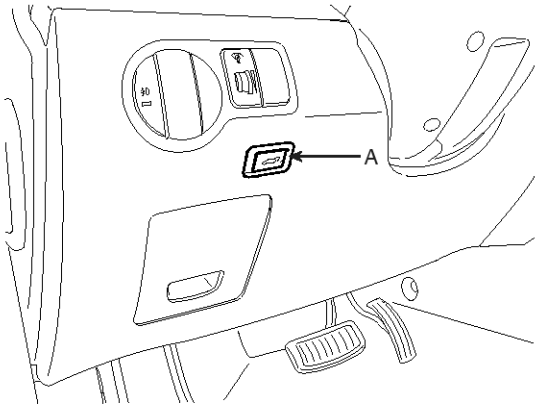
6. OPERATING ORDER

   Switch ON → clutch on → motor operation → pinion gear rotation → rack rectilinear motion → push rod motion → tail gate open/close

Operation

Power Tail Gate Open/close

1. The power tail gate is opened and closed automatically if the master switch (A) is pressed on the lower crash pad.



SENBE7554D

2. When the power tail gate door will power open/close fully, the warning lamp and the chime will operate 3 times.
3. General rules for chime functions
   - Chime & tail lamp shall operate prior to and during power opening or closing the Tailgate : 3 Times (0.5 sec on, 0.5 sec off), after 1 chime start opening or closing with two chimes.
   - Chime shall operate when a power operation cannot be performed as requested except handle pull : 1 Time (Duration 0.5 second on)
   - Chime shall operate when an obstacle has been detected : 3 Times (0.5 sec on, 0.5 sec off)
   - Chime shall operate if PTG has not reached primary latch position after a power cinch cycle : 3 Times (0.5 sec on, 0.5 sec off)

Power Tail Gate Operating Condition

1. The tail gate will not power open when vehicle is moving above 3 mph (5 km/h) or the gearshift lever is not in P (Park) for automatic transaxle.
2. The power tail gate will not open with the transmitter or the main control button when all power sliding doors are locked and closed.
3. The power tail gate will detect the resistance, then stop movement or move to the full open position to allow the object to be cleared.
4. If the automatic stop and reversal feature operates continuously more than twice during one opening or closing operation, the power tail gate may stop at that position. At this time, close the tailgate manually and operate the tailgate automatically again.
5. The PTG system is an electronic device and requires a minimum battery voltage to operate. The Electronic Control Unit (ECU) monitors the battery voltage present at the ECU input battery input and will not permit operation if the battery voltage is out of range.
6. If the PTG button is pressed during closing operation, the power tail gate may reverse direction and open fully.
7. Remove the accumulated snow or ice on the power tail gate before operating.

NOTICE

- *To prevent the battery from being discharged, do not leave the power sliding door and power tailgate at open position for a long time.*
- *The PTGM will go to a sleep mode and power operation will be disabled if the tail gate is left open longer than 6 hours.*

  Manually close the tail gate to the latched position to reset the PTGM. Power operation will be restored.

WARNING

- **Always disconnect the negative battery cable before attempting any power tailgate system service.**
- **Never attempt to enter or exit the vehicle with the tailgate in motion. You could be injured or cause damage to the power tailgate system and / or components.**

Power Operation

The PTG system shall not open the Tailgate when the vehicle is moving.

The PTG system shall operate through the full range of Tailgate travel.

The PTG system shall learn the position of each travel extreme: full open and full closed.

– : No action ●: Close ○: Open X : Stop

Vehicle Motion	Door Position Zone	ON/OFF	Door Lock Status	Operation			
				RKE Key fob Note 2	PSD main switch	PSD sub switch	Door handle switch
Not Moving	1	OFF	Any	○	○	–	X
		ON	Unlock	○	○	–	○
			Locked	○	X	–	X
	2	OFF	Any	○	○	X(Chime 1 T)	X
		ON	Unlock	○	○	○	X
			Locked	○	X	X	X
	3 or 4	OFF	Any	●	●	X(Chime 1 T)	X
		ON	Any	●	●	●	X
	Closing	OFF	Any	○	○	X	X
		ON	Any	○	○	○	X
	Opening 1 or 2	ON	Any	X	X	X	X
		OFF	Any	X	X	X	X
	Opening 3 or 4	OFF	Any	●	●	X	X
		ON	Any	●	●	●	X
Moving	1 or 2	ON/OFF	Any	X(Chime 1 T)	X(Chime 1 T)	X(Chime 1 T)	X
	3 or 4	OFF	Any	●	●	X(Chime 1 T)	X
		ON	Any	●	●	●	X
	Closing	ON	Any	●	●	●	X
	Opening 1 or 2	OFF	Any	X	X	X	X
		ON	Any	X	X	X	X
	Opening 3 or 4	OFF	Any	●	●	X	X
		ON	Any	●	●	●	X
Any	Any	ON/OFF	Any	Manual Move			

SENBE7557L

1. Vehicle condition

   Moving

   - (IGN=OFF and Vehicle Speed > 5 km/h) or (IGN= ON and (Vehicle Speed > 5 km/h or TRANS - not P))

   Not moving

   - (IGN=OFF and Vehicle Speed = 5 km/h) or (IGN= ON and (Vehicle Speed = 5 km/h and TRANS - P))

2. TAILGATE TRAVEL ZONES

   The Tailgate travel is divided into four zones starting at the full closed and latched position. Dimensions are at the bottom edge of the Tailgate and are approximate.

   Zone 1 : Power Latching - from primary to secondary latch (0 to 10 mm depending on latch travel).

   Zone 2 : Between Secondary and Crossover Point (Secondary to 20 degrees)

   Zone 3 : Between Crossover Point and Power Off (20 degrees to 79 degrees)

   Zone 4 : Power Off to Full Open - approximately 5° (15 counts from full open)

Adjustment

Power Tail Gate Initialization

Power Tailgate System Reset

Certain conditions may require that the PTG system be reset.

1. Remove the MEMORY fuse that provides logic power to the PTGM.
2. Wait 1 minute. Replace fuse. Initialize the PTGM.

Initialization Procedure

The Power Tailgate system initialization must start from the full closed or latched position. The Tailgate must be powered Open once to fully initialize the system (Obstacle detection shall be active during Tailgate initialization).

1. Manually close and latch the Tailgate.
2. Power the Tailgate open using the Open/Close switch, outside handle or the remote control.

Alternate Method

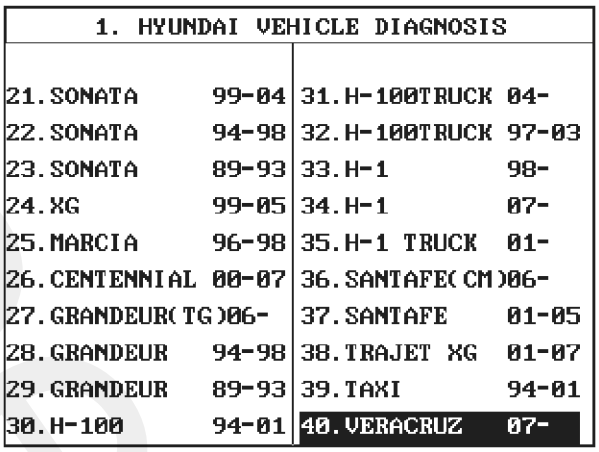
1. Remove the black connector (J2) from the PTGM.
2. Wait a short time. Replace connector. Initialize PTGM.

⚠CAUTION

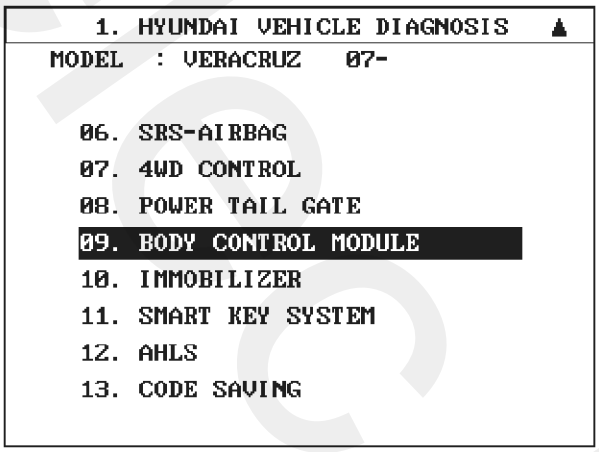
- **The PTG system initialization must start from the primary or secondary latched position.**
- **Obstacle detection shall be active during system initialization.**

BCM Diagnosis With Scan Tool

1. You can turn ON/OFF as below option function with the user option program.
   - Lock / Unlock option of power tail gate
2. Select the vehicle model and "BODY CONTROL MODULE".



SENBE8023L



SENBE8024L

3. Select the "USER OPTION" and "TAILGATE OPTION".

```
    1. HYUNDAI VEHICLE DIAGNOSIS
 MODEL  : VERACRUZ   07-
 SYSTEM : BODY CONTROL MODULE

   01. BODY CONTROL MODULE
   02. DRIVER DOOR MODULE(DDM)
   03. ASSIST DOOR MODULE(ADM)
   04. IMS
   05. TILT & TELESCOPE(TILT)
   06. USER OPTION
```

SENBE8025L

```
    1. HYUNDAI VEHICLE DIAGNOSIS
 MODEL  : VERACRUZ   07-
 SYSTEM : BODY CONTROL MODULE
          USER OPTION
   01. LOCK/UNLOCK ALARM
   02. ARM/DISARM BY KEY
   03. AUTO DOOR LOCK
   04. TILT STEERING&SEAT LINKAGE
   05. TAILGATE OPTION
```

SENBE8026L

4. Select the option "Enable" or "Disable".
   - Enable : PTG will be not opened with RKE/FOB when all door is "locked" and "closed"
   - Disable : PTG wil be opened with RKE/FOB regardless of door state.

```
          . TAILGATE OPTION
 *PURPOSE
 THIS FUNCTION IS FOR LIMITING THE
 PTG OPEN BY THE TX/FOB TAIL GATE
 "OPEN" BUTTON ACCORDING TO THE
 STATE OF OPEN/CLOSE OF ALL DOORS,
 HOOD AND TAIL GATE

 1.DISABLE: NO RESTRICTION
 2.ENABLE : PTG WILL BE NOT OPEN
 WHEN ALL DOORS ARE LOCKED
 PRESS[ENTER] TO CONTINUE!
```

SENBE8027L

```
TAIL GATE OPTION

*******CURRENT SET STATUS*******
ENABLE


********* SELECT STATUS *********
ENABLE
DISABLE
```

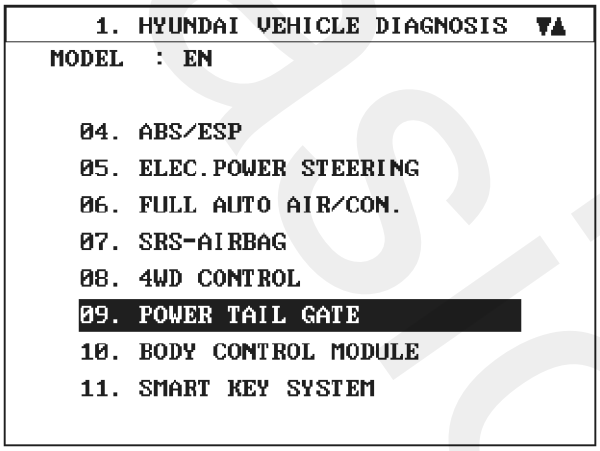
SENBE8028L

PTG Drive Unit

Inspection

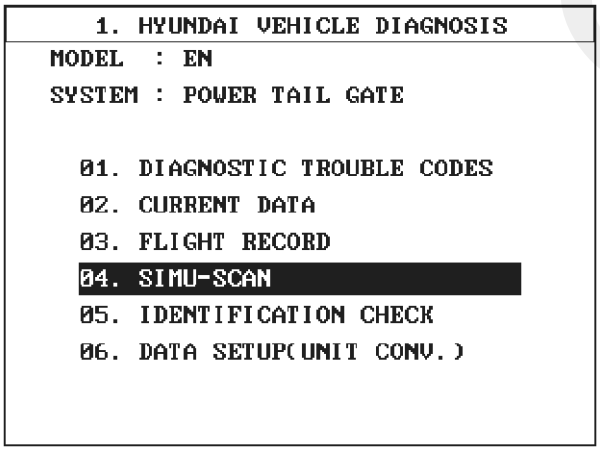
Power Tailgate Motor Inspection

1. Check the power tailgate motor by using the diagnostic tool.
2. Select a vehicle type and "POWER TAILGATE".

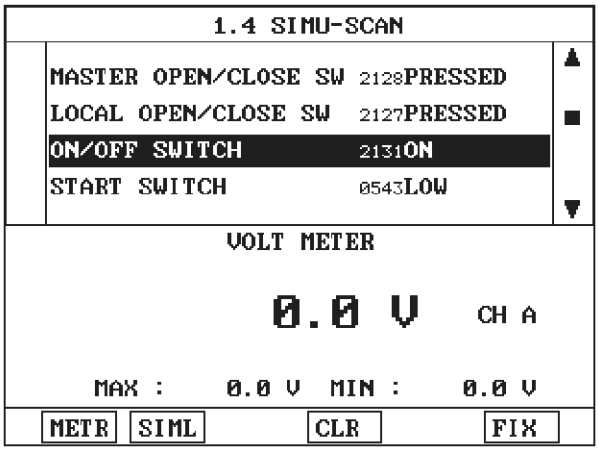


SENBE7560L

3. Select the "ACTUATION TEST" and "ON/OFF SWITCH" to operate tailgate motor.



SENBE7561L

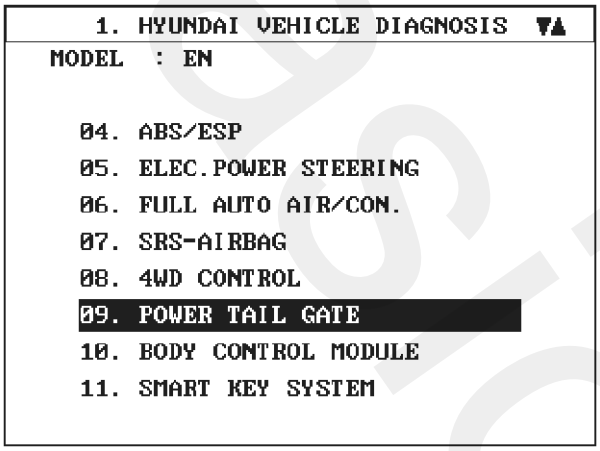


SENBE7563L

4. If there is no working in actuator, change the drive unit.

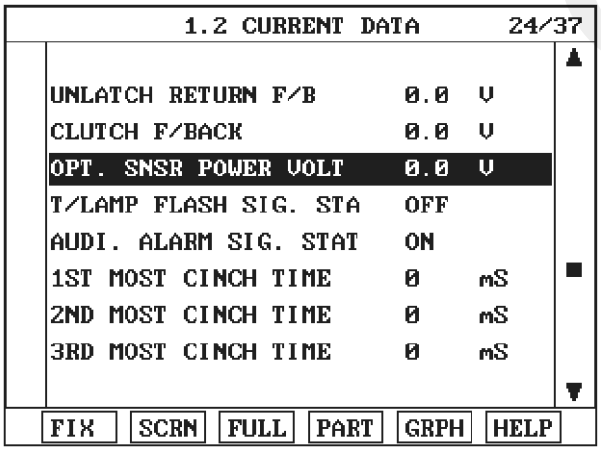
Optical Sensor Inspection

1. Check the power tailgate control module input/output value by using the diagnostic tool. If the operation of tailgate control module is abnormal, replace power tailgate drive unit.
2. When checking the optical sensor, select a vehicle type and "POWER TAILGATE" menu.



SENBE7560L

3. Select the "CURRENT DATA". And then check the optical sensor volt while operating power tailgate in power mode.

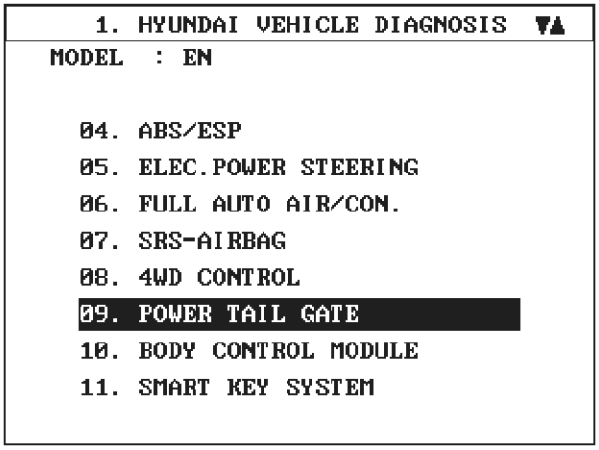


SENBE7565L

4. Change the drive unit, if there is no change during operation.

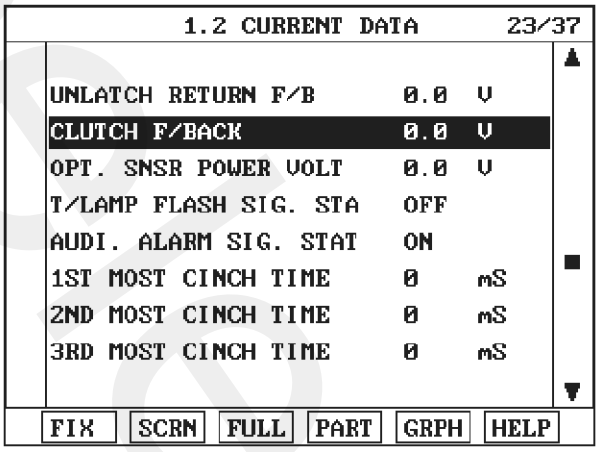
Drive Unit Clutch Inspection

1. Check the power tailgate control module input/output value by using the diagnostic tool. If the operation of tailgate control module is abnormal, replace power tailgate drive unit.
2. To check the clutch operation, select a vehicle type and "POWER TAILGATE" menu.



SENBE7560L

3. Select the "CURRENT DATA". And then check the clutch feedback sensor output while operating power tailgate in power mode.



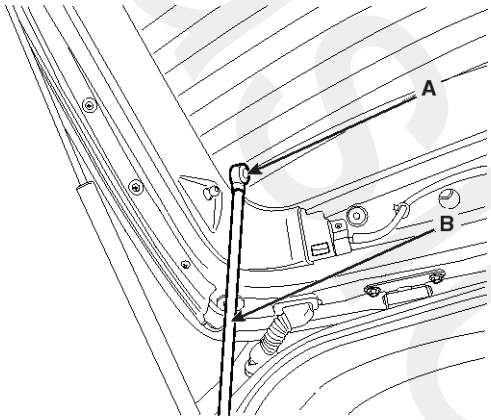
SENBE7566L

※ Above voltage and numerical value may be different from the real value.

4. Change the drive unit, if there is no change during operation.

Removal

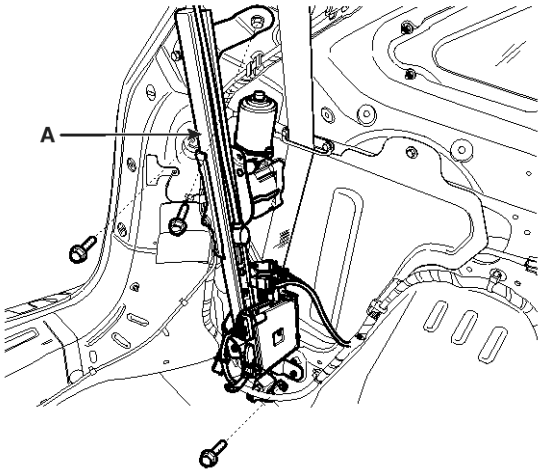
1. Disconnect the negative (-) battery terminal.
2. Remove the third, seat.
   (Refer to the BD group - "Seat")
3. Remove the luggage side trim.
   (Refer to the BD group - "Interior trim")
4. Use a small screwdriver to loosen clip (A).
   But do not remove power tailgate push rod (B).



SENBE7567D

5. Remove the power tail gate motor mounting bolts (3EA) and connectors (4EA). And then remove the power tail gate drive unit (A).

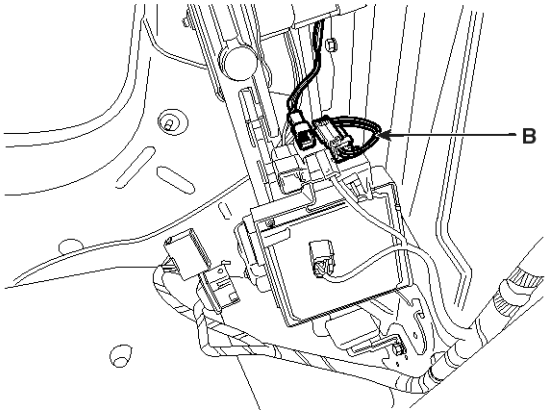
Torque : 0.22 - 0.27 N.m (0.022 - 0.027 kg.m)



SENBE7568D

NOTICE

PTG drive unit bracket connector (B) does not need to be disconnected in this procedure.



SENBE7569D

NOTICE

- *Connect the connectors tightly.*
- *Check the power tail gate for normal operation correctly.*

WARNING

- **A lost drive unit mounting bolt in the vehicle may make a noise.**
- **Don't operate the power tail gate when a push rod is removed.**
- **A learn cycle must be performed whenever the power is removed.**
- **Check the normal operating whenever a power tailgate component is removed or replaced. If the chime sound is heard, check the DTC, wiring harness and cable connections.**

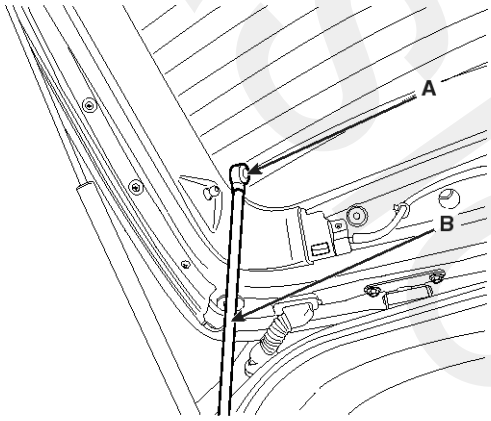
Installation

1. Reassemble the power tailgate drive unit and connect the connectors.
2. Reassemble the tailgate push rod.
3. Reassemble the luggage side trim.
4. Reassemble the third seat.

Power Tail Gate Module

Removal

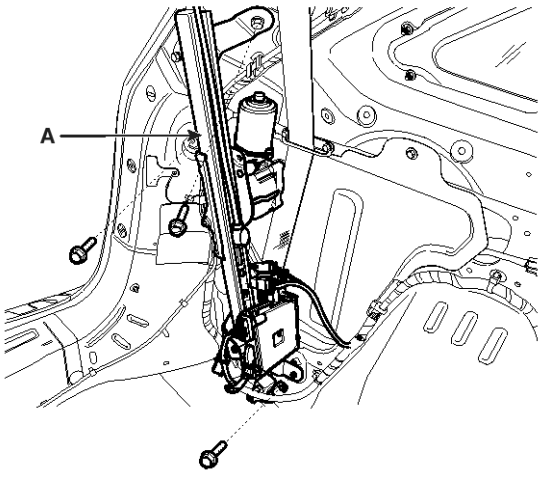
1. Disconnect the negative (-) battery terminal.
2. Remove the third, seat.
   (Refer to the BD group - "Seat")
3. Remove the luggage side trim.
   (Refer to the BD group - "Interior trim")
4. Use a small screw driver to loosen clip (A). But do not remove power tailgate push rod (B).



SENBE7567D

5. Remove the power tail gate module mounting bolts (2EA) and connectors (2EA). And then remove the power tail gate module (A).

Torque : 0.025 - 0.035 N.m (0.0025 - 0.0035 kg.m)



SENBE7568D

NOTICE

- *Connect the connectors tightly.*
- *Check the power tail gate for normal operation correctly.*

WARNING

- **A lost drive unit mounting bolt in the vehicle may make a noise.**
- **Don't operate the power tail gate when a push rod is removed.**
- **A learn cycle must be performed whenever the power is removed.**
- **Check the normal operating whenever a power tailgate component is removed or replaced. If the chime sound is heard, check the DTC, wiring harness and cable connections.**

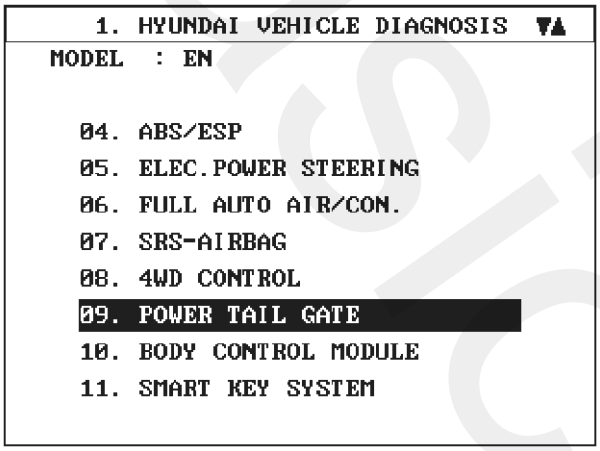
Installation

1. Reassemble the power tailgate module and connect the connectors.
2. Reassemble the tailgate push rod.
3. Reassemble the luggage side trim.
4. Reassemble the third seat.

Anti-Pinch Strip

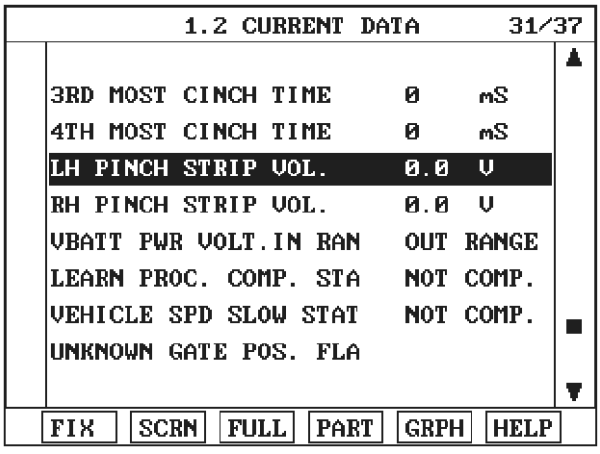
Inspection

1. Check the power tail gate control module input/output value by using the diagnostic tool. If the operation of tailgate control module is abnormal, replace anti pinch strip control module.
2. When checking the anti pinch strip operation, select a vehicle type and "POWER TAILGATE" menu.



SENBE7560L

3. Select the "CURRENT DATA". And then check the anti pinch strip sensor output while operating power tailgate in power mode.



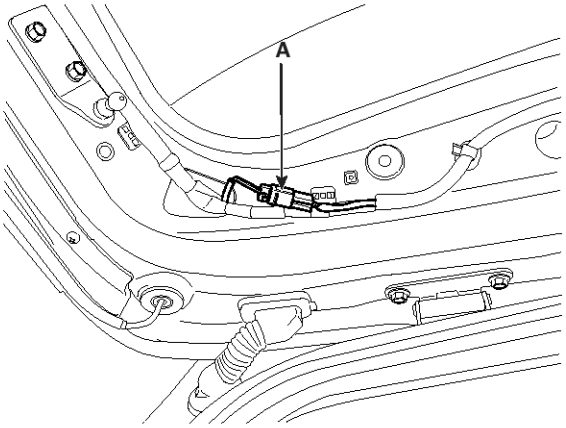
SENBE7583L

※ Above voltage and numerical value may be different from the real value.

4. Change the anti pinch strip sensor, if there is no change from OFF to ON during operation.

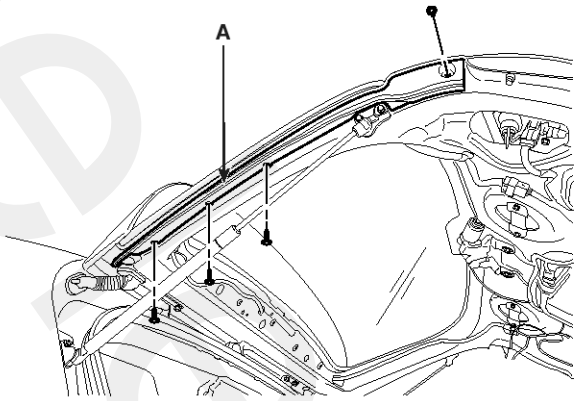
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the tail gate trim.
   (Refer to the BD group - "Tailgate")
3. Remove the anti-pinch strip sensor connector (A).



SENBE7572D

4. Remove the left and right side anti-pinch strip sensor (A) after removing the screws (4EA).



SENBE7573D

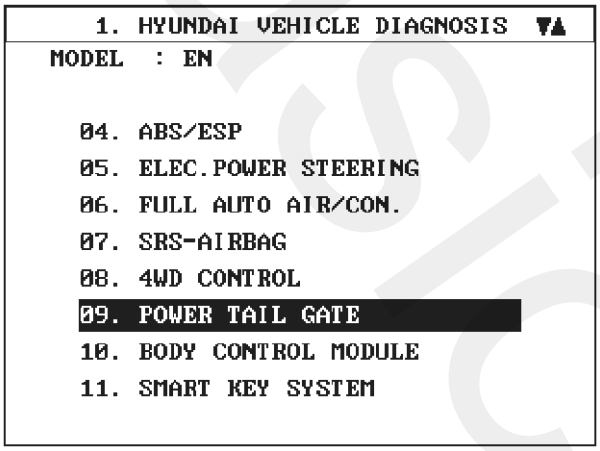
Installation

1. Reassemble the left and right side anti-pinch strip sensor using the screws.
2. Connect the anti-pinch strip sensor connector.
3. Reassemble the tailgate trim.

PTG Power Latch

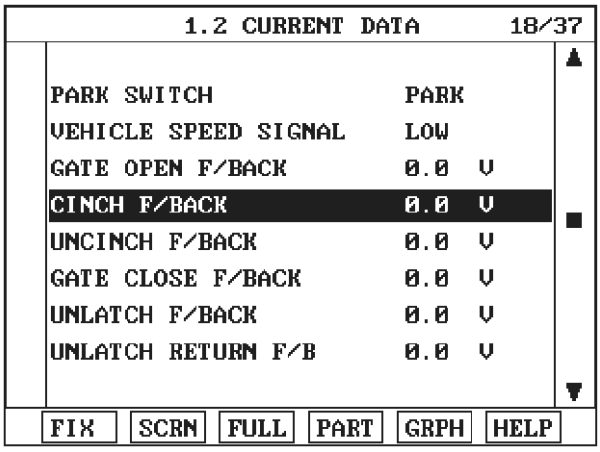
Inpection

1. Check the power tail gate control module input/output value by using the diagnostic tool. If the operation of tailgate control module is abnormal, replace power latch.
2. To check the power latch operation, select a vehicle type and "POWER TAILGATE" menu.



SENBE7560L

3. Select the "CURRENT DATA". And then check the cinch feedback and unlatch feedback output while operating power tailgate in power mode.



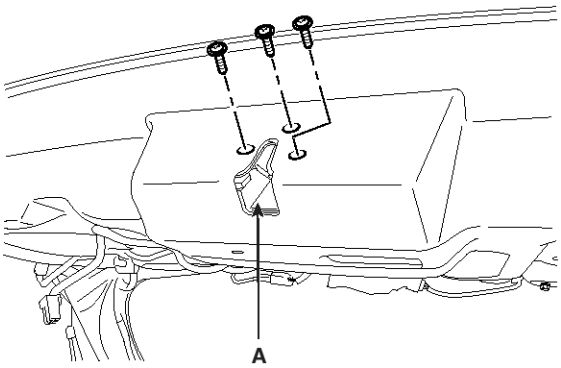
SENBE7574L

※ Above voltage and numerical value may be different from the real value.

4. Change the anti pinch strip sensor, if there is no change during operation.

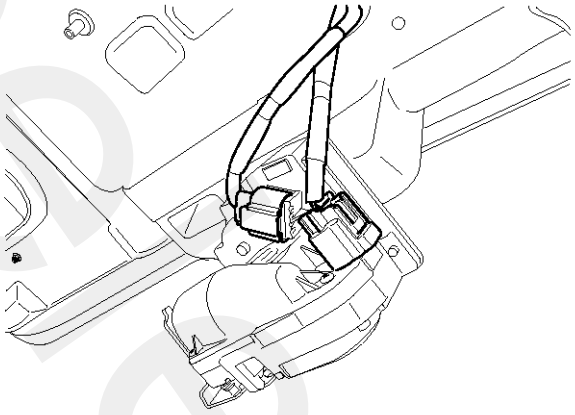
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the tail gate trim
   (Refer to the BD group - "Tailgate")
3. Remove the power latch assembly (A) after removing the nuts (3EA).



SENBE7575D

4. Remove the connector (B) from the power latch assembly (C).



SENBE7559D

NOTICE

- *Check the power tail gate for normal operation.*
- *Check the normal operating whenever a power tailgate component is removed or replaced. If the chime sound is heard, check the DTC, wiring harness and cable connections.*

Installation

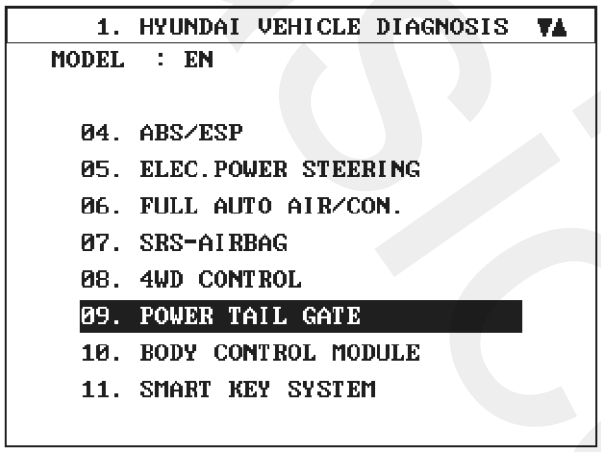
1. Reassemble the power latch assembly.
2. Connect the connectors and reassemble the tailgate trim.

Power Tail Gate Switch

Inspection

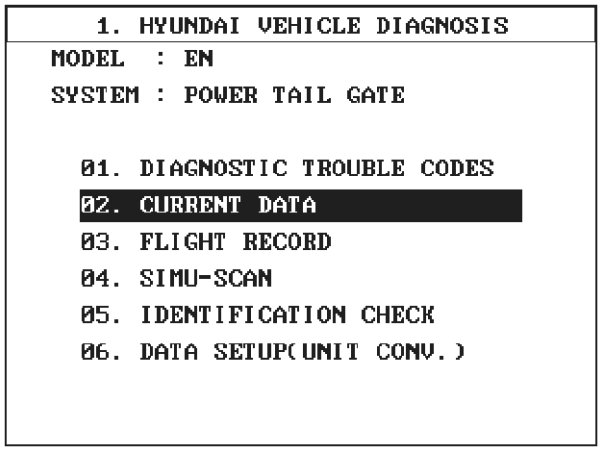
Master Switch Inspection

1. Check the master switch input/output value by using the diagnostic tool. If the operation of overhead console door switch is abnormal, check the BCM and replace.
2. When checking the master switch operation, select a vehicle type and "POWER TAILGATE".



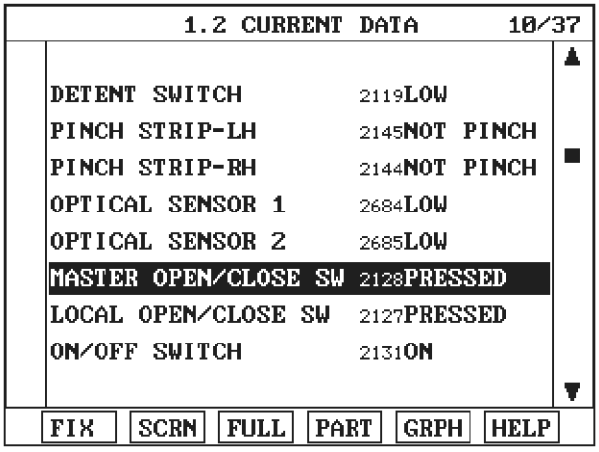
SENBE7560L

3. Select "CURRENT DATA".



SENBE7587L

4. Check the PSD PTG power control switch and PTG switch output value.

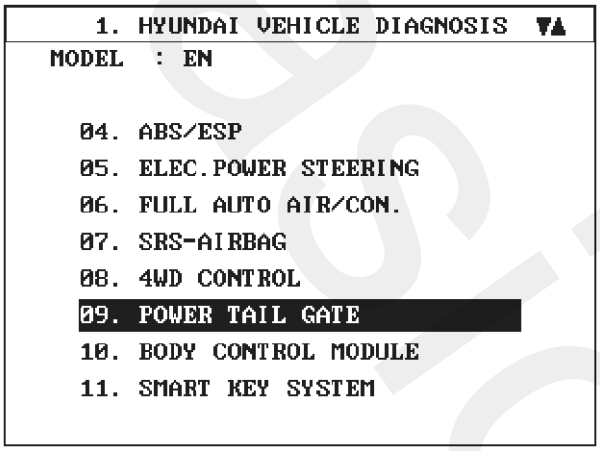


SENBE7584L

5. Confirm that output is changed by the controlling ON/OFF of each switch on the overhead console.

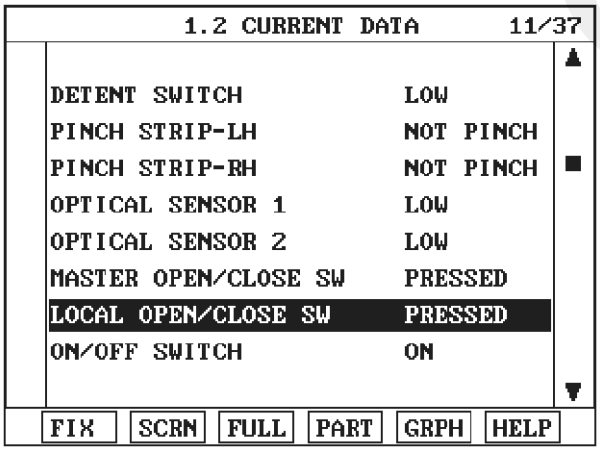
Tailgate Switch Inspection

1. Check the power tailgate control module input/output value by using the diagnostic tool. If the operation of tailgate module is abnormal, replace power tailgate switch.
2. When checking tailgate switch operation, select a vehicle type and "POWER TAILGATE" menu.



SENBE7560L

3. Select the sensor output. And then check the power tailgate local switch output value changed by the controlling PTG.



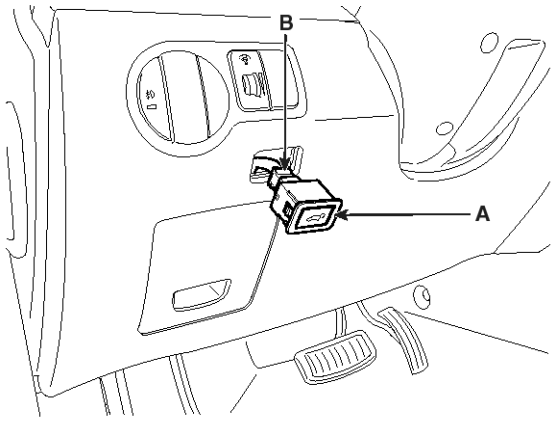
SENBE7588L

4. If there is no input/output change from OFF to ON during PTG operation, change the power tailgate switch.

Removal

Master Switch

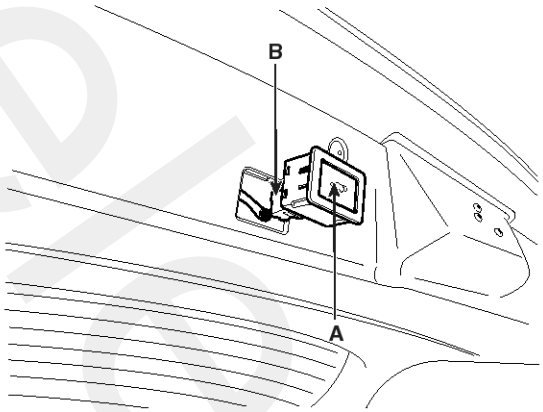
1. Disconnect the negative (-) battery terminal.
2. Remove the master switch on the lower crash pad by using the scraper.



SENBE7580D

Tail Gate Switch

1. Disconnect the negative (-) battery terminal.
2. Open the tail gate and remove the tail gate trim switch (A) using the appropriate trim tool. And then remove the connector (B).



SENBE7581D

Installation

Master Switch

1. Reassemble the master switch on the lower crash pad after connecting the connector.

Tailgate Switch

1. Reassemble the tailgate switch on the tailgate after connecting the connector.

Diagnosis And Testing - Power Tailgate System

The power tailgate system is a complex system containing many components. In order to perform conclusive testing, or receive outputs the power tailgate control module must be checked.

The most reliable, efficient, and accurate means to diagnose the power tailgate system requires the use of a scan tool and the proper Body Diagnostic Procedures manual.

The scan tool can be used to observe current switch status recorded in the power tailgate control module to help the technician diagnose an inoperative switch.

Before any testing of the power tailgate system is attempted, the battery should be fully charged, all power tailgate system inhibitors read and understood (Refer to power tailgate system description for list).

Following are quick reference diagnostic tables to help when diagnosing and testing the power tailgate system.

Condition	Possible Causes	Correction
Tailgate opens unexpectedly	Accidental activation or Failure of open/close command switch	Check for shorted or defective switch
	Failure of latch assembly	Check wiring connections
		Check for trouble codes, replace latch if necessary
	Failure of Power Tailgate or Body Control module	Disconnect then reconnect battery or fuse to reset module, function tailgate, if no function exists check for loose wire connections, see Body Diagnostic Manual for detailed procedures
Tailgate will not power open or close	Not in Park or false indication	Check switch status with SCAN tool
	Battery voltage at PTGM is too low	Check for proper voltage at the PTGM Charge battery
	Blown fuse	Check for blown fuse
	Gas strut failure	Check condition of tailgate gas struts
	BCM or tailgate control module critical fault codes	Check code status with SCAN tool
	Failure of latch assembly	Check wire connections and for blown fuse
		Check for foreign matter preventing the operation of latch assembly
Tailgate will not power open or close	Failure of motor assembly	Test motor assembly
	Binding or sticking of components	Establish location of binding and replace necessary components
	Wiring problems (system or vehicle)	Troubleshoot using electrical schematics Refer to wiring diagrams
Power loss during Tailgate operation	Wiring problems (system or vehicle)	Troubleshoot using electrical schematics. Refer to wiring diagrams
	Battery voltage at PTGM is too low	Check for proper voltage at the PTGM Charge battery
	Failure of Power Tailgate or Body Control Module	Check for diagnostic trouble codes with SCAN tool
	Failure of motor assembly	Test motor assembly

Condition	Possible Causes	Correction
No power latching in primary and/or secondary positions	Failure of latch assembly	Check wire connections and for blown fuse
		Check for diagnostic trouble codes and cycle with SCAN tool
		Troubleshoot using Body Diagnostic Manual. Replace latch assembly, if necessary
	Binding or sticking of components	Establish location of binding and replace necessary components
	Failure of Power Tailgate or Body Control Module	Check for diagnostic trouble codes with scan tool
	Tail Gate seal force too high	Inspect seals for damage, mis-assembly, foreign matter or other possible obstruction
	Failure of motor assembly	Test motor assembly
Latch will not release from primary position	Not in Park or false indication	Check switch status with SCAN tool
	Battery voltage at PTGM is too low	Check for proper voltage at the PTGM Charge battery
	Blown fuse	Check fuse and replace if required
	Failure of latch assembly	Check switch status with scan tool
		Check for foreign matter or damaged components preventing the operation of latch assembly
		Troubleshoot using body diagnostic manual. Replace latch assembly, if necessary
	Failure of outside handle connection	Check handle of brainplate.
	Failure of Power Tailgate or Body Control Module	Check for diagnostic trouble codes and cycle with scan tool
	Binding or sticking of components	Establish location of binding and replace necessary components
Key fob or overhead console switch does not power operate tailgate	Blown Fuse	Check fuse and replace
	Battery voltage at PTGM is too low	Check for proper voltage at the PTGM Charge battery
Does Not Power Unlatch	Failure of latch assembly	Check for foreign matter preventing the operation of latch assembly
		Check for diagnostic trouble codes and cycle with scan tool
		Check pawl and/or ratchet switch with SCAN tool
		Troubleshoot using body diagnostic manual

Condition	Possible Causes	Correction
Does Not Power Unlatch	Failure of Power Tailgate Module	Troubleshoot using body diagnostic manual
	Failure of Body Control Module (BCM)	Troubleshoot using body diagnostic manual
		Replace BCM if necessary
	Failure of RAM	Replace RAM if necessary
	Failure of key fob	Reprogram key fob
		Replace key fob if necessary
	Failure of Power Tailgate Module	Check for diagnostic trouble codes with scan tool, see Body Diagnostic Manual for detailed procedures
	Failure of tailgate motor assembly	Check for foreign matter preventing the operation of motor assembly
		Check wire connections
		Motor clutch does not engage, replace assembly
		Full open switch inoperative, replace switch, if necessary
		Troubleshoot using Body Diagnostic Manual Replace motor, if necessary
Tailgate does not stay open	Failure of tailgate gas struts	Replace gas struts
		Check for broken attachments
High inside/outside opening effort	Failure of tailgate gas struts	Replace gas struts
		Check for broken attachments
	Drive unit jammed or did not disengage	Troubleshoot using Body Diagnostic Manual Replace components, if necessary
	Binding or sticking of components	Establish location of binding and replace necessary components
Tailgate continues to cinch closed	Failure of latch assembly	Check wire connections and for blown fuse Check switches with SCAN tool
Tail gate continues to power close	Failure of latch assembly	Check wire connections
		Check for foreign matter
		Troubleshoot using Body Diagnostic Manual
	Control Module	Check for diagnostic trouble codes with Scan tool
	Wiring problems (system or vehicle)	Troubleshoot using electrical schematics Refer to wiring diagrams

Condition	Possible Causes	Correction
Tailgate continues to power open	Failure of PTGM or BCM	Check for diagnostic trouble codes and cycle, see Body Diagnostic Manual for detailed procedures
	Failure of motor assembly	Check for continuous drive condition
	Wiring problems (system or vehicle)	Troubleshoot using electrical schematics Refer to Wiring Diagrams
Tailgate opens very slowly	Battery voltage at PTGM is too low	Check for proper voltage at the PTGM Charge battery
	Failure of tailgate gas struts	Replace gas struts, if necessary
	Binding or sticking of components	Establish location of binding and replace necessary components
	Grade of vehicle too steep for power operation	Operate tailgate manually
	Failure of tailgate motor assembly	Replace motor assembly, if necessary
Squeaks, Noises and rattles	Foreign material in tail gate compartment	Remove foreign material
	Worn/Loose components	Check and tighten loose components

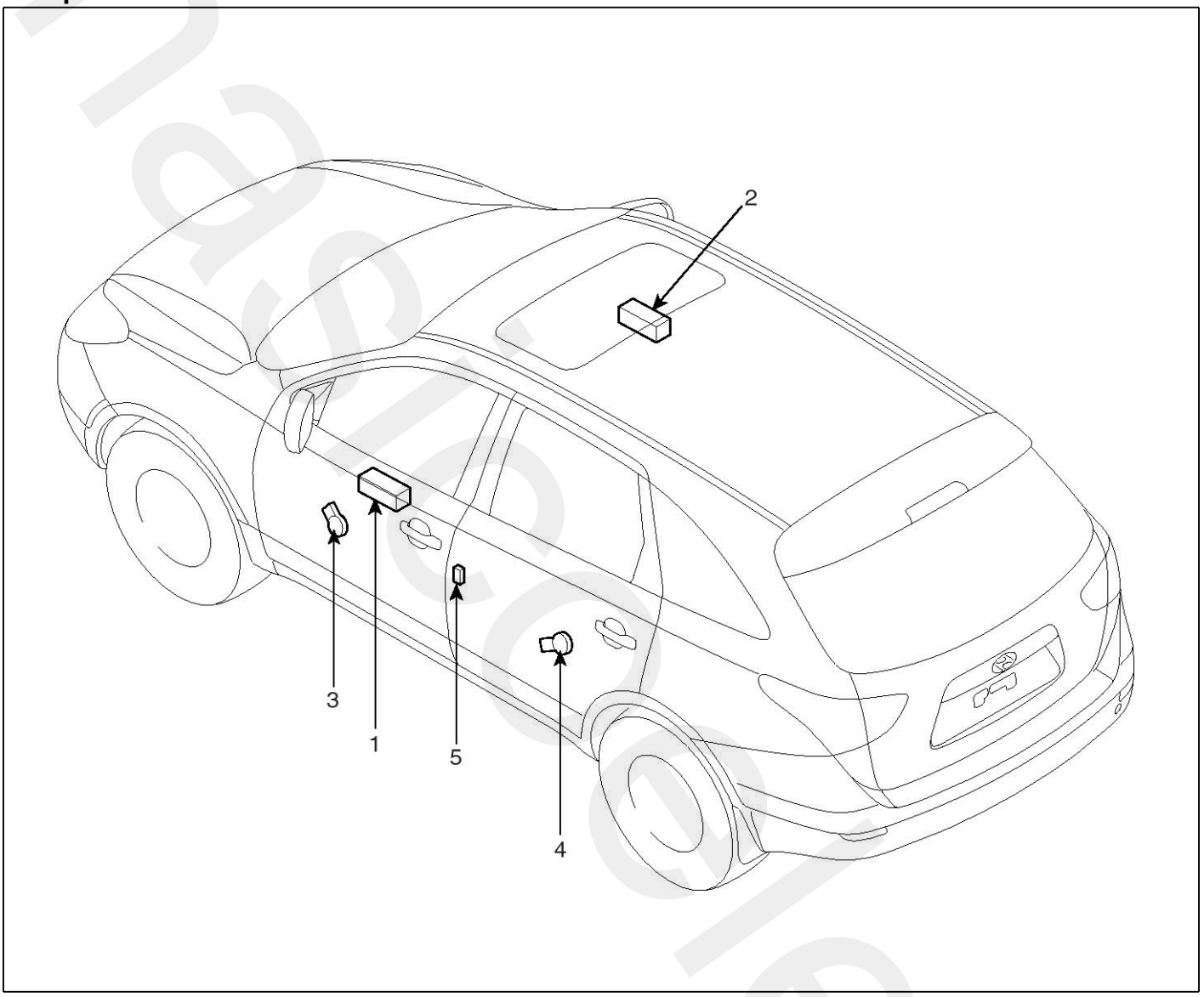
Input/output Monitoring

	BCM Display	Unit
1	Battery Logic Voltage	Voltages
2	Battery Power Voltage	Voltages
3	Optical Sensor Power	Voltages
4	Gate Optical Sensor 2	LOW/HIGH
5	Gate Optical Sensor 1	LOW/HIGH
6	Detent Switch	LOW/HIGH
7	Forkbolt Primary Switch	LOW/HIGH
8	Power Battery Voltage	OUT OF RANGE/IN RANGE
9	Forkbolt Secondary Switch	LOW/HIGH
10	Right Pinch Strip - Pinch Condition	Not Pinched/Pinched
11	Left Pinch Strip - Pinch Condition	Not Pinched/Pinched
12	Park Switch	Out Of Park/Park
13	Ignition (IG2) Swtich	LOW/HIGH
14	Tail Lamp Flash Feedback	LOW/HIGH
15	Local Open/Close Switch	Not Pressed/Pressed
16	Master Open/Close Switch	Not Pressed/Pressed
17	Spare Switch	LOW/HIGH
18	Vehicle Speed Slow Status	≥5kph/＜5kph

	BCM Display	Unit
19	On/Off Switch	ON/OFF
20	Start Switch	LOW/HIGH
21	Gate Open Feedback	Voltages
22	Cinch Feedback (PTG Only)	Voltages
23	Uncinch Feedback (PTG Only)	Voltages
24	Gate Close Feedback	Voltages
25	Unlatch Feedback	Voltages
26	Unlatch Return Feedback	Voltages
27	Clutch Feedback	Voltages
28	Gate Position Count	-
29	Most Recent Cinch Time	ms
30	2nd Most Recent Cinch Time	ms
31	3rd Most Recent Cinch Time	ms
32	4th Most Recent Cinch Time	ms
33	Left Pinch Strip Voltage	Voltages
34	Right Pinch Strip Voltage	Voltages

Power Windows

Component Location



SENBE9014L

1. DDM (Driver Door Module)
2. ADM (Assist Door Module)
3. Front window motor
4. Rear window motor
5. Rear window switch

Function Of Safety Power Window

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

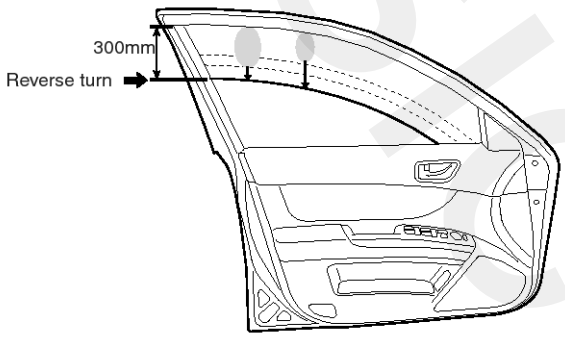
1. Safety function condition

   When detect the force of 100N (using the 10N/mm spring) during the window rising, window is reversed.

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

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

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

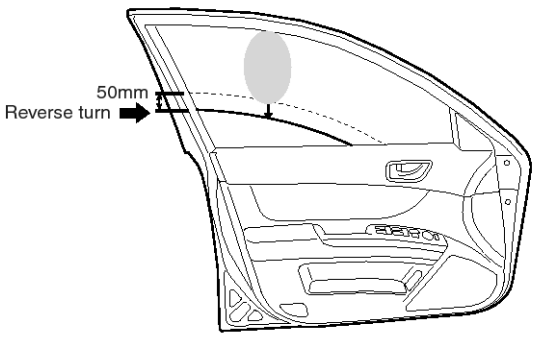


When detect the jamming during the 4mm~250mm from top of the door

ETRF320B

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

     → Window is reversed until 50mm from jamming position.



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

ETRF320C

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

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

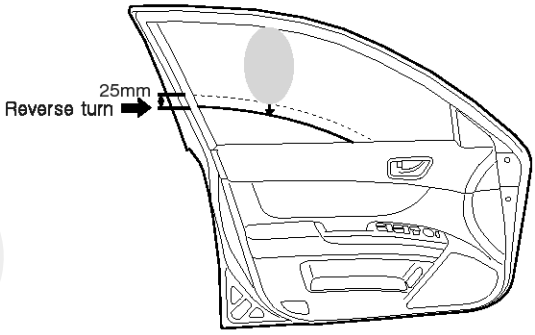
     → Window is reverse until 25mm from jamming position.

   - Auto-up function is not available during the 5 seconds from above condition.

     → When holding the auto-up switch, window is operated as a manual-up function. (Safety function is not activated.)

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

     → Window is reverse until 25mm from jamming position.



When holding the auto-up switch

ETRF320D

4. Safety function is not available area

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

Initializing Method Of The Safety Power Window

1. Initializing of Battery Connection

   When the battery is not connected after disconnecting the battery, safety power window switch need the initializing.

   1) Power window operation before initializing
      - Manual-Up/Safety 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
   4) Position control

      To detect the window position and direction of motor rotation, hall sensors are employed. ECU recognizes the fully closed position of the window and sets this relative window position value as "0". When the window goes downwards, based on the information from the hall sensor, the relative position value increments. On the contrary, when the window goes upwards, it decrements.

      NOTICE

      Motor position is only valid if the system stays in normalized state. (see initialization force limitation).
   5) Recall and storing the normalization information

      ECU records the normalization information into the specified location in Flash ROM. (as long as Flash ROM page is valid)
      - Storing conditions: 1 second after the motor stops
      - Recall conditions:

        Engine = on OR

        Power On Reset
   6) Switch signal filtering

      Debouncing time: 14ms

      T1, t2 and t3: Measured with signal that debouncing is done. In case T1 > 6ms, motor shall operate. In case T2 > 22ms, motor might operate in manual mode.

      When Auto up switch input is active, auto up mode is active till 300ms. After this and until switch is released, panic mode is enable. In the end when the switch is released, auto up mode is enabled again.

      The conditions for terminating the motor control by the (Semi) Auto Up/Down or Manual Up/Down:
      - Out of the operation voltage range OR
      - Thermal protection ON OR
      - Anti-pinch function OR
      - De-normalization OR
      - Engine = OFF OR
      - Other key input occurs

2. Thermal protection

   Software provides an algorithm in order to prevent the motor from thermal overheating under the specified conditions like the valid Flash ROM Data.

   After power on reset, the software thermal counter starts to count from the initial value. In case of motor running, software increases the thermal counter by using the motor heating characteristic, otherwise the thermal counter decreases by using the motor cooling characteristic.

   There exist 2 thermal protection limits. If the software thermal counter is over the first limit, the motor movement stops until the software thermal counter decrease to the release limit temperature value, but still allows the current movement to finish. If the software thermal counter is over the second limit (while motor running), the movement stops at once until the release temperature value is reached (reversing will not be interrupted by software thermal protection).

   The motor is able to continue to operate at least "15" cycles without a break under the above conditions and after thermal protection is activated, the motor turns to the operational condition within "35±5" seconds.

   Test starts with SW-thermal counter at the initial value.

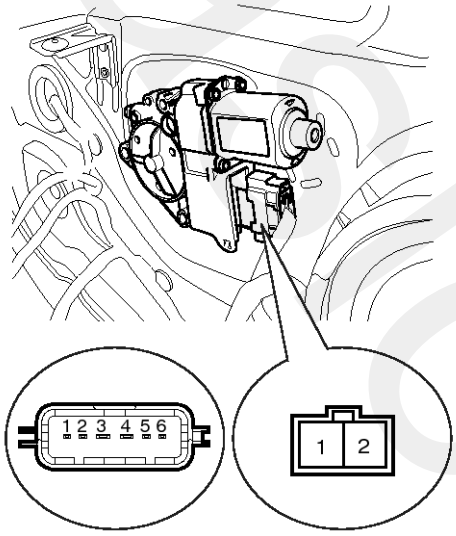
   Cycle: Full closed → 1sec. rest → Full opened → 1sec. rest

Power Window Motor

Inspection

Front Power Window Motor

1. Remove (-) negative battery terminal.
2. Remove the front door trim.
   (Refer to the BD group - "Front door")
3. Disconnect the motor connector from the motor.



[Safety window type]

SENBE7271L

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

Position			Terminal 1	Terminal 2
Left	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖
Right	DOWN	Clockwise	⊕	⊖
	UP	Counter-clockwise	⊖	⊕

SCMBE6272L

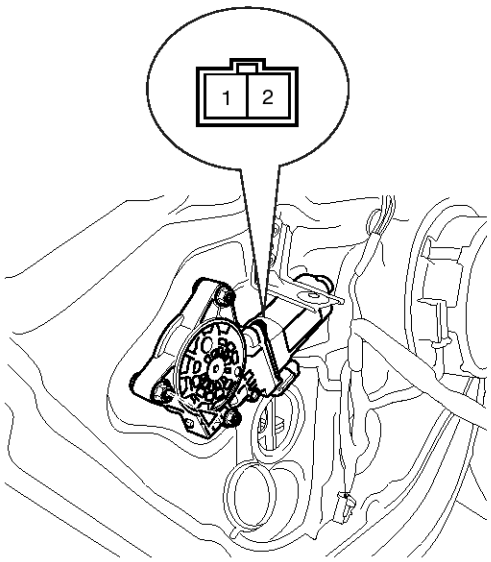
[Driver Safety Window Type]

Position			Terminal 1	Terminal 2
Driver seat	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖

SENBE7273L

Rear Power Window Motor

1. Remove (-) negative battery terminal.
2. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
3. Disconnect the motor connector from the motor.



SENBE7274D

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

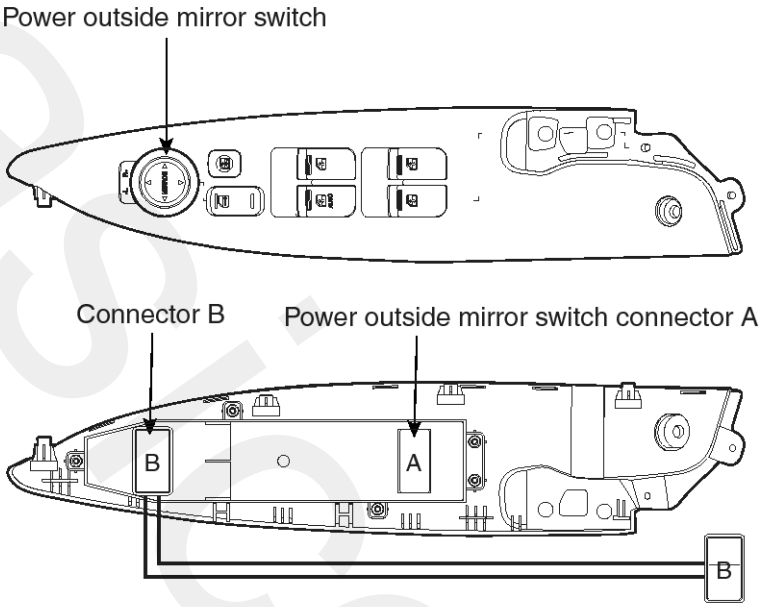
Position			Terminal 1	Terminal 2
Left	UP	Clockwise	⊖	⊕
	DOWN	Counter-clockwise	⊕	⊖
Right	DOWN	Clockwise	⊕	⊖
	UP	Counter-clockwise	⊖	⊕

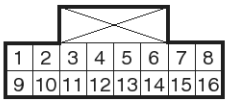
SCMBE6272L

Power Window Switch

Components

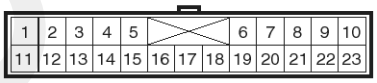
Power Window Main Switch





Connector A

No.	DESCRIPTION
1	MIRROR RIGHT
2	MIRROR LEFT
3	MIRROR UP
4	MIRROR DOWN
5	SIGNAL GND
6	ECU B+
7	IGN 2 (BACK UP)
9	-
10	DOOR UNLOCK MOTOR
11	DOOR LOCK MOTOR
12	B+ (MIRROR)
13	POWER GND
14	-

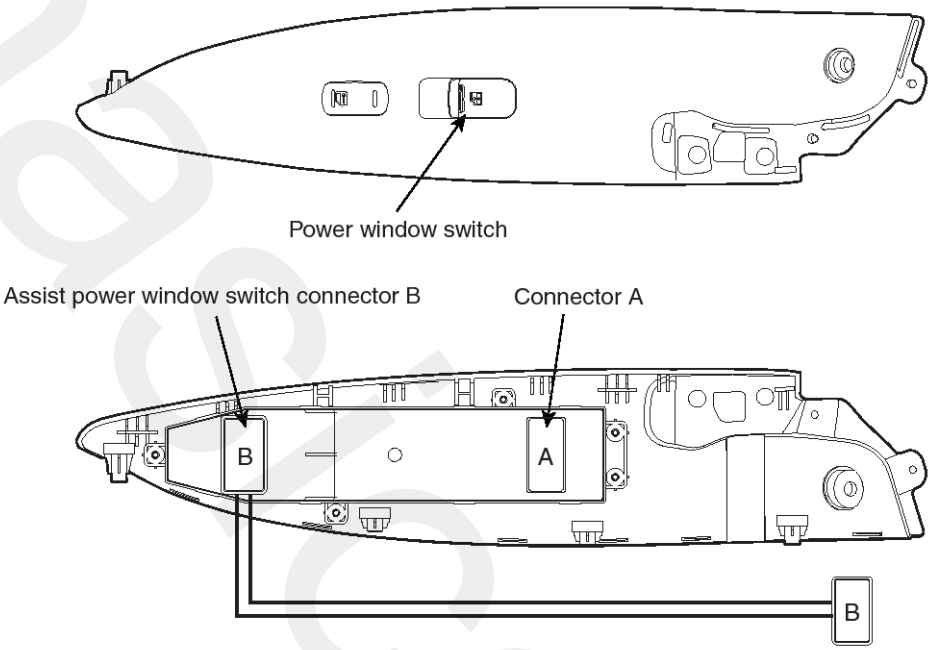


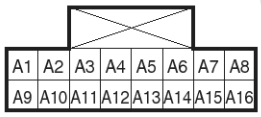
Connector B

No.	DESCRIPTION
1	IMS SET (M)
2	IMS 1
3	IMS 2
4	FL UP/D AT
5	FL D/UP AT
6	PWD
8	CAN HIGH
9	CAN LOW
11	MIRROR SENSOR Vcc
12	CRASH INPUT
13	RL DOOR KNOB UNLOCK SWITCH
14	FL DOOR KNOB UNLOCK SWITCH
15	FL DOOR SWITCH
16	FL DOOR KNOB LOCK SW
17	FL DOOR KNOB UNLOCK SW
19	MIRROR SENSOR H
20	MIRROR SENSOR V
23	MIRROR SENSOR GND

SENBE7259L

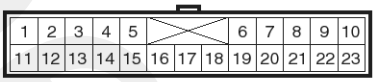
Assist Power Window Switch





Connector A

No.	Description
1	MIRROR RIGHT
2	MIRROR LEFT
3	MIRROR UP
4	MIRROR DOWN
5	SIGNAL GND
6	ECU B+
7	IGN 2
8	FL UP
9	-
12	B+(MIRR)
13	POWER GND
14	-
15	B+(POWER)
16	FL DOWN

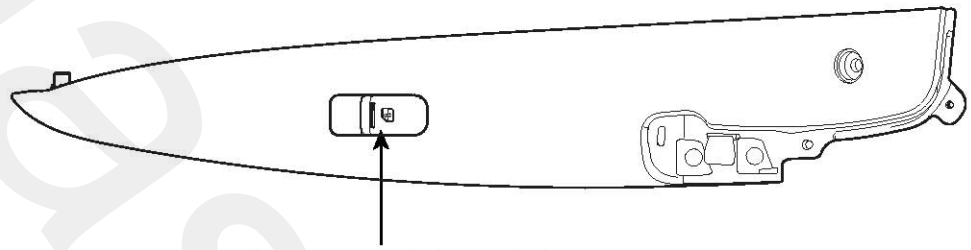


Connector B

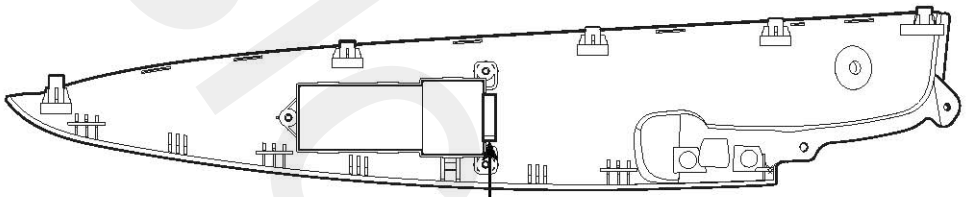
No.	Description
8	CAN HIGH
9	CAN LOW
11	MIRROR SENSOR Vcc
13	RL DOOR KNOB UNLOCK SWITCH
14	FL DOOR KNOB UNLOCK SWITCH
15	FL DOOR SWITCH
19	MIRROR SENSOR H
20	MIRROR SENSOR V
23	MIRROR SENSOR GND

SENBE7279L

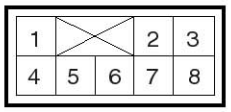
Rear Power Window Switch



Rear power window switch



Rear power window switch connector



No.	Description
1	GND
2	Window Lock
3	TAIL
4	Window down relay
5	Window up relay
6	Motor up
7	Motor down
8	B+

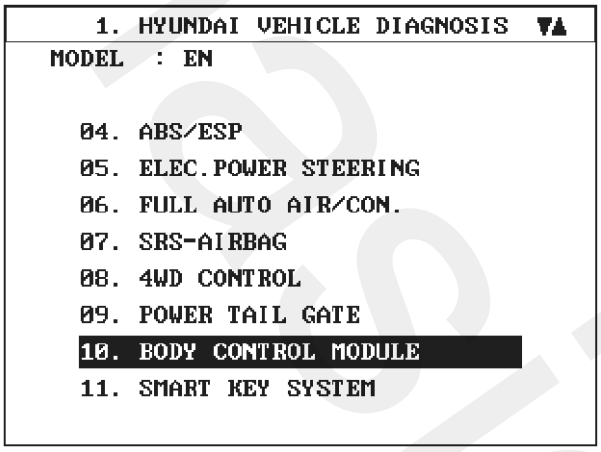
Position \ Terminal	6	8	7	1
UP	○	○	○	○
OFF	○		○	○
DOWN	○	○	○	○

SENBE7282L

Inspection

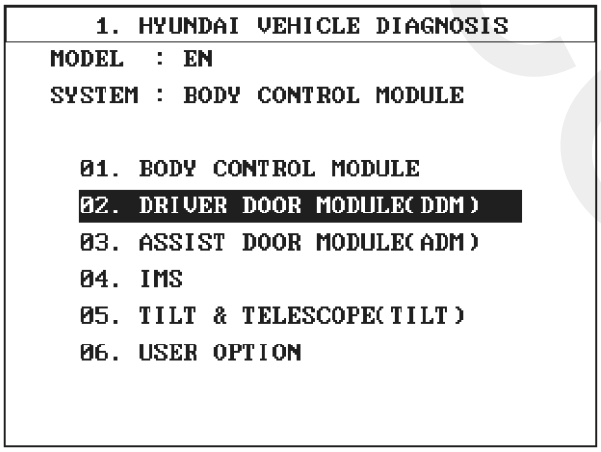
Driver Power Window Switch

1. When checking the anti pinch strip operation, select a vehicle type and "BODY CONTROL MODULE" menu.



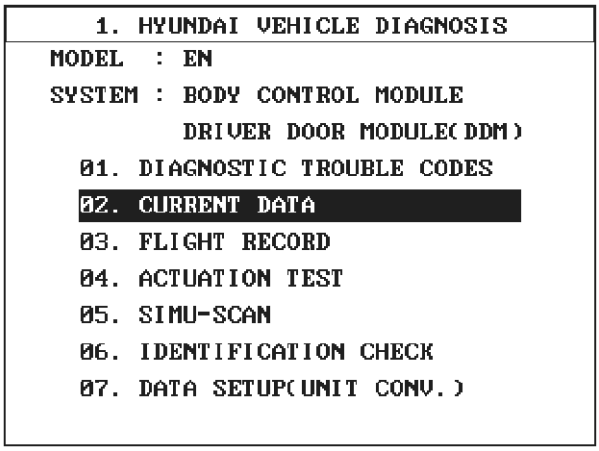
SENBE7201L

2. Select "DRIVER DOOR MODULE(DDM)".

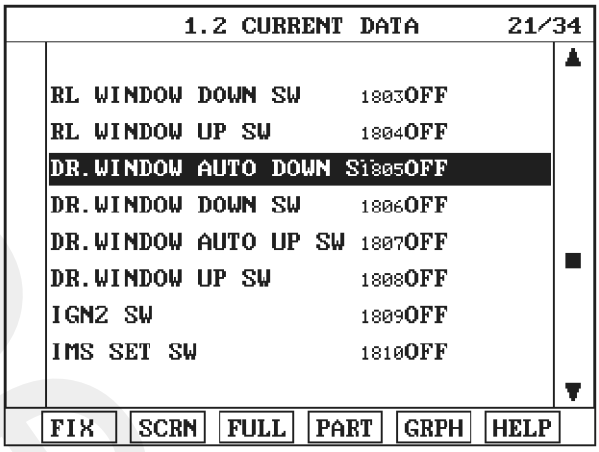


SENBE7312L

3. Select option "CURRENT DATA".



SENBE7313L



SENBE7429L

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

```
    1. HYUNDAI VEHICLE DIAGNOSIS
 MODEL  : EN
 SYSTEM : BODY CONTROL MODULE
          DRIVER DOOR MODULE(DDM)
   01. DIAGNOSTIC TROUBLE CODES
   02. CURRENT DATA
   03. FLIGHT RECORD
   04. ACTUATION TEST
   05. SIMU-SCAN
   06. IDENTIFICATION CHECK
   07. DATA SETUP(UNIT CONV.)
```

SENBE7427L

```
          1.4 ACTUATION TEST      04/11

 DR. WINDOW AUTO-DOWN
 DURATION    UNTIL IG OFF
 METHOD      ACTIVATION
 CONDITION   IG.KEY ON
             ENGINE OFF

   PRESS [STRT], IF YOU ARE READY !
   SELECT TEST ITEM USING UP/DOWN KEY

 [STRT] [STOP]
```

SENBE7428L

※ Above voltage and numerical value may be different from the real value.

5. Change the anti pinch strip sensor, if there is no change from OFF to ON during operation.

Assist Power Window Switch

1. When checking the ASSIST POWER WINDOW SWITCH, select a vehicle type and "BODY CONTROL MODULE" menu.

```
    1. HYUNDAI VEHICLE DIAGNOSIS  ▼▲
 MODEL  : EN

   04. ABS/ESP
   05. ELEC.POWER STEERING
   06. FULL AUTO AIR/CON.
   07. SRS-AIRBAG
   08. 4WD CONTROL
   09. POWER TAIL GATE
   10. BODY CONTROL MODULE
   11. SMART KEY SYSTEM
```

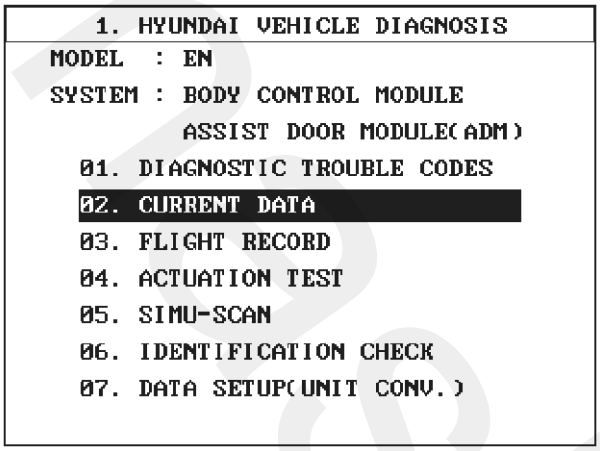
SENBE7201L

2. Select "ASSIST DOOR MODULE(ADM)".

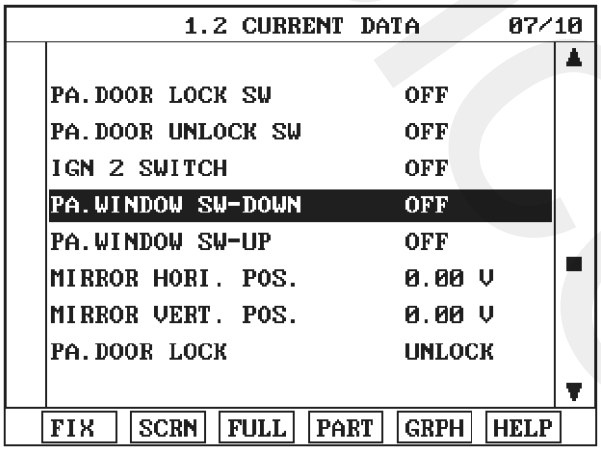
```
    1. HYUNDAI VEHICLE DIAGNOSIS
 MODEL  : EN
 SYSTEM : BODY CONTROL MODULE

   01. BODY CONTROL MODULE
   02. DRIVER DOOR MODULE(DDM)
   03. ASSIST DOOR MODULE(ADM)
   04. IMS
   05. TILT & TELESCOPE(TILT)
   06. USER OPTION
```

SENBE7564L

3. Select option "CURRENT DATA".

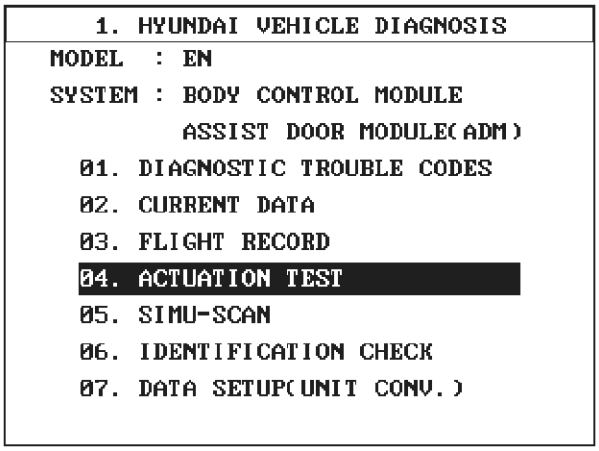


SENBE7485L

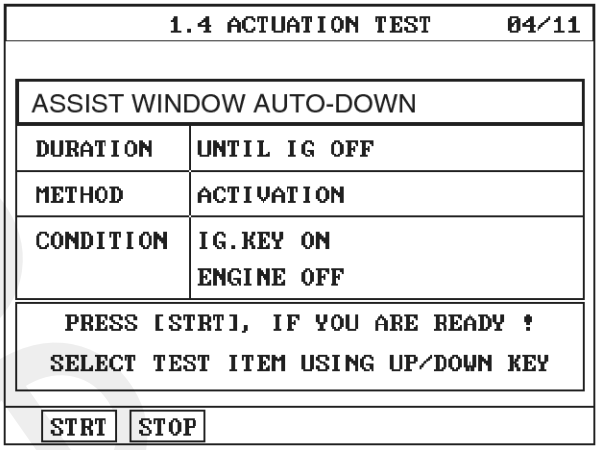


SENBE7486L

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



SENBE7487L



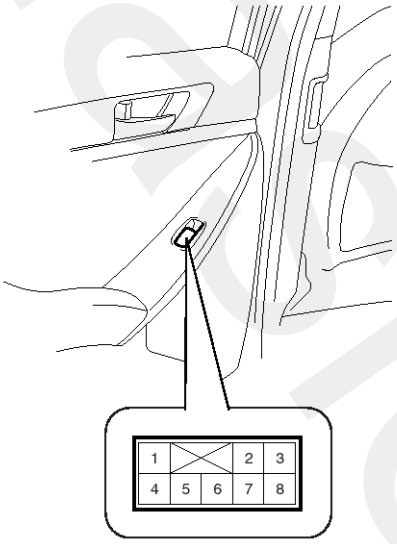
SENBE7488L

※ Above voltage and numerical value may be different from the real value.

5. Change the anti pinch strip sensor, if there is no change from OFF to ON during operation.

Rear Power Window Switch Inspection

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



SENBE7289D

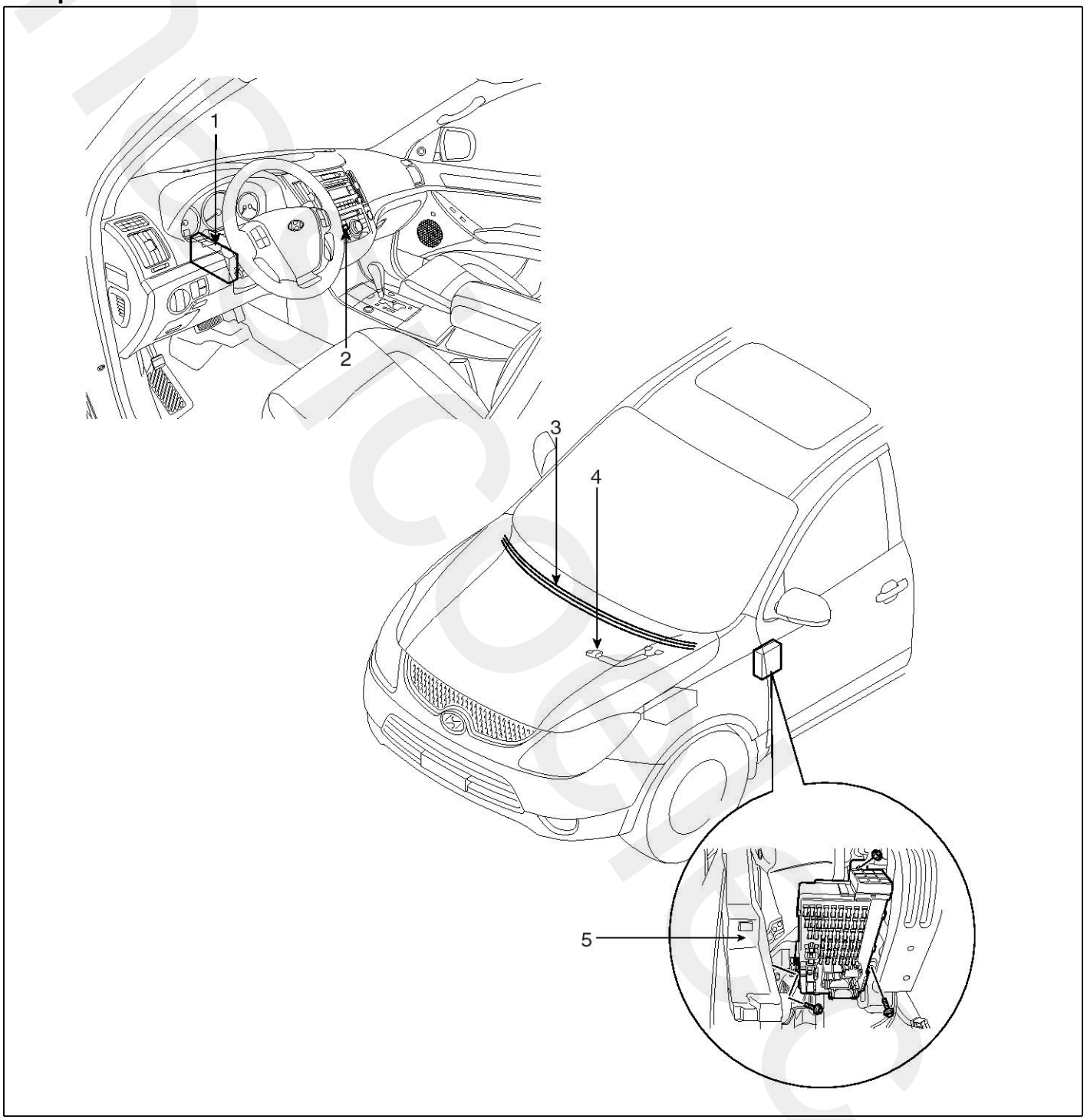
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Terminal / Position	6	8	7	1
UP	○——	——○	○——	——○
OFF	○——		○——	——○
DOWN	○——			——○
		○——	——○	

SENBE7291L

Windshield Deicer

Component Location



SENBE9015L

1. Body control module
2. Windshield deicer switch
3. Windshield deicer
4. Deicer connector
5. Windshield deicer relay

Description

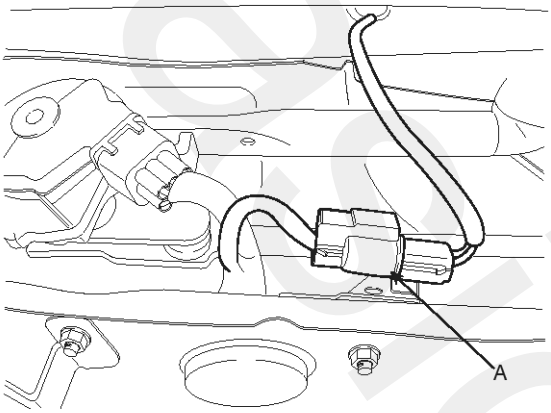
Windshield deicer system prevent windshield wiper from freezing in the winter season. It consists of deicer in the lower part of windshield, switch and relay. Body control module receives an input signal from the deicer switch, then controls relay. Operating condition is the same that of rear window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

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

Windshield Deicer

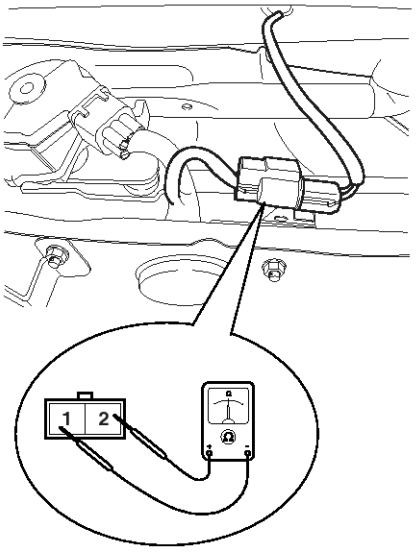
Inspection

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



SCMBE6301D

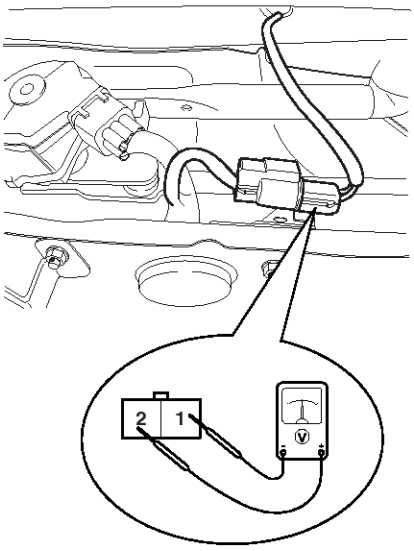
3. Check for continuity between the terminals of deicer lines.



SCMBE6302D

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

O K : approx. Battery voltage (12V)

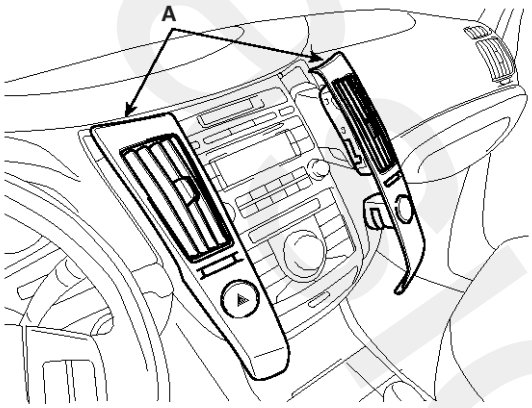


SCMBE6303D

Windshield Deicer Switch

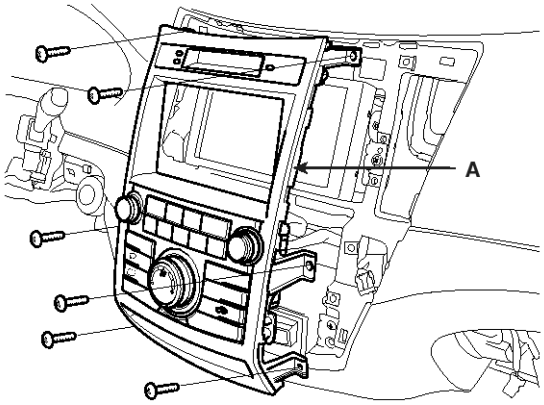
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the air vent pannel (A).
   (Refer to the BD group - "Crash pad")



SENBE7012D

3. Remove the connectors (Hazard lamp connector, incar temperature sensor connector).
4. Remove the center facia panel fixing screws, then remove the keyboard unit (A).



SENBE7017D

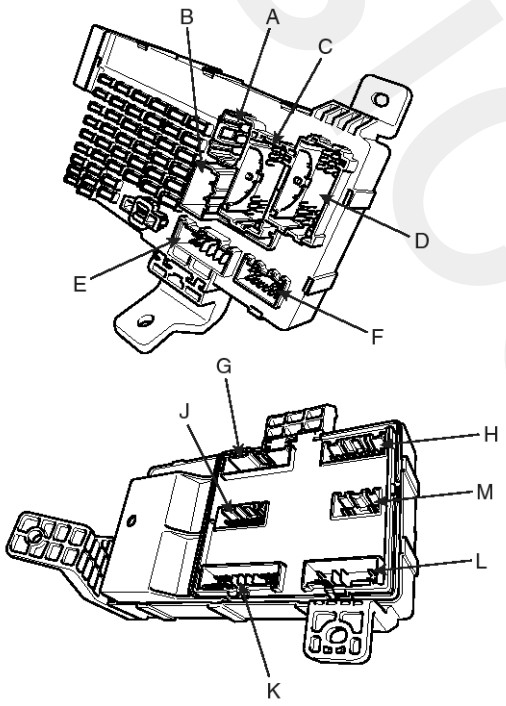
Installation

1. Reassemble the keyboard unit to the center facia panel.
2. Reassemble the center facia panel.
3. Connect the connectors, the reassemble the air vent panel.

Windshield Deicer Relay

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.2 in the I/P-B and No.11 terminal in the I/P-C when power and ground are connected to the No.2 terminal in the I/P-B and No.5 terminal in the I/P-J.
5. There should be no continuity between the No.2 terminal in the I/P-B and No.11 terminal in the I/P-C when power is disconnected.



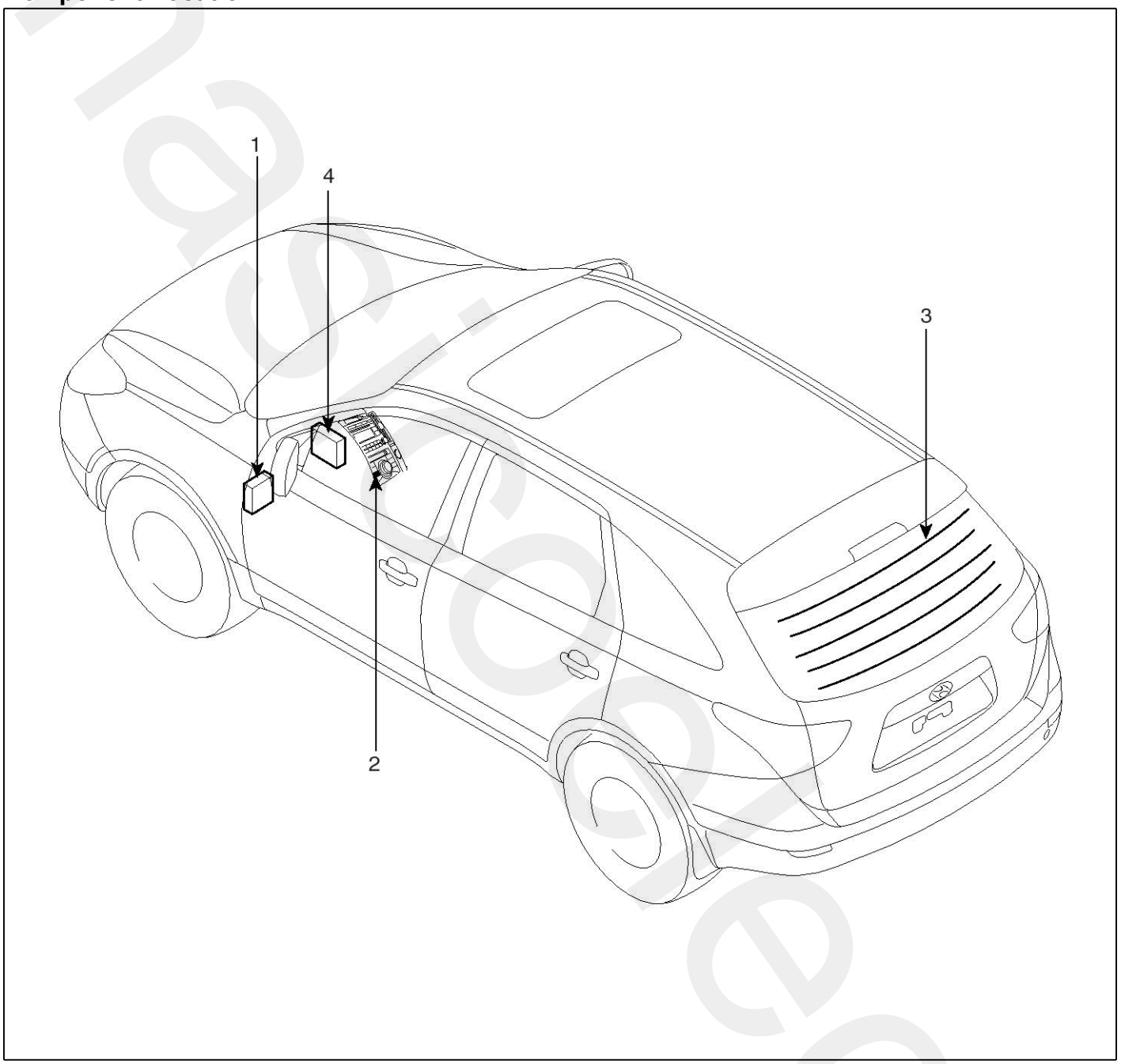
SENBE7241D

Terminal / Position	I/P-C (11)	I/P-B (2)	I/P-J (5)	I/P-B (2)
Disconnected			○	○
Connected	○	○	⊖	⊕

SENBE7293L

Rear Glass Defogger

Component Location



SENBE9016L

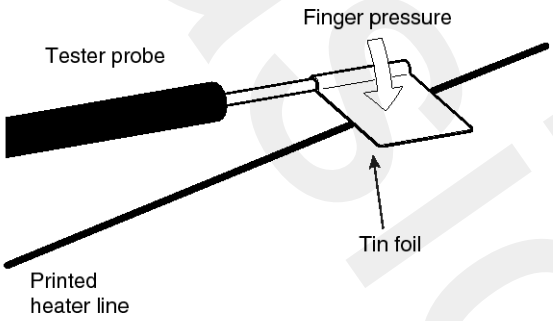
1. Junction box (Rear window defogger)
2. Rear window defogger switch (A/C control switch)
3. Rear window defogger
4. Body control module

Rear Glass Defogger Printed Heater

Inspection

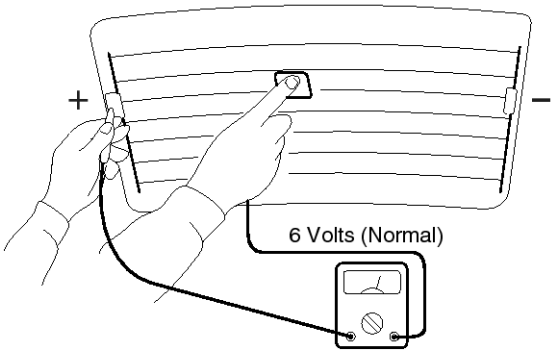
⚠CAUTION

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



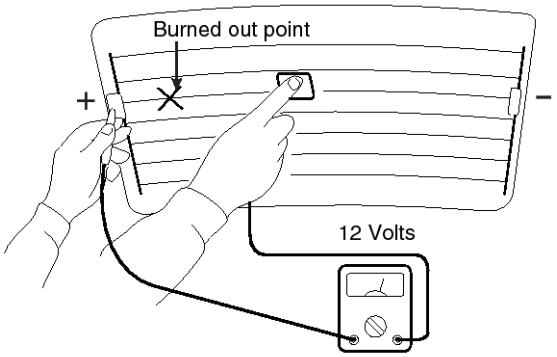
ETA9165A

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



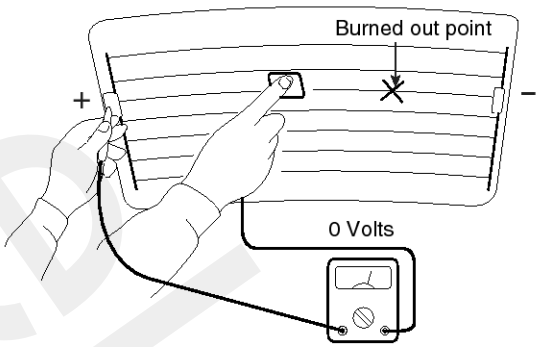
ETA9165B

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



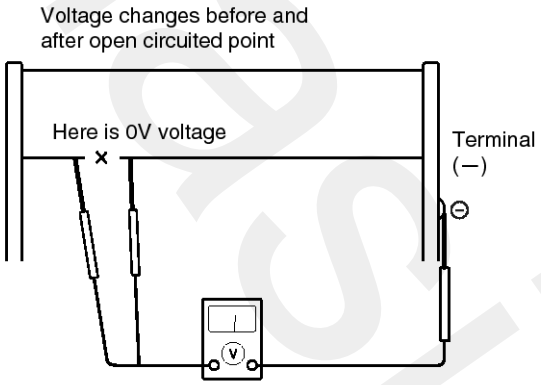
ETA9165C

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



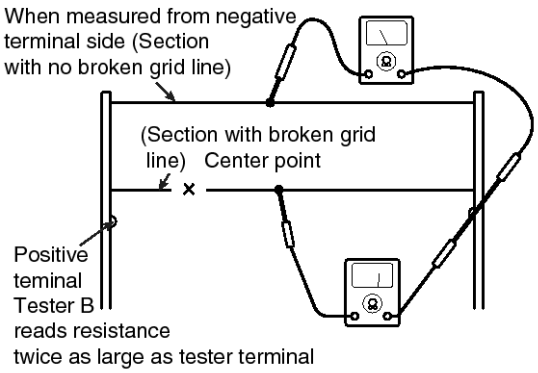
ETA9165D

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



ETA9165E

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



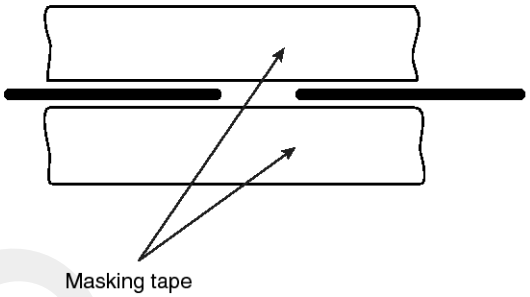
ETA9165F

Repair Of Broken Heater Line

Prepare the following items :

1. Conductive paint.
2. Paint thinner.
3. Masking tape.
4. Silicone remover.
5. Using a thin brush :

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

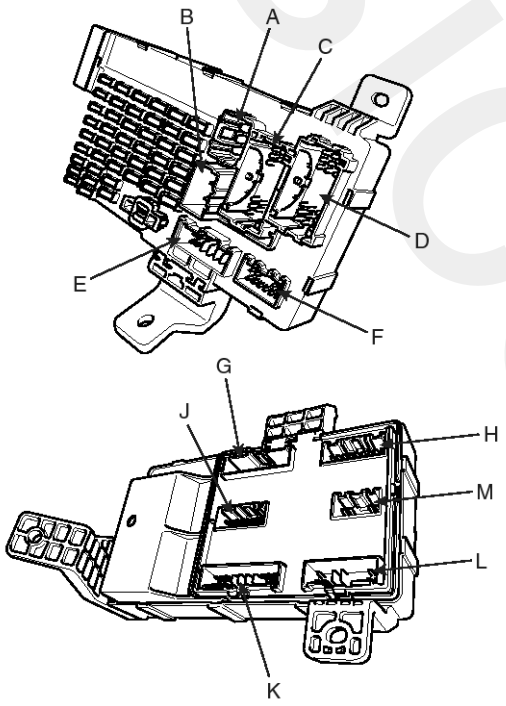


ETA9165G

Rear Glass Defogger Relay

Inspection

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



SENBE7241D

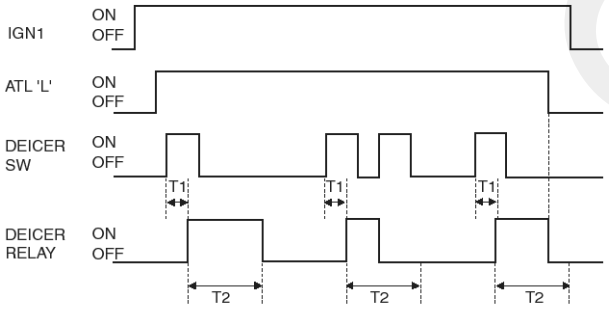
Terminal / Position	I/P-A (4)	I/P-E (7)	I/P-J (2)	I/P-A (4)
Disconnected			○	○
Connected	○	○	⊖	⊕

SENBE7294L

Rear Glass Defogger Timer

Inspection

1. If the Defogger SW is ON after the ALT "L" is ON in the state that the IGN1 SW is ON, then the Defogger output shall be ON for 20 minutes. (Operating in the state of the ENGINE RUNNING)
2. If the DEFOGGER SW is ON again while the DEFOGGER output is ON, then the DEFOGGER output shall be OFF.
3. If the ALT "L" is OFF or IGN1 is OFF while the DEFOGGER output is ON, then the DEFOGGER output shall be OFF.
4. If the ALT "L" > 10 volts, then it shall be in the Engine Running State (ALT "L" shall be ON); if the ALT "L" < 5 volts, then it shall be in the Engine Stop State (ALT "L" shall be OFF). Also, if the ALT "L" is more than 5 and less than 10 volts, then the former state shall be maintained.
5. If the defogger SW is pressed and the ALT "L" is ON, there shall be no the DEFOGGER relay output.

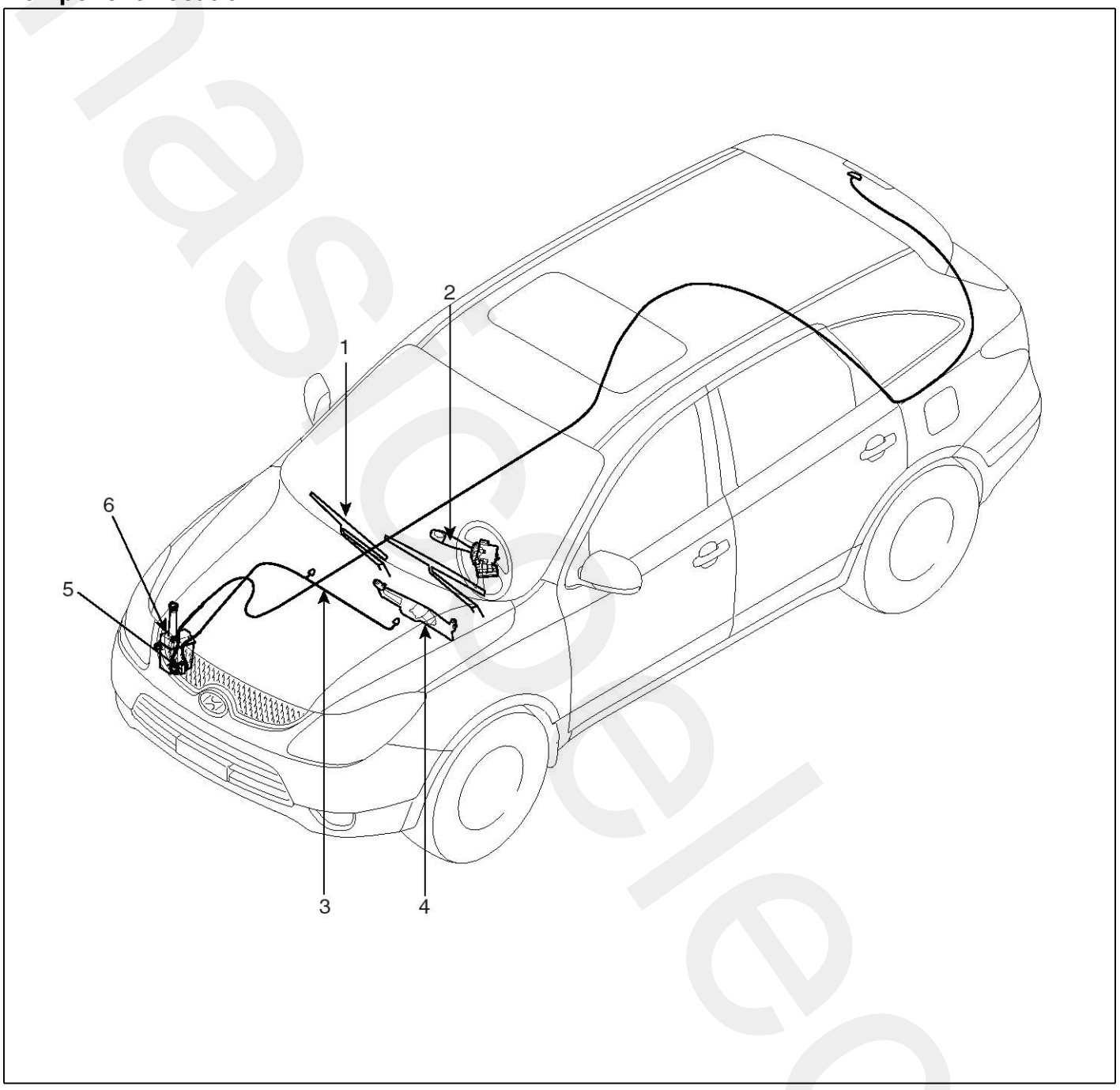


SCMBE6166L

T1 : 60 ± 20 msec, T2 : 20 ± 1 min.

Windshield Wiper/Washer

Component Location



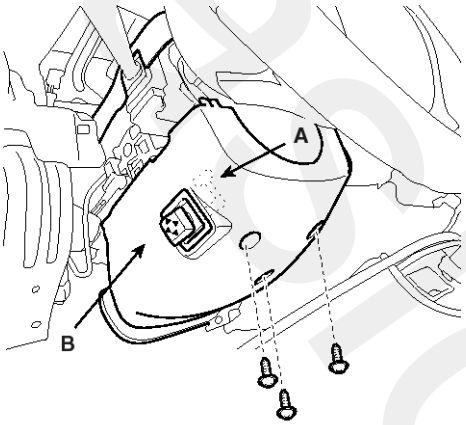
SENBE9017L

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

Windshield Wiper-Washer Switch

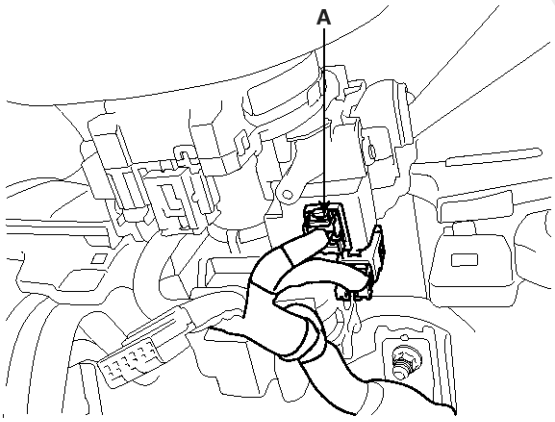
Removal

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



SENBE7321D

3. Remove the wiper switch assembly after disconnecting the front and rear wiper/washer switch connectors and loosening 2 screws.

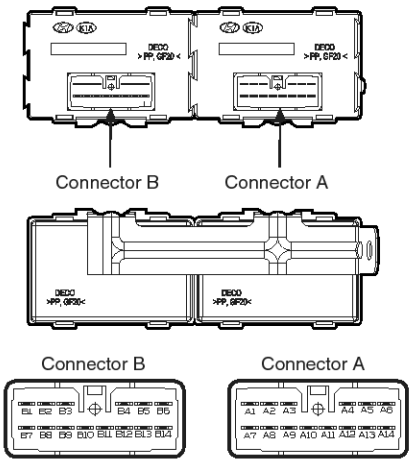


SENBE7322D

Installation

1. Connect the connectors and reassemble the wiper switch assembly.
2. Reassemble the steering column upper and lower shrouds.

Inspection



SENBE7197L

Front Wiper Washer

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.10 terminals when power and ground are connected to the No.1 and No.7 in the ICM-A.
2. There should be no continuity between the No.1 and No.10 terminals when power is disconnected.

Front Wiper

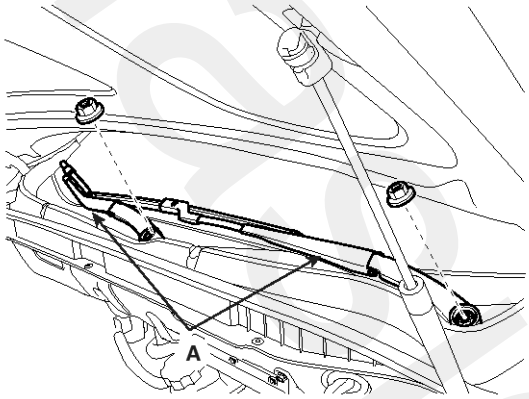
Check for continuity between the terminals.

1. There should be continuity between the No.2 and No.3 terminals when power and ground are connected to the No.1 and No.9 terminals in the ICM-A.
2. There should be no continuity between the No.2 and No.3 terminals when power is disconnected.

Front Wiper Motor

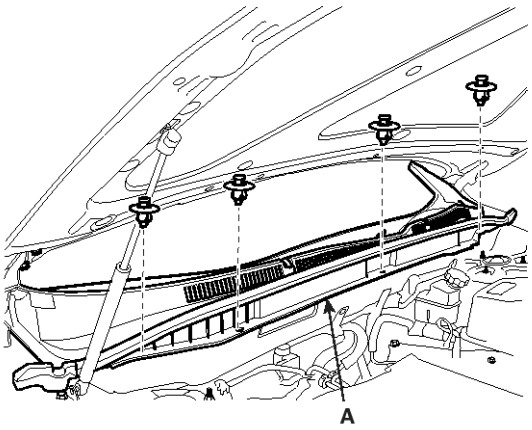
Removal

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



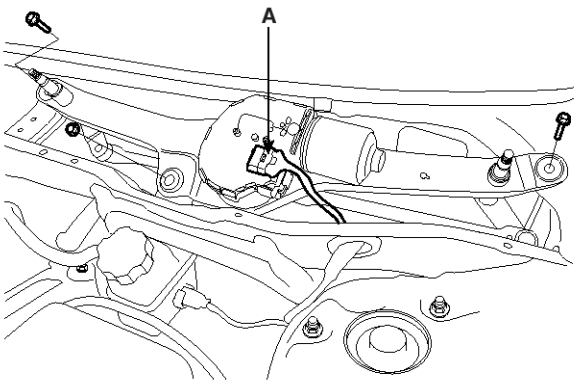
SENBE7341D

2. Remove the weather strip and the cowl top cover (A) after removing 4 rivets.



SENBE7337D

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



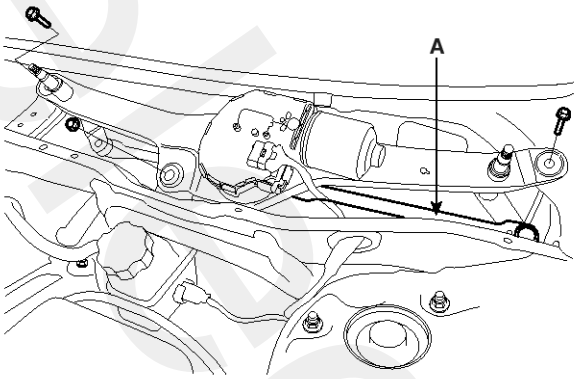
SENBE7344D

Installation

1. Reassemble the wiper motor & linkage assembly and connect the connector.

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

2. Push the linkage (A) into the sttoper to set the wiper blade properly before connecting the connector.



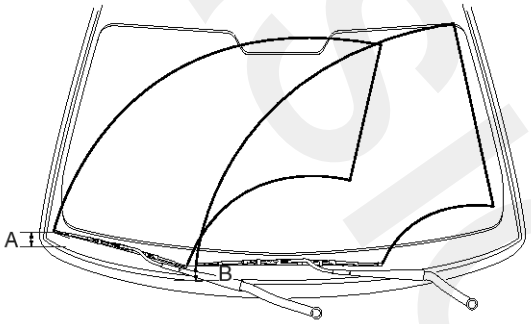
SENBE7342D

3. Reassemble the cowl top cover.
4. Reassemble the windshield wiper arm and blade.

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

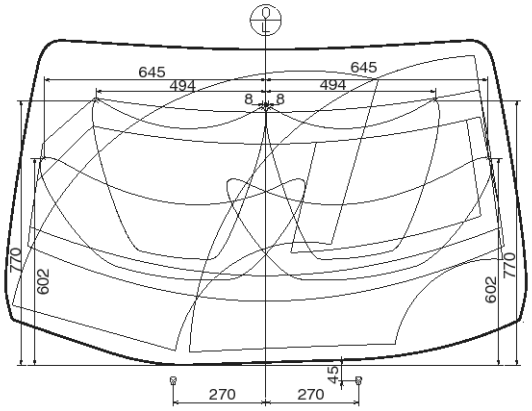
5. Install the wiper arm and blade to the specified position.

Specified position	A	B
Distance [in(mm)]	1.02 ± 0.2 (26.0 ± 5 mm)	0.98 ± 0.2 (25 ± 5 mm)



ATGE362C

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



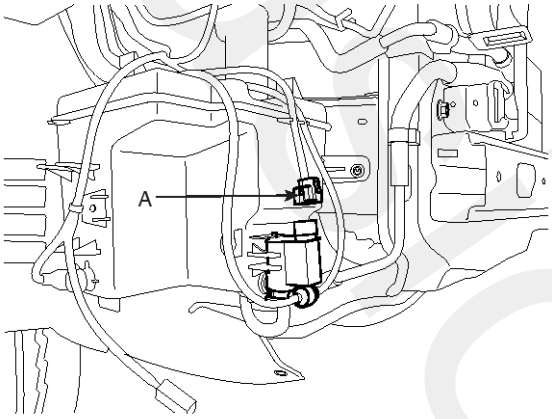
Unit : mm

SENBE7345L

Front Washer Motor

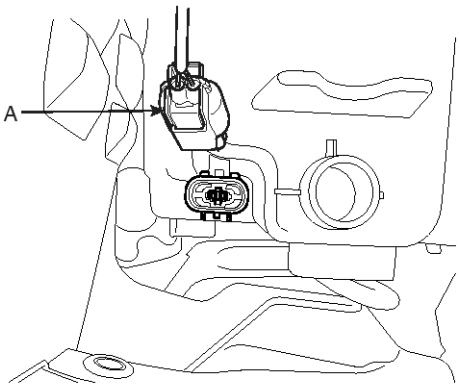
Removal

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



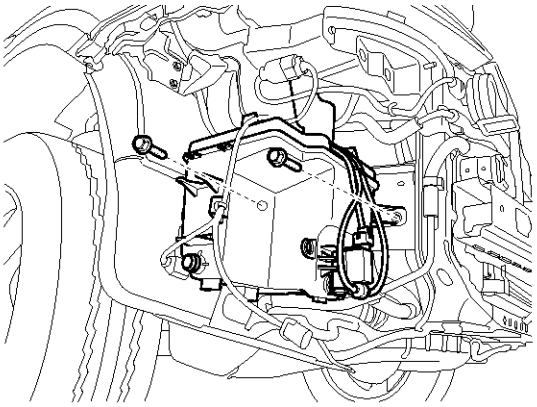
SENBE7335D

4. Disconnect the washer fluid level sensor switch connector (A).



SENBE7346D

5. Remove the washer reservoir after removing 3 bolts.



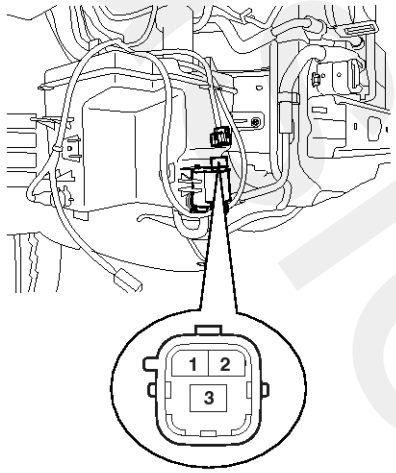
SENBE7349D

Installation

1. Reassemble the washer reservoir.
2. Connect the washer motor connector and washer hose.
3. Reassemble the front bumper cover.

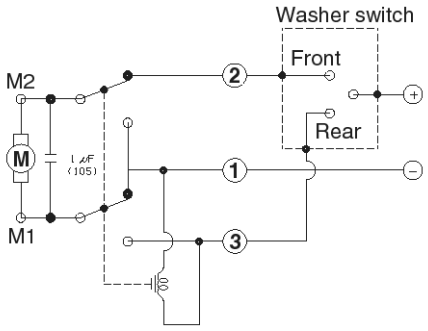
Inspection

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



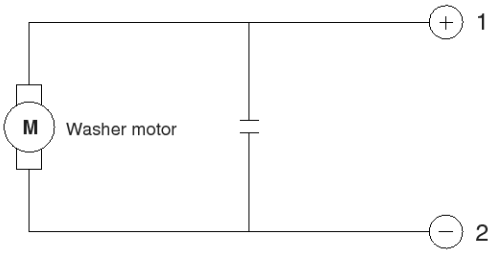
[Front & Rear washer]
1. Ground
2. Windshield washer (+)
3. Rear washer (+)

SENBE7348L



<Windshield & Rear washer motor>

SCMBE6349L



[Windshield washer motor]

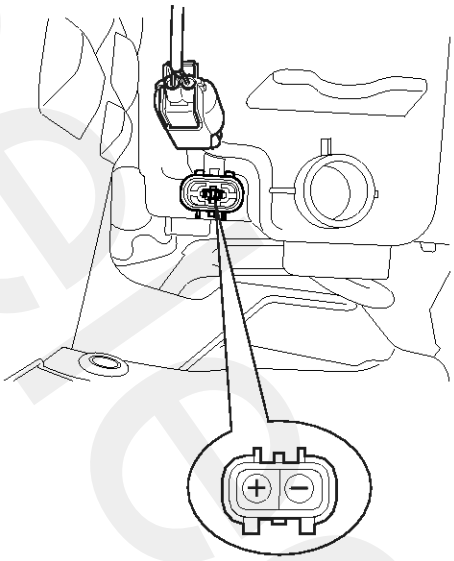
SCMBE6346L

Washer Fluid Level Sensor Switch

1. Disconnect the negative(-) battery terminal.
2. Drain the washer fluid less than 650 cc.
3. Check for continuity between the No. 1 and No.2 terminal in each float position.

   There should be continuity when the float is down.

   There should be no continity when the folat is up.
4. If the continuity is not as specified, replace the washer fluid level switch



SENBE7352D

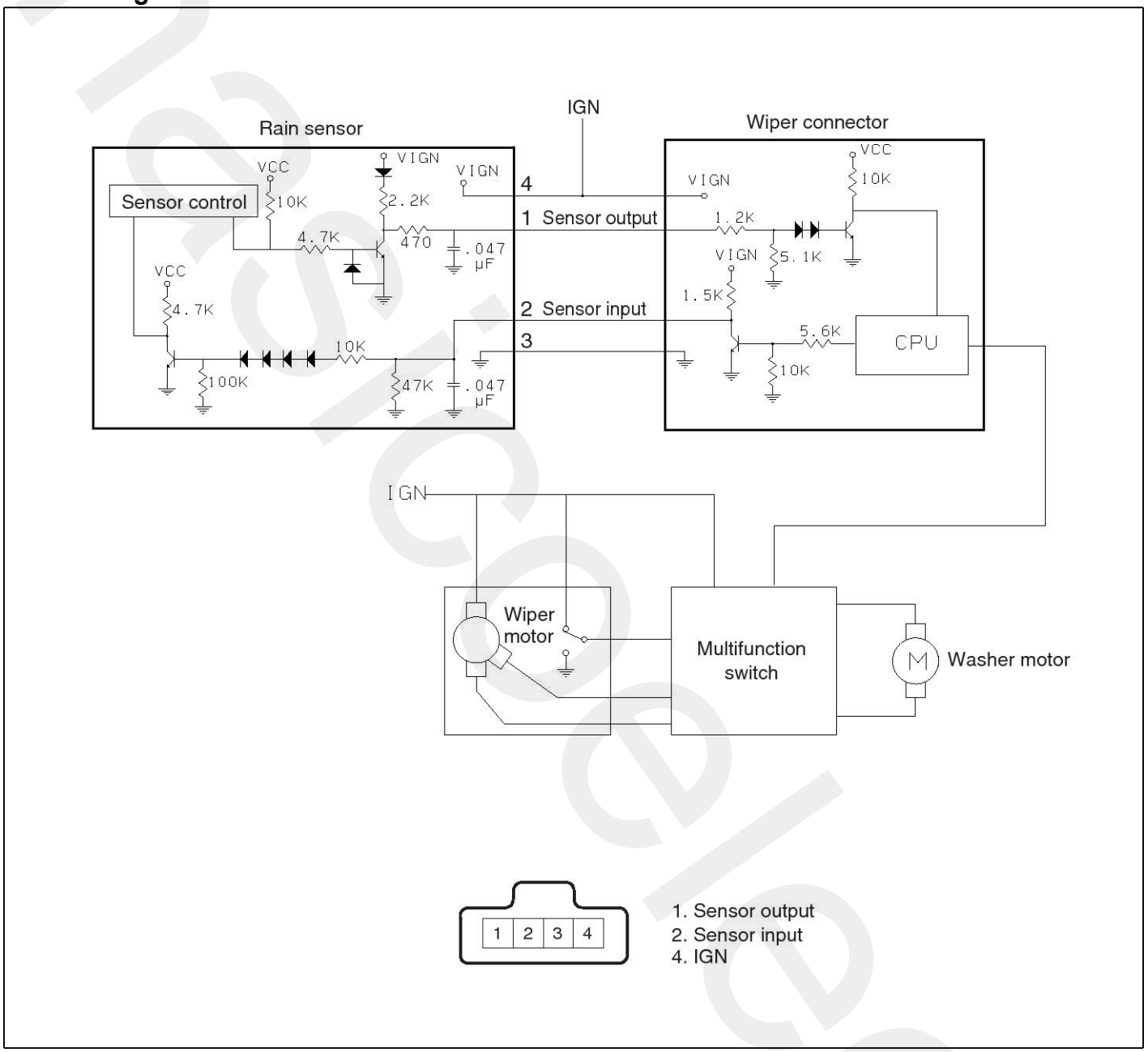
Terminal / Position	1	2
Over 650cc		
Under 650cc	○	○

(Tolerance : -50cc ~ +100cc)

SCMBE6353L

Rain Sensor

Circuit Diagram

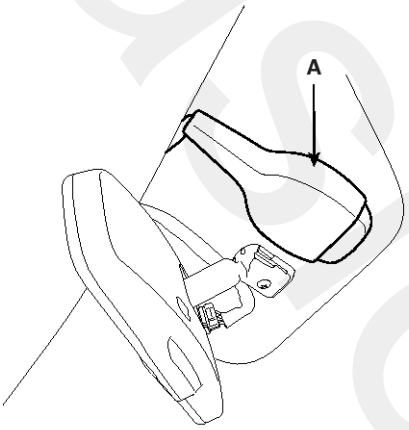


SENBE7338L

Description

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

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



SENBE7339D

Operating Modes - Rainsensing Windshield Wiper System

Multifunction Switch Position	Rainsensor Operating Mode	Sensor Action
MIST	MIST	Mist is controlled by the column switch. The sensor has no affect on this function
OFF	OFF	If not already parked, wiper motor runs in low speed until blades are in the depressed park position.
AUTOMATIC Automatic mode has 5 SENSITIVITY settings. This is further defined in par 84.	AUTOMATIC	AUTOMATIC Automatic INT/speed control. The sensitvity to raindrop accumulation on the windshield is set by the MULTIFUNCTION SWITCH sensitivity adjustment.
LOW SPEED	MANUAL	Wiper motor runs continuously in low speed, for example 45 wipes/minute. The sensor has no affect on this function
HI SPEED	MANUAL	Wiper motor runs continuously in high speed, for example 60 wipes/minute. The sensor has no affect on this function
WASH - DEMAND WASHER SW ≥ 0.6 SEC	WASH	If washer sw on after 0.6 sec then wipes during 2.5 to 3.8 sec. The rain sensor enables the wipers and controls the after wipes.
WASH - DEMAND WASHER SW < 0.6 SEC	WASH	If washer sw on less than 0.2 to 0.6 sec then once wipes

Off Mode

With the wipe switch in the OFF position and the ignition switch in the ON positions, the Rainsensor is considered to be in "OFF" mode. In this mode, the sensor commands the wiper to be off.

The Rainsensor monitors the state of the windshield during OFF mode so that knowledge of the state of the windshield is present when the MULTIFUNCTION SWITCH is moved to any SENSITIVITY setting. This optimizes the performance of the sensor when moving from the OFF condition to an AUTOMATIC mode. The algorithm assumes the nominal sensitivity setting when in the OFF mode.

Automatic Mode

When the MULTIFUNCTION SWITCH is moved to AUTO position and the ignition switch is in the RUN or ACCESSORY positions, the Rainsensor is considered to be in "AUTOMATIC" mode. Once a single "Instant wipe" as described in par 8.8 has occurred, the wipers remain at "Innerwiper/park" untill the Rainsensor determines that the dwell time at that position is appropriate for the amount of precipitation on the windshield, considering the driver input from the switch SENSITIVITY setting. After the dwell time the Rainsensor provides input to the wiper motor to activate the wipers to clear the preciptation from the windshield.

Automatic Int

For all AUTOMATIC INT operations the Rainsensor commands the wipers to operate in LOW SPEED for one wipe, followed by a variable dwell period in the inner wipe position.

Automatic Low

AUTOMATIC LOW SPEED operation is utilized when the amount of precipitation imping on the windshield exceeds the AUTOMATIC INT TO AUTOMATIC LOW threshold. This threshold includes sufficient hysterisis to prevent cycling between AUTOMATIC INT and AUTOMATIC LOW SPEED operation with a steady amount of precipitation accumulation on the windshield.

Automatic High

AUTOMATIC HIGH SPEED operation is utilized when the amount of precipitation imping on the windshield exceeds the AUTOMATIC LOW to AUTOMATIC HIGH threshold. This threshold includes sufficient hysterisis to prevent cycling between AUTOMATIC LOW to AUTOMATIC HIGH operation with a steady amount of precipitation accumulation on the windshield.

Wash Mode

The Rainsensor monitors the MULTIFUNCTION SWITCH to determine if the wash function is selected. Rainsensor enables the wiper motor to run in low speed during the wash mode and performs follow up wipes during 2.5 to 3.8 sec.

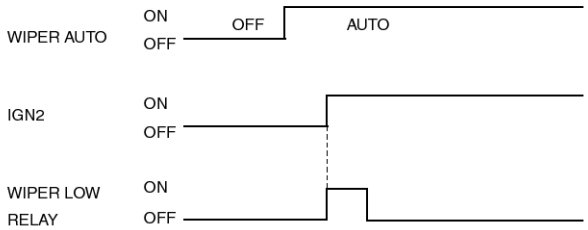
Manual Mode

The Rainsensor determines when a manual mode such as manual low, Mist, Off or manual high is selected. The column switch performs these modes and the rain sensor has no affect.

Inspection

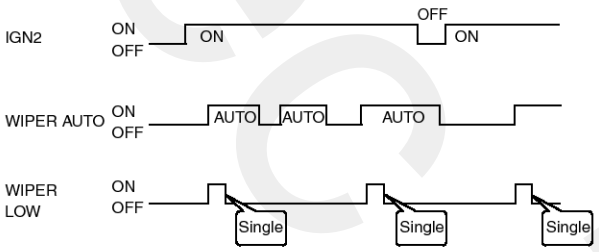
Rain Sensing Wiper

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



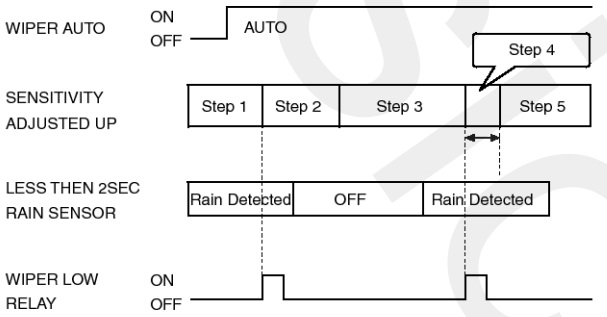
ETBF145E

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



ETBF145F

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



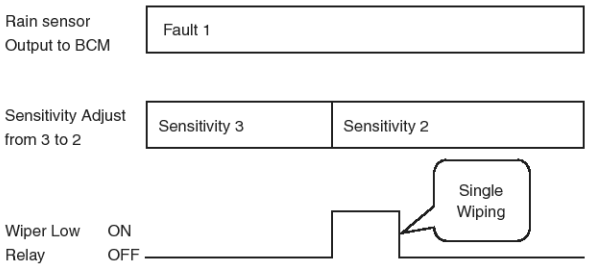
ETBF145G

5. Fault strategy for the rain sensor

   Rain Sensor Fault 1 - Internal Fault Detected

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

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

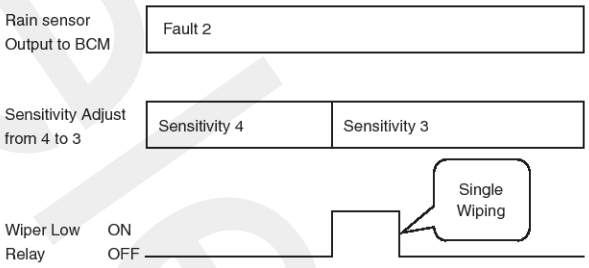


ETBF145H

   Rain Sensor Fault 2 - Glass Attachment Fault Detected

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

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



ETBF145I

   Rain Sensor Fault 3 - No Input Signal Present

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

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

Removal

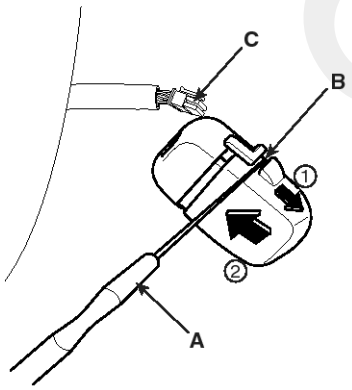
⚠CAUTION

The dust or foreign substance on the rain sensor have a bad effect upon the rain sensor capability,so protect the sensor surface with protection cover until installing the rain sensor to bracket for accurate funtion.

The coupling pad on the rain sensor surface has adherive strength, so the coupling pad could stick to the windshield by environment condition during the using time.

If separate it by force, it could be damaged. So make sure to separate the rain sensor from the windshield carefully.

1. Remove the rain sensor cover first. Be careful not to damage the cover latch by applying excessive force. To remove the latch, pull aside the latch using the cover hole (B) with the little (-) screwdriver (A).



SENBE7332D

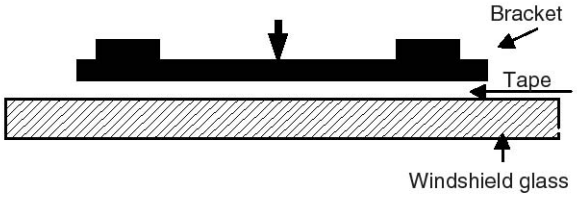
2. Remove the wiring harness connector (C) from sensor.
3. Rain sensor module is attached to the front windshield by glue replacing the front windshield, remove the rain sensor module from the existing front windshield and install on the new front windshield.

Installation

NOTICE

- *In case of the windshield with reflection layer which reflects the infrared rays in sensing field, should install the rain sensor into the field removed the reflection layer.*
- *Install the rain sensor after some time and be care not to be settled the dust after installation.*

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



ETZE015I

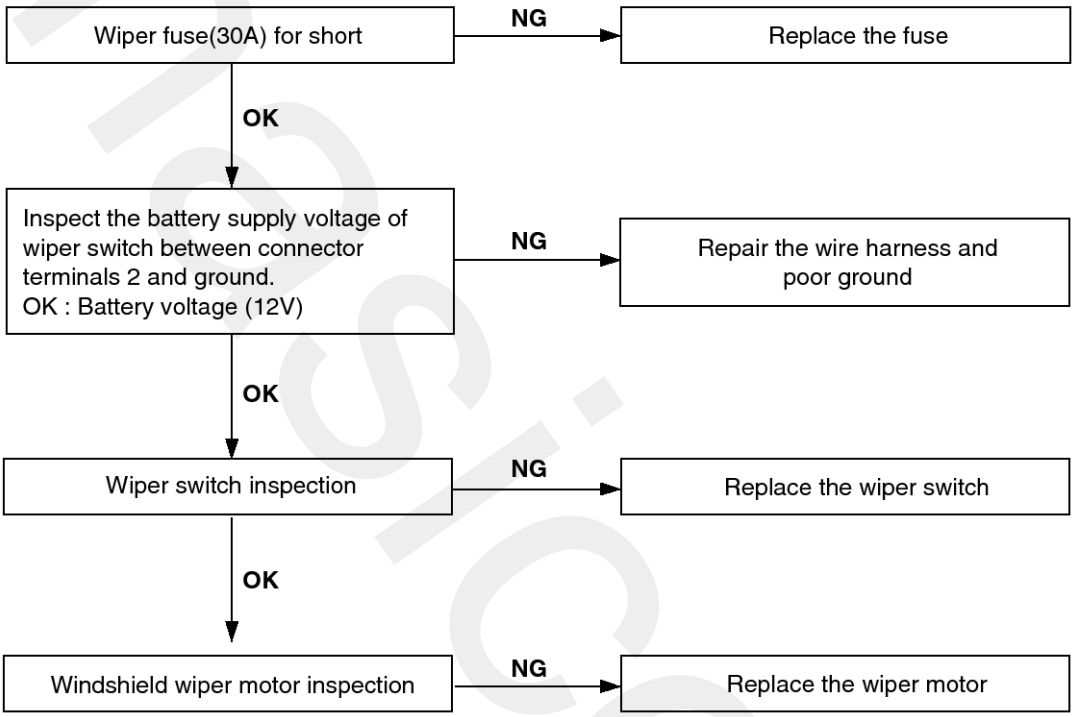
⚠CAUTION

It is very important that the coupling pad pushes the windshield completely to stick to each other without bubbles.

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

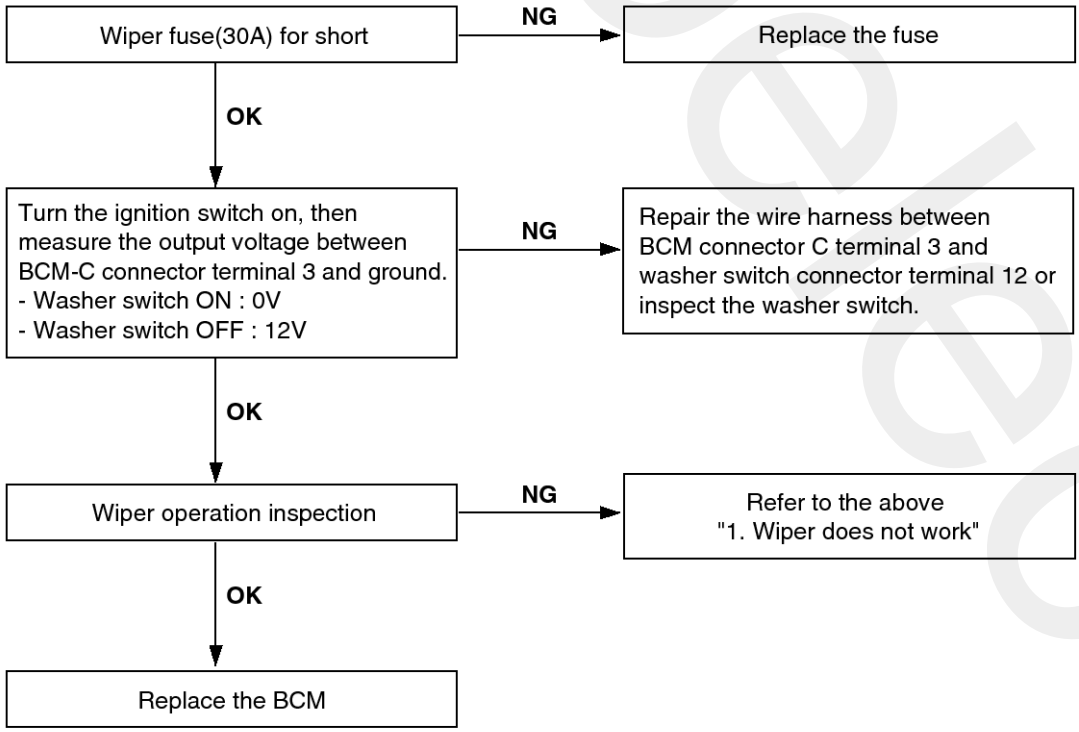
Troubleshooting

1. Wiper low and wiper high do not work.



SENBE7333L

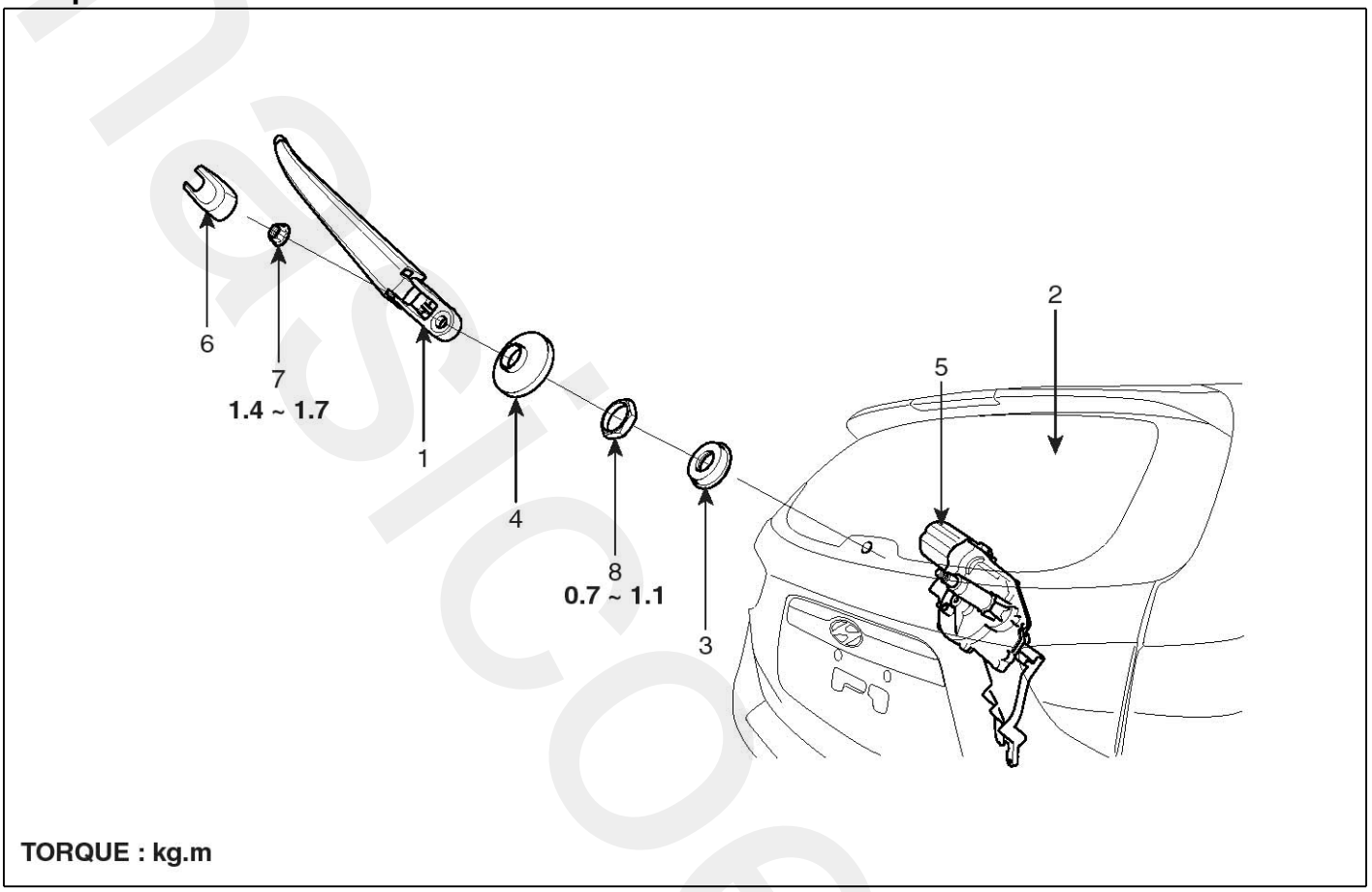
2. When washer switch is on, wiper does not work.



SENBE7334L

Rear Wiper/Washer

Component Location



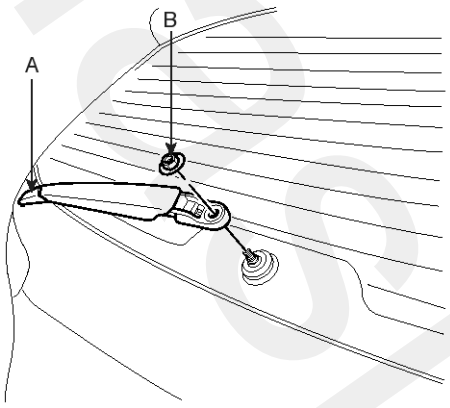
SENBE9018L

1. Rear wiper arm & blade
2. Tailgate glass
3. Cap & Pad
4. Outside cover
5. Rear wiper motor assembly
6. Head cap
7. Washer nut
8. HEX nut

Rear Wiper Motor

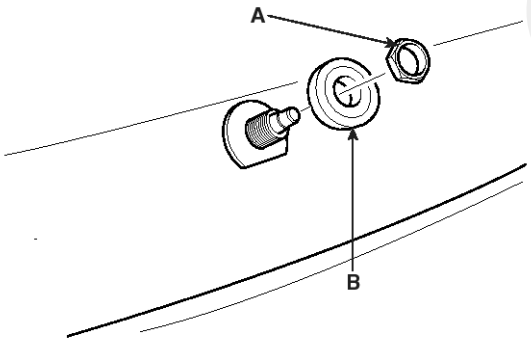
Removal

1. Detach the wiper cap, then remove the rear wiper arm (A) after removing a nut (B).



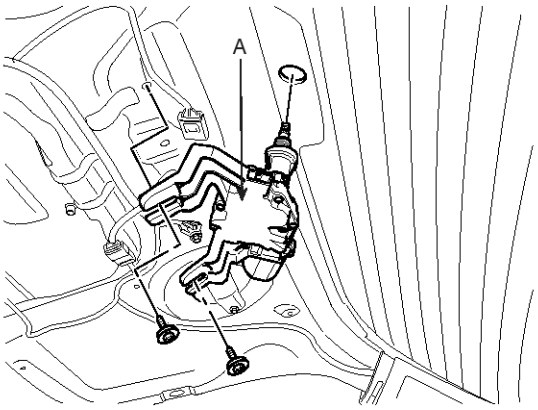
SENBE7361D

2. Remove the rear wiper cap & pad (B) after removing a HEX nut (A).



SCMBE6362D

3. Open the tailgate glass then remove the tailgate trim.
4. Disconnect the rear wiper motor connector then remove the rear wiper motor (A) after removing 2 bolts.



SENBE7363D

Installation

1. Reassemble the rear wiper motor assembly.

Tightening torque Nut :
14~17 Nm (1.4~1.7 kgf.m, 10.1~12.3 lbf.ft)

2. Reassemble the tailgate trim.
3. Reassemble the HEX nut and the rear wiper cap & pad.

Tightening torque Nut (A) :
10~13 Nm (1.0~1.3 kgf.m, 7.2~9.4 lbf.ft)

4. Reassemble the rear wiper arm and rear wiper cap.

Tightening torque Nut (B) :
14~17 Nm (1.4~1.7 kgf.m, 10.1~12.3 lbf.ft)

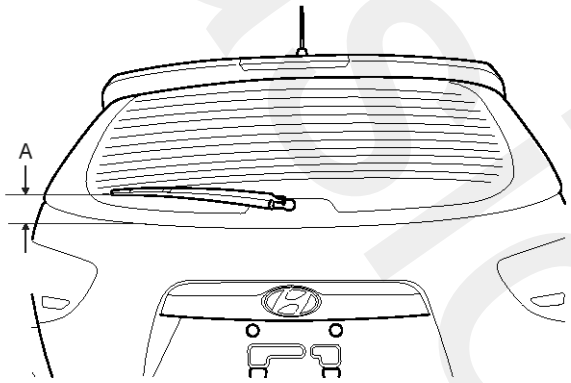
Inspection

Rear Wiper And Nozzel

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

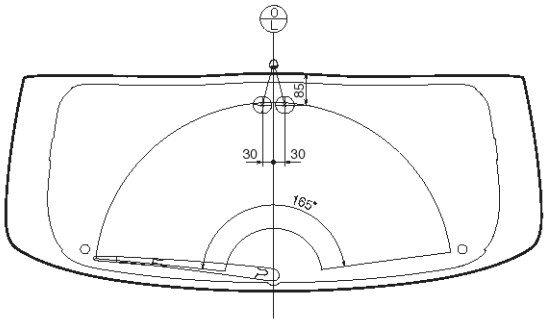
Specified position	A
Distance	1.417 ± 0.2 in (36 ± 5 mm)

※ Specified position : The first deicer line from bottom of the rear window.



SENBE7365D

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

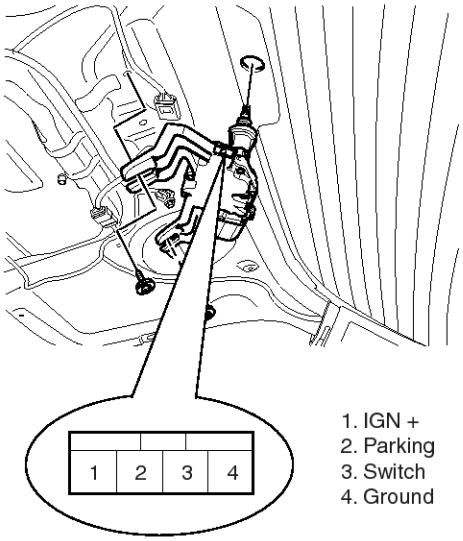


Unit : mm

SENBE7366L

Rear Wiper Motor

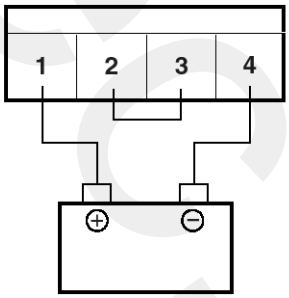
1. Remove the 4P connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 3 and 4 respectively.
3. Check that the motor operates normally. Replace the motor if it operates abnormally.



SENBE7364L

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 3.
3. Connect terminals 2 and 3.
4. Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 4.
5. Check that the motor stops running at the off position.

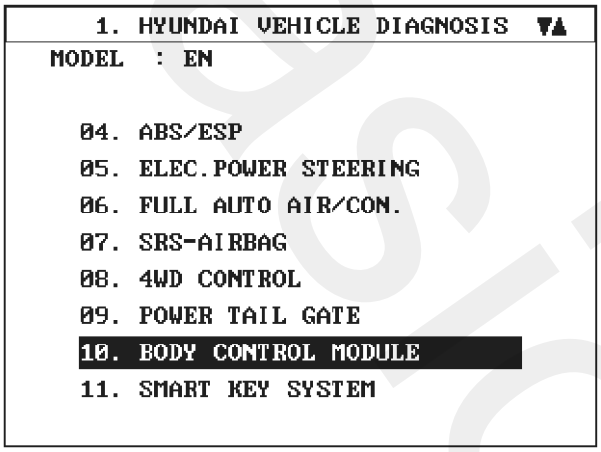


ATGE381F

Rear Washer Switch

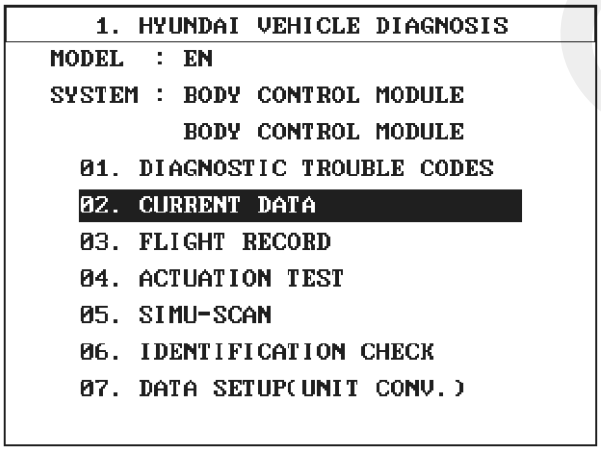
Inspection

1. Check BCM input/output value of each position of rear washer switch when you inspect the module whether faulty or not.
2. Select model and BCM menu.

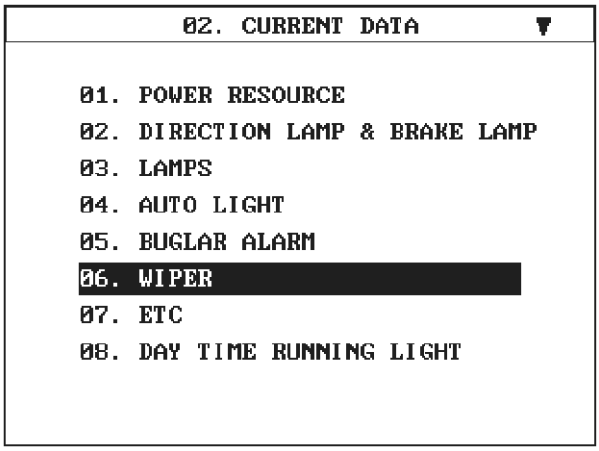


SENBE7201L

3. Select "CURRENT DATA" and "WIPER".

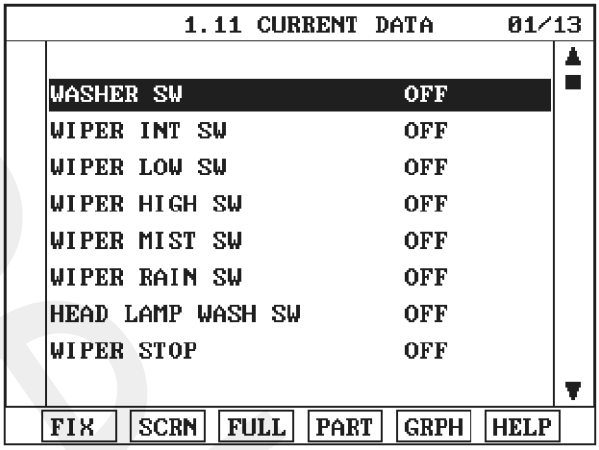


SENBE7356L



SENBE7359L

4. Check input/output value of rear washer.

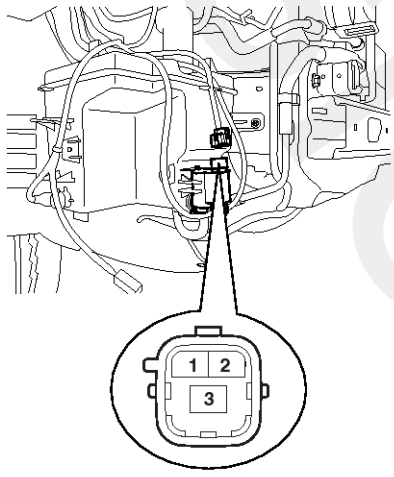


SENBE7358L

Rear Washer Motor

Inspection

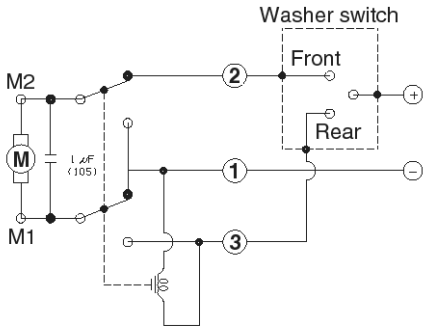
1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Remove the front bumper cover.
   (Refer to the BD group - "Front bumper")
3. Connect positive (+) and negative (-) battery cables to terminals 3 and 2 respectively to see that the washer motor runs and water is pumped.
4. Check that the motor operates normally.
   Replace the motor if it operates abnormally.



[Front & Rear washer]

1. Ground
2. Windshield washer (+)
3. Rear washer (+)

SENBE7348L



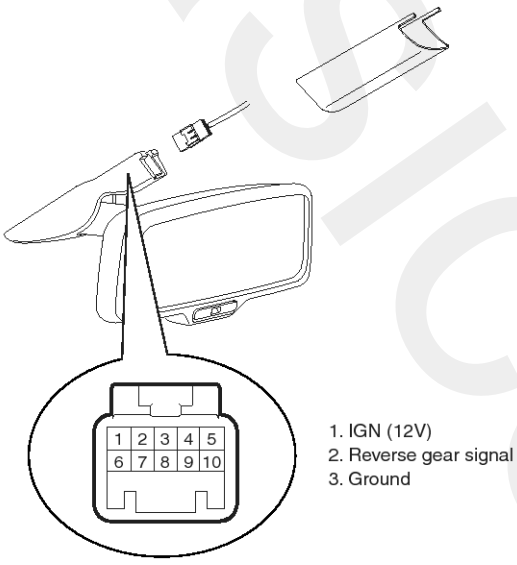
<Windshield & Rear washer motor>

SCMBE6369L

Electro chromic Inside Rear View Mirror

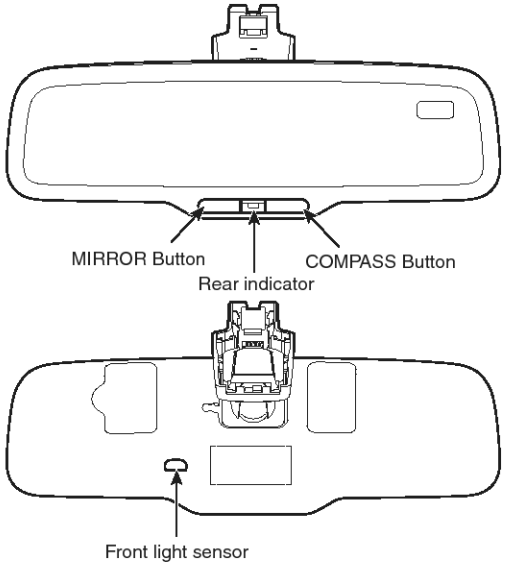
Description

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



SUNBE7380L

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.



SUNBE7381L

Automatic-dimming Function

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

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

NOTICE

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

Inspection

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

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

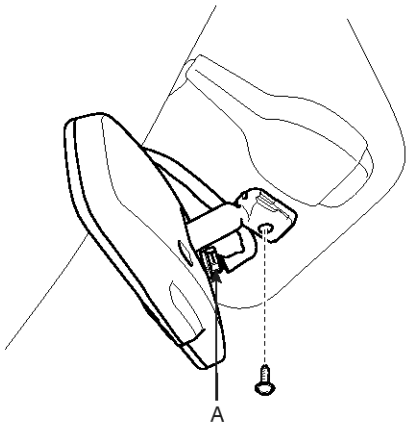
   NOTICE

   If this test is performed in daytime, the ECM may be darkened as soon as the front looking sensor is covered.
5. When the reverse gear is engaged, the ECM should not be darkened.

   When heading lights to both the front looking and rearward looking sensors, the ECM should not be darkened.

Removal

1. Disconnect the mirror connector (A) after removing the mirror wire cover and a screw.



SENBE7382D

2. Remove the mirror making sure the mounting bracket not to be damaged.

Installation

1. Reassemble the mirror.
2. Reassemble the connector, screw and wire cover.

Compass Mirror

Description

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

The mirror assembly shall display a compass heading.

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

Specification

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

Switch Point Accuracy

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

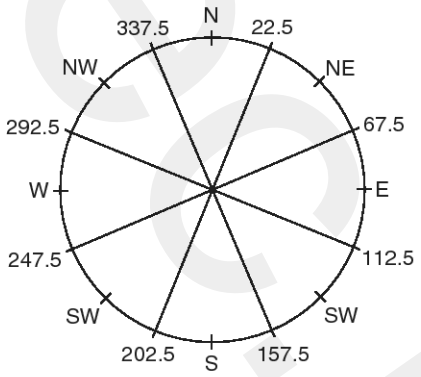
[Switch Points]

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

NOTICE

There should be hysteresis at each switch point.

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



ETQF241F

Compass Display Interval

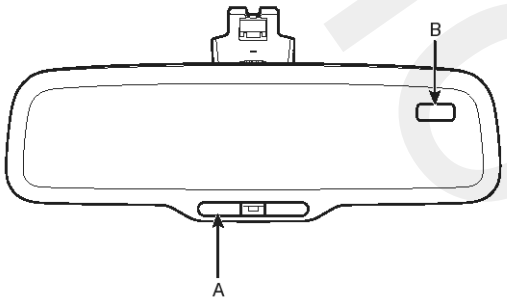
Compass display should be updated at every two seconds.

Function

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

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

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



SENBE7386L

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

Adjustment

Calibration Procedure

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

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

To Adjust The Zone Setting :

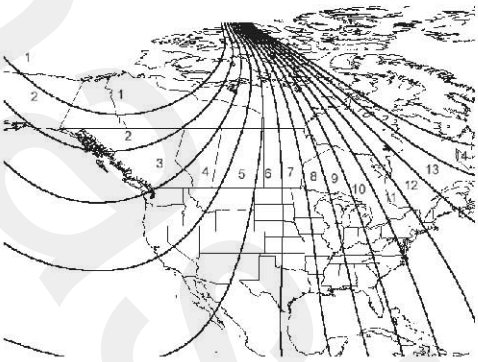
1. Determine the desired zone number based upon your current location on the zone maps.
2. Press and hold the Feature Control button for more than 6 but less than 9 seconds, the current zone number will appear on the display (B).
3. Pressing and holding the feature control button (A) again will cause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

To Re-calibrate The Compass :

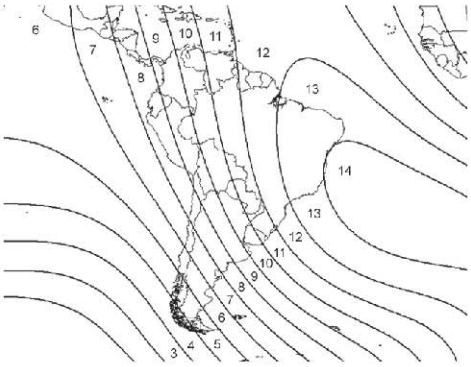
There are some conditions that can cause changes to the vehicle magnets. Items such as installing a ski rack or a antenna or even some body repair work on the vehicle can cause changes to the vehicle's magnetic field. In these situations, the compass will need to be re-calibrated to quickly correct for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

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

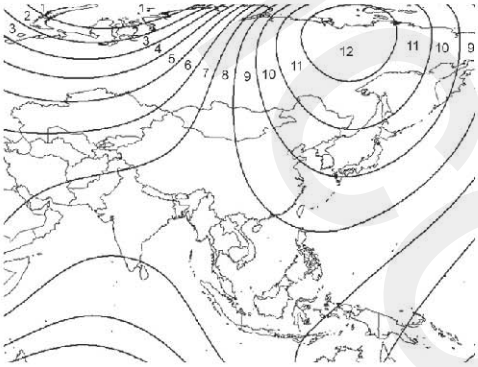
Zone Map



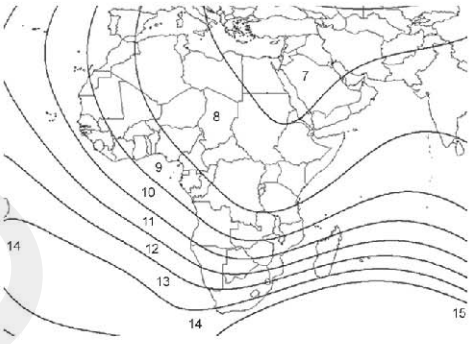
NORTH AMERICA



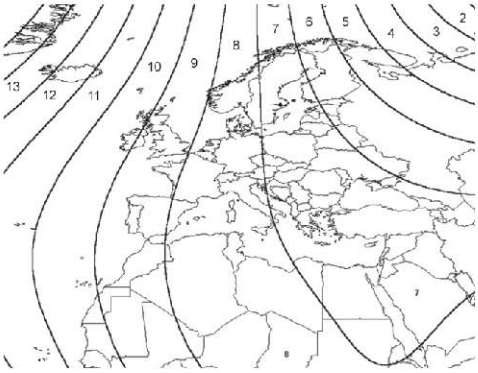
SOUTH AMERICA



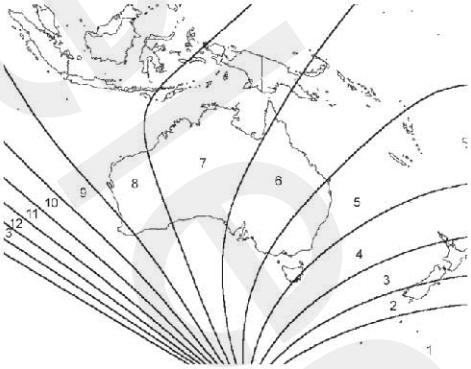
ASIA



AFRICA



EUROPE

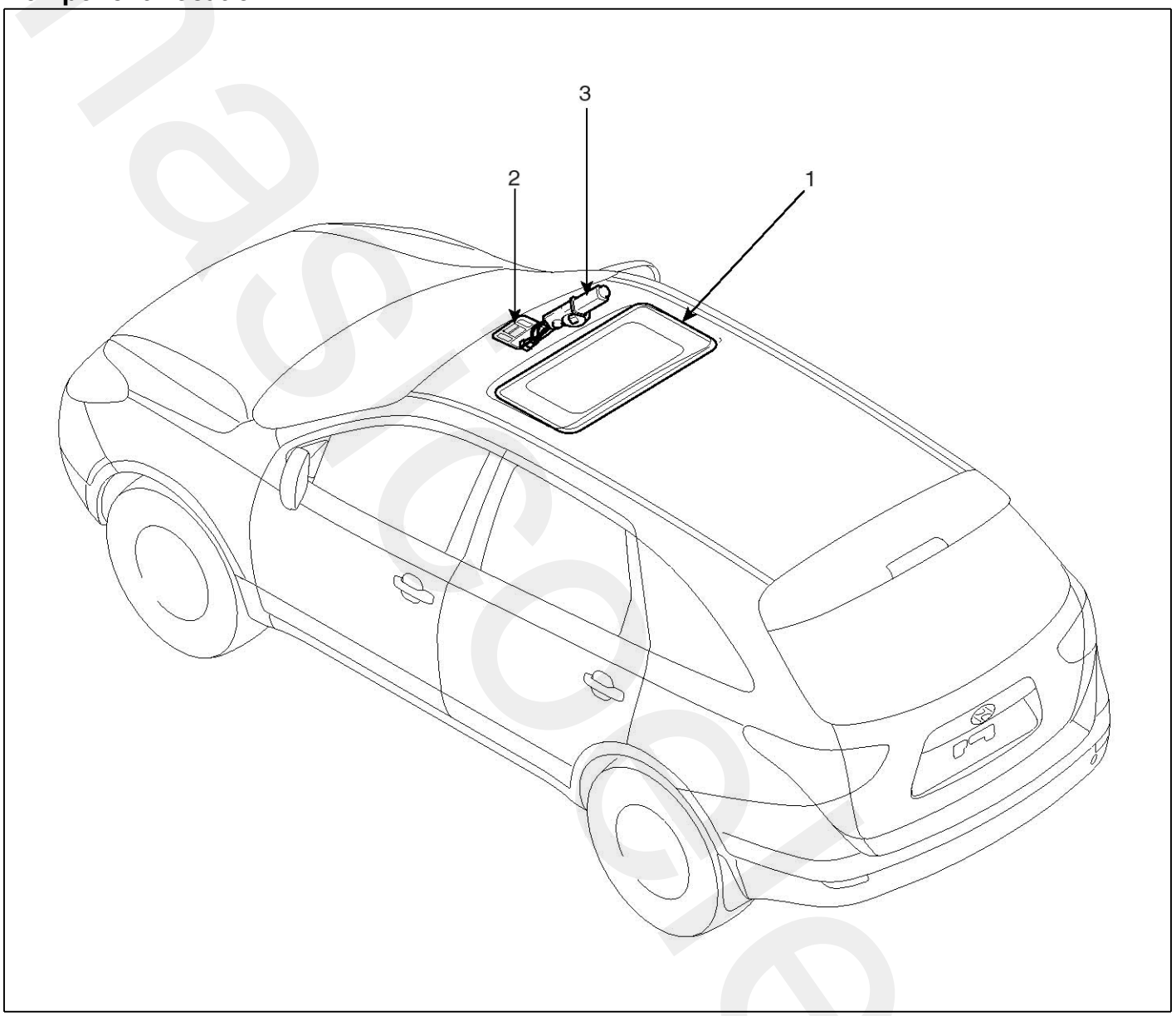


AUSTRALIA

ETQF241D

Sun Roof

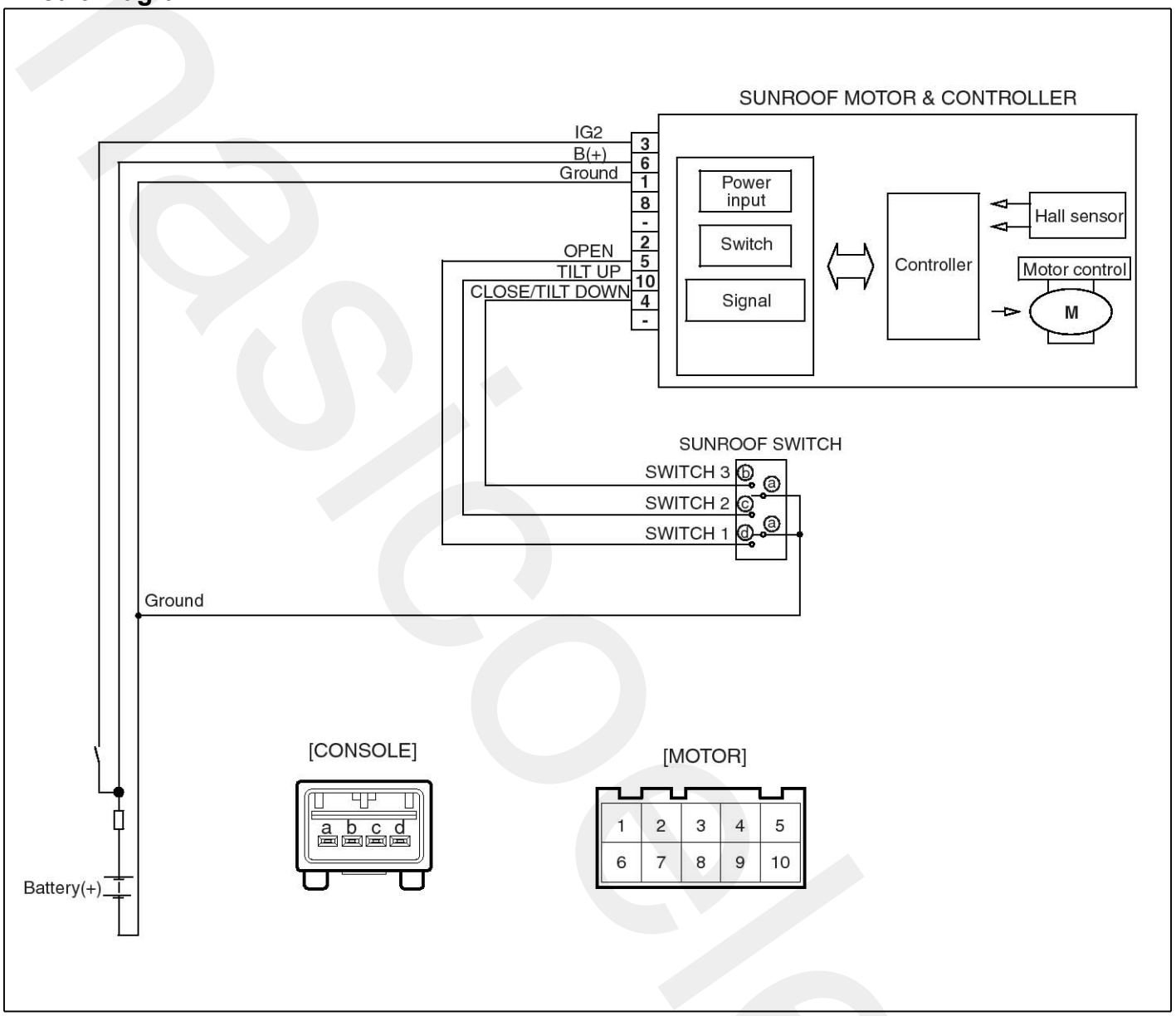
Component Location



SENBE9019L

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

Circuit Diagram

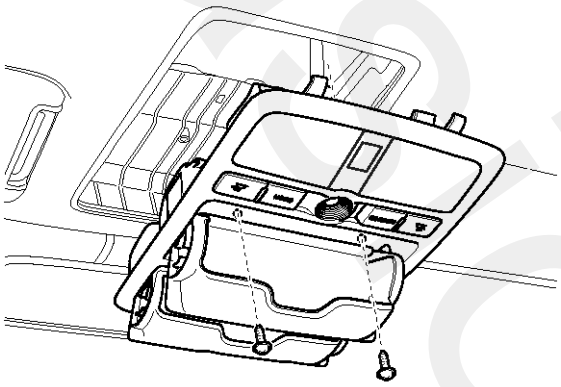


SENBE7421L

Sunroof Switch

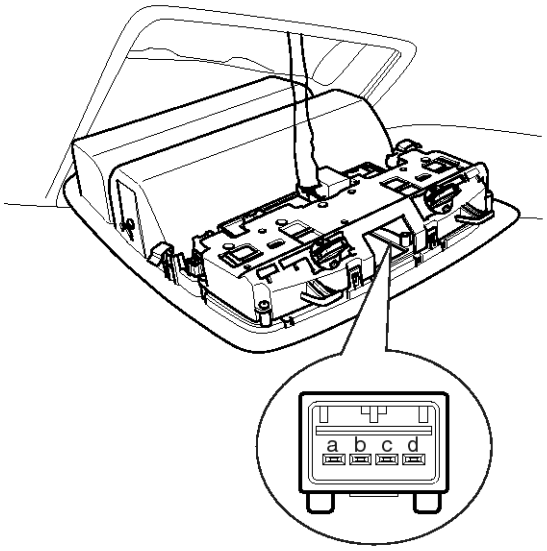
Inspection

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console. Disconnect the switch connector (6P) and Map lamp connector (2P), and then remove the overhead console lamp.



SENBE7422D

3. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.



[Switch side connector]

SENBE7423L

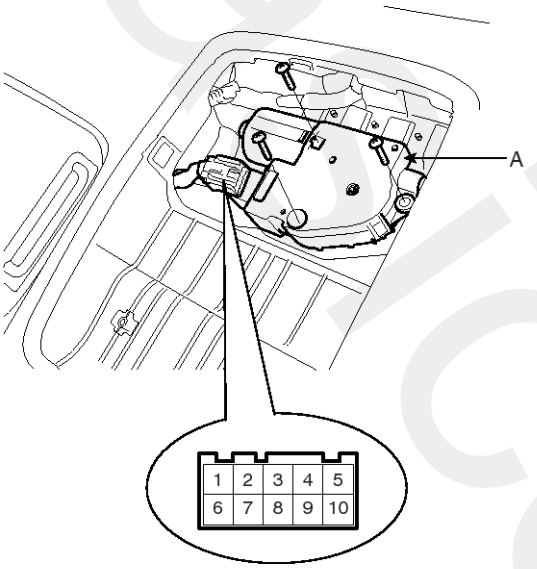
Position \ Terminal	a	b	c	d
Manual OPEN	○			○
Auto OPEN	○		○	○
Manual CLOSE, Manual tilt DOWN	○	○		
Auto CLOSE	○	○	○	
Manual tilt UP	○		○	

SENBE7424L

Sunroof Motor

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console then remove the sun roof motor mounting screws (3EA). And then remove the sunroof motor (A) after disconnecting the connector (10 Pin).



SENBE7425D

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

Terminal / Position	3	4	5	10
Manual OPEN	⊕		⊖	
Auto OPEN	⊕		⊖	⊖
Manual CLOSE, Manual tilt DOWN	⊕	⊖		
Auto CLOSE	⊕	⊖		⊖
Manual tilt UP	⊕			⊖

SENBE7426L

4. Make these input tests at the connector

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

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

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

Resetting The Sunroof

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

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

      Press the TILT 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.

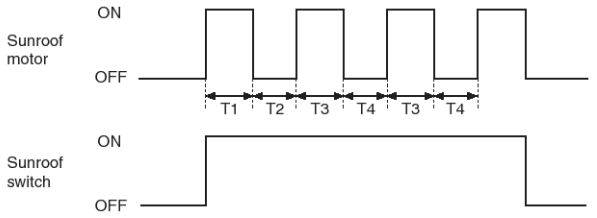
      Press and hold the CLOSE button for more than 5 seconds after the sunroof has closed completely. Press the TILT button until the sunroof has tilted upward completely.
3. Release the TILT button.
4. Press and hold the TILT button once again until the sunroof has returned to the original position of TILT after it is raised a little higher than the maximum TILT position.

   When this is complete, the sunroof system is reset.

Protecting The Overheated Motor

In order to protect the overheated sunroof motor by continuous motor operation, the sunroof ECU controls the Run-time and Cool-time of motor as followings;

1. The Sunroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st Run-time(120 ± 10sec.).
3. Motor which is operated continuously stops operating after the 1st Run-time(120 ± 10sec.).
4. And then Motor is not operated for the 1st Cool-time(18 ± 2sec.).
5. Motor is operated for the 2nd Run-time(10 ± 2sec.) at the continued motor operation after 1st Cool-time(18 ± 2sec.)
6. Motor which is operated continuously stops operating after the 2st Run-time(120 ± 10sec.)
7. Motor is not operated for the 2st Cool-time(18 ± 2sec.).
8. Motor repeats the 2nd Run-time and 2nd Cool-time at the continued motor operation.
   - In case that motor is not operated continuously, the Run-time which is limited for protecting the overheated motor is increased.
   - The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



SHDBE6476L

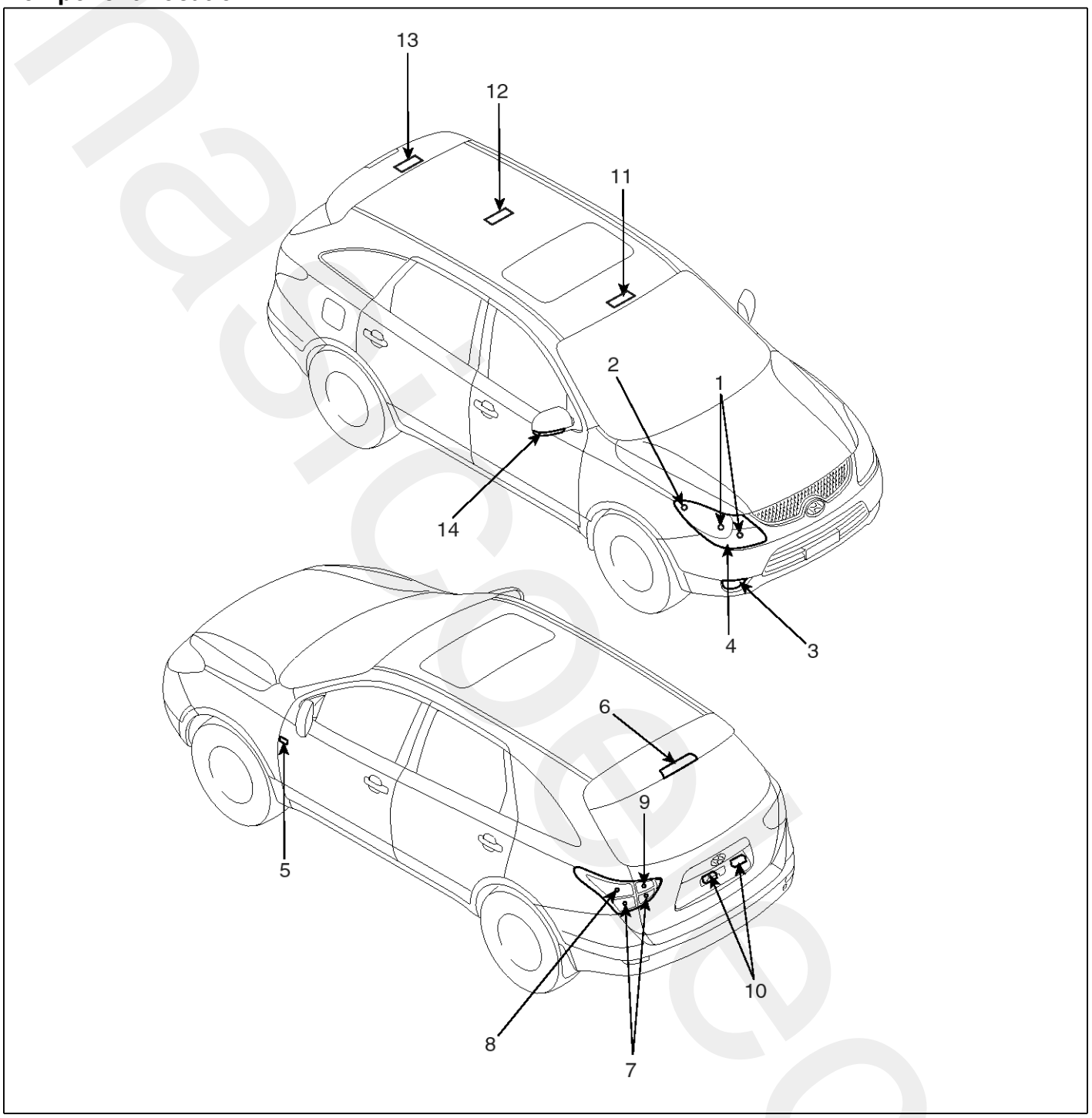
T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

Lighting System

Specification

Items		Bulb Wattage (W)
FRONT	Head lamp (High)	55
	Head lamp (Low)	55
	Front turn signal lamp	21
	Front position lamp	5
	Front fog lamp	55
	Side repeater	LED
REAR	Rear stop/tail lamp (Outside)	21/5
	Back up lamp	16
	Rear turn signal lamp	21
	License plate lamp	5
	High mounted stop lamp	LED
	Rear fog lamp - Europe	21
ROOM	Room lamp (Center/Side)	10
	Overhead console lamp	10 x 2
	Trunk room lamp (Cargo lamp)	10

Component Location



SENBE9020L

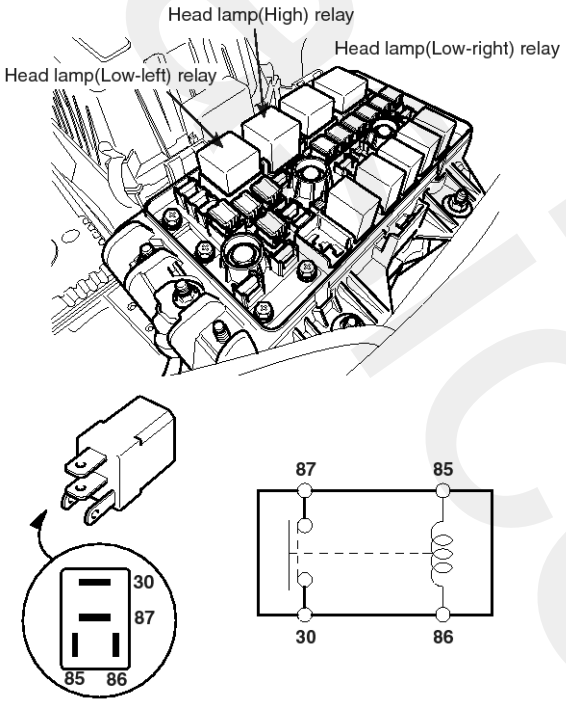
1. Head lamp (High/Low)
2. Front turn signal lamp
3. Front fog lamp
4. Position lamp
5. Side repeater
6. High mounting stop lamp
7. Tail/stop lamp
8. Rear turn signal lamp
9. Back up lamp
10. License plate lamp
11. Overhead console lamp
12. Room lamp
13. Trunk room lamp
14. Side turn signal lamp

Head Lamps

Inspection

Head Lamp Relay Inspection

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



SENBE7434L

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

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

SCMBE6195L

Adjustment

Head Lamp Aiming Instructions

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

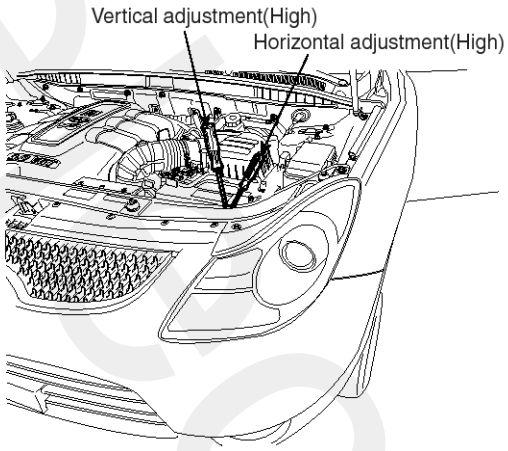
NOTICE

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

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

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

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

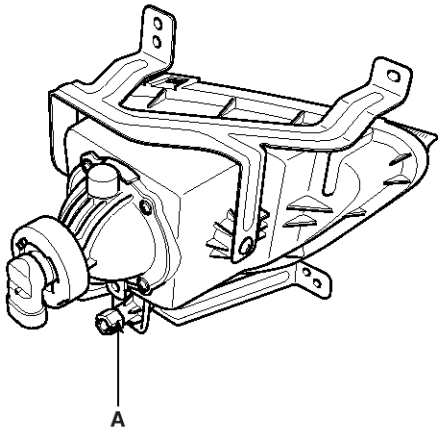


SENBE7440L

Front Fog Lamp Aiming

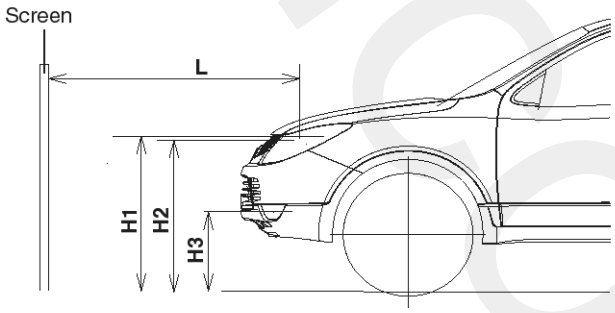
The front fog lamps should be aimed as the same manner of the head lamps aiming.

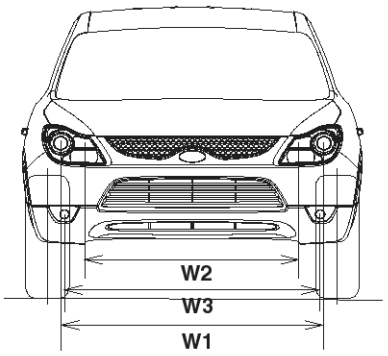
With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting gear (A).



SENBE7442D

Head Lamp And Fog Lamp Aiming Point





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

SENBE7443L

Unit : in (mm)

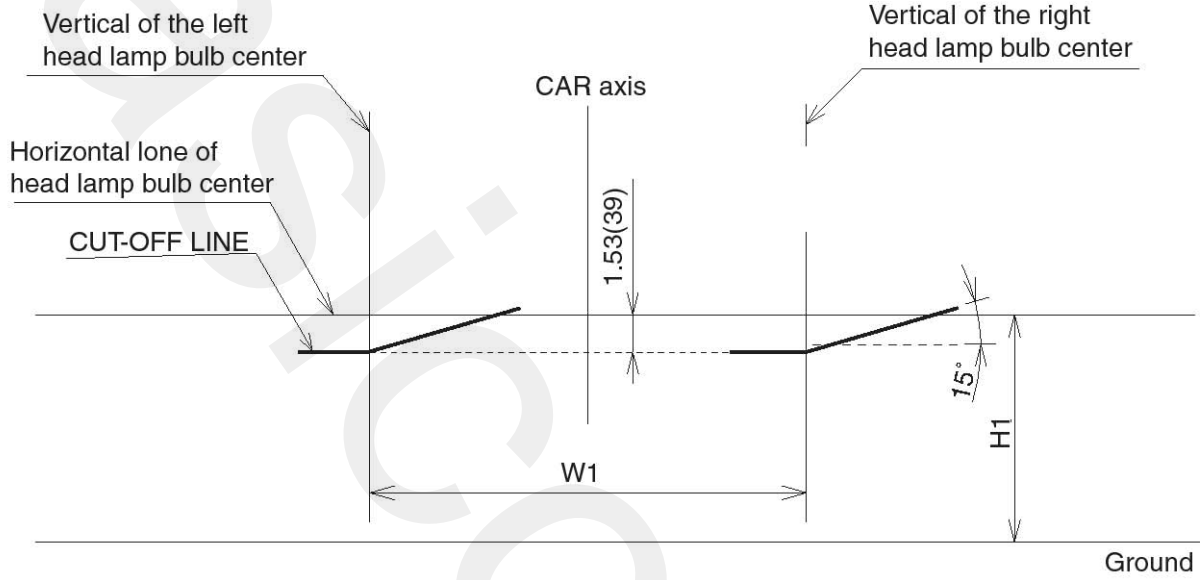
Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	35.8(910)	32.5(827)	18.8(480)	58.9(1,498)	48.4(1,230)	57.3(1,456)	118(3,000)
With driver	35.5(904)	32.3(821)	18.6(474)				

SENBE7444L

1. Turn the low beam on with driver.
   The cut-off line should be projected in the allowable range (shaded region).

In case of equipping with the manual leveling device, set the leveling device switch on the "O" position.

In case of equipping with the auto leveling device, set the initialization by using the diagnostic tool before aiming.

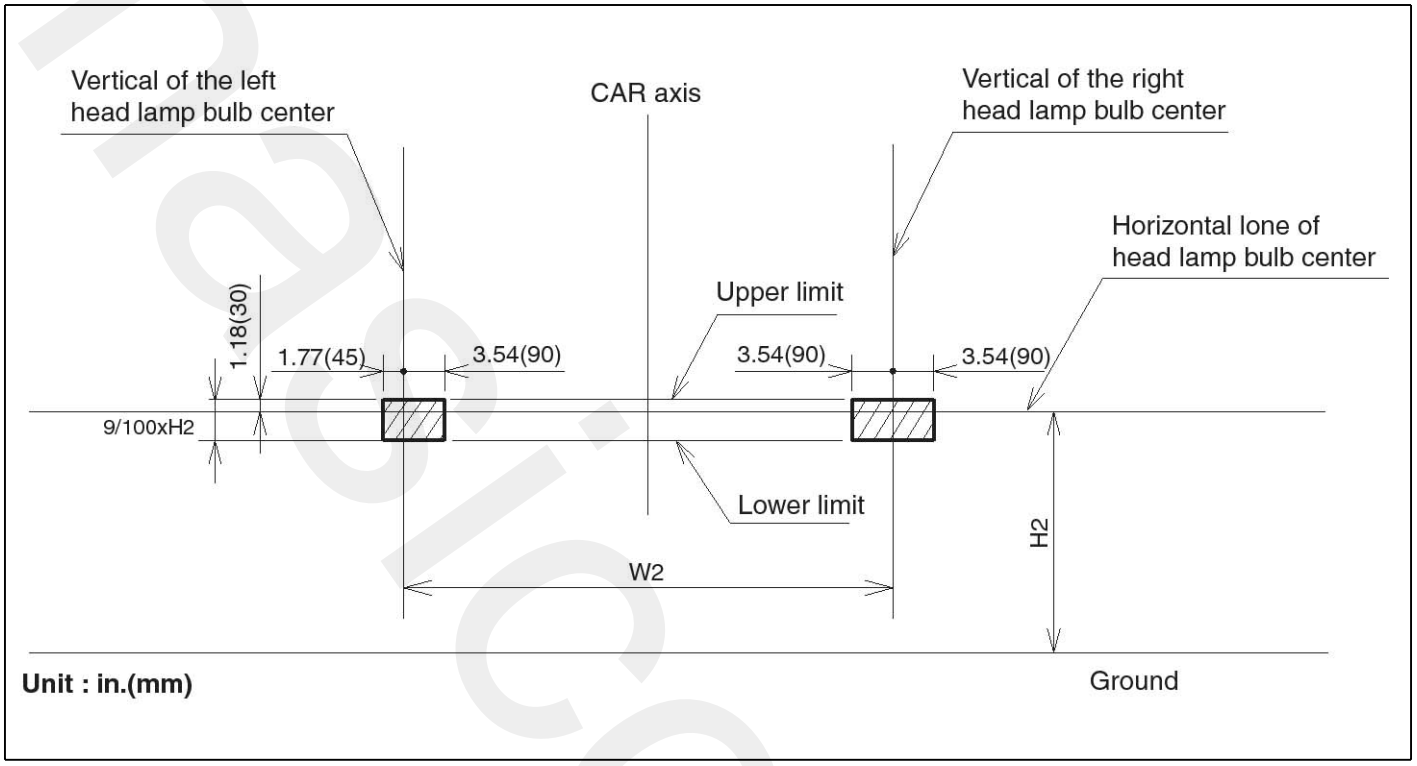


Unit : in.(mm)

SENBE7445L

2. Turn the high beam on with driver.

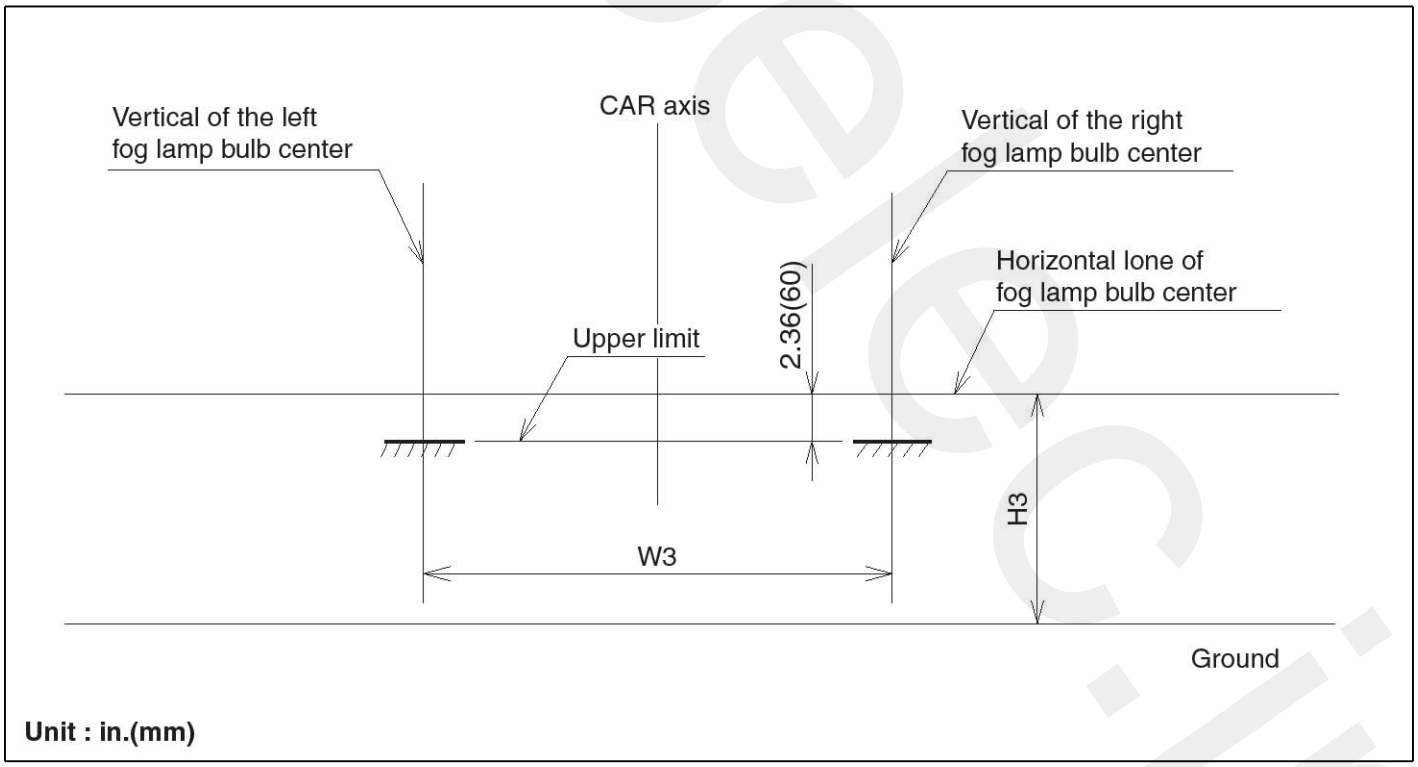
The cut-off line should be projected in the allowable range (shaded region).



SCMBE6446L

3. Turn the front fog lamp on with driver.

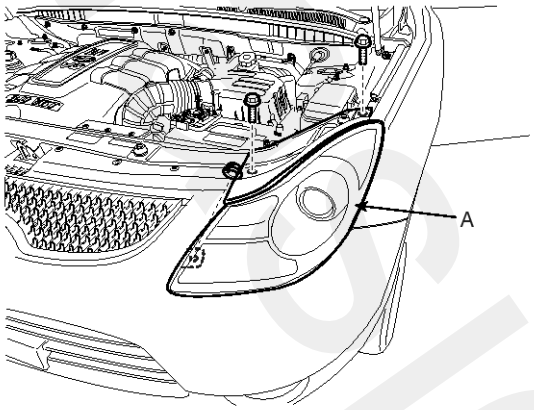
The cut-off line should be projected in the allowable range (shaded region)



SCMBE6447L

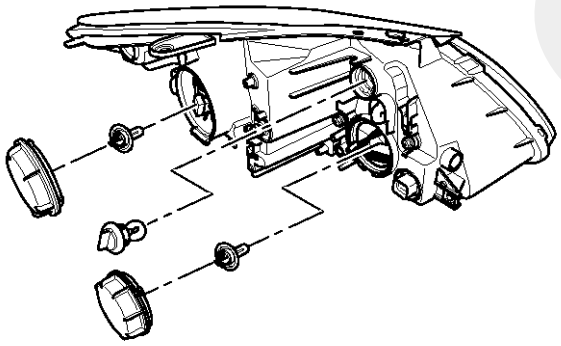
Removal

1. Disconnect the negative (-) battery terminal.
2. Loosen the mounting bolts and a nut of head lamp. Remove the head lamp assembly (A) after disconnecting the lamp connectors.



SENBE7431D

3. Remove the head lamp bulb after removing the bulb caps.



SENBE7435L

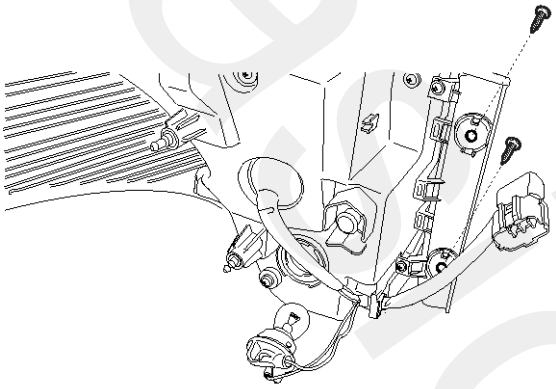
Installation

1. Install the head lamp bulbs.
2. Reassemble the head lamp bulb caps.
3. Reassemble the head assembly after connecting the lamp connector.

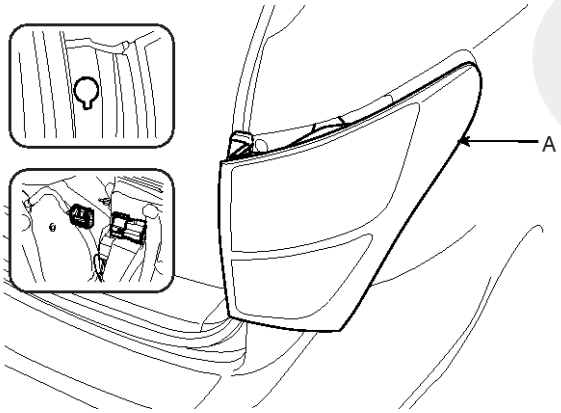
Turn Signal Lamp

Removal

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

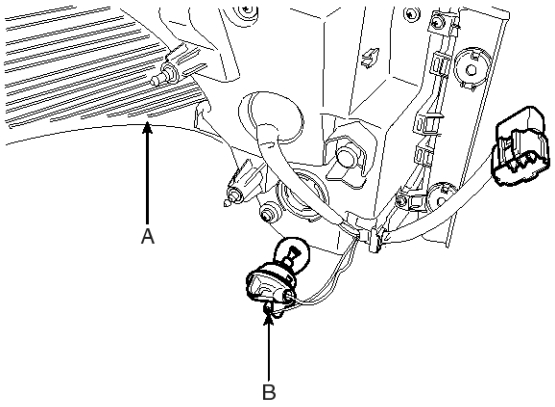


SENBE7448D



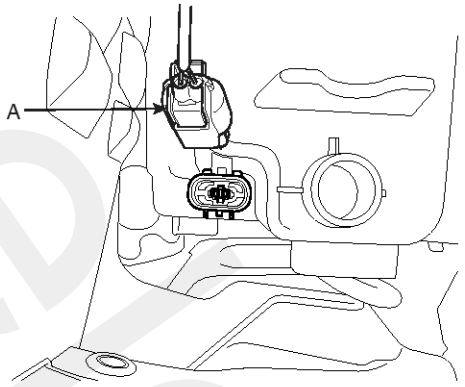
SENBE7449D

3. Replace the bulbs (B) after disconnecting the rear combination lamp assembly (A).



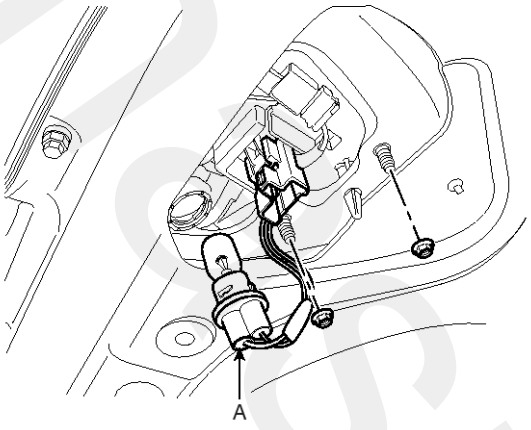
SENBE7450D

4. Disconnect the lamp cover on tailgate. Remove the lamp assembly after loosening the connector (A), Cap nuts (2EA) and nuts (4EA).



SENBE7346D

5. Remove the tailgate combination lamp assembly and the replace the bulbs (A).



SENBE7451D

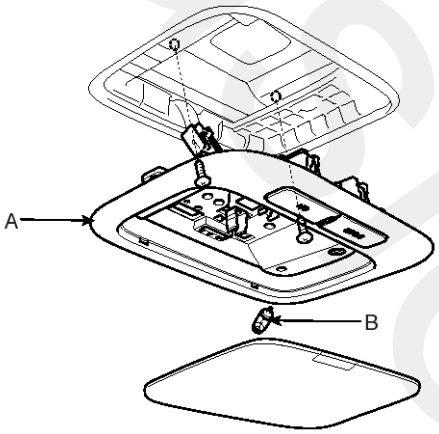
Installation

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

Room Lamp

Removal

1. Disconnect the negative (-) battery terminal.
2. Detach the lamp lens from the room lamp with a flat-tip screwdriver then replace the bulb (B).
3. Loosen the fixing screw (2EA) and disconnect the 4P connector. And then remove the room lamp assembly (A).



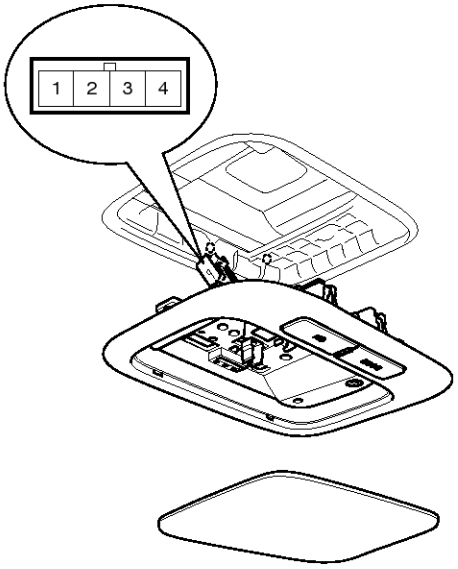
SENBE7452D

Installation

1. Install the room lamp assembly after connecting the lamp connector.
2. Install the lamp lens after assembling the bulb.

Inspection

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



SENBE7453D

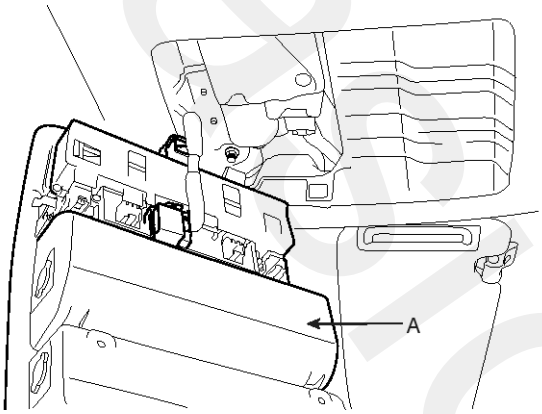
Terminal / Position	1	2	3	4
DOOR	○—(M)—○			
ROOM 1		○—(M)—○		
ROOM 2			○—(M)—○	

SENBE7458L

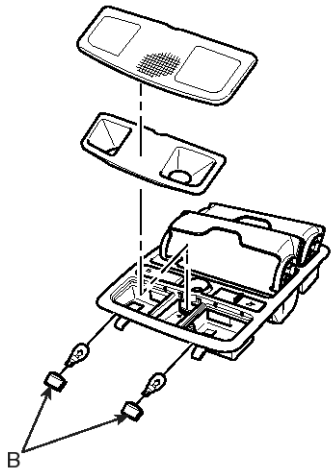
Overhead Console Lamp

Removal

1. Disconnect the negative (-) battery terminal.
2. Replace the bulb after removing the lens.
3. Remove the 2 screws, sunroof switch connectors. And then remove the overhead consol (A), lamp (B).



SENBE7455D



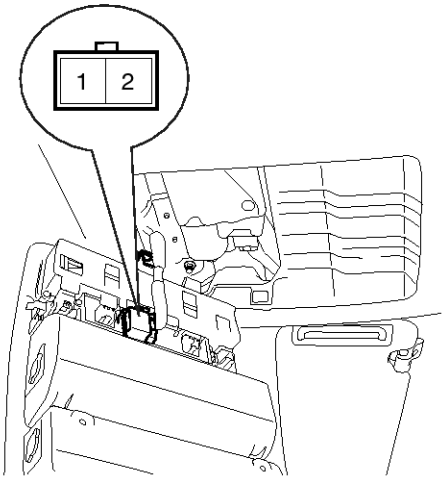
SENBE7456D

Installation

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

Inspection

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



SENBE7457D

Sort / Position / Terminal	Map lamp switch			
	LH		RH	
	ON	OFF	ON	OFF
1	●		●	
2	●		●	

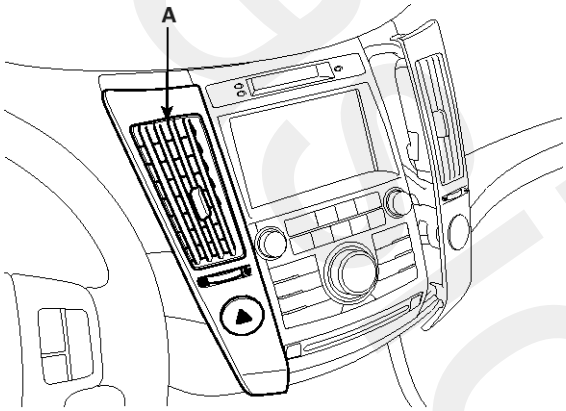
ETKE007M

Hazard Lamp Switch

Inspection

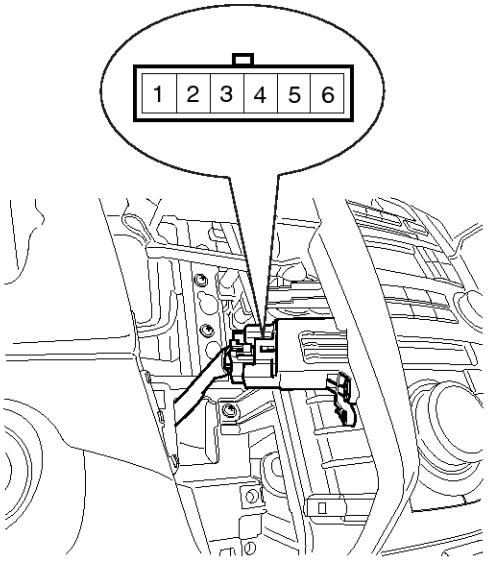
Hazard Lamp Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the air vent pannel (A).
   (Refer to the BD group - "Crash pad")



SENBE7463D

3. Disconnect the conectors.
4. Operate the switch and check for continuity between terminals with an ohmmeter.



SENBE7467D

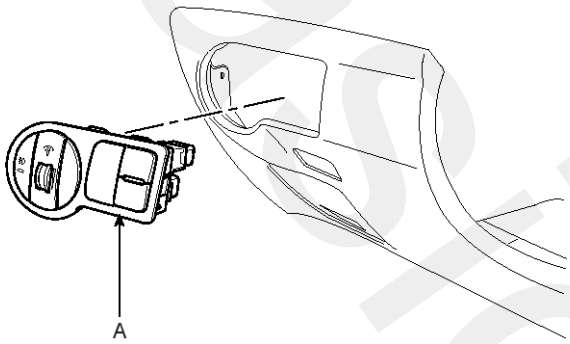
Terminal / Position	1	2	3	4	5	6
OFF	○—○					
ON					○—○	

SENBE7461L

Rheostat

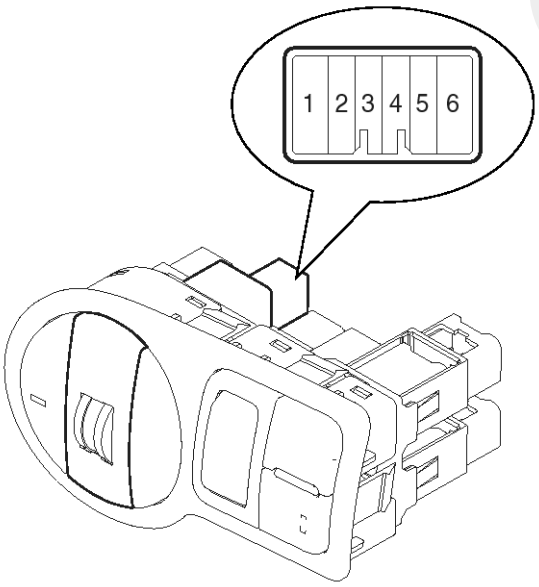
Inspection

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



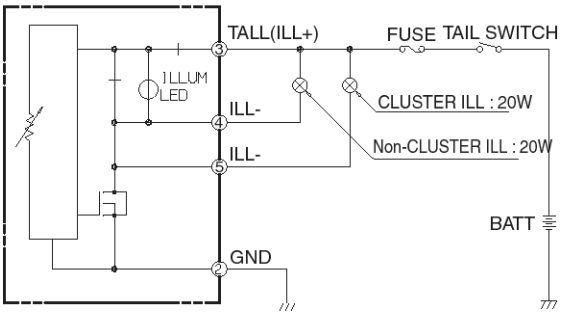
SENBE7473D

3. Remove the rheostat from lower crash pad switch assembly.



SENBE7474D

4. Check for intensity of new rheostat switch. 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.

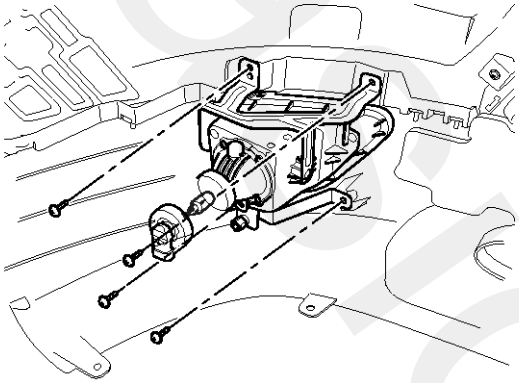


SENBE7475L

Front Fog Lamps

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front side cover screw.
3. Remove the front fog lamp assembly after loosening screws (4EA).



SENBE7441D

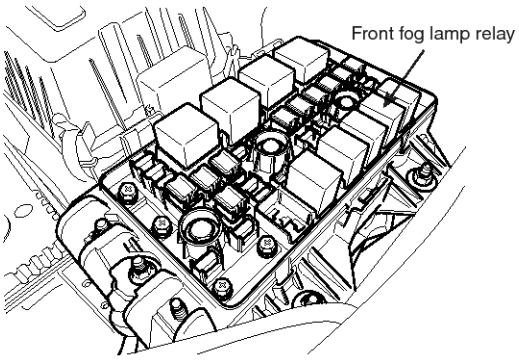
Installation

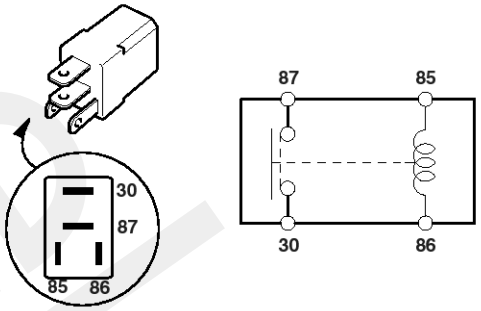
1. Install the front fog lamp bulb.
2. Connect the front fog lamp connector.
3. Install the front side cover.

Inspection

Front Fog Lamp Relay

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





SENBE7464L

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

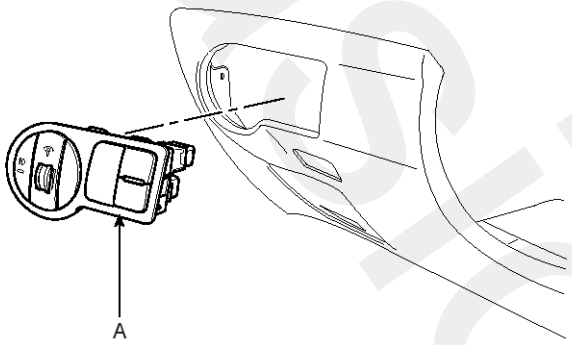
LTGE221B

Rear Fog Lamps

Inspection

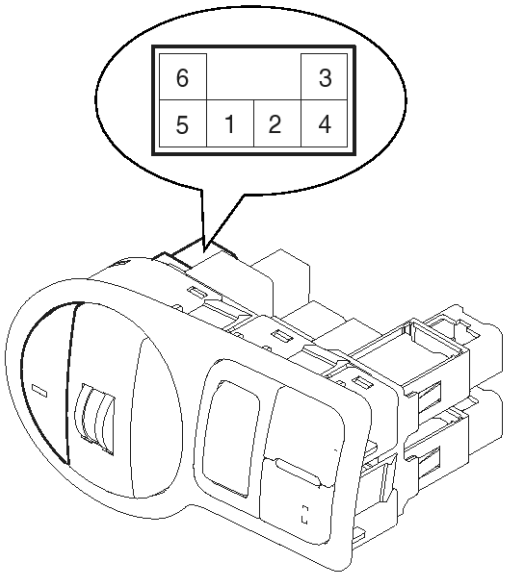
Rear Fog Lamp Switch

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



SENBE7473D

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



SENBE7481D

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

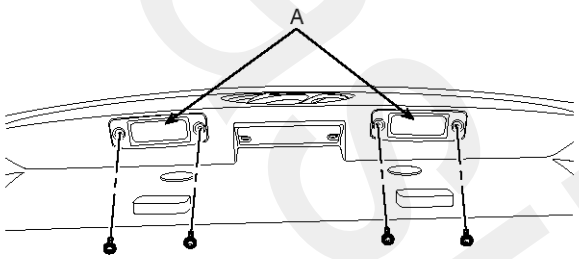
Position / Terminal	ON	OFF	Remarks
1			
2			
3			LAMP+
4			GND
5			ILL+
6			ILL-

SENBE7482L

License Lamps

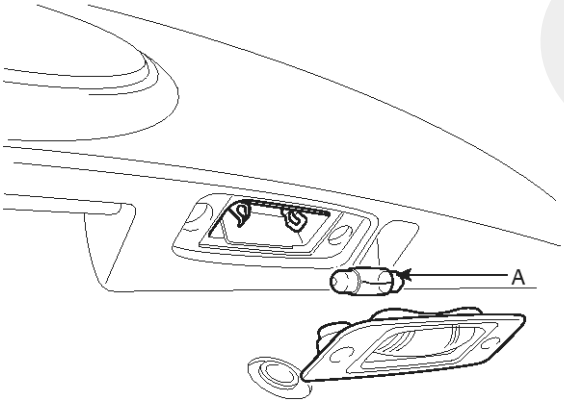
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the license lamp lens (A) from the panel after loosening a screw (2EA).



SENBE7465D

3. Replace the bulb (A).



SENBE7466D

Installation

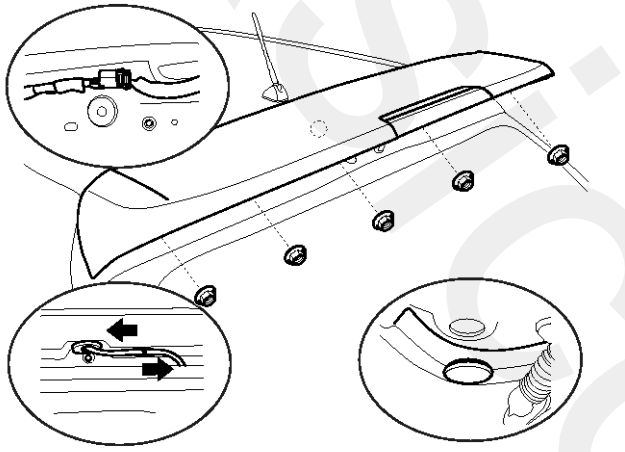
1. Install the bulb.
2. Install the license lamp lens.

High Mounted stop lamp

Removal

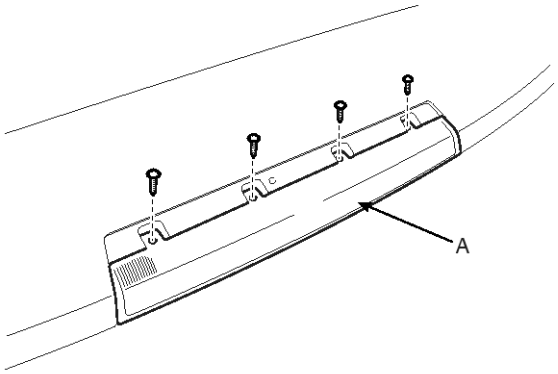
High Mounted Stop Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.
   (Refer to the BD group - "Tailgate")
3. Remove the high mounted stop lamp assembly after removing a cap nut and 5 bolts, then remove the spoiler.



SENBE7477D

4. Remove the spoiler lamp cover and loosening the screw (4EA). And then remove the high mounted stop lamp (A).



SENBE7478D

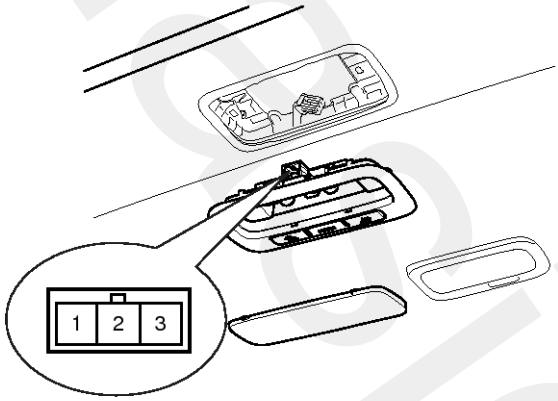
Installation

1. Install the high mounted stop lamp and spoiler lamp cover.
2. Install the high mounted stop lamp assembly.
3. Install the tailgate trim.

Trunk Lamps

Inspection

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



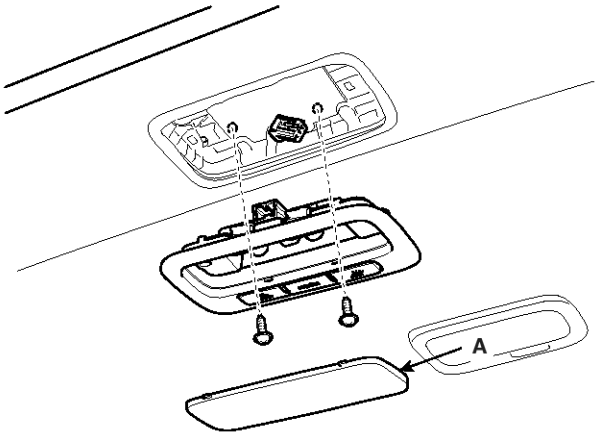
SENBE7327D

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

SCMBE6454L

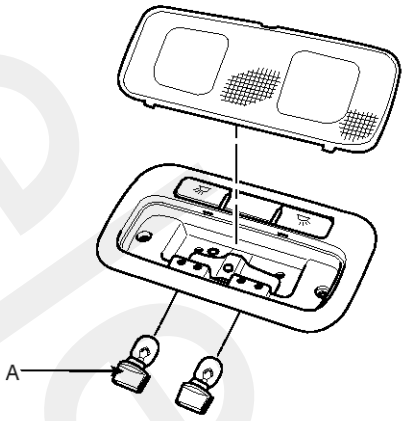
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the trunk room lamp lens (A) with a flat-tip screwdriver and replace the bult.



SENBE7476D

3. Remove the trunk room lamp assembly after removing 2 screws, then disconnect the 3P connector.



SENBE7326D

Installation

1. Install the trunk room lamp assembly after connecting the lamp connector.
2. Install the lamp lens after assembly the bulb.

Troubleshooting

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

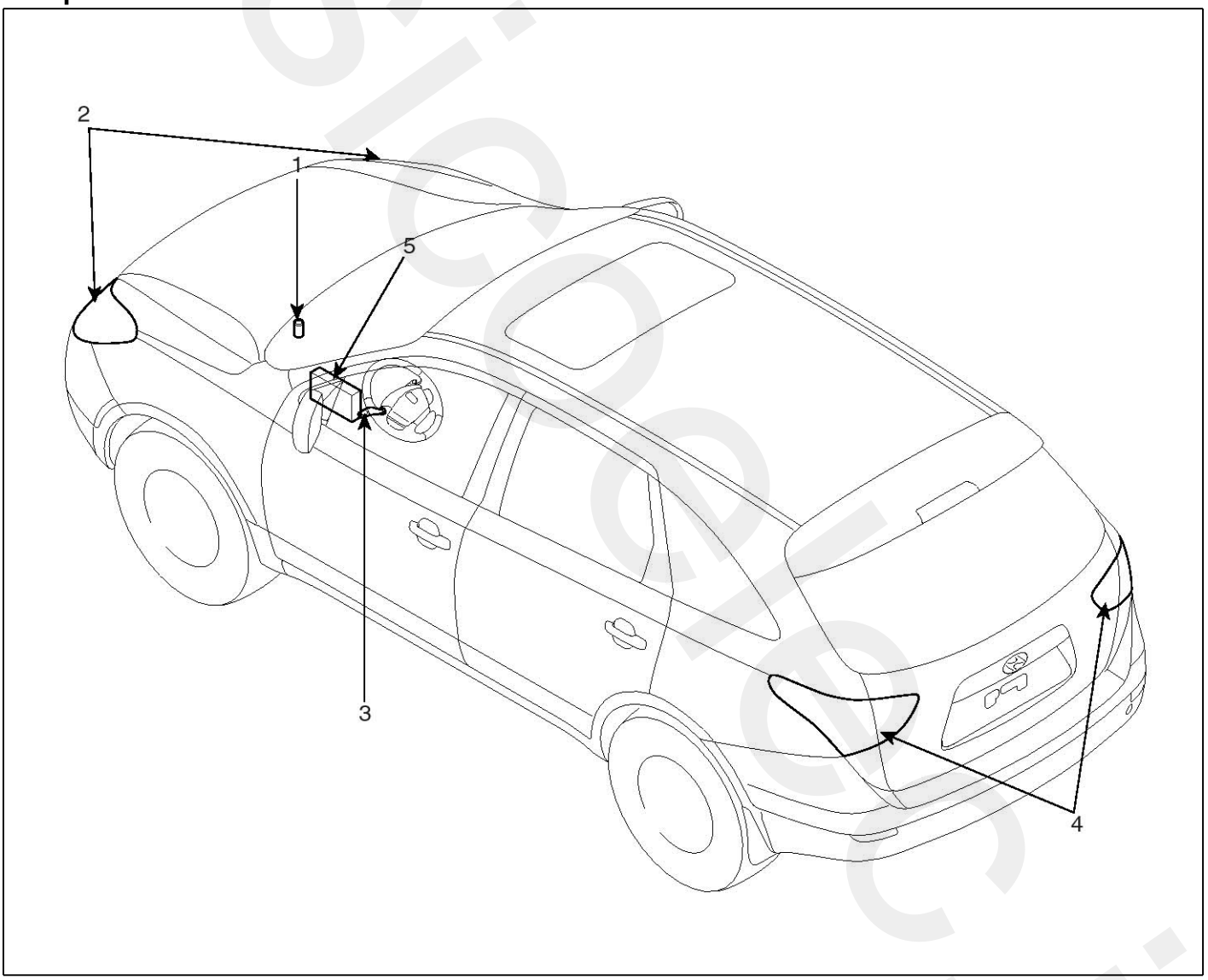
Symptom	Possible cause	Remedy
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps
	Flasher unit faulty	Check flasher unit
Back up lamps do not light	Bulb burned out	Replace bulb
	Back up lamp fuse (10A) blown	Check for short and replace fuse
	Back up lamp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

Auto Lighting Control System

Specifications

Item		Specifications
Rated voltage		5V
Load		Max. 1mA
Detection illuminations	Tail lamp	ON : 74 ± 16 (Lux), 1.77 ± 0.08 (V) OFF : 148 ± 32 (Lux), 3.47 ± 0.1 (V)
	Head lamp	ON : 18.5 ± 4 (Lux), 0.63 ± 0.06 (V) OFF : 37 ± 8 (Lux), 1.02 ± 0.06 (V)

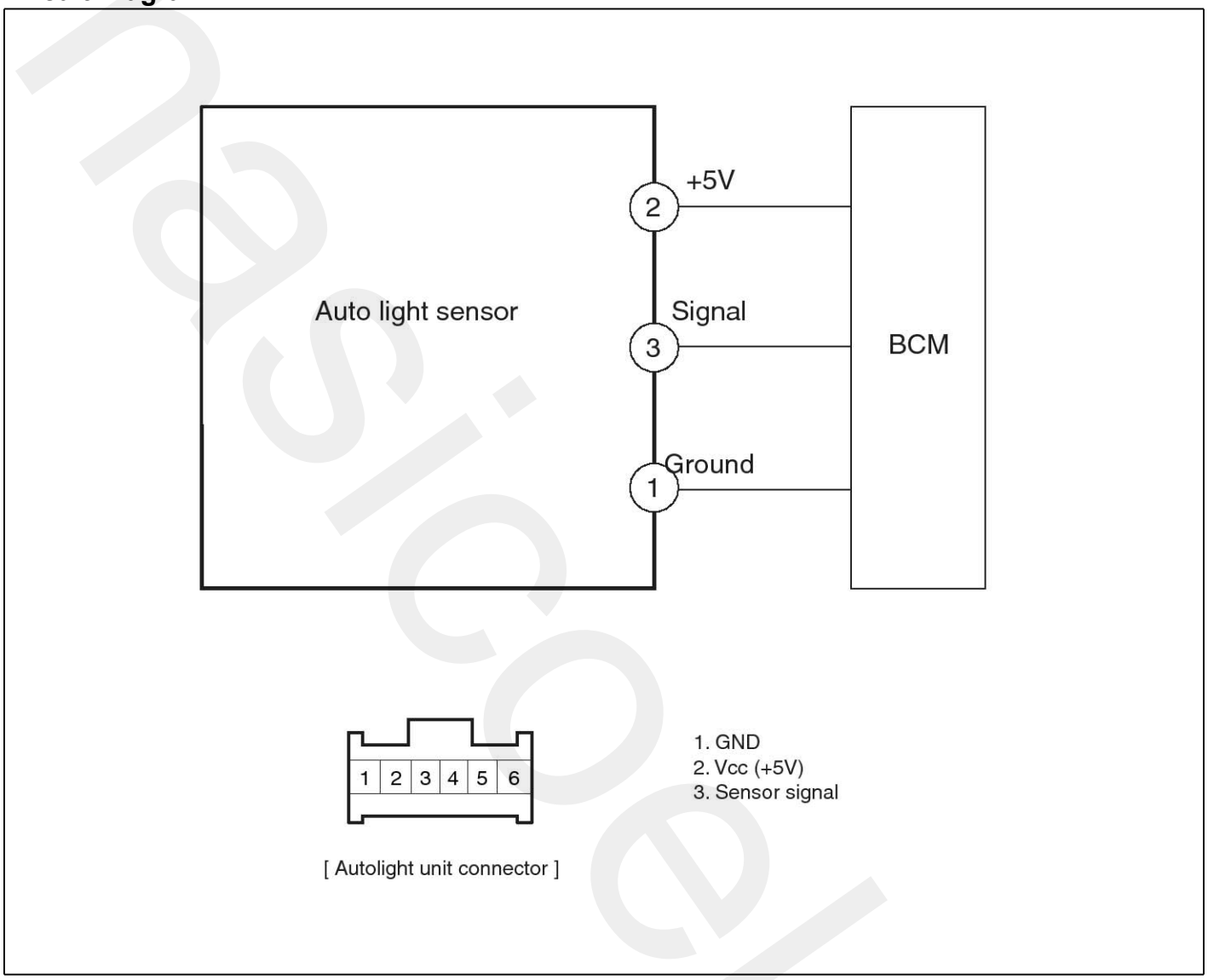
Component Location



SENBE9021L

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

Circuit Diagram



SENBE7515L

Description

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

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

Auto Light Sensor

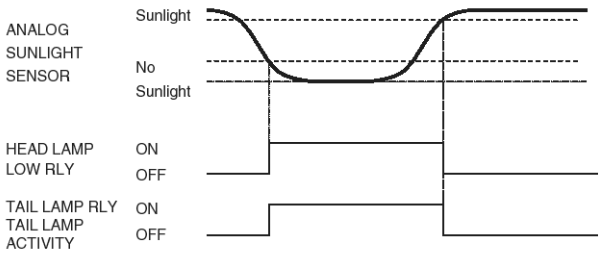
Inspection

In the state of IGN1 ON and IGN2 ON, when MULTI FUNCTION switch module detects AUTO LIGHT switch ON, TAIL LAMP RELAY output and HEAD LAMP LOW RELAY output are controlled according to AUTO LIGHT Sensor's INPUT. In the state of IGN1 ON, when MULTI FUNCTION switch module detects AUTO LIGHT switch ON, TAIL LAMP RELAY output is controlled according to AUTO LIGHT Sensor's INPUT.

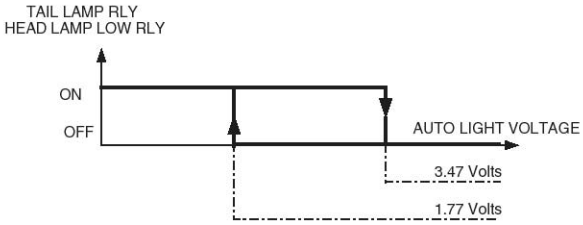
1. If IGN1 ON (for cranking) or ACC ON (for AV TAIL Function activity), the BCM supplies the power to Auto light sensor and monitors the range of this supply and raises up a failure as the supply's voltage is out of range (that is.: less than 4 Volts, more than 6 Volts).
2. The filtering of the error is 300ms to raise up this one, and also 300ms to clear this one.

   Then this failure occurs and as long as this is present, the head lamp must be turned on without taking care about the sunlight level provided by the sensor.

   This is designed to prevent any head lamp cut off when the failure occurs during the night.



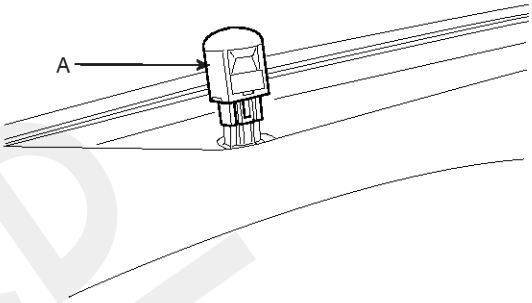
SENBE7609L



SENBE7610L

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the Photo & auto light sensor (A) using screw (-) driver.



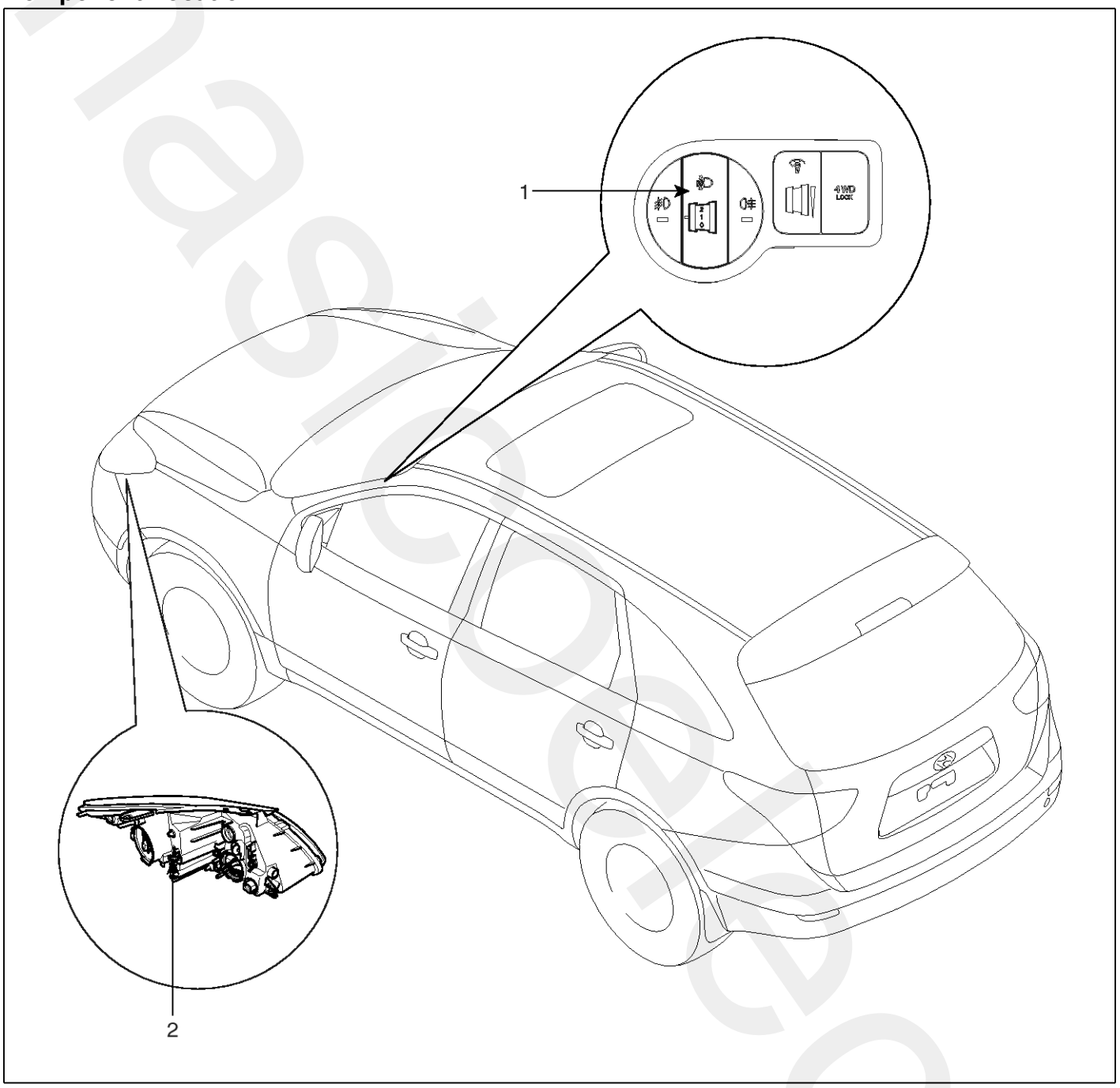
SENBE7511D

Installation

1. Install the auto light sensor.

Head lamp leveling Device

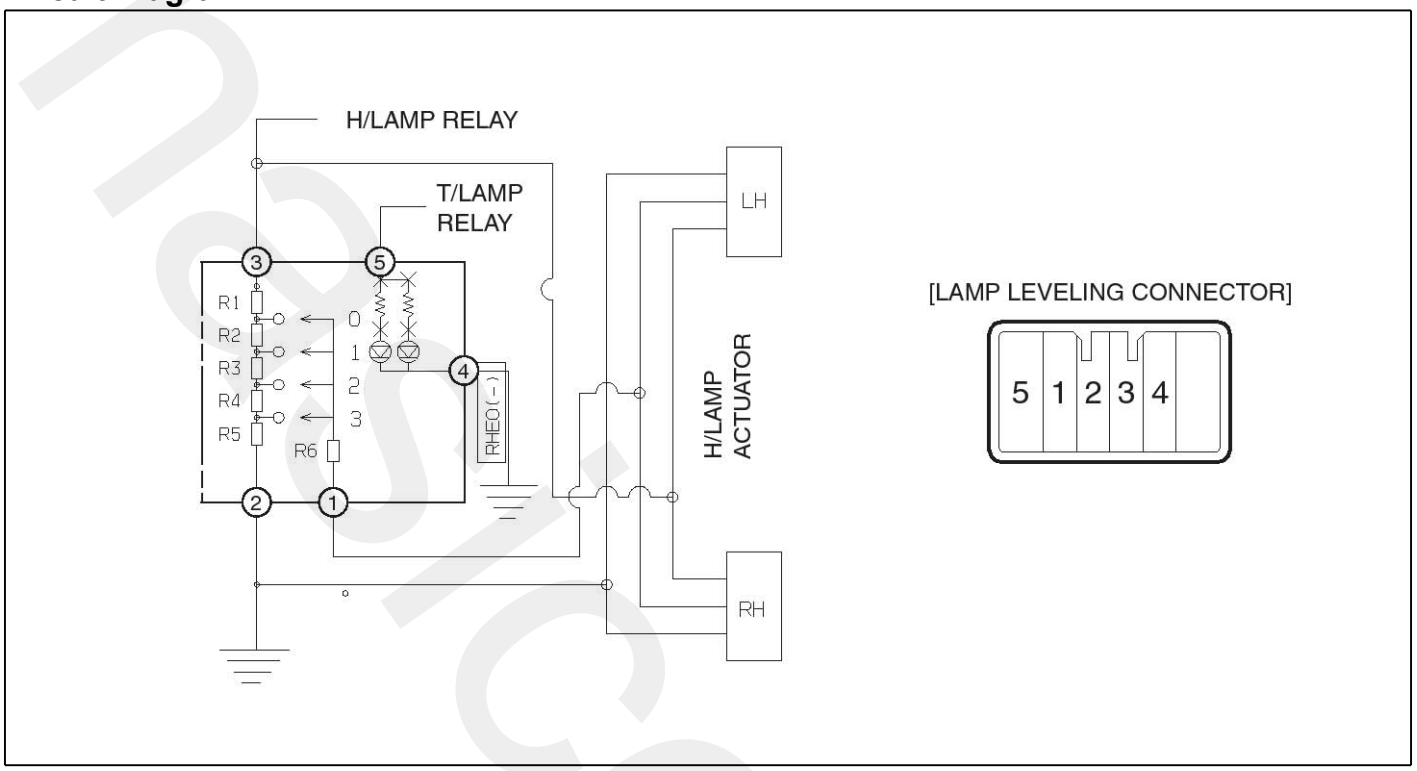
Component Location



SENBE9022L

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

Circuit Diagram

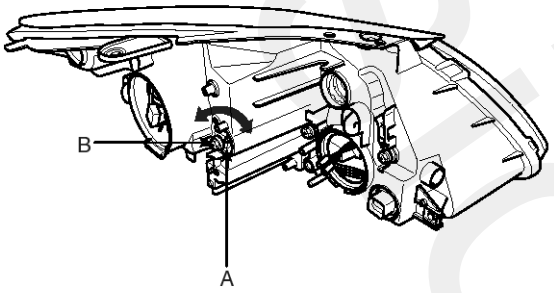


SENBE7491L

Head lamp leveling Actuator

Removal

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

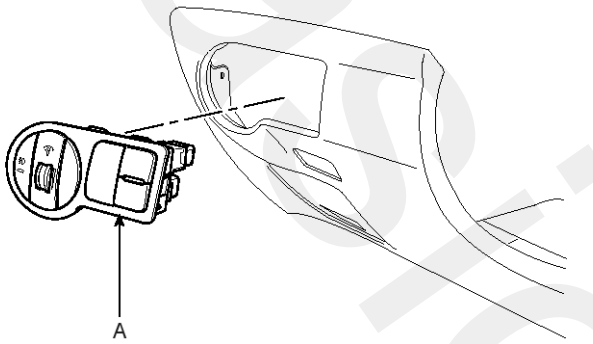


SENBE7494L

Head Lamp Leveling Switch

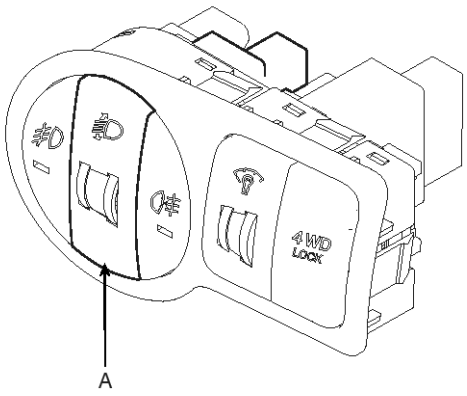
Inspection

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



SENBE7473D

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



SENBE7489L

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

Position No.	Rotation	Voltage (V)
0	0˚	11.05 ± 0.5V
1	20˚	9.1 ± 0.5V
2	40˚	7.54 ± 0.5V
3	60˚	6.63 ± 0.5V

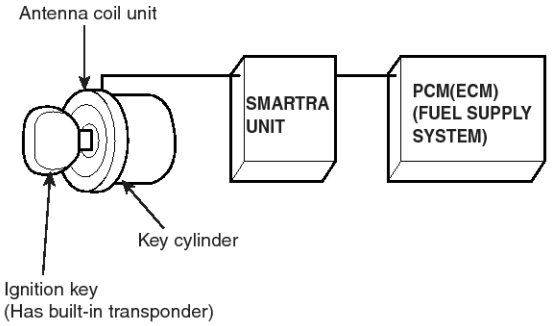
6. If the voltage is not as specified, replace the head lamp leveling switch.

Immobilizer System

Description

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

1. 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 PCM(ECM).
   - The SMARTRA communicates to the PCM(ECM) (Engine Control Module) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the SMARTRA.
   - When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the SMARTRA unit to the PCM(ECM).
   - If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the cluster will simultaneously come on for more than five seconds, indicating that the SMARTRA unit has recognized the code sent by the transponder.
   - If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue blinking for about five seconds until the ignition switch is turned OFF.
   - If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
   - The immobilizer system can store up to four key codes.
   - If the customer has lost his key, and cannot start the engine, contact HMC motor service station.

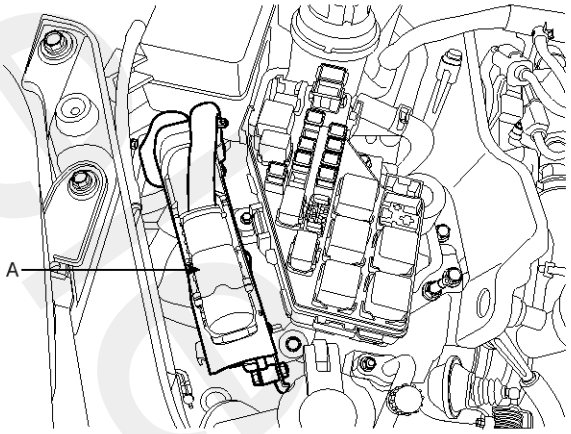


ETBF740B

Components Operations

PCM (Power Train Control Module)

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



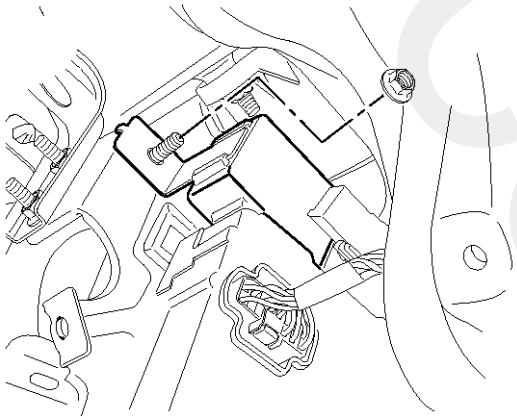
SENBE7544D

SMARTRA unit (B)

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 PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna.

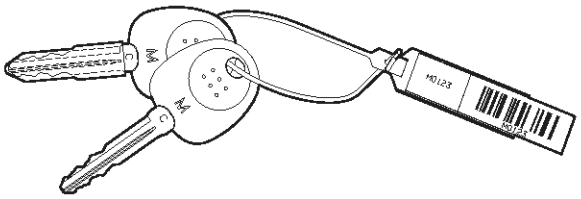
The SMARTRA does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the PCM(ECM) and vice versa.



SENBE7542D

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.



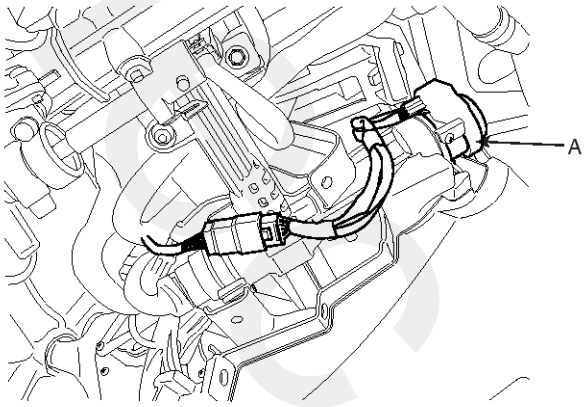
SENBE7540D

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.



SENBE7541D

Teaching Procedures

1. Key Teaching Procedure

   Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehicle owner.

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

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

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

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

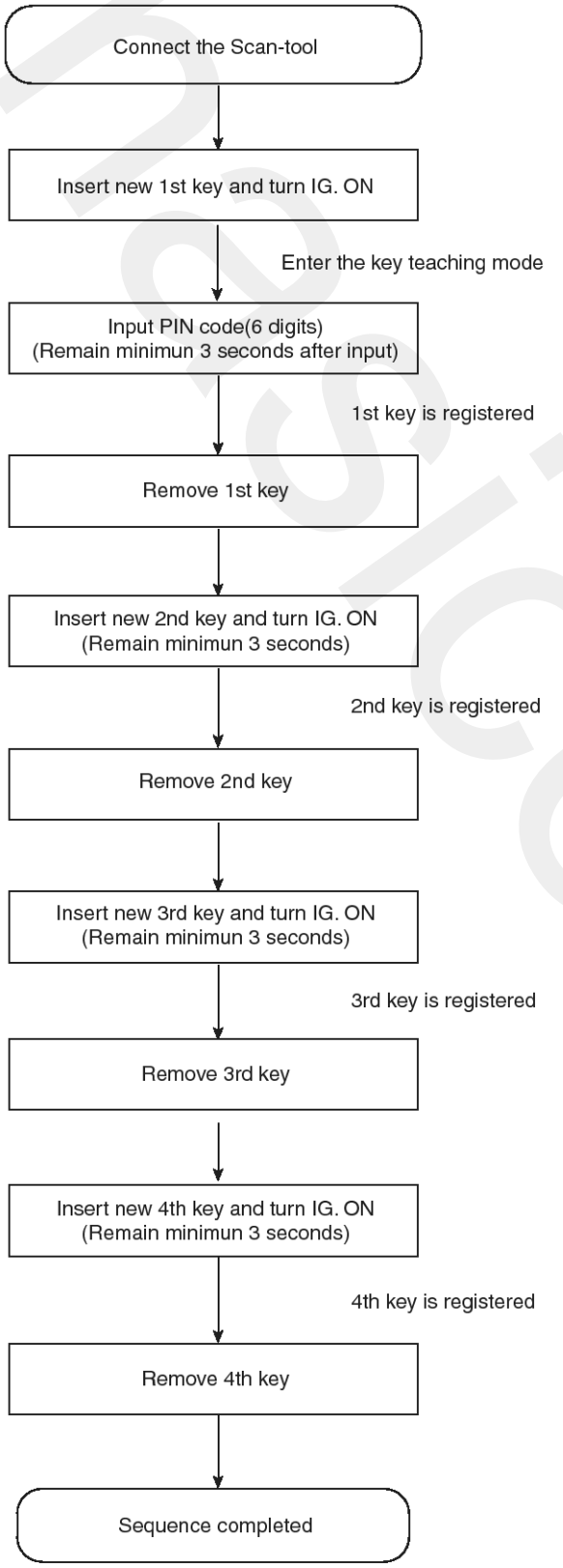
   The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognized by the PCM(ECM). This rejects the key and a message is sent to the tester.

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

   The maximum number of taught keys is 4

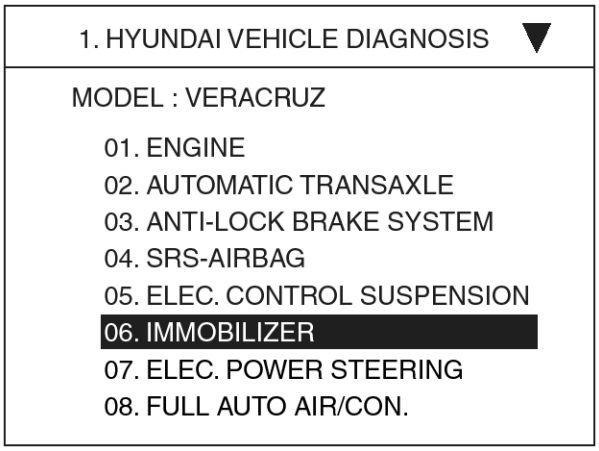
   If an error occurs during the Immobilizer Service Menu, the PCM(ECM) status remains unchanged and a specific fault code is stored.

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



ETBF740M

1) PCM(ECM) learnt status.



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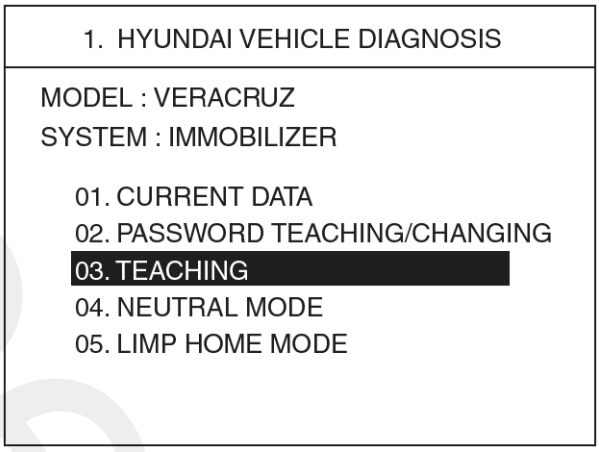

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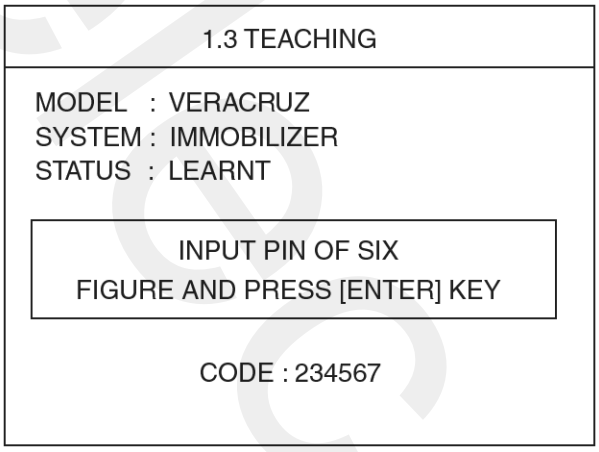

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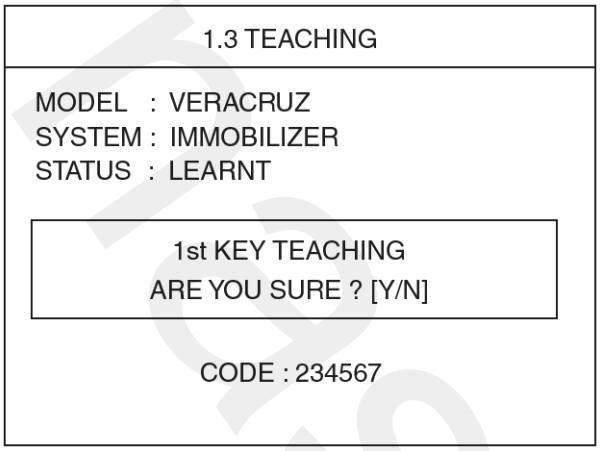

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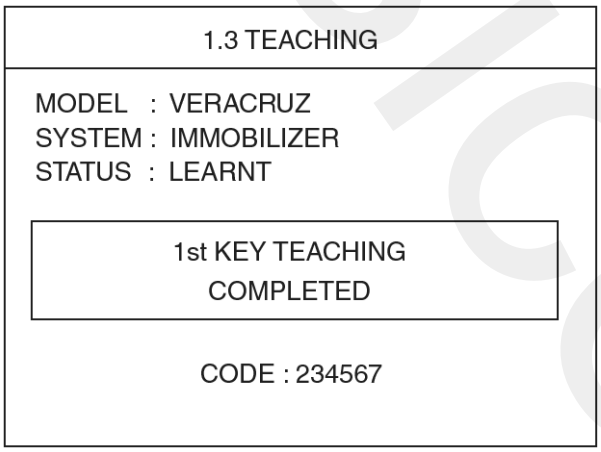

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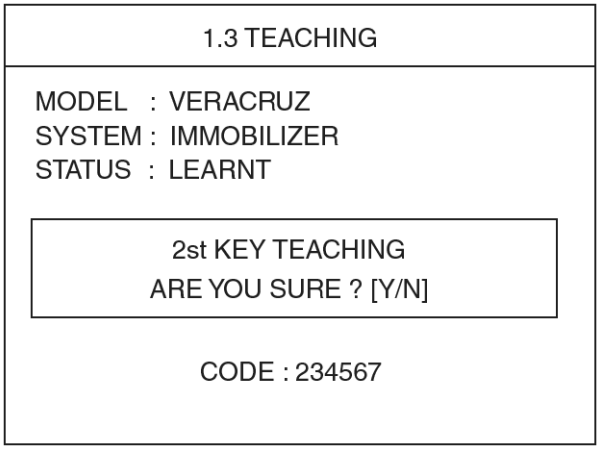

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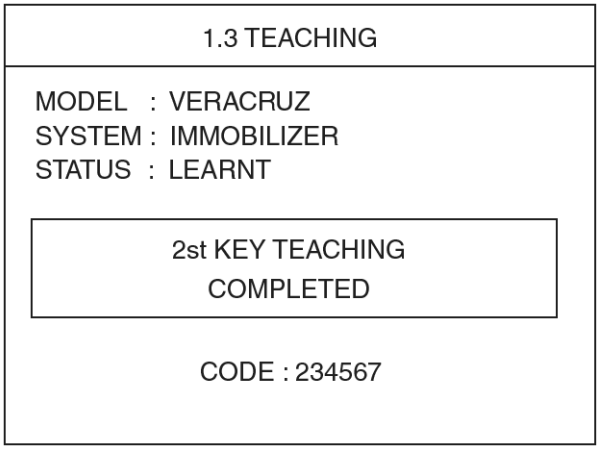
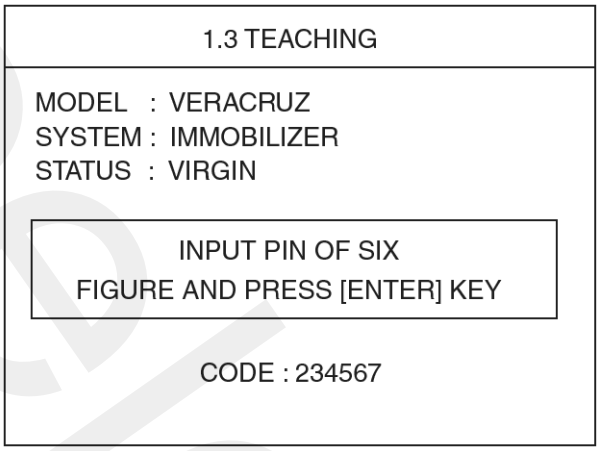


SENBE7657L

2) PCM(ECM) virgin status.

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

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



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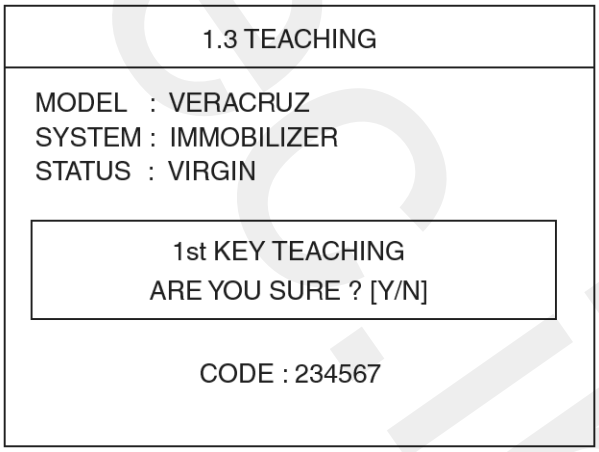

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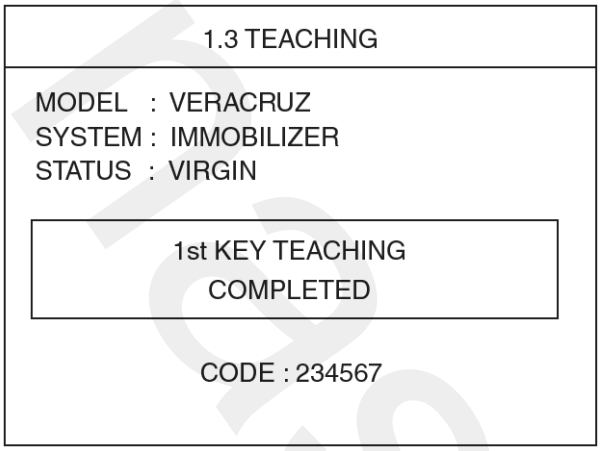

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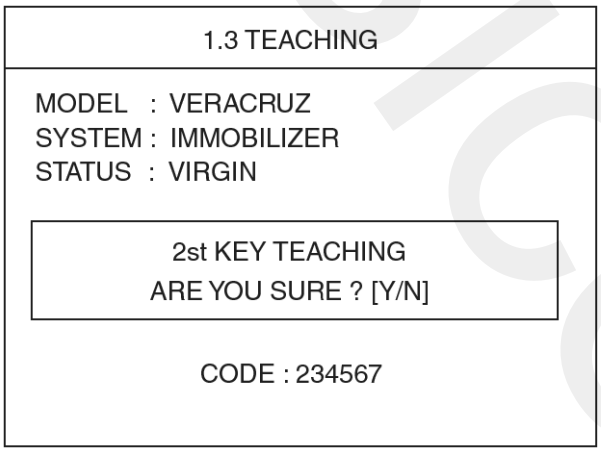

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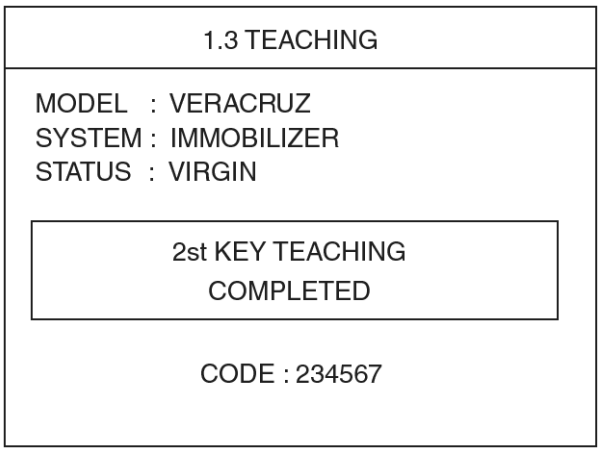


SENBE7662L

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.

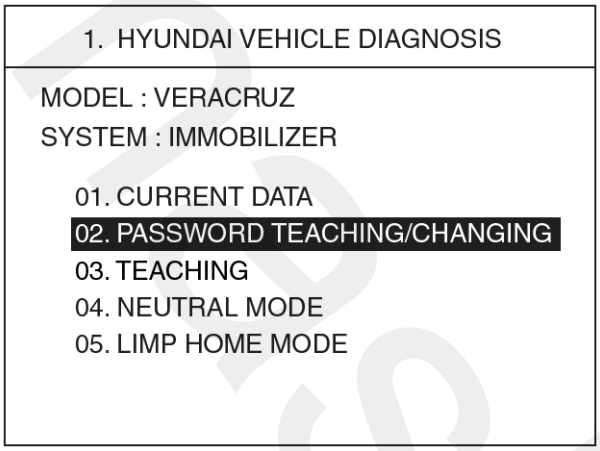
User password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to an PCM(ECM), the status of the password is "virgin" No limp home function is possible.

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

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

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

1) User password teaching



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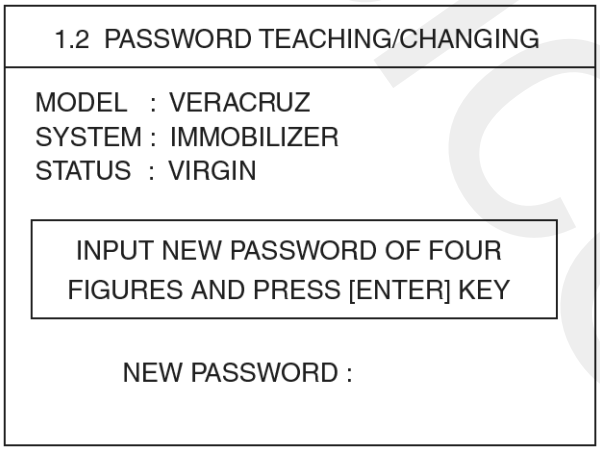

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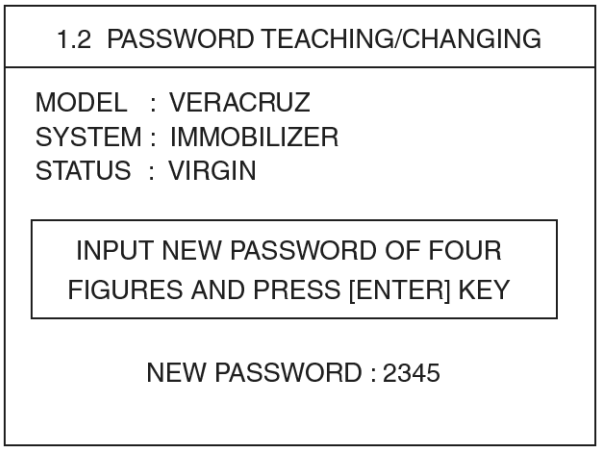

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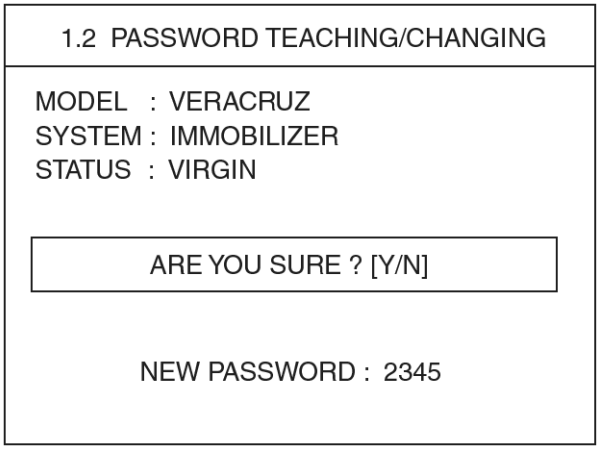

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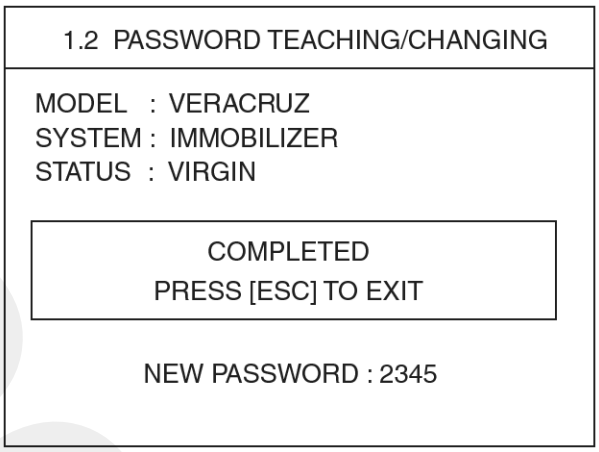


SENBE7667L

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

2) User password changing

1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : VERACRUZ
SYSTEM : IMMOBILIZER

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

SENBE7663L

1.2 PASSWORD TEACHING/CHANGING

MODEL : VERACRUZ
SYSTEM : IMMOBILIZER
STATUS : LEARNT

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

OLD PASSWORD :

SENBE7668L

1.2 PASSWORD TEACHING/CHANGING

MODEL : VERACRUZ
SYSTEM : IMMOBILIZER
STATUS : LEARNT

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

OLD PASSWORD : 2345

SENBE7669L

1.2 PASSWORD TEACHING/CHANGING

MODEL : VERACRUZ
SYSTEM : IMMOBILIZER
STATUS : LEARNT

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

NEW PASSWORD : 1234

SENBE7670L

1.2 PASSWORD TEACHING/CHANGING

MODEL : VERACRUZ
SYSTEM : IMMOBILIZER
STATUS : LEARNT

ARE YOU SURE ? [Y/N]

NEW PASSWORD : 1234

SENBE7671L

1.2 PASSWORD TEACHING/CHANGING

MODEL : VERACRUZ
SYSTEM : IMMOBILIZER
STATUS : LEARNT

COMPLETED
PRESS [ESC] TO EXIT

NEW PASSWORD : 1234

SENBE7672L

Limp Home Function

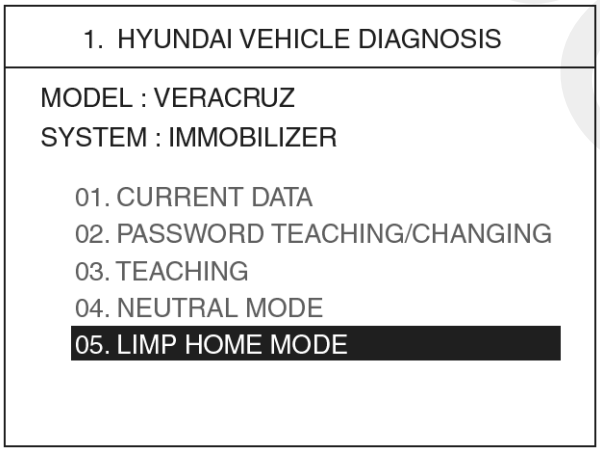
1. LIMP HOME BY TESTER

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

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

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

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



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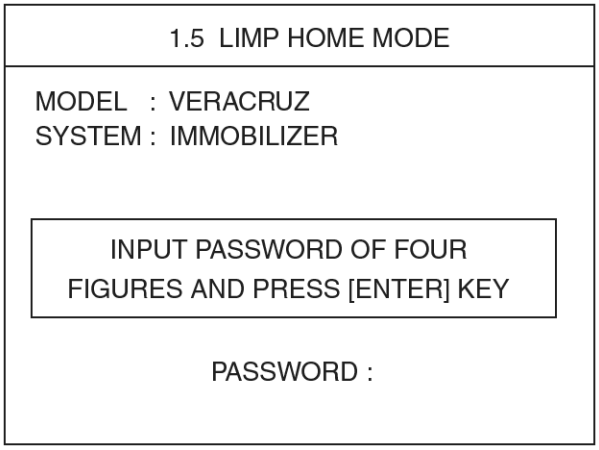

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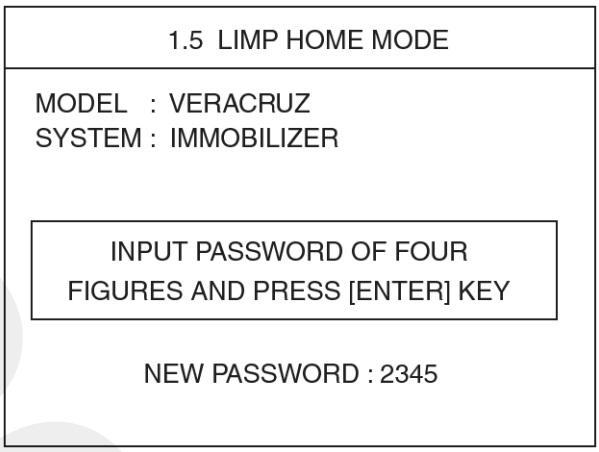

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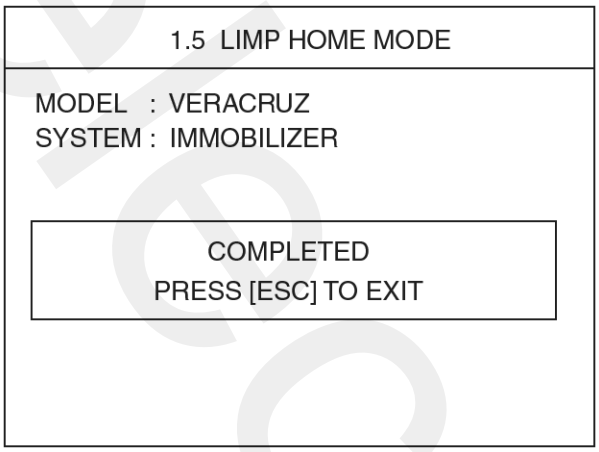


SENBE7688L

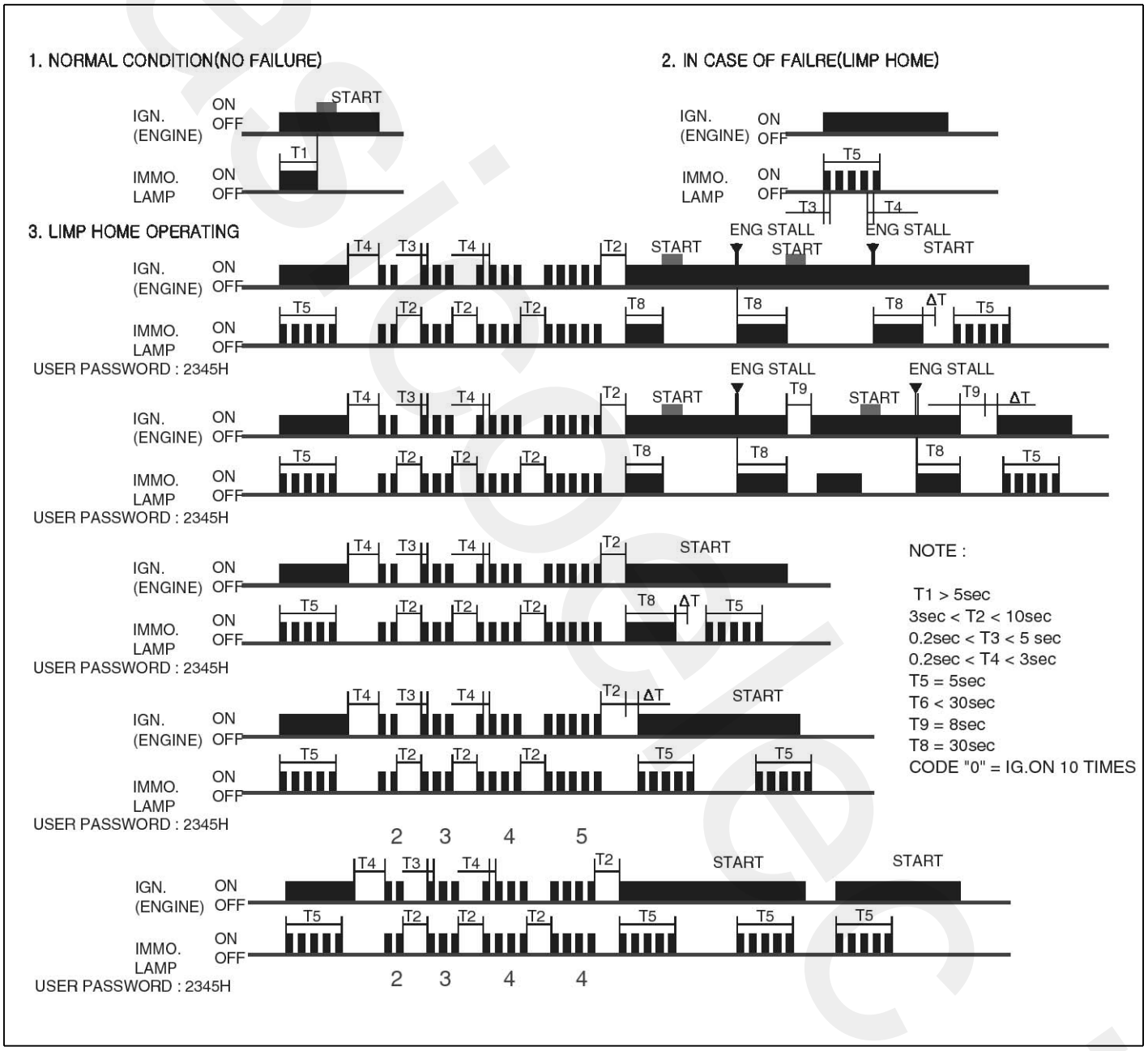
2. LIMP HOME BY IGNITION KEY

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

Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM(ECM) will be unlocked for a period of time (30 sec.).

The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again.

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



LTIF740N

Replacement

Problems And Replacement Parts:

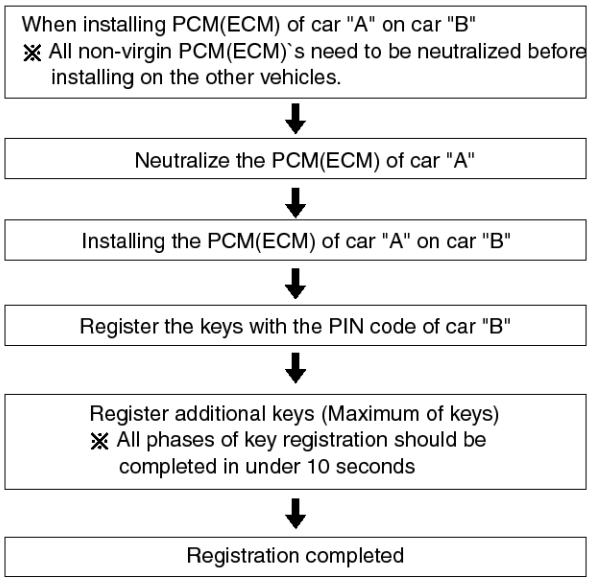
Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA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

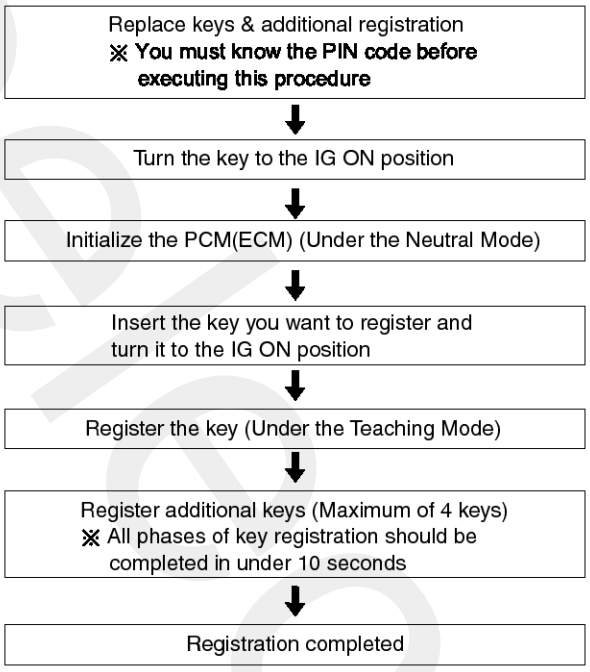
In case of a defective SMARTRA, there is no special procedure required. A new SMARTRA device simply replaces the old one. There are no transponder-related data stored in this device.

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



ETBF746A

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



ETBF746B

NOTICE

1. *When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.*
2. *When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2.*

   (Note that key #2 must be used within 10 seconds of removing key #1)
3. *When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.*

   The engine cannot be started even with the registered key #1.
4. *When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.*

   Always remember the 10 seconds zone.
5. *If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.*
6. *Be cautious not to overlap the transponder areas.*
7. *Problems can occur at key registration or vehicle starting if the transponders should overlap.*

Neutralising Of ECM

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

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

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

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

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

(Refer to the Things to do when Key & PIN Code the PCM(ECM) can be set to the "neutral" status by a scanner. A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the scanner. The communication messages are described at" Neutral Mode". After successfully receiving the data, the PCM(ECM) is neutralized.

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

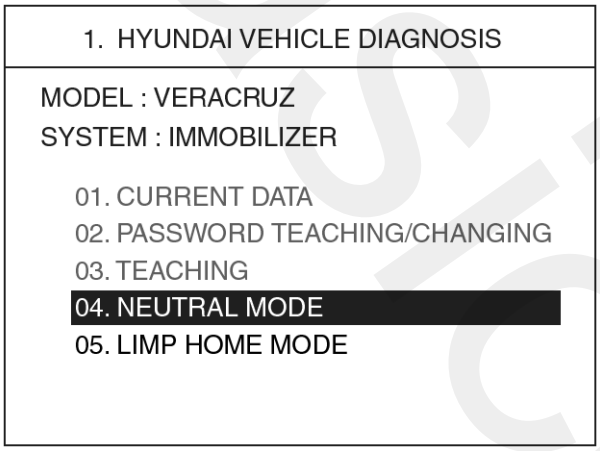
The teaching of keys follows the procedure described for virgin PCM(ECM). The vehicle specific data have to be unchanged due to the unique programming of transponder. If data should be changed, new keys with virgin transponder are requested.

NOTICE

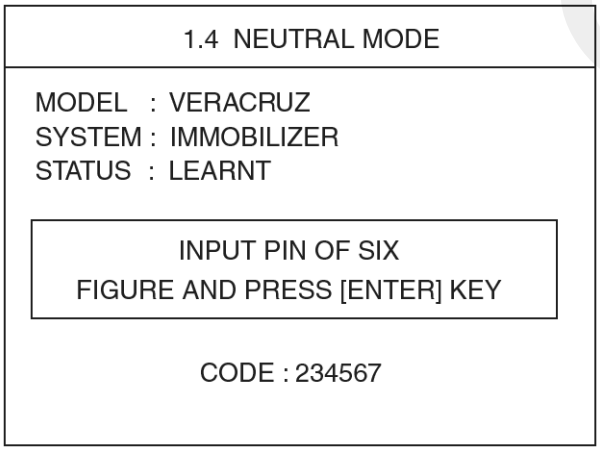
- *Neutralizing setting condition*
  - *In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"*
  - *Input correct PIN code by scanner.*
  - *Neutralizing meaning .*

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

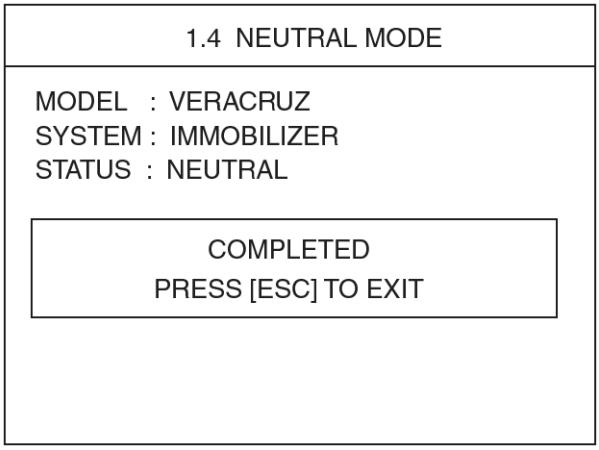
    : Locking of ECM (except key teaching permission)



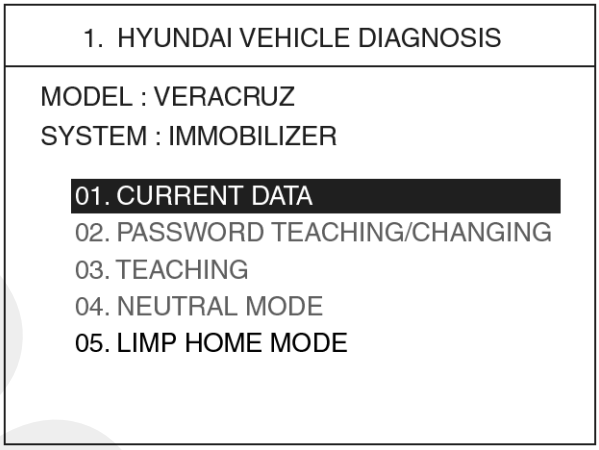
SENBE7673L



SENBE7674L



SENBE7675L



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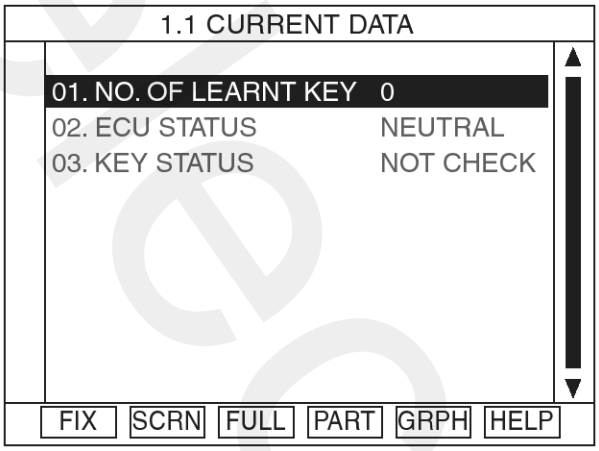
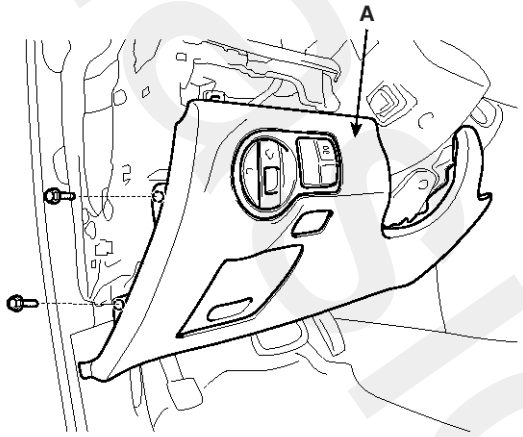


SENBE7677L

Immobilizer Control Unit

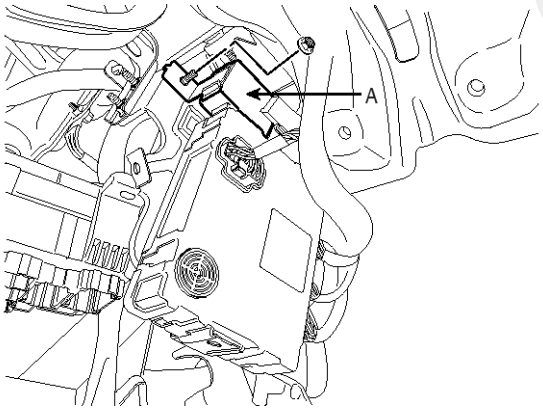
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A) after removing side cover. (Refer to the BD group - "Crash pad")



SENBE7680D

3. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) after loosening a nut.



SENBE7681D

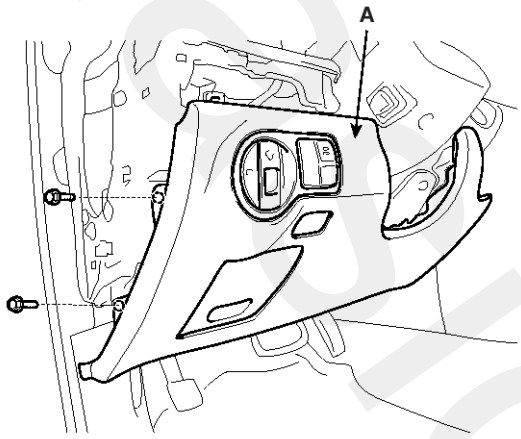
Installation

1. Reassemble the SMARTRA unit after connecting the connector.
2. Reassemble the driver crash pad lower panel.

Antenna Coil

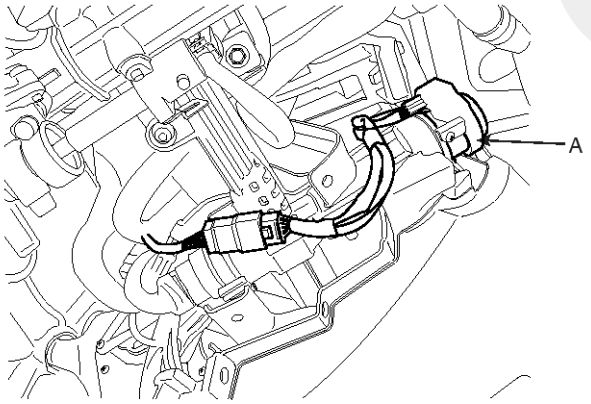
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A).
   (Refer to the BD group - "Crash pad")



SENBE7680D

3. Disconnect the 6P connector of the coil antenna and then remove the coil antenna (A) after loosening the screw.



SENBE7682D

Installation

1. Reassemble the coil antenna after connecting the connector.
2. Reassemble the crash pad lower panel.

Diagnosis Of Immobilizer Faults

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

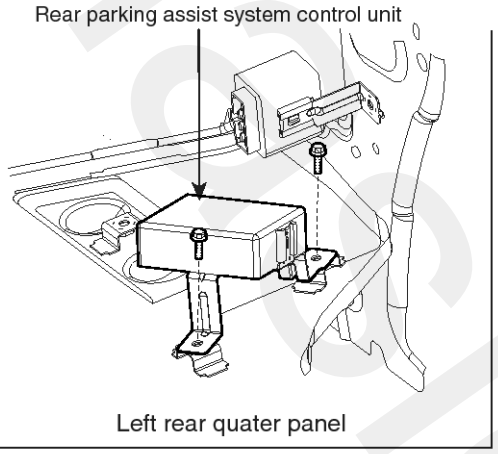
The following table shows the assignment of immobilizer related faults to each type:

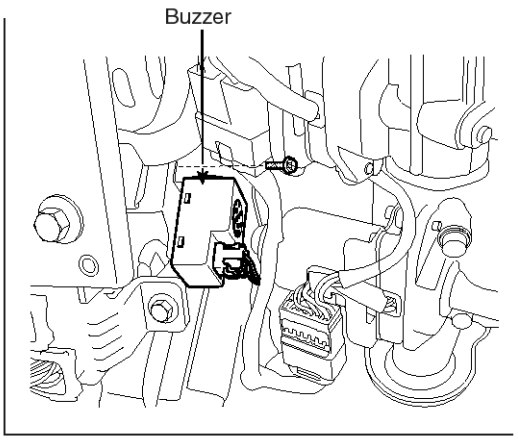
Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1. Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1. Transponder not in password mode 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Transponder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

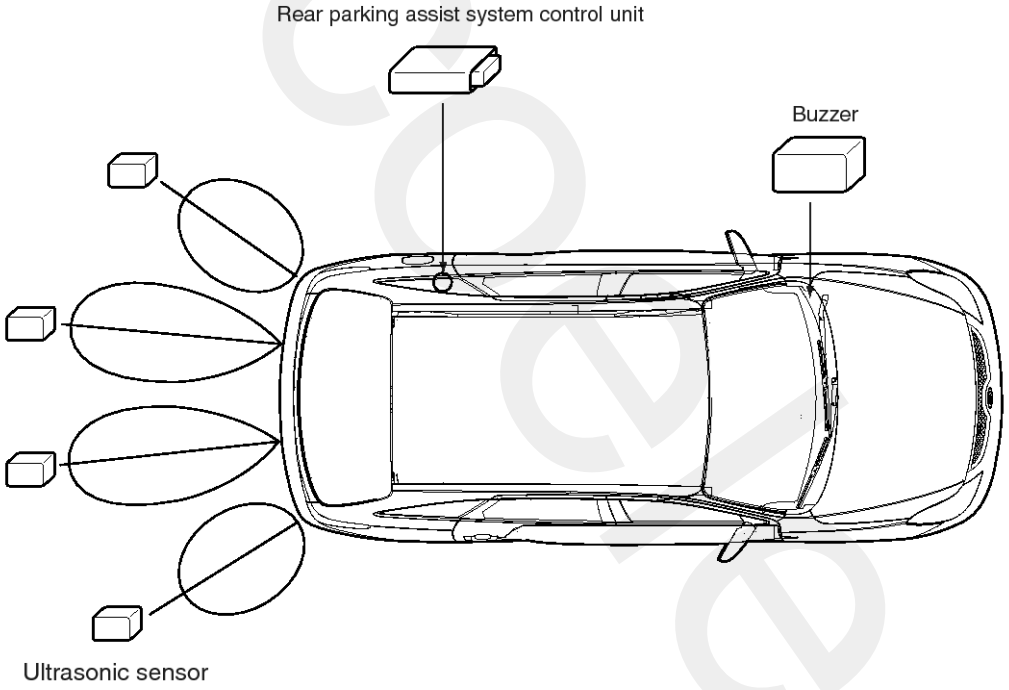
Rear Parking Assist System

Rear Parking Assist System Control Unit

Component Location



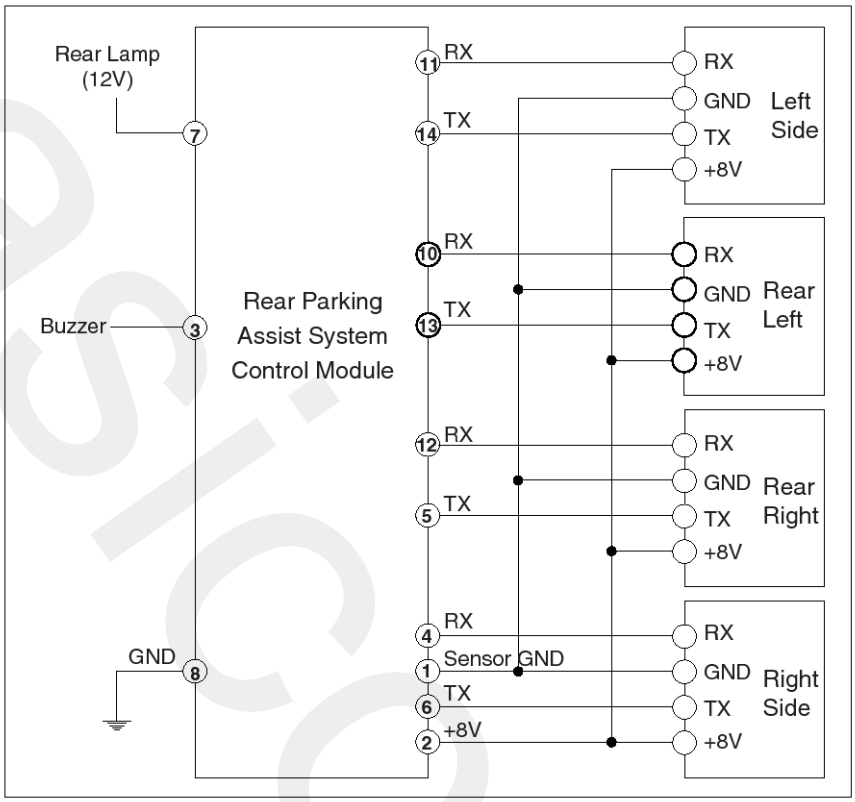


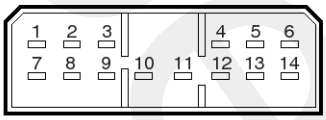


- First alarm : Object comes near to the sensor located at the rear of vehicle, within 81-120cm ± 15cm
- Second alarm : Object comes near to the sensor located at the rear of vehicle, within 41-80cm ± 10cm
- Third alarm : Object comes near to the sensor located at the rear of vehicle, within 40cm ± 10cm

SENBE7520L

Circuit Diagram





(14P Connector)

Pin configuration

Pin No.	Signal
1	GND SENSOR
2	+8V-SENSOR
3	PIEZO BUZZER
4	RX-SR SENSOR
5	TX-RR SENSOR
6	TX-SR SENSOR
7	BACK UP LAMP POWER
8	GND
10	RX-RL SENSOR
11	RX-SL SENSOR
12	RX-RR SENSOR
13	TX-RL SENSOR
14	TX-SL SENSOR

SENBE7527L

Description

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

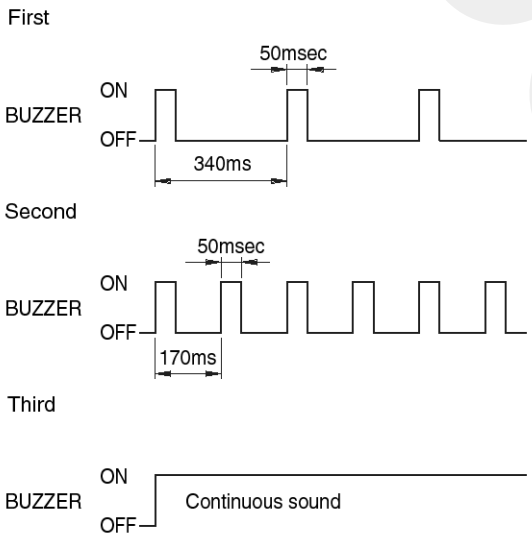
Alarm Range

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

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

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

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



LTKG976C

NOTICE

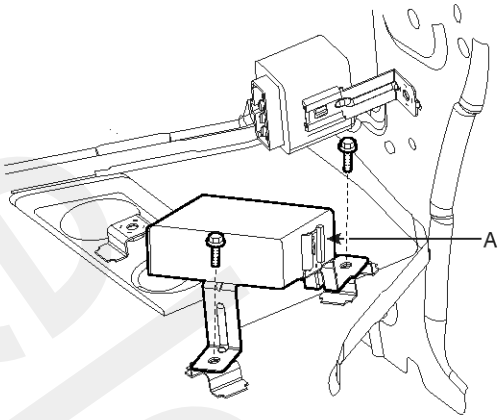
1. *Time tolerance of the above waveform : Time ± 10%*
2. *At nearer distance than 40cm, detection may not occur.*
3. *Alarm will be generated with vehicle reversing speed 10km/h or less.*

   For moving target, maximum operation speed shall be target approach speed of 10km/h.
4. *When the vehicle or the target is moving, sequential alarm generation or effective alarm may be failed.*
5. *False alarm, or failure of the alarm to trigger may occur in the following conditions.*
   - *Irregular road surface, gravel road, reversing toward grass.*
   - *Horn, motor cycle engine noise, large vehicle air brake, or other object generating ultrasonic wave is near.*
   - *When a wireless transmitter is used near to the sensor.*
   - *Dirt on the sensor.*
   - *Sequential alarm may not occur due to the reversing speed or the target shape.*

Removal

1. Remove the rear left quarter trim of the trunk.

   (Refer to the BD group - "Interior trim")
2. Loosen the mounting bolts and remove the rear parking assist system control module unit (A) from the quarter panel.



SENBE7521D

Installation

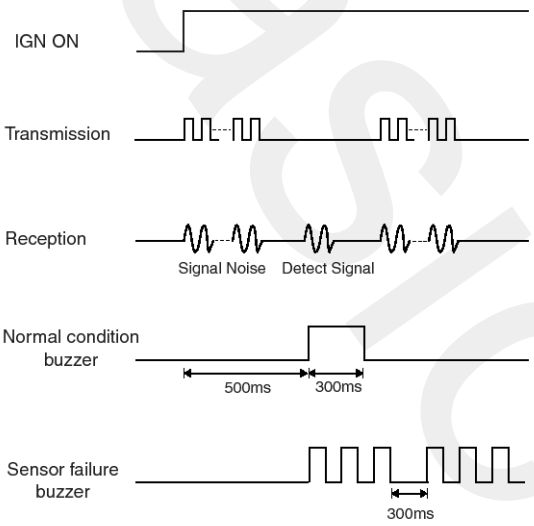
1. Reassemble the rear parking assist system control module.
2. Reassemble the rear left quarter trim.

Diagnosis

1. DIAGNOSIS

   Turn the ignition switch ON, then shift the transaxle lever to 'R'. The Back Warning System is then checked.

   If no trouble, it generates buzzer alarm sound for 0.3 seconds after 0.5 seconds from power approval.



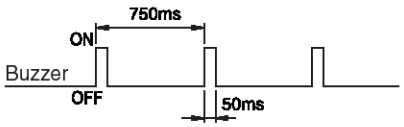
LTKG760B

2. DIAGNOSIS MODE

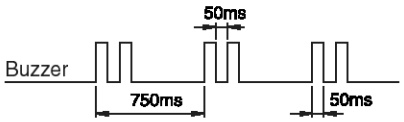
   Switch on diagnosis mode upon system failure.

   In case of system failure, then it indicates the failed point as follows.

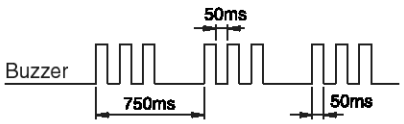
(1) Left side sensor failure buzzer



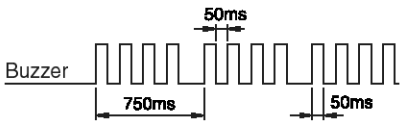
(2) Rear left side sensor failure buzzer



(3) Rear right side sensor failure buzzer



(4) Right side sensor failure buzzer



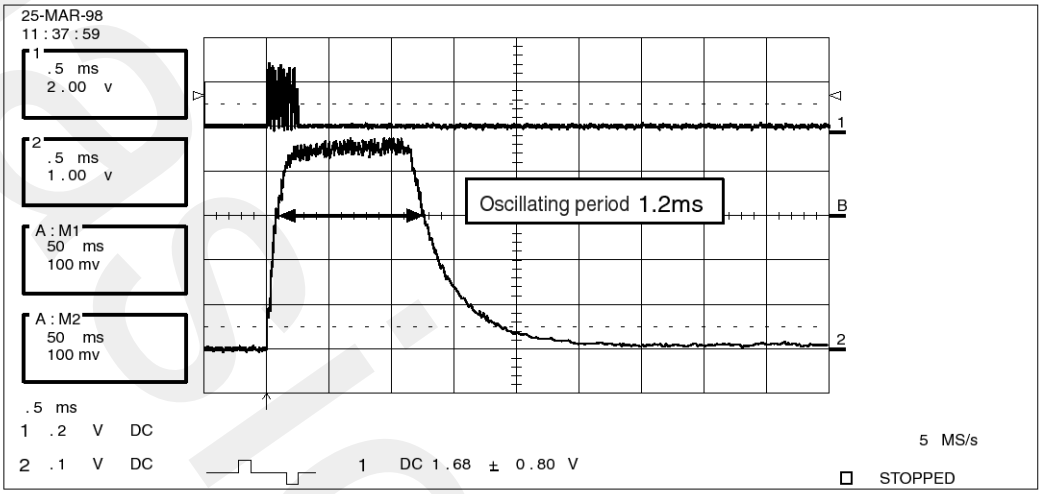
LTKG760C

Sensor Connection Checking

Transmit ultrasonic wave to the sensors, boost input signal, and detect wave.

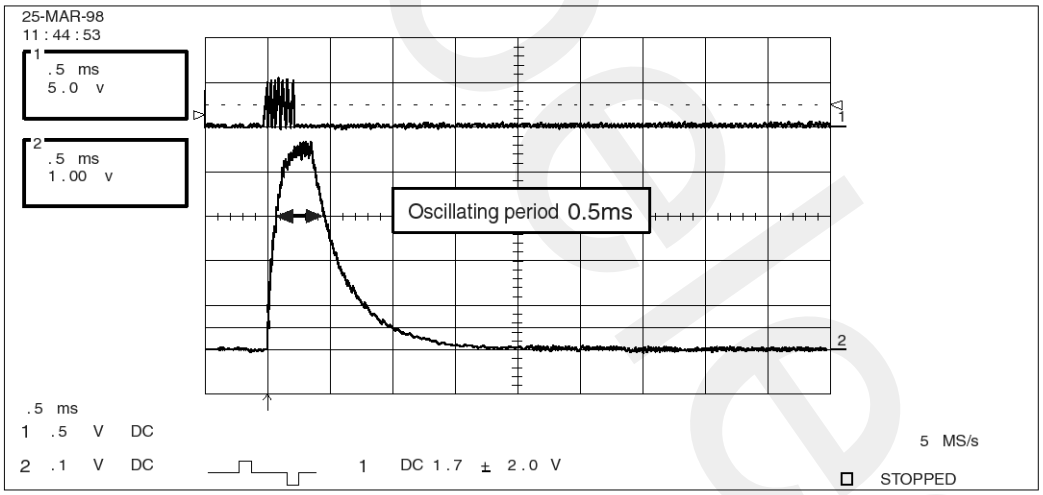
Waveform will be found, oscillating for a certain period of time.

1. Waveform for a normal sensor connection



BTKG230F

2. Waveform for a failed sensor connection



BTKG230G

NOTICE

Sensor connection will be checked for oscillating period of input signal 3V. If oscillating period is more than 0.8ms, it is normal.

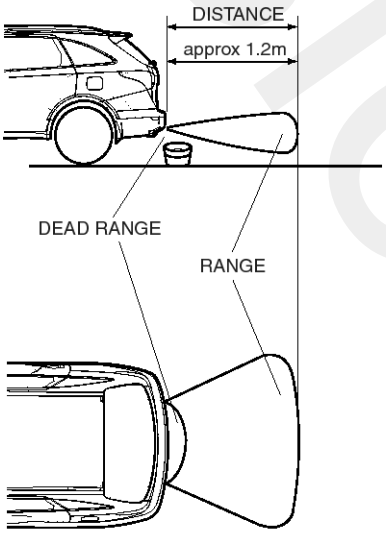
a. Left sensor failure : beep-beep-beep
b. Right sensor failure : beep beep-beep beep-beep beep
c. Rear-right sensor failure : beep beep beep-beep beep beep-beep beep beep
d. Right side sensor failure : beep beep beep beep-beep beep beep beep-beep beep beep beep

Warning

1. Range detected by back sensors is limited.

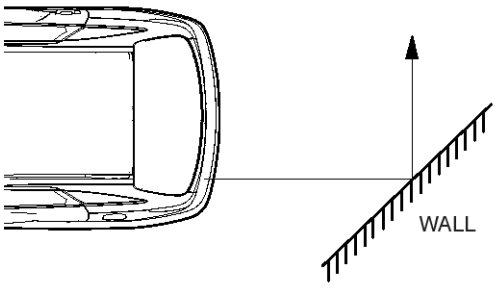
   Watch back before reversing
2. There is a blind spot below the bumper. Low objects (for example boundary barrier) may be detected from minimum 1.5m away unable to detect at nearer.
3. Besides there are some materials unable to be detected even in detection range as follows.
   1) Needles, ropes, rods,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

      (for example, fire extinguisher device covered with snow)



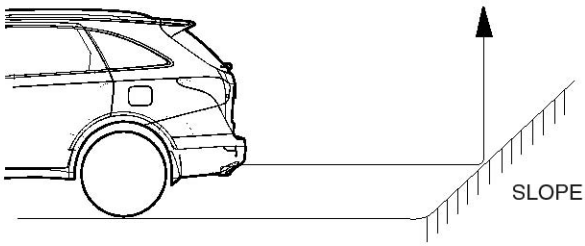
SENBE7524L

4. Reversing toward the sloped walls.



SENBE7525L

5. Reversing toward the sloped terrain.



SENBE7526L

6. False alarm may operate in the following condition: irregular road surface, gravel road, sloped road and grass. Upon alarm generation by grass the alarm may be generated by rock behind grass. Always visually check the area behind the vehicle before backing up.

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

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

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

6) Under heavy rain.
7) When reversing towards a vertical wall and the gap between the vehicle and the wall is 15cm. (Alarm may sound despite the absence of a barrier)
8) If radio antenna is installed at the rear.
9) If the vehicle rear wiring is re-routed or electrical component is added at the rear part.
10) Vehicle balance is changed due to the replacement of the rear spring.
11) The unit will operate normally when the vehicle speed is 5km/h or less.

    Above this speed, the unit may not operate normally

8. Check the rear bumper for installation condition and deformation. If installed improperly or the sensor orientation is deviated, it may cause malfunction.
9. Be careful not to apply shock during sensor installation on the transmission or reception unit.
10. When adding electrical devices or modifying harness at the rear body of the vehicle, ensure not to change the transmission and reception unit wiring.

    Tagging the transmission side and reception side, it may cause malfunction.
11. High power radio transmitter (above 10W) may cause malfunction. Do not install it on the vehicle.
12. Be careful that excessive heat or sharp objects shall not touch ultrasonic sensor surface.

    Do not cover the sensor opening or press the sensor.

Parking Assist Sensor

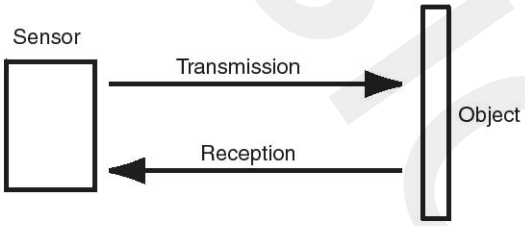
Operation

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

Distance Detection Type

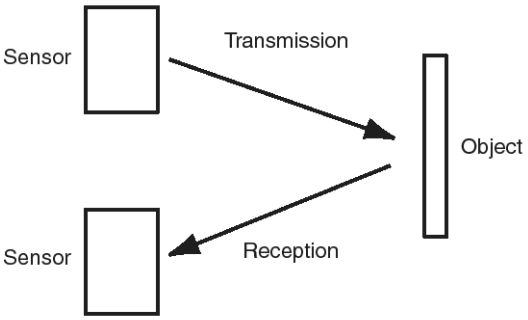
Direct detection type and indirect detection type are used together for improving effectiveness of the detection.

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



ETRF762A

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



ETRF762B

Measurement Principle

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

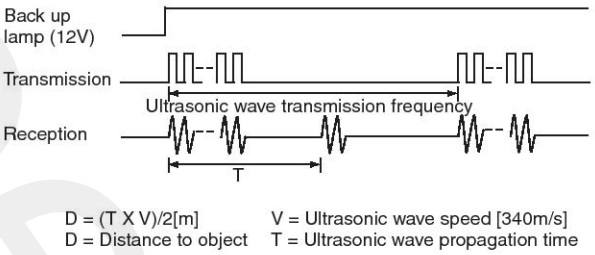
The propagation speed formula of ultrasonic wave in air is following :

$v=331.5 + 0.6t$ (m/s)

v=ultrasonic wave propagation speed

t=ambient temperature

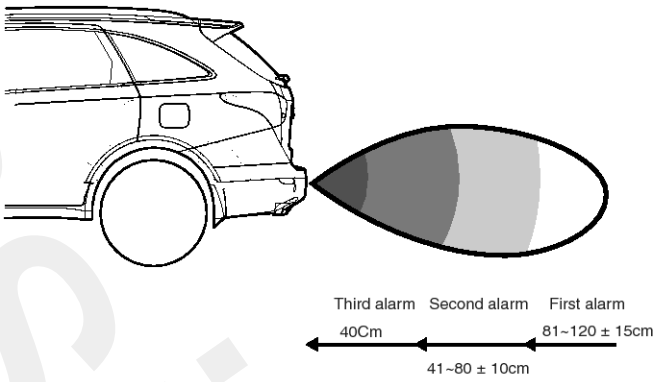
The basic principle of distance measurement using ultrasonic wave is :



ETRF762C

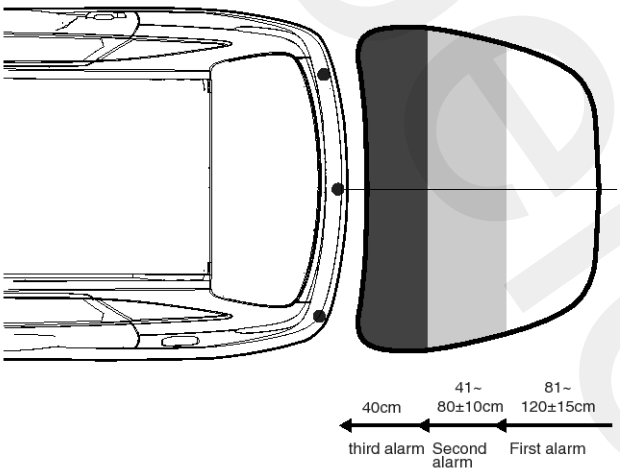
Sensor Detection Range

[Vertical range]



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

[Horizontal range]



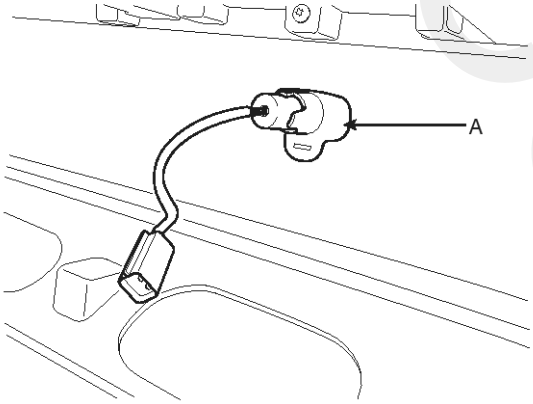
1. Distance tolerance(Messured at the front of sensor)
   81~120cm : ±15cm
   41~80cm : ±10cm
   40cm : ±10cm
2. Detection tolerance
   At 80cm : 90° ± 20°
   At 120cm : 10° ± 20°
3. At nearer distance than 40Cm detection may occur.
4. Measurement condition : Room temperature (20℃), 140mm diameter, 1m length rod.

NOTICE

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

Removal

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



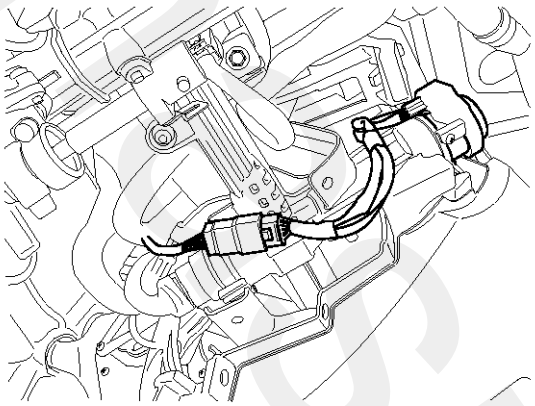
SENBE7523D

Installation

1. Connect the connector, and then reassemble the sensor.
2. Reassemble the rear bumper.

Ignition Switch Assembly

Inspection



SENBE7533D

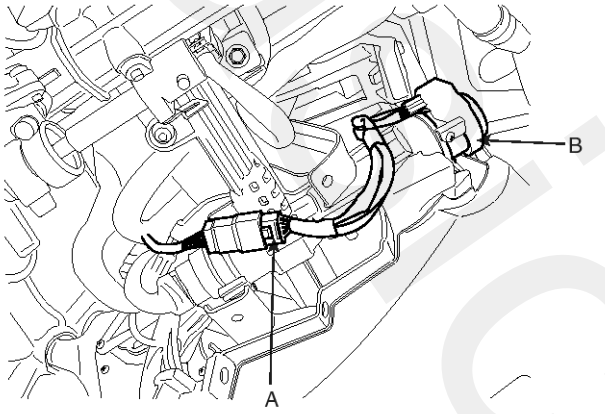
1. Disconnect the ignition switch connector and key warning switch connector from under the steering column.
2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

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

LTIF781E

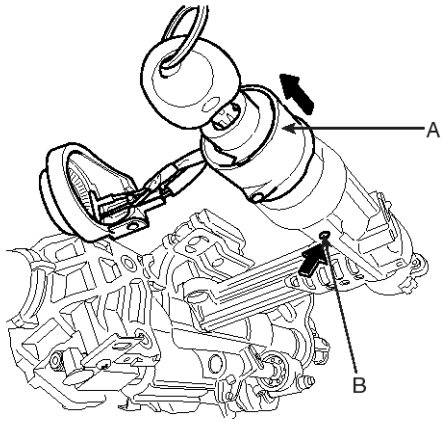
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
3. Remove the steering column cover.
   (Refer to the ST group)
4. Remove the key warning switch and key illumination lamp (B) after disconnecting the 6P connector (A).



SENBE7531D

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



SENBE7532D

Installation

1. Reassemble the key lock cylinder.
2. Reassemble the key warning switch and key illumination lamp.
3. Reassemble the steering column cover.
4. Reassemble crash pad lower panel.

Multiplex Communication

Driver Door Module (DDM)

Description

SWITHCH ASSY-POWER WINDOW MAIN (below, DDM) does CAN communication as part of CAN composition with BCM, SEAT ECU, TILT ECU, SMART KEY UNIT, POWER WINDOW ASSIST SWITCH and input/output signal by WIRE with IMS SWITCH and SAFETY ECU.

Manufactures BUTTON of POWER WINDOW MAIN SWITCH that driver is located on inside of driver seat door and does function connected with POWER WINDOW, MIRROR, DOOR LOCK/UNLOCK.

1. POWER WINDOW action by BUTTON
   1) About DRIVE SIDE POWER WINDOW BUTTON, each MANUAL UP/DOWN, AUTO UP/DOWN four actions by WIRE to SAFETY ECU SIGNAL output.
   2) About ASSIST SIDE POWER WINDOW BUTTON, transmit each MANUAL UP/DOWN two actions by CAN communication.
   3) About REAR LEFT/RIGHT POWER WINDOW BUTTON, transmit each MANUAL UP/DOWN two actions by CAN communication.
   4) Transmit P/WDW LOCK state by Wire SIGNAL output and CAN communication to SEFETY ECU.
2. MIRROR's position passivity action by MANUAL SWITCH (Up, Down, Left, Right)
3. Memory of MIRROR position by MEMORY SWITCH, regeneration action → 2 Person
4. CENTRAL DOOR LOCK/UNLOCK function.
5. Containment and return function of OUTSIDE MIRROR.

Control Function

1. POWER WINDOW CONTROL
   1) POWER WINDOW ENABLE SIGNAL ON Condition.
      - POWER WINDOW TIMER(FROM BCM) ON or IGN2(DDM itself) ON

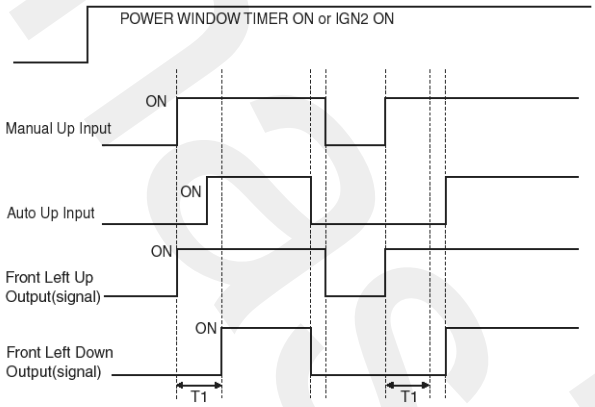
        (When satisfy one of two condition)
   2) UP/DOWN CONTROL SIGNAL
      - POWER WDW TIMER(FROM BCM) ON or IGN2(DDM itself) ON

        (When satisfy one of two condition)

SWITCH STATS	UP SIG	DOWN SIG	P/WINDOW ENABLE SIG
Initial state (OFF)	OFF	OFF	ON
MANUAL UP	ON	OFF	ON
MANUAL DOWN	OFF	ON	ON
MANUAL UP → AUTO UP	ON(maintenance)	OFF → ON	ON
MANUAL DOWN → AUTO DOWN	OFF → ON	ON(maintenance)	ON
OFF → AUTO UP	ON	OFF(40ms) → ON	ON
MANUAL DOWN → AUTO UP			
AUTO DOWN → AUTO UP			
OFF → AUTO DOWN	OFF(40ms) → ON	ON	ON
MANUAL UP → AUTO DOWN			
AUTO UP → AUTO DOWN			

* At POWER WINDOW TIMER (FROM BCM) OFF & IGN 2 (DDM) OFF, independently of SWITCHs' state UP SIGNAL and DOWN SIGNAL are OFF state preservation.

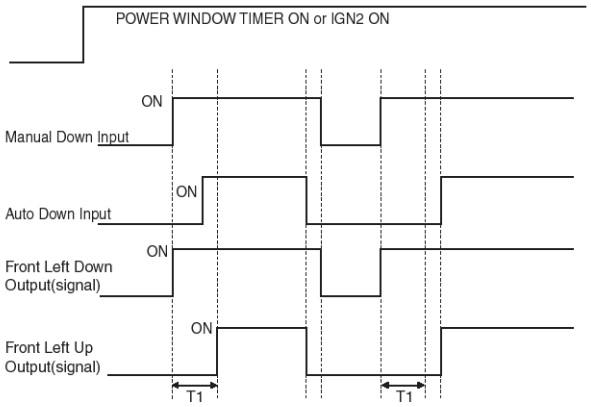
Auto/manual Up Output(signal) Operation Time Chart



SENBE7153L

T1 : 40mS ± 10mS

Auto/manual Down Output(signal) Operation Time Chart



SENBE7154L

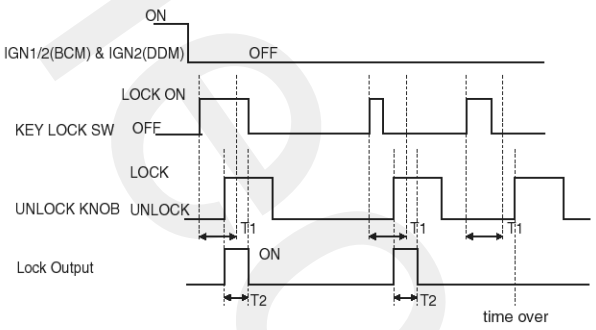
T1 : 40mS ± 10mS

2. CENTRAL DOOR LOCK/UNLOCK

Note	The seat of driver			The seat of assist (CAN reception)		CAN LOCK/UNLOCK (FROM BCM or SMK CAN reception) (Note 3)
	KNOB	KEY	POWER WINDOW SWITCH DOOR LOCK / UNLOCK SWITCH (Notice 4)	KNOB	POWER WINDOW SWITCH DOOR LOCK / UNLOCK SWITCH(Note 4)	
DOOR LOCK ALL DOOR	X	O (Note 1)	O	X	O	O
DOOR UNLOCK ALL DOOR	X	O (Note 2)	O (ATWS=O)	X	O (ATWS=O)	O

NOTICE

1. *In case of KEY LOCK SWITCH becomes ON in OFF, driver seat UNLOCK KNOB is LOCK state or becomes LOCK in UNLOCK within 3 seconds and when IGN1 OFF (FROM BCM) & IGN2 OFF (FROM BCM) & is IGN2 OFF (DDM itself), achieve LOCK. (T 1 : 3S ± 500 mSs, T 2:0.5s ± 100 mSs)*



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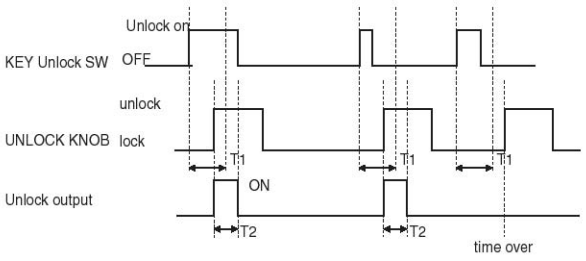
2. *When driver seat UNLOCK KNOB is UNLOCK state or becomes UNLOCK in LOCK within 3 seconds in case of KEY UNLOCK SWITCH becomes ON in OFF, achieve UNLOCK . (IGN 1/2 input disregard)*



SENBE7156L

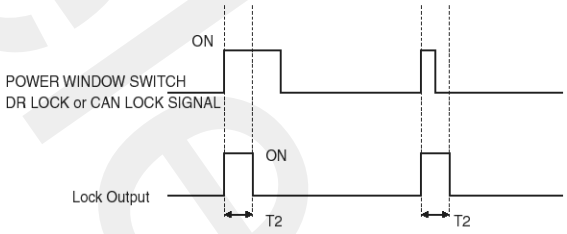
T1:3 Sed ± 500mS, T2:0.5Sec ± 100mS

3. *CAN LOCK/UNLOCK signal is same a below table.*

classification	Tx UNIT	CAN BIT
CAN LOCK	BCM	K LOCK=1
	Smart Key	(FOB1=1 or FOB2=1) & RKE LOCK=1
		(FOB1=1 or FOB2=1) & (Front Left P=1 or Front Right P=1) & P LOCK=1
CAN UNLOCK	BCM	K UNLOCK=1
	Smart Key	(FOB1=1 or FOB2=1) & RKE UNLOCK=1
		(FOB1=1 or FOB2=1) & (Front Left P=1 or Front Right P=1) & P UNLOCK=1

** FL : Front left, FR : Front right, RL : Rear left, RR : Rear right, FOB : Transmitter button*

** At DR LOCK in POWER WINDOW SWITCH or CAN LOCK signal reception,With UNLOCK KNOB state independently Lock output Display during 0.5S ± 0.1 secs. At DR UNLOCK in POWER WINDOW SWITCH or CAN UNLOCK signal reception Offer an Unlock output during 0.5 ± 0.1 secs independently with UNLOCK KNOB state. (IGN 1/2 input disregard)*



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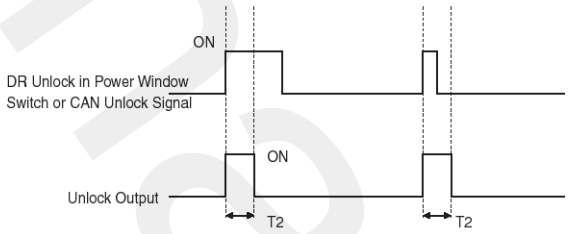


SENBE7158L

T2:0.5 Sec±100mS

3. CRASH UNLOCK

1) CONDITION 1

STATE	EVENT	ACTION
IGN1 ON(FROM BCM)	CRASH INPUT SIGNAL reception (FROM AIRBAG)	CRASH UNLOCK(CENTRAL) Output : 5±0.5sec

2) CONDITION 2

STATE	EVENT	ACTION
IGN1 ON(FROM BCM) and CRASH UNLOCK output: more than 5±0.5sec	One of the DS, AS, RL, RR KNOB is changed from UNLOCK state to LOCK state	CRASH UNLOCK Output: 5±0.5sec

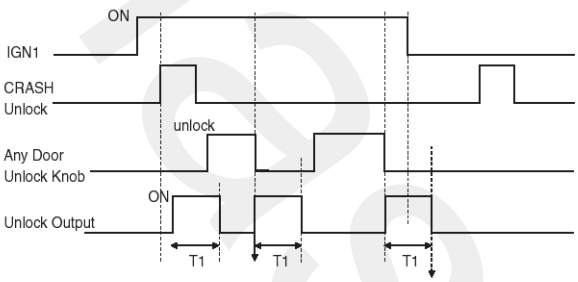
3) CONDITION 3

STATE	EVENT	ACTION
IGN1 ON(FROM BCM) and CRASH UNLOCK output: more than 5±0.5sec	CENTRAL DOOR LOCK SWITCH is ON STATE at P/WDW MAIN and ASSIST SWITCH	CENTRAL DOOR LOCK FUNCTION is not operated

4) CONDITION 4

STATE	EVENT	ACTION
IGN1 ON(FROM BCM) and CRASH UNLOCK output: more than 5±0.5sec	We have the situation change at IGN1 ON to OFF.	CRASH UNLOCK Output: 5±0.5sec

5) Ignore in case is changed by UNLOCK→ LOCK DOOR among CRASH OUTPUT 5 seconds output.



SENBE7159L

T1:5±0.5sec

6) Do not re-output after outputing crash-unlock for 5 seconds state at Knob Lock input in Unlock output. That is, in IGN1 On state When change by Lock in Knob Unlock state after Crash Unlock generating power, execute re-output.

4. AUTO DOOR LOCK

1) It selecting one among AUTO DOOR LOCK (connecting to vehicle speed), AUTO DOOR LOCK (connecting to a speed lever), AUTO DOOR LOCK (not application) , using breakdown diagnosis, driver can use AUTO DOOR LOCK function. (At the first by AUTO DOOR LOCK (connecting to vehicle speed) and AUTO DOOR LOCK (not application) in North America. act and AUTO DOOR LOCK (connecting to a speed lever)function Is applied in North America.)

5. CONNECTING A VEHICLE SPEED, AUTO DOOR LOCK

1) When the IGN1 is ON, if the vehicle speed is changed over 40km/h from under (the signal shall be transferred to CAN from BCM), and if one door lock switch of the all door lock switch (FL, FR, RL, and RR) is UNLOCK, then the LOCK signal shall be output. (0.5±0.1 sec), If one door lock switch of the all door lock switch (FL, FR, RL, and RR) is UNLOCK after LOCK signal is output, the LOCK OUTPUT (ON for 0.5±0.1sec, OFF for 0.5±0.1sec) shall be output at most 3 times (totally 4 times).

After that, if any one door lock switch is UNLOCK, then an append output shall not be performed, but if the vehicle speed is changed over 40km/h from under or if the IGN is ON from OFF(a vehicle speed hold over 40), then the auto door lock function shall be restarted. When all Door Knob is Unlock arter optput, it operates again(retry) only of IGN1 Off→ON.

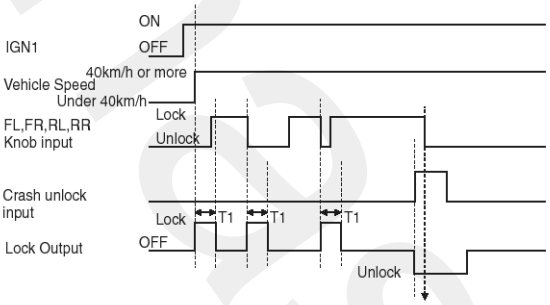
2) After 1) operation, if the vehicle speed is changed over 40km/h from under and if one door unlock switch of the all door unlock switch is UNLOCK, then the LOCK signal shall be output After that, if any one door lock switch is UNLOCK, then an append output shall not be performed, but if the vehicle speed is changed over 40km/h from under or if the IGN is ON from OFF(a vehicle speed hold over 40), then the auto door lock function shall be restarted. When all Door Knob is Unlock arter optput, it operates again(retry) only of IGN1 Off→ON.

3) AUTO DOOR LOCK function is prior in KEY REMINDER function.

4) CRASH UNLOCK's condition does not achieve AUTO DOOR LOCK. After this, when it's chaging IGN OFF→ ON, it achieve AUTO DOOR LOCK function.

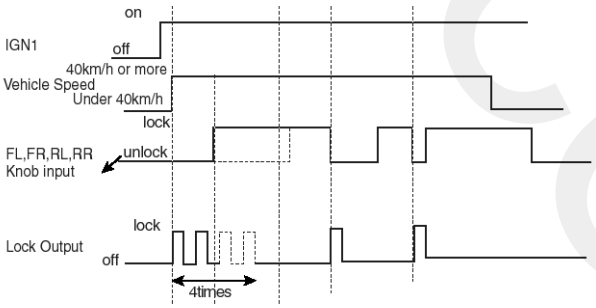
5) Vehicle speed is 20km/h (FROM BCM) love in North America specification.

6) TIME CHART



SENBE7160L

T1 : 0.5 ± 0.1sec.



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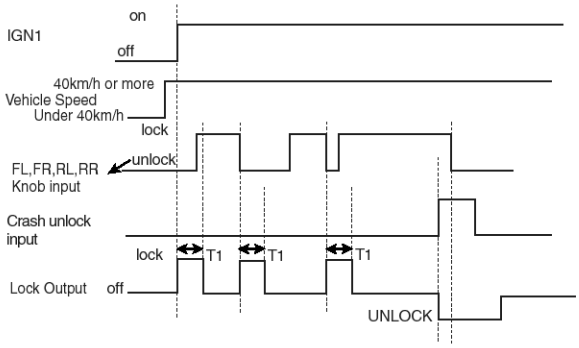

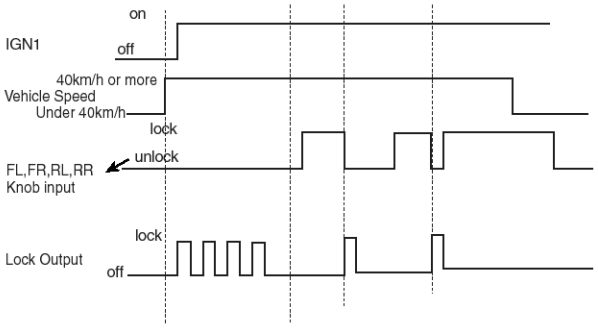

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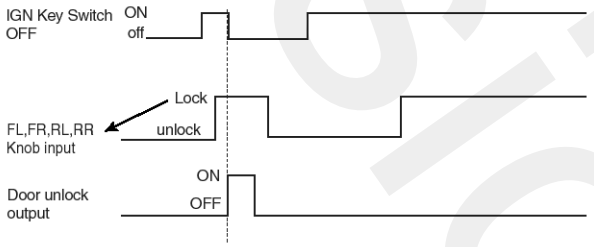
6. AUTO DOOR UNLOCK

1) It selecting one among AUTO DOOR UNLOCK (connecting to driver's seat), AUTO DOOR UNLOCK (taking out the key), AUTO DOOR UNLOCK (connecting to a speed lever), AUTO DOOR UNLOCK (not application), using breakdown diagnosis, driver can use AUTO DOOR UNLOCK function. (Default acts by AUTO DOOR UNLOCK (not application), and remembers selected function in CAN Message since. AUTO DOOR UNLOCK (connecting to a speed lever) function is applied in North America.)

7. AUTO DOOR UNLOCK (CONNECTING TO DRIVER'S SEAT)

1) It output UNLOCK in case of driver's DOOR UNLOCK KNOB change to UNLOCK from LOCK in all DOOR CLOSE states(0.5 ±0.1sec). AUTO DOOR UNLOCK(connecting to driver's seat) input condition at AUTO DOOR UNLOCK (CONNECTING TO A SPEED LEVER) output is ignored.

8. AUTO DOOR UNLOCK (TAKING OUT THE KEY)
   1) In IGN KEY SWITCH ON (KEY IN ON (BCM) or ACC ON (BCM) or IGN1 ON (BCM) or IGN2 ON (BCM) or IGN2 ON (DDM)) state, among all (FL, FR, RL, RR) DOOR UNLOCK KNOBs, if one DOOR LOCK is state that KEY is taken off (IGN KEY SW OFF (KEY IN OFF (BCM) & ACC OFF (BCM) & IGN1 OFF (BCM) & IGN2 OFF (BCM) & IGN2 OFF (DDM)) UNLOCK output. (0.5±0.1sec)



SENBE7164L

9. KEY REMINDER

- When the Door Warning Switch is ON (receiving state with CAN) and the FL door or FR door is opened (receiving state with CAN), the Door Lock function shall not be performed.

1) CONDITION 1

STATE	DESCRIPTION
INITIAL CONDITION	Key in & driver's door open & assist's door close
EVENT	Driver's door is changed from unlock to lock
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

2) CONDITION 2

STATE	DESCRIPTION
INITIAL CONDITION	Key in & driver's door close & assist's door open
EVENT	Assist's door is changed from unlock to lock
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

3) CONDITION 3

STATE	DESCRIPTION
INITIAL CONDITION	Key in & Driver's door open & Assist's door open
EVENT	Driver's door or Assist door is changed from unlock to lock
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

4) CONDITION 4

STATE	DESCRIPTION
INITIAL CONDITION	Key in & Driver's door lock
EVENT	Driver's door is OPEN
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

5) CONDITION 5

STATE	DESCRIPTION
INITIAL CONDITION	Key in & Assist's door lock
EVENT	Assist's door is OPEN
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

6) CONDITION 6

STATE	DESCRIPTION
INITIAL CONDITION	Driver's DOOR OPEN & Driver's DOOR LOCK
EVENT	KEY IN
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

7) CONDITION 7

STATE	DESCRIPTION
INITIAL CONDITION	Assist's DOOR OPEN, Assist's DOOR LOCK
EVENT	KEY IN
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

8) CONDITION 8

STATE	DESCRIPTION
INITIAL CONDITION	Driver's & Assist's DOOR OPEN , Driver's or Assist's DOOR LOCK
EVENT	KEY IN
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

9) CONDITION 9

STATE	DESCRIPTION
INITIAL CONDITION	KEY IN
EVENT	Within 0.5 sec after driver door close, if driver door unlock stats is changed to lock
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

10) CONDITION 10

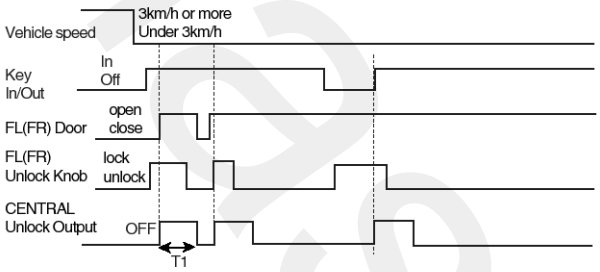
STATE	DESCRIPTION
INITIAL CONDITION	KEY IN
EVENT	Within 0.5 sec after assist door close, if assist door unlock stats is changed to lock
ACTION	CENTRAL DOOR UNLOCK FOR 1sec

11) After output of the UNLOCK (condition 1~10) if the FL Door Lock switch or FR Door Lock switch is still on LOCK, then the UNLOCK output comprising of the ON and OFF with the interval of 0.5 sec shall be performed at 3 times.

12) During 3 CYCLE repeats, output should be quitted in case of KEY is taken or DOOR KNOB state changes by UNLOCK , DOOR (FL or FR) that become LOCK becomes CLOSE (The quit at a next try)

13) After 3 CYCLE actions, It is not act more KEY REMINDER FUNCTION in case of keep LOCK state. It operate KEY REMINDER FUNCTION again in case of is KEY REMINDER condition after again. (at after there is DOOR CLOSE or KEY stripping or DOOR LOCK/UNLOCK Change of Condition back again KEY REMINDER condition appearance)

14) If the speed of vehicle is not less than 3 km/h (receiving state with CAN), then the Key Reminder shall not be operated.



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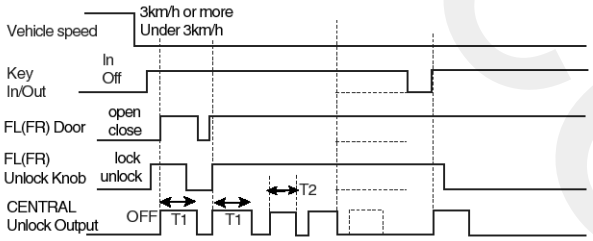


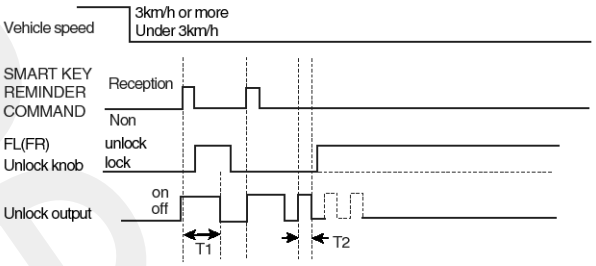
SENBE7166L

T1 : 1 ± 0.1sec, T2 : 0.5 ± 0.1sec.

10. KEY REMIDE FUNCTION BY SMART KEY

When a SMART KEY in the car and one door is open, if all door lock sw lock (judgement by pic), SMART KEY REMINDER COMMAND is received.(CAN communication reception-FROM PIC)

1) at the case of receiving SMART KEY REMINDER, operate UNLOCK output for 1 second.After UNLOCK output, when the state of FL DOOR LOCK SW or FR DOOR LOCK SW maintain the state of lock, operate unlock for interval of 0.5 second and make a pause of 3 times.
2) AT THE OUTPUT OF 3 TIMES, SUSPEND OUTPUT at the time of changing. (SUSPENDING NEXT TRY)
3) IF THE SPEED OF VEHICLE IS MORE THAN 3~5km/h (CAN COMMUNICATION RECEPTION), DON'T OPERATE KEY REMINDER.



SENBE7167L

T1 : 1 ± 0.1sec, T2 : 0.5 ± 0.1sec

11. DOOR LOCK/UNLOCK FUNCTION PRIORITY ORDER

1) DOOR LOCK/Unlock action priority rank ignores small.

2) Priority order is followed.

FUNCTION	PRIORITY
CRASH UNLOCK	1
AUTO DOOR LOCK/UNLOCK	2
KEY REMINDER	3
CENTRAL DOOR LOCK/UNLOCK	4

3) if there is equal output command during output Priority order same Door lock/unlock, input ignore. if there is contrast output command during output Priority order same Door lock/unlock, input ignore and present output immediately discontinue and executes output that is inputted after 100 ms(except CRASH UNLOCK, Without wating TIME 100 ms immediately action enforcement)

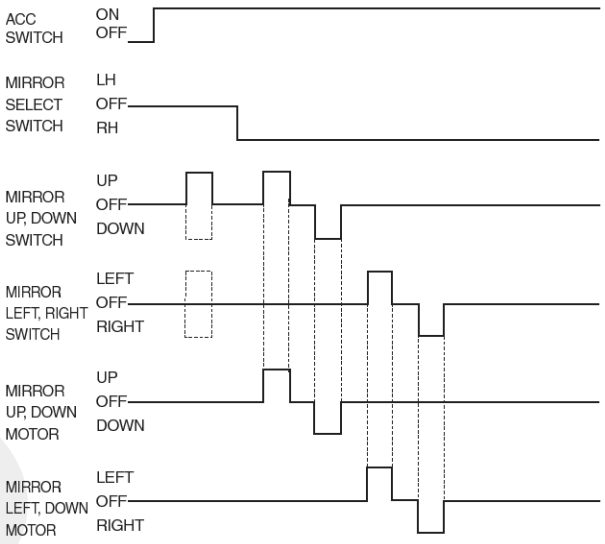
4) AT THE ACTIONES OF LOW PRIORITY ORDER, IF HIGH SIGNAL IS COMING IN, SUSPEND IMMEDIATELY AND OPERATE THE ACTION OF HIGH PRIORITY ORDER.

5) When was new output condition after existing output completion, send output after wait 100 ms by standard existing output completion point of time.(except CRASH UNLOCK, Without wating TIME 100 ms immediately action enforcement)

12. OUTSIDE MIRROR CONTROL BY MANUAL SWITCH

1) Manual Control for Outside Mirror LH

- At the ACC ON state, if the mirror select switch in the SW ASSY P/WDW MAIN is the LH state and the mirror direction switches (UP, DOWN, LEFT, and RIGHT) are operated, then the mirror motor shall be drive to control the mirror to the desired direction.



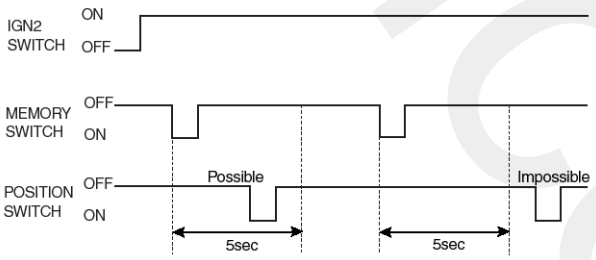
SENBE7169L

2) Manual Control for Outside Mirror RH

- At the ACC ON state, if the mirror select switch in the SW ASSY POWER WINDOW MAIN is the RH state and the mirror direction switches (UP, DOWN, LEFT, and RIGHT) are operated, then the driving signal shall be sent to the SW ASSY P/WDW MAIN through the CAN.

13. MEMORY OPERATION BY MEMORY SWITCH

1) If the position switch (POS1 or POS2) within 5 seconds after the memory switch is pushed at the ON state of the IGN2 (the switch module shall send the state signal through LIN), the present mirror position shall be memorized. (The 5-second duration from the ON state of the memory switch is the memory allowance period so that the allowance state shall be released if the 5 second duration is passed. That is, if the position switch (POS1 or POS2) is ON during the memory allowance period, then the present position shall be memorized.) Except, when the mirror manual switch at the LH is operated, the mirror position at RH shall not be memorized.



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2) The release of the memory allowance state shall be performed at any following condition that.
   - the 5 seconds are passed after the Memory switch is ON.
   - the IGN2 is ON.
   - the completing the Memory operation.
3) When at least two switches of the Memory switch, the POS1 switch, and the POS2 switch are pushed at the same, the signal input shall be ignored.
4) WHEN GETTING RID OF BATTERY, SAVE A MIRROR POSITION MEMORIED BY MEMORY SWITCH IN THE EEPROM.

14. REMINDER OPERATION BY MEMORY SWITCH

1) When the each position switch is pressed at the ON state of the IGN2, the mirror shall be positioned according to the memorized value.
2) If the position switch (POS1 or POS2) has not been memorized, then the reminding operation shall not be performed.
3) During reminding operation, if a position switch (POS1 or POS2) is pressed, then the latest pressed switch shall govern the reminding operation.
4) Prohibit Condition for the Reminding Operation
   - When the inhibit "P" switch is OFF.
   - When the IGN2 is OFF.
   - When the LH mirror switch is being operated.
   - When the speed of vehicle is over than 3 km.
   - When the Memory Stop switch is ON (IGN2 ON)

15. OUTSIDE MIRROR FAIL SAFE FUNCTION

1) If the sensor variation of 80㎷ and more is not occurred even there is an input variation from the position sensor when motor is driven, it shall be considered as occurring defects such as the harness disconnection, the motor failure, or the sensor malfunction so that the auto control operation should be quitted.
2) The mirror driving signal should not output over 15 seconds continuously.

   (Both the memory reminding and the manual switching operation)
3) Monitoring the Reminding Operation Time

   If the reminding operation does not complete within 40 seconds after starting, the output of the mirror motor should be quitted and the reminding operation should be finished.

16. OUTSIDE MIRROR DOWN OPERATION AT REVERSING (AUTO REVERS)

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
1	BASIC OPERATION	IGN	LH	NOT-R	A POS.	B POS.	SHIFT LEVER NOT-R→R	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
2		IGN	RH	NOT-R	A POS.	B POS.	SHIFT LEVER NOT-R → R	MIR L:NO CHANGE. MIR R:AUTO REVERSE TO (B-5°) POS.
3		IGN	N	NOT-R	A POS.	B POS.	SHIFT LEVER NOT-R →R	MIR L:NO CHANGE MIR R:NO CHANGE
4	RETURN AFTER BASIC OPERATION	IGN	LH	R	RESULT OF 1	RESULT OF 1	SHIFT LEVER R→ NOT-R	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
5		IGN	RH	R	A POS.	RESULT OF 2	SHIFT LEVER R→ NOT-R	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
6	MIRROR SWITCH IS OPERATED DURING AUTO REVERSE	IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	MIRROR SWITCH CONTROL	MIR L:BY MIRROR SWITCH OPERATION MIR R:AUTO REVERSE TO (B-5°) POS
7		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	MIRROR SWITCH CONTROL	MIR L:NO CHANGE MIR R:BY MIRROR SWITCH OPERATION
8	RECEIVE RETURN SIGNAL AFTER MIRROR SWITCH CONTROL DURING AUTOREVERSE	IGN	LH	R	COMPLETE FUN.6	COMPLETE FUN.6	SHIFT LEVER R→ NOT-R	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
9		IGN	RH	R	A POS.	COMPLETE FUN.7	SHIFT LEVER R→ NOT-R	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
10	MIRROR SWITCH IS OPERATED DURING RETURN TO ORIGIN	IGN	LH	R→NOT-R	DURING FUNC. 4	DURING FUNC. 4	MIRROR SWITCH CONTROL	MIR L:BY MIRROR SWITCH OPERATION MIR R:RETURN TO (B) POSITION
11		IGN	RH	R→NOT-R	A POS.	DURING FUNC. 5	MIRROR SWITCH CONTROL	MIR L:NO CHANGE MIR R:BY MIRROR SWITCH OPERATION
12	SELECT SWITCH IS CHANGED DURING AUTO REVE RSE	IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	CHANGE SELECT SWITCH TO N	MIR L:RETURN TO (A) POSITION AFTER 500ms MIR R:RETURN TO (B) POSITION AFTER 500ms
13		IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	SELECT SWITCH LH→N (WITHIN 500 ms)→RH	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
14		IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	SELECT SWITCH LH→N (AFTER 500ms)→RH	MIR L:RETURN TO (A) POSITION MIR R:AUTO REVERSE TO (B-5°) POS
15		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	CHANGE SELECT SWITCH TO N	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION AFTER 500ms
16		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	SELECT SWITCH RH→N→LH	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
17		IGN	N	NOT-R → R	A POS.	B POS.	SELECT SWITCH N→LH	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
18		IGN	N	NOT-R → R	A POS.	B POS.	SELECT SWITCH N→LH	MIR L:NO CHANGE MIR R:AUTO REVERSE TO (B-5°) POS
19	IGN OFF DURING AUTO REVE RSE	IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	IGN→ACC OR B+	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
20		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	IGN→ACC OR B+	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
21	IGN OFF AFTER COMPLETING AUTO REVERSE	IGN	LH	NOT-R → R	COMPLETE FUN.1	COMPLETE FUN.1	IGN→ACC OR B+	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
22		IGN	RH	NOT-R → R	A POS.	COMPLETE FUN.2	IGN→ACC OR B+	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
23	IGN OFF DURING RETURN TO ORIGIN	IGN	LH	R → NOT-R	DURING FUNC. 4	DURING FUNC. 4	IGN→ACC OR B+	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
24		IGN	RH	R → NOT-R	A POS.	DURING FUNC. 5	IGN→ACC OR B+	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
25	IGN IS ON DURING RETURN TO ORIGIN BY BEING OFF OF IGN	IGN→ ACC OR B+	LH	R	DURING FUNC. 23	DURING FUNC. 23	(SHIFT LEVER R→ NOT-R) AND NEXT (ACC OR B+→ IGN)	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
26		IGN→ ACC OR B+	LH	R	DURING FUNC. 23	DURING FUNC. 23	ACC OR B+ → IGN	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
27		IGN→ ACC OR B+	RH	R	A POS.	DURING FUNC. 24	(SHIFT LEVER R→ NOT-R) AND NEXT (ACC OR B+→ IGN)	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
28		IGN→ ACC OR B+	RH	R	A POS.	DURING FUNC. 24	ACC OR B+ → IGN	MIR L:NO CHANGE MIR R:AUTO REVERSE TO (B-5°) POS.
29	IN CASE OF IMS-POSITION SWITCH INPUT DURING MIRROR REVERSE OPERATION, IF IN INHIBIT CONDITION THEN OPERATING THE RETURN ACTS ELSE IN PLAY BACK CONDITION THEN REPLAY ACTS.							
30	THE POSITION A,B OF MIRROR IS OPERATED BY MIRROR SWITCH OR BY IMS MEMORIZED.							
31	IF THE CURRENT POSITION OF MIRROR IS DIFFERENT FROM MEMORIZED A,B IN CLAUSE 30 WHEN IGN ON→OFF, IT'S RECOVERED TO MIR L: (A).R: (B) POSITION.							
32	IGN ON STATUS, IF THE CURRENT POSITION OF MIRROR IS DIFFERENT FROM MEMORIZED A,B IN CLAUSE 30 WHEN MIRROR SELECT SW IS CHANGED TO LH→N OR RH→N, IT'S RECOVERED TO MIR L: (A).R: (B) POSITION.							
33	IN CASE OF CHANGING 'R' '0' → '1', OPERATION IS DONE AFTER 350 ± 50 msec.							

Assist Door Module (ADM)

Description

The POWER WINDOW ASSIST SWITCH ASSY shall be one component of the CAN SYSTEM. The SWITCH ASSY POWER WINDOW ASSIT shall communicate through CAN with the BCM, the SEAT ECU, the TILT ECU, the SWITCH ASSY POWER WINDOW MAIN.

1. POWER WINDOW OPERATIOPN BY BUTTON

   The SIDE P/WMW BUTTON shall output signal to the 2 operations of the Manual UP/DOWN

2. PASSIVE OPERATION OF MIRROR'S POSITION BY MANUAL SW (UP, DOWN, LEFT, RIGHT)

   THE RECEIPT FROM P/WDW MAIN SW WITH CAN COMMUNICATION

3. THE MEMORY AND REMINDING OPERATION FOR POSITIONING THE MIRROR USING MEMORY SWITCH(FOR 2 PASSENGERS)

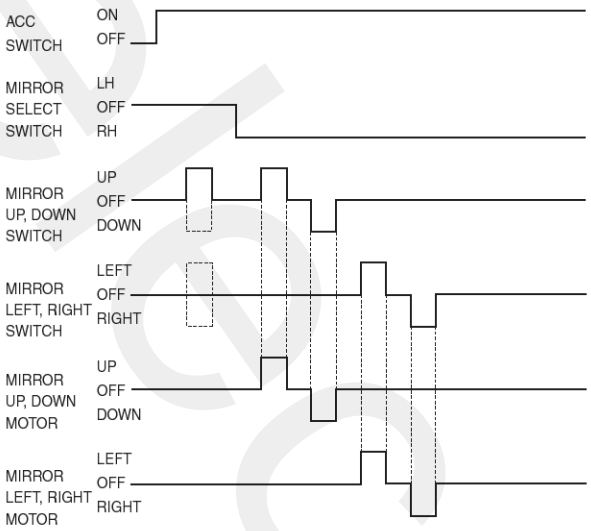
   THE RECEIPT FROM P/WDW MAIN SW WITH CAN COMMUNICATION

4. RECEIPT BY CENTRAL DOOR LOCK/UNLOCK BUTTON OPERATION WITH CAN COMMUNICATION

5. CONTAINMENT AND RETURN FUNCTION OF OUTSIDE MIRROR

Control Function

1. POWER WINDOW CONTROL
   1) POWER WINDOW Operating condition
      - POWER WINDOW LOCK SW(FROM DDM) OFF & POWER WINDOW TIMER(FROM BCM) ON or IGN2(ADM) ON
   2) POWER WINDOW UP/DOWN operating
      - Receiving P/WDW UP/DOWN (FROM DDM or ADM itself) signal input under POWER WINDOW drive condition, Run assist's POWER WINDOW. Can not be outputed more than 15 seconds by same one-way only.
2. OUTSIDE MIRROR CONTROL BY MANUAL SWITCH
   1) ASSIST SIDE OUTSIDE MIRROR OPERATION
      - The ACC ON state, if the mirror select switch in DDM is the RH state and the mirror direction switches (UP, DOWN, LEFT, and RIGHT) are operated, then the mirror motor shall be drive to control the mirror to the desired direction by receiving CAN msg. At this time, Up/Down direction conversion or Right/Left direction conversion, it have 100 ms Delay Times.



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3. OUTSIDE MIRROR MEMORY OPERATION BY MEMORY SWITCH
   1) AFTER RECEPTION FROM THE P/WDW MAIN SW WITH CAN COMMUNICATION, MEMORIZE ASSIST SIDE O/S MIRROR POSITION.

      Except, when the mirror manual switch at the RH is operated, the mirror position at RH shall not be memorized.
   2) WHEN GETTING RID OF BATTERY, SAVE THE MIRROR POSITION MEMORIED BY MEMORY SWITCH TO EEPROM.
4. OUTSIDE MIRROR REMINDING OPERATION BY MEMORY SWITCH
   1) Drive MIRROR reminding to position that is remembered if receive MIRROR reminding request (CAN) from DDM in IGN2 ON state.
   2) Reminding operation of position that is not remembered is not operation.
   3) It act reminding to position that is required lastly if it receive reminding request (FROM DDM) of different position during reminding operation.
   4) Reminding prohibition condition
      - INHIBIT "P" SW(FROM IMS) is OFF
      - IGN2 OFF
      - RH side MIRROR MANUAL SW's manufacturing (FROM DDM) is occured
      - vehicle speed is more than 3 Km/h (FROM BCM)
5. OUTSIDE MIRROR FAIL SAFE FUNCTION
   1) If the sensor variation of 80㎷ and more is not occurred even there is an input variation from the position sensor when motor is driven, it shall be considered as occurring defects such as the harness disconnection, the motor failure, or the sensor malfunction so that the auto control operation should be quitted.
   2) The mirror driving signal should not output over 15 seconds continuously. (Both the memory reminding and the manual switching operation)
   3) Monitoring the Reminding Operation Time. If the reminding operation does not complete within 40 seconds after starting, the output of the mirror motor should be quitted and the reminding operation should be finished.

6. OUTSIDE MIRROR DOWN OPERATION AT REVERSING (AUTO REVERS)

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
1	BASIC OPERATION	IGN	LH	NOT-R	A POS.	B POS.	SHIFT LEVER NOT-R→R	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
2		IGN	RH	NOT-R	A POS.	B POS.	SHIFT LEVER NOT-R → R	MIR L:NO CHANGE. MIR R:AUTO REVERSE TO (B-5°) POS.
3		IGN	N	NOT-R	A POS.	B POS.	SHIFT LEVER NOT-R →R	MIR L:NO CHANGE MIR R:NO CHANGE
4	RETURN AFTER BASIC OPERATION	IGN	LH	R	RESULT OF 1	RESULT OF 1	SHIFT LEVER R→ NOT-R	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
5		IGN	RH	R	A POS.	RESULT OF 2	SHIFT LEVER R→ NOT-R	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
6	MIRROR SWITCH IS OPERATED DURING AUTO REVE RSE	IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	MIRROR SWITCH CONTROL	MIR L:BY MIRROR SWITCH OPERATION MIR R:AUTO REVERSE TO (B-5°) POS
7		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	MIRROR SWITCH CONTROL	MIR L:NO CHANGE MIR R:BY MIRROR SWITCH OPERATION
8	RECEIVE RETURN SIGNAL AFTER MIRROR SWITCH CONTROL DURING AUTO REVE RSE	IGN	LH	R	COMPLETE FUN.6	COMPLETE FUN.6	SHIFT LEVER R→ NOT-R	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
9		IGN	RH	R	A POS.	COMPLETE FUN.7	SHIFT LEVER R→ NOT-R	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
10	MIRROR SWITCH IS OPERATED DURING RETURN TO ORIGIN	IGN	LH	R→ N-OT-R	DURING FUNC. 4	DURING FUNC. 4	MIRROR SWITCH CONTROL	MIR L:BY MIRROR SWITCH OPERATION MIR R:RETURN TO (B) POSITION
11		IGN	RH	R→ N-OT-R	A POS.	DURING FUNC. 5	MIRROR SWITCH CONTROL	MIR L:NO CHANGE MIR R:BY MIRROR SWITCH OPERATION
12	SELECT SWITCH IS CHANGED DURING AUTO REVE RSE	IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	CHANGE SELECT SWITCH TO N	MIR L:RETURN TO (A) POSITION AFTER 500ms MIR R:RETURN TO (B) POSITION AFTER 500ms
13		IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	SELECT SWITCH LH→N (WITHIN 500 ms)→RH	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
14		IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	SELECT SWITCH LH→N (AFTER 500 ms)→RH	MIR L:RETURN TO (A) POSITION MIR R:AUTO REVERSE TO (B-5°) POS
15		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	CHANGE SELECT SWITCH TO N	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION AFTER 500ms
16		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	SELECT SWITCH RH→N→LH	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
17		IGN	N	NOT-R → R	A POS.	B POS.	SELECT SWITCH N→LH	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
18		IGN	N	NOT-R → R	A POS.	B POS.	SELECT SWITCH N→LH	MIR L:NO CHANGE MIR R:AUTO REVERSE TO (B-5°) POS
19	IGN OFF DURING AUTO REVE RSE	IGN	LH	NOT-R → R	DURING FUNC. 1	DURING FUNC. 1	IGN→ACC OR B+	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
20		IGN	RH	NOT-R → R	A POS.	DURING FUNC. 2	IGN→ACC OR B+	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
21	IGN OFF AFTER COMPLETING AUTO REVERSE	IGN	LH	NOT-R → R	COMPLETE FUN.1	COMPLETE FUN.1	IGN→ACC OR B+	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
22		IGN	RH	NOT-R → R	A POS.	COMPLETE FUN.2	IGN→ACC OR B+	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
23	IGN OFF DURING RETURN TO ORIGIN	IGN	LH	R → NOT-R	DURING FUNC. 4	DURING FUNC. 4	IGN→ACC OR B+	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
24		IGN	RH	R → NOT-R	A POS.	DURING FUNC. 5	IGN→ACC OR B+	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
25	IGN IS ON DURING RETURN TO ORIGIN BY BEING OFF OF IGN	IGN →ACC OR B+	LH	R	DURING FUNC. 23	DURING FUNC. 23	(SHIFT LEVER R→ NOT-R) AND NEXT (ACC OR B+ →IGN)	MIR L:RETURN TO (A) POSITION MIR R:RETURN TO (B) POSITION
26		IGN →ACC OR B+	LH	R	DURING FUNC. 23	DURING FUNC. 23	ACC OR B+ →IGN	MIR L:AUTO REVERSE TO (A-5°) POS. MIR R:AUTO REVERSE TO (B-5°) POS.
27		IGN →ACC OR B+	RH	R	A POS.	DURING FUNC. 24	(SHIFT LEVER R→ NOT-R) AND NEXT (ACC OR B+ →IGN)	MIR L:NO CHANGE MIR R:RETURN TO (B) POSITION
28		IGN →ACC OR B+	RH	R	A POS.	DURING FUNC. 24	ACC OR B+ →IGN	MIR L:NO CHANGE MIR R:AUTO REVERSE TO (B-5°) POS.
29	IN CASE OF IMS-POSITION SWITCH INPUT DURING MIRROR REVERSE OPERATION, IF IN INHIBIT CONDITION THEN OPERATING THE RETURN ACTS ELSE IN PLAY BACK CONDITION THEN REPLAY ACTS.							
30	THE POSITION A,B OF MIRROR IS OPERATED BY MIRROR SWITCH OR BY IMS MEMORIZED.							
31	IF THE CURRENT POSITION OF MIRROR IS DIFFERENT FROM MEMORIZED A,B IN CLAUSE 30 WHEN IGN ON→OFF, IT'S RECOVERED TO MIR L: (A).R: (B) POSITION.							
32	IGN ON STATUS, IF THE CURRENT POSITION OF MIRROR IS DIFFERENT FROM MEMORIZED A,B IN CLAUSE 30 WHEN MIRROR SELECT SW IS CHANGED TO LH→N OR RH→N, IT'S RECOVERED TO MIR L: (A).R: (B) POSITION.							

NO	NAME OF OPERATION	POWER	SELECT SW	SHIFT LEVER	MIR POSITION		MANUAL CONTROL	RESULT
					L	R		
33	IN CASE OF CHANGING 'R' '0' → '1', OPERATION IS DONE AFTER 350 ± 50 msec.							