#### Body Electrical System > General Information > 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 EE group - "Battery")

#### NOTE

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

#### **Handling Connectors**

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



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



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



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



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



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



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



#### Handling Wires And Harnesses

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



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



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



#### **Testing And Repairs**

- 1. Do not use wires or harnesses with broken insulation.
  - Replace them or repair them by wrapping the break with electrical tape.
- 2. After installing parts, make sure that no wires are pinched under them.
- 3. When using electrical test equipment, follow the manufacturer's instructions and those described in this manual.
- 4. If possible, insert the remover tool from the wire side (except waterproof connector).



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

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



#### **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.

#### Body Electrical System > Audio > Specifications

Specification

#### Audio

ltem		Specification		
Model		RADIO/CD/MP3/XM (PA710S)	RADIO/6CDC/MP3/XM (PA760S, PA760S RSE)	
Power suppl	у	DC 1	4.4V	
Rated output		Max 43W x 4	Max 3.2Vrms	
Antenna		80PF 75Ω		
Tuning type		PLL synthesized type		
External amplifier & sub woofer		Internal amplifier	External amplifier (12 CH) & subwoofer & surround	
		-	RSE	
Frequency range / Channel	FM	87.5 ~ 107.9 MHz/200 KHz		
space	AM	530 ~ 1710 KHz/10 KHz		

#### XM : Satellite Radio

## RSE : Rear Seat Entertainment **Speaker & External Amplifier**

ltem		PA710S	PA760S	PA760S RSE
	Front	MAX 50W	40	40
	Rear	MAX 50W	40	40
Input Power	Tweeter	MAX 50W	50	20
(W or V)	Front center	-	32	32
	Tailgate	-	-	32
	Sub woofer	-	50	64
	Front	4.0 ± 0.5	2 ± 0.4	2 ± 0.4
	Rear	4.0 ± 0.5	2 ± 0.4	2 ± 0.4
Speaker	Tweeter	4.0 ± 0.5	4 ± 0.8	4 ± 0.8
mpedance (Ω)	Front center	-	-	2.15 ± 0.25
	Tailgate	-	-	2.15 ± 0.25
	Sub woofer	-	2.0 ± 0.3	1.4 ± 0.25
Speaker	Number	6	7	10
	Power supply	DC 14.4V	DC 14.4V	DC 14.4V
External Amplifier	Output power	MAX 43W x 4	MAX 310W (55W x 4CH + 45W x 2CH)	MAX 660W (55W x 12CH)
	Speaker Impedance (Ω)	4Ω x 6	2Ω x 5 + 4Ω x 2	2Ω x 4 + 2.15Ω x 3 + 4Ω x 2 + 1.4Ω x 1

## Body Electrical System > Audio > Components and Components Location

## **Component Location**



\* SDARS : Satellite Digital Audio Radio Service

## Body Electrical System > Audio > Audio Unit > Components and Components Location

## Components





#### [RADIO/MP3/CDC(PA760 RSE)]







NO	Connector A	Connector B	Connector C1	Connector C2	Connector C3
1	Vehicle speed	Rear right speaker(+)	MIC + (Bluetooth)	AUX input(R)	Surround
2	Illumination (+)	Front right speaker(+)	MIC - (Bluetooth)	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 VDD
8	Ground(Power)	Rear left speaker(-)			-

Connector D	Pin	Name	Pin	Name
	1	-	13	-
	2	-	14	RSE R ch out
	3	-	15	-
	4	-	16	RSE out ground
	5	-	17	-
10034667890000	6	RSE L ch in	18	RSE L ch out
. 13131617617822222	7	-	19	-
(Lininini)	8	RSE in ground	20	-
	9	RSE R ch in	21	RSE reset
	10	RSE DET	22	-
	11	-	23	-
	12	-	24	-

**External Amp** 



## Body Electrical System > Audio > Audio Unit > Repair procedures

#### Inspection

#### **CD** changer operation instructions

#### NOTE

- CD changer operation instructions may be somewhat different according to the CD changer model. The following method is just one example.



1. Press and release LOAD button.

#### CAUTION

- Be sure to press LOAD to open the CD slot. If feeding a CD into the slot by force, it may cause damage to the CD changer.
- 2. After "WAIT" is displayed on the LCD, the CD slot will open with "LOAD" displayed on the LCD.
- 3. Insert a CD. The player will pull the disc in and begin to play automatically.

#### CAUTION

- CD can be inserted only while "LOAD" is blinking on the LCD and the CD slot indicator is flashing.
- CD must be inserted with the label facing upward.
- This CD player is suitable only for 12cm discs. DO NOT use irregular shaped CDs.
- 4. To insert multiple discs, press and hold LOAD button for more than 0.8 seconds. A beep sound will be heard and it will let you load CDs into all of the slots in which no CD has been loaded.

#### CAUTION

- This CD player takes up to 6 discs. DO NOT try to load more than six.

#### CD changer improper operation cases

If inserting a CD into the CD slot by force, the CD door behind the slot may be broken or separated from the head. It will cause the CD player not to work. Be sure to press LOAD button before inserting a CD.

CDs jammed in the CD player deck

DO NOT insert foreign substances like coins or tickets into the CD player. It may cause damage to the CD player.

#### Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the crash pad center grill (A). (Refer to the BD group - "Crash pad")



3. Remove the crash pad center lower garnish (A).



4. Remove the center facia panel (A) after loosening the screws. (Refer to the BD group - "Crash pad")



- 5. Remove the connectors.
- 6. Remove the mounting bolts then remove the audio unit (A).



- 7. Remove the audio unit after disconnecting the audio connectors and cable.
- 8. Installation is the reverse of removal.

#### Inspection

- 1. Troubleshooting for Speaker
  - (1) Basic inspection of speaker

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



(2) Case Troubleshooting

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

#### CAUTION

- During handling of speakers.
- Do not damage the speaker with impact as like a drop or a throw.
- Be careful not to cover water and oil over the speaker.
- Caution during handling of speaker the material of diaphragm is paper which can easity to be torn by impact made out of and external force.
- Modifying audio system can electrically damage the speaker.
- If modified, the speakers are not covered by the manufacturer's warranty.

#### Replacement

#### **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.



3. Installation is the reverse of removal.

#### **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.



3. Installation is the reverse of removal.

#### **Crash Pad Speaker**

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



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



3. Installation is the reverse of removal.

## **Tailgate Speaker**

- 1. Remove the tailgate trim. (Refer to the BD group - "Tailgate")
- 2. Remove the tailgate speaker (A) after loosening 2 bolts.



## **External Amplifier**

- 1. Remove the front passenger seat after removing the 4 bolts and disconnecting the connector (Refer to the BD group "Front seat")
- 2. Remove the external amplifier (A) under the front passenger seat after removing the 3 bolts.



3. Installation is the reverse of removal.

#### **Tweeter Speaker**

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



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



3. Installation is the reverse of removal.

#### **Woofer Speaker**

- 1. Remove the left luggage side trim. (Refer to the BD group - "Rear seat")
- 2. Remove the woofer speaker (A) after removing 4 bolts and disconnecting the connector.



3. Installation is the reverse of removal.

#### Body Electrical System > Audio > Antenna > Repair procedures

#### 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.



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



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



## Replacement

- 1. Remove the rear roof trim. (Refer to the BD group - "Roof trim")
- 2. Disconnect the antenna connectors (2EA) to the feeder cable connectors.





- 3. Disconnect the 1P power connector from the roof antenna.
- 4. Remove the SDARS roof antenna from the roof panel hole after loosening a nut.



5. Installation is the reverse of removal.

## Body Electrical System > Audio > Audio Remote control > Schematic Diagrams

## **Circuit Diagram**



## Body Electrical System > Audio > Audio Remote control > Repair procedures

#### Inspection

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



[Audio + Voice]

Switch	Connector terminal	Resistance (±5%)
Voice	3 - 4 (LH)	10.7 kΩ
Volume down	3 - 4 (LH)	6.81 kΩ
Volume up	3 - 4 (LH)	4.61 kΩ
Mode	3 - 4 (LH)	2.11 kΩ
Seek down	3 - 4 (LH)	1.11 kΩ
Seek up	3 - 4 (LH)	430 Ω

#### Replacement

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



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



4. Installation is the reverse order of removal.

# Body Electrical System > Audio > Multimedia jack > Components and Components Location

#### Components

[AUX, USB	, iPod] [Jack Conn	ector]	[iPod Cable]	
T T	USB IPod AUX Connecto	Dr A		Connector B Connector C Connector D
Name	Multi-media Jack Connector A (USB/AUX/iPod)	USB Connector B	AUX Connector C	iPod Connector D
Connec tor	0230 560			
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
1/				-
18				HX TV
19				
20				GND
21				-
22				- Vidoo
23				Video
24				-
25				
20				
27				
20				Audio BEE
30				Signal wire GND

## Body Electrical System > Audio > Multimedia jack > Schematic Diagrams

## Circuit Diagram



## Body Electrical System > Audio > Multimedia jack > Description and Operation

#### 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.



## Body Electrical System > Audio > Multimedia jack > Repair procedures

#### Removal

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



3. Remove the console under cover connectors(A).



4. Remove the console under cover (A).



5. Remove the multimedia jack from the console under cover.

#### 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.

## Body Electrical System > Audio > Troubleshooting

## 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	<ul> <li>□ Will not play</li> <li>□ Weak</li> <li>□ Squealing noise</li> <li>□ Display/illumination poor</li> <li>□ CD skips &amp; jumps</li> <li>□ CD will not eject or insert</li> <li>□ Others (Describe) :</li> </ul>		
OTHERS	<ul> <li>Customer complaint contents :</li> <li>Have you checked customer's defects :</li> </ul>		
Using the customer complaint analysis check sheet for reference, ask the customer for as much detail as possible about the problem.			

There are 5 areas where a problem can occur: wiring harness, the radio, the CD player, antenna and speaker. Troubleshooting enables you to confine the problem to a particular area.



Chart 1





#### Chart 2



Chart 3



Chart 4



3. CD SOUND SK	(IPS						
1) Sound sometime	1) Sound sometimes skips when parking.						
Is CD face scratc	hed or dirty?	Yes	CD is defective, or clean CD.				
	No						
Does it play prope with an existing pr	rly if CD is replaced oper CD ?	No	Repair or replace CD player.				
	Yes	_					
Replace CD.							
<ul> <li>2) Sound sometimes skips when driving.</li> <li>(Stop vehicle, and check it.)</li> <li>(Check by using a CD which is free of scratches, dirt or other damage.)</li> </ul>							
Does sound skip when the side of the CD player is tapped ?     No     Check for skipping while driving and contact a service shop.							
	Yes	-					
Securely mount the	ne CD player.	]					





#### Chart 6



#### Chart 7



#### Body Electrical System > Multifunction switch > Specifications

#### **Specifications**

	Items	Specifications	
Rated voltage		DC 12V	
Operating temperature	range	-30°C ~ +80°C (-22 ~ +176°F)	
Rated load	Dimmer & passing switch	High : 1A (Relay load) Low : 1A (Relay load) Passing : 1A (Relay load)	
	Lighting switch	Lighting : 1A (Relay load)	
	Turn signal switch	6.6 ± 0.5A (Lamp load)	
	Wiper & mist switch	Low, High : 4A (Motor load) Intermittent : 0.22 ± 0.05A (Relay load) Lock : Max. 23A (Motor load) Mist : 4A (Motor load)	
	Washer switch	4A (Motor load)	
	Variable intermittent volume switch	Max. 25mA	
	Rear wiper & washer switch	Rear wiper : 200mA (Relay load) Rear washer : 4A (Motor load)	

#### Body Electrical System > Multifunction switch > Components and Components Location

#### Component



## Body Electrical System > Multifunction switch > Repair procedures

#### Inspection

#### **Lighting Switch Inspection**

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



## Lighting Switch (Auto Light)

Terminal Position	14	15	16	17
OFF				
I	0			-0
Ш	0	_0_		_0
AUTO			0	_0

## **Lighting Switch**

Terminal Position	14	15	16	17
OFF				
I	0			-0
Ш	0	_0_	_0_	_0

## **Dimmer And Passing Switch**

Terminal Position	1	2	10	11
HU		0		_0
HL			0	-0
Р	$\sim$			_0

HU: Head lamp high beam

- HL: Head lamp low beam
- P : Head lamp passing switch

## **Turn Signal Switch**

Hazard	Terminal Turn signal switch	7	8	9
	L		<u> </u>	_0
OFF	N			
	R	<u> </u>	_0	

## Wiper And Washer Switch Inspection

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


## Wiper Switch

[RAIN SENSOR]								
Terminal Position	1	2	3	4	5	6	13	14
MIST		0	0	0-	-0			
OFF		0-	0					
AUTO		0-	0		0	0	্প	<b>*</b> 0
LOW		0-			-0			
н	0-				ю			

## [STANDARD]

Terminal Position	1	2	3	4	5	6	13	14
MIST		0-	-0	0-	-0			
OFF		0-	-0					
INT		0-	-0		0-	-0	<b>`</b>	<b>*</b> 0
LOW		0-			-0			
н	0-				ю			

## Washer Switch

Terminal Position	5	7
OFF		
ON	0	O

## **Rear Wiper & Washer Switch**

Terminal Position	9	11	12
Rear washer	0		O
OFF			
ON	0	-0	
Rear washer	0		O

## Replacement

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



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



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



5. Installation is the reverse of removal.

## Body Electrical System > Horn > Components and Components Location

## **Component Location**



## Body Electrical System > Horn > Repair procedures

## Replacement

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).



3. Installation is the reverse of removal.

## Inspection

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



## Adjustment

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

## NOTE

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



## Body Electrical System > Navigation > Specifications

## Specifications

Unit

ltem	Specifications		
Power supply	DC 14.4V		
Freguency ranye	FM : 87.5~108.0MHz AM : 531~1602KHz		
Load Impedance	2 ohm x 4		
Tuning type	PLL SYNTHESIZED TUNING		
Antenna	80 pF 75 Ohm		
Dark current	Max 4mA (Head unti)		

## Speaker

ltem		Specifications
Input Power (W or V)	Front	Max.50
	Rear	Max.50
	Tweeter	Max.50
	Sub woofer	Max.50
	Front	2 ± 0.3
Speaker Impedance	Rear	2 ± 0.3
(Ω)	Tweeter	$3.4 \pm 0.5$
	Sub woofer	2 ± 0.3
Speaker Number		7

### External Amp

ltem	Specifications		
Power supply	DC 14.4V		
Output nominal power	240W (40W X 6CH)		
Load Impedance	2 Ohm		

#### **Roof Antenna**

ltem		Specifications		
Operate temperature		-30°C ~ 85°C		
Operation voltage	AM/FM	DC 9V ~ 16V		
	DMB	DC 9V ~ 16V		
	GPS	DC 4.5 ~ 5.5V		
Output impedance	AM/FM	75Ω		
	DMB	50Ω		
	GPS	50Ω		

## Body Electrical System > Navigation > Components and Components Location

**Component Location** 



\* SDARS : Satellite Digital Audio Radio Service

## Components

A/V & Navigation Head Unit



Connector A	Pin	Description	Pin	Description
	1	R INH	5	Illumination (-)
2468	2	Speed	6	Remote antenna
	3	ACC	7	Ground
	4	Illumination (+)	8	Battery (+)
Connector B	Pin	Description	Pin	Description
1	1	Speaker RR(-)	5	Speaker FL(-)
	2	Speaker RR(+)	6	Speaker FL(+)
	3	Speaker FR(-)	7	Speaker RL(-)
	4	Speaker FR(+)	8	Speaker RL(+)
Connector C	Pin	Description	Pin	Description
	C1-1	MIC (+)	C2-5	Remote control +
	C1-2	MIC (-)	C2-6	Remote Ground
C1 C2 C3	C1-3	ATL L	C3-1	AUX V GND
	C1-4	Auto light	C3-2	
_u2 u2 u2⊌⊑ Г за за аз П	C1-5	MUTE	C3-3	Amp MUTE
ിയ്ത്_യ്ത് ത്ത്ത്	C1-6	Door Unlock	C3-4	-
	C2-1	Aux in right	C3-5	
	C2-2	Aux in left	C3-6	AUX Video input
	C2-3	Aux GND	C3-7	-
	C2-4	Aux in detect	C3-8	Amp Remote control
Connector D	Pin	Description	Pin	Description
	1	-	13	Camera B+
	2	-	14	Camera PGround
	3	-	15	Camera CVBS
	4	-	16	Camera VGround
	5	-	17	-
	6	-	18	-
13 14 15 16 17 18 19 20 21 22 23 24	7	-	19	-
Connection	8	-	20	-
	9	-	21	-
	10	-	22	-
	11	-	23	-
	12	-	24	-

Radio antenna		Description	Pin	Description
	1	Signal	2	Ground
GPS/XM antenna	Pin	Description	Pin	Description
	1	GPS Signal	2	XM Signal
USB Connector	Pin	Description	Pin	Description
	1	USB VCC	3	USB D+
	2	USB D-	4	USB Ground

**External Amp** 



## Body Electrical System > Navigation > Description and Operation

## **Controls And Functions**

## **Control Panel**



#### 1. Power / Volume control Knob

A. Push knob (over 0.8 second) : Turns the power off.

- B. Push knob (under 0.8 second) : Each time the knob is pressed, the Audio is turned on and off.
- C. Turn knob : The range of volume adjustment is between 0 ~ 35.

#### 2. FM/AM button

Each press will change the bands in the following order: FM1  $\rightarrow$  FM2  $\rightarrow$  AM  $\rightarrow$  FM1

#### 3. XM button

Each press will change the bands in the following order: XM1  $\rightarrow$  XM2  $\rightarrow$  XM3  $\rightarrow$  XM1

#### 4. CD/AUX button

Each press will change the bands in the following order: DISC(CD, MP3)  $\rightarrow$  (USB or iPod)  $\rightarrow$ (AUX)  $\rightarrow$ DISC(CD, MP3)

#### 5. SEEK/TRACK Up/Down button

- A. Short key press (less than 0.8 second)
- FM/AM Mode : Automatically searches for the previous or next broadcast frequencyand starts playing.
- SAT Mode : Receives the previous or next channel.
- CD Mode : Plays the previous or next track.
- MP3, USB Mode : Plays the previous or next file.
- iPod Mode : Plays the previous or next song.
- B. Long key press (over 0.8 second)
- FM/AM Mode : Quickly moves through the frequencies while the button is pressed. Once released, automatically searches for broadcasts which can be received.
- SAT Mode : Quickly moves to the previous or next channel.
- CD Mode : REW/FF the current playing track.
- MP3, USB Mode : REW/FF the current playing file.
- iPod Mode : REW/FF the current playing song.

#### 6. TUNE Knob

A. FM/AM Mode : Turn the Knob to search for the desired frequency. Press theKnob to receive the selected frequency.

- B. SAT Mode : Turn the Knob to search for the desired channel. Press the Knobto receive the selected channel.
- C. CD Mode : Turn the knob to search for the desired track. Press the knob toplay the selected track.
- D. MP3, USB Mode : Turn the knob to search for the desired file. Press the knobto play the selected file.
- E. iPod Mode : Turn the knob to search for the desiredsong. Press the knob to play the selected song.
- 7. MAP VOICE button

Displays the map screen for the current position.

8. DEST button

Displays the Destination menu screen.

- 9. ROUTE button Displays the Route menu screen.
- 10. SET UP button Displays the Setup menu screen.
- 11. RESET button

Resets the system - if software locks-up.

NOTE

If holding the power off knob for 0.8 second does not shut down the system, carefully use a straightened paper clip at the access hole shown next to the right DISC indicator LED to reset the software. The system power will shut-off and restart.

#### 12. DISC insert indicator LED

Displays that a DISC has been inserted.

## Limitations Of The Navigation system

## **GPS Signal Reception State**

As the GPS satellite frequency is received/transmitted in straight lines, reception may not work if external devices are placed on or near the GPS antenna or when traveling through the following locations.

- Tunnels
- Basement parking structures
- Underneath an overpass
- Roads within forested areas
- Areas near high rise buildings
- Roads within canyons

## Vehicle Position Display

- 1. If multipass errors occur due to reflections from buildings or related causes, the current position mark on the navigation may differ from the actual position of the vehicle.
- 2. The position of the vehicle on the navigation may be different from the actual position. If the vehicle is under the occurrence, driving for a short period of time will allow vehicle to go through map matching or GPS information (several minutes may be necessary in certain cases).
  - A. When driving on a Y-shaped road with a narrow angle, the current position may be displayed in the opposite direction.
  - B. If the vehicle is loaded onto a car transport vehicle, the current position mark may be stalled on the last position prior to loading.
  - C. When driving on a spiral-shaped road.
  - D. When driving in mountain regions with sharp turns or sudden brakes.
  - E. When entering a road after having been in an underground parking structure, building parking structure, or turnable with many rotations.
  - F. When the tires have recently been replaced (Especially upon use of spare or studless tires)
  - G. If the battery terminal is removed.
  - H. When driving in city streets, the current position may be displayed on the opposite side or on an off-road position.
  - I. When changing the zoom level from the maximum zoom in level to a different zoom level, the current position mark may be displayed on a different road.
  - J. When driving in heavy traffic with frequent stop and go in traffic or intersections.

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

## **Route Guidance**

Suitable route guidance may not occur caused by search conditions or the driving position.

- · Guidance to go straight may be given while driving on a straight road.
- Guidance may not be given even when having turned at an intersection.
- There are certain intersections in which guidance may not occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc.)
- Guidance may be given to a position removed from the actual destination if roads to reach the actual destination do not exist or are too narrow.
- Faulty voice guidance may be given if the vehicle breaks from the designated route (ex : if a turn is made at an intersection while the navigation provided guidance to go straight).
- Map Data may be missing or incorrect causing route guidance to not be given.

## **Route Re-calculation**

The following phenomena may occur after conducting route recalculation.

- Guidance may be given to a position differing from the current position when turning at an intersection.
- Route recalculation may take a longer period of time when driving under high speeds.
- A route guidance signaling for a U-Turn in a No U-Turn location may occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc).
- Guidance may be given to a position removed from the actual destination do not exist or are too narrow.
- Faulty voice guidance may be given if the vehicle breaks from the designated route (ex : if a turn is made at an intersection while the navigation provided guidance to go straight)

## Body Electrical System > Navigation > Repair procedures

#### Removal

- 1. Disconnect the negative (-) battery terminal.
- Remove the crash pad center grill (A). (Refer to the BD group - "Crash pad")



3. Remove the crash pad center lower garnish (A).



4. Remove the center facia panel (A) after loosening the screws. (Refer to the BD group - "Crash pad")



- 5. Remove the connectors.
- 6. Remove the mounting bolts then remove the audio unit (A).



- 7. Remove the audio unit after disconnecting the audio connectors and cable.
- 8. Installation is the reverse of removal.

## Installation

- 1. Reconnect the navigation connector and antenna cable.
- 2. Install the navigation head unit.
- 3. Reconnect the hazard lamp connector
- 4. Install the center air bent panel.
- 5. Install the center fascia side garnish.

## NOTE

- Make sure the navigation head unit connectors are plugged in properly, and the antenna cable is connected properly.
- 6. Check the navigation system.

## Body Electrical System > Navigation > Roof antenna > Specifications

#### **Specifications**

Item		Specification
Storage temperature		-40°F ~ 221°F (-40°C ~ 105°C)
Operation tempe	erature	-22°C ~ 185°C (-30°C ~ 85°C)
	AM/FM	DC 9 ~ 16.0V
Operation voltage	ХМ	DC 3.6 ~ 5.5V
	GPS	DC 4.5 ~ 5.5V
	FM	50mA
Concumption ourrent	AM	40mA
Consumption current	ХМ	55mA
	GPS	40mA
Input/output impedance	AM/FM	75Ω
	XM/GPS	50Ω

## Body Electrical System > Navigation > Roof antenna > Components and Components Location

#### Components



# Body Electrical System > Navigation > Multimedia jack > Components and Components Location

## Components

[AUX,	USB, iPod]	[Jack Co	nnector]	[iF	Pod Cable]	
	USB IPod AUX	1 2 3 7 8 9 Con	4 5 6 10 11 12 A mector A			— Connector C — Connector D — Connector E
Name	Multi-med Conned (AUX/i	tia Jack ctor A Pod)	Multi-media Jack Connector B (USB)	USB Connector C	AUX Connector D	iPod Connector E
Connec tor		56				
1	AUX L	. IN	USB VCC	USB/iPod 5V	AUX1 L IN	-
2	AUX F	R IN	USB D-	USB D-/iPod TX	AUX1 R IN	-
3	AUX E	DET	USB D+	USB D+/iPod RX	Option/Video	-
4	-		USB Ground	USB/iPod GND	AUX1 GND	D+
5	-					-
6	Illuminati	ion (+)				D-
7	AUX F	REF				-
8	AUX shield	Ground				5V
9	-					
10	AUX V	GND				ACC ID
11	Illuminat	ion (-)				-
12	Ground	(AH)				-
13						•
14						GND
16						GND
17						-
18						BX
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

## Body Electrical System > Navigation > Multimedia jack > Schematic Diagrams

## Circuit Diagram

#### [AUX + USB + iPod] Multimedia jack



## Body Electrical System > Navigation > Troubleshooting

## **Troubleshooting Guide**

#### **Before Thinking The Product Has Malfunctioned**

- 1. Errors which occur during the operation or installation of the device may be mistaken as a malfunction of the actual device.
- 2. If you are having problems with the divice, try the suggestions listed below.
- 3. If the problems persist, contact your point of purchase or the nearest service center.

Problem	Function
There are small red, blue, or green dots on the screen	Because the LCD is manufactured with technology requiring high point density, a pixel deficiency or lighting may occur within 0.01% of total pixels.
The sound or image is not working	<ul><li>Has the switch for the vehicle been turned to [ACC] or [ON]?</li><li>Has the SYSTEM been turned OFF?</li></ul>
The video is being displayed but sound is not working	<ul><li>Has the volume been set to a low level?</li><li>Has the volume been set on mute?</li></ul>

When the power is turned on, the corners of the screen are dark	<ul> <li>The display looking somewhat darker after prolonged periods of use is a normal phenomenon with LCD panels. It is not a malfunction.</li> <li>If the screen is very dark, contact your point of purchase or the nearest service center.</li> </ul>
Sound is working from only one speaker	<ul> <li>Is the position of FAL/BAL sound controls or volume adjusted to only one side?</li> </ul>
The external device is not working	Is the external device connected with a standard connector cable?
The road is missing	Some map data may be missing or incorrect.
The road name is spoken incorrectly	The TTS(Text To Speech) engine speaks the street name based off of the phonetic spelling. This will continuously be update with the map datebase.

## Troubleshooting

Problem	Possible Cause	Solution
The power does not turn on.	The fuse is disconnected.	Replace with a suitable fuse. If the fuse is disconnected again, please contact your point of purchase or service center.
	Device is not properly connected.	Check to see that the device has been properly connected.
XM only goes through one category	The XM mode is in category.	Press the mode button to change to channel mode.
The DVD does not play.	The DISC has not been inserted or has been inserted upside down.	Insert the disc properly so that the sides are facing the correct direction.
	The DISC has been contaminated.	Wipe clean dirt and other foreign substances from the DISC.
	The vehicle battery is low.	Charge the battery. If the problem persists, please contact your point of purchase or service center.
	A disc which is not supported by the device has been inserted.	Insert a disc which is supported for play by the device.
The video does not work.	The brightness level has been set to the lowest level.	Adjust the brightness to a highter level.
The sound does not work.	<ul> <li>The volume level is set the lowest level.</li> <li>The connector is not properly connected.</li> <li>The device is currently fast-forwarding, rewinding, scanning, or playing in slow mode.</li> </ul>	<ul> <li>Adjust the volume level.</li> <li>Check the connection state.</li> <li>The sound will not work when the device is fast-forwarding, rewinding, scanning, or playing in slow mode.</li> </ul>
The sound or video quality is low.	<ul> <li>The DISC is dirty or scratched.</li> <li>Vibration is occuring from the position in which the conversion switch has been installed.</li> <li>The color and tone quality of the image is low.</li> </ul>	<ul> <li>Wipe off water or dirt from the DISC. Do not use a disc which has been scratched.</li> <li>The sound may be short-circuited and the image distorted if the device begins to vibrate. The device will return to normal operation once the vibration has stopped.</li> <li>Aging of the video display and deterioration in performance may cause certain quality degradations.</li> </ul>
The USB does not work.	<ul> <li>USB memory is damaged.</li> <li>USB memory has been contaminated.</li> <li>A separately purchased USB HUB is being used.</li> </ul>	<ul> <li>Please use after formatting the USB into FAT 12/16/32 format.</li> <li>Remove any foreign substances on the contact surface of the USB memory and multimedia terminal.</li> <li>Directly connect the USB memory with the multimedia 56</li> </ul>

	<ul> <li>A USB extension cable is being used.</li> <li>A USB which is not a Metal Cover Type USB Memory is being used.</li> <li>A HDD type, CF, SD Memory is being used.</li> <li>There are no music files which can be played.</li> </ul>	<ul> <li>terminal on the vehicle.</li> <li>Directly connect the USB memory with the multimedia terminal on the vehicle.</li> <li>Use a standard USB memory.</li> <li>Only MP3, WMA file formats are supported. Please use only the supported music file formats.</li> </ul>
The iPod is not recognized even though it has been connected.	<ul> <li>There are no titles which can be played.</li> <li>The iPod firmware version has not been properly updated.</li> <li>The iPod device does not recognize downloads.</li> </ul>	<ul> <li>Use iTunes to download and save MP3 files into the iPod.</li> <li>Use iTunes to update the firmware version and reconnect the iPod with the device.</li> <li>Reset the iPod and reconnect with the device.</li> </ul>

## Body Electrical System > Keyless Entry And Burglar Alarm > Specifications

## Specification

Items	Specifications
Rated voltage	DC 3V
Temperatare range	-4°F ~ 140°F (-20°C~+60°C)
Keyless entry transmitter	Lithium 3V battery (1EA)
Transmissible distance	30m or more
Life of battery	2 years or more (at 20 times per a day)
Button	3 (Door lock, Door unlock, Panic)
Transmission frequency	315 MHz

# Body Electrical System > Keyless Entry And Burglar Alarm > Components and Components Location

## **Component Location**



## Body Electrical System > Keyless Entry And Burglar Alarm > Description and Operation

## 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 the following occurs :

- 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 with the cycle of the ON for 30 sec. and OFF for 10 sec. 3 time or until the system is disarmed by pressing the unlock button on 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 UNLOCK button, all doors lock. When you push the UNLOCK button once, the driver's door unlock. And you push the unlock button again within 3 sec., all doors unlock. (Two turn unlock function)

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.

## Function

## Anti-theft Warning System



State	Description
Initial Condition	ALARM
Transition Condition	<ul> <li>When 4DOOR or Tailgate is OPEN and TX(Transmitter) UNLOCK is input</li> <li>After 30 seconds in the KEY IN ON and IGN1 ON and IGN2 ON states</li> <li>When all doors are unlocked (LOCK FAIL) within 5 seconds after the TX (Transmitter) LOCK input</li> </ul>

Operating	<ul> <li>ENTRY INTO THE DISARM STATE</li> <li>HORN, HAZARD, Burglar alarm output shall be OFF</li> <li>In the case of the TX UNLOCK input, the HAZARD LAMP signal is output with the guide of the ON/OFF of 0.5 accorde two times</li> </ul>
	with the cycle of the ON/OFF of 0.5 seconds two times.

State	Description
Initial Condition	In the DISARM state and any one of the IGN KEY OUT & 4DOOR and Tailgate are opened
Transition Condition	When entering TX UNLOCK
Operating	<ul> <li>Maintain in the DISARM state</li> <li>The HAZARD LAMP signal is output with the ON/OFF cycle of 0.5 seconds two times.</li> </ul>

## **Condition 3**

State	Description
Initial Condition	ARM WAIT state
Transition Condition	<ul> <li>When any one of the 4DOOR, HOOD or Tailgate is opened.</li> <li>When at least one or more doors are unlocked.</li> <li>In case of KEY IN.</li> <li>When the DRIVER KEY UNLOCK(Tailgate KEY UNLOCK) signal is input</li> </ul>
Operating	- ENTRY INTO THE DISARM STATE

## Condition 4

State	Description
Initial Condition	AUTOLOCK TIMER1 state
Transition Condition	<ul> <li>When any one of the 4DOOR, HOOD or Tailgate is opened.</li> <li>In case of KEY IN.</li> <li>LOCK FAIL after the LOCK attempt by the AUTO LOCK.</li> <li>LOCK FAIL after the LOCK attempt by the TX LOCK.</li> <li>LOCK FAIL after the LOCK attempt by the DRIVER KEY LOCK(Tailgate KEY LOCK).</li> </ul>
Operating	- ENTRY INTO THE DISARM STATE

#### **Condition 5**

State	Description
Initial Condition	AUTOLOCK TIMER2 state
Transition Condition	<ul> <li>When any one of the 4DOOR, HOOD or Tailgate is opened.</li> <li>In case of KEY IN.</li> <li>LOCK FAIL after the LOCK attempt by the AUTO LOCK.</li> <li>LOCK FAIL after the LOCK attempt by the TX LOCK.</li> <li>LOCK FAIL after the LOCK attempt by the DRIVER KEY LOCK</li> </ul>
Operating	- ENTRY INTO THE DISARM STATE

State	Description
Initial Condition	ARM state

Transition Condition	- IGN KEY ON - DRIVER KEY UNLOCK(Tailgate KEY UNLOCK) input.
Operating	- ENTRY INTO THE DISARM STATE

State	Description
Initial Condition	REARM state
Transition Condition	<ul> <li>After 30 seconds in the IGN KEY ON state.</li> <li>LOCK FAIL after the LOCK attempt by the TX LOCK.</li> <li>LOCK FAIL after the LOCK attempt by the DRIVER KEY LOCK.</li> <li>When entering DRIVER KEY UNLOCK.</li> </ul>
Operating	- ENTRY INTO THE DISARM STATE - Burglar alarm RELAY OFF

## **Condition 8**

State	Description
Initial Condition	REARM state
Transition Condition	<ul> <li>In case of TX UNLOCK Input in the state that any one of the 4DOOR or Tailgate is opened.</li> <li>In case of KEY IN.</li> <li>In case of the 4DOORor Tailgate or HOOD is closed and at least one door is unlocked.</li> </ul>
Operating	<ul> <li>ENTRY INTO THE DISARM STATE</li> <li>In the case of the TX UNLOCK INPUT, the HAZARD LAMP signal is output two times with the ON/OFF cycle of 0.5 seconds.</li> </ul>

## 2. ARM

## Condition 1

State	Description
Initial Condition	ARM state
Transition Condition	When entering TX LOCK
Operating	- Keep the ARM state - The HAZARD LAMP signal is output for 1s once.

#### Condition 2

State	Description
Initial Condition	ARM WAIT state
Transition Condition	After the ARM WAIT TIMER completion
Operating	- ENTRY INTO THE ARM state

## 3. ALARM

State	Description
Initial Condition	ARM state
Transition Condition	In case of 4DOOR, Tailgate or HOOD is opened.

Operating	- ENTRY INTO THE ALARM state - The Burglar alarm RELAY outputs is ON, and then, inhibit the start.
	- The Horn alarm shall be output three times with the cycle consisting of the
	ON for $2/s(\pm 2s)$ and the OFF for $10s(\pm 1s)$ . (At this time, the Hazard Lamp signal shall also be output as the Horn alarm.)

State	Description
Initial Condition	REARM state
Transition Condition	In case of 4DOOR, Tailgate or HOOD is opened.
Operating	<ul> <li>ENTRY INTO THE ALARM state</li> <li>The Horn alarm shall be output three times with the cycle consisting of the ON for 27s(±2s) and the OFF for 10s(±1s). (At this time, the Hazard Lamp signal shall also be output as the Horn alarm.)</li> </ul>



T1 : 27 ± 2sec, T2 : 0.4 ~ 0.5 sec,

T3 : 10 ± 1sec.

## 4. ARM WAIT

#### **Condition 1**

State	Description
Initial Condition	ARM WAIT state
Transition Condition	When entering TX LOCK
Operating	<ul> <li>Keep ARM WAIT state</li> <li>The HAZARD LAMP signal shall be output for 1s once.</li> </ul>

## **Condition 2**

State	Description
Initial Condition	DISARM state & IGN KEY OUT & 4DOOR, Tailgate and HOOD CLOSE state
Transition Condition	<ul> <li>In case of LOCK SUCCESS after the LOCK attempt by the TX LOCK.</li> <li>In case of LOCK SUCCESS after the LOCK attempt by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT.</li> <li>In case of 4DOOR, Tailgate, HOOD OPEN<close all="" doors="" li="" locked.<="" with=""> </close></li></ul>
Operating	<ul> <li>Entry into the ARM WAIT state</li> <li>The HAZARD LAMP signal shall be output for 1s once.</li> <li>Start the ARMWAIT TIMER</li> </ul>

State	Description
Initial Condition	ALARM state & IGN KEY OUT & 4DOOR, Tailgate and HOOD CLOSE state

Transition Condition	<ul> <li>In case of LOCK SUCCESS after the LOCK attempt by the TX LOCK.</li> <li>In case of LOCK SUCCESS after the LOCK attempt by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT.</li> </ul>
Operating	<ul> <li>Entry into the ARM WAIT state</li> <li>OFF the HORN, Burglar alarm output.</li> <li>The HAZARD LAMP signal shall be output for 1s once</li> <li>Start the ARMWAIT TIMER</li> </ul>

State	Description
Initial Condition	AUTOLOCK TIMER1 state
Transition Condition	<ul> <li>In case of LOCK SUCCESS after the LOCK attempt by the AUTOLOCK.</li> <li>In case of LOCK SUCCESS after the LOCK attempt by the TX LOCK.</li> <li>In case of LOCK SUCCESS after the LOCK attempt by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT</li> </ul>
Operating	<ul> <li>Entry into the ARM WAIT state</li> <li>The HAZARD LAMP signal shall be output for 1s once.</li> <li>Start the ARMWAIT TIMER</li> </ul>

## **Condition 5**

State	Description
Initial Condition	PREARM state
Transition Condition	- 4DOOR, Tailgate and HOOD are closed and all doors are locked.
Operating	<ul> <li>Entry into the ARM WAIT state</li> <li>The HAZARD LAMP signal shall be output for 1s once.</li> <li>Start the ARMWAIT TIMER</li> </ul>

#### **Condition 6**

State	Description
Initial Condition	REARM state
Transition Condition	<ul> <li>LOCK SUCCESS after the LOCK attempt by the TX LOCK.</li> <li>LOCK SUCCESS after the LOCK attempt by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT.</li> </ul>
Operating	<ul> <li>Entry into the ARM WAIT state</li> <li>The HAZARD LAMP signal shall be output for 1s once.</li> <li>Burglar alarm RLY OFF</li> <li>Start the ARMWAIT TIMER</li> </ul>

## 5. REARM

## **Condition 1**

State	Description
Initial Condition	ALARM state
Transition Condition	4DOOR, Tailgate and HOOD are closed and after the ALARM PATTERN completion
Operating	- Entry into the REARM state

## 6. AUTO-LOCK TIMER1

State	Description
Initial Condition	ARM state
Transition Condition	TX UNLOCK INPUT
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER1 state</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START the AUTOLOCK TIMER1</li> </ul>

State	Description
Initial Condition	REARM state
Transition Condition	- AUTO-LOCK TIMER1 state. - TX UNLOCK INPUT.
Operating	<ul> <li>keep the AUTO-LOCK TIMER1 state</li> <li>CASE1: AUTOLOCK TIMER1 COMPLETION LOCK ATTEMPT.</li> <li>CASE2: TX UNLOCK</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times</li> <li>RESTART THE AUTOLOCK TIMER1</li> </ul>

## **Condition 3**

State	Description
Initial Condition	ARM WAIT state
Transition Condition	TX UNLOCK INPUT
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER1 state</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START THE AUTOLOCK TIMER</li> </ul>

#### **Condition 4**

State	Description
Initial Condition	The DISARM state and 4DOOR, Tailgate and HOOD are closed and IGN KEY OUT
Transition Condition	TX UNLOCK INPUT
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER1 STATE</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START THE AUTOLOCK TIMER1</li> </ul>

State	Description
Initial Condition	ALARM state, and 4DOOR, Tailgate and HOOD CLOSE state
Transition Condition	TX UNLOCK INPUT
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER1 STATE</li> <li>Burglar alarm RELAY OFF</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START THE AUTOLOCK TIMER1</li> </ul>

State	Description
Initial Condition	REARM state
Transition Condition	TX UNLOCK INPUT
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER1 STATE</li> <li>Burglar alarm RELAY OFF</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START THE AUTOLOCK TIMER1</li> </ul>

## 7. AUTO-LOCK TIMER 2

## Condition 1

State	Description
Initial Condition	AUTO-LOCK TIMER2 state
Transition Condition	- AUTOLOCK TIMER2 COMPLETION. - TX UNLOCK INPUT.
Operating	<ul> <li>keep the AUTO-LOCK TIMER2 state</li> <li>CASE1: AUTOLOCK TIMER1 COMPLETION LOCK ATTEMPT.</li> <li>CASE2: TX UNLOCK</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times</li> <li>RESTART THE AUTOLOCK TIMER1</li> </ul>

#### Condition 2

State	Description
Initial Condition	REARM state
Transition Condition	DISARM state AND 4DOOR & Tailgate CLOSE & HOOD OPEN AND IGN KEY OUT
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER2 STATE</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START THE AUTOLOCK TIMER2</li> </ul>

## **Condition 3**

State	Description		
Initial Condition	ALARM STATE AND 4DOOR & Tailgate CLOSE & HOOD OPEN STATE		
Transition Condition	TX UNLOCK INPUT		
Operating	<ul> <li>Entry into the AUTO-LOCK TIMER2 STATE</li> <li>OFF the HORN, Burglar alarm Output</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> <li>START THE AUTOLOCK TIMER2</li> </ul>		

State	Description		
Initial Condition	PREARM START AND 4DOOR & Tailgate CLOSE & HOOD OPEN STATE		
Transition Condition	TX UNLOCK INPUT		

Operating	<ul> <li>Entry into the AUTO-LOCK TIMER2 STATE</li> <li>The HAZARD LAMP signal shall be output with the ON/OFF cycle of 0.5s two times.</li> </ul>
	- START THE AUTOLOCK TIMER2

#### 8. PREARM Condition 1

State	Description		
Initial Condition	AUTO-LOCK TIMER2 state		
Transition Condition	<ul> <li>LOCK SUCCESS after the LOCK attempt by the AUTO LOCK.</li> <li>LOCK SUCCESS after the LOCK attempt by the TX LOCK.</li> <li>LOCK SUCCESS after the LOCK attempt by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT.</li> </ul>		
Operating	- Entry into the PREARM state		

#### Condition 2

State	Description		
Initial Condition	DISARM state & IGN KEY OUT		
Transition Condition	<ul> <li>LOCK SUCCESS after the LOCK ATTEMPT by the TX LOCK in the state that 4 DOOR or Tailgate or HOOD is opened.</li> <li>LOCK SUCCESS after the LOCK ATTEMPT by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT in the state that 4 DOOR or Tailgate or HOOD is opened.</li> <li>The DOOR is turned to the CLOSE state from the OPEN state in the state that all doors are locked. But, the HOOD is opened.</li> </ul>		
Operating	- Entry into the PREARM state		

## **Condition 3**

State	Description		
Initial Condition	ALARM state & IGN KEY OUT & 4DOOR or Tailgate or HOOD OPEN		
Transition Condition	<ul> <li>LOCK SUCCESS after the LOCK attempt by the TX LOCK.</li> <li>LOCK SUCCESS after the LOCK attempt by the DRIVER KEY LOCK (Tailgate KEY LOCK) INPUT.</li> </ul>		
Operating	- Entry into the PREARM state - OFF the HORN, HAZARD, Burglar alarm OUTPUT		

## 9. RESET

## Condition 1

State	Description		
Initial Condition	ALARM, REARM state		
Transition Condition	Insert after the BATTERY is withdrawn		
Operating	- The Burglar alarm RELAY shall be ON and the HORN ALARM shall be output three times again.		

State	Description			
Initial Condition	ARM state			
Transition Condition	Insert after the BATTERY is withdrawn			

#### 10. PANIC ALARM

This function is to give the PANIC ALARM of the vehicle by using the HORN and HAZARD. The alarm starts the operating when the TX's PANIC signal is input in the state that KEYIN is OFF, ACC is OFF, IGN1 is OFF, IGN2 is OFF, and stops in the following conditions.

(1) When the TX is locked

- (2) When the TX is unlocked
- (3) When the PANIC signal is input
- (4) KEY IN ON OR INGN1 ON OR IGN2 ON INPUT
- (5) After PANIC alarm operating completion
- (6) When entered into the ARM mode

The PANIC ALARM is operated regardless of the Burglar alarm mode, but it is stopped when entered into the ARM mode, and the PANIC operation is also performed in the alarm mode by the Burglar alarm and the PANIC operating is performed under PANIC operation.

The HORN and HAZARD operating by the Burglar alarm function shall be prior to the PANIC ALARM and the HORN shall be OFF during the pause period of 10s under alarm in the alarming state by Burglar alarm.

KEYIN ON or OFF IGN1 ON or ON IGN2 ON	
TX PANIC OFF	
TX LOCK or OFF TX UNLOCK ON	<u></u>
	r_hr_
T30	
HORN ON (B/ALARM) OFF	
HAZARD ON (B/ALARM) OFF	
	NANĻ
HAZARD OFF	
T1 + 1 + 0 1 eee	

T30 :  $30 \pm 3$  sec.

#### 11. HORN ANSWER BACK

- (1) If the ARM WAIT state is maintained by the TX LOCK within 4s after entered into the ARM WAIT state by the TX LOCK, the HORN OUPUT shall operate side by side when the HAZARD alarm is operated.
- (2) If the ARM state is maintained by the TX LOCK within 4s after the TX LOCK input in the ARM state, the HORN OUPUT shall be gone side by side when the HAZARD alarm is operated.
- (3) If the ARMWAIT or ARM mode is canceled for T1, the HORN shall not be output.
- (4) Even if other registered TX LOCK during T1 operating is received, the HORN AND HAZARD shall be output.



## Body Electrical System > Keyless Entry And Burglar Alarm > Repair procedures

## 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.



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

[CENTRAL LOCK]			
Position	erminal	4	3
Front left	Lock	$\oplus$	θ
	Unlock	θ	Ð
Front right	Lock	θ	$\oplus$
	Unlock	$\oplus$	θ

## **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.



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

[CENTRAL LOCK]			
Position	erminal	4	3
Rear left	Lock	$\oplus$	Θ
	Unlock	θ	$\oplus$
Rear right	Lock	Θ	Ð
	Unlock	$\oplus$	θ

## **Tailgate Lock Actuator Inspection**

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



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

Terminal Position	2	3
Lock	θ	$\oplus$
Unlock	$\oplus$	Θ

## 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.



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

[CENTRAL LOCK]								
Termir			inal	2		5	1	
Position				2		5	'	
Central Lock	Front	Clocky	vise	$\sim$	-	C		
	left	Count	ter- /ise		(	$\rightarrow$	-0	
	Front right	Clocky	vise	$\sim$	-	D		
		clockv	ier- vise		(	$\rightarrow$	-0	
[CENTRAL LOCK]								
Terminal			1	5		2	6	
Position		'	5		۷	0		
Central Lock	Front left	Unlock		0			-0	
	Front right	Lock	0-		-	-0		

## **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.



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

[CENTRAL LOCK]							
Terminal Position		1	5	2	6		
Control Look	Unlock		0-		-0		
Central Lock	Lock	0		-0			

## **Tailgate Switch**

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



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

Terminal Position	1	4	
Lock	<u> </u>	0	
Unlock			

## **Door Switch**

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


# **Hood Switch**

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



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

Terminal Position	1	2
Hood open (Free)	<u> </u>	O
Hood close (Push)		

# **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.



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

Terminal Key position	5	6
Insert	0	O
Removal		

# **Burglar Horn**

- 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).



3. Installation is the reverse of removal.

# Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Repair procedures

#### Inspection

- 1. Check that the door work properly when the door lock or unlock button is pressed on the transmitter.
- 2. Remove the battery and check voltage if the door doesn't work properly.

#### Standard voltage : 3V



- 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).

#### WARNING

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

# Transmitter Code Registration

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



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

1. HYUNDAI VEHICLE DIAGNOS	IS
MODEL :	ALL
01. ENGINE 02. AUTOMATIC TRANSAXLE 03. ABS/ESP	
10. TRANSMITTER CODE SAVING	

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

#### TRANSMITTER CODE SAVE

REMOVE THE IG. KEY FROM THE KEY CYLINDER. CONNECT THE DLC CABLE AND 16 PIN CONNECTOR OF THE VEHICLE.

PRESS [ENTER], IF YOU ARE READY!

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

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

, NO. OF CODED KEY : 0 EA

TRANSMITTER CODE SAVE

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

1ST. TRANSMITTER SAVE SUCCESS!

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

NO. OF CODED KEY : 1 EA

TRANSMITTER CODE SAVE

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

, NO. OF CODED KEY : 1 EA



\* Transmitter code registration : Max 4EA

# Body Electrical System > Keyless Entry And Burglar Alarm > Troubleshooting

# Troubleshooting

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



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



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



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



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



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



# Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Description and Operation

# Description

Body control module (A) receives various input switch signals controlling time and alarm functions for tail lamp, 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/rear heated control.



# Operation

#### 1. WASHER INTERLOCKING WIPER

(1) If the Washer SW is ON in the IGN2 SW ON state, then the Wiper output shall be ON after T1, and if the Washer SW input is ON for 0.2~0.6 seconds, then the Wiper output shall be OFF after T3. However, WASHER SW input shall be disregarded during the Washer Wiper operating, but after operating the Washer Wiper, WASHER SW input shall be accepted first.



In case of T2 is less than 0.2s, T3=0

(2) If the Washer SW is ON in the IGN2 SW ON state, then the Wiper output shall be ON after T1, and if the Washer SW is ON over 0.6 seconds, after the Washer SW is OFF and the Wiper output shall be ON for 2.5~3.8 seconds and then, the Wiper output shall be OFF. However, WASHER SW input shall be disregarded during the Washer Wiper operating, but after the Washer Wiper operating, WASHER SW input be accepted first.



T1 : 0.3 ± 0.1s, T2 : more than 0.6s,

- T3:2.5~3.8s.
- (3) During INT Wiper operating, if the Washer SW is ON over 0.6 seconds, then the Washer Interlocking Wiper output shall be ON. If the Washer SW is ON for 0.2~0.6 seconds, then the Wiper output shall be ON once.



2. MIST INTERLOCKING WIPER

(1) In IGN2 SW ON, if the MIST SW is ON for 60ms or more, within 100ms, and then, wiper output shall be ON for 700ms within 100ms.



T3 : 700 ± 100 ms.

(2) If MIST SW input is continued, WIPER output shall be maintain the ON state, and then if MIST SW is OFF, the Wiper output shall be ON for 700ms since OFF time.



T1 : Min 60 ms, T2 : Max 100 ms,

T3 : 700 ± 100 ms, T4 : 700 ms

(3) Mist SW input shall be disregarded by INT WIPER, WASHER interlocking WIPER during operating WIPER.

#### 3. INT WIPER

According to the vehicle speed, control intermittent time of the Intermittent Wiper.

- A. IGN2 SW ON state.
- B. WIPER SW INT state
- C. INPUT the vehicle speed and the VOLUME value for setting the intermittent time
- (1) Output of Intermittent time ratio

Calculate the INT time rate by inputting the INT Time set Volume value (input voltage) "The INT Time Rate is to indicate the position where the Volume is located from the Slow (100%) to the Fast (0%) of the Knob. Therefore the Volume shall be linearly calibrated about the input voltage"

Input	INT Time
Voltage (V)	Ratio (%)
0	0
1.582	25
2.404	50
2.907	75
3.247	100

#### (2) Output of Standard Intermittent Time

"Calculate the intermittent time of the intermittent time ratio 100% and 0% at the vehicle speed (V) computed in (1) term by linear correction "

Int Vol.	Int Time (Min.)	Int Time (Typ.)	Int Time (Max.)
FAST (0%)	1.98	2.2	2.42
MID (25%)	3.51	3.9	4.29
MID (50%)	5.49	6.1	6.71
MID (75%)	7.47	8.3	9.13

SLOW (100%)	9	10	11

- 4. CONTROL of REAR WASHER Interlocking REAR WIPER
  - (1) If Rear Washer Switch is ON with IGN2 Switch ON, turn ON Rear Wiper Relay output after T1. If Rear Washer SW Input is carried on for 0.2~0.6 second, turn OFF Rear Wiper RLY after T3. However, Rear Washer SW input generated during operating Rear Wiper RLY is ignored, and received following the operation of Rear Wiper RLY.



T1 : 0.3±0.1 s, T2 : 0.2~0.6s, T3 : 0.7±0.1s.

- if T2 is net more than 0.2 Sec, T3=0
- (2) If Rear Washer SW is ON with IGN2 switch ON, turn ON Rear Wiper relay output after T1.

If Rear Washer switch input is continued for more than 0.6, turn ON and OFF Rear Wiper relay Output for 2.5~3.8 seconds after turning Rear Washer switch OFF. However Rear Washer switch Input during operating Rear Wiper relay is ignored and received after the operation of Rear Wiper relay



T1:0.3±0.1 s, T2: More than 0.6s, T3:3s.

- (3) Rear Washer SW Input is ignored during continuous operation of Rear Wiper RLY generated by Rear Wiper SW.
- (4) The function of REAR WASHER interlocking REAR WIPER is primarily taken, in case that Rear Washer switch Input is generated during intermittent operation of Rear Wiper relay by Rear Wiper switch

#### 5. TAIL LAMP AUTO CUT

After Key IN SW is On, if Tail SW is On, then Key IN SW shall be OFF; when the driver's door is opened, then the Tail Lamp shall be OFF automatically.

Also, in the state that the KEY IN SW is ON, after the driver's door is opened, if the KEY IN SW is OFF, then the Tail Lamp shall be OFF automatically.

After the Auto Cut, if the Tail SW is ON after OFF again, the Tail Lamp shall be ON, and the Auto Cut function shall be canceled.

After the Auto Cut, when KEY IN SW is ON again, TAIL LAMP shall be ON, and the Auto Cut function shall be canceled.

In the state of the AUTO CUT, if mounting or removing the BATTERY, then the AUTO CUT state shall be continued.



#### 6. HEAD LAMP LOW CONTROL

If HEAD LAMP LOW SW is On in the IGN1 On state, HEAD LAMP HIGH RELAY shall be ON so that HEAD LAMP HIGH can be controlled by HEAD LAMP RELAY and M/F SW.

IGN1	ON OFF	
HEAD LAMP LOW SW	ON OFF	
HEAD LAMP RELAY	ON OFF	
HEAD LAMP HIGH RELAY	ON OFF	

#### 7. AUTO LIGHT CONTROL

- (1) It shall be able to operate only in case of AUTO LIGHT is active, and comply with CALIBRATION PARAMETER TABLE of each spec.
- (2) IGN1 SW ON state, if the supply voltage of the AUTO LIGHT SENSOR is less than 4v or more than 6v, it is determined as the fault. In the fault state, in case of the AUTO LIGHT SW is ON, always HEAD LAMP RELAY shall be ON regardless of the Sensor value. FILTERING TIME for the fault and recovery with regard to the supply voltage is 300 msec respectively.
- (3) In the condition of LIGHT ON, when the AUTO LIGHT SENSOR value is entered into AUTO LIGHT control condition, then LIGHT shall be ON immediately.
- (4) If IGN1 SW is ON, and AUTO LIGHT SW is ON, and in LIGHT OFF state, and in case of AUTO LIGHT SENSOR value is the input value of the LIGHT ON, LIGHT shall be ON after 12 ± 0.2sec.
- (5) In LIGHT ON state, in case of the AUTO LIGHT SENSOR value is the input value of the LIGHT OFF, LIGHT shall be OFF after 12 ± 0.2sec.
- (6) If the SENSOR value is the input value of the TAIL LAMP ON, then TAIL LAMP RELAY shall be ON only, and if it is the input value of the HEAD LAMP ON, then HEAD LAMP HIGH RELAY shall be ON so that HEAD LAMP HIGH can be controlled by TAIL LAMP RELAY, HEAD LAMP RELAY, and multifunction (M/F) SW.
- (7) In the condition of LIGHT ON, when AUTO LIGHT SW is ON, HEAD LAMP RELAY shall be ON immediately, and when AUTO LIGHT SW is OFF, LIGHT shall be OFF immediately. The LIGHT ON value of the AUTO LIGHT SENSOR shall be complied with the table below.

	Tail lamp	Head lamp
ON	2.5 ±	0.05V
OFF	4.0 ±	0.05V



(8) The time chart according to filtering time and sensor for each applicable area shall be as follow.



- 8. Tail Interlocking av control
  - (1) If AutoLight power is less than 4V or over 6V with A\_ACC ON, it is considered to be malfunctioning. AV Tail Output should be OFF in malfunctioning. Power supply FILTERING time of failing and recovering takes

300msec each.

- (2) If AutoLight sensor value is equal to the input value of TAIL LAMP ON with ACC ON, turn ON AV Tail Output after 12 ± 0.2 sec.
- (3) If AutoLight sensor value is equal to the input value of TAIL LAMP OFF with AV Tail Output ON, turn OFF AV Tail Output after 12 ± 0.2sec.
- (4) A\_AutoLight sensor value of LIGHT ON is as follows.

	AV tail output	
ON	2.5±0.05V	
OFF	4.0±0.05V	



 $T1 : 12 \pm 0.2s, T2 : 12 \pm 0.2s.$ 

#### 9. DAYTIME RUNNING LIGHT

DRL (DAYTIME RUNNING LIGHT) OPTION is classified into the following two cases by the DRL OPTION LINE input.

(1) NON-DRL OPTION: In the case that DRL OPTION LINE is not connected.

(2) DRL OPTION: In the case that DRL CANADA OPTION LINE is connected and electrically grounded.

#### 10. DRL (CANADA)

If the IGN2 is ALT "L" are On, supply the power to the HEAD LAMP HIGH LAMP by turning the DRL CANADA RELAY ON.

If HEAD LAMP LOW RELAY is On by the HEAD LAMP switch, the DRL function shall be canceled. If the HEAD LAMP HIGH RELAY is On by the HEADLAMP HIGH switch or PASSING switch, the DRL function shall be canceled.

If P/BRAKE switch is ON(PARK), the DRL function shall be canceled.

In IGN2 state, if the HEAD LAMP HIGH RELAY is On by the HEADLAMP HIGH switch or PASSING switch, the HEAD LAMP HIGH INDICATOR shall be ON.

IGN2	ON OFF	
ALTL	ON OFF	
HEADLAMP SW	ON OFF	
HEADLAMP HIGH SW	ON OFF	
P/BRAKE SW	ON OFF	
DRL CANADA RELAY		
HEADLAMP HIGH INDICATOR	ON OFF	

#### 11. BUZZER SOUND

#### (1) BUZZER SOUND SPECIFICATION

	Frequency	Frequency DUTY	Cycle	Sound Pressure	Remark
Seat Belt Warning	800Hz	50%	1.0s	70±10Db	Decremental Sound
Key Operated	800Hz	50%	0.7s	70±10Db	Decremental Sound
Parking Start Waring	800Hz	50%	1.0s	70±10Db	Continuous Sound



- (2) The Priority Order : S/BELT WARNING > KEY OPERATED WARNING > PARKING START WARNING
- (3) If the output is OFF, maintain the output until the OFF cycle
- (4) Sound pressure measurement distance : 1.0 m

#### 12. SEAT BELT REMINDER FROM STATE IGN1 ON DRIVER UNBELTED

#### Condition 1

State	Description	
Initial condition	IGN1 ON DRIVER UNBELTED	
Event	IGN1 OFF	
Action	<ul> <li>Stop Bulb check 6 seconds driver indicator blinking</li> <li>Stop Normal 6 seconds driver indicator blinking</li> <li>The automaton state is changed to IGN1 OFF</li> </ul>	

#### Condition 2

State	Description
Initial condition	IGN1 ON DRIVER UNBELTED
Event	Driver side seat belt is belted
Action	<ul> <li>Stop Normal 6 seconds driver indicator blinking</li> <li>Stop ALL 6 seconds buzzer warning</li> <li>The automaton state is changed to IGN1 ON DRIVER BELTED</li> </ul>

#### **Condition 3**

State	Description
Initial condition	IGN1 ON DRIVER UNBELTED
Event	Vehicle Speed >= 10km/h
Action	<ul> <li>Start buzzer and driver indicator Pattern (10 times (6sec ON/24sec OFF) + 6sec ON)</li> <li>The automaton state is changed to PATTERN</li> </ul>

# FROM STATE PATTERN Condition 4

State	Description
Initial condition	PATTERN
Event	IGN1 OFF
Action	<ul> <li>Stop Buzzer and driver indicator Pattern</li> <li>Stop ALL 6s driver indicator blinking</li> <li>Stop ALL 6s buzzer warning</li> <li>The automaton state is changed to IGN1 OFF</li> </ul>

#### **Condition 5**

State	Description
Initial condition	PATTERN
Event	Driver side seat belt is belted
Action	<ul> <li>Stop Buzzer and driver indicator Pattern</li> <li>Stop Normal 6s driver indicator blinking</li> <li>Stop ALL 6s buzzer warning</li> <li>The automaton state is changed to IGN1 ON DRIVER BELTED</li> </ul>

#### **Condition 6**

State	Description
Initial condition	PATTERN
Event	Vehicle Speed <= 5km/h
Action	<ul> <li>Stop Buzzer and driver indicator Pattern</li> <li>if 6s buzzer period, after 6s warning stop Pattern</li> <li>The automaton state is changed to IGN1 ON DRIVER UNBELTED</li> </ul>

#### 13. KEY OPERATED WARNING

- (1) In state of KEY IN SW is IN, if the DRIVER DOOR is opened, then the CHIME BUZZER output shall be continued with the cycle of 0.7 seconds.
- (2) If KEY IN SW is OUT or the driver's door is closed during the Chime Buzzer output, then the output shall be OFF.



T1 : 0.7 ± 0.1sec.

#### 14. PARKING START WARNING

In the state that the IGN1 is ON or the Parking Brake is pulled, if the speed of vehicle is maintained over 10 km/h for 2~3 seconds or more, then the Chime Buzzer output shall be continued with 1 second cycle of the ON/OFF (0.3/0.7 seconds). But, after the speed of vehicle is maintained over 10 km/h for 2~3 seconds or more, if the Parking Brake is pulled, output immediately.



T3:0.7±0.1 sec.

#### 15. IGN KEY HOLE ILLUMINATION

- (1) If the driver's door (or assist's door) is opened in the state that the IGN1 SW is OFF, then the IGN Key Hole Illumination shall be ON.
- (2) In the (1) state, if the driver's door (or assist's door) is closed, then the IGN Key Hole Illumination shall be OFF after it is in the ON state for 30 seconds.
- (3) During the (1) and (2) operating, if the IGN1 SW is On, the IGN Key Hole Illumination shall be OFF immediately.
- (4) But, if it is in the ARM or ARM WAIT or ALARM or REARM Mode, then the IGN Key Hole Illumination shall be OFF immediately.

IGN1	ON OFF			
DRIVER or ASSIST DOOR SW	OPEN CLOSE		1	1
KEY ILL. LAMP	ON OFF			
T1:30	) ± 1 sec.			

# 16. DEFOGGER TIMER

- (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.</p>
- (5) If the defogger SW is pressed and the ALT "L" is ON, there shall be no the DEFOGGER RLY output.



T1 : 60 ± 20 msec, T2 : 20 ± 1 min.

#### 17. DECAY ROOM LAMP & KEYLESS UNLOCK TIMER Condition 1

State	Description
Initial Condition	Room lamp OFF & IGN1 OFF & 4DOOR AND Tailgate CLOSE

Transition Condition	In the state that all doors are closed, the 4DOOR or T/GATE is opened over 0.1 seconds.
Operating	- Entry into the ROOM LAMP ON state for 20 min - ROOM LAMP ON for 20 ± 1 min

#### **Condition 2**

State	Description
Initial Condition	Room lamp OFF & IGN1 OFF & 4DOOR AND Tailgate CLOSE
Transition Condition	In case of UNLOCK by the TX
Operating	<ul> <li>Entry into the ROOM LAMP ON state for 30s</li> <li>ROOM LAMP ON for 30 ± 3seconds</li> </ul>

# **Condition 3**

State	Description
Initial Condition	Room lamp OFF & IGN1 OFF & 4DOOR AND Tailgate CLOSE
Transition Condition	IGN1 ON and 4 DOOR or Tailgate OPEN over 0.1 seconds
Operating	- Entry into the ROOM LAMP ON state - ROOM LAMP ON



T1 :  $20 \pm 1$  min, T2 :  $30 \pm 3$  sec, T3 : 100 ms.

# Condition 4

State	Description
Initial Condition	ROOM LAMP ON for 30s & IGN1 OFF
Transition Condition	In the state that all doors are closed, the 4DOOR or Tailgate is opened over 0.1 seconds.
Operating	- Entry into the ROOM LAMP ON state for 20 min - ROOM LAMP ON for 20 $\pm$ 1min.

#### **Condition 5**

State	Description
Initial Condition	ROOM LAMP ON for 30s & IGN1 OFF
Transition Condition	In case of UNLOCK by the TX.
Operating	<ul> <li>Maintain in the ROOM LAMP ON state for 30s</li> <li>Extend the ROOM LAMP ON state for 30 seconds.</li> </ul>

# **Condition 6**

State	Description		
Initial Condition	ROOM LAMP ON for 30s & IGN1 OFF		
Transition Condition	IGN1 ON, or after 30 seconds, or when entered into the ARM state, or when all doors are locked.		



T1 : 20 ± 1 min, T2 : 30 ± 3 sec, T3 : 100 ms. **Condition 7** 

# State Description Initial Condition ROOM LAMP ON for 20min & IGN1 OFF Transition Condition IGN1 ON Operating - Entry into the ROOM LAMP ON state - ROOM LAMP ON.

#### **Condition 8**

State	Description		
Initial Condition	ROOM LAMP ON for 20min & IGN1 OFF		
Transition Condition	4DOOR AND Tailgate CLOSE		
Operating	<ul> <li>Entry into the ROOM LAMP ON state for 30s.</li> <li>ROOM LAMP ON for 30 ± 3 seconds.</li> </ul>		

#### **Condition 9**

State	Description		
Initial Condition	ROOM LAMP ON for 20min & IGN1 OFF		
Transition Condition	4DOOR AND Tailgate CLOSE & When All doors are locked, or After 20 minutes		
Operating	- Entry into the ROOM LAMP DECAYING state - The ROOM LAMP is decayed for $2 \pm 0.2$ seconds and then, shall be OFF.		



T3 : 100 ms.

# **Condition 10**

State	Description		
Initial Condition	ROOM LAMP DECAY & IGN1 OFF		
Transition Condition	In the state that all doors are closed, 4DOOR or T/GATE OPEN over 0.1 seconds		
Operating	- Entry into the ROOM LAMP ON state for 20min - ROOM LAMP ON for 20 ± 1minutes.		

#### Condition 11

State	Description		
Initial Condition	ROOM LAMP DECAY & IGN1 OFF & 4DOOR AND Tailgate CLOSE		
Transition Condition	In case of UNLOCK by the TX		
Operating	<ul> <li>Entry into the ROOM LAMP ON state for 30s</li> <li>ROOM LAMP ON for 30 ± 3 seconds.</li> </ul>		

# Condition 12

State	Description		
Initial Condition	ROOM LAMP DECAY		
Transition Condition	After completing the decaying		
Operating	- Entry into the ROOM LAMP OFF state - ROOM LAMP OFF.		

## **Condition 13**

State	Description		
Initial Condition	ROOM LAMP DECAY		
Transition Condition	IGN1 ON and OPEN 4 DOOR or Tailgate for 0.1 seconds		
Operating	- Entry into the ROOM LAMP ON state - ROOM LAMP ON.		



T1 : 20 ± 1 min, T2 : 30 ± 3 sec, T3 : 100 ms. Condition 14

State	Description		
Initial Condition	ROOM LAMP ON & IGN1 ON & 4DOOR or Tailgate OPEN		
Transition Condition	4DOOR AND Tailgate CLOSE		
Operating	<ul> <li>Entry into the ROOM LAMP DECAYING state</li> <li>The ROOM LAMP is decayed for 2 ± 0.2 seconds and then, shall be OFF</li> </ul>		

#### **Condition 15**

State	Description		
Initial Condition	ROOM LAMP ON & IGN1 ON & 4DOOR or Tailgate OPEN		
Transition Condition	IGN1 OFF		
Operating	<ul> <li>Entry into the ROOM LAMP ON state for 20min</li> <li>ROOM LAMP ON for 20 ± 1minutes.</li> </ul>		

#### **Condition 16**

State	Description		
Initial Condition	ROOM LAMP ON & IGN1 ON & 4DOOR or Tailgate OPEN		
Transition Condition	4DOOR AND Tailgate CLOSE & IGN1 OFF		
Operating	<ul> <li>Entry into the ROOM LAMP ON state for 30s</li> <li>ROOM LAMP ON for 30 ± 3seconds.</li> </ul>		



T3:100ms.

#### NOTE

- 1. When the IGN1 is ON, there shall be no blinking of the ROOM LAMP.
- 2. The decaying of the ROOM LAMP should be more than 32 steps.

#### **18. POWER WINDOW TIMER**

- (1) When the IGN2 SW is ON, then the Power Window Relay output shall be ON.
- (2) When the IGN2 SW is OFF, then the Power Window output shall be OFF after the output is maintained ON for 30 seconds.
- (3) In the condition of the Above (2), if the driver's or assist's door is opened, then the output shall be OFF immediately.
- (4) In the state that the driver's or assist's door is opened, if the IGN is OFF, then the Power Window output shall be OFF.
- (5) The SAFTEY POWER WINDOW ECU Output-port shall be controlled the same as the POWER WINDOW RELAY does.



T1:30 ± 3 sec.



A. Navigation wake up signal control

- (1) When KEY OUT, if TX UNLOCK is received, Navigation Wake-Up Signal is operating.
- (2) Navigation Wake-Up Signal is repeated, 60ms ON / OFF, 8 times.
- (3) After operating of Navigation Wake-up signal by TX UNLOCK input, if TX UNLOCK is received in T2 (60sec), Navigation Wake-Up Signal is not operating.
- (4) If Key IN is ON during operating Navigation Wake-Up Signal, Signal is maintained.



T1 :  $60 \pm 5$  msec, T2 : 1 min  $\pm 5$  sec

#### 20. DOOR LOCK/UNLOCK RELAY CONTROL (1) 2-TURN UNLOCK SPECIFICATION



	Unlock relay	Door unlock	Lock relay
Central lock	OFF	OFF	ON
Central unlock	ON	ON	OFF
Driver unlock	OFF	ON	OFF

#### 21. CENTRAL DOOR LOCK/UNLOCK

- (1) After the driver's door key lock SW is on, if the driver's door ACTUATOR UNLOCK SW changes from UNLOCk to LOCK within 3s, ALL DOOR LOCK output shall be ON for T1. But, in case of KEY IN and IGN1 SW ON, output shall be inhibited.
- (2) After the driver's door key unlock SW is on, if the driver's door ACTUATOR UNLOCK SW changes from LOCK to UNLOCK within 3s, ALL DOOR UNLOCK output shall be ON for T1.
- (3) When the TX (Transmitter) LOCK signal is received, all DOOR LOCK output shall be ON for T1.

- (4) When the TX UNLOCK signal is received, all DOOR UNLOCK output shall be ON for T1.
- (5) If the Door LOCK Switch (Power window) is locked , all DOOR LOCK output shall be ON for T1.
- (6) If the Door UNLOCK Switch (Power window) is unlocked, all DOOR UNLOCK output shall be ON for T1.But, in ARM state, the operation by POWER WINDOW UNLOCK Switch shall be inhibited.
- (7) The LOCK/UNLOCK by the SAFETY KNOB is non-interlocking. (Mechanical operation)
- (8) When connected to the BATTERY, there shall be no malfunction.(there shall be no malfunction in the KEY IN position)
- (9) Don't receive the input with less than 60msec(KEY LOCK/UNLOCK SW).
- (10) During output, if there are the output request, the current output shall be OFF immediately, and after 100ms delay, and then, perform the reverse direction output. But, if there are the output request during 100ms delay, perform the output for the last output request occurred.
- (11) In case of the Lock output and Unlock output condition are occurred at the same tine, perform the lock output and disregard the unlock output.
- (12) In case of all DOOR LOCK(UNLOCK) Switch is LOCK(UNLOCK) state, the LOCK(UNLOCK) request in power window always output.
- (13) In case of DRIVER DOOR UNLOCK Switch is UNLOCK state, the request of DRIVER DOOR UNLOCK does not output.
- (14) During DRIVER DOOR UNLOCK output, in case of the output request of ALL DOOR UNLOCK, perform DRIVER DOOR UNLOCK output according to ALL DOOR UNLOCK output.



T1 : 0.5 ± 0.1 sec, T2 : MAX 3 sec.

- 22. 2-TURN UNLOCK
  - (1) IF DRIVER KEY UNLOCK SW is OFF >ON (DRIVER DOOR LOCK SW is UNLOCK mechanically and BCM doesn't output) and then the Driver's ACTUATOR UNLOCK SW is LOCK > UNLOCK within 3s and Driver key unlock SW is OFF > ON within T1, all door unlock output shall be ON for T2..
  - (2) IF DRIVER KEY UNLOCK SW is OFF > ON (DRIVER DOOR LOCK SW is UNLOCK mechanically and BCM doesn't output) and then the Driver's ACTUATOR UNLOCK SW is LOCK > UNLOCK within 3s and receives TX UNLOCK within T1, the UNLOCK output shall be ON to all doors for T2.
  - (3) When the TX UNLOCK signal is received, the DRIVER DOOR UNLOCK output shall be ON for T2. But, if the TX UNLOCK signal is received within T1, the UNLOCK output shall be ON to all doors for T2.
  - (4) If after the TX UNLOCK signal is received, and after the DRIVER KEY UNLOCK SW is turned to ON from OFF (Driver door lock sw become UNLOCK, and BCM does not operate) within T1, actuator unlock sw is UNLOCK in 3s, the UNLOCK output shall be ON to all doors for T2.
  - (5) Even if other registered TX signal within T1 is received, the signal shall regard as the same TX signal.
  - (6) The DOOR LOCK(UNLOCK) output produced by the change of the DRIVER DOOR LOCK SW(KNOB) shall be not output.



T3: Max 3 sec

#### 23. IGN KEY REMINDER

- (1) If the Vehicle speed is over 3Km/h, then this function doesn't act on.
- (2) If KEY IN Switch is IN & the driver's door is opened & the driver's DOOR UNLOCK Switch is locked, then after 0.5 seconds, the unlock signal shall be output to the driver's door for 1s.
- (3) If it is in state of that KEY IN SW is IN & assist's DOOR is OPEN & assist's DOOR UNLOCK SW is LOCK, and after 0.5s, and then perform the ALL DOOR UNLOCK output for 1 second.
- (4) When (2) items are met at the same time, after 0.5 seconds, the unlock signal shall be output to all doors for 1 second in conformity with (3) item.
- (5) Although the unlock signal is output for 1 s by the (2), (3) items, if the lock state is maintained, the unlock signal shall be output at maximum three times (except for 1s output). (1s cycle: 0.5s ON/OFF)
- (6) After perform (5) items, in case of LOCK state is maintained, and in case of DOOR CLOSE, and then attempt the ALL DOOR UNLOCK one time.
- (7) In the KEY IN Switch is IN state, if the driver's door is closed within 0.5 seconds as soon as the driver's DOOR UNLOCK SW is turned to the LOCK from the UNLOCK, the unlock signal shall be output to the driver's door for 1 s one time.
- (8) In the KEY IN Switch is IN state, if the assist's door is closed within 0.5 seconds as soon as the assist's DOOR UNLOCK Switch is turned to the LOCK from the UNLOCK, the unlock signal shall be output to all doors for 1 s one time.
- (9) In the KEY IN Switch is IN state, if the driver's DOOR UNLOCK Switch is turned to the LOCK from the UNLOCK within 0.5 seconds as soon as the driver's door is turned to the closed state from the opened state, then the Unlock signal shall be output to the driver's door for 1 second one time.
- (10) In the KEY IN Switch is IN state, if the assist's DOOR UNLOCK Switch is turned to the LOCK from the UNLOCK within 0.5 seconds as soon as the assist's door is turned to the closed state from the opened state, then the Unlock signal shall be output to all doors for 1 second one time.
- (11) In the KEY IN state, after the DRIVER DOOR or ASSIST DOOR are opened, if the doors are locked by the Power window LOCK Switch, the unlock signal shall be output to all doors.
- (12) Even if the condition is not maintained for 0.5s after the UNLOCK condition is satisfied, the unlock signal shall be output. But, after the condition is satisfied as the result that the DOOR LOCK Switch is turned to the LOCK from the UNLOCK, if the KEY IN Switch is OFF at the passage time of 0.5s, the unlock signal shall not be output.



T4:0.5 sec Max

#### 24. CRASH DOOR UNLOCK

- (1) In the IGN KEY ON state, whenever the AIR BAG signal is received, the unlock signal shall be output always.
- (2) During the unlock output, even if the IGN KEY ON is turned to the OFF from the ON, the unlock output is maintained for the remained time.
- (3) After the UNLOCK output, if the DRIVER or ASSIST, REAR DOOR LOCK SW are turned to the LOCK from the UNLOCK, the unlock signal shall be output for T3.
- (4) The AUTO DOOR LOCK function is not performed in the CRASH UNLOCK condition.
- (5) The CRASH DOOR UNLOCK function is prior to the LOCK/UNLOCK control by the other functions.
- (6) The LOCK/UNLOCK requirement by the other functions is disregarded during the CRASH DOOR UNLOCK output or after it. But, if the IGN KEY OFF, the LOCK/UNLOCK control by the other functions shall be performed.



T3 : 5 ± 0.5 sec. \*1 ON : IGN KEY ON OFF : IGN KEY OFF

#### 25. 2-turn Mode change fuction

- (1) If Lock & Unlock buttons of RKE are pushed together more than 4sec, RKE transmits Two Turn Unlock Set/Reset Frame.
- (2) If DATA of (1) is received, BCM changes Two Turn Unlock Mode.
- (3) In case of Set state, if (1) data is received, mode is changed to Reset, and in case of Reset state if (1) data is received, mode is changed to Set.
- (4) In case of mode change, BCM output Hazard Lamp 4 times On/Off(1sec cycle) .



T1: 4.5sec within, T2: 4sec,

T3:1±0.1 sec.

26. 3KM SIGNAL OUTPUT CONTROL

If the vehicle speed is maintained at more than 3km/h for 2~3 seconds in the IGN1 ON state, the signal of 3 KM Output-port shall be ON.



# Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Repair procedures

# Replacement

- 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 antenna cable after loosening 3 bolts and disconnecting connector.



4. Installation is the reverse of removal.

#### Inspection

**BCM Connectors** 



Connector A

Connector B

Connector C

Connector D

Pin No.	Connector A	Connector B	Connector C	Connector D
1	Battery voltage	Tail switch	Front fog lamp switch	Defogger switch
2	Key interlock solenoid	-	INT switch	Unlock relay
3	Ground 1	Drive door switch	-	Lock relay
4	Room lamp	Hood switch	Key interlock	DRL relay
5	ALT "L"	Rear wiper switch	-	Head lamp low relay
6	IGN1	Drive actuator unlock switch	Vehicle speed	Wiper relay
7	-	Power window unlock switch	K-line	Hazard relay
8	AVN tail	Drive key lock switch	DRL control relay (CANADA)	
9	Head lamp high switch	Rear washer switch	-	Head lamp high indicator
10	ACC SW	Crash unlock	Washer switch	Key illumination lamp
11	Key IN switch	MIST switch	DRL option line	Rear wiper relay
12	IGN2	Sunlight sensor	-	Burglar alarm relay
13	Navigation Wake up signal	Sunlight sensor power	INT volume	Driver unlock relay
14	3KM to IMS	Seat belt switch	Shift lever P position switch	Tail relay
15		4Door switch	-	Head lamp high relay
16		Assistant door switch	-	-
17		Tailgate switch		Horn relay
18		Rear actuator unlock switch		Power window relay
19		Assistant actuator unlock switch		Seat belt indicator
20		Power window lock switch		Security indicator
21		Driver key unlock switch		Safety power window
22		Defogger switch		Ground 1
23		Parking brake switch		
24		Head lamp switch		
25		Auto light switch		
26		Autolight sensor ground		

# **BCM Input/output Specification**

#### Connector A

Pin No.

97

		(Operating Voltage 9	V to 16V at normal temperature / Output type)
A01	Battery voltage		9V ~ 16V
A02	Key interlock solenoid	L	ow side / FET
A03	Ground 1		GND
A04	Room lamp	L	ow side / FET
A05	ALT "L"		Analog input
		ON	Above 6V
A06		OFF	Below 2V
A07	-		-
A08	AVN tail	L	ow side / FET
		ON	Above 6V
A09	Head lamp high switch	OFF	Below 2V
		ON	Above 6V
A10	ACC switch	OFF	Below 2V
		ON	Above 6V
ATT	Key in switch	OFF	Below 2V
A10		ON	Above 6V
ATZ	IGN2 switch	OFF	Below 2V
A13	Navigation wake up signal	L	ow side / FET
A14	3KM TO IMS	L	ow side / FET

#### **Connector B**

Pin No.	Pin Name	Input acquisition threshold voltage (Operating Voltage 9V to 16V at normal temperature / Output type)	
P01	Tail awitab	ON	Above 6V
DUT		OFF	Below 2V
B02	-	-	-
DO2	Driver deer ewitch	ON	Above 6V
B03	Driver door switch	OFF	Below 2V
D04		ON	Above 6V
B04	Hood Switch	OFF	Below 2V
DOF	Deer wirde gwitch	ON	Above 6V
805	Rear wiper switch	OFF	Below 2V
DOG		ON	Above 6V
B06	Driver actuator unlock switch	OFF	Below 2V
DOZ	Dower window unlook owitch	ON	Above 6V
BU7	Power window unlock switch	OFF	Below 2V
DOO	Driver key lock switch	ON	Above 6V
DU0		OFF	Below 2V
POO	Rear washer switch	ON	Above 6V
B09		OFF	Below 2V
B10	Crash unlock	ON	Above 6V

		OFF	Below 2V
B11	MIST switch	ON	Above 6V
		OFF	Below 2V
B12	Sunlight sensor		Analog input
B13	Sunlight sensor power	5V a	utput, Analog input
D44		ON	Above 6V
В14	Seat beit Switch	OFF	Below 2V
D45		ON	Above 6V
B15	4Door switch	OFF	Below 2V
D40		ON	Above 6V
BIO	Assistant door switch	OFF	Below 2V
D47		ON	Above 6V
B1/	Taligate Svv	OFF	Below 2V
D40	Rear acturator unlock switch	ON	Above 6V
B18		OFF	Below 2V
D40	Assistant actuator unlock switch	ON	Above 6V
B19		OFF	Below 2V
Daa		ON	Above 6V
B20	Power window lock switch	OFF	Below 2V
<b>D</b> 04	Driver key unlock switch	ON	Above 6V
B21		OFF	Below 2V
Daa		ON	Above 6V
B22	Defogger switch	OFF	Below 2V
Daa		ON	Above 6V
B23	Park brake switch	OFF	Below 2V
DOA	Head lamp switch	ON	Above 6V
В24		OFF	Below 2V
DOS		ON	Above 6V
B25	Auto light switch	OFF	Below 2V
B26	Sunlight sensor ground		GND

#### **Connector C**

PIN NO.	Pin name	Input acquis (Operating Voltage 9\ C	ition threshold voltage / to 16V at normal temperature / Dutput type)	
C01	Front fog owitch	ON	Above 6V	
	From log switch	OFF	Below 2V	
<u> </u>		ON	Above 6V	
002	INT SWICH	OFF	Below 2V	
C03	-		-	
004	C04 Key interlock	ON	Above 6V	
C04		OFF	Below 2V	
C05	-		-	
C06	Vehicle speed	Fr	Frequency Input	
· · ·		÷	99	

C07	Diagnosis line	Communication Line	
<u> </u>	C08	ON	Above 6V
08	Code save	OFF	Below 2V
<u> </u>			-
09	-		-
C10		ON	Above 6V
010	Washer switch	OFF	Below 2V
014	C11 Drl option line	ON	Above 6V
CII		OFF	Below 2V
C12	-		-
C13	INT Volume	Analog input	
014	Shift lever P position switch	ON	Above 6V
C14		OFF	Below 2V
C15	-		-
C16	-		-

#### **Connector D**

Pin NO.	Pin Name	Input acquisition threshold voltage (Operating Voltage 9V to 16V at normal temperature / Output type)
D01	Defogger relay	Low side / FET
D02	Unlock relay	Low side / FET
D03	Lock relay	Low side / FET
D04	DRL relay	Low side / FET
D05	Head lamp low relay	Low side / FET
D06	Wiper relay	Low side / FET
D07	Hazard relay	Low side / FET
D08	-	-
D09	Head lamp high indicator	Low side / TR
D10	Key illumination lamp	High side / TR
D11	Rear wiper relay	Low side / FET
D12	Burglar alarm relay	Low side / FET
D13	Driver unlock relay	Low side / FET
D14	Tail relay	Low side / FET
D15	DRL Canada relay	Low side / FET
D16	-	-
D17	Horn relay	Low side / FET
D18	Power window relay	Low side / FET
D19	Seatbelt indicator	Low side / TR
D20	Security indicator	Low side / TR
D21	Safety power window	Low side / FET
D22	Ground1	GND

The body control module can diagnose with the diagnosis tool more quickly.

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

Section	BCM Display	Abbreviation	Unit	Remarks
	IGN1	IG1	OFF/ON	Input
	IGN2	IG2	OFF/ON	Input
	ALT L	ALT VOLT	OFF/ON	Input
Power	Key in switch	KEY IN	OUT/IN	Input
	Starter inhibit relay (+RK)	INHIBIT	ENABLE/ STOP	Output
	Power window relay	P/WDW relay	OFF/ON	Output
	Auto Light Power	LIGHT PWR	OFF/ON	
	Tail lamp switch	TAIL switch	OFF/ON	Input
	Auto light switch (-DRL)	LIGHT switch	OFF/ON	Input
	Head lamp switch	HEAD/L switch	OFF/ON	Input
	Front fog switch	FF FOG switch	OFF/ON	Input
	Head lamp high switch	H/LAMP HI	OFF/ON	Input
	Drl option line switch	DRL	NONE/DRL	Input
	Tail lamp relay	TAIL relay	OFF/ON	Output
Lown	Head lamp relay	H/L relay	OFF/ON	Output
Lamp	Hazard lamp relay (+RK)	HAZARD RL	OFF/ON	Output
	Driver seat belt IND.	D S/BELT	OFF/ON	Output
	Room lamp	ROOM LAMP	OFF/ON	Output
	IGN key hole ILL.	KEY ILL.	OFF/ON	Output
	Security indicator	S/IND.	OFF/ON	Output
	DRL relay	DRL relay	OFF/ON	Output
	Head lamp high relay	H/L relay	OFF/ON	Output
	Head lamp high IND.	H/L IND.	OFF/ON	Output
	Driver door open switch	D/DOOR switch	Closed/open	Input
	Assist door open switch	A/DOOR switch	Closed/open	Input
Entrance	4 Door switch	4Door switch	Closed/open	Input
	Tail gate switch	Tail	Closed/open	Input
	Hood switch (+RK)	Hood switch	Closed/open	Input
	DR.door ACT.POSI.switch	D/DR ACT	UNLOCK/LOCK	Input
	AS.door ACT.POSI.switch	A/DR ACT	UNLOCK/LOCK	Input
	RH,RR,T/gate ACT POSI.switch	ACT switch	UNLOCK/LOCK	Input
	DR.door key lock switch	DR KEY switch	OFF/ON	Input
	DR.door key unlock switch	D/DR KEY	OFF/ON	Input
	AS.door key unlock switch	A/DR KEY	OFF/ON	Input
LOCK/UI IIOCK	T/gate key unlock switch	TRUNK switch	OFF/ON	Input
	CTRL door lock switch	CTRL D/LO	OFF/ON	Input
	CTRL door unlock switch	CTRL D/UN	OFF/ON	Input
	Crash unlock signal	crash SIG	OFF/ON	Input
	Door lock relay	DR L/RLY	OFF/ON	Output
	Door unlock relay	DR U/RLY	OFF/ON	Output

	T/gate key lock switch	Trunk switch	OFF/ON	Output
	Dead lock relay		OFF/ON	Output
	Washer switch	Washer switch	OFF/ON	Input
	INT.Wiper switch	INT switch	OFF/ON	Input
	Rear defogger switch	RR DEF switch	OFF/ON	Input
Winer deferrer	H/lamp Washer switch	H/washer	OFF/ON	Input
wiper derogger	Wiper relay	wiper RLY	OFF/ON	Output
	Rear defogger relay	RR DEF RLY	OFF/ON	Output
	H/lamp washer RLY	H/L RLY	OFF/ON	Output
	Mist SW	MIST switch	OFF/ON	Input
	Over speed input	O/SPEED	OFF/ON	Input
	Driver seat belt switch	D S/B switch	Unbuckled/ buckled	Input
Warning	P/brake switch	P/BRAKE	Unpark/park	Input
	Buglar horn relay	BUR. RLY	OFF/ON	Output
	Chime bell	CHIM. BELL	OFF/ON	Output
	INT. Volume(-RAIN)	INT. VOL	V	Input
Analog input signal	Auto light SNSR	A/LIGHT	V	Input
	Speed signal	VSS	Km/h	Input
ETC	Safety P/W ECU	P/W ECU	OFF/ON	Input

# **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	Day Running light
8	Low speed wiping relay
9	High speed wiping relay
10	Defroster relay
11	Trunk release
12	B/A Horn
13	Room Lamp
14	Hazard Lamp + Flasher Buzzer Output
15	Left turn signal + Flasher Buzzer Output
16	Right turn signal + Flasher Buzzer Output
17	Buzzer
18	Key illumination
19	Seat Belt Indicator(Driver side and Assist side)

20	Head Lamp Washer
21	Start Inhibition output
22	External Buzzer output
23	Security Led output
24	Rear RH Power window Up
25	Rear RH Power Window Down
26	Rear LH Power window Up
27	Rear LH Power Window Down
28	Foot lamp output
29	AV TAIL output

## **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 menu.



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.



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

1. HYUNI	DAI VEHICLE DIAGNOSIS			
MODEL : SANTAFE SYSTEM : BODY CONTROL MODULE				
01. CUR 02. FLIG	RENT DATA HT RECORD			
03. ACTI	JATION TEST			
04. SIMU	J-SCAN			
05. IDEN	ITIFICATION CHECK			
06. USE	ROPTION			
07. DATA	SETUP (UNIT CONV.)			
1.3 ACTUATION TEST 09/21				
TAIL LAMP	RELAY/DRL UNIT			
DURATION	1 SECONDS			
METHOD	ACTIVATION			
CONDITION	ENGINE : IDLE			
	TRANSAXLE RANGE : P			
PRESS [S	TRT], IF YOU ARE READY !			
SELECT TEST ITEM USING UP/DOWN KEY				
STRT				

- 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.
    - A. Vehicle speed gearing AUTO DOOR LOCK (more than 20km/h)
    - B. AUTO DOOR LOCK non application
    - C. Shift lever gearing AUTO DOOR LOCK
    - D. Driver seat AUTO DOOR LOCK
    - E. AUTO DOOR UNLOCK non application
    - F. All doors UNLOCK in the case of driver door UNLOCK
    - G. All doors UNLOCK in the case of IGN key seperation.
  - (4) Riding & Getting off gearing
    - A. Seat installation state ON/OFF
    - B. Seat riding & getting off gearing ON/OFF
    - C. Column installation state ON/OFF
    - D. Column riding & getting off gearing ON/OFF

#### **User Option Mode**

The BCM offers 3 items user option mode for a user convenience (AUTO DOOR LOCK, ARM/DISARM BY KEY, HORN ANSWER BACK)

- It is able to set up the enable or disable of AUTO DOOR LOCK function or AUTO DOOR LOCK operation vehicle speed when using it.
- It is able to set up the enable or disable of enter the burglar alarm mode when using door lock by the key.
- It is able to set up the enable or disable of horn inform function when using door lock by the key or RKE.
- 1. Select option "SNATAFF(CM)" and press ENTER.
- 2. Select option "BODY CONTROL MODULE" and press ENTER.



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



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

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

- 6. Select option "ARM/DISARM BY KEY(+RKE)" by using the direction button(▲ / ▼).
- Select the parameter by using the direction button(◄ / ►) and press ENTER to save it. (Disable / Enable)
- 8. Select option "HORN ANSWER BACK (+RK)" by using the direction button(▲ / ▼).
- 9. Select the parameter by using the direction button (▲ / ▼) and press ENTER to save it (Disable/Enable)

# Body Electrical System > Seat Electrical > Components and Components Location

#### **Component Location**



# Body Electrical System > Seat Electrical > Schematic Diagrams

# **Circuit Diagram**



# Body Electrical System > Seat Electrical > Power Seat Motor > Repair procedures

# 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.



# **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.



## **Power Seat Motor**

1. Disconnect the connectors for each motor.



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

Position		1	2
Slide motor A	Frontward	$\oplus$	Θ
	Backward	θ	$\oplus$
Front height motor B	UP	θ	$\oplus$
	DOWN	$\oplus$	Θ
Rear height motor C	UP	$\oplus$	Θ
	DOWN	θ	$\oplus$
Reclining motor D	Forward	Θ	$\oplus$
	Rearward	$\oplus$	θ
Lumbar support E	Forward	$\oplus$	θ
	Rearward	Θ	$\oplus$

# Body Electrical System > Seat Electrical > Power Seat Control Switch > Repair procedures

## 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.


### Power seat switch connector A

			He	igh	nt s	wito	ch				ç	Sea	at swi	tch				He	ight s	w	itch (	Back	ward)		Reclining switch						
$  \searrow  $		Le	ft		Riç	ght		Fro	ntv	ward		Le	ft	Rig	gh	t		Le	əft	Γ	Rig	ght	Fr	ontwa	rd		Le	əft	Γ	Riç	ght
	UF		DOWN	ι	JP	DOV	٧N	Heig	ht	SEAT	F		R	F		R	U	Р	DOWN	J	UP	DOW	N HI	IEI RH	REC	He	ight	R		F	R
17	Ŷ	1	γ	Q		Ŷ	>				(	p	9	Ŷ		Q	5	2	Q	<	p	Ŷ				(	P	Q	5	>	Ŷ
11										Ŷ	Ŷ	Π	6	9	Ŷ	,													$\square$		
10										Q	(	5	Ŷ	9	Π	9				Ι									Π		
6										6			6	9	Π					Γ									Π		
5										6	6				6	)				Γ									Π		
8																									Ŷ	(	5	ļρ	Ī	Q	9
18																				Γ					9	(	P	6	5	$\rangle$	9
15				Π																Γ					6	(	5		Γ		6
16																				Γ					6			6	1	0	
2	6	Τ	Q	Π	Q	6	>	(	ρĪ			Τ			Γ					Τ									Г		
4	Ŷ	-	6	6		Ŷ	>	Q	Π																				Γ		
1	6	Τ			Τ	6	>	6	Π			Τ			Γ					Τ									Г		
3			6		9			(	51											T									Γ		
13		T							Τ			T			Γ		7	>	Q Q	T	Q	6	٩ ٩	9		Γ			Г		
14																	9	>	6	1	5	Q	Q	ļρ					Γ		
12		T							T			1					7	5		T	6		6	6					Г		
7																			6			0	6	6					Γ		

#### Driver lumbar connector B

	L/SUPT SW					
	RR	N	FR			
1	Q		Q			
2		QΟ				
3		Ó	Ó			
4	Ó	Ò				

## Body Electrical System > Seat Electrical > Seat Heater Switch > Repair procedures

### Inspection

## Front Seat Warmer Switch

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the seat warmer switch (A) with a trim removal tool.



3. Check that continuity exists between the terminals.

Terminal Position	2	6	3	4	1
ON	2	2	0	IND.	<b>-</b> 0
OFF		Illumina- tion			

## Body Electrical System > Seat Electrical > Seat Heater > Repair procedures

### Inspection

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



#### Standard value : Cushion : $4.73\Omega \pm 10\%$ , Back : $34.97\Omega \pm 10\%$

- 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  $\pm$  2°C (Cushion), 52  $\pm$  2°C (Back)

Terminal Position	1	2	3
HIGH	Ð	Θ	Θ
LOW		۲	Θ

## Body Electrical System > Fuel Filler Door > Components and Components Location

## **Component Location**



# Body Electrical System > Fuel Filler Door > Fuel Filler Door Release Actuator > Repair procedures

### Inspection

- 1. Remove the rear seat. (Refer to the BD group - "Rear seat")
- 2. Remove the luggage side trim. (Refer to the 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).



# Body Electrical System > Fuel Filler Door > Fuel Filler Door Open Switch > Repair procedures

### 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.



Body Electrical System > Fuses And Relays > Components and Components Location

## **Component Location**

[Engine room relay box]		
1. A/T control relay	7. Start relay	13. Rear defogger relay
<ol> <li>Cooling pan relay</li> <li>Front fog lamp relay</li> <li>A/C relay</li> <li>Head lamp relay (High)</li> <li>Main relay</li> </ol>	<ol> <li>8. Condenser fan 2 relay</li> <li>9. Condenser fan 1 relay</li> <li>10. Tail lamp relay</li> <li>11. Head lamp relay (Low-left side)</li> <li>12. Head lamp relay (Low-right side)</li> </ol>	<ol> <li>Horn relay</li> <li>Wiper relay</li> <li>Rain sensor relay</li> <li>Fuel pump relay</li> </ol>



Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Components and Components Location

**Component Location** 



#### **Relay Type**

Relay Name	Туре
Start Relay	MINI ISO
Engine Control Relay	MINI ISO
Head Lamp High Relay	MICRO ISO
A/CON Relay	MICRO ISO
Front Fog Lamp Relay	MICRO ISO
Condenser Fan Relay (High)	MICRO ISO
Back-Up Lamp Relay	MICRO ISO
Fuel Pump Relay	MICRO ISO
Rain Sensor Relay	MICRO ISO
Front Wiper Relay	MICRO ISO
Horn Relay	MICRO ISO
Front Wiper Deicer Relay	MICRO ISO
Rear Defogger Relay	MINI ISO
Head Lamp Low Relay (RH)	MICRO ISO
Head Lamp Low Relay (LH)	MICRO ISO
Tail Lamp Relay	MICRO ISO
Condenser Fan Relay (Low)	MICRO ISO

### **% USE THE DESIGNATED FUSE AND RELAY ONLY**

	FUSE	(A)	Circuit Protected		FUSE	(A)	Circuit Protected	
	ALT	175A	FUSIBLE LINK - BLR, B+ 2, P/WDW, ESC 1, ESC 2 FUSE - DEKCER, RR HTD, A/CON, FR FOG, H/LP LO LH H/LP LO RH	14	SENSOR 3	15A	G4KE - Injector #1~#4, Canister Close Valve Canister Purge Control Solanoid Valve G6DC - PCM, OI Control Valve #1/2 (Exhaust/Intake)	
	BATT	30A	Trailer Power Outlet	11			Canister Close Valve, Variable Intake Manifold Valve #1/2	
	IGN 1	40A	Ignition Switch (ACC, IG 1)	1.0	TAULDIN	10.4	License Lamp, Rear Combination Lamp (In) LH	
	ESC 1	40A	Multipurpose Check Connector, ESC Control Module	11 15	5 TAILLPLH 104		Rear Combination Lamp (Out) LH, Head Lamp LH	
1	CON FAN 2	50A	Condenser Fan Relay (High)	16	FUEL PUMP	15A	Fuel Pump Relay	
-	ESC 2	20A	ESC Control Module	17	FR WIPER	25A	Front Wiper Relay, Front Wiper Motor, Multifunction Switch (Wiper)	
	BLR	40A	FUSE - BLOWER	18	TCU	15A	PCM, Battery Sensor	
	P/WDW	40A	Power Window Relay, FUSE - SAFETY PWR	19	ESC	10A	Multipurpose Check Connector (G6DC), 4WD ECM ESC Control Module, Yaw Rate Sensor, Stop Lamp Switch (G6DC)	
	B+ 2	504	SWARMER S/ROOF PDM 2 P/AMP	20	COOLING	10A	Condenser Fan Relay (G6DC)	
	DYZ	300	AC INVERTER, DRL	21	B/UP LP	10A	Back-Up Lamp Relay, Back-Up Lamp Switch (G4KE)	
	IGN 2	40A	Ignition Switch (START, IG 2), Start Relay	22	H/LP	10A	Head Lamp Low Relay (LH/RH), Front Fog Lamp Relay Head Lamp High Relay	
	D. 4	60.4	FUSE - DR LOCK, HAZARD, ATM, PDM 1, STOP LP POWER CONNECTOR	22	ECU	10.4	DCM Alternator (CEDC) Transavia Danas Pulitik	
	D+ I	50M	(BCM 3, CLOCK ROOM LP, AUDIO 1)	20	HADHI	204	Head Lamp Mich Delay	
-	CON FAN 1	40A	Condenser Fan Relay (Low)	29	TVLP HI	200	CAKE She Lamp Switch Immebilizer Madula APCAI Balay	
	ECU MAIN	40A	Engine Control Relay	11			Fuel Pump Relay, Condenser Fan Relay (Low)-ligh)	
1	DEICER	15A	Front Wiper Deicer Relay	11			Crankshaft Position Sensor, Oil Control Valve #1/2	
2	RR HTD	30A	Rear Defogger Relay	25	SENSOR 1	10A	Camshaft Position Sensor #1/2, Oxygen Sensor (Up)	
3			-	11			G6DC - PCM, A/CON Relay, Fuel Pump Relay, Injector #1-#6	
4	H/LP LO RH	15A	Head Lamp Low Relay (RH)	11			Immobilizer Module	
5	HORN	15A	Hom Relay	1⊢	-		G4KE - PCM, Oxygen Sensor (Down)	
6	HALPLOTH	15A	Head Lamp Low Relay (LH)	26	SENSOR 2	15A	G6DC - PCM, Oxygen Sensor #1~#4	
7	H/LP HI IND	10A	Instrument Cluster (High Beam IND.)	11			Variable Charge Motion Actuator	
8		120	*			2203	G4KE - Condenser, Ignition Coil #1~#4	
9	A/CON	10A	A/CON Relay	27	IGN COIL	20A	G6DC - Condenser #1/2, Ignition Coll #1~#6	
10	ATM	15A	4WD ECM, PCM (G4KE), Back-Up Lamp Relay	28	SPARE	10A		
11			•	29	SPARE	15A	*	
12	TAIL LP BH	10A	Rear Combination Lamp (In)/(Out) RH, Head Lamp RH	30	SPARE	20A		
			Glove Box Lamp, Illuminations	31	SPARE	25A	# ::	
13	FR FOG	10A	Front Fog Lamp Relay	32	SPARE	30A	i.	

## **※ USE THE DESIGNATED FUSE AND RELAY ONLY**

# Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures

### 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.



## 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.



Terminal Power	85	86	30	87	87a
Disconnected	0	-0	0		-0
Connected O O					
* 87 : Normal of 87a : Normal * Rated Load of 1) NO : 20A (N 2) NC : 10A (N	pen closed urrent : 10TOR 10TOR	, Lamp   , Lamp	Load) Load)		

## 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.



Rated Load (	Current	
Connected	Θ	

Ó

Ó

0

0

Disconnected

0 -----

Resistive	Lamp	Inductive
30A	20A	20A

## 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.



## **Related Load Current**

Load	Resistive	Motor	Lamp
Terminal 30/87	15A	10A	10A
Terminal 30/87a	15A	10A	10A

### 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.

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Components and Components Location

### **Component Location**



FUSE	(A)	Circuit Protected	FUSE	(A)	Circuit Protected
START	10A	Burglar Alarm Relay	S/WARMER	15A	Driven/Passenger Seat Warmer Control Module
P/WDW LH	25A	Power Window Main Switch, Rear Power Window Switch LH	DRL	15A	ICM Relay Box (DRL Relay)
P/WDW RH	25A	Power Window Main Switch, Passenger Power Window Switch Rear Power Window Switch RH	HAZARD	15A	Hazard Relay, Hazard Switch, BCM, Instrument Cluster (IND.) Multifunction Switch (Light), Rear Combination Lamp (OUT) LH/RH
S/ROOF	20A	Sunroof Motor		-	Head Lamp LH/RH
P/SEAT	30A	Driver/Passenger Seat Manual Switch, Driver Lumbar Support Switch	RR WIPER	15A	Rear Wiper Relay, Rear Wiper Motor, Multifunction Switch (Wiper)
SAFETY PWR	25A	Safety Power Window Module	A/CON SW	10A	A/C Control Module
MIRR HTD	10A	Rear Defogger Switch, Driver/Passenger Power Outside Mirror	CLUSTER	10A	Alternator, Instrument Cluster (IND.), BCM, A/V & Navigation Head Uni Tire Pressure Monitoring Module, DVD Module
A/BAG 2	15A	Digital Clock & Telltail	DOM 1	104	DOM
A/BAG 1	15A	SRS Control Module, PODS Module	DD ACON	154	Netlland
ROOM LP	10A	Instrument Cluster (IND.), Driver/Passenger Door Lamp, MAP Lamp Room Lamp, Cargo Lamp, Driver/Passenger Vanity Switch	TPMS	10A	Tire Pressure Monitoring Module
A/CON	10A	A/C Control Module, Cluster Ionizer, Incar Sensor, Sunroof Motor Electro Chromic Mirror, Blower Balay, CM02 (Ground), Home Link	BCM 2	10A	Rheostat, BCM, Instrument Cluster (MICOM), AC Inverter Switch AC Inverter Module
AC INVERTER	25A	AC Inverter Module	AUDIO 2	10A	Audio, AV & Navigation Head Unit, BCM, DVD Module Digital Clock & Telltale, Power Outside Mirror Switch
P/AMP	30A	Amp	BLOWER	30A	Blower Relay, Blower Motor, A/CON SW 10A
P/OUTLET CTR	15A	Center Power Outlet	STOP LP	15A	Stop Lamp Switch
P/OUTLET	25A	Front Power Outlet & Cigarette Lighter, Rear Power Outlet	PDM 1	204	Not Used
<b>C/LIGHTER</b>	15A	Front Power Outlet & Cigarette Lighter	BCM 3	10A	BCM. Ignition Key ILL & Door Warning Switch. Security Indicator
		Door Lock/Unlock Relay, ICM Relay Box (Key Lock/Unlock Relay)	CLOCK	15A	A/C Control Module, Data Link Connector, Digital Clock & Telltail
DR LOCK	20A	BCM, Driver/Passenger Door Lock Actuator, Tail Gate Lock Actuator Bear Door Lock Actuator LH/RH, GM01 (Ground)	AUDIO 1	15A	Audio, A/V & Navigation Head Unit, DVD Module
A/BAG IND	10A	Instrument Cluster (IND.)	ATM	10A	Sport Mode Switch, Key Solenoid
		ESC Switch, Steering Angle Sensor, ICM Belay Box (Sub Start Belay)	PDM 2	15A	Not Used
ESC SW	10A	Driver/Passenger Seat Warner Control Module Multifunction Switch (Remote Control)	POWER CONNECTOR		FUSE - ROOM LP 15A, CLOCK 15A, AUDIO 1 15A, BCM 3 10A
T/SIG	10A	Hazard Switch			

### **※ USE THE DESIGNATED FUSE ONLY**

# Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Repair procedures

### Inspection

### Relay



### **Door Lock**

- 1. There should be continuity between the No.5 in the I/P-J and No.18 terminals in the I/P-D when power and ground are connected to the No.2 terminal in the I/P-C and No.9 terminal in the I/P-J.
- 2. There should be no continuity between the No.5 terminal in the I/P-J and No.18 terminal in the I/P-D when power is disconnected.

## **Door Unlock**

- 1. There should be continuity between the No.5 terminal in the I/P-J and No.7 terminal in the I/P-K when power and ground are connected to the No.2 terminal in the I/P-C and No.1 terminal in the I/P-K.
- 2. There should be no continuity between the No.5 terminal in the I/P-J and No.7 terminal in the I/P-D when power is disconnected.

### **Power Window**

- 1. There should be continuity between the No.6 in the I/P-F and No.14 terminal in the I/P-D when power and ground are connected to the No.10 terminal in the I/P-E and No.2 terminal in the I/P-J.
- 2. There should be no continuity between the No.6 terminal in the I/P-F and No.14 terminal in the I/P-D when power is disconnected.

### Hazard Lamp Relay

- 1. There should be continuity between the No.2 of I/P-C and No.3 or No.4 of I/P-E terminals when power and ground are connected to the No.2 of I/P-C and No.6 of I/P-G terminals.
- 2. There should be no continuity between the No.2 of I/P-C and No.3 or No.4 of I/P-E terminals when power is disconnected to the No.2 of I/P-C and No.6 of I/P-G terminals.

## **Buglar Alarm Horn**

- 1. There should be continuity between the No.1 of I/P-C and No.6 of I/P-J terminals when power and ground are connected to the No.1 of I/P-C and No.8 of I/P-J terminals.
- 2. There should be no continuity between the No.1 of I/P-C and No.6 of I/P-J terminals when power is disconnected to the No.1 of I/P-C and No.8 of I/P-J terminals.

### **Buglar Alarm Start**

- 1. There should be continuity between the No.10 of I/P-M and No.9 of I/P-K terminals when power and ground are connected to the No.10 of I/P-M and No.3 of I/P-A terminals.
- 2. There should be no continuity between the No.10 of I/P-M and No.9 of I/P-K terminals when power is disconnected to the No.10 of I/P-M and No.3 of I/P-A terminals.

### Blow

- 1. There should be continuity between the No.5 of I/P-A and No.8 of I/P-K terminals when power and ground are connected to the No.11 of I/P-A and No.8 or No.12 of I/P-M terminals.
- 2. There should be no continuity between the No.5 of I/P-A and No.8 of I/P-K terminals when power is disconnected to the No.11 of I/P-A and No.8 or No.12 of I/P-M terminals.

### 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.

## Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Description and Operation

## Description

The ICM is united with many kinds of relays and installed below the body control module. relay box (Assist compartment).



# Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Repair procedures

## Inspection

### **Rear Aircondition**

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.11 in the ICM-B.
- 2. There should be no continuity between the No.2 and No.3 terminals when power is disconnected.

## DRL

Check for continuity between the terminals.

- 1. There should be continuity between the No.8 and No.9 terminals when power and ground are connected to the No.4 and No.11 terminals in the ICM-A.
- 2. There should be no continuity between the No.8 and No.9 terminals when power is disconnected.

## Body Electrical System > Indicators And Gauges > Components and Components Location

### **Component Location**



# Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

## Components





	1 2 3 4 5 6 7 8 9 10 HEIPERENERIESTENERIES 11121314151617181920 HEIPERENERIESTENERIES	9 10111213141516		1 2 3 4 5 6 7 8 HEIGENERATION 9 10111213141516
NO	Connector A	Connector B	Connector C	Connector D
1	Turn signal-right	Washer level	Door	-
2	-	Immobilizer	Trunk open	-
3	High beam (-)	-	-	-
4	High beam (+)	-	Air bag (+)	-
5	Key out	Fuel GND (MICOM)	Air bag (-)	-
6	Fuel sender	Turn signal-left	-	-
7	-	4WD lock	Battery charge	-
8	-	4WD	Brake	-
9	-	-	Seat belt	-
10	Check engine	AMBIENT sensor	Oil pressure	TPMS Dignosis
11	C-CAN High	Trip computer mode sw	-	TPMS Tread
12	C-CAN Low	Trip reset sw	-	-
13	Power GND (-)	IG2+		-
14	-	GND (signal)		-
15	Illumination (+)	IGN+		-
16	Illumination (-)	Battery+		
17	High speed (BCM)			
18	-			
19	4P-out			
20	P-out			



	1 2 3 4 5 6 7 8 9 10 HELETENETENETENETENETEN 11121314151617181920 HELETENETENETENETENETENETENETENETENETENET	9 10111213141516	1 2 3 4 5 6 1 2 3 4 5 6 7 8 9 101112 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 2 3 4 5 6 7 8 SELECTION 9 10111213141516 UNION
NO	Connector A	Connector B	Connector C	Connector D
1	Turn signal-right	Washer level	Door	-
2	-	Immobilizer	Trunk open	-
3	High beam (-)	-	-	-
4	High beam (+)	-	Air bag (+)	-
5	-	Fuel GND (MICOM)	Air bag (-)	-
6	Fuel sender	Turn signal-left	-	-
7	B-CAN High	4WD lock	Battery charge	-
8	B-CAN Low	4WD	Brake	-
9	-	-	Seat belt	-
10	Check engine	AMBIENT sensor	Oil pressure	TPMS Dignosis
11	C-CAN High	Trip computer mode sw	-	TPMS Tread
12	C-CAN Low	Trip reset sw	-	Front left door
13	Power GND (-)	IG2+		Front right door
14	-	GND (signal)		Rear left door
15	Illumination (+)	IGN+		Rear right door
16	Illumination (-)	Battery+		-
17	High speed (BCM)			
18	-			
19	4P-out			
20	P-out			

# Body Electrical System > Indicators And Gauges > Instrument Cluster > Description and Operation

## Description

## ECO driving system

This system is designed to encourage eco-driving by providing real-time feedback to the driver.

The ECO indicator light assists you to drive in the most economical way.

The green indicator comes on when you drive with high fuel efficiency.

The fuel efficiency depends on driver's driving habit and road condition.

The system stops operation when the transaxle is in the P,R,N position or sports mode, or instantaneous fuel consumption mode is selected.

## ECO indicator ON/OFF

1. ECO indicator system stops operation when instantaneous fuel consumption mode is selected.

ECO indicator light is always OFF when driver select the "ECO OFF" mode pushing the "Trip" button.
 A. Set the main LCD display to "ECO ON" pushing "Trip" button as below picture.



B. And then set the "ECO OFF" pushing "Reset" button more than 1 second as below picture. In this option, ECO indicator light does not operate any trip mode.



# Body Electrical System > Indicators And Gauges > Instrument Cluster > Repair procedures

## Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the center facia panel (A) after and loosening 2 screws.



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



5. Disconnect the cluster connecters (A) and then remove the cluster (B).



6. Installation is the reverse of removal.

## 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.

#### NOTE

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



### [km/h]

Standard velocity (km/h)	20	40	60	80	100	120
Tolerance	+2.8	+3.3	+3.8	+4.4	+4.9	+5.5
(km/h)	-0.2	+0.3	+0.7	+1.2	+1.6	+2.1
Standard velocity(km/h)	140	160	180	200	220	-
Tolerance	+6.0	+6.6	+7.1	+7.7	+8.2	-
(km/h)	+2.5	+3.0	+3.4	+3.9	+4.3	

### [MPH]

Standard velocity (MPH)	10	20	40	60
Tolerance	+2.5	+2.4	+2.2	+2.6
(MPH)	+0.0	+0.4	+0.1	+0.1
Standard velocity (MPH)	80	100	120	140
Tolerance	+3.8	+3.7	+3.7	+3.6
(MPH)	+1.2	+1.1	+1.0	+0.8

## Vehicle Speed Sensor

- 1. Connect the positive (+) lead from battery to terminal 2 and negative (-) lead to terminal 1.
- 2. Connect the positive (+) lead from tester to terminal 3 and the negative (-) lead to terminal 1.
- 3. Rotate the shaft.
- 4. Check that there is voltage change from approx. 0V to 11V or more between terminals 3 and 1.
- 5. The voltage change should be 4 times for every revolution of the speed sensor shaft. If operation is not as specified, replace the sensor.



## Tachometer

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

### CAUTION

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

Revolution (rpm)	1,000	2,000	3,000	4,000	Remark
					132

Tolerance (rpm)	±100	±125	±150	±150	Gasoline
Revolution (rpm)	5,000	6,000	7,000	-	Remark
Tolerance (rpm)	±150	±180	±210	-	Gasoline

## **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.



## **Fuel Gauge Sender**

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



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

Position	Angle(°)	Resistance(Ω)
E	-40 ± 2.0	188.1
Warning lamp	-36 ± 2.0	173.9
1/2	0 ± 2.0	106.3
Sender (F)	40 ± 2.0	17.9

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

## NOTE

- Fuel warnig ON and OFF : Based on fuel / gage indication angle [ON : -36° / OFF : -34°]
- ON and OFF by gauge indication angle which is driven by MICOM after receiving the sender resistance of left fuel

### CAUTION

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

#### **Fuel Gauge Servo Sender**

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



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

Position	Angle(°)	Resistance(Ω)
E	-40 ± 2.0	188.1
1/2	0 ± 2.0	106.3
F	40 ± 2.0	17.9

#### **Engine Coolant Temperature Gauge**

- 1. Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
- 2. Connect a 12V, 3.4 wattages test bulb between the harness side connector terminal 1 and 3.
- 3. Turn the ignition switch ON.
- 4. Verify that the test bulb flashes and that the indicator moves to HOT position. If operation is not as specified, replace the cluster (Engine coolant temperature gauge). Then recheck the system.



### **Engine Coolant Temperature Sender**

1. Using an ohmmeter, measure the resistance between the terminal 1 and 3.



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

Temperature	140	159.8 ~ 230	261.3	E/G
[°F(°C)]	(60)	(71~110)	(127.4)	
Angle(°)	-40	-7 +2/-3	35 ± 5	Gasoline

## **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.



## **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.



## 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.



## Brake Fluid Level Warning Lamp

- 1. IG "ON" & Warning Lamp "ON" for 3 sec and then IG "OFF".
- 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.



## **Door Switch**

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



Terminal Position	1	2	Body (Ground)
Free(Door open)	0		_0
Push(Door close)			

## Seat Belt Switch

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

Seat belt condition	Continuity
Fastened	Non-conductive ( $\infty \Omega$ )
Not fastened	Conductive (Ω)



## 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

## Trip Switch

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the trip switch (A) from the cluster facia panel (B).



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

Terminal Position	2	3	4
MODE(PUSH)		0	O
RESET(PUSH)	0	O	

## Body Electrical System > Indicators And Gauges > Troubleshooting

## Troubleshooting

Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	Vehicle speed sensor faulty	Check vehicle speed sensor
	Wiring or ground faulty	Repair if necessary
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Tachometer faulty	Check tachometer
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Fuel gauge faulty	Check gauge
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Low fuel warning lamp does not light	Cluster fuse (10A) blown	Check for short and replace fuse
up	Warning lamp faulty	Check lamp
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not	Cluster fuse (10A) blown	Check for short and replace fuse
operate	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not	Cluster fuse (10A) blown	Check for short and replace fuse
light up	Warning lamp faulty	Check lamp
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not	Cluster fuse (10A) blown	Check for short and replace fuse
light up	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	Memory fuse (15A) blown	Check for short and replace fuse
warning lamp do not light up	Warning lamp faulty	Check lamp
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Seat belt warning lamp does not light	Cluster fuse (10A) blown	Check for short and replace fuse
up	Warning lamp faulty	Check lamp
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Invalid BCM	BCU faulty	Check BCM

### Body Electrical System > Power Door Locks > Components and Components Location

### **Component Location**



# Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

## 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.



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

[CENTRAL LOCK]					
Terminal Position		4	3		
Front left	Lock	θ	$\oplus$		
	Unlock	$\oplus$	θ		
Front right	Lock	θ	$\oplus$		
	Unlock	$\oplus$	θ		

## **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.



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

[CENTRAL LOCK]					
Position	Ferminal	4	3		
Rear left	Lock	θ	$\oplus$		
	Unlock	$\oplus$	Θ		
Rear right	Lock	θ	$\oplus$		
	Unlock	$\oplus$	θ		

## **Tailgate Lock Actuator**

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



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

Terminal Position	2	3
Lock	θ	$\oplus$
Unlock	$\oplus$	Θ

## 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.



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

[CENTRAL LOCK]						
Position		Termi	nal	2	5	6
	Fron	t Clockw	vise	$\sim$	_0	
Central	left	Count	er- /ise		0	-0
LOCK	Fron	t Clockw	vise		$\sim$	-0
right		Count clockw	er- /ise	0	_0	
[CENTRAL LOCK]						
Terminal 1 2					2	
Central Lock		Unlock		0—		-0
oonda	LUDK	Lock				

### **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.



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

[CENTRAL LOCK]					
Terminal Position		1	2		
Control Look	Unlock	0	O		
Central LOCK	Lock				

## **Tailgate Lock Switch**

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



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

Terminal Position	1	4
Lock	0	0
Unlock		

# Body Electrical System > Power Door Locks > Power Door Lock Relay > Repair procedures

### Inspection

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

### **Door Lock**

- 1. There should be continuity between the No.5 in the I/P-J and No.18 terminals in the I/P-D when power and ground are connected to the No.2 terminal in the I/P-C and No.9 terminal in the I/P-J.
- 2. There should be no continuity between the No.5 terminal in the I/P-J and No.18 terminal in the I/P-D when power is disconnected.



Terminal Power	l/P-D (18)	I/P-J (5)	I/P-C (2)	I/P-J (9)
Disconnected			$\sim$	_0
Connected	0	-0	Θ	÷

## **Door Unlock**

- 1. There should be continuity between the No.5 terminal in the I/P-J and No.7 terminal in the I/P-K when power and ground are connected to the No.2 terminal in the I/P-C and No.1 terminal in the I/P-K.
- 2. There should be no continuity between the No.5 terminal in the I/P-J and No.7 terminal in the I/P-D when power is disconnected.



# Body Electrical System > Power Door Locks > Power Door Lock Switch > Repair procedures

## Inspection

## 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")



3. Disconnect the connector from the switch.


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

Terminal Position	4	10	11
Lock		0	0
Unlock	0	0	

#### **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")
- 3. Disconnect the connector from the switch.



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

Terminal Position	3	4	7
Lock		0	
Unlock	0		0

#### Body Electrical System > Power Door Mirrors > Components and Components Location

#### **Component Location**

1. Power door mirror	2. Power door mirror switch

Body Electrical System > Power Door Mirrors > Power Out Side Mirror Switch > Components and Components Location

Components



# Body Electrical System > Power Door Mirrors > Power Out Side Mirror Switch > Repair procedures

#### Inspection

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



3. Check for the continuity between terminals of power door lock switch according to the table.



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



### Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

#### Inspection

1. Remove the front door quadrant inner cover (A). 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.



Terminal Position	6	7	8
UP	Θ	$\oplus$	$\oplus$
DOWN	÷	Θ	Θ
OFF	Θ	$\oplus$	$\oplus$
LEFT	Θ	Ð	Θ
RIGHT	Ð	Θ	$\oplus$

#### **Mirror Heater**

Terminal	1	2
Heater	0	0

#### Body Electrical System > Power Windows > Components and Components Location

#### **Component Location**



#### Body Electrical System > Power Windows > Power Window Motor > Repair procedures

#### 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 connector (2P) from the motor.



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.

Terminal Position			1	2
	UP	Clockwise	Θ	$\oplus$
Left	DOWN	Counter- clockwise	$\oplus$	Θ
Right	DOWN	Clockwise	$\oplus$	Θ
rugitt	UP	Counter- clockwise	Θ	$\oplus$

#### **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 2P connector from the motor.



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.

Terminal Position			1	2
	UP	Clockwise	Θ	$\oplus$
Left	DOWN	Counter- clockwise	$\oplus$	Θ
Right	DOWN	Clockwise	$\oplus$	Θ
rugiit	UP	Counter- clockwise	Θ	$\oplus$

### Body Electrical System > Power Windows > Power Window Switch > Components and Components Location

#### Components

#### **Power Window Main Switch**



**Assist Power Window Switch** 



**Rear Power Window Switch** 



### Body Electrical System > Power Windows > Power Window Switch > Description and Operation

#### Operation

#### **Function Of Safety Power Window**

When all door (Front, Rear) power window auto-up switch is operated, safety function is activated.

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



- B. When detect the jamming over the 250mm from top of the door.
   → Window is reversed until 50mm from jamming position.
  - $\rightarrow$  Window is reversed 50mm or bottom position in case of 50mm reversing distance.



- C. When detect the jamming over 300mm from top of the door.  $\rightarrow$  Window stops at reverse point.
- 3. Length of window reversing (holding the auto-up switch)
  - A. When detect the jamming during holding the auto-up switch.
    - $\rightarrow$  Window is reversed until 25mm from jamming position.
    - B. Auto-up function is not available during the 5 seconds from above condition.
       → When holding the auto-up switch, window is operated as a manual-up function. (Safety function is not activated.)
    - C. When detect the jamming during holding the auto-up switch again.  $\rightarrow$  Window is reversed until 25mm from jamming position.
    - D. When holding the auto-up switch after 5 seconds from above condition.  $\rightarrow$  Window is reverse until 25mm from jamming position.



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. Position counter and position initialization
  - (1) Position counter

Window position counting is implemented by use of one Hall Effect sensor (HEF) connected to timer capture unit

of the Controller with a resolution of 180° electrical.

Even the battery was separated from the car, it must keep the window position information.

(2) Position initialization

For position initialization, position counter detect the upper mechanical stop and lower mechanical Position. Motor control unit (MCU) allow only Manual mode activity (without ASD Anti-Squeeze Detection algorithm) feature) before to be initialized.

Initialization means the condition to move the window system with full anti-pinch function and related functions by detecting the window travel distance (Upper/Lower mechanical limits).

Conditions for initialization are

- A. de-initialized position counter
- B. Power window switch Up activated
- C. block condition detected

(no motor movement of more than 1 count during 1sec/ SW dependent)

Switch action with De-initialized condition :

A. Up direction : Manual & Auto P/WDW sw input  $\rightarrow$  manual mode;

- B. Down direction : Manual P/WDW sw input  $\rightarrow$  manual mode, + Auto s/w input  $\rightarrow$  auto mode
- (3) Re-initialization

During re-initialization, position counter is set to "zero" at upper block position to compensate counting errors by software, mechanical tolerances or physics. Conditions for re-initialization are

- A. initialized position counter.
- B. window at upper block position (capture range EEPROM programmable)
- C. block condition detected

(no motor movement of more than 1 count during 1 sec/ SW dependent)

(4) De-initialization

The system initialization/calibration will be lost in the following cases:

- A. After parameter modification via diagnostic
- B. Wrong EEPROM checksum at ECU wake-up or power-on
- C. Movement outside predefined window stroke (above learned top position, below predefined bottom position)
- D. De-initialization after a defined number (EEPROM) of reversals without re-initialization in the upper seal (activation /de-activation controlled by EEPROM value). A window down movement or switching off the window lifter permission resets the reversal counter value(activation by EEPROM bit).
- E. De-initialization after a defined number of movements (EEPROM) without re-initialization in the upper seal (activation /de-activation controlled by EEPROM value)
- F. Special de-initialization procedure :

The special window lifter de-initialization procedure works as follows:

- System is initialized
- Move window below soft-stop position (position EEPROM adjustable)
- Press MANU-down switch and keep it pressed
- Apply permission signal (serial-link = PIN 6) ON  $\rightarrow$  OFF  $\rightarrow$  ON within 2 seconds (time EEPROM adjustable)
- (5) Soft stop function

In order to reduce noise and mechanical stress, the window movement is stopped under control of the ECU before the bottom position is reached.

The clearance is 0 / +10 mm (at 11.5 V to 14.5 V).

To activate the soft bottom stop function, the top reference position and bottom reference position have to be initialized. Therefore, the window is lifted into the top position until the block condition is detected. This position is taken as top reference position.

Afterwards, the window is moved to the bottom position until the block condition is detected (mechanical stop). This position is taken as bottom reference position.

The bottom reference position is re-initialized :

- A. When window is operated down starting from soft stop position
- B. Every "9" stops at soft stop position.
- (6) Thermal protection

Thermal protection by software module is implemented to prevent from destruction of motor during overload condition. Motor temperature is estimated by integrating squared motor current as an estimate for heating power integral. When estimated motor temperature exceeds EEPROM programmable upper limit, motor is

deactivated for fixed delay time (default value = 30 sec.)

Thermal shutdown during a window operation will not interrupt the operation due to safety reasons.

- (7) Operation time limiter
- Maximal operation time of power window motor is limited to 15 sec (EEPROM programmable).
- (8) Continuous reverse

Current Number of Continuous reverse of window is 5. With the below condition, this counter Will be initialized. A. IG OFF

- B. DOWN signal ON
- C. WINDOW CLOSE

#### Body Electrical System > Power Windows > Power Window Switch > Repair procedures

#### Inspection

#### **Power Window Main Switch Inspection**

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



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.



#### **Power Window Lock Switch**

Terminal Position	12	10
NORMAL	0	0
LOCK		

#### **Assist Power Window Switch Inspection**

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



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	8	10	6	9	5
UP	0	-0		<u> </u>	_0
OFF	0	-0	<u> </u>		_0
DOWN		0	0	_0	-0

#### **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.



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	7	2	1	4
UP	0	0		_0	
OFF		0		_0	
DOWN	0		$\sim$	-0	_0

#### Body Electrical System > Power Windows > Power Window Relay > Repair procedures

#### 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.6 in the I/P-F and No.14 terminal in the I/P-D when power and ground are connected to the No.10 terminal in the I/P-E and No.2 terminal in the I/P-J.
- 5. There should be no continuity between the No.6 terminal in the I/P-F and No.14 terminal in the I/P-D when power is disconnected.



Terminal Position	l/P-D (14 or 15)	l/P-F (6)	I/P-J (2)	l/P-E (10)
Disconnected			0-	-0
Connected	$\sim$	_0	Θ—	÷

#### Body Electrical System > Power Windows > Troubleshooting

#### Troubleshooting

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



2. Driver's side window does not operate.



3. Passenger's side window does not operate.



Body Electrical System > Rear Glass Defogger > Components and Components Location

#### **Component Location**



### Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Printed Heater > Repair procedures

#### 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.



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



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



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



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



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



#### **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).



Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Switch > Repair procedures

#### Inspection

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the crash pad center speaker grill (A).



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



4. Remove the center facia panel (A) after loosening 2 screws. Take care not to damage fixing clips. (Refer to the BD group - "Crash pad")



- 5. Disconnect connectors.
- 6. Using an ohmmeter, inspect the continuity between the terminals after removing controller.



# Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Relay > Repair procedures

#### Inspection

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.



Terminal Power	86	85	87	30
Disconnected	0	_0		
Connected	Θ	÷	0	-0

# Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Timer > Repair procedures

#### 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.



T1 : 60 ± 20 msec, T2 : 20 ± 1 min.

# Body Electrical System > Windshield Wiper/Washer > Components and Components Location

#### **Component Location**



## Body Electrical System > Windshield Wiper/Washer > Windshield Wiper-Washer Switch > Repair procedures

#### Replacement

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



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



4. Installation is the reverse of removal.

#### Inspection

- 1. Multifunction switch operates head lamps and wiper by communicating with BCM through LIN communication.
- 2. Check BCM input/output value of each position of multifunction switch when you inspect the module whether faulty or not.
- 3. Select model and BCM menu.





4. Select "Current data" and wiper.

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

5. Check input/output value of washer & wiper switch.



#### Inspection

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.



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



#### **Wiper Switch**

[STANDARD]								
Terminal Position	1	2	3	4	5	6	13	14
MIST		0-	0	0-	-0			
OFF		0-	0					
INT		0-	0		0-	-0	3	<b>*</b> 0
LOW		0-			-0			
н	0				-0			

[RAIN SENSO	R]							
Terminal Position	1	2	3	4	5	6	13	14
MIST		0	0	0-	-0			
OFF		0-	0					
AUTO		0	0		0	0	<b>^</b>	<b>*</b> 0
LOW		0-			-0			
н	0				-0			

#### **Washer Switch**

Terminal Position	5	7
OFF		
ON	0	0

# Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Components and Components Location

#### **Component Location**



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

### Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

#### Replacement

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

Torque: 28~32 Nm (2.8~3.3 kgf.m, 20~23.1 lbf.ft)



2. Remove the weather strip and the cowl top cover (A) after removing 4 retainers.



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.

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



4. Installation is the reverse of removal.

#### Inspection

#### **Speed Operation Check**

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



1	4. High
2. B+	5. GND
3. Parking	6. Low

#### **Automatic Stop Operation Check**

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



Body Electrical System > Windshield Wiper/Washer > Front Washer Motor > Repair procedures

#### Replacement

#### CAUTION

- When servicing the washer pump, be careful not to damage the washer pump seal.
- Do not operate the washer pump before filling the washer reservoir.
- Failure to do so could result in premature pump failure.
- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the front bumper cover. (Refer to the BD group - "Front bumper")
- 3. Remove the washer hose (A) and the washer motor connector (B).



4. Disconnect the washer fluid level sensor switch connector (A).



5. Remove the washer reservoir after removing 3 bolts.



6. Installation is the reverse of removal.

#### NOTE

Before installing the pump motor, check the filter for foreign material or contamination. if necessary, clean the filter into the pump motor.

#### Inspection

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

#### NOTE

Before filling the reservoir tank with water, check the filter for foreign material or contamination. if necessary, clean the filter.

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



#### Washer Fluid Level Sensor Switch

- 1. Disconnect the negative(-) battery terminal.
- 2. Drain the washer fluid less than 650 cc.
- 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



#### Body Electrical System > Windshield Wiper/Washer > Troubleshooting

#### Troubleshooting

1. Wiper low and wiper high do not work.



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



#### Body Electrical System > Rear Wiper/Washer > Components and Components Location

#### **Component Location**



# 3. Grommet9. Bolt4. Outside cover10. Bush5. Rear wiper motor assembly11. Grommet6. Head cap11. Grommet

#### Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

#### Replacement

1. Detach the wiper cap (A), then remove the rear wiper arm (C) after removing a nut (B).

#### Tightening torque Nut (B) :

10~14 Nm (1.0~1.4 kgf.m, 7~10 lbf.ft)



2. Remove the rear wiper cap & pad (B) after removing a nut (A).

#### **Tightening torque Nut (A) :** 10~14 Nm (1.0~1.4 kgf.m, 7~10 lbf.ft)



- 3. Open the tailgate glass then remove the tailgate trim.
- 4. Disconnect the rear wiper motor connector then remove the rear wiper motor (B) after removing 3 bolts.



5. Installation is the reverse of removal.

#### Inspection

#### **Rear Wiper And Nozzel**

**Tightening torque Nut :** 

1. Set the rear washer nozzle on the specified spray position.


# **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.



# 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.



# Body Electrical System > Rear Wiper/Washer > Rear Washer Switch > Repair procedures

### Inspection

1. With the rear wiper & washer switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multifunction switch.



#### **Rear Wiper & Washer Switch**

Terminal Position	9	11	12
Rear washer	0		O
OFF			
ON	0	<u> </u>	
Rear washer	0		0

#### Body Electrical System > Rear Wiper/Washer > Rear Washer Motor > Repair procedures

#### 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 1 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.





# Body Electrical System > Electro chromic Inside Rear View Mirror > Description and Operation

# 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 10~70%. But, when the reverse gear is engaged, it stops functioning.

#### [Home Link]



8. Ground 9. Reverse gear signal 10. IGN (12V)

[Compass]



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





1. Status Indicator LED	4. Display
2. Buttom	5. Front light sensor
3. Rear light sensor	

# [Home Link]



4. Channel 3 Button



# **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.

#### NOTE

The mirror defaults to the "ON" position each time the vehicle is started.

#### Body Electrical System > Electro chromic Inside Rear View Mirror > Repair procedures

#### 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.



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.

#### Replacement

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



### NOTE

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



2. Installation is the reverse of removal.

# Body Electrical System > Electro chromic Inside Rear View Mirror > Compass Mirror > Description and Operation

#### 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

#### NOTE

There should be hysteresis at each switch point. Switch points between the 8 cardinal directions, these switch points are  $\pm 10^{\circ}$ 



#### **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.

 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.



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.

# Body Electrical System > Electro chromic Inside Rear View Mirror > Compass Mirror > Repair procedures

#### 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 in 2 complete circles at less than 8 KPH (5 MPH).

# Zone Map



# Homelink

#### Description

The HomeLink Wireless control system provides a convenient way to replace up to three hand-held radio-frequency (RF) transmitters with a single built-in device. This innovative feature will learn the radio frequency codes of most current transmitters to operate devices such as gate operators, garage door openers, entry door locks, security systems, even home lighting.

#### Specification

ltem	Description	Remark
Rated Voltage	DC 12V	Testing Voltage : 12.8V
Operating Voltage	9 ~ 18V	
Operating Temperature	-30 ~ 85°C	Should be operation at limit rage
Storage Temperature	-40 ~ 105°C	
Operating Humidity	95%	
Operating Current	23 ~ 100mA	
Low power Mode	4 ~ 16mA	
Reduce power Mode	10 ~ 25mA	
Insulation Resistant	100MΩ (500VM)	The case is exclude in EARTH
Dark current	0.3mA MAX	

#### Learn & Transmit Specification

Signal	Specification		Remark
Learn RF Signal	Learning Frequency	288-390 MHz	

	Learning Range	0-1m	Between H/L & Drive seat
	Transmission Frequency	288-390 MHz	
Transmit RF Signal	Transmission Range	13m MIN	
	Output Power	75.6dBµV/m MAX	Do as the FCC

\* In case of OT(Original Transmitter) range < 80% of Transmission SPEC. It should be apply to transmission range for 80% of OT.

1. Follow the OT or OR(Original Receiver) about reception & transmission frequency.

2. Transmission Range means the distance from which the receiving device RF signal from HomeLink)

3. Reception Range means the distance within which the HomeLink can be trained with RF signal from OT.

# Body Electrical System > Hands Free System > Components and Components Location Components

# 5 3

1. Hands free call switch 4. Front right speaker 5. Audio head unit (hands free control)

2. Mic

3. Front left speaker	

\* There is no hands free jack. This system supports Bluetooth(wireless system).

# Body Electrical System > Hands Free System > Description and Operation

# Function

#### **Bluetooth Phone Operation**

Bluetooth Volume



#### **General Feature**

- This system supports Bluetooth, a wireless system that allows you to make or receive calls without taking your hands from the steering wheel and without using cables to connect the phone and system.
- The phone must be paired to the system before using the hands-free feature. Only one linked cellular phone can be used with the system at a time.

#### CAUTION

If the vehicle is moving do not use a cellular phone or connect the Bluetooth phone.



Some Bluetooth devices may not be compatible with this system.

# **Voice Recognition Activation**

• The voice recognition engine contained in the Bluetooth System can be activated in the following conditions: - Button Activation

The voice recognition system will beactive when the 📈 button is pressed and after the sound of a Beep.

- Active Listening

The voice recognition system will beactive for a period of time when the Voice Recognition system has askedfor a customer response.

- The system can recognize single digits from zero to nine while number greaterthan ten will not be recognized.
- If the command is not recognized, the system will announce "Pardon" or Noinput voice signal from microphone. (Noresponse)
- The system shall cancel voice recognitonmode in following cases : When pressing the 尾 button and saying cancel following the beep. When not making a call and pressing the 📼 button. When voice recognition has failed 3 consecutive times.

• At any time if you say "help", the system will announce what commands areavailable.

#### Menu tree



# **Phone Setup**

#### Pairing phone

To use the hands-free system, you need to register your phone in the system. Up to 5 phones can be registered in the system.

- 1. Press the 尾 button.
- 2. Say "Set Up".
- 3. Say "Pair Phone".
- 4. Say "Yes".
- 5. Say the name of the contact.
- 6. Say "Yes".
- 7. The Pairing procedure of the cellularphone varies according to each cellularphone.

#### NOTE

The system may not function in the followingcases: If 5 phones have already been registered. If the system cannot communicate with the phone.

#### To connect phone

The registered phones can be selected. When the system connects to Bluetooth, the phone previously used is automatically selected. Select a different phone if necessary. Only the selected phone can be used with the hands-free system.

- 1. Press the 尾 button.
- 2. Say "Set Up".
- 3. Say "Select Phone".
- 4. Say the name of the contact or the number of the contact.
- 5. Say "Yes".

#### NOTE

The system may not function in the following cases: If the phone is not found. If the system does not recognize the voice command.

#### **Deleting phone**

The registered phones can be deleted.

1. Press the 尾 button.

- 2. Say "Set Up".
- 3. Say "Delete Phone".
- 4. Say the name of the contact, the number of the contact or "Delete all phone".
- 5. Say "Yes".

# Receiving a phone call

When receiving a phone call, a ring toneis audible and the system changes into telephone mode.

When receiving a phone call, the phone number and the message "Incoming" will be displayed.

- Do either one of the following: Press the send switch to take the call. Press the end switch to refuse the call.
- To adjust the ring volume, push "+" or "-" on the steering volume controls. Volume adjustment cannot be madeusing the audio system.
- To transfer a call to the phone:

The received call can be transferred from the hands-free system to the cellularphone that is connected to Bluetooth. For details, please refer to you user's manual for the cellular phone or go to the Key matrix in this manual (next page).

#### Talking on the phone

When talking on the phone, the display will differ depending on whether or not the vehicle is in motion. Number and "active call" is displayed.

When the call is finished, press the end switch.

#### NOTE

In the following situations, your voice may not reach the other party:

- 1. Talk alternately with the other partyon the phone. If you talk at the sametime, the voice may not reach eachother parties. (This is not a malfunction.)(It is not a malfunction.)
- 2. Keep the volume of receiving voice to a low level. Otherwise, high volumes may result in an echo. When you talk on the phone, speak clearly towards the microphone.
- 3. When driving on a rough road.
- 4. When driving at high speeds.
- 5. When the window is open.
- 6. When the air conditioning vents are facing the microphone.
- 7. When the sound of the air conditioning fan is loud.

#### Key matrix

			Class							
			Deined		Conn	ected				
No.	KEY Pair H/ Emj		H/P Empty	H/P Disconnected		BT SETUP menu	Incoming Call	Outgoing Call	Active Call	Active Call
1	S	SHORT	Not Paired	Not Connecting	-	-		-	2nd call 1st Call:waiting 2nd Call:active	2nd Call 2nd Call:waiting 1st Call:active
		LONG	-	-	-	-	-	-	Transfer o	call:secret
		SHORT	VR MODE Cancel	VR MODE Cancel	VR MODE Cancel	VR MODE Cancel	Reject Call	End Call	End Call	End Call
2	•	LONG [10sec]	-	-	Speaker Adaptation (Only English)	Speaker Adaptation (Only English)	-	-	-	-
3	Æ	SHORT	Active	Active	Active	Active	-	-	-	192

	LONG [10sec]	Change language	Change language	Change language	Change language	-	-	-	-
--	-----------------	--------------------	--------------------	--------------------	--------------------	---	---	---	---

# Body Electrical System > Hands Free System > Hands Free Switch > Schematic Diagrams

# Circuit Diagram





# Body Electrical System > Hands Free System > Hands Free Switch > Repair procedures

# Inspection

1. Check the hands free remote control switch for resistance between No.7 and No.8 terminals in each switch position.

Switch	Connector terminal	Resistance (±5%)
End	7 - 8 (RH)	18.9 kΩ
Send	7 - 8 (RH)	40.9 kΩ

2. Check the hands free remote control switch for resistance between No.3 and No.4 terminals in each switch position.

Switch	Connector terminal	Resistance (±5%)
Voice	3 - 4 (RH)	10.7 kΩ



# Removal

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



3. Remove the hands free remote control switch (B) after removing the steering wheel remote control switch connector (A) and 2 screws.



# Installation

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



Make sure the hands free remote control switch and the airbag module connectors are plugged in properly.

# Body Electrical System > Hands Free System > Hands Free Mic > Repair procedures

#### Inspection

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the hands free mic (A) after loosening the connector from loof top.



3. Check the continuity of Mic between terminals.

Mic(-) 3	(-)
	Mik
Mic(+) 2	(+)

# Body Electrical System > Hands Free System > Troubleshooting

#### Troubleshooting

#### **Bluetooth Hand Free**

Symptom	Possible Cause	Solution
Not pairing	Bluetooth device of Car is not discoverable mode	Enter Bluetooth pairing (searching) mode
	User's phone is Bluetooth off mode	User's phone set Bluetooth on
	Making an attempt pairing others Bluetooth System	Check Bluetooth device name and address (12 word) to attempt paring Ex) 000B24FFF123
	Pass key error	Input the passkey displayed on the Audio screen into the phone.
	5 phones have already been registered.	Delete paired phone list
	Bluetooth system cannot communicate with the phone.	Refer to IOP sheet ※ IOP : Inter-Operability
Not connection	User's phone or Bluetooth device of Car dose not register Bluetooth device to connect	Retry pairing
	Bluetooth system cannot communicate with the phone.	Waiting 1minute then Retry connection or phone power off/on. Refer to IOP sheet
Not redial	User phone system issue	Push the 2 times Send button

Not accept call	User phone system issue	Refer to IOP sheet
Not dialing	User's phone playing other menu (internet, mp3, game, etc)	Stop other menu then set normal mode
	Bluetooth system cannot communicate with the phone	Refer to IOP sheet

# Body Electrical System > Sun Roof > Components and Components Location

# **Component Location**



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

# Body Electrical System > Sun Roof > Schematic Diagrams

# **Circuit Diagram**



# Body Electrical System > Sun Roof > Sunroof Switch > Repair procedures

# 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 (4P) and Map lamp connector (2P), and then remove the overhead console lamp.



3. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.



# Body Electrical System > Sun Roof > Sunroof Motor > Repair procedures

# 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 after disconnecting the connector (10 Pin).



3. Apply +12V and ground to the terminals as shown below and check sunroof operation.

Terminal Position	3	4	5	10
TILT UP	$\oplus$			θ
SLIDE CLOSE/DOWN	$\oplus$	θ		
SLIDE OPEN	$\oplus$		Θ	

#### 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 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.
  - A. In case that motor is not operated continuously, the Run-time which is limited for protecting the overheated motor is increased.
  - B. The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,

# Body Electrical System > Lighting System > Specifications

# Specification

|--|

T3 :  $10 \pm 2$  sec., T4 :  $18 \pm 2$  sec.

Head lamp (High)	55
Head lamp (Low)	55
Front turn signal lamp	27/8
Front fog lamp	27
Rear stop/tail lamp (Outside & in side)	27/8
Back up lamp	16
Rear turn signal lamp	27
License plate lamp	5
Room lamp (Interior & Luggage)	10
Overhead console lamp	10
High mounted stop lamp	5 or LED
Glove box lamp	5

# Body Electrical System > Lighting System > Components and Components Location

**Component Location** 

<ol> <li>Head lamp (High/Low)</li> <li>Front turn signal lamp &amp; side mark &amp; position lamp</li> <li>Front fog lamp</li> <li>License plate lamp</li> <li>Rear side mark lamp</li> </ol>	<ul><li>6. High mounting stop lamp</li><li>7. Tail/stop lamp</li><li>8. Rear turn signal lamp</li><li>9. Back up lamp</li><li>10. Tail lamp</li></ul>

# Body Electrical System > Lighting System > Head Lamps > Repair procedures

# 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.



- 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			0	-0
Connected	0	_0	Θ	÷

## 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.

#### NOTE

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

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

- 1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
- 2. The vehicle should be placed on a flat floor.
- 3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
- 4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the vertical lines.

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



# 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).



# Head Lamp And Fog Lamp Aiming Point



							Unit : in (mm)
Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	35(889)	34.4(875)	19.3(492)	55 2(1 402)	45 0(1 144)	00 0/1 5/7)	118/3 000)
With driver	34.7(883)	34.2(869)	19.1(486)	55.2(1,402)	45.0(1,144)	50.5(1,547)	110(3,000)

1. Turn the low beam on with driver.

The cut-off line should be projected in the cut-off line as shown in the picture.



Unit : in.(mm)

\* In case of high beam, head lamp do not need aiming with proper beam-setting equipment.

2. Turn the front fog lamp on with driver.

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



# Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Loosen the mounting bolts (2EA) and a nut of head lamp. Remove the head lamp assembly after disconnecting the lamp connectors.



#### NOTE





3. Remove the head lamp bulb.



4. Installation is the reverse of removal.

# Body Electrical System > Lighting System > Room Lamp > Repair procedures

#### Replacement

#### **Interior Room**

- 1. Disconnect the negative (-) battery terminal.
- 2. Detach the lamp lens (A) from the room lamp (B) with a flat-tip screwdriver then replace the bulb (C).
- 3. Loosen the fixing screw (2EA) and disconnect the 3P connector. And then remove the room lamp assembly.



4. Installation is the reverse of removal.

# Luggage Room

- 1. Disconnect the negative (-) battery terminal.
- 2. Detach the lamp lens (A) from the luggage room lamp (B) with a flat-tip screwdriver then replace the bulb (C).
- 3. Loosen the fixing screws (2EA) and disconnect the 3P connector. And then remove the luggage room lamp assembly.



4. Installation is the reverse of removal.

# Inspection

#### Interior

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



Terminal Position	1	2	3
ON		$\sim$	) — O
DOOR	$\sim$	$\rightarrow$	
OFF			

# Luggage

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



Position	1	2	3
ON		$\sim$	÷
DOOR	0		O
OFF			

# Body Electrical System > Lighting System > Overhead Console Lamp > Repair procedures

# Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Replace the bulb after removing the lens.
- 3. Remove the 2 screws, sunroof switch connectors (4Pin / 3Pin). And then remove the overhead consol (A), lamp (B).





4. Installation is the reverse of removal.

#### 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. (Pin NO.1 : Door, 2 : Ground, 3 : B + )

Sor	t		Map la	amp s	witch	
Positio	n	LH			RH	
Terminal	ON	OFF	Door Open	ON	OFF	Door Open
3	ç		Ŷ	ç		Ŷ
2	ð		۲	ð		۲
1			6			6

# Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

#### Inspection

#### Hazard Lamp Switch

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the crash pad center speaker grill (A).



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



4. Remove the center facia panel after loosning the screw (2EA). (Refer to the BD group - "Crash pad")



- 5. Disconnect the connectors.
- 6. Operate the switch and check for continuity between terminals with an ohmmeter.



Terminal Position	2	3	6	9	10	5	7	8
OFF	Q	Q				0		-0
ON	Illum	nation	0	-0-	-0		0	-0

## Hazard Lamp Relay

- 1. Disconnect the negative (-) battery terminal.
- 2. Disconnect the passenger compartment.
- 3. Check for continuity between terminals. There should be continuity between the No.2 of I/P-C and No.3 or No.4 of I/P-E terminals when power and ground are connected to the No.2 of I/P-C and No.6 of I/P-G terminals.
- 4. There should be no continuity between the No.2 of I/P-C and No.3 or No.4 of I/P-E terminals when power is disconnected to the No.2 of I/P-C and No.6 of I/P-G terminals.



# Body Electrical System > Lighting System > Rheostat > Repair procedures

#### Inspection

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the lower crash pad switch assembly (A) by using a trim removal tool and then disconnect the connectors.



- 3. Remove the rheostat (B) from lower crash pad switch assembly.
- 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.

# Body Electrical System > Lighting System > Front Fog Lamps > Repair procedures

## Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the front side cover screw.
- 3. Disconnect the front fog lamp connector (A).



4. Remove the front fog lamp (A) turning it to the counter-clockwise direction.



5. Installation is the reverse of removal.

# 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.



# Body Electrical System > Lighting System > Rear Fog Lamps > Repair procedures

#### Inspection

#### **Rear Fog Lamp Switch**

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the lower crash pad switch (A) from the side crash pad cover by using a trim removal tool and then disconnect the connectors.
- 3. Remove the rear fog lamp (B) switch from lower crash pad switch.



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

Terminal Position	2	5	1	4	3
ON	<u>_</u>	<u>_</u>	$\sim$		~
OFF		Illumination			

# Body Electrical System > Lighting System > License Lamps > Repair procedures

#### Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the license lamp lens (A) from the panel after loosening a screw (2EA).



3. Replace the bulb (A).



4. Installation is the reverse of removal.

# Body Electrical System > Lighting System > High Mounted stop lamp > Repair procedures

#### Replacement

#### **High Mounted Stop Lamp**

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the tailgate. (Refer to the BD group - "Tailgate")
- 3. Remove the high mounted stop lamp assembly after removing 2 nuts, then remove the spoiler.



4. Remove the spoiler lamp cover (A) and loosening the screw (4EA). And then remove the high mounted stop lamp.



5. Installation is the reverse of removal.

# Body Electrical System > Lighting System > Rear combination lamp > Repair procedures

#### Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Loose the screws (3EA) holding the rear combination lamp then disconnect the 4P connector then remove the outside rear combination lamp.



3. Replace the bulbs (3EA) after disconnecting the rear combination lamp assembly.



4. Disconnect the lamp cover on tailgate. Remove the lamp assembly after loosening the connector (4pin), Cap nuts 215

(2EA) and nuts (2EA).

5. Remove the tailgate combination lamp assembly and the replace the bulbs.



6. Installation is the reverse of removal.

#### NOTE

- When installing, check if the tailgate wiring harness connector is connected securely.
- Verify that the tail, stop and back up lamps of the rear combination lamps light normally.

# Body Electrical System > Lighting System > Troubleshooting

# Troubleshooting

Symptom	Possible cause	Remedy		
One lamp does not light	Bulb burned out	Replace bulb		
(all exterior)	Socket, wiring or ground faulty	Repair if necessary		
Head lamps do not light	Bulb burned out	Replace bulb		
	Ignition fuse (LOW:15A, HIGH:15A) blown	Check for short and replace fuse		
	Head lamp fuse (15A) blown	Check for short and replace fuse		
	Head lamp relay faulty	Check relay		
	Lighting switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Tail lamps and license plate lamps do	Bulb burned out	Replace bulb		
not light	Tail lamp fuse (20A) blown	Check for short and replace fuse		
	Tail lamp relay faulty	Check relay		
	Lighting switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Stop lamps do not light	Bulb burned out	Replace bulb		
	Stop lamp fuse (15A) blown	Check for short and replace fuse		
	Stop lamp switch faulty	Adjust or replace switch		
	Wiring or ground faulty	Repair if necessary		
Stop lamps do not turn off	Stop lamp switch faulty	Repair or replace switch		
Instrument lamps do not light (Tail lamps light)	Rheostat faulty	Check rheostat		
	Wiring or ground faulty	Repair if necessary		
	Bulb burned out	Replace bulb		
Turn signal lamp does not flash on one	Turn signal switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Turn signal lamps do not light	Bulb burned out	Replace bulb		
-----------------------------------	--	----------------------------------	--	
	Turn signal lamp fuse (10A) blown	Check for short and replace fuse		
	Flasher unit faulty	Check flasher unit		
	Turn signal switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Hazard warning lamps do not light	Bulb burned out	Replace bulb		
	Hazard warning lamp fuse (15A) blown	Check for short and replace fuse		
	Flasher unit faulty	Check flasher unit		
	Hazard switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps		
	Flasher unit faulty	Check flasher unit		
Back up lamps do not light	Bulb burned out	Replace bulb		
	Back up lamp fuse (10A) blown	Check for short and replace fuse		
	Back up lamp switch (M/T) faulty	Check switch		
	Transaxle range switch (A/T) faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Room lamp does not light	Bulb burned out	Replace bulb		
	Room lamp fuse (15A) blown	Check for short and replace fuse		
	Room lamp switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
Front fog lamps do not light	Bulb burned out	Replace bulb		
	Front fog lamp fuse (15A) blown	Check for short and replace fuse		
	Front fog lamp relay faulty	Check relay		
	Front fog lamp switch faulty	Check switch		
	Wiring or ground faulty	Repair if necessary		
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		
Cargo 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		

## Body Electrical System > Auto Lighting Control System > Specifications

## Specifications

ltem	Specifications	
Rated voltage	5V	
Load	Max. 1mA	

Detection illuminations	Tail lamp	ON : 24 ± 5.2 (Lux), 1.77 ± 0.08 (V) OFF : 48 ± 10.5 (Lux), 3.47 ± 0.1 (V)
	Head lamp	ON : 6 ± 1.4 (Lux), 0.63 ± 0.06 (V) OFF : 12 ± 2.7 (Lux), 1.02 ± 0.06 (V)

# Body Electrical System > Auto Lighting Control System > Components and Components Location

## **Component Location**



## Body Electrical System > Auto Lighting Control System > Schematic Diagrams

## **Circuit Diagram**



## Body Electrical System > Auto Lighting Control System > Description and Operation

## 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.

# Body Electrical System > Auto Lighting Control System > Auto Light Switch > Repair procedures

## Inspection

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



Position	14	15	10	17
OFF				
I	0			-0
Ш	0	_0		_0
AUTO			0	_0

# Body Electrical System > Auto Lighting Control System > Auto Light Sensor > Repair procedures

#### Inspection

While operating the auto light switch, check if the operations are normal as shown in the timing chart.

- 1. Auto light sensor value is always read at IGN ON.
- 2. Light is turned ON after 12sec  $\pm$  0.2sec when auto light sensor value is same as light ON input value.
- 3. Light is turned OFF after 12sec ± 0.2sec when sensor value is same as light OFF input value.
- 4. Tail lamp and head lamp are turned ON when sensor value is same as tail lamp ON input value.
- 5. Light ON value of sensor is based on the below table.
- 6. Head lamp signal is output when head lamp switch is ON. After head lamp is turned OFF, head lamp signal output is immediately stopped if head lamp OFF luminance condition is met at auto light switch ON.

	Tail lamp, AV lamp	Head lamp (low beam)
ON	2.5 ± 0.05V	2.5 ± 0.05V
OFF	4.0 ± 0.05V	4.0 ± 0.05V



T1 : 12 ± 0.2 sec. T2 : 12 ± 0.2 sec.

## Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the Photo & auto light sensor (A) using screw (-) driver.



- 3. Remove the auto light connector (B).
- 4. Installation is the reverse of removal.

# Body Electrical System > Daytime Running Lights > DRL Control Module > Repair procedures

## Inspection

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



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



3. If the daytime running light is not operated well, Inspect the connector and terminals to be sure they are all making good contact.

If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system. If the terminals look OK, go to step 4.

4. Make these input tests at the connector by using ETM.

If any test indicates a problem, find and correct the cause, then recheck the system. If all the input tests prove OK, the BCM (Body control module) must be faulty; replace it.

## Body Electrical System > Immobilizer System > Description and Operation

#### Description

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

- 1. Encrypted SMARTRA type immobilizer
  - A. The SMARTRA system consists of a passivie challenge response (mutual authentication)transponder located in the ignition key, an antenna coil, a encoded SMARTRA unit, an indicator light and the PCM(ECM).
  - B. The SMARTRA communicates to the PCM(ECM) (Engine Control Module) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the SMARTRA.
  - C. When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the SMARTRA unit to the PCM(ECM).
  - D. If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the cluster will simultaneously come on for more than five seconds, indicating that the SMARTRA unit has recognized the code sent by the transponder.
  - E. If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue blinking for about five seconds until the ignition switch is turned OFF.
  - F. If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
  - G. The immobilizer system can store up to eight key codes.
  - H. If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



## **Components Operations**

## PCM (Power Train Control Module)

 The PCM(ECM) (A) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the PCM(ECM) simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the PCM(ECM).ERN (Encrypted Randorn Number) value between EMS and encrypted smartra unit is checked and the validity of coded key is decided by EMS.



## **ENCRYPTED 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 crash pad close to center cross bar. The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the SMARTRA device. And, the received messages from the PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna. The SMARTRA does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the PCM(ECM) and vice versa.



#### **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.



#### 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.



## Body Electrical System > Immobilizer System > Repair procedures

## **Teaching Procedures**

#### 1. Key Teaching Procedure

Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehicle owner.

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

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

The key teaching is done by ignition on with the key and additional tester commands. The PCM(ECM) stores the relevant data in the EEPROM and in the transponder. Then the PCM(ECM) runs the authentication required for confirmation of the teaching process. The successful programming is then confirmed by a message to the tester. If the key is already known to the PCM(ECM) from a previous teaching, the authentication will be accepted and the EEPROM data are updated. There is no changed transponder content (this is impossible for a learnt transponder). The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognized by the PCM(ECM). This rejects the key and a message is sent to the tester.

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

The maximum number of taught keys is 8

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

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

#### NOTE

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





#### 1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : SANTAFE SYSTEM : IMMOBILIZER

01. CURRENT DATA 02. PASSWORD TEACHING/CHANGING 03. TEACHING

04. NEUTRAL MODE

05. LIMP HOME MODE 06. SMARTRA NEUTRAL

#### 1.3 TEACHING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

> INPUT PIN OF SIX FIGURE AND PRESS [ENTER] KEY

> > CODE : 234567

1.3 TEACHING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

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

> > CODE : 234567

#### 1.3 TEACHING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

> 1st KEY TEACHING COMPLETED

CODE : 234567

#### 1.3 TEACHING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

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

> > CODE : 234567

1.3 TEACHING
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT
2st KEY TEACHING COMPLETED
CODE : 234567

#### (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.

1.3 TEACHING	
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN	
INPUT PIN OF SIX FIGURE AND PRESS [ENTER] KEY	
CODE : 234567	
1.3 TEACHING	
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN	
1st KEY TEACHING ARE YOU SURE ? [Y/N]	
CODE : 234567	

#### 1.3 TEACHING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN

> 1st KEY TEACHING COMPLETED

> > CODE : 234567

1.3 TEACHING
MODEL : SANTAFE SYSTEM: IMMOBILIZER STATUS : VIRGIN
2st KEY TEACHING ARE YOU SURE ? [Y/N]
CODE : 234567
1.3 TEACHING
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN 2st KEY TEACHING COMPLETED

#### 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 (learnt key) and sending the user password by tester. After successful teaching, the status of the user password changes from "virgin" to "learnt"

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

If 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

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

1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : SANTAFE
SYSTEM : IMMOBILIZER
01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE
06. SMARTRA NEUTRAL

#### 1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN

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

NEW PASSWORD :

#### 1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN

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

NEW PASSWORD : 2345

1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN

ARE YOU SURE ? [Y/N]

NEW PASSWORD: 2345

1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : VIRGIN

> COMPLETED PRESS [ESC] TO EXIT

NEW PASSWORD : 2345

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

(2) User password changing

#### 1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : SANTAFE SYSTEM : IMMOBILIZER

01. CURRENT DATA

## 02. PASSWORD TEACHING/CHANGING

03. TEACHING 04. NEUTRAL MODE 05. LIMP HOME MODE 06. SMARTRA NEUTRAL

#### 1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

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

OLD PASSWORD :

#### 1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

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

OLD PASSWORD : 2345

1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

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

NEW PASSWORD : 1234

#### 1.2 PASSWORD TEACHING/CHANGING

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

#### ARE YOU SURE ? [Y/N]

NEW PASSWORD : 1234

1.2 PASSWORD TEACHING/CHANGING
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT
COMPLETED PRESS [ESC] TO EXIT
NEW PASSWORD : 1234

## **Limp Home Function**

#### 1. LIMP HOME BY TESTER

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

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

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

1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : SANTAFE SYSTEM : IMMOBILIZER
01. CURRENT DATA 02. PASSWORD TEACHING/CHANGING 03. TEACHING 04. NEUTRAL MODE 05. LIMP HOME MODE
1.5 LIMP HOME MODE
MODEL : SANTAFE SYSTEM : IMMOBILIZER
INPUT PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY
PASSWORD :



#### 2. LIMP HOME BY IGNITION KEY

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

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

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



## Replacement

#### **Problems And Replacement Parts:**

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

## **Replacement Of ECM And Smartra**

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

In case of a defective SMARTRA, 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))



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



#### NOTE

- 1. When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.
- 2. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2. (Note that key #2 must be used within 10 seconds of removing key #1)
- 3. When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.

The engine cannot be started even with the registered key #1.

- 4. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3. Always remember the 10 seconds zone.
- 5. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
- 6. Be cautious not to overlap the transponder areas.
- 7. Problems can occur at key registration or vehicle starting if the transponders should overlap.

#### Neutralising Of ECM

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

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

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

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

This function is for neutralizing the PCM(ECM) and Key. Ex) when lost key, Neutralize the PCM(ECM) then teach keys.(Refer to the Things to do when Key & PIN Code the PCM(ECM) can be set to the "neutral" status by a scanner.If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

#### NOTE

- Neutralizing setting condition
  - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    - : PIN code (6) & user password (4) deletion.
    - : Locking of ECM (except key teaching permission)
- Neutralizing meaning:
  - PIN Code(6) & User P/Word(4) deletion
  - Locking of EMS(except Key Learning permission)

Function	En	gine Ru	nning	Learning		
EMS	Learnt Key	Limp Twice home Ignition		Key User Password		
Neutral	No	No	No	Yes	No	

1. HYUNDAI VEHICLE DIAGNOSIS

#### MODEL : SANTAFE

#### SYSTEM : IMMOBILIZER

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

#### 1.4 NEUTRAL MODE

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

> INPUT PIN OF SIX FIGURE AND PRESS [ENTER] KEY

> > CODE : 234567



## **Neutralising Of SMARTRA**

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

Ignition key (regardlss of key status) is inserted and after IGN ON.If receiving the correct vehicle password from GST, SMARTRA can be neutralized. The neutralization of SMARTRA is possible if DPN is same as the value inputted by GST. In case that the SMARTRA status is neutral, the EMS keeps the lock state. And the start is not possible by "twice ignition".

In case of changing the vehicle password, new virgin transponder must be only used. And in case of virgin key, after Learning the key of vehicle password, it can be used.

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

NOTE

- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learnt"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

Function	En	gine Ru	Learning		
SMARTRA	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	Yes (EMS learnt)	No	Yes	No

#### 1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : SANTAFE SYSTEM : IMMOBILIZER

01. CURRENT DATA

02. PASSWORD TEACHING/CHANGING 03. TEACHING

04. NEUTRAL MODE

05. LIMP HOME MODE

06. SMARTRA NEUTRAL

1.6 SMARTRA NEUTRAL

MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : LEARNT

> INPUT PIN OF SIX FIGURE AND PRESS [ENTER] KEY

> > CODE : 234567

1.6 SMARTRA NEUTRAL
MODEL : SANTAFE SYSTEM : IMMOBILIZER STATUS : NEUTRAL
COMPLETED
PRESS [ESC] TO EXIT
1 1 CUBBENT DATA
1.1 CURRENT DATA
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS 03. KEY STATUS VIRGIN
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS 03. KEY STATUS VIRGIN 04. SMARTRA3 STATRS
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS 03. KEY STATUS VIRGIN 04. SMARTRA3 STATRS
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS 03. KEY STATUS VIRGIN 04. SMARTRA3 STATRS
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS 03. KEY STATUS VIRGIN 04. SMARTRA3 STATRS
1.1 CURRENT DATA 01. NO. OF LEARNT KEY 0 02. EMS STATUS 03. KEY STATUS VIRGIN 04. SMARTRA3 STATRS

# Body Electrical System > Immobilizer System > Immobilizer Control Unit > Repair procedures

#### Replacement

1. Disconnect the negative (-) battery terminal.

- 2. Remove the crash pad. (Refer to the BD group - "Crash pad")
- 3. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) mounted on the left side cowl cross bar after loosening a shear bolt.



4. Installation is the reverse of removal procedure.

## Body Electrical System > Immobilizer System > Antenna Coil > Repair procedures

## Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the driver crash pad lower panel (A). (Refer to the BD group - "Crash pad")

## [LHD]



## [RHD]



3. Disconnect the 6P connector of the coil antenna and then remove the coil antenna (A) after loosening the screw.



4. Installation is the reverse of removal procedure.

## Body Electrical System > Immobilizer System > Troubleshooting

## **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	<ol> <li>Transponder not in password mode</li> <li>Transponder transport data has been changed.</li> </ol>	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	<ol> <li>Virgin SMARTRA at learnt EMS</li> <li>Neutral SMARTRA at learnt EMS</li> <li>Incorect the Authentication of EMS and SMARTRA</li> <li>Locking of SMARTRA</li> </ol>	P169A(SMARTRA Authentication fail)
SMARTRA fault	<ol> <li>No response from SMARTRA</li> <li>Antenna coil error</li> <li>Communication line error (Open/Short etc.)</li> <li>Invalid message from SMARTRA to PCM(ECM)</li> </ol>	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	<ol> <li>Corrupted data from transponder</li> <li>More than one transponder in the magnetic field (Antenna coil)</li> <li>No transponder (Key without transponder) in the magnetic field (Antenna coil)</li> </ol>	P1693 (Transponder no response error/invalid response)
PCM(ECM) fault	<ol> <li>Request from PCM(ECM) is invalid (Protocol layer violation- Invalid request, check sum error etc.)</li> </ol>	P1694 (PCM(ECM) message error)

PCM(ECM) internal permanent memory (EEPROM) fault	<ol> <li>PCM(ECM) internal permanent memory (EEPROM) fault</li> <li>Invalid write operation to permanent memory (EEPROM)</li> </ol>	P1695 (PCM(ECM) memory error)
Invalid key fault	P1696 (Authentication fail)	
Hi-Scan fault	1. Hi-Scan message error	P1697
Locked by timer1. Exceeding the maximum limit of Twice IGN ON ( $\supseteq$ 32 times)		P1699 (Twice IG ON over trial)

## Body Electrical System > Ignition Switch Assembly > Repair procedures

## Inspection



- 1. Disconnect the ignition switch connector (A) and key warning switch connector (B) from under the steering column.
- 2. Check for continuity between the terminals.
- 3. If continuity is not specified, replace the switch.

$\square$	TERMINAL		IGNITION SWITCH (A)					STEERING		KEY WARNING SWITCH (B)		KEY ILLUMIN	HOLE ATION(B)
POSITION	KEY	2	4	6	5	3	1	TRAVEL	TRAVEL	5	6	3	4
LOCK	REMOVAL							LO	СК				
LUCK								LOCK	UNLOCK				
ACC	INSERT	0	_0									Ιĭ	ĹĬ
ON		0		_0	<u> </u>	_0		UNL	оск		-0		
START		0		_0	<u> </u>	-0-	_0						

## Replacement

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the crash pad lower panel. (Refer to the BD group - "Crash pad")
- 3. Remove the ignition switch (A) after loosening the screw with IG ON and disconnecting the 6P connector.



- 4. Remove the steering column cover. (Refer to the ST group)
- 5. Remove the door warning switch and key illumination lamp (A) after disconnecting the 6P connector.



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



7. Installation is the reverse of removal procedure.

Body Electrical System > Back View Camera System > Components and Components Location

## **Component Location**

1. Back view camera	2. AVN monitor

## Body Electrical System > Back View Camera System > Schematic Diagrams

## Circuit Diagram



## Body Electrical System > Back View Camera System > Description and Operation

#### Description

Back view camera will activate when the backup light is ON with the ignition switch ON and the shift lever in the R position.

This system is a supplemental system that shows behind the vehicle through the LCD monitor of AVN head unit while backing-up.

#### WARNING

This system is a supplementary function only. It is the responsibility of the driver or always check the inside/ outside rearview mirror and the area behind the vehicle before and while backing up because there is blind spots

## Body Electrical System > Back View Camera System > Repair procedures

#### Removal

- 1. Remove the tailgate trim in the trunk after removing the screws and clips. (Refer to the BD group "Tailgate")
- 2. Remove the tailgate lid panel after loosening the mounting screws (4EA) and connector.

#### NOTE

2 screws of them can be removed after the removal of tailgate speaker

3. Disconnect the back view camera connector (A).



4. Remove the back view camera (B) after loosening the mounting screws (4EA).

#### Installation

- 1. Install the back view camera.
- 2. Install the tailgate speaker.
- 3. Install the tailgate lid panel.
- 4. Install the tailgate trim.

## Body Electrical System > RSE(Rear Seat Entertainment) System > Specifications

#### **Specifications**

Characteristic Item		Specification			
Picture size		Diagonal 20.3 cm (8.0 inch)			
Active area		176.64 x 99.36 mm			
Display technology		Full color TFT active matrix normally white			
Display modes		Normal, full			
Number of pixels		800(H) x RGB x 480(V)			
Dot pitch		0.2208 x 0.2070			
Pixel orientation		RGB or BGR stripe			
Viewing angle type		12 o'clock			
	Video	Composite video (NTSC and PAL) and Analog RGB (NTSC and PAL)			
Input signal	Control	I <sup>2</sup> C serial control bus on video functions, PWM Dimming Control for Brightness			
Brightness		Typical 500cd/m² at full Brightness			

Operation temperature	-30°C ~ 70°C
Storage temperature	-40°C ~ 85°C

# Body Electrical System > RSE(Rear Seat Entertainment) System > Components and Components Location

## **Component Location**



## Body Electrical System > RSE(Rear Seat Entertainment) System > Description and Operation

## Description

## **RSE System**

The RSE system contains the following components: DVD player, Roof Mount 8-inch WVGA LCD monitor with IR transceiver, Trimplate Module, IR remote controller, and IR headphone. The RSE system is designed to be functional with Delphi Audio H/U. The entire system is awake and operational whenever the vehicle is in either Ignition or Accessory power modes. The RSE system communicates with one of the Head Unites via CAN Serial Data Bus, The main control circuit of the RSE system resides in the DVD player module which communicates with the Trimplate Module, and with the Roof Mount Display Module.

In the Audio Head Unit system, the H/U audio signal can be passed to RSE system. The RSE has the ability to pass certain pre-defined controls to the Head Unit via remote controller through CAN bus.

For Radio H/U, only the RSE system can be sent its audio signal to this head unit. Head unit doesn't send audio signal to RSE system. RSE and H/U system can be controlled by each other via CAN Serial Date Bus.

The entire RSE system including the LCD monitor Display and DVD mechanism is controlled by a ON/OFF swtich located at the Trimplae unit. While in its ON state, the RSE system is set up to accept the commands from functional buttons located on the Trimplate Module or from the IR Remote Controller. There is a position-sensing switch located inside LCD Module to turn ON or OFF the LCD monitor power when its position is at 25 +/- 10 degrees from the closed and latched position. The RSE system has IR emitters to transmit a single channel stereo audio signal of the playing state to a matched IR wireless headphone.



## **LCD Monitor Protective Operation**

The monitor display has a built-in thermal sensor to sense the inside temperature of the monitor display package. This senor output is fed to a processor which will activate protective measure when the monitor operating temperature is rising close to the maximum allowable operating temperature limit of  $+76 \pm 5C$ .

## **DVD Mechanism Performance**

The DVD player is a single player.

The player is only capable of reading the bottom side of a disc. When inserting single sided disc the label should be up.

## Wireless Headphone

When the RSE is ON, its audio signal is transmitted from the IR transmitter located in the LCD monitor and is received and played back through the IR Headphones. The wireless headphone volume can be adjusted via the rotary volume on the headphones. The IR headphone is a single channel design.

# Body Electrical System > RSE(Rear Seat Entertainment) System > RSE Trimplate Unit > Components and Components Location

**Component Location** 

**Rse Trimplate Unit** 



# Body Electrical System > RSE(Rear Seat Entertainment) System > RSE Trimplate Unit > Repair procedures

#### Removal

- 1. Disconnect the negative(-) battery terminal.
- 2. Remove the console rear cover. (Refer to the BD group - "Console")
- 3. Disconnect the connectors.
- 4. Remove the RSE Trimplate unit (A) from the console rear cover (B) after loosening the screws (4EA).



## Installation

- 1. Assemble the RSE Trimplate unit to the console rear cover.
- 2. Connect the unit connectors after tightening the screws (4EA).
- 3. Install the console rear cover. (Refer to the BD group - "Console")

Body Electrical System > RSE(Rear Seat Entertainment) System > RSE LCD Monitor > Components and Components Location

## **Component Location**



# Body Electrical System > RSE(Rear Seat Entertainment) System > RSE LCD Monitor > Repair procedures

#### Removal

- 1. Disconnect the negative(-) battery terminal.
- 2. Remove the monitor cover (A).
- 3. Remove the RSE LCD monitor assembly (B) after loosening 4 bolts on the roof panel or roof rail.



4. Disconnect the connector from RSE LCD monitor.

## Installation

## Non-sunroof type

- 1. Install the mounting seal on the roof rail by bolts (8EA) if necessary.
- 2. Install the RSE LCD monitor assembly on the roof rail.
- 3. Connect the cable connector on the RSE monitor assembly until 'Click' sound.
- 4. Fix the monitor on the mounting seal by clips (2EA) and then tighten the bolts (4EA).
- 5. Push the RSE cover on the monitor assembly until 'Click' sound.



## Sunroof Type

- 1. Install the RSE LCD monitor assembly on the roof panel.
- 2. Connect the cable connector on the RSE monitor assembly until 'Click' sound.
- 3. Fix the monitor on the sunroof bracket by clips (2EA) and then tighten the bolts (4EA).
- 4. Push the RSE cover on the monitor assembly until 'Click' sound.



# Body Electrical System > RSE(Rear Seat Entertainment) System > DVD Player > Components and Components Location

## **Component Location**





Pin No.	Pin Name	Pin Deficition
1	VID IN	COMPOSITE VIDEO (AVN OR AUX TO RSE)
2	SYNC IN	RGB VIDEO SYNC SIGNAL
3	VID RED	RGB VIDEO RED SIGNAL
4	VID BLUE	RGB VIDEO BLUE SIGNAL
5	N.C	N.C
6	VID OUT	COMPOSITE VIDEO (RSE TO AVN)
7	AUX IN R	AUX AUDIO RIGHT IN

8	AUX IN COM	AUX AUDIO COMMON
9	CAN LOW	CAN BUS SIGNAL
10	AUX INT L	AUX JACK INSERTION STATUS
11	VID IN COM	COMPOSITE VIDEO COMMON (AVN OR AUX TO RSE)
12	RGB SYNC GND	RGB VIDEO SUNC SHIELD GROUND
13	VID GREEN	RGB VIDEO GREEN SIGNAL
14	RGB COM	RGB VIDEO COMMON
15	N.C	N.C
16	VID OUT COM	COMPOSITE VIDEO COMMON (RSE TO AVN)
17	AUX IN L	AUX AUDIO LEFT IN
18	CAN HIGH	CAN BUS SIGNAL
19	RSE RST	RESET SIGNAL TO RSE
20	AUX INT R	AUX JACK RIGHT INSERTION STATUS

#### **Connector B**

Pin No.	Pin Name	Pin Definition
1	ALT L	ALTERNATOR SIGNAL
2	N.C	N.C
3	AUD IN L	AUDIO LEFT
4	AUD OUT R	AUDIO RIGHT (RSE TO AVN OR AUDIO)
5	AUD OUT COM	AUDIO RIGHT (RSE TO AVN OR AUDIO)
6	DIM+ WAKEUP	DIMMING CONTROL SIGNAL
7	GND	BATTERY POWER GROUND
8	BAT+	BATTERY POWER
9	RSE DET	RSE DETECTION
10	AUD IN R	AUDIO RIGHT
11	AUD IN COM	AUDIO COMMON
12	AUD OUT L	AUDIO LEFT (RSE TO AVN OR AUDIO)
13	DIM- PWM	DIMMING CONTROL SIGNAL
14	ACC	VEHICLE ACC SIGNAL
15	GND	BATTERY POWER GROUND
16	BAT+	BATTERY POWER

#### Connector C

Pin No.	Pin Name	Pin Definition	
1	DO	SPI BUS DATA OUTPUT	
2	CL	SPI BUS CLOCK	
3	CE	SPI BUS CHIP ENABLE SIGNAL	
4	P GND	POWER GROUND	
5	LCD DIM	TRIMPLATE LCD DIMMING SIGNAL	
6	FBATT	BATTERY FOR TRIMPLATE BACKLIT	
7	POWER	POWER ON/OFF SIGNAL	
8	12V SW1	BATTERY SWITCH SIGNAL FOR TRIMPLATE	
9	R SW2	ROTARY ENCODER CCW	
----	---------	------------------------------	--
10	R SW1	ROTARY ENCODER CW	
11	LED DIM	TRIMPLATE LED DIMMING SIGNAL	
12	DI	SPI BUS DATA INPUT	

## Connector D

Pin No.	Pin Name	Pin Definition		
1	GND	GROUND		
2	FBATT	FILTERED BATTERY LINE		
3	P SW	LIMITED SWITCH SIGNAL		
4	FBATT	FILTERED BATTERY LINE		
5	GND	GROUND		
6	GND	GROUND		
7	VGND	VIDEO GROUND		
8	FB	RGB OVERLAY CONTROL SIGNAL		
9	IR REMOTE	IR REMOTE CONTROL SIGNAL		
10	FBATT IR SW	IR BATTERY SWITCH CONTROL SIGNAL		
11	RGB SYNC	ANALOG RGB SYNC SIGNAL		
12	VCC SW	VCC SWITCH CONTROL SIGNAL		
13	VBL SW	VBL SWITCH CONTROL SIGNAL		
14	GND	GROUND		
15	VGND	VIDEO GROUND		
16	GND	GROUND		
17	IR AUD L	IR AUDIO LEFT CHANNEL		
18	IR AUD COM	IRR AUDIO COMMON		
19	IR AUD R	IR AUDIO RIGHT CHANEL		
20	GND (IR)	GROUND		
21	GND	GROUND		
22	FBATT	FILTERED BATTERY LINE		
23	FBATT	FILTERED BATTERY LINE		
24	VGND	VIDEO GROUND		
25	DISP DIM	DIMMING CONTROL SIGNAL		
26	GND	GROUND		
27	I2C DATA	I2C BUS DATA SIGNAL		
28	I2C CLK	I2C BUS CLOCK SIGNAL		
29	GND	GROUND		
30	T OUT	THERMISTOR OUTPUT SIGNAL		
31	GND	GROUND		
32	VGND	VIDEO GROUND		
33	VBO	ANALOG RGB BLUE SIGNAL		
34	VGO	ANALOG RGB GREEN SIGNAL		
35	VRO	ANALOG RGB RED SIGNAL		
36	VGND	VIDEO GND		

37	DISP VID	BACKLIGHTING GROUND RETURN	
38	VGND	VIDEO GND	
39	VSYNC	VERTICAL SYNC SIGNAL	
40	HSYNC	HORIZONTAL SYNC SIGNAL	

# Body Electrical System > RSE(Rear Seat Entertainment) System > DVD Player > Repair procedures

## Removal

- 1. Disconnect the negative(-) battery terminal.
- 2. Remove the console and rear console cover (A). (Refer to the BD group - "Console")
- 3. Loosen the bolts (2EA) from the rear console mounting bracket.
- 4. Remove the DVD player (B) from the center floor panel (C) after loosening 2 bolts.



5. Disconnect the connector from DVD player.

## Installation

- 1. Install DVD player on the rear console bracket.
- 2. Install the DVD player on the center floor panel and connect the DVD player connectors.
- 3. Install the console. (Refer to the BD group - "Console")

# Body Electrical System > AC Inverter System > Specifications

# Specifications

#### A/C Inverter Unit

ltems	Specifications		
Input voltage range	DC 10.0 ~ 16.0V		
Operating voltage range	DC 12.7 ~ 15.0V		
A/C output voltage range	AC 103.5 ~ 126.5Vrma		
A/C output frequency	54 ~ 66Hz		

A/C output wave form	Modified sire wave			
Cooling system	Natural cooling			
Maximum output power	150W MIN. 75W MIN. (With resistance load)			
Operating temperature range	-30 ~ +75°C (-22 ~ 167°F)			
Storage temperature range	-40 ~ +85°C (-40 ~ 185°F)			
	Input high voltage protection	<ul> <li>When input voltage is between 15V and 17V, the DC/AC inverter stops AC output.</li> <li>And when input voltage becomes less than 15V, the DC/AC inverter restart.</li> <li>When input voltage exceeds 17V furthar, the DC/AC inverter opens an own relay and shotdown itself.</li> </ul>		
	Input low voltage protection	<ul> <li>When input voltage is less then 10.8V, the DC/AC inverter stops its AC output.</li> <li>And when input voltage exceeds 12.7V, the DC/AC inverter rastart.</li> </ul>		
	Output high voltage protection	<ul> <li>When output wave height exceeds 170V, the DC/AC inverter stops its AC output</li> <li>And when it becomes less than 170V, the DC/AC inverter rastart</li> </ul>		
Protective function	Output over current protection	<ul> <li>When the load exceeding 150W is connected to the DC/AC inverter it will be OCL (Over current limit) -mode to defend over current.</li> <li>If OCL mode continues during about 2sec., the DC/AC inverter stops its output.</li> <li>After it passes over 40sec from the DC/AC inverter stops, the inverter restarts its output.</li> </ul>		
	Output low voltage protection	<ul> <li>When the output voltage is below the setup value, the DC/AC inverter stops its output.</li> <li>When the output low voltage protection is worked on, the DC/AC inverter shuts down.</li> <li>To restart DC/AC inverter, 'IG-off-ON' is necessary.</li> </ul>		
	Over heat protection	<ul> <li>When the temperature inside or DC/AC inverter rises and a regular level is exceeded, the DC/AC inverter stops its output.</li> <li>When the over heat protection is worked on, the DC/AC inverter shuts down.</li> <li>To restart DC/AC inverter, 'IG-off-ON' is necessary.</li> </ul>		
Outlet LED	<ul> <li>When the DC/AC inverter is providing AC power, outlet LED is lighting.</li> <li>When input voltage is between 11.0 and 10.8, outlet LED is blinking (The blink frequency is about 2Hz.)</li> <li>When input voltage is under 10.8V, outlet LED is stops operating.</li> <li>When the DC/AC inverter is not providing AC power, outlet LED is unlighting.</li> </ul>			

#### A/C Inverter Outlet

Items	Specifications
Outlet rating	115VrmsAC and 3ArmsAC
Insulation resistance	100Mohm, which measured at 500V

Contact resistance	Less than or equal to 50mohm.	
Color	Black	
Operating temperature	-30°C ~ 75°C (-22 ~ 167°F)	
Preservation temperature	-40°C ~ 85°C (-40 ~ 185°F)	
Material	ABS	
LED color	Green	

# Body Electrical System > AC Inverter System > Components and Components Location

# **Component Location**



# Body Electrical System > AC Inverter System > Schematic Diagrams

## **Circuit Diagram**



# Body Electrical System > AC Inverter System > Description and Operation

## Description

The inverter system covered by this specification consists of the following;



- DC/AC Inverter converts the battery's DC voltage to 115Vrms, 60Hz AC voltage.
- The battery's DC voltage is input to the inverter by wiring.
- DC voltage from battery is converted to DC high voltage.

Its conversion is performed by DC/DC converter area in the DC/AC inverter.

- DC high voltage is converted to the AC voltage.

Its conversion is performed by DC/AC converter area in the DC/AC inverter.



VH, peak voltage of output changes according to input battery voltage.

The effective value of output is controlled by changing pulse width (Ton).

- The AC voltage from the DC/AC Inverter is output to the standard AC Outlet for vehicle use by a wiring.
- The DC/AC Inverter has some protect functions for protecting itself and the connecting things.



These supply 115VAC/150W electric power to operate electric accessories or equipment when the key is in the "ON" position or engine is running. The AC Inverter is turn on by pushing in the switch. To turn the AC Inverter off, push the switch a second time.

#### CAUTION

- When not using the AC Inverter, make sure that the switch is turned off, and close the AC Inverter cover.
- Use when the engine is running and remove a plug from the AC Inverter after using the electric appliance. Using
  when the engine stops or remaining the electric appliance with plugged in for long time may cause the battery
  to be discharged.
- Do not use the electric accessories or equipment more than maximum electric power consumption count 150W by AC 115V.
- Some electronic devices can cause electronic interference when plugged into the AC Inverter. These devices may cause excessive audio noise and malfunctions in other electronic systems or devices used in your vehicle.
- Do not use the broken electric accessories or equipment, it is receiving an electric shock and becomes impossible to use an AC Inverter and vehicle.
- Do not use two or more electric accessories or equipment at the same time by plug sockets for branch.

## WARNING

- AC Inverter can be dangerous! When using the AC Inverter, carefully observe the following precautions to avoid serious injuries.
- Do not use the output of the heated electric product(coffeepot, toaster, heater, etc.). It will be cause of a fire.
- Do not put a foreign element(pin, etc.) and do not touch by wet hand, you may get an electric shock.
- Do not use the electric products that a steam comes, such as a coffeepot, an electric steam iron. Steam had fogged the glass or mirror of vehicle.
- Do not let the child touch an AC Inverter.
- When not in use an AC Inverter, close the cover. If the foreign element(rain water, beverage, pin, snow, etc.) into the plug socket, it may cause breaking down the vehicle and injury or death by electric shock.

# Body Electrical System > AC Inverter System > AC Inverter Unit > Repair procedures

#### Removal

- 1. Disconnect the negative(-) battery terminal.
- 2. Remove the luggage side trim. (Refer to the BD group - "Luggage side trim")
- 3. Remove the A/C Inverter unit (A) after loosening 2 bolts.



4. Disconnect the unit connector.

## Installation

- 1. Install the A/C Inverter unit.
- 2. Connect the unit connector.
- Install the luggage side trim. (Refer to the BD group - "Luggage side trim")

## Body Electrical System > AC Inverter System > AC Inverter Switch > Repair procedures

#### Removal

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



3. Disconnect the connectors.



4. Remove the A/C Inverter switch (A) from the console upper cover.



# Installation

- 1. Install the A/C inverter switch to the console upper cover.
- 2. Connect the A/C inverter switch connector.
- 3. Install the console upper cover. (Refer to the BD group - "Console")

## Inspection

- 1. Disconnect the negative (-) battery terminal.
- 2. Remove the A/C inverter switch (A) from the console upper cover.



3. Check that continuity exists between the terminals.

Position Terminal	ON(PUSH)	OFF(FREE)	REMARK
з	Q		
6	0		
4			GND
1	ow	ow	IDN+
5	0	À	ILL-
2	0–777-	Ŷ	ILL+

# Body Electrical System > AC Inverter System > AC Inverter Oultet > Repair procedures

# Removal

- 1. Disconnect the negative(-) battery terminal.
- 2. Remove the A/C inverter outlet (A) from the luggage side trim.



3. Disconnect the outlet connector.

## Installation

- 1. Connect the A/C inverter outlet connector.
- 2. Install the A/C inverter outlet on the luggage side trim.