

Body Electrical System

ETACS (ELECTRONIC TIME AND ALARM CONTROL SYSTEM)

BODY CONTROL MODULE

TRUNK LID OPENER

TRUNK LID RELEASE ACTUATOR
TRUNK LID OPEN SWITCH

INDICATORS AND GAUGES

INSTRUMENT CLUSTER

POWER DOOR LOCKS

POWER DOOR LOCK SWITCH

POWER SEAT

POWER SEAT MOTOR

AIR VENTILATION SEAT

LIGHTING SYSTEM

TURN SIGNAL LAMP
SIDE REPEATER LAMP

REAR CURTAIN SYSTEM

REAR CURTAIN
REAR CURTAIN UNIT
REAR CURTAIN SWITCH

REAR PARKING ASSIST SYSTEM

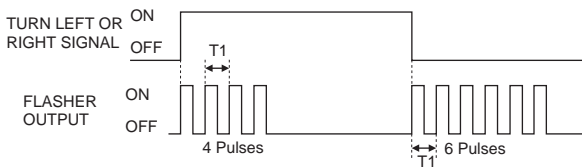
REAR PARKING ASSIST SYSTEM CONTROL
MODULE
ULTRASONIC SENSOR

ETACS (ELECTRONIC TIME AND ALARM CONTROL SYSTEM)

BODY CONTROL MODULE

OPERATION E055DD2E

FLASHER OUTPUT OPERATION



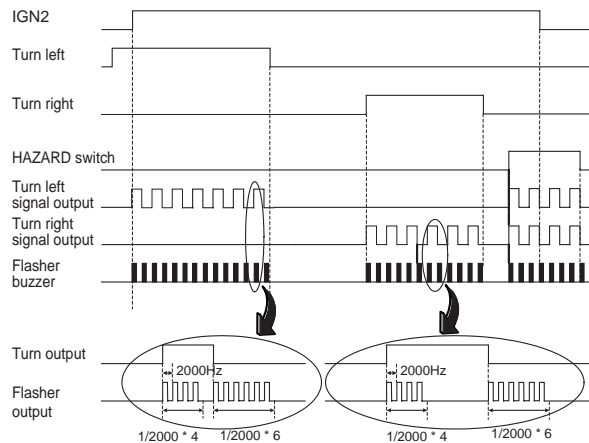
SGHBE6152L

1. NORMAL OPERATING CONDITION

Turn signal period: 85 ± 10 period/min (regulation: 90 ± 30 period/min)

While IGN2 is on, if TURN SIGNAL LEFT switch or TURN SIGNAL RIGHT switch or HAZARD switch input is detected, turn signal outputs are turned on following the switch input (LEFT, RIGHT or HAZARD).

Priority: HAZARD > TURN SIGNAL

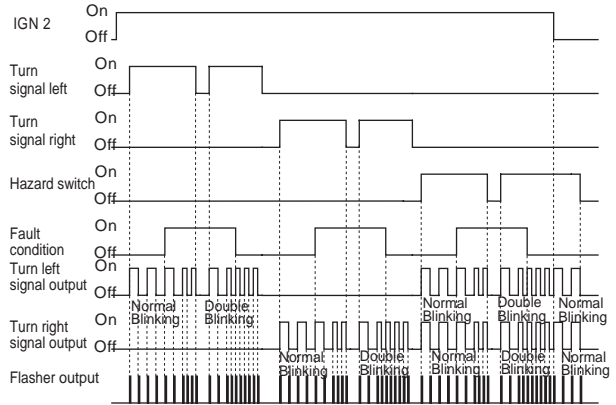


SGHBE6150L

Normal : 85 ± 10 Period/min

2. DOUBLE BLINKING CONDITION

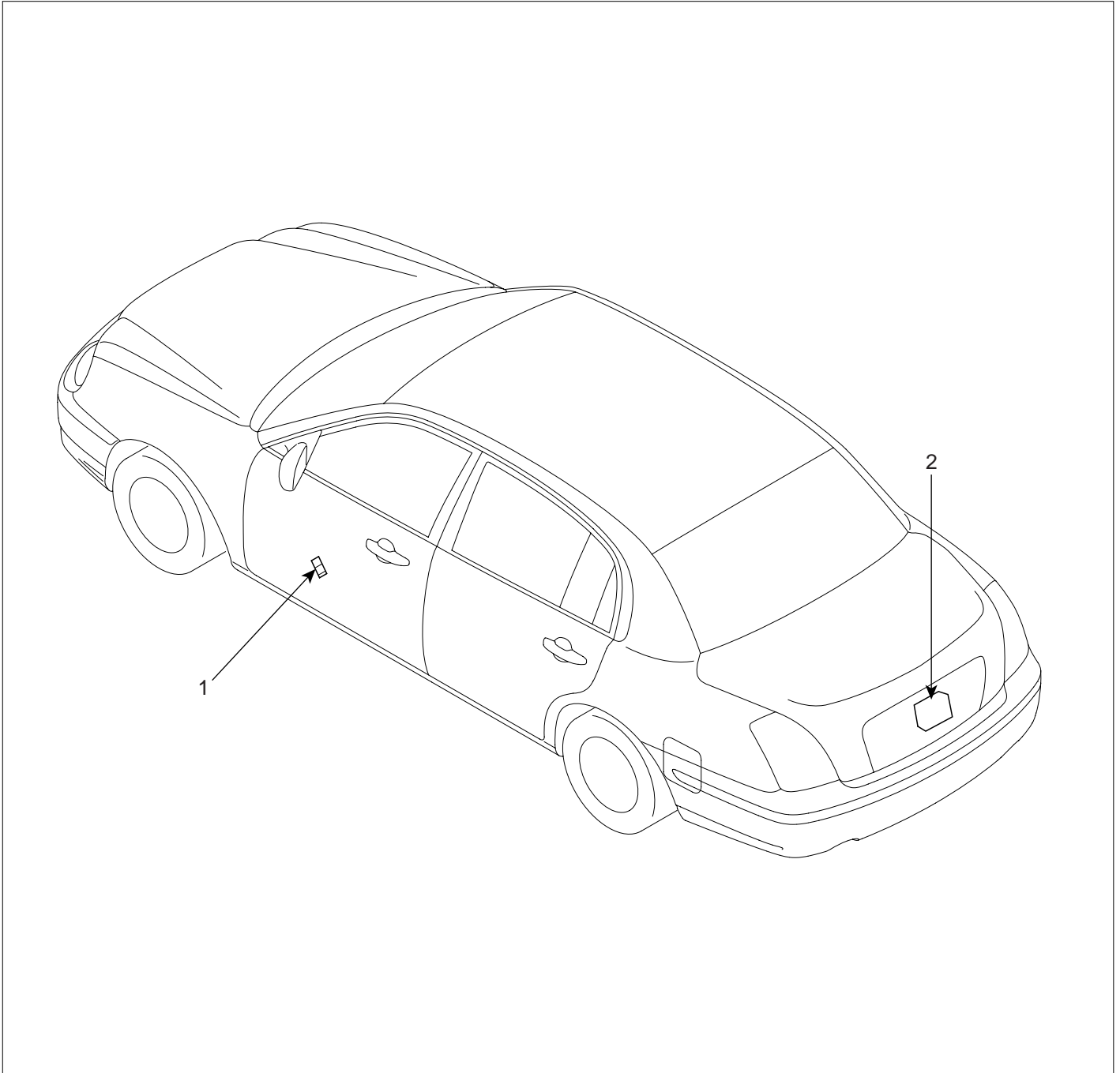
When one of the FRONT or REAR is broken-down (Lamp failure), the turn signal blinks with double frequency. Lamp failure condition as indicated below.



SGHBE6151L

TRUNK LID OPENER

COMPONENT LOCATION E67BFF1B



1. Trunk lid open switch

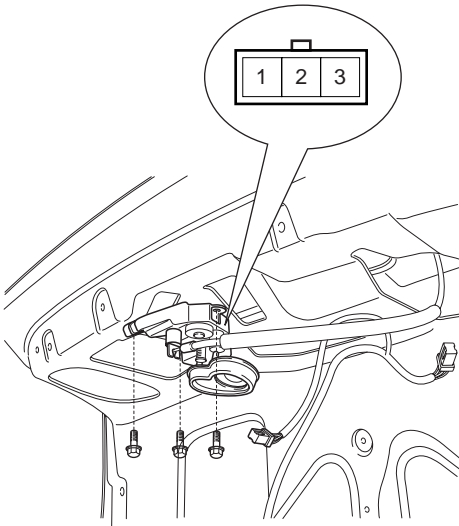
2. Trunk lid release actuator

SGHBE6160L

TRUNK LID RELEASE ACTUATOR

INSPECTION EB76BCFE

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



SGHBE6161D

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

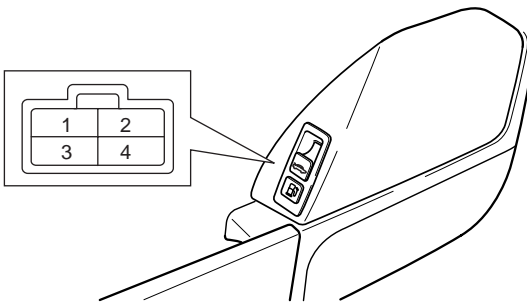
Terminal	2	3
Position	⊕	⊖

SGHBE6162L

TRUNK LID OPEN SWITCH

INSPECTION E43DCCC1

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



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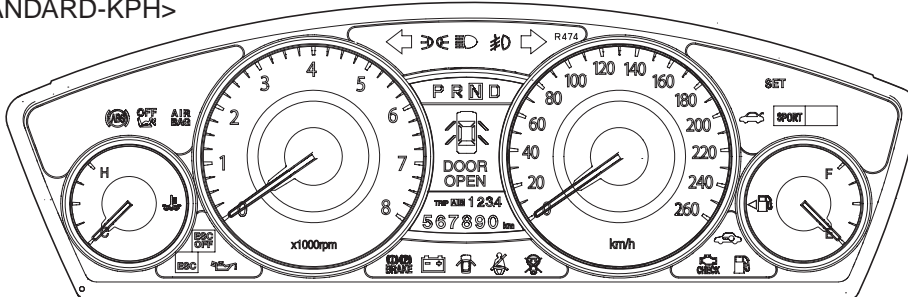
INDICATORS AND GAUGES

INSTRUMENT CLUSTER

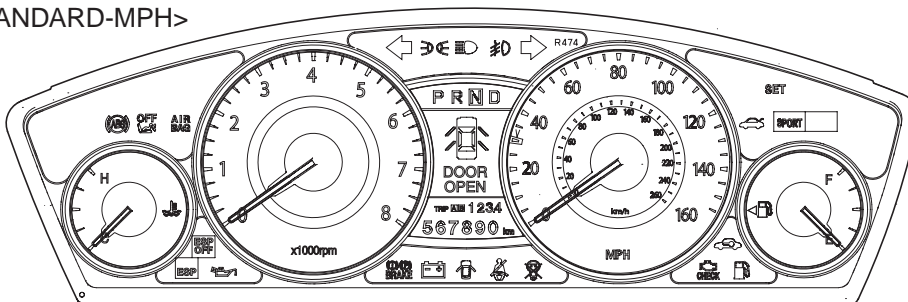
COMPONENTS EB997BD6

<FRONT>

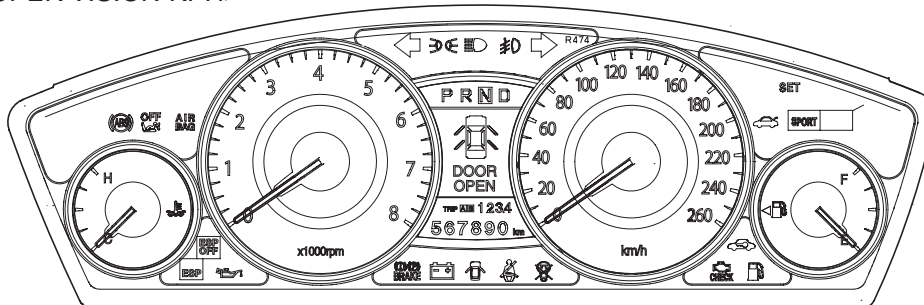
<STANDARD-KPH>



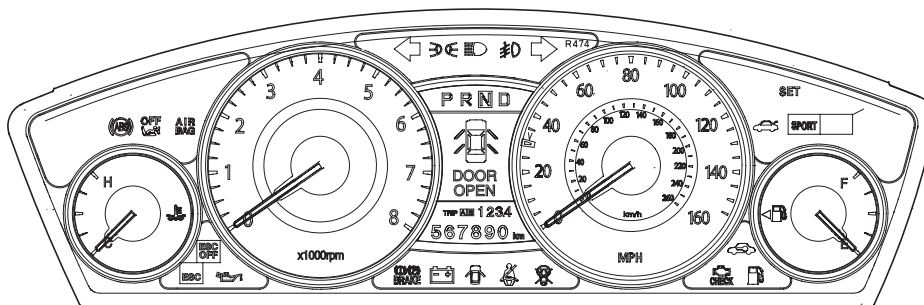
<STANDARD-MPH>

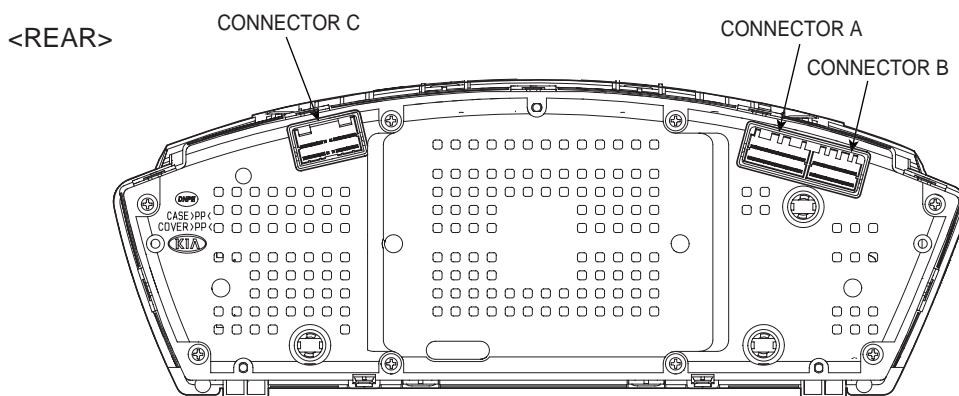


<SUPER VISION-KPH>



<SUPER VISION-MPH>





CONNECTOR A		CONNECTOR B		CONNECTOR C	
NO.	CONNECTOR A	NO.	CONNECTOR B	NO.	CONNECTOR C
1	LEFT INDICATOR	1	EPS OFF	1	-
2		2	ABS/EBD	2	CRUISE
3	HIGH BEAM INPUT	3	OIL PRESSURE	3	-
4	FRONT FOG LAMP	4	BRAKE	4	SPORT
5	RIGHT INDICATOR	5	BATT CHARGE	5	SET
6	P	6	SEAT BELT	6	TEMP INPUT
7	R	7	PAB(+)	7	BUZZER
8	N	8	PAB(-)	8	FUEL INPUT
9	D	9	DOOR OPEN F/L	9	SPEED INPUT
10	PWM SIGNAL	10	DOOR OPEN F/R	10	TACHO INPUT
11	POWER GND	11	DOOR OPEN R/L	11	-
12	FBWS	12	DOOR OPEN R/R	12	-
13	TRIP SW	13	STOP LAMP FAIL	13	-
14	TRIP RESET SW	14	AIR BAG(+)	14	-
15	LOW WASHER	15	AIR BAG(-)	15	IGN-1
16	T/LID OPEN	16	SPARE	16	BATTERY
17	EPS			17	SIGNAL GND
18	SPEED WARNING			18	FUEL GND
19	CHECK ENGINE			19	ILL(+)
20	IMMOBILIZER			20	ILL(-)

INSPECTION EFE2932A

SPEEDOMETER

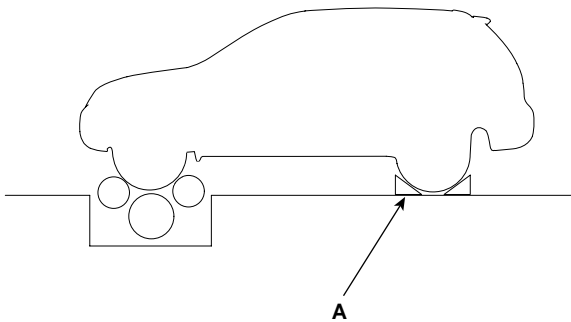
1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.
3. Check if the speedometer indicator range is within the standard values.

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.



SCMBE6203L

[KM/H]

Velocity (km/h)	20	40	60	80	100	120
Tolerance - All (km/h)	+4.0 +0	+5.5 +2.0	+6.0 +2.0	+7.0 +2.5	+8.0 +3.0	+10.0 +4.0
Tolerance - CANADA (km/h)	+2.5 +0.5	+3.0 +0.5	+4.0 +1.0	+5.5 +1.5	+6.5 +1.5	+7.5 +2.0
Velocity (km/h)	140	160	180	200	220	240
Tolerance - All (km/h)	+10.0 +4.0	+11.0 +4.0	+12.5 +4.0	+13.5 +5.0	+14.5 +6.0	+12.0 +4.0
Tolerance - CANADA (km/h)	+9.0 +2.5	+9.0 +2.5	+10.0 +3.0	+11.0 +3.5	+11.5 +4.0	+12.0 +4.0

[MPH]

Velocity (MPH)	10	20	40	60	80
Tolerance (MPH)	+2.7 +0.7	+3.0 +0.8	+5.0 +1.2	+6.0 +1.5	+6.0 +2.0
Velocity (MPH)	100	120	140	160	
Tolerance (MPH)	+7.5 +2.5	+8.5 +3.0	+10.0 +3.5	+10.0 +5.0	

TACHOMETER

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

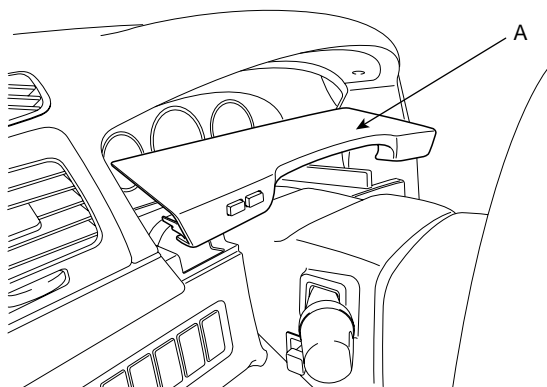
CAUTION

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

Revolution (RPM)	1000	2000	3000	4000
Tolerance (RPM) MAX. 8000rpm	±120	±140	±170	±170
FREQUENCY	3000RPM (150Hz)			
Revolution (RPM)	5000	6000	7000	8000
Tolerance (RPM) MAX. 8000rpm	±200	±240	±260	±260
FREQUENCY	3000RPM (150Hz)			

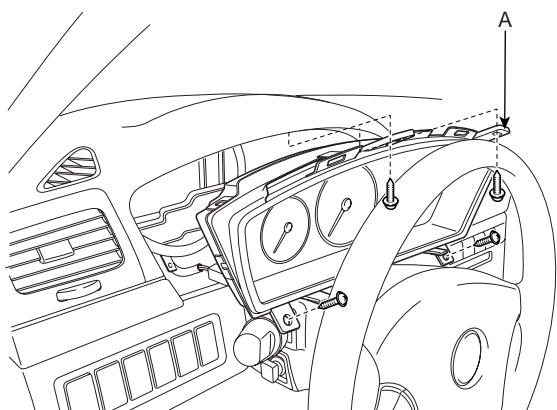
REMOVAL E22AD6DD

1. Disconnect the negative (-) battery terminal.
2. Remove the cluster lower facia panel (A) after loosening 2 screws.
3. Disconnect trip switch connector.



SGHBE6223D

4. Remove the cluster upper facia panel(A) after loosening 2 screws.
5. Pull out the cluster (A) from the housing after removing 4 screws.



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6. Disconnect the cluster connectors and then remove the cluster.

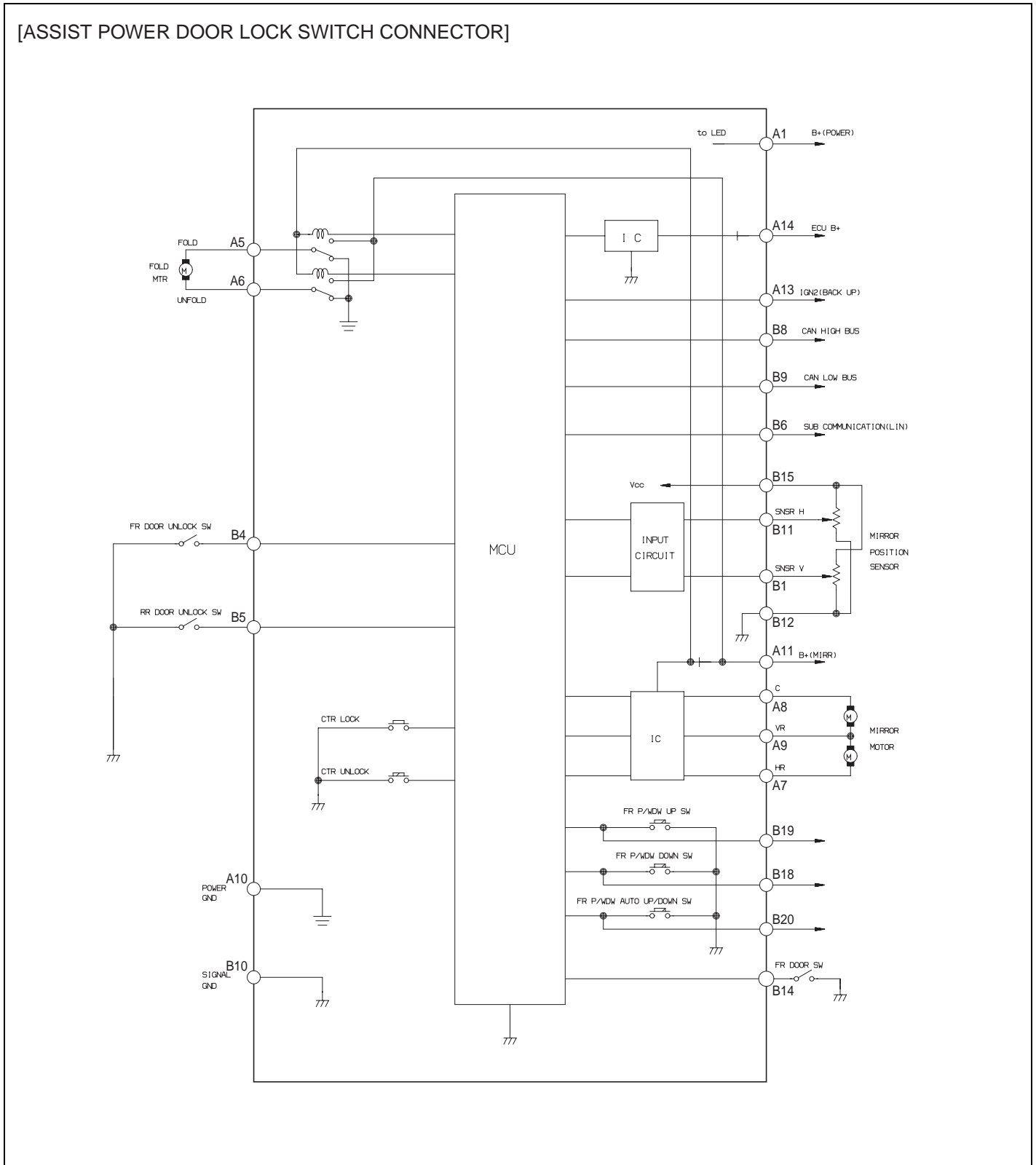
INSTALLATION E493BF9E

1. Assemble the cluster after connecting the cluster connectors.
2. Install the cluster with 4 screws.
3. Install the cluster upper facia panel.
4. Install the cluster lower facia panel after connecting the trip switch connectors.

POWER DOOR LOCKS

POWER DOOR LOCK SWITCH

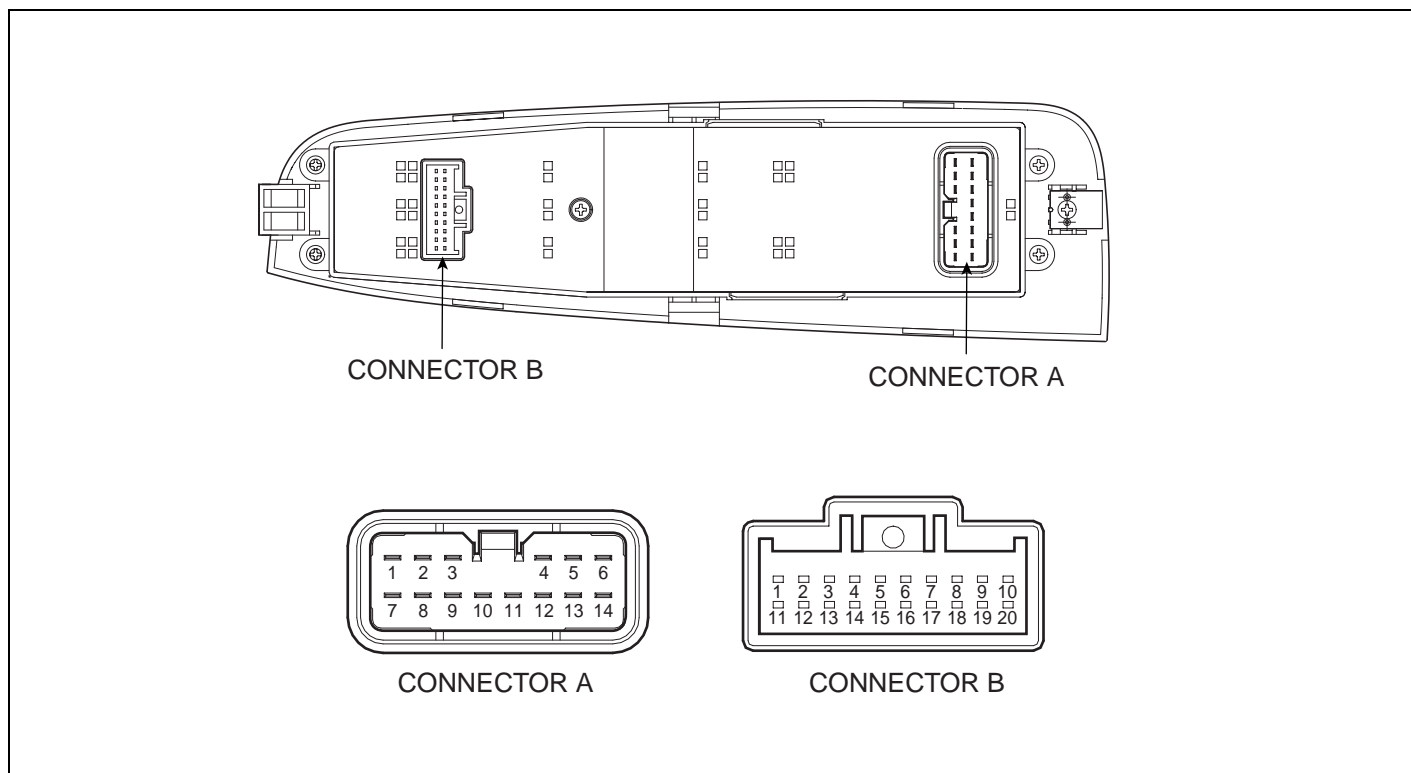
CIRCUIT DIAGRAM E924200B



POWER DOOR LOCKS

COMPONENT LOCATION

E1B83D16



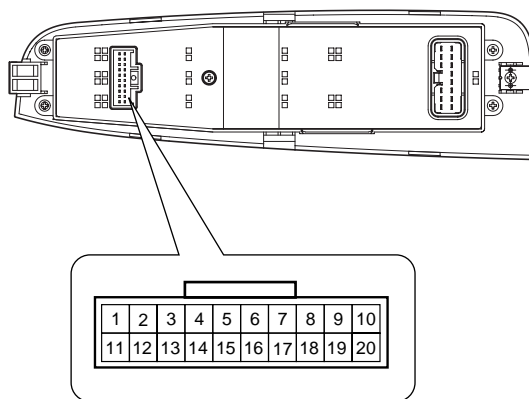
SGHBE6241L

INSPECTION

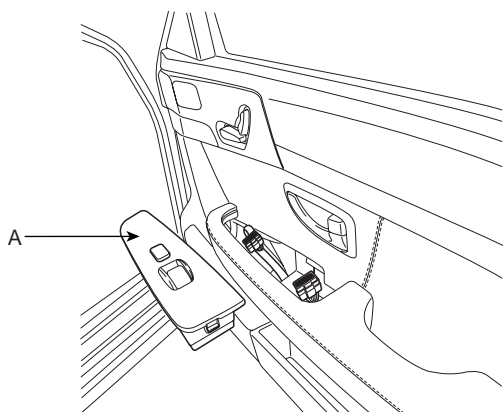
EF12C7E4

ASSIST DOOR LOCK SWITCH

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



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SGHBE6248D

3. Disconnect the connector from the switch.

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

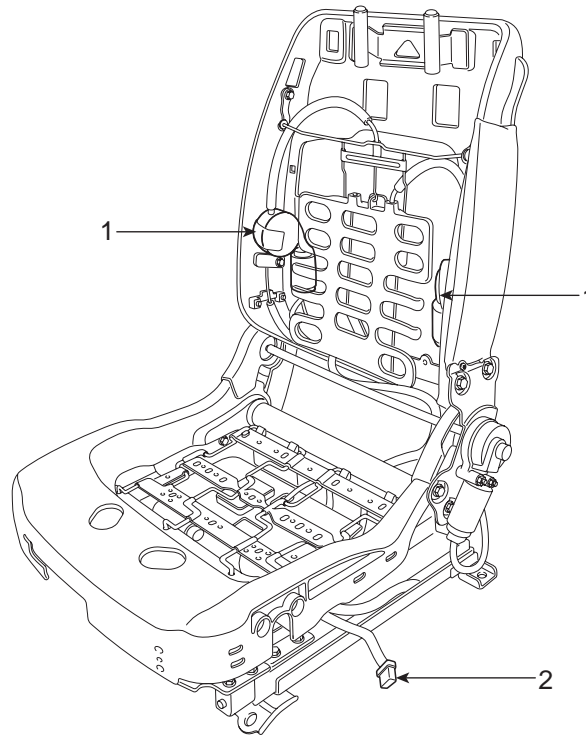
Terminal Position	5	4	GND
Lock		○ — ○	○ — ○
Unlock	○ — ○		○ — ○

SGHBE6251L

POWER SEAT

COMPONENTS E88E5426

[POWER LUMBAR SUPPORT]



1. Lumbar support motor

2. Lumbar support control switch connector

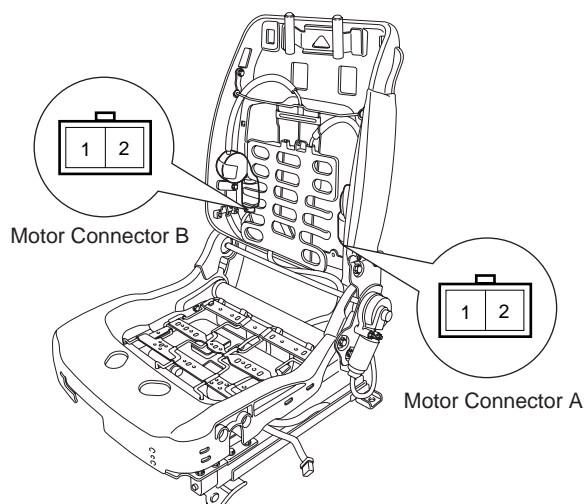
SGHBE6440L

POWER SEAT MOTOR

INSPECTION EC3FF24B

POWER LUMBAR SUPPORT

1. Disconnect the motor connector after removing the seat.
(Refer to the Body group - Front seat)



SGHBE6441L

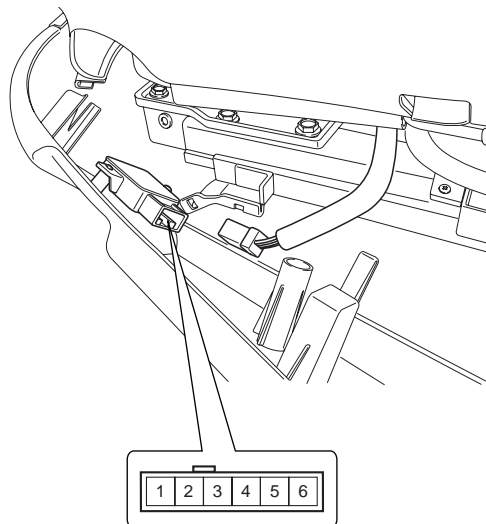
2. When the battery connected directly to the motor terminals, check the motors run smoothly.
3. Reverse the connections and check that the motor turns in reverse.
4. If there is an abnormality, replace the motors.

Position		Terminal	
		1	2
Lumbar support A	Forward	⊕	⊖
	Backward	⊖	⊕
Lumbar support B	Up	⊕	⊖
	Down	⊖	⊕

SGHBE6443L

POWER LUMBAR SUPPORT SWITCH

1. Operate the power seat switch and check for continuity between terminals.
If continuity is not as specified, replace the switch.



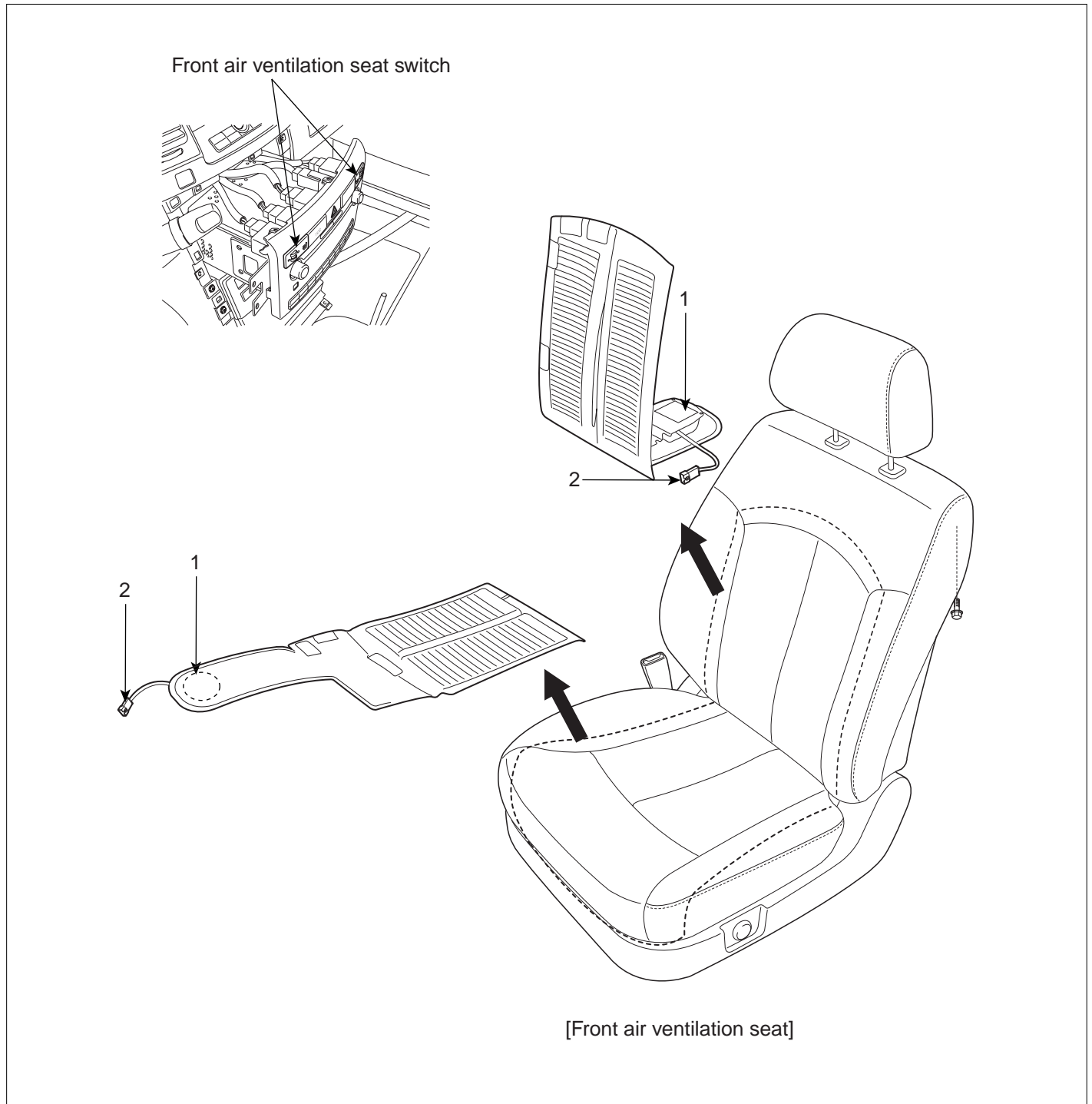
SGHBE6444D

Position		Terminal					
		1	2	3	4	5	6
Lumbar support switch	Forward		○	—	○		
	Backward	○	—		○		
	Up				○	—	○
	Down				○	—	○

SGHBE6445L

AIR VENTILATION SEAT

COMPONENTS EB1C2F68



1. FAN

2. FAN Connector(2P)

SGHBE6256L

DESCRIPTION E8CE1B06

Using the indraft power of FAN on seat, remove the moisture, sweat and warmth from occupants and surface of seats.

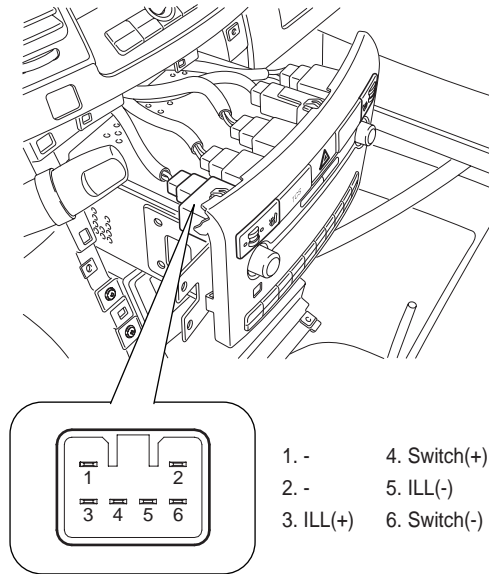
NOTE

1. Make sure not to spoil drink or water on the seat when equipping with climate control system seat.
2. When equipping with front air ventilation seat, make sure not to prevent the filter from getting the vinyl or book into behind the seat.
3. Because of inhaling the slight air, it is difficult to feel the air strength by the sense of touch.

INSPECTION E8EE6C4A

FRONT AIR VENTILATION SEAT SWITCH

1. Remove the front air ventilation seat switch assembly after removing the center facia panel. (Refer to the Body group - Interior trim)
2. Remove the front air ventilation seat switch (Drive, Assist) Connectors(6P).



SGHBE6257L

3. Check the resistance between switch connector terminals 4 and 6 at each switch position if the resistance is not as specified, replace the switch.

SWITCH(SEAT WARMER ONLY)

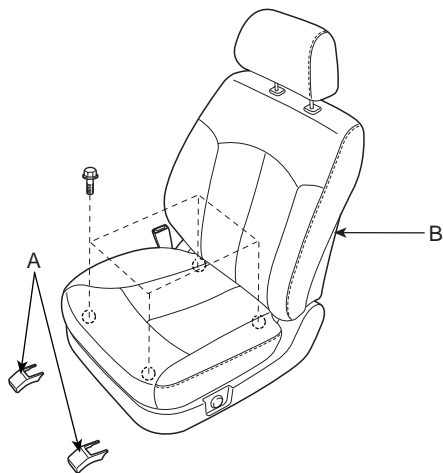
Position	Switch angle	Resistance()
0	0°	-
1	47	8000
2	94	6300
3	141	4760
4	188	2500
5	238	470

SWITCH(SEAT WARMER AND AIR VENTILATION)

Position	Switch angle	Resistance(K)
3	0	1.62
2	22	3.72
1	44	6.39
0	66	9.95
1	88	14.95
2	110	22.63
3	132	35.33
4	154	60.23
5	175	105.53

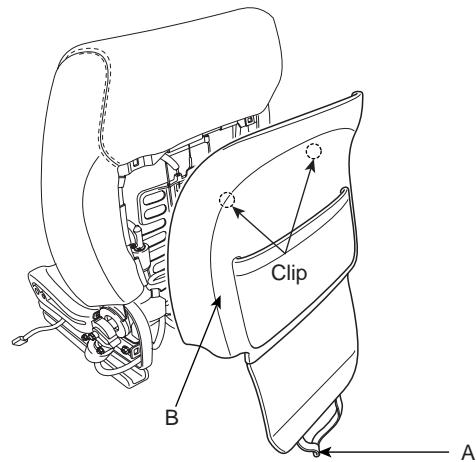
BACK FAN

1. Remove the seat assembly mounting cover (A). After loosening the seat assembly mounting bolts, remove the seat assembly (B).



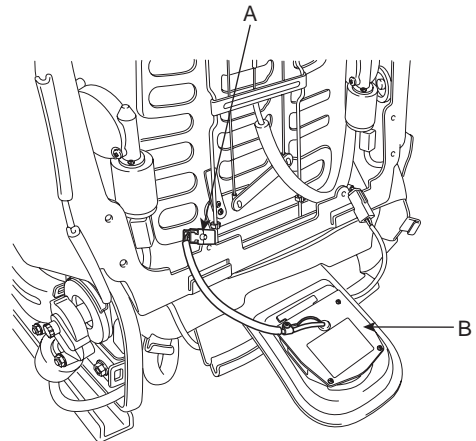
SGHBE6260D

2. After disconnecting the scuff band (A), remove the seat back panel (B).



SGHBE6261L

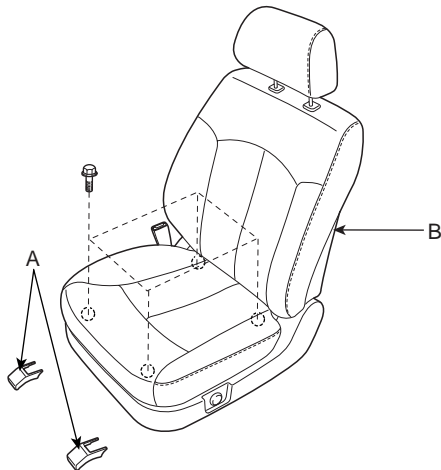
3. Disconnect the connector (A) from the seat cover. And if the FAN (B) is not operating properly, change the FAN.



SGHBE6262D

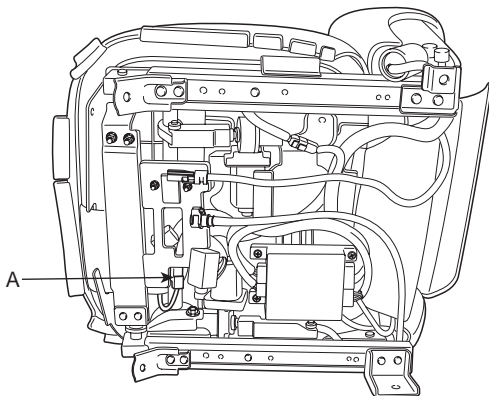
CUSHION FAN

1. Remove the seat assembly mounting cover (A). After loosening the seat assembly mounting bolts, remove the seat assembly (B).



SGHBE6260D

2. Disconnect the connector (A) from the seat cover. And if the FAN (B) is not operating properly, change the FAN.



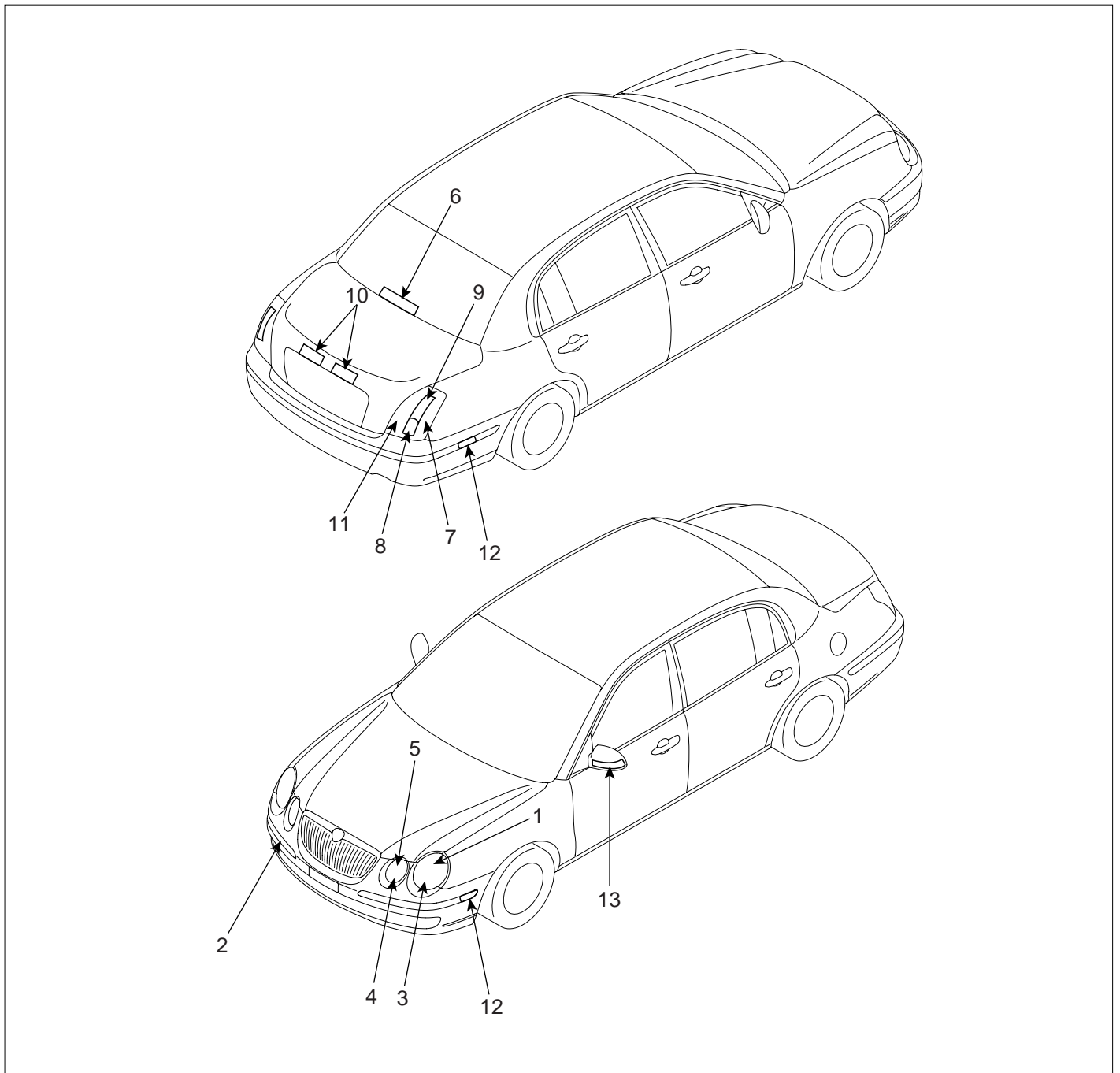
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LIGHTING SYSTEM

SPECIFICATION EDD2DF50

Items	Bulb Wattage (W)
Head lamp (High)	55
Head lamp (Low)	35
Front turn signal lamp	14.5 (LED) / 5 (BULB)
Front position lamp	5
Front fog lamp	55
Rear stop/tail lamp (Outside)	27/8
Back up lamp	18
Rear turn signal lamp	28
Rear fog lamp	5
License plate lamp	5
Side repeater	5
Room lamp	10
Overhead console lamp	5
High mounted stop lamp	2.5 LED
Glove box lamp	5
Trunk lamp	5

COMPONENT LOCATION E1BFAB6B



- 1. Head lamp (Low)
- 2. Front turn signal lamp
- 3. Front fog lamp
- 4. Position lamp
- 5. Head lamp (High)
- 6. High mounting stop lamp
- 7. Tail lamp

- 8. Back up lamp
- 9. Rear turn signal lamp
- 10. License plate lamp
- 11. Stop lamp
- 12. Side repeater lamp
- 13. Trun signal lamp (Door Mirror)

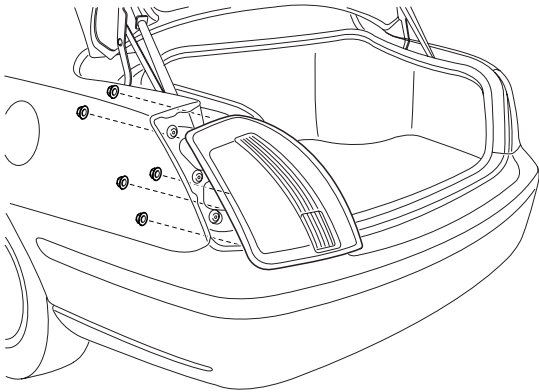
SGHBE6430L

TURN SIGNAL LAMP

REMOVAL E3A0858D

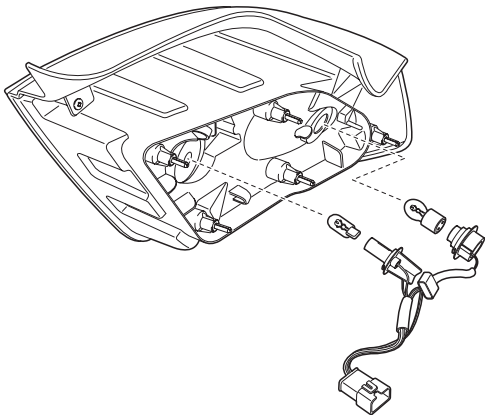
REAR COMBINATION LAMP

1. Disconnect the negative (-) battery terminal.
2. Loosen the nuts (5EA) holding the rear combination lamp then disconnect the connector then remove the outside rear combination lamp.



SGHBE6449D

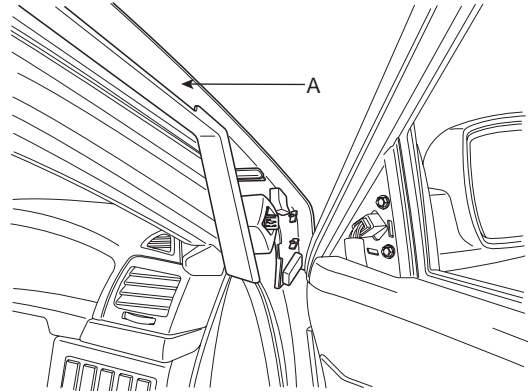
3. Replace the bulbs (2EA) after disconnecting the rear combination lamp assembly.



SGHBE6450D

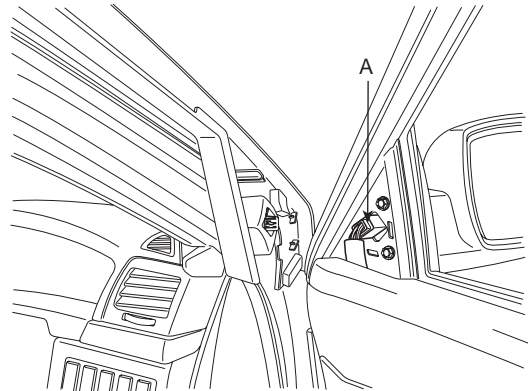
TURN SIGNAL LAMP(DOOR MIRROR)

1. Disconnect the negative (-) battery terminal.
2. Remove the tweeter speaker cover (A). (Refer to the BD group - " Front Door")



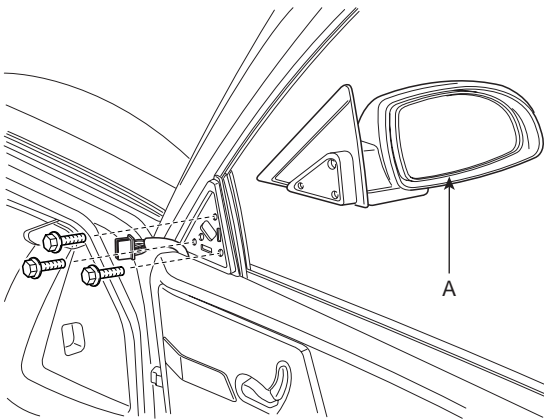
SGHBE6451D

3. Disconnect the door mirror connector (A).



SGHBE6452D

4. Loosen the 3 bolts and screw then remove the door mirror(A).



SGHBE6453D



CAUTION

Turn signal lamp of door mirror is used LED (Light-emitting Diode).

INSTALLATION

E13BC7ED

REAR COMBINATION LAMP

1. Connect the bulbs to the rear combination lamp assembly.
2. Connect the rear combination lamp connector.
3. Reassemble the rear combination lamp assembly.

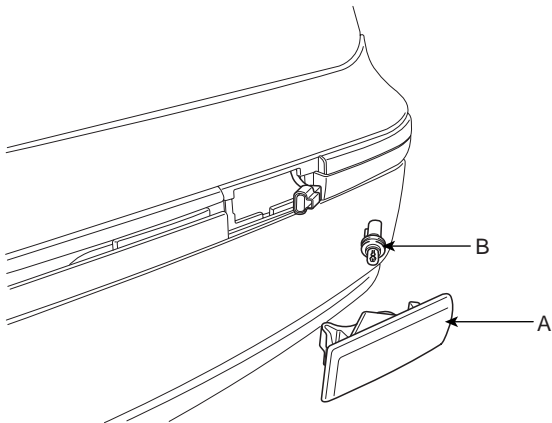
TURN SIGNAL LAMP(DOOR MIRROR)

1. Reassemble the door mirror to the door.
2. Connect the door mirror connector.
3. Reassemble the tweeter speaker.

SIDE REPEATER LAMP

REMOVAL E3A5AA38

1. Disconnect the negative (-) battery terminal.
2. Remove the side repeater lens (A) from the panel using the scraper.



SGHBE6455L

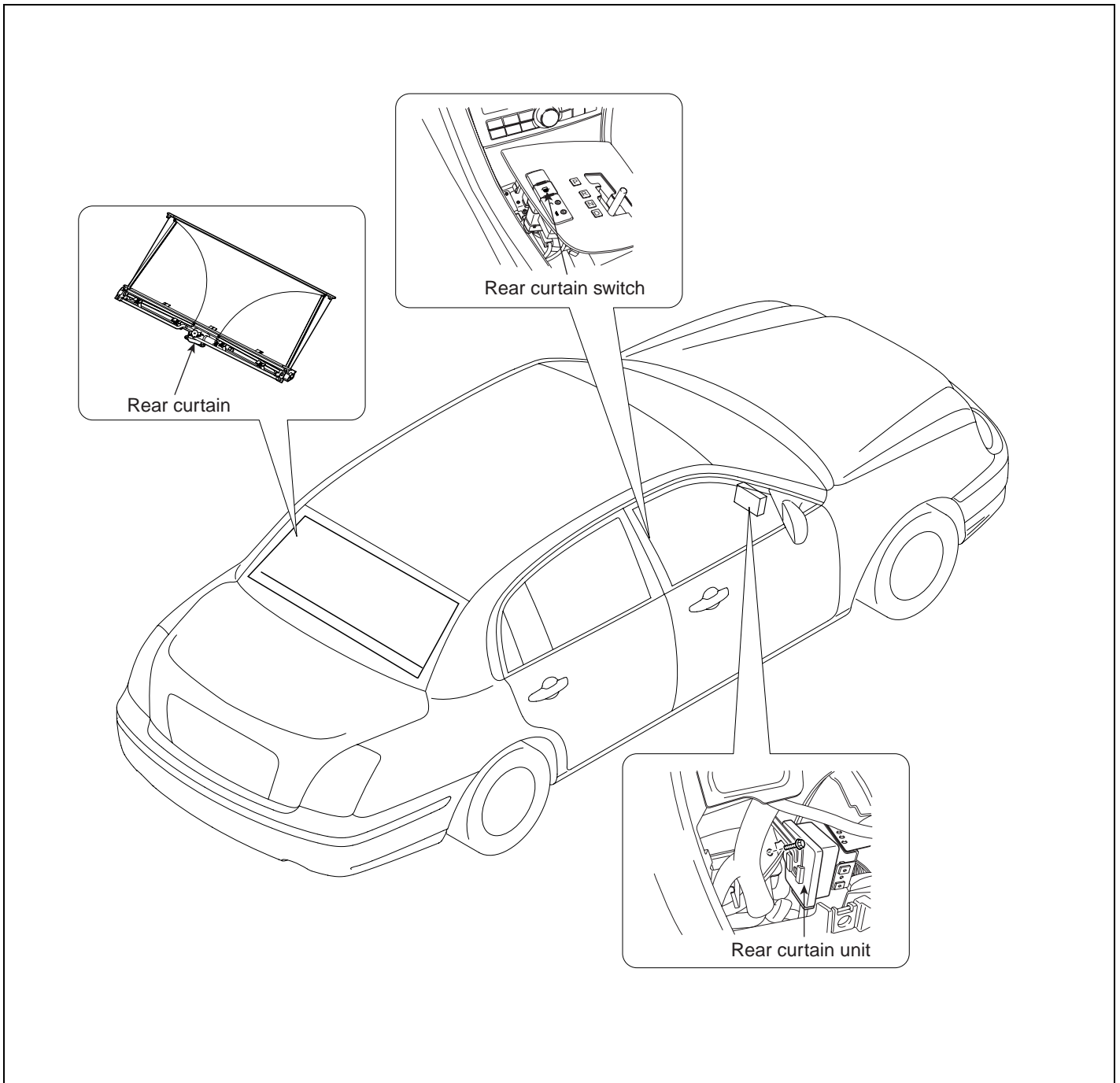
3. Replace the bulb(B).

INSTALLATION E32EC9B3

1. Install the bulb.
2. Install the side repeater lamp lens.

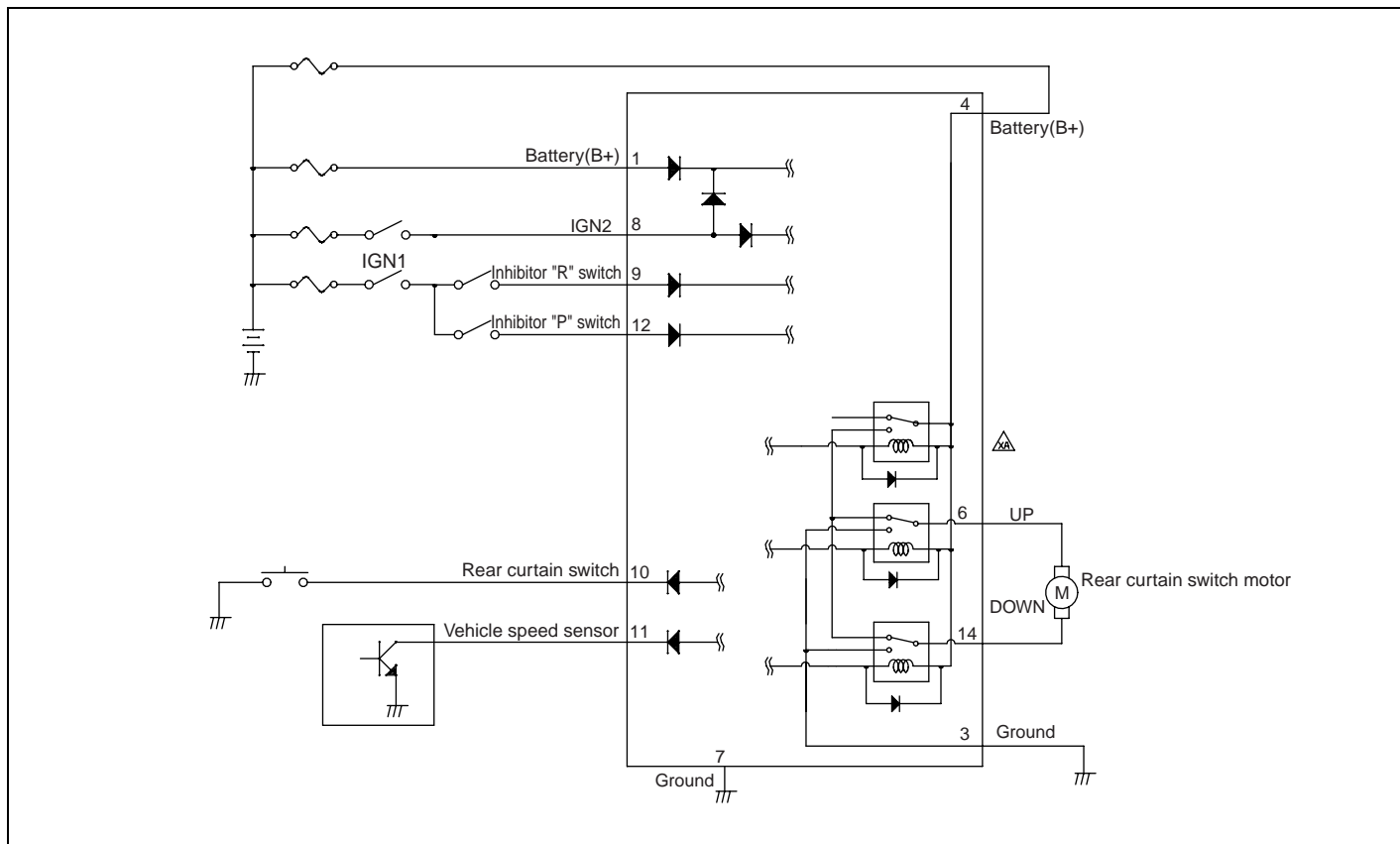
REAR CURTAIN SYSTEM

COMPONENT LOCATION E9EFABFE



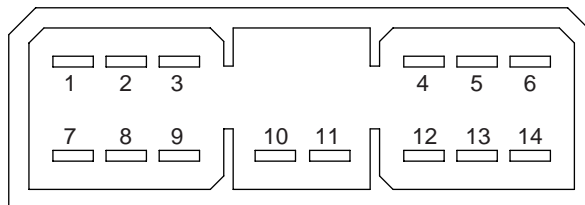
SGHBE7390L

CIRCUIT DIAGRAM EA1AD087



ETBF390A

REAR CURTAIN UNIT CONNECTOR



KTCF390B

PIN NO.	Connector	PIN NO.	Connector
1	B+	8	IG2
2	-	9	Inhibitor " R" switch
3	Ground	10	Rear curtain switch
4	B+	11	Vehicle speed sensor
5	-	12	Inhibitor " P" switch
6	Motor UP	13	-
7	Ground	14	Motor DOWN

REAR CURTAIN SYSTEM

BE -25

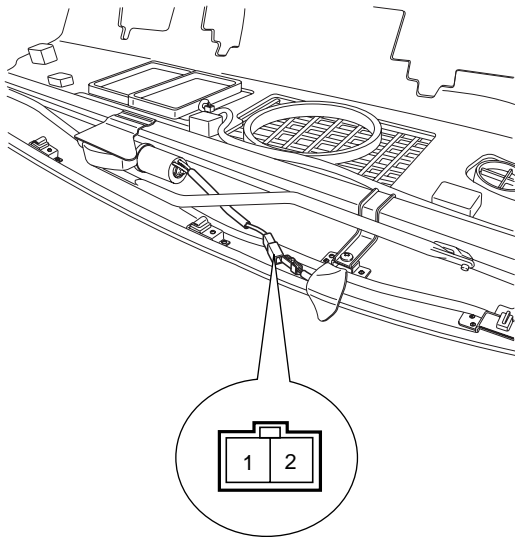
DESCRIPTION E4BDA84A

You can up & down rear curtain automatically by pressing the rear curtain switch. Rear curtain protect passenger from a direct ray of light by covering rear glass.

REAR CURTAIN

INSPECTION ED09099F

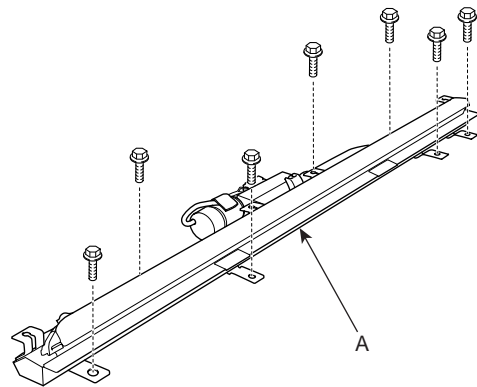
Connect the battery voltage and check the rear curtain motor rotation. If the motor does not operate properly, substitute with a known-good rear curtain motor and check for proper operation.



SGHBE6391D

REMOVAL ED1B8625

1. Disconnect the negative (-) battery terminal.
2. Remove the rear package tray after removing the rear seat. (Refer to the Body group- interior trim)
3. Remove the connector of the rear curtain and 6 mounting bolts.
4. Remove the rear curtain (A) from the rear package trim.



SGHBE6392D

INSTALLATION EA1D3DF1

1. Reassemble the rear curtain to the rear package trim.
2. Connect the rear curtain connector.
3. Reassemble the rear package tray.

REAR CURTAIN UNIT

INSPECTION E03B9768

1. AUTO UP/AUTO DOWN FUNCTION

- 1) IGN ON, if you press the rear curtain switch, rear curtain motor operates the reverse direction of the before direction. (UP/DOWN)
- 2) After replacing battery, if you operates rear curtain switch, rear curtain is operated auto up.
- 3) If the switch input occurred during rear curtain auto up or auto down, rear curtain is operated to the reverse direction after making a pause.
- 4) AUTO function stop when detect an excess current.

2. TIMER FUNCTION

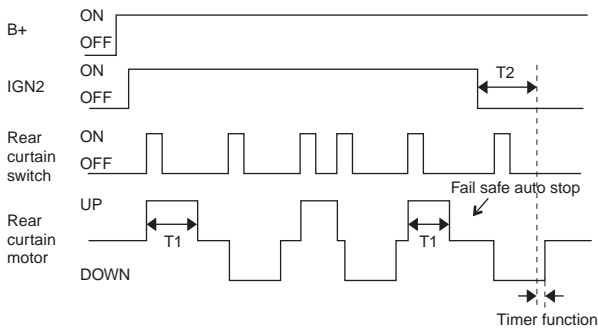
- 1) It can be possible to operate rear curtain for 30 sec after IGN OFF.
- 2) It can be possible to operate rear curtain operation by the end of motor operation although timer is finished during auto up/ down.

3. FAIL SAFE FUNCTION

If motor operation doesn't stop more than 10 sec after starting, motor is stopped by inner relay auto OFF.

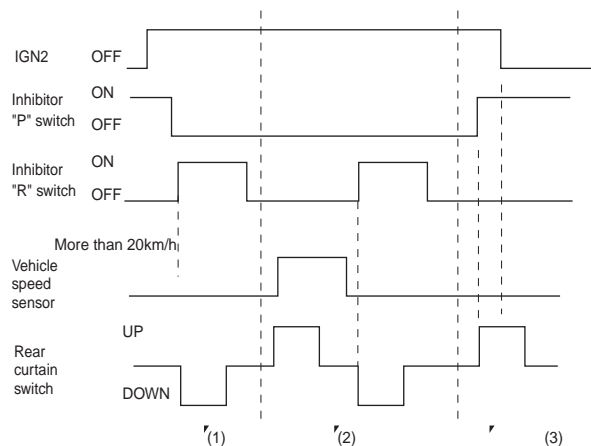
4. RETROGRESSION GEARING FUNCTION

- 1) When, rear curtain motor IGN ON, rear curtain UP and shift lever "P" position, rear curtain motor linked with the signal makes auto down.
- 2) When the vehicle speed is above 20 km/h from 1) condition, rear curtain motor linked with the signal makes auto up. Only, the motor does not operate below 20 km/h.
- 3) When shift lever position will be changed from R to P from 1) condition, rear curtain motor linked with the signal makes auto up. Only, the case where the driver presses the knock-down switch is excepted.
- 4) To the case where the driver presses the down switch from rear curtain up condition motor does not do a retrogression gearing operation and the up return operation due to a vehicle speed. After that, when driver presses the switch and the motor becomes auto up, the retrogression gearing operation is possible again.

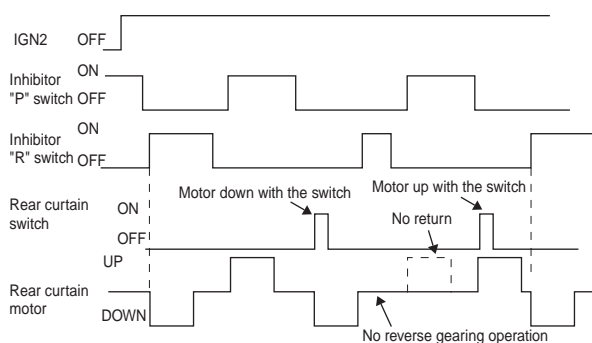


ETBF392B

T1 : MAX 10 sec,
T2 : 30 sec.



ETBF392C



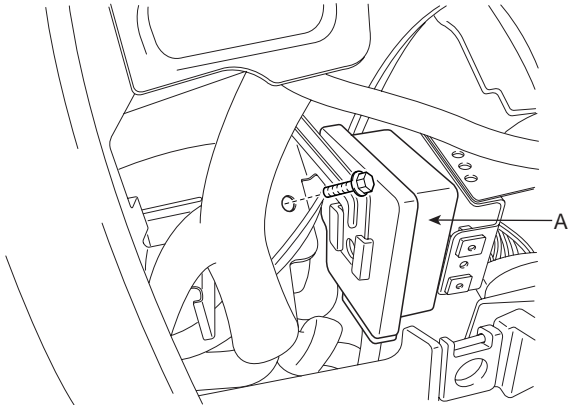
ETBF392D

REAR CURTAIN SYSTEM

BE -27

REMOVAL EC2292DD

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel. (Refer to the Body group - Crash pad)
3. Remove the rear curtain unit (A) after removing a mounting nut and connector.



SGHBE6393D

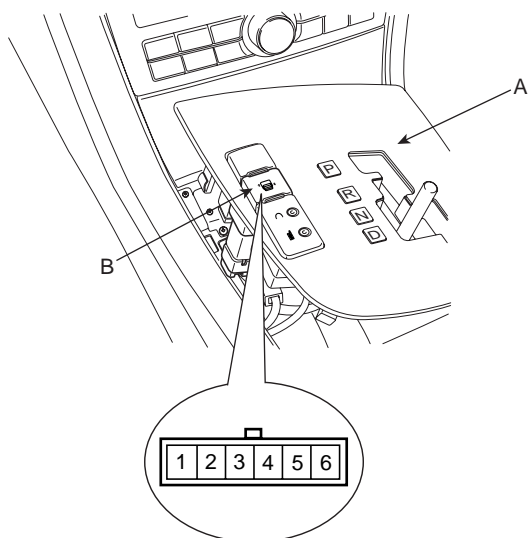
INSTALLATION EC07EEDE

1. Reassemble the rear curtain unit and then connect the connector.
2. Reassemble the center facia panel.

REAR CURTAIN SWITCH

INSPECTION E9AD00A5

1. Disconnect the negative (-) battery terminal.
2. Remove the console upper cover (A) by using the scrapper.
3. Remove the rear curtain switch (B) from the console upper cover (A) after removing the connector.



SGHBE6394D

4. Check for continuity between the terminals. If the continuity is not as specified, replace the rear curtain switch.

Terminal Position	5	6	4	3
ON				
OFF	Illumination			

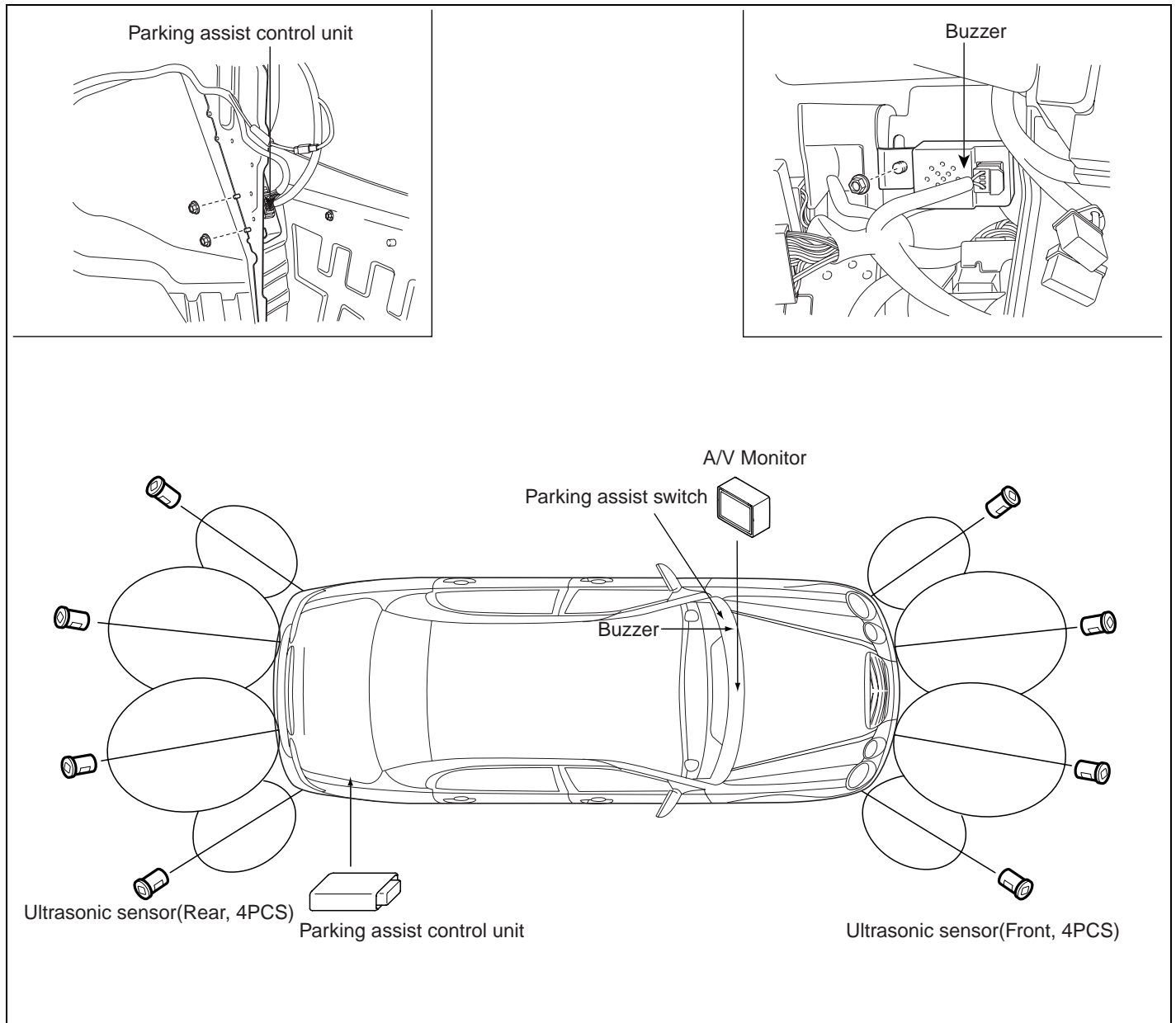
ETBF393B

REAR PARKING ASSIST SYSTEM

SPECIFICATION E8DB1C4F

Item		Specification
Parking assist control unit	Rated voltage	DC 12V
	Operating voltage	DC 9 ~ 16V
	Operating temperature	-30°C ~ +80°C
	Operating temperature	-40°C ~ +85°C
	Operating current	600mA MAX
	Reseving frequency	48 ± 5 KHZ
	Monitoring method	The front sides - less than 10km/h The rear sides - less than 15km/h
	Alarm method	Direct & Indirect monitoring
Ultrasonic sensor	Rated voltage	DC 8V
	Operating voltage	DC 6 ~ 9V
	Operating current	100mA MAX
	Operating temperature	-30°C ~ +80°C
	Reserving temperature	-40°C ~ +85°C
	Beam width	Horizontal 100°/Vertical 40°
	Operating frequency	48 ± 5KHZ
	Sensors number	8PCS (Front 4, Rear 4)
Piezo buzzer	Rated voltage	DC 12V
	Operating voltage	DC 9 ~ 16V
	Operating temperature	-30°C ~ +80°C
	Reserving temperature	-35°C ~ +85°C
	Operating current	60mA MAX
	Sound, Tone	Oscillation frequency : 2.2 ± 0.5KHZ Sound level : 70dB (DC 13V, /m)

COMPONENT LOCATION E926A83B



SGHBE7001L

DESCRIPTION ECA5A6FA

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

OPERATION E7F874A0

OPERATING CONDITION

1. If the ignition switch is on,
2. If the operating switch is on,
3. The valid operating speed of vehicle ; When the vehicle moving forward less than 10km/h and backward less than 15 km/h.
4. Front warning sensor operating case - In state of any state except 'P'range, 'R'range.
Back warning sensor operating case - In state of 'R' range.
5. The state of 'Parking brake' is released.

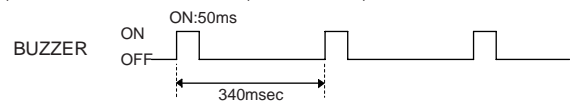
When above 1, 2, 3, 4, 5 are in 'and' condition, it operates properly.

DISTANCE MEASUREMENT AND WARNING METHOD

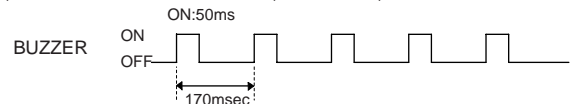
- It may not operate if it' s distance from the object is already less than approximately 30 cm when the system is ON..
- Self diagnosis alarm flashes all indicators of each sensor in 0.5 seconds..
- The third distance alarm flashes the third alarm indicator of each sensor in every 0.5 second.

1. Rear side of the vehicle

1) THE FIRST ALARM AREA (61cm~100cm)



2) THE SECOND ALARM AREA (31cm~60cm)



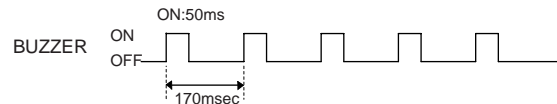
3) THE THIRD ALARM AREA (BELOW 30cm)



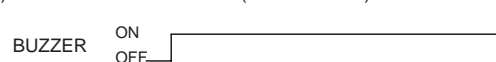
SGHBE7002L

2. Front side of the vehicle

1) THE SECOND ALARM AREA (31cm~60cm)



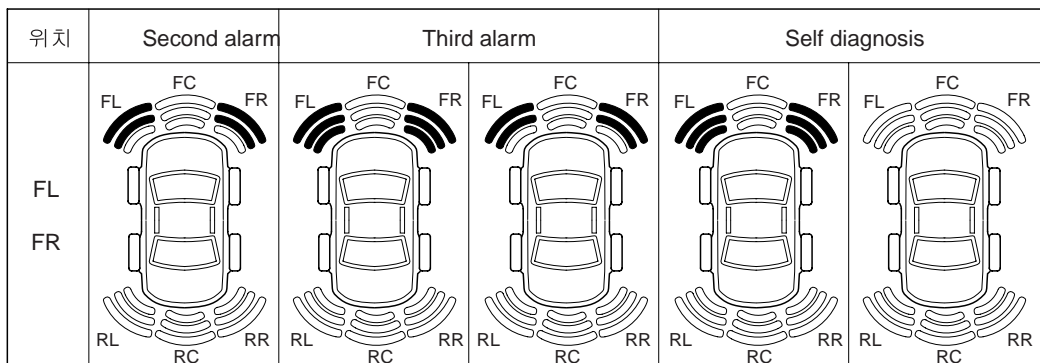
2) THE THIRD ALARM AREA (BELOW 30cm)



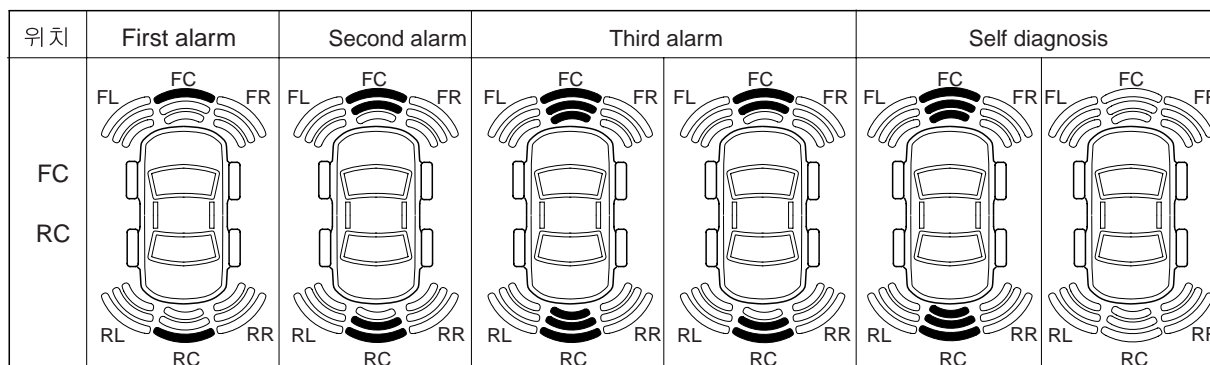
SGHBE7003L

3. Indicator state

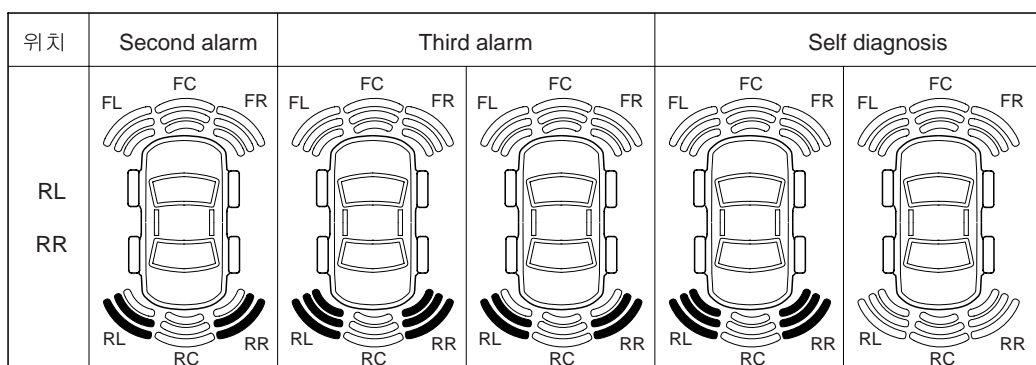
[Front side]



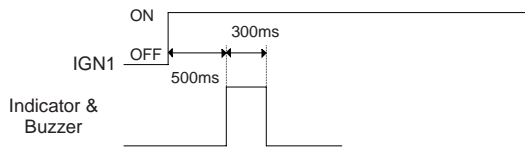
[Front/rear center]



[Rear side]



4. When backing the vehicle



SGHBE7006L

Operate with ignition switch on and shift the lever to position "R".

If no trouble, it generates buzzer alarm sound ON for 0.3 seconds after 0.5 seconds.

NOTICE USING THIS PRODUCT

This product is an assistant device in order to enhance a convenience under driving which gives the alarm according to the adjacent degree to the object by monitoring an object between the front & back 100cm and the corner 60cm when slowly moving forward at 15[km/h], or parked at 10[km/h].

This system can't monitor an obstacle because the detectable range and object are limited, so be careful.

Don't guarantee the vehicle accident and damage resulted from the defect of the product.

1. Can't normally operate in the following cases.

- 1) When the sensor is frozen.(normally operate if it is thawed)
- 2) When covering the sensor surface with the materials such as a snow or water drop etc. (normally operate if it is removed or the obstacle of the sensor face is removed.)

2. The monitoring range can become narrow in the following cases.

- 1) When the materials such as a snow or water-drop,etc. are attached to the monitoring part of the sensor. (recover the normal monitoring range if it is removed.)
- 2) A scorcher or severe cold.
- 3) An object smaller than the diameter 14cm, length 1m.

3. Can malfunction in the following cases.

- 1) When backing the vehicle on an uneven road, gravel road, sloping road, grass.
- 2) In the case that the object occurring the ultrasonic wave such as the vehicle horn, motorcycle's engine sound and full-size sedan's air brake,etc. is adjacent.
- 3) In the case that is overtaken by the rainstorm or raises the spray
- 4) When using the wireless apparatus which has the transmission function near the sensor.
- 5) When the sensor is covered with a snow.

4. The following objects may not be monitored.

- 1) A sharp object or a thin object such as a rope
- 2) An object easy to absorb the sound wave such as a cotton or sponge, snow, etc.

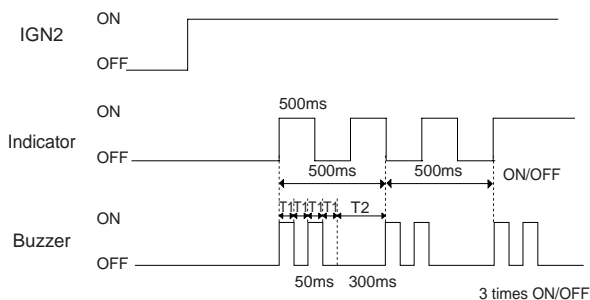
5. The others</ptxt>

- 1) The danger alarm amy not be made successively according to the traveling speed, or target' shape.
- 2) Can malfunction in the following cases; the bumper height or the sensor' fitting status is changed, or an accessory besides the vehicle when delivered is attached to the sensor adjacent to the bumper within the detectable area.
- 3) Even if the object exists within 30cm from the sensor, it may not be detected, so be careful.
- 4) If the sensor indicate the error, check the sensor' state because the sensor is frozen or a snow, water drop are covered, and then remove by using a soft material when stained.
- 5) Don't the following actions which result in the damage of the sensor surface; press the surface of the sensor by force, or impact it with a hard object, or scratch with a sharp object.

SELF-DIAGNOSIS E723AFFC

If the system is supplied with the power(when the ignition is on), MICOM shall check the abnormal conditions of the system and sensors exist or not.

1. When the system is out of order



T1 : 50ms, T2 : 300ms.

SGHBE7007L

- Sensors with something wrong mark as follows using the indicator and the buzzer, and other sensors with no wrong performs monitoring function normally.

2. When both the normal and abnormal state of sensors show at the same time

When there is a problem in any sensors and indicator shows the state of sensors' malfunction, other sensors perform monitoring function normally, or in reverse case, indicator marks the state of sensor's malfunction, but buzzer normally alarms the nearest obstacle from the vehicle.

3. Alarm priority condition(buzzer only)

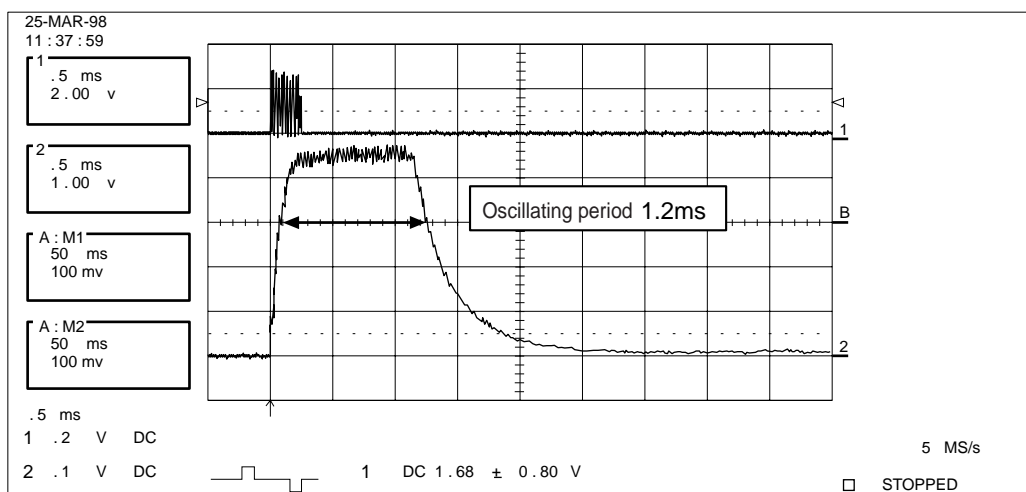
When multiple sensors detect obstacles, the nearest one is alarmed without Division in sensors.

4. Sensor connection checking

Transmit ultrasonic wave to the sensors, boost input signal, and detect wave.

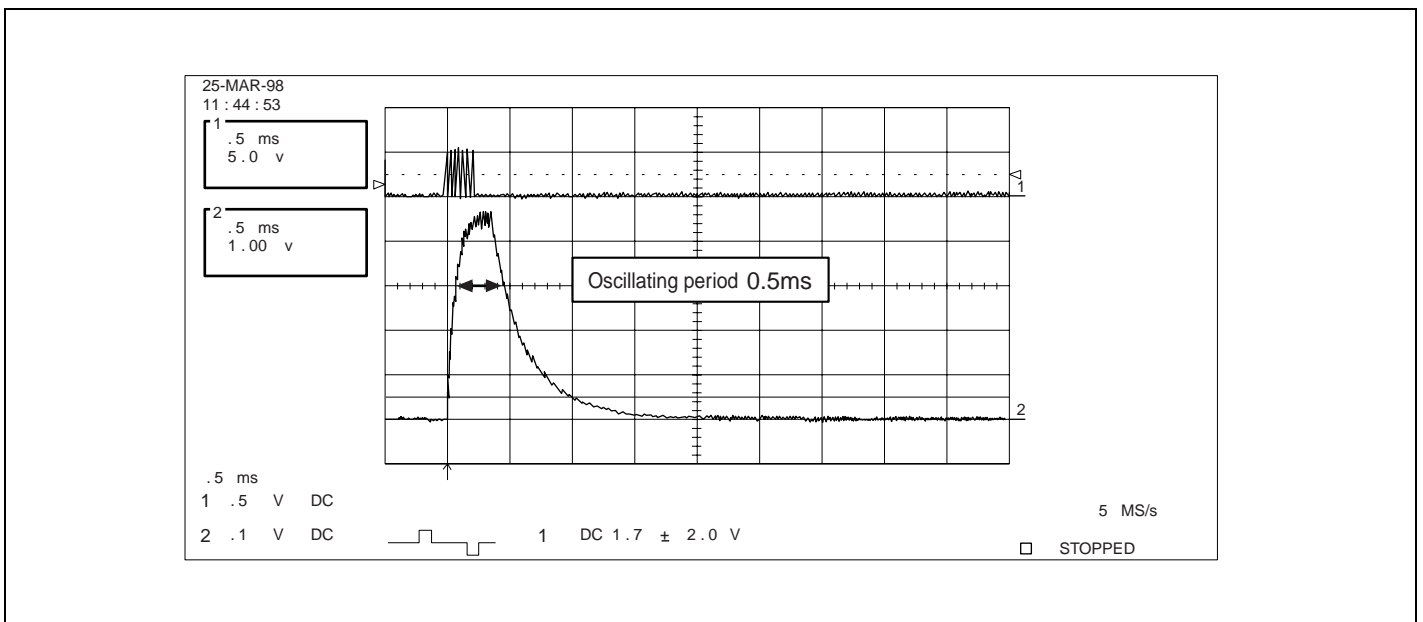
Waveform will be found, oscillating for a certain period of time.

1) Waveform for a normal sensor connection



BTKG230F

2) Waveform for a failed sensor connection



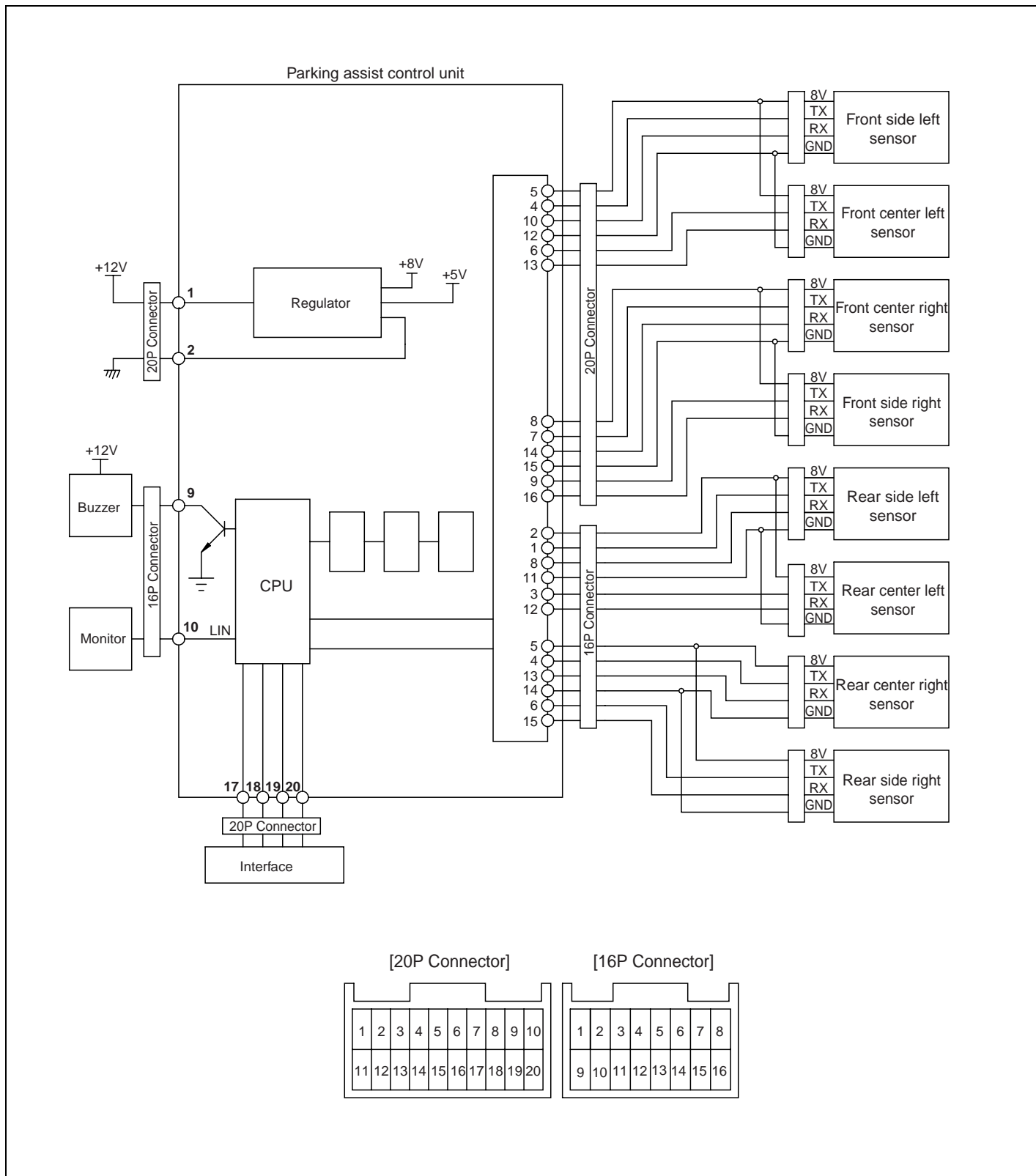
BTKG230G

NOTE

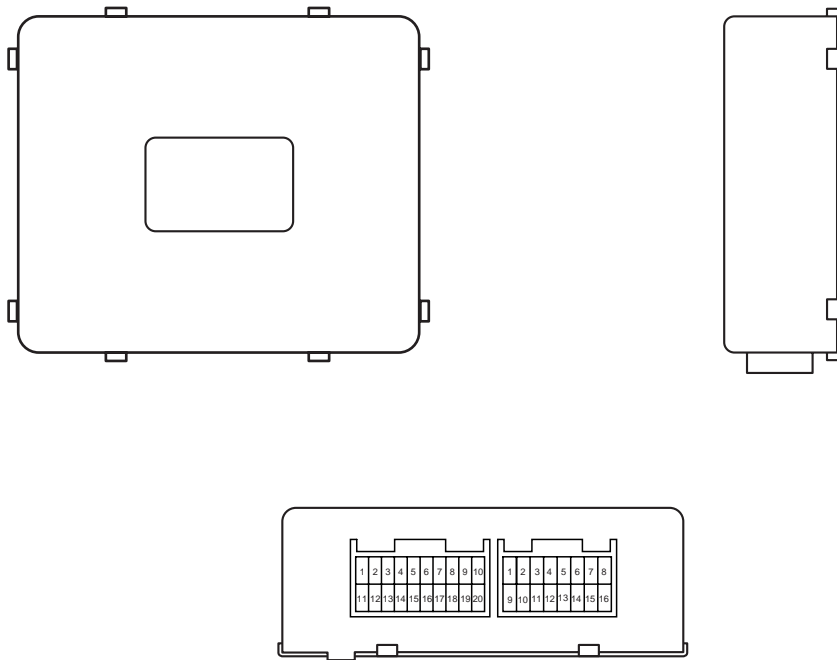
Sensor connection will be checked for oscillating period of input signal 3V. If oscillating period is more than 0.8ms, it is normal.

REAR PARKING ASSIST SYSTEM CONTROL MODULE

CIRCUIT DIAGRAM EDEFB3CF



CONTROL UNIT TERMINAL ALIGNMENT AND INSPECTION

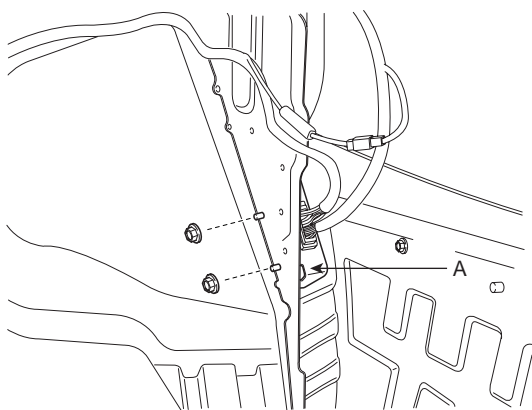


단자점검

CONNECTOR(20P)		CONNECTOR(16P)	
PIN NO.	Connector	PIN NO.	Connector
1	POWER	1	RL-TX(RL:REAR LEFT)
2	GND(MAIN)	2	RL & RCL POWER
3	-	3	RCL-TX (RCL : REAR CENTER LEFT)
4	FL-TX(FL:FRONT LEFT)	4	RCR-TX(RCR : REAR CENTER RIGHT)
5	FL & FCL POWER	5	RR & RCR POWER
6	FCL-TX(FCL:FRONT CENTER LEFT)	6	RR- TX(RR : REAR RIGHT)
7	FCR-TX(FCR:FRONT CENTER RIGHT)	7	-
8	FR & FCR POWER	8	RL-RX
9	FR-TX(FR:FRONT RIGHT)	9	BUZZER
10	FL-RX	10	LIN
11	-	11	RL & RCL GND
12	FL & FCL GND	12	RCL - RX
13	FCL-RX	13	RCR - RX
14	FCR-RX	14	RR & RCR GND
15	FR&FCR GND	15	RR - RX
16	FR-RX	16	-
17	P-RANGE		
18	R-BRAKE		
19	R-GEAR		
20	SPEED-SEN		

REMOVAL E9ECE91B

1. Remove the right side trim of the trunk.
2. Loosen the mounting nuts and disconnect the connector.
3. Remove the parking assist control unit(A).



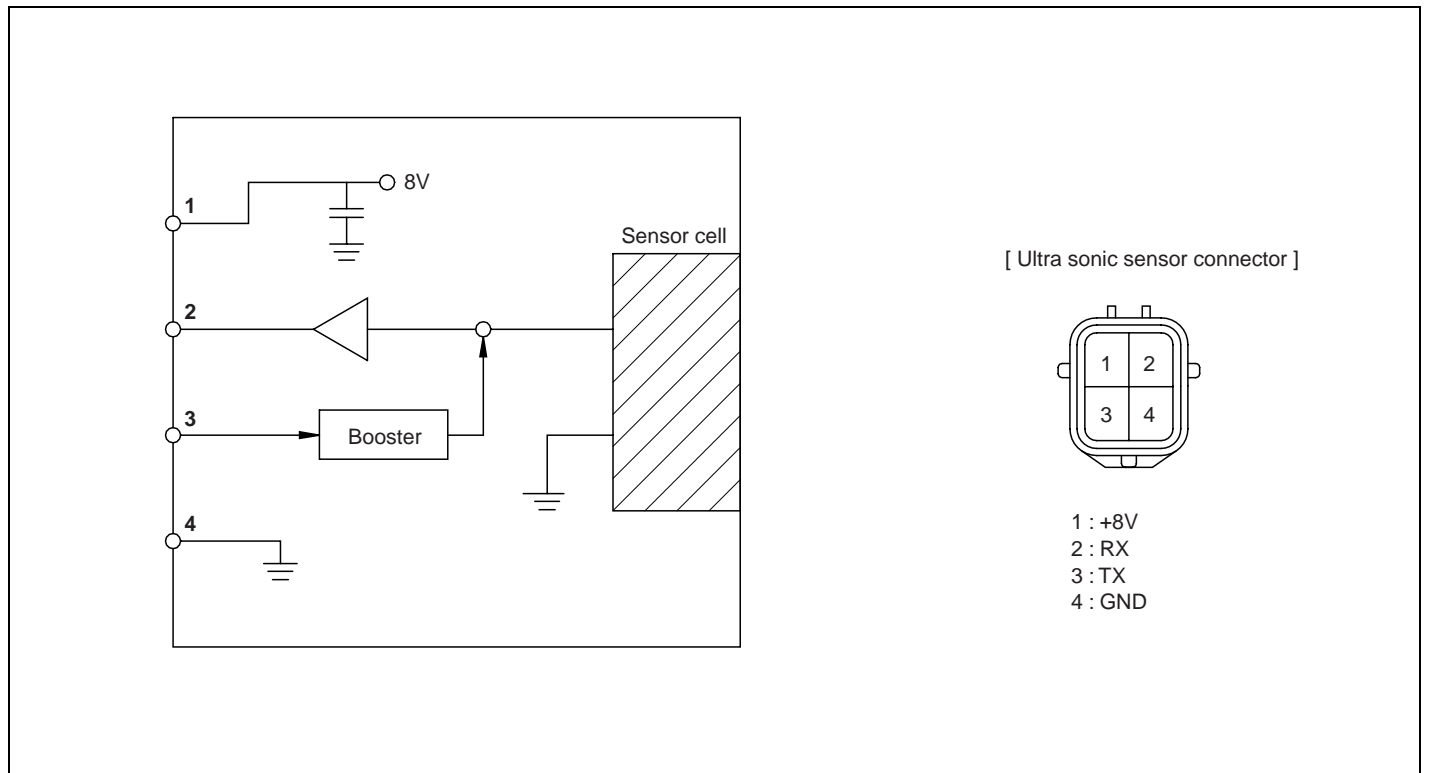
SGHBE6009D

INSTALLATION EEF7C42A

1. Reassemble the parking assist control unit.
2. Connect the connector and then reassemble the right side trim of the trunk.

ULTRASONIC SENSOR

CIRCUIT DIAGRAM E6E7E0C0



SGHBE7014L

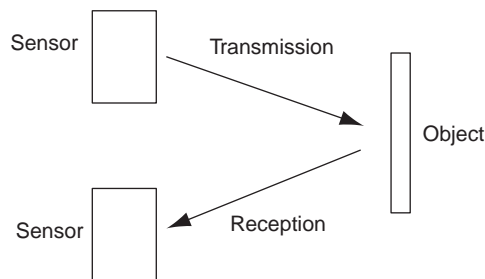
OPERATION PRINCIPLE EA1A4FCF

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

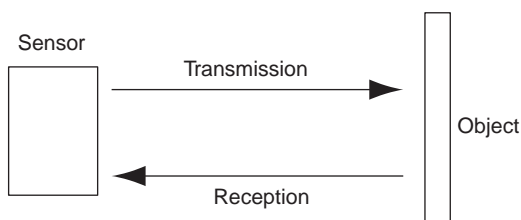
DISTANCE DETECTION TYPE

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

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



ETRF762B



ETRF762A

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

MEASUREMENT PRINCIPLE

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

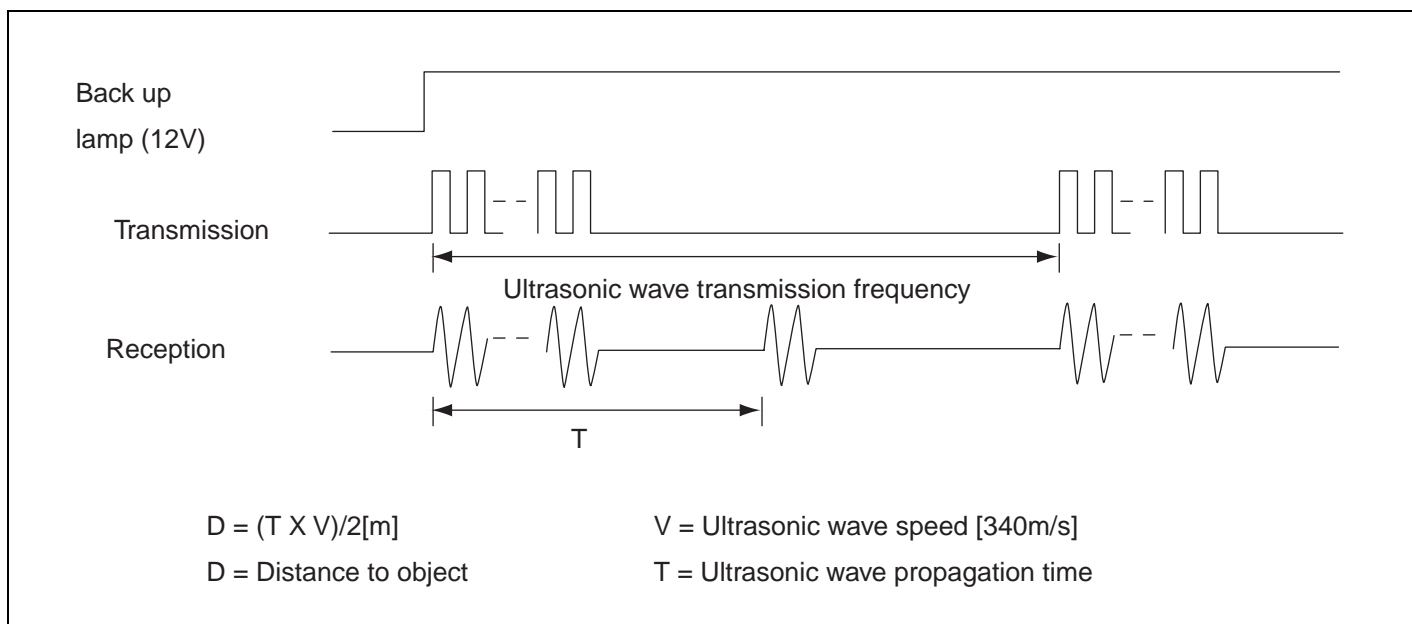
The propagation speed formula of ultrasonic wave in air is following :

$$v=331.5 + 0.6t \text{ (m/s)}$$

v=ultrasonic wave propagation speed

t=ambient temperature

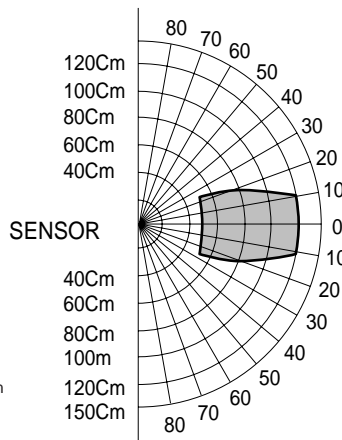
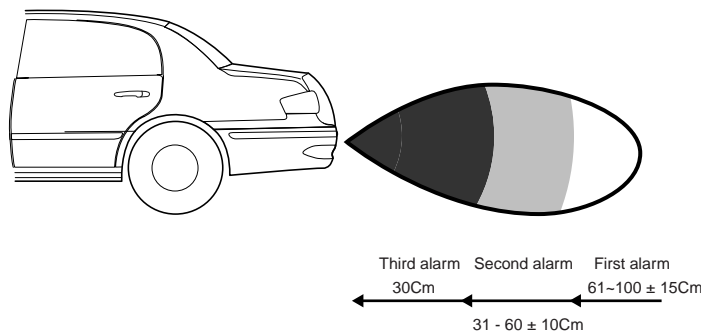
The basic principle of distance measurement using ultrasonic wave is :



LTLG762C

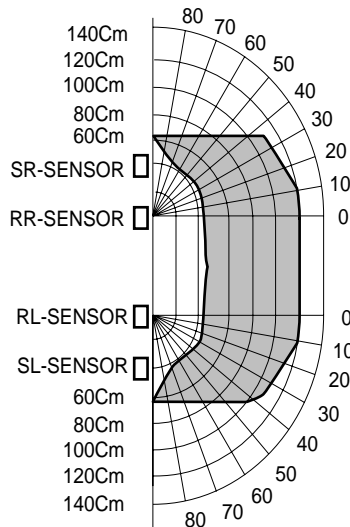
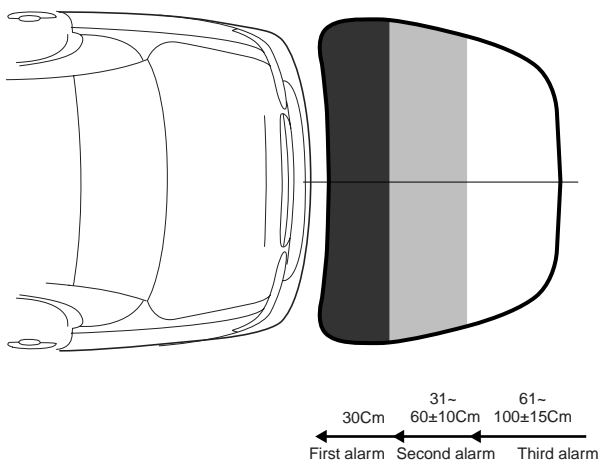
SENSOR DETECTION RANGE

[Vertical range]



1. Distance tolerance(Measured at the front of sensor)
 - 61~100cm : ±15cm
 - 31~60cm : ±10cm
 - 30cm : ±10cm
2. Detection tolerance
 - At 30cm : 30° ± 15°
 - At 60cm : 15° ± 15°
 - At 100cm : 10° ± 15°
3. At nearer distance than 30cm detection may occur.
4. Measurement condition : Room temperature (20°C), 90mm diameter, 3m length rod.

[Horizontal range]



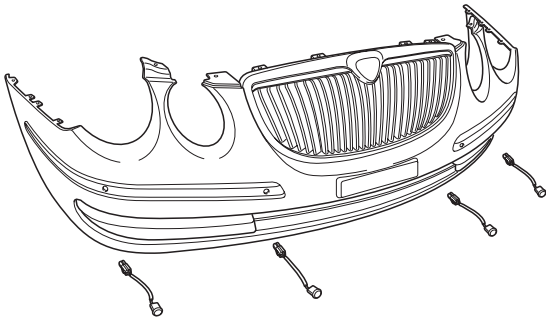
1. Distance tolerance(Measured at the front of sensor)
 - 61~100cm : ±15cm
 - 31~60cm : ±10cm
 - 30cm : ±10cm
2. Detection tolerance
 - At 60cm : 70° ± 20°
 - At 100cm : 20° ± 20°
3. At nearer distance than 30Cm detection may occur.
4. Measurement condition : Room temperature (20°C), 140mm diameter, 3m length rod.

NOTE

1. 14cm (dia.) plastic rod is used for the test target.
2. The test result may differ by a different target object.
3. Detection range may be reduced by dirt accumulated on sensor, and extremely hot or cold weather.
4. The following object may not be detected.
 - Sharp object or thin object like rope.
 - Cotton sponge, snow or other materials absorbing sonic wave.
 - Smaller objects than 9cm (dia.), 1m length.

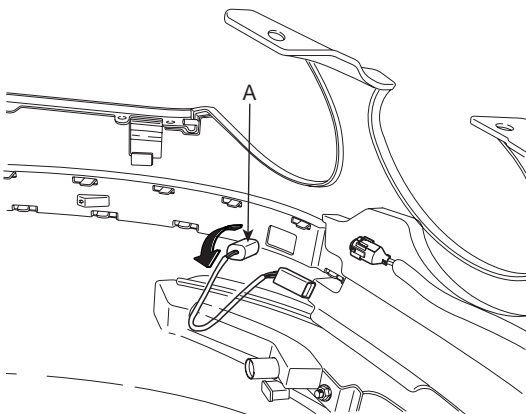
REMOVAL E36E4680

1. Disconnect the negative(-) battery terminal.
2. Remove the front and rear bumper (Refer to the Body group - "Front/Rear bumper").



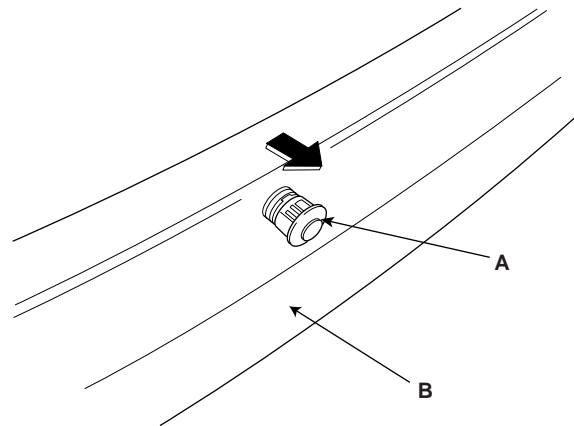
SGHBE6012D

3. Disconnect the sensor connector at the inside of the rear bumper, and then remove the ultrasonic sensor(A) from the housing.



SGHBE6013D

4. Remove the ultrasonic sensor(A) from the housing(B).



KTZE308A

INSTALLATION E2B0286D

1. Reassemble the ultrasonic sensor and connect the connector.
2. Reassemble the front and rear bumper.